Form No. 3393-253 Rev A

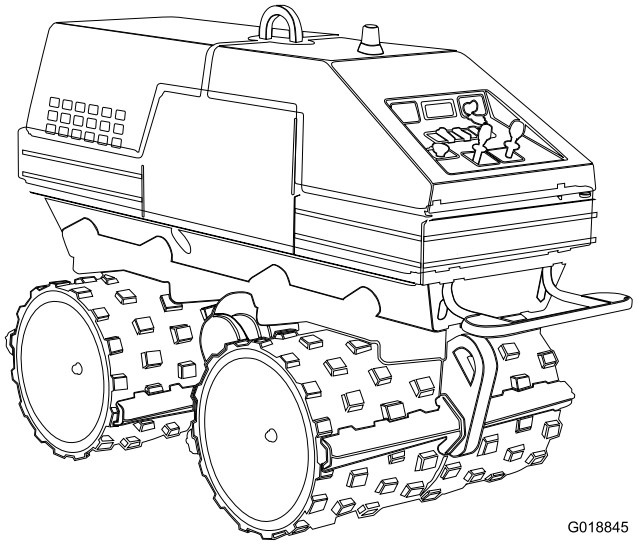
TORO®

Count on it.

Operator's Manual

TR-34D Trench Roller

Model No. 68039—Serial No. 315000001 and Up



G018845

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

3393-253 A

⚠ 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.

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Important: This engine is not equipped with a spark arrester muffler. 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. Other states or federal areas may have similar laws.

Introduction

This machine is intended for use in various soil conditions for landscaping and construction work. It is designed to perform a compacting soil, and allows for direction control or remote control use.

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. Figure 1 identifies the location of the model and serial numbers on the product. Write the numbers in the space provided.

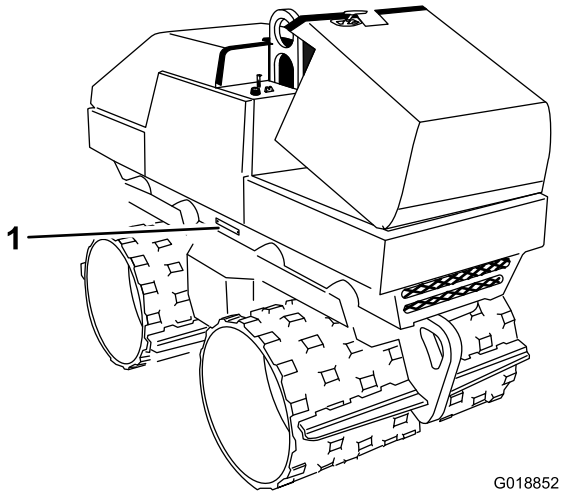


Figure 1

1. Model and serial number location

Model No. _____

Serial No. _____

Figure 2 shows the location of the identification numbers on radio-control transmitter and radio-control receiver. Write the numbers in the space provided.

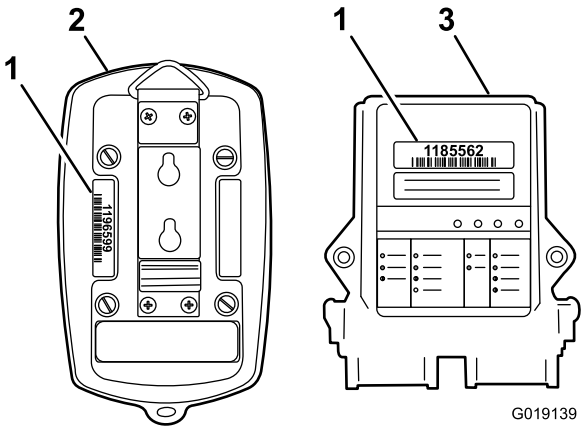


Figure 2

1. Transmitter serial number tag
2. Radio-control transmitter
3. Radio-control receiver
4. Receiver serial number tag

Transmitter Serial No. _____

Receiver Serial No. _____

8111 Lyndale Avenue South
Bloomington, MN 55420

This manual identifies potential hazards and has safety messages identified by the safety alert symbol (Figure 3), which signals a hazard that may cause serious injury or death if you do not follow the recommended precautions.

Figure 3

1. Safety alert symbol

This manual uses 2 words to highlight information. **Important** calls attention to special mechanical information and **Note** emphasizes general information worthy of special attention.

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Safety

Improper use or maintenance by the operator or owner 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

This product is capable of crushing or amputating hands and feet. Always follow all safety instructions to avoid serious injury or death.

⚠ 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 English, 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 occurring to himself or herself, other people or damage to property.

Preparation

- Evaluate the terrain to determine the proper and safe actions to perform the job. Only use accessories and attachments approved by the manufacturer.
- Wear appropriate clothing including hard hat, safety glasses, long pants, safety shoes, and hearing protection. Long hair, loose clothing or jewelry may get tangled in moving parts.
- Inspect the area where the equipment is to be used and remove all objects such as tools, building materials, and personal items which can be damaged by the machine.
- Use extra care when handling fuels. They are flammable and vapors are explosive.
  - Use only an approved container for storing and transporting fuel.
  - Never remove the fuel cap or add fuel to the machine with the engine running.
  - Never add fuel to the machine or drain fuel from the machine indoors.
  - Allow the engine to cool before fueling the machine.
  - Do not smoke while fueling the machine.
- Check that the operator's presence controls, safety switches, and shields are attached and functioning properly. Do not operate unless they are functioning properly.
- Before compacting soil, have the area marked for underground utilities.

Operation

- Never run an engine in an enclosed area.
- Never carry people or equipment on top of the machine.
- Only operate in good light, keeping away from holes and hidden hazards.
- Be sure all traction controls are in neutral and parking brake is engaged before starting the engine.
- Slow down and use extra care on hillsides. Soil conditions affect the machine's stability.
- Never park on a hill.
- Never operate the machine with the vibration function On, and moving across the side of a hill.
- Do not operate in standing water.
- Do not park the machine for an extended period in a trench, ditch, or low-lying area that might fill with water. Lift or move the machine to a level, well drained surface.
- Do not operate at the edge of embankments or roads because the machine may tip over.
- Slow down and use caution when making turns and crossing roads and sidewalks.
- Use care when approaching blind corners, shrubs, trees, or other objects that may obscure vision.
- Stop on level ground, engage parking brake, shut off the engine before leaving the operator's position for any reason.
- Look behind and down before backing up to be sure of a clear path.
- Ensure that the area is clear of other people before operating the machine. Stop the machine if anyone enters the area.
- Never carry passengers and ensure that the working area is clear of bystanders.
- Keep feet clear of drums.
- Hearing protection is required when operating this equipment.
- Do not operate the machine under the influence of alcohol or drugs.
- Locate the pinch point areas marked on the machine and keep hands and feet away from these areas.
- For foot protection, wear steel toe shoes or toe pads.

- Never operate with the guards not securely in place. Be sure all interlocks are attached, adjusted properly, and functioning property.
- Do not exceed the rated operating capacity of the machine, as the machine may become unstable which may result in loss of control.
- Do not change the engine governor setting or overspeed the engine.
- Use care when loading or unloading the machine into a trailer or truck.
- Never leave the machine running unattended. Always stop the engine, set the parking brake, and remove the key before leaving.
- Never jerk the controls; use a steady motion.
- Watch for traffic when operating near or crossing roadways.
- Do not touch parts which may be hot from operation. Allow them to cool before attempting to maintain, adjust, or service.
- Check for overhead clearances (i.e. branches, doorways, electrical wires) before driving under any objects and do not contact them.
- Ensure that you operate the machine in areas where there are no obstacles in close proximity to the operator. Failure to maintain adequate distance from trees, walls, and other barriers may result in injury as the machine backs up during operation if the operator is not attentive to the surroundings. Only operate the unit in areas where there is sufficient clearance for the operator to safely maneuver the product.
- Lightning can cause severe injury or death. If lightning is seen or thunder is heard in the area, do not operate the machine; seek shelter.

Slope Operation

Slopes are a major factor related to loss-of-control and tip-over accidents, which can result in severe injury or death. All slopes require extra caution.

- Do not park the machine on a hillside or slope.
- If possible, avoid driving the machine across a slope. When crossing a slope is necessary, drive the machine straight up the slope, across the top, and then straight down the slope.
- Slow down and use caution when making turns and when changing directions on slopes.
- Do not operate the machine on hillsides or slopes exceeding the angles recommended in Stability Data (page 6). See also the Slope Chart (page 7) and Tilt Chart (page 8).
- Never operate the machine with the vibration function On, and moving up or down a grade that is greater than 45 percent (24°).
- Never operate the machine with the vibration function Off, and moving up or down a grade that is greater than 55 percent (29°).
- Never operate the machine with the vibration function Off, and moving across the side of a hill with a grade that is greater than 18 percent (10°).
- Remove obstacles such as rocks, tree limbs, etc. from the work area. Watch for holes, ruts, or bumps, as uneven terrain could overturn the machine. Tall grass can hide obstacles.
- Use only Toro-approved attachments. Attachments can change the stability and the operating characteristics of the machine. Warranty may be voided if used with unapproved attachments.
- Avoid starting or stopping on a slope. If the machine loses traction, ensure that the vibration function is turned to the Off position and proceed slowly, straight down the slope.
- Avoid turning on slopes. If you must turn, turn slowly.
- Do not operate near drop-offs, ditches, or embankments. The machine could suddenly turn over if a drum goes over the edge of a cliff or ditch, or if an edge caves in.
- Do not operate on wet grass. Reduced traction could cause sliding.

Maintenance and Storage

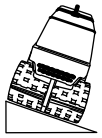
- Park the machine on a level surface, set the parking brake, stop the engine, and remove the key. Wait for all movement to stop before adjusting, cleaning, or repairing.
- Clean debris from the drives, muffler, and engine to help prevent fires. Clean up fuel, oil, and hydraulic fluid spillage.
- Let the engine cool before storing and do not store near flame.
- Do not store fuel near flames or drain indoors.
- Never allow untrained personnel to service the machine.
- Use jack stands to support components of the machine when required.
- Carefully release pressure from components with stored energy.
- Disconnect the battery before making any repairs. Disconnect the negative terminal first and the positive last. Reconnect positive first and negative last.
- Keep hands and feet away from moving parts. If possible, do not make adjustments with the engine running.
- Charge batteries in an open well ventilated area, away from spark and flames. Unplug the charger before connecting or disconnecting it from the battery. Wear protective clothing and use insulated tools.
- Keep all parts in good working condition and all hardware tightened. Replace all worn or damaged decals.

- Never tamper with safety devices.
- Keep the machine free from the buildup of mud, rocks, or other debris. Clean up oil or fuel spillage. Allow the machine to cool before storing.
- Use extra care when handling fuels. They are flammable and vapors are explosive.
  - Use only an approved container.
  - Never remove the fuel cap or add fuel when the engine is running. Allow the engine to cool before refueling. Do not smoke.
  - Never refuel the machine indoors.
  - Never store the machine or fuel container inside where there is an open flame, such as near a water heater or furnace.
  - Never fill a fuel container while it is inside a vehicle, trunk, cargo box of a truck, or any surface other than the ground.
  - Keep container nozzle in contact with the tank during filling.
- Stop and inspect the equipment if you strike an object. Make any necessary repairs before restarting.
- Use only genuine Toro replacement parts to ensure that original standards are maintained.
- Battery acid is poisonous and can cause burns. Avoid contact with skin, eyes, and clothing. Protect your face, eyes, and clothing when working with a battery.
- Battery gases can explode. Keep cigarettes, sparks and flames away from the battery.
- Keep your body and hands away from pin hole leaks or nozzles that eject high pressure hydraulic fluid. Use cardboard or paper to find hydraulic leaks; never use your hands. Hydraulic fluid escaping under pressure can penetrate skin and cause injury requiring surgery within a few hours by a qualified surgeon or gangrene may result.

Stability Data

The following tables list the maximum slope recommended for the machine in the positions listed in the tables. Slopes over the listed degree in the stability data table may cause the machine to become unstable.

Stability Data Table

Slope Operation Type:	**Operational Limit: Vibration Off** Grade (Degrees)	**Operational Limit: Vibration On** Grade (Degrees)
 **Uphill**	55% (29°)	45% (24°)
 **Downhill**	55% (29°)	45% (24°)
 **Across the hill**	18% (10°)	0% (0°)

Slope Chart

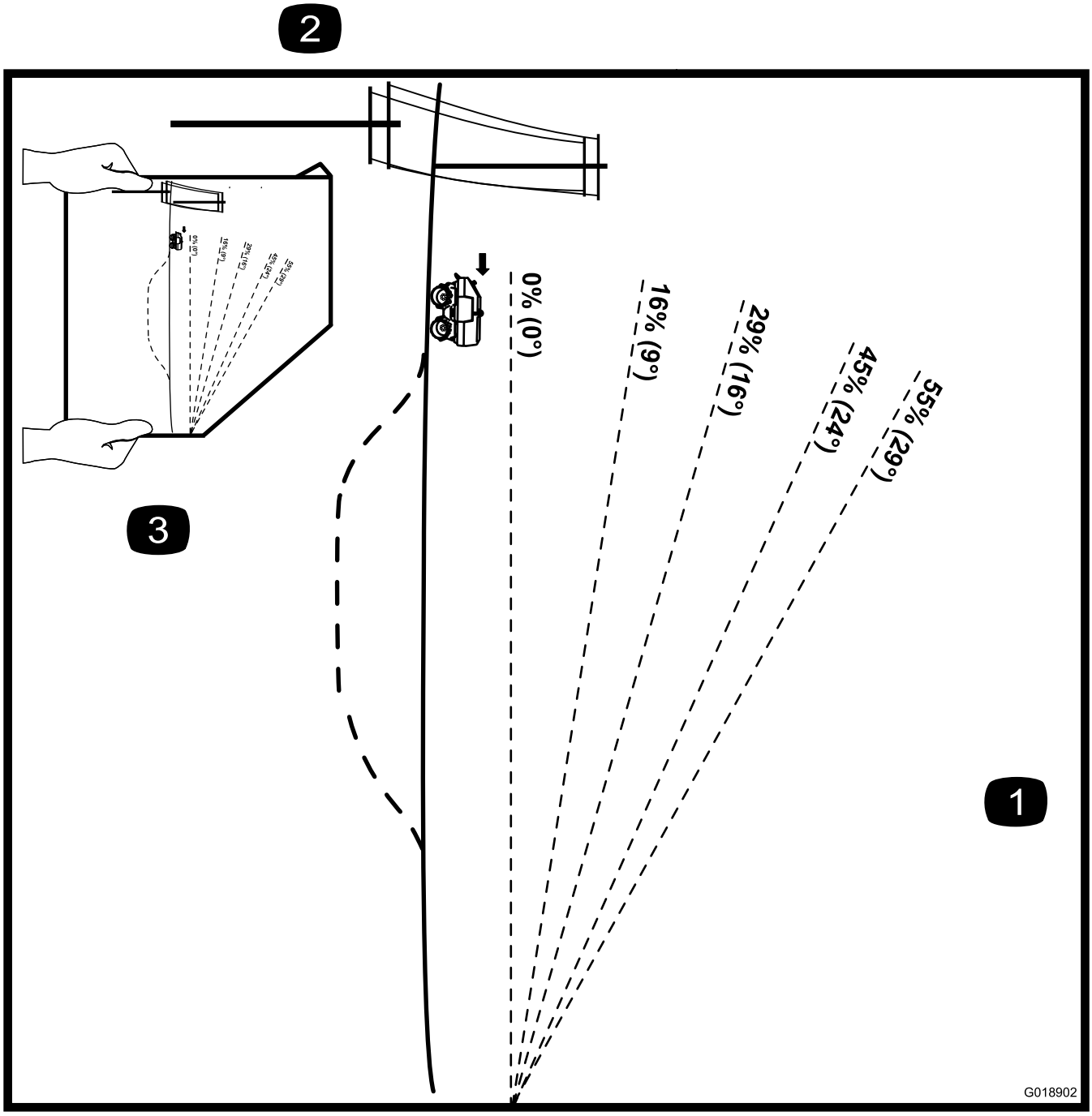


Figure 4

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1. To determine the maximum slope you can safely operate the machine, refer to the Stability Data section. Use the grade indicator to determine the grade of incline before operating. **Do not operate this machine on a grade greater than that specified in the Stability Data section.** Fold along the appropriate line to match the observed grade.
2. Align this edge with a vertical surface such as a utility pole, tree, building, etc.
3. Example of how to compare grade with folded edge.

Note: For tilt limits, refer to Figure 5.

Tilt Chart

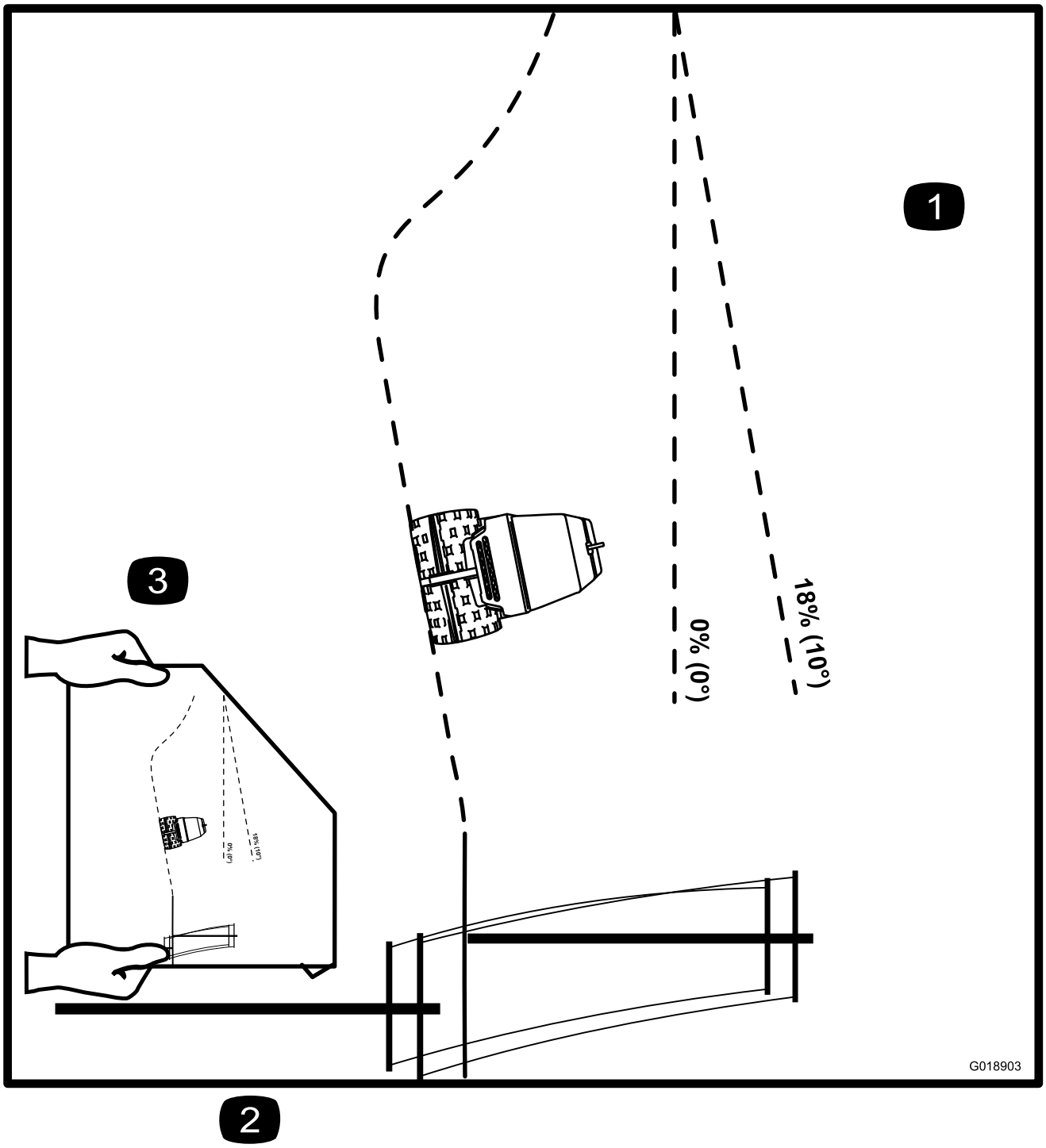

Figure 5

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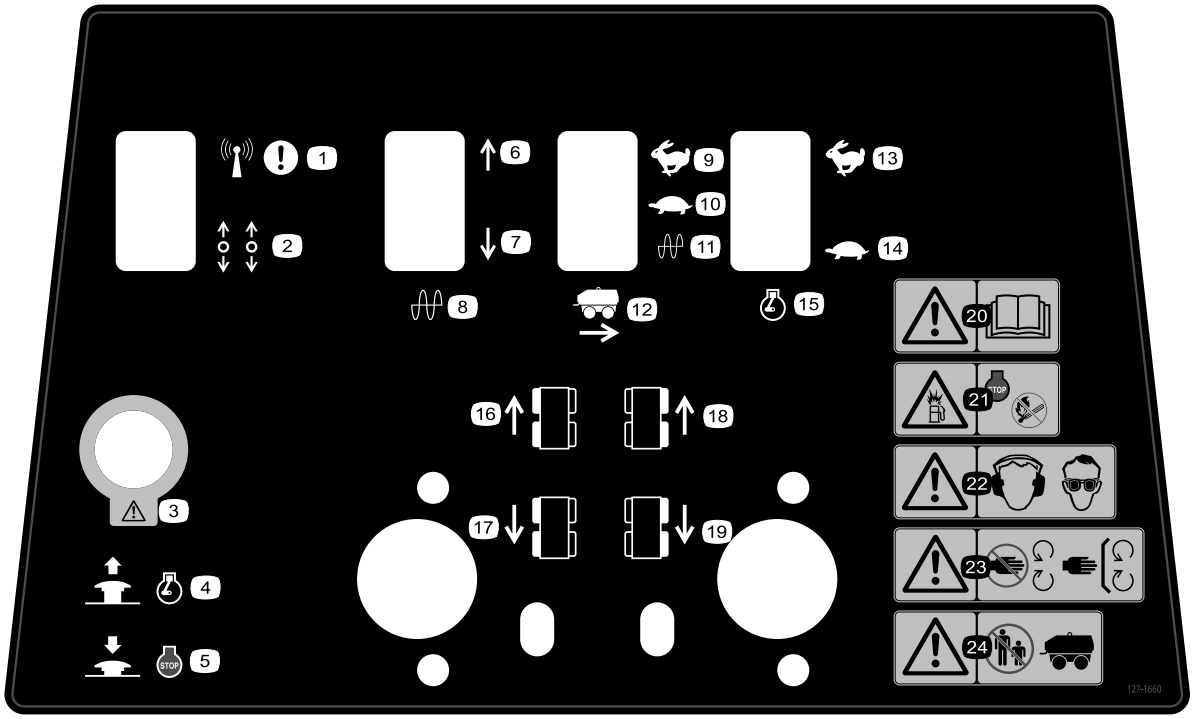
1. To determine the maximum tilt you can safely operate the machine, refer to the Stability Data section. Use the tilt indicator to determine the degree of slope before operating. **Do not operate this machine on a slope greater than that specified in the Stability Data section.** Fold along the appropriate line to match the recommended slope.
2. Align this edge with a vertical surface such as a utility pole, tree, building, etc.
3. Example of how to compare slope with folded edge.

Note: For slope limits, refer to Figure 4.

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.

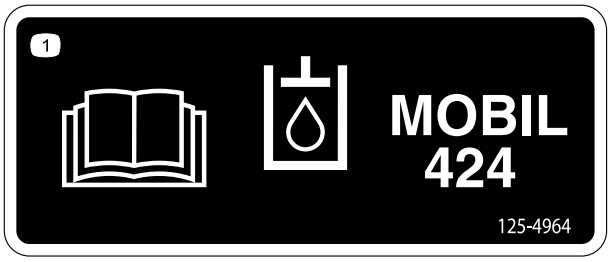


127–1660

1. Remote-control mode
2. Manual mode
3. Warning—emergency stop
4. Pull up to run the engine
5. Press down to stop the engine
6. Forward vibration
7. Reverse vibration
8. Vibration direction toggle
9. Fast—travel speed
10. Slow—travel speed
11. Vibration On
12. Travel-speed/vibration
13. Fast—engine speed
14. Slow—engine speed
15. Engine speed control
16. Left-forward traction
17. Left-reverse traction
18. Right-forward traction
19. Right-reverse traction
20. Warning—read the *Operator's Manual*.
21. Explosion hazard, fuel—stop the engine and extinguish all flames before refueling.
22. Warning—wear hearing protection; wear eye protection.
23. Warning—keep away from moving parts; keep guards and shields in place.
24. Warning—keep bystanders away when operating the machine.

