Form No. 3383-875 Rev A

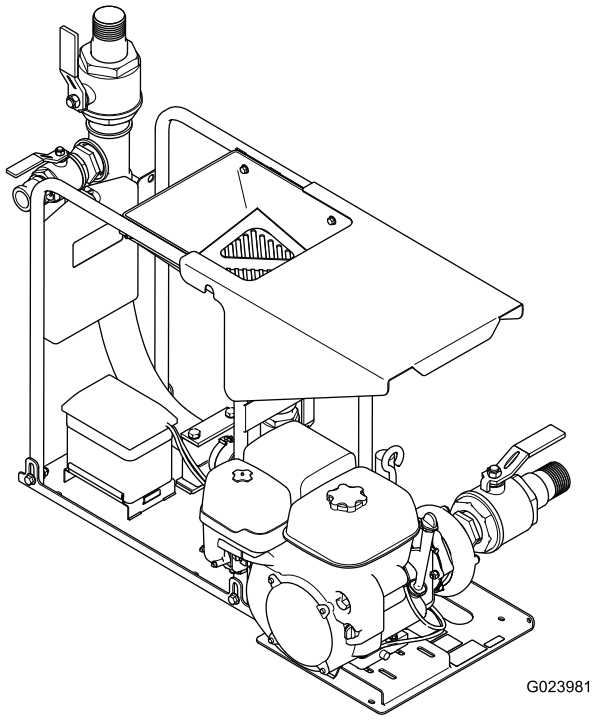
TORO®

Count on it.

Operator's Manual

Gas-Powered FM 330 Fluid Mixer

Model No. 23890—Serial No. 313000001 and Up



G023981

Register at www.Toro.com.
Original Instructions (EN)

CE

3383-875 A

This product complies with all relevant European directives. For details, please see the separate product-specific Declaration of Conformity (DOC) sheet.

⚠ WARNING

CALIFORNIA
Proposition 65 Warning

This product contains a chemical or chemicals known to the State of California to cause cancer, birth defects, or reproductive harm.

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

Use of this product may cause exposure to chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

This spark ignition system complies with Canadian ICES-002.

Because in some areas there are local, state, or federal regulations requiring that a spark arrester be used on the engine of this machine, a spark arrester is available as an option. If you require a spark arrester, contact your Authorized Toro Service Dealer.

Genuine Toro spark arresters are approved by the USDA Forestry Service.

Important: It is a violation of California Public Resource Code Section 4442 to use or operate the engine on any forest-covered, brush-covered, or grass-covered land without a spark arrester muffler maintained in working order, or the engine constricted, equipped, and maintained for the prevention of fire. Other states or federal areas may have similar laws.

The enclosed *Engine Owner's Manual* is supplied for information regarding the US Environmental Protection Agency (EPA) and the California Emission Control Regulation of emission systems, maintenance, and warranty. Replacements may be ordered through the engine manufacturer.

Introduction

This machine is designed to mix drilling-fluid products with clean water. You can mount the machine onto a suitable trailer and connect the machine to a suitable horizontal directional drill. Read and understand the directional drill *Operator's Manual*.

Read this information carefully to learn how to operate and maintain your product properly and to avoid injury and product damage. You are responsible for operating the product properly and safely.

You may contact Toro directly at www.Toro.com for product and accessory information, help finding a dealer, or to register your product.

Whenever you need service, genuine Toro parts, or additional information, contact an Authorized Service Dealer or Toro Customer Service and have the model and serial numbers of your product ready. Write the numbers in the space provided.

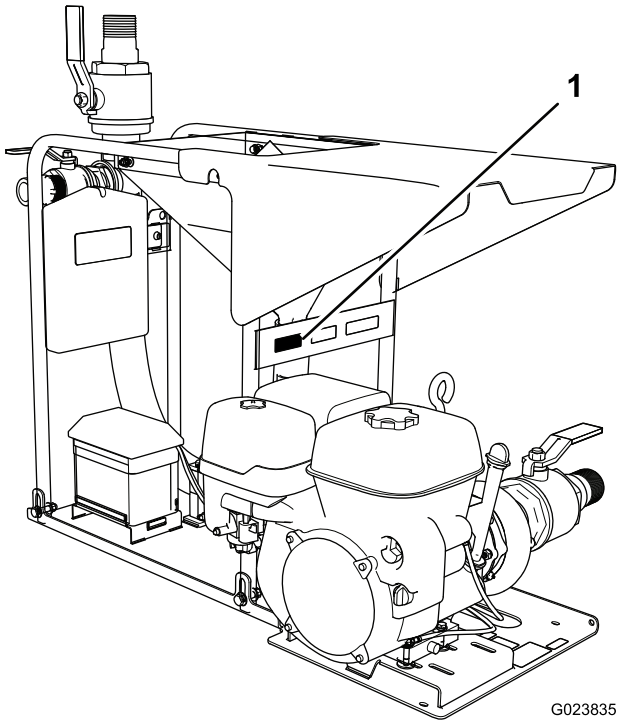


Figure 1

1. Model and serial number location

Model No. _____

Serial No. _____

This manual identifies potential hazards and has safety messages identified by the safety alert symbol (Figure 2), which signals a hazard that may cause serious injury or death if you do not follow the recommended precautions.

Figure 2

1. Safety alert symbol

This manual uses 2 words to highlight information. **Important** calls attention to special mechanical information

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Contact us at www.Toro.com.
Printed in the USA

and **Note** emphasizes general information worthy of special attention.

Contents

Safety

Improperly using or maintaining the machine can result in injury. To reduce the potential for injury, comply with these safety instructions and always pay attention to the safety alert symbol ⚠, which means: *Caution*, *Warning*, or *Danger*—personal safety instruction. Failure to comply with the instruction may result in personal injury or death.

Safe Operating Practices

Always follow all safety instructions to avoid serious injury or death.

⚠ WARNING

Handling various drilling-fluid materials can generate dust and fumes containing chemicals, such as silica, known to cause serious or fatal injury or illness, such as respiratory disease, silicosis, cancer, birth defects, or other reproductive harm.

- **Use good work practices and follow the recommendations of the manufacturer or suppliers, OSHA, and other occupational and trade associations.**
- **Always follow respiratory precautions.**
- **When the hazards from inhalation cannot be eliminated, the operator and any bystanders should wear a respirator approved by OSHA for the material being handled.**

⚠ WARNING

Engine exhaust contains carbon monoxide, an odorless, deadly poison that can kill you.

Do not run the engine indoors or in an enclosed area.

Training

- Read the *Operator's Manual* and other training material. If the operator(s) or mechanic(s) cannot read or understand the information, it is the owner's responsibility to explain this material to them.
- Become familiar with the safe operation of the equipment, operator controls, and safety signs.
- All operators and mechanics should be trained. The owner is responsible for training the users.
- Never let children or untrained people operate or service the equipment. Local regulations may restrict the age of the operator.
- The owner/user can prevent and is responsible for accidents or injuries to people or damage to property.

Preparation

Become familiar with the safe operation of the equipment, operator controls, and safety signs.

- Use only accessories and attachments approved by the manufacturer.
- Wear a respirator or a dust mask.
- Operating the equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating the machine.
- Use extra care when handling fuels. They are flammable, and the vapors are explosive. Use the following practices when handling fuel:
  - Use only an approved fuel container.
  - Never remove the fuel cap or add fuel with the engine running.
  - Allow the engine to cool before refueling.
  - Do not smoke.
  - Never add fuel or drain the machine indoors.
  - Replace the fuel cap and tighten it securely.
  - Keep the container nozzle in contact with the tank during filling.
  - Never fill a container while it is inside a vehicle, trunk, pick-up bed, or any surface other than the ground.
  - Never store the machine or fuel container inside where there is an open flame, such as near a water heater or furnace.
  - If fuel is spilled, wipe it off the engine and equipment.
- Ensure that the machine is on a level surface before operating the machine.
- Before every use, ensure that the machine is properly secured.

Operation

- Never run an engine in an enclosed or poorly ventilated area.
- Only operate the machine in good lighting conditions.
- Before starting the machine, make sure that there are no persons or obstacles near or under the machine.
- Stop the engine before leaving the machine for any reason.

  Never leave a running machine unattended. Always stop the engine and verify that all moving parts have stopped.
- Avoid prolonged breathing of exhaust fumes. Engine exhaust fumes can cause sickness or death.
- Do not operate the machine under the influence of alcohol or drugs.
- Ensure that the area is clear of other people or pets before operating the machine. Stop the machine if anyone enters the area.
- Do not touch parts which may be hot from operation. Allow them to cool before attempting to maintain, adjust, or service the machine.
- Never move the machine while the engine is running.
- Ensure that all the guards and shields are securely in place before operating the machine.
- If the machine should start making an unusual noise or vibration, stop the engine. Wait for all moving parts to come to a complete stop and cool. Vibration is generally a warning of trouble. Inspect for clogging or damage. Clean and repair and/or replace damaged parts.
- Do not change the engine governor setting or overspeed the engine.
- Lightning can cause severe injury or death. If you see lightning or hear thunder in the area, do not operate the machine; seek shelter.

Maintenance and Storage

- Before performing maintenance, do the following:
  - Ensure that the machine is on level ground.
  - Stop the engine. Wait for all movement to stop before adjusting, cleaning, or repairing.
  - Let the engine cool before performing maintenance or storing.
  - Disengage all power and operation controls.
- Never lubricate, service, repair, or adjust the machine while it is running.
- Keep equipment materials clear from the muffler and engine to help prevent fires. Clean up any oil or fuel spillage.
- Never allow untrained personnel to service the machine.
- Keep hands, feet, and clothing away from moving parts. If possible, do not make adjustments with the engine running.
- Keep all parts in good working condition and all hardware tightened. Replace all worn or damaged decals.
- Remove any buildup of grease, oil, or debris from the machine.
- Stop and inspect the machine if a foreign object enters the hopper or causes another obstruction. Make any necessary repairs before starting the machine.
- Do not tamper with safety devices.
- Keep all nuts, bolts, screws, and hose clamps securely tightened. Keep equipment in good condition.
- To best protect your investment and maintain optimal performance of your Toro equipment, count on Toro genuine parts. When it comes to reliability, Toro delivers replacement parts designed to the exact engineering specifications of our equipment. For peace of mind, insist on Toro genuine parts.

Hauling

- Ensure that the transport vehicle has a carrying capacity to handle the weight of the machine and a full tank of fluid—**in addition to** any other machines or materials that the transport vehicle may need to carry. The mixing system alone requires a carrying capacity of at least 2,268 kg (5,000 lb) for a system that uses a single 1,893 L (500-gallon) tank, up to 9,072 kg (20,000 lb) for a system that uses two 3,785 L (1000-gallon) tanks.
- Use care when loading or unloading the machine onto a trailer or truck.
- Ensure that the tank is empty before loading the machine onto a trailer or truck.
- Secure the machine using adequate bolts through all the mounting holes of both the mixer frame and the tank frame.

Sound Power Level

This unit has a sound power level of 103 dBA, which includes an Uncertainty Value (K) of 1 dBA.

The sound power level was determined according to the procedures outlined in EN/ISO 3744.

Sound Pressure Level

This unit has a sound pressure level at the operator's ear of 90 dBA, which includes an Uncertainty Value (K) of 1 dBA.

As this product does not have a dedicated operator's position, the sound pressure level was determined according to the procedures outlined in the Machinery Safety Directive 2006/42/EC.

Measurements were taken on all 4 sides of the machine with the microphone positioned along the centerline of the area facing the microphone. In each case, the microphone was located at a height of 1.6 m from the ground and a distance of 1 m from the surface area of the machine. For this model, the loudest tested point is shown in Figure 3.

