FM25

Operator's Manual

CE

CMW®

Issue 1.0

053-1187

Overview

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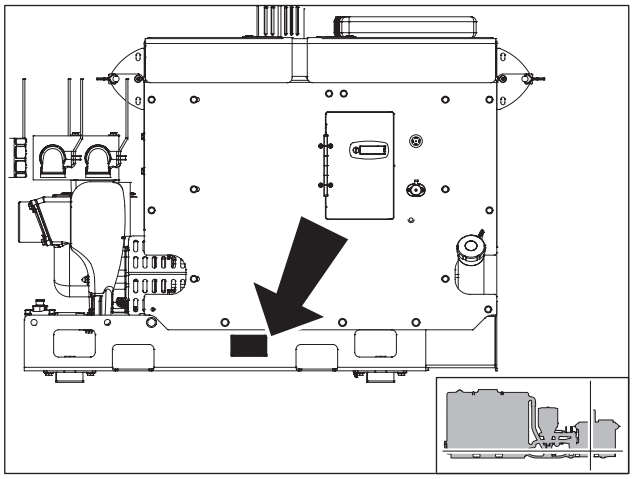
Serial Number Location

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

Item	
date of manufacture	
date of purchase	
fluid unit serial number	
engine serial number	



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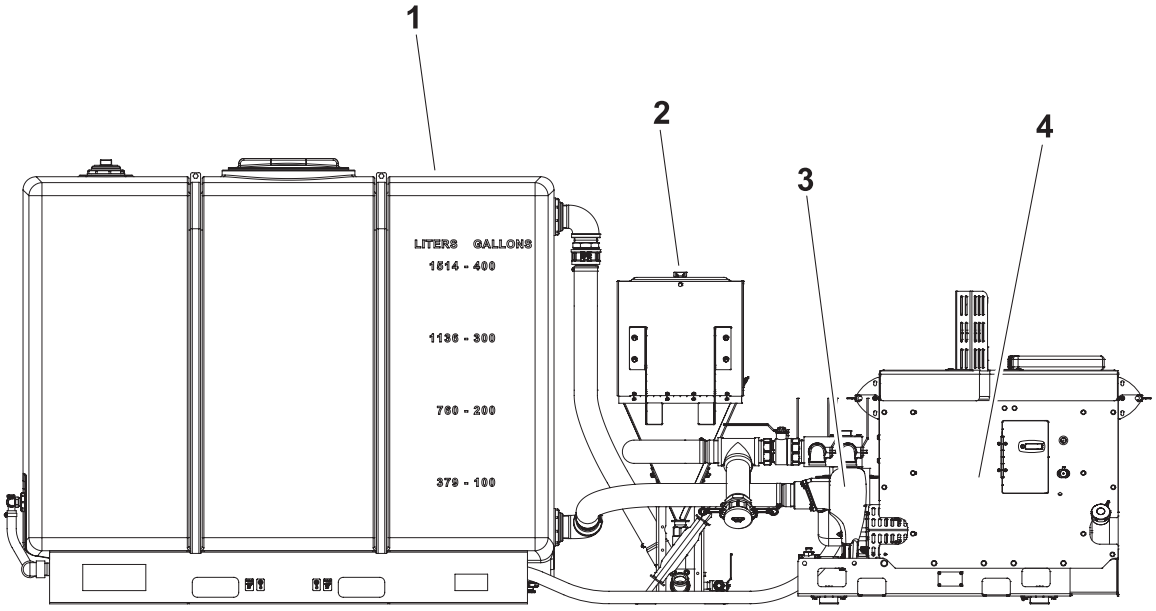
Intended Use

The FM25 is a self-contained drilling fluid unit capable of mixing up to 1000 gal (3785 L) of drilling fluid per tank and transferring fluid under pressure to the drilling unit. It is intended for operation in ambient temperatures from 0° to 115°F (-18° to 46°C). Use in any other way is considered contrary to the intended use.

The FM25 can be used with Ditch Witch drilling units and locating equipment. It should be operated, serviced, and repaired only by persons familiar with its particular characteristics and acquainted with the relevant safety procedures.

Unit Components



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1. tank
2. hopper
3. pumps
4. power unit

About This Manual

This manual contains information for the proper use of this machine. See the beige **Operation Overview** pages 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.

FM25
Operator's Manual

Issue number 1.0/OM-10/07
Part number 053-1187

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Zahn and InterChange are pending trademarks of The Charles Machine Works, Inc.

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part number, revision level, and publication date of this manual, and factory contact information

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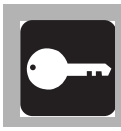

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Guidelines

Follow these guidelines before operating any jobsite equipment:

- Complete proper training and read operator's manual before using equipment.
- Contact One-Call (888-258-0808) and any utility companies which do not subscribe to One-Call. Have all underground pipes and cables located and marked before operating equipment. If you damage a utility, contact utility company.
- 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.
- 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 is present.
- Contact your Ditch Witch dealer if you have any question about operation, maintenance, or equipment use.

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 an imminently hazardous situation which, if not avoided, will result in death or serious injury.

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

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

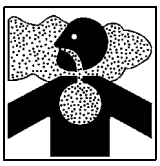
Watch for two other words: **NOTICE** and **IMPORTANT**.

NOTICE can keep you from doing something that might damage the machine or someone's property. It can also alert you against unsafe practices.

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

Safety Alerts

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

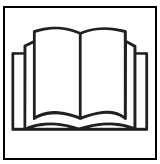


DANGER Deadly gases. Lack of oxygen or presence of gas will cause sickness or death. Provide ventilation.

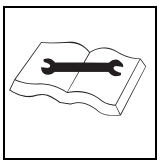
WARNING Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.

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

WARNING Moving parts could cut off hand or foot. Stay away.



WARNING Incorrect procedures could result in death, injury, or property damage. Learn to use equipment correctly.



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.

WARNING Fire or explosion possible. Fumes could ignite and cause burns. No smoking, no flame, no spark.

WARNING Moving traffic - hazardous situation. Death or serious injury could result. Avoid moving vehicles, wear high visibility clothing, post appropriate warning signs.

CAUTION Flying objects may cause injury. Wear hard hat and safety glasses.

CAUTION Hot parts may cause burns. Do not touch until cool.

CAUTION Exposure to high noise levels may cause hearing loss. Wear hearing protection.

CAUTION Fall possible. Slips or trips may result in injury. Keep area clean.

CAUTION Battery acid may cause burns. Avoid contact.

CAUTION Improper handling or use of chemicals may result in illness, injury, or equipment damage. Follow instructions on labels and in material safety data sheets (MSDS).

Emergency Procedures

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

EMERGENCY SHUTDOWN - Turn ignition switch to stop position or push remote engine stop button (if equipped).

Electric Strike Description

When working near electric cables, remember the following:

- Electricity follows all paths to ground, not just path of least resistance.
- Pipes, hoses, and cables will conduct electricity back to all equipment.
- Low voltage current can injure or kill. Almost one-third of 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 **on truck or trailer**, DO NOT MOVE. Remain on truck or trailer and take the following actions. The order and degree of action will depend on the situation.

- Warn people nearby that an electric strike has occurred. Instruct them to leave the area and contact utility.
- Contact utility company to shut off power.
- Do not return to area or allow anyone into area until given permission by utility company.

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

- LEAVE AREA.
- Contact utility company to shut off power.
- Do not return to area or allow anyone into area until given permission by utility company.

If a Gas Line is Damaged

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

- Immediately shut off engine(s), if this can be done safely and quickly.
- Remove any ignition source(s), if this can be done safely and quickly.
- Warn others that a gas line has been cut and that they should leave the area.
- 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.

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) 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.

