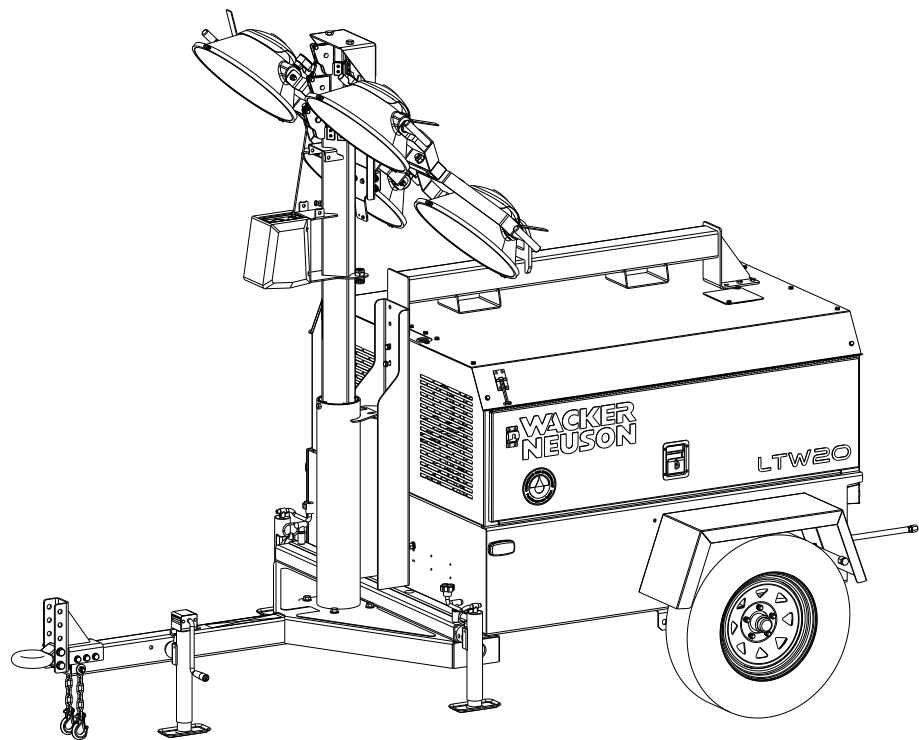


Operator's Manual

Light Tower

LTW20Z-1



Machine Type
Material Number
Version
Date
Language

LTW20Z-1
5100052099 / 3300029088
04
06/2022
[en-US]



Imprint

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Original operator's manual

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The machine on the cover is for illustration purposes only and may therefore have special equipment (options).

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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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1 Foreword

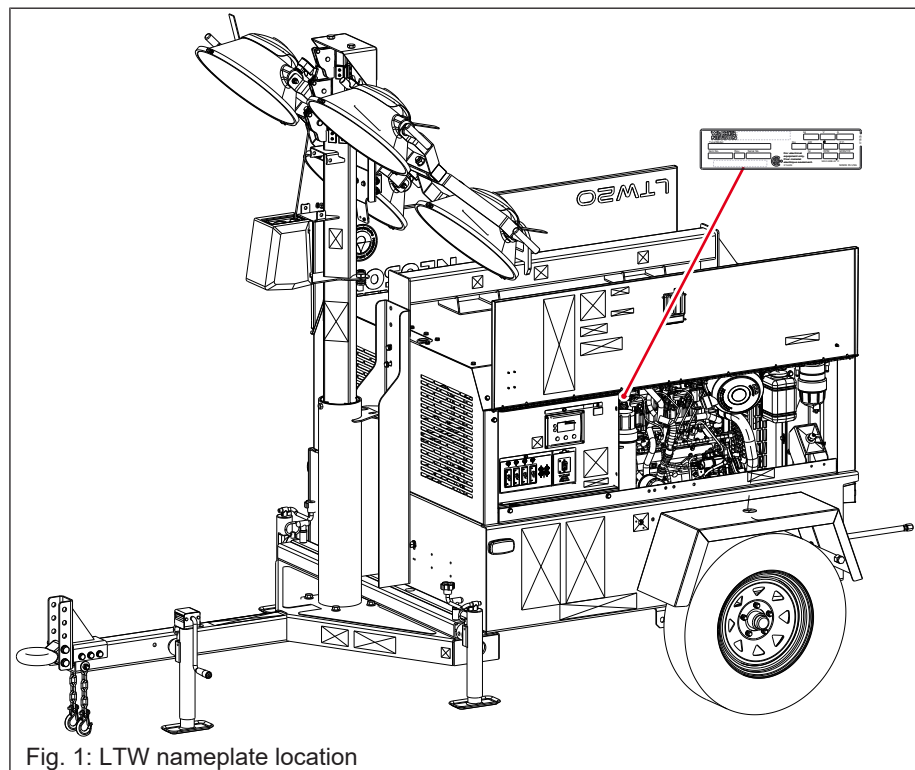
1.1 Machine Identification

The following machines and variants/options are described:

Machine	Item Number
LTW20Z-1	5100051571, 5100051572

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.



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.

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 73](#) 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:

- Using the machine as a ladder, support, or work surface
- Using the machine to carry or transport passengers or equipment
- Using the machine to tow other machines
- 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
- 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 Metal Halide Lamp Safety



⚠ WARNING

Personal injury hazard

Broken or punctured lamps can cause serious skin burns and eye inflammation from shortwave ultraviolet radiation.

- ▶ Do not operate the light tower if a lamp is damaged.
- ▶ Replace damaged lamps immediately.

Operating safety

- Replace damaged lamps. For instructions, see [Replacing/Removing Lamps on page 55](#).
- Alternative lamps that automatically extinguish when the outer envelope is broken or punctured are commercially available.

3.3 Radiation Compliance

This machine meets the radio interface radiated emission requirements of European Standard EN 13309 for Construction Machinery.

The lamps provided with your light tower are electric discharge lamps. They are designed for use with metal halide ballasts only, and require time to reach full brightness on initial startup and after a power interruption. These lamps comply with FDA regulation performance standard 21 CFR 1040-30.

3.4 Safety Guidelines for Operating the Machine

Operator and service training and knowledge

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.

Operator and service qualifications

Only trained personnel are permitted to start, operate, and shut down the machine. They also must meet the following qualifications:

- Have received instruction on how to properly use the machine
- Are familiar with required safety devices

The machine must not be accessed or operated by:

- Children
- People impaired by alcohol or drugs

Application area

Be aware of the application area.

- Remain aware of changing positions and the movement of other equipment and personnel in the application area/jobsite.
- Do not operate the machine in areas that contain flammable objects, fuels, or products that produce flammable vapors.

Personal protective equipment (PPE)

Wear the following personal protective equipment (PPE) while operating this machine:

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

Tie back long hair and remove all jewelry (including rings).

3.5 Safety Guidelines for Maintenance

Before servicing or maintaining the machine, [see Safety Guidelines for Operating the Machine on page 12](#).

Precautions

Follow the precautions below when servicing or maintaining 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.

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.

3.6 Safety Guidelines for Using Internal Combustion Engines



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.
- 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.

3.7 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>

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 metal halide or LED light fixtures is vertically mounted to the top of the cabinet. As the engine runs, the generator converts mechanical energy into electric power. The metal halide or 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.

4.2 Overview of the Labels

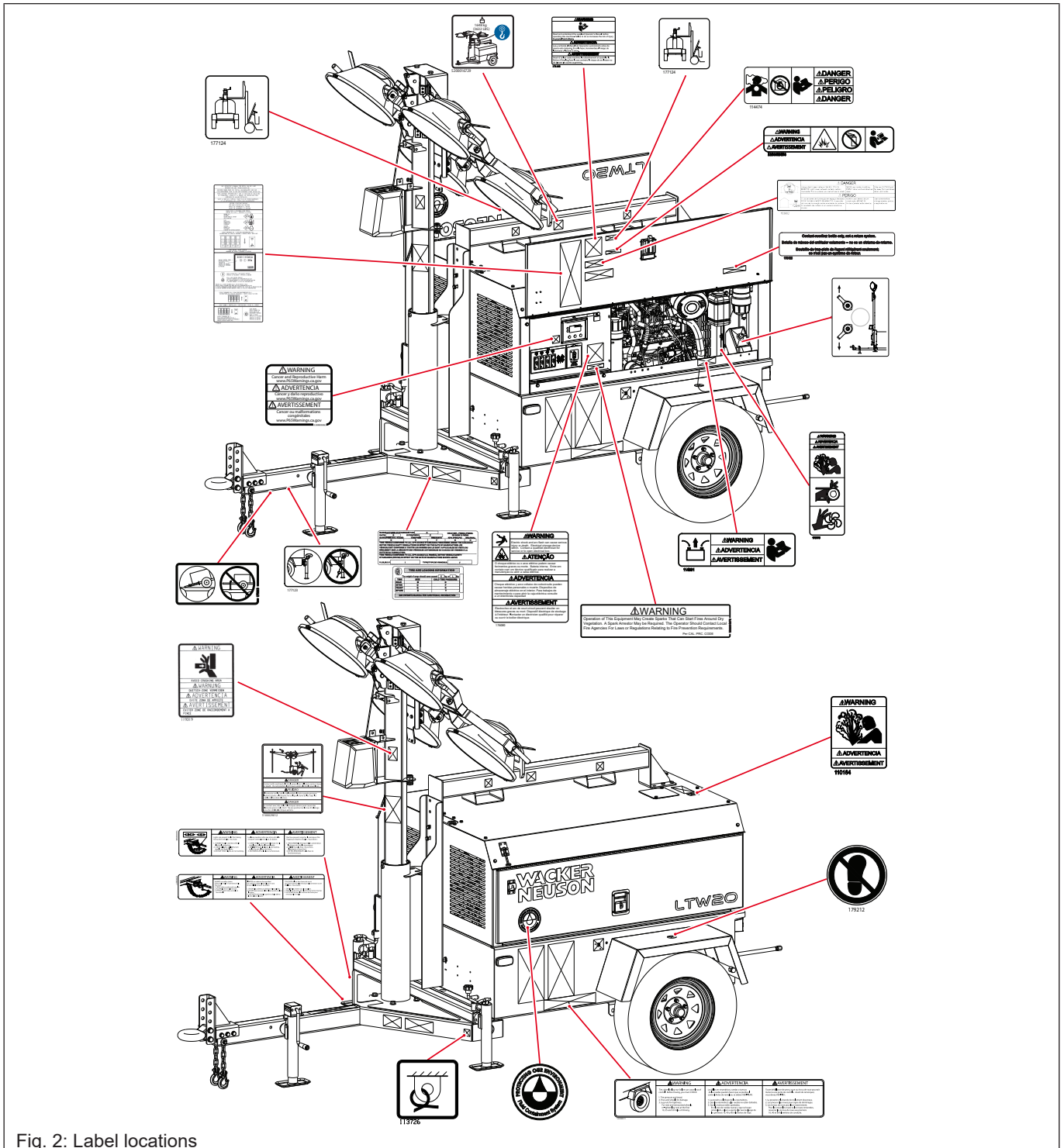


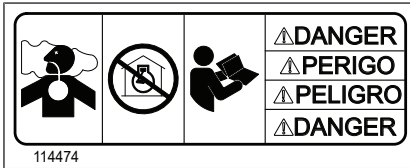
Fig. 2: Label locations

4.3 Safety Label Meanings



DANGER

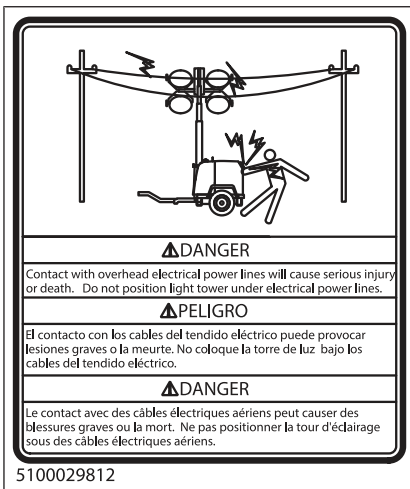
Using a light tower indoors **CAN KILL YOU IN MINUTES**. Light tower exhaust contains carbon monoxide. This is a poison you cannot see or smell. NEVER use inside a home or garage, **EVEN IF** doors and windows are open. Only use **OUTSIDE** and far away from windows, doors, and vents.



DANGER

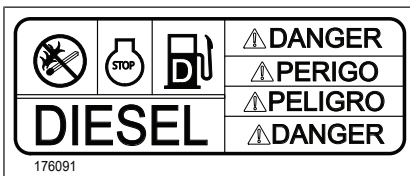
Asphyxiation hazard

- Engines emit carbon monoxide.
- Do not run the machine indoors or in an enclosed area unless adequate ventilation, through such items as exhaust fans or hoses, is provided.
- Read the Operator's Manual.
- No sparks, flames, or burning objects near the machine.
- Stop the engine before refueling.



DANGER

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



DANGER

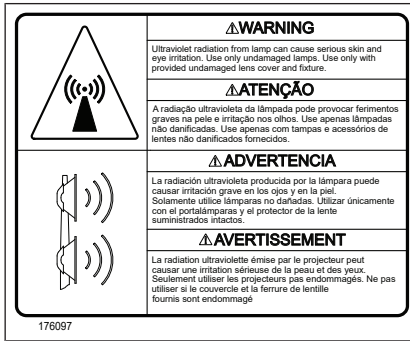
Explosion hazard

No sparks, flames, or burning objects near machine. Stop the engine before adding fuel. Use only diesel fuel.



WARNING

California Proposition 65 Warning
Cancer and Reproductive Harm
www.P65Warnings.ca.gov.



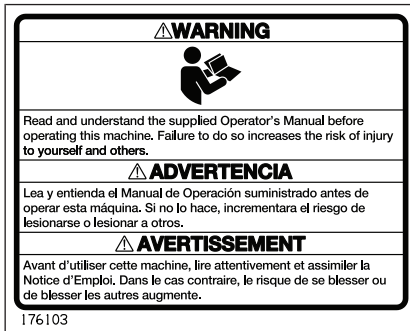
WARNING

Ultraviolet radiation from lamp can cause serious skin and eye irritation. Use only with undamaged lamps. Use only with provided undamaged lens cover and fixture.



WARNING

Electric shock and arc flash can cause serious injury or death. Electrical storage device within. Contact a qualified electrician for service or to open electrical box.



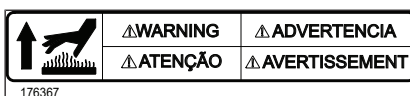
WARNING

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



WARNING

Hot surface hazard



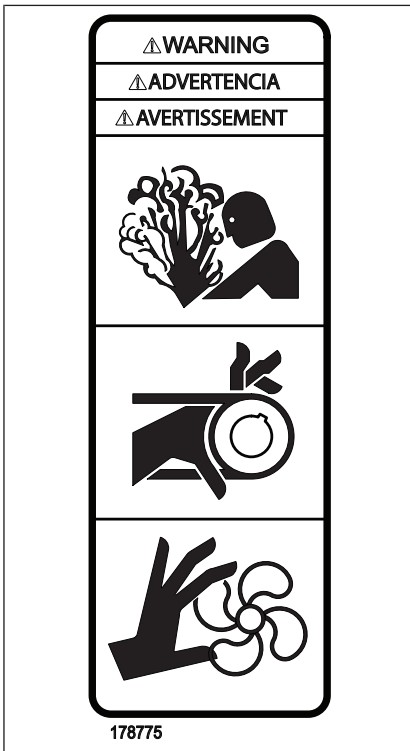
WARNING

Hot surface hazard



WARNING

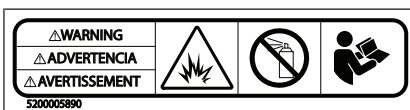
Explosion hazard
Pressurized contents. Do not open when hot.



WARNING

Personal injury hazards

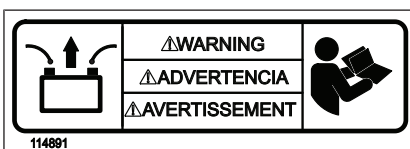
- Pressurized contents. Do not open when hot!
- Pinching/cutting hazard.
- Rotating machinery.



WARNING

Explosion hazard

- Do not use evaporative starting fluids such as ether on this engine.
- The engine is equipped with a cold starting aid. Using evaporative starting fluids can cause an explosion which can cause engine damage, personal injury, or death.
- Read and follow the engine starting instructions in this operator's manual.



WARNING

Electrical shock hazard

- Disconnect battery before servicing.
- Read the operator's manual.





WARNING

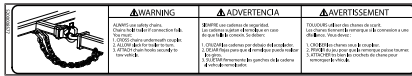
Operation of this equipment may create sparks that can start fires around dry vegetation. A spark arrester may be required. The operator should contact local fire agencies for laws or regulations relating to fire prevention requirements.



WARNING

Uncoupling will cause trailer to come loose from tow vehicle.

1. CHECK the pintle LOAD RATING is same or greater than ring LOAD RATING.
2. LOCK the clamp in place using a pin or lock.



WARNING

ALWAYS use safety chains. Chains hold trailer if connection fails. You must:

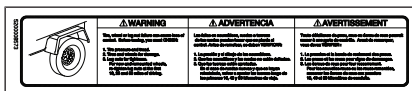
1. CROSS chains underneath coupler.
2. ALLOW slack for trailer to turn.
3. ATTACH chain hooks securely to tow vehicle.



WARNING

Trailer can roll if it comes loose. Safety brake applies when chain pulls brake lever.

