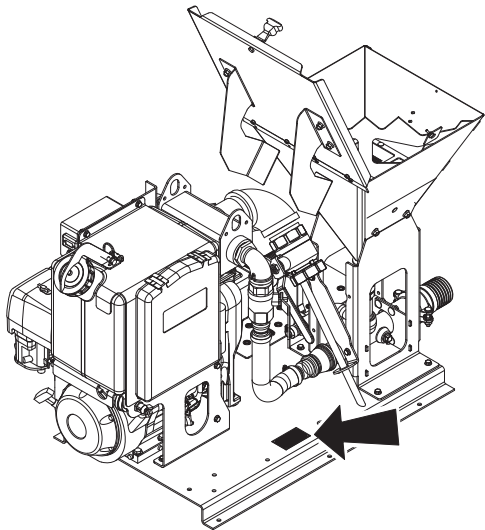


SERVICE

SERIAL NUMBER

Record the serial numbers and date of purchase of your equipment in the spaces below.



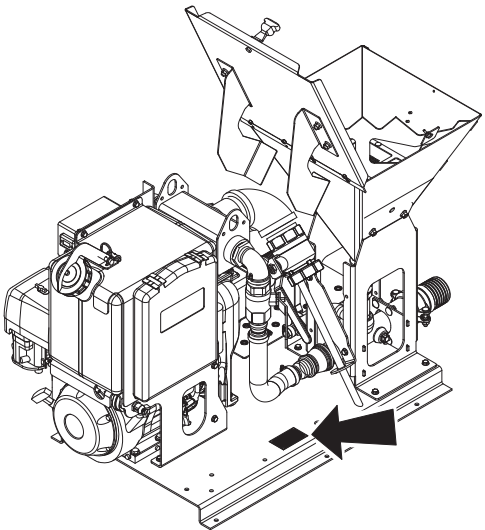
om0677h.eps

Date of manufacture:	
Date of purchase:	
Fluid mixing unit serial number:	

SERVICE

SERIAL NUMBER

Record the serial numbers and date of purchase of your equipment in the spaces below.



om0677h.eps

Date of manufacture:	
Date of purchase:	
Fluid mixing unit serial number:	

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.

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.

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. 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.

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. 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.

**Operator's Manual
FM13V**

Issue No. 2.0/OP-7/2014
Part Number 053-1125

Copyright 2007, 2014
by The Charles Machine Works, Inc.,
Perry, Oklahoma



, Ditch Witch, CMW, Jet Trac, Roto Witch, Subsite, , and The Underground Authority Worldwide are registered trademarks of The Charles Machine Works, Inc.

**Operator's Manual
FM13V**

Issue No. 2.0/OP-7/2014
Part Number 053-1125

Copyright 2007, 2014
by The Charles Machine Works, Inc.,
Perry, Oklahoma



, Ditch Witch, CMW, Jet Trac, Roto Witch, Subsite, , and The Underground Authority Worldwide are registered trademarks of The Charles Machine Works, Inc.

CONTENTS

SERVICE	1
Serial Number	1
Support Procedure	2
Resources	2
FOREWORD	3
OVERVIEW	7
CONTROLS	9
Switches and Gauges	9
Valves	13
SAFETY	17
Accessories	18
Safety Alert Classifications	19
Safety Alerts	20
LIFT	23
PREPARATION	25
Check Equipment	25
Select Drilling Fluid	26

CONTENTS

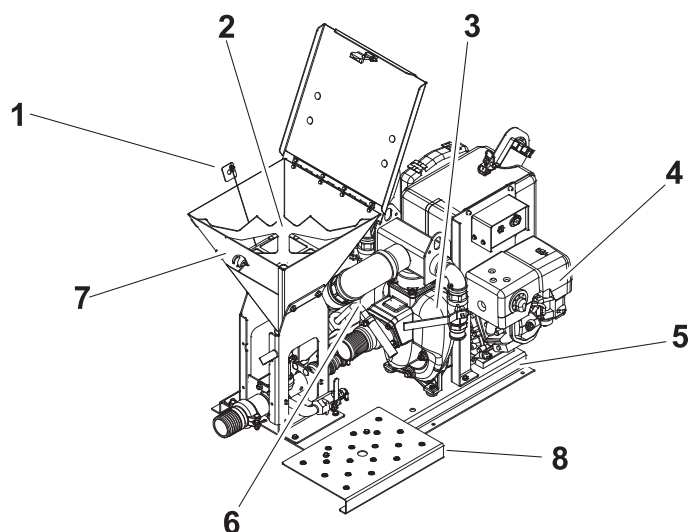
SERVICE	1
Serial Number	1
Support Procedure	2
Resources	2
FOREWORD	3
OVERVIEW	7
CONTROLS	9
Switches and Gauges	9
Valves	13
SAFETY	17
Accessories	18
Safety Alert Classifications	19
Safety Alerts	20
LIFT	23
PREPARATION	25
Check Equipment	25
Select Drilling Fluid	26

OPERATION	29
Mix Drilling Fluid	30
Pump Fluid to Drilling Unit	33
Drain System	34
LUBRICATION AND MAINTENANCE	37
Overview	38
Engine Oil	39
Air Filter	40
Pump	40
TROUBLESHOOTING	41
SPECIFICATIONS	43
FM13V	43
Drilling Fluid Tanks	45

OPERATION	29
Mix Drilling Fluid	30
Pump Fluid to Drilling Unit	33
Drain System	34
LUBRICATION AND MAINTENANCE	37
Overview	38
Engine Oil	39
Air Filter	40
Pump	40
TROUBLESHOOTING	41
SPECIFICATIONS	43
FM13V	43
Drilling Fluid Tanks	45

OVERVIEW

The FM13V is a platform mounted venturi mixing system which mixes drilling fluid quickly and efficiently. It transfers drilling fluid for use with directional drilling systems. The FM13V has two available drilling fluid mixing tank sizes: 500 gal (1892 L) and 1000 gal (3785 L).

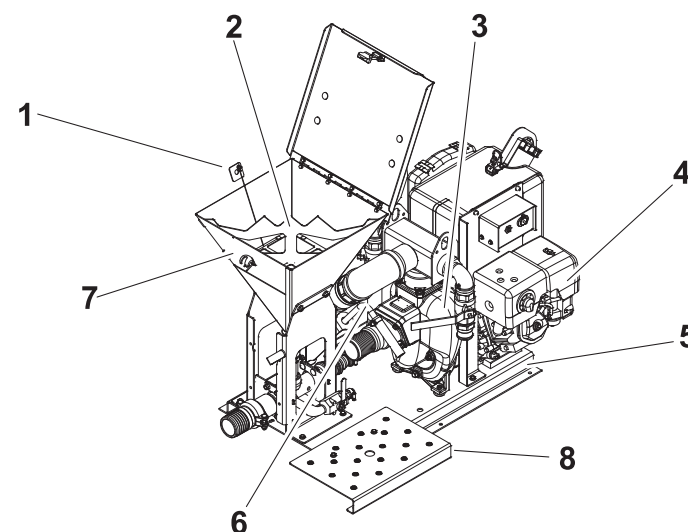


om0674h.eps

- | | |
|-------------------|------------------------|
| 1. metering plate | 5. base |
| 2. bag ripper | 6. suction wand |
| 3. pump | 7. dry chemical hopper |
| 4. engine | 8. platform |

OVERVIEW

The FM13V is a platform mounted venturi mixing system which mixes drilling fluid quickly and efficiently. It transfers drilling fluid for use with directional drilling systems. The FM13V has two available drilling fluid mixing tank sizes: 500 gal (1892 L) and 1000 gal (3785 L).



