410SX

Gas

Operator's Manual

CE

CMW®

Issue 2.3
Original Instruction

053-2678

Chapter ContentsOverview

Chapter Contents

Serial Number Location 2

Intended Use 3

Unit Components 4

- Tractor 4
- Plow 4
- Trencher 5
- Drill 5
- Reel Carrier 6

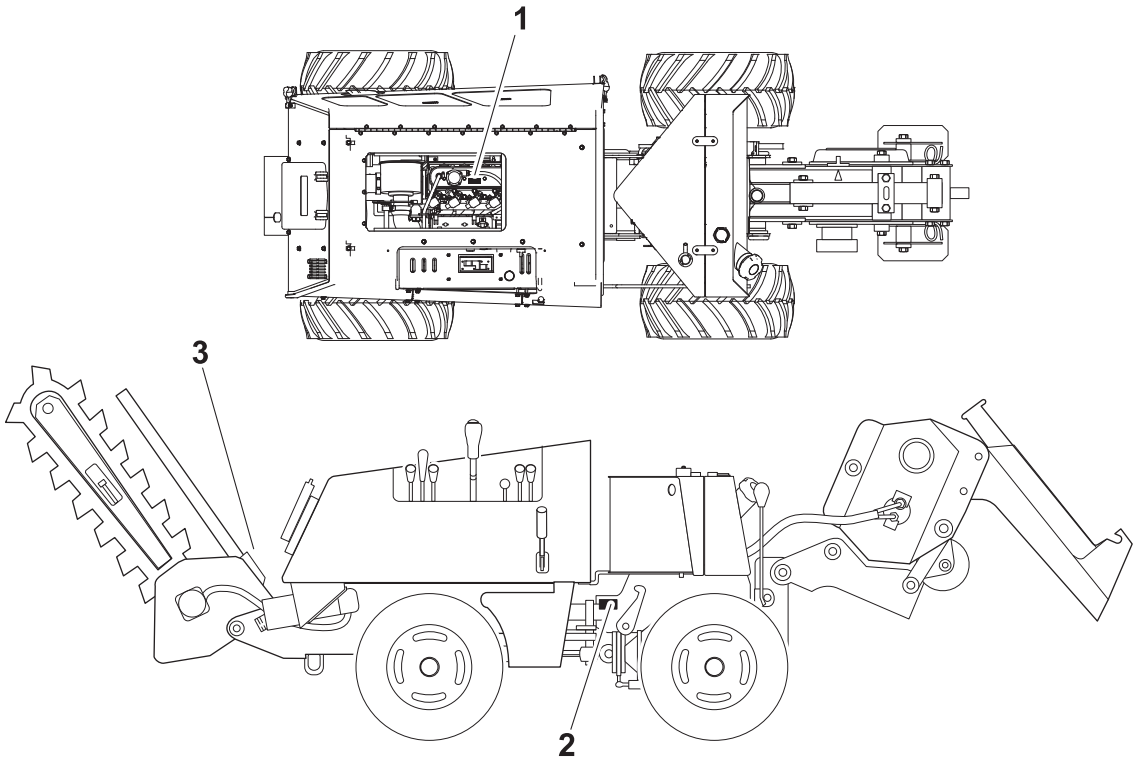
Operator Orientation. 7

About This Manual 7

- Bulleted Lists 7
- Numbered Lists 7

Serial Number Location

Record serial numbers and date of purchase in the spaces provided.



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Date of manufacture	
Date of purchase	
H400 trencher serial number (3)	
410sx tractor serial number (2)	
Engine serial number (1)	

Intended Use

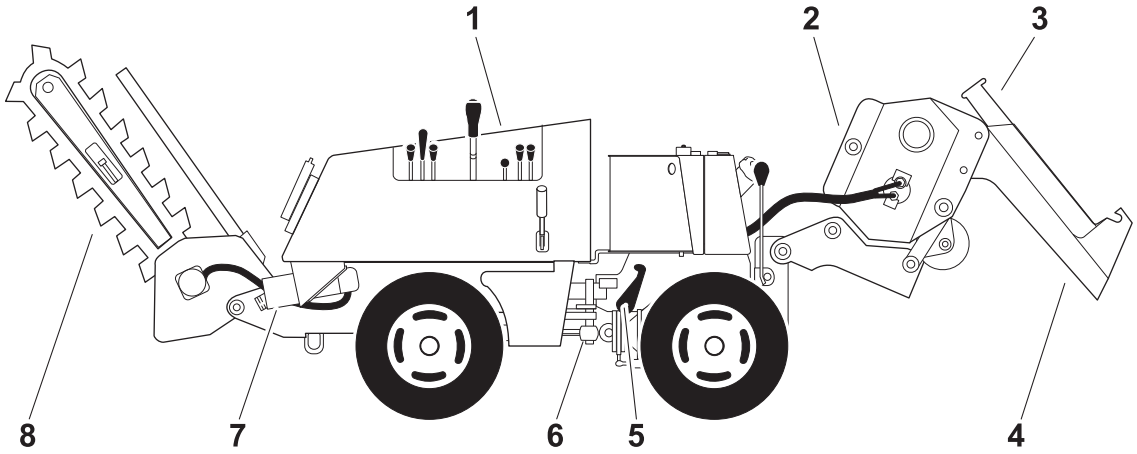
The 410sx is an articulating, hydrostatic, four-wheel drive, pedestrian vibratory plow designed to bury cable or pipe in a variety of soils. An optional trenching attachment, drilling attachment, and reel carrier are available. The 410sx is powered by a liquid-cooled 49.6 hp (37.0 kW) four-cylinder Kubota gasoline engine.

The unit is designed for operation in temperatures typically experienced in excavation and construction work environments. Provisions may be required to operate in extreme temperatures. Contact your Ditch Witch dealer. Use in any other way is considered contrary to the intended use.

The H400 trencher should be used with genuine Ditch Witch chain, teeth, and sprockets. The 410sx should be operated, serviced, and repaired only by persons familiar with its particular characteristics and acquainted with the relevant safety procedures.

Unit Components

Tractor



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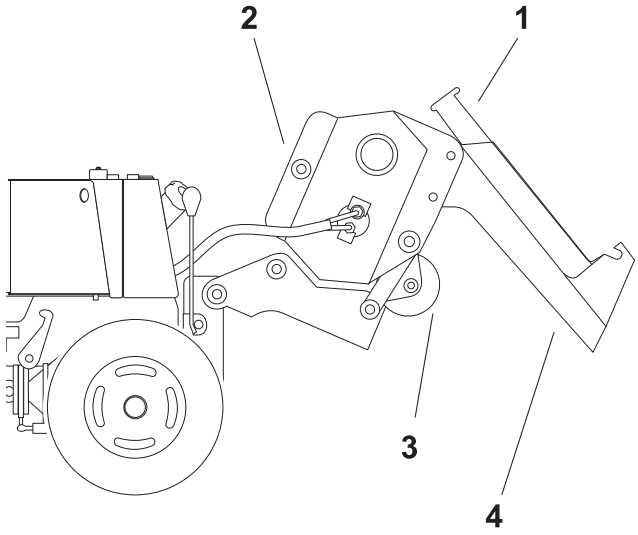
1. Operator console
2. Vibrator
3. Feed tube
4. Plow blade
5. Frame lock
6. Articulation joint
7. Drilling attachment
8. Trencher attachment

Plow



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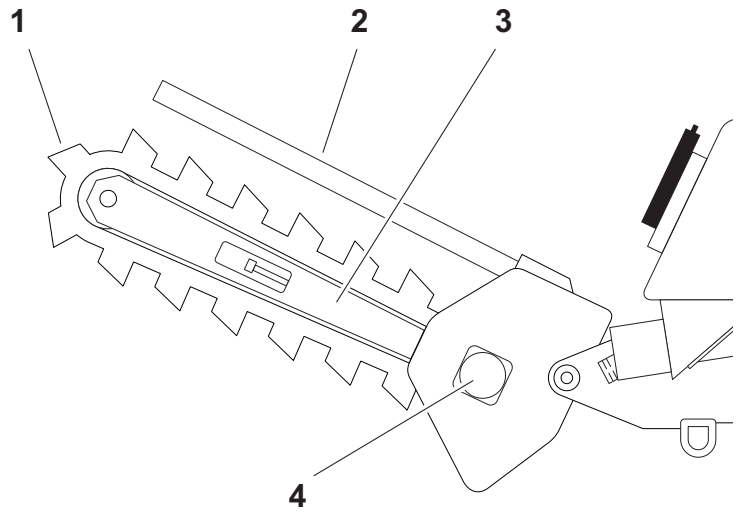
1. Feed tube
2. Vibrator
3. Sod cutter (optional)
4. Plow blade

H400 Trencher



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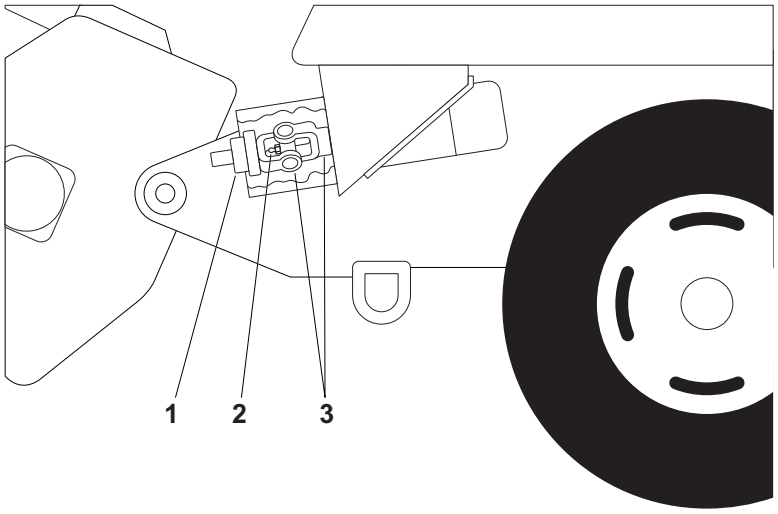
1. Digging chain
2. Restraint bar
3. Digging boom
4. Auger

Drill



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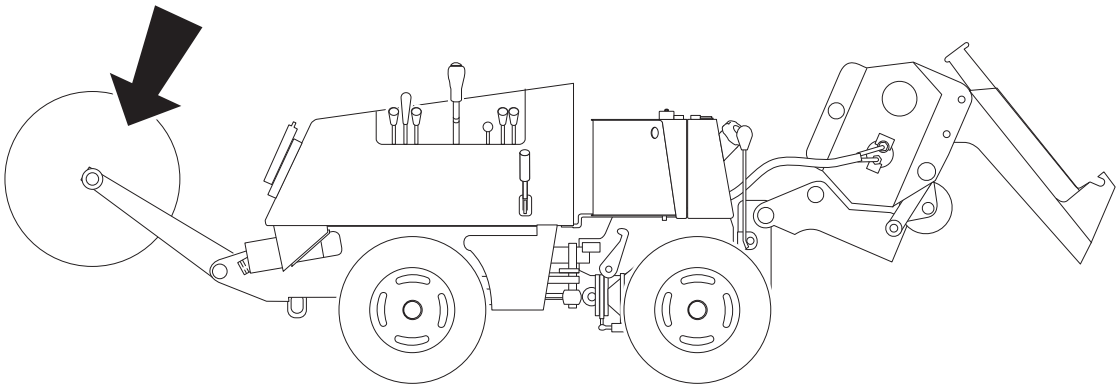
1. Coupler
2. Zerk
3. U-joint

Reel Carrier



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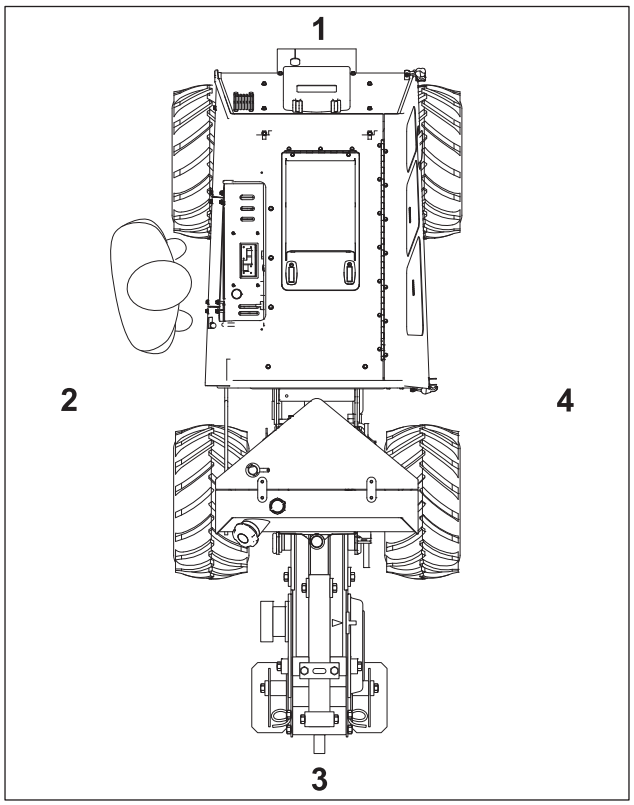
1. Front reel carrier

Operator Orientation

1. Front of unit
2. Left of unit
3. Rear of unit
4. Right of unit

Right and left sides of machine are determined by facing front of unit while standing at the controls.



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About This Manual

This manual contains information for the proper use of this machine. See **Operation Overview** for basic operating procedures. 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 you use and 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.

410sx Gas
Operator's Manual

Issue number 2.3/OM-03/15
Part number 053-2678

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 11
machine safety alerts and emergency procedures

Controls 25
machine controls, gauges, and indicators and how to use them

Operation Overview 33
an overview for completing a job with this machine: planning, setting up, installing product, and restoring the jobsite; with cross references to detailed procedures

Prepare 37
procedures for inspecting and classifying the jobsite, planning the installation path, and preparing the jobsite for work

Drive 43
procedures for startup, cold start, driving, and shutdown

Transport 47
procedures for lifting, hauling, and towing

Plow 55
procedures for plowing

Trench 61
procedures for trenching

Drill 65
procedures for drilling

Systems and Equipment 73
ROPS, plow blades, chain, teeth, sprockets, and optional equipment

Complete the Job 79
procedures for backfilling and restoring the jobsite and rinsing and storing equipment

Service 81
service intervals and instructions for this machine including lubrication, replacement of wear items, and basic maintenance

Specifications 119
machine specifications including weights, measurements, power ratings, and fluid capacities

Support 125
the warranty policy for this machine, and procedures for obtaining warranty consideration and training

Service Record 129
a record of major service performed on the machine

Safety

Chapter Contents

Guidelines 14

Emergency Procedures 15

- Electric Strike Description 15
- If an Electric Line is Damaged 16
- If a Gas Line is Damaged 15
- If a Fiber Optic Cable is Damaged 17
- If Machine Catches on Fire 17

Safety Alert Classifications 19

Machine Safety Alerts 20

Guidelines

Follow these guidelines before operating any jobsite equipment:

- Complete proper training and read operator's manual before using equipment.
- Contact your local One-Call (811 in USA) or the One-Call referral number (888-258-0808 in USA and Canada) to have underground utilities located before digging. Also contact any utilities that do not participate in the One-Call service. Mark proposed path with white paint prior to contacting One-Call or utilities.
- 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.
- Wear personal protective equipment.
- 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 ditchwitch.com/resources/safety.
- Replace missing or damaged safety shields and safety signs.
- Use equipment carefully. Stop operation and investigate anything that does not look or feel right.
- Do not operate unit where flammable gas may be present.
- Contact your Ditch Witch dealer if you have any question about operation, maintenance, or equipment use.
- Complete the equipment checklist located at www.ditchwitch.com/resources/safety.

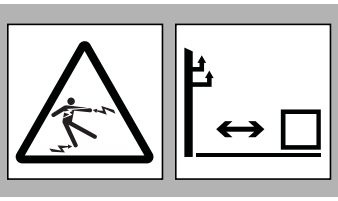
Emergency Procedures

⚠ WARNING Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment. 274-050

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

EMERGENCY SHUTDOWN - Release all controls and turn ignition switch to STOP.

Electric Strike Description



⚠ DANGER Electric shock. Contacting electric lines will cause death or serious injury. Know location of lines and stay away.

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 and you are **near pedestrian unit**, DO NOT MOVE and do not touch unit. Take the following actions. The order and degree of action will depend upon the situation.

- Warn people nearby that an electric strike has occurred. Instruct them to leave the area and contact utility.
- Do not allow anyone into area until given permission by utility company.
- Do not allow anyone to touch equipment.

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.
- 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.

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.

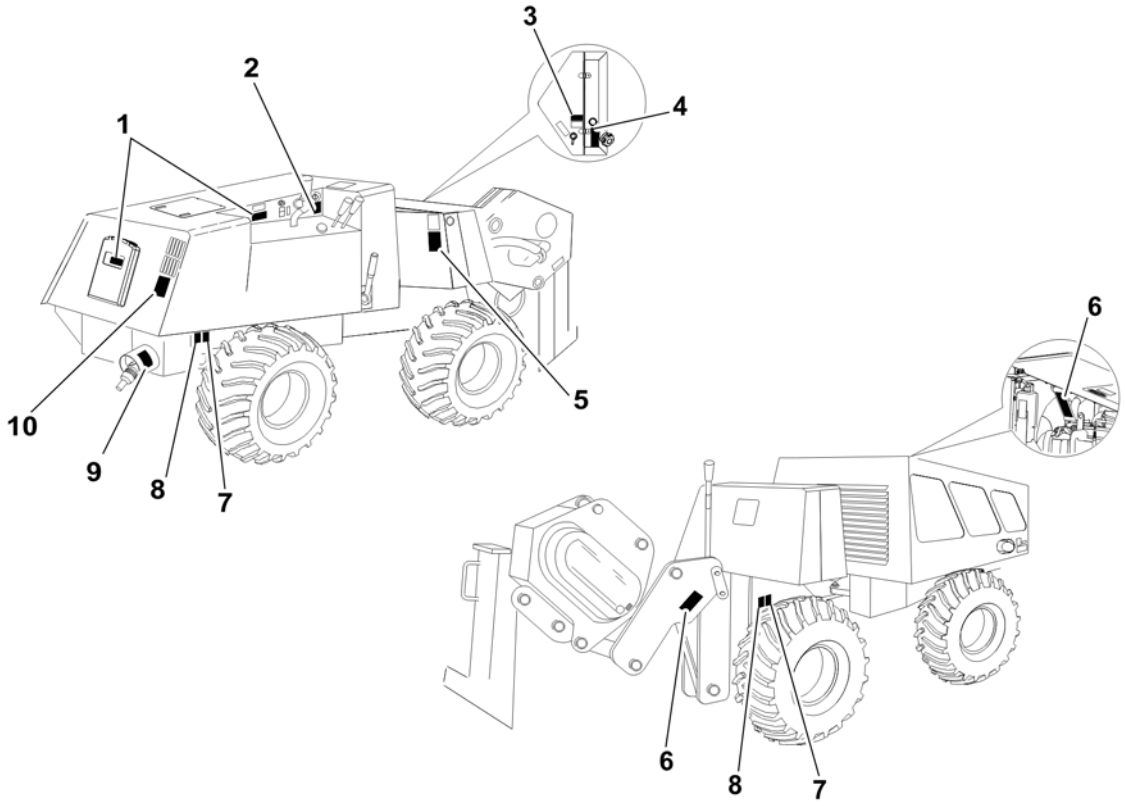
CAUTION indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

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

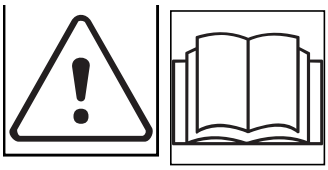
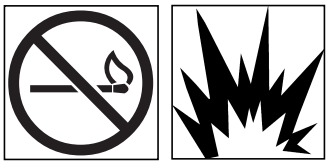
NOTICE indicates information considered important, but not hazard-related (e.g., messages relating to property damage).

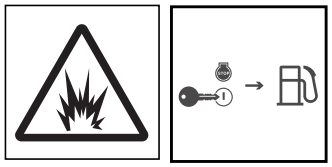
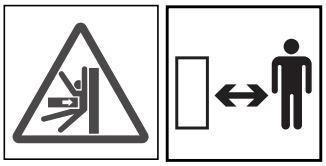
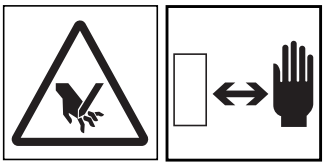
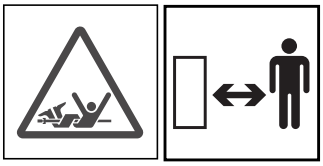
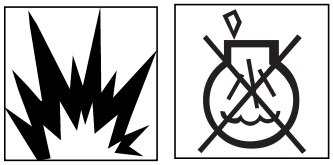
IMPORTANT can help you do a better job or make your job easier in some way.