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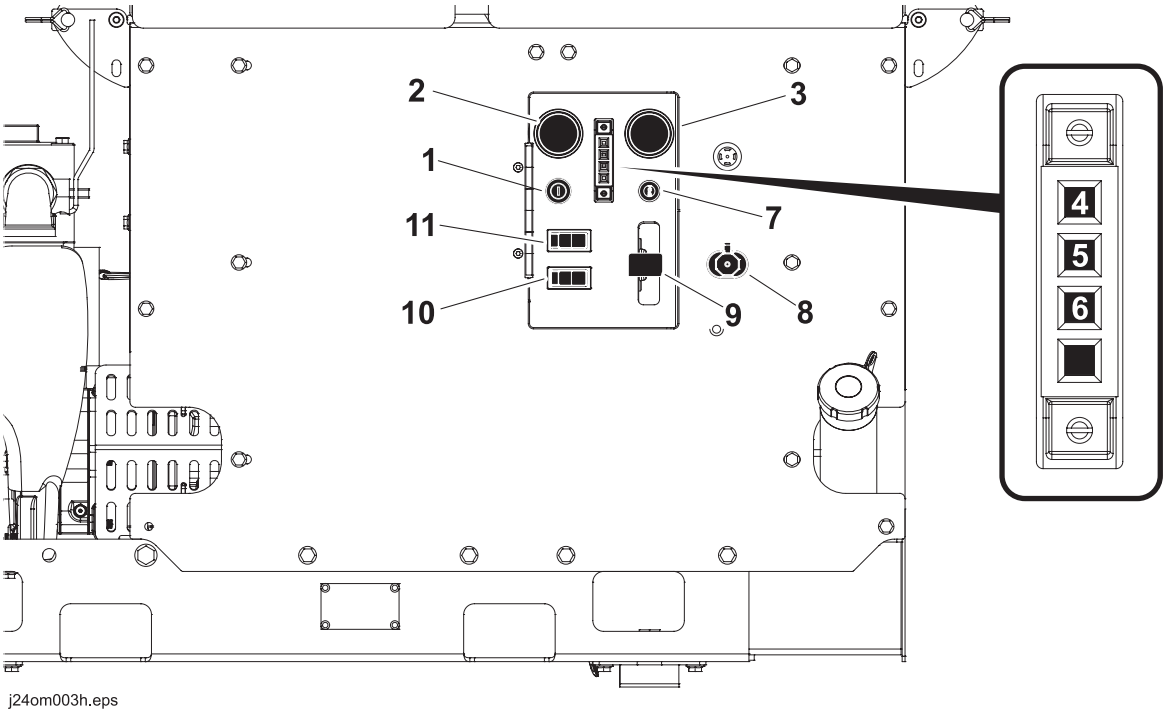
Power Unit



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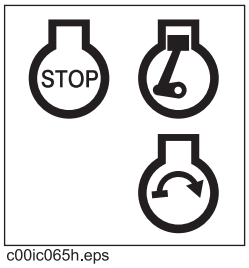
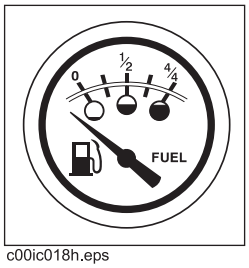
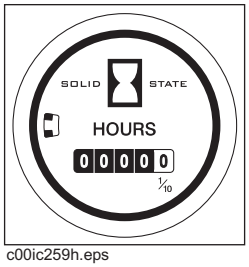
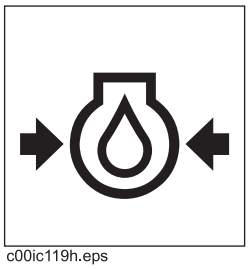
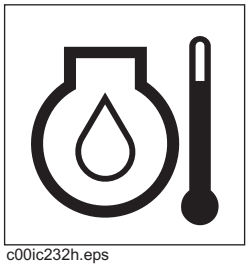
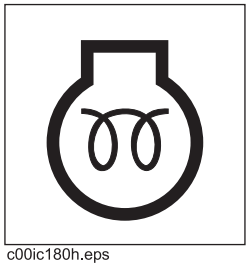
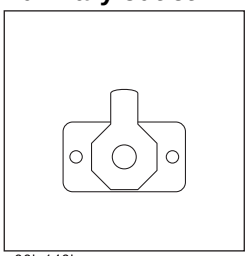
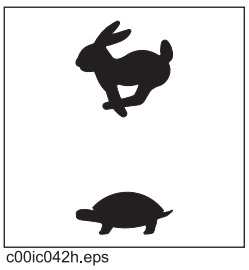
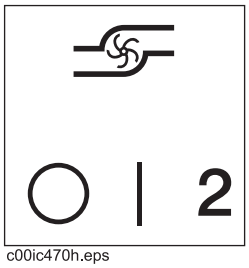
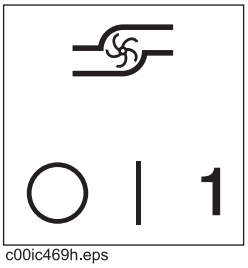
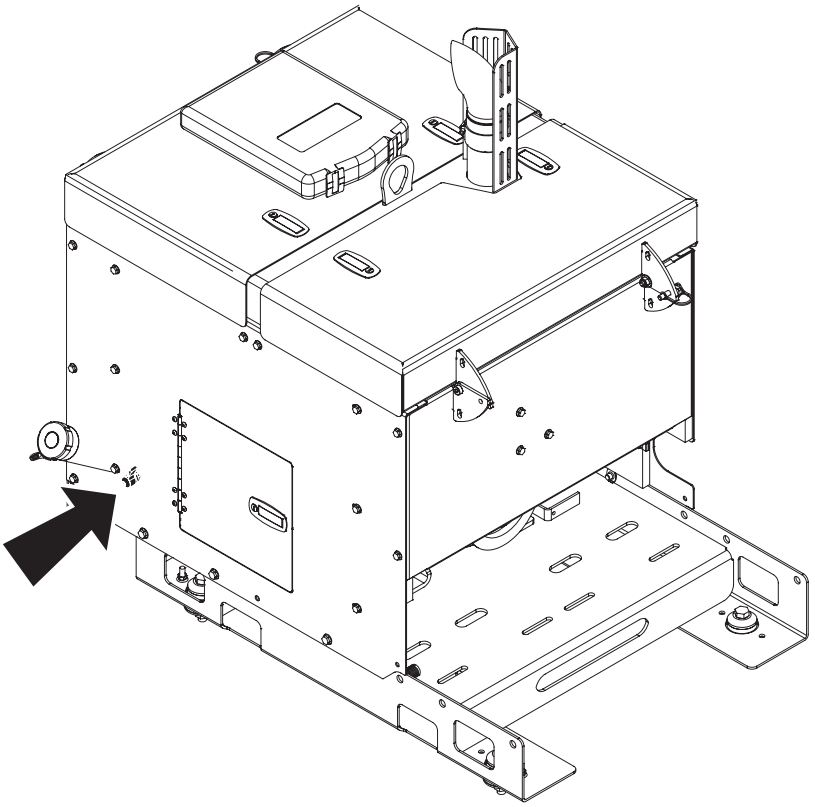
1. Ignition
2. Fuel gauge
3. Hourmeter
4. Engine oil pressure indicator
5. Coolant temperature indicator
6. Glow plug wait indicator
7. Glow plug button
8. Auxiliary outlet
9. Throttle
10. Pump 2 control
11. Pump 1 control

Item	Description	Notes
1. Ignition  c00ic065h.eps	To start engine, insert key and turn clockwise. To stop engine, turn key counterclockwise.	

Item	Description	Notes
2. Fuel gauge  c00ic018h.eps	Displays fuel level in tank.	Use #2 diesel fuel. In temperatures below 40° F (4° C), use #1 diesel fuel. Tank holds 9.2 gal (35 L).
3. Hourmeter  c00ic259h.eps	Displays engine operating time.	Hourmeter runs when ignition switch is on. Use these times to schedule service.
4. Engine oil pressure indicator  c00ic119h.eps	Indicates engine oil pressure is low. Also lights briefly when engine is started.	Engine will stop. 1. Check oil level. 2. Check for leaks before starting engine.
5. Coolant temperature indicator  c00ic232h.eps	Lights when engine coolant temperature is over 210°F (100°C).	• Allow engine to cool. • Check coolant level.

Item	Description	Notes
6. Glow plug wait indicator  c00ic180h.eps	Lights when intake air pre-heater is operating. Wait until light goes off before starting engine.	
7. Glow plug button c00ic180h.eps	To activate glow plugs, press.	**IMPORTANT:** Wait until glow plug wait indicator goes off before starting engine.
8. Auxiliary outlet  c00ic140h.eps	To operate work lights or other 12V devices, plug into outlet.	Outlet has power only when ignition switch is on.
9. Throttle  c00ic042h.eps	To increase engine speed, move up. To decrease engine speed, move down.	
10. Pump 2 control  c00ic470h.eps	To turn on pump, press right side of switch. To turn off pump, press left side of switch.	

Item	Description	Notes
11. Pump 1 control  c00ic469h.eps	To turn on pump, press right side of switch. To turn off pump, press left side of switch.	