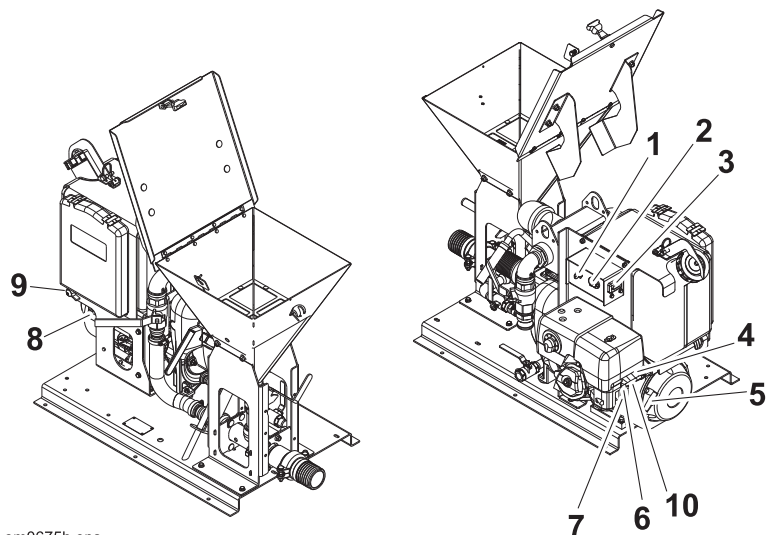
om0674h.eps

- | | |
|-------------------|------------------------|
| 1. metering plate | 5. base |
| 2. bag ripper | 6. suction wand |
| 3. pump | 7. dry chemical hopper |
| 4. engine | 8. platform |

CONTROLS

SWITCHES AND GAUGES

OVERVIEW

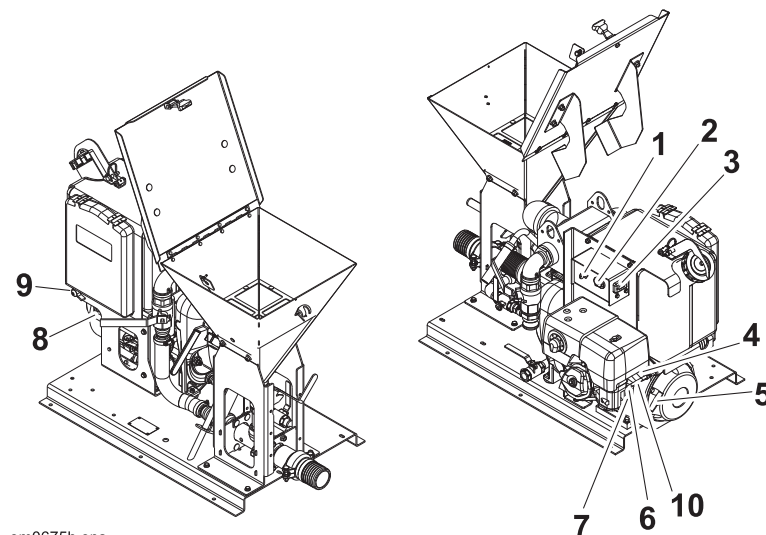


- | | |
|--|---|
| 1. ignition switch (electric start only) | 6. choke |
| 2. auxiliary outlet (12VDC, electric start only) | 7. secondary fuel shut-off valve |
| 3. hourmeter | 8. engine stop switch |
| 4. throttle | 9. battery disconnect (electric start only) |
| 5. rope start | 10. primary fuel shut-off valve (rope start only) |

CONTROLS

SWITCHES AND GAUGES

OVERVIEW



- | | |
|--|---|
| 1. ignition switch (electric start only) | 6. choke |
| 2. auxiliary outlet (12VDC, electric start only) | 7. secondary fuel shut-off valve |
| 3. hourmeter | 8. engine stop switch |
| 4. throttle | 9. battery disconnect (electric start only) |
| 5. rope start | 10. primary fuel shut-off valve (rope start only) |

DESCRIPTIONS

Ignition Switch (Electric Start Only)

This switch has three positions.

- Insert key and turn clockwise to the “ON” position.
- Turn switch all the way clockwise to the “Start” position.
- Release when engine starts. Key will return to on position.
- Turn counterclockwise to STOP to stop engine.

IMPORTANT Turn ignition switch to the STOP position any time the engine stops running.

Auxiliary Outlet (Electric Start Only)

This outlet provides auxiliary power to electrical accessories. To operate work lights or other 12V devices, plug into outlet.

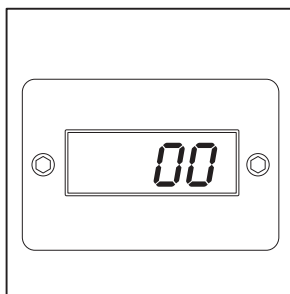
Notice Engine alternator is capable of delivering 3 Amps at 3600 RPM. Running engine at part throttle while using electrical accessories, or using accessories that use more than 3 amps for an extended time may discharge battery.

Tachometer/Hourmeter

This gauge records engine operating time. Use these times to schedule lubrication and maintenance.

When engine is operating, engine rpm is displayed.

When engine is not operating, engine operating time is displayed.



om0683h.eps

DESCRIPTIONS

Ignition Switch (Electric Start Only)

This switch has three positions.

- Insert key and turn clockwise to the “ON” position.
- Turn switch all the way clockwise to the “Start” position.
- Release when engine starts. Key will return to on position.
- Turn counterclockwise to STOP to stop engine.

IMPORTANT Turn ignition switch to the STOP position any time the engine stops running.

Auxiliary Outlet (Electric Start Only)

This outlet provides auxiliary power to electrical accessories. To operate work lights or other 12V devices, plug into outlet.

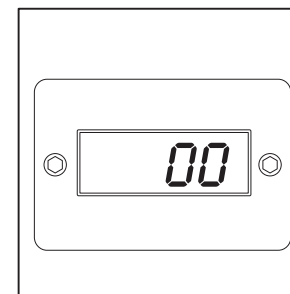
Notice Engine alternator is capable of delivering 3 Amps at 3600 RPM. Running engine at part throttle while using electrical accessories, or using accessories that use more than 3 amps for an extended time may discharge battery.

Tachometer/Hourmeter

This gauge records engine operating time. Use these times to schedule lubrication and maintenance.

When engine is operating, engine rpm is displayed.

When engine is not operating, engine operating time is displayed.



om0683h.eps

Throttle

This lever adjusts engine speed during mixing process.

- Move lever to the right to decrease engine speed.
- Move lever to the left to increase engine speed.

Rope Start

On rope start units, this is the primary method for starting engine. The rope is a backup method to start engine if electric start fails.

Pull rope to start engine.

Choke

This valve regulates air/fuel mixture. To help start cold engine, close valve.

Secondary Manual Fuel Shut-off Valve

This valve stops the flow of fuel from the fuel tank to the engine when unit is transported or stored. This valve is present on both electric start and rope start units.

- To open valve, turn lever to the right.
- To close valve, turn lever to the left.

Throttle

This lever adjusts engine speed during mixing process.

- Move lever to the right to decrease engine speed.
- Move lever to the left to increase engine speed.

Rope Start

On rope start units, this is the primary method for starting engine. The rope is a backup method to start engine if electric start fails.

Pull rope to start engine.

Choke

This valve regulates air/fuel mixture. To help start cold engine, close valve.

Secondary Manual Fuel Shut-off Valve

This valve stops the flow of fuel from the fuel tank to the engine when unit is transported or stored. This valve is present on both electric start and rope start units.

- To open valve, turn lever to the right.
- To close valve, turn lever to the left.

Engine Stop Switch

This switch controls power to the ignition system **for electric start** units. This switch turns power on and off **for rope start** units.

- To turn power on, turn clockwise.
- To turn power off, turn counterclockwise.

Note The ignition switch is the preferred method of stopping engine **for electric start** units. For normal operation, leave this switch on all the time and use ignition switch to stop and start unit. Turn key to the off position when engine is not running.

Battery Disconnect (Electric Start Only)

This switch connects/disconnects power from battery during service and long-term storage.

- To connect, move switch so that indicator points left.
- To disconnect, move switch so that indicator points right.

Primary Fuel Shut-off Valve

For rope start units, use this valve to stop the flow of fuel from the fuel tank to the engine when unit is transported or stored.

- To open valve, turn valve until tab is aligned with hose.
- To close valve, turn valve until tab is not aligned with hose.