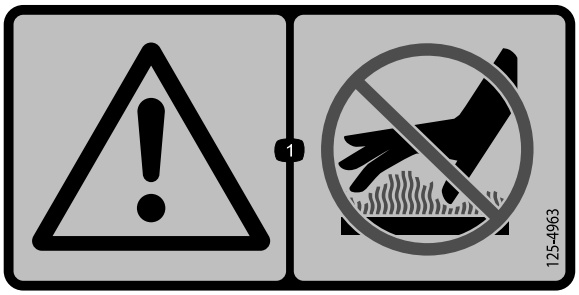
127–1656

1. Read the *Operator's Manual* for information on the radio-control mode—1) Position the switch to the radio-control mode; 2) Rotate the key to the engine-stop position; 3) Press the link/start button once—wait for the active-link light to illuminate; 4) Press the link/start button to start the engine.
2. Read the *Operator's Manual* for information on the manual mode—1) Position the switch to the manual mode; 2) Position the traction switch to slow; 3) If the engine is warm, position the engine-speed switch to slow; if the engine is cold, position the engine-speed switch to fast; 4) Turn the key to the engine-start position for 10 seconds or less to start the engine, then release the key to the engine-run position.
3. LED display
4. Engine—stop
5. Engine—run
6. Engine—start



125–4964

1. Read the *Operator's Manual* for oil information.



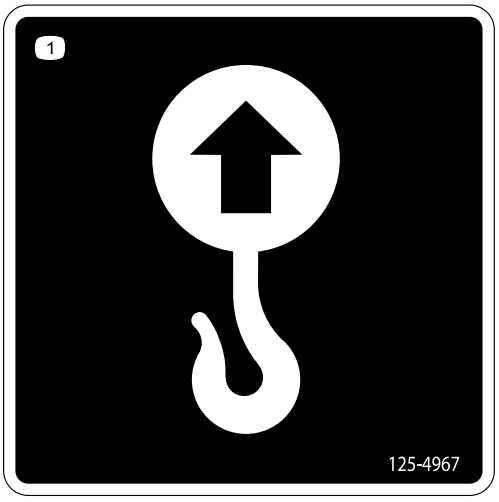
125–4963

1. Warning—keep hands away from hot surfaces

CALIFORNIA SPARK ARRESTER WARNING

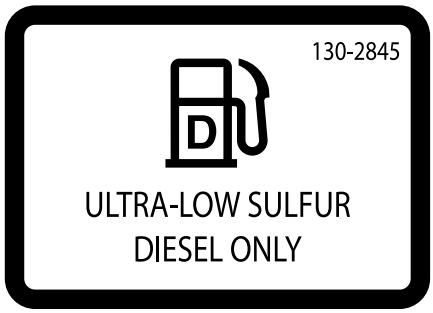
Operation of this equipment may create sparks that can start fires around dry vegetation. A spark arrester may be required. The operator should contact local fire agencies for laws or regulations relating to fire prevention requirements. 117-2718

117–2718

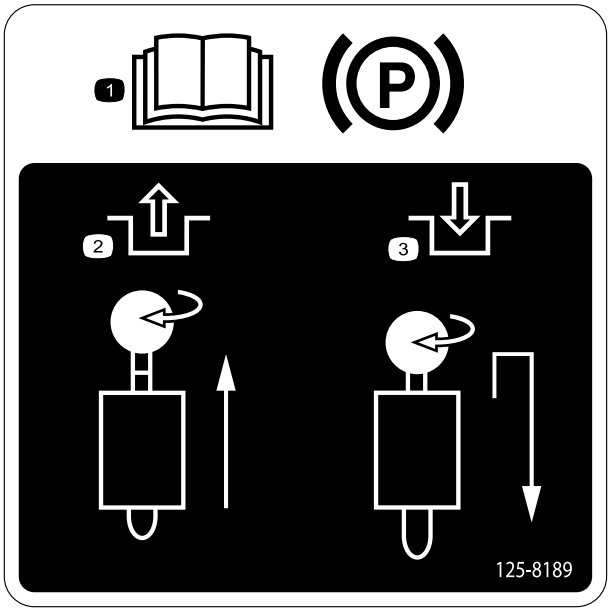


125–4967

1. Lift point

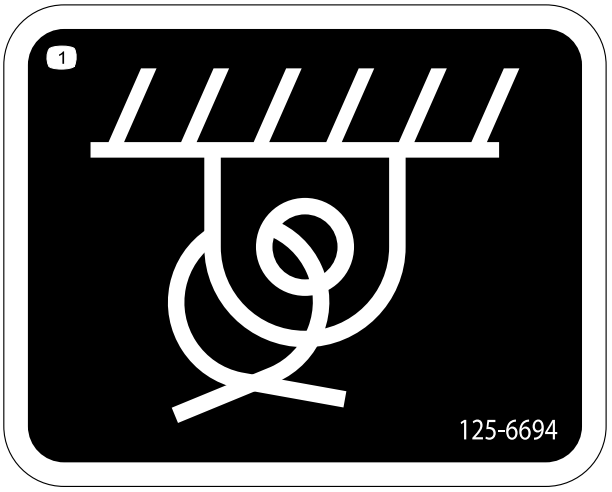


130–2845



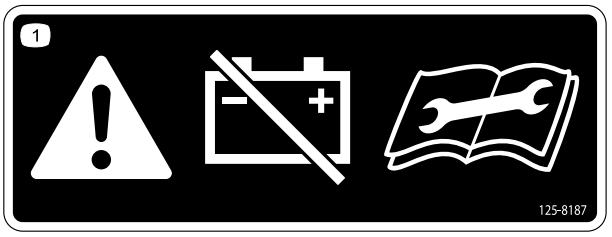
125–8189

1. Read the *Operator's Manual* for information on operating the parking brake.
2. To release the parking brake, pull the knob up fully, rotate it 90° clockwise, and then gently release the knob.
3. To set the parking brake, pull the knob up slightly, rotate it 90° clockwise, and then gently release the knob.



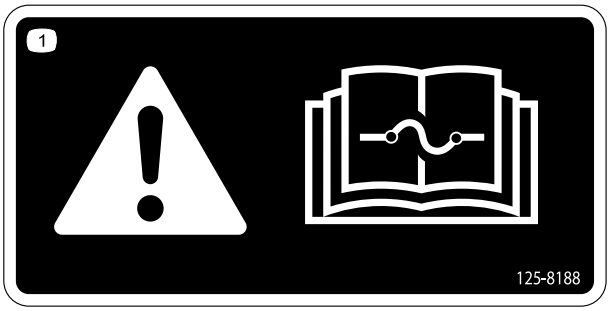
125–6694

1. Tie down location



125–8187

1. Warning—disconnect the batter and consult the *Operator's Manual* before performing service or maintenance on the machine.



125–8188

1. Warning—read the *Operator's Manual* for information on fuses.

Product Overview

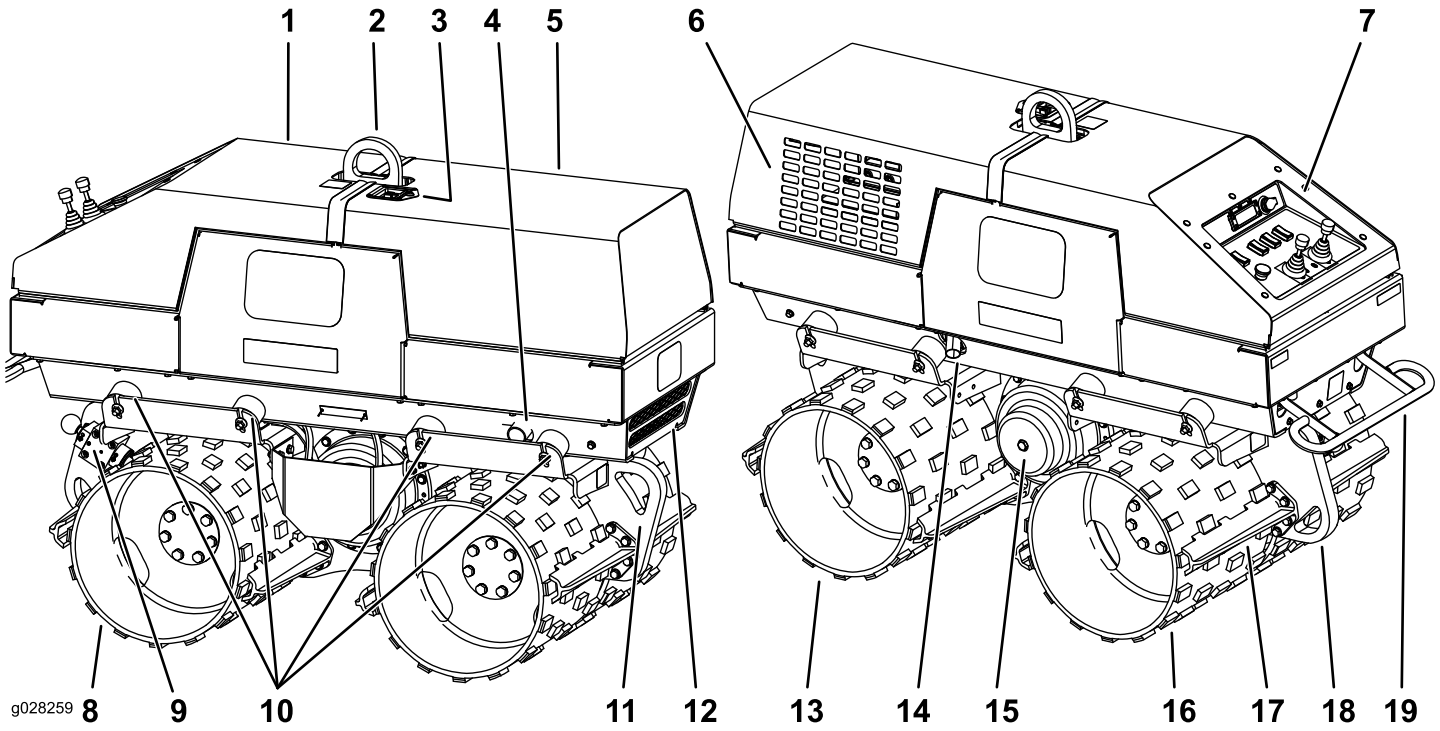


Figure 6

1. Rear hood
2. Lift ring
3. Hood-latch handle
4. Oil-cooler duct
5. Front hood
6. Engine grill
7. Control panel
8. Right-rear drum
9. Parking brake
10. Isolators
11. Forward tie-down ring
12. Air inlet
13. Left-front drum
14. Engine-exhaust pipe
15. Eccentric oil plug
16. Left-rear drum
17. Drum scraper bar
18. Rear tie-down ring
19. Safety bar

Controls

Become familiar with all the controls (Figure 7 and Figure 15) before you start the engine and operate the machine.

Control Panel

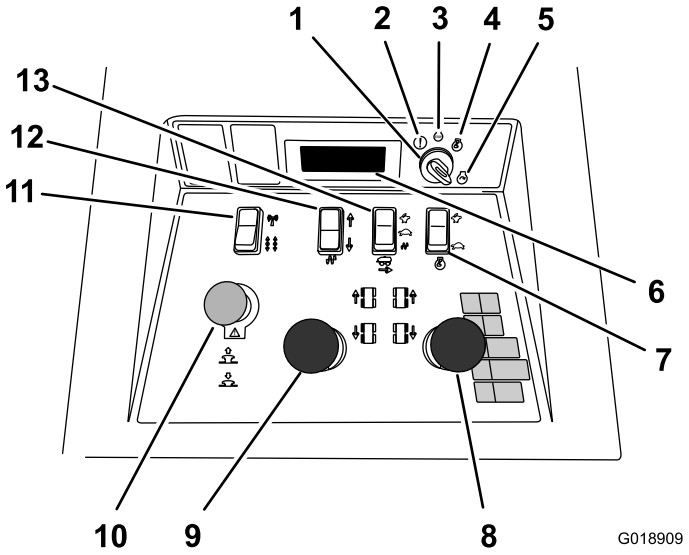


Figure 7

1. Key and key switch
2. Information
3. Engine—stop
4. Engine—run
5. Engine—start
6. LED display
7. Engine-speed switch (fast | slow)
8. Right, traction-control (forward/reverse)
9. Left, traction-control (forward/reverse)
10. Emergency-stop button
11. Mode switch (remote-control mode | manual mode)
12. Vibration-direction switch (forward | reverse)
13. Travel-speed/vibration switch (fast | slow | vibration On)

LED Display

Location and operation: The LED display is located on the control panel. The display is embedded into the electronic ignition control block, and is controlled through the microprocessor. The display provides the operator or mechanic operating information about the systems on the machine. The following section describes the information shown in the display.

Display while starting-up—voltage: During engine start-up, the display shows the battery voltage level. Rotate the key switch to the Start position to display the battery voltage.

Display while running the machine—rpm: When the engine is running, the display shows the engine rpm. After starting the machine, the key switch will rotate back to engine-run position and the engine rpm is indicated in the display.

Display when the key switch is in the information position—hour meter—faults/warnings—software version: To view operation information for the machine, rotate the key switch to the information position (counterclockwise from the Off position).

- Hour meter
- Fault messages
- Fault history
- Warnings
- Software version

Note: Operation information is stored in nonvolatile memory. In the event that battery power is lost, this information remains intact. Upon restoring battery power, the stored operation information is available for display.

Hour Meter

The hour meter display indicates the total number of hours the machine has run.

Rotate the key switch to the Accessory position to display the hour meter information.

Fault Messages

The fault messages define the situations that cause the engine of the machine to shut down or not start. These safeguards include engine protect circuits or other machine protection devices. Fault messages will be shown on the display and will indicate what event has shut down the engine.

Rotate the key switch to the information position to view the fault messages should they occur.

- **LOW OIL**—this message displays when the proper oil pressure is not achieved or maintained (monitored by the oil pressure switch).
- **CYL HEAD TEMP**—this message displays when the temperature of the cylinder head exceeds the safe operating temperature (monitored by the temperature switch in the cylinder head).
- **TILT**—this message displays when the machine tip angle is exceeded (monitored by the tip switch).
- **ESTOP**—this message displays when the emergency stop button on the control panel is depressed, and has not been reset (monitored by the emergency stop button position).

Note: The LED display always indicates the last fault message that occurred. The nonvolatile memory in the microprocessor always requires an input, therefore the last message will be displayed even after the fault has been corrected.

Fault History

The microprocessor records the last 20 fault messages to the nonvolatile memory; access the fault history as follows:

1. Rotate the key switch to the Information position to display the hour meter, last fault, and software version level.
2. During the display of the last fault, quickly rotate the key switch to the Off position, and then rotate the key switch to the Information position.

Note: The display will show the last 20 faults, beginning with the most recent. To turn off the display at any time, turn the key switch to the Off position.

Warnings

Warning messages are defined as messages that indicate the electrical system is not operating correctly. Warning messages will flash in the display when the machine is running in the manual operator mode. The 3 warning messages are as follows:

Note: If the V Reg L or the Bat Low message is indicated in the display, stop the engine. If a V Reg L warning message is indicated, refer to your *Engine Operator's Manual.* If a Bat Low warning message is indicated, check the alternator output voltage and charge or replace the battery.

- **V REG**—the voltage regulator low message indicates that the electrical system is not charging correctly.
- **BAT LOW**—the battery low message indicates the voltage level of the battery is low. This message will display when the battery output is 10 volts or less.
- **RPM LOW**—the revolutions per minute low message indicates the engine speed is below the minimum speed (monitored by alternator output).

Software Version

The software version display indicates revision level of the software for the microprocessor.

To display the software version information, rotate the key switch to the Information position.

Key Switch

Use the key switch to start and run the engine, stop the engine, and power the accessory display. The key switch has 4 positions: Information, Off, Run, and Start.

- Start the engine by rotating the key switch to the engine-start position, and then releasing the key when engine starts; the key it will move automatically to the engine-run position (Figure 8).

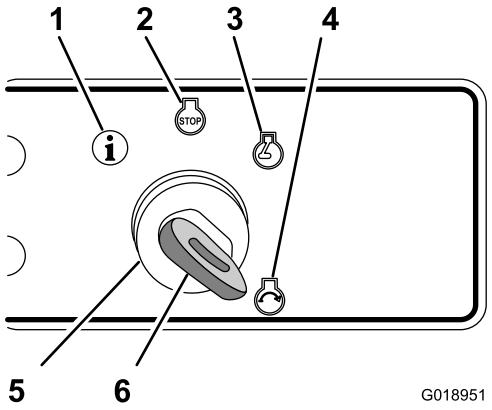


Figure 8

1. Information
2. Engine—Off
3. Engine—run
4. Engine—start
5. Key switch
6. Key

- Stop the engine by rotating the key switch to the engine-Off position (Figure 8).
- Display the hour meter, the last fault message, and the software version by rotating the key switch to the Information position (Figure 8).

Mode Switch

Use the mode switch to control the reception of commands from the remote-control transmitter. Selecting the switch to the radio-control mode or manual-mode position changes intended machine form of operation (Figure 9).

Important: Prolong the battery life of the machine by selecting the mode switch to the *manual mode* position when the machine is not in use.

Note: Select the mode switch to the radio-control mode position to operate the machine with the **remote-control transmitter**.

Select the mode switch to the manual-mode position to operate the machine with the **control panel**.

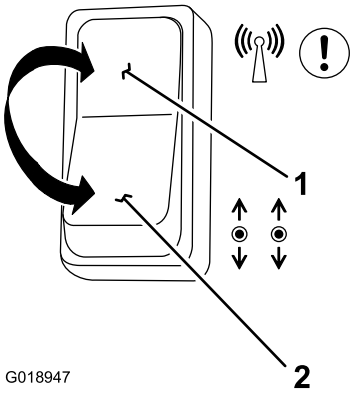


Figure 9

1. Radio-control mode
2. Manual mode

Vibration Direction Switch

Use the vibration direction switch to select the direction eccentric rotation when the vibration function active (Figure 10).

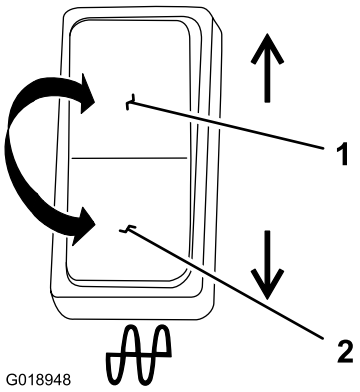


Figure 10

1. Vibrate forward
2. Vibrate reverse

- Vibration movement in a forward direction.
- Vibration movement in the reverse direction.

Travel-speed/Vibration Switch

Important: Select the slow, travel-speed setting when moving the machine in and out of the trench, when loading the machine onto a transport vehicle, and when unloading the machine from a transport vehicle.

Use the travel-speed switch to control travel speed of the machine (vibration Off) or activate the machine-vibration function (Figure 11).

Note: The vibration function is inoperative when moving the machine in the fast-travel speed or the slow-travel speed settings.

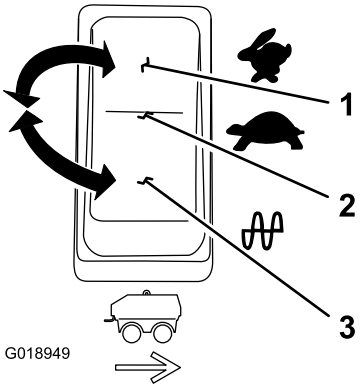


Figure 11

1. Fast-travel (vibration-off)
2. Slow-travel (vibration-off)
3. Vibration On (slow travel)

Engine-speed Switch

Use the engine-speed switch to change the engine RPM between the slow and fast, engine-speed settings (Figure 12).

Important: Perform machine operations such as moving the machine and vibration functions with the engine-speed switch in the fast, engine-speed position.

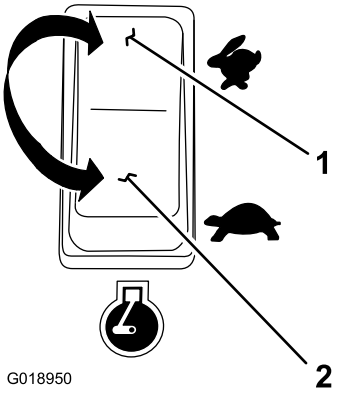


Figure 12

1. Fast, engine-speed
2. Slow, engine-speed

Emergency Stop Button

Use the emergency stop in any situation when the immediate stop of the machine is required. Pressing the emergency stop button will shut the machine off immediately.

The emergency stop button is located on the control panel and is labeled G021430 below the red-colored button. Perform the following steps to stop the machine in an emergency situation, and reset the machine when the emergency-stop condition is corrected:

1. Press the emergency stop button down to immediately shut off the machine (Figure 13).

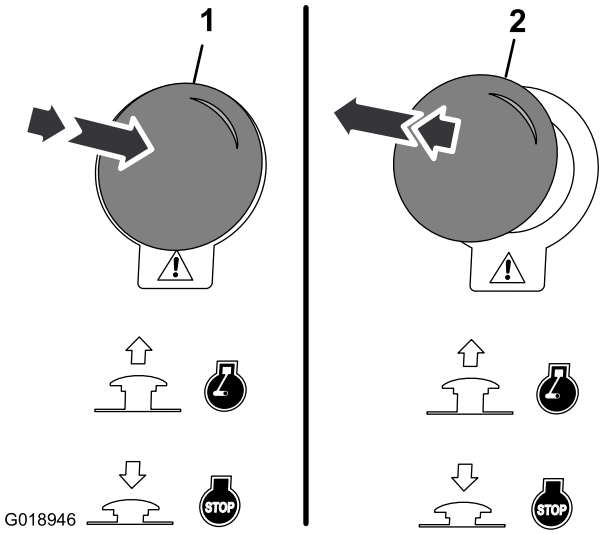


Figure 13

1. Emergency stop position
2. Reset for normal operation

2. Pull the emergency stop button up to resume normal machine operation (Figure 13).

Traction Controls

Move the left and right, traction-control levers to manually move the machine in the forward or reverse direction (straight, left or right) (Figure 14).

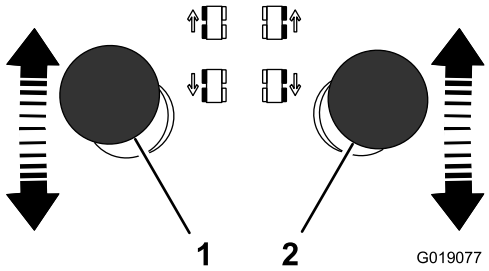


Figure 14

Radio Set

A radio set is a matched address code and radio frequency for a radio-control transmitter and the radio-control receiver. The address codes and radio frequency for the radio set are unique, and must match for the machine to function properly. This relationship assures that the transmitter can control only one receiver/machine, and that multiple compactors can be used on the job site without interference. Refer to the 7 digit serial numbers that you recorded on page titled Introduction (Figure 2).

Remote-control Transmitter

Important: Keep the remote-control transmitter dry. Do not pressure wash the remote-control transmitter.

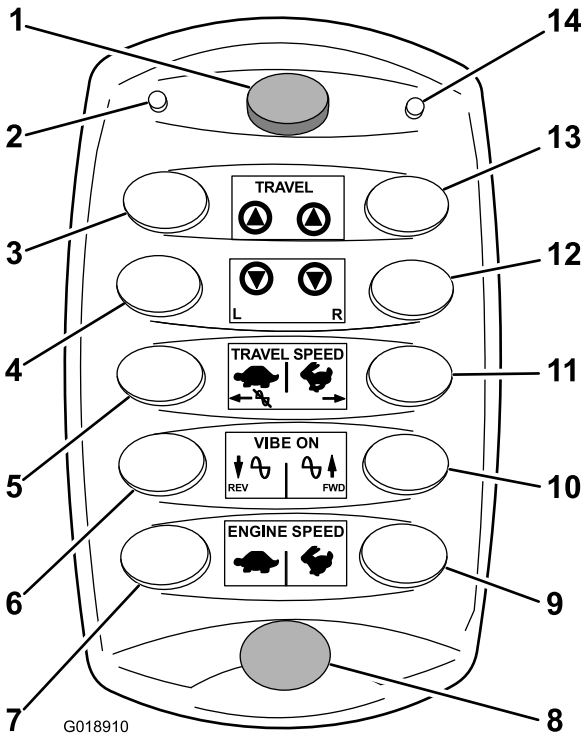


Figure 15

1. Link / start button (green)
2. Low battery light (remote-control transmitter)
3. Left, forward-traction button (up arrow)
4. Left, reverse-traction button (down arrow)
5. Slow, travel-speed button (vibration Off)
6. Reverse vibration button (vibration On)
7. Slow, engine-speed button (not functional)
8. Emergency-stop/power-Off button
9. Fast, engine-speed button (not functional)
10. Forward vibration button (vibration On)
11. Fast, travel-speed button (vibration Off)
12. Right, reverse-traction button (down arrow)
13. Right, forward-traction button (up arrow)
14. Active link light (flashes)

Link/Start Button

Press the link/start button (green button) to establish a radio link between the remote-control transmitter and the radio receiver in the machine and to start the engine in the machine (Figure 15).

Note: The link/start button is the top button (centered left and right) on the remote-control transmitter.

Functions:

1. Establish a link to the radio receiver of the machine.
2. Start the engine of the machine.

Traction-control Buttons

Press and hold the traction-control buttons to move the machine in the forward or reverse direction (straight, left or right) (Figure 15).

Important: To stop the movement of the machine, release the traction-control buttons.

- Move the machine forward.
- Move the machine backward.
- Turn the machine left.
- Turn the machine right.

Travel Speed Buttons

Important: Use the slow-travel speed setting when moving the machine in and out of trenches, when loading the machine onto a trailer, and when unloading the machine from a trailer.

Use the travel speed buttons on the remote-control transmitter to control the travel speed of the machine (vibration Off) or activate the vibration function of the machine (Figure 15).

Note: The vibration function is inoperative when moving the machine in the fast travel-speed setting or slow travel-speed setting.

- Move the machine at minimum-travel speed.
- Move the machine at maximum-travel speed.
- Stop the vibration function (press and release either the slow or fast, travel-speed button).

Vibration On Buttons

Use the vibe On buttons to select the direction eccentric rotation when the vibration function active (Figure 15).

Note: To stop the vibration function with the remote-control transmitter, press the slow, travel-speed button; refer to Travel Speed Buttons (page 17).

- Vibrate in a forward direction.
- Vibrate in a reverse direction.

Engine Speed Buttons

The engine-speed buttons on the remote-control transmitter do not function. The engine speed is automatically controlled by the microprocessor in the machine when operating in the remote-control mode.

When the machine is started with the remote-control transmitter, the engine will start at the slow-engine speed, after 1 second the engine will automatically accelerate to the fast-engine speed and sustain that speed.

Emergency-stop/Power-Off Button

Press the emergency-stop/power-Off button (red button) turn off the machine in an emergency situation or during normal operation (Figure 15).