1. ATTACH brake CHAIN securely to tow vehicle so lever will be pulled if trailer separates.
2. CHECK brake fluid level.
3. DO NOT TOW trailer if brake fluid is NOT FULL.

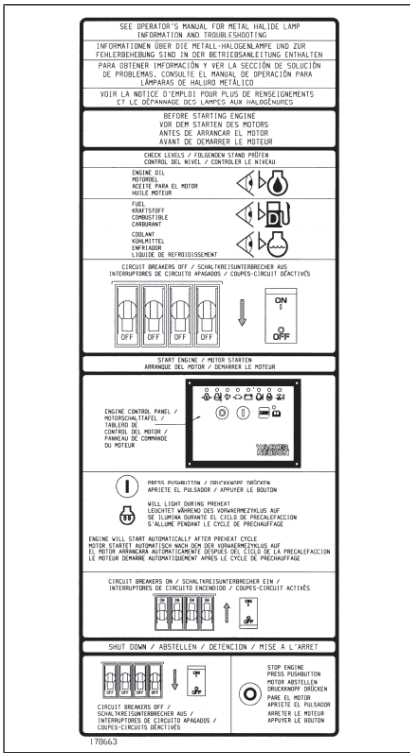


WARNING

Tire, wheel, or lug nut failure can cause loss of control. Before towing, you must CHECK:

1. Tire pressure and tread.
2. Tires and wheels for damage.
3. Lug nuts for tightness. For new and remounted wheels, retighten lug nuts at the first 10, 25, and 50 miles of driving.

4.4 Information Label Meanings



See Operator's Manual for metal halide lamp information and troubleshooting.

Before starting engine

Check levels

Engine oil

Fuel

Coolant

Circuit breakers off

Start engine

Engine control panel

Press pushbutton

Will light during preheat

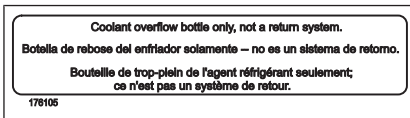
Engine will start automatically after preheat cycle

Circuit breakers on

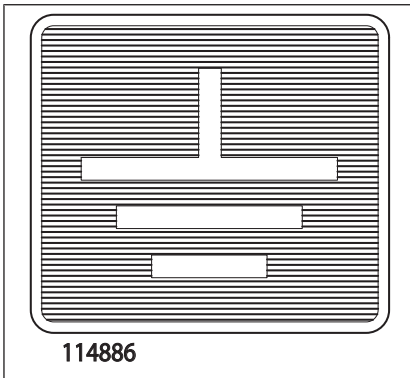
Shut down

Circuit breakers off

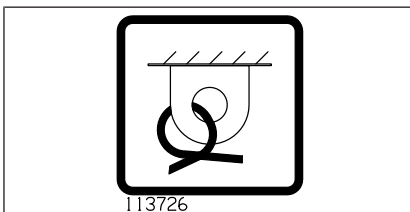
Stop engine



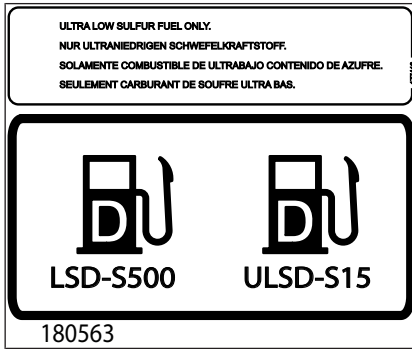
Coolant overflow bottle only, not a return system.



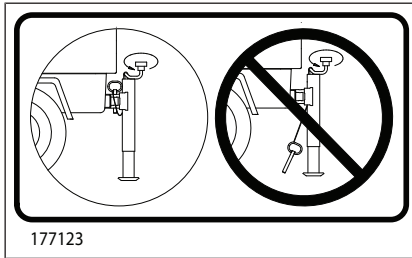
Electrical ground



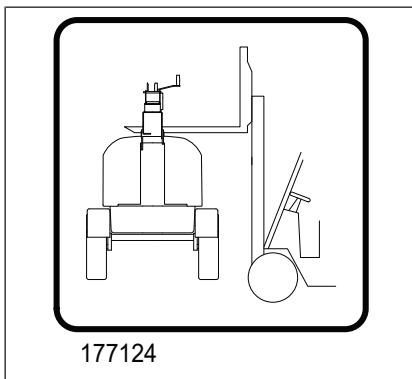
Tie-down point



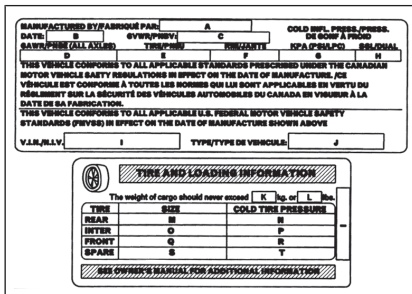
Ultra low sulfur fuel only



Insert jack locking pin before extending jack.



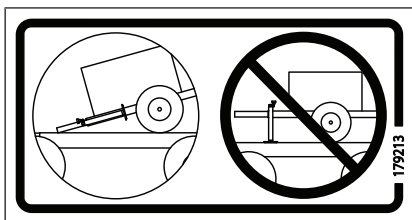
Fork lift pocket



(on trailer, if equipped)

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.



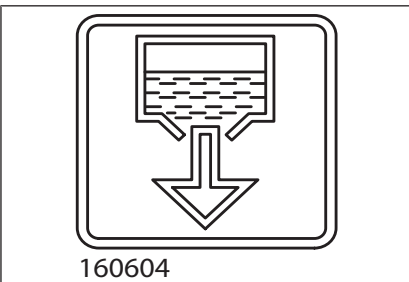
Transport position of the jack



Not a step



Protecting Our Environment
Fluid containment system
(if equipped)

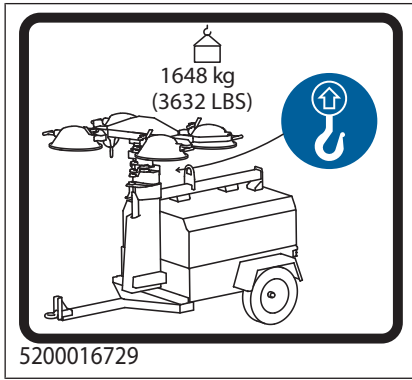


Skid drain access point



Notification of National Association of Trailer Manufacturers (NATM) compliance

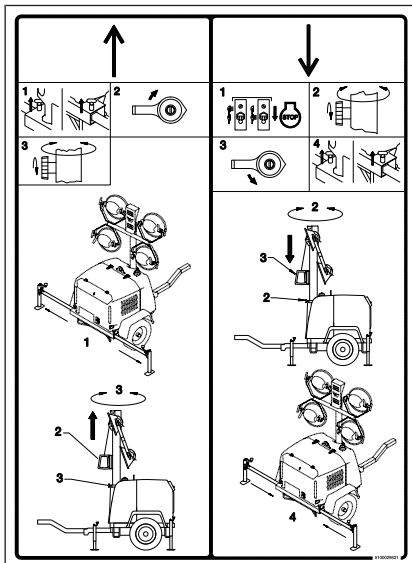




Lifting point
1648 kg (3632 lb)

120V 20A	120V 20A	120V 20A	120V 20A
L1 (A)	L1 (B)	L2 (A)	L2 (B)

Receptacle boxes



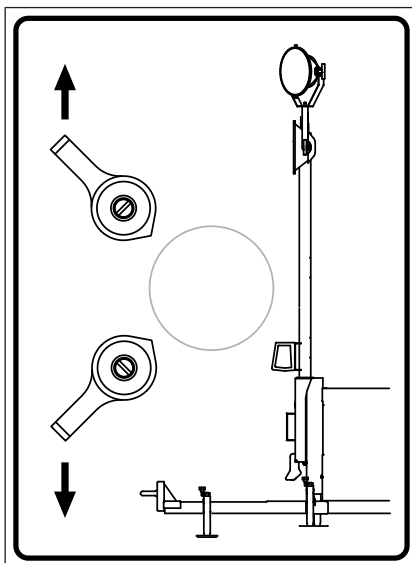
Power winch

To raise tower

1. Lift pins and extend outriggers.
2. Raise tower with switch.
3. Loosen mast rotation knob to aim tower. Tighten knob when tower is aimed.

To lower tower

1. Turn off breakers and engine.
2. Loosen mast rotation knob and rotate tower forward. Tighten knob when tower is facing forward.
3. Lower tower with switch.
4. Lift pins and retract outriggers.



Power winch switch

- Raise tower with switch handle up.
- Lower tower with switch handle down.

5 Transportation

5.1 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.

5.2 Before Lifting and Transporting Checklist

Requirements

- Machine stopped
- Flatbed truck or trailer capable of supporting the machine's weight
- Chains, hooks, or straps capable of supporting the machine's weight



⚠ 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 lifting or transporting the machine, check the following items:

Machine

- Check that all accessories are securely stored within the machine.
- Check that all doors and access panels of the machine are closed.
- Check that all electrical supplies are disconnected from the machine.
- Check that the generator is shut down.
- Check that the outriggers are retracted.
- Allow the lights to cool for 10-15 minutes before lifting or moving the machine.

Loading and transporting equipment

- Check that the transport vehicle or trailer can support the weight of the machine.
- Check that the transport vehicle or trailer is wide enough to support the machine.

- Check that the wheels of the transport vehicle or trailer are chocked during the loading process.
- Check that the transport vehicle or trailer is clean and free of grease, oil, ice, and other loose material.
- 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:

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

5.3 Lifting and Tie-Down Points

The following illustration indicates the locations of these items on the machine:

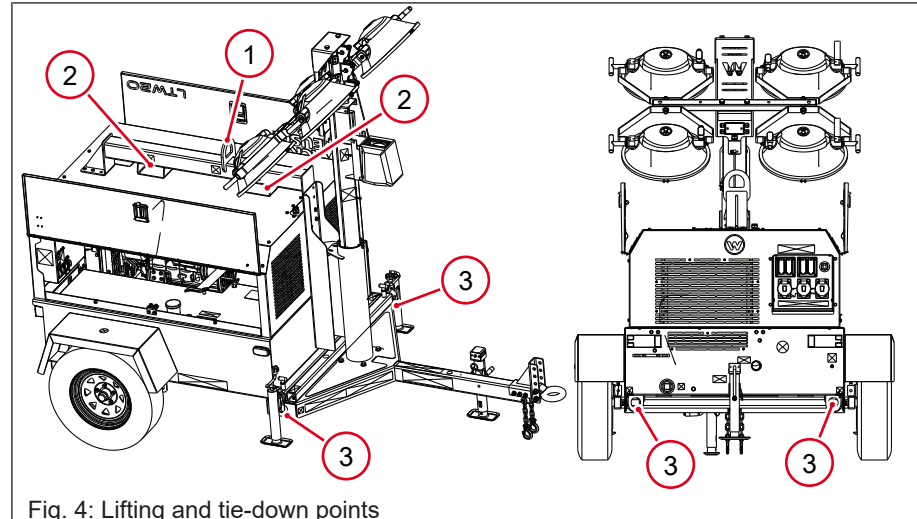


Fig. 4: Lifting and tie-down points

1 Lifting eye

2 Forklift pockets

3 Tie-down points

5.4 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 tow the machine if any of the trailer's lug nuts are missing.

- Do not tow the machine if the trailer's tires have less than 1.5 mm (1/16 in.) of tread.
- Do not tow the machine if trailer tires are underinflated.
- Do not tow the machine unless the trailer's brakes are functioning properly.
- Do not tow the machine if trailer lighting is not functioning properly.
- Do not exceed the trailer manufacturer's speed limitations.
- Only tow the machine when the trailer's lug nuts are properly torqued.
- Only tow the machine when the trailer's tires are properly inflated.
- Only tow the machine when all trailer lights are functioning correctly.
- Only tow the machine when the trailer's safety chains are connected to the towing vehicle in a crisscross pattern.
- 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.

6 Commissioning

6.1 Leveling the Trailer—Vertical Mast Light Towers



⚠ WARNING

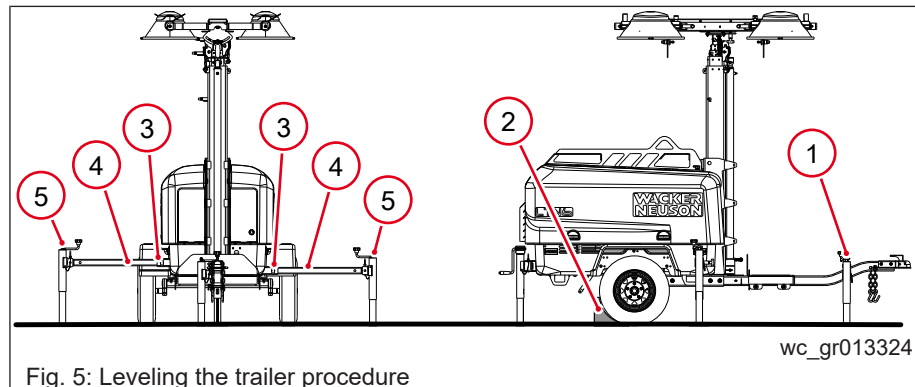
Tipping and falling hazard

Failure to level the trailer or extend the outriggers will reduce the stability of the unit.

- ▶ Level the trailer and extend the outriggers before raising the tower. The outriggers must remain extended while the tower is up.

Procedure

1. Pull the locking pin on the tongue jack (1) and rotate the tongue jack down 90° as shown. Insert the pin once the jack is in position.



2. Block or chock the trailer wheels (2).
3. Crank the tongue jack down to raise the trailer tongue off the vehicle.
4. Pull the outrigger lock pins (3) to release the outriggers. Pull both outriggers (4) out until you feel the lock pin snap into place.
5. Pull the locking pins on the outrigger jacks (5). Rotate the jacks down 180°. Insert the pins once the jacks are in position.
6. Extend the jack(s) on the highest side(s) of the trailer until they rest firmly on the ground. Extend the remaining jacks until the trailer is level.

6.2 Aiming the Light Fixtures—Vertical Mast Light Towers

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. This procedure requires the tower to be lowered and the engine stopped. To rotate the lights, [see Manually Rotating the Light Bar on page 32](#).

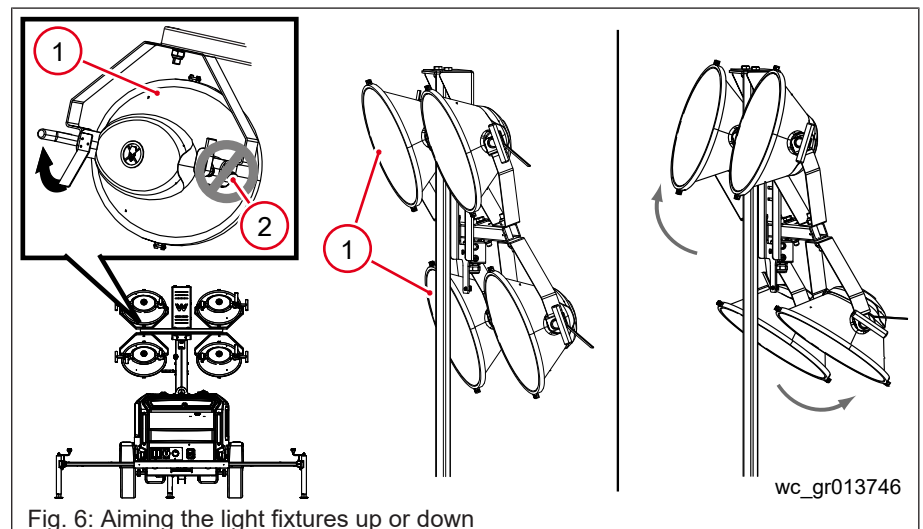
Requirements

Before adjusting the lights, make sure that the following conditions have been met:

- The engine is stopped.
- The tower is completely lowered.
- The lights are cool to the touch.

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 the light fixture and aim it to the left or right. If necessary, loosen the bracket nut (1) to allow movement of the fixture.

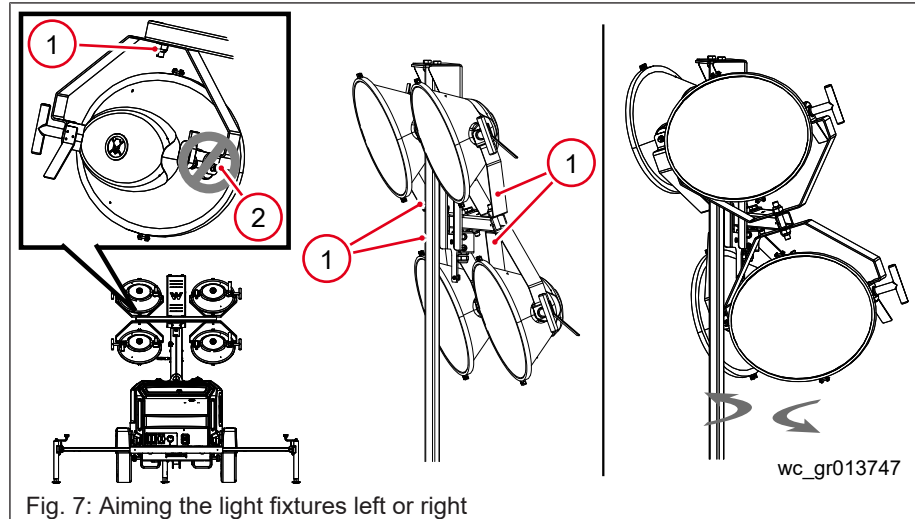


Fig. 7: Aiming the light fixtures left or right

2. If loosened, tighten the bracket nut **(1)** when the light is aimed properly. **Note:** The bracket nut should be only tight enough so that slight resistance is present when aiming the fixture.
3. Repeat steps 1 and 2 for each remaining light fixture, if desired.

