Repair Manual

Light Tower

LTN 6
LTN 8

EN

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Manufacturer

Wacker Neuson Production Americas LLC

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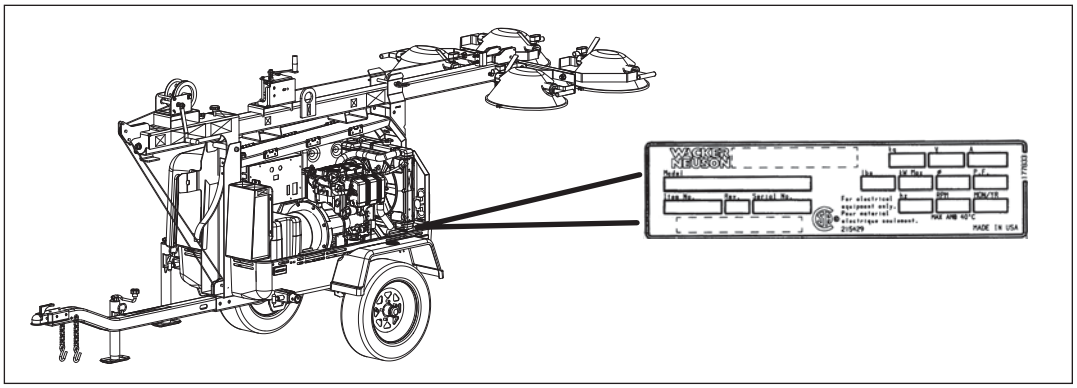
Foreword

SAVE THESE INSTRUCTIONS—This manual contains important instructions for the machine models below. These instructions have been written expressly by Wacker Neuson Production Americas LLC and must be followed during installation, operation, and maintenance of the machines.

Machine	Item Number	Rev
LTN 6C	0620118	100+
	0620298	100+
	0620551	100+
	0620555	100+
	0620728	100+
	0621235	100+
	5200004091	100+
LTN 6K/8K	0620734	100+
	0620893	100+
	0620938	100+
	0620939	100+
	5200004092	100+
	5200004093	100+
	5200004769	100+
LTN 6L	0620117	100+
	0620297	100+
	0620550	100+
	0620553	100+
	0620727	100+
	5200004090	200+
	5200004768	200+



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Machine identification

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

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:

Machine documentation

- From this point forward in this documentation, Wacker Neuson Production Americas LLC will be referred to as Wacker Neuson.
- Keep a copy of the Operator's Manual with the machine at all times.
- Use the separate Parts Book supplied with the machine to order replacement parts.
- If you are missing any of these documents, please contact Wacker Neuson to order a replacement or visit www.wackerneuson.com.
- When ordering parts or requesting service information, be prepared to provide the machine model number, item number, revision number, and serial number.

Expectations for information in this manual

- This manual provides information and procedures to repair the above Wacker Neuson model(s). For your own safety and to reduce the risk of injury, carefully read, understand, and observe all instructions described in this manual.
- Wacker Neuson 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. Wacker Neuson reserves the right to change any portion of this information without notice.

CALIFORNIA Proposition 65 Warning

Combustion exhaust, some of its constituents, and certain vehicle components contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Laws pertaining to spark arresters

NOTICE: 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.

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 Wacker Neuson.
- **Approved modifications** are those performed by an authorized Wacker Neuson service center according to written instructions published by Wacker Neuson.
- **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 Wacker Neuson dealer immediately if you have questions about approved or unapproved parts, attachments, or modifications.

1 Safety Information

1.1 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.

This is the safety alert symbol. It is used to alert you to potential personal hazards.

► Obey all safety messages that follow this symbol.

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: Used without the safety alert symbol, NOTICE indicates a situation which, if not avoided, could result in property damage.

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

1.2 Machine Description and Intended Use

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 lights is mounted to the top of the cabinet. Dual winches tilt, raise, and lower the telescoping tower. As the engine runs, the generator converts mechanical energy into electric power. The metal halide lights run off this power. Receptacle(s) are also present to power auxiliary loads. The operator uses the control panel to operate and monitor the machine.

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. Refer to the product specifications for the output voltage and frequency of this Light Tower, and for the maximum output power limit of this Light Tower.

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

- The following are some examples of misuse:
- Connecting a load that has voltage and frequency requirements that are incompatible with the machine output
- Overloading the machine with a device that draws excessive power during either continuous running or start-up
- Operating the machine in a manner that is inconsistent with all federal, state and local codes and regulations
- Using the machine as a ladder, support, or work surface
- Using the machine to carry or transport passengers or equipment
- Using the machine to tow other machines (unless factory equipped)
- Using the machine as a hoist or hanging items from the tower
- 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

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This machine has been designed and built in accordance with the latest global safety standards. It has been carefully engineered to eliminate hazards as far as practicable and to increase operator safety through protective guards and labeling. However, some risks may remain even after protective measures have been taken. They are called residual risks. On this machine, they may include exposure to:

- Heat, noise, exhaust, and carbon monoxide from the engine
- Heat from the lights
- Ultraviolet radiation from the lights
- Fire hazards from improper refueling techniques
- Fuel and its fumes
- Electric shock and arc flash
- Personal injury from improper lifting the trailer tongue

- Glare from lights (lights may blind drivers of nearby motor vehicles if the lights are incorrectly positioned)
- 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.

1.3 Safety Guidelines for Operating the Machine

Operator training

Before operating the machine:

- Read and understand the operating instructions contained in all manuals delivered with the machine.
- Familiarize yourself with the location and proper use of all controls and safety devices.
- Contact Wacker Neuson for additional training if necessary.

When operating this machine:

- Do not allow improperly trained people to operate the machine. People operating the machine must be familiar with the potential risks and hazards associated with it.

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

Work area

- Make sure the area immediately surrounding the Light Tower is clean, neat, and free of debris.
- The tower extends up to 9 m (30 ft). Make sure the area above the trailer is open and clear of overhead wires and obstructions.

Machine setup

- Make sure the machine is on a firm, level surface and will not tip, roll, slide, or fall while operating.
- Make sure the machine is well-grounded and securely fastened to a good earthen ground per national and local regulations.
- The trailer must be leveled and the outriggers extended before raising the tower. The outriggers must be extended while the tower is up.
- Never connect the machine to other power sources, such as supply mains of power companies.

Machine integrity

- Do not start a machine in need of repair.
- Do not use the machine if the insulation on any electrical cord is cut or worn through.

- Do not operate the lights without the protective lens cover in place or with a lens cover that is cracked or damaged.
- Replace or repair electrical components with components that are identical in rating and performance to the originals.

While operating the machine

- Keep the area behind the trailer clear of people and obstructions while raising and lowering the tower.
- Do not raise the tower or operate the machine in high winds. Lower the tower immediately if high winds or electrical storms are expected in the area.
- Do not raise, lower, or turn the tower while the unit is operating.
- If any part of the tower hangs up, or the winch cable develops slack while raising or lowering the tower, STOP immediately! Contact an authorized Wacker Neuson service representative.
- Do not disengage the tower locking pin while the tower is up.
- Lamps become extremely hot in use! Allow the lamps and fixtures to cool 10–15 minutes before handling.
- Lower the tower when not in use.

1.4 Lamp Safety

Description

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 standards 21 CFR 1040-30.

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 according to the instructions in section *Removing / Replacing Lamps.*
- Alternative lamps that automatically extinguish when the outer envelope is broken or punctured are commercially available.

1.5 Operator Safety while Using Internal Combustion Engines

WARNING
Internal combustion engines present special hazards during operation and fueling. Failure to follow the warnings and safety standards could result in severe injury or death.

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

DANGER
Exhaust gas from the engine contains carbon monoxide, a deadly poison. Exposure to carbon monoxide can kill you in minutes.

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

Operating safety

When running the engine:

- Keep the area around 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.

When running the engine:

- 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.

Refueling safety

When refueling the engine:

- 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).

When refueling the engine:

- Do not smoke.
- Do not refuel a hot or running engine.
- Do not refuel the engine near sparks or open flames.

1.6 Safety Guidelines for Towing the Machine

WARNING
Risk of severe injury or death. Improper trailer condition and towing technique can lead to an accident.

► Obey the trailer manufacturer's instructions and the instructions below to reduce the risk of an accident.

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 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 inch) of tread.
- Do not tow the machine unless the trailer's brakes are functioning properly.
- Do not exceed the trailer manufacturer's speed limitations.

When towing the machine:

- 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.

1.7 Service Safety

WARNING
High voltage! This machine produces high voltage capable of causing serious injury or death.

► Only a qualified electrician should troubleshoot or repair electrical problems occurring with this machine.

Precautions

- To reduce the risk of personal injury, read and understand the service procedures before performing any service to the machine.
- All adjustments and repairs MUST be completed before operation. Do not operate the machine with a known problem or deficiency! All repairs and adjustments should be completed by a qualified technician.
- Do not service the machine if your clothing or skin is wet.

Personal Protective Equipment (PPE)

Wear the following Personal Protective Equipment (PPE) while servicing or maintaining this machine:

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

In addition, before servicing or maintaining the machine:

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

Before servicing the machine

- Turn the engine off before performing maintenance or making repairs.
- Make sure the engine start switch is turned to OFF.
- Make sure the circuit breakers are open (off).
- Make sure the negative terminal on the battery is disconnected.
- Do not perform even routine service (oil / oil filter changes, cleaning, etc.) unless all electrical components are shut down.
- Make sure water has not accumulated around the base of the machine. If water is present, move the machine and allow it to dry before servicing.
- If the machine must be started while servicing, keep hands, feet, and loose clothing away from moving parts on the generator and engine.