Note: The emergancy-stop/power-Off button is the bottom button (centered left and right) on the remote-control transmitter.

- Turn off the machine off immediately in an emergency situation.
- Turn off the machine during normal operation.

Parking Brake

The parking brake mechanism is a spring loaded plunger that rests against the surface of the drum when the brake is engaged. Use the brake knob to engage and disengage the parking brake of the machine; refer to Using the Parking Brake (page 28).

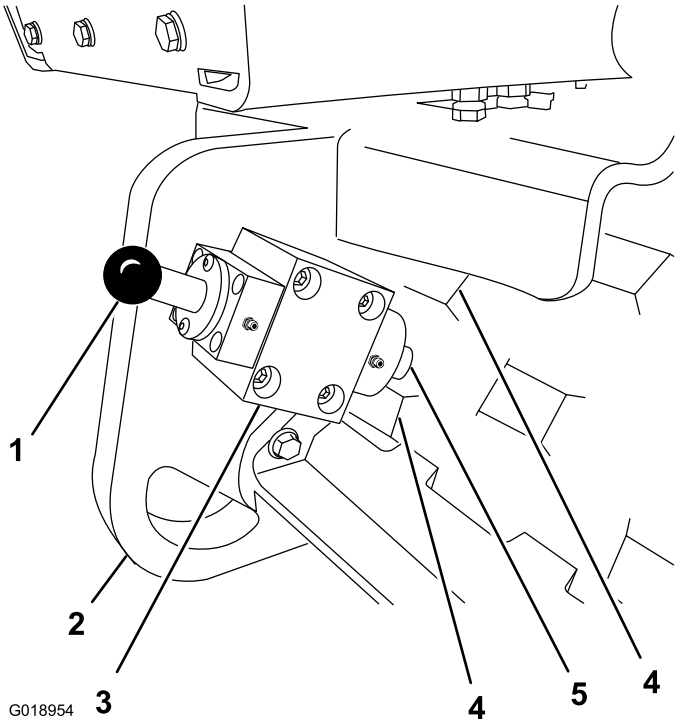


Figure 16

1. Brake knob
2. Rear, tie-down ring
3. Parking brake
4. Drum pad
5. Plunger

Anti-crush Bar

The anti-crush bar is a safety device that is located at the rear of the machine, and below the control panel. When triggered, the anti-crush bar prevents the machine from reverse travel in the event that the operator becomes entrapped behind the machine.

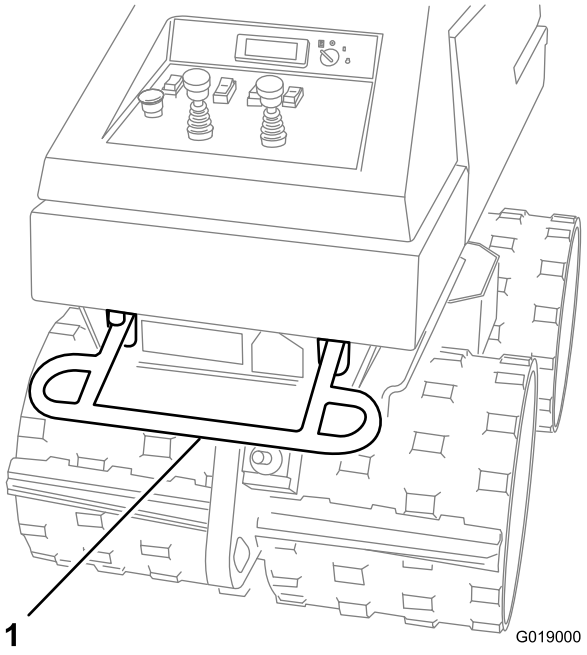


Figure 17

1. Anti-crush bar

Fuel Gauge

The fuel gauge is part of the fuel-tank cap, and indicates the level of fuel in the fuel tank.

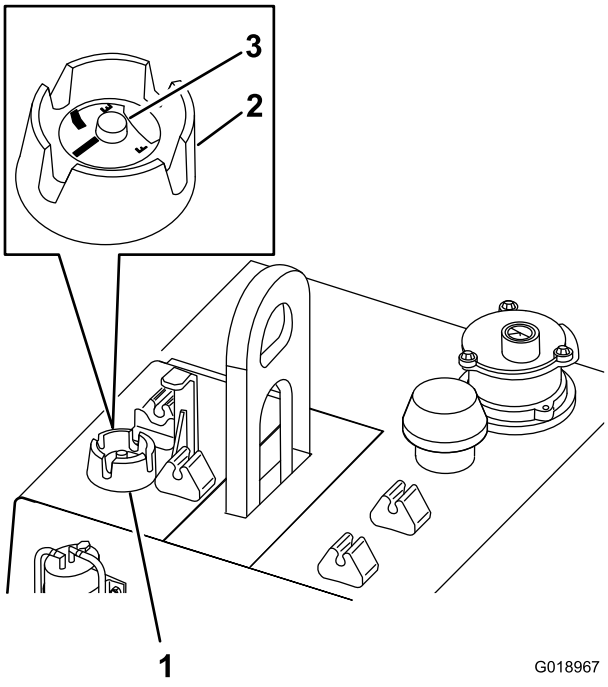


Figure 18

1. Fuel-tank cap and fuel gauge
2. Fuel-tank cap
3. Fuel gauge

Hydraulic-filter Gauge

The hydraulic-filter gauge indicates the pressure of hydraulic fluid flowing through the hydraulic filter.

The pressure ranges for the hydraulic-filter gauge are as follows:

- Normal (green): 0 to 137 kPa (0 to 20 PSI)
- Caution (yellow): 137 to 172 kPa (20 to 25 PSI)
- Service the filter (red): 172 to 689 kPa (25 to 100 PSI)

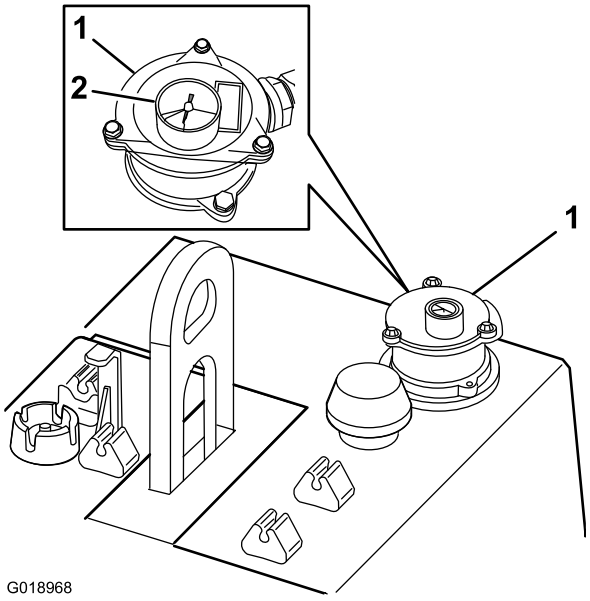


Figure 19

1. Hydraulic-filter housing
2. Hydraulic-filter gauge

Hydraulic-tank Gauge

Use the hydraulic-tank gauge to observe the level of hydraulic fluid in the tank. The tank gauge is located on the left-rear side of the hydraulic tank.

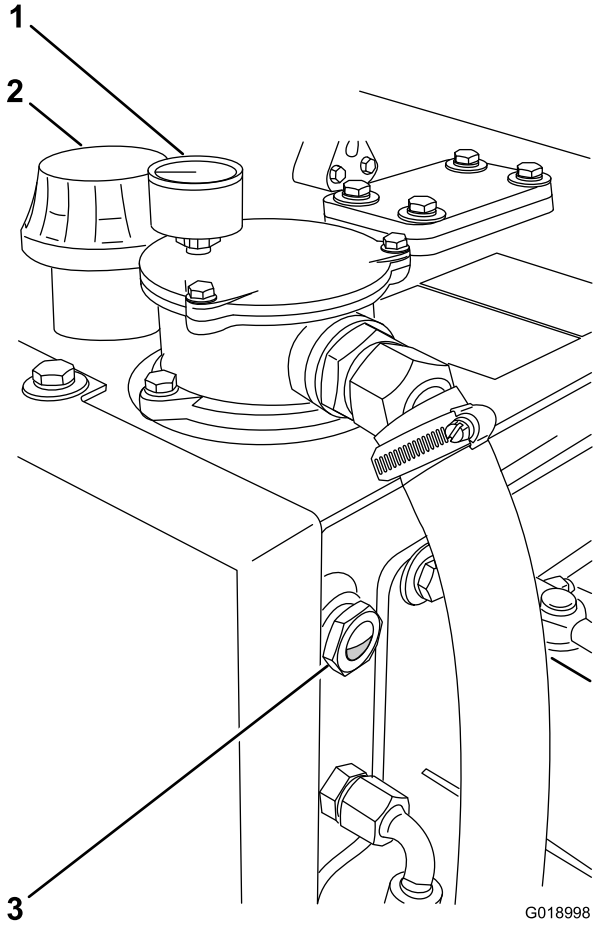


Figure 20

1. Hydraulic-filter gauge
2. Cap/breather
3. Hydraulic-tank gauge

Specifications

Note: Specifications and design are subject to change without notice.

Model 68039	
Width	86 cm (34 inch)
Length	167.7 cm (66 inch)
Height	119 cm (46.4 inch)
Weight	1406 Kg (3100 lb)
Engine oil capacity	0.95 L (2 fl qt)
Fuel capacity	11.3 L (3 US gallon)
Hydraulic tank capacity	49 L (13 US gallon)

Vibration Specifications

Description	Value
Vibration Frequency	33.3 Hz (2000 vpm)
Centrifugal Force	69.87 kN (15709 lb)
Total Applied Force	82.7 kN (18609 lb)
Static Linear Pressure	85 N/cm (48 psi)
Dynamic Linear Pressure	432 N/cm (247 psi)
Total Applied Linear Pressure	516 N/cm (295 psi)
Static Applied Padfoot Pressure	516 N/cm (73.06 psi)
Dynamic Applied Padfoot Pressure	127 N/cm (370 psi)
Total Applied Padfoot Pressure	647.5 N/cm (443.3 psi)

Operation

Never move the machine across a slope greater than 18% grade (10°).

Never park the machine on a hill.

Before starting the machine, make sure that there are no persons near the machine or obstacles under the machine.

⚠ CAUTION

Exposure to loud noise can cause hearing impairment or loss.

Wear hear protection when operating the machine.

Important: Users must be trained to operate the machine. Read the *Operator's Manual* and *Engine Owner's Manual.* Learn to operate the machine safely.

Important: Before operating the machine, check the fuel and oil level, and remove debris from the machine. Ensure that the area is clear of people and debris. You should also know and have marked the locations of all utility lines.

Note: Determine the left and right sides of the machine from the normal operating position.

Setting up the Machine

Connecting the Battery Cable

1. Open the rear hood; refer to Accessing the Machine (page 24).
2. Verify the torque on the positive cable (Figure 21).

   Note: The torque should be 60 to 70 inch-lb (5 to 6 ft-lb).

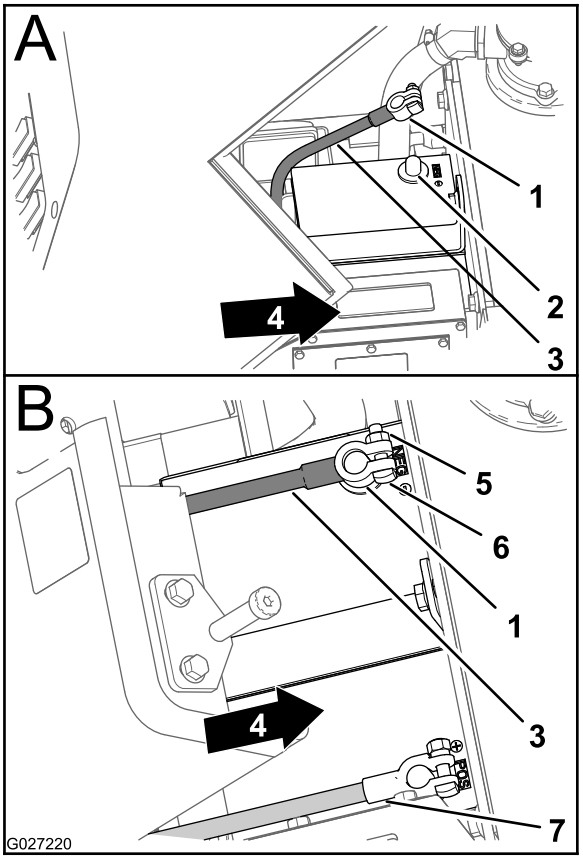


Figure 21

1. Negative cable clamp
2. Negative battery post
3. Negative battery cable (black)
4. Front of the machine
5. Nut
6. Bolt
7. Positive cable clamp (red cable)

3. Secure the negative battery cable to the negative battery post.
4. Torque the nut (Figure 2) and the T-bolt for the negative cable clamp to 678 to 791 N-cm (60 to 70 in-lb).
5. Check the battery voltage; refer to Checking the Battery Voltage of the Machine (page 46).
6. Close the hood; refer to Accessing the Machine (page 24).

Pre-start Checklist

1. Check the engine oil level.
2. Check the engine air filter element.
3. Check the engine fuel level.

   Note: Always use clean, fresh fuel to prevent damage to the fuel injection components.
4. Check the hydraulic fluid level.
5. Check the hardware for looseness.
6. Check the hoses for loose fittings and signs of a leak.
7. Check that the Emergency Stop button is not damaged, and that the bottom moves up and down.
8. Check that the Anti-crush bar, switch, and actuation components are not damaged, and that all parts move and work properly.

Fuel

Use only clean, fresh diesel fuel with an ultra low (<15 ppm) sulfur content. The minimum cetane rating for the diesel fuel should be 40. Purchase fuel in quantities that can be used within 30 days to ensure fuel freshness.

Fuel tank capacity: 11.5 L (3 US gallon)

Important: Do not use kerosene or gasoline instead of diesel fuel. Failure to observe this caution will damage the engine.

- Outside air temperatures **above** 32° F (0° C), use summer grade diesel fuel (No. 2-D)

  Note: Use of summer grade fuel above 32° F (0° C) will contribute toward longer fuel pump life and increased power.
- Outside air temperatures **below** 32° F (0° C), use winter grade (No. 1-D or No. 1-D/2-D blend)

  Note: Use of winter grade fuel at lower temperatures provides easier starting and reduce fuel filter plugging.

⚠ 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 nozzle and fuel tank or fuel container opening.**
- **Keep fuel away from your eyes and skin.**

Filling the Fuel Tank

⚠ DANGER

Under certain conditions, diesel fuel and fuel vapors are highly flammable and explosive. A fire or explosion from fuel can burn you and others and can cause property damage.

- **Use a funnel and fill the fuel tank outdoors, in an open area, when the engine is off and is cold. Wipe up any fuel that spills.**
- **Do not fill the fuel tank completely full. Add fuel to the fuel tank until the level is 1/4 to 1/2 in. (6 to 13 mm) below the bottom of the filler neck. 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.**
- **Never fill the fuel tank inside an enclosed trailer.**
- **Do not operate without 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 equipment from the truck or trailer and refuel the equipment with its wheels on the ground.**
- **If this is not possible, then fuel 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.**

Important: Store fuel in a clean, safety-approved container and keep the cap in place.

1. Remove the cap for the fuel tank by turning the cap counterclockwise and the lifting the cap up until the quantity sensor is clear of the filler neck of the fuel tank. (Figure 22).

Note: Do not allow the dirt and debris to enter the fuel tank or to accumulate on the quantity sensor.

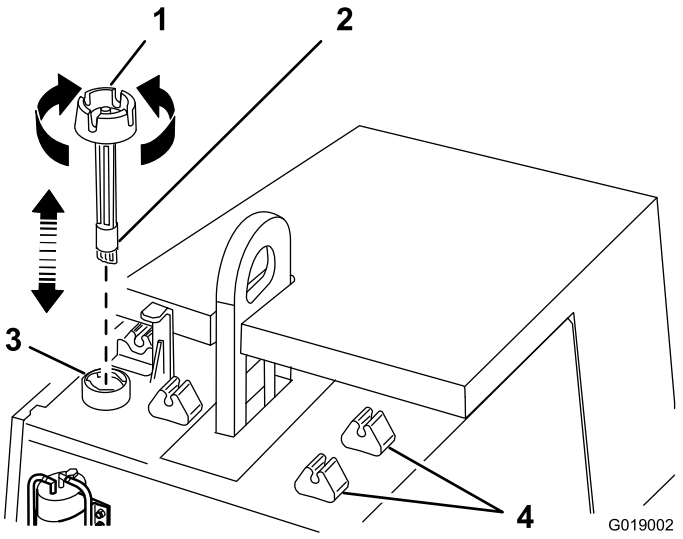


Figure 22

1. Fuel cap
2. Quantity sensor
3. Filler neck (fuel tank)
4. Hood clip

2. Fill the tank with fuel until the level is 6 to 13 mm (1/4 to 1/2 inch) below the bottom of the filler neck.
3. Install the fuel tank cap by inserting the quantity sensor of the fuel cap through the filler neck.
4. Tighten the fuel cap clockwise hand tight (Figure 22).

Priming the Fuel System

Bleed the fuel system before starting the engine if any of the following conditions occur:

- Initial start up of a new machine.
- Engine has ceased running due to lack of fuel.
- Maintenance has been performed upon fuel system components (e.g., filter replaced).

Note: When performed, the engine should start after priming the fuel system. However, if engine does not start, air may be trapped between injection pump and injectors; contact your Authorized Service Dealer.

1. Remove the key, and allow the engine to cool.

2. Open the forward hood.
3. Ensure that the fuel level in the tank is greater that one-third full.
4. Remove the fuel cap and sensor assembly (Figure 23).

   Note: Do not allow the dirt and debris to enter the fuel tank or accumulate on the quantity sensor.

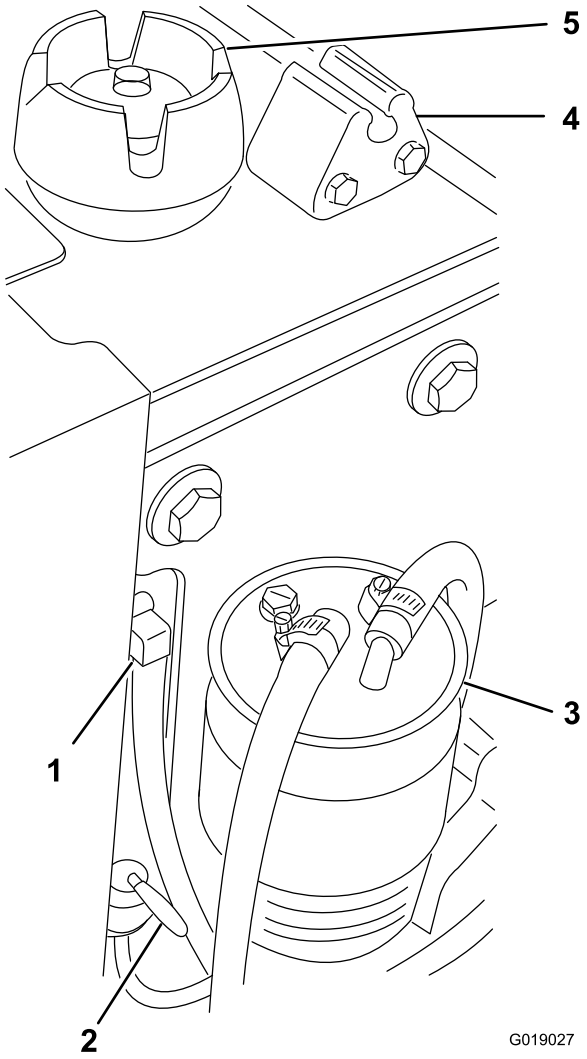


Figure 23

1. Fuel return line
2. Fuel-shutoff valve
3. Fuel/water separator
4. Hood clip
5. Fuel cap/sensor

5. At the fuel pump, operate the priming lever until fuel is heard flowing back into the fuel tank through the fuel return line. (Figure 24).

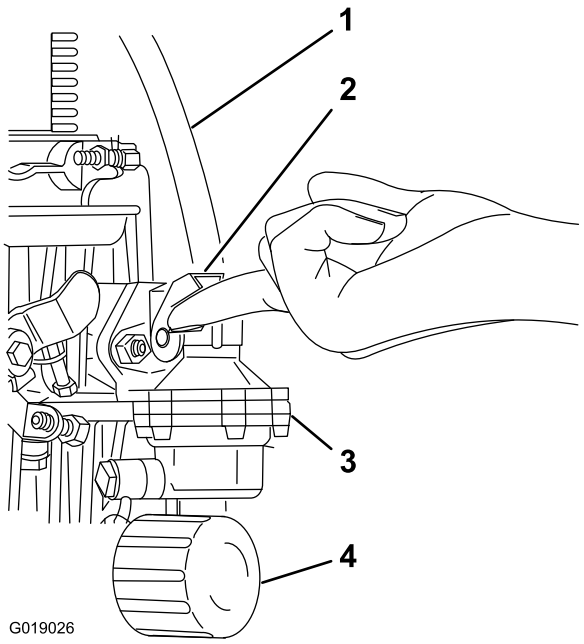


Figure 24

1. Fuel line
2. Fuel priming lever
3. Fuel pump
4. Oil filter

6. Install the fuel cap and sensor assembly (Figure 23).
7. Close the forward hood.

Accessing the Machine

Opening the Hood

Open the forward hood as follows:

1. At the forward hood, pivot the latch handle for the hood to the vertical position (Figure 25).

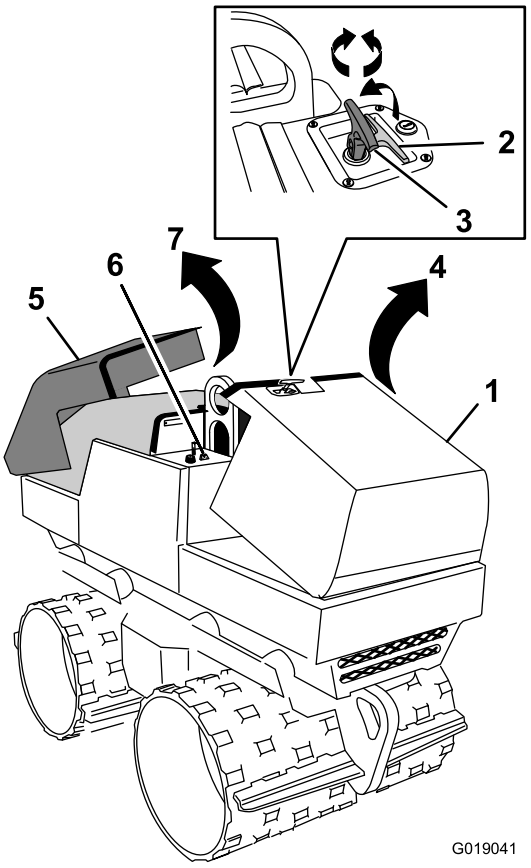


Figure 25

1. Forward hood
2. Latch handle (stowed)
3. Latch handle (vertical)
4. Forward hood opening
5. Rear hood
6. Hood clip
7. Rear hood opening

2. Rotate the latch handle clockwise (Figure 25).
3. Grasp the latch handle tightly, and pull up firmly to unseat the hood from the hood clips (Figure 25).
4. Rotate the hood up (Figure 25).

Open the rear hood as follows:

Note: Ensure that the forward hood is open before opening the rear hood.

1. Grasp the forward edge of the rear hood.
2. Pull up firmly on the hood to unseat it from the hood clips (Figure 25).
3. Rotate the hood up (Figure 25).

Closing the Hood

Note: If the rear hood and the forward hood are open, the rear hood must be closed before closing the forward hood.

Close the rear hood as follows:

1. Grasp the forward edge of the rear hood.
2. Rotate the hood down (Figure 25).
3. Push down firmly on the hood to seat it into the hood clips.

Close the forward hood as follows:

Note: Ensure that the rear hood is closed before closing the forward hood.

1. Grasp the latch handle, and rotate the hood down (Figure 25).
2. Push down firmly on the hood to seat it into the hood clips.
3. Rotate the latch handle counterclockwise (Figure 25).
4. Pivot the handle down to the stowed position (Figure 25).

Engine Oil and Hydraulic Fluid

Checking the Engine Oil Level

Service Interval: Before each use or daily

Oil Type: Detergent diesel engine oil (all trademark oils which fulfil at least one of the following specifications: **ACEA**-B2/E2 or higher, or **API** service CH-4 or higher)

Crankcase Capacity: 1.9 L (2 qt)

Viscosity: Refer to Figure 26.

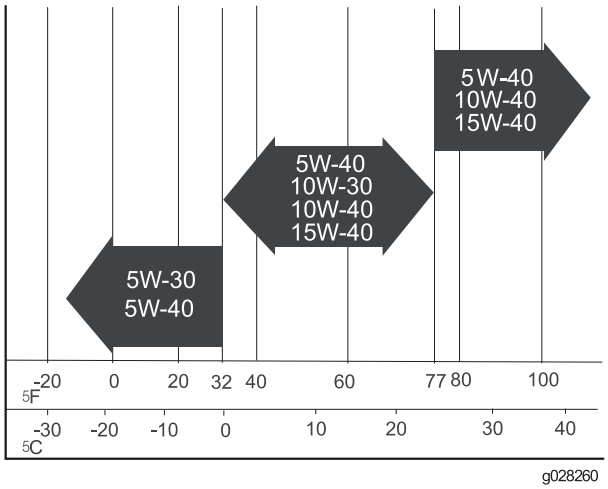


Figure 26

1. Park the machine on a level surface.
2. Stop the engine, remove the key, and allow the engine to cool.
3. Open the forward hood.