For electric start units, the primary fuel shutoff is electrically-actuated. The valve is closed when the ignition switch is off and open when the ignition switch is on.

Engine Stop Switch

This switch controls power to the ignition system **for electric start** units. This switch turns power on and off **for rope start** units.

- To turn power on, turn clockwise.
- To turn power off, turn counterclockwise.

Note The ignition switch is the preferred method of stopping engine **for electric start** units. For normal operation, leave this switch on all the time and use ignition switch to stop and start unit. Turn key to the off position when engine is not running.

Battery Disconnect (Electric Start Only)

This switch connects/disconnects power from battery during service and long-term storage.

- To connect, move switch so that indicator points left.
- To disconnect, move switch so that indicator points right.

Primary Fuel Shut-off Valve

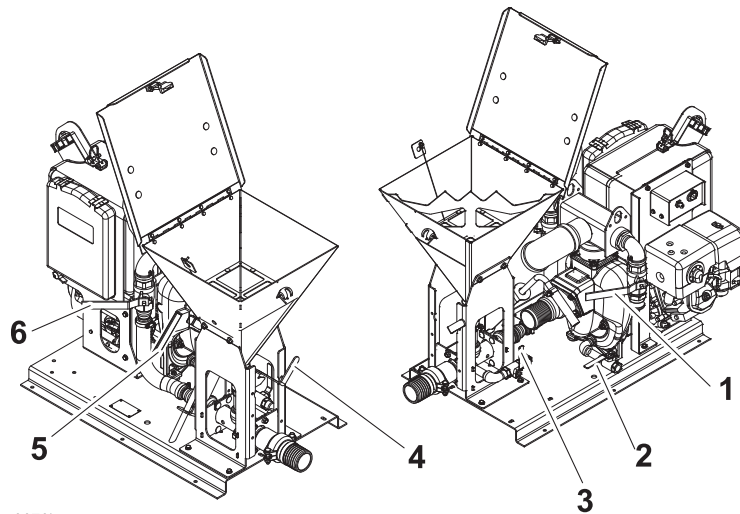
For rope start units, use this valve to stop the flow of fuel from the fuel tank to the engine when unit is transported or stored.

- To open valve, turn valve until tab is aligned with hose.
- To close valve, turn valve until tab is not aligned with hose.

For electric start units, the primary fuel shutoff is electrically-actuated. The valve is closed when the ignition switch is off and open when the ignition switch is on.

VALVES

OVERVIEW

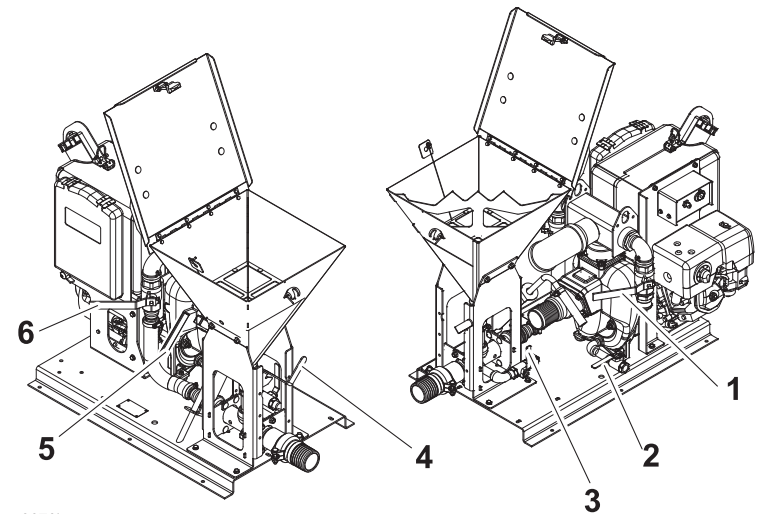


om0676h.eps

- | | |
|--------------------------|------------------------------|
| 1. mixing jet valve | 4. dry chemical hopper valve |
| 2. pump drain valve | 5. discharge valve |
| 3. liquid chemical valve | 6. mixing venturi valve |

VALVES

OVERVIEW



om0676h.eps

- | | |
|--------------------------|------------------------------|
| 1. mixing jet valve | 4. dry chemical hopper valve |
| 2. pump drain valve | 5. discharge valve |
| 3. liquid chemical valve | 6. mixing venturi valve |

DESCRIPTIONS

Mixing Jet Valve

This valve controls the flow of fluid from pump to the mixing jets in tank.

- Turn valve handle counterclockwise 1/4 turn to open valve.
- Turn valve handle clockwise 1/4 turn to close valve.

Pump Drain Valve

This valve drains fluid from pump and some fluid lines.

- Turn handle counterclockwise 1/4 turn to open.
- Turn clockwise 1/4 turn to close.

Liquid Chemical Hopper Valve

This valve controls the flow of polymers or wetting agents to the mixing system.

- Turn handle counterclockwise 1/4 turn to open valve.
- Turn handle clockwise 1/4 turn to close valve.

DESCRIPTIONS

Mixing Jet Valve

This valve controls the flow of fluid from pump to the mixing jets in tank.

- Turn valve handle counterclockwise 1/4 turn to open valve.
- Turn valve handle clockwise 1/4 turn to close valve.

Pump Drain Valve

This valve drains fluid from pump and some fluid lines.

- Turn handle counterclockwise 1/4 turn to open.
- Turn clockwise 1/4 turn to close.

Liquid Chemical Hopper Valve

This valve controls the flow of polymers or wetting agents to the mixing system.

- Turn handle counterclockwise 1/4 turn to open valve.
- Turn handle clockwise 1/4 turn to close valve.

Dry Chemical Hopper Valve

This valve controls flow of dry chemicals into mixing venturi.

- Turn handle to left (counterclockwise) to open valve.
- Move handle to right (clockwise) to close valve.

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

Discharge Valve

This valve controls the flow of drilling fluid from mixing tank to drilling unit.

- Turn handle counterclockwise 1/4 turn to open valve.
- Turn handle clockwise 1/4 turn to close valve.

Mixing Venturi Valve

This valve controls flow of fluid through mixing venturi at the bottom of the dry hopper.

- Turn handle counterclockwise 1/4 turn to open.
- Turn handle clockwise 1/4 turn to close.

Dry Chemical Hopper Valve

This valve controls flow of dry chemicals into mixing venturi.

- Turn handle to left (counterclockwise) to open valve.
- Move handle to right (clockwise) to close valve.

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

Discharge Valve

This valve controls the flow of drilling fluid from mixing tank to drilling unit.

- Turn handle counterclockwise 1/4 turn to open valve.
- Turn handle clockwise 1/4 turn to close valve.

Mixing Venturi Valve

This valve controls flow of fluid through mixing venturi at the bottom of the dry hopper.

- Turn handle counterclockwise 1/4 turn to open.
- Turn handle clockwise 1/4 turn to close.

SAFETY

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

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.

ACCESSORIES

Fire Extinguisher

If required, a fire extinguisher should be mounted 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.

ACCESSORIES


Fire Extinguisher


If required, a fire extinguisher should be mounted 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.


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.


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**.

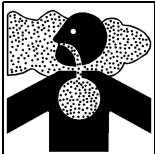
NOTICE indicates information considered important, but not hazard-related (e.g., messages relating to property damage).

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

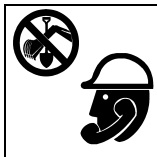
SAFETY ALERTS



⚠ 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.

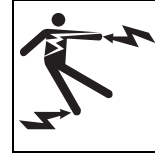


⚠ WARNING Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.

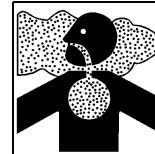


⚠ WARNING Crushing weight could cause death or serious injury. Use proper procedures and equipment or stay away.

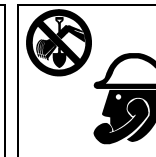
SAFETY ALERTS



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



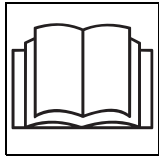
⚠ DANGER Deadly gases. Lack of oxygen or presence of gas will cause sickness or death. Provide ventilation.



