Operator’s Manual

Light Tower

LTG14

Machine Type	**LTG14**
Material Number	**5100075437 / 3300035184**
Version	**02**
Date	**08/2024**
Language	**[en-US]**

Imprint

Publisher and copyright holder:

Wacker Neuson America Corporation

N92W15000 Anthony Ave

Menomonee Falls, WI 53051, USA

www.wackerneuson.us

Original instructions

California Proposition 65 Warning

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

Cancer and Reproductive Harm

www.P65Warnings.ca.gov

⚠ WARNING

Batteries, battery posts, terminals and related accessories contain lead and lead compounds, and other chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. WASH HANDS AFTER HANDLING.

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Table of Contents

1 Foreword

1.1 Machine Identification

The following machines and variants/options are described:

Machine	Item Number
LTG14	5100067945

Machine identification

A nameplate listing the model number, item number, revision, and serial number is attached to this machine. The location of the nameplate is shown below.

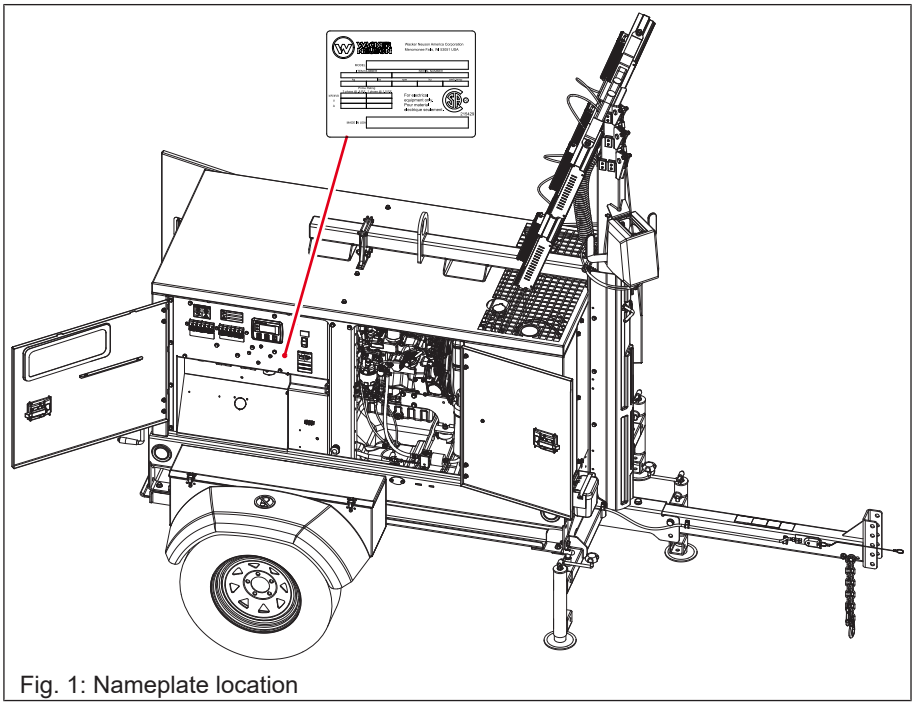


Fig. 1: Nameplate location

Serial number (S/N)

For future reference, record the serial number in the space provided below. You will need the serial number when requesting parts or service for this machine.

Serial number:

1.2 Machine Documentation

Keep a copy of the operator's manual with the machine at all times.

From this point forward in this documentation, Wacker Neuson America Corporation will be referred to as Wacker Neuson or the manufacturer.

For spare parts information, please see your Wacker Neuson dealer, or visit the Wacker Neuson website at http://www.wackerneuson.com/.

When ordering parts or requesting service information, be prepared to provide the machine model number, item number, and serial number.

1.3 Expectations for Information in This Manual

This manual provides information and procedures to safely operate and maintain this machine. For your own safety and to reduce the risk of injury, carefully read, understand, and observe all instructions described in this manual.

The manufacturer expressly reserves the right to make technical modifications, even without notice, which improve the performance or safety standards of its machines.

The information contained in this manual is based on machines manufactured up until the time of publication. The manufacturer reserves the right to change any portion of this information without notice.

The illustrations, parts, and procedures in this manual refer to the manufacturer's factory-installed components. Your machine may vary depending on the requirements of your specific region.

1.4 Laws Pertaining to Spark Arresters

State Health Safety Codes and Public Resources Codes specify that in certain locations spark arresters be used on internal combustion engines that use hydrocarbon fuels. A spark arrester is a device designed to prevent accidental discharge of sparks or flames from the engine exhaust. Spark arresters are qualified and rated by the United States Forest Service for this purpose. In order to comply with local laws regarding spark arresters, consult the engine distributor or the local Health and Safety Administrator.

1.5 Manufacturer's Approval

This manual contains references to approved parts, attachments, and modifications. The following definitions apply:

- Approved parts or attachments are those either manufactured or provided by the manufacturer.
- Approved modifications are those performed by an authorized service center according to written instructions published by the manufacturer.
- Unapproved parts, attachments, and modifications are those that do not meet the approved criteria.

Unapproved parts, attachments, or modifications may have the following consequences:

- Serious injury hazards to the operator and persons in the work area
- Permanent damage to the machine which will not be covered under warranty

Contact your dealer immediately if you have questions about approved or unapproved parts, attachments, or modifications.

1.6 Abbreviations

Acronym	Definition	Acronym	Definition
CAN	Controller area network	CARB	California Air Resource Board
CDL	Commercial driver’s license	CO	Carbon monoxide
CPU	Central processing unit	DTC	Diagnostic trouble code
ECU	Engine control unit	EGR	Exhaust gas recirculation
EPA	Environmental protection agency	GAWR	Gross axle weight rating
GFCI	Ground fault circuit interrupter	GVWR	Gross vehicle weight rating
Hz	Hertz	IBC	Intermediate bulk container
kVA	Kilovolt-ampere	kW	Kilowatt
L3	Level load logic	NATM	National association of trailer manufacturers
NHTSA	National highway traffic safety administration	PPE	Personal protective equipment
S/N	Serial number	VAC	Volts alternating current
VIN	Vehicle identification number	—	—

2 Usage

2.1 Intended Use

This machine is intended for the illumination of outdoor areas. This machine is also intended for the purpose of supplying electrical power to connected loads. For more information, see Generator on page 88 for the output voltage and frequency of this light tower, and for the maximum output power limit of this light tower.

2.2 Unintended Use

This machine has been designed and built strictly for the intended use described above. Using the machine for any other purpose could permanently damage the machine or seriously injure the operator or other persons in the area. Machine damage caused by misuse is not covered under warranty.

The following are some examples of misuse:

- Connecting a load that has voltage and frequency requirements that are incompatible with the machine output
- Overloading the machine with a device that draws excessive power during either continuous running or start-up
- Operating the machine in a manner that is inconsistent with all federal, state, and local codes and regulations
- Using the machine as a hoist, or hanging items from the tower
- Using the machine as a ladder, support, or work surface
- Operating the machine outside of factory specifications
- Operating the machine in a manner inconsistent with all warnings found on the machine and in the operator's manual

2.3 Residual Risks

This machine has been designed and built in accordance with the latest global safety standards. It has been carefully engineered to eliminate hazards as far as practicable and to increase operator safety through protective guards and labeling.

However, some risks may remain even after protective measures have been taken. They are called residual risks. On this machine, they may include exposure to:

- Heat, noise, exhaust, and carbon monoxide from the engine
- Heat from the lights
- Glare from the lights (lights may blind drivers of nearby motor vehicles if the lights are incorrectly positioned)
- Fire hazards from improper refueling techniques
- Fuel and its fumes
- Electric shock and arc flash
- Personal injury from improper lifting techniques
- Typical hazards related to towing a trailer on roads and highways

To protect yourself and others, make sure you thoroughly read and understand the safety information presented in this manual before operating the machine.

3 Safety

3.1 Signal Words Used in This Manual

This manual contains DANGER, WARNING, CAUTION, *NOTICE,* and NOTE signal words which must be followed to reduce the possibility of personal injury, damage to the equipment, or improper service.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

► To avoid death or serious injury from this type of hazard, obey all safety messages that follow this signal word.

⚠ WARNING

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

► To avoid possible death or serious injury from this type of hazard, obey all safety messages that follow this signal word.

⚠ CAUTION

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

► To avoid possible minor or moderate injury from this type of hazard, obey all safety messages that follow this signal word.

NOTICE

NOTICE identifies a situation that causes damage if it is not observed.

► To avoid possible damage from this type of hazard, obey all safety messages that follow this signal word.

Note: A Note contains additional information important to a procedure.

3.2 Safety Guidelines for Operating the Machine

Operator and service training, knowledge, and qualifications

Before operating, maintaining, or servicing the machine:

- Familiarize yourself with the location and proper use of all controls and safety devices.
- Know the rules for the jobsite.
- Contact Wacker Neuson for additional training if necessary.

When operating this machine:

- Do not allow improperly trained people to operate the machine.
- People operating the machine must be familiar with the potential risks and hazards associated with it.
- Follow legal and other mandatory regulations relevant to accident prevention and environmental protection. These may include handling hazardous substances, issuing and/or wearing PPE, or obeying traffic regulations.

The machine must not be accessed or operated by:

- Children
- People impaired by alcohol, drugs, or prescription drugs

Application area

Be aware of the application area.

- Keep unauthorized personnel, children, and pets away from the machine.
- Remain aware of changing positions and the movement of other equipment and personnel in the application area/job site.
- Do not operate the machine in areas that contain flammable objects, fuels, or products that produce flammable vapors.
- Keep the area around the muffler free of debris such as leaves, paper, cartons, etc. A hot muffler could ignite the debris and start a fire.

Safety devices, controls, and attachments

Only operate the machine when:

- All safety devices and guards are in place and in working order.
- All controls operate correctly.
- The machine is set up correctly according to the instructions in the operator’s manual.
- The machine is clean.
- The machine’s labels are legible.

To ensure safe operation of the machine:

- Do not operate the machine if any safety devices or guards are missing or inoperative.
- Do not modify or defeat the safety devices.
- Only use accessories or attachments that are approved by the manufacturer.

Personal protective equipment (PPE)

Wear the following PPE while operating, servicing, or maintaining this machine:

- Close-fitting work clothes that do not hinder movement
- Safety glasses with side shields
- Hearing protection
- Safety-toed footwear

In addition, before servicing or maintaining the machine:

- Tie back long hair.
- Remove all jewelry (including rings).

Before starting

The machine, including all components, safety devices, labels, and attachments must be in good condition before use. Be sure the machine is on a firm, level surface and will not tip, roll, slide, or fall while operating.

- Never connect machine to other power sources, such as supply mains of power companies.
- Never use the machine if the insulation on the electrical cord is cut or worn through.
- Never raise the tower or operate the machine in high winds.
- The tower extends up to 9 m (30 ft). Make sure the area above the trailer is open and clear of overhead wires and obstructions.

Operation

- Remain aware of the machine's moving parts. Keep hands, feet, and loose clothing away from the machine's moving parts.
- Do not consume the operating fluids used in this machine. Depending on your machine model, these operating fluids may include water, wetting agents, fuel (gasoline, diesel, kerosene, propane, or natural gas), oil, coolant, hydraulic fluid, heat transfer fluid (propylene glycol with additives), battery acid, or grease.
- Keep the area under and around the light tower clear of people while raising and lowering the tower.
- Do not move the light tower while it is operating or while the tower is raised.

After use

- Stop the engine when the machine is not being operated.
- Close the fuel valve on engines equipped with one when the machine is not being operated.
- Ensure that the machine will not tip over, roll, slide, or fall when not being operated.
- Store the machine properly when it is not being used. The machine should be stored in a clean location out of the reach of children.

3.3 Safety Guidelines for Maintenance

Before servicing or maintaining the machine, see Safety Guidelines for Operating the Machine on page 13.

Precautions

Follow the precautions below when servicing or maintaining the machine.

- Read and understand the service procedures before performing any service to the machine.
- Personnel servicing or maintaining the machine must be familiar with the associated potential risks and hazards.

- Turn off the machine before performing maintenance or making repairs.
- Remain aware of the machine's moving parts. Keep hands, feet, and loose clothing away from the machine's moving parts.
- Before servicing the light tower, make sure the tower is lowered, the engine is turned off, the circuit breakers are open (off), and the negative terminal on battery is disconnected. Do not perform even routine service (oil/filter changes, cleaning, etc.) unless all electrical components are shut down.
- Always turn off light circuit breakers and shut down engine before disconnecting light fixtures or changing light bulbs.
- Always turn off light circuit breakers and shut down engine before disconnecting light fixtures.

Machine modifications

When servicing or maintaining the machine:

- Use only accessories/attachments that are approved by Wacker Neuson.
- Do not defeat safety devices.
- Do not modify the machine without the express written approval of Wacker Neuson.

Replacing parts and labels

- Replace worn or damaged components.
- Replace all missing and hard-to-read labels.
- When replacing electrical components, use components that are identical in rating and performance to the original components.
- When replacement parts are required for this machine, use only Wacker Neuson replacement parts or those parts equivalent to the original in all types of specifications, such as physical dimensions, type, strength, and material.

Cleaning

When cleaning and servicing the machine:

- Keep the machine clean and free of debris such as leaves, paper, cartons, etc.
- Keep the labels legible.
- Do not clean the machine while it is running.
- Never use gasoline or other types of fuels or flammable solvents to clean the machine. Fumes from fuels and solvents can become explosive.

Electrical service safety

- Make sure clothing and shoes are dry, stand on a dry wooden platform or rubber insulating mat, and use tools with insulated handles when servicing the machine.
- Do not allow water to accumulate around the base of the machine. If water is present, move the machine and allow the machine to dry before servicing.
- Do not pressure wash the control panel, generator end, or any other electrical components when cleaning the machine.

Cooling system safety

- Do not attempt to open the radiator cap while the unit is running or before the engine has cooled down. Severe burns may result!
- Engine coolant is toxic to humans and animals. Clean up spills and dispose of waste engine coolant in accordance with local environmental regulations.

3.4 Safety Guidelines for Using Internal Combustion Engines

⚠ DANGER

Poisoning hazard

Exhaust gas contains carbon monoxide, a deadly poison.

► Never operate the machine inside an enclosed area, such as a tunnel, unless adequate ventilation is provided through such items as exhaust fans or hoses.

⚠ WARNING

Personal injury hazard

Failure to follow the warnings and safety standards during operation and fueling could result in severe injury or death.

► Read and follow the warning instructions in the engine owner's manual and the safety guidelines below.

Running the engine

- Keep the area around the exhaust pipe free of flammable materials.
- Make sure the engine compartment is free of debris before running the machine.
- Check the fuel lines and the fuel tank for leaks and cracks before starting the engine. Do not run the machine if fuel leaks are present or the fuel lines are loose.
- Do not smoke while operating the machine.
- Do not run the engine near sparks or open flames.
- Do not touch the engine or muffler while the engine is running or immediately after it has been turned off.

- Do not operate a machine when its fuel cap is loose or missing.
- Do not start the engine if fuel has spilled or a fuel odor is present. Move the machine away from the spill and wipe the machine dry before starting.
- Do not use the machine in areas with a risk of explosion or fire.

Refueling safety

- Clean up any spilled fuel immediately.
- Refill the fuel tank in a well-ventilated area.
- Replace the fuel tank cap after refueling.
- Use suitable tools for refueling (for example, a fuel hose or funnel).
- Do not smoke.
- Do not refuel a hot or running engine.
- Do not refuel the engine near sparks or open flames.

3.5 Safety Guidelines for Mobile Generators

⚠ DANGER

Carbon monoxide hazard

Using this machine indoors can kill you in minutes. Exhaust gas contains carbon monoxide (CO). This is a deadly poison you cannot see or smell. If you can smell the exhaust, you are breathing CO. Even if you cannot smell the exhaust, you could still be breathing CO.

► Never operate the machine inside an enclosed area, such as a home, tunnel, or garage unless it is vented properly.

► Only use the machine outside and far away from windows, doors, and vents. These openings can pull in exhaust gas.

► Always use a battery-powered or battery-backup CO alarm in nearby structures. Even when you use the machine correctly, CO may leak into nearby structures.

► If you start to feel sick, dizzy, or weak after the machine has been running, move to fresh air IMMEDIATELY. See a doctor. You could have carbon monoxide poisoning.

⚠ WARNING

Electrocution hazard

Generators present special hazards during operation and servicing. These include the risk of electrocution or severe electrical shock. Failure to follow the safety information below can result in severe injury or death.

► Read and follow the safety instructions in this operator's manual.

► Contact the generator manufacturer for additional information regarding the generator.

⚠ WARNING

Injury hazard

Backfeed from the generator into the public power distribution system can cause serious injury or death to utility workers.

► Connections to a building's electrical system must be made by a qualified electrician and comply with all applicable laws and electrical codes.

Installing as backup power

Special hazards exist when installing this machine as a backup power supply. Improper connection of the mobile generator to a building's electrical system can allow electrical current from the generator to backfeed into utility lines. This may result in electrocution of utility workers, fire, or explosion.

If connected to a building's electrical system, the generator must meet the power, voltage, and frequency requirements of the equipment in the building. Differences in power, voltage, and frequency requirements may exist and improper connection may lead to equipment damage, fire, and personal injury or death.

General safety

- Do not use evaporative starting fluids to start the engine. They are highly explosive.
- Do not store items such as excess oil, rags, or tools on top of or inside the machine. These items are a fire hazard and can restrict cooling air.
- Ensure that electrical cords attached to the machine are in serviceable condition without cuts, cracks, or exposed wires.
- Do not route electrical cords over vibrating or hot parts of the machine.
- Do not stand on the machine.
- Do not enclose or cover the machine when it is in use, or when it is hot.

4 Description of the Machine

4.1 Machine Description

This machine is a mobile, trailer-mounted light tower. The Wacker Neuson light tower consists of a trailer with a cabinet containing a diesel engine, a fuel tank, a control panel, and an electric alternator. A telescoping tower with four LED light fixtures is vertically mounted to the front of the unit. As the engine runs, the alternator converts mechanical energy into electric power. The LED lights run off this power. Receptacle(s) are also provided to power auxiliary loads. The operator uses the control panel to operate and monitor the machine.

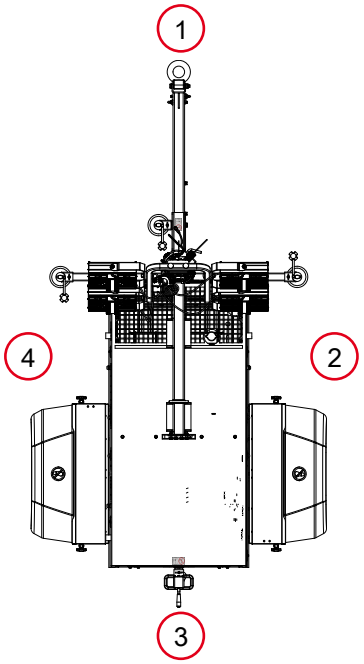


Fig. 2: Top view of machine

Right/left/front/rear

The following terms are used in this manual referring to sides of the machine.