4. Clean around the oil dipstick and dipstick fitting (Figure 27).

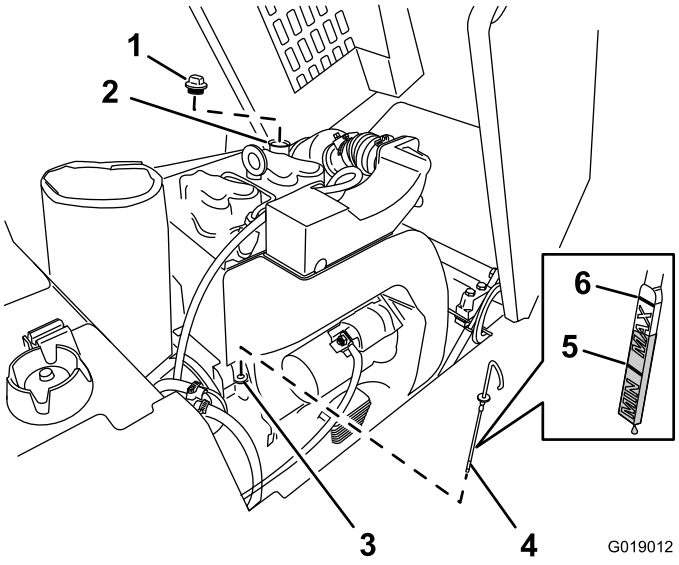


Figure 27

1. Oil-filler cap
2. Oil-filler neck
3. Dipstick fitting
4. Dipstick
5. Min oil-level
6. Max oil-level

5. Pull out the dipstick and wipe the metal end clean.
6. Slide the dipstick into the dipstick fitting.
7. Pull the dipstick out and look at the metal end.
8. If the oil level is below the Min-level mark on the dipstick (Figure 27), perform the following steps:
   A. Clean around the oil-filler cap, and remove the cap (Figure 27).
   B. Slowly pour enough oil into the oil-fill tube to raise the level on the dipstick to between the Min- and Max-oil level (Figure 27).

      Important: Do not overfill the crankcase with oil because the engine may be damaged.

   C. Install the oil-filler cap (Figure 27).
9. Insert the dipstick into the dipstick fitting, and seat the dipstick firmly.
10. Close the hood.

Checking the Hydraulic Fluid Level

Service Interval: Before each use or daily

Hydraulic Tank Capacity: 49 L (13 US gallons)

- **Toro Premium Transmission/Hydraulic Tractor Fluid** (refer to your Authorized Toro Dealer for more information)
- **Toro Premium All Season Hydraulic Fluid** (refer to your Authorized Toro Dealer for more information)
- If either of the above Toro fluids are not available, you may use **Mobilfluid 424** multipurpose tractor lubricant.

Important: Always use the correct hydraulic fluid. Unspecified fluids will damage the hydraulic system.

Note: The hydraulic fluid specifications must fall within the listed range for all of the following material properties and the fluid should meet the listed industry standards.

Toro will not assume responsibility for damage caused by improper substitutions, so use only products from reputable manufacturers who will stand behind their recommendations.

Hydraulic Fluid Table—

Material Properties	
Viscosity, ASTM D445	cSt at 40° C (104° F): 55 to 62
	cSt at 110° C (230° F): 9.1 to 9.8
Viscosity index, ASTM D2270	140 to 152
Pour Point, ASTM D97	-37 to -43° C (-35 to -46° F)
Industry Standards	
API GL-4, AGCO Powerfluid 821 XL, Ford New Holland FNHA-2-C-201.00, Kubota UDT, John Deere J20C, Vickers 35VQ25 and Volvo WB-101/BM.	

Note: Many hydraulic fluids are almost colorless, making it difficult to spot leaks. A red dye additive for the hydraulic system oil is available in 2/3 oz. (20 ml) bottles. One bottle is sufficient for 4-6 gal (15-22 l) of hydraulic oil. Order part no. 44-2500 from your Authorized Toro Dealer.

1. Park the machine on a level surface.
2. Stop the engine, remove the key, and allow the engine to cool.
3. Open the rear hood.
4. Clean the area around the cap/breather and filler neck of the hydraulic tank. Clean the hydraulic tank sight gauge (Figure 28).

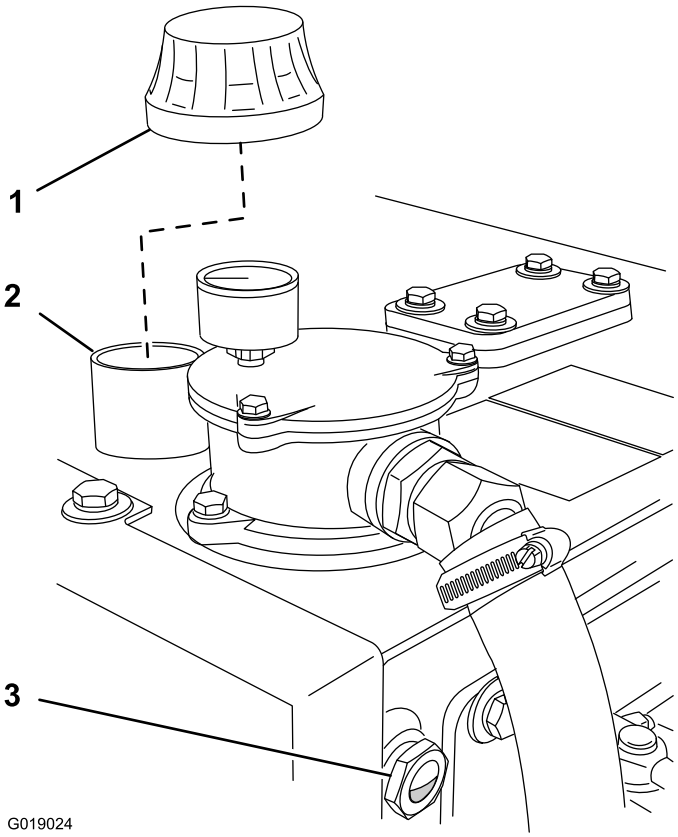


Figure 28

1. Breather/cap
2. Hydraulic tank filler neck
3. Sight gauge

5. Check that the fluid level displayed in the sight gauge indicates a 6.35 to 12.5 mm (0.25 to 0.50 inch) air bubble seen at the top of the gauge (Figure 28).
6. If the hydraulic fluid level is low , perform the following steps:

⚠ DANGER

The breather/cap is designed to pressurize the hydraulic tank to 34.5 kPa (5 PSI).

Loosen the cap slowly to avoid injury whenever adding fluid or maintaining the hydraulic system.

   A. Place a rag over the hydraulic tank breather/cap, and slowly turn the cap counterclockwise to remove the breather/cap.
   B. Add fresh hydraulic fluid to the tank through the hydraulic tank filler neck.

      Note: Add hydraulic fluid until the fluid level indicates a 6.35 to 12.5 mm (0.25 to 0.50 inch) air bubble seen at the top of the sight gauge.

   C. Install the breather/cap on the hydraulic tank filler neck.
7. Close the rear hood.

Starting and Stopping the Engine

Start and stop the machine in either the manual mode (at the control panel) or in the remote-control mode (with the remote-control transmitter).

Starting the Engine—Manual Mode

Note: Install the optional Glow-Plug Kit if you will be starting the engine in temperatures below 7°C (45°C).

Important: If the engine is run at high speeds when the hydraulic system is cold (i.e., when the ambient air temperature is near freezing or lower), hydraulic system damage could occur. When starting the engine in cold conditions, allow the hydraulic system to warm by operating the engine at slow-engine speed for 2 to 5 minutes before switching to the fast-engine speed.

1. Ensure that the handle of the fuel-shutoff valve to the On position. (Figure 23).
2. At the control panel, press the mode switch to the manual-mode position; refer to the Mode Switch (page 14).
3. Press the engine-speed switch to the slow, engine-speed position; refer to the Engine-speed Switch (page 15)
4. Insert the key into the key switch, and rotate the key clockwise to the Start position.

   Important: Do not engage the starter for more than 10 seconds at a time. If the engine fails to start, allow a 30-second cooldown period between attempts. Failure to follow these instructions can burn out the starter motor.
5. Release the key when engine starts.

   Note: The key it will move automatically to the engine-run position.

Starting the Engine—Remote-control Mode

Important: When the ambient air temperature is near freezing or lower, start the engine in the manual mode and allow the hydraulic system to warm before operating the machine in the remote-control mode; refer to Starting the Engine—Manual Mode (page 26).

1. At the control panel, press the mode switch to the remote-control mode position; refer to the Mode Switch (page 14).
2. Ensure that the key switch is rotated to the Off position; refer to the Key Switch (page 14).
3. At the radio-control transmitter, press the On button once to establish a radio link with the machine.
4. Press and hold the On button again to start the engine.

Note: The engine speed is automatically controlled by the microprocessor on the machine. The engine will start and operate at the slow-engine speed for one second, and then automatically accelerate the engine to the fast-engine speed.

Stopping the Engine—Manual Mode

These instructions describe how to stop the engine at the control panel under normal operating circumstances.

1. Ensure that the mode switch is selected to the manual-control position; refer to the Mode Switch (page 14)
2. Press the travel-speed/vibration switch to the slow, travel-speed position (vibration Off); refer to the Travel-speed/Vibration Switch (page 15).
3. Press the engine-speed switch to the slow position; refer to the Engine-speed Switch (page 15).

   Note: If the engine has been working hard or is hot, allow the machine to run at the slow-engine speed setting for a 1 or 2 minutes before turning the ignition key off. This helps cool the engine before it is stopped. In an emergency, stop the engine immediately.
4. Rotate the key switch counterclockwise to the Off position; refer to the Key Switch (page 14).

Stopping the Engine—Remote-control Mode

These instructions describe how to stop the engine with the radio-control transmitter under normal operating circumstances.

1. On the radio-control transmitter, press the slow, travel-speed button (vibration Off); refer to the Travel Speed Buttons (page 17).

   Note: If the engine has been working hard or is hot, allow the machine to run for a 1 or 2 minutes before turning the ignition key off. This helps cool the engine before it is stopped. In an emergency, stop the engine immediately.
2. On the radio-control transmitter, press the emergency-stop/power-off button (the red button); refer to the Emergency-stop/Power-Off Button (page 17).

Note: Store the radio-control transmitter in a safe, dry place (the transmitter storage compartment under the rear hood).

Emergency Stop—Manual Mode

Important: The emergency stop button on the control panel will stop the engine in both the manual mode and the remote-control mode.

This instruction describe how to stop the engine at the control panel in an emergency circumstance.

At the control panel, press the Emergency Stop button down; refer to the Emergency Stop Button (page 15).

Note: Pull the emergency stop button up to resume normal machine operation.

Emergency Stop—Remote-control Mode

Important: The emergency stop button on the control panel will stop the engine in both the manual mode and the remote-control mode.

This instruction describe how to stop the engine with the radio-control transmitter in an emergency circumstance.

At the radio-control transmitter, press the Emergency Stop/Power off button (the red button); refer to the Emergency-stop/Power-Off Button (page 17).

Stopping the Machine

Never park the machine on a hill.

⚠ CAUTION

A child or untrained bystander could attempt to operate the machine and be injured.

Remove the key from the switch when leaving the machine, even if just for a few seconds.

Important: Do not park the machine for an extended period in a trench, ditch, or low-lying area that might fill with water. Lift or move the machine to a level, well drained surface.

Stopping the Machine—Manual Mode

1. Release both of the traction controls refer to Traction Controls (page 16).
2. Stop the engine; refer to Stopping the Engine—Manual Mode (page 27).
3. Set the parking brake; refer to Using the Parking Brake (page 28).
4. Remove the key from the key switch.

Stopping the Machine—Remote-control Mode

Important: To avoid depleting the battery of the machine, select the mode switch to the manual-mode position when stopping the machine.

1. Release all the traction-control buttons; refer to the Traction-control Buttons (page 17).
2. Stop the engine; refer to Stopping the Engine—Remote-control Mode (page 27).

3. Select the mode switch on the control panel to the manual mode position; refer to the Mode Switch (page 14).
4. Set the parking brake; refer to Using the Parking Brake (page 28).
5. Remove the key from the key switch.

Using the Parking Brake

⚠ WARNING

Failure to set the parking brake when the machine is left unattended could cause damage to the machine or cause an injury to the operator or bystanders.

Always set the parking brake before leaving the machine.

Failure to disengage the parking brake before moving the machine may cause damage to the parking brake or the machine or both. Release the parking brake before moving the machine.

Setting the Parking Brake

Important: Whenever possible, park the machine on a firm, level surface.

Important: The plunger for the parking brake must be on the against the side of the drum pad and the surface of the drum.

1. Set the machine to manual mode; refer to Moving the Machine—Manual Mode (page 31).
2. Set the engine-speed switch to the slow, engine-speed position, refer to the Engine-speed Switch (page 15).
3. Set the travel speed to the slow-travel/vibration-off position; refer to the Travel-speed/Vibration Switch (page 15).
4. Using the traction controls, center the parking brake between 2 drum pads; refer to the Traction Controls (page 16).
5. Pull the brake knob of the parking brake out slightly and rotate the knob approximately 90° clockwise or unit the plunger is released (Figure 29).

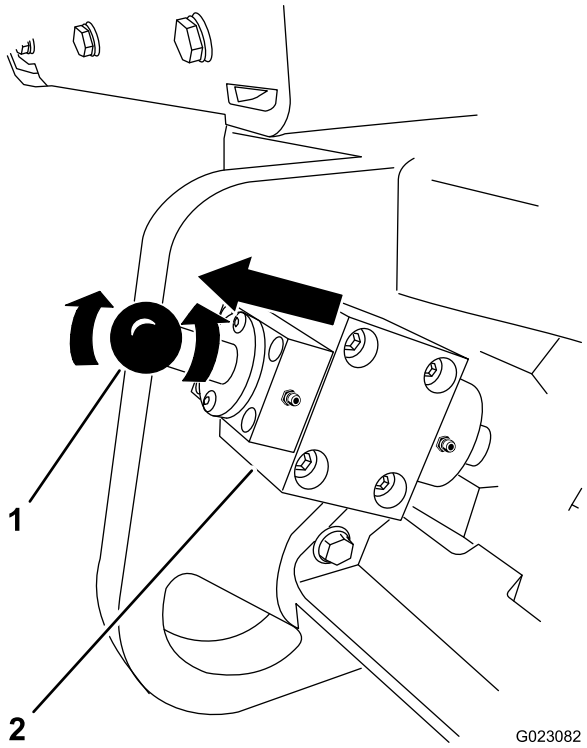


Figure 29

1. Knob
2. Parking brake

6. Gently release the brake knob of the parking brake, allowing it to retract into the parking brake housing, until the plunger is resting against the side of the drum pad and the surface of the drum (Figure 31, Figure 30, Figure 33, and Figure 32).
7. Align the pad of the drum and the plunger of the parking brake by moving the machine forward or backward as follows:
   - For a machine that is parked **downhill**—align the side of the drum pad that is **rotating upward** against the side of the plunger of the parking brake (Figure 31 and Figure 30).

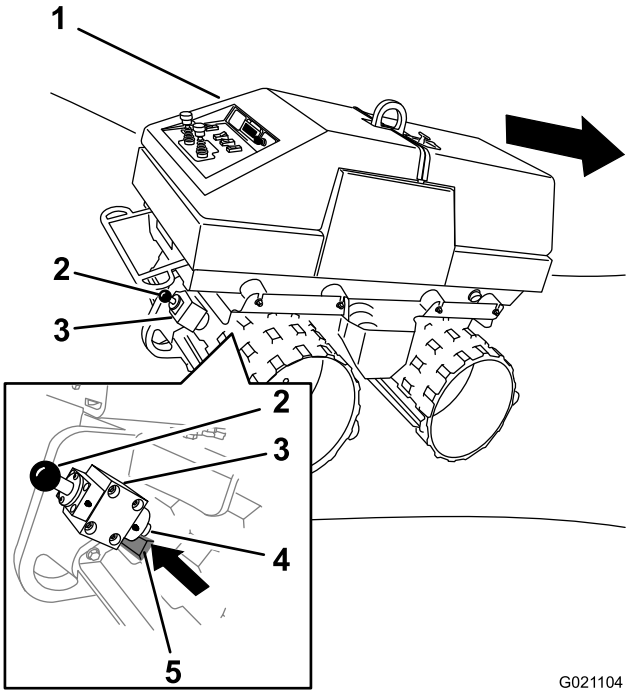


Figure 30

1. Parked machine—downhill
2. Brake knob
3. Parking brake
4. Plunger
5. Drum pad (downhill position)

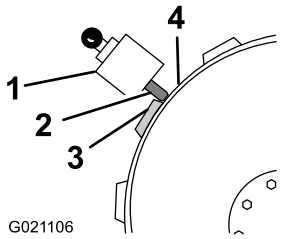


Figure 31

1. Parking brake
2. Plunger
3. Drum pad rotating upward (parking the machine downhill)
4. Drum surface

- For a machine that is parked **uphill**—align the side of the drum pad that is **rotating downward** against the side of the plunger of the parking brake (Figure 33 and Figure 32).

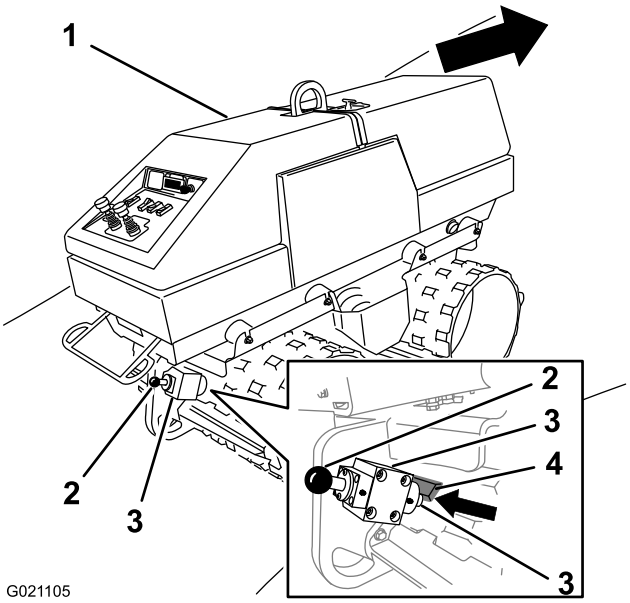


Figure 32

1. Parked machine—uphill
2. Brake knob
3. Parking brake
4. Plunger
5. Drum pad (uphill position)

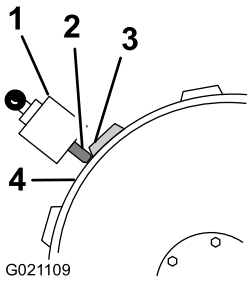


Figure 33

1. Parking brake
2. Plunger
3. Drum pad rotating downward (parking the machine uphill)
4. Drum surface

8. Stop the engine and remove the key.

Releasing the Parking Brake

Note: When the parking brake is released, the plunger is in the up-lock position, approximately 12.7 mm (1/2 inch) above the drum pads.

1. Pull the parking brake handle out fully and rotate the handle approximately 90° clockwise or until it snaps into the up-lock position (Figure 29).
2. Gently release the parking brake handle, allowing it to retract until the parking brake is resting in the retract detent (Figure 30 and Figure 32).

Moving a Non-functioning Machine

Important: **Do not tow or pull a non-functioning machine. Retrieve and transport the machine using lifting equipment, refer to Lifting the Machine (page 30) and Preparing the Machine for Transport (page 30).**

Important: **Do not allow a non-functioning machine to remain located in a trench, ditch, or low-lying area that might fill with water. Lift the non-functioning machine and locate it on a level, well drained surface.**

Lifting the Machine

Important: **Ensure the lifting equipment has a 2110 Kg (4650 lb) vertical lift capacity.**

Important: **Never lift a machine with the engine running.**

Lift the machine using the lift ring (Figure 34) as follows:

1. Stop the engine; refer to Starting and Stopping the Engine (page 26).
2. Ensure that the forward hood and rear hood are closed and latched.
3. Connect the lift rigging to the lift ring on the machine (Figure 34), and lift the machine.

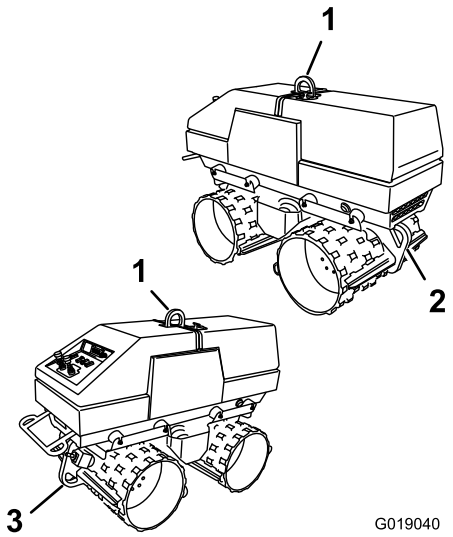


Figure 34

1. Lift Ring
2. Forward, tie-down ring
3. Rear, tie-down ring

Preparing the Machine for Transport

Important: **Ensure that the transport vehicle is rated for a 1406 Kg (3100 lb) load and has tie-down points.**

- **Lift the machine** onto a transport vehicle; refer to Lifting the Machine (page 30).
- **Drive the machine** on a transport vehicle.

⚠ DANGER

You can lose of control of the machine when driving it on ramps onto or off of the transport vehicle when left-hand and right-hand drums have unequal traction.

Ensure that the ramps and drums provide equal traction to the left-hand and right-hand sides of the machine.

Important: **Use ramps that have a 2110 Kg (4650 lb) capacity and a solid, continuous-traction surface.**

Important: **The ramp used to support the machine while loading it onto the transport vehicle cannot exceed 55% (29°) angle limit of the machine; refer to the Tilt Chart (page 8).**

Note: Do not operate or drive the machine on the roadway.

1. Set the machine to the slow-travel speed (vibration Off); refer to the Travel-speed/Vibration Switch (page 15) and the Travel Speed Buttons (page 17).
2. Set the engine speed to the fast, engine-speed position; refer to the Engine-speed Switch (page 15).
3. Drive the machine onto the transport vehicle.
4. Stop the engine; refer to Starting and Stopping the Engine (page 26).
5. Secure the machine to the transport vehicle using blocking and load binders between the anchor rings on the transport vehicle and the tie-down rings on the machine (Figure 35).

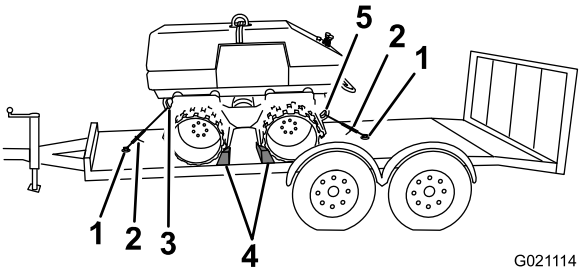


Figure 35

1. Anchor ring
2. Load binder
3. Forward, tie-down ring
4. Blocking
5. Rear, tie-down ring

6. Ensure that the ramps are secure before transporting the machine.

Moving and Vibrating Operation

⚠ CAUTION

Trenches without wall support can collapse and trap equipment and personnel. In trenches without wall supports, operate the machine in the remote-control mode.

Important: Use the slow, travel-speed setting for the following operations:

- **When moving the machine up, down, or across slopes.**
- **When moving the machine in and out of trenches.**
- **When moving the machine around corners.**
- **When loading the machine on to the transport vehicle.**
- **When unloading the machine from the transport vehicle.**

Moving the Machine Across a Slope

⚠ CAUTION

If the machine tips over, engine oil can flood the cylinders; starting the machine after a tip-over event will cause damage to the engine. Follow the instructions for recovering the machine after a tip-over event; refer to Recovering the Machine After a Tip-over Event (page 34).

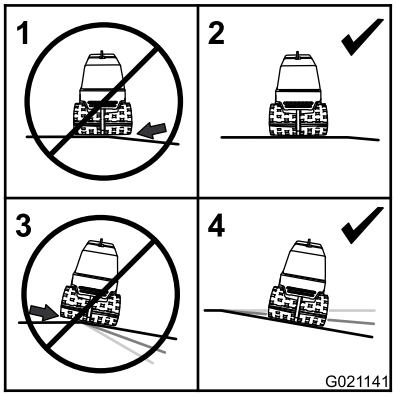


Figure 36

1. Do not move the machine across an incline where the machine is partially on the plane.
2. Move the machine across when fully on the plane.
3. Do not move the machine across an incline where the machine is partially on the slope
4. When necessary, move the machine across an incline where the machine is fully on a slope of 18% (10°) or less.

Moving the Machine—Manual Mode

Use the traction controls to move the machine forward or backward, and turn the machine left or right.

⚠ CAUTION

Do not operate the machine with the parking brake engaged. Failure to disengage the parking brake may cause damage to the parking brake or the machine or both.

Important: When moving and steering the machine, keep both hands on the traction-control levers.

1. Start the engine using the manual mode; refer to Starting the Engine—Manual Mode (page 26).
2. Select the engine-speed switch to the fast, engine-speed position; refer to the Engine-speed Switch (page 15).
3. Select a travel-speed/vibration switch position for the following operations:

   Refer to the Travel-speed/Vibration Switch (page 15)

   - Move the machine forward: slow-travel speed or fast-travel speed.
   - Move the machine backward: slow-travel speed.
   - Turn the machine: slow-travel speed.
4. Disengage the parking brake; refer to Releasing the Parking Brake (page 29).
5. Move and steer the machine by doing the following:
   - To **stop** the movement or turning of the machine, return the levers to the neutral (default) position (Figure 37).

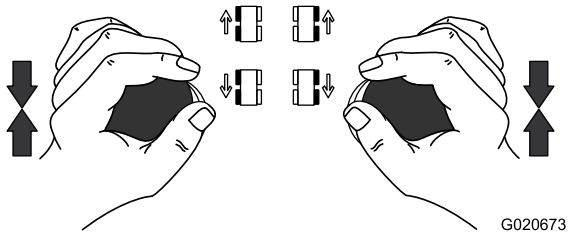


Figure 37

- To move the machine **forward**, grasp the both traction-control levers with your hands and push both levers forward (Figure 38).