Safety devices and modifications

- Replace all safety devices and guards after repair and maintenance.
- Do not modify the machine without the express written approval of the manufacturer.

Replacing parts and labels

- Replace worn or damaged components.
- Use only spare parts recommended by Wacker Neuson.
- Replace all missing and hard-to-read labels.
- Check all external fasteners at regular intervals.

Lifting and transporting

When lifting the machine:

- Make sure slings, chains, hooks, ramps, jacks and other types of lifting devices are attached securely and have enough weight-bearing capacity to lift or hold the machine safely.
- Remain aware of the location of other people when lifting the machine.

To reduce the possibility of injury:

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

2 Operation

2.1 Starting

Requirements

- Fully charged battery
- Fuel in fuel tank
- Circuit breakers in the OFF position

Procedure

Perform the procedure below to start the machine.

NOTICE: Do not use starting fluids to aid in the starting of the engine.

1. Check the condition of the winch cable. Do not start the machine if it is damaged.
2. Check the condition of the electric cable to the lights on the tower. Do not start the machine if it is damaged.
3. Set the individual circuit breakers to the OFF position—starting the engine under load will damage the machine.
4. Turn the key to the heat/glow plug position until the engine is sufficiently preheated. Then, turn the key to the crank position until the engine starts, and release the key.

NOTICE: Do not hold the key in the crank position for more than 10 seconds. This could cause the starter motor to overheat. If the engine doesn't start within 10 seconds, release the key and wait 30 seconds before attempting to start the engine again.

5. Allow the machine to warm up before operating the lights.

2.2 Stopping

Requirements

- Lights turned off
- All loads removed from power outlets

Procedure

Perform the procedure below to stop the machine.

1. Remove any load connected to the power outlets.
2. Set the individual circuit breakers to the OFF position—stopping the engine under load will damage the machine.
3. Turn the key to the OFF position.

2.3 Raising the Tower (Manual Winch System)

Background

The Light Tower includes two separate winches: the tilting winch for lifting the tower to the vertical position; and the telescoping winch 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

- Engine is stopped
- Light Tower is located on a firm, flat surface clear of overhead wires and obstructions
- Winch cables are in serviceable condition and resting properly in pulleys
- Light tower has been leveled, with all outriggers extended and locked

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 hazards. Certain actions may cause the tower to fall or the Light Tower to tip over.

► Do not extend the tower beyond the red marking on the tower shaft.

► 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.

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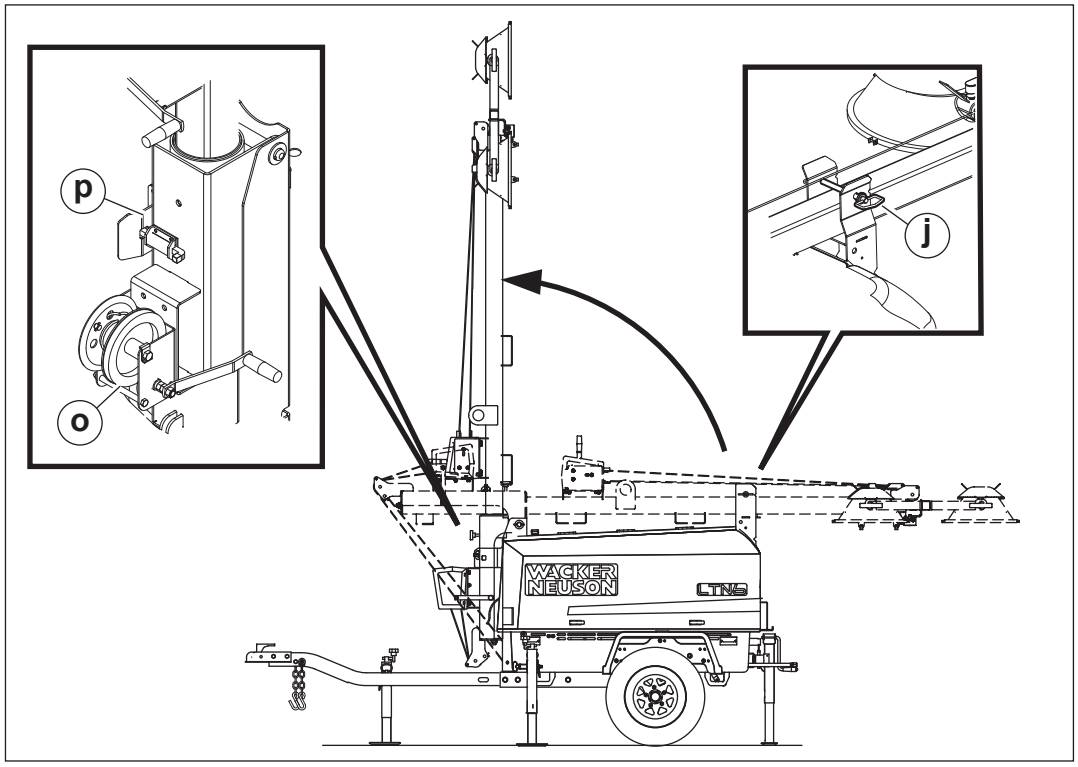
Reference graphic



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Procedure

Perform the procedure below to raise the tower.

Tilting the tower

1. Remove the cradle locking pin **(j)** from the cradle.
2. Check the operation of the tilt winch **(o)** by rotating the 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 its handle is rotated clockwise.

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

3. Continue to rotate the winch handle and tilt the tower to the vertical position until the vertical tower locking pin **(p)** locks the tower in place. Be certain the vertical tower locking pin is fully engaged in the locking position before raising the tower.

This procedure continues on the next page.

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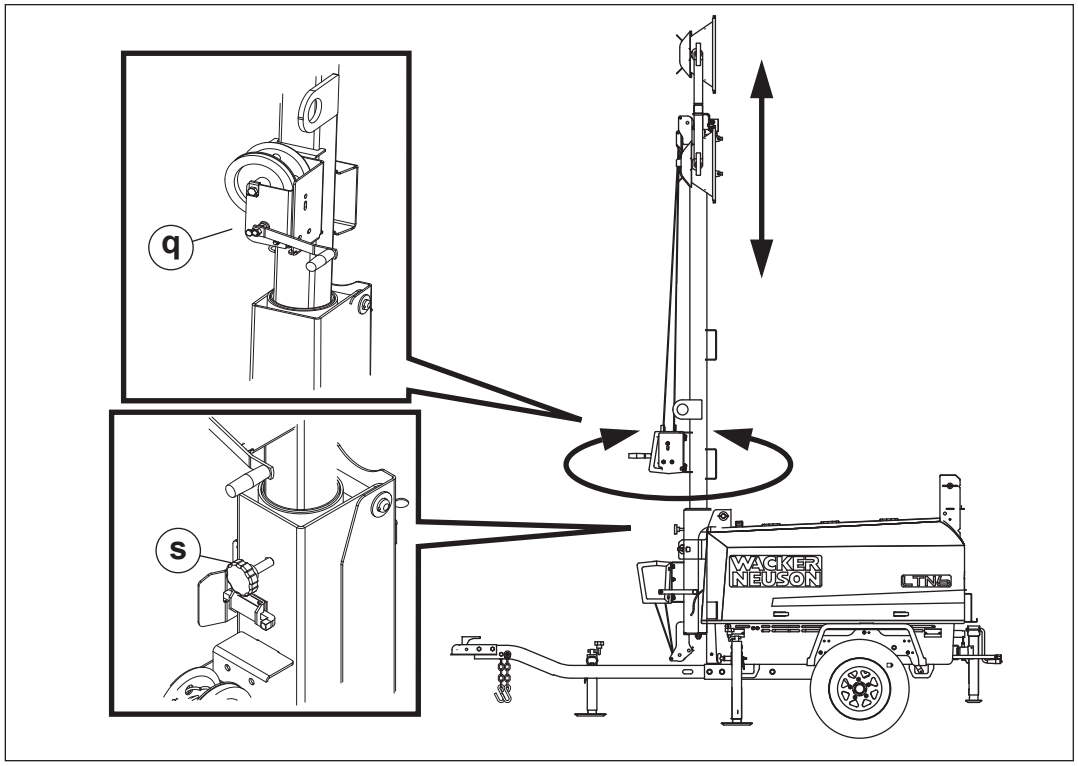
Raising the tower

4. After the tower is vertical, check the operation of the telescoping winch **(q)** by rotating the 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 its handle is rotated clockwise.