- Front **(1)**
- Right **(2)**
- Rear **(3)**
- Left **(4)**

4.2 Overview of the Labels

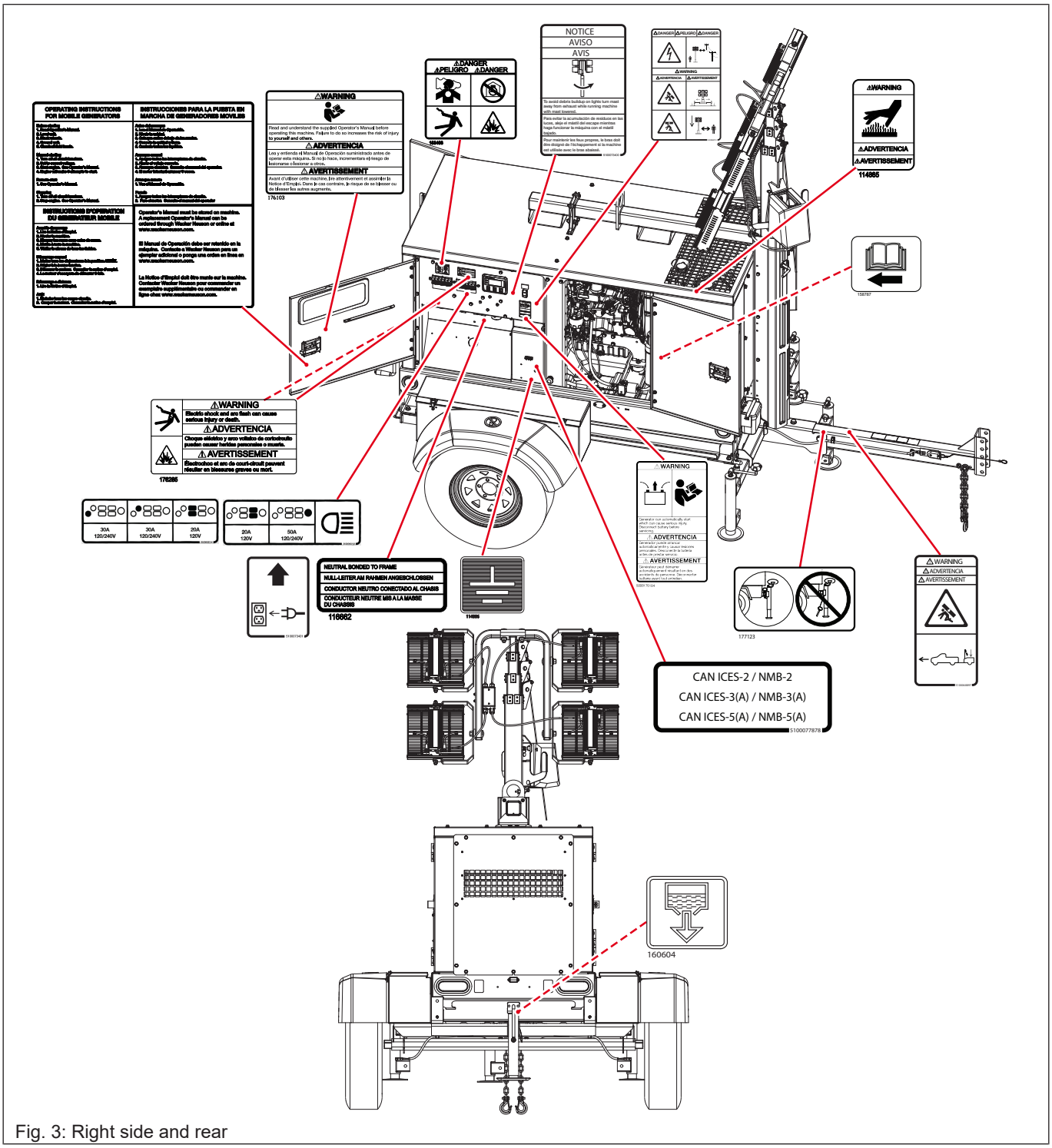


Fig. 3: Right side and rear

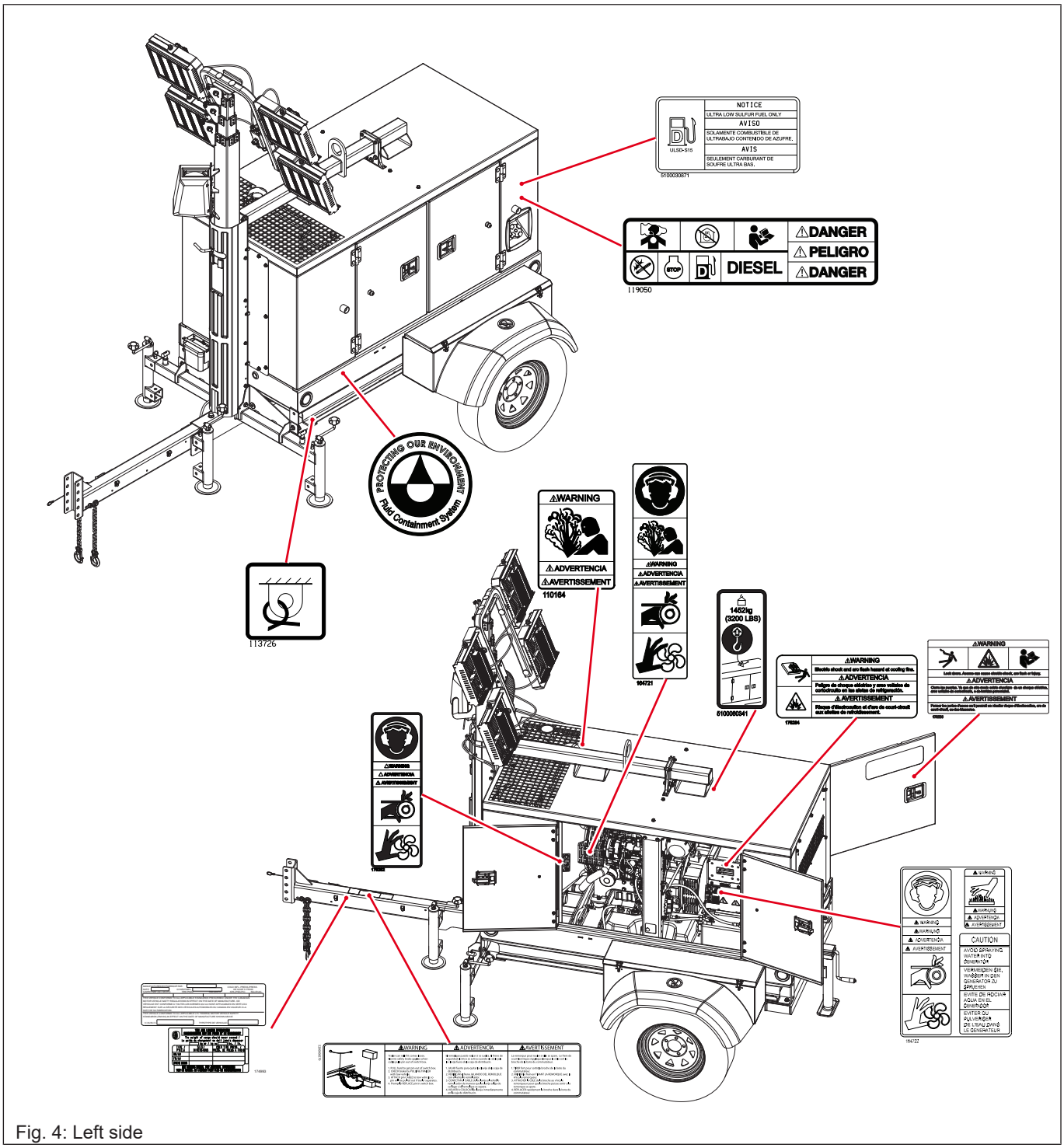


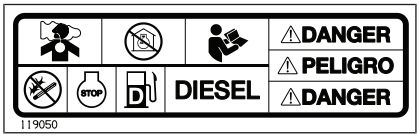
Fig. 4: Left side

4.3 Safety Label Meanings

DANGER

Asphyxiation hazard

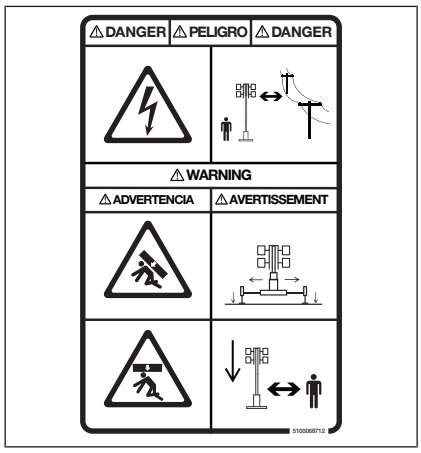
- Engines emit carbon monoxide.
- Do not run the machine indoors or in an enclosed area.
- Electric shock and arc flash can cause serious injury or death.



DANGER

Asphyxiation hazard

- Do not run the machine indoors or in an enclosed area without adequate ventilation.
- Read the operator's manual for instructions.
- No sparks, flames, or burning objects near machine.
- Stop the engine before adding fuel.
- Use only diesel fuel.



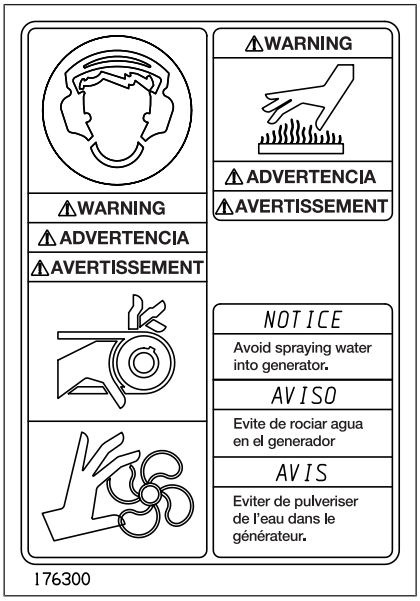
DANGER

Contact with overhead electrical power lines will cause serious injury or death. Do not position the machine under electrical power lines.

WARNING

Failure to level the trailer or extend the outriggers will reduce the stability of the unit. Extend the outriggers and level the trailer before raising the tower.

Bystanders can be struck by the tower as it is being raised or lowered. Do not allow anyone to stand near the tower while raising or lowering the tower.



WARNING

Personal injury hazards

To prevent hearing loss, wear hearing protection.

Hand injury if entangled in moving belt.

Rotating machinery. Do not reach inside with engine running.

WARNING

Hot surface hazard

NOTICE

Avoid spraying water into generator.

WARNING

Personal injury hazards

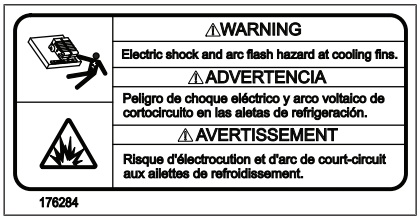
- To prevent hearing loss, wear hearing protection when operating the machine.
- Hand injury if entangled in moving belt.
- Rotating machinery. Do not reach inside machine when the engine is running.

WARNING

California Proposition 65 Warning

Cancer and Reproductive Harm

www.P65Warnings.ca.gov



WARNING

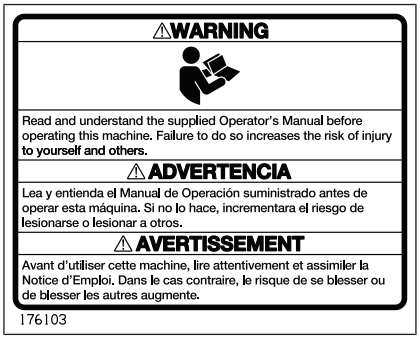
Electric shock and arc flash hazard at cooling fins.

WARNING

Electric shock, arc flash, and injury hazards

Lock doors. Access can cause electric shock, arc flash, or injury.

Read the operator's manual for more information.



WARNING

Injury hazard

Read and understand the supplied operator's manual before operating this machine. Failure to do so increases the risk of injury to yourself and others.

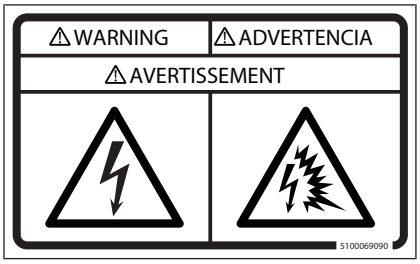
WARNING

Hot surface hazard

WARNING

Explosion hazard

Pressurized contents. Do not open when hot.

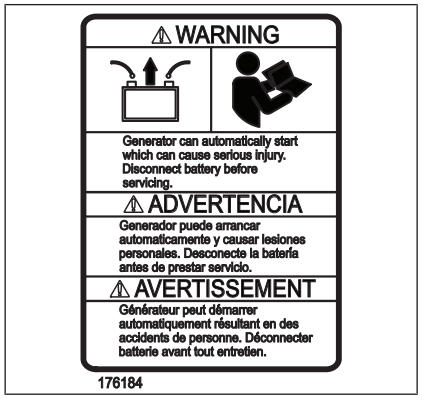


WARNING

Personal injury hazard

Electric shock and arc flash can cause serious injury or death.

4



WARNING

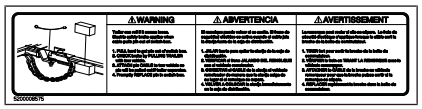
Injury hazard

Generator can automatically start which can cause serious injury. Disconnect battery before servicing.

WARNING

Tipping/falling hazard

Lower the tower before towing.

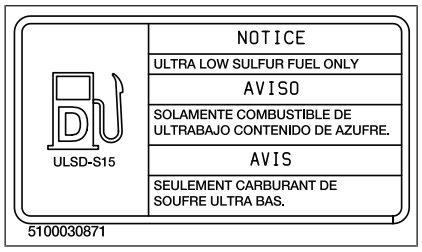


WARNING

Injury hazard

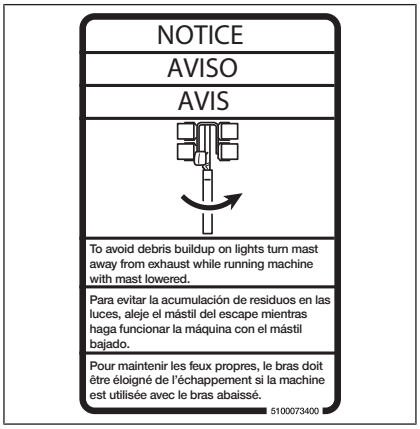
Trailer can roll if it comes loose. Electric safety brake applies when cable pulls pin out of switch box.

1. PULL hard to get pin out of switch box.
2. CHECK brake by PULLING TRAILER with tow vehicle.
3. ATTACH pin CABLE to tow vehicle so pin will be pulled out if trailer separates.
4. Promptly REPLACE pin in switch box.



NOTICE

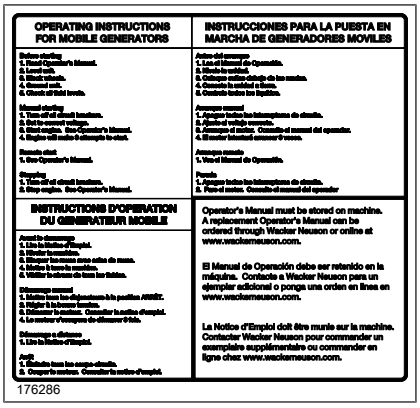
Ultra low sulfur fuel only (diesel machines).



NOTICE

To avoid debris buildup on the lights, turn the mast away from the exhaust while running the machine with the mast lowered.

4.4 Information Label Meanings



Operating instructions

Before starting

1. Read Operator's Manual.
2. Level unit.
3. Block wheels.
4. Ground unit.
5. Check all fluid levels.

Manual starting

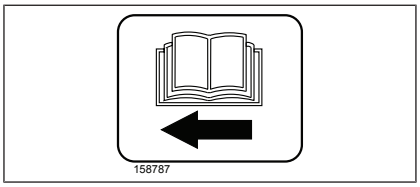
1. Turn off all circuit breakers.
2. Set to correct voltage.
3. Start engine. See Operator's Manual.
4. Engine will make 3 attempts to start.

Remote start

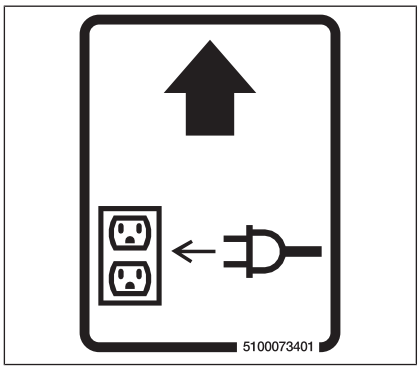
- See Operator's Manual.

Stopping

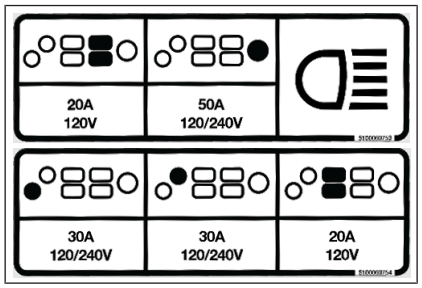
1. Turn off all circuit breakers.
2. Stop engine. See Operator's Manual.



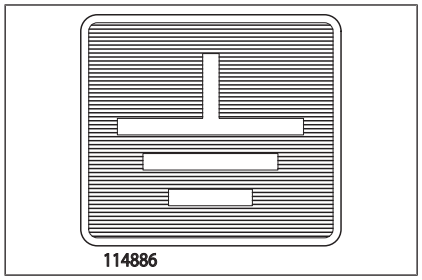
Operator's manual must be stored on machine. Replacement operator's manual can be ordered through your local Wacker Neuson distributor.



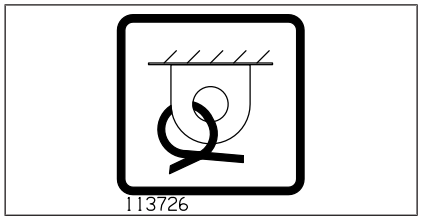
Outlet location



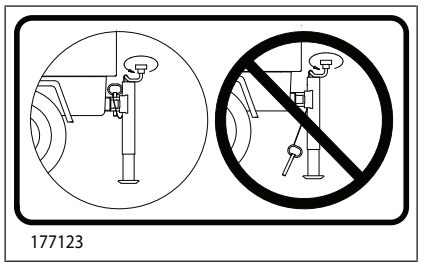
Standard and deluxe outlet breaker designations



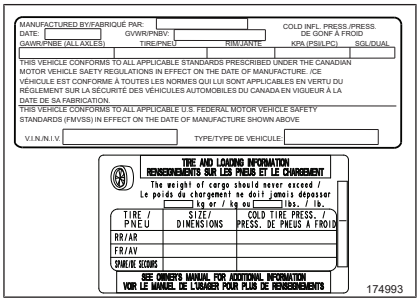
Electrical ground



Tie-down point



Insert jack locking pin before extending jack.



Certification label (VIN)

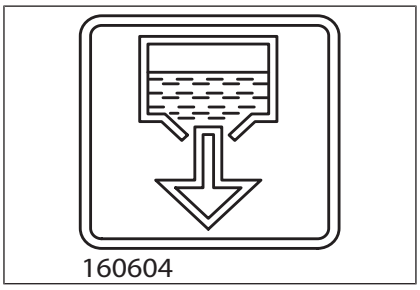
Also attached to each unit is a certification label. This label specifies that the trailer conforms with all Federal Motor Vehicle Standards in effect at the time of manufacture. The label includes the vehicle identification number (VIN) for the trailer.

Not a step

Protecting Our Environment

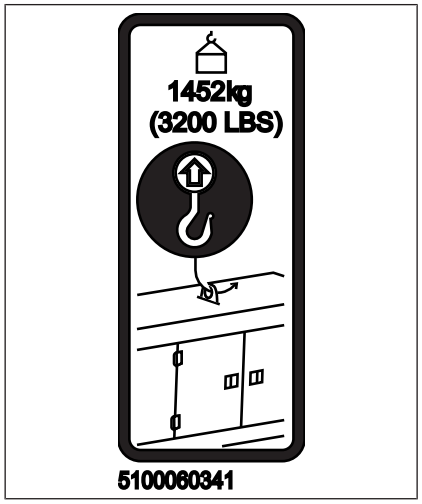
Fluid containment system

(if equipped)

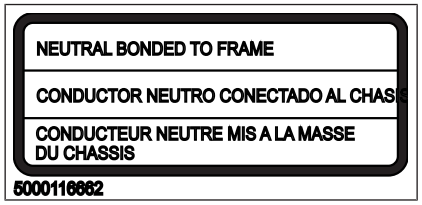


Skid drain access point

Notification of National Association of Trailer Manufacturers (NATM) compliance

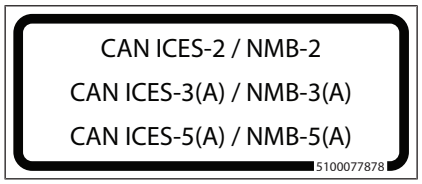


Lifting point



Neutral bonded to frame

There is a permanent conductor between the generator (stator winding) and the frame.



Industry Canada ICES-002 Compliance Label:

CAN ICES-2/NMB-2

CAN ICES-3(A)/NMB-3(A)

CAN ICES-5(A)/NMB-5(A)

5 Transportation

5.1 Machine Positions

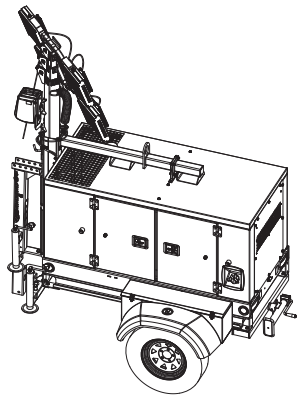


Fig. 5: Shipping/storage position

The following machine positions are referred to in this manual.

Shipping/storage position

This position is intended mainly for the shipping process but can also be used for storage to save space.

- Tongue flipped up
- Tongue jack parallel with flipped tongue
- Lights facing toward the trailer tongue
- Jacks stowed in higher mounting position

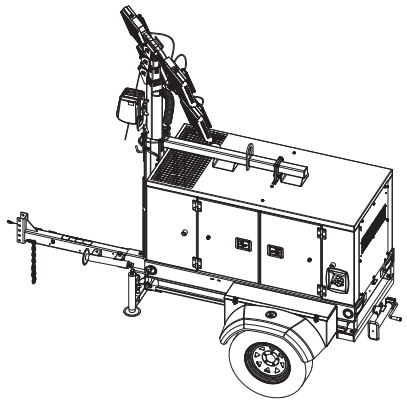


Fig. 6: Travel/horizontal position

Travel/horizontal position

This position is used to tow the machine.

- Tongue flipped down
- Tongue jack parallel with flipped tongue
- Jacks stowed in higher mounting position
- Lights facing toward the trailer tongue

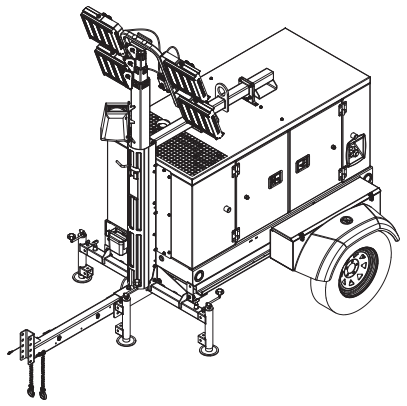


Fig. 7: Operating position

Operating position

This position is used when operating the machine.

- Tongue flipped down
- Tongue jack perpendicular to tongue and lowered
- Jacks in lower mounting position

5.2 Lowering and Raising the Trailer Tongue

⚠ CAUTION

Pinching and crushing hazard

To avoid possible injury, keep fingers away from the pivot point when lowering or raising the trailer tongue.

Overview

The trailer tongue folds to save space, mainly during the shipping process. Perform the following procedure to lower the tongue. Reverse the procedure to raise the tongue for shipping or storage purposes.

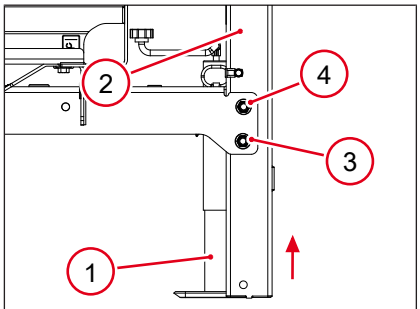


Fig. 8: Trailer tongue in raised position

Procedure

1. Swing the trailer jack **(1)** down and raise the jack to move the foldable portion **(2)** of the trailer tongue about 5 cm (2 in.) off the ground.
2. While supporting the foldable portion of the trailer tongue, remove the lower pin **(3)**.
3. Loosen, but do not remove, the top nut **(4)** and bolt securing the trailer tongue.

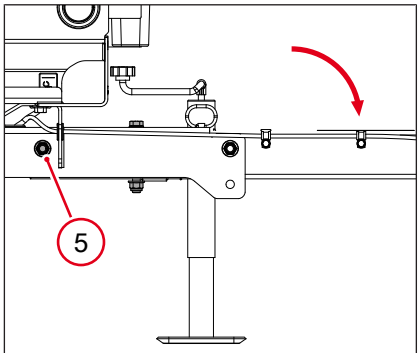


Fig. 9: Trailer tongue in lowered position

4. Carefully rotate the foldable portion of the trailer tongue down.
5. Install the pin removed earlier in the position shown **(5)**.
6. Tighten all hardware to a range of 160–180 Nm (118–132 lb-ft).

5.3 Safety Guidelines for Lifting and Transporting

When lifting the machine:

- Remain aware of the location of other people when lifting the machine.
- Only use the lifting points and tie-downs described in the operator's manual.
- Make sure the transporting vehicle has sufficient load capacity and platform size to safely transport the machine.

To reduce the possibility of injury:

- Do not stand under the machine while it is being lifted or moved.
- Do not get onto the machine while it is being lifted or moved.

5.4 Preparing the Machine for Transport on a Truck or Trailer

⚠ WARNING

Crushing hazard

Improperly securing the machine can lead to a crushing hazard.

► Use only the designated tie-down points to secure the machine to a truck or trailer.

Checklist

Before transporting the machine, check the following items:

Machine

- All doors and access panels of the machine are closed.
- All electrical connections are disconnected from the machine.
- The machine is shut down.
- The tower is completely lowered.
- The tongue and jack are in the shipping position.