6.3 Manually Rotating the Light Bar

Overview

The operator can rotate the light bar 360° while the tower is lowered.

Procedure

1. Loosen the mast rotation knob **(1)**.

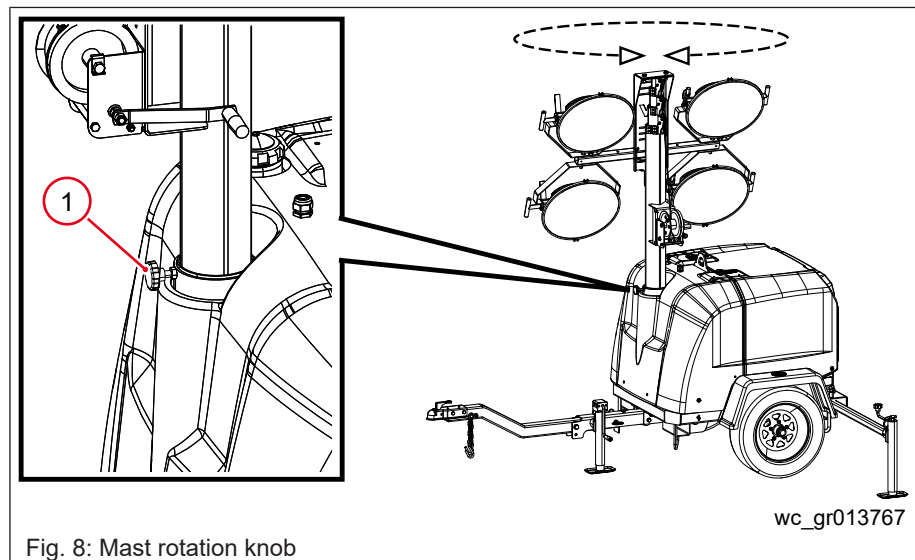
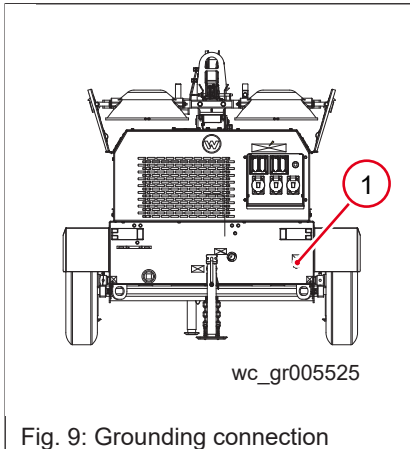


Fig. 8: Mast rotation knob

2. Rotate the light bar to the desired position.
3. Tighten the mast rotation knob.

7 Operation

7.1 Grounding the Light Tower



External grounding

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

Function

This ground connection is used for electrically grounding the light tower 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

Requirements

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

Procedure

1. Remove the fuel cap (1).

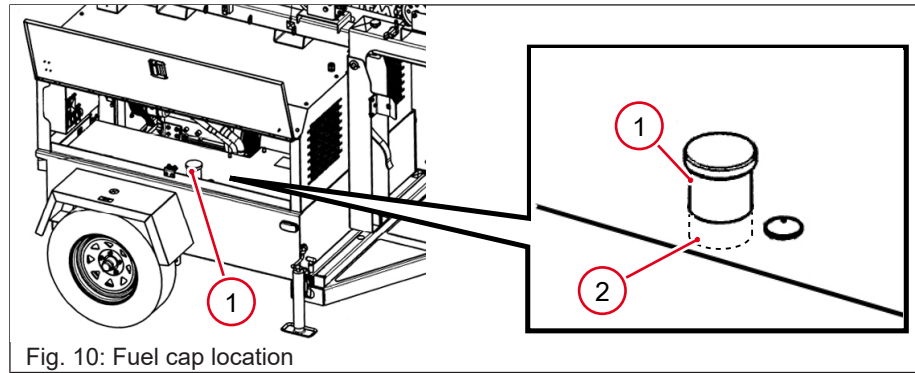


Fig. 10: Fuel cap location

2. Fill the fuel tank to the bottom of the fuel tank neck (2).
3. Install the fuel cap.

7.3 Raising the Tower (Manual Winch System)



⚠ 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.
- ▶ Do not pull the vertical tower locking pin 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 rear of the machine 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.

Background

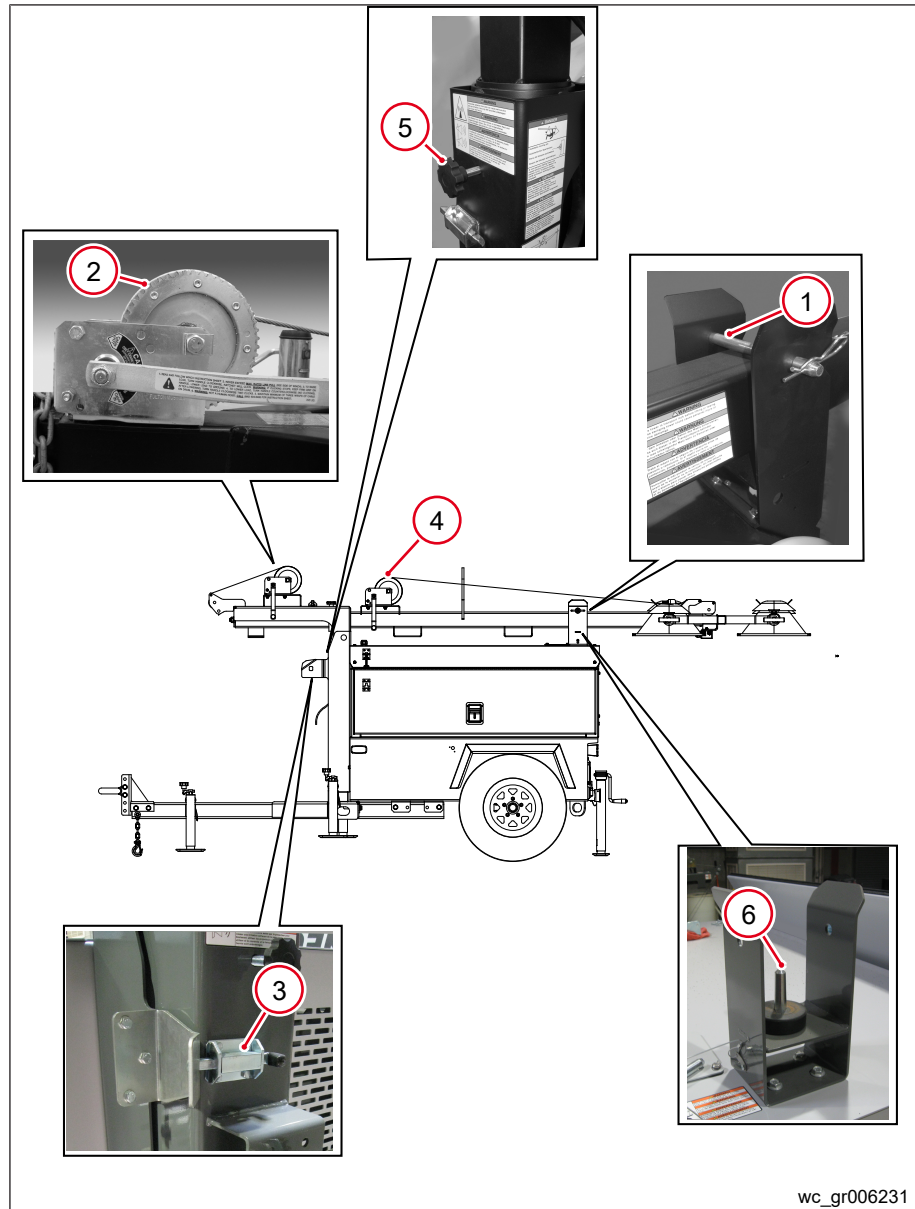
The light tower includes two separate winches—one for lifting the tower to the vertical position, the other for raising the tower. Each winch is an automatic brake-type winch that automatically brakes when the handle is released. The handle must be rotated to wind in the cable as well as to unwind the cable.

Requirements

- Machine shut down
- Machine on a firm, flat surface clear of overhead wires and obstructions
- Winch cables in serviceable condition and resting properly in pulleys
- Machine leveled with all outriggers extended and locked

Lifting the tower to the vertical position

1. Remove the cradle locking pin **(1)** from the cradle.



wc_gr006231

2. Check the operation of the tilt winch **(2)** by rotating the winch handle 1/4 turn clockwise (“cable in” direction). The winch pawl must engage the winch gear teeth. When operating properly, the winch pawl will make a “clicking” sound when the winch handle is rotated clockwise.
3. Continue to rotate the winch handle and lift the tower to the vertical position until the vertical tower locking pin **(3)** locks the tower in place. Be certain the vertical tower locking pin is fully engaged in the locking position before raising the tower.

Raising the tower

1. After the tower is vertical, check the operation of the telescoping winch **(4)** by rotating the winch handle 1/4 turn clockwise (“cable in” direction). The winch pawl must engage the winch gear teeth. When operating properly, the winch pawl will make a “clicking” sound when the winch handle is rotated clockwise.

2. Continue rotating the winch handle until the tower is at the desired height. Do not overcrank the winch when the tower is fully extended.

Rotating the tower

Once the tower is at the desired height, rotate the tower to the desired direction.

1. Loosen the rotation locking knob **(5)**.
2. Rotate the tower until the lights face the desired direction.
3. Retighten the rotation locking knob.

7.4 Lowering the Tower (Manual Winch System)

Requirements

- Operating instructions read and understood
- Lights off
- Machine shut down
- Winch cables in serviceable condition and resting properly in pulleys



⚠ 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.
- ▶ Do not pull the vertical tower locking pin 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 rear of the machine while raising or lowering the tower.



⚠ WARNING

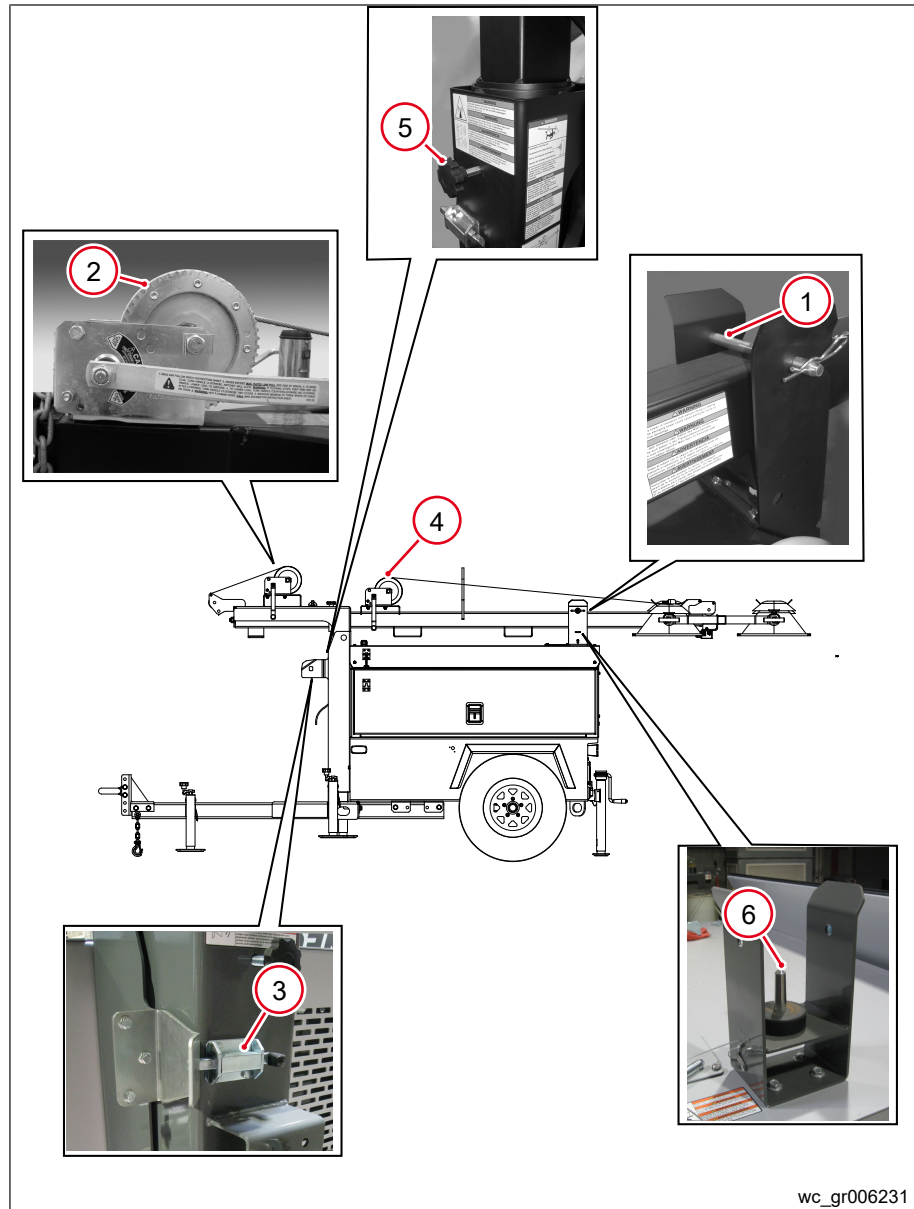
Personal injury hazard

Tower could collapse if the winch cable develops slack.

- ▶ Stop turning the winch immediately if part of the tower hangs up, or if a winch cable develops slack before the tower is fully lowered.

Procedure

1. Turn the handle on the telescoping winch **(4)** counterclockwise (“cable out” direction).



2. Loosen the rotation locking knob **(5)** and rotate the tower so the lights face the rear of the trailer and the telescoping winches are facing toward the trailer tongue.
3. Pull and hold the tower locking pin **(3)**. Rotate the handle on the tilt winch **(2)** counterclockwise (“cable out” direction) until the tower spring begins to pivot the tower down.



Information

If the tower hangs up, level the trailer, and slightly shake or twist the tower assembly to free the bind. Contact an authorized Wacker Neuson service center immediately if this procedure does not correct the problem.

4. Release the tower locking pin and continue to rotate the handle until the tower is resting in the transport cradle. Make sure that the secondary locking pin (6) penetrates all sections of the tower.
5. After the tower is down, secure it in the cradle by inserting the cradle lock pin (1). Insert the clip through the pin to lock it in place.
6. Position the light fixtures to aim at the ground.

7.5 Raising the Tower (Power Winch System)



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.
- ▶ Do not pull the vertical tower locking pin 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 rear of the machine 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.

Background

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

The tower and light bar can be rotated 360°. If you wish to position the light bar so the lights illuminate to the left, to the right, or to the rear, the light bar should be rotated when the tower is fully lowered. For further information, see [Manually Rotating the Light Bar on page 32](#).

Requirements

- Machine shut down
- Machine positioned on a firm, flat surface clear of overhead wires and obstructions
- Winch cables in serviceable condition and resting properly in pulleys
- Machine leveled with all outriggers extended and locked

Procedure

1. Check the operation of the telescoping winch (1). Turn the telescope rotary switch (2) on the control panel to the UP position.

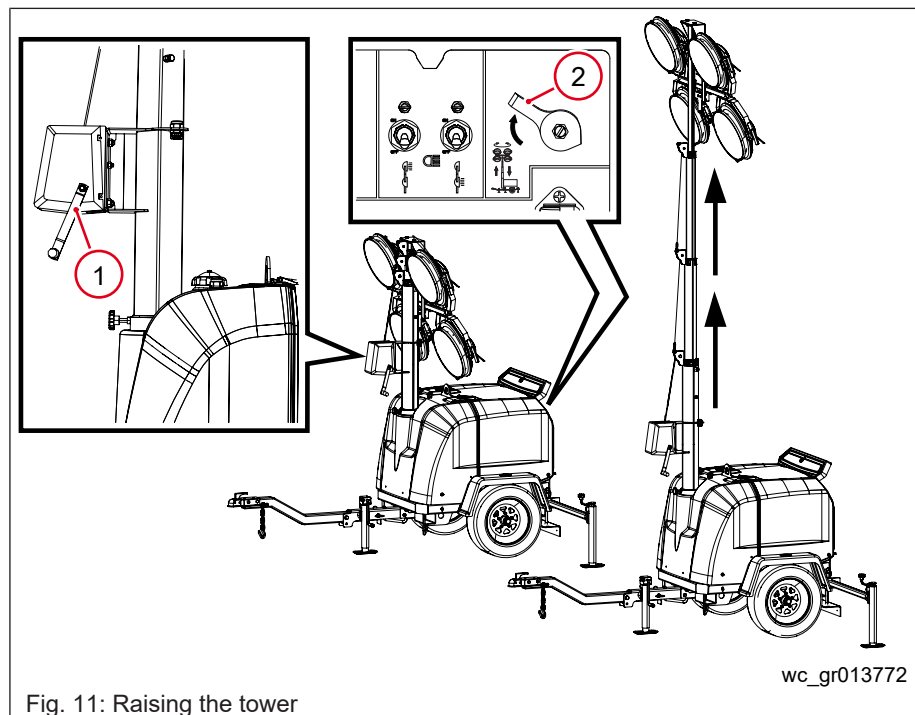


Fig. 11: Raising the tower

2. Continue to hold the telescope rotary switch until the tower is at the desired height. Release the switch when the tower is at the desired height.