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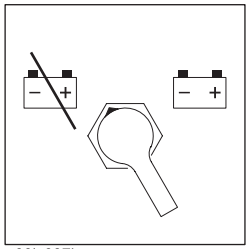
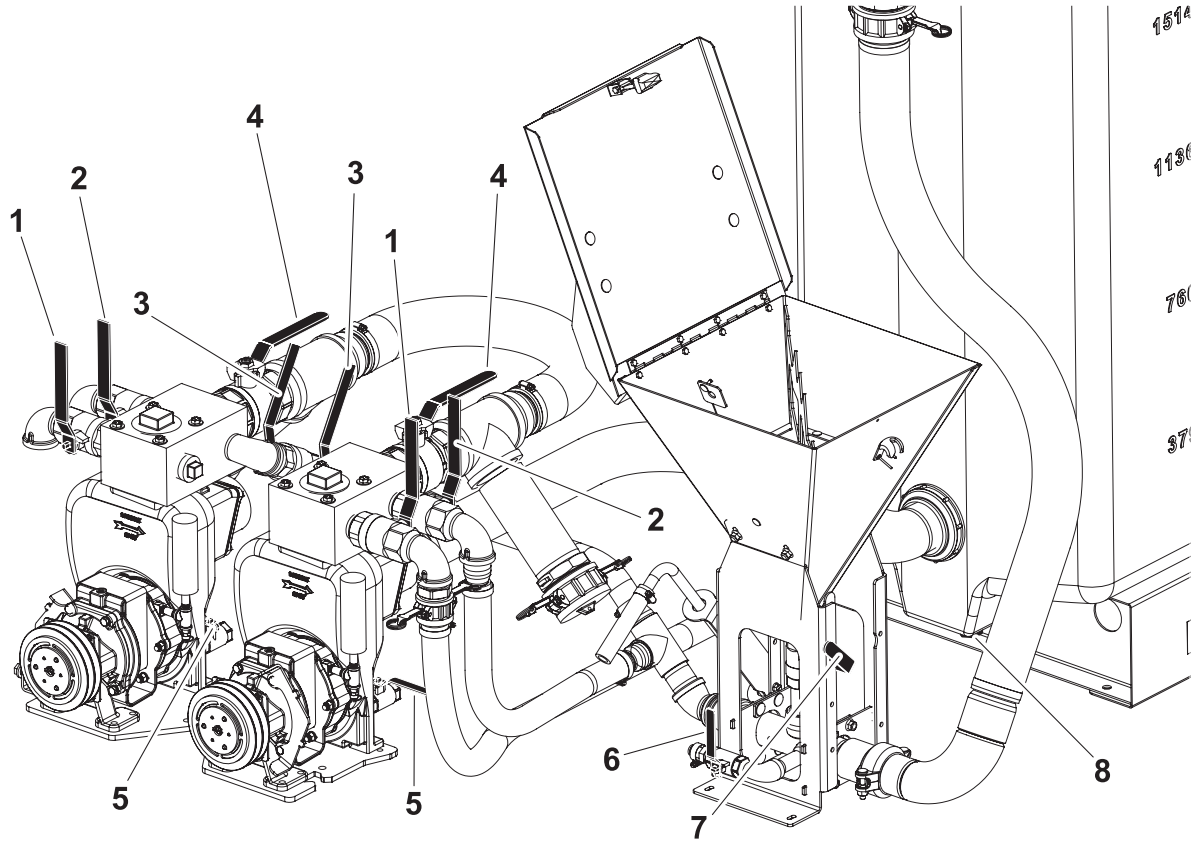
Item	Description	Notes
Battery disconnect switch  c00ic097h.eps	To connect, move clockwise. To disconnect, move counterclockwise.	

Mixing Unit



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1. Mixing jet valve
2. Circulation valve
3. Transfer valve
4. Discharge valve
5. Pump drain valve
6. Liquid additive pickup valve
7. Hopper valve
8. Drain plug

Item	Description	Notes
1. Mixing jet valve	To allow flow from pump to tank jets, open valve. To stop flow from pump to tank jets, close valve.	
2. Circulation valve	To circulate fluid while mixing, open valve. To stop circulation, close valve.	See "Operation Overview" on page 25 for information about how to use this control.

Item	Description	Notes
3. Transfer valve	To allow flow from pump to pump, open valve. To stop flow from pump to pump, turn off engine.	
4. Discharge valve	To allow flow from pump to drilling unit, open valve. To stop flow from pump to drilling unit, close valve.	
5. Pump drain valve	To drain pump, open valve. To use pump, close valve.	
6. Liquid additive pickup valve	To allow liquid additives to flow into mixture, open valve. To stop flow of liquid additives, close valve.	**IMPORTANT:** Do not open valve unless pump is running and mixing venturi valve is open. Fluid could flow back into hopper.
7. Hopper valve	To allow flow from hopper to mixing venturi, open valve. To stop flow from hopper to mixing venturi, close valve.	**IMPORTANT:** • Open valve only when pouring additives into hopper for mixing. Close valve when finished. • Do not open valve unless pump is running and mixing venturi valve is open. Fluid could flow back into hopper.
8. Tank drain plug	To drain fluid from tank, remove plug. Replace plug before refilling tank.	

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Planning

1. Gather information about jobsite (page 30).
2. Inspect jobsite (page 30).
3. Check supplies and prepare equipment (page 32).

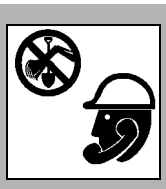
Setting Up at Jobsite

1. Prepare jobsite (page 31).
2. Position fluid unit and connect to drilling unit. See drilling unit operator's manual.

   IMPORTANT: Leave unit hitched to towing vehicle or properly stabilized.

3. Block trailer wheels.

Mixing Fluid



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

NOTICE:

- Wear personal protective equipment including hard hat, safety eye wear, and hearing protection.
- Do not wear jewelry or loose clothing.

1. Verify that hopper throat is not plugged before mixing.
2. Fill fluid tank with water. Allow room for additives.
3. Open circulation valve and tank discharge valve.
4. Start engine and run at half throttle or higher.
5. Turn pump on.
6. Open hopper valve that corresponds to that pump.

IMPORTANT: Do not open valve unless pump is running and mixing venturi valve is open. Fluid could flow back into hopper.

7. Open hopper lid and pour in bentonite. See page 39.

IMPORTANT: Before adding bentonite to drilling fluid, be sure drilling unit is equipped to use a bentonite mixture.

8. Close hopper valve and close hopper lid.
9. Mix well.
10. Open liquid additives pickup valve to add liquid additives to mixture.

IMPORTANT: Run clean water through liquid additives pickup tube after each use.

Transferring Fluid

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

NOTICE: If electrical strike occurs while fluid hose is connected to drilling unit, fluid system will also become electrified.

1. Connect hose from mixing pump to drilling unit.
2. Open hopper and discharge valves.

   IMPORTANT: If drilling fluid contains bentonite, leave circulation valve approximately half open to allow continuous mixing while drilling.

3. Adjust engine throttle to maintain positive head at pump when unit is pumping fluid.
   - Half throttle is recommended for most drilling situations.
   - A higher throttle setting is required when recirculating fluid to maintain the mix in the tank.

Operating in Cold Weather

For successful operation in cold weather, follow these procedures.

- Use pump to keep drilling fluid circulating at all times, even during transport to and from the jobsite.
- If possible, use all drilling fluid in tank before transporting unit.
- For cold weather storage, drain tank and ensure all fluid system valves are open. Also open drain valve on pump.

Leaving Jobsite

1. Rinse unit and tools (page 44).
2. Disconnect hoses (page 44).

Prepare

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- Prepare for Working Near Existing Utilities 30
- Plan for Emergency Services 30

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Prepare Jobsite 31

Check Supplies and Prepare Equipment 32

- Assemble Accessories 32
- Check Supplies 32
- Prepare Equipment 32

Gather Information

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

Arrange for Traffic Control

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

Prepare for Working Near Existing Utilities

If jobsite may contain electrical lines, wear protective boots and gloves meeting the following standards:

- Boots must have high tops and meet the electric hazard protection requirements of ANSI Z-41, 1991, when tested at 14,000 volts. Tuck legs of pants completely inside boots.
- Gloves must have 17,000 AC maximum use voltage, according to ASTM specification D120-87.

If working around higher voltage, use gloves and boots with appropriately higher ratings.