Machine Safety Alerts



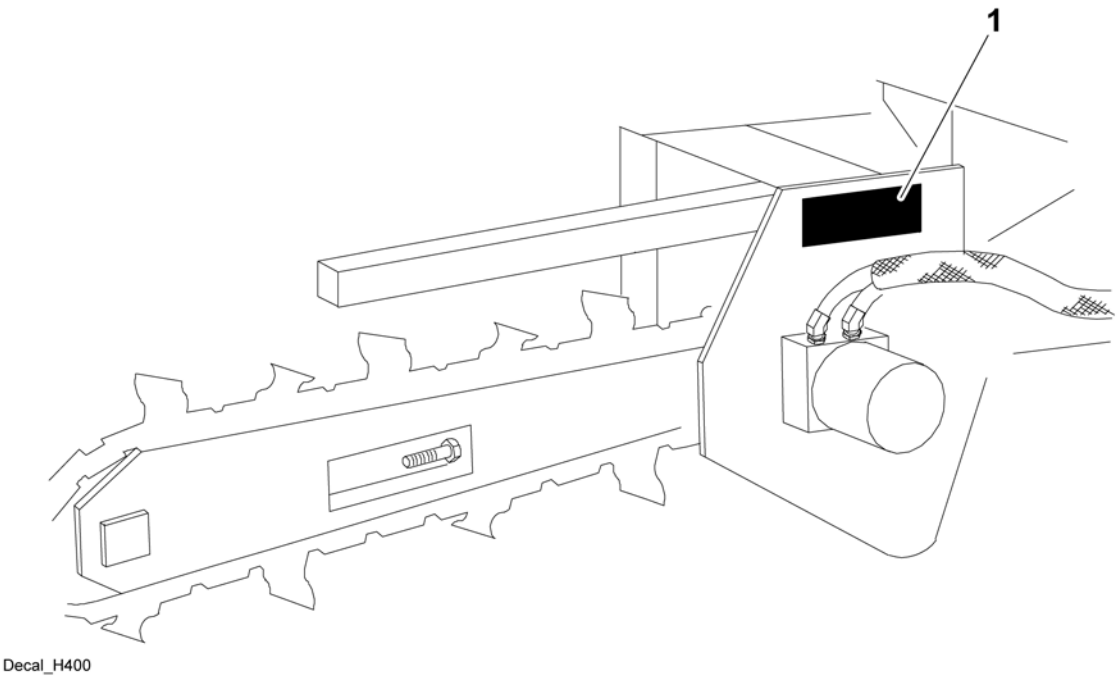
Decal_410SXGas.png

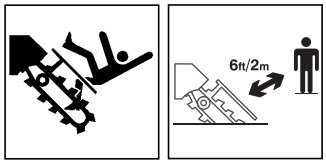
1		**WARNING** Read operator's manual. Know how to use all controls before operating machine. When you see this sign ⚠ on the machine or in the manual, read it and use caution. Your safety is at stake.
2		**WARNING** Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.
3		**WARNING** Fire or explosion possible. Fumes could ignite and cause burns. No smoking, no flame, no spark.

4		**DANGER** Fire or explosion possible. Shut engine off before fueling.
5		**WARNING** Crushing weight could cause death or serious injury. Use proper procedures and equipment or stay away.
6		**WARNING** Moving parts could cut off hand or foot. Stay away.
7		Tiedown location. See Transport chapter for more information.
8		Lift point. See Transport chapter for more information.
9		**DANGER** Turning shaft will kill you or crush arm or leg. Stay away.
10		**WARNING** Explosion possible. Using starting fluids will cause ignition in the intake manifold.

Trencher

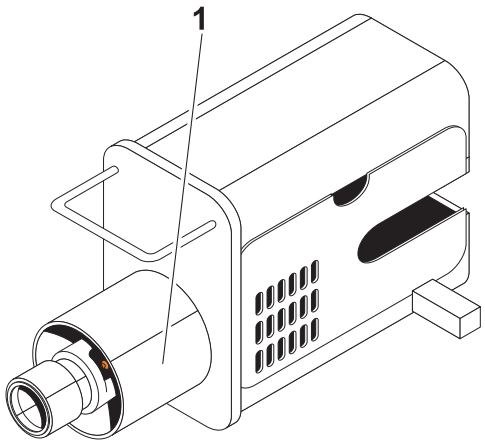
H400



1		**DANGER** Moving digging teeth will cause death or serious injury. Trench cave-in can cause you to fall. Stay away.

Drilling Attachment

RWIII/RWIV



Decal_RW_III

1		**DANGER** Turning shaft will kill you or crush arm or leg. Stay away.

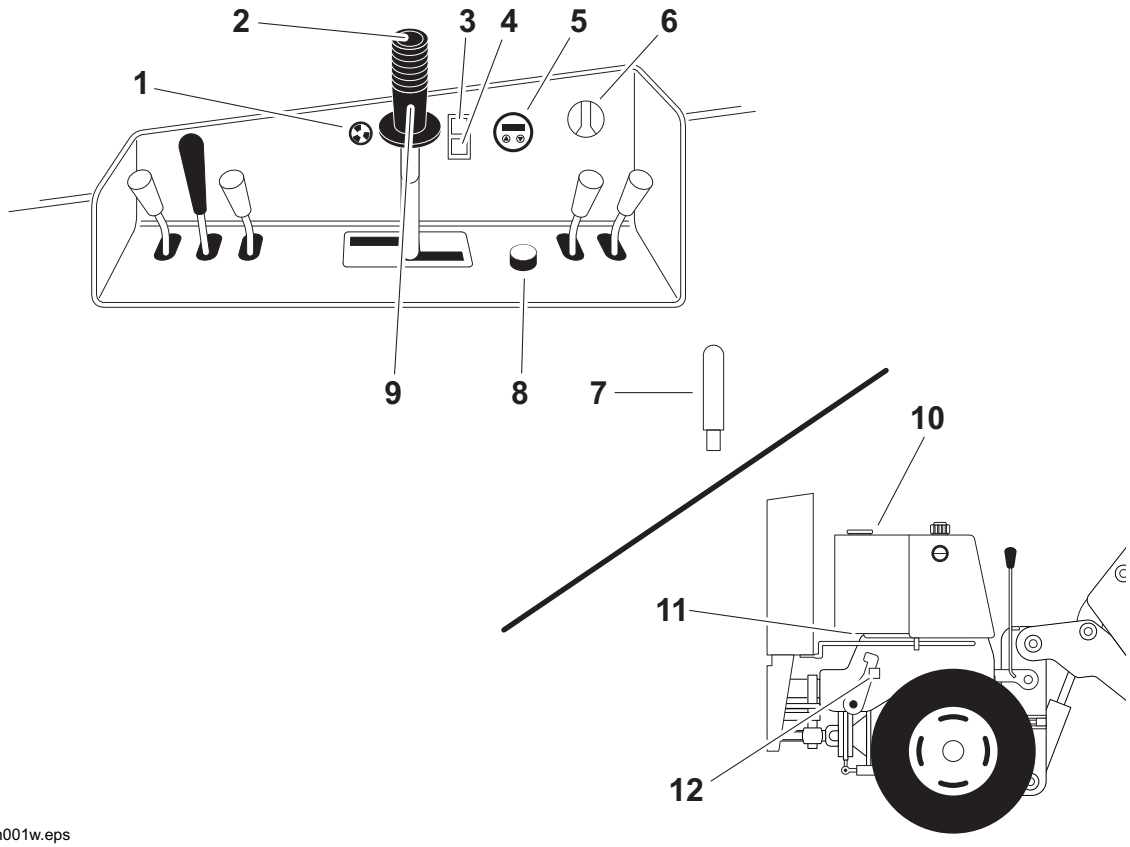
Controls

Chapter Contents

Tractor 26

Attachment 30

Tractor



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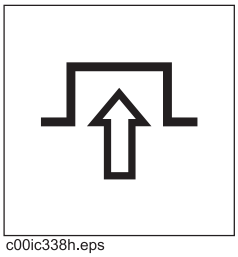
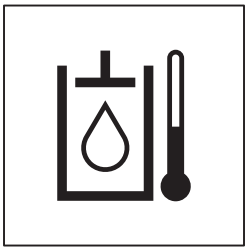
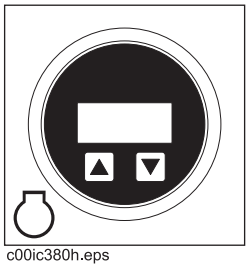
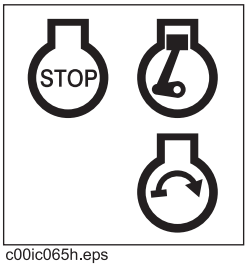
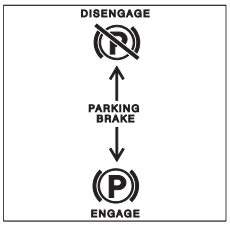
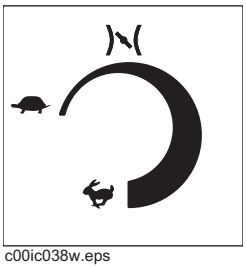
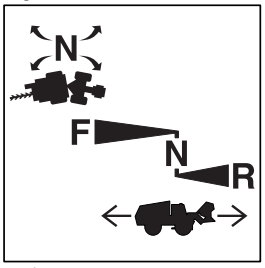
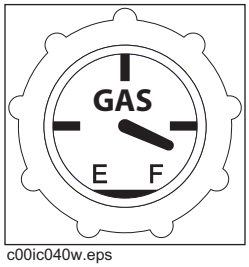
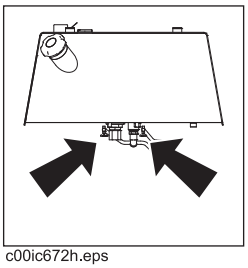
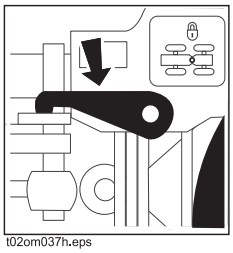
1. Alarm speaker
2. Operator presence switch
3. Hydraulic fluid temperature indicator
4. Check engine / Malfunction indicator light (MIL)
5. Engine information display
6. Ignition switch
7. Parking brake
8. Throttle control
9. Ground drive speed/direction control
10. Fuel gauge
11. Fuel shutoff valves
12. Frame lock

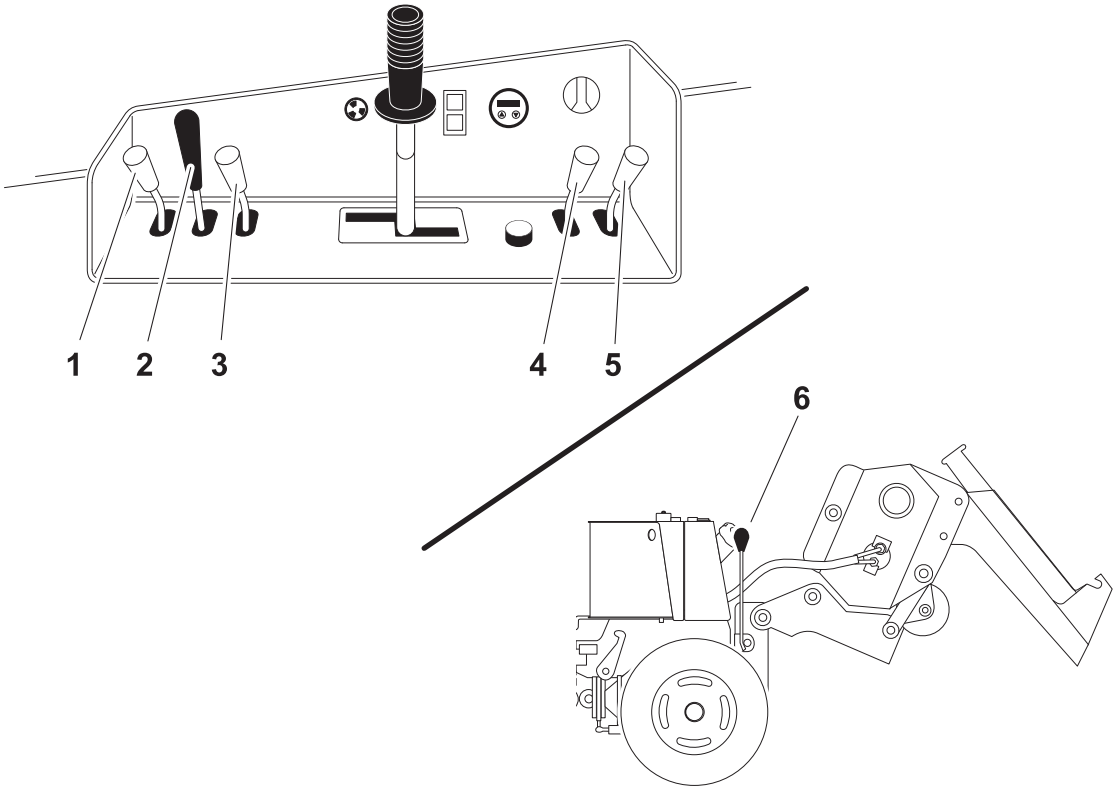
Item	Description	Notes
1. Alarm speaker	Sounds to alert operator of a critical malfunction.	

Item	Description	Notes
2. Operator presence switch  c00ic338h.eps	Detects when operator is present. Press and hold switch before moving ground drive control or digging controls out of neutral.	If switch is released during operation, alram will sound and engine will die.
3. Hydraulic fluid temperature indicator  c00ic098a.eps	Lights if hydraulic fluid overheats.	If light remains on: • Check that engine fan is turning when engine is running. • Turn off engine and let it cool. • Check hydraulic fluid level. • Check front of hydraulic cooler for debris.
4. Check engine / Malfunction indicator light  c00ic039w.eps	Lights when an engine problem has been detected.	Lights momentarily when ignition switch is turned to the ON or START position.
5. Engine information display  c00ic380h.eps	Displays status of certain engine functions: RPM, engine hours, battery voltage, oil pressure, coolant temperature, and engine diagnostic codes.	See "Engine Diagnostic Codes" on page 78. "Engine hours" refers to amount of time key is on position without engine running. "Machine Hours" refers to amount of time engine has been running above 100 rpm.

Item	Description	Notes
6. Ignition switch  c00ic065h.eps	To start engine, insert key and turn clockwise. To stop engine, turn counter clockwise.	**IMPORTANT:** If engine does not start on first attempt, check that all interlock requirements have been met, return switch to STOP, and try again.
7. Parking brake (orange)  Ic0032c.eps	To engage the parking brake, push. To disengage the parking brake, pull.	
8. Throttle  c00ic038w.eps	To increase engine speed, turn clockwise. To decrease engine speed, turn counterclockwise.	
9. Speed/Direction Control  c00ic002a.eps	To move forward, push toward F. To move backward, pull toward R. To turn, move control to left or right. To go faster in any direction, move farther from neutral. To stop, return to neutral.	

Item	Description	Notes
10. Fuel gauge  c00ic040w.eps	Displays fuel level in tank.	Use only approved gasoline fuel. Fuel tank holds 8.5 gal (32.2 L).
11. Fuel shutoff valves  c00ic672h.eps	Opens and closes fuel line between tank and engine.	Located under tank on right side. Valve on the right shuts off fuel return. Valve on the left shuts off fuel supply.
12. Frame lock (yellow)  t02om037h.eps	Prevents articulation joint from moving during transport or maintenance. To lock, move lock into gate.	Use speed/direction control to pivot unit at articulation joint until lock is fully engaged.

Attachment Controls



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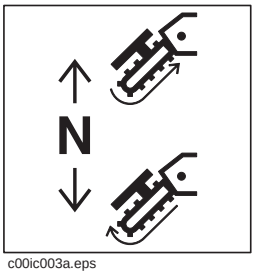
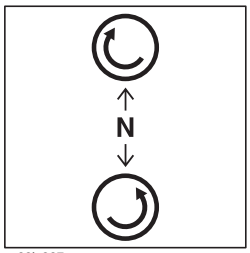
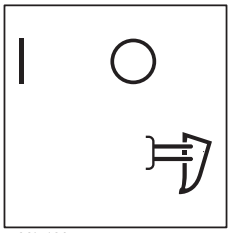
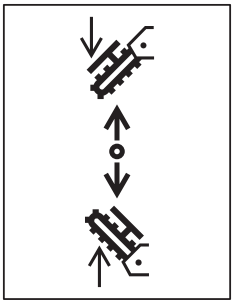
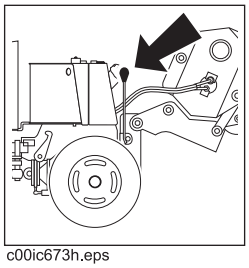
1. Digging chain control (optional)
2. Drill control (optional)
3. Plow vibrator control
4. Plow lift/lower control
5. Trencher lift/lower control (optional)
6. Plow swing lock

Item	Description	Notes
1. Digging chain control  c00ic003a.eps	To start digging chain, push. To reverse digging chain, pull. To stop digging chain, return to neutral position.	Optional, for use with H400 trenching attachment.

Item	Description	Notes
2. Drill direction control  c00ic007a.eps	To rotate drill string clockwise, push. To rotate drill string counter clockwise, pull.	Optional, for use with Roto Witch drilling attachment.
3. Plow vibrator control  c00ic108a.eps	To start, push. To stop, move to neutral position.	
4. Trencher lift control  c00ic106a.eps	To lower, push. To raise, pull.	Optional, for use with H400 trenching attachment.
5. Plow lift control  c00ic107a.eps	To lower, push. To raise, pull.	

Item	Description	Notes
6. Plow swing lock (blue)  c00ic673h.eps	To engage plow swing lock, move control toward tractor. To disengage, move control toward plow.	

Operation Overview

Chapter Contents

Planning 34

Plowing 34

Trenching 34

Drilling 35

Leaving Jobsite 35

Planning

1. Gather information about jobsite. See page 38.
2. Inspect jobsite. See page 39.
3. Classify jobsite. See page 40.
4. Select plow blade for your installation. See page 75
5. Select chain and teeth to match your soil type, if necessary. See page 76.
6. Check supplies and prepare equipment. See page 42.
7. Haul equipment to jobsite. See page 50.

Plowing

1. Start unit. See page 44.
2. Position tractor and controls. See page 57.
3. Attach product. See page 57.
4. Begin plowing. See page 58.
5. Complete the installation. See page 79.
6. Shut down tractor. See page 45.

Trenching

1. Start unit. See page 44.
2. Position tractor and controls. See page 62.
3. Begin trenching. See page 63.
4. Complete the installation. See page 79.
5. Shut down tractor. See page 45.

Drilling

1. Start unit. See page 44.
2. Dig approach trench and target trench. See page 67.
3. Assemble drill string and position tractor. See page 67.
4. Begin drilling. See page 69.
5. Use drill string guide as needed. See page 70.
6. Add rod. See page 71.
7. Backream. See page 71.
8. Shut down tractor. See page 45.
9. Disassemble joints. See page 72.

Leaving Jobsite

1. Restore jobsite. See page 80.
2. Rinse equipment. See page 80.
3. Stow tools. See page 80.
4. Haul equipment away from jobsite. See page 50.

Prepare

Chapter Contents

Gather Information 38

- Review Job Plan 38
- Notify One-Call Services 38
- Arrange for Traffic Control 38
- Plan for Emergency Services 38

Inspect Site 39

- Identify Hazards 39

Classify Jobsite. 40

- Inspect Jobsite 40
- Select a Classification 40
- Apply Precautions 41

Check Supplies and Prepare Equipment 42

- Supplies 42
- Fluid Levels 42
- Condition and Function 42
- Accessories 42

Gather Information

A successful job begins before you dig. 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.

Notify One-Call Services

Contact your local One-Call (811 in USA) or the One-Call referral number (888-258-0808 in USA and Canada) to have underground utilities located before digging. Also contact any utilities that do not participate in the One-Call service.

Arrange for Traffic Control

If working near a road or other traffic area, contact local authorities about safety procedures and regulations.

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.

Inspect Site

Inspect jobsite before transporting equipment. Check for the following:

- changes in elevation such as hills or other open trenches
- obstacles such as buildings, railroad crossings, or streams
- signs of utilities (See "Inspect Jobsite" on page 40.)
- traffic
- access
- soil type and condition

Identify Hazards

Identify safety hazards and classify jobsite. See "Classify Jobsite" on page 40.

WARNING Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.

To help avoid injury:

- Wear personal protective equipment including hard hat, safety eye wear, and hearing protection.
- Do not wear jewelry or loose clothing.
- Notify One-Call and companies which do not subscribe to One-Call.
- Comply with all utility notification regulations before digging or drilling.
- Verify location of previously marked underground hazards.
- Mark jobsite clearly and keep spectators away.

Remember, jobsite is classified by hazards in place -- not by line being installed.

Classify Jobsite

Inspect Jobsite

- Follow U.S. Department of Labor regulations on excavating and trenching (Part 1926, Subpart P) and other similar regulations.
- Contact your local One-Call (811 in USA) or the One-Call referral number (888-258-0808 in USA and Canada) to have underground utilities located before digging. Also contact any utilities that do not participate in the One-Call service.
- Inspect jobsite and perimeter for evidence of underground hazards, such as:
  - "buried utility" notices
  - utility facilities without overhead lines
  - gas or water meters
  - junction boxes
  - drop boxes
  - light poles
  - manhole covers
  - sunken ground
- Have an experienced locating equipment operator sweep area within 20' (6 m) to each side of trench path. Verify previously marked line and cable locations.
- Mark location of all buried utilities and obstructions.
- Classify jobsite.

Select a Classification

Jobsites are classified according to underground hazards present.

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

NOTICE: If you have any doubt about jobsite classification, or if jobsite might contain unmarked hazards, take steps outlined previously to identify hazards and classify jobsite before working.

Apply Precautions

Once classified, precautions appropriate for jobsite must be taken.

Electric Jobsite Precautions

Use one or both of these methods.

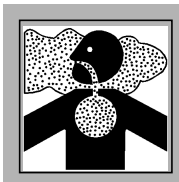
- Expose line by careful hand digging or soft excavation.
- Have service shut down while work is in progress. Have electric company test lines before returning them to service.

Natural Gas Jobsite Precautions

In addition to positioning equipment upwind from gas lines, use one or both of these methods.

- Expose lines by careful hand digging or soft excavation.
- Have gas shut off while work is in progress. Have gas company test lines before returning them to service.

Crystalline Silica (Quartz) Dust Precautions



⚠WARNING Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.

Cutting, drilling or working materials such as concrete, sand, or rock containing quartz may result in exposure to silica dust. Silica dust may cause lung disease and is known to the State of California to cause cancer.

To help avoid injury:

- Use water spray or other means to control dust.
- If workers are exposed to dust, they must wear appropriate breathing protection.

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.

Check Supplies and Prepare Equipment

Supplies

- fuel
- keys
- personal protective equipment, such as hard hat and safety glasses

Fluid Levels

- fuel
- hydraulic fluid
- battery charge
- engine oil

Condition and Function

- digging chain and teeth
- fan belts
- light bulbs
- filters (air, oil, hydraulic)
- tires
- pumps and motors
- hoses and valves
- signs, guards, and shields

Accessories

Fire Extinguisher

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

Drive

Chapter Contents

Start Unit 44

Drive 45

Shut Down 45

Start Unit

Before operating tractor, read engine manufacturer's starting and operating instructions. Follow instructions for new engine break-in.

⚠WARNING Runaway possible. Machine could run over you or others. Learn how to use all controls. Start and operate only from operator's position.