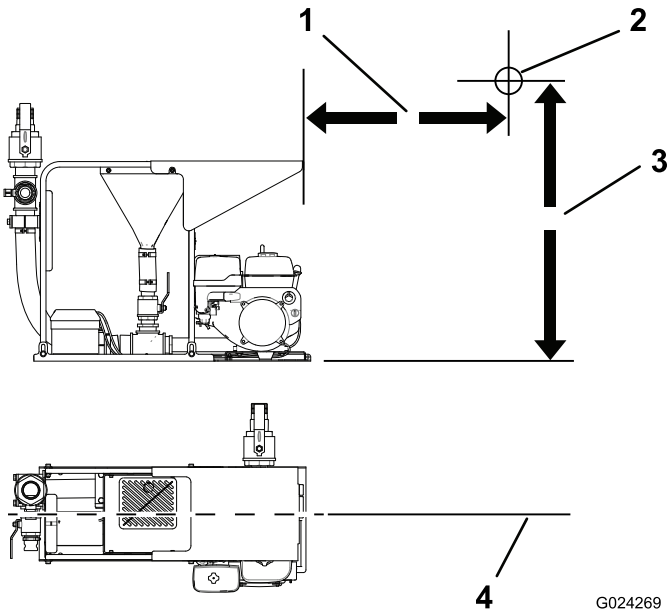


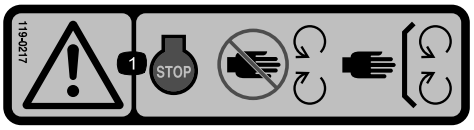
Figure 3

1. 1 m (39 inches)
2. Measurement point
3. 1.6 m (63 inches)
4. Centerline of the machine

Safety and Instructional Decals

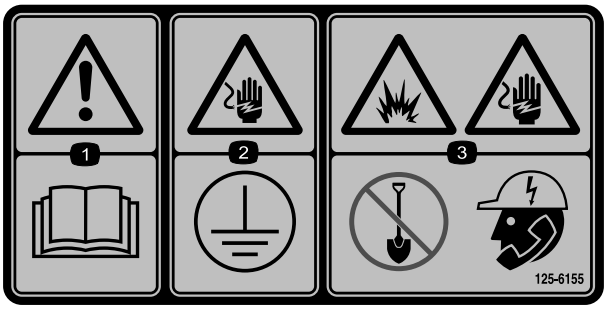
Safety decals and instructions are easily visible to the operator and are located near any area of potential danger. Replace any decal that is damaged or lost.

117-2718



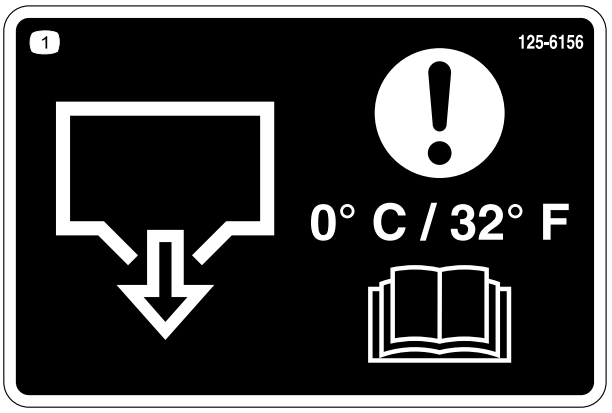
119–0217

1. Warning—stop the engine; keep away from moving parts; keep all guards and shields in place.



125–6155

1. Warning—read the *Operator's Manual*.
2. Electrical shock hazard—ensure the equipment is grounded before starting drill operation.
3. Explosion hazard; electrical shock hazard—Call local utilities before digging underground.

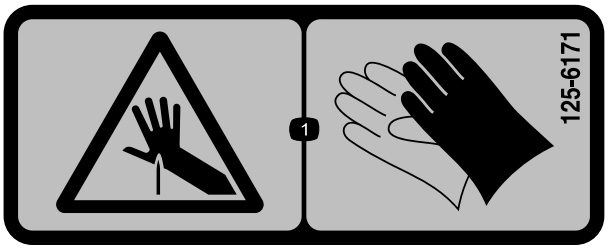


125–6156

1. Tank drain—read the *Operator's Manual*.

125–6161

1. Use E10 fuel; do not use E15 or E85 fuel.



125-6171

1. Piercing hazard—wear hand protection.

Setup

Loose Parts

Use the chart below to verify that all parts have been shipped.

Description	Qty.	Use
Bolt (5/16 x 3/4 inch) Nut (5/16 inch)	2 2	Connect the battery.
Circulation hose Hose clamp	1 3	Connect the pump to the tank.

Media and Additional Parts

Description	Qty.	Use
Transfer hose	1	Connect the mixer to the drill.

Connecting the Battery

⚠ WARNING

CALIFORNIA
Proposition 65 Warning

Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

1. Remove the red plastic cover from the positive battery terminal (Figure 4).

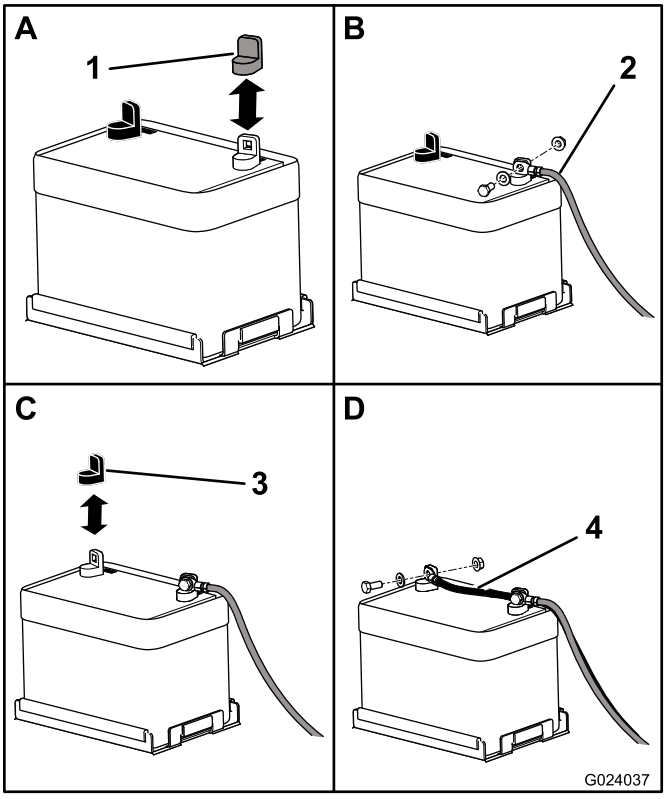


Figure 4

1. Red cover
2. Positive cable
3. Black cover
4. Negative cable

2. Use a bolt (5/16 x 3/4 inch) and a nut (5/16 inch) to mount the positive cable to the positive battery terminal.
3. Remove the black plastic cover from the negative battery terminal.
4. Use a bolt (5/16 x 3/4 inch) and a nut (5/16 inch) to mount the negative cable to the negative battery terminal.

Connecting the Pump to the Tank

Ensure that the frame of the fluid mixer and the frame of the tank are secured to a strong surface, with an adequate fastener through each mounting hole (Figure 5).

Note: Ensure that the mixer and the tank are in a position that allows the hoses to connect them without stretching or kinking.

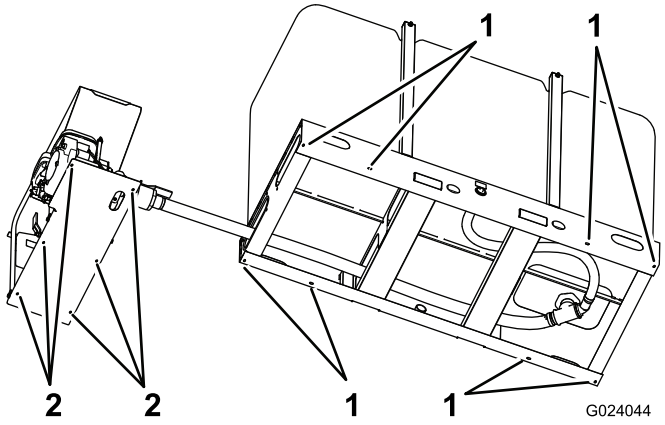


Figure 5
Underside shown

1. Mounting holes in tank frame
2. Mounting holes in mixer frame

1. Locate the suction hose connected to the bottom of the tank, and pull the loose end out from under the tank.
2. Use a hose clamp (provided) to connect the loose end of the hose to the pump inlet on the mixer as shown in Figure 6, Figure 7, and Figure 8.

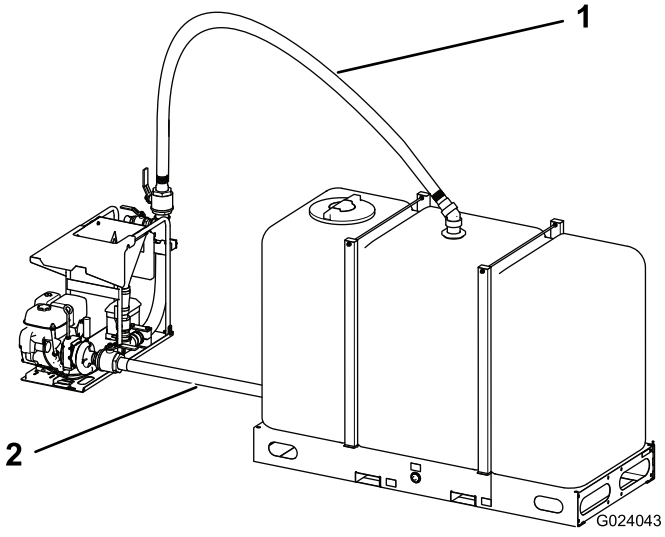


Figure 6

1. Circulation hose
2. Suction hose

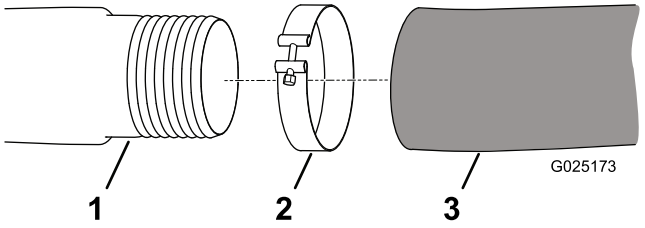


Figure 7

1. Fitting
2. Hose clamp
3. Hose

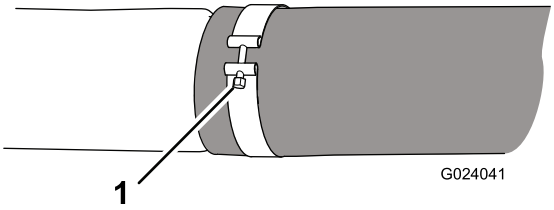


Figure 8

1. Locknut

3. Tighten the hose clamp by tightening the locknut.
4. Use 2 hose clamps (provided) to connect the other hose to the top of the tank and the top of the mixer as shown in Figure 6, Figure 7, and Figure 8.
5. Tighten the hose clamps by tightening the locknuts.

Product Overview

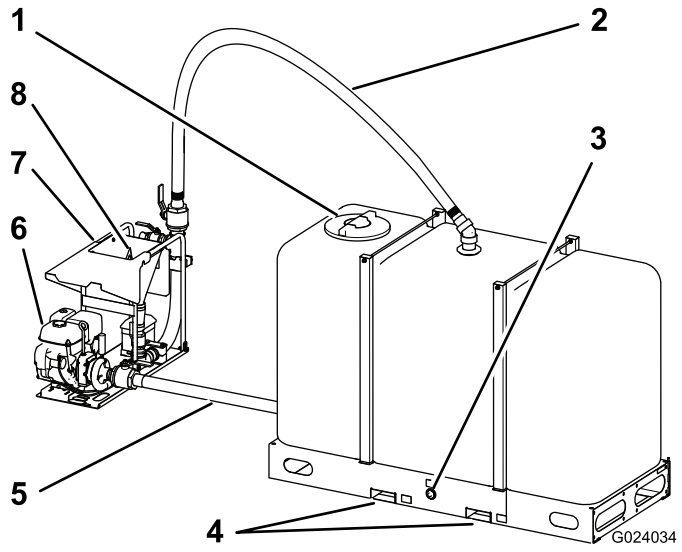


Figure 9
Tank sold separately

1. Access hatch
2. Circulation hose
3. Tank drain plug
4. Forklift pockets
5. Suction hose
6. Engine
7. Hopper
8. Grate

Controls

Become familiar with all the controls before you start the engine and operate the machine.