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

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



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Rotating the tower

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

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

2.4 Lowering the Tower (Manual Winch System)

Requirements

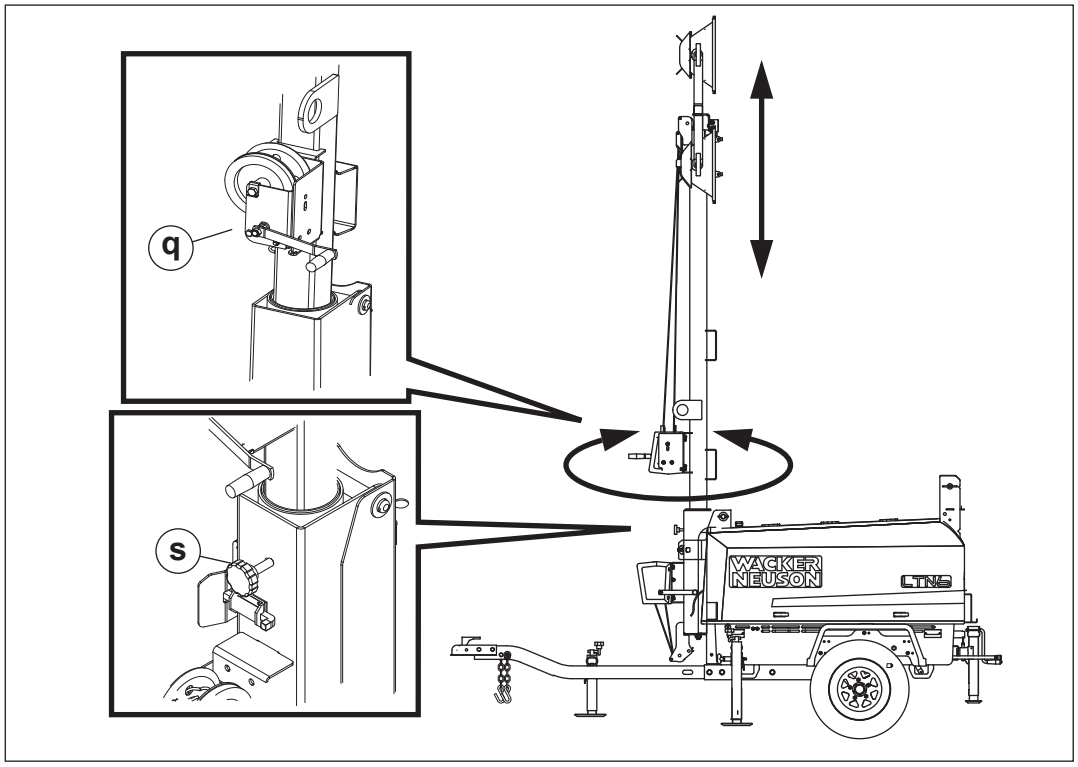
- Lights are turned off
- Engine is stopped
- Outriggers are extended and locked in place

WARNING

Tipping/falling hazards. Certain actions may cause the tower to fall or the machine to tip over.

- ► Do not extend the tower beyond the red marking on the tower shaft.
- ► 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.

Reference graphic



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Procedure

Follow the procedure below to lower the tower.

4. Loosen the rotation locking knob **(s)** and rotate the tower so the lights face the rear of the trailer and the winches are facing toward the trailer tongue.

This procedure continues on the next page.

Continued from the previous page.

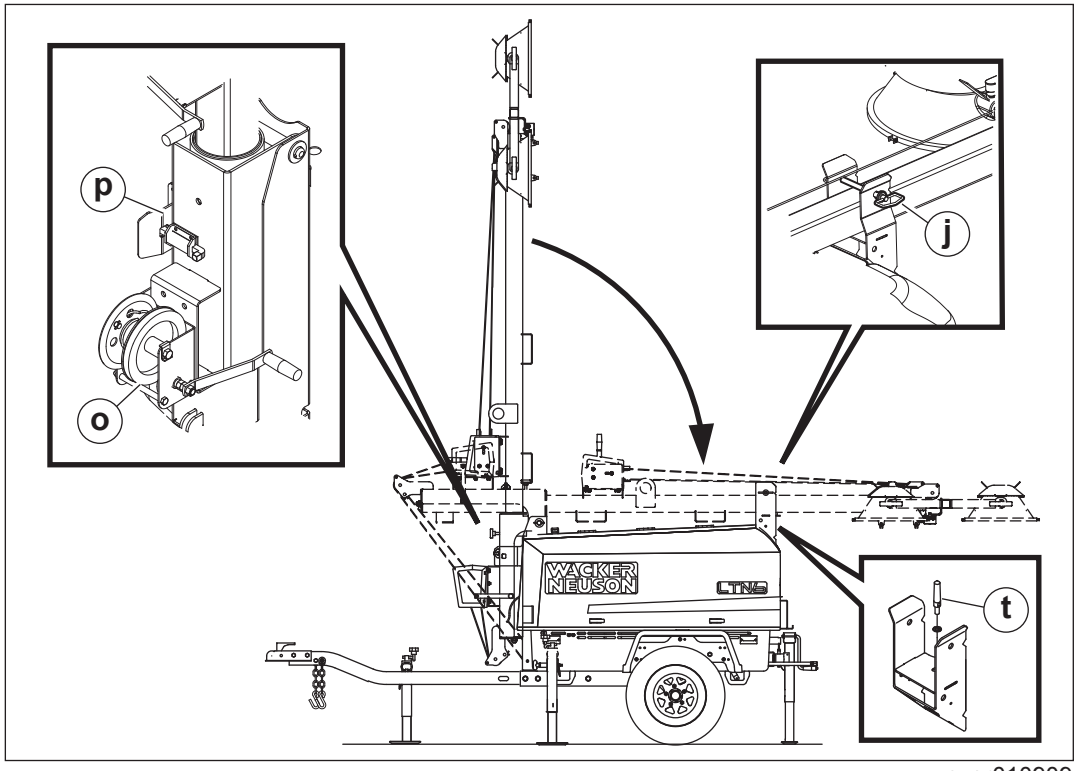
WARNING
Personal injury hazard. Bystanders can be struck by the tower as it is being raised or lowered.

► Do not allow anyone to stand near the rear of the machine while raising or lowering the tower.

5. Turn the handle on the telescoping winch **(q)** counterclockwise (“cable out” direction) until the tower is lowered completely.
6. Pull and hold the tower locking pin **(p)**; rotate the handle on the tilt winch **(o)** counterclockwise (“cable out” direction) until the tower spring begins to pivot the tower down.

Note: *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.*

7. 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 **(t)** penetrates all sections of the tower.



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8. After the tower is down, secure it in the cradle by inserting the cradle lock pin **(j)**. Insert the clip through the pin to lock it in place.
9. Position the light fixtures to aim at the ground.

2.5 Raising the Tower (Power Winch System)

Background The Light Tower includes two separate winches: the tilting winch for lifting the tower to the vertical position; and the telescoping winch for raising the tower.

Requirements

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

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 hazards. Certain actions may cause the tower to fall or the Light Tower to tip over.

► Do not extend the tower beyond the red marking on the tower shaft.

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

► 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.

► Do not allow anyone to stand near the rear of the machine while raising the tower.

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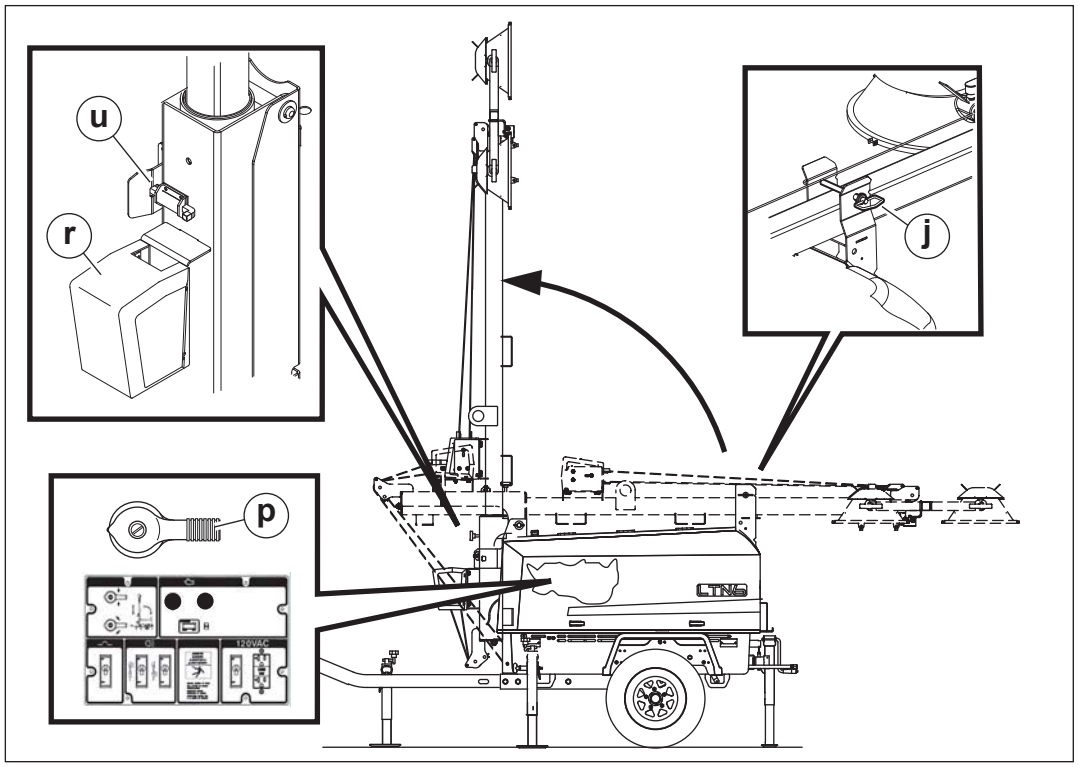
Reference graphic



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Procedure

Perform the procedure below to raise the tower.

Tilting the tower

1. Remove the cradle locking pin **(j)** from the cradle.
2. Check the operation of the tilt winch **(r).** Turn the tilt rotary switch **(p)** on the control panel to the up position. The tower should begin to tilt.

NOTICE: Do not attempt to lift or raise the tower if the winch is damaged or not operating properly, or if the winch cables are worn or damaged. Continuous running of the winch in excess of four minutes will damage the winch motor.

3. Hold the tilt rotary switch in the up position and raise the tower to the vertical position until the vertical tower locking pin **(u)** locks the tower in place. Be certain the vertical tower locking pin is fully engaged in the locking position before raising the tower.