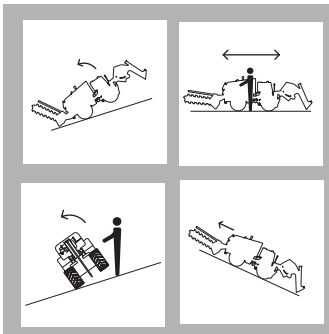
⚠WARNING Read operator's manual. Know how to use all controls before operating machine. When you see this sign ⚠ on the machine or in the manual, read it and use caution. Your safety is at stake.

To help avoid injury:

- Read operator's manual before operating equipment. Follow instructions carefully. Contact your Ditch Witch dealer for operation information or demonstration.
- Wear hard hat, safety glasses, and other protective equipment required by job. Do not wear jewelry or loose clothing that can catch on controls.

1. Move all controls and switches to the neutral or disengaged position.
2. Verify that parking brake is engaged.
3. Insert key into ignition switch and turn to the ON position.
4. Verify that check engine light (engine malfunction indicator) is on.
5. Set throttle at low idle.
6. Turn ignition switch to START position. Release key when engine starts.
7. Verify that check engine light (engine malfunction indicator light) is off. If not, stop engine by turning ignition switch to OFF position. Check for cause of engine malfunction.
8. Run engine at half-throttle or less for five minutes before operating tractor. During warm-up, check that all controls work properly.

Drive



WARNING Tipover possible. Machine can tip over and crush you.

To help avoid injury:

- Always operate so that operator is on uphill side of machine.
- Keep digging boom low when operating or transporting on a slope.
- Never jerk control levers. Use a steady even motion.
- Drive slowly and cautiously at all times.

EMERGENCY SHUTDOWN: Turn ignition switch to STOP.

1. Raise attachments for ground clearance. Ensure that plow swing lock is engaged.
2. Check that tires are positioned straight or in direction of intended movement.
3. Release parking brake.
4. Press and hold operator presence switch.
5. Move ground drive control in desired direction of travel.
6. Adjust throttle for desired speed of travel.

Shut Down

1. When job is complete, move ground drive control to neutral.

NOTICE: Machine should not be parked on a slope unless chocked, blocked, or parking brake engaged.

2. Return all controls to neutral or disengaged position.
3. Engage parking brake.
4. Lower all attachments to ground.
5. Move throttle to low idle for 2-3 minutes to cool.
6. Turn ignition switch to OFF position. If leaving machine unattended, remove key.
7. For maintenance or long-term storage, turn battery disconnect switch, if equipped, to the disconnect position.

Transport

Chapter Contents

Lift 48

- Points 48
- Procedure 48

Haul 50

Tie Down 51

- Points 51
- Procedure 51

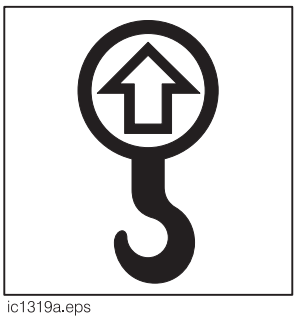
Tow 53

Lift

⚠WARNING Crushing weight. If load falls or moves it could kill or crush you. Use proper procedures and equipment or stay away.

Points

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



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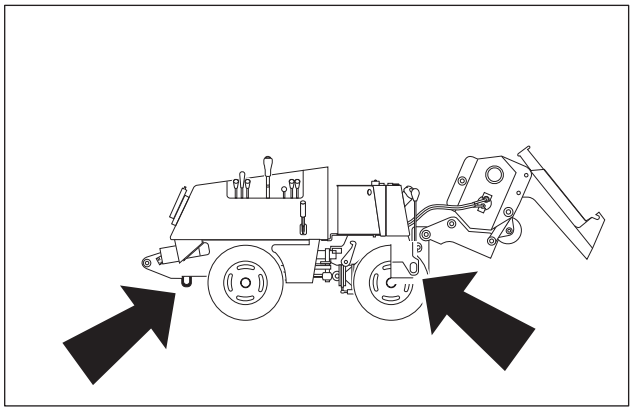
Procedure

Tractor

Use a crane capable of supporting the equipment's size and weight. See “410sx” on page 119.

- Engage frame lock. See page 26.
- Use indicated lift points.
- Do not attempt to lift tractor with attachments installed.



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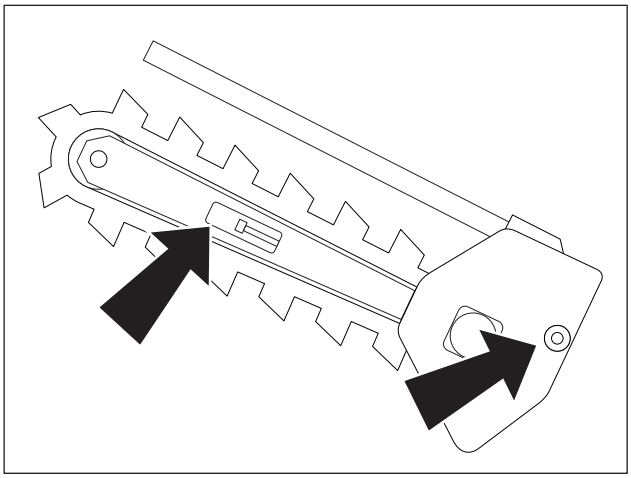
H400 Trencher

Use crane capable of supporting the equipment's size and weight. See page 119 or measure and weigh equipment before lifting.

NOTICE: Do not lift tractor with attachments installed.



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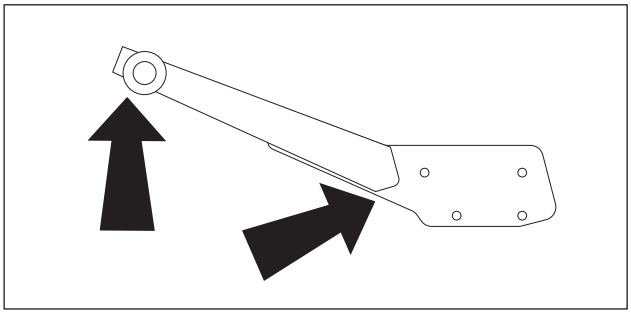
Reel Carrier

Use crane capable of supporting the equipment's size and weight. See page 119 or measure and weigh equipment before lifting.

NOTICE: Do not lift tractor with attachments installed.



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Haul

Load

⚠ WARNING Crushing weight. If load falls or moves it could kill or crush you. Use proper procedures and equipment or stay away.

To help avoid injury:

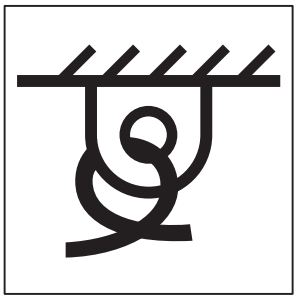
- Load unit with engine in low idle and boom as low as possible.
- Load trailer on level ground.
- Load trailer correctly to avoid trailer swaying.
- Attach trailer to vehicle before loading or unloading.
- If loading onto a tilt-bed trailer, ensure that tilt latch is secured in the correct position.
- Ten to fifteen percent of total vehicle weight (equipment plus trailer) must be on tongue to help prevent trailer sway.

1. Start engine. See page 44 for proper start-up procedures.
2. Raise trencher boom, but keep it low.
3. Fully raise or remove plow blade and ensure that plow swing lock is engaged.
4. Release parking brake.
5. Slowly drive tractor onto trailer.
6. Position tractor on trailer deck for proper weight distribution.
7. Engage parking brake.
8. Lower attachments to trailer bed and turn tractor off. See page 45 for proper shutdown procedures.
9. Engage frame lock.
10. Attach chains to tractor and attachments where tie-down decals are located. See page 51.

Tie Down

Points

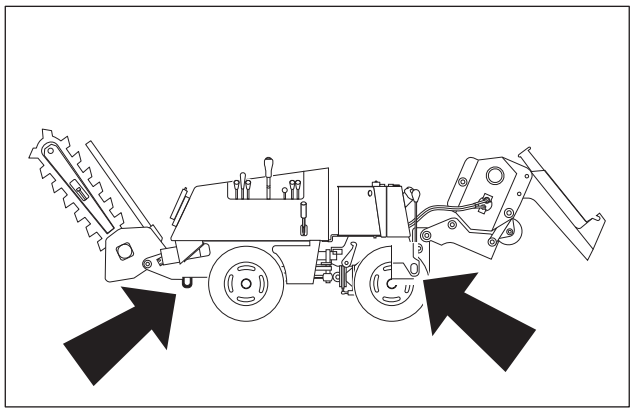
Tie-down points are identified by tie-down decals. Securing to trailer at other points is unsafe and can damage machinery.



ic1320a.eps

Procedure

Attach chains at front and rear tie-down points. Make sure chains are tight before transporting unit.



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Unload

WARNING Crushing weight. If load falls or moves it could kill or crush you. Use proper procedures and equipment or stay away.

To help avoid injury:

- Unload unit with engine in low idle and boom as low as possible.
- Unload trailer on level ground.
- Attach trailer to vehicle before loading or unloading.
- If trailer tilts, ensure that tilt latch is secured in the correct position.

1. Lower trailer or ramps.
2. Remove chains from tiedowns.
3. Start tractor. See page 44 for proper start-up procedures.
4. Raise trencher boom, but keep it low.
5. Fully raise or remove plow blade and ensure that plow swing lock is engaged.
6. Disengage frame lock.
7. Disengage parking brake.
8. Slowly back unit down trailer or ramps.

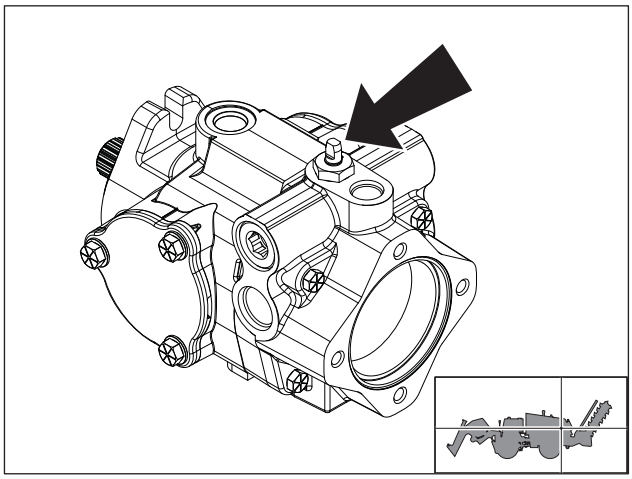
Tow

Under normal conditions, tractor should not be towed. If tractor becomes disabled and towing is necessary:

- Open hydrostat bypass valve.
- Do not tow for more than 200 yd (180 m).
- Tow at less than 1-2 mph (1.5-3.0 km/h).
- Unit cannot be steered as it is towed.
- Use maximum towing force of 1.5 times unit weight.

Procedure

1. Attach tow line to all available tie-down points facing towing vehicle.
2. Check that all controls are in neutral position.
3. Open valve (shown) by turning cartridge 1/4 turn so that flat sides are horizontal.
4. Move speed/direction control in direction of travel.
5. Disengage parking brake.



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Return Unit to Normal Operation

1. Engage parking brake.
2. Block wheels.
3. Disconnect from tow point.
4. Turn tow valve cartridge to original position.

Plow

Chapter Contents

Setup 56

- Position Tractor 57
- Attach Product 57

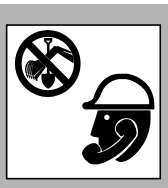
Operation 58

Setup

EMERGENCY SHUTDOWN - Turn ignition switch to STOP.

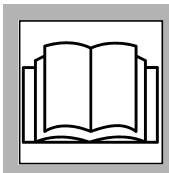

⚠WARNING Crushing weight could cause death or serious injury. Use proper procedures and equipment or stay away.

To help avoid injury: Keep everyone at least 6' (2 m) from machine, attachments, and their range of movement.

⚠WARNING Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.

To help avoid injury: Comply with all utility notification regulations before digging or drilling.



⚠WARNING Read operator's manual. Know how to use all controls before operating machine. When you see this sign ⚠ on the machine or in the manual, read it and use caution. Your safety is at stake.

To help avoid injury: Use attachments or counterweights to make front and rear loads balance when all attachments are raised. Contact your Ditch Witch dealer about counterweighting for your equipment.

NOTICE:

- Choose the correct plow blade length for the desired depth of material cover. If using a vertically adjustable, multi-depth blade, select the proper installation height.
- Do not operate vibrator unless plow blade is in the ground.

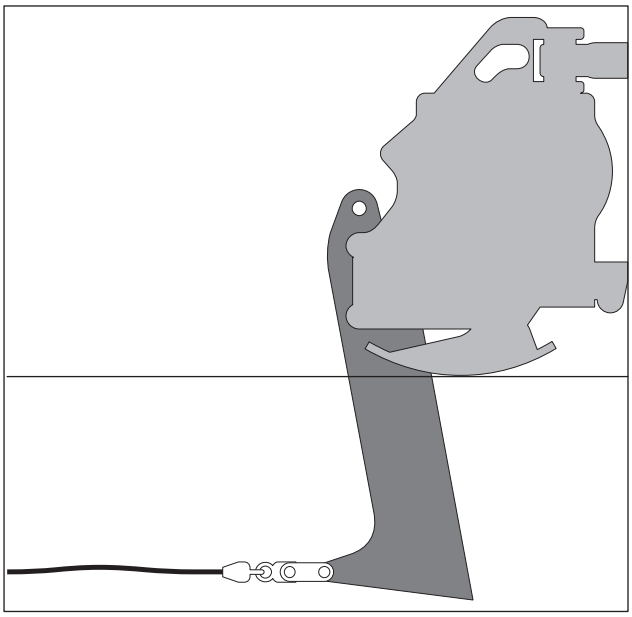
Position Tractor

1. Start tractor. See page 44 for start-up procedures.
2. Drive to starting point. Move in line with planned path. See page 45 for operating procedures.
3. Engage parking brake.
4. Lower plow blade to starting point of path.
5. Turn ignition switch to STOP.

Attach Product

To Pull Product

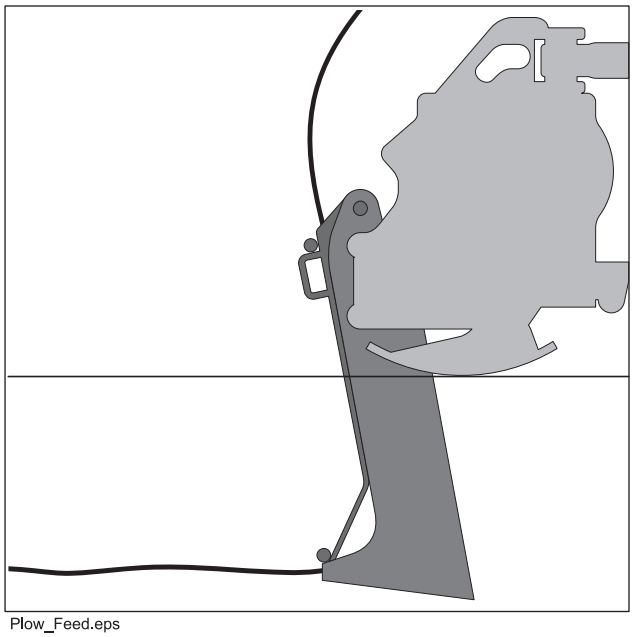
1. Insert material into pulling grip.
2. Tape grip with duct tape.


Plow_Pull.eps

To Feed Product

1. Remove cable guide.
2. Feed cable through tube from top to bottom.
3. Replace cable guide and tighten fasteners.
4. Secure cable.

NOTICE: Keep everyone away from material being installed.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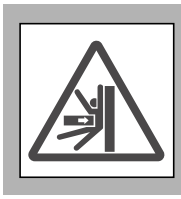
Operation



⚠ WARNING Crushing weight could cause death or serious injury. Use proper procedures and equipment or stay away.

⚠ DANGER Electrical shock. Contacting electrical lines will cause death or serious injury. Know location of lines and stay away.

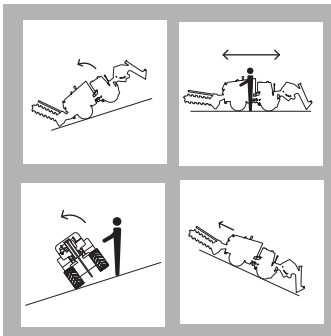
To help avoid injury: Expose lines by hand before digging. Cutting high voltage cable can cause electrocution

⚠ WARNING Read operator's manual. Know how to use all controls before operating machine. When you see this sign ⚠ on the machine or in the manual, read it and use caution. Your safety is at stake.

NOTICE:

- Do NOT plow with the blade partially raised. Only operate the plow with blade fully in the ground.
- Do NOT move ground drive control to reverse with the blade in the ground.

Start Plowing



WARNING Tipover possible. Machine can tip over and crush you.

To help avoid injury:

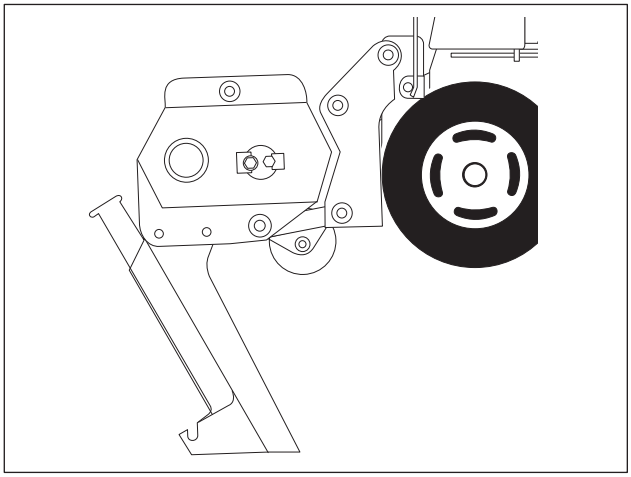
- Always operate so that operator is on uphill side of machine.
- Keep digging boom low when operating or transporting on a slope.
- Never jerk control levers. Use a steady even motion.
- Drive slowly and cautiously at all times.

1. Start unit. (See "Start Unit" on page 44.)
2. Adjust throttle to low idle.
3. Check that ground drive control is in neutral.
4. Disengage parking brake.
5. Move ground drive control forward to a slow speed and lower plow blade until it begins to break the soil.
6. Move the plow vibrator control to the ON position. PLOW WILL VIBRATE.

NOTICE:

- Move slowly while lowering the plow blade into the ground.
- Do NOT move ground drive control to reverse with the blade in the ground.
- Do NOT plow with the blade partially raised.

7. Lower the plow blade into the ground to full depth.
8. Increase engine speed to a point with the least tractor vibration and the highest ground drive speed possible without tire slippage.
9. Check cable for damage during plowing. Run continuity checks on electric cable and check pipe pressure. Damage can result from improper operation, incorrect blade choice, striking underground obstructions, or other conditions.



t39om051w.eps

Finish Plowing

1. When installation is complete, move ground drive control to the neutral position.
2. With vibrator running, lower throttle speed and raise plow to just below ground level.
3. Move plow vibrator control to OFF.

> ***NOTICE:*** Do not operate vibrator when plow is out of the ground. This will cause excessive vibration and will cause rapid wear, and possible damage to the unit and product being installed.

4. Engage plow swing lock.
5. Raise plow out of ground.
6. Engage parking brake.
7. Turn ignition switch to OFF and remove product from plow.
8. Start tractor and drive a short distance away from work site.
9. Shut down tractor. See page 45 for proper shutdown procedures.

Trench

Chapter Contents

Setup 62

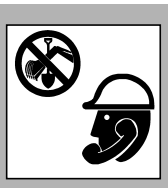
Operation 63

Setup

EMERGENCY SHUTDOWN - Release button on operator presense handle and turn ignition switch to OFF position.

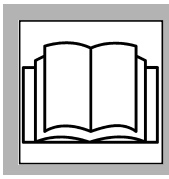

⚠WARNING Crushing weight could cause death or serious injury. Use proper procedures and equipment or stay away.

To help avoid injury: Use attachments or counterweights to make front and rear loads balance when all attachments are raised. Contact your Ditch Witch dealer about counterweighting for your equipment.

⚠WARNING Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.

To help avoid injury: Comply with all utility notification regulations before digging or drilling.



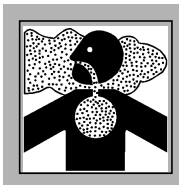
⚠WARNING Read operator's manual. Know how to use all controls before operating machine. When you see this sign ⚠ on the machine or in the manual, read it and use caution. Your safety is at stake.

IMPORTANT:

- When cutting asphalt, start trench in soil at edge of road and use shortest possible boom at full depth.
- For optimal spoils delivery, adjust the auger positions forward or backward to accommodate terrain and digging depth.

1. Start tractor. See page 44 for start-up procedures.
2. Drive to starting point. Move in line with planned trench. See page 45 for operating procedures.
3. Engage parking brake.
4. Lower boom to just above ground.
5. Check that boom is in line with planned trench.

Operation



⚠ CAUTION Breathing crystalline silica dust may cause lung disease. Cutting, drilling, or working materials such as concrete, sand, or rock containing quartz may result in exposure to silica dust. Use dust control methods or appropriate breathing protection when exposed to silica dust.

⚠ DANGER Electrical shock. Contacting electrical lines will cause death or serious injury. Know location of lines and stay away.

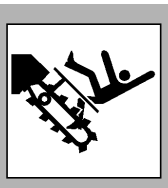
To help avoid injury: Expose lines by hand before digging. Cutting high voltage cable can cause electrocution.

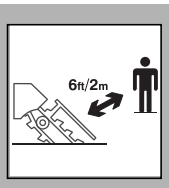
⚠ WARNING Read operator's manual. Know how to use all controls before operating machine. When you see this sign ⚠ on the machine or in the manual, read it and use caution. Your safety is at stake.

To help avoid injury:

- Comply with all utility notification regulations before digging or drilling.
- Notify companies that do not subscribe to One-Call.

⚠ CAUTION Flying objects thrown by machine may strike people. Wear hard hat and safety glasses.





⚠ DANGER Moving digging teeth will cause death or serious injury. Trench cave-in can cause you to fall. Stay away.

To help avoid injury:

- Ensure parking brake is engaged.
- Allow 3' (1 m) between digging teeth and obstacle. Machine might jerk when digging starts.
- Keep everyone at least 6' (2 m) from machine, attachments, and their range of movement.