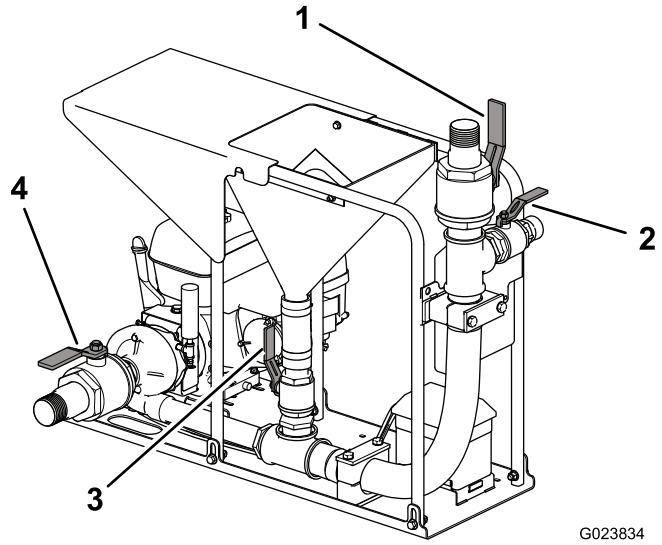


Figure 10

1. Circulation valve
2. Transfer valve
3. Hopper valve
4. Suction valve

Circulation Valve

The circulation valve (Figure 10) controls the flow from the pump to the tank.

Suction Valve

The suction valve (Figure 10) controls the flow from the tank to the pump.

Hopper Valve

The hopper valve (Figure 10) controls the flow from the hopper into the mixing system. The hopper valve is most effective when it is just slightly open, as the fluid then creates a vacuum effect and draws the bentonite and other components into the flow.

Transfer Valve

The transfer valve (Figure 10) controls the flow from the mixing system to the drill.

Engine Controls

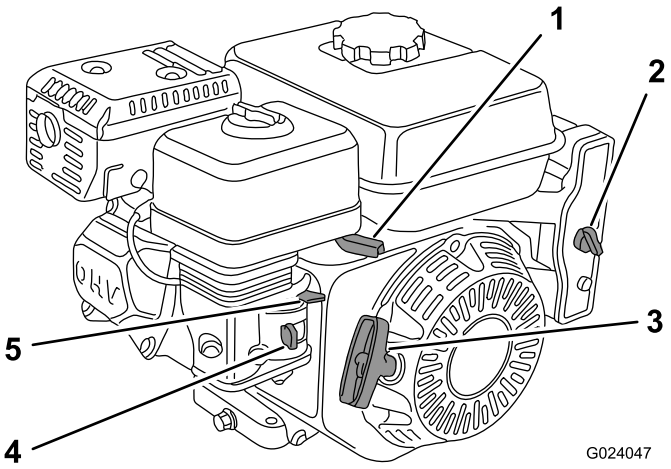


Figure 11

1. Throttle lever
2. Electric-start switch
3. Recoil-start handle
4. Fuel valve
5. Choke lever

Fuel Valve

The fuel valve (Figure 12) is located underneath the choke lever. Move the lever for the fuel valve to the On position before attempting to start the engine. When you have finished mixing, stop the engine and move the fuel valve lever to the Off position.

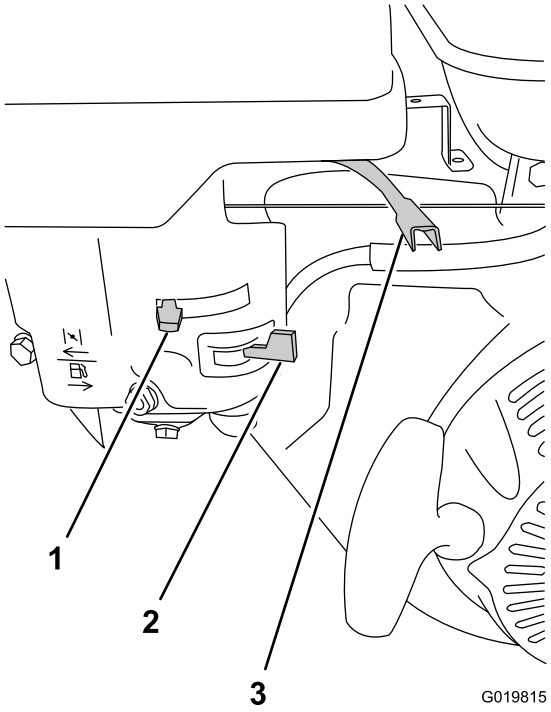


Figure 12

1. Choke lever
2. Fuel valve
3. Throttle lever

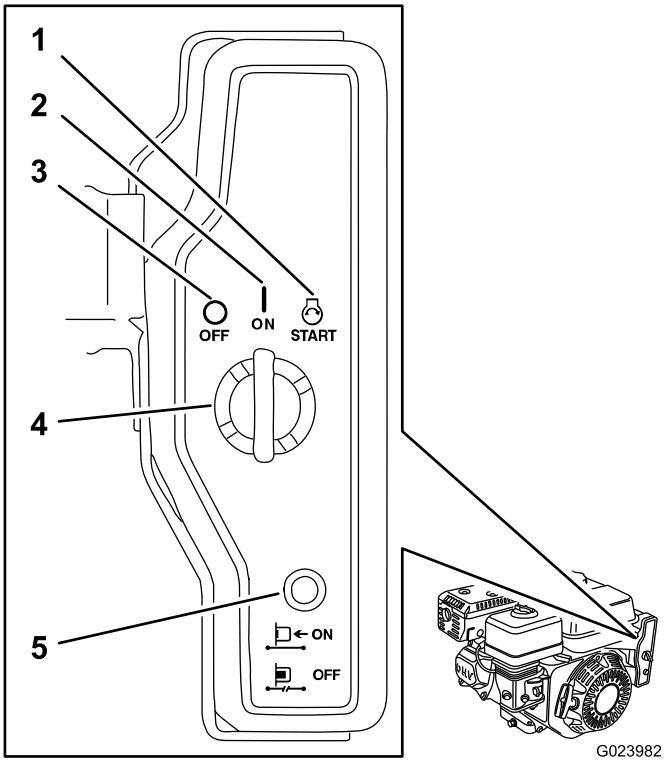


Figure 13

1. **Start** position
2. **On** position
3. **Off** position
4. Ignition switch
5. Circuit-protector button

Choke Lever

Use the choke lever (Figure 12) to start a cold engine. Before pulling the recoil-start handle, move the choke lever to the closed position. Once the engine is running, move the choke lever to the open position. Do not use the choke if the engine is already warmed up or the air temperature is high.

Throttle Lever

The throttle lever (Figure 12) controls the speed (rpm) of the engine. It is located next to the choke lever. It sets the engine speed and therefore can increase and decrease the speed of the pump.

Electric-start Switch

The electric-start switch (Figure 13) allows the operator of the machine to start and stop the engine. This switch is located on the front of the engine. Rotate the On/Off switch to the Start position to start the engine. Rotate the On/Off switch to the On position to allow the engine to run. Rotate the On/Off switch to the Off position to stop the engine.

Circuit-protector Button

The engine has a circuit protector that is designed to protect the battery-charging circuit. A short circuit, or a battery with reverse polarity, will trip the circuit protector. If the green indicator pops out, that indicates that the circuit protector has switched off. If this occurs, determine the cause of the problem, and correct it before resetting the circuit protector. To reset the circuit protector, push the button (Figure 13).

Recoil-start Handle

If the battery is not charged, you can start the engine with the recoil-start handle. To start the engine, pull the recoil-start handle (Figure 11) quickly to turn the engine over. The engine controls described above must all be set correctly for the engine to start.

Oil-level Switch

The oil-level switch is located inside the engine; it prevents the engine from running if the oil level falls below the safe operating limit.

Specifications

Mixer

Flow rate	Length	Width	Height	Weight
Up to 1249 L/minute (330 gallons/minute)	141 cm (55.4 inches)	90 cm (35.3 inches)	116 cm (45.8 inches)	209 kg (460 lb)

Tanks

Capacity	Length	Width	Height	Dry weight
1893 L (500 US gallons)	203 cm (80.0 inches)	79 cm (31.0 inches)	177.8 cm (70.0 inches)	241 kg (532 lb)
3785 L (1000 US gallons)	257 cm (101.3 inches)	109 cm (42.8 inches)	191 cm (75.3 inches)	397 kg (876 lb)

Operation

Preparing to Use the Machine

- Review all of the safety decals on the machine.
- Use a dust mask or respirator.
- Ensure that you are familiar with the safety regulations and shutdown procedures described in the *Operator's Manual* and the engine owner's manual.
- Ensure that all guards are in place and in good condition.
- Check the fuel and oil levels of the engine.
- When preparing to mix fluid:
  1. Move the machine to a level job-site surface.
  2. Ensure that the hoses are connected appropriately and securely.

Grounding the Mixer and the Tank

Ground the mixing system.

Connect a braided grounding strap or a jumper cable (sold separately) from the **mixer** frame to the ground.

Adjusting the Valves

⚠ WARNING

If you run the engine when the mixing valves are not adjusted as directed, the pump can direct fluid out through the hopper and push the grate into the air.

Ensure that the mixing valves are adjusted appropriately and that the grate is tethered to the hopper, before starting the engine.

To open a valve, turn the handle so that it is in line with the pipe. To close a valve, turn the handle so that it is perpendicular to the pipe (Figure 14).

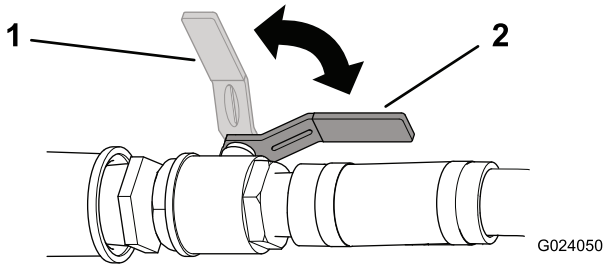


Figure 14

1. Closed position
2. Open position

Before starting the engine, ensure that the hopper valve and the transfer valve are both **closed**, and the suction valve and the circulation valve are both **open** (Figure 10).

Adding Fuel

- For best results, use only clean, fresh (less than 30 days old), unleaded gasoline with an octane rating of 87 or higher ((R+M)/2 rating method).
- Ethanol: Gasoline with up to 10% ethanol (gasohol) or 15% MTBE (methyl tertiary butyl ether) by volume is acceptable. Ethanol and MTBE are not the same. Gasoline with 15% ethanol (E15) by volume is not approved for use. **Never use** gasoline that contains more than 10% ethanol by volume, such as E15 (contains 15% ethanol), E20 (contains 20% ethanol), or E85 (contains 85% ethanol). Using unapproved gasoline may cause performance problems and/or engine damage which may not be covered under warranty.
- **Do not** use gasoline containing methanol.
- **Do not** store fuel either in the fuel tank or fuel containers over the winter unless a fuel stabilizer is used
- **Do not** add oil to gasoline.

⚠ DANGER

In certain conditions, fuel is extremely flammable and highly explosive. A fire or explosion from fuel can burn you and others and can damage property.