⚠ 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.



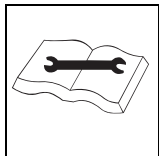
⚠ WARNING Incorrect procedures could result in death, injury, or property damage. Learn to use equipment correctly.



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



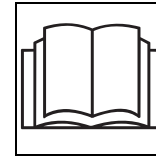
⚠ WARNING Moving traffic - hazardous situation. Death or serious injury could result. Avoid moving vehicles, wear high visibility clothing, post appropriate warning signs.



⚠ 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.



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



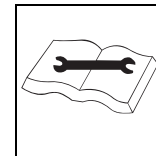
⚠ WARNING Incorrect procedures could result in death, injury, or property damage. Learn to use equipment correctly.



⚠ 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.



⚠ 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.



⚠ 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 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).



⚠ 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 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).

LIFT

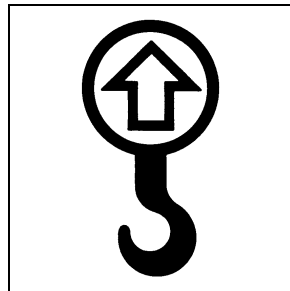


⚠ WARNING Crushing weight. If load falls or moves it could kill or crush you. Use proper procedures and equipment or stay away.

LIFT

Points

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

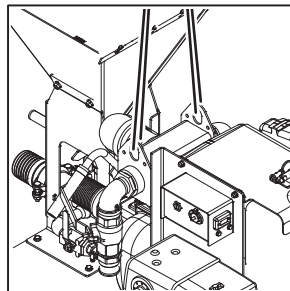


Mixing Unit

Lift mixing unit by attaching chains to lift points on top of pump.

Bolt base to truck or trailer bed using provided holes.

If mounting without a base, ensure pump coupler is covered.



om0678h.eps

LIFT

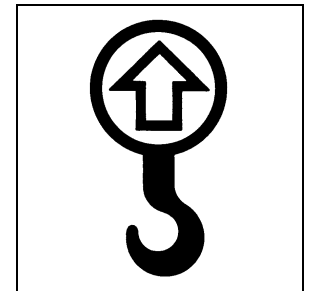


⚠ WARNING Crushing weight. If load falls or moves it could kill or crush you. Use proper procedures and equipment or stay away.

LIFT

Points

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

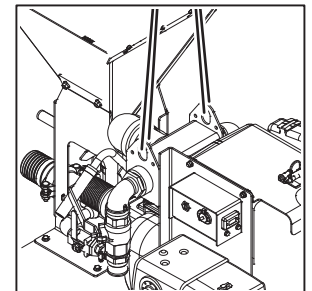


Mixing Unit

Lift mixing unit by attaching chains to lift points on top of pump.

Bolt base to truck or trailer bed using provided holes.

If mounting without a base, ensure pump coupler is covered.

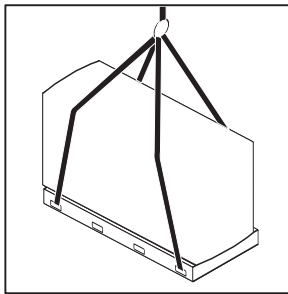


om0678h.eps

Tank

Lift fluid tank by attaching sling to lift points located on side of tank.

IMPORTANT: Empty tank before lifting.

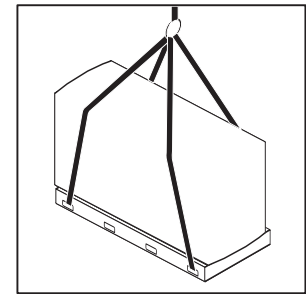


om0679h.eps

Tank

Lift fluid tank by attaching sling to lift points located on side of tank.

IMPORTANT: Empty tank before lifting.



om0679h.eps

PREPARATION

CHECK EQUIPMENT

Check the following before starting each day's work. Refer to **LUBRICATION AND MAINTENANCE** for additional information and locations.

- General appearance of equipment
- Safety sign location and readability
- All guard and shield locations. Replace if missing or worn.
- Condition of all wear items such as strainers, filters, hoses, and clamps
- Drilling fluid hoses, and electric cables for signs of leakage, wear, or other damage.
- Engine crankcase oil level. Keep oil level at the highest line on dipstick. Do not overfill.
- Fuel level. Fuel tank should be filled at the end of the day to reduce condensation.
- All nuts and bolts. Tighten if necessary.

PREPARATION

CHECK EQUIPMENT

Check the following before starting each day's work. Refer to **LUBRICATION AND MAINTENANCE** for additional information and locations.

- General appearance of equipment
- Safety sign location and readability
- All guard and shield locations. Replace if missing or worn.
- Condition of all wear items such as strainers, filters, hoses, and clamps
- Drilling fluid hoses, and electric cables for signs of leakage, wear, or other damage.
- Engine crankcase oil level. Keep oil level at the highest line on dipstick. Do not overfill.
- Fuel level. Fuel tank should be filled at the end of the day to reduce condensation.
- All nuts and bolts. Tighten if necessary.

SELECT DRILLING FLUID

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

- 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. Although specific conditions at each jobsite vary, use the following guidelines when selecting a drilling fluid.

If soil is...	use...
Smooth, flowing sand	Bentonite + medium chain polymer
Coarse sand or light soil	Bentonite
Heavy clay	Long chain polymer
Swelling clay	Long chain polymer
Rock	Bore-Gel

For recommended mixture to reach desired drilling fluid viscosity or thickness, contact your Ditch Witch dealer.

SELECT DRILLING FLUID

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

- 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. Although specific conditions at each jobsite vary, use the following guidelines when selecting a drilling fluid.

If soil is...	use...
Smooth, flowing sand	Bentonite + medium chain polymer
Coarse sand or light soil	Bentonite
Heavy clay	Long chain polymer
Swelling clay	Long chain polymer
Rock	Bore-Gel

For recommended mixture to reach desired drilling fluid viscosity or thickness, contact your Ditch Witch dealer.

Bentonite

Bentonite is a dry powder. When properly mixed with water, it cakes 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 7.5 and 10.
- 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, read "Measuring Funnel Viscosity" in **OPERATION**.

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

Mixtures

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

Bore-Gel contains premixed bentonite, polymer, and soda ash. Use 15 lb/100 gal (6.8 kg/378.5 L) in normal drilling conditions, up to 45 lb/100 gal (20.4/378.5 L) in sand or gravel and up to 50 lb/100 gal (22.6/378.5 L) in rock.

Bentonite

Bentonite is a dry powder. When properly mixed with water, it cakes 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 7.5 and 10.
- 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, read "Measuring Funnel Viscosity" in **OPERATION**.

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

Mixtures

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

Bore-Gel contains premixed bentonite, polymer, and soda ash. Use 15 lb/100 gal (6.8 kg/378.5 L) in normal drilling conditions, up to 45 lb/100 gal (20.4/378.5 L) in sand or gravel and up to 50 lb/100 gal (22.6/378.5 L) in rock.

Plan Drilling Fluid Requirements

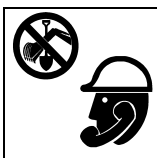
1. Determine drilling conditions and choose appropriate drilling fluid mix.
2. Estimate amount of supplies needed and check availability.
 - Drilling fluid
 - Water supply. If more water than can be carried with the unit will be needed, arrange to transport additional water.
 - Bentonite and/or polymer
3. Check water quality.
 - Visually perform pH test on water. If pH is below 5.0, add 1 cup (.25 L) soda ash per tank. Test and repeat until pH is between 7.5 and 10.

Plan 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.
 - Visually perform pH test on water. If pH is below 5.0, add 1 cup (.25 L) soda ash per tank. Test and repeat until pH is between 7.5 and 10.

OPERATION

This section covers basic operation. For questions about specific situations, contact your Ditch Witch dealer.



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

NOTICES:

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

OPERATION

This section covers basic operation. For questions about specific situations, contact your Ditch Witch dealer.