Begin Trenching

1. If necessary, adjust throttle to low idle.
2. Move the digging chain control to the ON position. DIGGING CHAIN WILL MOVE.
3. Increase engine speed to full throttle.
4. Slowly lower digging boom to depth.
5. Release parking brake.

NOTICE: Machine moves in reverse during trenching.

6. Move ground drive control to desired speed.
7. Lower boom to trench depth and push ground drive control forward to desired trenching speed.

NOTICE:

- Do not make sharp turns. Lower boom to full depth when turning.
- If an object becomes lodged in chain, move attachment speed/direction control to neutral and raise boom slightly. Reverse chain direction. If object must be removed manually, turn engine off and engage parking brake.

Finish Trenching

1. When trench is complete, move ground drive control to neutral.
2. Adjust throttle to low idle.
3. Raise boom.
4. As boom clears top of trench, move digging chain control to the OFF position.
5. Drive away from work site.
6. Shut down tractor. See page 45 for proper shutdown procedures.

Drill

Chapter Contents

Prepare Jobsite and Equipment 67

- Approach Trench 67
- Target Trench 67
- Drill Rod and Equipment 68

Drill 69

- Using Drill String Guide 70

Add Rod 71

Backream 71

Disassemble Joints 72

Drilling Attachment

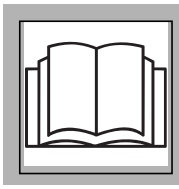

DANGER Turning shaft will kill you or crush arm or leg. Stay away.

To help avoid injury:

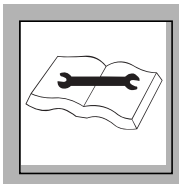
- Do not straddle trench or drill pipe while drilling. Keep everybody at least 10' (3 m) away from drill pipe during operation.
- Keep all persons away from material being installed. If swivel malfunctions, material being installed can rotate.
- Use a guide to align drill rod when starting a bore. Guides are available from your Ditch Witch dealership.


WARNING Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.

To help avoid injury: Set up warning barriers and keep people away from equipment and jobsite while drilling.



WARNING Read operator's manual. Know how to use all controls before operating machine. When you see this sign ⚠ on the machine or in the manual, read it and use caution. Your safety is at stake.



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

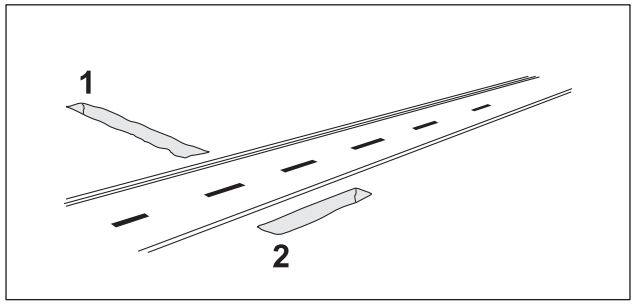
To help avoid injury:

- Do not alter controls. Improper control function can cause serious injury.
- Do not tape or tie down switch or lever.
- Stop drilling and turn off power supply if releasing control does not stop turning shaft. Have unit repaired.

Prepare Jobsite and Equipment

Approach Trench (1)

1. Mark path where you intend to drill.
2. Dig an approach trench (1) along the intended bore path.



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IMPORTANT: The approach trench should be at least:

- deep enough for pipe to lay flat and enter soil at correct angle
- 20' (6 m) long
- 4" (100 mm) wide

Target Trench (2)

1. Select a completion point for the drilling project.
2. Dig a target trench (2) **across** the anticipated completion point.

IMPORTANT:

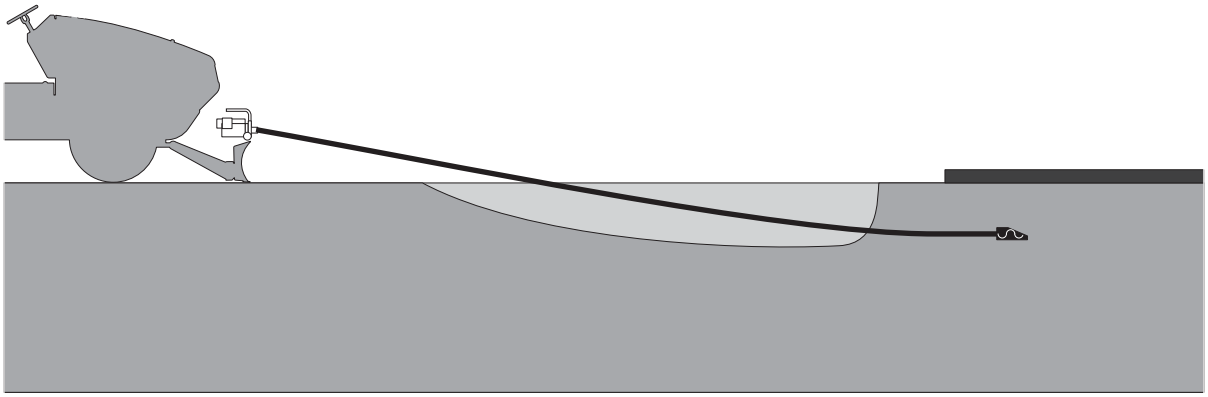
- The actual length of the target trench depends on soil conditions and length of pipe sections. Make it deep enough for drill bit to enter slightly above the trench floor.
- An alternative to digging a target trench is to use an electronic tracker to locate the bit, then dig down with posthole diggers. This method may be desirable to minimize surface soil disturbance.

Drill Rod and Equipment

1. Assemble at least 20' (6 m), but not more than 30' (9 m), of drill rod.

> ***NOTICE:*** More than 10-15' (3-4.5 m) of drill rod out of the trench increases the tendency of drill rod to bend.

2. Install drill bit.
3. Put drill string in approach trench.
4. Move tractor to the approach trench and align the drilling attachment with the intended bore path.
5. Turn off engine.
6. Attach drill string to drilling attachment.



DrillRod_Trencher

Drill

EMERGENCY SHUTDOWN: Release drilling control and turn ignition switch to OFF.

1. Move throttle control to low idle.
2. Start tractor's engine.
3. Move lever forward to begin clockwise rotation. (See page 31 for attachment control information.)
4. Slowly advance tractor while maintaining clockwise rotation.

NOTICE:

- Drilling too quickly causes bit to drift off course and may bend drill rod. After bore path is established, speed may be slightly increased.
- If drill rod starts to bend, stop forward movement of unit and back the unit slightly until rod straightens. Do not drill with bent rod.
- If drill rod hits an obstruction, rotate drill string counterclockwise to back up slightly.

Using Drill String Guide

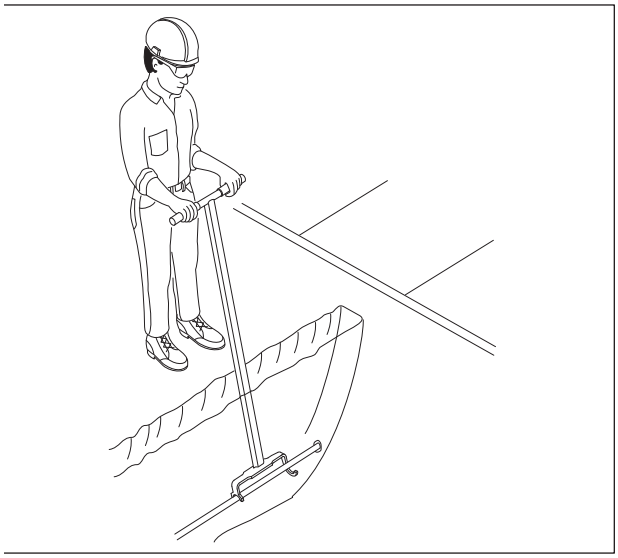
DANGER Turning shaft will kill you or crush arm or leg. Stay away.

To help avoid injury:

- Do not straddle trench or drill rod while drilling. Keep everybody at least 10' (3 m) away from drill rod during operation.
- Use a drill string guide to align drill rod when starting a bore. Guides are available from your Ditch Witch dealership.

Use drill string guide to align drill string as it enters the soil. When using drill string guide, follow these guidelines:

- Use only approved Ditch Witch drill string guide (p/n 179-737).
- Stand only on the **left** side of the approach trench.
- Keep drill string guide at least 3' (1 m) behind bit.
- Use drill string guide to control only the first 5' (1.5 m) of the bore path.
- After drilling 5' (1.5 m), stop unit and remove drill string guide.
- **Do not** use drill string guide during backreaming or any time the drill string is being pulled back.



rillStringGuide.eps

Add Rod

IMPORTANT: Use a helper to add drill rod.

1. Use control to stop drilling attachment.
2. Use ground drive controls to back up unit 6" (150 mm) to loosen drill rod in ground.
3. Disconnect drill rod from drilling attachment.
4. Use ground drive controls to move unit away from bore.
5. Add one drill rod to continue bore.
   - Have a helper direct unit operator to align drilling attachment with new rod and stop when drilling attachment and rod are 1" (25 mm) apart.
   - Have a helper lightly hold rod and direct unit operator to move unit forward slowly.
   - As soon as rod begins to engage drilling attachment, have helper release rod and move hands and arms clear of drilling attachment.

Backream

After drill bit enters target trench, the bore hole may be enlarged by changing the drill bit to a backreamer and drawing it back through the initial bore.

1. Turn tractor ignition switch to STOP.
2. Replace drill bit with backreamer.
3. Start tractor engine and begin clockwise rotation.

NOTICE: Always rotate clockwise during backreaming. Rotate counterclockwise only to dislodge a dry bore bit or reamer that has seized in the bore hole.

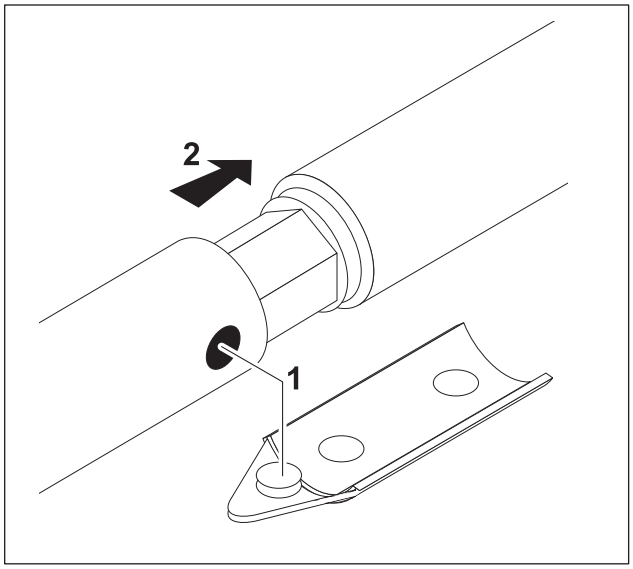
4. Slowly back up tractor while maintaining rotation.
5. When backreamer exits the bore hole, stop rotation immediately.

NOTICE:

- Do not try to increase hole size too much in one pass. Several passes using successively larger reamers will save wear on machine.
- During backreaming, keep drill string straight. Sharp bends in the drill rod at the motor coupling can cause rod failure.

Disassemble Joints

1. Press tab through hole in female side of joint (1) using special tool or screwdriver.
2. Pull rods apart (2).



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Chapter ContentsSystems and Equipment

Optional Equipment 74

Plow Blades 75

Chain, Teeth, and Sprockets 76

Chain and Tooth Maintenance 76

Chain Types 76

Chain Selection 77

Engine Diagnostic Codes 78

Optional Equipment

See your Ditch Witch dealer for more information about the following optional equipment.

410sx Tractor

Equipment	Description
plow blades and pulling grips	Choose the most efficient plow blade for your job based on your desired cover depth range, feed chute diameter, and feed chute radius, as well as your desired speed for straight plowing.
tires	26" or dual wheels are available
dual wheels	distributes weight of unit across jobsite surface
counterweights	required to balance unit configured with optional attachments
front reel carrier	mounted on the front of the tractor (use without trencher attachment)
sod cutter kit	breaks sod to make plowing more efficient

H400 Trenching Attachment

Equipment	Description
booms	provide depth options of 24" (610 mm), 30" (762 mm), or 36" (914 mm)

Drilling Attachment

Equipment	Description
downhole tools	a variety of bits and backreamers for varying soil conditions are available through your Ditch Witch dealer

Plow Blades

Blade Maintenance

- Keep cable guide wing bolts tight. Loose cable guide bolts will break due to plow vibration.
- Keep plow feed tube free of rock and debris so that material pulls freely though tube.
- Use a speed blade only for straight or gently curving installations. Do not use speed blades for installations that require sharp turns.
- Use the plow blade most appropriate for the type of material being installed. Contact your Ditch Witch dealer for information about the most effective blade for your jobsite conditions.

Blade Types

Type	Description
feed blade	used to "stitch" flexible material into the ground as it is fed through a chute or tube located at the back of the blade
speed blade	a thin feed-type blade used for high speed, straight plowing
pull blade	used to pull rigid or semi-rigid material into the ground through a tunnel made by a "bullet" at the bottom of the blade; a pulling grip is used to attach the material to the blade

Chain, Teeth, and Sprockets

Chain and Tooth Maintenance

- Always replace sprockets at the same time you replace the digging chain. Sprockets and chain are designed to work together. Replacing one without the other will cause premature wear of the new part.
- Do not use worn teeth. Using dull, worn teeth will decrease production and increase shock load to other trencher components. It can also cause chain stretch, which leads to premature chain wear and failure.
- Maintain the proper amount of tension on the digging chain. Overtightening will cause chain stretch and loss of machine performance. For correct tightening procedure, see page 90.
- Use the tooth pattern most appropriate for your digging conditions. If you move to a different soil type, contact your Ditch Witch dealer for information about the most effective chain type and tooth pattern.

Chain Types

Chain type	Features
4-pitch	standard chain
2-pitch	more teeth for smoother cutting
alternating side bar	prevents spoil compaction on chain
bolt-on adapters	allow easy configuration changes
Shark Chain II	versatile, virtually maintenance-free
combination	provides pick and shovel effect

Chain Selection

These charts are meant as a guideline only. No one chain type works well in all conditions. See your Ditch Witch dealer for soil conditions and chain recommendations for your area. Ask for the latest Chain, Teeth, and Sprockets Parts Catalog.

- 1 = best
- 2 = better
- 3 = good
- 4 = not recommended

Chain	Sandy Soil	Soft Soil	Medium Soil	Hard Soil	Rocky Soil	Sticky Soil
4-pitch cup tooth	3	1	2	3	4	1
2-pitch cup tooth	2	3	1	1	3	4
bolt-on adaptor, 2-pitch	4	4	3	2	1	4
bolt-on adaptor/cup tooth combo	4	3	2	1	2	4
Shark Chain II	4	3	2	1	1	4
alternating side bar	4	4	4	4	4	1

Soil	Description
sandy soil	sugar sand, blow sand, or other soils where sand is the predominant component
soft soil	sandy loam
medium soil	loams, loamy clays
hard soil	packed clays, gumbo, all compacted soils
rocky soil	chunk rock, glacial till, cobble, rip rap, gravel
sticky soil	gumbo, sticky clays

Engine Diagnostic Codes

This unit is equipped with a self-diagnostic computer-controlled fuel management system. A variety of sensors send input data to an ECU (Electronic Control Unit) that compares inputs with pre-programed parameters and sends output voltage to a variety of actuators to adjust and operate the engine within specified parameters.

Warning indicators on the engine display tell the operator when critical and non-critical faults develop. Non-critical faults occur when engine sensors detect moderate trouble with coolant temperature, oil pressure, oxygen levels, or intake air temperature. Non-critical faults cause the check engine light/malfunction indicator to light. Critical faults cause the engine to derate and/or shutdown. In both cases, a fault code is stored in the ECU. If the fault corrects itself, the engine will gradually return to normal power. The check engine light/malfunction indicator will stay on until the trouble goes away, but the fault code remains stored.

Engine shutdown will occur due to critical faults in engine coolant temperature or oil pressure. Before shutdown, the operator alert indicator will light continuously and the engine will begin a rapid power derate. If the fault does not improve in 30 seconds, the engine will shutdown. Fault codes are shown on the engine information display.

The following chart lists critical codes that the operator can troubleshoot. For all other codes, contact your Ditch Witch dealer.

DTC	SPN	FMI	DTC Name	Detected Item	DTC Set Conditions	System Action
P0524	100	1	Oil pressure low	Low oil pressure	Run time wait for oil pressure exceeds 15 seconds. RPM lower limit is below 600 rpm Oil pressure switch is receiving less than 1.5V input	Engine shutdown
P0183	174	3	Fuel Temp: gasoline high	Operating in a hot environment Sensor out of calibration	Fuel temperature is above 140°F/60°C	Power derate
P0182	174	4	Fuel Temp: gasoline low	Operating in a frigid temperature Sensor out of calibration	Fuel temperature is below -35°F/ -37°C	None
P0563	168	15	Battery voltage high	System voltage abnormally high	Voltage is above 16VDC	AL disable KC Low rev limit
P0562	168	17	Batter voltage low	Wiring harness open/short/damage Battery abnormality	Voltage is below 9VDC and rpm is above 100 rpm	AL disable KC Power derate

Complete the Job

Chapter Contents

Restore Jobsite 80

Rinse Equipment 80

Stow Tools 80

Restore Jobsite

After product is installed, return spoils to the trench.

Rinse Equipment

Spray water onto equipment to remove dirt and mud.

NOTICE: Do not spray water onto operator's console. Electrical components could be damaged. Wipe down instead.

Stow Tools

Make sure all tools and accessories are loaded and properly secured on trailer.

Service

Chapter Contents

Service Precautions 82

Recommended Lubricants/Service Key 83

- Engine Oil Selection Chart 85

10 Hour 86

50 Hour 90

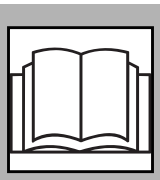
250 Hour 98

500 Hour 99

1000 Hour 102

As Needed 107

Service Precautions



⚠WARNING Read operator's manual. Know how to use all controls before operating machine. When you see this sign ⚠ on the machine or in the manual, read it and use caution. Your safety is at stake.

To help avoid injury:

- Unless otherwise instructed, all service should be performed with engine off.
- Allow equipment to cool before performing service.
- Refer to engine manufacturer's manual for engine maintenance instructions.
- Before servicing equipment, lower unstowed attachments to ground.

Cleaning Precaution

NOTICE: When cleaning equipment, do not spray electrical components with water.

Welding Precaution

NOTICE: Welding can damage electronics.

- Disconnect negative cable on battery before welding to prevent damage to battery.
- 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.

Recommended Lubricants/Service Key

Item	Description
GEO	Gasoline engine oil meeting API service classification SL or higher and SAE viscosity recommended by engine manufacturer
MPG	Multipurpose grease meeting ASTM D217 and NLGI 5
MPL	Multipurpose gear oil meeting API service classification GL-5 (SAE 80W90)
THF	Tractor hydraulic fluid, similar to Phillips 66 HG, Mobilfluid 423, Chevron Tractor Hydraulic Fluid, Texaco TDH Oil, or equivalent
DEAC	Diesel engine antifreeze/coolant meeting ASTM D5345 (prediluted) or D4985 (concentrate)
	Check level of fluid or lubricant
	Check condition
	Filter
	Change, replace, adjust, service, or test

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 recommended lubricants. Fill to capacities listed in See "Specifications" on page 119.

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

NOTICE:

- Use only genuine Ditch Witch parts, filters, and approved lubricants to maintain warranty.
- Use the "Service Record" on page 129 to record all required service to your machine.

Approved Fuel

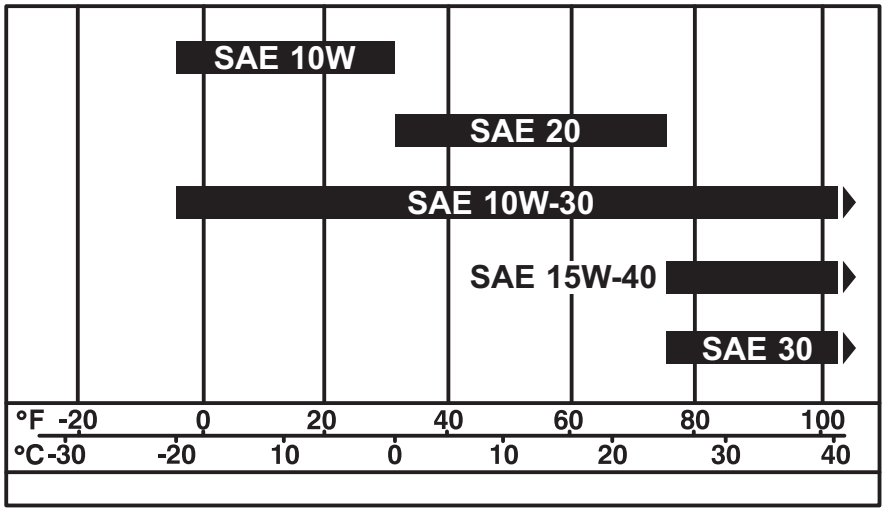
This engine is designed to run on unleaded gasoline and 10 percent volume ethanol (E10). use only high quality fuel meeting ASTM D4814 or equivalent. Do not use gasoline blended with methyl alcohol.

Approved Coolant

This unit was filled with John Deere Cool-Gard coolant before shipment from factory. Add only John Deere Coo-Gard (255-006) or any fully-formulated, ethylene glycol based, low-silicate, heavy-duty diesel engine coolant meeting ASTM specificationD6210 (fully formulated) or D4985 (low silicate).

NOTICE: Do not use water or high-silicate automotive-type coolant. This will lead to engine damage or premature engine failure.

Engine Oil Selection Chart



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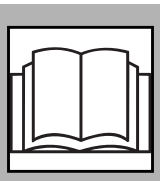
Select oil based on ambient temperature range expected before next oil change.



⚠ WARNING Read operator's manual. Know how to use all controls before operating machine. When you see this sign ⚠ on the machine or in the manual, read it and use caution. Your safety is at stake.

To help avoid injury:

- Unless otherwise instructed, all service should be performed with engine off, frame lock engaged, plow lowered and trencher lowered.
- Refer to engine manufacturer's manual for engine maintenance instructions.