7.6 Lowering the Tower (Power Winch System)



⚠ 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.
- ▶ Do not pull the vertical tower locking pin 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 rear of the machine while raising or lowering the tower.

Requirements

- Lights off
- Machine shut down
- Outriggers extended and locked in place

Procedure

1. Hold the rotary switch (2) in the DOWN position (“cable out” direction) until the tower is completely lowered.

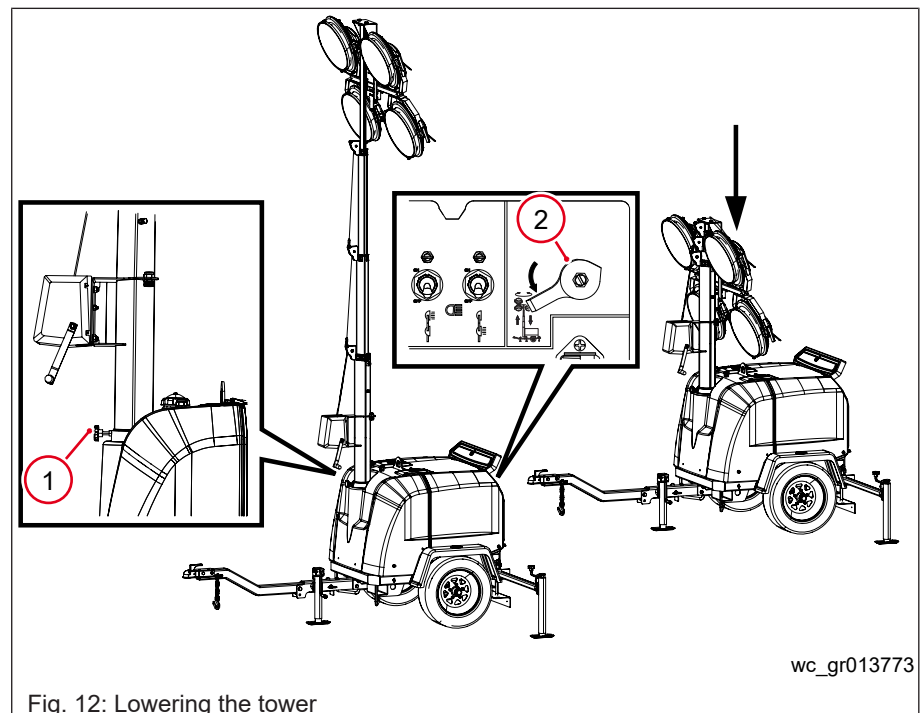


Fig. 12: Lowering the tower

2. If the light bar has been rotated, loosen the locking knob **(1)** and rotate the tower so the light bar and winch are facing toward the trailer tongue. For further information, see [Manually Rotating the Light Bar on page 32](#).
3. If the lights have been aimed vertically or horizontally, return them to a position parallel to the light bar. For further information, see [Aiming the Light Fixtures—Vertical Mast Light Towers on page 31](#).

7.7 Control Panel—Lights

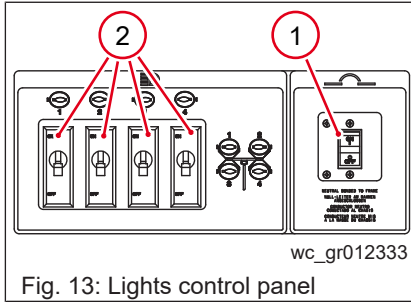


Fig. 13: Lights control panel

1 Main circuit breaker

2 15A circuit breakers (lights)

7.8 Engine Control Module

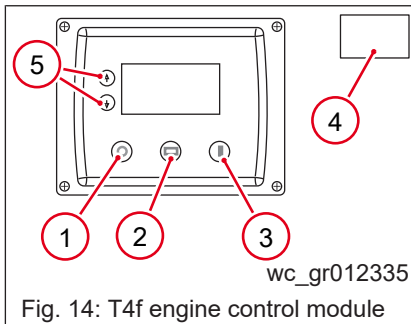


Fig. 14: T4f engine control module

1 Stop/Reset button

2 Auto start button

3 Start button

4 Hour meter

5 Menu navigation buttons (up/down)

7.9 Starting the Machine

Prerequisites

- Engine oil, fuel, and coolant at proper levels
- Electrical cable on the tower in serviceable condition
- Circuit breakers in their OFF positions



Information

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



NOTICE

Do not use starting fluids to aid in starting of engine.



⚠ WARNING

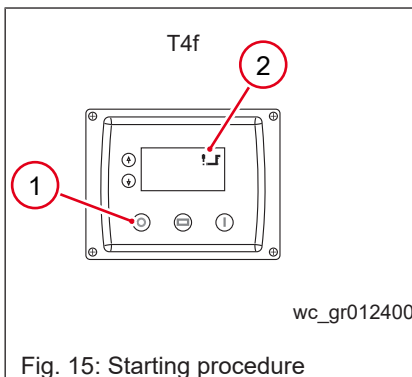
Electric shock hazard

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

7

Procedure

1. Press the START switch (1). This initiates the pre-heat timer, energizes the fuel solenoid, and energizes the starter motor.
2. The engine will crank for 10 seconds, and then rest for 10 seconds. If the engine does not start immediately, the cycle will repeat three times.
3. If the engine does not start after three attempts, the starting sequence will be terminated and the Overcrank shutdown indicator (2) will light.
4. When the engine starts, the starter motor is disengaged.



Information

After the starter motor has disengaged, the Safety On timer is activated. This timer is pre-set for a 12 second delay and allows oil pressure, high engine temperature, underspeed, and charge failure to stabilize without triggering the fault.

5. Allow engine to warm up before operating lights.

7.10 Stopping the Machine

Prerequisite

Lights off



NOTICE

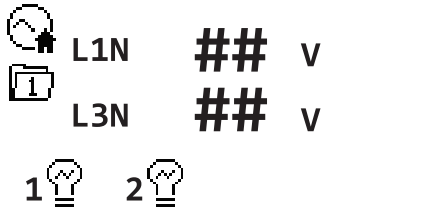
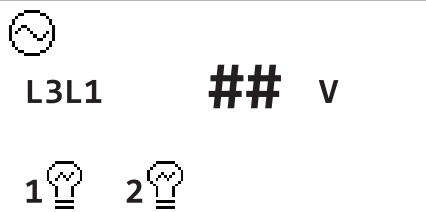
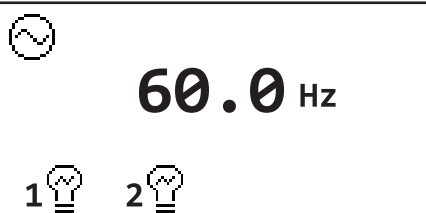

Generator will be damaged if the engine is shut down before turning off the lights.
















Stopping the machine

















Push the STOP button to de-energize the fuel solenoid.


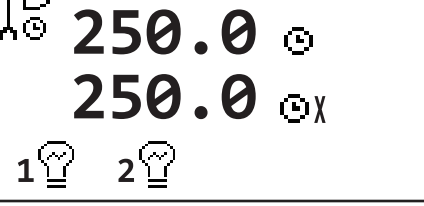
7.11 Machine Monitoring

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

 <p>L1N ## V L3N ## V</p> <p>1 2 </p> <p>wc_gr012363</p>	<p>Volts “V”—Displays the AC output voltage being produced by the generator.</p>
 <p>L3L1 ## V</p> <p>1 2 </p> <p>wc_gr012362</p>	<p>Volts “V”—Displays the AC output voltage being produced by the generator.</p>
 <p>60.0 Hz</p> <p>1 2 </p> <p>wc_gr012361</p>	<p>Hertz “Hz”—Displays output frequency. This gauge should read approximately 60 Hz under a no-load condition. If the frequency is too high, check the engine rpm.</p>
 <p>#### RPM</p> <p>1 2 </p> <p>wc_gr012364</p>	<p>Displays the engine rpm.</p>

 <div style="text-align: center; font-size: 2em;"> 0h 1m </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> 1  2  </div> <p style="text-align: right; font-size: 0.8em;">wc_gr012356</p>	<p>Displays the metered usage of the machine in hours (h) and minutes (m).</p>
 <div style="text-align: center; font-size: 2em;"> 12.0 v </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> 1  2  </div> <p style="text-align: right; font-size: 0.8em;">wc_gr012357</p>	<p>Displays the available voltage of the battery.</p>
 <div style="text-align: center; font-size: 1.5em;"> #### °C #### °F </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> 1  2  </div> <p style="text-align: right; font-size: 0.8em;">wc_gr012359</p>	<p>Displays the engine coolant temperature.</p>
 <div style="text-align: center; font-size: 1.5em;"> #### Bar #### psi #### kPa </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> 1  2  </div> <p style="text-align: right; font-size: 0.8em;">wc_gr012358</p>	<p>Displays the engine oil pressure.</p>
 <div style="text-align: center; font-size: 2em;"> 250.0 Ⓞ 250.0 ⓄX </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> 1  2  </div> <p style="text-align: right; font-size: 0.8em;">wc_gr012360</p>	<p>Displays the maintenance interval as well as the time remaining until maintenance is required.</p> <p>Each parameter is displayed on a separate screen:</p> <ul style="list-style-type: none"> • Oil change • Air filter • Fuel filter

 <p>L1N ## V</p>  <p>L3N ## V</p> <p>1  2 </p> <p>wc_gr012363</p>	<p>Volts “V”—Displays the AC output voltage being produced by the generator.</p>
 <p>L3L1 ## V</p> <p>1  2 </p> <p>wc_gr012362</p>	<p>Volts “V”—Displays the AC output voltage being produced by the generator.</p>
 <p>60.0 Hz</p> <p>1  2 </p> <p>wc_gr012361</p>	<p>Hertz “Hz”—Displays output frequency. This gauge should read approximately 60 Hz under a no-load condition. If the frequency is too high, check the engine rpm.</p>
 <p>#### RPM</p> <p>1  2 </p> <p>wc_gr012364</p>	<p>Displays the engine rpm.</p>
 <p>0h 1m</p> <p>1  2 </p> <p>wc_gr012356</p>	<p>Displays the metered usage of the machine in hours (h) and minutes (m).</p>

 <p>12.0 v</p> <p>1 2</p> <p>wc_gr012357</p>	<p>Displays the available voltage of the battery.</p>
 <p>250.0</p> <p>250.0</p> <p>1 2</p> <p>wc_gr012360</p>	<p>Displays the maintenance interval as well as the time remaining until maintenance is required.</p> <p>Each parameter is displayed on a separate screen:</p> <ul style="list-style-type: none"> • Oil change • Air filter • Fuel filter

7.12 Alarms and Shutdown Conditions

Background

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

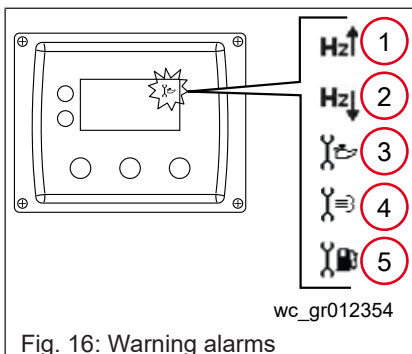
Warning alarms

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:

- Generator over-frequency (1)
- Generator under-frequency (2)
- Time to maintenance—oil (3)
- Time to maintenance—air filter (4)
- Time to maintenance—fuel filter (5)

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



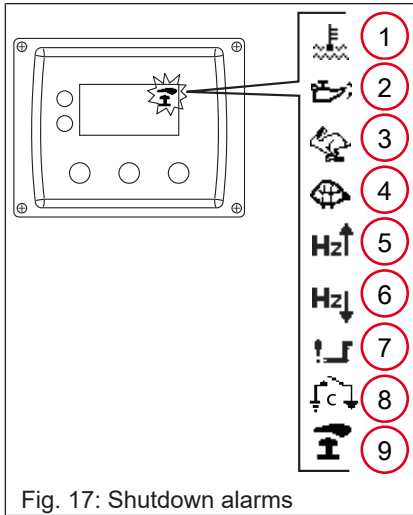


Fig. 17: Shutdown alarms

Shutdown alarms

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

- High coolant temperature (1)
- Low oil pressure (2)
- Overspeed (3)
- Underspeed (4)
- Generator over-frequency (5)
- Generator under-frequency (6)
- Overcrank (7)
- Low coolant level (if equipped) (8)
- Emergency stop (9)

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”.

Alarm and shutdown limits

Variable	Normal	Warning	Shutdown	To Reset
Coolant temp.	85°C± 8	—	95°C	Add coolant. Press “Stop.”
Oil pressure	60–80 psi	—	15 psi	Add engine oil. Press “Stop.”
Overspeed	60 Hz	63 Hz	66 Hz	Press “Stop.”
Underspeed	60 Hz	57 Hz	55 Hz	Press “Stop.”
Overcrank	—	—	After 3 attempts	Press “Stop.”
Time to maintain: • Oil • Air • Fuel	250 hours 250 hours 500 hours	0 hours	—	Navigate to the applicable maintenance screen and press and hold “Stop” for 10 seconds.
Coolant level	Above sender	—	Below sender	Add coolant. Press “Stop.”
E-stop	—	—	E-stop activated	Pull E-stop button out and press “Stop.”

7.13 Resetting the Maintenance Timers

Background

The maintenance timers are preset on the controller. When the timer expires, the alarm will display in the upper right corner of the screen. The maintenance timers are preset as follows:

- Oil change interval: 250 hours
- Air filter change interval: 250 hours
- Fuel filter change interval: 500 hours

Procedure

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

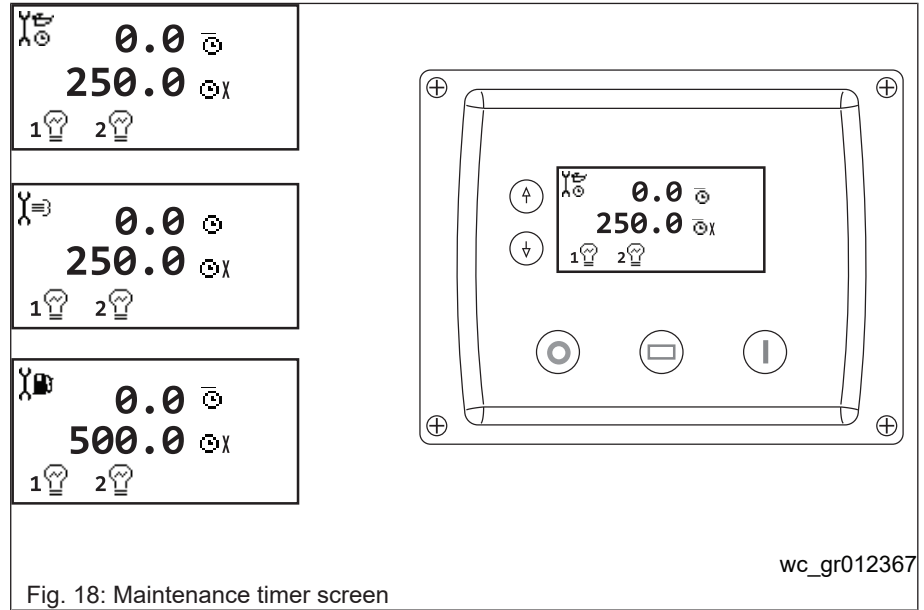


Fig. 18: Maintenance timer screen

1. Use the up and down arrows **(1)** to navigate to the applicable screen.
2. Press and hold the “Stop” button **(2)** for 10 seconds. The timer will re-set.



7.14 Auto Mode (Remote Run)

The engine controller is capable of automatically starting the engine. Contact Wacker Neuson Product Support for more information.

7.15 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).

7.16 Receptacle Panel

Overview

The light tower is equipped with receptacles for running accessories and tools from the generator. Power to these receptacles is available any time the engine is running and the circuit breakers are in the ON position.

Receptacles

The receptacle panels are equipped as follows:

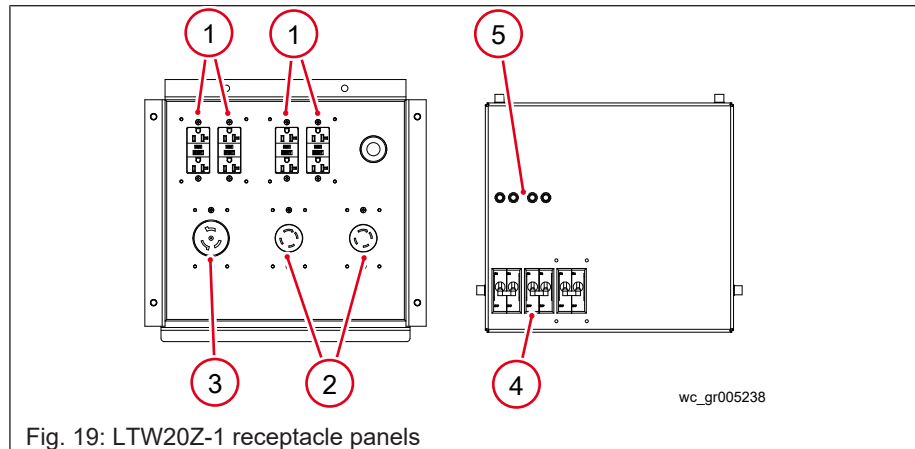


Fig. 19: LTW20Z-1 receptacle panels

Model	Callout	Quantity	Description
LTW20Z-1	1	4	120V Ground Fault Circuit Interrupt (GFCI) convenience receptacle
	2	2	120/240V single phase receptacle
	3	1	120/240V single phase receptacle
	4	3	Circuit breaker for 120/240V and 240V single phase receptacle
	5	4	Circuit breaker for 120V GFCI receptacle



Information

Do not draw more than 15,000 watts from the receptacles with all of the lights on or the lights will turn off. Load to at least 50% of the rated load to prevent wet stacking.