Loading and transporting equipment

- The transport vehicle or trailer can support the weight of the machine.
- The lifting equipment, such as chains, hooks, or straps, can support the weight of the machine.
- The wheels of the transport vehicle or trailer are chocked during the loading process.
- The transport vehicle or trailer is clean and free of grease, oil, ice, and other loose material.
- The machine's trailer jack is not used to support the trailer tongue during transporting.
- **Note:** The rear plate of the flipped-up tongue is used to support the machine.
- Check that any ramps used in the loading process:
  - Can support the weight of the machine.
  - Are clean and free of grease, oil, ice, and other loose material.
  - Are securely connected to the transport vehicle or trailer.
  - Are of sufficient length to keep the loading angle 15° or less.

In addition:

- Make sure the loading area is flat and the ground is stable.
- Check the overall height of the machine once loaded. Plan your travel route so that there will be adequate clearance for overpasses, road signs, buildings, etc.
- Check local regulations regarding transporting and obey these regulations.

5.5 Lifting the Machine

Before lifting the machine, see Safety Guidelines for Lifting and Transporting on page 32 and see Preparing the Machine for Transport on a Truck or Trailer on page 33.

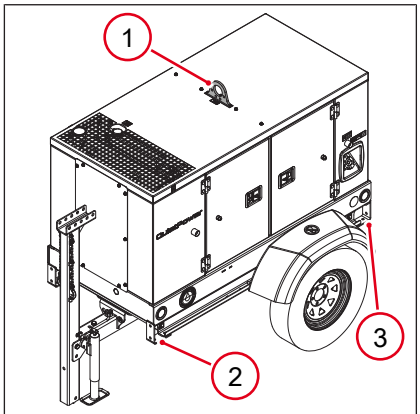


Fig. 10: Lifting eye

Procedure

1. Attach the lifting devices and equipment to the lifting eye **(1)** using hooks, shackles, and chains. Do not attach lifting devices to any other part of the machine.
2. Lift the machine a small distance.
3. Check for stability. If necessary, lower the machine, reposition the lifting device, and lift the machine a small distance again.
4. Continue lifting the machine as necessary.
5. Move slowly and position the machine on the ground or on the vehicle, paying particular attention that all the personnel is at a safe distance from the moving load.
6. If loading onto a transport vehicle, secure the machine to the transport deck using the specified front **(2)** and rear **(3)** tie-down points on the machine with certified straps, chains, or cables.

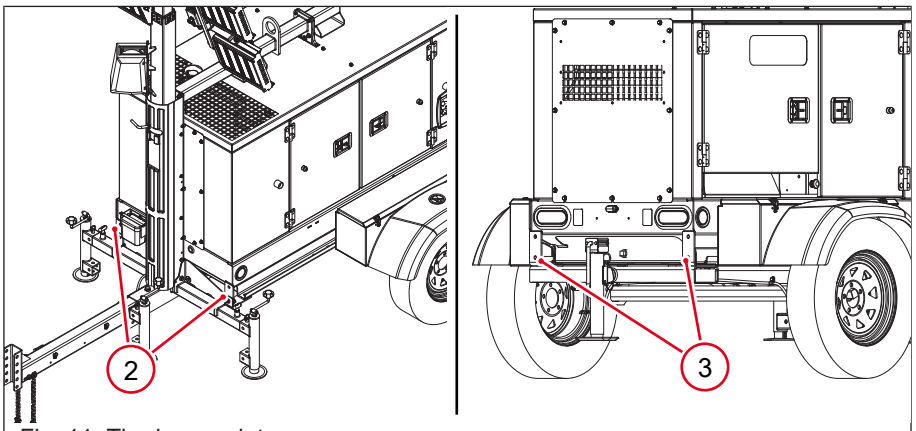


Fig. 11: Tie-down points

5.6 Safety Guidelines for Towing

When towing the machine:

- Do not tow the machine if the towing vehicle’s hitch or the trailer’s coupler are damaged.
- Do not tow the machine if safety chains are damaged.

- Do not exceed the trailer manufacturer's speed limitations. Wacker Neuson recommends a maximum towing speed of 88 km/h (55 mph) on highways and paved roads and 16 km/h (10 mph) on rugged roads and terrain.
- Maintain extra distance between the towing vehicle and other vehicles.
- Avoid soft shoulders, curbs, and sudden lane changes.
- Abide by all licensing requirements for your area.

If you have not driven a towing vehicle with trailer before, practice turning, stopping, and backing up the towing vehicle with trailer in an area away from traffic. Only drive the towing vehicle with trailer when you are confident in your ability to do so.

5.7 Reporting Safety Defects

If you believe your trailer has a defect which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Wacker Neuson .

If NHTSA receives similar complaints, it may open an investigation; and if it finds that a safety defect exists in a group of trailers, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or Wacker Neuson .

To contact NHTSA, you may either contact the Vehicle Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153); go to http://www.safercar.gov; or write to:

Administrator

NHTSA

1200 New Jersey Avenue S.E.

Washington, DC 20590

You can also obtain other information about your motor vehicle safety from http://www.safercar.gov

5.8 Before Towing Checklist

Before towing the machine, check the licensing requirements for trailers in your area. Also, check the following items:

Towing vehicle

- The towing vehicle is rated to tow the load.
- The towing vehicle is in serviceable condition.
- Do any necessary service/maintenance on the towing vehicle.

Machine

- All electrical connections are disconnected from the machine.
- The machine is shut down.

- The tower is completely lowered.
- The winch and light fixtures are in the travel position, facing toward the trailer tongue.

Hitch and coupler

- The towing vehicle and hitch have a rating equal to or greater than the gross vehicle weight rating (GVWR) of the machine. For further information, --- MISSING LINK ---.
- The hitch of the towing vehicle and coupler of the trailer are compatible.
- The coupler and the hitch are in good condition.
- All fasteners on the coupler and chains are tight.
- The coupler has fresh grease applied to it.

Wheels

- All lug nuts are in place and are properly torqued.
- The trailer's tires have more than 1.5 mm (1/16 in.) of tread.
- The tires are inflated to the proper pressure.

Trailer preparation

- All doors and access panels are closed and latched.
- Appropriate hazardous material placards are installed, if applicable, according to local regulations.

Trailer operation

- The trailer jack is in the travel (horizontal) position. For further information, see Machine Positions on page 31.
- The directional and running lights on the trailer function correctly.
- The safety chains of the trailer are connected to the towing vehicle using a crisscross pattern.

5.9 Towing the Machine

NOTICE

Towing the machine without certain components oriented properly and secured may cause machine damage.

► Configure the machine into the travel position. For further information, see Machine Positions on page 31.

► When aiming the lights, be sure the locking pin of the mast rotation handle seats into a notch in the tower.

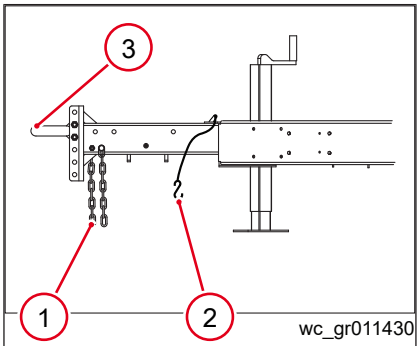


Fig. 12: Safety chains, breakaway cable, and coupler

Overview

The mobile generator's trailer is equipped with brakes (surge or electric), safety chains **(1)**, lights, and a coupler (pintle or ball-type) **(3)**.

Only use the brakes as designed.

The breakaway cable **(2)** is not a parking brake and should not be used as one.

Licensing requirements

- In most states, large trailers must be registered and licensed by the State Department of Transportation. Before towing, be sure to check licensing requirements.
- Drivers towing trailers may be required to carry a commercial driver's license (CDL). Check your local and state licensing regulations before towing the mobile generator.

Coupler maintenance

- A film of grease on the coupler extends coupler life and eliminates squeaking. Wipe the coupler clean and apply fresh grease each time the trailer is towed.

Procedure

1. Read and follow the towing safety guidelines. For further information, see Safety Guidelines for Towing on page 34.
2. Complete the shutdown procedures.
3. Complete the Before Towing Checklist. For further information, see Before Towing Checklist on page 35.
4. Configure the machine into the travel position. For further information, see Machine Positions on page 31.
5. Connect the machine to the towing vehicle and connect the lights.
6. Tow the machine as needed.

5.10 Testing the Breakaway System—Electric Brakes

⚠ WARNING

Personal injury hazard

A faulty breakaway system may lead to an accident and personal injury if the machine/trailer breaks away.

► Do not tow the machine/trailer if the breakaway system is faulty.

NOTICE

Testing the breakaway system with the wiring plug connected may cause damage to the electronic brake control.

► Disconnect the trailer wiring plug from the tow vehicle before testing.

When

- Before towing
- Monthly if the machine is not in service

Requirements

- Voltmeter
- Battery charger or backup battery (charged)

Procedure

1. Connect the machine/trailer to the tow vehicle.
2. Disconnect the trailer wiring plug **(1)** from the tow vehicle.

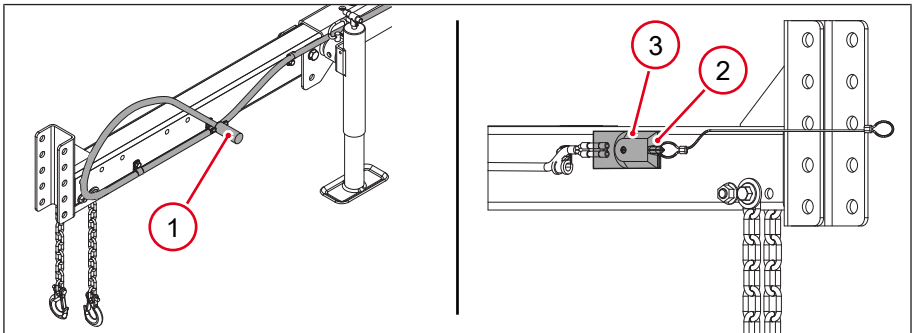


Fig. 13: Trailer wiring plug and brake switch

3. Pull the breakaway pin **(2)** out of the brake switch **(3)** (to activate the brakes) and attempt to tow the machine/trailer at a very slow speed (less than 5 mph). When activated, a properly working breakaway system causes substantial drag on the trailer wheels and may even cause the trailer wheels to lock.
4. Stop the tow vehicle.
5. If the brakes did not function, check the voltage of the breakaway battery. To do so:
   - ⇨ Remove the cover of the battery box.
   - ⇨ Remove the wires connected to the breakaway battery **(4)**.
   - ⇨ Measure the voltage. If 12–14 VDC is not measured, replace or recharge the breakaway battery.
6. If 12–14 VDC was measured but the brakes did not function, there is a wiring or mechanical fault with the brakes. Repair any faults before towing.

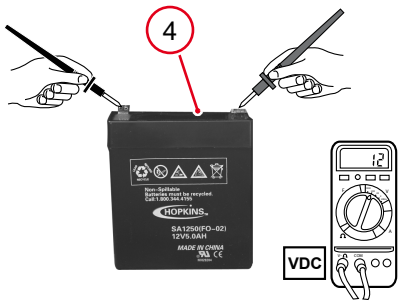


Fig. 14: Breakaway battery

7. If the brakes function properly:
   - ⇨ Reconnect the wires to the breakaway battery.
   - ⇨ Install the cover on the battery box.
   - ⇨ Install the breakaway pin **(2)** into the brake switch.
   - ⇨ Connect the trailer wiring plug to the tow vehicle.

6 Commissioning

6.1 Preparing the Machine for First Use

1. Make sure all loose packaging materials have been removed from the machine.
2. Check the machine and its components for damage. If there is visible damage, do not operate the machine. Contact your Wacker Neuson dealer immediately for assistance.
3. Take inventory of all items included with the machine and verify that all loose components and fasteners are accounted for.
4. Attach component parts not already attached.
5. Add fluids as needed and applicable, including, but not limited to, fuel, engine oil, and coolant.
6. Move the machine to its operating location.

6.2 Positioning the Machine

⚠ WARNING

Fire hazard

Do not move the machine while it is running.

► Shut down the machine before moving or repositioning it.

⚠ WARNING

Electric shock hazard

The tower extends up to 7 m (23 ft) and could contact overhead wires or obstructions.

► Position the trailer on a firm, flat surface clear of overhead wires and obstructions.

⚠ WARNING

Tipping hazard

Machines positioned on a hill or an incline may slide, break away, or roll over.

► Do not position the machine on a hill or an incline.

⚠ WARNING

Explosion and fire hazard

Risk of severe injury or death.

► Do not operate the machine near flammable vapors, fuels, or combustibles.

Before positioning the machine, see Safety Guidelines for Using Internal Combustion Engines on page 17.

Requirements

Position the machine so that:

- The machine exhaust will not enter nearby structures.
- The machine does not block traffic.
- The machine is not near any combustible material or flammable vapor.
- All of the machine's access doors/panels may be accessed.
- For machines with trailers, chocks **(1)** are installed under the wheels.

6.3 Aiming the Light Fixtures

Overview

- Each individual light fixture can be independently aimed up, down, left, or right. There are four total light fixtures on each machine.
- This procedure is not for rotating the lights as a single unit while the tower is raised. To rotate the lights, see Manually Rotating the Light Bar on page 42.

Requirements

- Machine shut down
- Tower lowered
- Lights cool to the touch

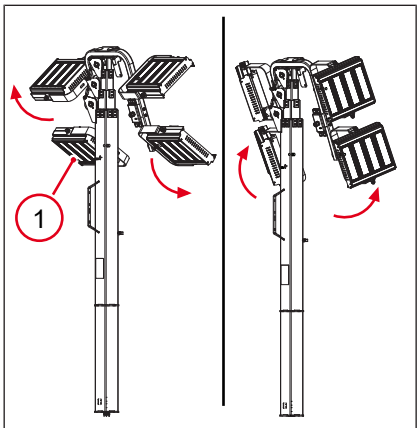


Fig. 15: Aiming the lights

Aiming the light fixtures up or down

1. Grasp the light fixture **(1)** and aim it up or down.
2. Repeat step 1 for each remaining light fixture, if desired.

Aiming the light fixtures left or right

1. Grasp a light fixture and aim it to the left or right.
2. Repeat step 1 for each remaining light fixture, if desired.

6.4 Manually Rotating the Light Bar

Overview

The operator can rotate the light bar 360° while the tower is raised or lowered. Do not rotate the tower past 360° to avoid exceeding the length of the wire.

Note: If the machine is running while the tower is lowered, make sure to rotate the tower so that the lights are not positioned over the exhaust pipe.

Procedure

1. Loosen the rotation locking handle **(1)**.

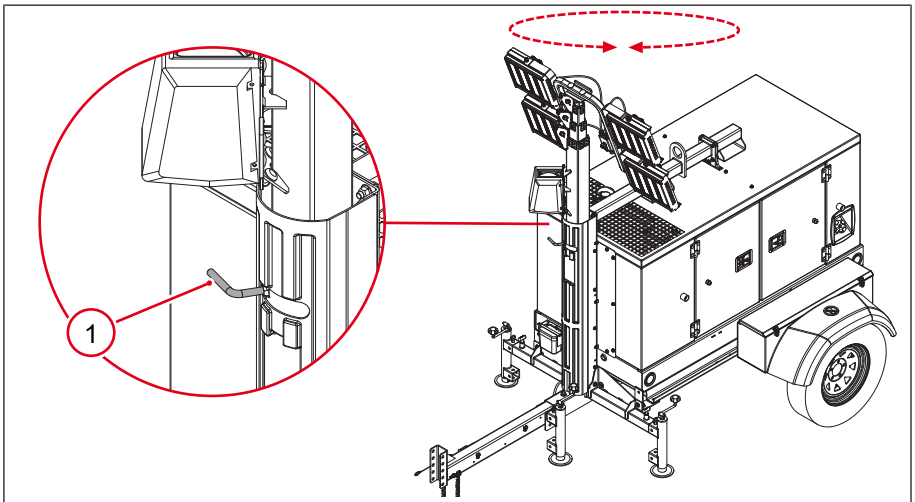


Fig. 16: Rotation locking handle

2. Rotate the tower to the desired position.
3. Tighten the rotation locking handle.

6.5 Leveling the Trailer

⚠ WARNING

Tipping and falling hazard

Failure to level the trailer will reduce the stability of the unit.

► Level the trailer before raising the tower. The three leveling jacks must remain engaged while the tower is up.

Procedure

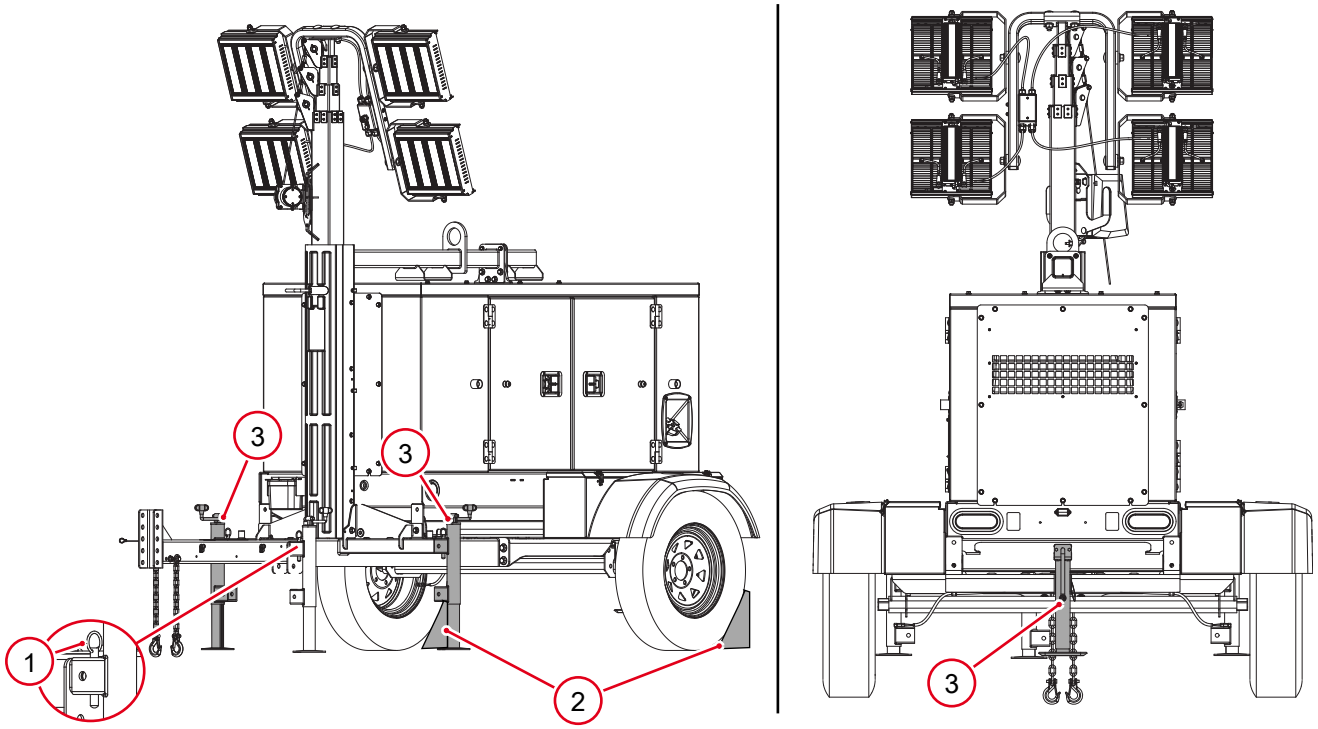


Fig. 17: Leveling jacks and chocks

Configure the tongue and jacks into the operating position. For further information, see Machine Positions on page 31.

From the travel position:

1. Pull the pin **(1)** on the tongue jack and move the jack into the lower mounting position. Insert the pin once the jack is in position.
2. Block or chock **(2)** the trailer wheels.
3. Pull the leveling jack pins to release the leveling jacks **(3)**. Move the leveling jacks to the lower mounting position.
4. Lower the jacks until they rest firmly on the ground.

7 Operation

7.1 Grounding the Machine

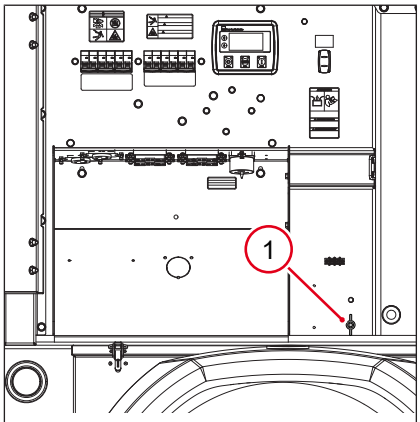


Fig. 18: Grounding connection

External grounding

A ground connection **(1)** is located on the trailer frame.

Function

This ground connection is used for electrically grounding the machine when necessary to comply with the National Electrical Code and other federal, state, and local regulations. For grounding requirements in your area, consult with a qualified electrician, electrical inspector, or local agency having jurisdiction over electrical compliance.

If the light tower is used at a construction site, there may be additional regulations which must be observed.

Internal grounding

- The exposed, conductive, noncurrent-carrying components that could become energized (for example, fuel tank, engine, generator housing, control panel, enclosure, trailer, tower sections, and light fixtures) are bonded (connected) to the machine's frame.
- The grounding wires of the machine's power outputs (receptacles) are bonded (connected) to the machine's frame.
- The neutral of the generator stator winding is bonded (connected) to the machine's frame.

7.2 Refueling the Machine

⚠ WARNING

Fire and explosion hazard

Fuel and its vapors are extremely flammable and can be explosive. Burning fuel can cause severe burns.

► Keep all sources of ignition away from the machine while draining the fuel tank.

► Clean up spilled fuel immediately.

► Do not smoke while refueling.

Requirements

- Machine shut down
- Engine cool
- Machine/fuel tank level with the ground
- Fresh, clean fuel supply

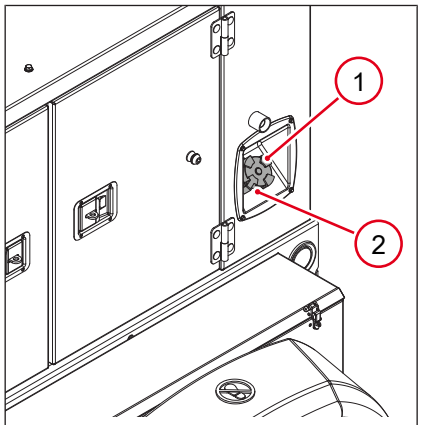


Fig. 19: Fuel cap location

Procedure

1. Remove the fuel cap **(1)**.
2. Fill the fuel tank to the bottom of the fuel tank neck **(2)** to allow for expansion space between the fuel level and the top of the tank.
3. Install the fuel cap.