10 Hour

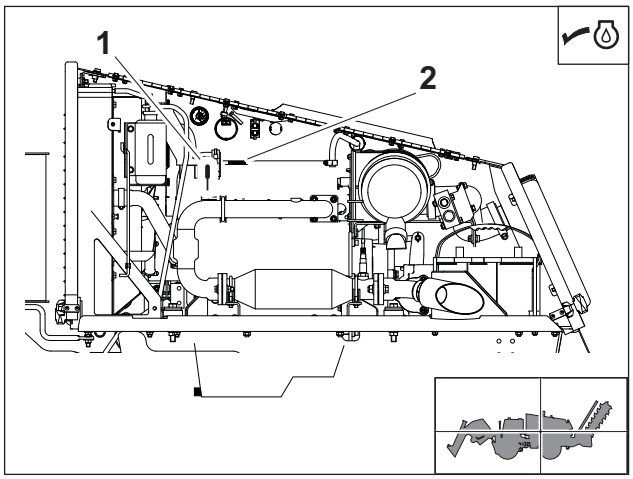
Location	Task	Notes
TRACTOR	Check engine oil level	GEO
	Check air filter restriction indicator	
	Check hydraulic fluid level	THF
	Check hydraulic hoses	
	Check tire pressure and lugnuts	
	Check exhaust clamp	
	Check engine coolant level	
PLOW	Check plow gearbox oil level	MPL, check when oil is cold
TRENCHER	Lube outboard auger bearing	MPG
	Check digging chain tension	

Tractor

Check Engine Oil Level

While engine oil is warm, check oil level at dipstick (1) every 10 hours. Add GEO at fill (2) as necessary to keep oil level at highest line on dipstick. Do not overfill.

IMPORTANT: See page 83 for GEO specifications.



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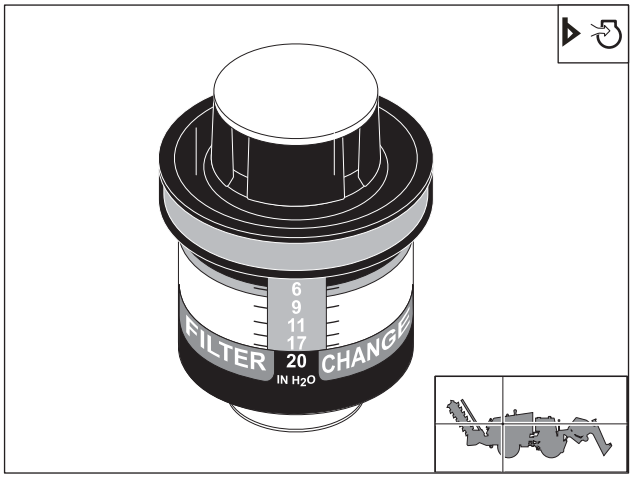
Check Air Filter Restriction Indicator

Check air filter restriction indicator every 10 hours. Change air filter elements when air filter restriction indicator reaches the red zone.

NOTICE: Only open the air filter canister when air restriction is indicated. Change the elements, do not attempt to clean them.

- Compressed air or water may damage filter elements.
- Tapping filter elements to loosen dirt may damage the elements.



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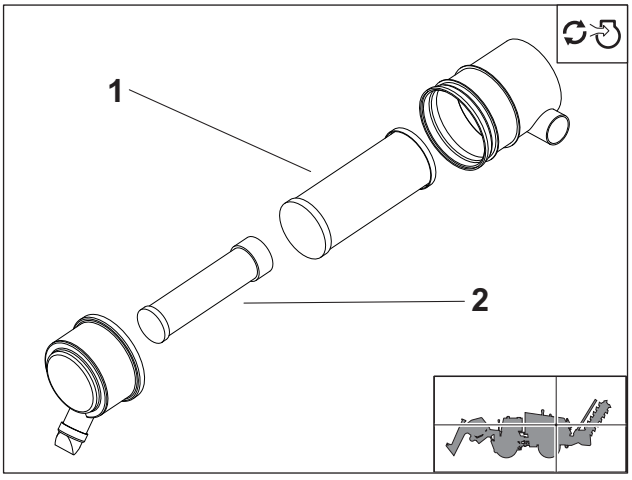
To change:

1. Remove air filter cover and remove primary (1) and safety (2) elements.
2. Wipe inside of housing and wash cover.
3. Insert new elements.
4. Replace cover.
5. Reset air filter restriction indicator.



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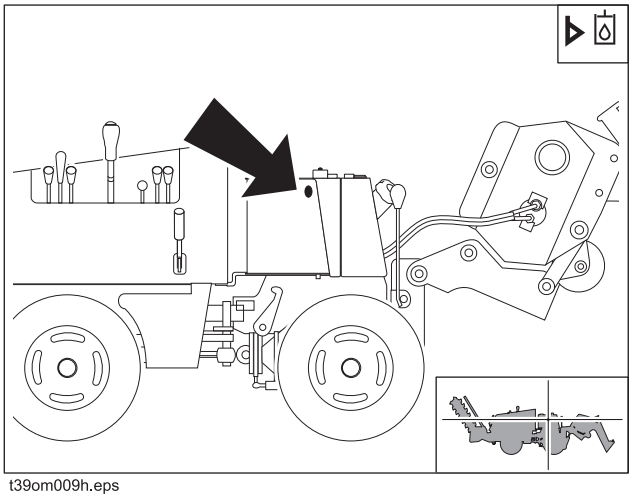
Check Hydraulic Fluid Level

With tractor level and attachments raised, check fluid at sight glass (2) every 10 hours. Fluid should be halfway up sight glass. Add THF at fill (1) as necessary. Do not overfill.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Check Hydraulic Hoses

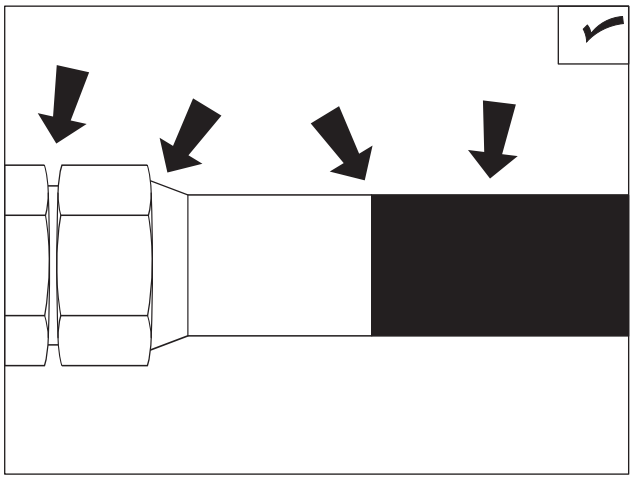
⚠ WARNING Fluid or air pressure could pierce skin and cause injury or death. Stay away. Escaping pressurized fluid can cause injury or pierce skin and poison.

To help avoid injury:

- 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.
- Use a piece of cardboard or wood, rather than hands, to search for leaks. Fluid leaks can be hard to detect.
- Wear protective clothing, including gloves and eye protection.

If you are injured, seek immediate medical attention from a doctor familiar with this type of injury.

Check hydraulic hoses for leaks every 10 hours.

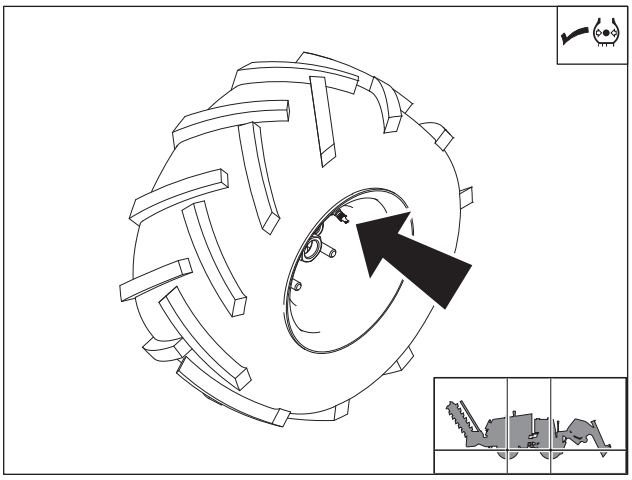


CheckHoses.eps

Check Tire Pressures

Check tire pressures before each use.

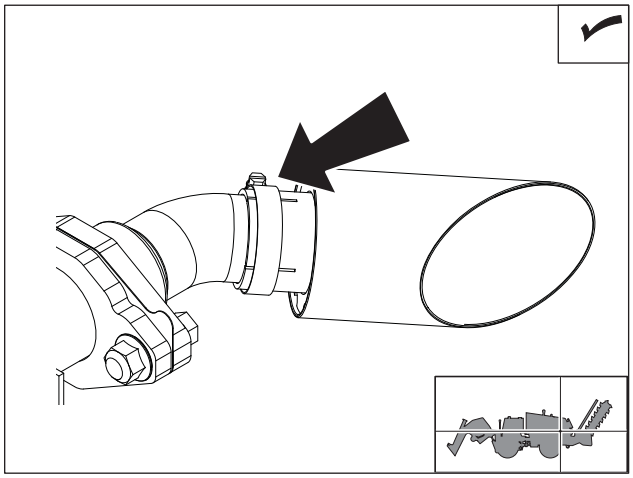
Tire option	Max. pressure
26 x 12.00-12 4-ply bar lug	20 psi (1.4 bar)
DUALS ONLY: 23 x 10.5-12 6-ply bar lug	20 psi (1.4 bar)



t39om004w.eps

Check Exhaust Clamp

Check clamp and lock screw on exhaust extension every 10 hours to ensure that it is tight. Replace if needed.

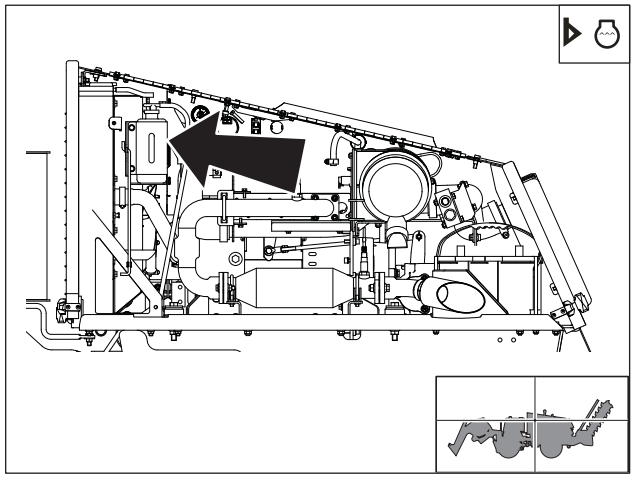

t39om061w.eps

Check Engine Coolant Level

Check engine coolant level every 10 hours with engine cool at plastic overflow tank. Maintain coolant level above low level mark. If low, add approved coolant. Clean debris from radiator cooling fins using compressed air or pressurized water.

NOTICE:

- Use caution when removing radiator pressure cap.
- To prevent engine damage or premature failure, use only approved coolant.
- Do not mix coolant types.
- See "Approved Coolant" on page 84.

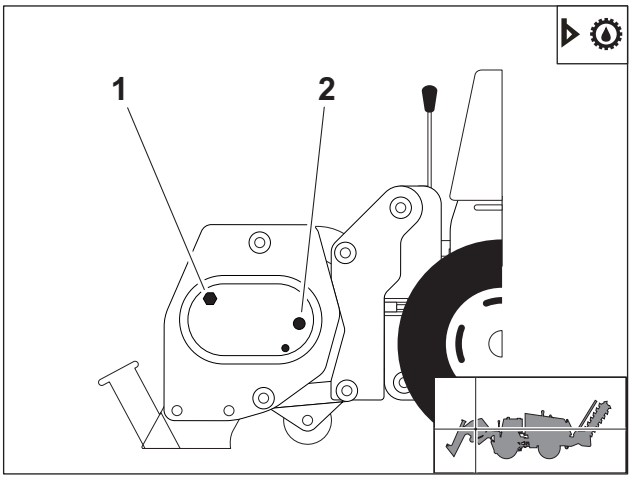

t39om063w.eps

Plow

Check Plow Gearbox Oil Level

Check plow vibrator oil level every 10 hours. Check when oil is cold, with vibrator level and skid shoes on ground. Remove plow blade and sod cutter if necessary. Oil should be halfway up sight glass (2). Add MPL as needed at fill (1).

IMPORTANT: Do not add oil to plow vibrator when hot. Let plow vibrator cool before removing fill plug.

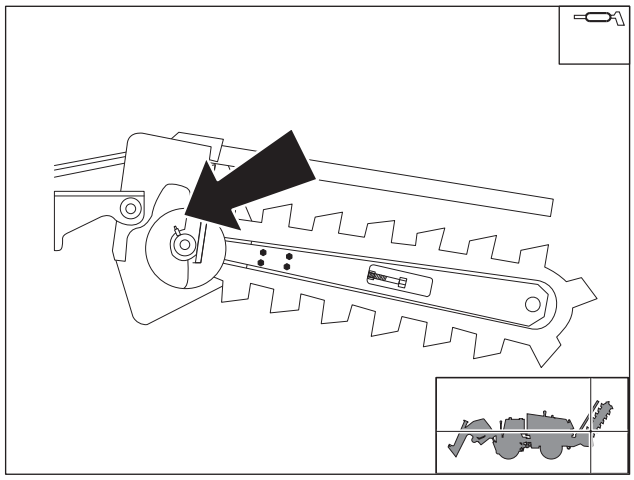


t39om064w.eps

Trencher

Lube Trencher Outboard Auger Bearing

Wipe zerk clean and lube every 10 hours with 8-10 pumps of MPG.



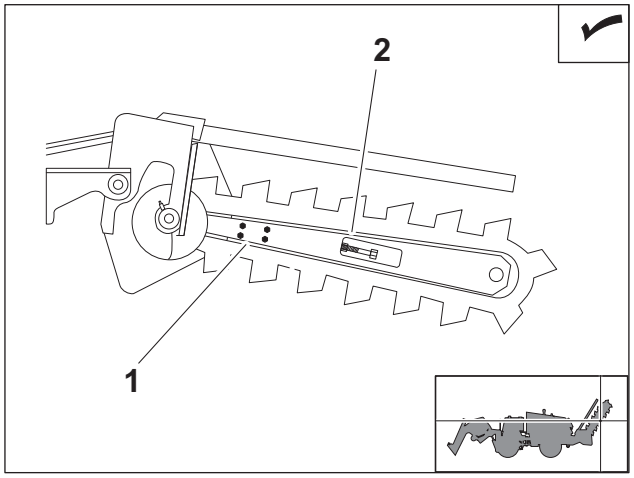
t39om006w.eps

Check Digging Chain Tension

If unit is equipped with H400 trenching attachment, check digging chain tension every 10 hours. Distance between chain and boom (4) should be approximately 1" (25 mm).

To adjust chain with roller boom:

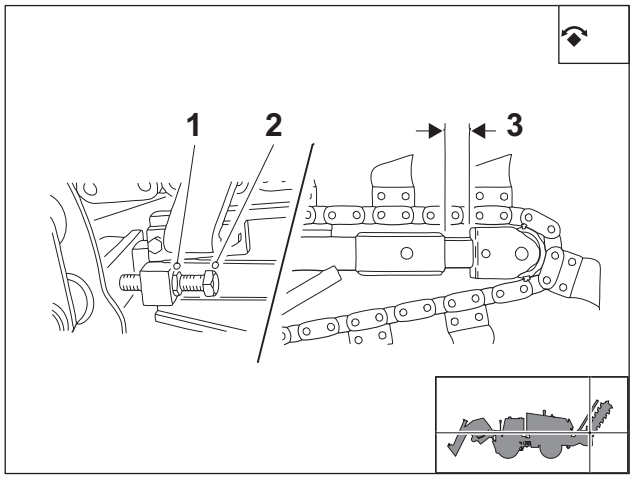
1. Lower boom to ground and stop engine.
2. Engage parking brake.
3. Loosen four trencher clamp bolts (1).
4. Loosen jam nut (2) and turn adjusting screw 78 ft•lb (106 N•m).



t39om007w.eps

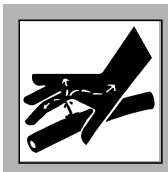
To adjust chain with sprocket boom:

1. Lower boom and stop engine.
2. Engage parking brake.
3. Adjust chain tension by tightening or loosening adjustment screw (2) and jam nut (1). Digging chain tension is correct when 1-1.5" (25-40 mm) of slide and stop is exposed (3).
4. Tighten jam nut.



t39om008w.eps

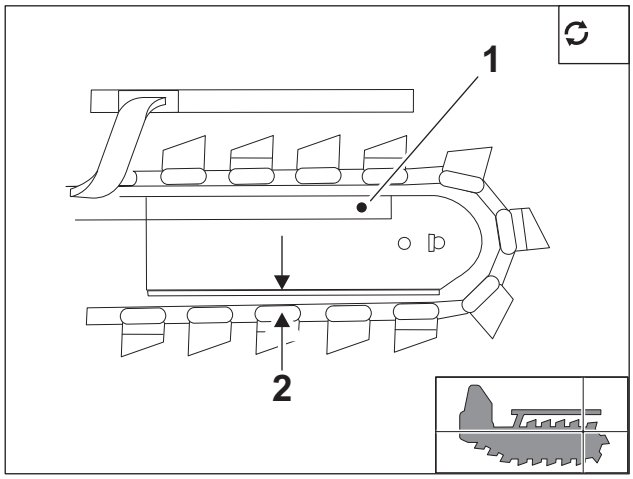
To adjust roller boom with grease cylinder:



WARNING Pressurized fluid or air could pierce skin and cause injury or death. Stay away.

To help avoid injury: Service digging boom grease cylinder only while standing on opposite side of boom. Wear gloves and safety glasses, and cover fitting with cloth when relieving pressure in cylinder.

1. With boom horizontal, measure distance from bottom of boom to chain (2). When properly adjusted, distance should be 1.5-2.0" (40-50 mm).
2. To tighten chain, remove plug and pump MPG into cylinder (1). To relieve chain tension, loosen plug on grease cylinder.



t39om010w.eps

50 Hour

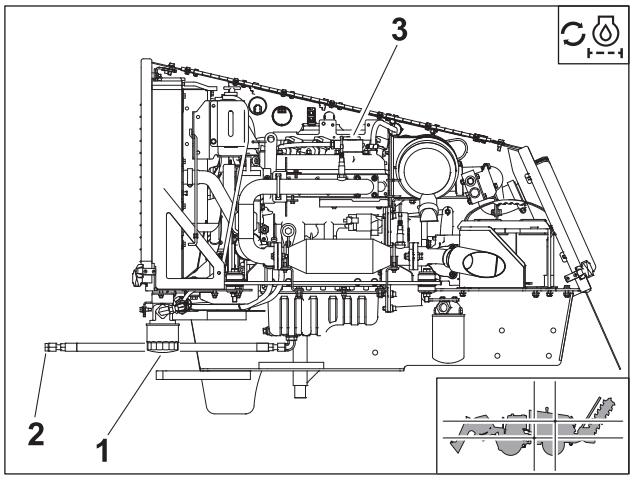
Location	Task	Notes
TRACTOR	Change engine oil and filter	GEO, initial service 5.5 qt (5.2 L)
	Check fan/alternator belt tension	20 ft•lb (20 N•m)
	Check exhaust system	
	Check radiator hoses	
	Clean battery terminals	
	Check air filter dust ejection valve	
	Check fuel lines	

Change Engine Oil and Filter (Initial Service)

Change engine oil and filter after first 50 hours, and every 200 hours afterward.

To change:

1. Drain crankcase (1) while oil is warm.
2. Replace filter (2) each time oil is changed.
3. Add GEO at fill neck (3) until oil level is at highest line on dipstick.

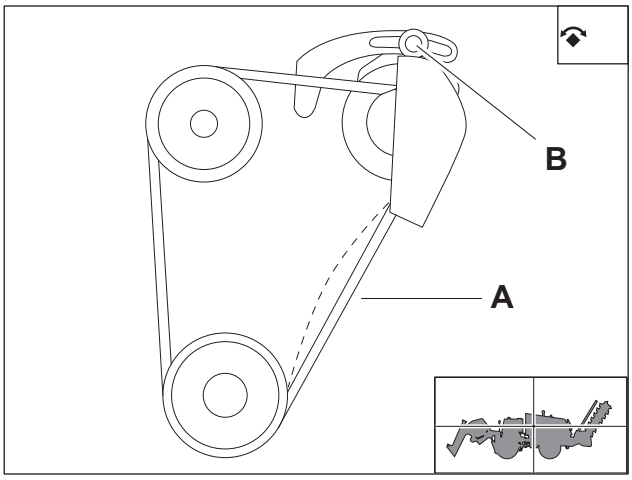


t39om010h.eps

NOTICE: To prevent engine fire, immediately wipe off any oil that drips on the exhaust tubes or thermal blankets. Replace thermal blankets if oil gets between the blanket and the exhaust system. Do not operate machine with oil between the blanket and the exhaust system

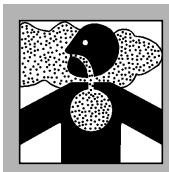
Check Fan/Alternator Belt Tension

Check belt tension every 50 hours. Belt is properly tensioned when it moves about 0.28 - 0.35" (7-9 mm) when pushed at the long span (A). To adjust belt, loosen bolt (B) and move tensioner pulley. Tighten bolt (B) to 20 ft-lb (27 N-m).



t39om011w.eps

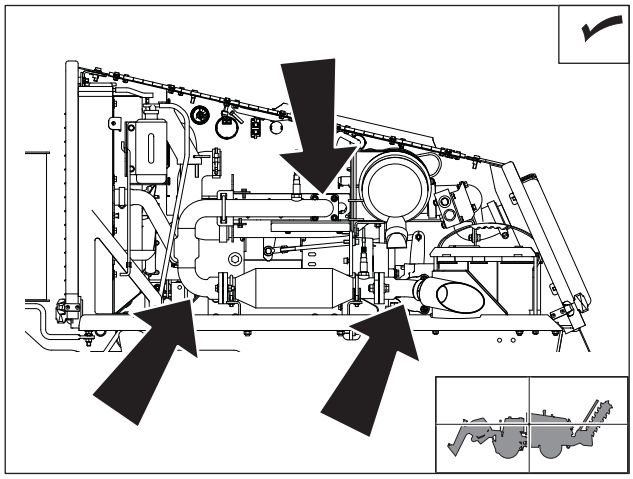
Check Exhaust System



WARNING Thermal blankets contain refractory ceramic fibers, which are a possible carcniogen and will cause irritation when airborne. Wear proper personal protective equipment, including gloves, safety glasses and breathing protection.