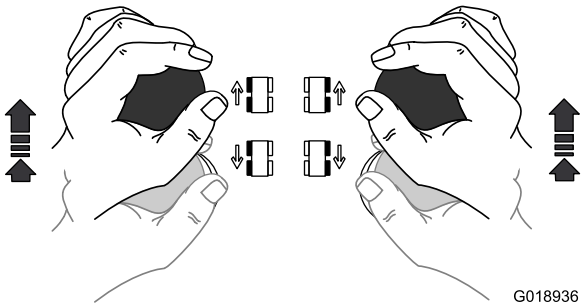


Figure 38

- To move the machine **backward**, grasp the traction-control levers with your hands and pull back on both levers. To stop the machine, return the levers to the neutral position (Figure 39).

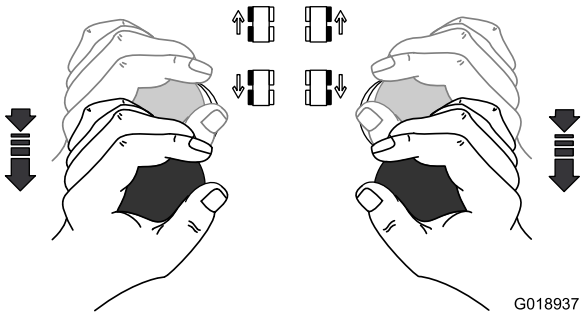


Figure 39

- To turn the machine **left**, grasp the both traction-control levers with your hands and pull the left, traction-control lever backward, and push the right, traction-control lever forward (Figure 40).

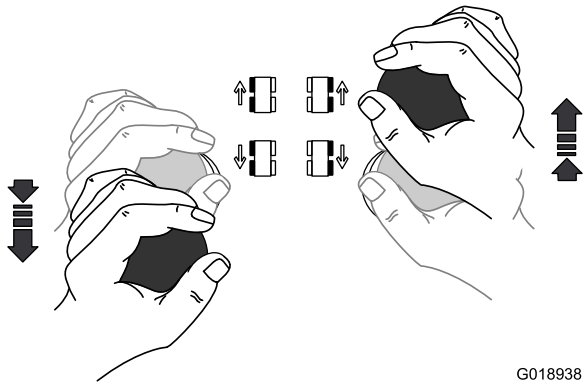


Figure 40

- To turn the machine **right**, grasp the both traction-control levers with your hands and push the left, traction-control lever forward, and pull the right, traction-control lever backward (Figure 41).

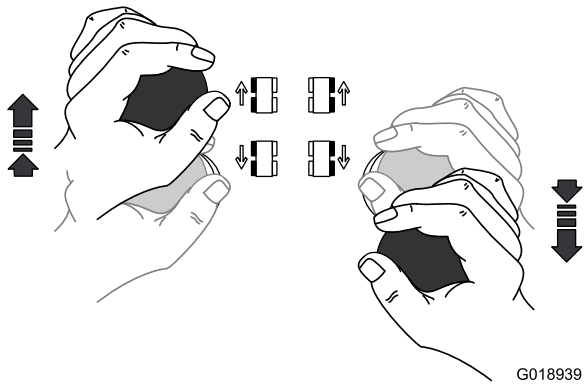


Figure 41

Moving the Machine—Remote-control Mode

The traction-control buttons for moving the machine in the forward or backward direction (straight, left or right) are located on the remote-control transmitter. Use the remote-control transmitter to move and steer the machine as follows:

Important: To stop the movement of the machine, release the traction-control button.

1. Start the engine using the remote-control mode; refer to Starting the Engine—Remote-control Mode (page 26)

   Note: The engine speed is automatically controlled by the microprocessor on the machine. The engine will crank over and operate at the slow-engine speed for one second, and then automatically accelerate the engine to the fast-engine speed.

2. Select the travel-speed/vibration buttons for the following operations:

   Refer to Travel-speed/Vibration Switch (page 15)

- Move the machine forward: slow or fast, travel-speed button.
- Move the machine backward: slow, travel-speed button.
- Turn the machine: slow, travel-speed button.

3. Perform the following steps to move and control the machine direction of travel:

   Note: The buttons must be pushed and held down to move the machine.

   - To **stop** the movement or turning of the machine, release the traction button(s).
   - To move the machine **forward**, press and hold the left, forward-traction button and the right, forward-traction button (Figure 42).

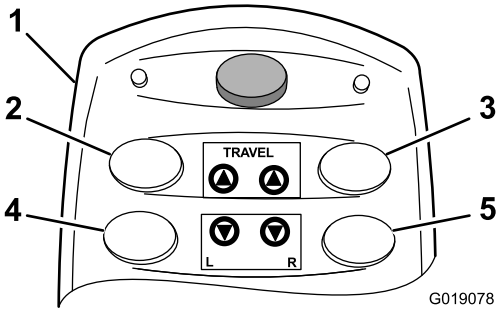


Figure 42

1. Remote-control transmitter
2. Left, forward-traction button
3. Right, forward-traction button
4. Left, reverse-traction button
5. Right, reverse-traction button

   - To move the machine **backward**, press and hold the left, reverse-traction button and the right, reverse-traction button (Figure 42).
   - To turn the machine **left**, press and hold the left, reverse-traction button and the right, forward-traction button (Figure 42).
   - To turn the machine **right**, press and hold the left, forward-traction button and the right, reverse-traction button (Figure 42).

Vibrating Operation

Move and steer the machine to align it to the site location; refer to Moving the Machine—Manual Mode (page 31) or Moving the Machine—Remote-control Mode (page 32).

- When operating in the **Manual mode** (control panel) start the vibration function by perform the following:

  1. Select the engine-speed switch to the fast, engine-speed position (Figure 43).

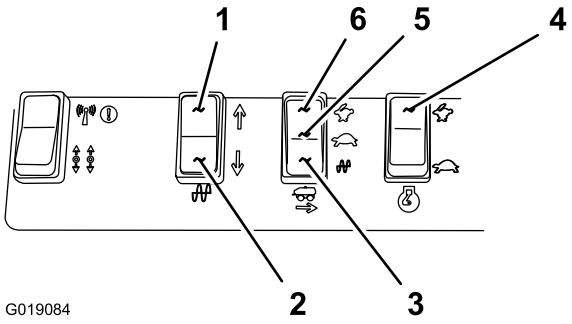


Figure 43

1. Vibration-direction switch—forward
2. Vibration-direction switch—reverse
3. Travel-speed/vibration switch—vibration On
4. Engine-speed switch—fast
5. Travel-speed/vibration switch—slow
6. Travel-speed/vibration switch—fast

  2. Select a vibration direction as follows:
     - Start the vibration function in the forward direction by pressing the vibration direction switch forward (Figure 43).
     - Start the vibration function in the reverse direction by pressing the vibration direction switch backward (Figure 43)

3. Select the travel-speed/vibration switch to the vibration On position (fully backward).
4. Steer the machine using the traction controls; refer to Moving the Machine—Manual Mode (page 31).
5. Stop the vibration function by selecting travel-speed/vibration switch to the slow-travel speed (fully forward) position, or to the middle position (fast-travel speed).

- When operating in the **Remote-control mode** (remote-control transmitter) start the vibration function by perform the following:
  1. Select a vibration direction as follows:
     - Start the vibration function in the forward direction by pressing and releasing the forward-vibration button (Figure 44).
     - Start the vibration function in the reverse direction by pressing and releasing the reverse-vibration button (Figure 44)

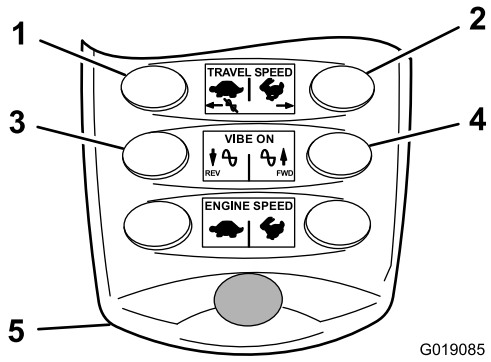


Figure 44

1. Slow, travel-speed button
2. Fast, travel-speed button
3. Forward-vibration button
4. Reverse-vibration button
5. Remote-control transmitter

  2. Steer the machine using the traction control buttons; refer to Moving the Machine—Remote-control Mode (page 32).
  3. Stop the vibration function by select either selecting the slow, travel-speed button or the fast, travel-speed button.

Recovering the Machine After a Tip-over Event

Retrieving the Machine

1. Connect the lifting equipment to the one of the following lifting points for the following rollover event.
   - The machine is on its side:
     A. Secure the lifting equipment to the lifting ring of the machine (Figure 45); refer to Lifting the Machine (page 30).

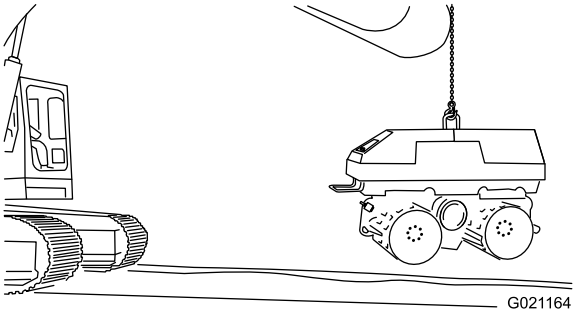


Figure 45

     B. Slowly raise the lifting equipment to rotate the machine so the top of the machine is up (Figure 45).

     Note: When lifting the machine, ensure that it does not swing excessively.

   - The machine is upside down:

     Note: Recovering a machine that is upside down requires 2 units of lifting equipment.

     A. Attach the first unit of lifting equipment to the forward or rear tie-down ring (Figure 46).

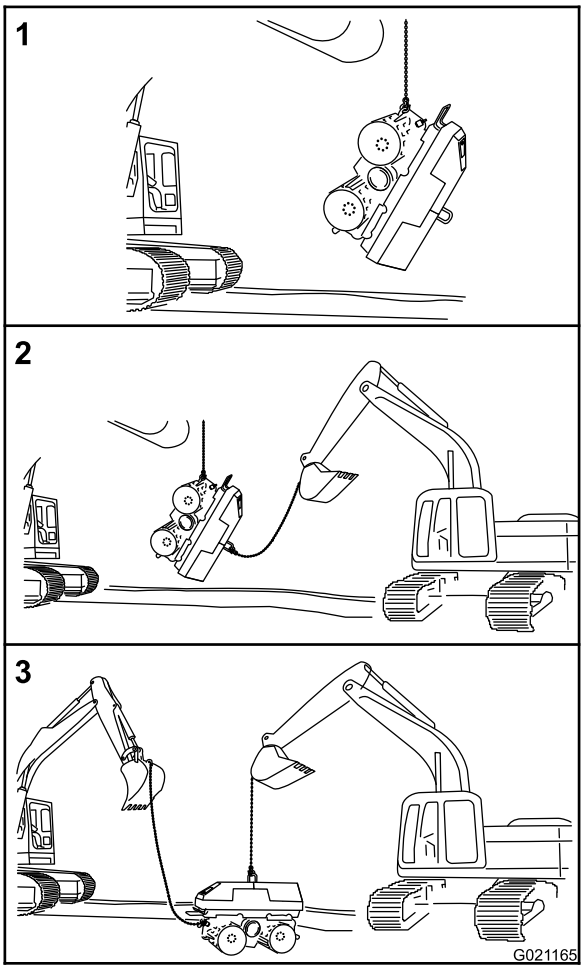


Figure 46

B. Slowly raise the lifting equipment to rotate the machine vertical (Figure 46).

C. Attach the second unit of lifting equipment to the lifting ring (Figure 46); refer to Lifting the Machine (page 30).

D. Transfer the weight of the machine from the first unit of lifting equipment to the second lifting unit (Figure 46).

Note: The machine should be aligned with the top up.

2. Move the machine to a level surface.
3. Lower the machine and disconnect the lifting equipment (Figure 46).
4. Clean any debris from the exhaust duct, oil-cooler duct, control panel, and the forward and side grills; refer to Removing Debris from the Machine (page 57).
5. Inspect the machine for damage.

Important: Repair damage to the machine before operating it.

Note: Closely inspect the anti-crush bar, control panel, parking brake, and the hydraulic lines for the motor on the eccentric.

6. Check the engine, air-filter element by looking at the pleats of the element while shining a bright light on the inside of the filter.

Note: Replace the air-filter element if it is covered with oil, dirt, or dust; refer to Servicing the Air Filter (page 42).

Removing the Fuel Injectors

1. Open the forward hood.
2. Close the fuel-shutoff valve (Figure 23).
3. Clean any dirt and debris from the engine.

Note: Ensure that no dirt is on the cylinder head area near the fuel injectors.

4. Remove the bolt, washer, and clamp that secures the fuel hose to the top-forward side of the forward-cylinder head.

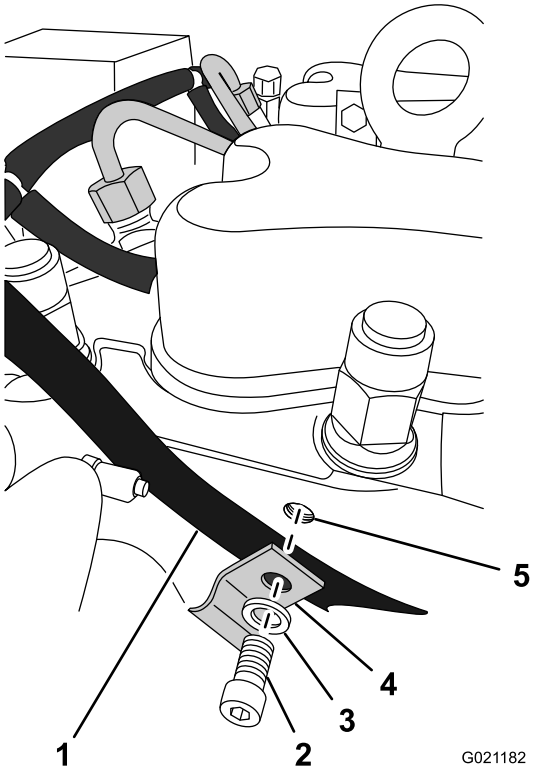


Figure 47

1. Fuel hose
2. Bolt
3. Washer
4. Clamp
5. Forward-cylinder head

5. Remove the bolt and nut that secure the fuel-tube clamp to the support bracket, and remove the clamp.

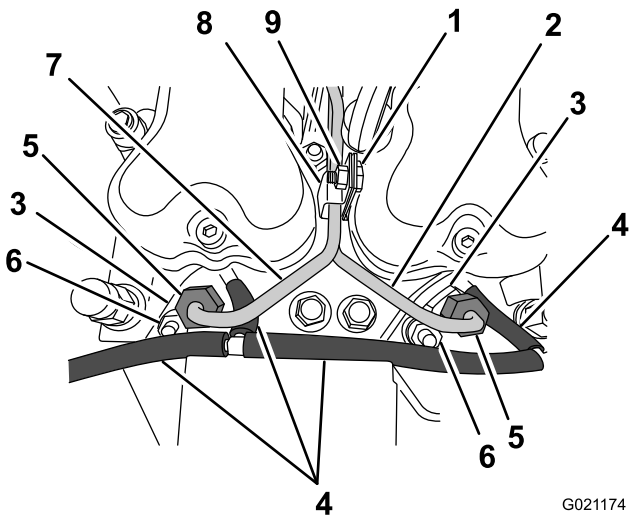


Figure 48

1. Bolt
2. Forward-fuel tube
3. Retainer
4. Rubber hose
5. Tube nut
6. Retainer nut
7. Rear fuel tube
8. Clamp
9. Nut (6 mm)

6. Loosen the tube nuts for both of the fuel injectors (Figure 48 and Figure 49).

7. Pull the fuel tubes away from the fuel injectors.
8. Remove the retainer nuts, washers, lock washers, and retainers that secure the fuel injectors to the cylinder head (Figure 49).

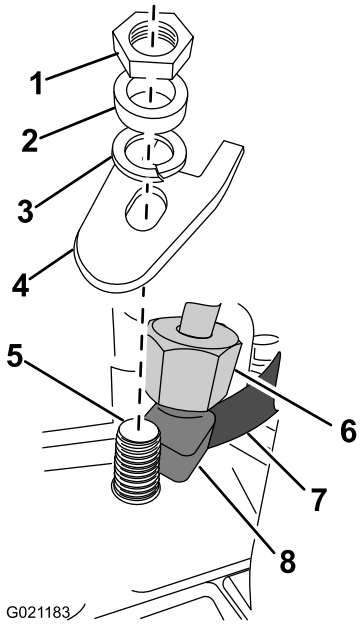


Figure 49

1. Retainer nut
2. Washer
3. Lock washer
4. Retainer
5. Stud
6. Tube nut
7. Fuel hose
8. Injector

Note: Do not remove the rubber hoses from the injectors.

9. Using a twisting and pulling motion, remove the **rear-fuel injector** from the cylinder head (Figure 50).

Note: If necessary, remove the cable ties that secure the fuel hose.

Note: Secure the fuel-injector gaskets for installation in step 1-A of Installing the Fuel Injectors (page 36).

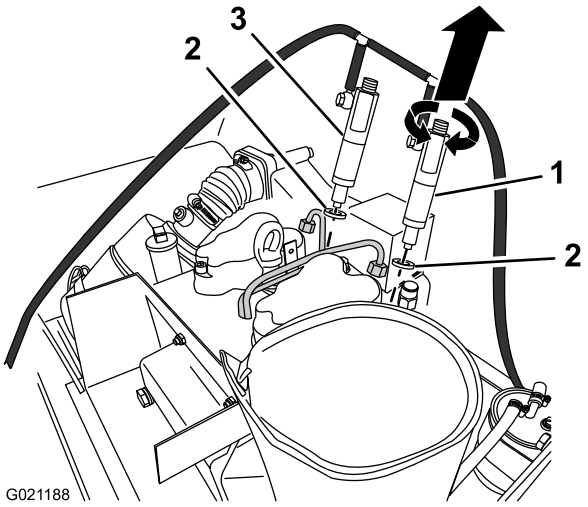


Figure 50

1. Rear-fuel injector

10. Using a twisting and pulling motion, remove the **forward-fuel injector** from the cylinder head (Figure 50).

Purging the Cylinders of Oil

1. Wrap the end of the fuel tubes and the fuel injectors with a clean rag.

   Note: These rags will protect the tubes and injectors from contamination.

2. Loosely pack rags into the cylinder-head area of the fuel injector holes.

   Note: These rags will absorb the oil that is ejected from the cylinder.

   Important: Stand away from the engine.

3. Select the engine-speed switch to the slow, engine-speed position.
4. Use the key switch to crank the engine for 3 seconds.
5. Replace any oil-soaked rags at the area of the fuel injector holes.
6. Repeat steps 4 and 5 until oil stops ejecting from the fuel injector holes.
7. Remove the rags from the fuel-injector holes and the fuel injectors.

Installing the Fuel Injectors

1. Install the fuel injectors as follows:
   A. Install the gaskets around the bottom tips of the fuel injectors.

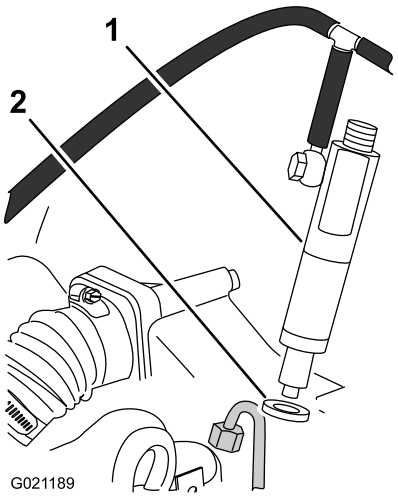


Figure 51

1. Fuel injector
2. Gasket

B. Install the forward-fuel injector into the cylinder head.

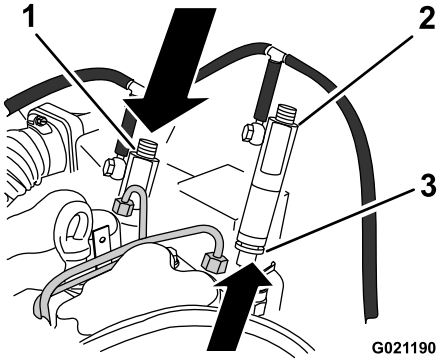


Figure 52

1. Forward-fuel injector
2. Rear-fuel injector
3. Gasket

C. Install the rear-fuel injector into the cylinder head .

Important: Ensure that the fuel injectors are fully seated into the cylinder head.

D. Install the retainers, washers, lock washers, and nuts that were removed in step 8 of Removing the Fuel Injectors (page 35).

E. Torque the retainer nuts to 23 N-m (17 ft-lb).

F. Align the fuel tubes over the fuel injectors.

G. Thread the fuel-tube nuts onto the fuel injectors.

H. Secure the fuel tubes to the support bracket with the clamp, bolt, and nut that were removed in step 5 of Removing the Fuel Injectors (page 35).

I. Tighten the fuel-tube nuts to 25 N-m (19 ft-lb).

J. Secure the fuel hose to the top-forward side of the forward-cylinder head with the bolt, washer, and clamp removed in step 4 of Removing the Fuel Injectors (page 35).

2. Check the level of the engine oil; refer to Checking the Engine Oil Level (page 24).
3. Check the hydraulic fluid level; refer to Checking the Hydraulic Fluid Level (page 25).
4. Open the fuel-shutoff valve (Figure 23).
5. Prime the fuel system; refer to Priming the Fuel System (page 22).
6. Select the engine-speed switch to the slow, engine-speed position.
7. Start the engine, refer to Starting and Stopping the Engine (page 26).

   Note: The engine may initially produce blue-white smoke while it runs.
8. Run the engine in the following order:
   A. slow-engine-speed for 2 minutes
   B. fast-engine-speed for 5 minutes
   C. slow-engine-speed for 1 minute
   D. stop the engine.

Note: Refer to the Engine-speed Switch (page 15) and Stopping the Engine—Manual Mode (page 27).

Maintenance

Recommended Maintenance Schedule(s)

Maintenance Service Interval	Maintenance Procedure
After the first 25 hours	• Change the engine oil and filter.
After the first 50 hours	• Replace the hydraulic filter.
Before each use or daily	• Check the engine oil level. • Check the hydraulic fluid level. • Service the air filter, housing and cover for the engine. • Remove debris from the machine. • Check for loose fasteners.
Every 40 hours	• Grease the machine (Grease immediately after every washing). • Replace the air filter of the engine (more frequently if conditions are dusty or sandy). • Tighten the engine mounting hardware. • Clean the cooling system.
Every 100 hours	• Change the engine oil and filter. • Replace the fuel filter/water separator canister. • Check the battery cable connections. • Replace the hydraulic filter or when the hydraulic-filter gauge indicates Caution (yellow) or Service Filter (red). • Check the hydraulic lines for leaks, loose fittings, kinked lines, loose mounting supports, wear, weather, and chemical deterioration. • Check the isolators. • Check for accumulation of dirt and debris in the chassis.
Every 250 hours	• Check and clean the fuel injectors.
Every 350 hours	• Change the eccentric lubrication.
Every 400 hours	• Check the fuel lines and connections for deterioration, damage, or loose connections.
Every 800 hours	• Change the hydraulic fluid.
Every 1,500 hours	• Replace all moving hydraulic hoses.
Monthly	• Check the battery voltage.
Yearly	• Drain the fuel tank.
Yearly or before storage	• Touch up chipped paint.

⚠ WARNING

After operating the machine, the muffler, engine, and engine shroud are hot and can burn you if touched.

Allow all components in the engine compartment to cool before preforming any maintenance on the machine.

⚠ CAUTION

If you leave the key in the ignition switch, someone could accidently start the engine and seriously injure you or other bystanders.

Remove the key from the ignition before you do any maintenance.

Important: Refer to your *Engine Manual* for additional maintenance procedures.

Note: Determine the left and right sides of the machine from the normal operating position.

Premaintenance Procedures

Before preforming maintenance on the machine, perform the following steps:

1. Park the machine on a level surface.
2. Set the parking brake.
3. Stop the engine and remove the key; refer to Starting and Stopping the Engine (page 26).
4. Allow the engine to cool.

Lubrication

Greasing the Machine

Service Interval: Every 40 hours—Grease the machine (Grease immediately after every washing).

Grease Type: Lithium-based grease.

1. Open the forward and rear hoods.
2. Clean the grease fittings with a rag.
3. Connect a grease gun to the fittings (Figure 53).