7.3 Control Panels and Receptacles—Deep Sea

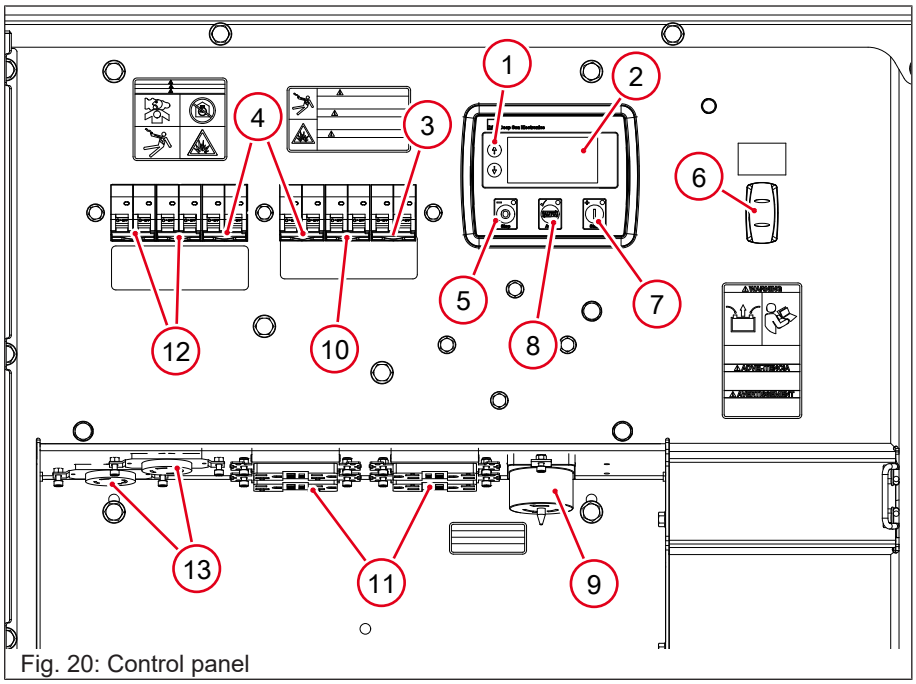


Fig. 20: Control panel

Ref.	Description	Ref.	Description
1	Menu navigation buttons (up/down)	2	Controller display
3	Lights circuit breaker	4	GFCI circuit breaker(s)
5	Stop/reset button	6	Tower winch rocker switch
7	Start button	8	Auto start button
9	50A receptacle	10	50A receptacle breaker
11	20A GFCI receptacles	12	30A receptacle breakers (deluxe)
13	30A receptacles (deluxe)	14	—

7.4 Before Starting

Before putting the light tower into service, review each item on the following checklist. Light towers often run unattended for long periods of time. Therefore, it is important to make sure that the machine is set up properly to avoid possible operating problems.

Check machine condition

- Verify that the machine is level and positioned on a stable surface.
- Perform a walk-around to check for visible damage. Check for:
  - External damage (dents, cracks, broken door latches, etc.)
  - Loose or missing fasteners
  - Loose or missing parts
  - Cut or worn insulation on electrical cords
  - Damaged light fixtures
  - Fluid leaks
  - Restricted air flow at the engine exhaust
  - Problems with the trailer (if equipped, see Maintaining the Trailer on page 62)
- Carefully inspect the winch cable for any kinks, frays, or abnormal stiffness, and replace it, if damaged.
- Ensure that all electrical connections are tight.
- Verify that all electrical cords are in serviceable condition with no exposed wires, cuts, or cracks in the insulation.
- Close and secure access covers after starting the machine.

Check internal components

Open the access hood on the rear of the machine. Check for:

- Damage to control panels, switches, or convenience receptacles
- Loose or missing fasteners
- Loose or missing parts
- Fluid leaks
- Rags, containers, or other debris inside the cabinet

Check the engine

- Check fuel, engine oil, and coolant levels. Add fluids if necessary.
- Verify that the fuel lines are undamaged and correctly connected.
- Verify that the air filter element is clean and undamaged. Replace if necessary.
- Check to make sure no debris has lodged in vents, near the radiator, or around the fan.
- Check to make sure that the exhaust compartment is clean and nothing is touching the muffler or exhaust pipes.
- Check fan belt and hoses on engine for loose connections or fraying. Tighten or replace as required.

Review safety information

Review and follow instructions provided in the Safety chapter at the beginning of this operator's manual. For further information, see Safety on page 13.

7.5 Starting the Machine

⚠ WARNING

Electric shock hazard

Do not start the generator if the insulation on the tower electrical cable is cut or worn through.

Note: If fuel tank was drained or run dry it may be necessary to bleed fuel lines. Refer to the engine operator's manual.

Prerequisites

- Electrical cable on the tower in serviceable condition
- Circuit breakers in their OFF positions

Procedure

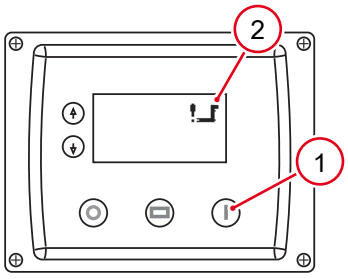


Fig. 21: Starting procedure

1. Wake the controller from sleep mode by pressing any button.
2. Press the Start button **(1)**.
3. Once the controller is active, press the Start button again within 30 seconds to start the machine.
   ⇨ If the engine does not start, the starting sequence is terminated, and the fail to start shutdown indicator **(2)** illuminates. Wait 15 seconds before attempting to start again.
   ⇨ When the engine starts, the starter motor is disengaged.
   Note: After the starter motor has disengaged, the safety on timer is activated. This timer is pre-set for a 10 second delay and allows oil pressure, high engine temperature, underspeed, and charge failure to stabilize without triggering the fault.
4. Allow engine to warm up before operating lights and receptacles.

7.6 Operating the Lights

Turn on the circuit breakers above the light icon one at a time.

7.7 Shutting Down the Machine

NOTICE

Starting the engine with a load on it may cause damage.

► Do not start the engine under load.

NOTICE

Shutting down the engine before turning off the lights may lead to premature wear or failure of generator components.

1. Disconnect all loads from the machine.
2. Turn all breakers off.
3. Press the Stop button to stop the machine.

7.8 Raising and Lowering the Tower

⚠ WARNING

Electric shock hazard

Do not use the light tower if insulation on any of the electrical cords is cut or worn through. Bare wires in contact with the metal frame of the trailer or tower can cause electrocution.

► Repair or replace the cord before using the machine.

⚠ WARNING

Electrocution hazard

► Do not position the light tower under electrical power lines.

⚠ WARNING

Tipping/falling hazard

Certain actions may cause the tower to fall or the machine to tip over.

► Do not raise the tower or operate the light tower in high winds.

► Do not touch the winch pawl while the tower is raised.

⚠ WARNING

Personal injury hazard

Bystanders can be struck by the tower as it is being raised or lowered.

► Do not allow anyone to stand near the right side of the winch while raising or lowering the tower.

NOTICE

Do not attempt to lift the tower if the winch is damaged or not operating properly, or if the winch cables are worn or damaged.

NOTICE

Allowing loose cable to wind onto drum may shorten the life of the cable and cause serious winch damage. Make sure that the first layer of cable on the drum is wound neatly and tightly. Excess cable length makes loose, criss-crossing wraps more likely.

Background

The light tower includes a telescoping winch for raising the tower.

The tower and light bar can be rotated 360°. For further information, see Manually Rotating the Light Bar on page 42.

Requirements

- Machine on a firm, flat surface clear of overhead wires and obstructions
- Winch cables in serviceable condition and seated properly in pulleys
- Machine leveled with all leveling jacks extended and locked

Raising the tower using the power winch

1. If the machine is off, press the red Stop button to wake the Deep Sea controller.
2. Check the operation of the telescoping winch **(3)**. Press and hold the telescope rocker switch **(4)** on the control panel in the UP position.

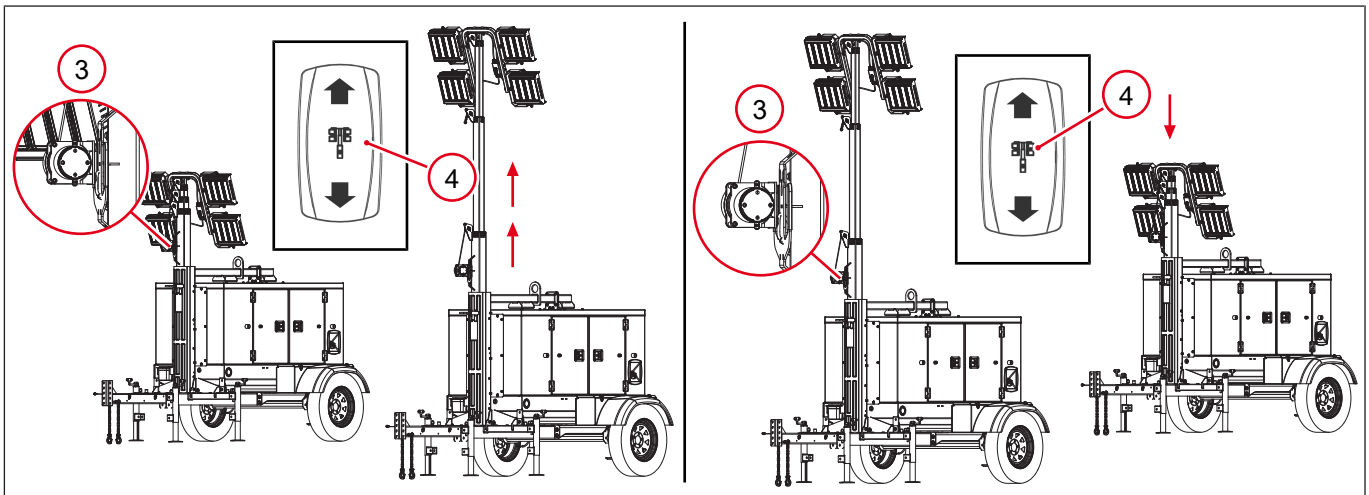


Fig. 22: Power winch—raising and lowering

3. Release the switch when the tower is at the desired height. Do not overcrank the winch when the tower is fully extended.

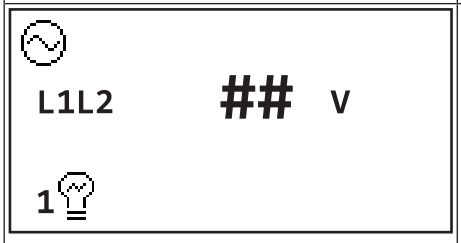
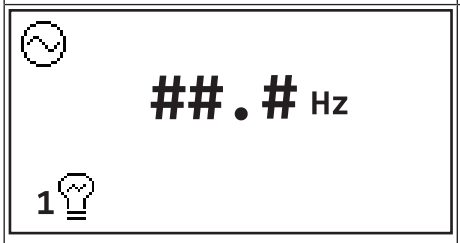
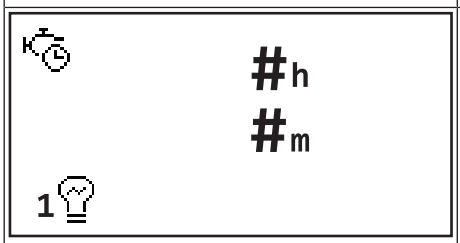
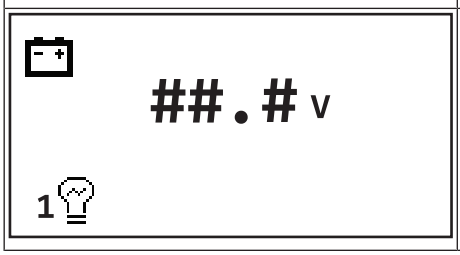
Lowering the tower using the power winch

Hold the rocker switch in the DOWN position (“cable out” direction) until the tower is completely lowered.

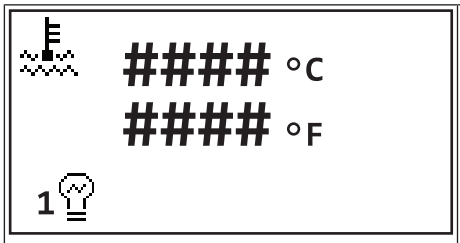
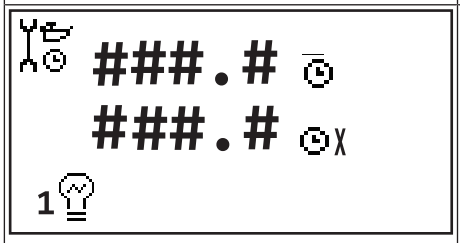
Note: To lower the tower in the event of a power failure, remove the plug in the side of the winch housing and install the manual crank supplied with the machine. Rotate the handle until the tower is fully lowered.

7.9 Machine Monitoring

Engine and generator information is displayed on the LCD panel. The user can scroll through the screens to monitor machine parameters.

	Displays the AC output voltage being produced by the generator.
	Displays the AC output voltage being produced by the generator.
	Displays output frequency.
	Displays the engine rpm.
	Displays the metered usage of the machine in hours (h) and minutes (m).
	Displays the available voltage of the battery.

7

	Displays the engine coolant temperature.
	Displays the time remaining until maintenance (oil change) is required and the maintenance interval.

7.10 Alarms and Shutdown Conditions

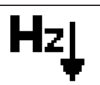
Background

The machine controller monitors variables of engine and machine function. The machine controller has two types of alarms: warning alarms and shutdown alarms.

Warning alarms

Warnings are non-critical alarm conditions that do not affect the operation of the generator system. They serve to draw the operator's attention to an undesirable condition. Warning alarms are self-resetting when the fault condition is removed.

Warning alarms include:

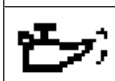
Icon	Description
	Over-voltage
	Under-voltage
	Overspeed
	Underspeed
	Over-voltage on 12V battery
	Under-voltage on 12V battery
	Charge alternator low
	Low fuel

Icon	Description
	ECU amber DM1 DTC
	Intake filter restricted
	Overcurrent

During a warning alarm condition, the LCD panel displays the type of warning alarm. The machine is not shut down.

Shutdown alarms

Shutdown alarms are latching alarms and stop the generator. Shutdown alarms include:

Icon	Description
	High coolant temperature
	ECU data fail
	Overcurrent
	ECU red DM1 DTC
	Low coolant level (if equipped)
	Low oil pressure
	Overspeed
	Underspeed
	Overvoltage
	Charge alternator fail
	Emergency stop (if equipped)

During a shutdown alarm condition, the LCD panel displays the type of alarm that caused the machine shutdown. Remove the fault condition, then press Stop.

The most common alarms are listed here. In rare circumstances, others may appear. If an unknown alarm icon appears, refer to the DSEL401 MKII operator's manual or contact Wacker Neuson for assistance.

Variable	Normal	Warning	Shutdown	To Reset
Fuel level	>15%	5%	—	Fill fuel tank. Press Stop/Reset.
Coolant temp.	85°C ±8	—	>109°C	Add coolant. Press Stop/Reset.
Oil pressure	Pressure while engine running; switch open	—	No pressure while engine running; switch closed	Add engine oil. Press Stop/Reset.
Overspeed	60 Hz	63 Hz	66 Hz	Press Stop/Reset.
Underspeed	60 Hz	57 Hz	54 Hz	Press Stop/Reset.
Overcrank	—	—	After 1 attempt	Press Stop/Reset.
Time to maintain	500 hr	0 hr	—	Reset controller.
Coolant level	Above sender	—	Below sender	Add coolant. Press Stop/Reset.
Air filter differential pressure	< 5.00 kPa	> 5 kPa	—	Clean/replace intake filter. Press Stop/Reset.

7.11 Resetting the Maintenance Timers—Deep Sea

Background

The maintenance timers are preset on the controller. When the timer expires, the alarm displays in the upper right corner of the screen. The maintenance timers vary based on the machine's engine and configuration. Scroll through the controller to check the values.

Procedure

After the required maintenance has been completed, perform the following procedure to reset a maintenance timer.

1. Use the up and down arrows **(1)** to navigate to the applicable screen.

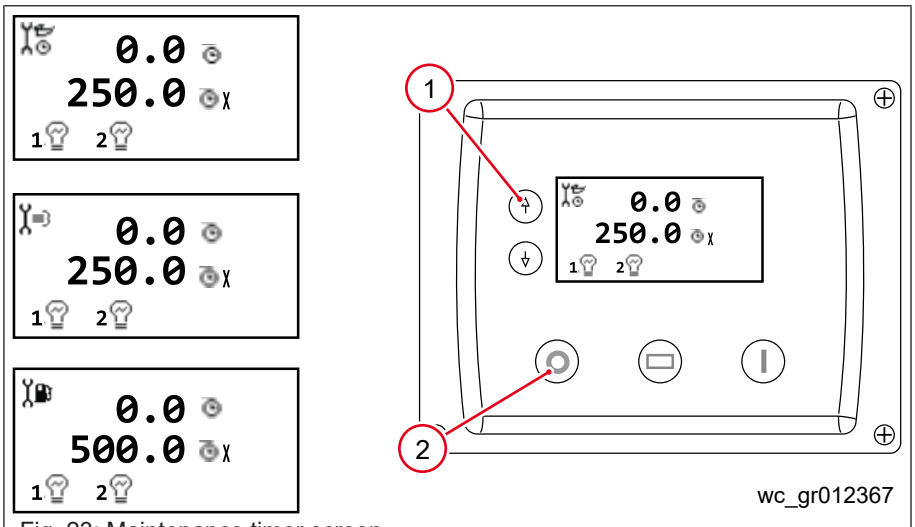


Fig. 23: Maintenance timer screen

2. Press and hold the Stop button **(2)** for 10 seconds. The timer resets.

7.12 Adjusting the Screen Contrast

1. Enter the editor mode by pressing and holding the Stop **(1)** and Auto **(2)** buttons simultaneously.

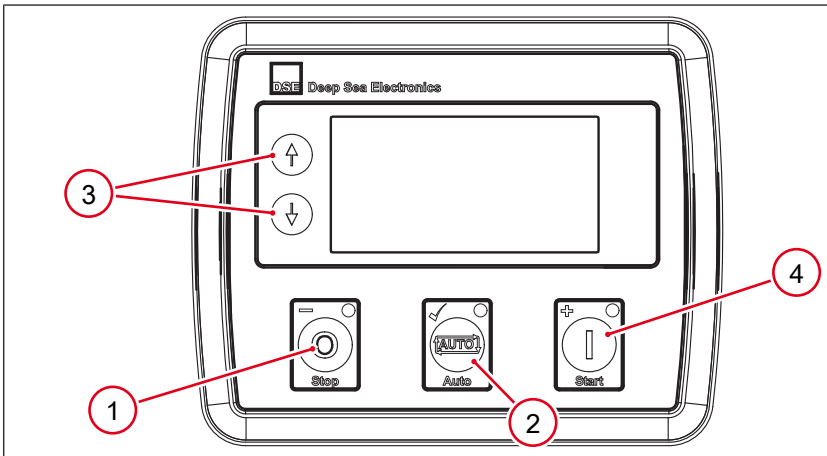


Fig. 24: Controller buttons

2. Press the up or down arrows **(3)** and then the Auto button to select the configuration editor (wrench icon). Refer to the following table.
   Note: If a PIN code is required, contact Wacker Neuson for the PIN code. For security purposes, the PIN code entry automatically clears when the editor is exited (manually or automatically).
3. Press the down button.
4. Press the Auto button to select 101.
5. Press the Auto button again to edit the value.
6. Press the Stop (-) or Start (+) **(4)** buttons to adjust the value.
7. Save and exit the editor by pressing and holding the Auto button. To exit without saving, press and hold Stop.

Configuration Editor Parameters for Contrast		
Unit	**Description**	**Parameter**
101	Adjust screen contrast	0 (%)

7.13 Auto Mode (Auto Start/Stop) (if equipped)

⚠ WARNING

Personal injury hazard

Machine can automatically start which can cause serious injury.

► Make sure the machine is positioned outside in an area free of hazards. For further information, see Positioning the Machine on page 40.

The engine controller is capable of automatically starting or stopping the engine.

A scheduled run will begin only if the controller is in auto mode (LED **(1)** is lit) with no shutdown alarm present. If the controller is in stop/reset mode or manual/start mode when a scheduled run begins, the engine will not start. However, if the controller is set to auto mode during a scheduled run, the engine will start.

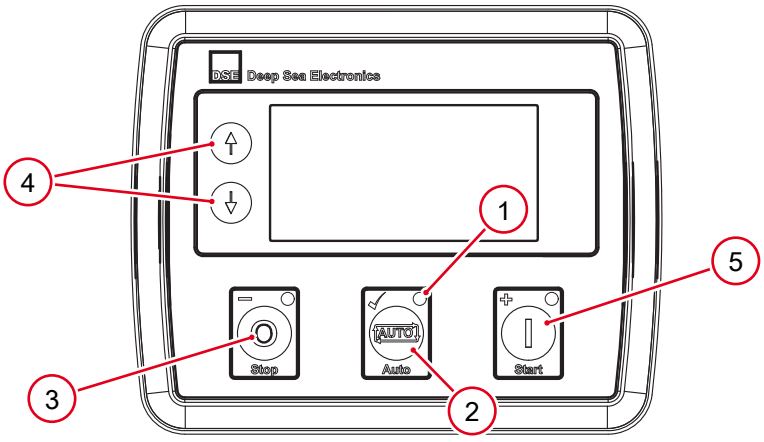


Fig. 25: Controller buttons

Auto start by photo cell

Note: Auto start by photo cell is on by default.

1. Press the Auto button **(2)** once. The indicator LED above the Auto button illuminates.
2. Place the main breaker and light breaker(s) in the UP position (closed).

The machine is now in auto mode.

Shortly before the sun sets, the machine will start and turn on the lights automatically.

When the sun rises, the machine will turn off the lights and then shut down.

This cycle will continue until the machine is taken off auto mode by pressing the red Stop button.

To configure auto start by photo cell:

1. Enter the editor mode by pressing and holding the Stop **(3)** and Auto buttons simultaneously.
2. Press the up or down arrows **(4)** and then the Auto button to select the configuration editor (wrench icon). Refer to the following table.
   Note: If a PIN code is required, contact Wacker Neuson for the PIN code. For security purposes, the PIN code entry automatically clears when the editor is exited (manually or automatically).
   - ⇨ Press the up and down arrows to cycle through the editor in increments of 100.
   - ⇨ Press the Stop (-) or Start (+) buttons to cycle through the editor in increments of 1.
   - ⇨ When viewing the parameter to be edited, press the Auto button. The value flashes.
   - ⇨ Press the Stop (-) or Start (+) buttons to adjust the value to the required setting.