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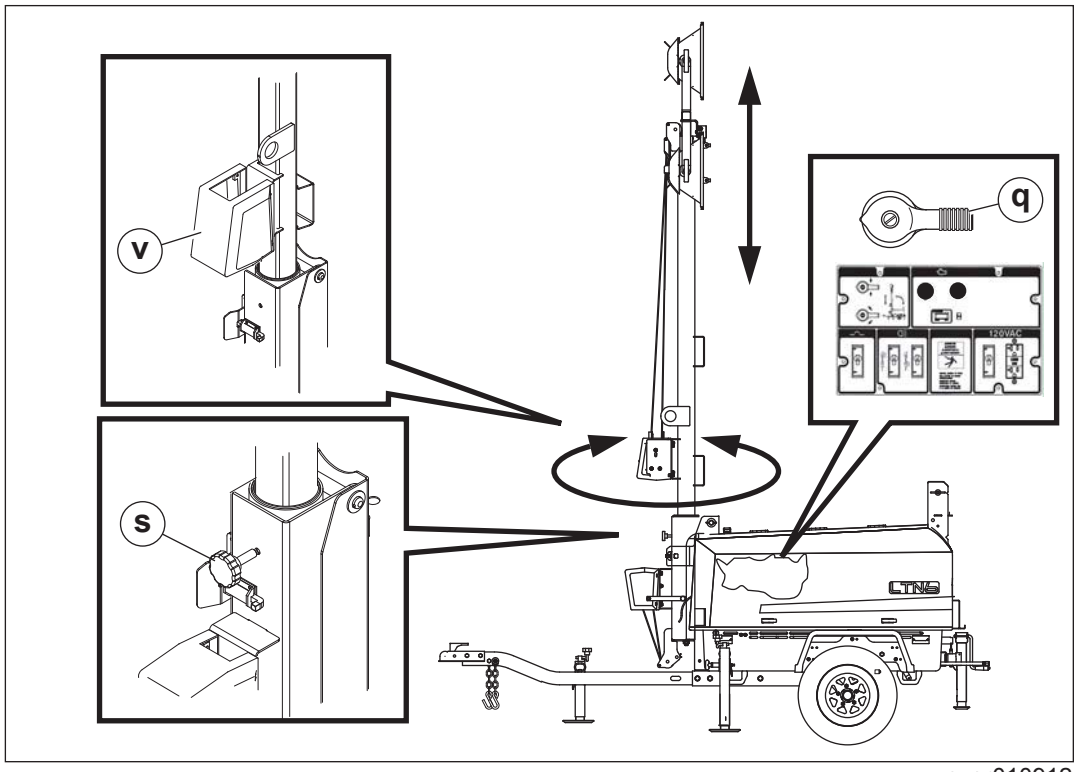
Raising the tower

4. After the tower is vertical, check the operation of the telescoping winch **(v)**. Turn the telescope rotary switch **(q)** on the control panel to the up position.



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5. 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.

Rotating the tower

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

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

2.6 Lowering the Tower (Power Winch System)

Requirements

- Lights are turned off
- Engine is stopped
- Outriggers are extended and locked in place

WARNING
Tipping/falling hazards. Certain actions may cause the tower to fall or the machine to tip over.

► Do not extend the tower beyond the red marking on the tower shaft.

► Do not pull the vertical tower locking pin while the tower is raised.

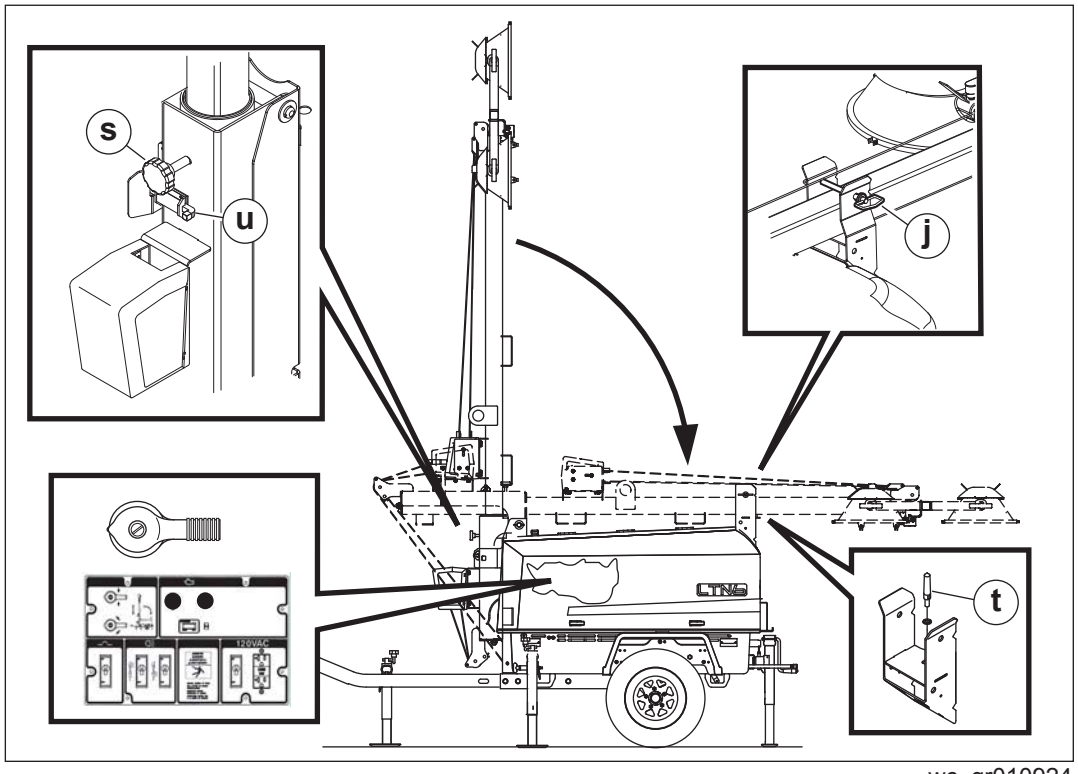
Procedure

Perform the procedure below to lower the tower.

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.

1. Loosen the rotation locking knob **(s)** and rotate the tower so that the lights face the rear of the trailer and the winches face toward the trailer tongue.



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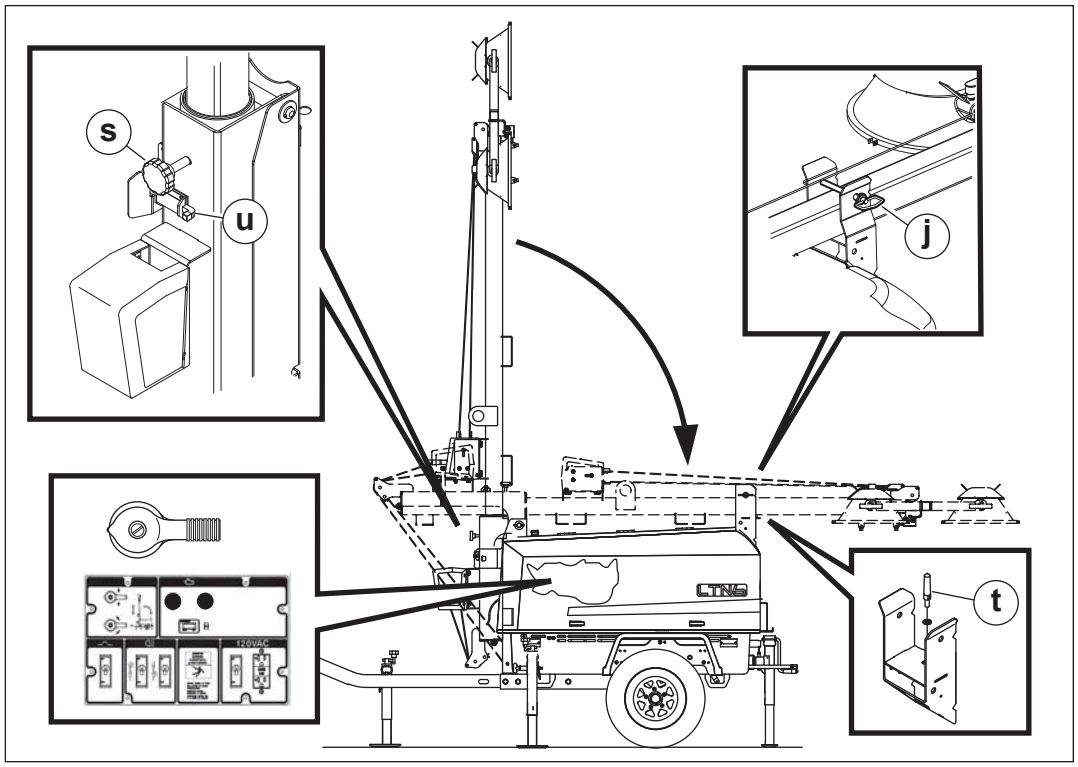
2. Hold the rotary switch in the down position (“cable out” direction) until the tower is completely lowered.
3. Pull and hold the tower locking pin **(u)**: hold the tilt-winch rotary switch in the down position until the tower spring begins to pivot the tower down. Release the tower locking pin. Continue to hold the tilt-winch rotary switch in the down position until the tower is resting in the transport cradle. Make sure that the secondary locking pin **(t)** penetrates all sections of the tower.



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4. After the tower is down, secure it in the cradle by inserting the cradle locking pin **(j)**. Insert the clip through the cradle locking pin.
5. Position the light fixtures to aim at the ground.

3 Troubleshooting Engine Starting (no crank, no start)

3.1 Preparing for Diagnostic Procedures

Tools required

All procedures can be accomplished with the following tools:

- Multimeter (volt/ohm meter)
- General hand tools (ratchet set, screwdrivers, etc.)