- **Fill the fuel tank outdoors, in an open area, when the engine is cold. Wipe up any fuel that spills.**
- **Never fill the fuel tank inside an enclosed trailer.**
- **Do not fill the fuel tank completely full. Add fuel to the fuel tank until the level is no higher than the screen on the filter in the fuel tank. This empty space in the tank allows the fuel to expand.**
- **Never smoke when handling fuel, and stay away from an open flame or where fuel fumes may be ignited by a spark.**
- **Store fuel in an approved container and keep it out of the reach of children. Never buy more than a 30-day supply of fuel.**
- **Do not operate without the entire exhaust system in place and in proper working condition.**

⚠ DANGER

In certain conditions during fueling, static electricity can be released causing a spark which can ignite the fuel vapors. A fire or explosion from fuel can burn you and others and can damage property.

- **Always place fuel containers on the ground away from your vehicle before filling.**
- **Do not fill fuel containers inside a vehicle or on a truck or trailer bed because interior carpets or plastic truck bed liners may insulate the container and slow the loss of any static charge.**
- **When practical, remove fuel-powered equipment from the truck or trailer and fuel the equipment with the wheels on the ground.**
- **If this is not possible, then refuel such equipment on a truck or trailer from a portable container, rather than from a fuel dispenser nozzle.**
- **If a fuel dispenser nozzle must be used, keep the nozzle in contact with the rim of the fuel tank or container opening at all times until fueling is complete.**

⚠ WARNING

Fuel is harmful or fatal if swallowed. Long-term exposure to vapors can cause serious injury and illness.

- **Avoid prolonged breathing of vapors.**
- **Keep your face away from the nozzle and the fuel tank or conditioner opening.**
- **Keep fuel away from your eyes and skin.**

Important: Do not mix oil with fuel.

Recommended Fuel

Unleaded Gasoline	
U.S.	Pump octane rating 87 or higher
Except U.S.	Research octane rating 92 or higher Pump octane rating 87 or higher

Using Fuel Stabilizer/Conditioner

Use a fuel stabilizer/conditioner in the machine to keep the fuel fresh during storage of 90 days or less. If you are storing the machine for longer, drain the fuel tank; refer to Storing the Machine (page 28).

Important: Do not use fuel additives containing methanol or ethanol.

Add the correct amount of fuel stabilizer/conditioner to the fuel, and follow the directions of the manufacturer.

Note: Fuel stabilizer/conditioner is most effective when mixed with fresh fuel. To minimize the chance of varnish deposits in the fuel system, use fuel stabilizer at all times.

Filling the Fuel Tank

Capacity: 6.1 L (1.6 US gallons)

1. Ensure that the machine is on a level surface, stop the engine, and allow the engine to cool.
2. Clean around the fuel cap and remove it (Figure 15).

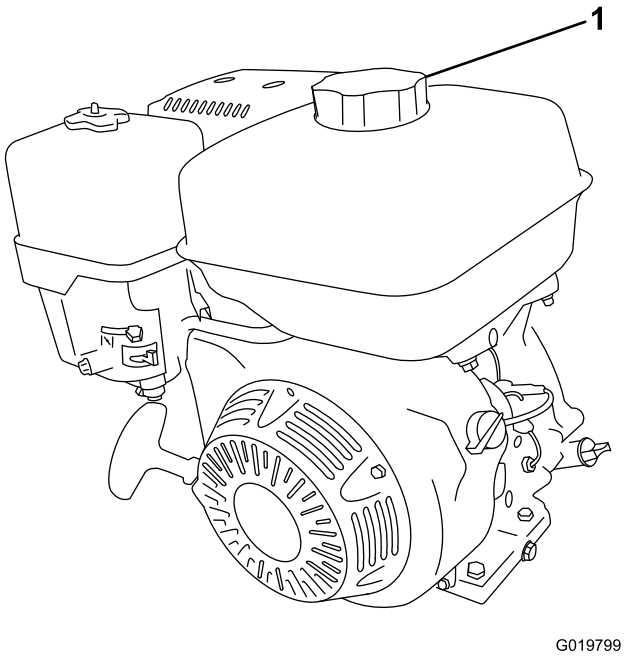


Figure 15

1. Fuel cap

3. Add unleaded gasoline to the fuel tank, until the level is at the bottom of the maximum fuel level, as shown in Figure 16.

   Important: The extra space in the tank allows gasoline to expand. Do not fill the fuel tank completely full.

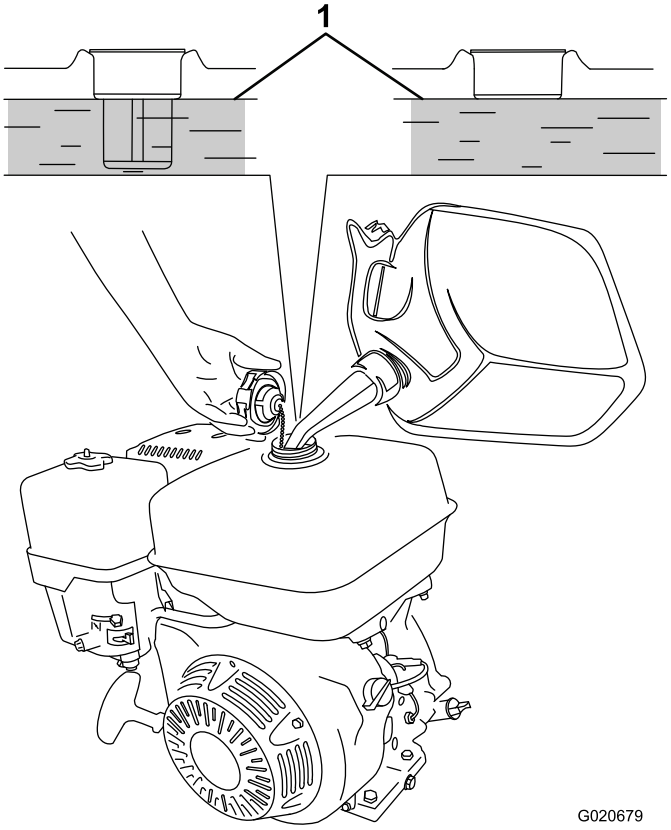


Figure 16

1. Maximum fuel level

4. Install the fuel cap securely (Figure 15).
5. Wipe up any gasoline that may have spilled.

Checking the Engine-oil Level

Service Interval: Before each use or daily

Important: Use 4-cycle motor oil that meets or exceeds the requirements for API service category *SJ, SL, SM, or higher.*

Crankcase Capacity: 1.1 L (1.2 US qt)

Important: If the oil level in the crankcase is too low or too high and you run the engine, you may damage the engine. This type of damage is not covered by the warranty.

Note: Use SAE 10W-30 for general use. You can use the other viscosities shown in the chart when the average temperature in your area is within the indicated range (Figure 17).

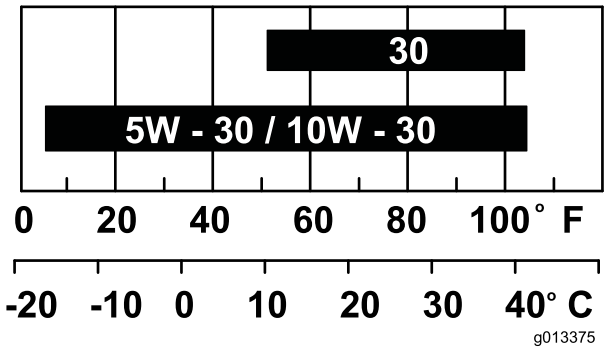


Figure 17

1. Place the machine on a flat, level surface, and stop the engine.
2. Allow the engine to cool.
3. Clean around the oil dipstick.
4. Remove the oil-fill cap/dipstick and wipe the end clean (Figure 18).

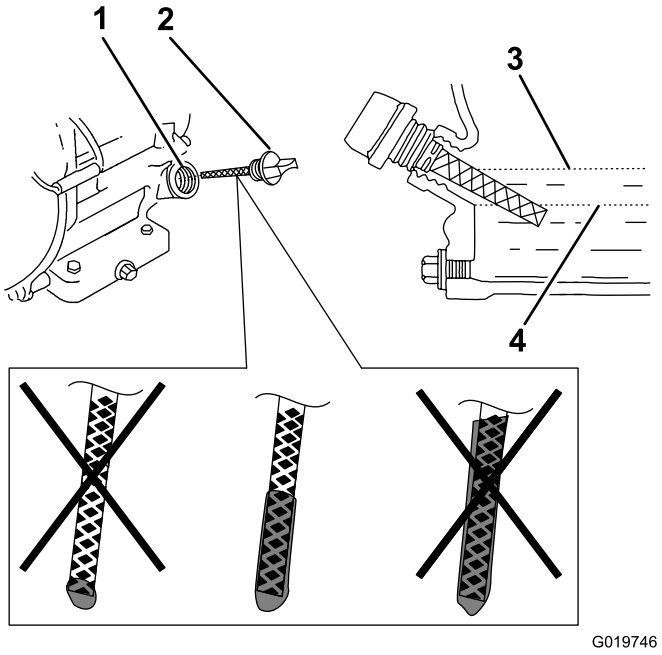


Figure 18

1. Fill port
2. Dipstick
3. Oil-level upper limit
4. Oil-level lower limit

5. Slide the dipstick fully into the fill port without threading it into the port (Figure 18).
6. Remove the dipstick and look at the end. If the engine oil level is low, slowly pour only enough oil into the fill port to raise the level to the Full mark on the dipstick (Figure 18).

   Note: Toro Premium Engine Oil is available from your Authorized Toro Dealer.
7. Install and secure the dipstick (Figure 18).

Starting and Stopping the Engine

⚠ WARNING

If you run the engine when the mixing valves are not adjusted as directed, the pump can direct fluid out through the hopper and push the grate into the air.

Ensure that the mixing valves are adjusted appropriately and that the grate is tethered to the hopper, before starting the engine.

Important: Because the fluid cools the pump seal, the pump may overheat if you run the engine without fluid in the mixer. Do not run the engine without fluid in the mixer.

Starting the Engine

1. On the engine, move the throttle lever away from the Min position, 1/3 of the way toward the Max position (Figure 19); refer to Throttle Lever (page 10).

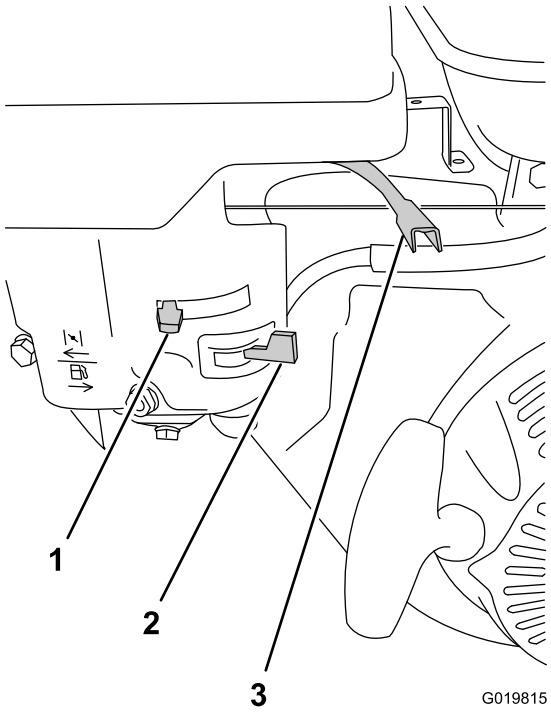


Figure 19

1. Choke lever
2. Fuel valve
3. Throttle lever

2. Move the lever of the fuel valve to the On position—all the way to the right (Figure 19); refer to Fuel Valve (page 9).
3. Position the choke lever as follows:

- To start a cold engine, move the choke lever to the Closed position—all the way to the left (Figure 19); refer to Choke Lever (page 10).
- To start a warm engine, move the choke lever in the Open position—all the way to the right.

4. Rotate the engine switch to the On position (Figure 19); refer to Electric-start Switch (page 10).
5. Turn the key to the Start position, and hold it there until the engine starts (Figure 20).