Circuit breakers

Circuit breakers **(5)** on the back of the receptacle panel protect the GFCI receptacles. The GFCI receptacles should be tested for proper operation each time they are used.

Testing a GFCI receptacle

Perform the manual test procedure below before each use to test a GFCI receptacle.

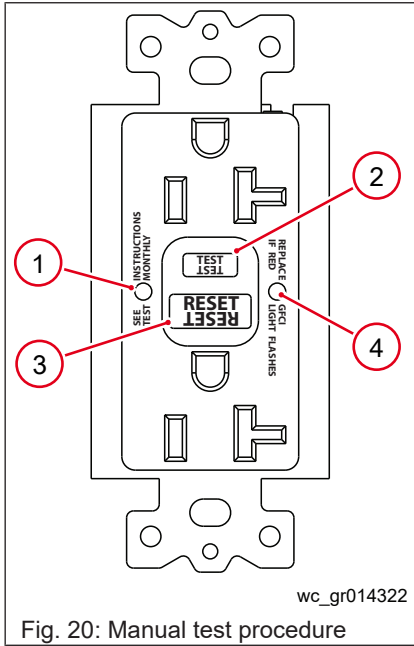


Fig. 20: Manual test procedure

1. Turn the power on at the control panel.
⇒ A green LED power ON indication light **(1)** will illuminate on the GFCI receptacle.
2. Push the test button **(2)** in.
⇒ The reset button **(3)** should pop out.
⇒ Power to the GFCI receptacle should be off.
3. Push the reset button in.
⇒ A green LED power ON indication light will illuminate on the GFCI receptacle.

In addition to the manual test shown above, the GFCI receptacle has a self-test feature. The red LED failure indication light **(4)** will flash if the GFCI receptacle has lost its GFCI protection. Do not use the GFCI receptacle until it is replaced.

7.17 Emergency Stop Switch

Location

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

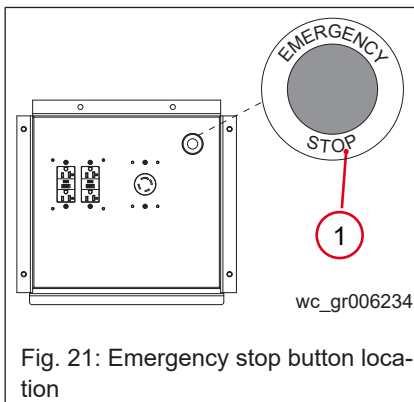


Fig. 21: Emergency stop button location

Operation

- Activate the emergency stop switch by pushing the red button in.
- Pushing the emergency stop switch opens the main circuit breaker and the fuel solenoid and results in the engine shutting down and an indicator to illuminate.
- The switch will remain in until the button is pulled out.



NOTICE

Press the emergency stop button only in the case of an actual emergency where the generator must be stopped immediately. In all other instances, open the main line circuit breaker and then press the engine controller Off "O" button.

7.18 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 nameplate rating for a few hours to raise the exhaust temperature high enough to clean out the exhaust system.

8 Maintenance

8.1 Maintenance Table

Maintenance cycle	Personnel	For further information	
Daily	Operating personnel	[▶ 57]	Daily Inspection
		[▶ 57]	Checking Engine Coolant
Every week	Operating personnel	[▶ 54]	Maintaining the Trailer
250 hours	Service personnel	[▶ 60]	Maintaining the Fuel/Water Separator
500 hours	Service personnel	[▶ 59]	Changing the Engine Oil
As needed	Service personnel	[▶ 54]	Installing/Removing Light Fixtures
		[▶ 55]	Replacing/Removing Lamps

8.2 Periodic Maintenance Schedule

The table below lists basic machine and engine maintenance. Tasks designated with check marks may be performed by the operator. Tasks designated with square bullet points require special training and equipment.

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

Item	Task	Interval (hours of service)							
		Before each use	100	200	500	800	1 year	2 years	
Fluids	Check for leaks.	√							
Engine oil	Check level.	√							
Fuel	Check level.	√							
Coolant	Check level.	√							
Air filter dust cup	Empty dust.	√							
Battery electrolyte	Check level.		√						
Fan belt	Check condition and tension.		√						
Air filter element	Clean.		1						
Radiator hoses	Check condition			√					
Intake air hose	Check condition and clear obstructions.			√					
Fuel filter	Replace		Replace after every 250 hours of operation.						
Engine oil	Change*		Replace after every 250 hours of operation						
Oil filter	Replace				▪				
Radiator	Flush				▪				
Fan belt	Replace				▪				
Fuel tank	Remove sediment				▪				
Valve clearance	Check and adjust as needed					▪			

Item	Task	Interval (hours of service)						
		Before each use	100	200	500	800	1 year	2 years
Air filter element	Replace						▪	
Radiator coolant	Change							▪
Battery	Replace							▪
Radiator hoses and clamps	Replace							▪
Fuel pipes and clamps	Replace							▪

*Change engine oil and filter after first 50 hours of operation.

8.3 Maintaining the Trailer

Tires

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

Wheels

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

8.4 Installing/Removing Light Fixtures

Requirements

- Circuit breakers are turned off
- Engine is shut down



⚠ WARNING

Electric shock hazard

Turn off all light circuit breakers and shut down engine before disconnecting light fixtures or changing lamps.



⚠ WARNING

Burn hazard

Lamps and fixtures become extremely hot in use. Allow lamps and fixtures to cool 10 to 15 minutes before handling.



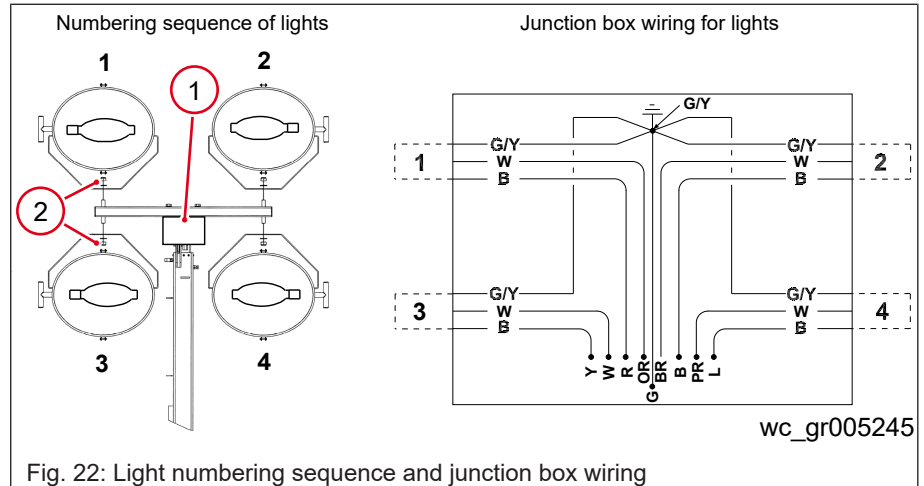
NOTICE

Only a trained technician should be allowed to install and remove fixture wiring.

Procedure

Follow the procedure below to remove the light fixtures.

1. Disconnect the electrical cords at the junction box (1).



2. Remove the nuts (2) from the fixture mounting brackets.
3. Remove both the fixtures and the brackets from the mounting studs.

Wire Colors							
BK	Black	RD	Red	YL	Yellow	OR	Orange
GN	Green	TN	Tan	BR	Brown	PU	Purple
BU	Blue	VIO	Violet	CL	Clear	SH	Shield
PK	Pink	WH	White	GY	Gray	LB	Light blue

8.5 Replacing/Removing Lamps



⚠ WARNING

Burn hazard

Lamps become extremely hot in use.

- ▶ Allow lamps and fixtures to cool 10 to 15 minutes before handling.

8



⚠ WARNING

Personal injury hazard

Ultraviolet radiation from the lamps can cause serious skin and eye irritation.

- ▶ Use only undamaged lamps.
- ▶ Use the lamps only with undamaged original equipment lenses and fixtures.



⚠ WARNING

Explosion hazard

Grease or oil residue on the lamp can cause the outer jacket to burst or shatter. Hot flying glass particles can cause personal injury, property damage, burns, or fire.

- ▶ Do not operate any lamps with lenses that are cracked, damaged, or missing.
- ▶ Do not scratch the lamp or subject the lamp to excess pressure.
- ▶ Wear eye protection and gloves when removing or replacing lamps.

Requirements

- Machine shut down
- Light circuit breakers turned OFF
- Lamps and fixtures cool to the touch
- Eye and hand protection

Removing the lamp

1. Remove the screws (1) securing the flange rings (2) and remove the flange rings.

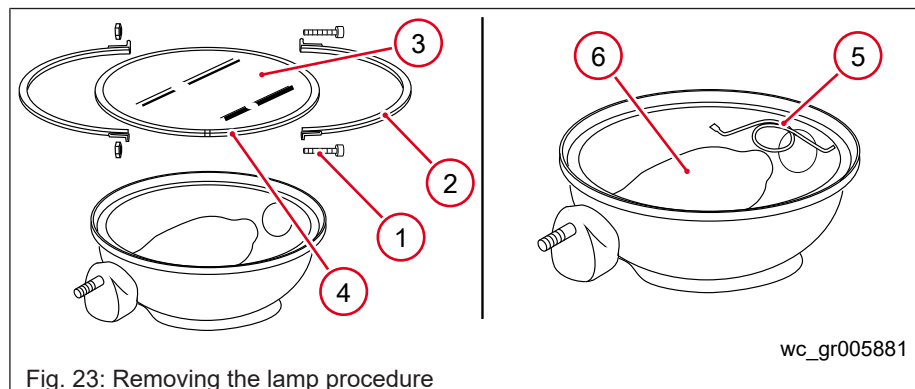


Fig. 23: Removing the lamp procedure

2. Remove the lens (3) with the gasket (4) attached.
3. Remove the hardware securing one side of the lamp stabilizer (5). Once removed, swing the lamp stabilizer to the side and unscrew the lamp (6).

Installing the lamp

1. Screw the lamp in firmly, but not forcibly, to minimize loosening due to vibration. Secure it with the lamp stabilizer.
2. Install the gasket around the lens and secure the lens to the reflector with the flange rings and screws.

8.6 Daily Inspection

Procedure

Inspect the following items daily.

- Check for fluid leaks.
- Check fluid levels.
- Inspect condition of electrical cords.
- Check that winch cables are in good condition.
- Check that the vertical mast locking pin and its spring are secured, aligned, and operating properly.

Changing engine oil

Change engine oil after first 50 hours of operation and every 250 hours thereafter. For further information, [see Changing the Engine Oil on page 59](#) and refer to the engine manufacturer's operator's manual for lubrication specifications.



▲ WARNING

Personal injury or equipment damage hazards

- ▶ Do not use light tower if electrical cord insulation is cut or worn through.
- ▶ Do not use a winch cable that is kinked or starting to unravel.
- ▶ Do not operate engine if oil level is below ADD mark on dipstick. Keep the oil level within the crosshatch pattern or FULL mark on the dipstick.

8.7 Checking Engine Coolant

When

Every 10 hours or daily

Requirements

- Machine shut down
- Cold engine
- Radiator cap cool enough to touch with bare hands



⚠ WARNING

Burn hazard

Pressurized coolant can cause serious burns.

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

Procedure

Follow the procedure below to check the engine coolant.

1. Slowly loosen radiator cap to relieve pressure in the system.
2. Remove radiator cap.
3. Check coolant level and add coolant as needed to 19 mm (3/4 in.) below bottom of filler neck.
4. Replace radiator cap.

8.8 Servicing the Air Cleaner

When

Replace the air filter cartridge when the yellow indicator of the engine air filter gauge reaches the red line.

Procedure

The air cleaner assembly contains a one-piece single element air filter cartridge (3). Follow the procedure below to replace the air filter cartridge.

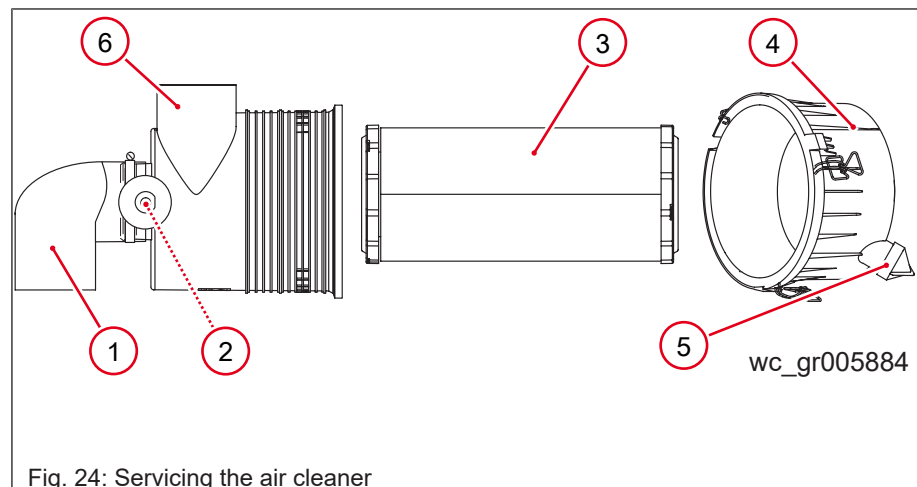


Fig. 24: Servicing the air cleaner

1. Remove the end cover (4), then discard the entire air filter cartridge.
2. Insert a new air filter cartridge.
3. Install the end cover, making sure that the dust cap (5) is clean and is pointing downward.

Routine inspection

- Periodically, make sure the inlet pipe **(6)** is free from obstructions.
- Check all connections and make sure they are snug. An air leak at the neck clamp, gauge connection, or intake pipe can quickly lead to expensive engine repairs.
- Make sure that the intake piping **(1)** is fully engaged over the neck of the filter to ensure a good seal.
- If the filter housing, gauge connection **(2)**, neck, or inlet pipe are crushed or damaged, replace them immediately.

8.9 Changing the Engine Oil



▲ WARNING

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 500 hours

Requirements

- Warm engine
- Plastic sheet and container of suitable size to collect drained oil
- Replacement oil (Engine—T4f 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 ADD mark on the dipstick. Always keep the oil level within the crosshatch pattern or FULL 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

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

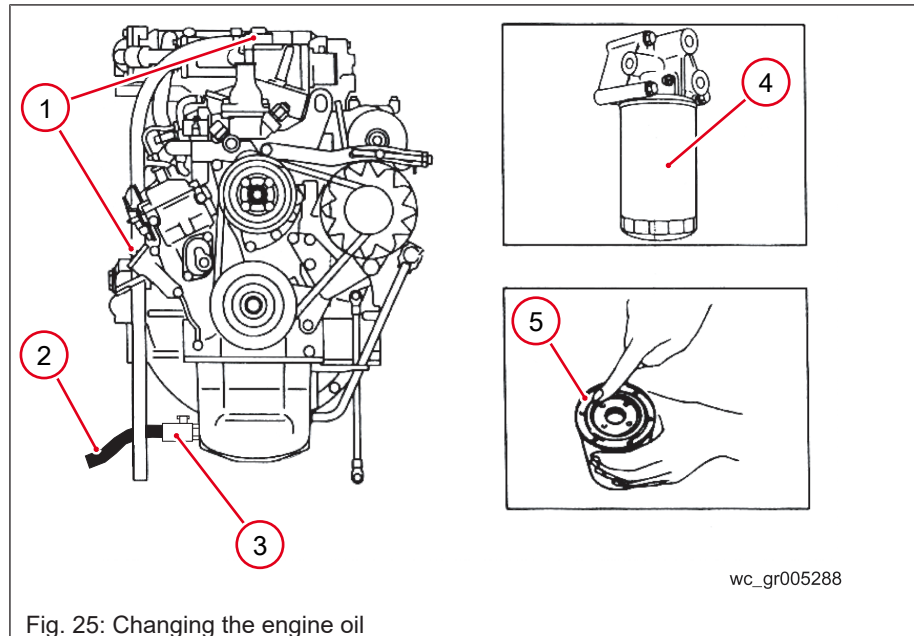


Fig. 25: Changing the engine oil

2. Locate the oil drain hose **(2)** and feed it through the opening at the rear of the light tower cabinet.
3. Remove the cap from the end of the oil drain hose. Open the valve **(3)** at the hose connection and allow the oil to drain into a suitable container.
4. 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.
5. Fill the engine crankcase through the oil filler opening to the upper mark on the dipstick. For oil quantity and type, Engine—T4f.
6. Install the oil filter cap.

Replacing the oil filter element

1. Use a filter wrench to remove the oil filter element **(4)**. Discard the used element.
2. Apply a thin coat of oil to the O-ring on the new element **(5)**.
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. Torque to 14.7–20.6 Nm (10.8–15.2 ft. lbs.).