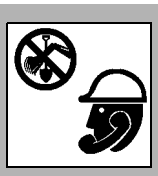
Plan for Emergency Services

Have the telephone numbers for local emergency and medical facilities on hand. Check that you will have access to a telephone.

Inspect 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
- Mark location of all buried utilities and obstructions.

Prepare Jobsite



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

NOTICE:

- If jobsite classification is in question or if the possibility of unmarked electric utilities exists, classify jobsite as electric.
- Cutting high voltage cable can cause electrocution. Expose lines by hand before digging.
- All vegetation near operator's station must be removed. Contact with trees, shrubs, or weeds during electrical strike could result in electrocution.

Check Supplies and Prepare Equipment

Assemble 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.

Check Supplies

- water and additional hoses
- fuel
- drilling fluid additives, such as bentonite and polymer

Prepare Equipment

Fluid Levels

- fuel
- engine oil

Condition and Function

- filters (air, oil)
- tires
- hoses and valves
- couplers and fittings
- water tank

Transport

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- Points 34
- Procedure 34

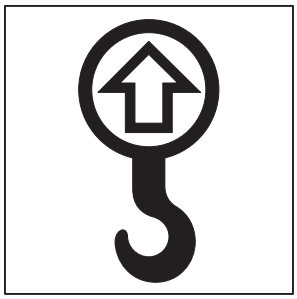
Haul 35

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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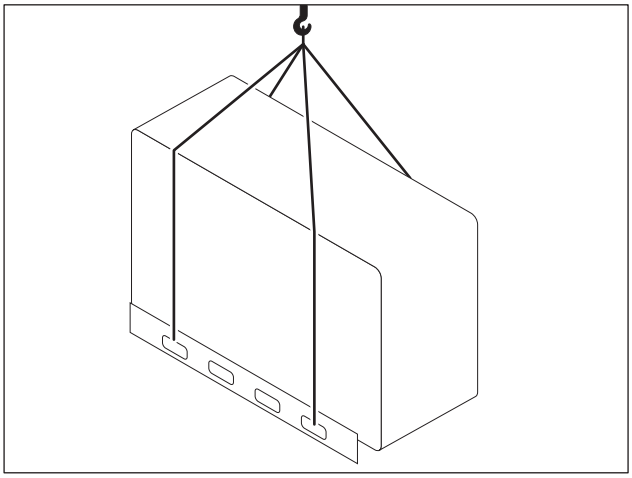
Procedure

Tank

Use crane capable of supporting the equipment's size and weight. See “Specifications” on page 57 or measure and weigh equipment before lifting. Lift mixing tank by attaching lifting devices at lift points and joining at a common lift point.

IMPORTANT: Empty tank before lifting.



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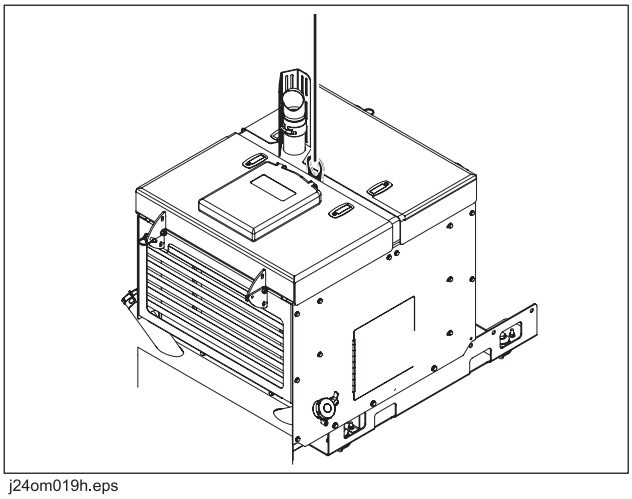
Power Unit

Use crane capable of supporting the equipment's size and weight. See “Specifications” on page 57 or measure and weigh equipment before lifting. Lift power unit by attaching lifting device at lift point.



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Haul

IMPORTANT: For trailer information, see the trailer manufacturer's manual.

Drilling Fluid Concepts

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Recommended Products 38

Guidelines 38

Polymer 39

Bentonite 39

Mixtures 40

- General mixing order 40
- Basic fluid recipes 41

Drilling Fluid Requirements 42

Funnel Viscosity 42

Recommended Products

For productive drilling and equipment protection, use these recommended Baroid® products, available from your Ditch Witch dealer.

- Soda ash
- Quik-Gel™ dry powder bentonite (p/n 259-804)
- E-Z Mud™ liquid polymer (p/n 259-805)
- Liqui-Trol™ liquid polymer suspension (p/n 259-808)
- Quik-Trol™ dry powder polymer (p/n 259-809)
- Bore-Gel™ drilling fluid (p/n 259-807)
- Con-Det™ water-soluble cleaning solution (p/n 259-810)

Guidelines

Match drilling fluid to soil type. This chart is meant as a guideline only. See your local Ditch Witch dealer for soil conditions and drilling fluid recommendations for your area. Also see our interactive Drilling Fluid Formulator at **www.ditchwitch.com**.

Soil type	Drilling fluid recommendation
smooth, flowing sand	bentonite or Bore-Gel + medium chain polymer
coarse sand or light soil	bentonite or Bore-Gel
heavy clay	long chain polymer + Con-Det
swelling clay	long chain polymer + Con-Det
rock	Bore-Gel

Polymer

This drilling fluid additive provides excellent lubrication and increases viscosity in average soils and heavy clay. In swelling clay, polymer can reduce swelling that traps pipe in the bore.

There are two types of polymer:

- long chain such as Baroid EZ-Mud
- medium chain such as Baroid Quik-Trol

Bentonite

Bentonite is a dry powder. When properly mixed with water, it forms a thin cake on bore walls, lubricating the bore, keeping it open, and holding fluid in the bore.

Some things to remember when mixing bentonite:

- Use clean water free of salt, calcium, or excessive chlorine.
- Use water with pH level between 9 and 10.
- Use water with hardness of less than 120 ppm.
- Do not use bentonite containing sand.
- Mix bentonite thoroughly or it will settle in tank.
- Do not mix bentonite to a funnel viscosity of over 50.

For information on measuring funnel viscosity, see “Funnel Viscosity” on page 42.

Mixtures

NOTICE: Bentonite does not mix well in water containing polymer. To use both, mix bentonite first, then add polymer.

- If chemicals are added in the wrong order, they will not mix properly and will form clumps.
- If tank contains bentonite/polymer mix and more drilling fluid is needed, completely empty tank and start with fresh water before mixing another batch.

General mixing order

1. Soda ash
2. Bentonite
3. Polymer
4. Con-Det

Bore-Gel contains premixed bentonite, polymer, and soda ash. Follow guidelines below to ensure proper drilling fluid viscosity for expected drilling conditions.

Conditions	Amount to Use	
normal drilling	15 lb/100 gal	7 kg/380 L
sand or gravel	up to 45 lb/100 gal	up to 21 kg/380 L
rock	up to 50 lb/100 gal	up to 23 kg/380

Basic Fluid Recipes

Soil type	Mixture/100 gal (378 L) of water	Notes
fine sand	35 lb (16 kg) Bore-Gel	
coarse sand	35 lb (16 kg) Bore-Gel .5 lb (225 g) No-Sag	Add .5 lb (225 g) of Quik-Trol for additional filtrate control
fine sand below water table	40 lb (18 kg) Bore-Gel .75 lb (340 g) Quik-Trol	Add .5 - 1 gal (2-4 L) of Dinomul in high torque situations
coarse sand below water table	40 lb (18 kg) Bore-Gel .75 lb (340 g) Quik-Trol .75 lb (340 g) No-Sag	Add .5 - 1 gal (2-4 L) of Dinomul in high torque situations
gravel	50 lb (23 kg) Bore-Gel .75 lb (340 g) Quik-Trol .75 lb (340 g) No-Sag	Add .5 lb (225 g) of Barolift to reduce loss of returns
cobble	50 lb (23 kg) Bore-Gel .75 lb (340 g) Quik-Trol .75 lb (340 g) No-Sag	Add .5 lb (225 g) of Barolift to reduce loss of returns
sand, gravel, clay or shale	35 - 40 lb (16-18 kg) Bore-Gel .5 pt (235 mL) EZ-Mud .5 gal (2 L) Con-Det	Vary mixture according to percentage of sand and clay
clay	.5 lb (225 g) Poly Bore .5 gal (2 L) Con-Det	Flow rate should be 3-5 parts fluid to 1 part soil. May use .25 - .5 gal (1-2 L) of Penetrol instead of Con-Det
swelling/sticky clay	.75 - 1 lb (340-450 g) Poly Bore .5 - 1 gal (2-4 L) Con-Det	Flow rate should be 3-5 parts fluid to 1 part soil. May use .25 - .5 gal (1-2 L) of Penetrol instead of Con-Det
solid rock (shale)	40 lb (18 kg) Bore-Gel	Use .5 pt (235 mL) of No Sag for large diameter or longer bores
solid rock (other than shale)	40 - 50 lb (18-23 kg) Bore-Gel	Use .5 pt (235 mL) of EZ-Mud in reactive shales
rock/clay mixture	40 - 50 lb (18-23 kg) Bore-Gel .5 pt (235 mL) EZ-Mud	
rock/sand mixture	40 - 50 lb (18-23 kg) Bore-Gel	Use .5 pt (235 mL) of No Sag for large diameter or longer bores
fractured rock	50 lb (23 kg) Bore-Gel .5 - 1lb (225-450 g) No-Sag	Use .5 lb (225 g) of Barolift to reduce fluid loss to formation