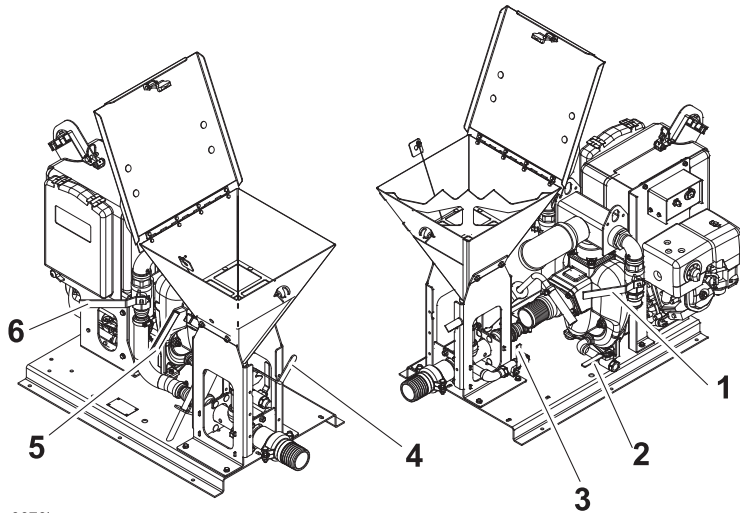


⚠ WARNING Jobsite hazards could cause death or serious injury. Use correct equipment and work methods. Use and maintain proper safety equipment.

NOTICES:

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

MIX DRILLING FLUID



om0676h.eps

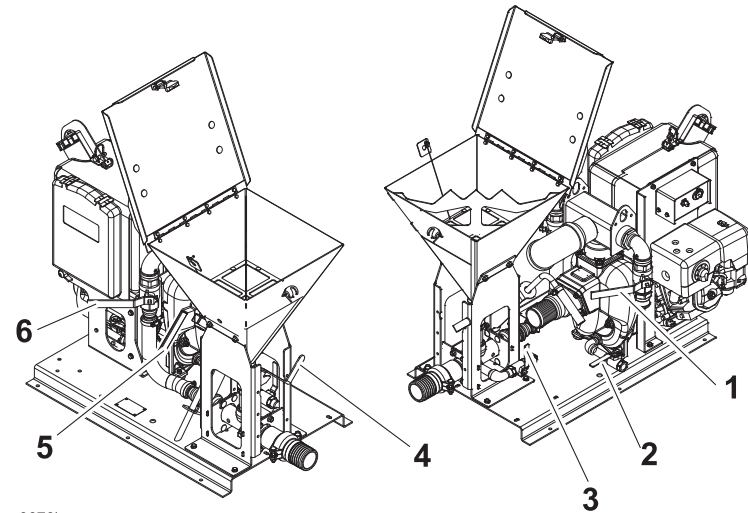
1. Ensure valve in suction line and at least one valve on the pressure side of the pump is open.
2. If necessary, choke cold engine.
3. Move throttle to half open.
4. Start engine.
 - **For electric start** units, turn ignition switch to start position and release when engine starts.
 - **For rope start** units, turn engine stop switch to ON and pull rope.

IMPORTANT: On **electric start** units, if battery is dead, turn key to ON and pull start rope.

5. Open choke after engine is warm.

EMERGENCY SHUTDOWN: For **electric start** units, turn ignition switch to STOP. For **rope start** units, turn engine stop switch to OFF.

MIX DRILLING FLUID



om0676h.eps

1. Ensure valve in suction line and at least one valve on the pressure side of the pump is open.
2. If necessary, choke cold engine.
3. Move throttle to half open.
4. Start engine.
 - **For electric start** units, turn ignition switch to start position and release when engine starts.
 - **For rope start** units, turn engine stop switch to ON and pull rope.

IMPORTANT: On **electric start** units, if battery is dead, turn key to ON and pull start rope.

5. Open choke after engine is warm.

EMERGENCY SHUTDOWN: For **electric start** units, turn ignition switch to STOP. For **rope start** units, turn engine stop switch to OFF.

NOTICES:

- If chemicals are added in the wrong order, they will not mix properly and will form clumps. See "Mixtures" in Preparation.
 - If tank contains bentonite/polymer mix and more drilling fluid is needed, completely empty tank and start with fresh water before mixing another batch.
6. Open tank jet valve (3) and mixing venturi valve (6).
 7. Start engine on mixing pump.
 8. Partially open dry chemical hopper valve (4). Listen for a noticeable "suction" sound.

IMPORTANT Add polymers at a very slow rate.

9. For dry chemicals, open sack using bag ripper located inside dry chemical hopper and pour chemicals into hopper.

NOTICE Metering plate can be seated in bottom of dry chemical hopper to allow dry chemicals to be added at a slower rate.

- Approximate feed rate with metering plate, 50 lb : 1.5 minutes.
 - Approximate feed rate without metering plate, 50 lb : 0.7 minutes.
10. Open dry chemical valve (4) slowly.
 11. For liquid polymer and other liquid chemicals, pour needed amount of additive into a suitable container, insert wand into container.
 12. Open liquid chemical valve (3) slowly.
 13. Open fillwell on top of tank and check fluid in tank to ensure that chemicals are mixed correctly.
 14. If clumps of chemical or polymer can be seen in fluid tank, reduce the rate at which materials are added.

NOTICES:

- If chemicals are added in the wrong order, they will not mix properly and will form clumps. See "Mixtures" in Preparation.
 - If tank contains bentonite/polymer mix and more drilling fluid is needed, completely empty tank and start with fresh water before mixing another batch.
6. Open tank jet valve (3) and mixing venturi valve (6).
 7. Start engine on mixing pump.
 8. Partially open dry chemical hopper valve (4). Listen for a noticeable "suction" sound.

IMPORTANT Add polymers at a very slow rate.

9. For dry chemicals, open sack using bag ripper located inside dry chemical hopper and pour chemicals into hopper.

NOTICE Metering plate can be seated in bottom of dry chemical hopper to allow dry chemicals to be added at a slower rate.

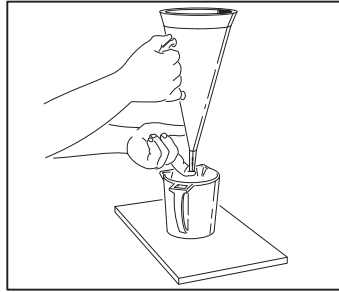
- Approximate feed rate with metering plate, 50 lb : 1.5 minutes.
 - Approximate feed rate without metering plate, 50 lb : 0.7 minutes.
10. Open dry chemical valve (4) slowly.
 11. For liquid polymer and other liquid chemicals, pour needed amount of additive into a suitable container, insert wand into container.
 12. Open liquid chemical valve (3) slowly.
 13. Open fillwell on top of tank and check fluid in tank to ensure that chemicals are mixed correctly.
 14. If clumps of chemical or polymer can be seen in fluid tank, reduce the rate at which materials are added.

Measure 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 and a measuring cup, available from your Ditch Witch Dealer.

1. Take a fresh sample from the drilling fluid tank. The sample must be more than 1 qt (.95 L).
2. Hold funnel over 1 qt (.95 L) measuring cup and place a finger over outlet.
3. Pour test sample into top of funnel through screen to ensure no large particles enter the funnel that might alter the measurement. Fill to screen.
4. Remove finger and time flow. Count the number of seconds necessary for 1 qt (.95 L) of fluid to pass through funnel. The number of seconds is the viscosity.
5. Thoroughly rinse measuring cup and Marsh funnel with water.



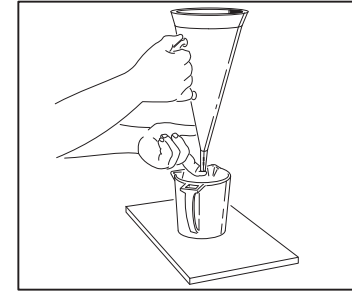
om1082.eps

Measure 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 and a measuring cup, available from your Ditch Witch Dealer.