8.10 Maintaining the Fuel/Water Separator

When

- As needed—empty the separator water bowl
- Every 250 hours—replace the separator element

Requirements

- Container of suitable size to drain water from the separator element
- Replacement separator element

Emptying the separator bowl

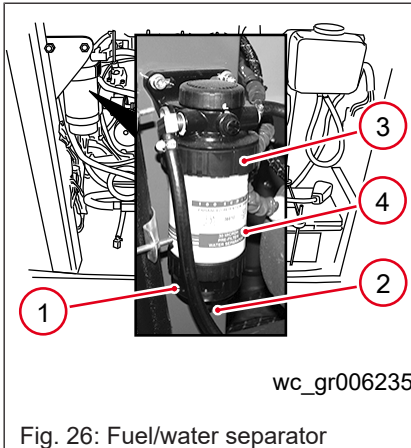
Follow the procedure below to empty the separator bowl **(1)**.

1. Open the water bowl drain **(2)**.
2. Allow the water to drain into a suitable container.
3. Close the water bowl drain.

Changing the separator element

Follow the procedure below to change the separator element.

1. Loosen the element retainer **(3)**.
2. Remove the element retainer and element **(4)** from the separator head.
3. Unscrew the separator bowl from the element.
4. Screw the separator bowl onto the replacement element.
5. Insert the retainer and replacement element into the separator head.
6. Tighten the element retainer.



8.11 Engine Maintenance—Isuzu Tier 4 Final



▲ 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 engine maintenance schedule(s) in this chapter are reproduced from the engine owner's manual. For additional information, see the engine owner's manual.

Periodic inspection and maintenance list

In order to maintain safe and economical engine operation, performance of periodic inspection and maintenance is recommended.



Information

After 1500 hours, perform inspection and maintenance for every 250 hours or 500 hours in accordance with this table.

Lubrication system

Inspection/Maintenance Item	Daily	250 Hours	500 Hours	750 Hours	1000 Hours	1250 Hours	1500 Hours	Remarks
Oil level and contamination	•							
Oil leak	•							
Oil pressure gauge indication or lighting of warning light	•							Approx. 285 kPa (3 kgf / cm ² / 43 psi) or more per 2200 min ⁻¹
Oil pressure warning light	•							Off (in operation)
Replacing the engine oil (remote filter type)			•		•		•	Every 500 hours
Replacing the engine oil (cartridge type)		•	•	•	•	•	•	Every 250 hours
Replacing the oil filter			•		•		•	Every 500 hours

Fuel system

Inspection/Maintenance Item	Daily	250 Hours	500 Hours	750 Hours	1000 Hours	1250 Hours	1500 Hours	Remarks
Fuel leak	•							
Water removal from fuel	•							
Replacing the fuel filter element			• ¹⁾		• ¹⁾		• ¹⁾	Every 500 hours
Inspecting and cleaning the supply pump strainer			•		•		•	Every 500 hours
Replacing the electromagnetic pump filter (paper type)			• ¹⁾		• ¹⁾		• ¹⁾	Every 500 hours
Cleaning the electromagnetic pump filter (steel mesh type)			• ¹⁾		• ¹⁾		• ¹⁾	Every 500 hours
Inspecting and cleaning the injector								Every 3000 hours

1) Shorten the interval from every 500 hours to every 250 hour depending on the fuel management and refuel status

Cooling system

Inspection/Maintenance Item	Daily	250 Hours	500 Hours	750 Hours	1000 Hours	1250 Hours	1500 Hours	Remarks
Coolant quantity	•							Inspecting the reserve tank
Abnormal discoloration and contamination of coolant	•							
Coolant leak	•							
Radiator cap installation condition	•							As specified by the machine manufacturer

Inspection/Maintenance Item	Daily	250 Hours	500 Hours	750 Hours	1000 Hours	1250 Hours	1500 Hours	Remarks
Inspecting (replacing) the generator drive belt	•		•		•		•	Deflection when approx. 98 N (10 kgf / 22 lb) is applied Single belt -When reused: 6.0 – 6.5 mm (0.24 – 0.26 in) -New belt: 5.5 – 6.0 mm (0.22 – 0.24 in) Double belt -When reused: 8.3 – 9.3 mm (0.33 – 0.37 in) -New belt: 7.7 – 8.7 mm (0.30 – 0.34 in)
Inspection using the coolant temperature gauge or monitor	•							75 – 90°C (167 – 194°F)
Replacing the coolant								Every 12 months
Cleaning the coolant passage								Every 12 months
Cleaning the intercooler and radiator exterior	•							As specified by the machine manufacturer
Inspection and maintenance the cooling system	•							As specified by the machine manufacturer
Inspecting the functionality of radiator cap ¹⁾	•							As specified by the machine manufacturer

1) When performing inspection or maintenance, consult an Isuzu distributor

Intake/exhaust system

Inspection/Maintenance Item	Daily	250 Hours	500 Hours	750 Hours	1000 Hours	1250 Hours	1500 Hours	Remarks
Replacing the air cleaner element								As specified by the machine manufacturer
Inspecting the air filter case for cracking and replacing as necessary							•	Every 1500 hours
Inspecting the turbocharger								Every 3000 hours (blower cleaning as necessary)
Inspecting and cleaning the EGR valve								Every 3000 hours
Inspecting and cleaning the EGR cooler							•	Every 1500 hours

Electrical system

Inspection/Maintenance Item	Daily	250 Hours	500 Hours	750 Hours	1000 Hours	1250 Hours	1500 Hours	Remarks
Inspecting the engine failure indication and liquid crystal display (LCD)	•							
Inspecting the battery fluid level	•							Adding distilled water (as specified by the machine manufacturer)
Cleaning the battery terminals	•							
Charging status	Current meter	•						Immediately after start, + side (large) → (small) Normal operation, + side (small)
	Charge light	•						Off (in operation)
Measuring the specific gravity of battery fluid	•							As specified by the machine manufacturer
Inspecting and cleaning the starter and generator ¹⁾					•			Every 1000 hours
Inspecting the wiring and connections								As specified by the machine manufacturer
Preheating status	•							
Inspecting the engine controller								Every 3000 hours

1) When performing inspection or maintenance, consult an Isuzu distributor

Engine/others

Inspection/Maintenance Item	Daily	250 Hours	500 Hours	750 Hours	1000 Hours	1250 Hours	1500 Hours	Remarks
Inspecting and replacing the fuel oil pipe and coolant pipe								Every 24 months
Engine startability and abnormal noises	•							
Exhaust conditions	•							Exhaust color
Measuring the compression pressure ¹⁾					•			Every 1000 hours
Inspecting and adjusting the valve clearance ¹⁾					•			Every 1000 hours 0.40 mm (0.016 in) for both intake and exhaust (in cold engine)

1) When performing inspection or maintenance, consult an Isuzu distributor

8.12 Coolant

Overview

The coolant is a type of fluid which is made by mixing tap water and the long-life coolant “BESCO LLC SUPER TYPE E or BESCO LLC SUPER TYPE AS” with an appropriate ratio. It has the function of cooling off the heat generated by the engine.

Handling the long-life coolant

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 tap water with an appropriate ratio.

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

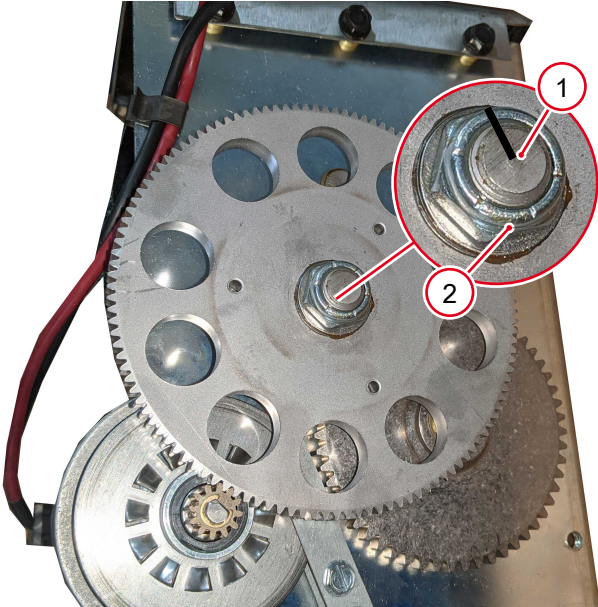
High voltage

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

Problem	Cause	Remedy
No light (lamp)	Lamp is too hot	Allow lamp to cool 10–15 minutes before restarting.
	Faulty lamp connection	Check that lamp is tight in socket. Check connections inside connection boxes on light fixtures and tower.
	Plug connection at fixture is loose or damaged	Repair or replace the plug connection.
	Lamp broken or burned out	Check for the following: <ul style="list-style-type: none"> • broken arc tube or outer lamp jacket • broken or loose components in lamp envelope • blackening or deposits inside lamp tube
	Circuit breaker turned on	Turn off circuit breaker.
	Circuit breaker loose or faulty	Repair or replace the circuit breaker.
	Generator output incorrect	Check incoming voltage to ballast. Incoming voltage should be 120V ± 5V. If voltage is incorrect, engine speed may need to be adjusted or generator may require service.
	Low or no ballast output	With the fixture cord removed from its receptacle, the voltage should measure 400 to 445 VAC. If proper voltage is not achieved, perform capacitor check to determine if capacitor or coil needs to be replaced.

Problem	Cause	Remedy
Low light output	Lamp degraded	Replace lamp due to normal lamp life.
	Low ballast output	Check ballast for proper voltage output.
	Fixture or lens dirty	Clean reflective surface inside fixture and both inside and outside surface of glass lens.
Power winch models: Tower does not fully extend	Clutch needs adjustment	 <ol style="list-style-type: none"> 1. Verify that the tower is in the completely down position. 2. Remove the winch cover. Note the location of the left and right side screws for reassembly as they are different. 3. Mark the position of the clutch adjustment nut to stud (1) to aid in adjustment. 4. WARNING! All nut adjustments must only be made when the tower is completely down. 5. Tighten the nut (2) in 1/12th turn increments and attempt to raise the tower after each adjustment until the winch clutch does not slip until the end of travel is reached. Verify that the clutch slips at end of travel. <ul style="list-style-type: none"> ⇒ When properly adjusted, at the end of travel, the sound of the winch motor changes, and the clutch engages. When releasing the switch, the main gear counter-rotates approximately 1/8th turn, and the winch brake engages, holding the tower at full extension. 6. Lower the tower. 7. Replace the winch cover, returning the unit back to its original configuration.

10 Storage

10.1 Long-Term Storage

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.

11.2 LED Lights

The LED light option includes 4 X 300 Watt LED fixtures that require less than 1 second warm-up time, no maintenance, and 100-264 VAC. The LED fixtures are rated for use in extreme cold temperatures to -40°F and offer voltage and current protection.

12 Technical Data

12.1 Engine

Machine		LTW20Z-1
Engine	Make / type	Isuzu
Model		4LE2TAGV02, Tier 4 Final
Number of cylinders		4
Displacement	cm ³ (in ³)	2179 (133)
Engine speed	rpm	1800
Power @ 1800 rpm - continuous/standby	kW (hp)	23.5 (31.5) / 30.0 (40.0)
Coolant capacity	L (qt)	12.6 (13.3)
Oil capacity	L (qt)	10.4 (11.0)
Battery	V/ccA (standard) (custom)	12/750 12/950
Fuel	Type	Diesel
Fuel tank capacity	L (gal)	215.8 (57)
Fuel consumption, prime load	L/hr (gal/hr)	6.0 (1.6)
Running time, prime load	Hr	34.8

12.2 Generator

Machine		LTW20Z-1
Make/Type	—	Mecc Alte / Brushless
Model	—	ECP28 VL4 C
Frequency	Hz	60
Generator speed	Rpm	1800
Prime output	kW (kVA)	18.6 (23.3)
AC voltage output	V, phase	120/240, 1Ø
Amps	A	155/78
Excitation type	—	AVR
Power factor	—	1.0
Voltage regulation	—	±1.00%
Insulation class	—	H

12.3 Machine

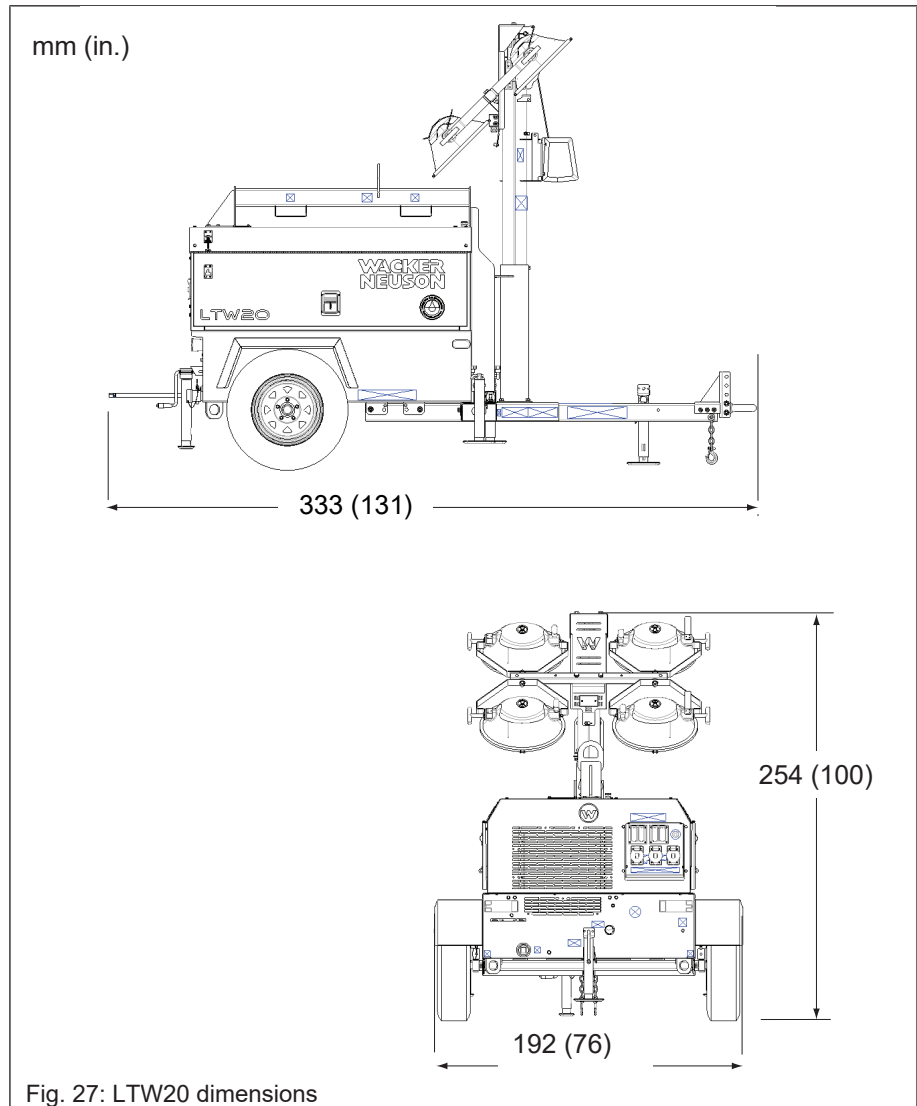
Machine		LTW 20Z-1 Metal halide	LTW 20Z-1 LED
Operating weight	kg (lb)	1565 (3450)	
Travel Dimensions (L x W x H)	cm (in.)	333 x 192 x 254 (131 x 76 x 100)	
Height—tower extended	m (ft)	7 (23)	
Lighting system		4@1100W	4@300W
Ballast		Coil and core	
Max. lighting coverage @ 5 ft. candles (54 lux)	m ² (ft ²)	9,320 (857)	5,420 (504)
Sound level at 7 m (23 ft.)	dB (A)	71.2	
AC receptacles		4 duplex, 3 twist-lock	
120V GFI duplex		4@20A	
120/240 V twist lock		2@30A 1@50A	
Surge brakes (if equipped)	Fluid type	DOT3	
Tires	Size	ST205 / 75D15(C)	

12.4 Metal Halide Radiation Compliance

This machine meets the radio interference radiated emission requirements of European Standard EN 13309 for construction machinery.

The lamps provided with this machine are electric discharge lamps. They are designed for use with metal halide ballasts only and require time to reach full brightness on initial startup and after a power interruption. These lamps comply with FDA regulation performance standards 21 CFR 1040-30.

12.5 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

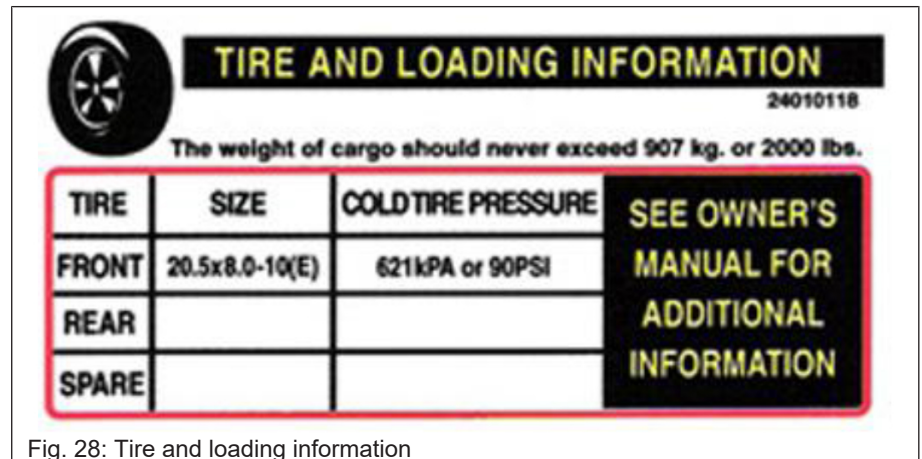


Fig. 28: Tire and loading information

1. Locate the statement, “The weight of cargo should never exceed XXX kg or XXX lbs.,” on your vehicle’s placard. See figure 1-1.
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 light-weight 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.