Before contacting Wacker Neuson

Complete the following information before contacting Wacker Neuson Service:

1. Perform the diagnostic procedures in this packet.
2. Fill in the information where requested or place a check mark next to the result that applies on the following pages and below.
3. Technician name:_____
4. Company name:_____
5. Phone:_____
6. Machine serial number:_____Hour meter:_____
7. List the issue(s) you are having:

   _____

   _____

   _____

   _____

   _____

8. Contact Wacker Neuson Service via fax or phone with the information gathered.

3.2 Troubleshooting Sequence

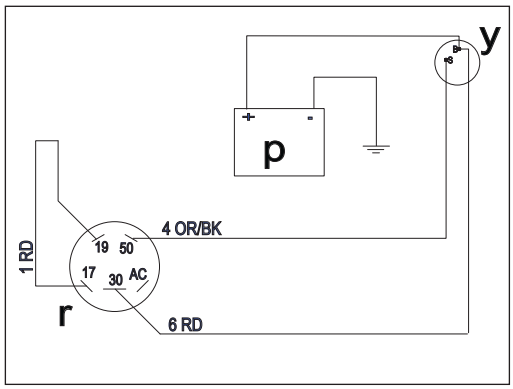
Background

On Light Towers with the CAT engine, current to the starter solenoid **(y)** is fed from the battery **(p)**, through the key switch **(r)** to the starter solenoid.

When troubleshooting a no-crank, no-start condition, do so in the sequence listed below.

Task	See topic	No.
1. Check the battery and ground wiring.	*Checking the Battery and Ground Wiring*	3.3
2. Check power to the starter solenoid.	*Checking the Key Switch and Power to the Starter Solenoid*	3.4

Reference graphic



wc_gr011312

3.3 Checking the Battery and Ground Wiring

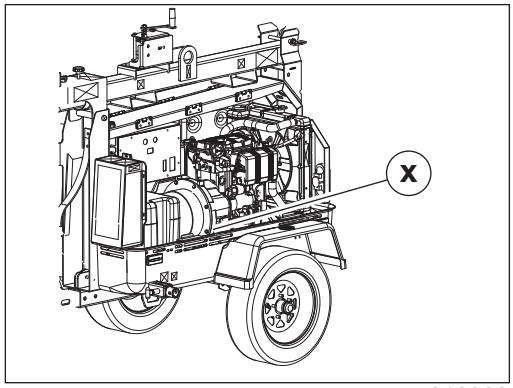
Requirements

- Multimeter

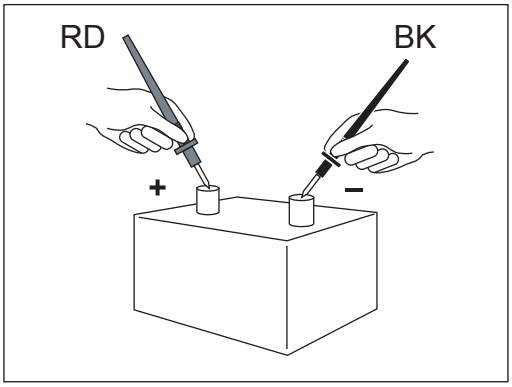
Procedure

Perform the procedure below to check the battery and ground wiring.

1. If applicable, check that the emergency stop button is in the out (deactivated position).
2. Open the side panel and locate the battery **(x)**.



wc_gr010920



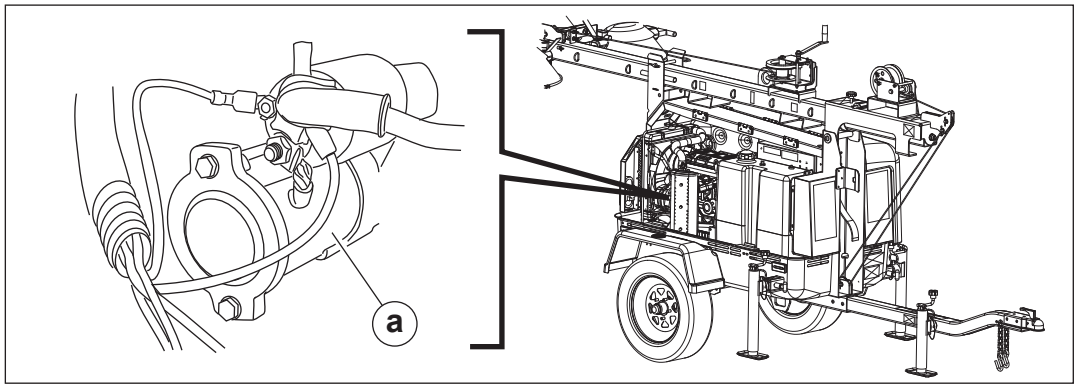
wc_gr006879

3. Measure the DC voltage across the battery posts.

Is at least 12 VDC measured?

Yes ____	No ____
Continue.	Replace or recharge the battery.

4. Locate the starter **(a)**.



wc_gr010921

5. Measure the DC voltage between the starter's positive terminal and the battery's negative terminal.

This procedure continues on the next page.

Continued from the previous page.

Is at least 12 VDC measured?

Yes ____	No ____
Continue.	Check the connections of the large red wire between the battery and the starter. Repair the wire as necessary.

6. Measure the DC voltage between the starter positive terminal and engine ground.

Is at least 12 VDC measured?

Yes ____	No ____
Continue.	Check the connections of the ground wires between the battery and the machine frame. Repair the wires as necessary.

7. Hold the key to the START position and measure the DC voltage between the starter positive terminal and engine ground while the starter attempts to crank the engine.

Is at least 10.5 VDC measured?

Yes ____	No ____
The battery is OK. Problems are within the engine. See the engine manufacturer's information.	Replace or recharge the battery.

Result

The battery and ground wiring have now been checked.

If the problem has not been resolved, continue with the next topic.

3.4 Checking the Key Switch and Power to the Starter Solenoid

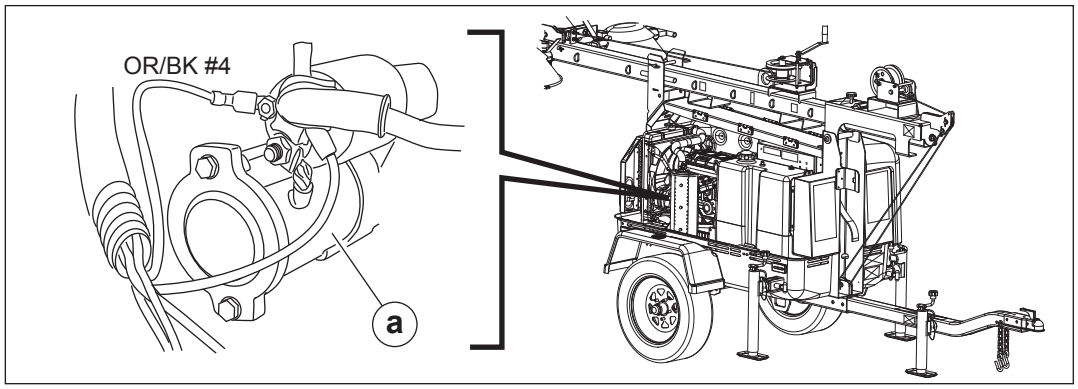
Requirements

- Multimeter
- Fully charged battery

Procedure

Perform the procedure below to check power to the starter solenoid.

1. Locate the starter **(a)**.



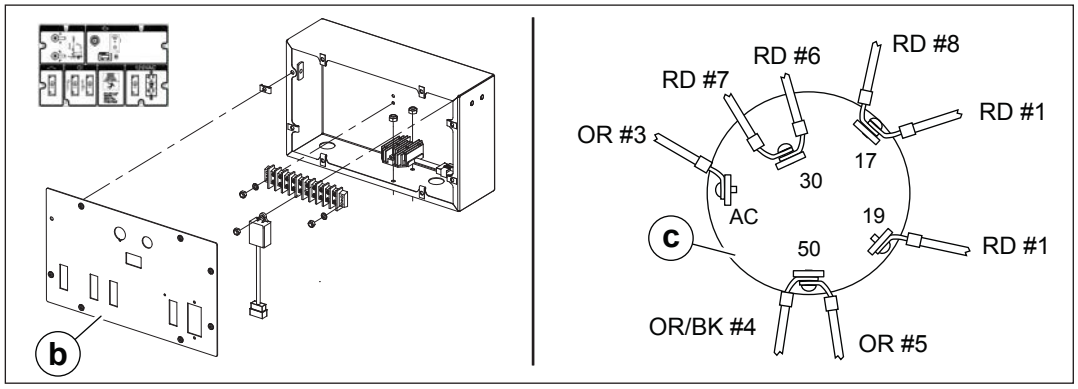
wc_gr010918

2. Check that the OR/BK #4 wire is connected to the starter solenoid. If it is disconnected, reconnect it and retry starting the engine. Otherwise, continue.
3. Turn the key to the ON position. While the key is in the ON position, measure the DC voltage between the OR/BK #4 wire and ground.

Is at least 12 VDC measured?

Yes ____	No ____
The starter solenoid is receiving power. Problems with the engine not cranking are within the engine. See the engine manufacturer's information.	The starter solenoid is not receiving power. Continue.

4. Remove the control panel **(b)**.



wc_gr010919

5. Locate the key switch **(c)**.

This procedure continues on the next page.

Continued from the previous page.

6. Check the connections of all the wires connected to the key switch. Tighten any loose connections.
7. Measure the DC voltage between RD wire #6 (terminal 30) and ground.

Is at least 10.5 VDC measured?

Yes ____	No ____
Continue.	Replace or repair RD wire #6.

8. Turn the key to the START position and measure the DC voltage between terminal 50 and ground.

Is at least 10.5 VDC measured?