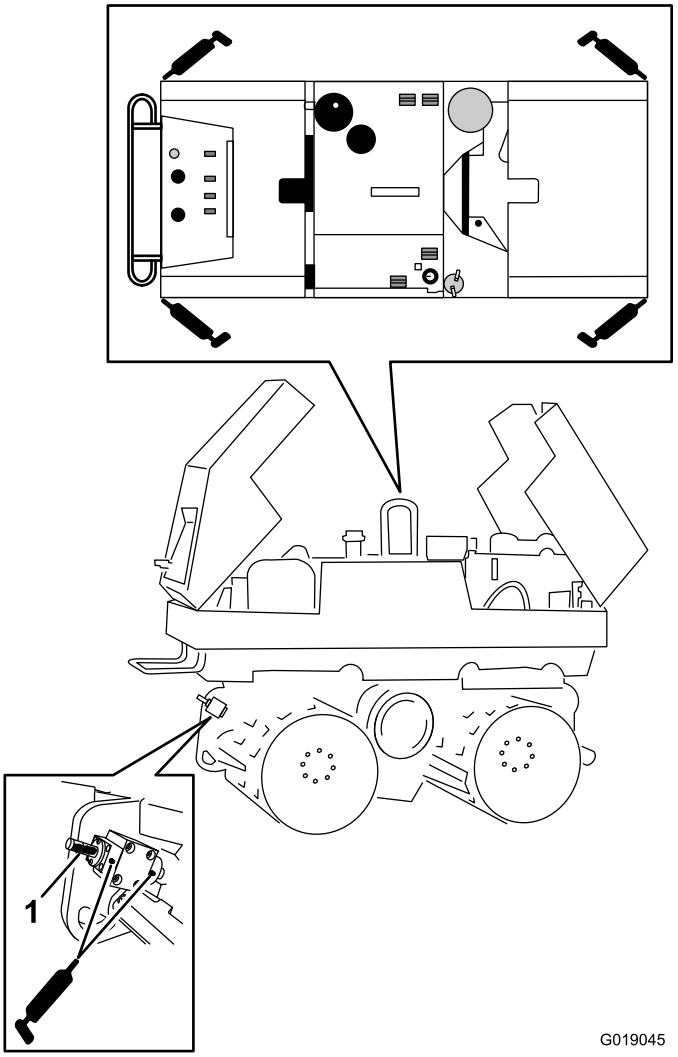


Figure 53

1. Brake handle

4. Pump grease into the grease fittings until grease begins to ooze out of the bearings (approximately 3 pumps).
5. Clean off any excess grease with a rag.
6. Close the forward and rear hoods.

Engine Maintenance

Changing the Engine Oil and Filter

Service Interval: After the first 25 hours—Change the engine oil and filter.

Every 100 hours—Change the engine oil and filter.

Note: Change oil and oil filter more frequently when operating conditions are extremely hot or dusty.

Oil Type: Detergent, diesel-engine oil (all trademark oils which fulfil at least one of the following specifications: **ACEA**-B2/E2 or higher, or **API** service CH-4 or higher)

Crankcase Capacity: 1.9 L (2 qt)

Viscosity: Refer to Figure 54.

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

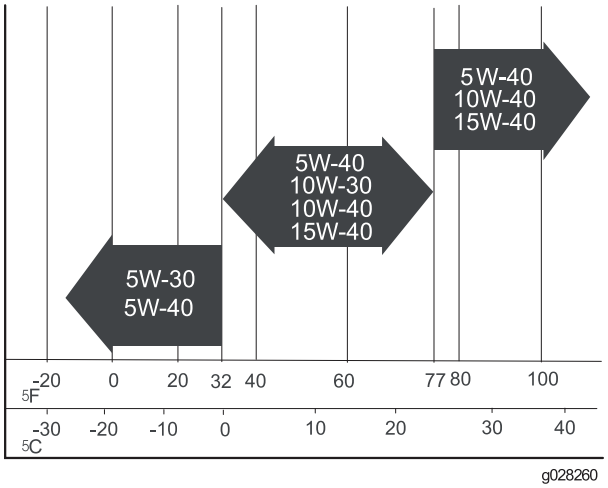


Figure 54

Draining the Engine Oil

⚠ CAUTION

Components will be hot if the machine has been running. If you touch hot components you may be burned.

Allow the machine to cool before performing maintenance or touching components under the hood.

Prepare to drain the engine oil as follows:

1. Open the forward hood.
2. At the left-front area of the engine, locate the drain hose that is attached to the engine oil drain valve.

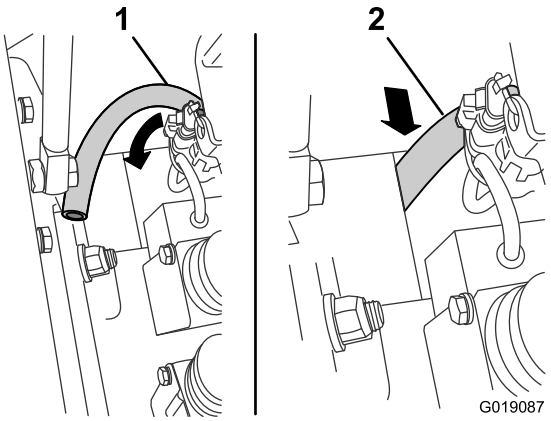


Figure 55

1. Engine oil drain hose (stowed position)
2. Engine oil drain hose (drain position)

3. Move the free end of the hose from the stowed position, out the opening at the bottom of the engine compartment, and to the drain position.

   Note: The drain hose should be aligned below the front grill.

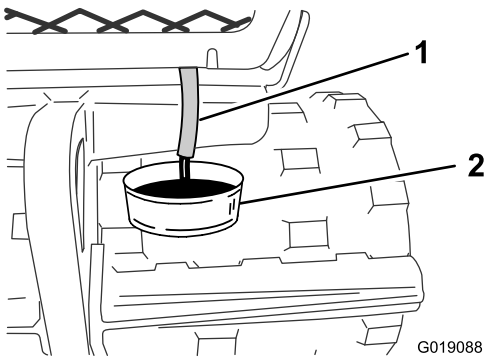


Figure 56

1. Engine oil drain hose (drain position)
2. Drain pan

4. Start the engine and allow it to run at the slow-engine speed for five minutes; refer to Starting and Stopping the Engine (page 26) and Engine-speed Switch (page 15).

   Note: Warming the engine oil allows it to drain better.

5. Stop the engine and remove the key.
6. Place a drain oil pan below the oil drain hose.

   Note: Use a drain pan with a 3 L (3.17 qt) capacity or more.

Drain the engine oil as follows:

⚠ CAUTION

Hot engine components can cause injury. Use caution when opening and closing the oil-drain valve.

1. Locate the oil-drain valve at the front, bottom area of the engine (Figure 57).
2. Rotate the lever for the drain valve counterclockwise to the open position. (Figure 57).

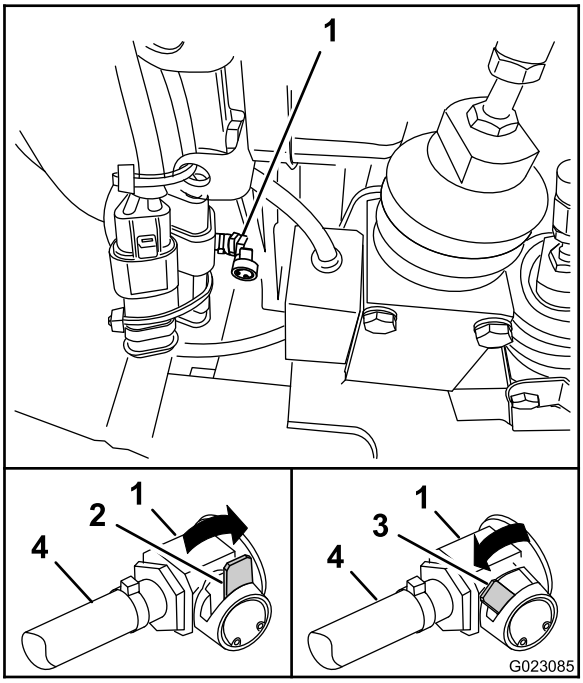


Figure 57

1. Oil-drain valve
2. Lever (closed position)
3. Lever (open position)
4. Drain hose

3. When the oil has completely drained from the engine, rotate the lever on the drain valve clockwise to the closed position (Figure 57).

   Note: Dispose of the used oil at a certified recycling center.
4. Wipe the end of the drain hose, pull the hose into the engine compartment, and place it in the stowed position (Figure 55).
5. Change the oil filter; refer to Changing the Oil Filter (page 41).

Changing the Oil Filter

1. Place a shallow pan or rag under the filter to catch oil (Figure 58).

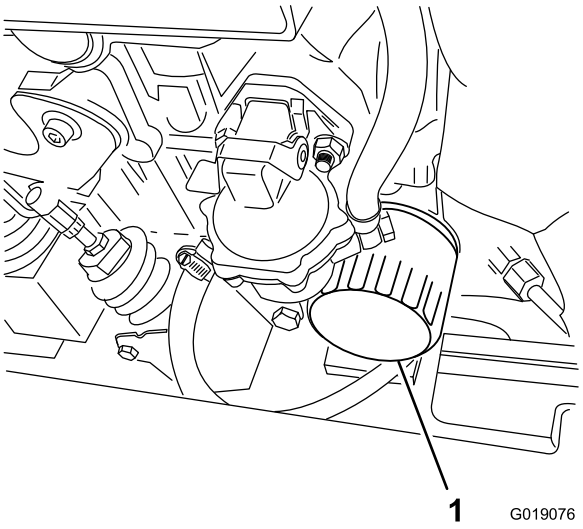


Figure 58

1. Engine oil filter

2. Rotate the oil filter counterclockwise and remove the old filter (Figure 58).

   Note: Dispose the used oil filter at a certified recycling center.
3. On the engine, wipe the sealing surface of the filter adapter clean with a rag.
4. Prepare the new oil filter as follows:
   A. Pour new oil of the proper type through the center hole of the filter until the oil reaches the bottom of the threads.
   B. Allow a minute or two for the oil to be absorbed by filter material, then pour off the excess oil.
   C. Apply a thin coat of new oil to the rubber gasket on the replacement filter.
5. Install the replacement oil filter to the filter adapter. Turn the oil filter clockwise until the rubber gasket contacts the filter adapter, then tighten the filter an additional 1/2 turn (Figure 58).
6. Fill the crankcase with the specified oil; refer to Engine Oil and Hydraulic Fluid (page 24).

Filling the Engine with Oil

Engine oil capacity: 0.95 L (2 qt)

1. Clean around the oil-filler cap, and remove the cap.
2. Slowly pour approximately 0.76 L (1.5 qt) of the specified oil in through the oil-filler neck (Figure 59).

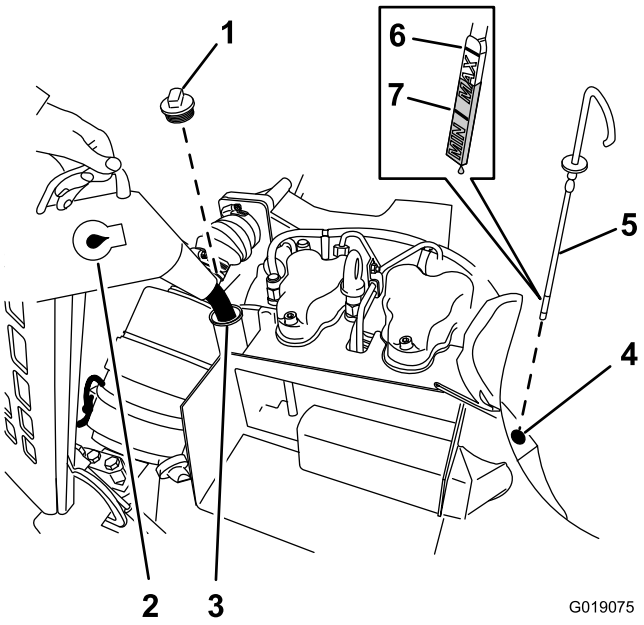


Figure 59

1. Oil-filler cap
2. Engine oil
3. Oil-filler neck
4. Dipstick fitting
5. Dipstick
6. Max-oil level
7. Min-oil level

3. Check the engine oil level as follows:
   A. Clean around the oil dipstick and dipstick fitting.
   B. Pull out the dipstick and wipe the metal end clean.
   C. Slide the dipstick fully into the dipstick fitting.
   D. Pull the dipstick out and look at the metal end.
   E. If the oil level is below the Min-level mark on the dipstick, slowly pour enough oil into the oil-fill tube to raise the level on the dipstick to between the Min- and Max-oil level (Figure 59).

      Important: Do not overfill the crankcase with oil.

   F. Install the oil filler cap in the filler neck (Figure 59).
   G. Insert the dipstick into the dipstick fitting, and seat the dipstick firmly.
4. Start the engine and allow it to run at the slow-engine speed for 2 minutes; refer to Starting the Engine—Manual Mode (page 26) and Engine-speed Switch (page 15).
5. Stop the engine and wait for 2 minutes; refer to Stopping the Engine—Manual Mode (page 27).
6. Repeat steps 3-B through 3-G.
7. Close the hood.

Servicing the Air Filter

Important: Prevent engine damage by always operating the machine with the air filter and cover installed.

Servicing the Air Filter, Housing, and Cover

Service Interval: Before each use or daily—Service the air filter, housing and cover for the engine.

1. Open the forward hood.
2. Check the air-filter housing and air-intake boot for damage. Check the entire intake system for damage, signs of leaks, and loose hose clamps.

   Note: Repair or replace damaged components before operating the machine.
3. Release the latches on the air-filter cover and pull it off of the air filter housing (Figure 60).

   Important: Do not remove the air filter.

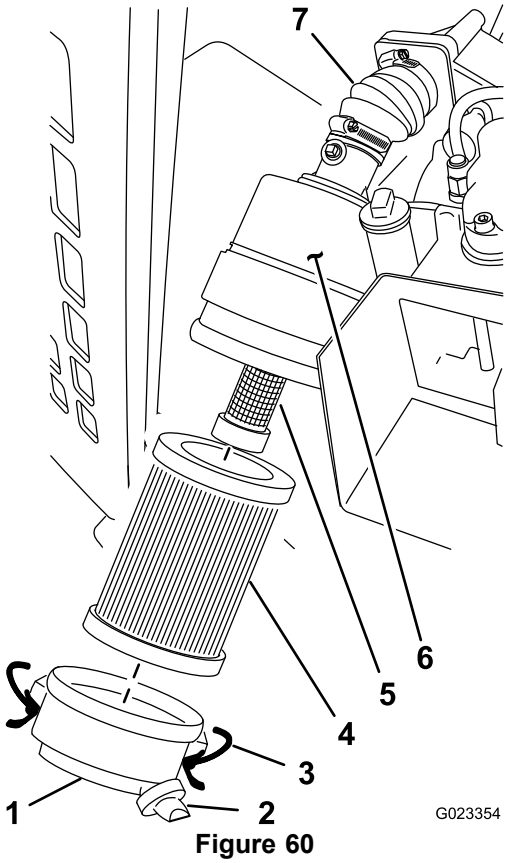


Figure 60

1. Air-filter cover
2. Dust cap
3. Latch
4. Primary-air filter
5. Secondary-air filter
6. Air-filter housing
7. Air-intake boot

4. Squeeze the dust cap sides to open it and knock the dust out.
5. Clean the inside of the air-filter cover with compressed air.
6. Check the visible portion of the exterior air filter surface.
   - If the filter surface is clean, perform the following:
     A. Install the air filter cover with the dust cap facing down and back, and secure the latches on the filter cover (Figure 60).

        Note: Ensure that the cover is seated correctly and seals with the air filter housing.

     B. Close the forward hood.
   - If the filter surface is dirty, replace the air filter as described in Replacing the Air Filter (page 43).

Replacing the Air Filter

Service Interval: Every 40 hours—Replace the air filter of the engine (more frequently if conditions are dusty or sandy).

1. Release the latches on the air-filter cover and pull it off of the air-filter housing (Figure 60).
2. Gently remove the primary-air filter from the air-filter housing (Figure 60).

   Note: Avoid knocking the filter into the side of the housing.

   Important: Do not attempt to clean the air filter.
3. Gently remove the secondary-air filter from the air-filter housing (Figure 60).
4. Inspect the new filter elements and the rubber seal for damage.

   Note: If the filter is damaged, install a new air filter that is undamaged.
5. Install the secondary-air filter into the air-filter housing (Figure 60).

   Important: Do not press on the soft, inside area of the filter.

   Note: Ensure that it is centered in the housing and fully seated by pushing on the outer rim of the filter while installing it.
6. Install the primary-air filter into the air-filter housing (Figure 60).

   Important: Do not press on the soft, inside area of the filter.

   Note: Ensure that it is centered in the housing and fully seated by pushing on the outer rim of the filter while installing it.
7. Install the air-filter cover with the dust cap facing down and back, and secure the latches on the filter cover (Figure 60).

   Note: Ensure that the cover is seated correctly and seals with the air filter housing.
8. Close the forward hood.

Engine Hardware

Tightening the Engine Mounting Hardware

Service Interval: Every 40 hours—Tighten the engine mounting hardware.

Tighten the 4 nuts and 4 bolts that secure the engine to the upper frame to 68 N-m (50 lb-ft); refer to Figure 61 and Figure 62.

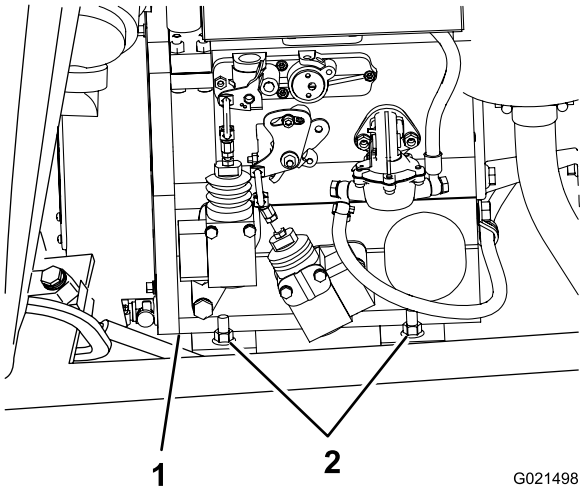


Figure 61

1. Engine (left side)
2. Nut (engine mounting)

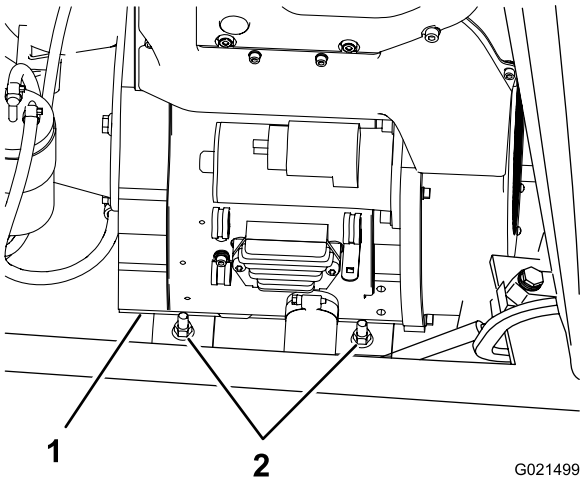


Figure 62

1. Engine (right side)
2. Nut (engine mounting)

Fuel System Maintenance

⚠ DANGER

Under certain conditions, diesel fuel and fuel vapors are highly flammable and explosive. A fire or explosion from fuel can burn you and others and can cause property damage.

- **Use a funnel and fill the fuel tank outdoors, in an open area, when the engine is off and is cold. Wipe up any fuel that spills.**
- **Do not fill the fuel tank completely full. Add fuel to the fuel tank until the level is 6 to 13 mm (1/4 to 1/2 inch) below the bottom of the filler neck. 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 a clean, safety-approved container and keep the cap in place.**

Replacing the Fuel Filter/Water Separator Canister

Service Interval: Every 100 hours/Monthly (whichever comes first)—Replace the fuel filter/water separator canister.

Removing the Fuel Filter/Water Separator

1. Open the forward hood.
2. Locate the fuel-shutoff valve at the right-lower corner of the fuel tank (Figure 63).

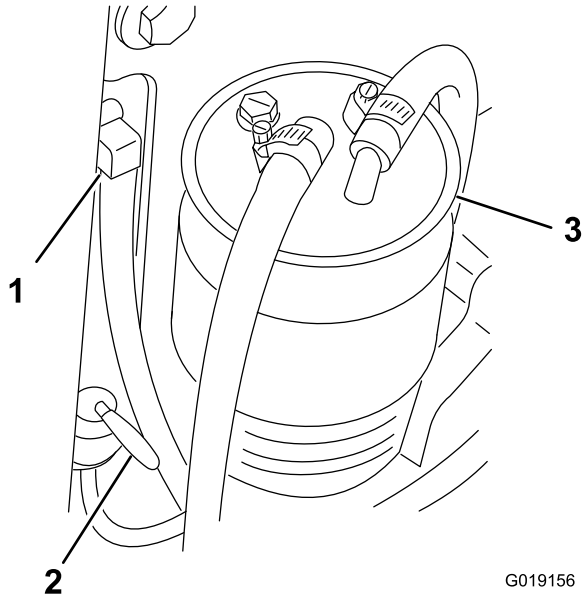


Figure 63

1. Fuel return line
2. Fuel-shutoff valve
3. Fuel/water separator

3. Rotate the handle of the fuel-shutoff valve to the Off position (Figure 63).
4. Locate the fuel filter/water separator canister on the right-forward side of the heat shield for the fuel tank (Figure 64).

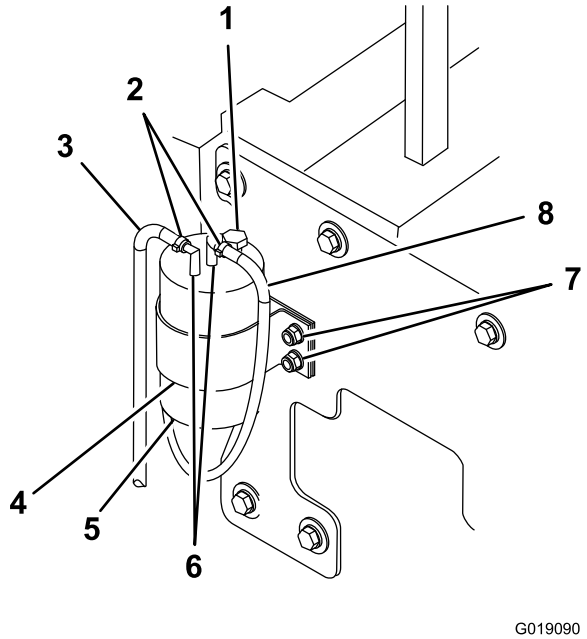


Figure 64

1. Hex-head plug
2. Hose clamps
3. Fuel outlet hose
4. Canister Strap
5. Fuel filter/water separator canister
6. Fittings
7. Nuts
8. Fuel inlet hose

5. Clean the area where the filter canister mounts.

6. Loosen the hose clamps that secure the 2 fuel lines (Figure 64).
7. Loosen the 2 nuts that secure the canister strap and the filter/separator canister to the studs on the fuel tank heat shield (Figure 64).

Installing the Fuel Filter/Water Separator

1. Remove the hex-head plug from the replacement fuel filter/water separator (Figure 65).

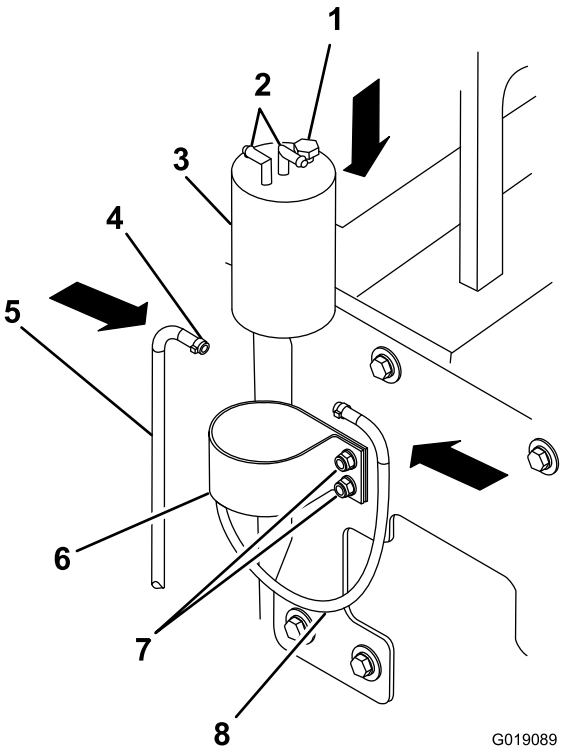


Figure 65

1. Hex-head screw
2. Fittings
3. Fuel filter/water separator canister
4. Hose clamp
5. Fuel outlet hose
6. Canister Strap
7. Nuts
8. Fuel inlet hose

2. Fill the replacement filter/water separator with clean, fresh fuel.
3. Apply PTFE thread-sealing tape to the threads of the hex-head plug and install the plug in the replacement filter separator.
4. Remove the old filter/separator canister from the straps.
5. Install the replacement canister in straps with the hex-head plug toward the heat shield (Figure 65).
6. Tighten the nuts that secure the filter/separator canister and strap to the heat shield (Figure 65).
7. Transfer the hoses and clamps, one at a time, from the old filter/separator canister to the replacement canister. Slide the hoses over the fittings of a new filter/separator canister (Figure 65).
8. Tighten the hose clamps.
9. Drain and discard the old filter.

   Note: Dispose the used fuel filter at a certified recycling center.
10. Rotate the handle of the fuel-shutoff valve to the On position (Figure 63).
11. Close the forward hood.

Draining the Fuel Tank

Service Interval: Yearly

Draining the Fuel Tank

1. Ensure that the engine and exhaust system is cool.
2. Open the both hoods.
3. Remove the right-side panel; refer to Removing the Right-Side Panel (page 54).
4. Place a waste-fuel container with a 11.5 L (3 US gallons) capacity under drain valve at the right-lower corner of the fuel tank (Figure 66).

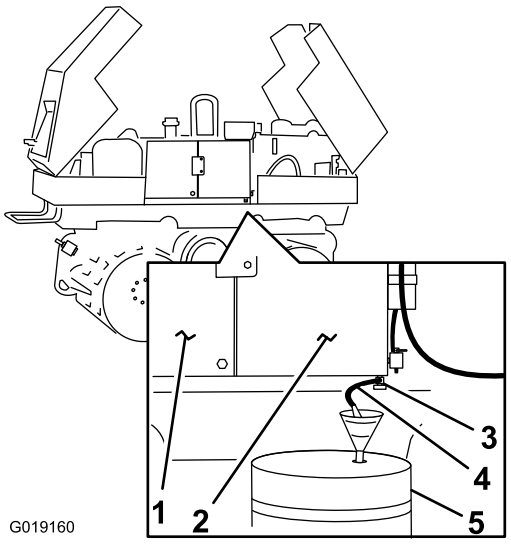


Figure 66

1. Hydraulic tank
2. Fuel tank
3. Drain valve (fuel tank)
4. 6 mm (1/4 inch) fuel-resistant hose
5. Waste-fuel container

5. Slip a fuel-resistant hose with a 6 mm (1/4 inch) inside diameter over the fitting of the drain valve (Figure 66).

   Note: Ensure that the fuel resistant hose is long enough to reach the waste fuel container.