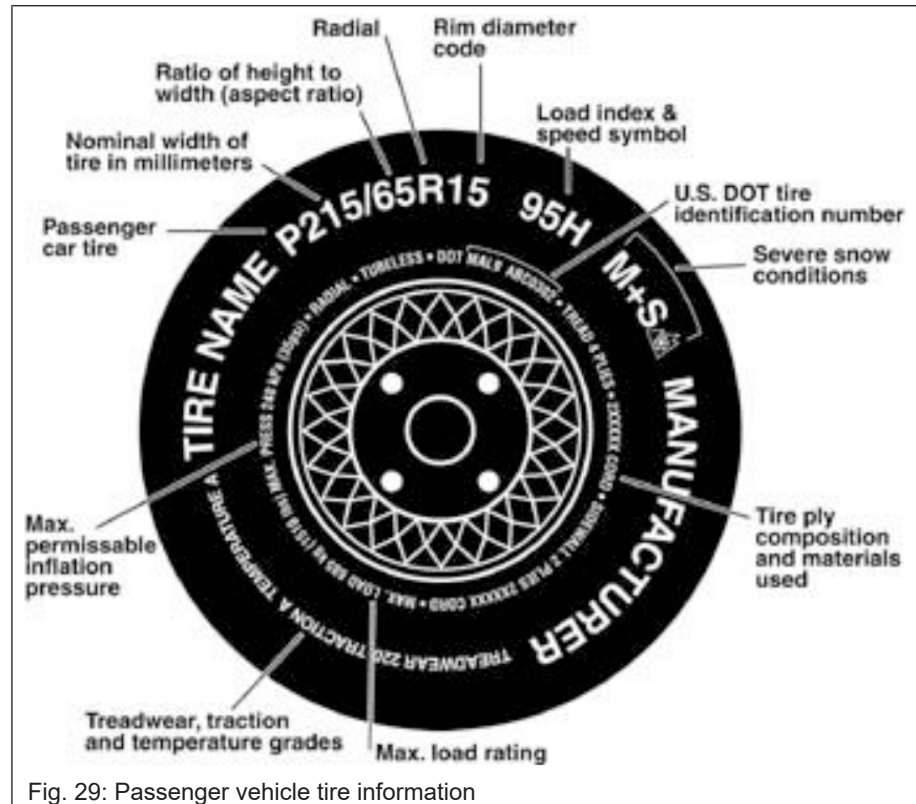


Fig. 29: Passenger vehicle tire information

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.

13.8 Tire Safety Tips

Preventing tire damage

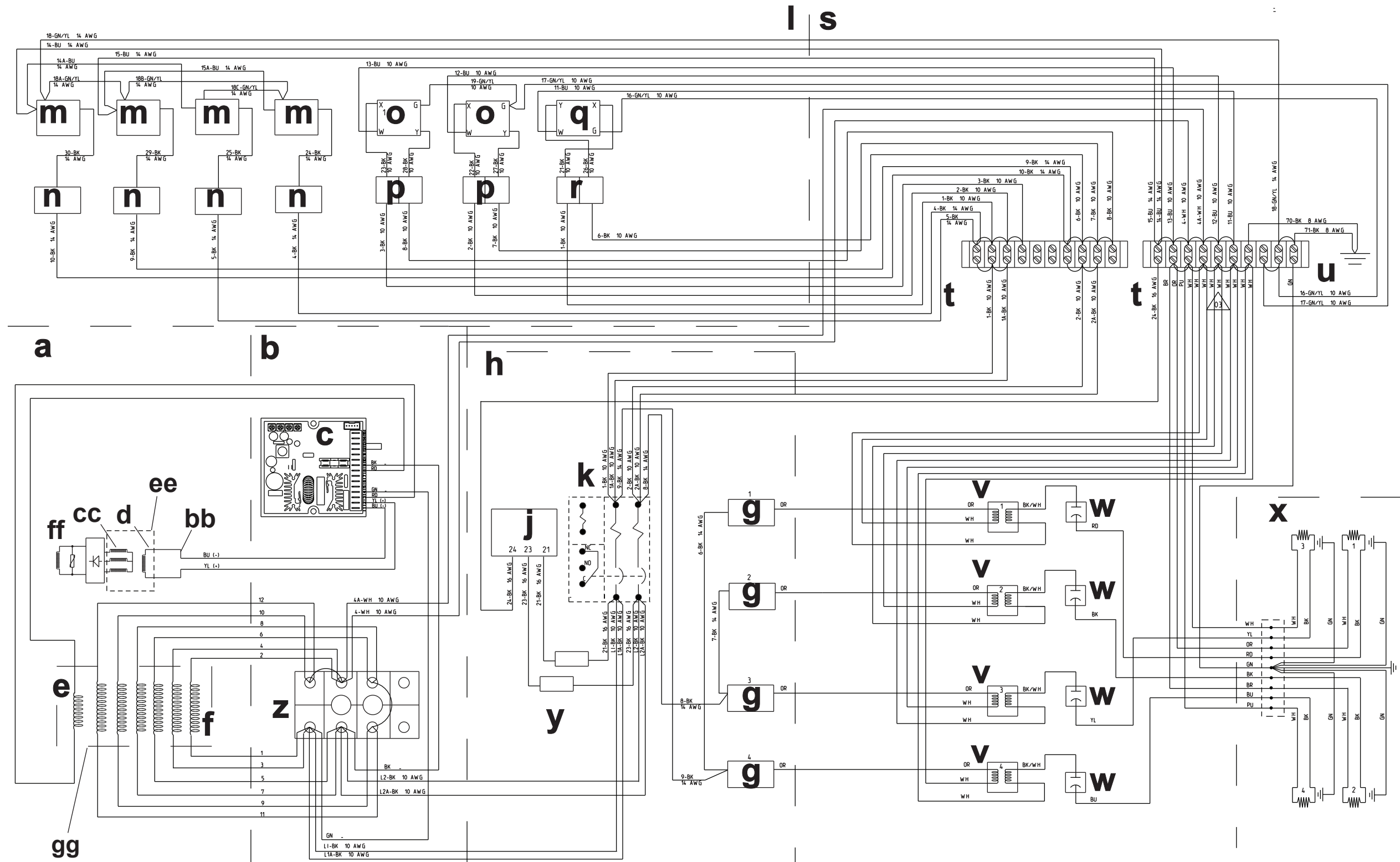
- Slow down if you have to go over a pothole or other object in the road.
- Do not run over curbs or other foreign objects in the roadway, and try not to strike the curb when parking.

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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LTW 20Z-1—Electrical Schematic T4f—Metal Halide Lights Module



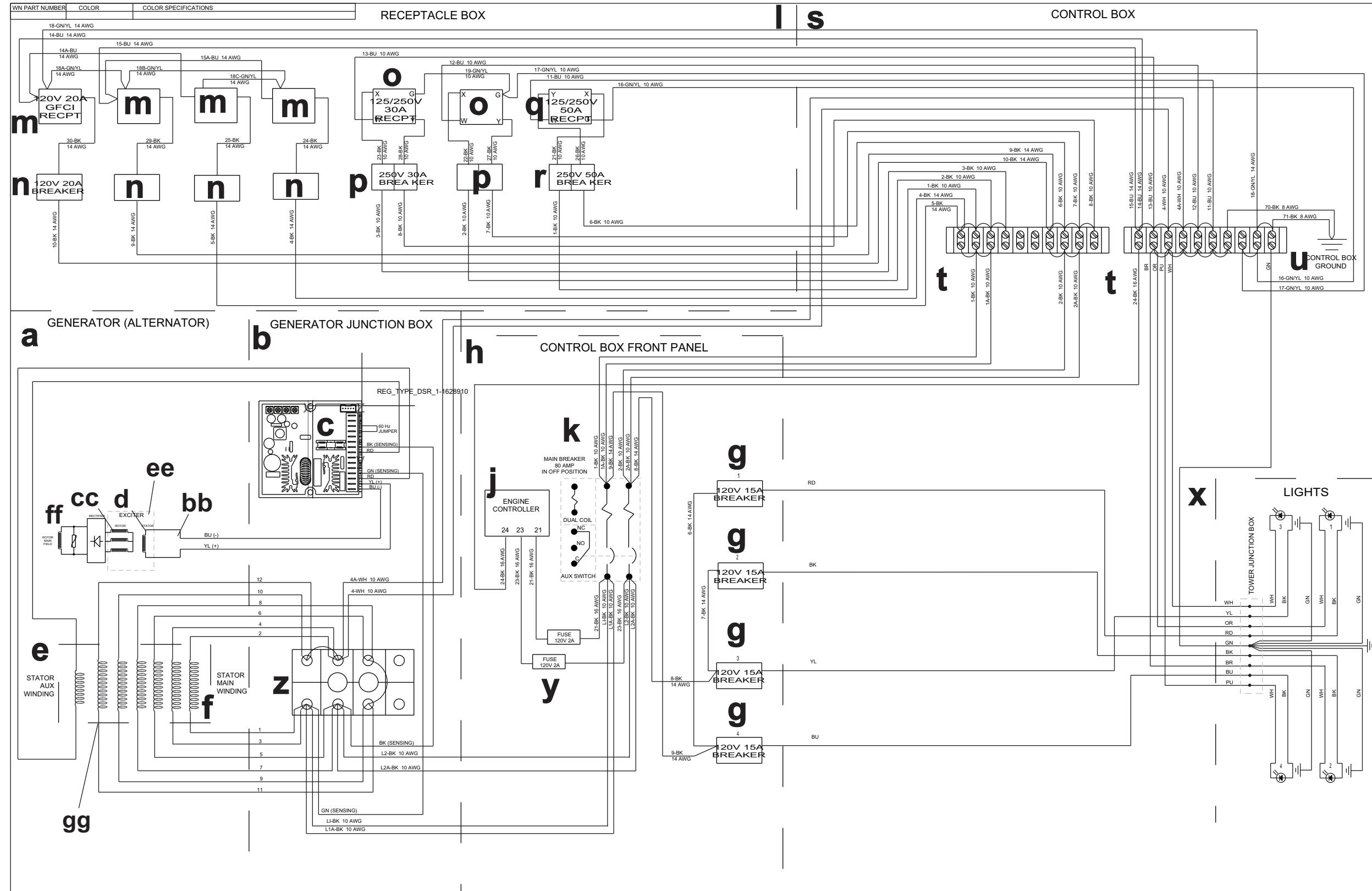
wc_gr012330

LTW 20Z-1—Electrical Schematic Components—T4f

Ref.	Description	Ref.	Description
a	Generator	q	Receptacle, 120/240V, 50A
b	Generator junction box	r	Circuit breaker, 240V, 50A
c	Voltage regulator	s	Control box
d	Exciter	t	Terminal strip
e	Stator (aux. winding)	u	Control box ground
f	Stator (main winding)	v	Transformer
g	Circuit breaker, 120V, 15A	w	Capacitor
h	Control box front panel	x	Lights
j	Engine controller	y	Fuse, 120V, 2A
k	Main breaker, 80A	z	Generator connection block
l	Receptacle box	bb	Exciter stator
m	Receptacle, 120V, 20A GFCI	cc	Rotating rectifier
n	Circuit breaker, 120V, 20A	ee	Rotor
o	Receptacle, 120/240V, 30A	ff	Main rotor winding
p	Circuit breaker, 240V, 30A	gg	Stator

Wire Colors							
BK	Black	RD	Red	YL	Yellow	OR	Orange
GN	Green	TN	Tan	BR	Brown	PU	Purple
BU	Blue	VIO	Violet	CL	Clear	SH	Shield
PK	Pink	WH	White	GY	Gray	LB	Lt. blue

LTW 20Z-1—Electrical Schematic T4f—LED Lights Module

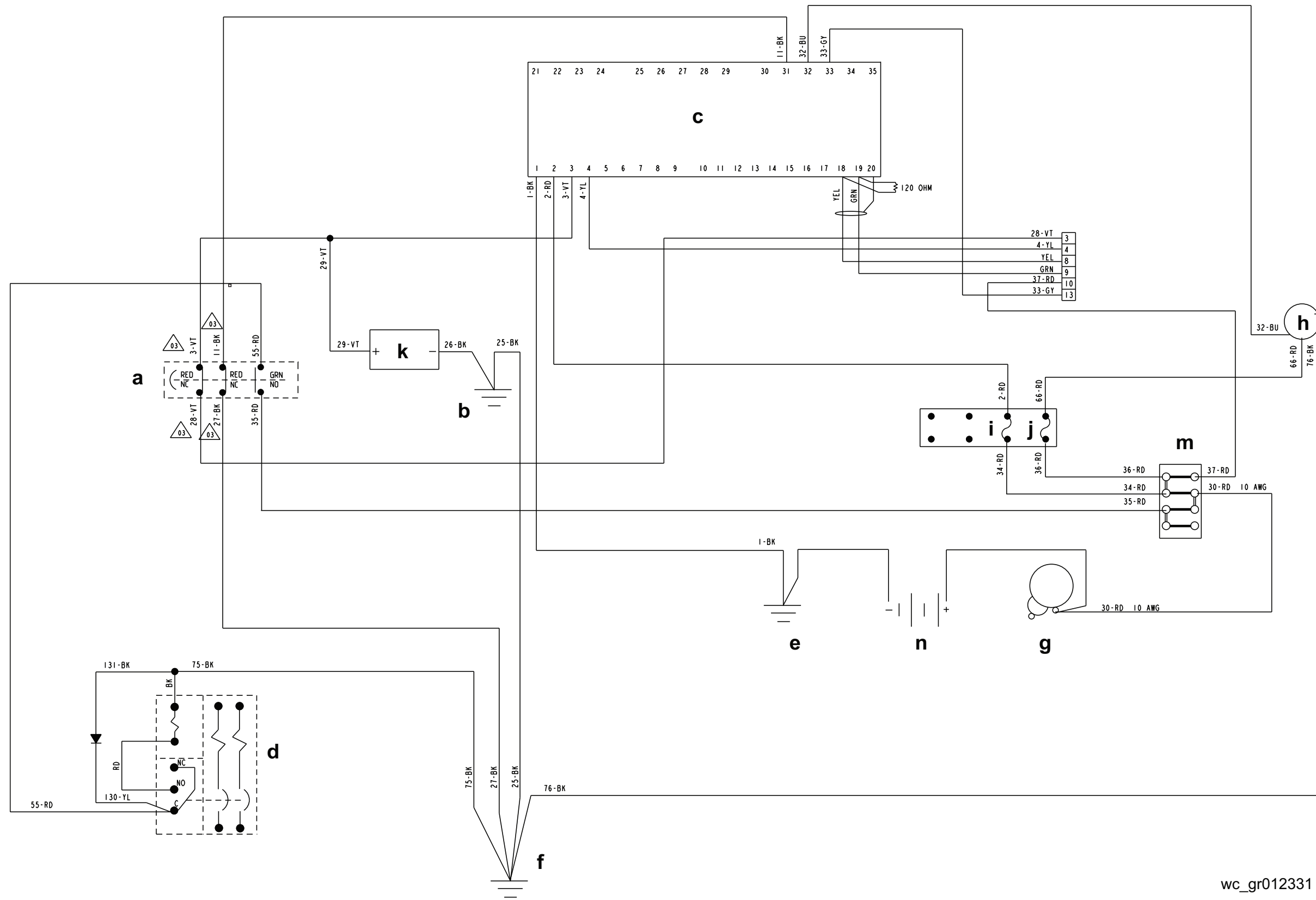


LTW 20Z-1—Electrical Schematic Components T4f—LED Lights Module

Ref.	Description	Ref.	Description
a	Generator	q	Receptacle, 120/240V, 50A
b	Generator junction box	r	Circuit breaker, 240V, 50A
c	Voltage regulator	s	Control box
d	Exciter	t	Terminal strip
e	Stator (aux. winding)	u	Control box ground
f	Stator (main winding)	v	Transformer
g	Circuit breaker, 120V, 15A	w	Capacitor
h	Control box front panel	x	Lights
j	Engine controller	y	Fuse, 120V, 2A
k	Main breaker, 80A	z	Generator connection block
l	Receptacle box	bb	Exciter stator
m	Receptacle, 120V, 20A GFCI	cc	Rotating rectifier
n	Circuit breaker, 120V, 20A	ee	Rotor
o	Receptacle, 120/240V, 30A	ff	Main rotor winding
p	Circuit breaker, 240V, 30A	gg	Stator

Wire Colors							
BK	Black	RD	Red	YL	Yellow	OR	Orange
GN	Green	TN	Tan	BR	Brown	PU	Purple
BU	Blue	VIO	Violet	CL	Clear	SH	Shield
PK	Pink	WH	White	GY	Gray	LB	Lt. blue