1. Take a fresh sample from the drilling fluid tank. The sample must be more than 1 qt (.95 L).
2. Hold funnel over 1 qt (.95 L) measuring cup and place a finger over outlet.
3. Pour test sample into top of funnel through screen to ensure no large particles enter the funnel that might alter the measurement. Fill to screen.
4. Remove finger and time flow. Count the number of seconds necessary for 1 qt (.95 L) of fluid to pass through funnel. The number of seconds is the viscosity.
5. Thoroughly rinse measuring cup and Marsh funnel with water.



om1082.eps

PUMP FLUID TO DRILLING UNIT



⚠ 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 mixing pump hose to drilling unit.

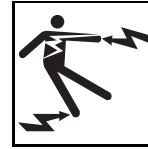
NOTICE To prevent damage to the drilling fluid pump, make sure y-strainer is used in-line between mixing unit and drilling unit.

2. Open discharge valve of mixing pump, adjust engine throttle to full to purge all air from the line when starting drilling fluid pump on drilling unit. After flow is stable, adjust throttle to give desired flow rate to drilling unit (approximately half throttle).

IMPORTANT:

- To reduce agitation in tank when using polymer-based drilling fluids, partially close the tank jet valve.
- Overmixing of polymer-based drilling fluids can reduce fluid viscosity.
- Close venturi valve when dry chemical hopper is not in use.

PUMP FLUID TO DRILLING UNIT



⚠ 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 mixing pump hose to drilling unit.

NOTICE To prevent damage to the drilling fluid pump, make sure y-strainer is used in-line between mixing unit and drilling unit.

2. Open discharge valve of mixing pump, adjust engine throttle to full to purge all air from the line when starting drilling fluid pump on drilling unit. After flow is stable, adjust throttle to give desired flow rate to drilling unit (approximately half throttle).

IMPORTANT:

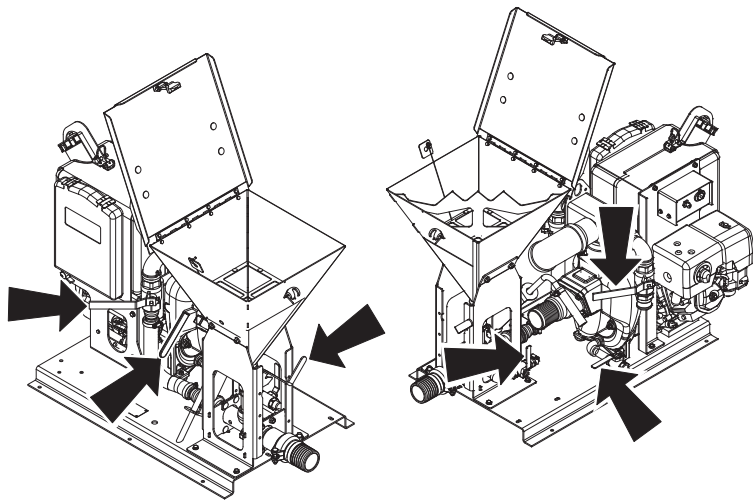
- To reduce agitation in tank when using polymer-based drilling fluids, partially close the tank jet valve.
- Overmixing of polymer-based drilling fluids can reduce fluid viscosity.
- Close venturi valve when dry chemical hopper is not in use.

DRAIN SYSTEM

Drain system under the following circumstances:

- Temperature is expected to be 32°F (0°C) or below.
- System is not going to be used for several days.
- System is going to be used on a different job requiring different chemicals.

1. Pump as much fluid as possible out of tanks.
2. Shut off pumps and open all valves (shown). Disconnect tank jet hose.



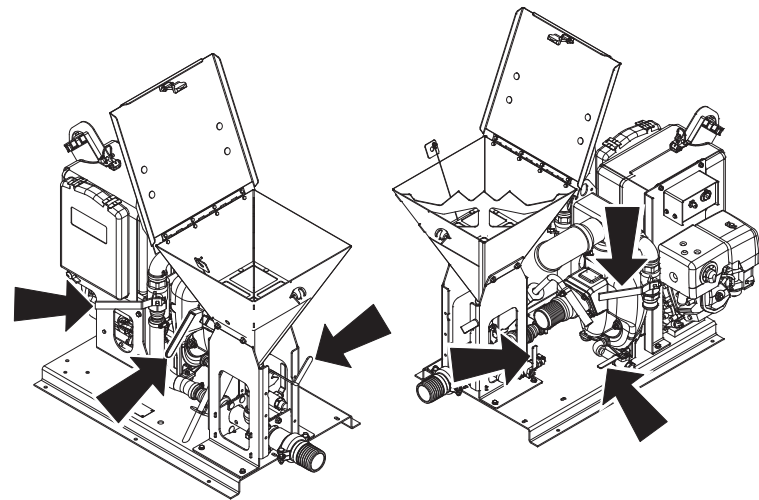
om0684h.eps

DRAIN SYSTEM

Drain system under the following circumstances:

- Temperature is expected to be 32°F (0°C) or below.
- System is not going to be used for several days.
- System is going to be used on a different job requiring different chemicals.

1. Pump as much fluid as possible out of tanks.
2. Shut off pumps and open all valves (shown). Disconnect tank jet hose.



om0684h.eps

-
3. Lower suction wand to allow fluid to drain from hose and mixing venturi.
 4. Allow fluid to drain into suitable containers.
 5. Recycle or properly dispose of fluid.
 6. If needed, drain any remaining fluid in tank by removing plug on bottom of tank's suction end.
 7. When finished, pull up the ground wire and grounding stake (if used). Store in secure place.

-
3. Lower suction wand to allow fluid to drain from hose and mixing venturi.
 4. Allow fluid to drain into suitable containers.
 5. Recycle or properly dispose of fluid.
 6. If needed, drain any remaining fluid in tank by removing plug on bottom of tank's suction end.
 7. When finished, pull up the ground wire and grounding stake (if used). Store in secure place.

LUBRICATION AND MAINTENANCE

**⚠ WARNING**

Fluid under pressure can pierce skin and cause injury or death. Stay away.

NOTICES:

- Before using system, check that all connections are tight and all lines are undamaged.
- Fluid leaks can be hard to detect. Use a piece of cardboard or wood, rather than hands, to search for leaks.
- Wear protective clothing and eye protection.
- If you are injured, seek immediate medical attention.

**⚠ WARNING**

Crushing weight. If load falls or moves, death or serious injury can result. Use proper procedures and equipment or stay away.

NOTICE: Unless otherwise instructed, all service in this chapter should be performed with the engine(s) shut off.

LUBRICATION AND MAINTENANCE

**⚠ WARNING**

Fluid under pressure can pierce skin and cause injury or death. Stay away.

NOTICES:

- Before using system, check that all connections are tight and all lines are undamaged.
- Fluid leaks can be hard to detect. Use a piece of cardboard or wood, rather than hands, to search for leaks.
- Wear protective clothing and eye protection.
- If you are injured, seek immediate medical attention.

**⚠ WARNING**

Crushing weight. If load falls or moves, death or serious injury can result. Use proper procedures and equipment or stay away.

NOTICE: Unless otherwise instructed, all service in this chapter should be performed with the engine(s) shut off.

OVERVIEW

Interval	Task	Page no.
daily	check engine oil	39
50 hours	grease pump	40
100 hours	change engine oil	39
	change air filter element	40

Lubricant chart:	
GEO	Gasoline engine oil (see chart for appropriate SAE viscosity rating) meeting API engine service classification SD
NLGI #1	Polyurea based NLGI #1

OVERVIEW

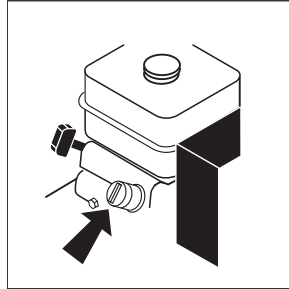
Interval	Task	Page no.
daily	check engine oil	39
50 hours	grease pump	40
100 hours	change engine oil	39
	change air filter element	40

Lubricant chart:	
GEO	Gasoline engine oil (see chart for appropriate SAE viscosity rating) meeting API engine service classification SD
NLGI #1	Polyurea based NLGI #1

ENGINE OIL

Check Oil

Check engine oil at dipstick before each operation. Add GEO at fill neck as necessary to keep oil level at highest line on dipstick.