3. Save and exit the editor by pressing and holding the Auto button. To exit without saving, press and hold Stop.

Configuration Editor Parameters for Auto Start by Photo Cell		
Unit	**Description**	**Parameter**
328	Enable photo cell	(0) OFF, **(20) ON** (20 enables photo cell)

Auto start using the scheduler

Notes

- Auto start by photo cell should be off before using the scheduler or telematics (if equipped). To reenable auto start by photo cell, first disable the scheduler.
- For the scheduler to work, the date and time must be set correctly first. Refer to the following table.

To set the date and time:

1. Enter the editor mode. Press and hold the Stop and Auto buttons simultaneously.
2. Press the up or down arrows and then the Auto button to select the operator editor (human icon). Refer to the following table.
3. Save and exit the editor by pressing and holding the Auto button. To exit without saving, press and hold Stop.

7

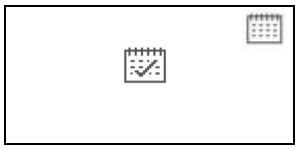
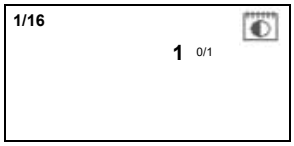
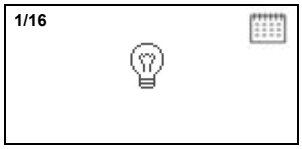
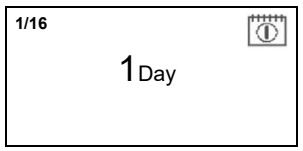
Configuration Editor Parameters for Time, Date, and Location Settings		
Unit	**Description**	**Parameter**
1001	Time of day	(0) OFF, **(20) ON** (20 enables photo cell)
1002	Day of month	1–31 preloaded for CST zone
1003	Month of year	1–12 preloaded for CST zone
1004	Year	2020 (2000–2029) preloaded for CST zone
1005	Enable daylight savings	(1) ON, (0) OFF
1006	Daylight saving offset	0:00 Hours:Minutes (+0:00 to +2:00)
1007	Latitude (**+**N or **-**S of equator)	**+43.18°** Decimal Degrees, preloaded for CST zone
1008	Longitude (**+**E or **-**W of Greenwich, England)	**-88.09°** Decimal Degrees, preloaded for CST zone
1009	Time zone offset (from Greenwich, England)	**-6:00** Hrs (+E or -W of Greenwich), preloaded for CST zone
1010	Sunset offset	0:00 Hours:Minutes (-2:00 to +2:00)
1011	Sunrise offset	0:00 Hours:Minutes (-2:00 to +2:00)

To configure auto start by schedule:

1. To access the scheduler editor, navigate to the scheduler page(s) using the arrows and press and hold the Stop button.
2. Use the Stop (-) or Start (+) **(5)** buttons or arrow buttons to scroll through the scheduler editor.
3. To edit the parameters, press the Auto button.
4. Use the Stop (-) or Start (+) buttons to change the value. The displayed value or icon flashes when in edit mode.

5. Press the Auto button to set the new value.
6. Press and hold the Auto button to save the changes and exit the scheduler editor.

Use the Deep Sea computer software for more comprehensive module configurations.

Screen	Parameter	Description
	Scheduler enable	Select whether the scheduler is enabled or disabled
	Schedule period	Select a schedule period of weekly, monthly, or daily.
	Auto mode	Select either 0 or 1, where 0 uses the configured time, and 1 uses the sunrise and sunset calculation.
	Run mode	Scroll through the light bulb icons to select the filled light bulb for on load (load switch closed).
	Start time	Set the time at which the schedule should start.
	Start day	Set the day of the week on which the schedule should start. This screen only appears if you set the schedule to run weekly or monthly. The days correspond with numbers, as follows: 1=Monday, 2=Tuesday, 3=Wednesday, 4=Thursday, 5=Friday, 6=Saturday, 7=Sunday
	Start week	Select the week of the month on which the schedule should start: 1, 2, 3, or 4. This screen only appears if you set the schedule to run monthly.
	Duration	Set the duration, in hours, of the schedule.

7.14 Generator Derating

Background

All generators are subject to derating for altitude and temperature. Although derating should not affect operation of the lights, it will reduce the available reserve power to the receptacles.

Derating percentages

Ratings are typically reduced 3% per 300 m (1000 ft) elevation above sea level, and 2% per 5.5°C (10°F) increase in ambient temperature above 25°C (78°F).

7.15 Emergency Stop Switch

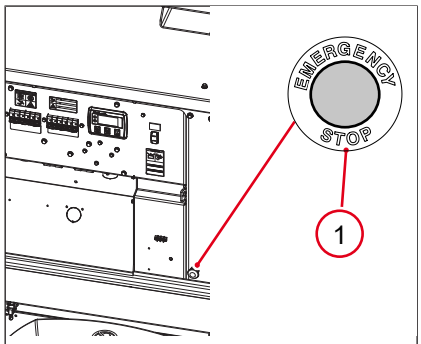


Fig. 26: Emergency stop button location

Location

The emergency stop switch **(1)** is the red button located on the receptacle panel at the rear of the light tower cabinet.

Operation

- Activate the emergency stop switch by pushing the red button in.
- Pushing the emergency stop switch opens the main circuit breaker and fuel solenoid. The engine shuts down, and an indicator illuminates.
- The switch remains in until the button is pulled out.

7.16 Wet Stacking

Overview

Wet stacking is the buildup of unburned diesel fuel, moisture, and carbon particles in the exhaust system of the machine. This occurs when diesel fuel is not completely burned off during use, and a black, oily residue accumulates in the exhaust system due to operating the machine at a light load for extended periods of time.

Wet stacking can lead to reduced engine performance, pollution, premature engine wear, and permanent engine damage.

Prevention

- Use the right sized machine for the needs of the job.
- Follow the maintenance schedule.
- Load the machine greater than 30% of the engine rating.
- Run the machine a few minutes per week at the operational temperature.
- Have the machine regularly serviced by an experienced service technician.

Solution

- Have the machine serviced by an experienced service technician.
- Operate the machine at a load of about 75–80% of the machine's name-plate rating for a few hours to raise the exhaust temperature high enough to clean out the exhaust system.

8 Maintenance

8.1 General Maintenance

⚠ WARNING

Injury and machine damage hazard

A poorly maintained machine can malfunction, causing injuries or permanent damage to the machine.

► Keep the machine in safe operating condition by performing periodic maintenance and making repairs as needed.

8.2 Maintenance Table

Maintenance cycle	Personnel	For further information	
Daily	Operating personnel	[▶ 61]	Checking and Cleaning the Radiator
		[▶ 64]	Checking the Engine Oil
Every week	Operating personnel	[▶ 65]	Checking the Exhaust System
Every month	Operating personnel	[▶ 37]	Testing the Breakaway System—Electric Brakes
10 hours	Operating personnel	[▶ 46]	Before Starting
		[▶ 62]	Maintaining the Trailer
50 hours	Operating personnel	[▶ 66]	Checking and Draining the Containment System
100 hours	Operating personnel	[▶ 67]	Maintaining the Fuel Filter
250 hours	Operating personnel	[▶ 68]	Cleaning the Machine
		[▶ 68]	Maintaining the Battery
500 hours	Operating personnel	[▶ 69]	Maintaining the Air Cleaner
1000 hours	Operating personnel	[▶ 67]	Maintaining the Fuel Filter
		[▶ 70]	Changing the Engine Oil and Filter
2000 hours	Operating personnel	[▶ 72]	Filling the Radiator
6000 hours	Operating personnel	[▶ 72]	Filling the Radiator

8.3 Checking and Cleaning the Radiator

⚠ CAUTION

Personal injury hazard

Using compressed air or high-pressure water may cause eye injuries due to flying debris, dust, and steam.

► Wear eye protection when using compressed air or high-pressure water.

NOTICE

Cleaning the radiator improperly will damage the radiator fins.

- ► Do not use high-pressure water or compressed air at a pressure greater than 28 psi (193 kPa).
- ► Do not use a wire brush.

When

Daily

Requirements

- Machine shut down and engine cool to the touch
- Compressed air

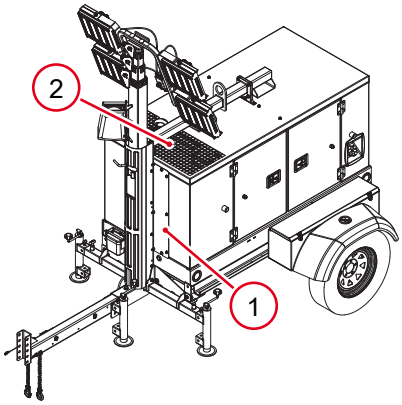


Fig. 27: Exhaust screen

Procedure

1. Inspect the radiator for damage and any excessive dirt and debris. If there is no damage and the radiator is clean, no further action is necessary. Otherwise, continue with this procedure.
2. Remove the front access panel **(1)**.
3. Use compressed air to clean loose particles from the radiator.
4. Clear any obstructions from the exhaust screen **(2)** on the top of the machine.

8.4 Maintaining the Trailer

When

Daily before towing

Tires

- Keep tires inflated to the proper pressure as shown on the tire sidewall.
- Check tread periodically for wear.
- Replace tires as required.

Wheels

- Check that lug nuts are tight.
- Replace any missing lug nuts immediately.

Axle hubs

- Grease axle hubs using a good wheel-bearing grease.

Brakes

Note: If the fluid level has fallen too low, bleed the brake lines to remove any air trapped in the lines. Then, fill to the proper level with clean brake fluid.

- Check level of brake fluid in actuator at front of trailer at regular intervals.
- Fill brake fluid to approximately 1 inch below top of reservoir using DOT-3 heavy-duty brake fluid.
- Tighten filler plug securely.
- Check operation of brakes before each trip.
- Check the functionality of the breakaway switch if the trailer is equipped with electric brakes.

Safety chains

- Inspect the safety chains for any damage.

Lights

- Check the functionality of all lights.

8.5 Engine Oil Viscosity

⚠ WARNING

Health hazard

Most used liquids from this machine contain small amounts of materials that can cause cancer and other health problems if inhaled, ingested, or left in contact with skin for prolonged periods of time.

► Take steps to avoid inhaling or ingesting used liquids.

► Wash skin thoroughly after exposure to used liquids.

The viscosity of the engine oil is an important factor when determining the correct engine oil to use in your machine. Use an engine oil of appropriate viscosity based on the expected outside air temperature.

Refer to the following table when choosing engine oil:

Recommended Oil		
With Specifications	API	CI-4 or better
	ACEA	E7 or better
Viscosity	SAE	0w-40 (-40°C–50°C / -40°F–122°F) 10w-40 (-25°C–50°C / -13°F–122°F)

Refer to the engine owner's manual for more information.

8.6 Checking the Engine Oil

⚠ WARNING

Health hazard

Most used liquids from this machine contain small amounts of materials that can cause cancer and other health problems if inhaled, ingested, or left in contact with skin for prolonged periods of time.

- ► Take steps to avoid inhaling or ingesting used liquids.
- ► Wash skin thoroughly after exposure to used liquids.

NOTICE

Engine damage can occur if the oil level is too high or if the incorrect oil is used.

- ► Oil must be removed from the engine if the oil level is above the max line.
- ► Use only the recommended oil.

NOTICE

Prevent dirt and debris from contaminating the engine oil. Carefully clean the oil cap, dipstick, and the surrounding area before removing the cap.

Do not mix different types of engine oil. This can adversely affect the lubricating properties of the engine oil.

Environment

Use a suitable container to collect, store, and dispose of drained fluids and lubricants in accordance with current environmental protection regulations.

When

Every 10 hours or daily

Requirements

- Machine on a level surface
- Machine shut down for several minutes
- Recommended oil (for oil specifications, see Engine Oil Viscosity on page 63)
- A clean cloth

Overview

Maintaining the appropriate engine oil prevents excessive wear of the engine.

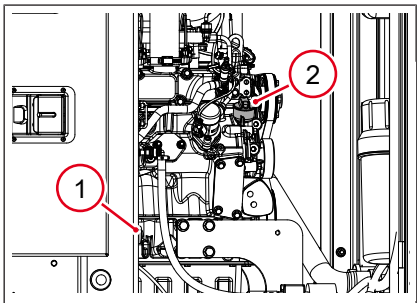


Fig. 28: Dipstick and oil cap

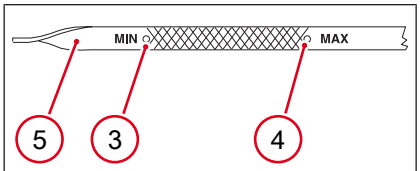


Fig. 29: Dipstick marks

Procedure

1. Open the engine access door.
2. Carefully remove the dipstick **(1)** and wipe it clean.
3. Fully insert the dipstick into the dipstick tube and remove it again to check the engine oil level.
4. If the engine oil level is between the MIN **(3)** and MAX **(4)** marks, the level is acceptable. Do not add engine oil.
5. If the oil level is below **(5)** the MIN mark, remove the engine oil cap **(2)** and add enough oil to raise the level within the MIN-MAX range.
   - ⇨ Repeat steps 1, 2, and 3 to check engine oil level.
   - ⇨ Install the engine oil cap when the engine oil level is sufficient.
6. Install the dipstick.

8.7 Checking the Exhaust System

When

Weekly

Requirements

- Engine stopped
- Exhaust pipes and muffler cool to the touch

Overview

A leaky exhaust system adversely affects machine operation. Symptoms include increased noise and visible soot deposits. Leaking exhaust can also ignite surrounding materials and pipe insulation, causing a fire.

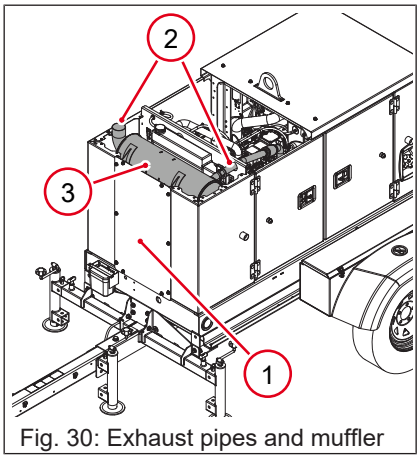


Fig. 30: Exhaust pipes and muffler

Procedure

1. Open the access door on the right side of the machine and remove the front access panel **(1)**.
2. Inspect the exhaust pipes **(2)** and muffler **(3)**, looking for:
   - ⇨ Cracks or holes
   - ⇨ Burned or missing insulation
   - ⇨ Loose or missing clamps
   - ⇨ Black soot deposits, especially around welds and joints

3. Start the engine and listen carefully for:
   - ⇨ Excessive noise
   - ⇨ Rumbling
   - ⇨ High-pitched whine
   - ⇨ Rattling
4. Repair or replace faulty components before putting the machine back into service.

8.8 Checking and Draining the Containment System

NOTICE

It is important to check the containment system regularly. A large amount of fluid collected in a 24-hour period indicates a significant leak.

Environment

Use a suitable container to collect, store, and dispose of drained fluids and lubricants in accordance with current environmental protection regulations.

When

Every 50 hours

Requirements

- Machine shut down
- Engine cool to the touch
- Machine on a level surface
- Plastic sheet and container of sufficient volume to collect drained fluid

Overview

Certain machines are equipped with a containment system. The containment system protects the environment by collecting fluid leaks (fuel, coolant, or oil) which might otherwise contaminate the soil.

It is important to check the containment system regularly. A large amount of fluid collected in a 24-hour period indicates a significant leak.

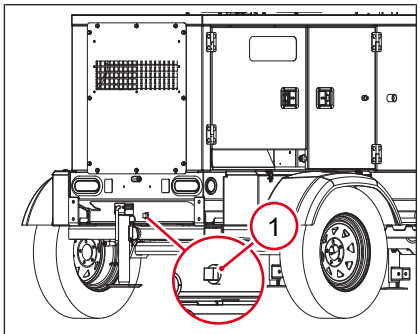


Fig. 31: Drain plug

Procedure

1. Open the access door on either side of the machine.
2. Look down between the fuel tank and side of the machine and check for fluid in the containment system.

3. If fluid has accumulated, drain the containment system.
   - ⇨ Place a plastic sheet and a collection container beneath the machine.
   - ⇨ Remove the drain plug **(1)**. Drain accumulated fluid into a suitable container.
   - ⇨ Apply pipe sealant to the drain plug.
   - ⇨ Install the drain plug.

8.9 Maintaining the Fuel Filter

Environment

Use a suitable container to collect, store, and dispose of drained fluids and lubricants in accordance with current environmental protection regulations.

When

- Drain the water every 100 hours.
- Change the fuel filter every 1,000 hours.

Requirements

- Machine shut down and secure
- Replacement water separator
- Container of sufficient volume to collect drained fluid
- Filter wrench

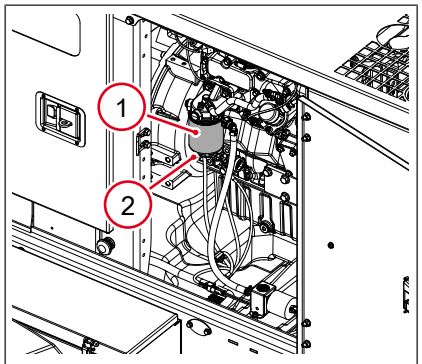


Fig. 32: Fuel filter and wing nut

Draining the water

The fuel filter **(1)** is located in the engine compartment.

1. Place a collection container beneath the fuel filter.
2. Loosen the cap **(2)** at the bottom of the water separator without removing it.
3. Drain any water present.
4. Tighten the wing nut.

Replacing the fuel filter

Note: Do not fill the new fuel filter cartridge with fuel.

1. Use a filter wrench to remove the fuel filter cartridge. Discard the used cartridge.
2. Lubricate the O-ring at the top of the new fuel filter with some petroleum jelly or some clean diesel fuel.
3. Hand-tighten the cartridge until its sealed face comes in contact with the O-ring.

8.10 Cleaning the Machine

When

Every 250 hours

Suggested cleaning materials

- Compressed air
- Clean water supply
- Mild detergent
- Clean, dry cloths

Cleaning the interior

- Check the fluid level in the containment system (if equipped) and drain if necessary. For more information, see Checking and Draining the Containment System on page 66.
- Remove rags, containers, or other debris from the cabinet. Nothing should be stored inside the machine except in the tool boxes located on the fenders.
- Remove leaves, twigs, and any other debris from the exhaust compartment.
- Wipe interior surfaces clean of oil, dust, and dirt.

Cleaning the exterior

Clean the exterior of the machine with clean water and a mild detergent.

8.11 Maintaining the Battery

⚠ WARNING

Explosion hazard

Batteries can emit explosive hydrogen gas.

► Keep all sparks and flames away from the battery.

► Do not short-circuit battery posts.

When

Every 250 hours

Safety precautions

Observe the following safety precautions to prevent serious damage to the electrical system.

- Do not disconnect the battery while the machine is running.
- Do not attempt to run the machine without a battery.

- In the event that the machine has a discharged battery, either replace the battery with a fully charged battery or charge the battery using an appropriate battery charger.
- Dispose of waste batteries in accordance with local environmental regulations.

Battery connections

To connect the battery:

1. Place all electrical switches in the OFF position.
2. Connect the red positive (+) battery cable to the battery.
3. Connect the black negative (-) battery cable to the battery.

To disconnect the battery:

1. Stop the engine.
2. Place all electrical switches in the OFF position.
3. Disconnect the black negative (-) battery cable from the battery.
4. Disconnect the red positive (+) battery cable from the battery.

Maintaining battery condition

- Follow the battery manufacturer's maintenance recommendations.
- Keep battery terminals clean and connections tight.
- When necessary, tighten the cables and grease the cable clamps with petroleum jelly.
- Maintain the battery at full charge to improve cold weather starting.

8.12 Maintaining the Air Cleaner

⚠ WARNING

Fire hazard

Flammable liquids pose a fire hazard when cleaning.

► Do not use gasoline or other types of low flash point solvents to clean the air cleaner.

NOTICE

Compressed air can damage air filter elements.

► Do not use compressed air to clean the air filter elements.

When

Every 500 hours or as needed—replace the elements

The air filter must be cleaned and replaced more frequently under very dusty conditions.

Requirements

- Machine shut down
- Damp cloth
- New air filter element

Procedure

1. Release the two latches **(1)** and remove the cover **(2)** from the air cleaner housing.

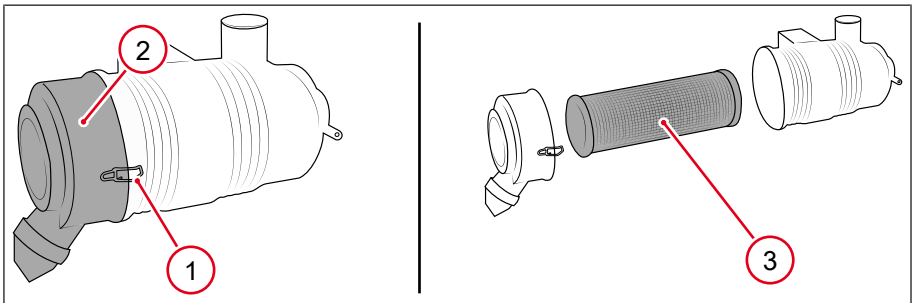


Fig. 33: Latches, cover, and filter element

2. Remove the air filter element **(3)** from the air cleaner housing.
3. Clean the inside of the air cleaner housing components with a damp cloth.
4. Install the new air filter element.
5. Install the cover and fasten the latches.

8.13 Changing the Engine Oil and Filter

⚠ WARNING

Health hazard

Most used oil contains small amounts of materials that can cause cancer and other health problems if inhaled, ingested, or left in contact with skin for prolonged periods of time.

► Take steps to avoid inhaling or ingesting used engine oil.

► Wash skin thoroughly after exposure to used engine oil.

When

Every 1,000 hours

Requirements

- Warm engine
- Plastic sheet and container of suitable size to collect drained oil
- Replacement oil (see Engine Oil Viscosity on page 63 for oil quantity and type)

NOTICE

Check the engine oil daily before starting the engine. Do not operate the engine if the oil level is below the MIN mark on the dipstick. Always keep the oil level within the crosshatch pattern or MAX mark on the dipstick.

Environment

In the interests of environmental protection, place a plastic sheet and a container under the machine to collect any liquid which drains off. Dispose of this liquid in accordance with environmental protection legislation.