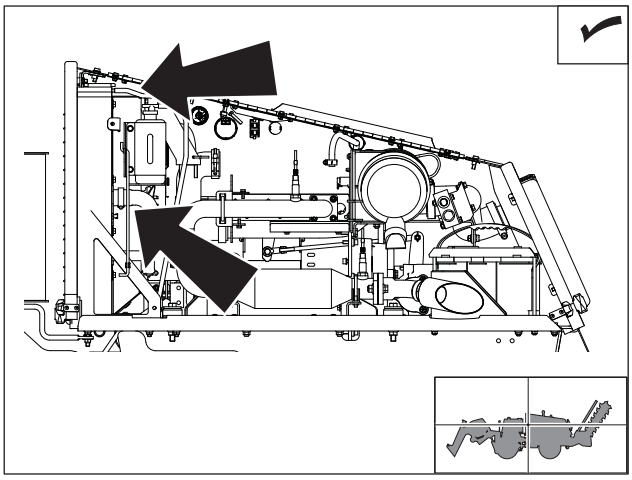
To help avoid injury, place damaged blanket in a plastic bag to prevent material from becoming airborne during disposal.

Check for any loose or damaged components every 50 hours. Check exhaust thermal blankets and replace if damaged. Check heat shields near the battery, starter and air cleaner and replace if damaged.


t39om065w.eps

Check Radiator Hoses

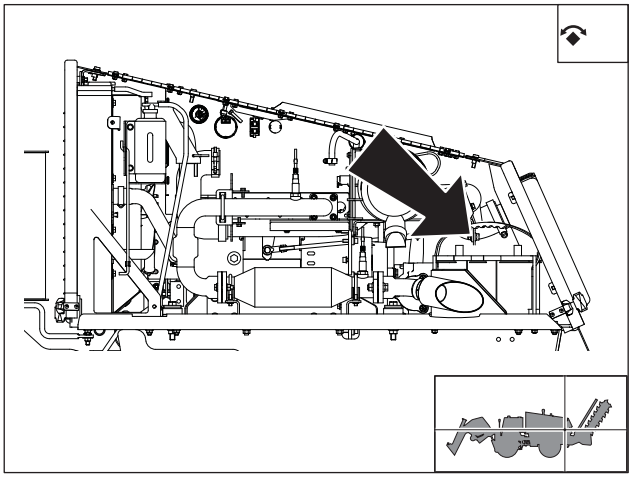
Check radiator hoses for leaks, abnormal swelling, or other signs of deterioration every 50 hours. Also check for leaks or corrosion at water pump and fittings.



t39om032w.eps

Clean Battery Terminals

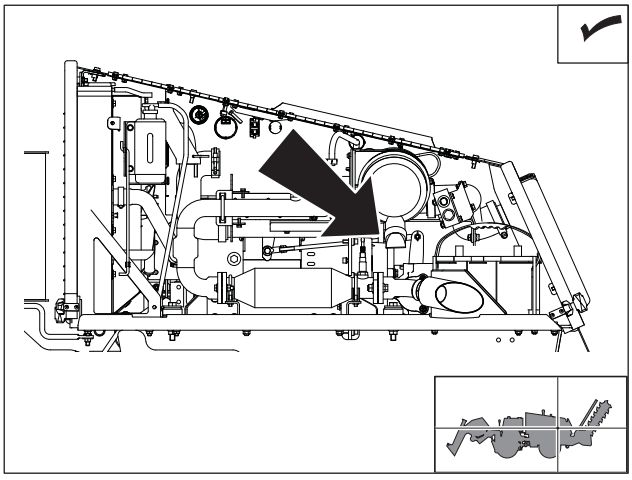
Clean battery terminals to remove any corrosion and apply MPG to terminals after cleaning to reduce corrosion. Check for signs of internal corrosion in cables and tighten any loose connections.



t39om033w.eps

Check Air Filter Dust Ejection Valve

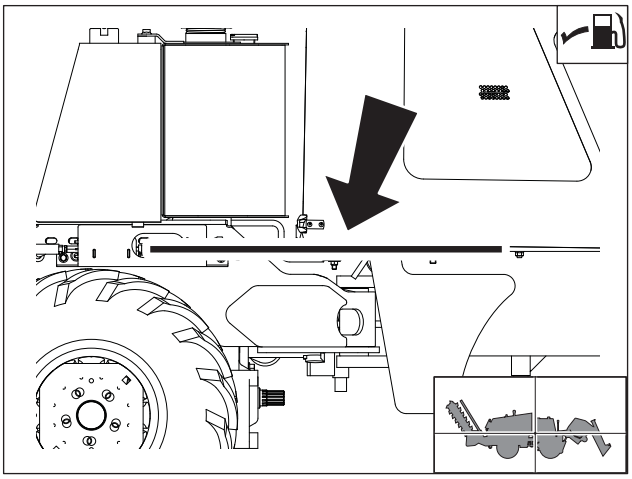
Check the dust ejection valve on the air filter every 50 hours. Replace if damaged. The valve should close when the engine is running for proper operation. Ensure that air filter cover is installed with valve at the 6 o'clock position.



t39om034w.eps

Check Fuel Lines

Check fuel lines for any signs of leaks or wear every 50 hours. Replace as needed only with low permeable fuel hose rated at 225 psi (p/n 105-1792), required for EPA emission regulations.



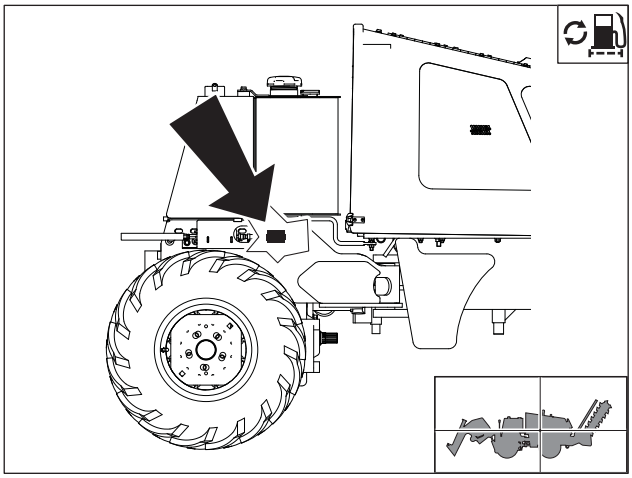
t39om070w.eps

100 Hour

Location	Task	Notes
TRACTOR	Change fuel filter	See engine operator's manual for more information

Change Fuel Filter

Change fuel filter (shown) every 100 hours.



t39om037w.eps

200 Hour

Location	Task	Notes
TRACTOR	Change engine oil and filter	5.5 qt (5.2 L) GEO
	Clean spark plugs	See engine operator's manual for more information

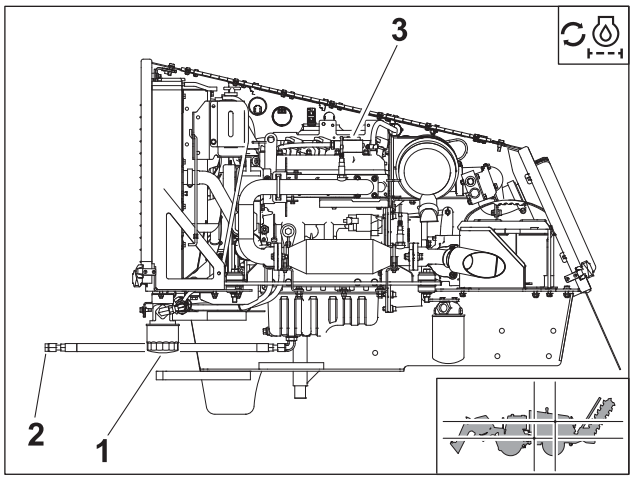
Change Engine Oil and Filter

Change engine oil and filter after first 50 hours, and every 200 hours afterward.

To change:

1. Drain crankcase (1) while oil is warm.
2. Replace filter (2) each time oil is changed.
3. Add GEO at fill neck (3) until oil level is at highest line on dipstick.

NOTICE: To prevent engine fire, immediately wipe off any oil that drips on the exhaust tubes or thermal blankets. Replace thermal blankets if oil gets between the blanket and the exhaust system. Do not operate machine with oil between the blanket and the exhaust system

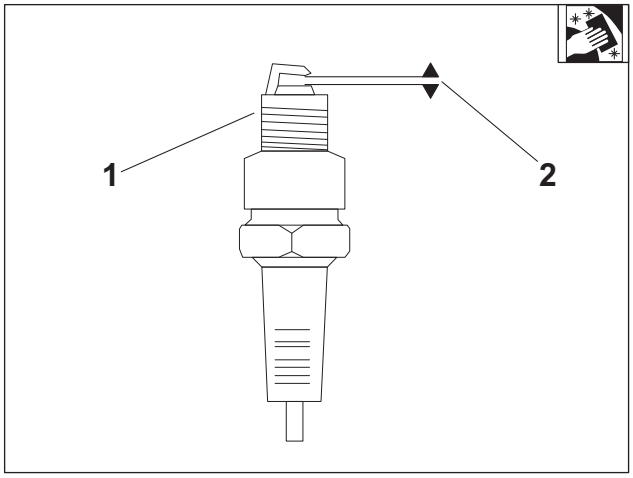


t39om010h.eps

Clean Spark Plugs and Check Gap

1. Remove the spark plug and remove carbon from the electrode.
2. Measure the spark plug gap with a feeler gauge and adjust or replace the spark plug if the measured gap differs from the factory specification: 0.028-0.031 in (0.70-0.80 mm)
3. Replace the spark plug if the electrode or the insulator is deformed or cracked.
4. Tighten the spark plug to 20 ft-lb (27 N-m).

IMPORTANT: When reassembling, install the ignition coil inside the spark plug terminal firmly. Make sure that the wiring and the ignition coil are correctly connected.



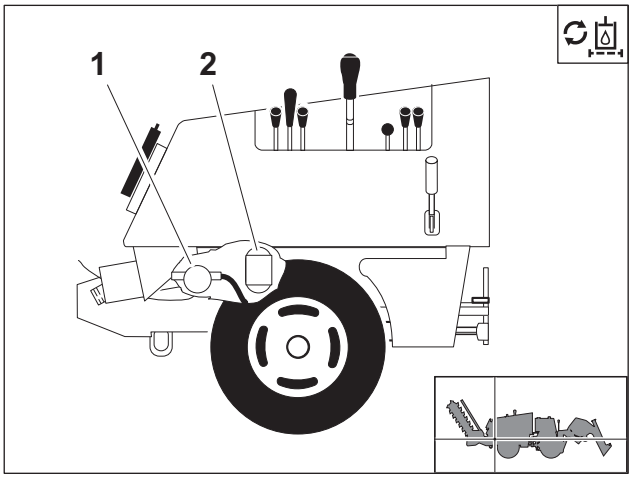
t39om068w.eps

250 Hour

Location	Task	Notes
TRACTOR	Change hydraulic fluid filters	14 gal (53 L)

Change Hydraulic Fluid Filters

Change hydraulic fluid filters every 250 hours. Spin-on type filter elements should be hand-tightened. Do not overtighten. Check oil level at hydraulic reservoir sight glass and fill with fluid as needed.



t39om035w.eps

500 Hour

Location	Task	Notes
TRACTOR	Change hydraulic fluid and filter	13.2 gal (50 L) THF
	Lubricate and inspect u-joints	MPG
	Check ground drive differential oil level	MPL
	Check ground drive gearbox oil level	MPL
PLOW	Change plow vibrator oil	2.4 pt (1 L) MPL

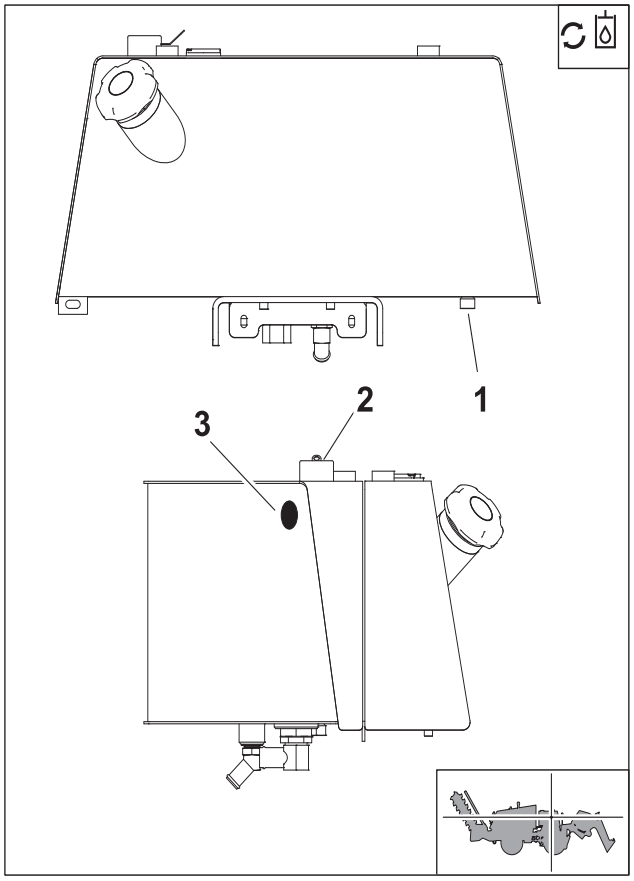
Tractor

Change Hydraulic Fluid and Filters

Change hydraulic fluid and filters every 500 hours.

To change hydraulic fluid:

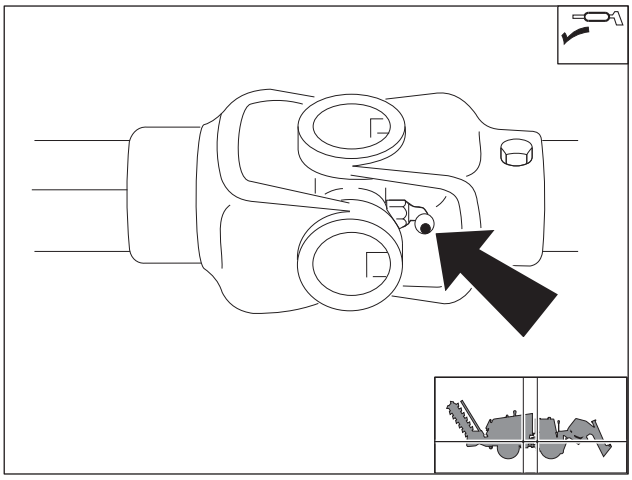
1. With fluid warm, remove drain plug (1), located at bottom of reservoir on right side of tractor.
2. Drain fluid and replace plug.
3. Fill through fill cap (2) to center of reservoir sight glass (3) with THF. Reservoir capacity is 13.2 gal (50 L).



t39om011h.eps

Lubricate and Inspect U-Joints

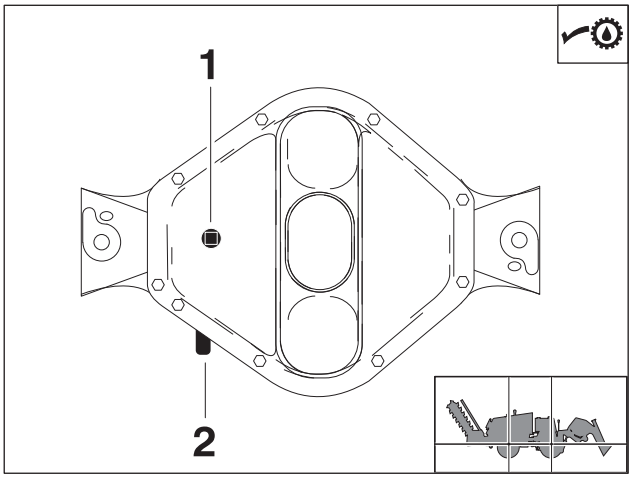
Lubricate U-joints at zerks (shown) with MPG every 500 hours. Clean zerk before servicing to prevent contamination. Also check U-joints for wear or damage.



t39om012w.eps

Check Differential Oil Level

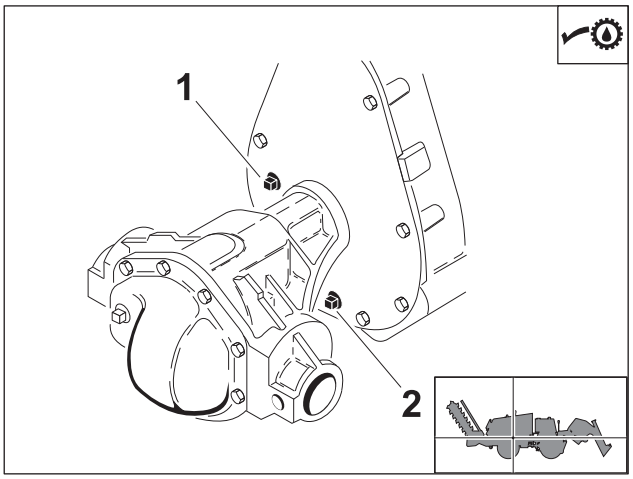
Check oil level at fill plug (1) every 500 hours. Add MPL as needed.



t39om013w.eps

Check Ground Drive Gearbox Oil Level

Check oil level at plug (1) every 500 hours. Add MPL as needed.



t39om014w.eps

Plow

Change Plow Vibrator Oil

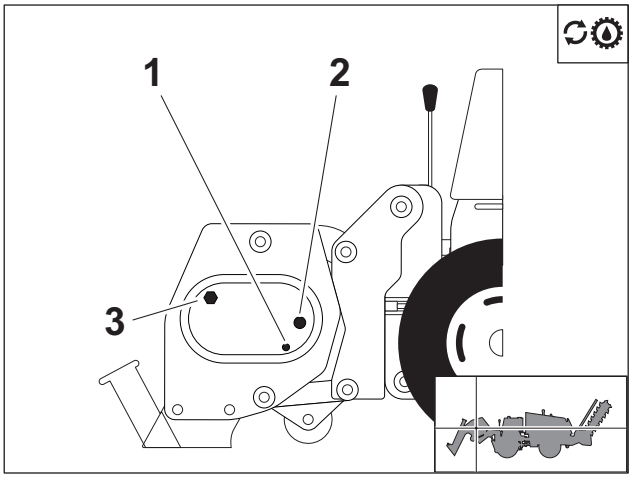
Change plow vibrator oil every 500 hours.

To change:

1. Remove drain plug (1) located just below sight glass (2) on gearbox cover.
2. Drain oil and replace plug.
3. Add MPL at fill (3) until cold oil is halfway up sight glass (2).

NOTICE: Fill capacity is 2.4 pt (1 L). Do not overfill.

IMPORTANT: Do not drain oil from plow vibrator when hot. Let vibrator cool before removing drain plug.



t39om072w.eps

1000 Hour

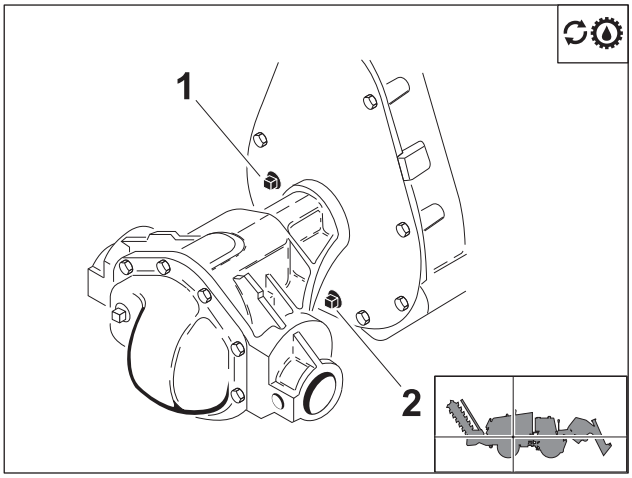
Location	Task	Notes
TRACTOR	Change ground drive transmission oil	4 pt (1.9 L) MPL
	Change ground drive differential oil	4.5 qt (2.1 L) MPL
	Check engine PCV valve	

Change Ground Drive Transmission Oil

Change ground drive transmission oil every 1000 hours.

To change:

1. Drain oil at drain plug (2) and replace plug.
2. Fill with MPL to level of fill plug opening (1). Capacity is 4 pints (1.9 L).



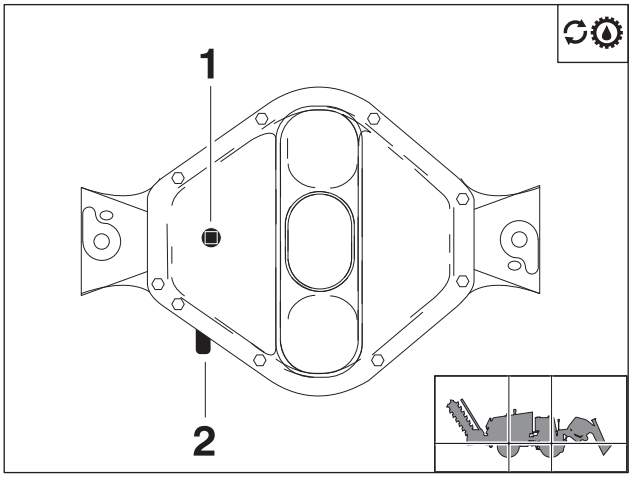
t39om073w.eps

Change Differential Oil

Change differential oil every 1000 hours.

To change oil:

1. Drain oil at plug (2) and replace plug.
2. Fill with MPL to level of fill plug opening (1). Capacity is 4.5 pt (2.1 L).