   If the engine does not start within 5 seconds, release the key, and wait at least 10 seconds before operating the starter again.

   Note: Using the electric starter for more than 5 seconds at a time will overheat the starter motor and can damage it.

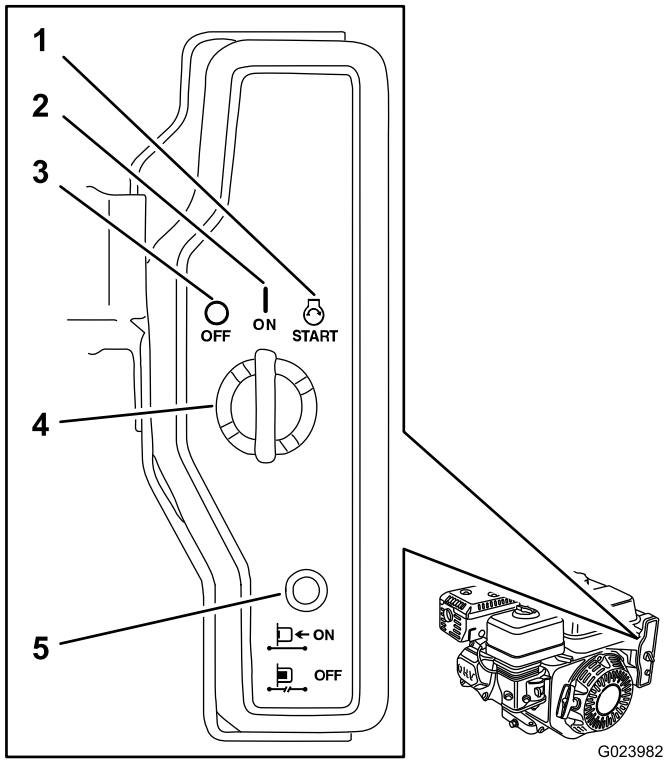


Figure 20

1. Start position
2. On position
3. Off position
4. Ignition switch
5. Circuit-protector button

Note: If the choke lever is set to the Closed position to start the engine, gradually move it back toward the Open position as the engine warms up. If the engine stalls or hesitates, move the choke lever back toward the Closed position until the engine runs smooth. Allow the engine to warm up, then move the choke lever to the Open position; refer to Choke Lever (page 10).

Stopping the Engine

⚠ WARNING

In an emergency situation, stop the engine immediately.

Important: During normal operation, if the engine has been working hard or is hot, let it idle for a minute before stopping the engine. This helps to cool the engine before stopping.

1. Ensure that the choke lever is in the Off position (Figure 19); refer to Choke Lever (page 10).
2. Move the throttle lever to the Min position (Figure 19); refer to Throttle Lever (page 10).
3. Rotate the engine switch to the Off position; refer to Electric-start Switch (page 10).

Mixing the Fluid

⚠ WARNING

If you run the engine when the mixing valves are not adjusted as directed, the pump can direct fluid out through the hopper and push the grate into the air.

Ensure that the mixing valves are adjusted appropriately and that the grate is tethered to the hopper, before starting the engine.

⚠ WARNING

Drilling fluid can be very slippery. If there are drilling-fluid components on the ground or other surfaces, someone could slip and fall, resulting in serious personal injury.

Wear slip-resistant footwear and use caution while working in areas with drilling-fluid components.

There is a variety of materials available for creating different types of drilling fluid. Match the drilling fluid to suit the needs of the soil conditions, and follow the manufacturer's instructions that are printed on the packaging of the product.

Note: The order in which you add the components of the fluid is important. Follow the instructions of the manufacturers.

1. Ensure that the grate is tethered to the hopper and that the valves are adjusted appropriately; refer to Adjusting the Valves (page 11).
2. Start the engine; refer to Starting the Engine (page 14).
3. Add the appropriate amount of water to the tank through the hatch (Figure 9).

   If you are using water from a ditch or a pond, place a very fine screen over the inlet of the hose to prevent unwanted material from entering the mixing system.

Ensure that there is enough room for additives in the mixing system.

4. Test the pH of the water. If it is below 8, add soda ash until the pH is 8 or higher.

   Note: Supplies for testing pH are available where swimming-pool supplies are sold.

5. Slightly open the valve at the bottom of the hopper.

   Note: The valve works more effectively when it is open only slightly; it creates a vacuum effect that allows the dry components to enter the mixer at a faster rate.

6. Add the appropriate amount of bentonite to the hopper.

   Note: Add the bentonite slowly to avoid clumping—1 bag in approximately 3 to 5 minutes. Open the tank cover and look to ensure that the fluid components are mixing correctly. If you see any clumps, add the components at a slower rate.

7. After you have added the appropriate amount of bentonite, add any polymers that the particular soil conditions require.

8. Lastly, add any other liquids that the soil conditions require.

9. Allow the machine to thoroughly mix the fluid for several minutes.

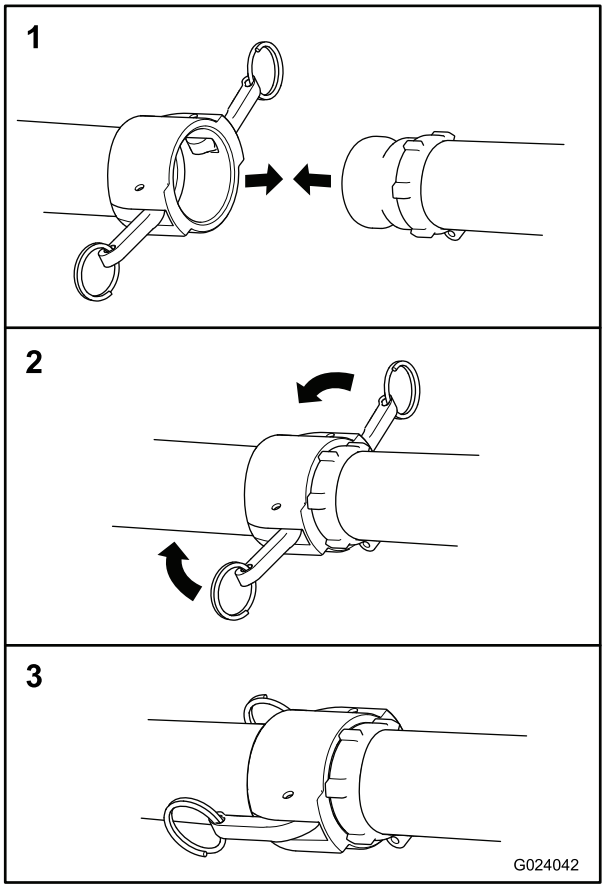


Figure 21

Pumping the Fluid to the Drill

⚠ DANGER

The fluid mixer will be electrified if the hose is attached to the drill and the drill strikes an electrical line. Contacting the fluid mixer during an electrical strike may cause bodily harm.

- **Ensure that the fluid-mixer frame and the tank frame are bonded to the ground rod.**
- **If a strike occurs, stay away from the fluid mixer and the drill. Do not contact the mixer until the electrical strike has been corrected.**

1. Use the transfer hose (provided) to connect the mixer and the drill.

   Note: The mixer has a male camlock fitting (Figure 21) located after the transfer valve.

2. Open the transfer valve to allow the fluid to flow to the drill.

   Note: Keep the circulation valve open so that the fluid continues to circulate in the mixer.

Important: Unless you are using additional equipment to thoroughly clean the drilling fluid, do not circulate the used fluid through the mixer. Doing so may damage the pump.

Dispose of the used drilling fluid, as well as the unused fluid left in the tank, according to environmental regulations.

Draining the Tank

To drain the tank, remove the drain plug from the side of the tank frame (Figure 9).

Dispose of the used drilling fluid, as well as the unused fluid left in the tank, according to environmental regulations.

Protecting the Machine from Freezing

1. Ensure that all the valves are open.
2. Rinse the tank with clean clear water and then pump it through the system, removing as much of the slurry mix in the system as possible.

3. Drain the tank; refer to Draining the Tank (page 16).
4. Drain any remaining fluid from the pump by removing the drain plug in the bottom of the pump (Figure 22).

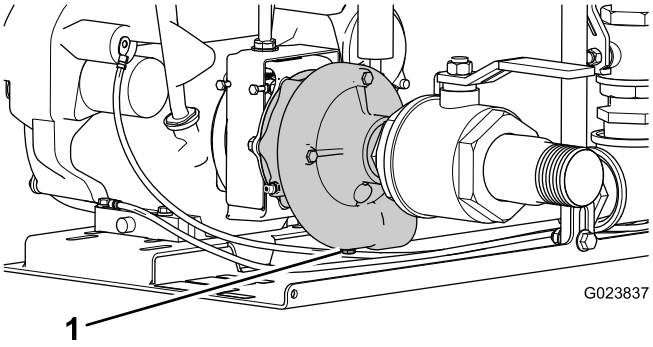


Figure 22

1. Drain plug

5. To prevent the valve at the base of the hopper from freezing around the edges, either leave the valve open half way, or close the valve and pour an environmentally friendly antifreeze into the hopper until about 51 mm (2 inches) of fluid covers the valve.

Operating Tips

- Use the correct fluid formula for the situation and the soil conditions.
- When using fluid with any polymer in it, do not over-mix the fluid, as over-mixing can lower the viscosity of it. Partially close the circulation valve, or decrease the engine speed; refer to Throttle Lever (page 10).
- Some types of polymers prevent additional bentonite from mixing with the fluid. If the fluid contains polymer and you need more fluid, drain the mixer and make a new batch of fluid.
- Ensure that the valves are adjusted appropriately when the machine is running; refer to Adjusting the Valves (page 11).
- Clean the drilling fluid out and rinse the inside of the hoses and the tank with water to prevent the fluid from drying up and plugging the lines.
- Keep the hopper inlet clean to prevent the dry mix from mixing with rain or dew and causing a plug.

Maintenance

Important: **Before performing any maintenance procedures, first stop the engine, wait 5 minutes to allow all moving parts to come to a complete stop and cool, and disconnect the spark-plug wire.**

Recommended Maintenance Schedule(s)

Maintenance Service Interval	Maintenance Procedure
After the first 25 hours	• Change the engine oil.
Before each use or daily	• Check the engine-oil level. • Inspect the air-cleaner elements.
After each use	• Clean the machine.
Every 50 hours	• Clean the air-cleaner elements. Clean them more frequently in dusty operating conditions.
Every 100 hours	• Lubricate the pump. • Change the engine oil. • Check the spark plug. • Clean the spark arrester. • Clean the sediment cup. • Check the battery cable connections.
Every 300 hours	• Replace the paper air-cleaner element. Replace it more frequently in dusty operating conditions. • Replace the spark plug.
Yearly or before storage	• Clean the fuel sediment cup.

Important: **Refer to your engine *Operator's Manual* for additional maintenance procedures.**

Premaintenance Procedures

Preparing the Machine for Maintenance

1. Park the transport vehicle on a level surface and chock the tires, or remove the machine from the transport vehicle.
2. Ensure that the engine and muffler are cool.
3. Turn the electric-start switch to the Off position.

Disconnecting the Spark-plug Wire

Disconnect the spark-plug wire from the terminal of the spark plug (Figure 23).

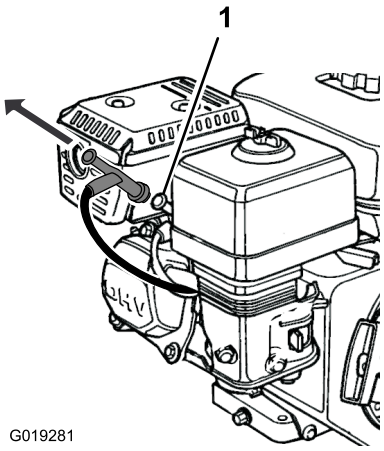


Figure 23

1. Spark plug

Lubrication

Lubricating the Pump

Service Interval: Every 100 hours

Grease Type: NLGI #1 heavy-duty EP grease (Toro part 505-162)

Use a grease gun to pump grease into the grease fitting on the side of the pump (Figure 24).