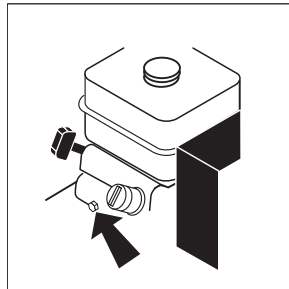


Om0260c.eps

Change Oil

Change oil every 100 hours with GEO.

- Pull drain plug and drain crankcase while oil is still warm.
- Refill at fill neck with 2.3 pt (1.1 L) of GEO.

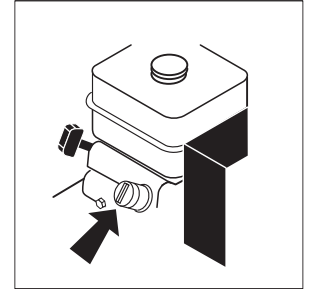


Om0265c.eps

ENGINE OIL

Check Oil

Check engine oil at dipstick before each operation. Add GEO at fill neck as necessary to keep oil level at highest line on dipstick.

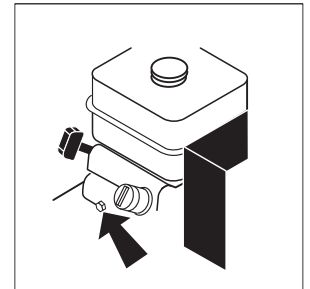


Om0260c.eps

Change Oil

Change oil every 100 hours with GEO.

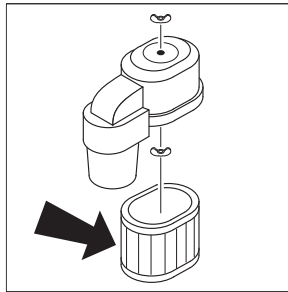
- Pull drain plug and drain crankcase while oil is still warm.
- Refill at fill neck with 2.3 pt (1.1 L) of GEO.



Om0265c.eps

AIR FILTER

Change foam air filter element every 100 hours. Do not allow dirt to fall into carburetor.

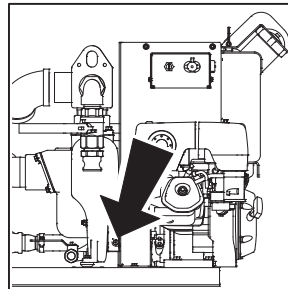


Om0200c.eps

PUMP

Lube grease fitting with Lubra-plate -630-AA every 50 hours.

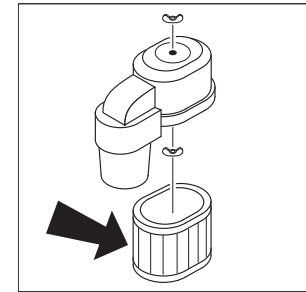
Grease cavity is full when grease escapes from grease cylinder relief valve.



om0680h.eps

AIR FILTER

Change foam air filter element every 100 hours. Do not allow dirt to fall into carburetor.

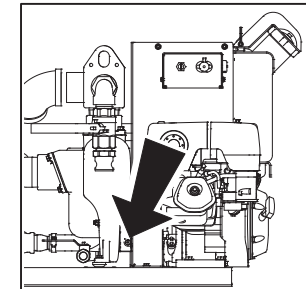


Om0200c.eps

PUMP

Lube grease fitting with Lubra-plate -630-AA every 50 hours.

Grease cavity is full when grease escapes from grease cylinder relief valve.



om0680h.eps

TROUBLESHOOTING

The FM13V has a metering plate in the bottom of the dry chemical hopper sized to match material flow to fluid volume going through venturi. This plate helps each unit maintain the approximate time required to feed 50 lb (22.7 kg) of material into tank when engine is running at full speed. Changing material flow rate by removing or resizing plate will affect mixing results.

Problem	Possible solutions
Slow feed rate from hopper	Run engine at full speed
	Place control valves in recommended mixing positions.
	Clear obstructions from metering plate and check that screen is in place.
	Remove build-up from venturi chamber.
	Clean plugged hoses and fittings. Repair or replace damaged hoses and fittings.
	See pump instructions for procedure on checking flow.
Poor drilling fluid mix characteristics	Test water pH and treat if necessary (see PREPARATION for instructions).
Clumps in drilling fluid tank	Check feed rate.

TROUBLESHOOTING

The FM13V has a metering plate in the bottom of the dry chemical hopper sized to match material flow to fluid volume going through venturi. This plate helps each unit maintain the approximate time required to feed 50 lb (22.7 kg) of material into tank when engine is running at full speed. Changing material flow rate by removing or resizing plate will affect mixing results.

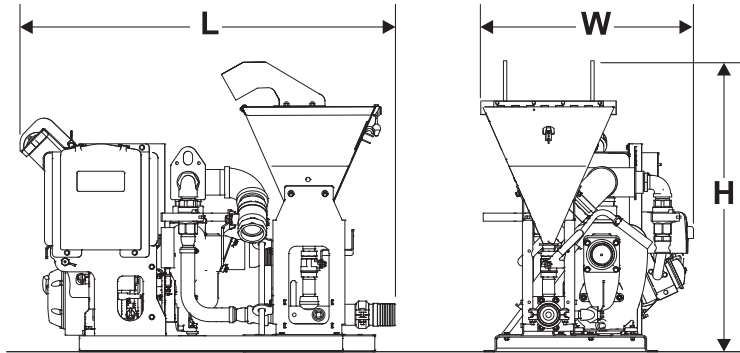
Problem	Possible solutions
Slow feed rate from hopper	Run engine at full speed
	Place control valves in recommended mixing positions.
	Clear obstructions from metering plate and check that screen is in place.
	Remove build-up from venturi chamber.
	Clean plugged hoses and fittings. Repair or replace damaged hoses and fittings.
	See pump instructions for procedure on checking flow.
Poor drilling fluid mix characteristics	Test water pH and treat if necessary (see PREPARATION for instructions).
Clumps in drilling fluid tank	Check feed rate.

Problem	Possible solutions
Low yield properties	Check feed rate.
	Make sure screen is in strainer.
	Check water pH.
	Try different brand of drilling fluid additive.
	Add polymer to drilling fluid tank only after bentonite has been yielded out.
Hourmeter does not work.	<p>Replace hourmeter. Contact your local Ditch Witch dealership for replacement parts.</p> <ul style="list-style-type: none"> • Mount with provided screws. • Wrap pick-up wire around spark plug wire no more than four times. Ensure that pick-up wire does not come in contact with spark plug and is not near a heat source (i.e. muffler). • Attach ground wire to an engine block bolt. <p>Important: Ensure that hourmeter is not placed too close to a sound source other than the engine. Failure to do so will result in inaccurate readings.</p>

Problem	Possible solutions
Low yield properties	Check feed rate.
	Make sure screen is in strainer.
	Check water pH.
	Try different brand of drilling fluid additive.
	Add polymer to drilling fluid tank only after bentonite has been yielded out.
Hourmeter does not work.	<p>Replace hourmeter. Contact your local Ditch Witch dealership for replacement parts.</p> <ul style="list-style-type: none"> • Mount with provided screws. • Wrap pick-up wire around spark plug wire no more than four times. Ensure that pick-up wire does not come in contact with spark plug and is not near a heat source (i.e. muffler). • Attach ground wire to an engine block bolt. <p>Important: Ensure that hourmeter is not placed too close to a sound source other than the engine. Failure to do so will result in inaccurate readings.</p>