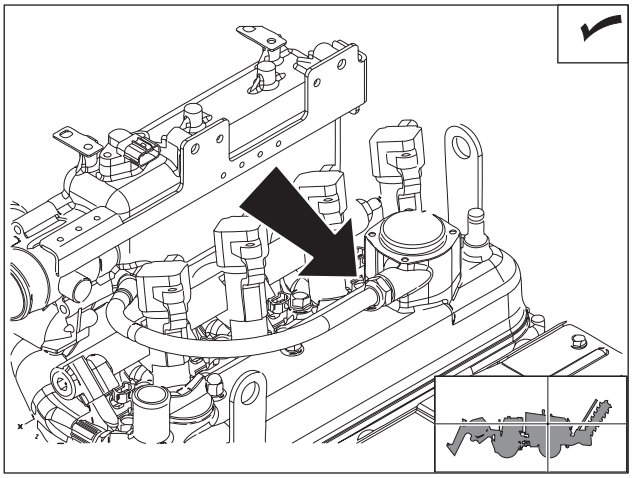


t39om016w.eps

Check PCV Valve

Check PCV valve every 1000 hours. To check:

1. Remove the PCV valve from the valve cover with the hose still attached.
2. Shake the valve: if it rattles, it is good. If it does not rattle, replace it. Always replace the hose with the PCV valve.



t39om066w.eps

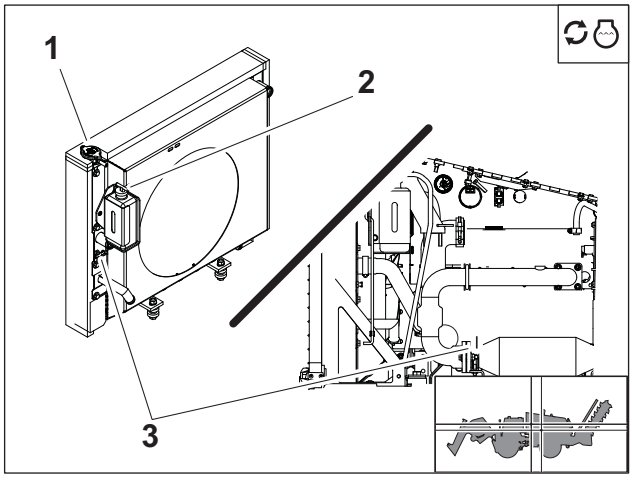
2000 Hour Service

Location	Task	Notes
TRACTOR	Change engine coolant	
	Change spark plugs	See engine operator's manual for more information.
	Change PCV valve	See engine operator's manual for more information.

Tractor

Change Engine Coolant

Change coolant every 2 years or 2000 hours. See Recommended Coolant on page 83.



t39om039w.eps

To change coolant:

1. Locate drains at the side of the radiator tanks.
2. Remove fill cap and drain coolant and close drain valves.
3. Fill with approved coolant to the bottom of radiator fill neck. Capacity is 1.5 gal (5.7 L).
4. Inspect radiator cap and replace if seal is damaged.
5. Install cap.
6. Fill coolant overflow bottle with approved coolant to half full.
7. Run engine with thermostat open (>185°F/ 85°C engine temperature) for several minutes.
8. Stop engine and let cool completely.
9. Remove cap and fill with coolant to the bottom of the fill neck. Replace cap.

10. Clean debris from radiator cooling fins using compressed air or pressurized water.

NOTICE:

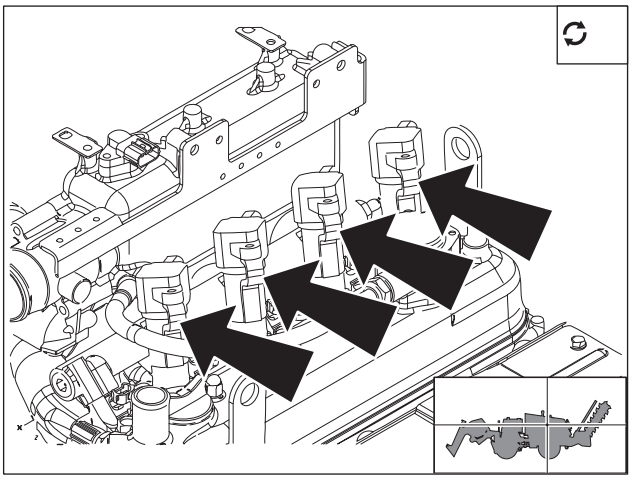
- To prevent engine damage, it is extremely important that different coolants not be mixed or interchanged without extreme care. It is strongly recommended that a single brand and type of coolant be used consistently for all service and maintenance.
- Tractors are shipped with John Deere Cool-Guard coolant.
- Should it be necessary to switch coolant brands or types, all residual coolant must first be carefully flushed from the cooling system.
- Failure to properly flush old coolant may result in engine failure.
- Do not use water as coolant.

Change Spark Plugs

Change spark plugs every 2000 hours. To change spark plug:

1. Disconnect the ignition coil.
2. Remove the spark plug.
3. Use a feeler gauge to set gap on new spark plug to 0.028-0.031 in (0.70-0.80 mm)
4. Install new spark plug and tighten to 20 ft-lb (27 N-m).

IMPORTANT: When reassembling, install the ignition coil inside the spark plug terminal firmly. Make sure that the wiring and the ignition coil are correctly connected.

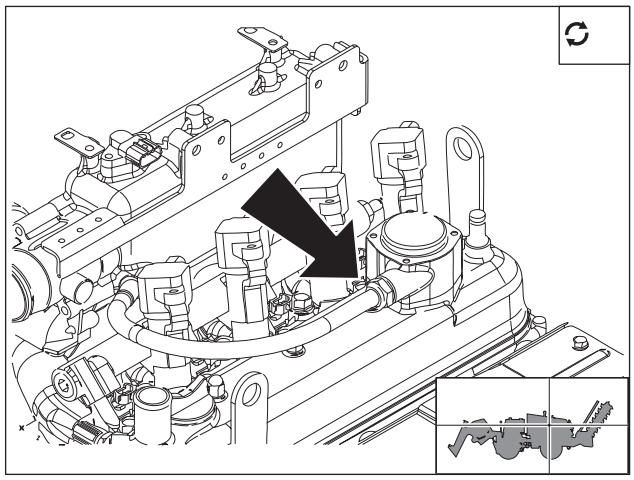


t39om067w.eps

Change PCV Valve

Change PCV valve every 2000 hours. To change:

1. Remove the PCV valve and hose from the valve cover (shown).
2. Install the new PCV valve with new hose.

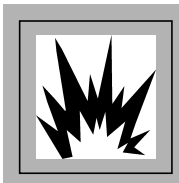


t39om069w.eps

As Needed

Location	Task	Notes
TRACTOR	Refuel	
	Check wheel lug nut torque (90 ft•lb /122 n•m)	
	Check and adjust parking brake	
TRENCHER	Check trencher mounting bolts	
	Check digging teeth and bits	
	Replace digging chain	
PLOW	Clean plow blade feed tube	
	Check plow arm pins and bushings	
	Check plow attachment mounting bolts	240 ft•lb (324 N•m)
	Replace plow blade	
REEL CARRIER	Check reel carrier arms and cable guides	
DRILL	Lube shaft, coupler and u-joint	MPG

Refuel



⚠WARNING Explosion possible. Serious injury or equipment damage could occur. Follow directions carefully.

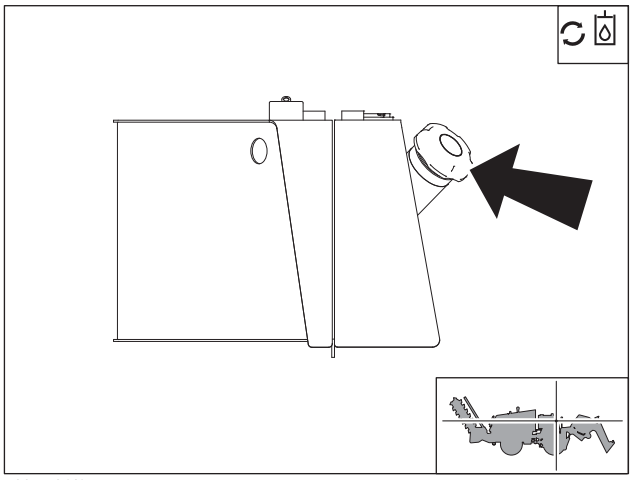
To help avoid injury, observe the following precautions while refueling.

- Do not refuel with the engine running.
- Touch an unpainted metal surface to discharge any static electricity. Sparks resulting from static electricity can cause fuel vapors to ignite while refueling.
- Always hold the grips on the fuel tank cap and turn it slowly to remove it. A whooshing sound may be heard when the fuel tank is loosened. Wait until the sound cannot be heard before fully removing the cap. In hot weather, pressurized fuel may spray out the filler neck and cause injury.
- Do not allow anyone that has not discharged static electricity from their body to come close to an open fuel tank.
- Do not inhale vaporized fuel. Fuel contains substances that are harmful if inhaled.
- Do not smoke while refueling the unit. Doing so may cause the fuel to ignite and cause a fire.
- Do not return to the vehicle or touch any person that is statically charged. This may cause static electricity to build up, resulting in a possible ignition hazard.
- Securely insert the fuel nozzle into the fuel filler neck. If fuel is added with the nozzle slightly lifted away from the fuel filler neck, the automatic shutoff function may not operate, resulting in fuel overflowing from the tank.
- Do not spill fuel during refilling. Doing so may damage the unit, such as causing the exhaust system to operate abnormally or damaging fuel system components or the unit's painted surface.

Refuel unit as needed. To refuel:

1. Turn engine switch off and let the engine cool for 3-5 min.
2. Open fuel cap.
3. Insert fuel nozzle and add fuel.
4. Install fuel cap and turn until you hear a click.

NOTICE: If cap becomes damaged, only replace with a Kelch 203325 vented fuel cap (p/n 362-1481).



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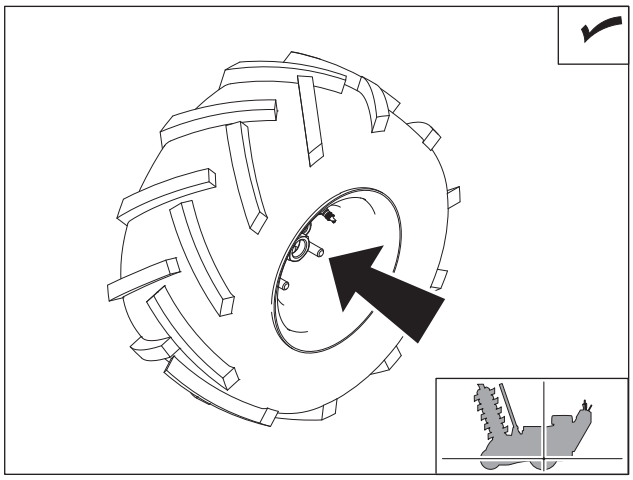
Check Wheel Lug Nut Torque

Check wheel lug nut torque before each use. Tighten to 90 ft•lb (122 N•m).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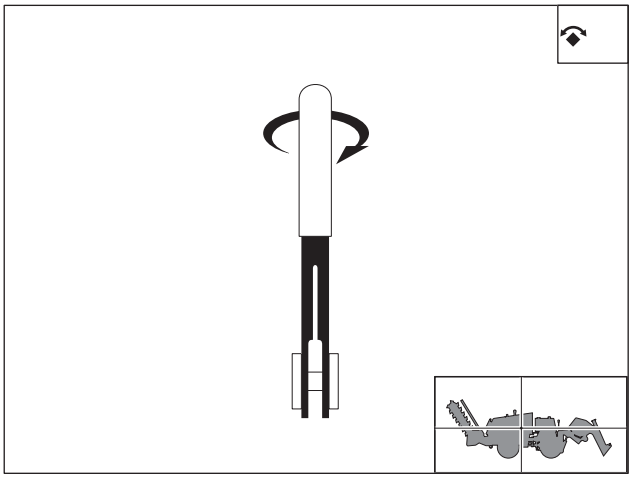
Check and Adjust Parking Brake

Check and adjust parking brake as needed.

To adjust:

1. Remove orange sleeve with brake released.
2. Turn handle clockwise to tighten. Do not overtighten.
3. Replace sleeve.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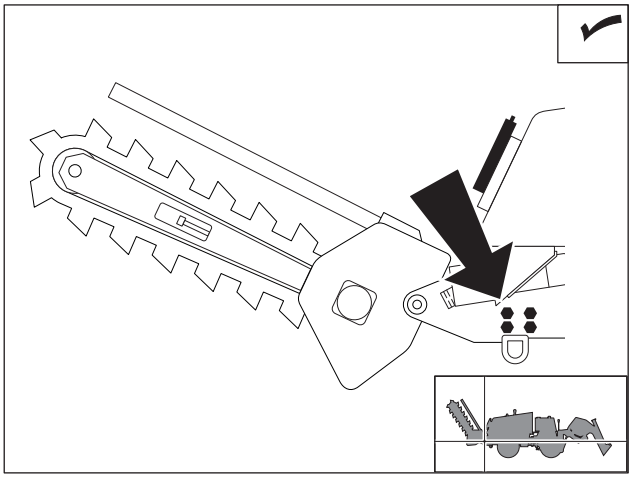
Trencher

Check Trencher Mounting Bolts

Check bolts every 10 hours. Tighten to 310 ft•lb (420 N•m).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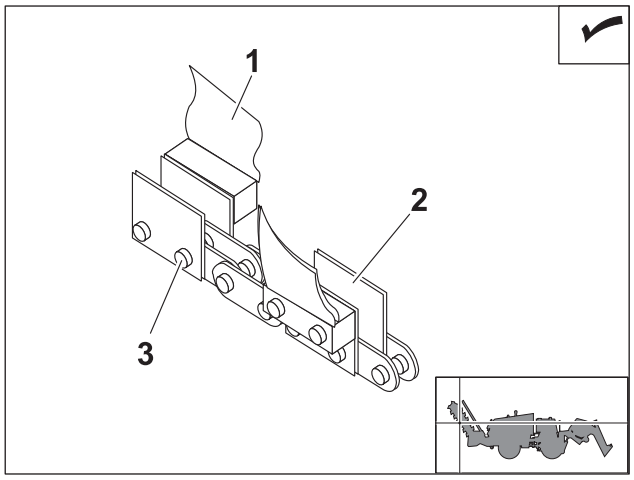
Check Digging Chain Teeth and Bits

Check teeth (1) for wear every 10 hours. Replace worn teeth, using Ditch Witch replacement parts and maintaining original tooth pattern.

Check chain every 10 hours. Replace worn or broken chains. If sidebars (2) are bent or loose on chain pins (3), chain spacers should be used to join sidebars.

For more efficient digging, contact your Ditch Witch dealer for information about the tooth pattern best suited to your jobsite.



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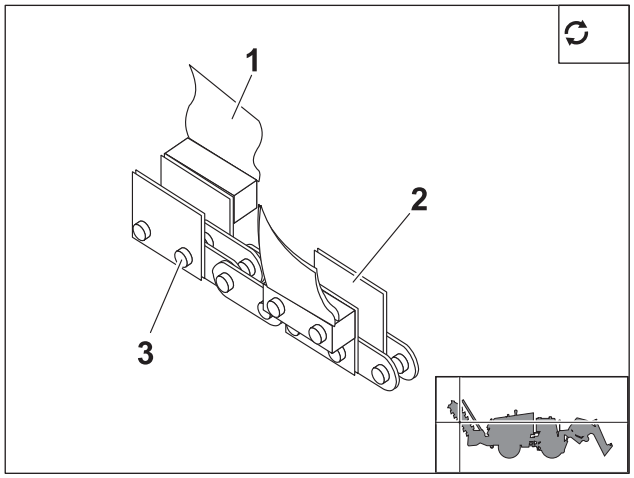
IMPORTANT: If using rock chain bits, check that bits rotate freely. Clean chain and check bits after each use. Replace bit when carbide cap or insert is worn or adapter can be damaged.

Replace Digging Chain

Visually check digging chains for wear on rollers and sidebars (2). Check pins (3) and bushing wear by measuring distance between chain pins and comparing it with a new chain. Also check digging teeth (1).

IMPORTANT: Replace sprockets when a new chain is installed.



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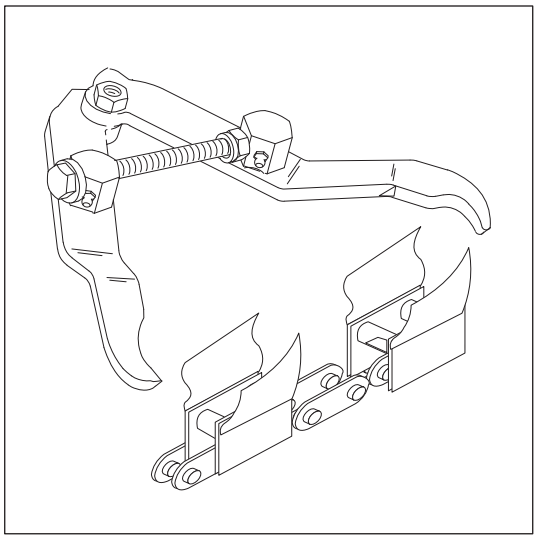
To remove chain:

1. Fasten and adjust seat belt.
2. Start tractor. See page 44 for proper start-up procedures.
3. Move attachment direction/speed control until digging chain connector pin is on top of boom.
4. Lower boom to ground.
5. Engage parking brake.
6. Turn ignition switch to STOP.
7. Roller booms: Secure chain by clamping links on either side of connector pin with chain jaws (shown). Squeeze jaws to reduce pressure on connector pin.

   Sprocket booms: Lock rear idler sprocket.
8. Loop cable through links nearest connector pin.



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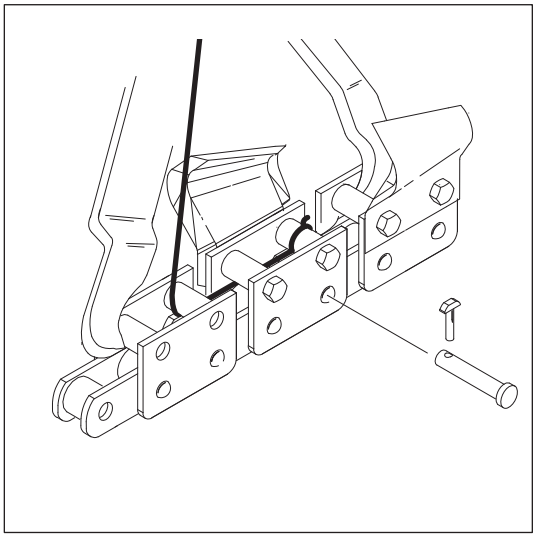

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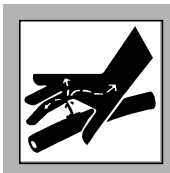
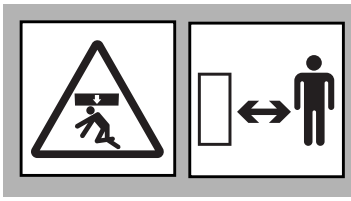


⚠WARNING Pressurized fluid could pierce skin and cause injury or death. Stay away.

NOTICE: Service digging boom grease cylinder only while standing on opposite side of boom. Wear gloves and safety glasses, and cover fitting with cloth when relieving pressure in cylinder.

9. Loosen plug on grease cylinder or turn tension bolts counterclockwise to relieve chain tension.
10. Stand clear of chain and remove lock key from connector pin. Drive connector pin out of link.



⚠ WARNING Crushing weight could cause death or serious injury. Use proper procedures and equipment or stay away.

11. Unclamp links. Slowly release cable and lower chain to ground.
12. Lay chain on ground with teeth down.

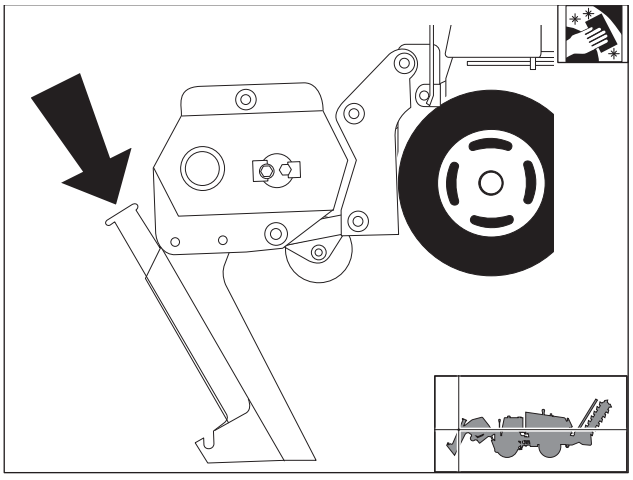
To install chain:

1. Lay chain on ground with teeth down and pointed toward unit. Loop cable through end links.
2. Fasten and adjust seatbelt.
3. Start tractor. See page 44 for start-up procedures.
4. Disengage parking brake.
5. Move ground drive control to reverse.
6. Back unit up until chain extends past head shaft about 1' (305 mm).
7. Move ground drive control to neutral.
8. Lower boom to horizontal position.
9. Engage parking brake.
10. Turn ignition switch to STOP.
11. Pull rear end of chain over tail roller or sprocket.
12. Pull until chain is in place on boom.
13. Move chain down boom until chain connector pin and lock key can be installed. Install connector pin and lock key.
14. Tighten chain by pumping EPG into grease cylinder.

Plow

Clean Plow Feed Tube

Clean feed tube every 10 hours.



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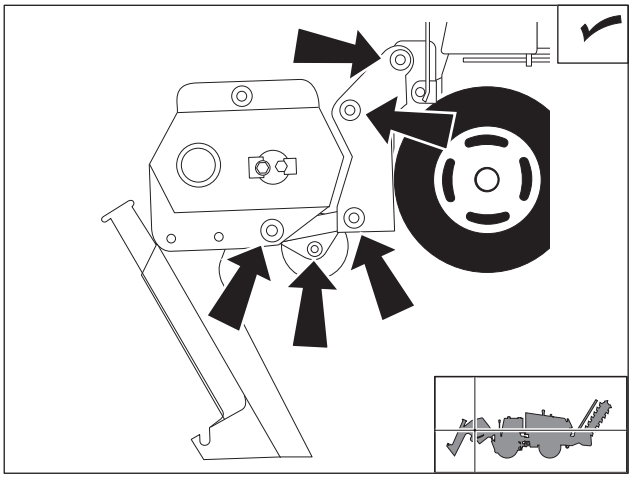
Check Plow Arm Pins and Bushings

Check plow arm pins and bushings every 10 hours. Replace bushings at first sign of wear.