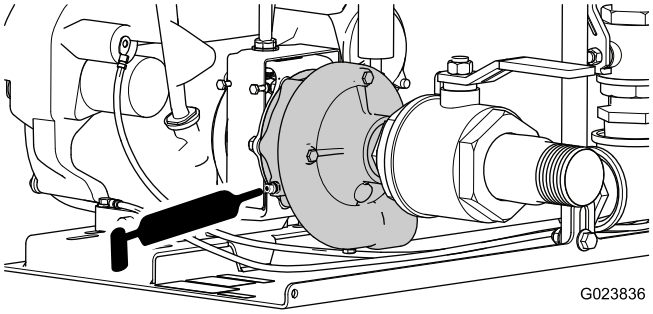


Figure 24

Engine Maintenance

Servicing the Air Cleaner

Service Interval: Before each use or daily—Inspect the air-cleaner elements.

Every 50 hours—Clean the air-cleaner elements. Clean them more frequently in dusty operating conditions.

Every 300 hours/Yearly (whichever comes first)—Replace the paper air-cleaner element. Replace it more frequently in dusty operating conditions.

Important: Do not operate the engine without the air-filter assembly; extreme engine damage will occur.

1. Stop the engine and wait for all moving parts to stop.
2. Disconnect the wire from the spark plug; refer to Disconnecting the Spark-plug Wire (page 19).
3. Remove the nut that secures the cover (Figure 25).

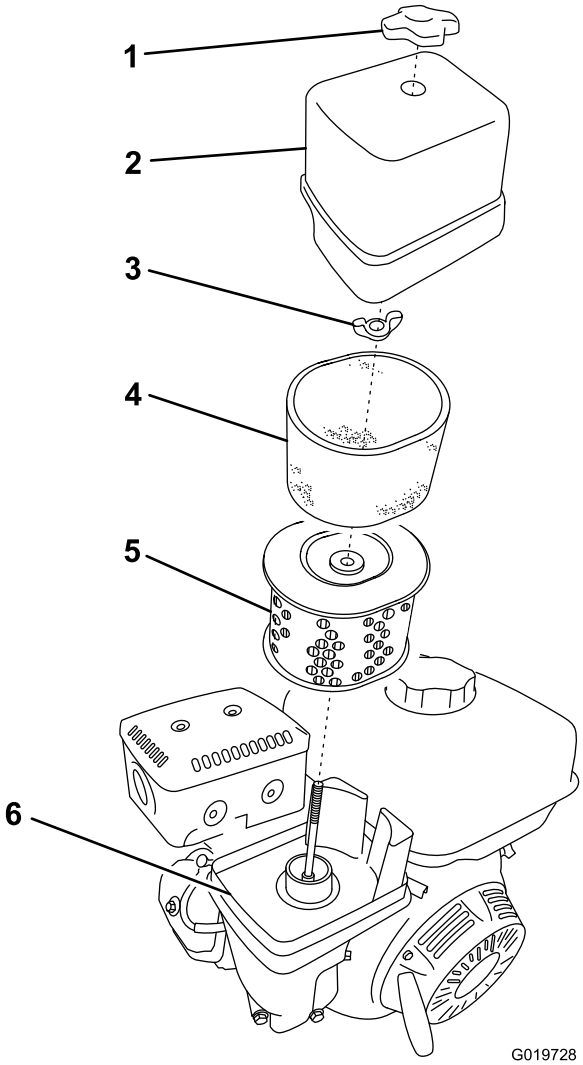


Figure 25

1. Cover nut
2. Cover
3. Wing nut
4. Foam element
5. Paper element
6. Base

4. Remove the cover.

   Note: Be careful to prevent dirt and debris from falling into the base.

5. Remove the foam and paper elements from the base (Figure 25).
6. Remove the foam element from the paper element (Figure 25).
7. Inspect the foam and paper elements, and replace them if they are damaged or excessively dirty.
8. If the paper element is excessively dirty, replace it.

   Note: Never try to brush dirt off the paper element; brushing forces the dirt into the fibers.

9. Clean the foam element in warm, soapy water or in a **nonflammable** solvent.

   Note: Do not use fuel to clean the foam element because it could create a risk of fire or explosion.

10. Rinse and dry the foam element thoroughly.
11. Dip the foam element in clean engine oil, then squeeze out the excess oil.

    Note: Excess oil in the foam element restricts the air flow through the element and may reach the paper filter and clog it.
12. Wipe dirt from the base and the cover with a moist rag.

    Note: Be careful to prevent dirt and debris from entering the air duct leading to the carburetor.
13. Install the air-cleaner elements and ensure that they are properly positioned.
14. Securely install the cover with the nut.

Changing the Engine Oil

Service Interval: After the first 25 hours

Every 100 hours

Toro Premium Engine Oil is available from your Authorized Toro Dealer.

Important: Use 4-cycle motor oil that meets or exceeds the requirements for API service category *SJ, SL, SM, or higher.*

Crankcase Capacity: 1.1 L (1.2 US qt)

Important: If the oil level in the crankcase is too low or too high and you run the engine, you may damage the engine. This type of damage is not covered by the warranty.

Note: Use SAE 10W-30 for general use. You can use the other viscosities shown in the chart when the average temperature in your area is within the indicated range (Figure 26).

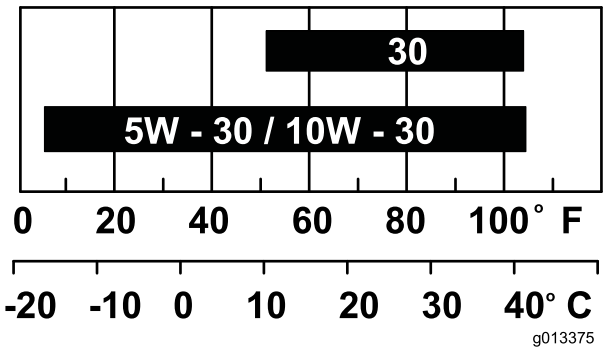


Figure 26

Draining the Engine Oil

⚠ WARNING

Oil may be hot after the engine has been run, and contact with hot oil can cause severe personal injury.

Avoid contacting the hot engine oil when you drain it.

1. Stop the engine and wait for all moving parts to stop.
2. Disconnect the wire from the spark plug; refer to Disconnecting the Spark-plug Wire (page 19).
3. Place a suitable receptacle under the oil-drain hole of the engine (Figure 27).

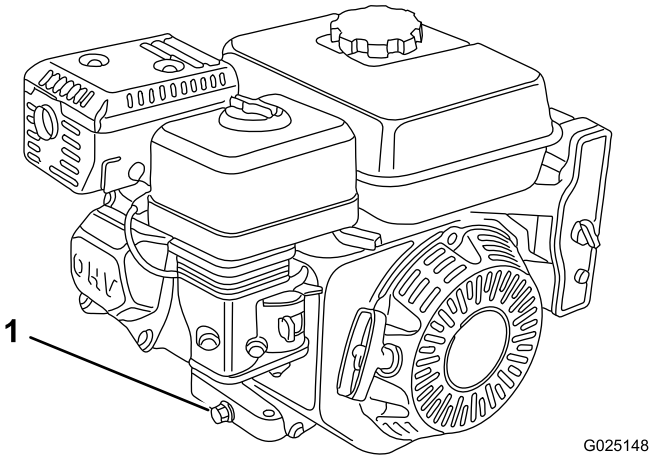


Figure 27

1. Oil-drain hole

4. Remove the drain plug (Figure 27).
5. When the oil has drained completely, install the drain plug with a new washer (Figure 27).

   Note: Dispose of the used oil at a certified recycling center.

Filling the Engine Crankcase with Oil

1. Remove the dipstick (Figure 28) and slowly pour oil into the fill hole until the oil reaches the upper-limit mark (bottom edge of the oil-fill hole) on the dipstick.

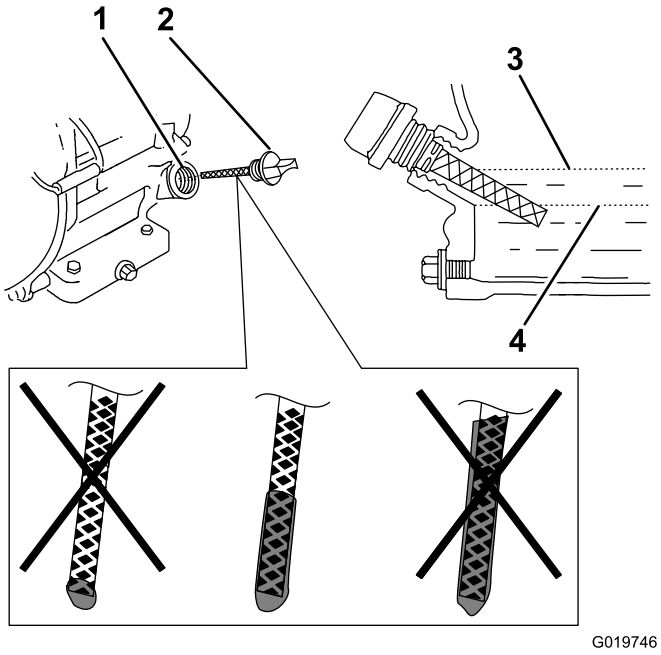


Figure 28

1. Oil-fill hole
2. Dipstick
3. Oil-level upper limit
4. Oil-level lower limit

2. Replace and secure the dipstick.
3. Wipe up any spilled oil.

Servicing the Spark Plug

Service Interval: Every 100 hours/Every 6 months (whichever comes first)—Check the spark plug.

Every 300 hours/Yearly (whichever comes first)—Replace the spark plug.

Type: NGK BPR6ES or equivalent

Gap: 0.7 to 0.8 mm (0.028 to 0.031 inch)

Note: Use a 13/16 inch (21 mm) spark-plug wrench for removing and installing the spark plug.

Removing the Spark Plug

1. Ensure that the machine is on a level surface and turn off the engine; refer to Stopping the Engine (page 15).
2. Ensure that the machine surfaces are cool.
3. Pull the spark-plug wire off the terminal of the spark plug (Figure 29).

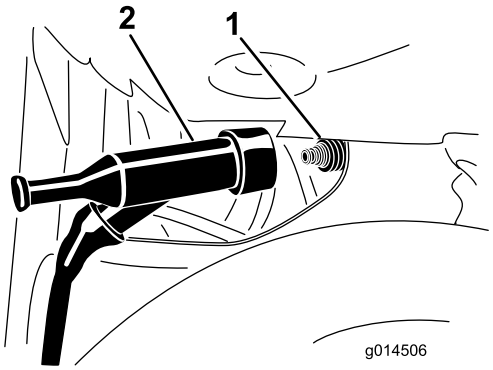


Figure 29

1. Spark plug
2. Wire

4. Clean around the spark plug.
5. Rotate the spark plug counterclockwise using a 13/16 inch (21 mm) spark-plug wrench to remove the plug and the sealing washer (Figure 30).

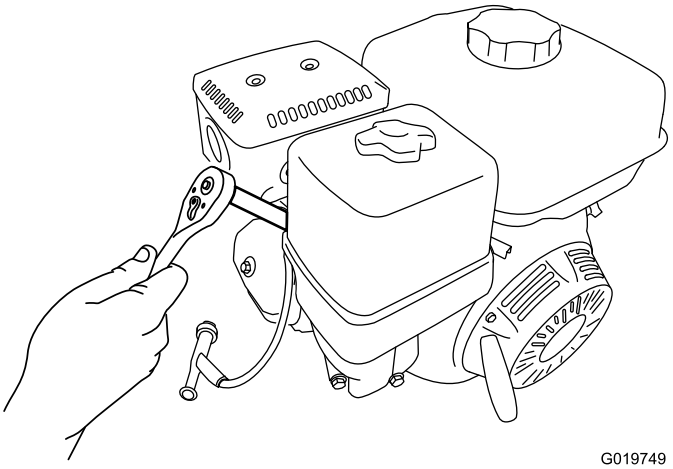


Figure 30

Checking the Spark Plug

Note: Use a gapping tool/feeler gauge to check and adjust the gap. Install a new spark plug if necessary.