Procedure

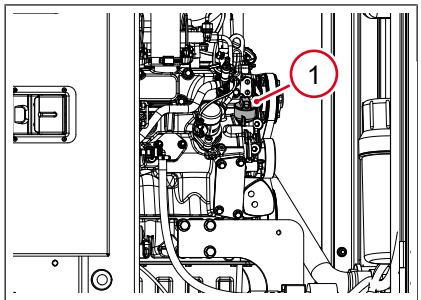


Fig. 34: Engine oil filler cap

1. Wipe the area around the oil filler cap **(1)** clean, and remove the cap.

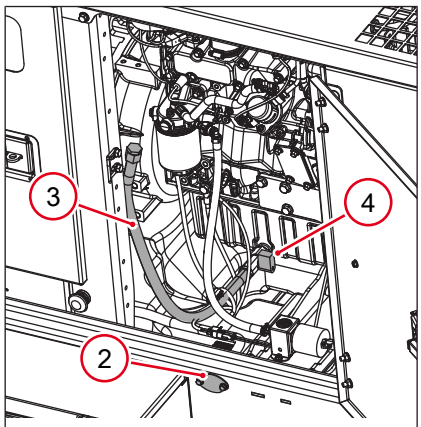


Fig. 35: Oil drain hose

2. Remove the cover plate **(2)** from the oil drain access hole on the side of the skid.
3. Locate the oil drain hose **(3)** and feed it through the opening on the side of the cabinet.
4. Remove the cap from the end of the oil drain hose. Open the valve **(4)** at the hose connection and allow the oil to drain into a suitable container.
5. After the oil has been drained completely, close the valve at the hose connection and replace the cap at the end of the hose. Return the hose to its storage location.
6. Fill the engine crankcase through the oil filler opening to the upper mark on the dipstick. For oil quantity and type, see Engine Oil Viscosity on page 63.
7. Install the oil filter cap.

Replacing the oil filter element

1. Use a filter wrench to remove the oil filter element **(5)**. Discard the used element.

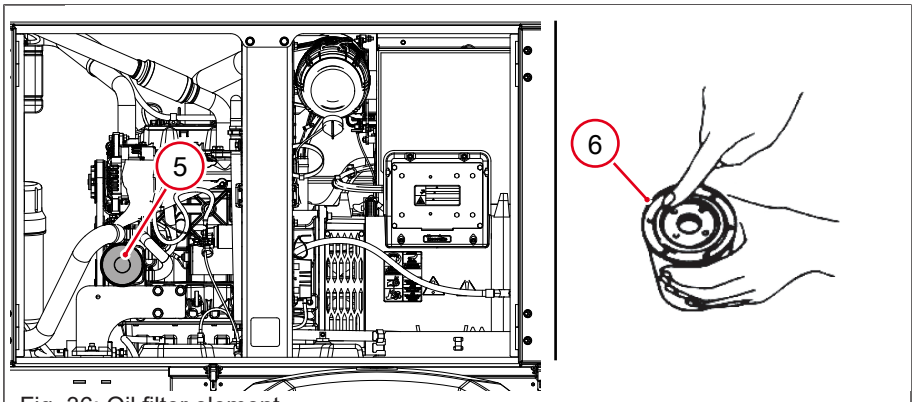


Fig. 36: Oil filter element

2. Apply a thin coat of oil to the O-ring on the new element **(6)**.
3. Hand-tighten the element until its sealed face comes in contact with the O-ring.
4. Use a filter wrench to tighten the new element.

8.14 Maintaining the Emission Control System

For machines sold in North America:

Normal maintenance, replacement, or repair of emission control devices and systems may be performed by any repair establishment or individual; however, warranty repairs must be performed by a dealer/service center authorized by Wacker Neuson. The use of service parts that are not equivalent in performance and durability to authorized parts may impair the effectiveness of the emission control system and may have a bearing on the outcome of a warranty claim.

8.15 Filling the Radiator

⚠ WARNING

Burn hazard

Engine coolant is hot and under pressure at operating temperature. It can cause severe personal injury.

- ► Check the engine coolant level only after the engine has been shut down and is cool.
- ► Do not add engine coolant directly to the radiator when hot.
- ► Check the coolant level at the reserve tank and add coolant as needed.
- ► Wear eye protection when handling the engine coolant.
- ► Tighten the radiator cap securely after checking the radiator. Steam can escape during engine operation if the cap is loose.

⚠ WARNING

Burn hazard

Engine coolant can contain alkali.

► Avoid engine coolant contact with skin and eyes.

NOTICE

Automotive-type coolants do not contain the correct coolant additives to protect heavy-duty diesel engines. They often contain a high concentration of silicates which can damage the engine and cooling system.

► Use an OAT or HOAT coolant mixed to the appropriate percentage with distilled water. For further information, see Coolant on page 74.

NOTICE

Use long-life ethylene glycol coolant in this engine. Refer to the engine owner's manual for more information.

When

Every 2,000 hours or 2 years

Requirements

- Machine shut down
- Engine cool to touch
- Fresh coolant (as needed)

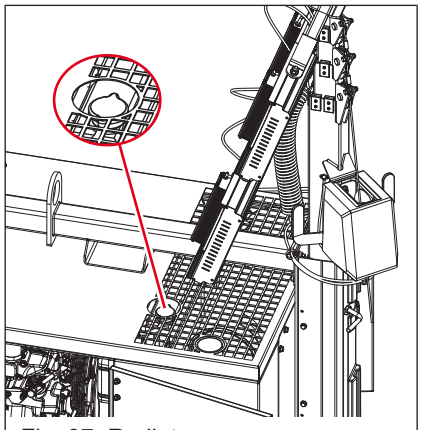


Fig. 37: Radiator cap

Procedure

1. Open the access cover on the roof.
2. Slowly rotate the radiator cap counterclockwise to release any remaining system pressure. Unscrew and remove the radiator cap after the pressure is released.
3. Add coolant by filling at a rate of approximately 5.68 L (1.5 gallons) per minute for 6 minutes.
4. Wait 10 minutes. Then, fill at a rate of approximately 5.68 L (1.5 gallons) per minute for 3.5 minutes or until full.
5. Run the machine under a 50% load for approximately 15 minutes until the coolant temperature exceeds 88°C (190°F).
6. Inspect the radiator cap and cap seal for damage. Clean the radiator cap or replace if necessary.
7. Install the radiator cap.

8.16 Coolant

Overview

The coolant is a type of fluid made by mixing distilled water and ethylene glycol long life coolant concentrate or propylene glycol long life coolant concentrate. Its function is to cool the heat generated by the engine.

Note: If ethylene glycol is used, make sure to use organic acid technology (OAT) low silicate or hybrid organic acid technology (HOAT) low silicate.

Handling the long-life coolant (LLC)

To prevent the engine damage due to freezing of the coolant and to protect the cooling system from corrosion, mix the specified long-life coolant (LLC) and distilled water with an appropriate ratio. See the table below.

Usage Region	Outside Temperature	LLC Concentration
Warm region (other than the cold region specifications)	-12°C (10°F) or above	30%
Cold region (cold region specifications)	-30°C (-22°F) or above	50%

9 Troubleshooting

9.1 General Troubleshooting

⚠ WARNING

High voltage

This unit uses high voltage circuits capable of causing serious injury or death.

► Only a qualified electrician should troubleshoot or repair electrical problems occurring in this equipment.

Problem	Cause	Remedy
No start (engine)	Battery discharged	Charge battery.
	Battery connections corroded	Clean battery connections.
	Blown fuse	Replace fuse.
	Defective starter	Replace starter.
Start and stop (engine)	No fuel	Fill tank with fuel.
	Clogged fuel filter	Bleed fuel lines.
	Fuel circuit failure	Replace fuel filter.
		Check fuel lines.
No generator output	Voltage regulator malfunction	Call Wacker Neuson for service.
Low oil pressure	Low oil level	Fill engine sump with oil.
	Clogged oil filter	Replace oil filter.
	Oil pump failure	Call Wacker Neuson for service.
High coolant temperature	Electrical overload	Reduce load.
	Low coolant level	Fill with coolant.
	Low oil level	Fill sump with oil.
	Clogged oil filter	Replace oil filter.
	Blocked or dirty radiator	Clean radiator.
Black smoke from engine	Clogged air filter	Clean/replace air filter cartridges.
	Electrical overload	Reduce load.
	High oil level	Remove excess oil.
	Fuel circuit failure	Call Wacker Neuson for service.

9.2 Accessing Engine DTCs

To view the engine DTC(s), press the Up and Down buttons simultaneously to enter the navigation menu. In the navigation menu, press the Up or Down buttons to find the DTC section and press the Auto Mode (✓) button to enter.

To view the active DTC(s) alarms, repeatedly press Up or Down buttons until the LCD screen displays the alarm.

Continuing to press the Up or Down buttons cycles through the other DTC alarms.

To exit the active DTC(s) alarm section, press the Up or Down buttons simultaneously to enter the navigation menu. Then, cycle to the desired instrumentation section using the Up or Down buttons and press the Auto Mode (✓) button to enter.

Acronym	Description
MIL	Malfunction indicator lamp (hardwired) red lamp
SVS	Service vehicle soon (hardwired) yellow lamp
RS	Red stop (CAN) lamp
AW	Amber warning (CAN) lamp
SPN	Suspect parameter number
FMI	Failure mode indicator

9.2.1 List of Deep Sea Controller Diagnostic Trouble Codes

SPN	Warning FMI	Shutdown FMI	Description
96	17	1	Fuel level low
100	17	1	Oil pressure low (analog sensor)
100	17	1	Oil pressure low (digital input)
100	2	2	Oil pressure sensor fault
110	15	0	Coolant temperature high (analog sensor)
110	15	0	Coolant temperature high (digital input)
110	2	2	Coolant temperature sensor fault
167	17	1	Charge alternator failed
168	15	0	Plant battery voltage high
168	17	1	Plant battery voltage low
190	15	0	Overspeed
190	17	1	Underspeed
2436	17	1	Generator average AC frequency under
2436	15	0	SPN generator average line-line AC RMS voltage over
2440	17	1	Generator average line-line AC RMS voltage under
2440	15	0	Generator average line-line AC RMS voltage over
2444	17	1	Generator average line-neutral AC RMS voltage under
2444	15	0	Generator average line-neutral AC RMS voltage over
2448	15	0	Generator average AC RMS current over

9.2.2 Engine Diagnostic Trouble Codes

No.	P Code	Name	Description	MIL	SVS	RS	AW	SPN	FMI
				Wired		CAN			
1	P0122	ACCP1L	Accelerator pedal sensor No.1 signal too low	1		1		91	4
2	P0123	ACCP1H	Accelerator pedal sensor No.1 signal too high	1		1		91	3
3	P0222	ACCP2L	Accelerator pedal sensor No.2 signal too low	1		1		29	4
4	P0223	ACCP2H	Accelerator pedal sensor No.2 signal too high	1		1		29	3
5	P0113	THAH	Air temperature sensor signal too high	1		1		105	3
6	P0112	THAL	Air temperature sensor signal too low	1		1		105	4
7	P0118	THWH	Coolant temperature sensor signal too high	1		1		110	3
8	P0117	THWL	Coolant temperature sensor signal too low	1		1		110	4
9	P0238	PIMH	Boost pressure sensor signal too high	1	1			102	3
10	P0237	PIML	Boost pressure sensor signal too low	1		1		102	4
11	P2229	PATMH	Atmosphere pressure sensor signal too high	1		1		108	3
12	P2228	PATML	Atmosphere pressure sensor signal too low	1		1		108	4
13	P0563	VBBH	Vehicle system voltage too high (> 16V)	1	1	1	1	168	3
14	P0562	VBBL	Vehicle system voltage too low (< 8V)	1		1		168	4
15	P0642	VCC1L	Battery 5V reference 1 circuit low (5V power supply for sensor)	1		1		3509	4
16	P0643	VCC1H	Battery 5V reference 1 circuit high (5V power supply for sensor)	1		1		3509	3
17	P0652	VCC2L	Battery 5V reference 2 circuit low (5V power supply for sensor)	1		1		3510	4
18	P0653	VCC2H	Battery 5V reference 2 circuit high (5V power supply for sensor)	1		1		3510	3
19	P2148	BSTWV1	COM1 Injector drive system output short to BATT Injector1 or Injector2 output short to BATT	1		1		523350	3
20	P2147	GSTWV1	COM1 Injector drive system output short to GND Injector1 or Injector2 output short to GND	1		1		523350	4
21	P2146	NCCOM1	COM1 Injector drive system output open load both Injector1 or Injector2 open load	1		1		523350	5
22	P2151	BSTWV2	COM2 Injector drive system output short to BATT Injector3 output short to BATT	1		1		523352	3
23	P2150	GSTWV2	COM2 Injector drive system output short to GND Injector3 output short to GND	1		1		523352	4
24	P2149	NCCOM2	COM2 Injector drive system output open load both Injector3 open load	1		1		523352	5
25	P0201	NCTWV1	Injector1 output open load injector coil open	1		1		1393	5
26	P0203	NCTWV2	Injector3 output open load injector coil open	1		1		1394	5
27	P0204	NCTWV3	Injector2 output open load injector coil open	1		1		1395	5
28	P0611	LCHG	Capacitor charge-up circuit malfunction injector (low charge)	1		1		167	31

No.	P Code	Name	Description	MIL	SVS	RS	AW	SPN	FMI
29	P0200	OCHG	Capacitor charge-up circuit malfunction injector (excessive charge)	1		1		167	1
30	P062D	VDIC2CLK	VDIC2 (IC that drives injectors) internal clock failure	1		1		697	2
31	P062B	VDIC2CMC	VDIC2 (IC that drives injectors) communication failure	1		1		697	19
32	P0607	SCPU	CPU fault; watchdog IC fault	1		1		2802	31
33	P0606	MCPU	CPU fault; main CPU fault	1		1		2802	12
34	P0601	FROM	Checksum error—flash area	1		1		2802	14
35	P060B	ADERR	AD converter error	1		1		536090	31
36	P062A	SHUTOF	Shut off path check error	1		1		536091	31
37	P0336	NEPUM	Crank position (CKP) sensor performance invalid	1		1		249	2
38	P0337	NENOP	Crank position (CKP) sensor no pulse	1		1		249	8
39	P0342	GNOP	Camshaft position (CMP) sensor no pulse	1		1		637	8
40	P0341	GPUM	Camshaft position (CMP) sensor performance invalid	1		1		637	2
41	P0016	NEGUM	Crankshaft and camshaft synchronous error	1		1		190	2
42	P0615	STSWBT	Starter switch short to BATT		1		1	430	3
43	P0503	SPDH	Vehicle speed sensor frequency too high		1		1	84	8
44	P0502	SPDL	Vehicle speed sensor input open/short		1		1	84	5
45	P0501	SPDSG	Vehicle speed sensor signal invalid		1		1	84	2
46	P0219	NEOR	Engine over speed condition		1		1	190	0
47	P0541	GRELGD	Glow relay output open load/short to GND		1		1	626	4
48	P0542	GRELBT	Glow relay output short to BATT		1		1	626	3
49	P0617	STRYBT	Starter relay short to battery		1		1	430	5
50	P0616	STRYGD	Starter relay short to GND		1		1	430	4
51	U0073	CANB1	CAN1 node error		1		1	1083	19
52	P02EE	BTTWV1	Injector1 boost time-out (no injection peak current)	1		1		1393	9
53	P02F0	BTTWV2	Injector3 boost time-out (no injection peak current)	1		1		1394	9
54	P02F1	BTTWV3	Injector2 boost time-out (no injection peak current)	1		1		1395	9
55	P060C	MSC	MSC communication error	1		1		536092	31
56	P060D	SPIOCEAN	SPI communication error (Ocean)	1		1		536093	31
57	P060E	SPIATPIC	SPI communication error (Amb Press. Sensor)	1		1		536094	31
58	P0228	PTOPH	Accelerator pedal for ASC (PTO) sensor signal too high	1		1		28	3
59	P0227	PTOPL	Accelerator pedal for ASC (PTO) sensor signal too low	1		1		28	4
60	P2123	PTOP2H	Accelerator pedal for ASC (PTO) sensor 2 signal too high	1		1		28	20

No.	P Code	Name	Description	MIL	SVS	RS	AW	SPN	FMI
61	P2122	PTOP2L	Accelerator pedal for ASC (PTO) sensor 2 signal too low	1		1		28	21
62	P2280	AFC	Air filter clogging error	1		1		107	2
63	P0462	FLEVL	Fuel level sensor signal too low		1		1	96	4
64	P0463	FLEVH	Fuel level sensor signal too high		1		1	96	3
65	P0069	EVSTAMBPOFSCHK	Ambient pressure cross check		1		1	108	2
66	P2226	EVSTAMBPRNGPHYMAX	Ambient pressure physical range check, maximum diagnosis		1		1	108	0
67	P2227	EVSTAMBPRNGPHYMIN	Ambient pressure physical range check, minimum diagnosis		1		1	108	1
68	P050C	EVSTCOOLTTOFSCHK	Coolant temperature cross check (at cold start)		1		1	110	2
69	P011B	EVSTCOOLTTSTUCK	Coolant temperature warm-up check		1		1	110	31
70	P0106	EVSTINTKMNFLDPOFSCHK	Intake manifold pressure cross check		1		1	102	2
71	P0236	EVSTINTKMNFLDPPLBTY	Intake manifold pressure rationality check	1		1		102	31
72	P0111	EVSTINTKMNFLDTOFSCHK	Intake manifold temperature sensor offset check monitoring		1		1	105	2
73	P00AA	EVSTINTKMNFLDTPLBTYMAX	Intake manifold temperature sensor rationality check monitoring		1		1	105	0
74	P00AB	EVSTINTKMNFLDTPLBTYMIN	Intake manifold temperature sensor rationality check monitoring		1		1	105	1
75	P0524	POILDN	Engine oil pressure down	1		1		100	1
76	P0217	THWOT	Coolant temperature exceeds upper limit	1		1		110	0
77	U1001	CANB2	CAN2 node error		1		1	1084	19
78	P0385	NEGNON	Engine starter motor not engaged	1		1		190	9
79	P2269	WGTHR	Water in fuel filter failure		1		1	97	2
80	P0234	TBOPH	Boost pressure sensor exceeds upper limit	1		1		1127	0
81	P0299	TBOPL	Boost pressure sensor exceeds lower limit	1		1		1127	1
82	P0694	CFANLBT	Coolant fan low speed relay short to battery		1		1	1639	5
83	P0693	CFANLGD	Coolant fan low speed relay short to GND		1		1	1639	6
84	P0696	CFANHBT	Coolant fan high speed relay short to battery	1		1		1639	3
85	P0695	CFANHGD	Coolant fan high speed relay short to GND	1		1		1639	4
86	U0107	TSC1TMERR	TSC1 Time out error	1		1		3349	9
87	U0408	TSC1RC	TSC1 rolling count test	1		1		3349	10
88	U0408	TSC1CS	TSC1 checksum test	1		1		3349	2
89	P0232	ELPUMPBT	Electric lift pump relay short to battery		1		1	4082	3
90	P0231	ELPUMPGD	Electric lift pump relay short to GND		1		1	4082	4

No.	P Code	Name	Description	MIL	SVS	RS	AW	SPN	FMI
91	U1103	ECSTMERR	ECS rolling count test error		1		1	516097	9
92	U0422	ECSRC	ECS rolling count test error		1		1	516097	10
93	U0422	ECSCS	ECS checksum test error		1		1	516097	2
94	P2A12	RSTWV1	TWV1 coil short circuit	1		1		1393	6
95	P2A14	RSTWV2	TWV2 coil short circuit	1		1		1394	6
96	P2A16	RSTWV3	TWV3 coil short circuit	1		1		1395	6

10 Storage

10.1 Long-Term Storage

NOTICE

Allowing the battery to freeze or completely discharge is likely to cause permanent damage.

- ► Periodically charge the battery while the machine is not in use.
- ► In cold climates, store and charge the battery indoors or in a warm location.

When

Prepare your machine for extended storage if it will not be operated for 30 days or more.

Overview

Extended storage of equipment requires preventive maintenance. Performing these steps helps to preserve machine components and ensures the machine will be ready for future use. While not all of these steps necessarily apply to this machine, the basic procedures remain the same.

Preparing for storage

Perform the procedures below to prepare your machine for storage.

- Complete any needed repairs.
- Replenish or change oils (engine, exciter, hydraulic, and gearcase) per the intervals specified in the periodic maintenance schedule table.
- Grease all fittings and, if applicable, repack bearings.
- Inspect engine coolant. Replace coolant if it appears cloudy, is more than two seasons old, or does not meet the average lowest temperature for your area.
- If your machine has an engine equipped with a fuel valve, start the engine, close the fuel valve, and run the engine until it stops.
- Consult the engine owner's manual for instructions on preparing the engine for storage.

Stabilizing the fuel

After completing the procedures listed above, fill the fuel tank completely and add a high-quality stabilizer to the fuel.

- Choose a stabilizer that includes cleaning agents and additives designed to coat/protect the cylinder walls.
- Make sure the stabilizer you use is compatible with the fuel in your area, fuel type, grade, and temperature range. Do not add extra alcohol to fuels which already contain it (for example, E10).

- For engines with diesel fuel, use a stabilizer with a biocide to restrict or prevent bacteria and fungus growth.
- Add the correct amount of stabilizer per the manufacturer's recommendations.

Storing the machine

Perform these remaining steps to store your machine.

- Wash the machine and allow it to dry.
- Move the machine to a clean, dry, secure storage location. Block or chock the wheels to prevent machine movement.
- Use touch-up paint as needed to protect exposed metal against rust.
- If the machine has a battery, either remove or disconnect it.
- Cover the machine. Exposed rubber items should be protected from the weather. Either cover them or use a protectant.

11 Factory-Installed Options

11.1 Overview

This machine may be equipped with one or more of the following factory-installed options. To verify if any of these options are installed on your machine, contact Wacker Neuson America Corporation at 1-800-770-0957. A nameplate listing the model number, item number, and serial number is attached to each unit. Please have this information available when contacting Wacker Neuson America Corporation .

The illustrations shown in this chapter represent typical installations. The factory-installed options on your machine may look different.

This machine comes standard with a 650 CCA battery. For easier starting in colder weather climate, Wacker NeusonWacker Neuson recommends the larger (1,000 CCA) battery.

11.2 Engine Block Heater

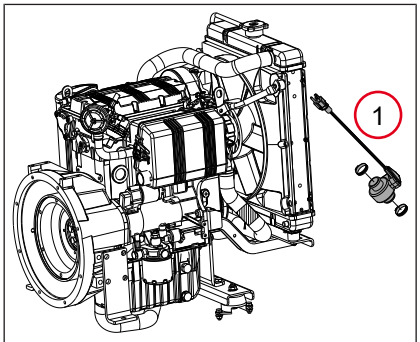


Fig. 38: Engine block heater

The engine block heater **(1)** includes a block heater with a cord. The function of the block heater is to heat the engine coolant/engine block to improve cold-weather engine starting. Plug the cord into a 120V power supply.

11.3 Battery Disconnect

NOTICE

Power interruption while the engine is running may cause damage to electrical components.