Yes ____	No ____
Continue.	The key switch has failed. Replace it.

9. Check the condition and continuity of OR/BK #4. Repair or replace it as necessary.

Result Power to the starter solenoid has now been checked.

4 Troubleshooting Engine Starting (crank, no start)

4.1 Troubleshooting Sequence

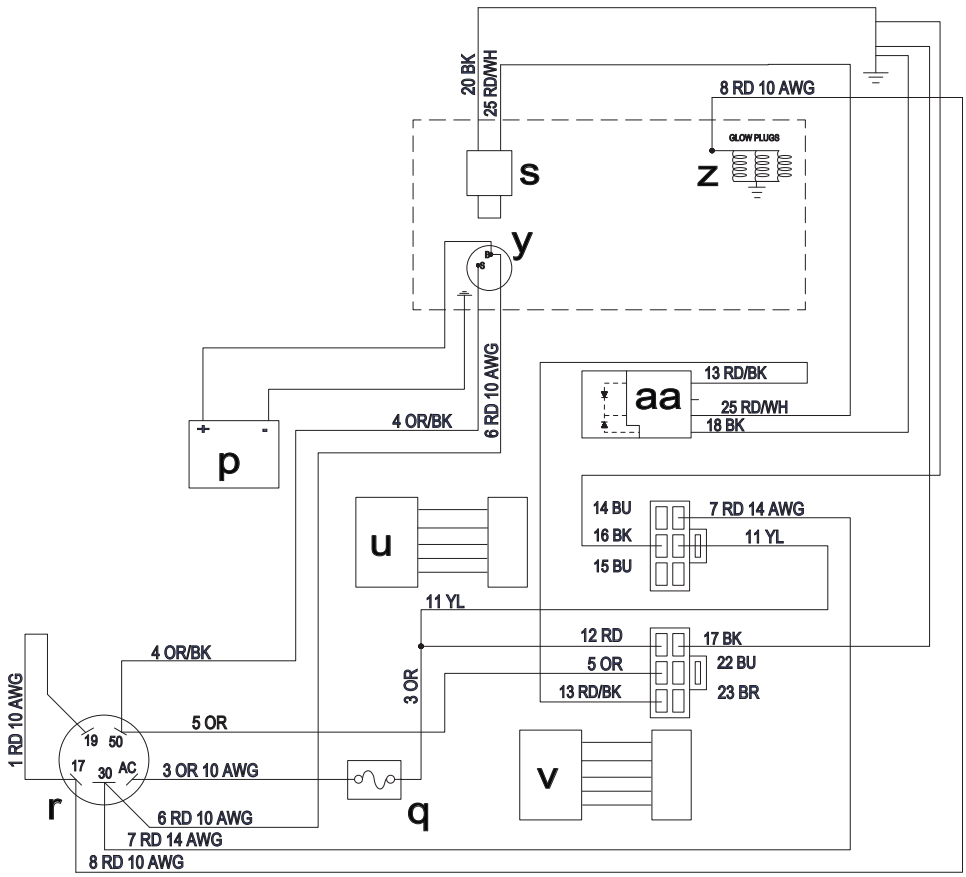
Background

On Light Towers with CAT engines, current to the fuel solenoid **(s)** is fed from the battery **(p)** through the key switch **(r)** to the 15A fuse **(q)**, to the shut-down relay **(v)**, to the checking diode **(aa)**, and finally to the fuel solenoid.

When troubleshooting a crank-no-start condition, do so in the sequence listed below.

Task	See topic	No.
1. Check fuel in tank.	—	—
2. Check the key switch.	*Checking the Key Switch*	4.2
3. Check the 15A fuse.	*Checking the 15A Fuse*	4.3
4. Check the shut-down relay.	*Checking the Shut-down Relay*	4.4
5. Check the diode.	*Checking the Diode*	4.5
6. Check the power to the fuel solenoid.	*Checking Power to Fuel Solenoid*	4.6
7. Check the power to the glow plugs.	*Checking Power to the Glow Plugs*	4.7
8. Check the glow plugs.	*Checking a Glow Plug*	4.8

Reference graphic



wc_gr011310

4.2 Checking the Key Switch

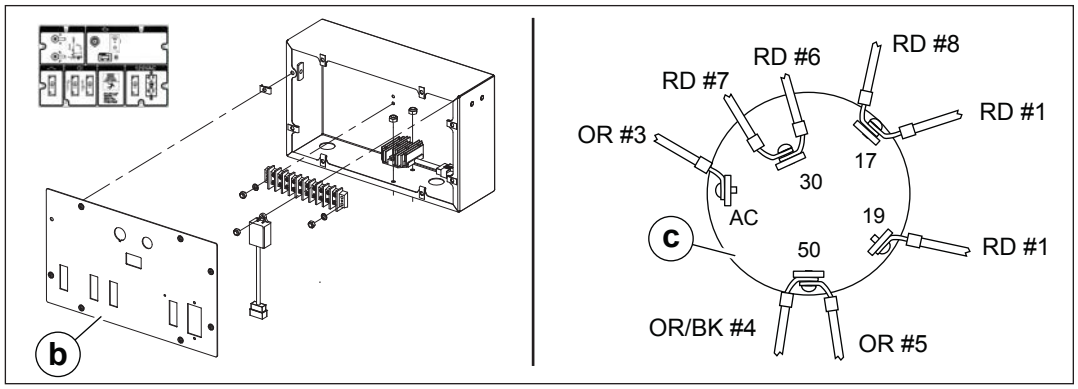
Requirements

- Multimeter
- Fully charged battery
- Fuel in fuel tank

Procedure

Perform the procedure below to check power to the starter solenoid.

1. Remove the control panel **(b)**.



wc_gr010919

2. Locate the key switch **(c)**.
3. Check the connections of all the wires connected to the key switch. Tighten any loose connections.
4. Turn the key to the ON position and measure the DC voltage between OR wire #3 (terminal AC) and ground.

Is at least 10.5 VDC measured?

Yes ____	No ____
Continue.	The key switch has failed. Replace it.

5. Turn the key to the HEAT position and measure the DC voltage between RD wire #8 (terminal 17) and ground.

Is at least 10.5 VDC measured?

Yes ____	No ____
The key switch is functioning.	The key switch has failed. Replace it.

Result

The key switch has now been checked. If the problem has not been resolved, continue with the next topic.

4.3 Checking the 15A Fuse

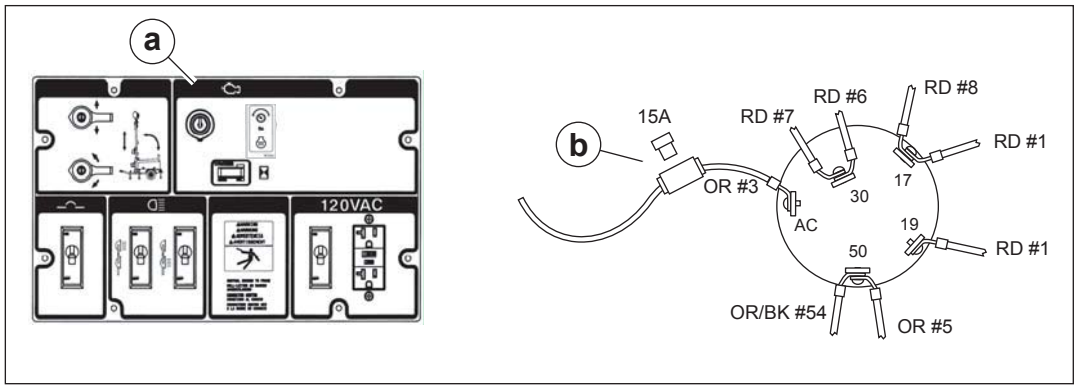
Requirements

- Multimeter
- Functioning key switch

Procedure

Perform the procedure below to the 15A fuse.

1. Remove the control panel **(a)** and locate the 15A fuse **(b)**.



wc_gr010922

2. Check the condition of the 15A fuse **(b)**. Replace it if it is blown.

Result

The 15A fuse has now been checked. If the problem has not been resolved, continue with the next topic.

4.4 Checking the Shut-down Relay

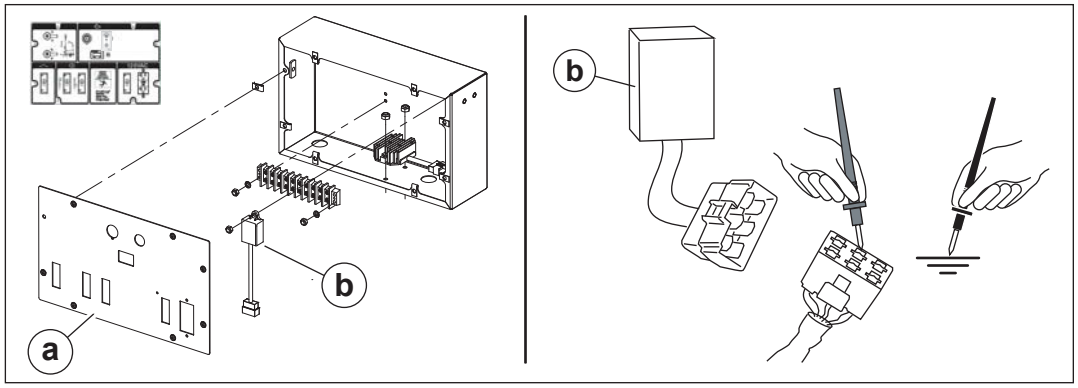
Requirements

- Fully charged battery
- Functioning key switch
- Functioning 15A fuse
- Multimeter

Procedure

Perform the procedure below to check the shut-down relay.