6. Place the free end of the hose into the waste fuel container (Figure 66).
7. Open the drain valve and allow the tank to empty.
8. Close the drain valve and remove the hose that was attached to the valve in step 5 (Figure 66).

   Note: Dispose of the drained fuel at a certified recycling center.

9. Install the right-side panel; refer to Installing the Right-Side Panel (page 55).
10. Close the both hoods.

Fuel Lines and Fuel Injectors

Checking the Fuel Lines and Connections

Service Interval: Every 400 hours/Yearly (whichever comes first)

Note: Contact your Toro Authorized Service Dealer for assistance in fixing damaged fuel lines.

1. Inspect the fuel lines and connections for deterioration, damage, or loose connections.
2. Inspect the fuel lines and connections for leaks.
3. Tighten any loose connections.

Servicing the Fuel Injectors

Service Interval: Every 250 hours

Contact your Toro Authorized Service Dealer maintenance of the fuel injection system.

Electrical System Maintenance

Servicing 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.

Important: The machine is equipped with a dry-cell battery. Automotive (wet-cell) batteries are not designed to withstand severe vibration or being inverted. Do not replace the dry-cell battery of this machine with an automotive (wet-cell) battery.

Always keep the battery clean and fully charged. Use a paper towel to clean the battery case. If the battery terminals are corroded, clean them with a solution of four parts water and one part baking soda. Apply a light coating of grease to the battery terminals to reduce corrosion.

The machine-electrical system is 12 volt.

Checking the Battery Voltage of the Machine

Service Interval: Monthly—Check the battery voltage.

1. Insert the machine key into the key switch and rotate the key switch to the Run position.
2. Wait 5 minutes, and note the voltage shown on the LED display.

   Note: Refer to the battery charge table to determine the charge state of the battery.

Battery Charge-state Table

Volts	Battery State
12.7 and above	100% charge
12.7–12.6	85–100% charge
12.6–12.4	75–85% charge
12.4–12.2	50–75% charge
12.2–12.0	25–50% charge
Below 12.0	Fully discharged

Checking the Battery Cable Connection

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

Check that the battery cable clamps are secure to the positive and negative battery terminals.

Charging the Battery

⚠ WARNING

Charging the battery produces gasses that can explode.

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

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

1. Clean the exterior of the battery case and the battery posts.

   Note: Connect the leads of the battery charger to battery posts before connecting the charger to the electrical source.

2. Look at the battery and identify the positive and negative battery posts.
3. Connect the positive lead of the battery charger to the positive-battery post (Figure 67).

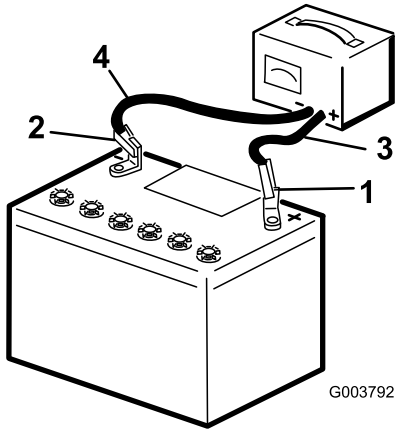


Figure 67

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

4. Connect the negative lead of the battery charger to the negative-battery post (Figure 67).
5. Connect the battery charger to the electrical source.

   Important: Do not overcharge the battery.

   Note: Charge the battery a shown in battery charging table.

Battery-charger Table

Charger setting	Charging time
4 to 6 amperes	30 minutes
25 to 30 amperes	10 to 15 minutes

6. When the battery is fully charged, unplug the charger from the electrical source, then disconnect the charger leads from the battery posts (Figure 67).
7. Connect the positive (red) and negative (black) battery cables.

Jump Starting the Battery

⚠ DANGER

Jump starting a weak battery that is cracked, frozen, has low electrolyte level, or an open/shorted battery cell, can cause an explosion resulting in serious personal injury.

Do not jump start a weak battery if these conditions exist.

⚠ WARNING

Batteries contain acid and produce explosive gases.

- **Shield the eyes and face from the batteries at all times.**
- **Do not lean over the batteries.**

⚠ CAUTION

Corrosion or loose connections can cause unwanted electrical voltage spikes at anytime during the jump starting procedure.

Do not attempt to jump start with loose or corroded battery terminals or damage to the engine may occur.

⚠ CAUTION

Connecting the jumper cables incorrectly (wrong polarity) can immediately damage the electrical system.

Be certain of battery terminal polarity and jumper cable polarity when hooking up batteries.

Note: The following instructions are adapted from the SAE J1494 Rev. Dec. 2001 – Battery Booster Cables –

Surface Vehicle Recommended Practice (SAE – Society of Automotive Engineers).

These instructions are for negative ground systems only.

Ensure the following conditions are met before jump starting the machine:

- The electrical systems of both machines have same rated voltage.
- The machines do not touch.
- The electrical systems of both machines are switched off.

1. Check the weak battery for terminal corrosion (white, green, or blue "snow"), it must be cleaned off prior to jump starting. Clean and tighten battery cable connections as necessary.
2. Make sure the battery of the booster machine is in good condition and fully charged to 12.6 volts or greater.

   Note: Use 4 to 6 AWG (American Wire gauge) jumper cables with short lengths to reduce voltage drop between systems.

   Ensure that the cables are color coded or labeled for the correct polarity.
3. Connect the positive (+) cable to the positive (+) terminal of the discharged battery that is wired to the starter or solenoid as shown in Figure 68.

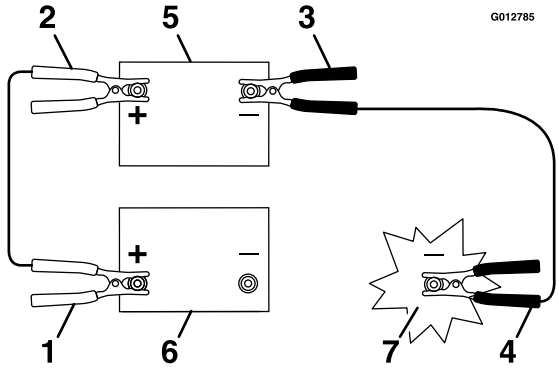


Figure 68

1. Positive (+) cable on discharged battery
2. Positive (+) cable on booster battery
3. Negative (–) cable on the booster battery
4. Negative (–) cable on the engine block
5. Booster battery
6. Discharged battery
7. Engine block

4. Connect the other end of the positive cable to the positive terminal of the booster battery.
5. Connect the black negative (–) cable to the other terminal (negative) of the booster battery.
6. **Make the final connection on the engine block of the stalled machine (not to the negative battery post) and away from the battery. Stand Back.**
7. Start the stalled machine and remove the cables in the reverse order of connection (the engine block (black) connection is the first to disconnect).

Electrical and Electronic

Diagnostic Light Codes

Important: Keep the remote-control receiver and transmitter dry.

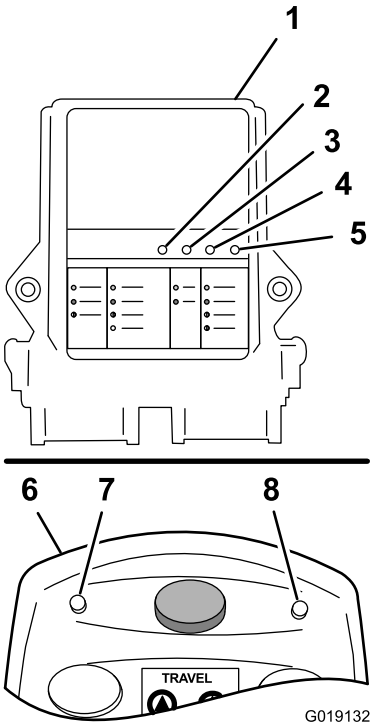


Figure 69

1. Remote-control receiver
2. Emergency-stop light
3. Function or fault light
4. Link light
5. Status light
6. Remote-control transmitter
7. Battery light (red)
8. Active light (yellow)

The following table explains the diagnostic codes for the indicator lights of the remote-control receiver:

Remote–control Receiver Diagnostic Codes Table

Light	System	Condition
Green (steady)	Emergency stop	Active
Red (steady)	Emergency stop	Inactive
Flashing red	Emergency stop	Fault
Green (steady)	Function or Fault	Function On (no fault)
Red (steady)	Function or Fault	Short to ground or over current
Flashing red	Function or Fault	Short to supply
Not lit	Function or Fault	No function On
Green (steady)	Link	Connected
Red (steady)	Link	No link
Green (steady)	Status	OK
Red (steady)	Status	Fault
Green (flashing)	Status	Low battery
Red (flashing)	Status	Internal fuse open (blown)
Red and green (flashing together)	Link and status	Setup failure

The following table explains the diagnostic codes for the indicator lights of the remote-control transmitter:

Remote-control Transmitter Diagnostic Codes Table

Light	Flash rate	Condition
Yellow (active)	Medium	Normal operation. The light will remain illuminated momentarily when a function button is pressed or released.
	Slow	Download mode (not used)
Red (battery)	Slow	The transmitter battery is low
	Fast (10 seconds)	Transmitter failure
Yellow (active) and Red (battery)	Fast (together)	Configuration mode (not used)
	Slow (together)	Stuck button detected
	Slow (after power down)	Unit still powered

Replacing the Radio-Control Transmitter Batteries

The radio-control transmitter features a light that indicates the battery power in the transmitter is low. The light is located to the right of the link/start button (Figure 70).

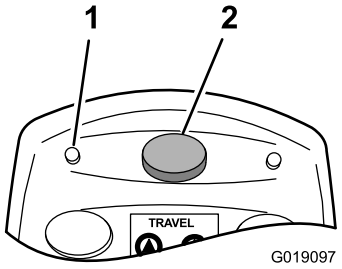


Figure 70

1. Battery light
2. Link / start button (green button)

If the low-battery light (red) for the radio-control transmitter is illuminated, change the batteries as follows:

Note: Use 4 AA batteries (1.5 volt).

1. Loosen the 4 screws that secure the battery cover from the back of the radio-control transmitter, and remove the cover (Figure 71).

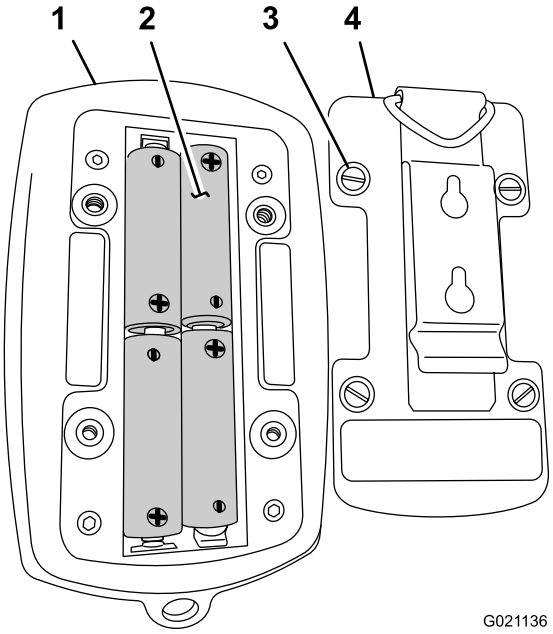


Figure 71

1. Remote-control transmitter (back side)
2. AA battery
3. Screw
4. Battery cover

2. Remove the depleted batteries.

   Note: Dispose of batteries in accordance with relevant Federal, state, and local laws.

3. Insert the replacement batteries (Figure 71).

4. Install the battery cover to the transmitter and secure with the 4 screws (Figure 71) loosened in step 1.

Servicing the Fuses

The electrical system is protected by 3 fuses. The electrical system typically requires no maintenance; however, if a fuse blows, check the component/circuit for a malfunction or a short. Figure 72 shows the fuse positions in the junction box.

Note: If the machine will not start, either the ECM (electronic-control module) or the radio-control receiver fuse could be open (blown).

Service the fuses as follows:

1. Stop the engine and remove the key.
2. Open the rear hood; refer to Opening the Hood (page 24).
3. Remove the positive battery cable from the battery.
4. Locate the junction box in the right side of the compartment.
5. Remove the 8 bolts that secure the auxiliary panel to the junction box. Remove the auxiliary panel and gasket (Figure 72).

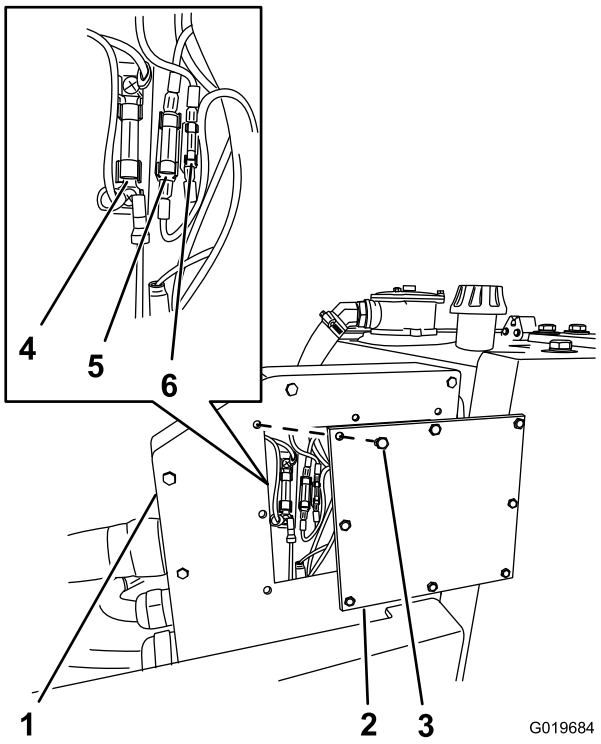


Figure 72

1. Junction box
2. Auxiliary panel
3. Bolt
4. 30 Amp fuse, electronic control module (+12 volt)
5. 10 Amp fuse, radio (ground)
6. 1 Amp fuse, radio (+12 volt)

6. Check the fuses for damage or an open circuit (blown); refer to Figure 72.

   Note: Replace fuses as needed.
7. Install the auxiliary panel to the junction box using the 8 bolts removed in step 5 (Figure 72).
8. Install the positive battery cable to the battery.
9. Close the rear hood; refer to Closing the Hood (page 24)

Cooling System Maintenance

Servicing the Cooling System

⚠ DANGER

Rotating shaft and fan can cause personal injury.

- **Do not operate the machine without the covers in place.**
- **Keep fingers, hands and clothing clear of rotating fan and drive shaft.**
- **Shut off the engine and remove the ignition key before performing maintenance.**

Cleaning Cooling System

Service Interval: Every 40 hours—Clean the cooling system.

Clean the cooling system at each scheduled maintenance. Perform the following steps to clean the air inlet screens and engine cooling fins of the cooling system:

1. Wash the machine with soapy water.
2. Rinse off mud and dirt with water.
3. Blow off dirt and debris from the engine with pressurized air (30 psi maximum).

Hydraulic System Maintenance

Replacing the Hydraulic Filter

Removing the Hydraulic Filter

Service Interval: After the first 50 hours—Replace the hydraulic filter.

Every 100 hours—Replace the hydraulic filter or when the hydraulic-filter gauge indicates Caution (yellow) or Service Filter (red).

⚠ DANGER

The breather/cap is designed to pressurize the hydraulic tank to 34.5 kPa (5 psi). Built-up pressure can cause injury.

Loosen the cap slowly whenever adding fluid or maintaining the hydraulic system.

⚠ CAUTION

Built-up hydraulic pressure can cause personal injury or burns.

Before disconnecting any hydraulic lines, be sure the engine is off and relieve all pressure from the hydraulic system.

Important: Do not substitute an automotive oil filter or severe hydraulic system damage may result.

Note: Refer to the Hydraulic-filter Gauge (page 19).

1. Open the rear hood.
2. Bleed the pressure from the hydraulic tank as follows:
   A. Place a rag over the hydraulic tank breather/cap, and slowly turn the cap counterclockwise to remove the breather/cap (Figure 73).

      Note: The tank pressure will vent to the atmosphere.

   B. Install the breather/cap (Figure 73).

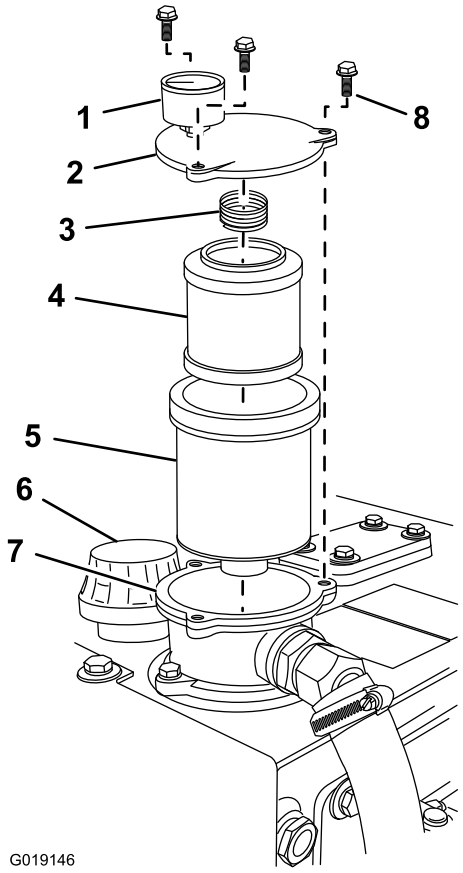


Figure 73

1. Hydraulic-filter gauge	4. Filter element	7. Filter housing
2. Filter cover	5. Filter bowl	8. Hex-head bolt
3. Spring	6. Breather/cap	

⚠ CAUTION

Built-up hydraulic pressure can cause personal injury or burns.

Ensure that the hydraulic-filter gauge indicates 0 kPa (0 psi) before removing the filter cover from the filter housing.

3. Remove the hydraulic filter as follows:
   A. Remove the 3 hex-head bolts that secure the filter cover to the filter housing (Figure 73).
   B. Remove the filter cover, spring, filter element, and filter bowl (Figure 73).

   Note: Dispose the used filter element at a certified recycling center.

Installing the Hydraulic Filter

1. Install the filter as follows:
   A. Wipe the filter bowl clean with a clean, lint-free cloth.
   B. Install the filter bowl into the filter housing Figure 73.
   C. Apply a thin coat of the specified hydraulic fluid to the surface of the gasket on the new filter element; refer to the hydraulic fluids listed in Changing the Hydraulic Fluid (page 53).
   D. Install the new filter element into the filter bowl (Figure 73).
   E. Install the spring (Figure 73).
   F. Align the filter cover to the filter housing, and align the hydraulic filter gauge adjacent to the breather/cap on the hydraulic tank (Figure 73).
   G. Thread the 3 hex head screws that were remove in step A of Removing the Hydraulic Filter (page 51) through the filter cover and into the filter housing (Figure 73).
   H. Torque the screws to 9.9 N-m (7 ft-lb).
2. Check the hydraulic fluid level in the tank; refer to Hydraulic-tank Gauge (page 19).

   Note: If the fluid level is low, add hydraulic fluid; refer to Checking the Hydraulic Fluid Level (page 25).

⚠ WARNING

Hydraulic fluid escaping under pressure can penetrate skin and cause injury. Fluid injected into the skin must be surgically removed within a few hours by a doctor familiar with this form of injury or gangrene may result.

- **Keep your body and hands away from pin hole leaks or nozzles that eject high pressure hydraulic fluid.**
- **Use cardboard or paper to find hydraulic leaks, never use your hands.**

3. Start the engine and check that the hydraulic filter gauge is in the normal range; refer to Checking the Hydraulic Fluid Level (page 25)
4. Check that there no hydraulic leaks.
5. Stop the engine; refer to Starting and Stopping the Engine (page 26).
6. Close the rear hood.

Changing the Hydraulic Fluid

Service Interval: Every 800 hours/Yearly (whichever comes first)—Change the hydraulic fluid.

Hydraulic Fluid Specification:

Note: Use only one of the following fluids in the hydraulic system.

- **Toro Premium Transmission/Hydraulic Tractor Fluid** (refer to your Authorized Toro Dealer for more information)
- **Toro Premium All Season Hydraulic Fluid** (refer to your Authorized Toro Dealer for more information)
- If either of the above Toro fluids are not available, you may use **Mobilfluid 424** multipurpose tractor lubricant .

Important: Always use the correct hydraulic fluid. Unspecified fluids will damage the hydraulic system.

Note: The hydraulic fluid specifications must fall within the listed range for all of the following material properties and the fluid should meet the listed industry standards.

Toro will not assume responsibility for damage caused by improper substitutions, so use only products from reputable manufacturers who will stand behind their recommendations.

Hydraulic Fluid Table

Material Properties	
Viscosity, ASTM D445	cSt at 40° C (104 ° F): 55 to 62
	cSt at 110° C (230° F): 9.1 to 9.8
Viscosity index, ASTM D2270	140 to 152
Pour Point, ASTM D97	-37 to -43° C (-35 to -46° F)
Industry Standards	
API GL-4, AGCO Powerfluid 821 XL, Ford New Holland FNHA-2-C-201.00, Kubota UDT, John Deere J20C, Vickers 35VQ25 and Volvo WB-101/BM.	

Note: Many hydraulic fluids are almost colorless, making it difficult to spot leaks. A red dye additive for the hydraulic system oil is available in 20 ml (2/3 fl oz) bottles. One bottle is sufficient for 15 to 22 L (4 to 6 US gallons) of hydraulic oil. Order part no. 44-2500 from your Authorized Toro Dealer.

1. Ensure that the engine and exhaust system is cool.
2. Open the both hoods.
3. Remove the right-side panel; refer to Removing the Right-Side Panel (page 54).
4. Drain the hydraulic tank as follows:
   A. Place a rag over the hydraulic tank breather/cap, and remove the cap.
   B. Place a waste oil container with a 57 L (15 US gallons) capacity under the drain plug at the right-lower side of the hydraulic tank (Figure 76).

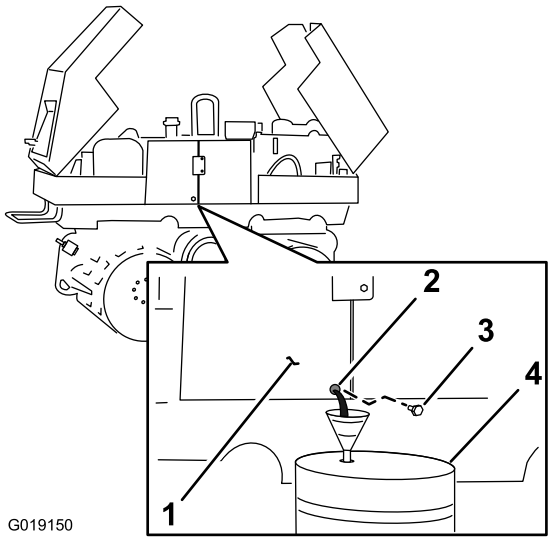


Figure 74

1. Hydraulic tank
2. Drain-plug hole
3. Drain plug
4. Waist-oil container

   C. Remove the drain plug and allow the hydraulic fluid to drain into the container (Figure 76).

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

   D. Clean the drain plug and apply PTFE thread-sealing tape to the threads.
   E. When the hydraulic oil is drained from the tank, install the drain plug in the drain plug hole, and tighten (Figure 76).
5. Fill the hydraulic tank as follows:
   A. Fill the hydraulic tank with approximately 49 L (13 US gallons) of Toro Premium Transmission/Hydraulic Tractor Fluid or an equivalent; refer to Hydraulic-tank Gauge (page 19).
   B. Install the hydraulic tank breather/cap.
   C. Start the engine and let it run for a 1 or 2 minutes.
   D. Stop the engine and check for hydraulic fluid leaks.
   E. Check the hydraulic fluid level. If necessary, add hydraulic fluid until the fluid level indicates a 6.35–12.5 mm (0.25–0.50 inch) air bubble seen at the top of the sight gauge; refer to Checking the Hydraulic Fluid Level (page 25).
6. Install the right-side panel; refer to Installing the Right-Side Panel (page 55).
7. Close the both hoods.

Checking the Hydraulic Lines

Service Interval: Every 100 hours—Check the hydraulic lines for leaks, loose fittings, kinked lines, loose mounting supports, wear, weather, and chemical deterioration. (Repair all damaged hydraulic lines before operating the machine.)

Every 1,500 hours/Every 2 years (whichever comes first)—Replace all moving hydraulic hoses.

⚠ WARNING

Hydraulic fluid escaping under pressure can penetrate skin and cause injury. Fluid injected into the skin must be surgically removed within a few hours by a doctor familiar with this form of injury or gangrene may result.