► Do not use the battery disconnect switch while the engine is running.

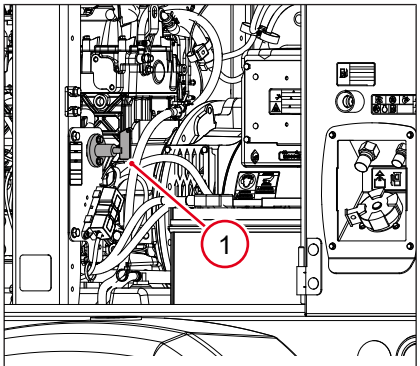


Fig. 39: Battery disconnect

An ON-OFF switch **(1)** is available which disconnects the battery. A removable key securely locks the switch in the OFF position.

11.4 Battery Charger

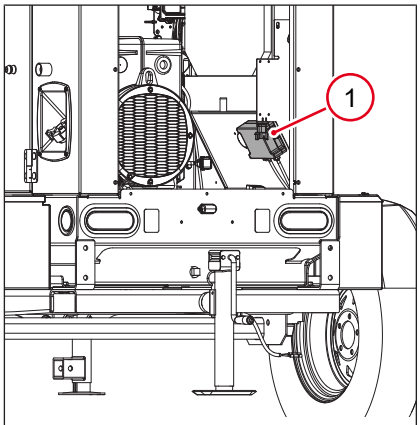


Fig. 40: Battery charger location

An optional battery charger **(1)** maintains the battery at peak power while the machine is turned off. Use of a battery charger is recommended when the generator is not operated on a regular basis. The battery charger prevents voltage drain and reduces the possibility of having to jump-start the engine after long periods of inactivity. Plug the cord into a 120V power supply.

11.5 External Electrical Plug

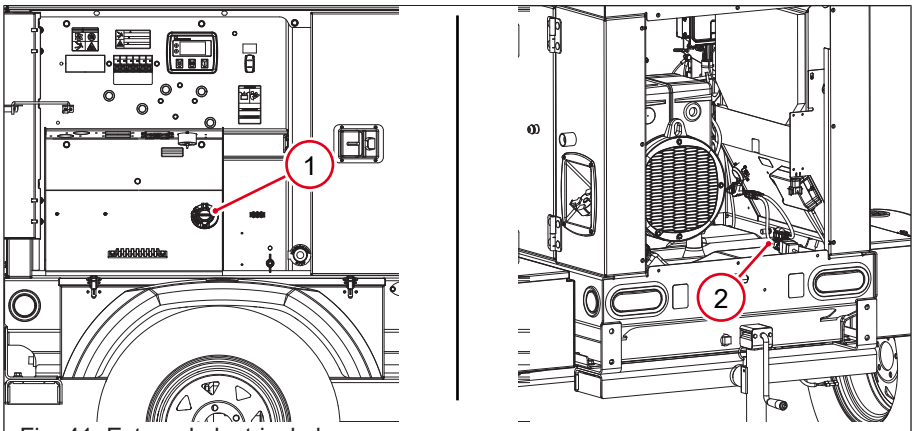


Fig. 41: External electrical plug

The external electrical plug **(1)** allows a 120V power supply to be connected to the battery charger (if equipped) and block heater (if equipped) with the generator doors closed. Connect a 120V power supply to the external plug.

Connect only the block heater and battery charger to the plugs **(2)** inside the machine.

11.6 Fuel Filter Heater

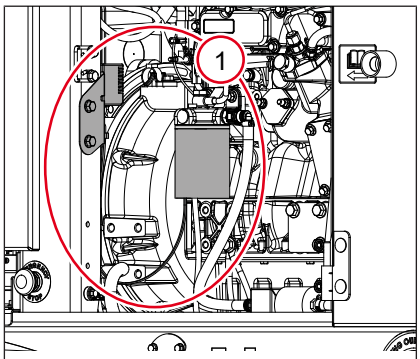


Fig. 42: Fuel filter heater

The fuel filter heater option **(1)** consists of a wrap to cover the fuel filter, a thermostat, and a wiring harness connected to the machine's main wiring harness. This option helps prevent diesel fuel from gelling in the filter. The fuel filter heater turns on in temperatures below 45°F (7°C). The operator can also adjust the temperature using a knob.

11.7 Quick Oil Change

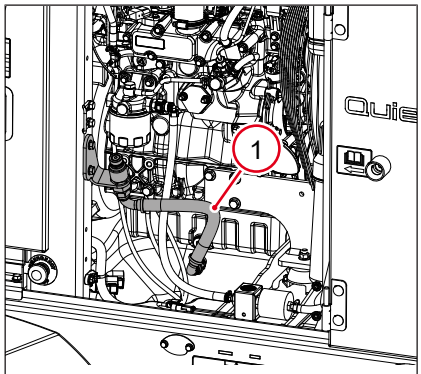


Fig. 43: Quick oil change drain

The quick oil change option evacuates the engine oil from the sump directly to waste containment.

11.8 Low Coolant Shutdown

⚠ WARNING

Burn hazard

Engine coolant is hot and under pressure at operating temperature. It can cause severe personal injury.

- ► Check the engine coolant level only after the engine has been shut down and is cool.
- ► Do not add engine coolant directly to the radiator when hot.
- ► Check the coolant level at the reserve tank and add coolant as needed.
- ► Wear eye protection when handling the engine coolant.
- ► Tighten the radiator cap securely after checking the radiator. Steam can escape during engine operation if the cap is loose.

⚠ WARNING

Burn hazard

Pressurized coolant can cause serious burns.

- ► Only remove radiator cap when it is cool enough to touch with bare hands.

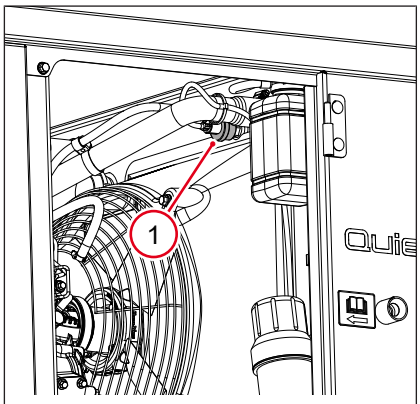


Fig. 44: Low coolant sensor

Overview

The low-coolant shutdown system consists of an electronic sensor that monitors coolant level. The sensor **(1)** is mounted to the radiator and wired into the ECM. The sensor probe is submerged in radiator coolant.

Function

If it is necessary to open the radiator, only do so with the engine off, and only when coolant is cool enough to touch with bare hands. Slowly loosen the radiator cap to relieve pressure first, before removing it completely.

11.9 External Fuel Supply Connection

Requirements

- Engine stopped and cool to the touch
- Fuel supply and return hoses with compatible quick-disconnect fittings

Overview

Quick-disconnect fuel fittings allow an external fuel supply to be connected.

Note: The required fitting size is ISO 7241-1-Series B. The supply is 1/2 in. and the return is 3/8 in.

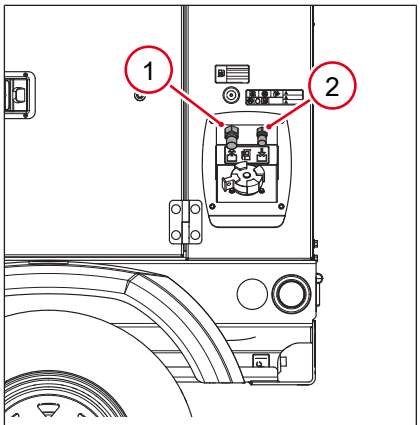


Fig. 45: Hose fittings

Procedure

1. Connect the external feed hose at the external feed hose fitting **(1)**.
2. Connect the external return hose at the external return hose fitting **(2)**.

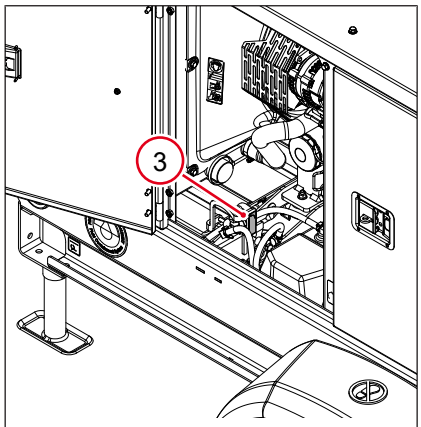


Fig. 46: External fuel supply handle

3. Move the fuel valve handle **(3)** from the down position for internal fuel supply to the up position for external fuel supply.

Note: When connected to an external tank, there is a required fuel pressure of 400 mbar to 4,000 mbar. This pressure is measured at the high pressure fuel pump inlet.

11.10 Cooling Fan

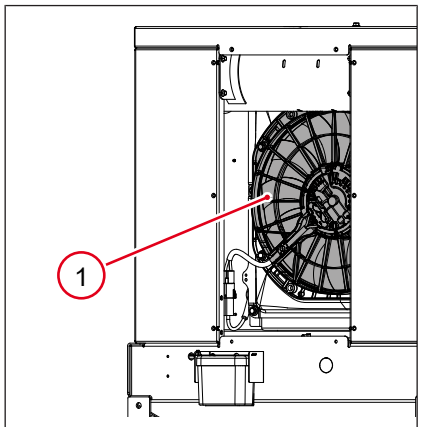


Fig. 47: Variable speed fan

The cooling fan may either be a constant speed or variable speed fan **(1)** driven by the engine. The variable fan speed is controlled by engine temperature.

12 Technical Data

12.1 Engine

Machine	Unit	LTG14
Engine make/type	—	Kohler
Model	—	KSD1403NA
Number of cylinders	—	3
Displacement	L (in^3)	1.4 (85.4)
Engine speed	rpm	1800
Power @ 1800 rpm—continuous/standby	kW (hp)	17 (22.8)
Coolant capacity	L (qt)	5.8 (6.1)
Oil capacity	L (qt)	5.2 (5.5)
Battery	V/ccA	12 / 650
Fuel	Type	Diesel
Fuel tank capacity	L (gal)	247.1 (65.28)
Fuel consumption, prime load	L/hr (gal/hr)	4.1 (1.1)
Running time, prime load	hr	54.7

12.2 Generator

Machine	Unit	LTG14
Make/Type	—	Mecc Alte / Brushless
Model	—	ECP28 3S4 C
Frequency	Hz	60
Generator speed	rpm	1800
Prime output	kW (kVA)	13 (13)
AC voltage output	V, phase	120/240, 1Ø
Amps	A	240 / 54.2
Excitation type	—	AVR
Power factor	—	1.0
Voltage regulation	—	±1.00%
Insulation class	—	H

12.3 Machine

Machine	Unit	LTG14
Operating weight	kg (lb)	1,255 (2,760)
Travel Dimensions (L x W x H)	cm (in.)	239 x 4,913 x 199 (94 x 1,934 x 78)
Height–tower extended	m (ft)	7.2 (23.75)
Lighting system	W	4 x 320
Max. lighting coverage @ 5 fc (54 lux)	m^2 (ft^2)	890 (9,600)
Sound level at 7 m (23 ft)	dB (A)	63.4

Machine	Unit	LTG14
AC receptacles	—	2 duplex, 1 twist-lock (standard) 2 duplex, 2 twist-lock (optional)
Tires	Size	ST205/75D15 load rating C

12.4 Dimensions

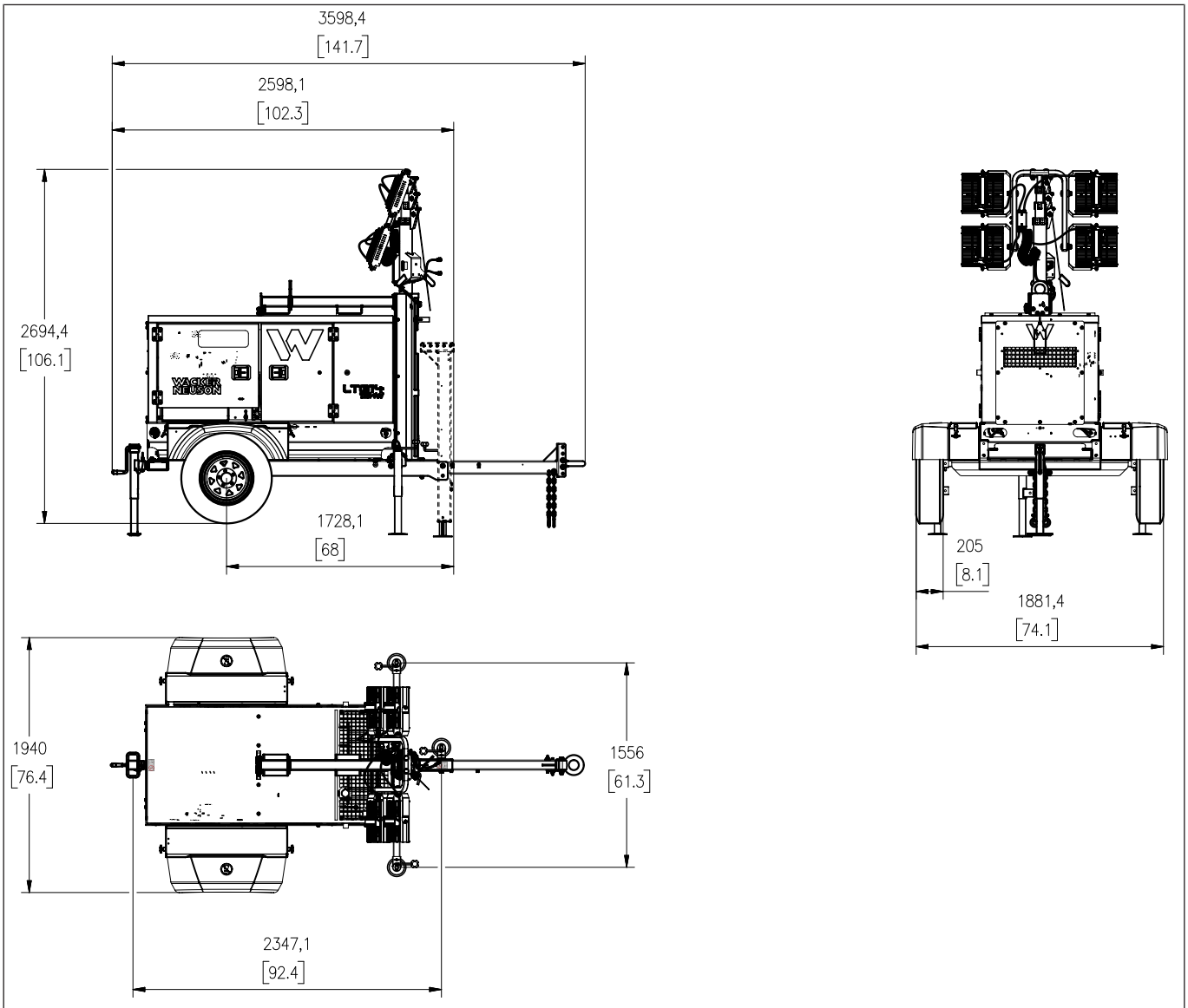


Fig. 48: Dimensions

13 Tire Safety Information

13.1 Tire Safety Information

Introduction to tire safety information

Federal Regulation 49 CFR 575 requires trailer manufacturers to include certain tire information in the owner's manuals for the trailers they manufacture. This regulation requires that the information be in the English language. This chapter includes all the information required by Federal Regulation 49 CFR 575.

13.2 Tire Safety Information Section Descriptions

This portion of the User's Manual contains tire safety information as required by 49 CFR 575.6.

Section 1.1 contains "Steps for Determining Correct Load Limit—Trailer."

Section 1.2 contains "Steps for Determining Correct Load Limit—Tow Vehicle."

Section 1.3 contains a Glossary of Tire Terminology, including "cold inflation pressure," "maximum inflation pressure," "recommended inflation pressure," and other non-technical terms.

Section 1.4 contains information from the NHTSA brochure entitled "Tire Safety—Everything Rides On It." This brochure, as well as the preceding subsections, describes the following items:

- Tire labeling, including a description and explanation of each marking on the tires, and information about the DOT tire identification number (TIN).
- Recommended tire inflation pressure, including a description and explanation of:
  - Cold inflation pressure.
  - Vehicle placard and location on the vehicle.
  - Adverse safety consequences of under inflation (including tire failure).
  - Measuring and adjusting air pressure for proper inflation.
- Tire care, including maintenance and safety practices.
- Vehicle load limits, including a description and explanation of the following items:
  - Locating and understanding the load limit information, total load capacity, and cargo capacity.
  - Calculating total and cargo capacities with varying seating configurations including quantitative examples showing / illustrating how the vehicles cargo and luggage capacity decreases as combined number and size of occupants' increases. This item is also discussed in Section 3.
  - Determining compatibility of tire and vehicle load capabilities.
  - Adverse safety consequences of overloading on handling and stopping on tires.

13.3 Steps for Determining Correct Load Limit—Trailer

Determining the load limits of a trailer includes more than understanding the load limits of the tires alone. On all trailers there is a Federal certification/VIN label that is located on the forward half of the left (road) side of the unit. This certification/VIN label indicates the trailer's Gross Vehicle Weight Rating (GVWR). This is the most weight the fully loaded trailer can weigh. It also provides the Gross Axle Weight Rating (GAWR). This is the most a particular axle can weigh. If there are multiple axles, the GAWR of each axle is provided.

If your trailer has a GVWR of 10,000 pounds or less, there is a vehicle placard located in the same location as the certification label described above. This placard provides tire and loading information. In addition, this placard shows a statement regarding maximum cargo capacity. Cargo can be added to the trailer, up to the maximum weight specified on the placard. The combined weight of the cargo is provided as a single number. In any case, remember: the total weight of a fully loaded trailer can not exceed the stated GVWR.

For trailers with living quarters installed, the weight of water and propane also need to be considered. The weight of fully filled propane containers is considered part of the weight of the trailer before it is loaded with cargo, and is not considered part of the disposable cargo load. Water however, is a disposable cargo weight and is treated as such. If there is a fresh water storage tank of 100 gallons, this tank when filled would weigh about 800 pounds. If more cargo is being transported, water can be off-loaded to keep the total amount of cargo added to the vehicle within the limits of the GVWR so as not to overload the vehicle. Understanding this flexibility allows you, the owner, to make choices that fit your travel needs.

When loading your cargo, be sure it is distributed evenly to prevent overloading front to back and side to side. Heavy items should be placed low and as close to the axle positions as reasonable. Too many items on one side may overload a tire. The best way to know the actual weight of the vehicle is to weigh it at a public scale. Talk to your dealer to discuss the weighing methods needed to capture the various weights related to the trailer. This would include the weight empty or unloaded, weights per axle, wheel, hitch or king-pin, and total weight.

Excessive loads and/or underinflation cause tire overloading and, as a result, abnormal tire flexing occurs. This situation can generate an excessive amount of heat within the tire. Excessive heat may lead to tire failure. It is the air pressure that enables a tire to support the load, so proper inflation is critical. The proper air pressure may be found on the certification/VIN label and/or on the tire placard. This value should never exceed the maximum cold inflation pressure stamped on the tire.

Trailers 10,000 pounds GVWR or less

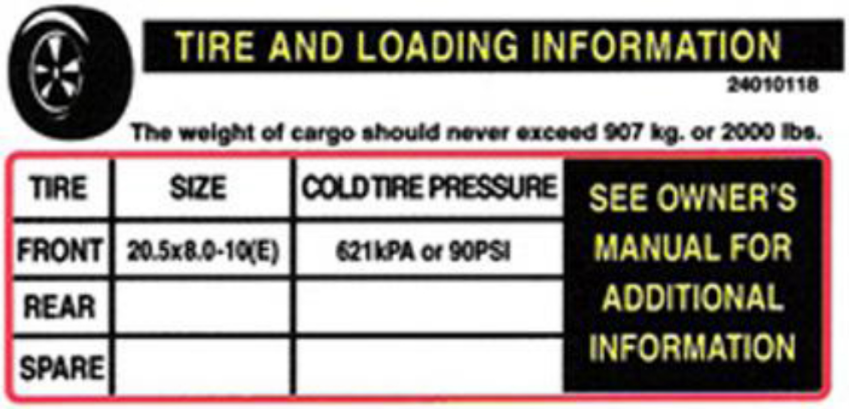


Fig. 49: Tire and loading information

1. Locate the statement, “The weight of cargo should never exceed XXX kg or XXX lbs.,” on your vehicle’s placard. See the graphic above.
2. This figure equals the available amount of cargo and luggage load capacity.
3. Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage load capacity.

The trailer’s placard refers to the tire information placard attached adjacent to or near the trailer’s VIN (Certification) label at the left front of the trailer.

Trailers over 10,000 pound GVWR (Note: these trailers are not required to have a tire information placard on the vehicle)

1. Determine the empty weight of your trailer by weighing the trailer using a public scale or other means. This step does not have to be repeated.
2. Locate the gross vehicle weight rating (GVWR) of the trailer on your trailer’s VIN (certification) label.
3. Subtract the empty weight of your trailer from the GVWR stated on the VIN label. That weight is the maximum available cargo capacity of the trailer and may not be safely exceeded.

13.4 Steps for Determining Correct Load Limit—Tow Vehicle

1. Locate the statement, “The combined weight of occupants and cargo should never exceed XXX lbs.,” on your vehicle’s placard.
2. Determine the combined weight of the driver and passengers who are riding in your vehicle.
3. Subtract the combined weight of the driver and passengers from XXX kilograms or XXX pounds.
4. The resulting figure equals the available amount of cargo and luggage capacity. For example, if the “XXX” amount equals 1400 lbs. and there are five 150 lb. passengers in your vehicle, the amount of available cargo and luggage capacity is 650 lbs. (1400-750 (5 x 150) = 650 lbs.).

5. Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage capacity calculated in Step # 4.
6. If your vehicle is towing a trailer, load from your trailer is transferred to your vehicle. Consult the tow vehicle's manual to determine how this weight transfer reduces the available cargo and luggage capacity of your vehicle.

13.5 Glossary of Tire Terminology

Accessory weight

The combined weight (in excess of those standard items which may be replaced) of automatic transmission, power steering, power brakes, power windows, power seats, radio and heater, to the extent that these items are available as factory-installed equipment (whether installed or not).

Bead

The part of the tire that is made of steel wires, wrapped or reinforced by ply cords and that is shaped to fit the rim.

Bead separation

This is the breakdown of the bond between components in the bead.

Bias ply tire

A pneumatic tire in which the ply cords that extend to the beads are laid at alternate angles substantially less than 90 degrees to the centerline of the tread.

Carcass

The tire structure, except tread and sidewall rubber which, when inflated, bears the load.

Chunking

The breaking away of pieces of the tread or sidewall.

Cold inflation pressure

The pressure in the tire before you drive.

Cord

The strands forming the plies in the tire.