1. Open the control panel **(a)** and locate the shut-down relay **(b)**.



wc_gr010925

2. Disconnect the shut-down relay.
3. Turn the key to the ON position and measure the DC voltage between the RD #12 wire of the connector and ground.

Is at least 10.5V measured?

Yes ____	No ____
Continue.	Power is not reaching the shut-down relay. Repair or replace the RD #12 wire.

4. Turn and hold the key to the START position and measure the DC voltage between the OR #3 wire of the connector and ground.

Is at least 10.5V measured?

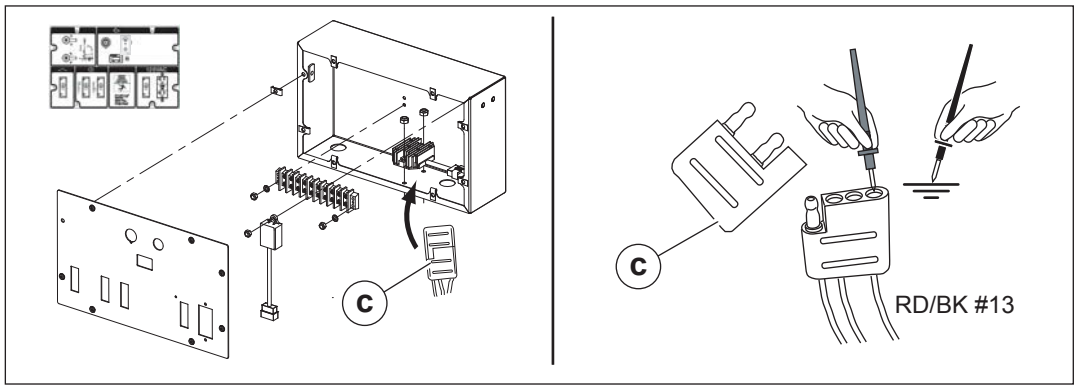
Yes ____	No ____
Continue.	Power is not reaching the shut-down relay. Repair or replace the OR #3 wire.

5. Reconnect the connector to the shut-down relay.

This procedure continues on the next page.

Continued from the previous page.

6. Locate the diode **(c)** and disconnect it.



wc_gr010927

7. Turn the key to the ON position and measure the DC voltage between the RD/BK #13 wire and ground.

Is at least 10.5V measured?

Yes ____	No ____
The shut-down relay is OK.	Check the condition of the RD/BK #13 wire. If it is OK, then the shut-down relay has failed. Replace the shut-down relay.

Result

The shut-down relay has now been checked. If the problem has not been resolved, continue with the next topic.

4.5 Checking the Diode

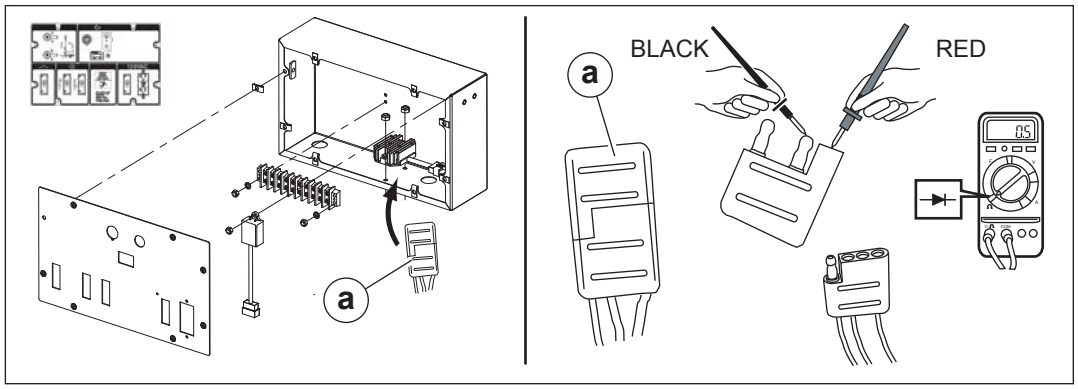
Requirements

- Functioning shut-down relay
- Multimeter with diode test setting

Procedure

Perform the procedure below to check the diode.

1. Open the control panel and locate the diode **(a)**.



wc_gr010929

2. Disconnect the diode.
3. Using the diode scale on your multimeter, check the function of the diode. A functioning diode will show approximately 0.5 VDC in one direction, and no voltage in the other.

Does the diode function?

Yes ____	No ____
The diode is OK.	The diode has failed. Replace it.

Result

The diode has now been checked. If the problem has not been resolved, continue with the next topic.

4.6 Checking Power to the Fuel Solenoid

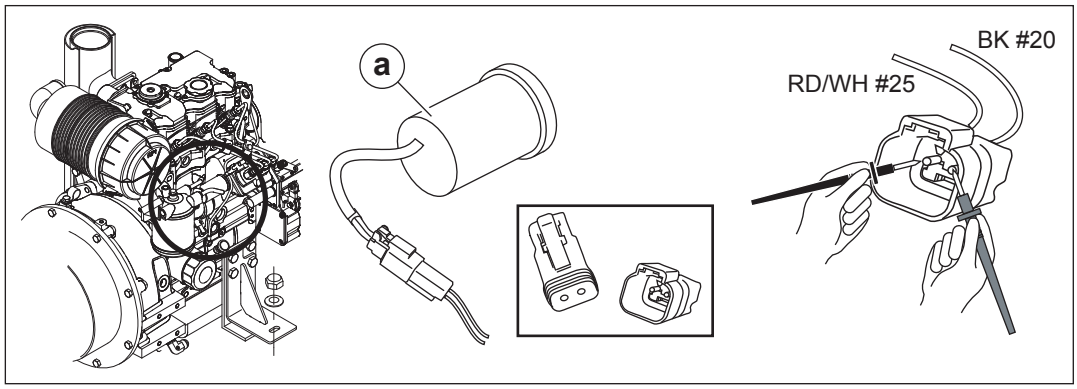
Requirements

- Functioning diode
- Multimeter

Procedure

Perform the procedure below to check the fuel solenoid.

1. Locate the fuel solenoid and disconnect it **(a)**.



wc_gr010930

2. Turn the key to the START position and measure the DC voltage between the two pins of the connector.

Is at least 10.5V measured?

Yes ____	No ____
The fuel solenoid is receiving power. The problem is within the engine. See the engine manufacturer's information.	Check the condition and continuity of the RD/WH #25 wire. Also check the condition and continuity of the BK #19 wire to ground. Repair or replace the wiring as needed.

Result

The fuel solenoid has now been checked. If the problem has not been resolved, continue with the next topic.

4.7 Checking Power to the Glow Plugs

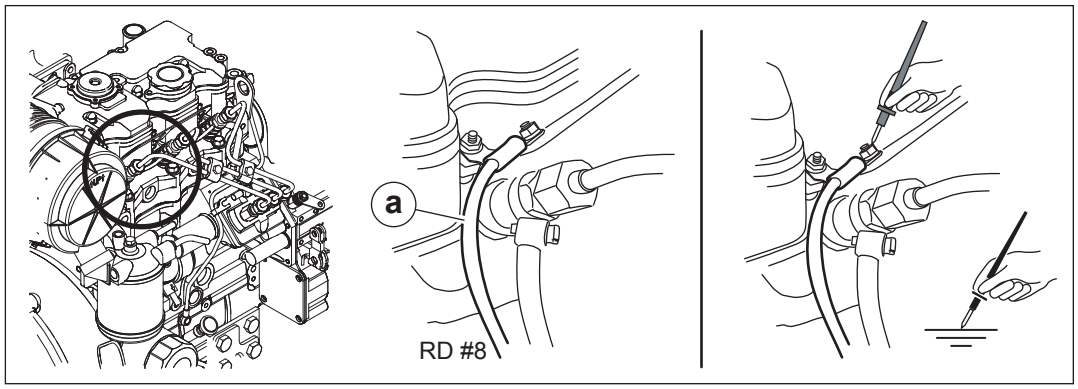
Requirements

- Functioning diode
- Multimeter

Procedure

Perform the procedure below to check power to the glow plugs.

1. Locate the RD #8 wire **(a)** connected to the glow plugs.



wc_gr010931

2. Turn the key to the HEAT position and measure the DC voltage between RD #8 wire and ground.

Is at least 10.0V measured?

Yes ____	No ____
The glow plugs are receiving power.	The glow plug is not receiving power. Check the condition and continuity of the RD #8 wire. Repair or replace the wiring as needed.

Result

Power to the glow plugs has now been checked.

4.8 Checking a Glow Plug

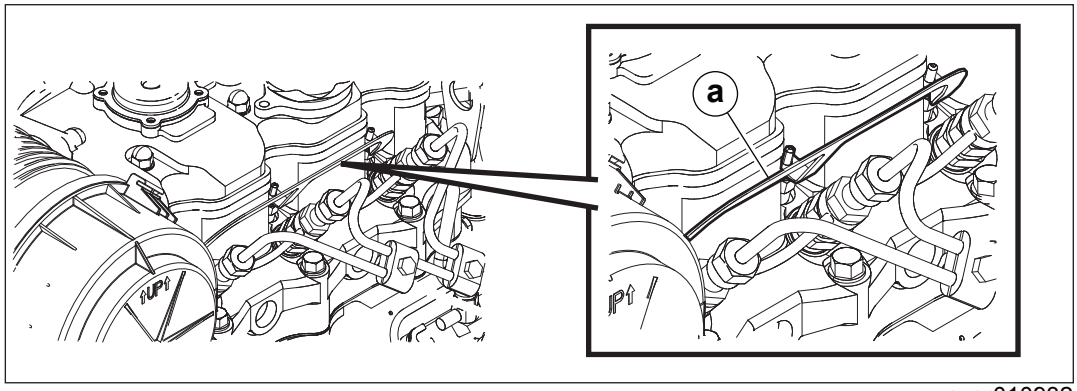
Requirements

- Multimeter
- Engine cool

Procedure Perform the procedure below to check the function of the glow plugs.