SPECIFICATIONS

FM13V

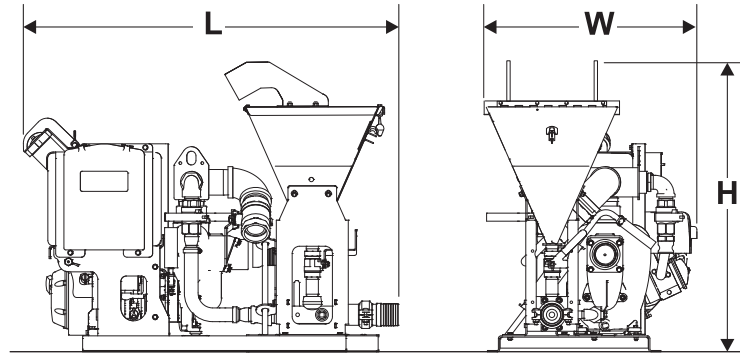


om0681h.eps

Dimensions	U.S.	Metric
Length	60 in	1.5 m
Height	43 in	1.1 m
Width	26 in	660 mm
Weight	450 lb	204 kg
Drilling fluid system	U.S.	Metric
Maximum flow rate at 26 viscosity	300 gpm	1135 L/m
Mixing hopper capacity	1.0 cu ft	28 L
Drilling fluid/mixing tank	500/1000 gal	1892/3785 L
Mixing time for 50 lb (22.7 kg)	0.7 min	0.7 min
Mixing time for 100 lb (45 kg)	1.5 min	1.5 min
Fluid capacities	U.S.	Metric
Fuel tank	6.0 gal	22.7 L
Engine oil	2.3 pt	1.1 L

SPECIFICATIONS

FM13V



om0681h.eps

Dimensions	U.S.	Metric
Length	60 in	1.5 m
Height	43 in	1.1 m
Width	26 in	660 mm
Weight	450 lb	204 kg
Drilling fluid system	U.S.	Metric
Maximum flow rate at 26 viscosity	300 gpm	1135 L/m
Mixing hopper capacity	1.0 cu ft	28 L
Drilling fluid/mixing tank	500/1000 gal	1892/3785 L
Mixing time for 50 lb (22.7 kg)	0.7 min	0.7 min
Mixing time for 100 lb (45 kg)	1.5 min	1.5 min
Fluid capacities	U.S.	Metric
Fuel tank	6.0 gal	22.7 L
Engine oil	2.3 pt	1.1 L

Engine	U.S.	Metric
Engine: Honda GX390		
Fuel: gasoline		
Cooling medium: air		
Number of cylinders: one		
Displacement	23.7 cu in	389 cu cm
Bore	3.53 in	90 mm
Stroke	2.52 in	64 mm
Gross power @ 3600 rpm	11.7 hp	8.7 kW

Noise Level:

Operator 92 dbA sound pressure per ISO 6394.

Exterior 105 dbA sound power per ISO 6393.

Engine	U.S.	Metric
Engine: Honda GX390		
Fuel: gasoline		
Cooling medium: air		
Number of cylinders: one		
Displacement	23.7 cu in	389 cu cm
Bore	3.53 in	90 mm
Stroke	2.52 in	64 mm
Gross power @ 3600 rpm	11.7 hp	8.7 kW

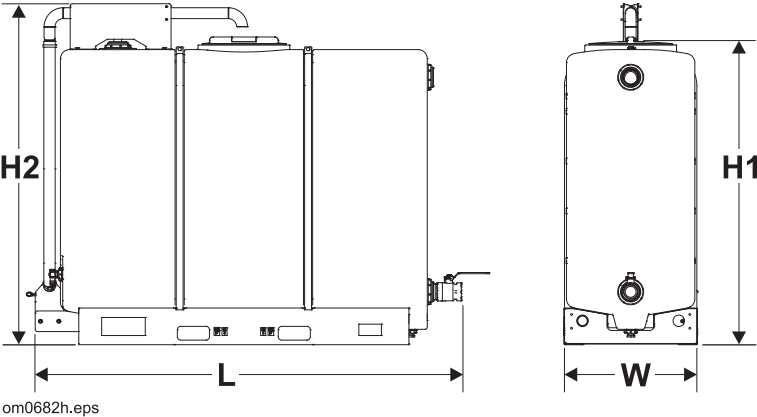
Noise Level:

Operator 92 dbA sound pressure per ISO 6394.

Exterior 105 dbA sound power per ISO 6393.

DRILLING FLUID TANKS

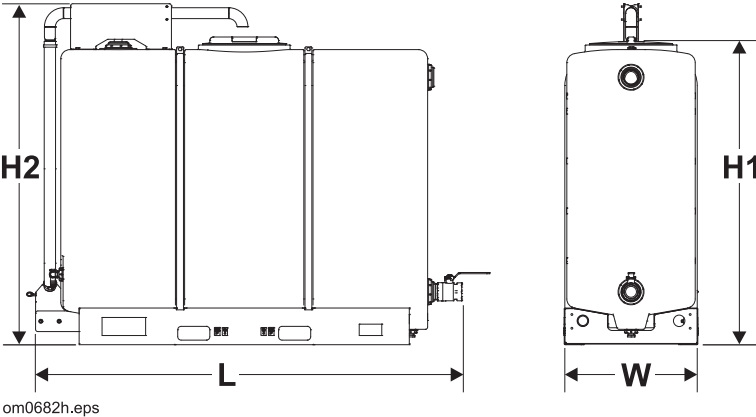
500 gal (1893 L) tank



Dimensions	U.S.	Metric
Length	93 in	2.36 m
Height (H ₁)	68 in	1.73 m
Height (H ₂)	75 in	1.91 m
Width	30 in	800 mm
Weight (empty)	550 lb	250 kg
Weight (full of water)	4720 lb	2141 kg

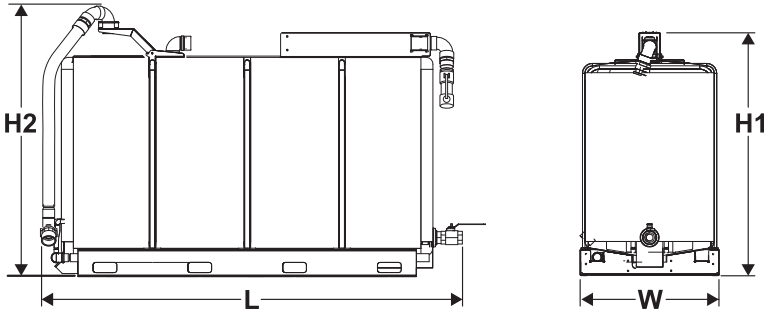
DRILLING FLUID TANKS

500 gal (1893 L) tank



Dimensions	U.S.	Metric
Length	93 in	2.36 m
Height (H ₁)	68 in	1.73 m
Height (H ₂)	75 in	1.91 m
Width	30 in	800 mm
Weight (empty)	550 lb	250 kg
Weight (full of water)	4720 lb	2141 kg

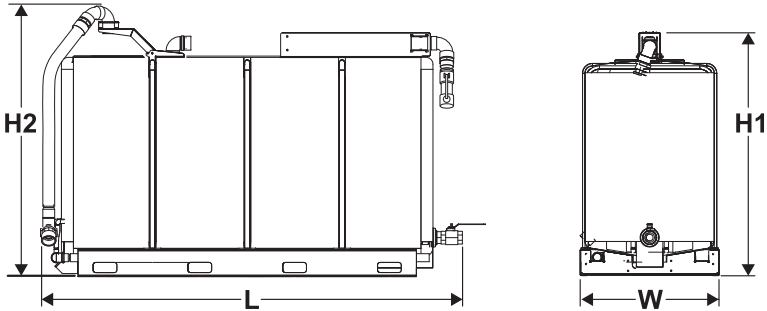
1000 gal (3786 L) tank



om0685h.eps

Dimensions		U.S.	Metric
	Length	125 in	3.18 m
	Height (H ₁)	72 in	1.83 m
	Height (H ₂)	79 in	2.01 m
	Width	42 in	1.07 m
	Weight (empty)	1000 lb	454 kg
	Weight (full of water)	9350 lb	4241 kg

1000 gal (3786 L) tank



om0685h.eps

Dimensions		U.S.	Metric
	Length	125 in	3.18 m
	Height (H ₁)	72 in	1.83 m
	Height (H ₂)	79 in	2.01 m
	Width	42 in	1.07 m
	Weight (empty)	1000 lb	454 kg
	Weight (full of water)	9350 lb	4241 kg