Cord separation

The parting of cords from adjacent rubber compounds.

Cracking

Any parting within the tread, sidewall, or inner liner of the tire extending to cord material.

CT

A pneumatic tire with an inverted flange tire and rim system in which the rim is designed with rim flanges pointed radially inward and the tire is designed to fit on the underside of the rim in a manner that encloses the rim flanges inside the air cavity of the tire.

Curb weight

The weight of a motor vehicle with standard equipment including the maximum capacity of fuel, oil, and coolant, and, if so equipped, air conditioning and additional weight optional engine.

Extra load tire

A tire designed to operate at higher loads and at higher inflation pressures than the corresponding standard tire.

Groove

The space between two adjacent tread ribs.

Gross axle weight rating

The maximum weight that any axle can support, as published on the Certification/VIN label on the front left side of the trailer. Actual weight determined by weighing each axle on a public scale, with the trailer attached to the towing vehicle.

Gross vehicle weight rating

The maximum weight of the fully loaded trailer, as published on the Certification/VIN label. Actual weight determined by weighing trailer on a public scale, without being attached to the towing vehicle.

Hitch weight

The downward force exerted on the hitch ball by the trailer coupler.

Innerliner

The layer(s) forming the inside surface of a tubeless tire that contains the inflating medium within the tire.

Innerliner separation

The parting of the innerliner from cord material in the carcass.

Intended outboard sidewall

The sidewall that contains a white-wall, bears white lettering or bears manufacturer, brand, and/or model name molding that is higher or deeper than the same molding on the other sidewall of the tire or the outward facing sidewall of an asymmetrical tire that has a particular side that must always face outward when mounted on a vehicle.

Light truck (LT) tire

A tire designated by its manufacturer as primarily intended for use on lightweight trucks or multipurpose passenger vehicles.

Load rating

The maximum load that a tire is rated to carry for a given inflation pressure.

Maximum load rating

The load rating for a tire at the maximum permissible inflation pressure for that tire.

Maximum permissible inflation pressure

The maximum cold inflation pressure to which a tire may be inflated.

Maximum loaded vehicle weight

The sum of curb weight, accessory weight, vehicle capacity weight, and production options weight.

Measuring rim

The rim on which a tire is fitted for physical dimension requirements.

Non-pneumatic rim

A mechanical device which, when a non-pneumatic tire assembly incorporates a wheel, supports the tire, and attaches, either integrally or separably, to the wheel center member and upon which the tire is attached.

Non-pneumatic spare tire assembly

A non-pneumatic tire assembly intended for temporary use in place of one of the pneumatic tires and rims that are fitted to a passenger car in compliance with the requirements of this standard.

Non-pneumatic tire

A mechanical device which transmits, either directly or through a wheel or wheel center member, the vertical load and tractive forces from the roadway to the vehicle, generates the tractive forces that provide the directional control of the vehicle and does not rely on the containment of any gas or fluid for providing those functions.

Non-pneumatic tire assembly

A non-pneumatic tire, alone or in combination with a wheel or wheel center member, which can be mounted on a vehicle.

Normal occupant weight

This means 68 kg (150 lb) times the number of occupants specified in the second column of Table I of 49 CFR 571.110.

Occupant distribution

The distribution of occupants in a vehicle as specified in the third column of Table I of 49 CFR 571.110.

Open splice

Any parting at any junction of tread, sidewall, or innerliner that extends to cord material.

Outer diameter

The overall diameter of an inflated new tire.

Overall width

The linear distance between the exteriors of the sidewalls of an inflated tire, including elevations due to labeling, decorations, or protective bands or ribs.

Pin weight

The downward force applied to the 5th wheel or gooseneck ball, by the trailer kingpin or gooseneck coupler.

Ply

A layer of rubber-coated parallel cords.

Ply separation

A parting of rubber compound between adjacent plies.

Pneumatic tire

A mechanical device made of rubber, chemicals, fabric and steel or other materials, that, when mounted on an automotive wheel, provides the traction and contains the gas or fluid that sustains the load.

Production options weight

The combined weight of those installed regular production options weighing over 2.3 kg (5 lb) in excess of those standard items which they replace, not previously considered in curb weight or accessory weight, including heavy duty brakes, ride levelers, roof rack, heavy duty battery, and special trim.

Radial ply tire

A pneumatic tire in which the ply cords that extend to the beads are laid at substantially 90 degrees to the centerline of the tread.

Recommended inflation pressure

This is the inflation pressure provided by the vehicle manufacturer on the Tire Information label and on the Certification/VIN tag.

Reinforced tire

A tire designed to operate at higher loads and at higher inflation pressures than the corresponding standard tire.

Rim

A metal support for a tire or a tire and tube assembly upon which the tire beads are seated.

Rim diameter

This means the nominal diameter of the bead seat.

Rim size designation

This means the rim diameter and width.

Rim type designation

This means the industry of manufacturer’s designation for a rim by style or code.

Rim width

This means the nominal distance between rim flanges.

Section width

The linear distance between the exteriors of the sidewalls of an inflated tire, excluding elevations due to labeling, decoration, or protective bands.

Sidewall

That portion of a tire between the tread and bead.

Sidewall separation

The parting of the rubber compound from the cord material in the sidewall.

Special trailer (ST) tire

The "ST" is an indication the tire is for trailer use only.

Test rim

The rim on which a tire is fitted for testing, and may be any rim listed as appropriate for use with that tire.

Tread

That portion of a tire that comes into contact with the road.

Tread rib

A tread section running circumferentially around a tire.

Tread separation

Pulling away of the tread from the tire carcass.

Treadwear indicators (TWI)

The projections within the principal grooves designed to give a visual indication of the degrees of wear of the tread.

Vehicle capacity weight

The rated cargo and luggage load plus 68 kg (150 lb) times the vehicle's designated seating capacity.

Vehicle maximum load on the tire

The load on an individual tire that is determined by distributing to each axle its share of the maximum loaded vehicle weight and dividing by two.

Vehicle normal load on the tire

The load on an individual tire that is determined by distributing to each axle its share of the curb weight, accessory weight, and normal occupant weight (distributed in accordance with Table I of CRF 49 571.110) and dividing by 2.

Weather side

The surface area of the rim not covered by the inflated tire.

Wheel center member

In the case of a non-pneumatic tire assembly incorporating a wheel, a mechanical device which attaches, either integrally or separably, to the non-pneumatic rim and provides the connection between the nonpneumatic rim and the vehicle; or, in the case of a non-pneumatic tire assembly not incorporating a wheel, a mechanical device which attaches, either integrally or separably, to the non-pneumatic tire and provides the connection between tire and the vehicle.

Wheel-holding fixture

The fixture used to hold the wheel and tire assembly securely during testing.

13.6 Tire Safety—Everything Rides on It

The National Traffic Safety Administration (NHTSA) has published a brochure (DOT HS 809 361) that discusses all aspects of Tire Safety, as required by CFR 575.6. This brochure is reproduced in part below. It can be obtained and downloaded from NHTSA, free of charge, from the following web site:

http://www.nhtsa.dot.gov/cars/rules/TireSafety/ridesonit/tires_index.html

Studies of tire safety show that maintaining proper tire pressure, observing tire and vehicle load limits (not carrying more weight in your vehicle than your tires or vehicle can safely handle), avoiding road hazards, and inspecting tires for cuts, slashes, and other irregularities are the most important things you can do to avoid tire failure, such as tread separation or blowout and flat tires. These actions, along with other care and maintenance activities, can also:

- Improve vehicle handling
- Help protect you and others from avoidable breakdowns and accidents
- Improve fuel economy
- Increase the life of your tires.

This booklet presents a comprehensive overview of tire safety, including information on the following topics:

- Basic tire maintenance
- Uniform Tire Quality Grading System
- Fundamental characteristics of tires
- Tire safety tips

Use this information to make tire safety a regular part of your vehicle maintenance routine. Recognize that the time you spend is minimal compared with the inconvenience and safety consequences of a flat tire or other tire failure

13.7 Safety First—Basic Tire Maintenance

Properly maintained tires improve the steering, stopping, traction, and load-carrying capability of your vehicle. Underinflated tires and overloaded vehicles are a major cause of tire failure. Therefore, as mentioned above, to avoid flat tires and other types of tire failure, you should maintain proper tire pressure, observe tire and vehicle load limits, avoid road hazards, and regularly inspect your tires.

Finding your vehicle’s recommended tire pressure and load limits

Tire information placards and vehicle certification labels contain information on tires and load limits. These labels indicate the vehicle manufacturer's information including:

- Recommended tire size
- Recommended tire inflation pressure
- Vehicle capacity weight (VCW–the maximum occupant and cargo weight a vehicle is designed to carry)
- Front and rear gross axle weight ratings (GAWR– the maximum weight the axle systems are designed to carry).

Both placards and certification labels are permanently attached to the trailer near the left front.

Understanding tire pressure and load limits

Tire inflation pressure is the level of air in the tire that provides it with load-carrying capacity and affects the overall performance of the vehicle. The tire inflation pressure is a number that indicates the amount of air pressure–measured in pounds per square inch (psi)–a tire requires to be properly inflated. (You can also find this number on the vehicle information placard expressed in kilopascals (kpa), which is the metric measure used internationally.)

Manufacturers of passenger vehicles and light trucks determine this number based on the vehicle's design load limit, that is, the greatest amount of weight a vehicle can safely carry and the vehicle's tire size. The proper tire pressure for your vehicle is referred to as the "recommended cold inflation pressure." (As you will read below, it is difficult to obtain the recommended tire pressure if your tires are not cold.) Because tires are designed to be used on more than one type of vehicle, tire manufacturers list the "maximum permissible inflation pressure" on the tire sidewall. This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

Checking tire pressure

It is important to check your vehicle's tire pressure at least once a month for the following reasons:

- Most tires may naturally lose air over time.
- Tires can lose air suddenly if you drive over a pothole or other object or if you strike the curb when parking.
- With radial tires, it is usually not possible to determine underinflation by visual inspection.

For convenience, purchase a tire pressure gauge to keep in your vehicle. Gauges can be purchased at tire dealerships, auto supply stores, and other retail outlets.

The recommended tire inflation pressure that vehicle manufacturers provide reflects the proper psi when a tire is cold. The term cold does not relate to the outside temperature. Rather, a cold tire is one that has not been driven on for at least three hours. When you drive, your tires get warmer, causing the air pressure within them to increase. Therefore, to get an accurate tire pressure reading, you must measure tire pressure when the tires are cold or compensate for the extra pressure in warm tires.

Steps for maintaining proper tire pressure

1. Locate the recommended tire pressure on the vehicle's tire information placard, certification label, or in the owner's manual.
2. Record the tire pressure of all tires.
3. If the tire pressure is too high in any of the tires, slowly release air by gently pressing on the tire valve stem with the edge of your tire gauge until you get to the correct pressure.
4. If the tire pressure is too low, note the difference between the measured tire pressure and the correct tire pressure. These "missing" pounds of pressure are what you need to add.
5. At a service station, add the missing pounds of air pressure to each tire that is underinflated.
6. Check all the tires to make sure they have the same air pressure (except in cases in which the front and rear tires are supposed to have different amounts of pressure).

If you have been driving your vehicle and think that a tire is underinflated, fill it to the recommended cold inflation pressure indicated on your vehicle's tire information placard or certification label. While your tire may still be slightly underinflated due to the extra pounds of pressure in the warm tire, it is safer to drive with air pressure that is slightly lower than the vehicle manufacturer's recommended cold inflation pressure than to drive with a significantly underinflated tire. Since this is a temporary fix, don't forget to recheck and adjust the tire's pressure when you can obtain a cold reading.

Tire size

To maintain tire safety, purchase new tires that are the same size as the vehicle's original tires or another size recommended by the manufacturer. Look at the tire information placard, the owner's manual, or the sidewall of the tire you are replacing to find this information. If you have any doubt about the correct size to choose, consult with the tire dealer.

Tire tread

The tire tread provides the gripping action and traction that prevent your vehicle from slipping or sliding, especially when the road is wet or icy. In general, tires are not safe and should be replaced when the tread is worn down to 1/16 of an inch. Tires have built-in treadwear indicators that let you know when it is time to replace your tires. These indicators are raised sections spaced intermittently in the bottom of the tread grooves. When they appear "even" with the outside of the tread, it is time to replace your tires. Another method for checking tread depth is to place a penny in the tread with Lincoln's head upside down and facing you. If you can see the top of Lincoln's head, you are ready for new tires.

Tire balance and wheel alignment

To avoid vibration or shaking of the vehicle when a tire rotates, the tire must be properly balanced. This balance is achieved by positioning weights on the wheel to counterbalance heavy spots on the wheel-and-tire assembly. A wheel alignment adjusts the angles of the wheels so that they are positioned correctly relative to the vehicle's frame. This adjustment maximizes the life of your tires. These adjustments require special equipment and should be performed by a qualified technician.

Tire repair

The proper repair of a punctured tire requires a plug for the hole and a patch for the area inside the tire that surrounds the puncture hole. Punctures through the tread can be repaired if they are not too large, but punctures to the sidewall should not be repaired. Tires must be removed from the rim to be properly inspected before being plugged and patched.

Tire fundamentals

Federal law requires tire manufacturers to place standardized information on the sidewall of all tires. This information identifies and describes the fundamental characteristics of the tire and also provides a tire identification number for safety standard certification and in case of a recall.

Information on Passenger Vehicle Tires

Please refer to the diagram below.

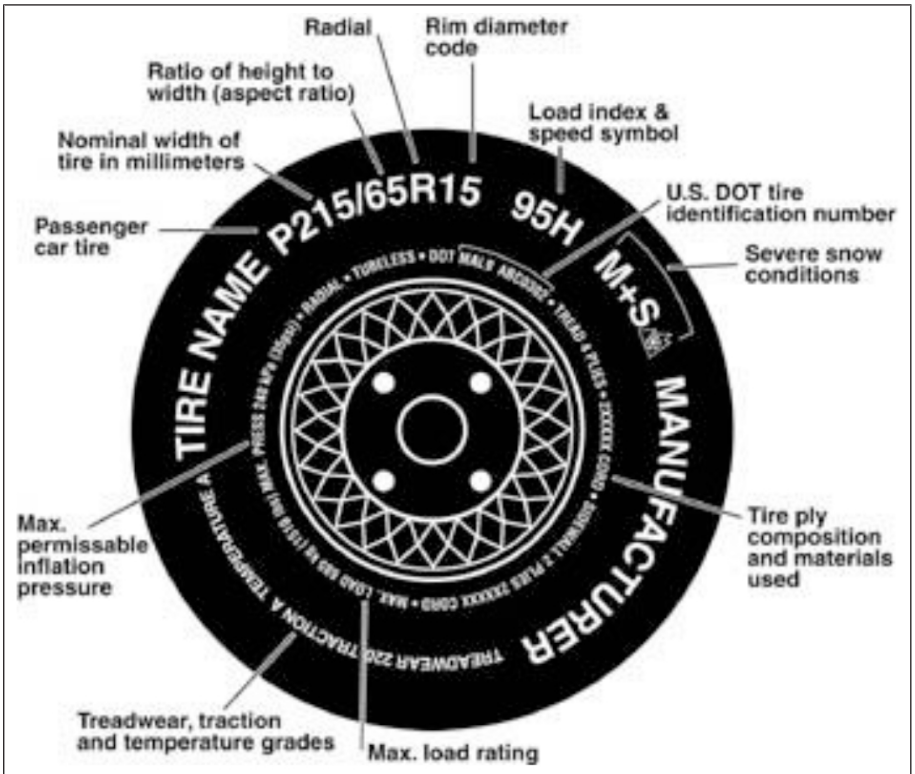


Fig. 50: Passenger vehicle tire information

P

The "P" indicates the tire is for passenger vehicles.

Next number

This three-digit number gives the width in millimeters of the tire from sidewall edge to sidewall edge. In general, the larger the number, the wider the tire.

Next number

This two-digit number, known as the aspect ratio, gives the tire's ratio of height to width. Numbers of 70 or lower indicate a short sidewall for improved steering response and better overall handling on dry pavement.

R

The "R" stands for radial. Radial ply construction of tires has been the industry standard for the past 20 years.

Next number

This two-digit number is the wheel or rim diameter in inches. If you change your wheel size, you have to purchase new tires to match the new wheel diameter.

Next number

This two- or three-digit number is the tire's load index. It is a measurement of how much weight each tire can support. You may find this information in your owner's manual. If not, contact a local tire dealer. Note: You may not find this information on all tires because it is not required by law.

M+S

The "M+S" or "M/S" indicates that the tire has some mud and snow capability. Most radial tires have these markings; hence, they have some mud and snow capability.

Speed rating

The speed rating denotes the speed at which a tire is designed to be driven for extended periods of time. The ratings range from 99 miles per hour (mph) to 186 mph. These ratings are listed below. Note: You may not find this information on all tires because it is not required by law.

Letter Rating	Speed Rating
Q	99 mph
R	106 mph
S	112 mph
T	118 mph
U	124 mph
H	130 mph
V	149 mph
W	168 mph[1)]
Y	186 mph[2)]

1) For tires with a maximum speed capability over 149 mph, tire manufacturers sometimes use the letters ZR.
2) For tires with a maximum speed capability over 186 mph, tire manufacturers always use the letters ZR.

U.S. DOT tire identification number

This begins with the letters "DOT" and indicates that the tire meets all federal standards. The next two numbers or letters are the plant code where it was manufactured, and the last four numbers represent the week and year the tire was built. For example, the numbers 3197 means the 31st week of 1997. The other numbers are marketing codes used at the manufacturer's discretion. This information is used to contact consumers if a tire defect requires a recall.

Tire ply composition and materials used

The number of plies indicates the number of layers of rubber-coated fabric in the tire. In general, the greater the number of plies, the more weight a tire can support. Tire manufacturers also must indicate the materials in the tire, which include steel, nylon, polyester, and others.

Maximum load rating

This number indicates the maximum load in kilograms and pounds that can be carried by the tire.

Maximum permissible inflation pressure

This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

UTQGS information

Treadwear number

This number indicates the tire's wear rate. The higher the treadwear number is, the longer it should take for the tread to wear down. For example, a tire graded 400 should last twice as long as a tire graded 200.

Traction letter

This letter indicates a tire's ability to stop on wet pavement. A higher graded tire should allow you to stop your car on wet roads in a shorter distance than a tire with a lower grade. Traction is graded from highest to lowest as "AA," "A," "B," and "C."

Temperature letter

This letter indicates a tire's resistance to heat. The temperature grade is for a tire that is inflated properly and not overloaded. Excessive speed, underinflation or excessive loading, either separately or in combination, can cause heat build-up and possible tire failure. From highest to lowest, a tire's resistance to heat is graded as "A," "B," or "C."

Please refer to the following diagram.

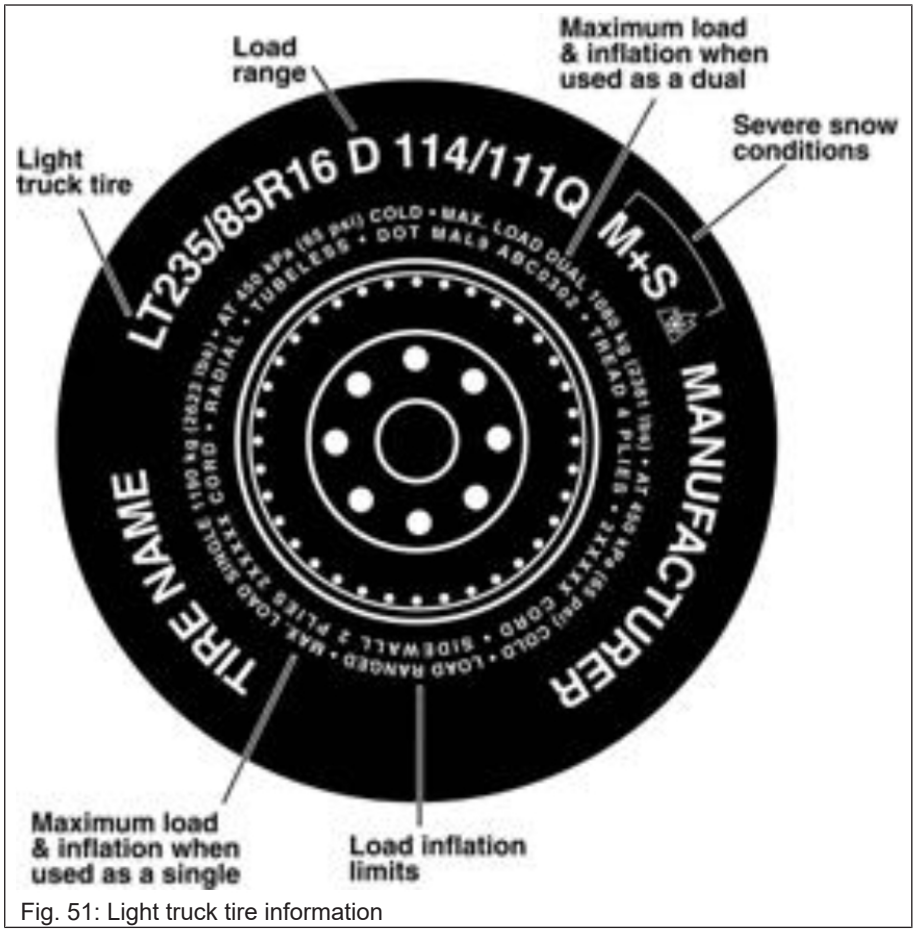


Fig. 51: Light truck tire information

Tires for light trucks have other markings besides those found on the sidewalls of passenger tires.

LT

The "LT" indicates the tire is for light trucks or trailers.

ST

An "ST" is an indication the tire is for trailer use only.

Max. load dual kg (lb) at kPa (psi) cold

This information indicates the maximum load and tire pressure when the tire is used as a dual, that is, when four tires are put on each rear axle (a total of six or more tires on the vehicle).

Max. load single kg (lb) at kPa (psi) cold

This information indicates the maximum load and tire pressure when the tire is used as a single.

Load range

This information identifies the tire's load-carrying capabilities and its inflation limits.

13.8 Tire Safety Tips

Preventing tire damage

- Slow down if you have to go over a pothole or other object in the road.
- Do not run over curbs or other foreign objects in the roadway, and try not to strike the curb when parking.

Tire safety checklist

- Check tire pressure regularly (at least once a month), including the spare.
- Inspect tires for uneven wear patterns on the tread, cracks, foreign objects, or other signs of wear or trauma.
- Remove bits of glass and foreign objects wedged in the tread.
- Make sure your tire valves have valve caps.
- Check tire pressure before going on a long trip.
- Do not overload your vehicle. Check the Tire Information and Loading Placard or User’s Manual for the maximum recommended load for the vehicle.

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