Drilling Fluid Requirements

1. Determine drilling conditions and choose appropriate drilling fluid mix.
2. Estimate amount of supplies needed and check availability.
   - Drilling fluid
   - Water supply. If more water than can be carried with the unit will be needed, arrange to transport additional water.
   - Bentonite and/or polymer
3. Check water quality.
   - Use meter or pH test strips to test pH of water. If pH is below 9.0, add 1 lb (454 g) soda ash per tank. Test and repeat until pH is between 9 and 10.
   - Check water hardness using hardness test strips. Treat with soda ash if hardness exceeds 125 ppm.

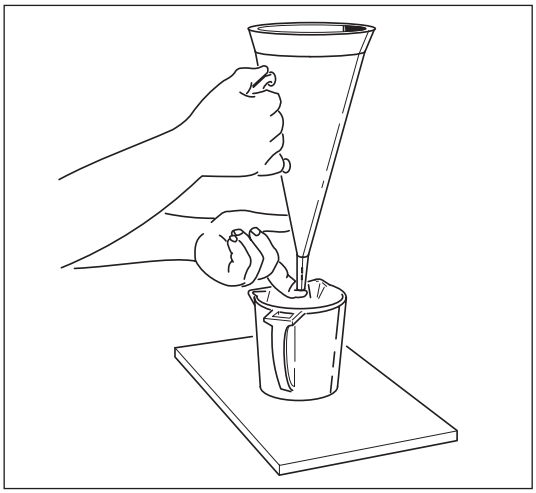
Funnel Viscosity

Viscosity is the measure of internal resistance of a fluid to flow; the greater the resistance, the higher the viscosity. Viscosity of drilling fluids must be controlled.

To determine viscosity, you will need a Marsh funnel (p/n 259-267) and a measuring cup, available from your Ditch Witch dealer.

IMPORTANT: Make sure Marsh funnel is clean and free of obstruction and that you have a stopwatch available for timing the viscosity.

1. Using wash hose and a clean container, take a fresh sample of drilling fluid. The sample must be at least 1.5 qt (1.4 L).
2. With finger over bottom of funnel, fill with fluid from the container through the screen until fluid reaches the bottom of the screen.
3. Move funnel over 1 qt (.95 L) container.
4. Remove finger from bottom of funnel and use the stopwatch to count the number of seconds it takes for 1 qt (.95 L) of fluid to pass through the funnel. The number of seconds is the viscosity.
5. Thoroughly rinse measuring cup and Marsh funnel.



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Complete the Job

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Rinse Equipment 44

Disconnect 44

Rinse Equipment

Spray water onto equipment to remove dirt and mud.

Disconnect

Disconnect and store hoses and cables.

Service

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- Welding Precaution 46
- Washing Precaution 46

Recommended Lubricants/Service Key 47

- Engine Oil Temperature Chart 48
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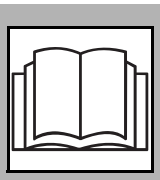
Service Precautions



WARNING Incorrect procedures could result in death, injury, or property damage. Learn to use equipment correctly.

NOTICES:

- Unless otherwise instructed, all service should be performed with engine off.
- Refer to engine manufacturer's manual for engine maintenance instructions.

Welding Precaution

NOTICE: Welding can damage electronics.

- Welding currents can damage electronic components. Connect welder ground close to welding point and make sure no electronic components are in the ground path. .
- Disconnect battery at battery disconnect switch before welding to prevent damage to battery.
- Do not turn off battery disconnect switch with engine running, or alternator and other electronic devices may be damaged.

Washing Precaution

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

Recommended Lubricants/Service Key

Item	Description
DEO	Diesel engine oil meeting or exceeding CH-4 per the API service classification or E5 per the European Automobile Manufacturer's Association (ACEA) and SAE viscosity recommended by engine manufacturer (SAE 10W30)
MPG	Multipurpose grease meeting ASTM D217 and NLGI 5
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

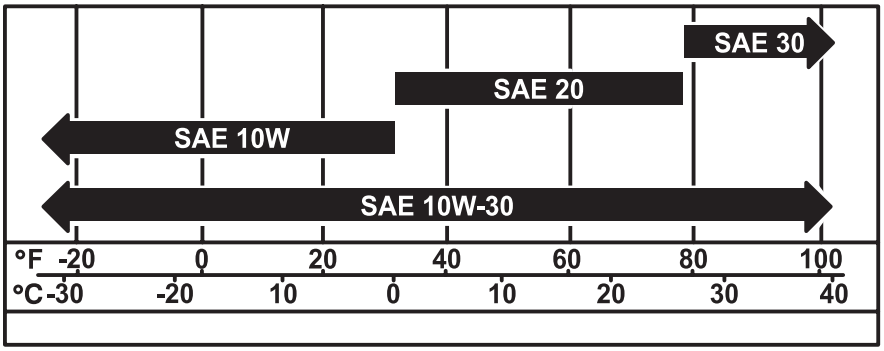
Proper lubrication and maintenance protects Ditch Witch equipment from damage and failure. Service intervals listed are for minimum requirements. In extreme conditions, service machine more frequently. Use only recommended lubricants. Fill to capacities listed in "Fluid Capacities" on page 92.

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

NOTICE:

- Use only genuine Ditch Witch parts, filters, approved lubricants, TJC, and approved coolants to maintain warranty.
- Use the "Service Record" on page 65 to record all required service to your machine.

Engine Oil Temperature Chart



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Temperature range anticipated before next oil change

Approved Coolant

Any coolant is approved for use with this unit. However, it was filled with John Deere Cool-Gard coolant before shipment from factory. Add only Cool-Gard (p/n 255-006) or any fully-formulated, ethylene glycol based, low-silicate, heavy-duty diesel engine coolant meeting ASTM specification D5345 (prediluted) or D4985 (concentrate). Before using any other kind of coolant, completely flush radiator.

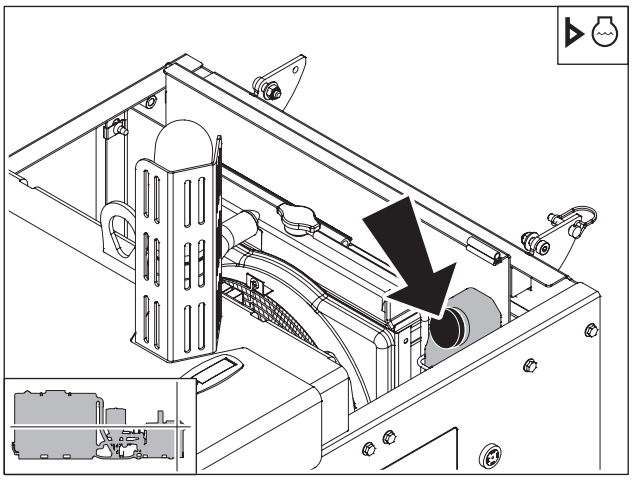
NOTICE: Do not mix heavy-duty diesel engine coolant and automotive-type coolant. This will lead coolant breakdown and engine damage.

10 Hour

Location	Task	Notes
	Check coolant level	DEAC
	Check engine oil level	DEO

Check Coolant Level

Check coolant level every 10 hours. Add coolant at cap (shown) as needed to maintain level between LOW and FULL on overflow tank.