1. Look at the center of the spark plug (Figure 31). If you see light brown or gray on the insulator, the engine is operating properly.

   Important: Never clean the spark plug. Always replace the spark plug when it has a black coating, worn electrodes, an oily film, or cracks.

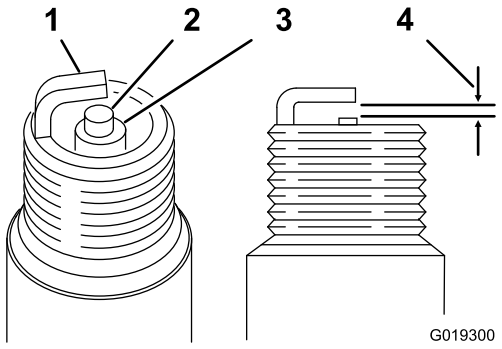


Figure 31

1. Side electrode
2. Center electrode
3. Insulator
4. 0.7 to 0.8 mm (0.028 to 0.031 inch) gap

2. Use a gapping tool for spark plugs or a feeler gauge to measure the gap between the side electrode and center electrode (Figure 31).
3. If the gap is not within the specified range, do the following:
   A. If the gap is **too small**, carefully bend the side electrode **away** from the center electrode until the gap between the electrodes is 0.7 to 0.8 mm (0.028 to 0.031 inch).
   B. If the gap is **too large**, carefully bend the side electrode **toward** the center electrode until the gap between the electrodes is 0.7 to 0.8 mm (0.028 to 0.031 inch).

Installing the Spark Plug

Important: Ensure that the gap between the side and center electrodes is correct before installing the spark plug.

1. Thread the spark plug clockwise into the spark-plug hole by hand.

   Note: Avoid cross-threading the spark plug with the threads of the spark-plug hole.
2. Rotate spark plug clockwise using a 13/16 inch (21 mm) spark-plug wrench until the plug and sealing washer are seated (Figure 30).
3. Tighten the spark plug as follows:
   - When installing an **in-service** spark plug, tighten the plug an additional 1/8 to 1/4 turn.
   - When installing a **new** spark plug, tighten the plug an additional 1/2 turn.
4. Push the spark-plug wire onto the terminal of the spark plug (Figure 29).

Servicing the Spark Arrester

Cleaning the Spark Arrester

Service Interval: Every 100 hours

Note: A spark arrester is available as an option. If you require a spark arrester, contact your Authorized Toro Service Dealer.

Genuine Toro spark arresters are approved by the USDA Forestry Service.

⚠ WARNING

If the engine has been running, the muffler will be hot.

1. Remove the 2 nuts (8 mm) and remove the muffler from the cylinder (Figure 32).

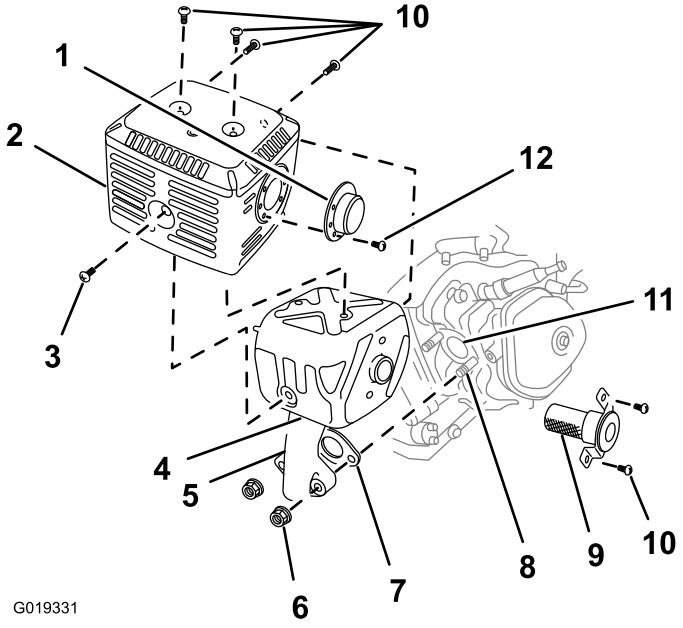


Figure 32

1. Deflector (if applicable)
2. Protector
3. Screw (6 mm)
4. Muffler
5. Exhaust pipe
6. Nut, 8 mm (2)
7. Gasket
8. Bolt (8 mm)
9. Spark arrester
10. Screws (5 mm)
11. Exhaust port
12. Screw (4 mm)

2. Remove the 3 screws (4 mm) from the exhaust deflector and remove the deflector (Figure 32).
3. Remove the screws (5 mm and 6 mm) from the muffler protector, and remove the muffler protector (Figure 32).
4. Remove the screw (4 mm) from the spark arrester and remove the spark arrester from the muffler (Figure 32).
5. Use a brush to carefully remove carbon deposits from the spark-arrester screen (Figure 33).

   Note: Replace the spark arrester if it has breaks or holes.

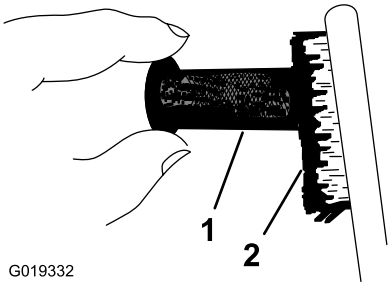


Figure 33

1. Screen
2. Brush

6. Install the spark arrester, muffler protector, exhaust deflector, and muffler in the reverse order of disassembly.

Fuel System Maintenance

Servicing the Fuel System

Cleaning the Sediment Cup

Service Interval: Every 100 hours/Every 6 months (whichever comes first)—Clean the sediment cup.

Yearly or before storage—Clean the fuel sediment cup.

Underneath the fuel valve is a sediment cup to catch dirt in the fuel.

1. Ensure that the machine is on a level surface and stop the engine; refer to Stopping the Engine (page 15).
2. Ensure that the engine and the exhaust system surfaces are cool.
3. Move the lever of the fuel valve to the Off position, all the way to the left (Figure 34).
4. Unscrew the sediment cup (Figure 34).
5. Remove the fuel filter and O-ring (Figure 34).

   Note: Do not misplace the O-ring.

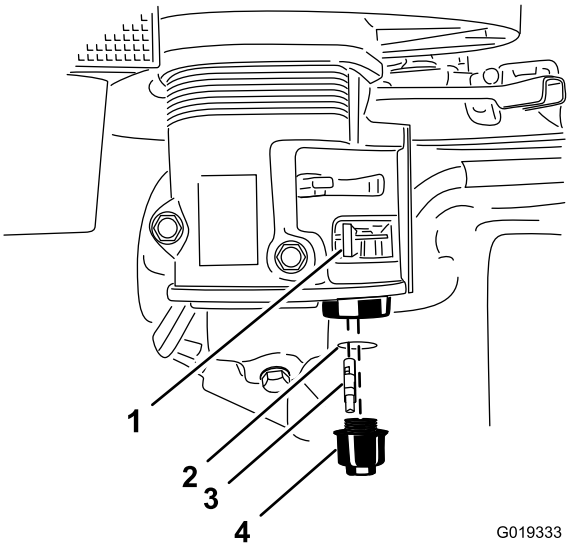


Figure 34

1. Fuel valve (Off)
2. O-ring
3. Fuel filter
4. Sediment cup

   Note: Do not clean the O-ring in solvent.

6. Clean the fuel filter and sediment cup using a nonflammable solvent, and dry it carefully.
7. Wipe the O-ring with a clean, dry cloth.
8. Install the fuel filter in the bottom of the carburetor (Figure 34).
9. Align the O-ring in to the groove in the sediment cup and install the sediment cup to fuel valve housing.

10. Move the lever of the fuel valve to the On position (all the way to the right) and check for leaks. If it leaks, replace the O-ring.

Electrical System Maintenance

Inspecting and Replacing the Fuse

The engine has a fuse (Figure 35) that protects the electric-starter relay circuit and the battery-charging circuit. If the fuse burns out, the electric starter will not work. You can still start the engine with the recoil-start handle, but the engine will not charge the battery.

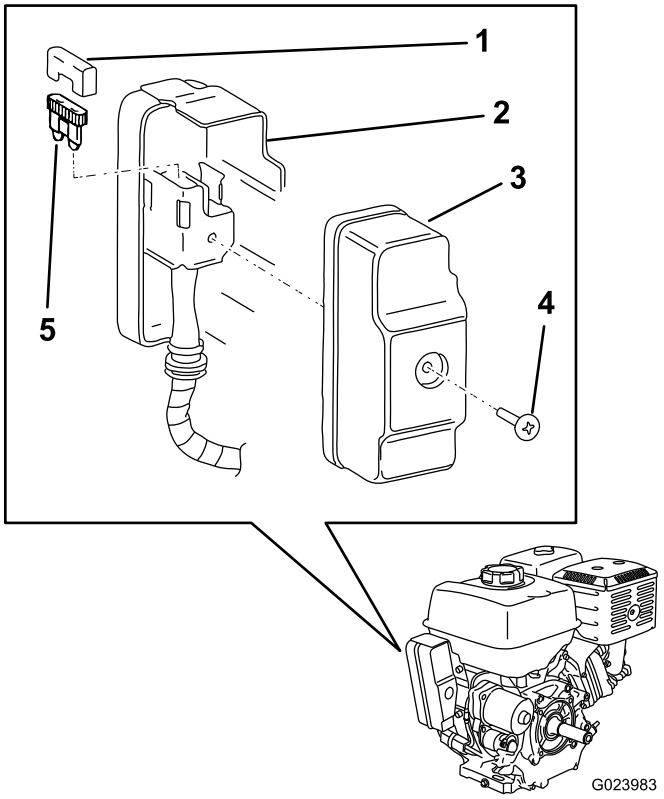


Figure 35

1. Fuse cap
2. Engine-switch housing
3. Rear cover
4. Screw
5. Fuse

1. Remove the screw from the rear cover of the housing behind the electric-start switch.
2. Remove the rear cover.
3. Remove the fuse cap, then remove and inspect the fuse.

   If the fuse is burnt out, discard it and install a new fuse with the same rating; refer to the engine owner's manual.

   Important: Do not use a fuse with a rating higher than the original fuse; serious damage to the electrical system or a fire could result.
4. Install the rear cover, and secure it with the screw.

Charging the Battery

⚠ WARNING

Charging the battery produces gases that can explode, seriously injuring you or bystanders.

Never smoke near the battery, and keep sparks and flames away from the battery.

Important: Always keep the battery fully charged. This is especially important to prevent battery damage when the temperature is below 0°C (32°F).

1. Charge the battery for 10 to 15 minutes at 25 to 30 amps, or 30 minutes at 10 amps.
2. When the battery is fully charged, unplug the charger from the electrical outlet, and disconnect the charger leads from the battery posts (Figure 36).
3. Install the battery in the machine and connect the battery cables; refer to Replacing the Battery (page 26).

   Important: Do not run the machine with the battery disconnected; electrical damage may occur.

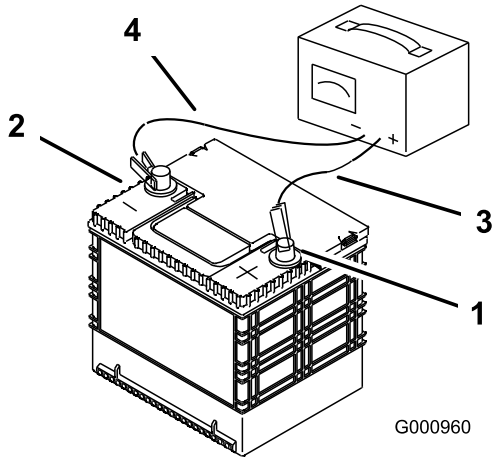


Figure 36

1. Positive battery post
2. Negative battery post
3. Red (+) charger lead
4. Black (-) charger lead

If the battery no longer holds a charge, replace it; refer to Replacing the Battery (page 26).