- **Keep your body and hands away from pin hole leaks or nozzles that eject high pressure hydraulic fluid.**
- **Use cardboard or paper to find hydraulic leaks, never use your hands.**

Hydraulic and Fuel Tank Access

Removing the Right-Side Panel

1. Remove the bolts and washers that secure the front of the right-side panel to the **front-hood rail** (Figure 75).

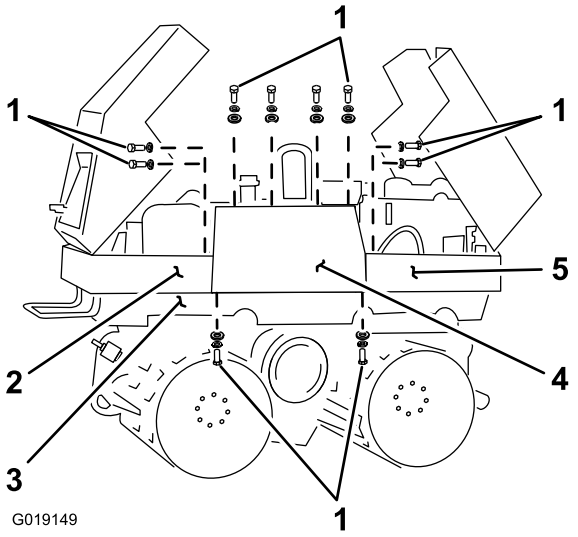


Figure 75

1. Bolts and washers
2. Rear hood rail
3. Upper frame
4. Right-side panel
5. Front hood rail

2. Remove the bolts and washers that secure the back of the right-side panel to the **rear-hood rail** (Figure 75).
3. Remove the bolts and washers that secure the right-side panel to the **upper frame** (Figure 75).
4. Remove the bolts and washers that secure the top of the right-side panel to the **hydraulic tank and fuel tank** (Figure 75).
5. Remove right-side panel from the machine chassis as shown in Figure 76.

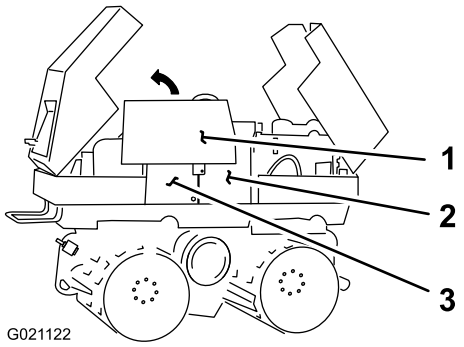


Figure 76

1. Right-side panel
2. Fuel tank
3. Hydraulic tank

Installing the Right-Side Panel

1. Align the right-side panel with the mounting points at the hydraulic tank, fuel tank, upper frame, rear-hood rail, and front-hood rail (Figure 75 and Figure 76).
2. Secure the right-side panel to the **hydraulic tank and fuel tank** with the bolts and washers (Figure 75) removed in step 4 in Removing the Right-Side Panel (page 54).
3. Secure the right-side panel to the **front and rear hood rails** with the bolts and washers (Figure 75) removed in steps 1 and 2 in Removing the Right-Side Panel (page 54).
4. Secure the right-side panel to the **upper frame** with the bolts and washers (Figure 75) removed in step 3 in Removing the Right-Side Panel (page 54).

Eccentric Maintenance

Changing the Eccentric Lubricant

Service Interval: Every 350 hours—Change the eccentric lubrication.

Oil Type: Detergent oil (API service SG, SH, SJ, or higher)

Oil Capacity: 235 ml (8 ounce)

Viscosity: SAE 30W

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

Draining the Eccentric Lubrication

1. Locate the hydraulic motor for the eccentric at the right-lower exterior of the machine (Figure 77).

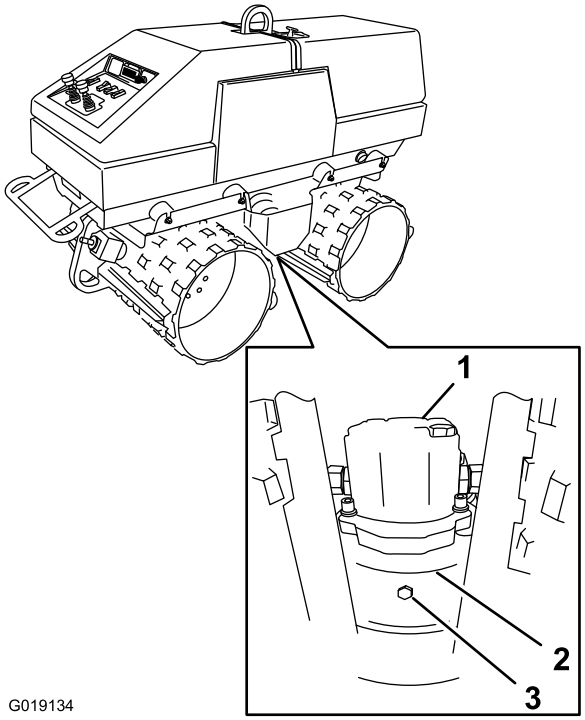


Figure 77

1. Hydraulic motor
2. Eccentric-motor cap
3. Drain plug

2. Locate the eccentric-motor cap on which hydraulic motor mounts (Figure 77).
3. Place a drain pan beneath the eccentric-motor cap.

4. Remove the drain plug from the bottom of the eccentric-motor cap and allow the oil to drain (Figure 77).
5. Clean the drain plug and apply PTFE thread-sealing tape to the threads.
6. Install the drain plug into the drain hole of the eccentric-motor cap (Figure 77).

Filling the Eccentric with Lubricant

1. Locate the eccentric end cap at the left-lower exterior of the machine (Figure 78).

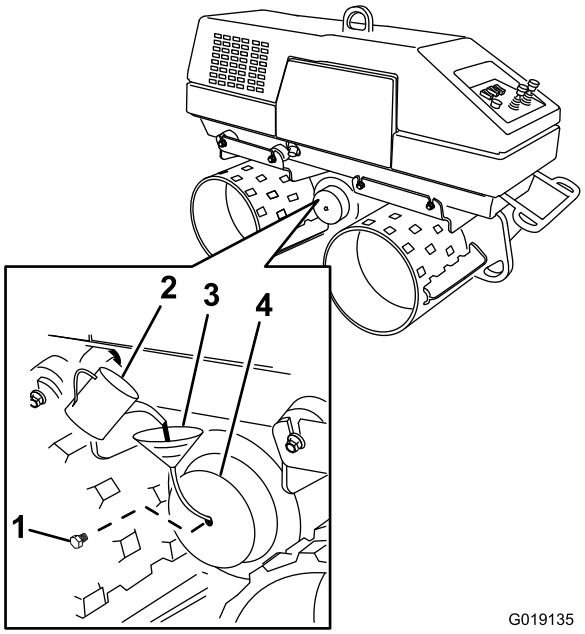


Figure 78

1. Fill plug
2. SAE 30W oil
3. Funnel with attached hose
4. Eccentric end cap

2. Remove the fill plug from the eccentric end cap (Figure 78).
3. Pour 235 ml (8 ounce) of the specified oil into the eccentric oil reservoir through the fill hole as shown in Figure 78.

   Note: A funnel with an attached hose is recommended.
4. Clean the fill plug and apply PTFE thread-sealing tape to the threads.
5. Install the fill plug into the fill hole of the end cap (Figure 78).

Maintaining the Isolators

Checking the Isolators

Service Interval: Every 100 hours—Check the isolators.

1. Torque the flange nuts on the isolators (Figure 6) to 90 to 112 N-m (67 to 83 ft-lbs).

   Note: Ensure that both of the nuts that secure each isolator are tightened.
2. Look for sagging, cracks, or separations in the rubber of each isolator. Replace the isolator if severe sagging, cracking, or partial separation is present.

   Note: Apply thread-locking adhesive to the threads on the isolators when installing new isolators.

Cleaning

Removing Debris from the Machine

Service Interval: Before each use or daily

Important: Operating the engine with blocked grill and/or cooling shrouds removed, will result in engine damage from overheating.

1. Park the machine on a level surface, turn the engine off , and remove the key; refer to Starting and Stopping the Engine (page 26).
2. Open the forward and rear hoods and allow the engine to cool; refer to Opening the Hood (page 24).
3. Clean any debris from the front grills.
4. Wipe away debris from the air filter.
5. Clean any dirt and debris on the engine and in the cooling fins with a brush or blower.

   Important: It is preferable to blow dirt out, rather than washing it out. If water is used, keep it away from electrical items and hydraulic valves. Do not use a high-pressure washer. High-pressure washing can damage the electrical system and hydraulic valves or deplete grease.
6. Clean debris from the hood opening, muffler, and heat shields.
7. Clean debris from the oil-cooler duct (Figure 6) and the engine-exhaust pipe (Figure 6).
8. Close the hoods; refer to Closing the Hood (page 24).

Cleaning the Chassis

Service Interval: Every 100 hours—Check for accumulation of dirt and debris in the chassis.

Over time, the chassis under the engine collects dirt and debris that must be removed. Using a flashlight, inspect the area under the engine, fuel tank, and hydraulic tank on a regular basis. When the debris is 25–50 mm (1–2 inch) deep, have an Authorized Service Dealer remove the drums and flush the chassis clean.

Storage

1. Park the machine on a level surface, turn the engine off, and remove the key, refer to Starting and Stopping the Engine (page 26).
2. Remove dirt and grime from the entire machine.

   Important: You can wash the machine with mild detergent and water. Do not pressure wash the machine. Avoid excessive use of water, especially near the control panel, engine, hydraulic pumps, and motors.
3. Service the air filter; refer to Servicing the Air Filter (page 42).
4. Grease the machine; refer to Greasing the Machine (page 39).
5. Disconnect the negative (black) battery cable from the battery post; refer to Servicing the Battery (page 46).
6. Change the engine oil; refer to Changing the Engine Oil and Filter (page 40).
7. Prepare the fuel system as follows:
   A. Remove the fuel filter/water separator; refer to Removing the Fuel Filter/Water Separator (page 44).
   B. Remove the hex-head plug from the fuel filter/water separator canister; refer to Removing the Fuel Filter/Water Separator (page 44).
   C. Drain the fuel from the canister.
   D. Install the hex-head plug remove in step B in the fuel filter/water separator canister.
   E. Install the fuel filter/water separator; refer to Installing the Fuel Filter/Water Separator (page 45).
   F. Drain the fuel tank; refer to Draining the Fuel Tank (page 45).
   G. Flush the fuel tank with fresh, clean, fresh fuel.
   H. Secure all fuel system fittings.
8. Charge the battery; refer to Charging the Battery (page 47).
9. Check and tighten all bolts, nuts, and screws. Repair or replace any part that is damaged.
10. Paint all scratched or bare metal surfaces. Paint is available from your Authorized Service Dealer.
11. Store the machine in a clean, dry garage or storage area. Remove the key from the ignition switch and keep it in a memorable place.
12. Cover the machine to protect it and keep it clean.

Removing the Machine from Storage

1. Check and tighten all fasteners.
2. Perform any needed maintenance procedures; refer to Maintenance (page 38).
3. Check the engine oil level; refer to Checking the Engine Oil Level (page 24).
4. Check the hydraulic fluid level; refer to Checking the Hydraulic Fluid Level (page 25).
5. Charge the battery; refer to Charging the Battery (page 47).
6. Connect the negative (black) battery cable to battery post; refer to Servicing the Battery (page 46).
7. Fill the fuel tank with fresh fuel; refer to Filling the Fuel Tank (page 22).

Troubleshooting

Problem	Possible Cause	Corrective Action
The starter does not crank.	1. Emergency stop button activated.	1. Reset the emergency stop button.
	2. The battery is discharged.	2. Charge the battery or replace it. Select the mode switch to the manual-mode position when stopping the machine.
	3. The electrical connections are corroded or loose.	3. Clean and tighten the ground terminal. Check the electrical connections for good contact.
	4. A fuse is blown or loose.	4. Correct or replace the fuse.
	5. The relay or switch is damaged.	5. Contact your Authorized Service Dealer.
	6. Starter or starter solenoid is damaged.	6. Contact your Authorized Service Dealer.
	7. Internal engine components are siezed.	7. Contact your Authorized Service Dealer.
The engine cranks, but does not start.	1. The ambient temperature is below 7°C (45°F) freezing.	1. Install the Glow-Plug kit. Contact your Authorized Service Dealer to purchase this kit.
	2. Incorrect starting procedure.	2. Refer to Starting and Stopping the Engine.
	3. The fuel tank is empty.	3. Fill with fresh fuel; Refer to Adding Fuel.
	4. The fuel-shutoff valve is closed.	4. Open the fuel-shutoff valve.
	5. The fuel system is contaminated with dirt, water, stale fuel, or incorrect fuel.	5. Drain and flush the fuel system; add fresh fuel.
	6. Improper fuel grade for cold weather use.	6. Drain the fuel system and replace the fuel filter. Add fresh fuel of proper grade for ambient temperature conditions. You may need to warm the entire machine.
	7. Fuel filter is obstructed.	7. Replace the fuel filter; refer to Servicing the Fuel Filter.
	8. There is air in the fuel.	8. Check for air leaks at the fuel hose connections and fittings between the fuel tank and engine; Tighten the fittings or replace damaged hoses. Refer to Priming the Fuel System.
	9. The injection nozzles or pump are malfunctioning.	9. Contact your Authorized Service Dealer.
	10. Air filter is obstructed.	10. Clean or replace the air filter; refer to Servicing the Air filter.
	11. Tip switch is faulty.	11. Contact your Authorized Service Dealer.
	12. The engine crankcase has too much oil.	12. Drain to the correct level; refer to Servicing the Engine.
	13. Slow cranking speed.	13. Check the battery, oil viscosity, and starting motor (contact your Authorized Service Dealer).
	14. Engine speed is too low.	14. Reset to correct value; Contact your Authorized Service Dealer.
	15. Worn cylinder or piston rings.	15. Replace; Contact your Authorized Service Dealer.

Problem	Possible Cause	Corrective Action
The engine starts, but does not keep running.	1. The fuel tank venting is restricted.	1. Loosen the cap. If the engine runs with the cap loosened, replace the cap.
	2. Fuel filter is obstructed.	2. Replace; refer to Servicing the Fuel Filter.
	3. Improper fuel grade for cold weather use.	3. Drain the fuel system and replace the fuel filter. Add fresh fuel of proper grade for ambient temperature conditions.
	4. There is air in the fuel system.	4. Check for air leaks at the fuel hose connections and fittings between the fuel tank and engine; Tighten the fittings or replace damaged hoses. Refer to Priming the Fuel System.
	5. Dirt or water is in the fuel system.	5. Drain and flush the fuel system; add fresh fuel.
	6. The fuel pump is damaged.	6. Contact your Authorized Service Dealer.
	7. Engine exhaust is restriction at the exhaust pipe.	7. Clean or replace the exhaust pipe.
The engine runs, but knocks or misses.	1. The fuel system is contaminated with dirt, water, stale fuel, or incorrect fuel.	1. Drain and flush the fuel system; add fresh fuel.
	2. The engine overheating.	2. Refer to Engine Overheats.
	3. There is air in the fuel system.	3. Bleed nozzles and check for air leaks at the fuel hose connections and fittings between the fuel tank and engine.
	4. The fuel injection nozzles are damaged.	4. Contact your Authorized Service Dealer.
	5. The engine has low compression.	5. Contact your Authorized Service Dealer.
	6. The fuel injection pump timing is incorrect.	6. Contact your Authorized Service Dealer.
	7. There is excessive carbon build-up in the engine.	7. Contact your Authorized Service Dealer.
	8. The engine has internal wear or damage.	8. Contact your Authorized Service Dealer.
The engine does not idle.	1. The fuel tank venting is restricted.	1. Loosen the cap. If the engine runs with the cap loosened, replace the cap.
	2. The fuel system is contaminated with dirt, water, stale fuel, or incorrect fuel.	2. Drain and flush the fuel system; add fresh fuel.
	3. The air filter is obstructed.	3. Clean or replace the air filter; refer to Servicing the Air filter.
	4. The fuel filter is obstructed.	4. Replace the fuel filter.
	5. There is air in the fuel.	5. Bleed the nozzles and check for air leaks at fuel hose connections and fittings between the fuel tank and engine.
	6. The fuel pump is damaged.	6. Contact your Authorized Service Dealer.
	7. The engine has low compression.	7. Contact your Authorized Service Dealer.

Problem	Possible Cause	Corrective Action
The engine overheats.	1. The cooling air system is restricted.	1. Clean any debris from the front and side grills. Inspect and clean the engine cooling air inlet and outlet, and the cylinder heads and cylinders.
	2. The crankcase oil level is incorrect.	2. Fill or drain to the full mark.
	3. The engine experiences excessive load.	3. Reduce the ground speed; refer to operating the Travel Speed Switch or the Travel Speed Buttons.
	4. The fuel system has the incorrect fuel type.	4. Drain and flush the fuel system; add fresh fuel.
	5. Defective injector or injection timing is incorrect.	5. Contact your Authorized Service Dealer.
There is excessive black smoke from exhaust.	1. The engine experiences excessive load.	1. Reduce the ground speed; refer to operating the Travel Speed Switch or the Travel Speed Buttons.
	2. Air filter is obstructed.	2. Clean or replace the air filter; refer to Servicing the Air filter.
	3. The fuel system has the incorrect fuel type	3. Drain the fuel system and refill with specified fuel.
	4. The injection pump timing is incorrect.	4. Contact your Authorized Service Dealer.
	5. The injection pump is damaged.	5. Contact your Authorized Service Dealer.
	6. The injection nozzles are damaged.	6. Contact your Authorized Service Dealer.
There is excessive white smoke from exhaust.	1. The engine crankcase has too much oil.	1. Check the oil level and drain to the full mark.
	2. The engine has worn valves or valve guides.	2. Contact your Authorized Service Dealer.
	3. The oil seat at intake valve is defective.	3. Contact your Authorized Service Dealer.
	4. The injection pump timing is incorrect.	4. Contact your Authorized Service Dealer.
	5. The fuel injection nozzles are damaged.	5. Contact your Authorized Service Dealer.
	6. The engine has low compression.	6. Contact your Authorized Service Dealer.
A low oil warning message is indicated in the LED display.	1. The engine crankcase has a low oil level.	1. Service the engine oil; refer to Checking the Engine Oil Level.
	2. The oil pressure switch is faulty.	2. Replace the oil pressure switch.
The engine consumes an excessive quantity of oil.	1. The engine has worn valves or valve guides.	1. Contact your Authorized Service Dealer.
	2. The engine has low compression.	2. Contact your Authorized Service Dealer.
	3. The engine crankcase has too much oil.	3. Check the oil level and drain to the full mark.
	4. The oil filter or oil pressure switch is loose.	4. Tighten the oil filter or pressure switch.
	5. The oil drain valve leaking.	5. Drain the oil and replace the drain valve.

Problem	Possible Cause	Corrective Action
The engine loses power.	1. The engine experiences excessive load.	1. Reduce the ground speed; refer to operating the Travel Speed Switch or the Travel Speed Buttons.
	2. The fuel tank vent is restricted.	2. Contact your Authorized Service Dealer.
	3. The fuel system is contaminated with dirt, water, stale fuel, or incorrect fuel.	3. Drain and flush the fuel system; add fresh fuel.
	4. There is air in the fuel system.	4. Bleed the nozzles and check for air leaks at fuel hose connections and fittings between the fuel tank and engine.
	5. The injection pump timing is incorrect.	5. Contact your Authorized Service Dealer.
	6. The injection pump is damaged.	6. Contact your Authorized Service Dealer.
	7. The air filter is dirty.	7. Clean or replace the air filter; refer to Servicing the Air filter.
	8. The engine exhaust is restriction at the exhaust pipe.	8. Clean or replace the exhaust pipe.
	9. The crankcase oil level is incorrect.	9. Fill or drain the oil to the full mark.
	10. The engine is overheating.	10. Refer to Engine Overheats.
	11. The engine has low compression.	11. Contact your Authorized Service Dealer.
The machine lacks power.	1. The engine is not warmed up.	1. Run the machine at the slow-engine speed for 5 minutes before machine operation.
	2. The hydraulic fluid level is low.	2. Add hydraulic fluid; refer to Checking the Hydraulic Fluid Level.
	3. The hydraulic filter or strainer is obstructed.	3. Replace the hydraulic filter; refer Replacing the Hydraulic Filter.
	4. The fuel filter is obstructed.	4. Replace the fuel filter.
	5. The hydraulic manifold is faulty.	5. Contact your Authorized Service Dealer.
The voltage regulator message is indicated in the LED Display.	1. The electrical system is faulty.	1. Check all wires and repair.
	2. The battery is not charging.	2. Contact your Authorized Service Dealer.
The machine does not drive.	1. The traction control lever not fully engaged.	1. Move the traction control lever fully.
	2. The parking brake is engaged.	2. Release the parking brake.
	3. Rocks or foreign material are wedged between the scraper and drum.	3. Remove the rocks or material.
	4. The hydraulic fluid level low.	4. Add hydraulic fluid to the reservoir.
	5. The solenoid is faulty in the directional control valve.	5. Contact your Authorized Service Dealer.
	6. The hydraulic pump and/or wheel motor is damaged.	6. Contact your Authorized Service Dealer.
	7. The relief valve is damaged.	7. Contact your Authorized Service Dealer.
The machine has no high travel speed.	1. The solenoid is faulty in the directional control valve.	1. Contact your Authorized Service Dealer.
	2. The check valve is installed backward.	2. Contact your Authorized Service Dealer.
	3. The hydraulic manifold is faulty.	3. Contact your Authorized Service Dealer.
The drums rotate at different speeds.	1. The check valve is faulty.	1. Contact your Authorized Service Dealer.

Problem	Possible Cause	Corrective Action
The machine has no vibration function.	1. The eccentric support bearing is siezed. 2. The eccentric motor is faulty. 3. The solenoid is faulty in the directional control valve.	1. Contact your Authorized Service Dealer. 2. Contact your Authorized Service Dealer. 3. Contact your Authorized Service Dealer.
The machine operates in manual mode, but not in radio-remote control mode.	1. The mode switch is in the manual-mode position. 2. The ignition switch is in the On position. 3. The battery for the radio-control transmitter is faulty. 4. The battery in the machine has low voltage. 5. The operator is using the wrong radio-control transmitter for the machine. 6. The radio-control receiver has no power.	1. Select the mode switch to the remote-control mode position. 2. Rotate the key switch to the Off position, and remove the key. 3. Replace the batteries in the transmitter. 4. Charge or replace the battery in the machine. 5. Compare the serial number on the back of the transmitter with the serial number on the cover of the of the radio-control receiver. 6. Check and replace open (blown) fuse for the receiver power or ground circuit.
The machine suddenly stopped when in radio-control mode.	1. The machine is out of range for the remote-control transmitter. 2. The battery in the machine has low voltage. 3. The battery for the radio-control transmitter is faulty. 4. The fuse for the receiver power or ground circuit is open (blown) . 5. The wiring in the machine has an open circuit.	1. Walk toward machine. 2. Charge or replace the battery in the machine. 3. Replace the batteries in the transmitter. 4. Replace the fuse. 5. Check all wires and repair any wiring damage.
Not all of the machine functions operate.	1. The radio-control receiver has a possible chip failure.	1. Contact your Authorized Service Dealer.

The Toro Warranty

A limited warranty (see warranty periods below)

Concrete, Masonry, and Compaction Equipment

Conditions and Products Covered

The Toro Company and its affiliate, Toro Warranty Company, pursuant to an agreement between them, jointly warrant your Toro Concrete, Masonry, and Compaction Equipment Products listed below to be free from defects in materials or workmanship.

This warranty covers the cost of parts and labor, but you must pay transportation costs.

The following time periods apply from the date of purchase:

Products	Warranty Period
Concrete Mixers	1 year
・Spindle Bearings	Lifetime* (original owner only)
Mortar Mixers	1 year
・Drum Bearings and Seals	Lifetime* (original owner only)
Forward Plate Compactors	2 years
Reversible Plates	1 year
Rammer Compactors	2 years
Mud Buggy	1 year
Vibrating Trench Roller	2 years
Concrete Saws	1 year
Masonry Saws	1 year
Power Trowels	1 year
Screeds	1 year
Concrete Vibrators	1 year

Where a warrantable condition exists, we will repair the Product at no cost to you including diagnosis, labor, and parts.

*Lifetime Warranty - If the bearing(s) or seal(s) on your mixer fail, it will be replaced under warranty, at no cost for parts or labor.

Instructions for Obtaining Warranty Service

If you think that your Toro Product contains a defect in materials or workmanship, follow this procedure**:

1. Contact any Authorized Servicing Outlet to arrange service at their dealership. To locate one convenient to you, access our website at www.Toro.com. Select “Where to Buy” and select “Contractor” under product type. You may also call our toll free number below.
2. Bring the product and your proof of purchase (sales receipt) to them.
3. If for any reason you are dissatisfied with the Service Outlet’s analysis or with the assistance provided, contact us at:

   SWS Customer Care Department
   Toro Warranty Company
   8111 Lyndale Avenue South
   Bloomington, MN 55420-1196
   Toll Free: 800-888-9926

**Toro Authorized Rental Customers who have purchased products directly from Toro and have signed the Toro Rental Customer Agreement have the ability to perform their own warranty work. Please visit Toro’s Rental Portal for electronic warranty clam filing procedures or call the toll free number above.

Owner Responsibilities

You must maintain your Toro Product by following the maintenance procedures described in the *Operator’s Manual*. Such routine maintenance, whether performed by a dealer or by you, is at your expense. Parts scheduled for replacement as required maintenance (“Maintenance Parts”), are warranted for the period of time up to the scheduled replacement time for that part. 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 express 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, modified, or unapproved accessories
- Product failures which result from failure to perform required maintenance and/or adjustments
- 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, belts, wipers, spark plugs, tires, filters, gaskets, wear plates, seals, O-rings, drive chains, clutches.
- Failures caused by outside influence. Items considered to be outside influence include, but are not limited to, weather, storage practices, contamination, use of unapproved coolants, lubricants, additives, or chemicals, etc.
- Normal “wear and tear” items. Normal “wear and tear” includes, but is not limited to, worn painted surfaces, scratched decals, etc.
- Any component covered by a separate manufacturer’s warranty
- Pickup and delivery charges

General Conditions

Repair by an Authorized Servicing Outlet or Self-Service as an Authorized Rental Customer is your sole remedy under the 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. 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.

Except for the engine warranty coverage and the Emissions warranty referenced below, if applicable, there is no other express 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) or the California Air Resources Board (CARB). Refer to the California 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 outside 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 Distributor's service or have difficulty obtaining guarantee information, contact the Toro importer. If all other remedies fail, you may contact us at Toro Warranty Company.

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