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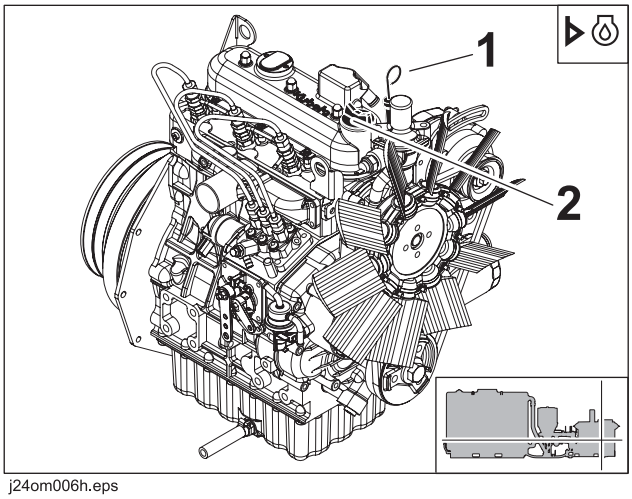
Check Engine Oil Level

Check engine oil level at dipstick (1) every 10 hours. Add DEO at fill (2) as needed to maintain oil level at highest line on dipstick.



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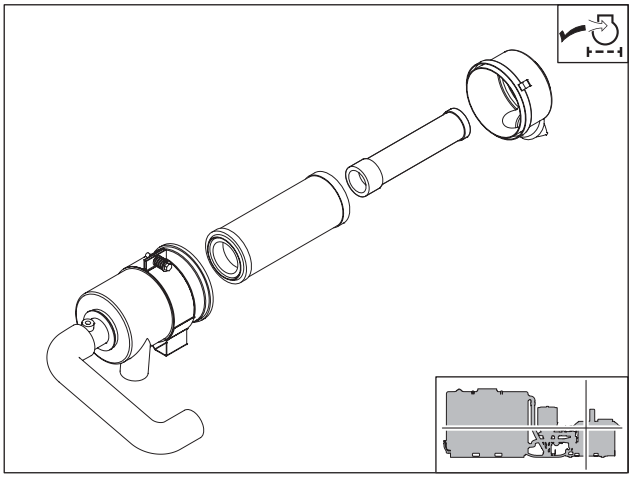
50 Hour

Location	Task	Notes
	Check air filter	
	Check battery	
	Change engine oil and filter	Initial, DEO
	Lube pump	
	Check radiator	

Check Air Filter

Check air filter every 50 hours. Replace as needed.



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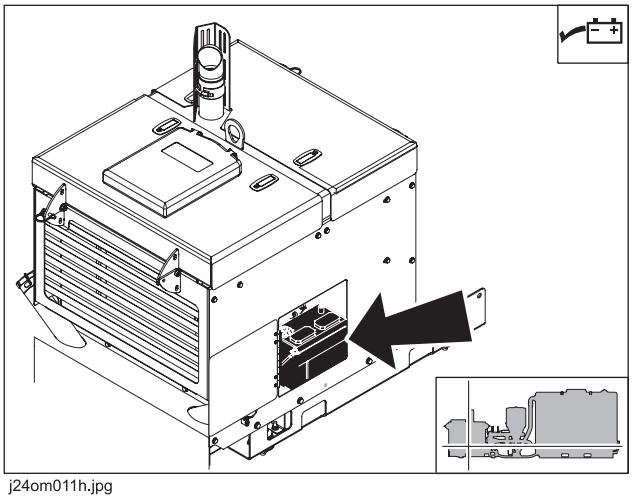
Check Battery

Check battery connections for corrosion every 50 hours. Keep connections clean and tight. Batteries supplied by the factory are maintenance free. Service replacement batteries according to manufacturer's instructions.



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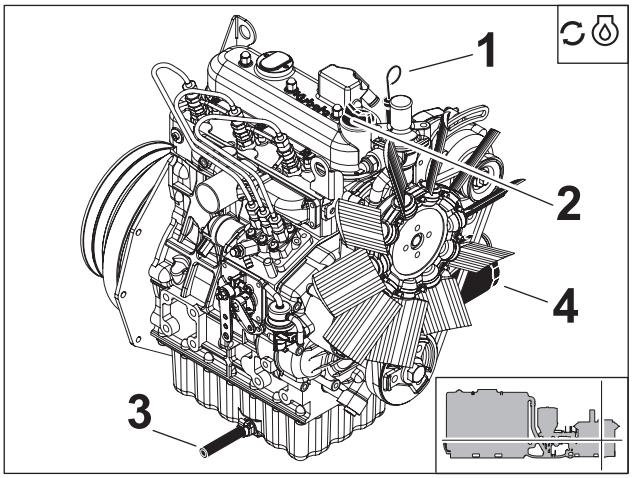
Change Engine Oil and Filter (Initial)

Change engine oil after 50 hours while oil is warn and with unit parked on level ground.

1. Open drain (3).
2. Replace filter (4).
3. Close drain.
4. Add DEO at fill (2) until oil level is at highest line on dipstick (1).



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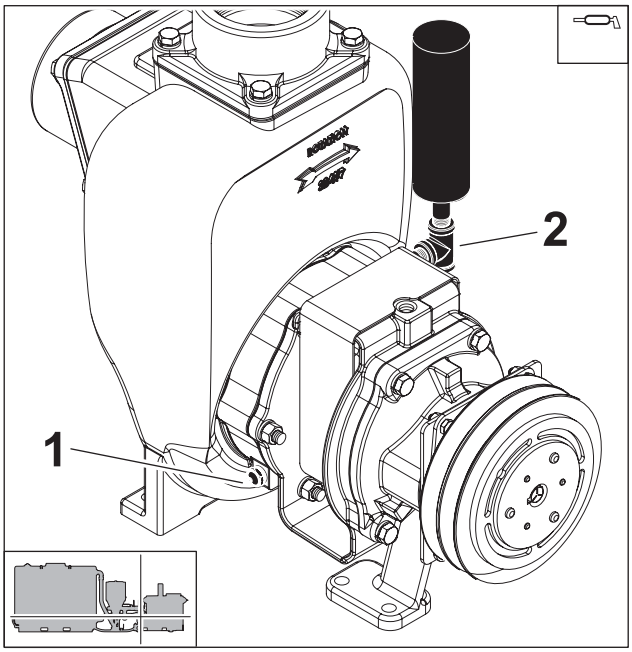
Lube Pump

Lube zerk (2) with MPG every 50 hours. Grease cavity is full when grease escapes from grease cylinder relief valve (1).



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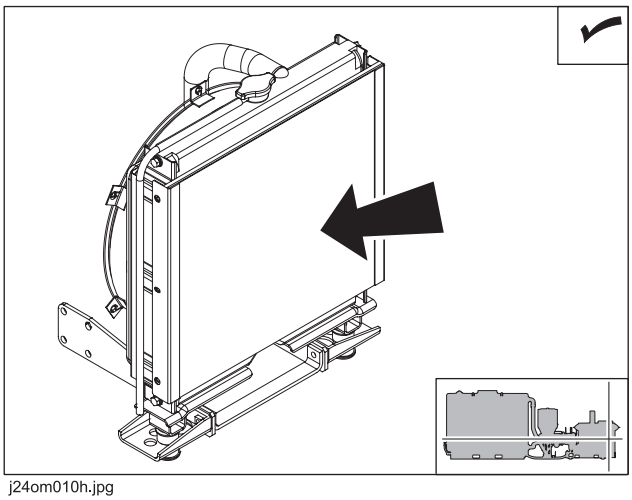
Check Radiator

Check radiator for dirt, grass, and other foreign matter every 50 hours. Clean out with compressed air or spray wash if required. Be careful not to damage fins with high-pressure air or water. Check more often if operating in dusty or grassy conditions.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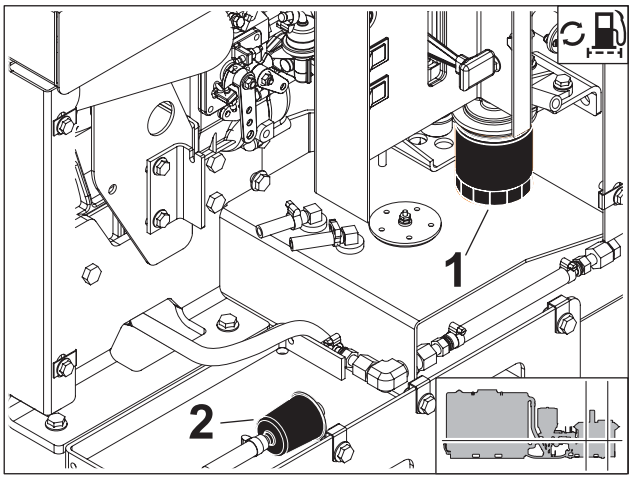
100 Hour

Location	Task	Notes
	Change fuel filters	
	Check fan belt tension	

Change Fuel Filters

Change fuel filter (1) and inline fuel filter (2) every 100 hours.