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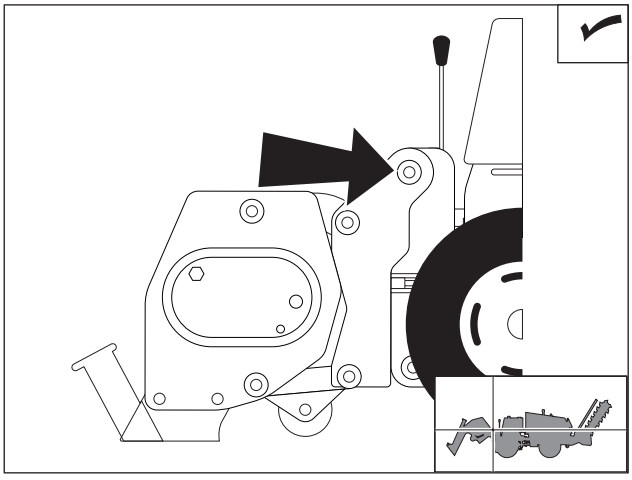
Check Plow Attachment Mounting Bolts

Check bolts every 10 hours. Tighten to 240 ft•lb (324 N•m). Check floating cable feed bolts for looseness or wear.



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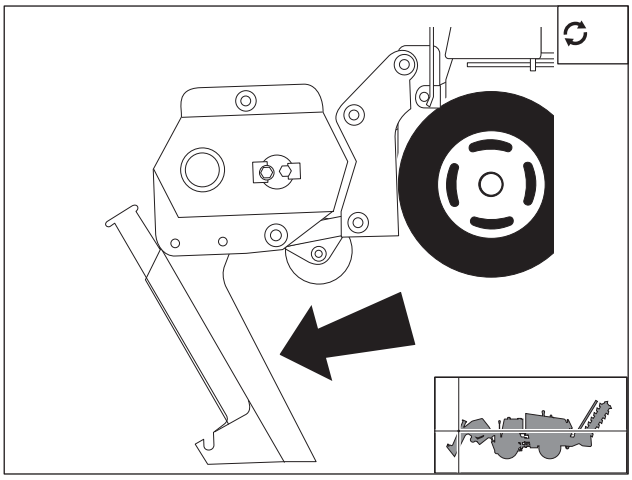
Replace Plow Blade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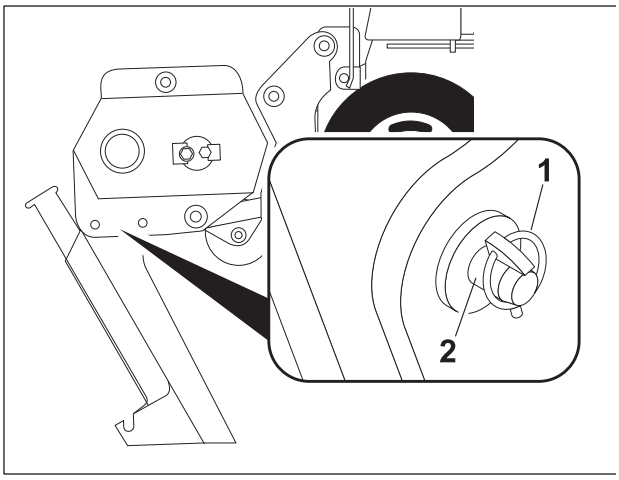
Check plow blade for wear and replace as needed. Blade should be changed if:

- Plow toe edge is worn to a curve
- Side plates begin to peel
- Plow blade bends
- Plow blade is worn scratched or gouged.

Remove Plow Blade



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1. Position plow so blade just clears the ground.
2. Stop engine.
3. Engage parking brake.
4. Remove keeper pins (1).
5. Remove lower plow blade pin (2).
6. Support the plow blade.
7. Remove the upper plow blade pin.
8. Remove plow blade.

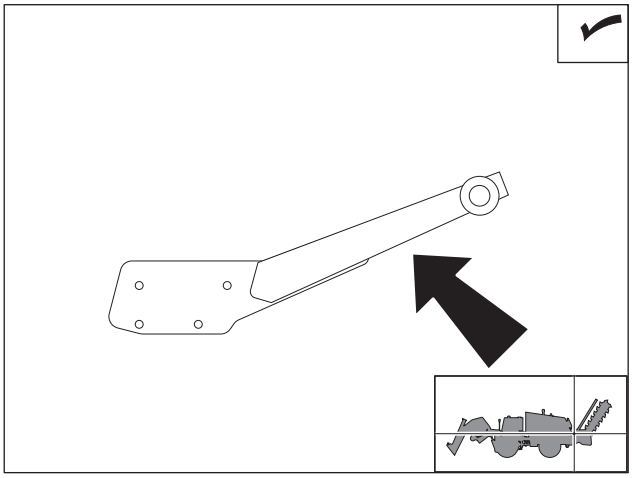
Install Plow Blade

1. If the plow blade is a vertically adjustable, multi-depth blade, select the proper installation height.
2. Engage parking brake.
3. Start engine (See "Start Unit" on page 44.)
4. Move throttle to low idle.
5. Lower digging boom (if equipped) to ground.
6. Raise vibrator halfway.
7. Insert plow blade, aligning blade boss with the upper pin in the vibrator housing. Use the ground to support the toe of the blade.
8. Install upper tapered pin and keeper pins.
9. Raise the vibrator so the blade can be fitted into the lower boss of the vibrator housing.
10. Install the lower tapered pin and keeper pins.
11. Lower vibrator until blade rests on ground.
12. Stop engine.

Reel Carrier

Check Reel Carrier Arms and Cable Guides

Check reel carrier arms and cable guides for damage. Replace if necessary.



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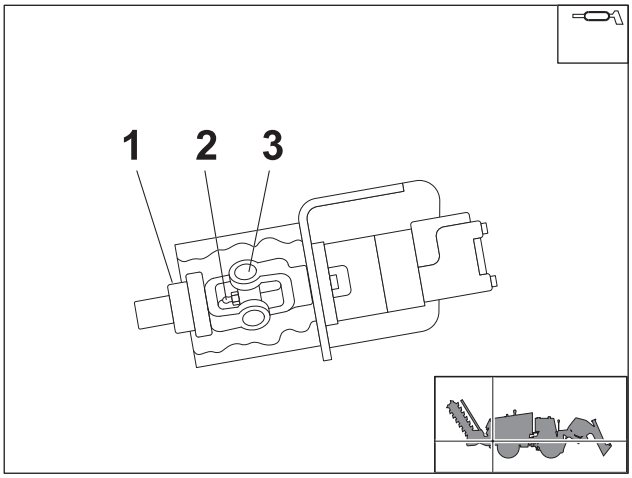
Drill

Lube Shaft, Coupler and U-joint

If tractor is equipped with optional drilling attachment, lube shaft (2), coupler (1), and u-joints (3) as needed. Wipe zerk clean before servicing to prevent contamination.



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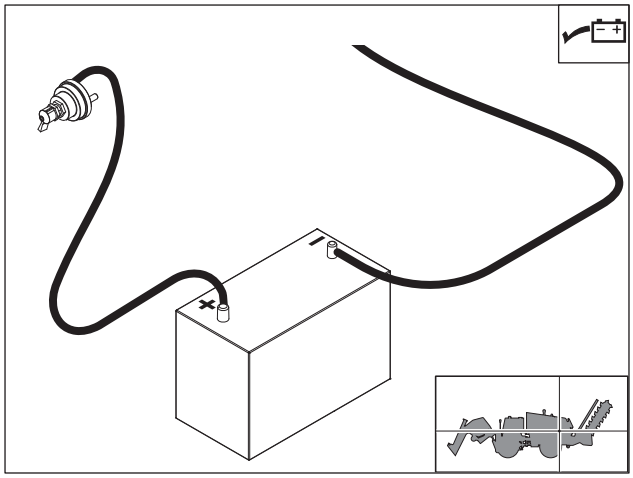
Check Batteries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Check batteries as needed. Keep batteries clean and terminals free of corrosion.

To clean:

1. Turn battery disconnect switch, if equipped, to the off position.
2. Ensure that no ignition sources are near batteries.
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. Replace battery and/or cables if damaged.

NOTICE: For the 410sx Gas, ONLY USE the following replacement battery: Optima 8004-003 (p/n 215-1165).

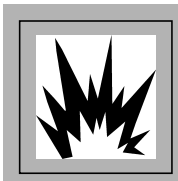
6. Apply MPG to terminals after cleaning to reduce corrosion.
7. Connect battery cable clamps, **positive (+)** cable first.
8. Tighten any loose connections.
9. Ensure that battery tiedowns are secure.
10. Turn battery disconnect switch to the on position.

⚠ WARNING Explosion possible. Serious injury or equipment damage could occur. Follow directions carefully.

To help avoid injury:

- Do not create sparks and do not short across battery terminals for any reason.
- Do not operate 410sx Gas unit without battery heat shields in place.

Charge Battery



⚠ WARNING Explosion possible. Serious injury or equipment damage could occur. Follow directions carefully.

To help avoid injury:

- Use a single 12V maximum source for charging. Do not connect to rapid chargers or dual batteries.
- Use caution and wear personal protective equipment such as safety eyewear, when charging or cleaning battery.
- Keep sparks, flames, cigarettes, or any other ignition source away from batteries at all times. Internal contents are extremely hazardous. Leaking fluid is corrosive. Battery may be explosive at higher temperatures.
- Always charge battery in an open area with sufficient ventilation.
- NEVER lean over battery when making connections.
- Do not allow vehicles to touch when charging.
- Do not attempt to charge a battery that is leaking, bulging, heavily corroded, frozen, or otherwise damaged.
- NEVER short-circuit battery terminals for any reason or strike battery posts or cable terminals.
- Refer to MSDS for additional information regarding this battery.

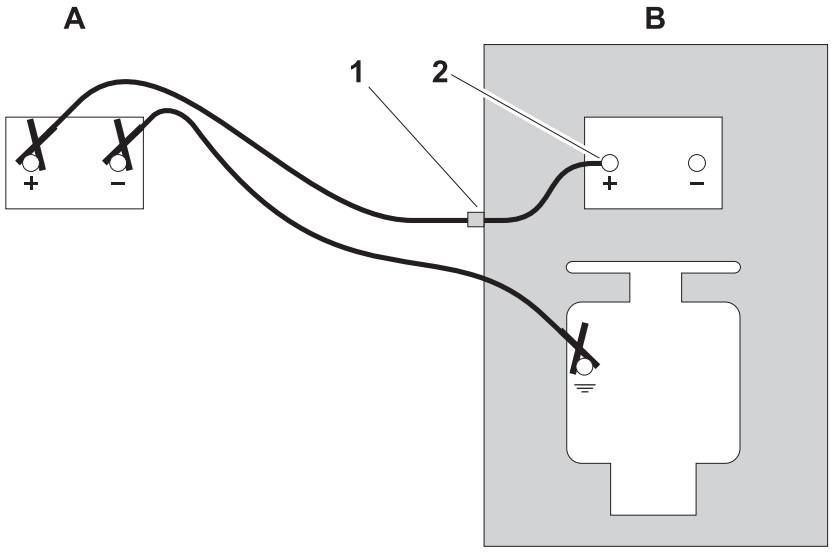
Before You Start

Electronic components can be easily damaged by electrical surges. Jump starting can damage electronics and electrical systems, and is not recommended. Attempt to charge the battery instead. Use quality large diameter charging cables capable of carrying high currents (400 amps or more). Cheap cables may not allow enough current flow to charge a dead/discharged battery.

Read all steps thoroughly and review illustration before performing procedure.

Charging Procedure (Engine Off)

1. Park service vehicle close to disabled equipment but do not allow vehicles to touch. Engage parking brake in both vehicles.
2. Turn the ignition switch to the OFF position in both vehicles, and turn off all electrical loads. Disconnect the machine controller.



3. Inspect battery in disabled vehicle (B) for signs of cracking, bulging, leaking, or other damage. Connect red positive (+) charging cable clamp to positive (+) post (2) of battery in disabled vehicle first.

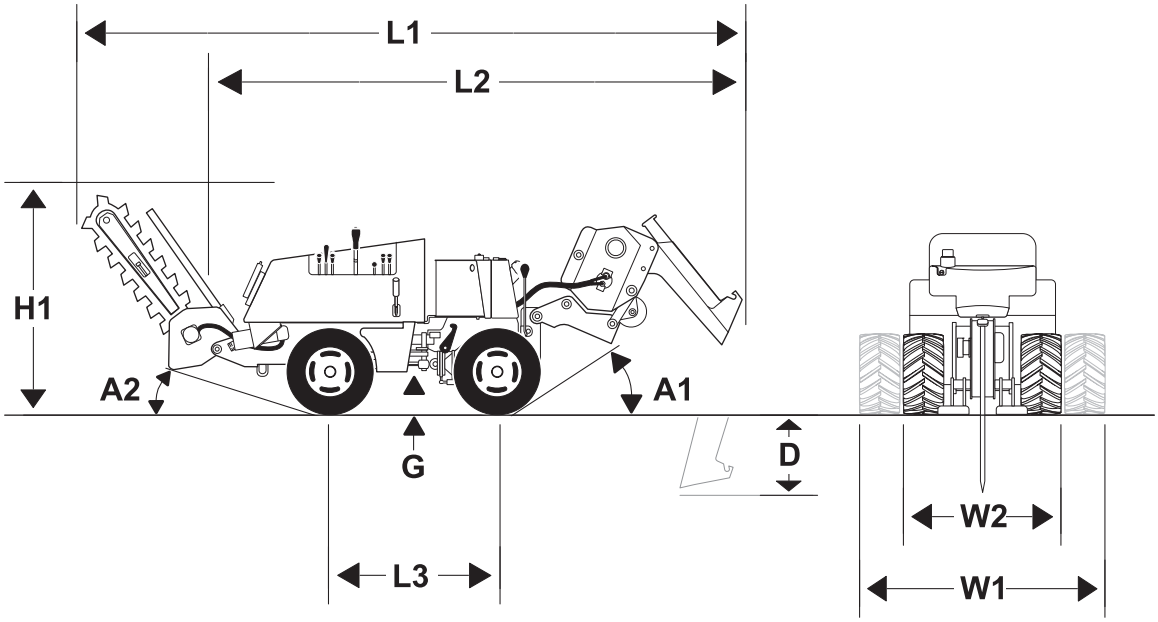
IMPORTANT: Some equipment may have a positive charging cable terminal (1) located externally. If so equipped, connect red positive (+) charging cable clamp to terminal.

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

If the disabled vehicle did not start, check for loose or corroded battery cable connections. Poor connections will prevent current from charging the failed battery. Clean terminals and posts if necessary and repeat steps above.

Specifications

410sx



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Dimensions *		U.S.	Metric
H1	Height from top of raised plow	58 in	1.5 m
	Height from top of 2' (610 mm) boom and chain	63.5 in	1.6 m
A1	Angle of departure without blade	39°	39°
	Angle of departure with 2' (610 mm) blade	17°	17°
A2	Angle of approach with trenching attachment	21°	21°
	Angle of approach without trenching attachment	22°	22°
L1	Maximum length plowing with trenching attachment and 3' (915 mm) boom	151 in	3.8 m
L2	Maximum length plowing without trenching attachment	118 in	3.0 m
L3	Wheelbase	46 in	1.2 m
W1	Width, transport (23 x 10.50 dual tires)	56 in	1.4 m
W2	Width, transport (26 x 12-12 tires)	48.5 in	1.2 m

	Centerline plow to outside edge of unit, blade centered (26 x 12-12 tires)	24 in	610 mm
D	Maximum cover depth*	24 in	610 mm

Dimensions are based on unit equipped with 26 x 12-12 tires unless otherwise specified.
* Suggested maximum depth. Actual depth will depend on job requirements and soil conditions.

Operation	**U.S.**	**Metric**
Ground drive speeds @ high idle rpm		
Maximum transit forward (26 x 12-12 tires)	2.9 mph	4.6 km/h
Maximum transit forward (23 x 10.50-12 tires)	2.5 mph	4.0 km/h
Maximum transit reverse (26 x 12-12 tires)	1.5 mph	2.5 km/h
Maximum transit reverse (23 x 10.50-12 tires)	1.3 mph	2.1 km/h
Maximum pipe or cable diameter, pull type plow blade	3 in	75 mm
Vehicle clearance circle, wall-to-wall, with trenching attachment and 18" (457 mm) plow blade		
Right turn (26 x 12-12 tires)	21 ft	6.4 m
Right turn (23 x 10.50-12 tires)	20 ft	6.1 m
Left turn (26 x 12-12 tires)	19 ft	5.8 m
Left turn (23 x 10.50-12 tires)	18 ft	5.5 m
Operating weight		
Basic unit weight with 18" (46 cm) plow blade and H400 with 36" (91 cm) boom and cup tooth chain	3610 lb	1632 kg

Power	**U.S.**	**Metric**
Engine: Kubota WG1605-G-E3 liquid-cooled four cylinder with electronic governor		
Fuel: unleaded gasoline		
Displacement	93.79 cu in	1.537 L
Bore	3.11 in	79 mm
Stroke	3.09 in	78.4 mm
Engine manufacturer's gross power rating @ 3600 rpm (SAE J1995)	49.6 hp	37kW
Estimated net power rating @ 3600 rpm (SAE J1349)	47.6 hp	35.5 kW

Hydraulic System	U.S.	Metric
Ground drive pump capacity @ high idle	18.0 gpm	68.0 L/min
Ground drive pump relief pressure	4000 psi	276 bar
Attachment pump capacity @ high idle	20.3 gpm	77.0 L/min
Attachment pump relief pressure	3000 psi	207 bar
Auxiliary pump capacity at high idle	8.4 gpm	31.8 L/min
Auxiliary pump relief setting	2000 gpm	138 bar
Filtration: charge full flow; 25 psi (2 bar) bypass, 10 micron nominal filter return full flow, 15 psi (1 bar) bypass, 10 micron nominal filter		

Power Train			
Ground drive transmission: hydrostatic drive infinitely variable from zero to maximum, lever operated speed/direction control			
Differentials: Dana model 44 limited slip			
Service brake: ground drive speed/direction control brakes machine hydraulically when moved to neutral position			
Parking brake: mechanical disc and caliper, hand-operated			
Tires: Load rating at 10 mph (16 km/h)			
	26x 12-12 4-ply bar lug; inflated to 20 psi (1.38 bar)	1780 lb	807 kg
Attachment drive transmission: hydrostatic lever-operated			

Battery
Group 75DT, SAE reserve capacity 110 min., SAE cold crank @ 0° F (-18° C), 800 amp

Fluid Capacities	U.S.	Metric
Fuel tank	8.5 gal	32.2 L
Engine oil with filter	5.5 qt	5.2 L
Coolant system	1.5 gal	5.7 L
Hydraulic reservoir	13.2 gal	50 L
Hydraulic system	15.2 gal	57.5 L
Ground drive gearbox	2.0 qt	2.0 L
Ground drive differentials	4.5 pt	2.1 L
Plow vibrator	2.4 qt	1.1 L

Attachments			
H400 Trencher			
	Trench width	3.5-6 in	89-152 mm
	Trench depth, maximum	36 in	914 mm
	Boom travel up	78°	78°
	Boom travel down	57°	57°
	Headshaft speed w/o chain (no load	320 rpm	320 rpm
	Digging chain speed	441 ft/min	134 m/min
	Centerline of trench to outside edge, left	22 in	559 mm
	Centerline of trench to outside edge, right	27 in	686 mm
	Distance from ground to headshaft, boom up	24 in	610 mm
	Distance from ground to headshaft, boom down	8 in	200 mm
	Headshaft overhang (centerline of front axle to centerline of headshaft)	38.5 in	980 mm
Reel Carrier			
	Width, maximum	24 in	610 mm
	Diameter, maximum	36 in	635 mm
	Capacity, maximum	200 lb	45.4 kg
Roto Witch® Drilling Attachment			
	Bore diameter	1.75 - 12 in	45-305 mm
	Motor displacement	18.7 in^3	5 m^3
	Torque @ 3000 psi	750 ft•lb	1009 N•m
	Speed, low (no load)	185 rpm	185 rpm
	Speed, high (no load)	240 rpm	240 rpm

Noise Levels
Operator 91 dBA sound pressure per ISO 6394
Exterior 105 dBA sound power per ISO 6393

Vibration
Average vibration transmitted to the operator's hand during normal trenching operation is 4.4 m/sec^2. Average vibration transmitted to the operator's hand during normal plowing operation is 9.54 m/sec^2.

Unless otherwise specified, all figures are for standard equipment only.

Specifications are called out according to SAE recommended procedures. 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 necessarily match that described.

Support

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 Charles Machine Works, Inc. (CMW) 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, 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 CMW or its authorized dealer. CMW will provide the location of its inspection facilities or its nearest authorized dealer upon inquiry. CMW reserves the right to supply remanufactured replacements parts under this warranty as it deems appropriate.

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

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 CMW's Product Support department, P.O. Box 66, Perry, OK 73077-0066, or contact your local Ditch Witch dealer.

First version: 1/91; Latest version: 11/11

A Note To Ditch Witch Equipment Owners:

If your equipment was purchased through a Ditch Witch dealer, there is no need to read further.

However, if you purchased from any other source, please fill out the form on the reverse side and return it to us.

This will enable you to receive updates on this equipment as well as information on new products of interest.

Thanks for using Ditch Witch equipment.

(Please Fold Along This Line And Seal At Bottom With Tape)

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO 23 PERRY OKLAHOMA

POSTAGE WILL BE PAID BY

The Charles Machine Works, Inc.
P.O. Box 66
Perry, Oklahoma 73077-9989

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Ditch Witch® Registration Card

Please Type or Print All Information

Purchaser's Company Name

Attention

Street Address or P.O. Box

City County

State Zip Nation

( )

Phone Number With Area Code

Model Serial Number

Attachments/Accessories Serial Numbers

Attachments/Accessories Serial Numbers

Attachments/Accessories Serial Numbers

Name of Ditch Witch Dealership

Your Signature

Ditch Witch® Registration Card

Please Type or Print All Information

Purchaser's Company Name

Attention

Street Address or P.O. Box

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State Zip Nation

( )

Phone Number With Area Code

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Attachments/Accessories Serial Numbers

Attachments/Accessories Serial Numbers

Name of Ditch Witch Dealership

Your Signature

Service Record

Service Performed	Date	Hours

Service Performed	Date	Hours