Replacing the Battery

1. Remove the cover of the battery box.
2. Disconnect the negative (black) ground cable from the battery post.

⚠ WARNING

Incorrect battery cable routing could damage the machine and cables, causing sparks. Sparks can cause the battery gases to explode, resulting in personal injury.

- **Always disconnect the negative (black) battery cable before disconnecting the positive (red) cable.**
- **Always connect the positive (red) battery cable before connecting the negative (black) cable.**

⚠ WARNING

Battery terminals or metal tools could short against metal machine components, causing sparks. Sparks can cause the battery gases to explode, resulting in personal injury.

- **When removing or installing the battery, do not allow the battery terminals to touch any metal parts of the machine.**
- **Do not allow metal tools to short between the battery terminals and metal parts of the machine.**

3. Remove the positive (red) battery cable.
4. Remove the battery.
5. Place the new battery in the tray.
6. Install the positive (red) battery cable to the positive (+) battery terminal, and tighten the nut onto the bolt.
7. Install the negative (black) ground cable to the negative (-) battery terminal, and tighten the nut onto the bolt.
8. Install the cover of the battery box, and secure it with the strap.

Recycle the old battery at an authorized facility.

Checking and Cleaning the Battery

Service Interval: Every 100 hours—Check the battery cable connections.

Keep the top of the battery clean. If the machine is stored in a location where temperatures are extremely high, the battery will discharge more rapidly than if the machine is stored in a cooler location.

Keep the top of the battery clean by washing it with a brush dipped in ammonia or a solution of sodium bicarbonate. Flush the top surface with water after cleaning. Do not remove the fill cap while cleaning the battery.

The battery cables must be tight on the terminals to provide good electrical contact.

If corrosion occurs at the battery terminals, disconnect the cables, negative (-) cable first, and scrape the clamps and terminals separately. Connect the cables, positive (+) cable first, and coat the terminals with petroleum jelly.

Cleaning

Cleaning the Machine

Regular cleaning and washing will increase the life span of the machine. Clean the machine after each use, before the dirt hardens.

Ensure that the fuel-tank cap and oil cap/dipstick are secure to avoid getting water in the engine.

Use care when using a high-pressure sprayer, because it can damage warning decals, instruction signs, and the engine.

Storage

Storing the Machine

For storage over 30 days, prepare the machine as follows:

1. Remove dirt and grime from the external parts of the entire machine, especially the engine. Clean dirt and debris from the outside of the engine cylinder-head fins and the blower housing.

   Important: You can wash the machine with mild detergent and water.

2. If necessary, protect the machine from freezing; refer to Protecting the Machine from Freezing (page 16).
3. Drain the tank; refer to Draining the Tank (page 16).
4. Condition the fuel system as follows:
   A. Add a petroleum-based stabilizer/conditioner to fuel in the tank. Follow the mixing instructions from the stabilizer manufacturer. **Do not** use an alcohol-based stabilizer (ethanol or methanol).

      Important: Do not store stabilizer/conditioned fuel over 90 days.

      Note: Fuel stabilizer/conditioner is most effective when mixed with fresh fuel and used at all times.

   B. Run the engine for 5 minutes to distribute the conditioned fuel through the fuel system.
   C. Stop the engine, allow it to cool, and drain the fuel tank using a pump-type siphon. Dispose of fuel properly; recycle it according to local codes.
   D. Start the engine and run it until it stops.
   E. Choke the engine.
   F. Start and run the engine until it will not start again.
5. Clean the sediment cup; refer to Cleaning the Sediment Cup (page 24).
6. Service the air cleaner; refer to Servicing the Air Cleaner (page 20).
7. Change the engine crankcase oil; refer to Changing the Engine Oil (page 21).
8. Remove the spark plug and check the condition; refer to Servicing the Spark Plug (page 22).
9. Condition the engine as follows:
   A. Remove the spark plug and pour 2 tablespoons of engine oil into the spark-plug hole; refer to Servicing the Spark Plug (page 22).
   B. Pull the recoil-start handle slowly to crank the engine and distribute the oil inside the cylinder.
   C. Install the spark plug; refer to Servicing the Spark Plug (page 22).

   Note: Do not install the wire on the spark plug.
10. Grease the machine; refer to Lubricating the Pump (page 19).
11. Check and tighten all bolts, nuts, and screws. Repair or replace any part that is damaged.
12. Paint all scratched or bare metal surfaces. Paint is available from your Authorized Toro Dealer.
13. Store the machine in a clean, dry garage or storage area.
14. Cover the machine to protect it and keep it clean.

Troubleshooting

Problem	Possible Cause	Corrective Action
The engine does not start.	1. The fuel-valve lever is in the Off position. 2. The choke is closed. 3. The choke is open. 4. The engine On/Off switch is in the Off position. 5. The engine oil level is low (engines with the oil-level switch). 6. The fuel tank is empty. 7. The engine contains bad/old fuel. 8. The spark plug is fouled or improperly gapped. 9. The spark plug is wet with fuel (flooded engine). 10. The spark-plug wire is loose or disconnected.	1. Move the fuel-valve lever to the On position. 2. Open the choke when starting a hot engine. 3. Close the choke when starting a cold engine. 4. Rotate the switch to the On position. 5. Fill the engine, with the recommended oil, to the proper level. 6. Fill the fuel tank with fresh fuel. 7. Drain the fuel tank and carburetor. Refuel with fresh gasoline. 8. Gap or replace the spark plug. 9. Remove the spark plug, dry it, and install the plug. Start the engine with the throttle in the Max position. 10. Disconnect the spark-plug wire, clean the spark-plug terminal and the terminal socket in the boot of the spark-plug wire, and connect the spark-plug wire.
The engine lacks power or runs rough.	1. The air filter is restricted. 2. The engine contains bad/old fuel. 3. There is water or contamination in the fuel. 4. The fuel line is restricted. 5. The choke is closed. 6. The spark plug is worn or has buildup on the electrodes. 7. There is too much oil in the engine crankcase.	1. Clean or replace the air filter element(s). 2. Drain the fuel tank and carburetor. Fill the fuel tank with fresh fuel. 3. Drain the fuel tank and carburetor. Fill the fuel tank with fresh fuel. 4. Clean the fuel filter and sediment cup. 5. Open the choke. 6. Check the electrode gap and adjust or replace the spark plug. 7. Drain the oil to the proper level.
The fluid does not circulate at full efficiency.	1. The pump inlet is clogged.	1. Contact an Authorized Service Dealer.

Notes:

Notes:

The Toro Underground Warranty

A Limited Warranty

Underground Equipment

Conditions and Products Covered

The Toro Company and its affiliate, Toro Warranty Company, pursuant to an agreement between them, jointly warrant your Toro Underground Equipment ("Product") to be free from defects in materials or workmanship. Where a warrantable condition exists, we will repair the Product at no cost to you including diagnostics, labor, and parts. The following warranty applies from the date the Product is delivered to the original retail purchaser or rental owner.

Products	Warranty Period
RT600, RT1200, DD2024, and DD4045	2 years or 1500 operating hours, whichever occurs first
All Other Engine Powered Base Units and Fluid Mixers	1 year or 1000 operating hours, whichever occurs first
All Serialized Attachments	1 year
Rock Hammer	6 months
Engines	Through engine manufacturers: 2 years or 2000 operating hours, whichever occurs first

Instructions for Obtaining Warranty Service

You are responsible for notifying the Underground Dealer from whom you purchased the Product as soon as you believe a warrantable condition exists. If you need help locating a Underground Dealer, or if you have questions regarding your warranty rights or responsibilities, you may contact us at:

Toro Customer Care
Toro Warranty Company
8111 Lyndale Avenue South
Bloomington, MN 55420-1196
Toll Free at 855-493-0088 (U.S. Customers)
1-952-948-4318 (International Customers)

Owner Responsibilities

As the Product owner, you are responsible for required maintenance and adjustments stated in your *Operator's Manual*. Failure to perform required maintenance and adjustments can be grounds for disallowing a warranty claim.

Items and Conditions Not Covered

Not all product failures or malfunctions that occur during the warranty period are defects in materials or workmanship. This warranty does not cover the following:

- Product failures which result from the use of non-Toro replacement parts, or from installation and use of add-on, or modified non-Toro branded accessories and products. A separate warranty may be provided by the manufacturer of these items.
- Product failures which result from failure to perform recommended maintenance and/or adjustments. Failure to properly maintain your Toro product per the Recommended Maintenance listed in the *Operator's Manual* can result in claims for warranty being denied.
- Product failures which result from operating the Product in an abusive, negligent, or reckless manner.
- Parts subject to consumption through use unless found to be defective. Examples of parts which are consumed, or used up, during normal Product operation include, but are not limited to: brakes, filters, lights, bulbs, belts, tracks or tires, digging teeth, digging booms, digging, drive, or track chains, track pads, drive sprockets, idlers, rollers, blades, cutting edges, or other ground engaging components.
- Failures caused by outside influence. Conditions considered to be outside influence include, but are not limited to, weather, storage practices, contamination, use of unapproved fuels, coolants, lubricants, additives, water, or chemicals, etc.
- Failure or performance issues due to the use of fuels (e.g. gasoline, diesel, or biodiesel) that do not conform to their respective industry standards.
- Normal noise, vibration, wear and tear, and deterioration.
- Normal "wear and tear" includes, but is not limited to, damage to seats due to wear or abrasion, worn painted surfaces, scratched decals, etc.
- Hauling expenses, travel time, mileage, or overtime associated with transporting product to the authorized Toro dealer.

Parts

Parts scheduled for replacement as required maintenance in the *Operator's Manual,* are warranted for the period of time up to the scheduled replacement time for that part. Parts replaced under this warranty are covered for the duration of the original product warranty and become the property of Toro. Toro will make the final decision whether to repair any existing part or assembly or replace it. Toro may use remanufactured parts for warranty repairs.

Maintenance is at Owner's Expense

Engine tune-up, lubrication, cleaning and polishing, replacement of filters, coolant, and completing recommended maintenance are some of the normal services Toro products require that are at the owner's expense.

General Conditions

Repair by an Authorized Toro Underground Dealer is your sole remedy under this warranty.

Neither The Toro Company nor Toro Warranty Company is liable for indirect, incidental or consequential damages in connection with the use of the Toro Products covered by this warranty, including any cost or expense of providing substitute equipment or service during reasonable periods of malfunction or non-use pending completion of repairs under this warranty. Except for the Emissions warranty referenced below, if applicable, there is no other express warranty. All implied warranties of merchantability and fitness for use are limited to the duration of this express warranty.

Some states do not allow exclusions of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above exclusions and limitations may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Note regarding engine warranty:

The Emissions Control System on your Product may be covered by a separate warranty meeting requirements established by the U.S. Environmental Protection Agency (EPA) and/or the California Air Resources Board (CARB). The hour limitations set forth above do not apply to the Emissions Control System Warranty. Refer to the Engine Emission Control Warranty Statement supplied with your product or contained in the engine manufacturer's documentation for details.

Countries Other than the United States or Canada

Customers who have purchased Toro products exported from the United States or Canada should contact their Toro Distributor (Dealer) to obtain guarantee policies for your country, province, or state. If for any reason you are dissatisfied with your Underground Dealer's service or have difficulty obtaining guarantee information, contact the Toro importer.

Australian Consumer Law: Australian customers will find details relating to the Australian Consumer Law either inside the box or at your local Toro Dealer.