1. Remove filters.
2. Fill new filter with clean fuel.
3. Apply fuel oil over the gasket and hand-tighten.



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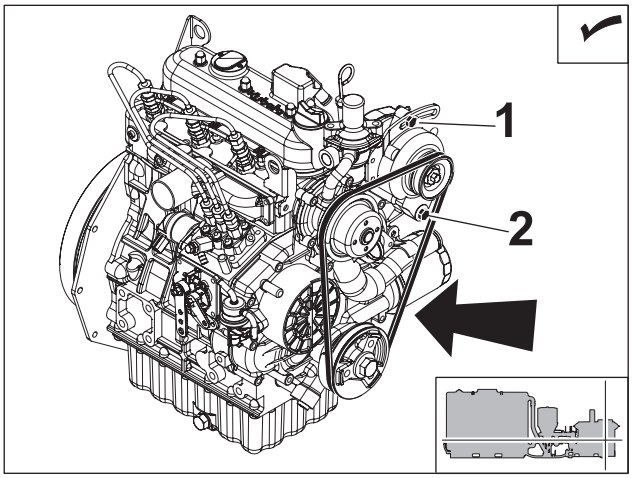
Check Fan Belt Tension

Check pump drive belt tension every 100 hours.

1. Turn off engine and remove key.
2. Apply moderate thumb pressure to top of belt.

   Belt is properly tensioned when deflection (A) is 1/4-1/2" (5-13 mm). To adjust, see page 56.



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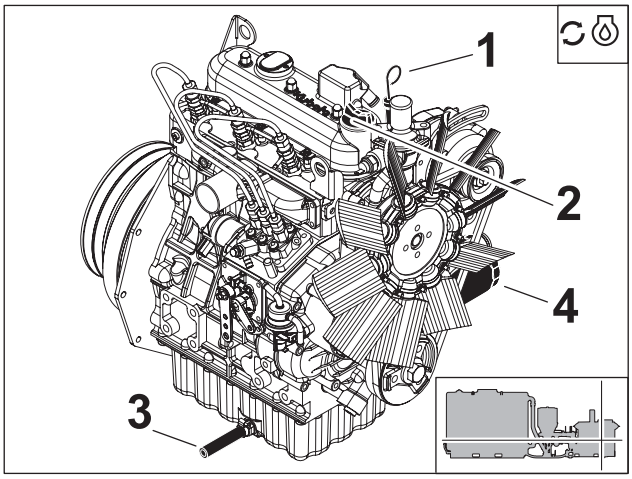
150 Hour

Change Engine Oil and Filter

Change engine oil every 150 hours while oil is warn and with unit parked on level ground.

1. Open drain (3).
2. Drain crankcase while oil is warm.
3. Replace filter (4).
4. Close drain.
5. Add DEO at fill (2) until oil level is at highest line on dipstick (1).



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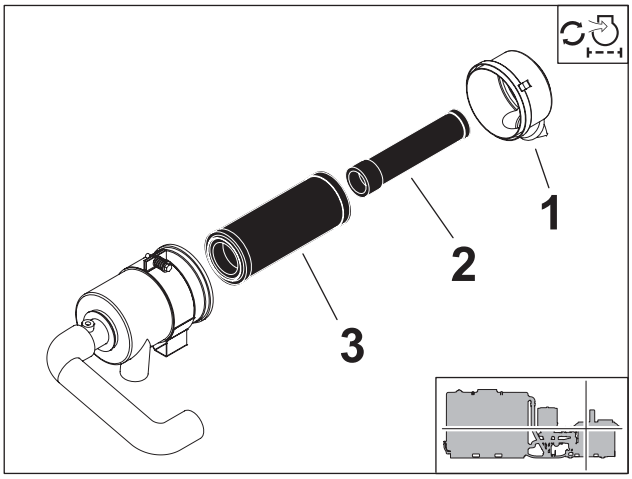
250 Hour

Change Air Filter

Change air filter every 250 hours.

1. Open air filter housing at latches (1).
2. Remove primary (2) and secondary (3) elements.
3. Wipe inside of housing and wash end cup.
4. Insert new primary and secondary elements.
5. Close air filter case.



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500 Hour

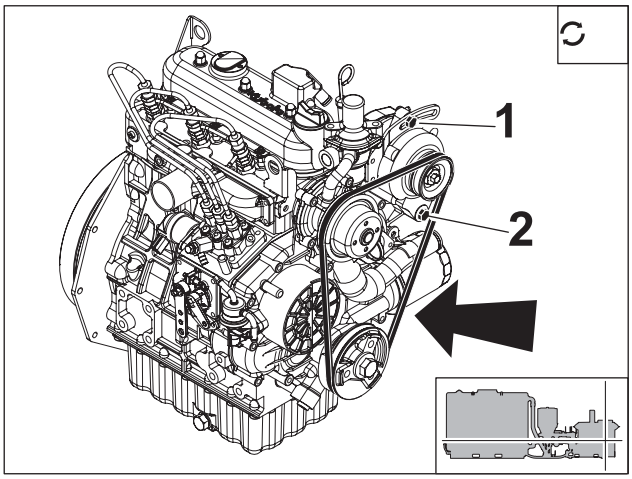
Location	Task	Notes
	Replace fan belt	
	Replace pump drive belt	

Replace Fan Belt

Replace fan belt (shown) every 500 hours.

To replace

1. Loosen bolts (1, 2) and remove belt.
2. Install new belt and adjust properly. See page 56.



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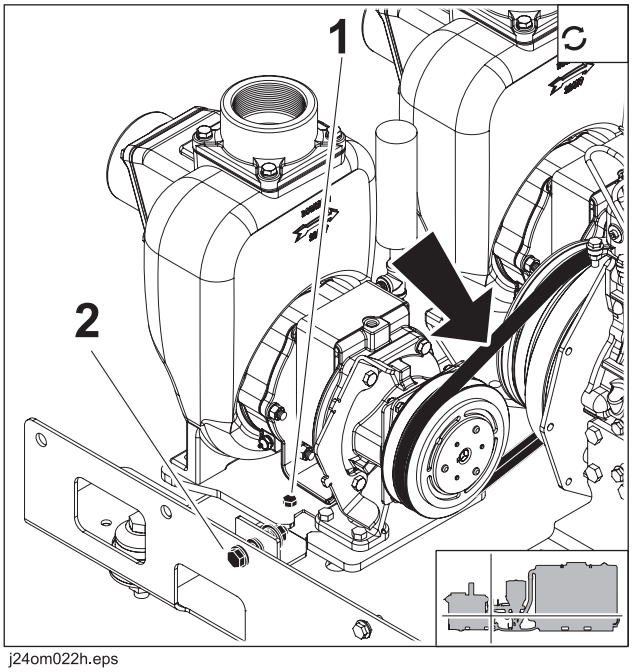
Replace Pump Drive Belt

Replace pump drive belt (shown) every 500 hours.

To replace

1. Loosen three bolts (1, 2; third bolt is on other side of pump mount plate) and remove belt.
2. Install new belt and adjust properly. See page 56.



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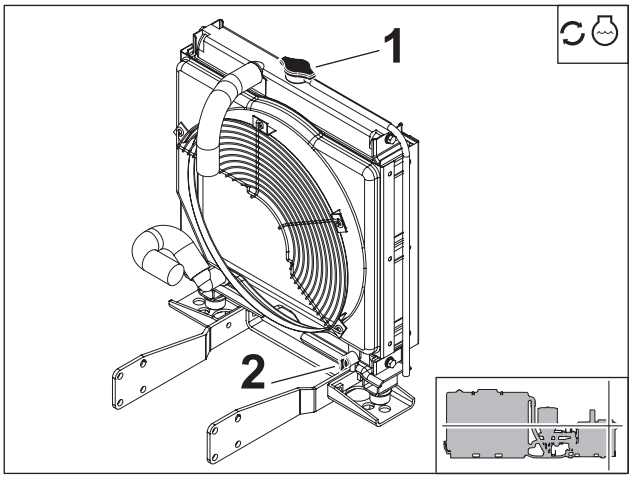
2000 Hour

Change Engine Coolant

Drain cooling system at drain (2). Add approved coolant at fill (1) every two years or 2000 hours.