Engine Wiring—T4f



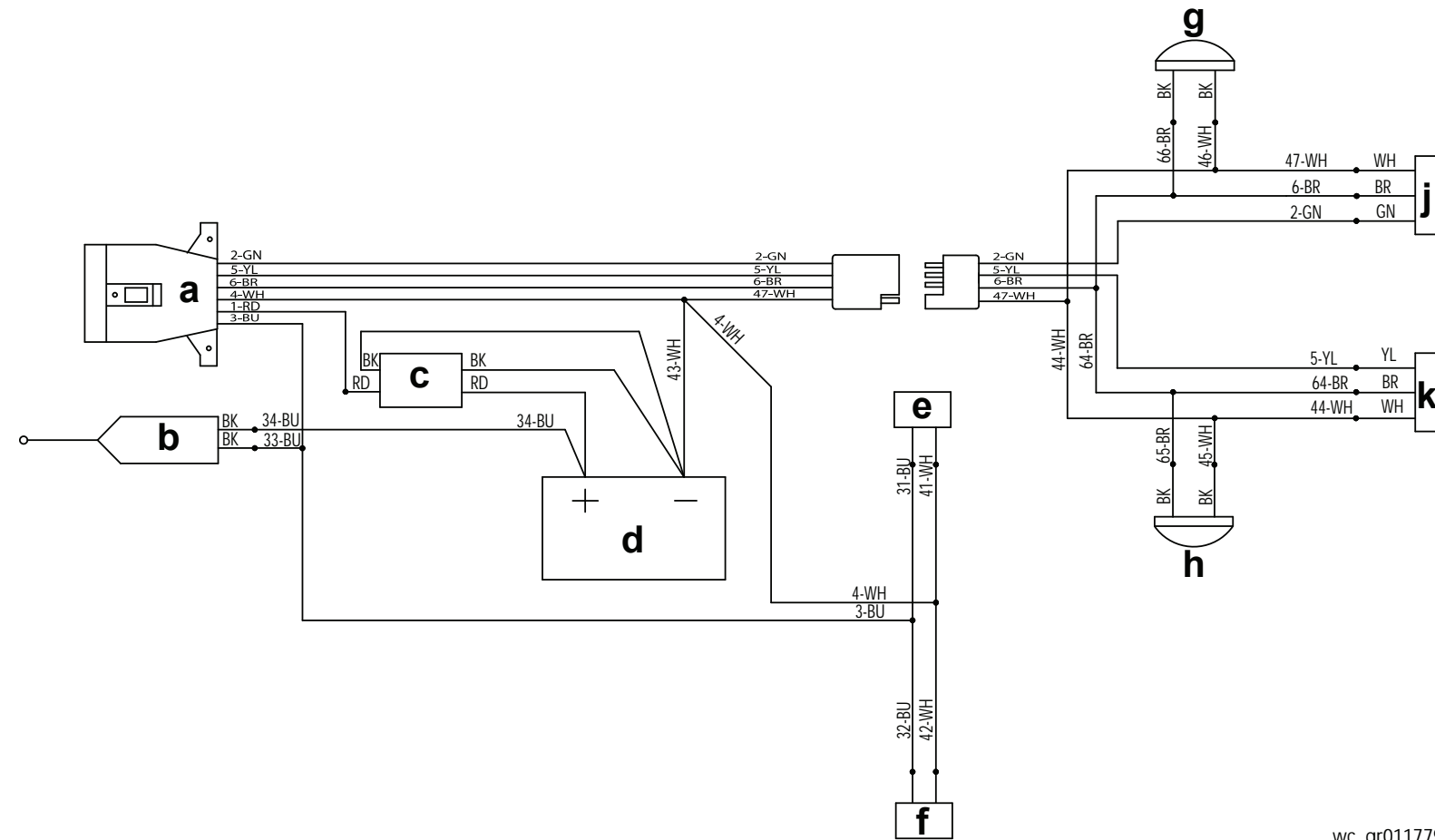
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Engine Wiring Components—T4f

Ref.	Description	Ref.	Description
a	Emergency stop switch	h	Coolant level sensor
b	Control panel ground	i	Fuse, 10 Amp
c	Engine controller	j	Fuse, 2 Amp
d	Main breaker switch (off position)	k	Hour meter
e	Engine ground	m	Terminal block
f	Control box ground	n	Battery
g	Starter motor	—	—

Wire Colors							
BK	Black	RD	Red	YL	Yellow	OR	Orange
GN	Green	TN	Tan	BR	Brown	PU	Purple
BU	Blue	VIO	Violet	CL	Clear	SH	Shield
PK	Pink	WH	White	GY	Gray	LB	Lt. blue

Trailer Wiring (Electric Brakes)



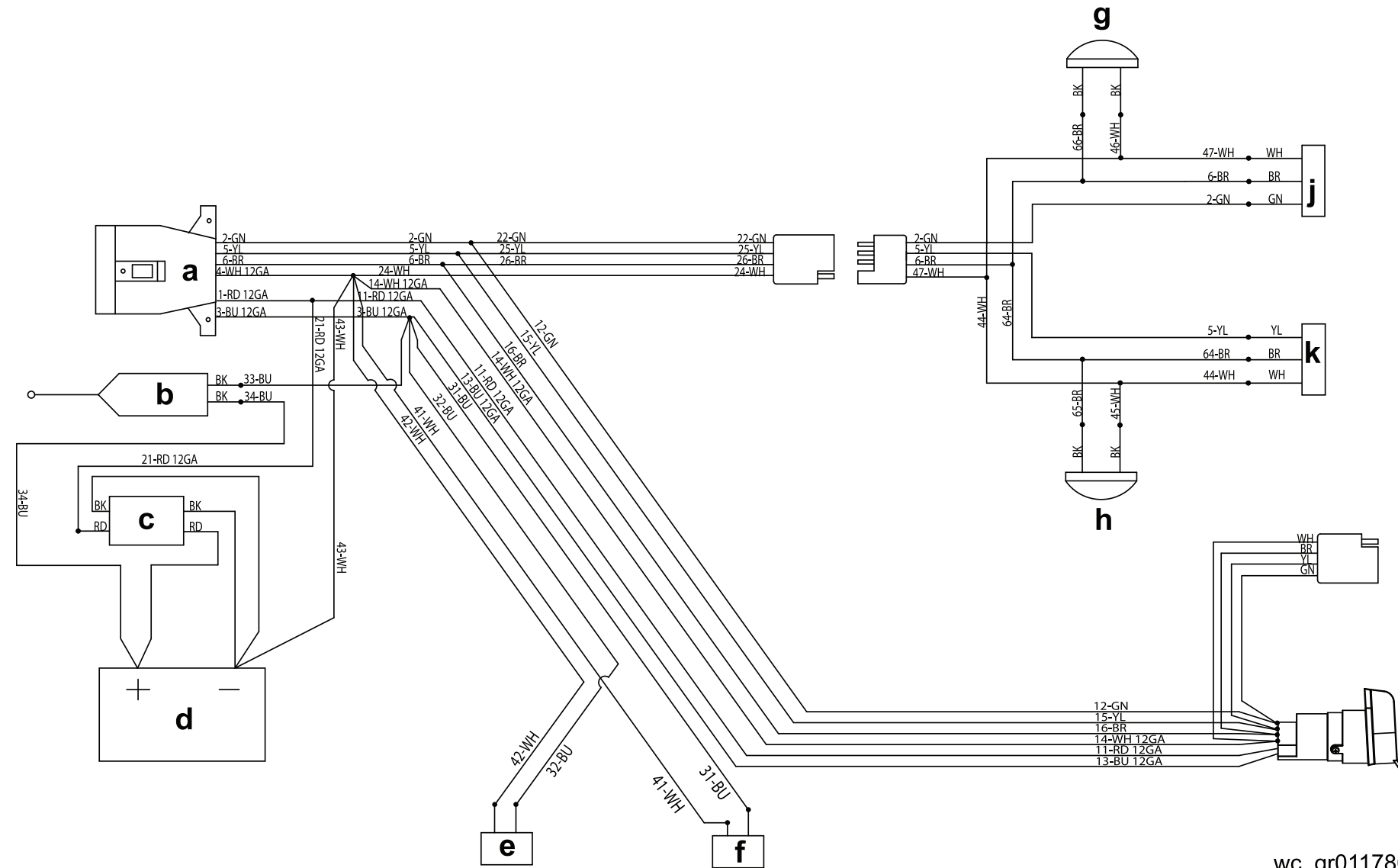
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Trailer Wiring Components (Electric Brakes)

Ref.	Description	Ref.	Description
a	Main trailer plug	f	Left brake
b	Breakaway switch	g	Front right side light
c	Battery charger	h	Front left side light
d	Breakaway battery	j	Rear right tail light
e	Right brake	k	Rear left tail light

Wire Colors							
BK	Black	RD	Red	YL	Yellow	OR	Orange
GN	Green	TN	Tan	BR	Brown	PU	Purple
BU	Blue	VIO	Violet	CL	Clear	SH	Shield
PK	Pink	WH	White	GY	Gray	LB	Lt. blue

Trailer Wiring (Electric Brakes)—Rear Hitch Option

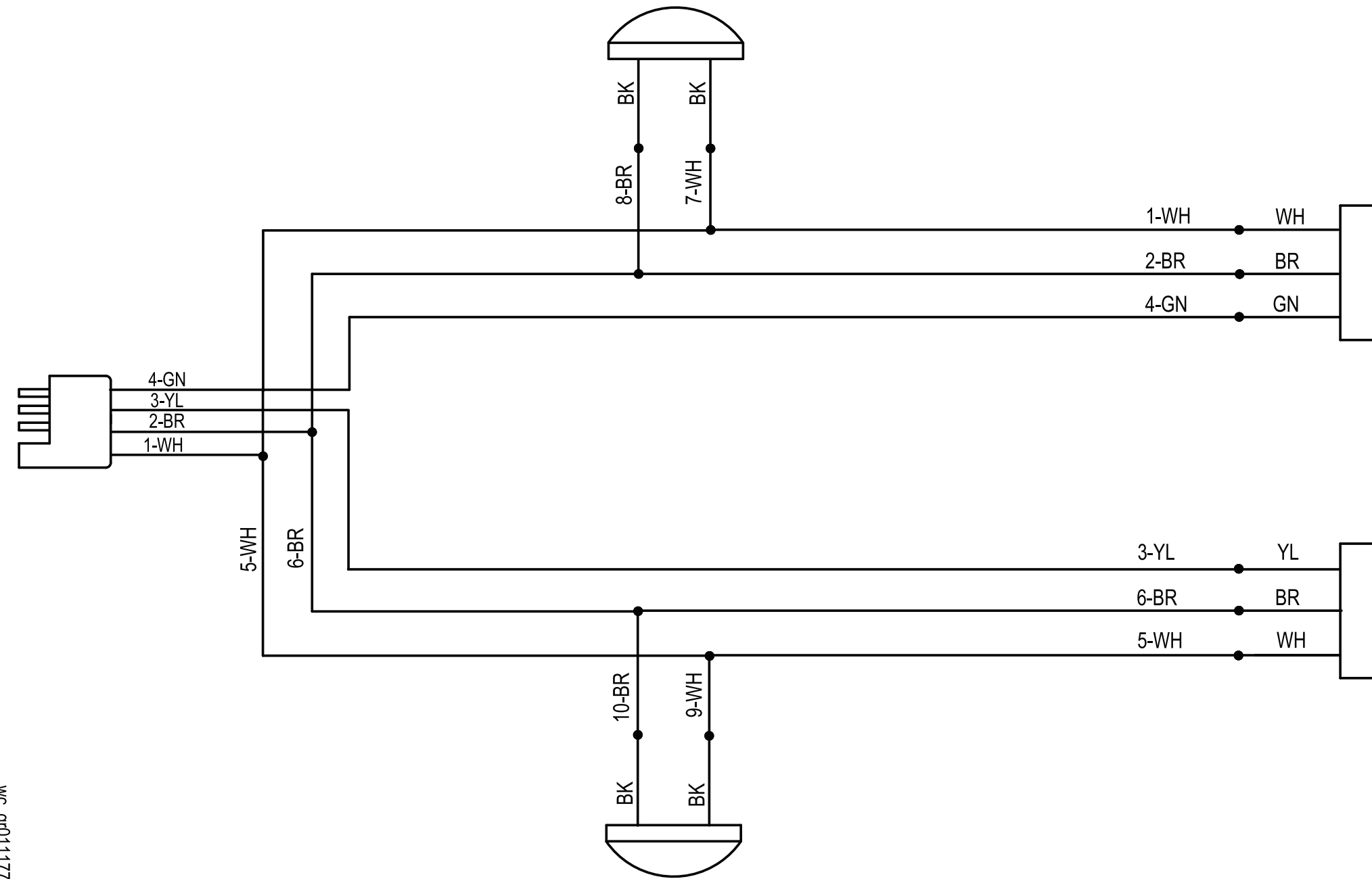


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Trailer Wiring Components (Electric Brakes)

Ref.	Description	Ref.	Description
a	Main trailer plug	f	Left brake
b	Breakaway switch	g	Front right side light
c	Battery charger	h	Front left side light
d	Breakaway battery	j	Rear right tail light
e	Right brake	k	Rear left tail light

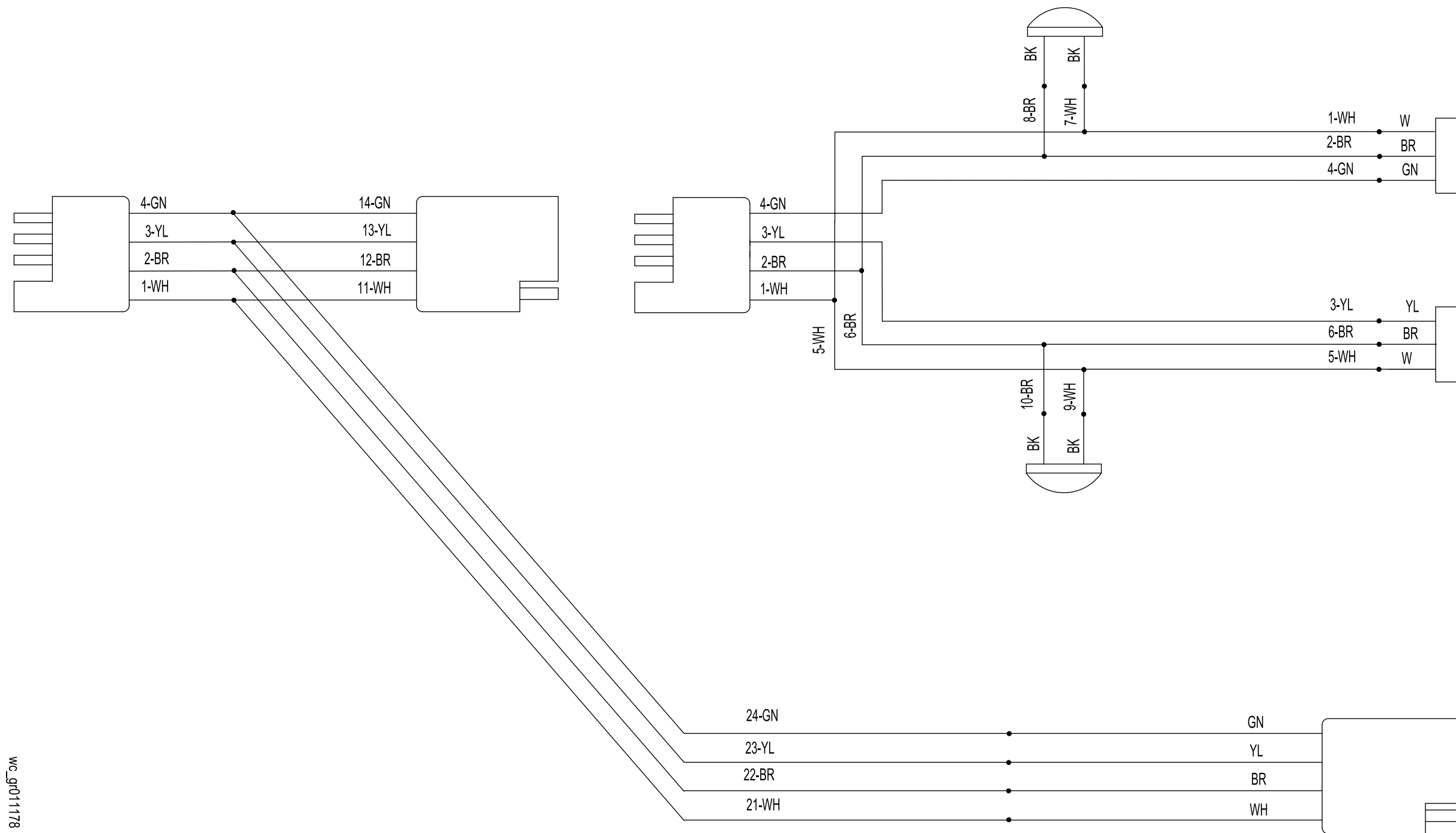
Trailer Wiring (Surge Brakes/No Brakes)



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Wire Colors							
BK	Black	RD	Red	YL	Yellow	OR	Orange
GN	Green	TN	Tan	BR	Brown	PU	Purple
BU	Blue	VIO	Violet	CL	Clear	SH	Shield
PK	Pink	WH	White	GY	Gray	LB	Lt. blue

Trailer Wiring (Surge Brakes/No Brakes)—Rear Hitch Option



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Wire Colors							
BK	Black	RD	Red	YL	Yellow	OR	Orange
GN	Green	TN	Tan	BR	Brown	PU	Purple
BU	Blue	VIO	Violet	CL	Clear	SH	Shield
PK	Pink	WH	White	GY	Gray	LB	Lt. blue

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