NOTICE:

- The use of non-approved coolant may lead to engine damage or premature engine failure and will void engine warranty.
- See "Approved Coolant" on page 48. for list of approved coolants.



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As Needed

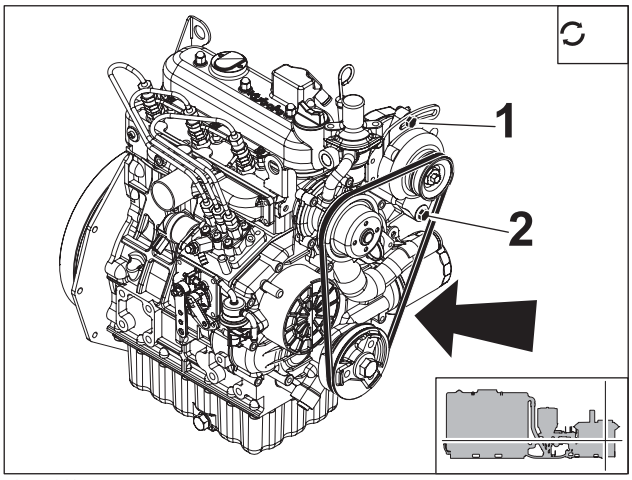
Location	Task	Notes
	Adjust fan belt	
	Adjust pump drive belt	

Adjust Fan Belt

Adjust fan belt as needed.

1. Turn off engine and remove key.
2. Apply moderate thumb pressure to belt between pulleys where shown.

   Belt is properly tensioned when deflection is about 1/4-3/8" (7-9 mm).
3. If needed, loosen alternator bolts (shown) and pull alternator out until correct tension is reached.



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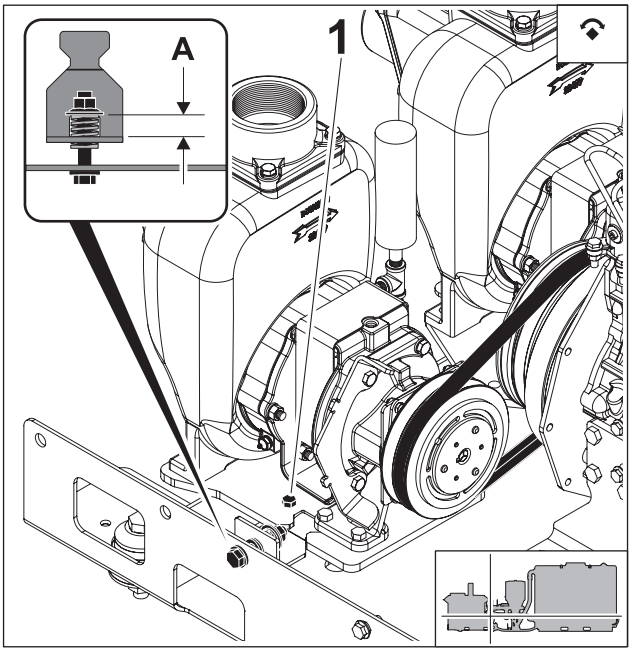
Adjust Pump Drive Belt

Adjust pump drive belt as needed.

1. Loosen two bolts (1, other bolt is on other side of pump mount plate) until pump slides freely.
2. Adjust bolt (2) to increase or decrease tension.

   When washer is aligned with cutout and dimension A (shown) is 3/4" (19 mm), tension is correct.
3. Once tension is set, tighten bolts.



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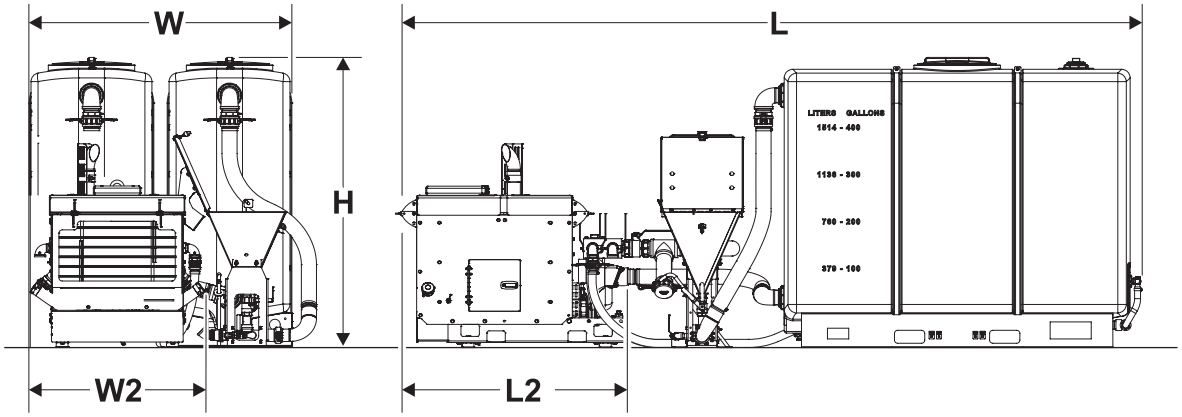
Specifications



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Component weights	U.S.	Metric
Pumping/power unit	1150 lb	520 kg
Mixing hopper (each)	100 lb	50 kg
500-gal (1892-L) tank and hoses (each)	500 lb	230 kg
500-gal (1892-L) tank and hoses (w/500 gal/1892 L water)	4650 lb	2100 kg
1000-gal (3785-L) tank and hoses (each)	1050 lb	480 kg
1000-gal (3785-L) tank and hoses (w/990 gal/3748 L water)	9250 lb	4200 kg

Dimensions with two 1000-gal (3785-L) tanks		U.S.	Metric
L	Length	205 in	5.21 m
L2	Length, power unit		
W	Width	96 in	2.44 m
W2	Width, power unit		
H	Height, without fill pipe	72 in	1.83 m
	Height, with fill pipe	80 in	2.03 m
Weight, dry		3450 lb	1570 kg
System weight, with fluid (990 gal/3748 L per tank)		19,850 lb	9000 kg

Dimensions with two 500-gal (1892-L) tanks (not shown)		U.S.	Metric
L	Length, overall	175 in	4.45 m
W	Width, overall	92 in	2.34 m
H	Height, without fill pipe	68 in	1.73 m
	Height, with fill pipe	75 in	1.91 m
Weight, dry		2350 lb	1070 kg
System weight, with fluid (500 gal/1892 L per tank)		10, 650 lb	4830 kg

Performance	U.S.	Metric
Centrifugal pump suction port diameter	3 in	76 mm
Centrifugal pump discharge port diameter	3 in	76 mm
Maximum fluid pressure	50 psi	3.4 bar
Maximum pump discharge rate (each pump)	300 gpm	1135 L/min
Flow rate to drilling unit (42 viscosity fluid @ 30 psi/2.1 bar)	10-200 gpm	38-750 L/min
Drilling fluid tank capacity (nominal, each tank)	500/1000 gal	1892/3785 L
Solids addition rate with metering plate	30 lb/min	14 kg/min
Solids addition rate without metering plate	75 lb/min	34 kg/min
Dry mixing hopper capacity	1 ft^3	28 L
Typical tank mixing time	7-10 min	

Engine		U.S.	Metric
Kubota D1105, diesel			
	Cooling medium	water	
	Injection	indirect	
	Aspiration	natural	
	Number of cylinders	3	
	Displacement	68.5 in^3	1.12 L
	Bore	3.07 in	78.0 mm
	Stroke	3.09 in	78.4 mm
Manufacturer's gross power (per SAE J1995)		24.8 hp	18.5 kW
Estimated net power rating (per SAE J1349)		21.6 hp	16.1 kW
Rated speed		3000 rpm	3000 rpm

* Exceeding these operating angles will cause engine damage. This DOES NOT IMPLY machine is stable to maximum angle of safe engine operation.

Fluid Capacities	U.S.	Metric
Fuel tank	9.2 gal	35 L
Engine oil, including filter	4.2 qt	4 L

Noise levels
Operator 88 dBA sound pressure per ISO 6394. Exterior 101 dBA sound power per ISO 6393.

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

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 (Exception: 2 years for all SK attachments). 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: 7/05

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

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Your Signature

Service Record

Service Performed	Date	Hours

Service Performed	Date	Hours