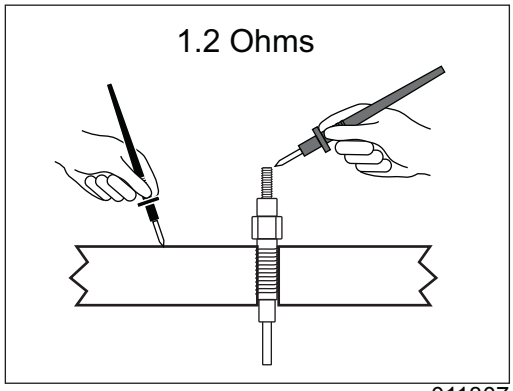
WARNING
Burn hazard. Glow plugs become extremely hot when the engine is running.
► Do not remove the glow plugs when conducting this test.

1. Locate the glow plugs.



wc_gr010932

2. Disconnect the bar **(a)** that connects the glow pugs.
3. Measure the resistance between the end of a glow plug and engine ground. Measure all glow plugs.



wc_gr011307

Is approximately 1.2 ohms measured for each?

Yes ____	No ____
The glow plugs are OK.	The glow plug has failed. Replace all glow plugs.

Result The glow plugs have now been checked.

5 Troubleshooting Engine Start (starts, then shuts down)

5.1 Preparing for Diagnostic Procedures

Tools required

All procedures can be accomplished with the following tools:

- Multimeter (volt/ohm meter)
- General hand tools (ratchet set, screwdrivers, etc.)

Before contacting Wacker Neuson

Complete the following information before contacting Wacker Neuson Service:

1. Perform the diagnostic procedures in this packet.
2. Fill in the information where requested or place a check mark next to the result that applies on the following pages and below.
3. Technician name:_____
4. Company name:_____
5. Phone:_____
6. Machine serial number:_____Hour meter:_____
7. List the issue(s) you are having:

   _____

   _____

   _____

   _____

   _____

8. Contact Wacker Neuson Service via fax or phone with the information gathered.

5.2 Troubleshooting Sequence

On Light Towers with CAT engines, when troubleshooting a condition where the engine starts, then shuts down shortly after starting, check the following items in the sequence listed below.

Task	See topic	No.
1. Check the engine oil.	—	—
2. Check the coolant level.	—	—
3. Check the oil switch.	*Checking the Oil Switch*	5.3
4. Check the coolant temperature sender.	*Checking the Coolant Temperature Sender*	5.4

5.3 Checking the Oil Switch

Requirements

- Engine oil level OK
- Engine stopped
- Functioning shut-down relay
- Mechanical oil pressure gauge

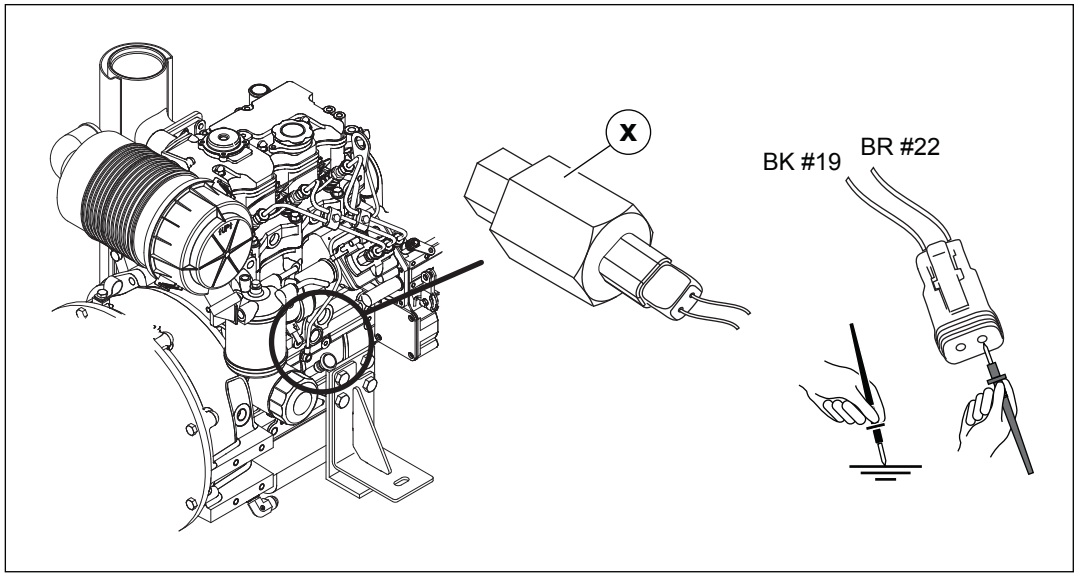
Background

The shut-down relay sends a low voltage (approximately 2.5 VDC) signal to the oil pressure switch. If this signal finds a path to ground, the shut-down relay disconnects power to the fuel solenoid and the engine stops. The oil pressure switch is normally closed. When the engine is running, oil pressure inside the engine opens the contacts of the oil pressure switch. If oil pressure falls to a level where the contacts close, the signal voltage from the shut-down relay will have a path to ground and the engine will stop. A built-in timer within the shut-down relay allows the fuel solenoid to remain open during the engine cranking (starting) process.

Procedure

Perform the procedure below to check the oil pressure switch.

1. Check the engine oil level. Add oil if necessary.
2. Check the function of the shut-down relay. See topic 4.4 *Checking the Shut-down Relay*.
3. Open the engine compartment and locate the oil pressure switch **(x)**.



wc_gr010933

4. Disconnect the oil pressure switch.
5. Check for continuity between the BR #23 wire and ground.

Is there continuity?

Yes ____	No ____
The BR #23 wire has shorted to ground. Repair or replace it.	Continue.

This procedure continues on the next page.

Continued from the previous page.

6. With the key in the ON position, check the DC voltage between the BR wire #23 and ground.

Is at least 2.0V measured?

Yes ____	No ____
Continue.	The shut-down relay has failed. Replace it.

7. Remove the oil pressure switch and install an oil pressure gauge.
8. Start the engine and check the oil pressure.

Does the engine hold sufficient pressure?

Yes ____	No ____
The oil pressure switch has failed. Replace it.	There is a problem within the engine. See the manufacturer's information.

Result

The oil pressure switch has now been checked.
If the problem has not been resolved, continue with the next topic.

5.4 Checking the Temperature Switch

Requirements

- Engine coolant level full
- Engine stopped and cool
- Functioning shut-down relay

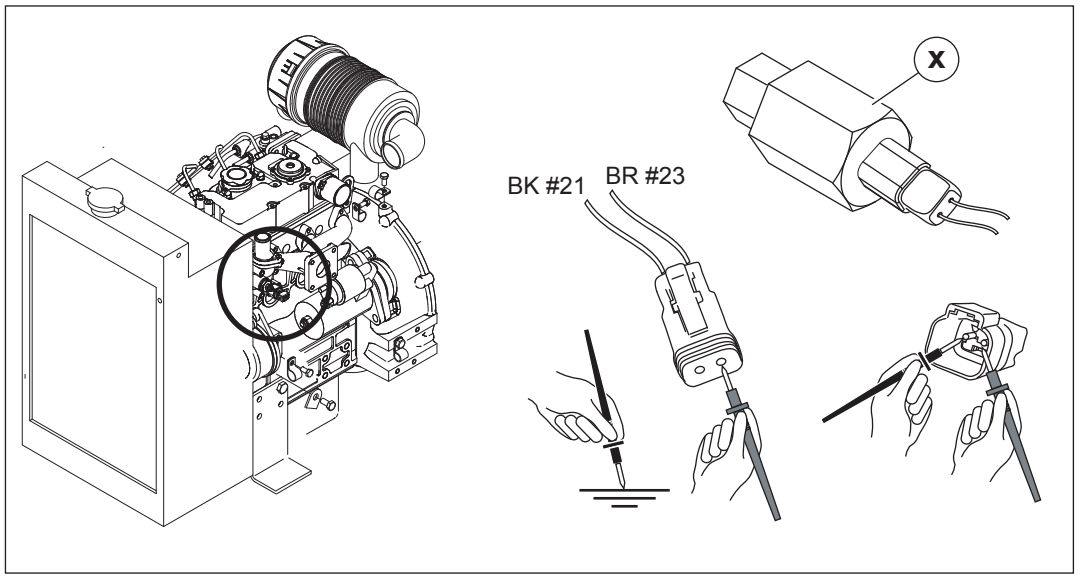
Background

The shut-down relay sends a low voltage (approximately 2.5 VDC) signal to the temperature switch. If this signal finds a path to ground, the shut-down relay disconnects power to the fuel solenoid and the engine stops. The temperature switch is normally open. When the engine exceeds normal operating temperature, the contacts on the temperature switch close, the signal voltage from the shut-down relay will have a path to ground, and the engine will stop.

Procedure

Perform the procedure below to check the temperature switch.

1. Check the coolant level. Add coolant if necessary.
2. Open the engine compartment and locate the temperature switch **(x)**.



wc_gr010934

3. Disconnect the temperature switch.
4. Check for continuity between the BU #22 wire and ground.

Is there continuity?

Yes ____	No ____
The BU #22 wire has shorted to ground. Repair or replace it.	Continue.

This procedure continues on the next page.

Continued from the previous page.

5. With the key in the ON position, check the DC voltage between the BU wire #22 and ground.

Is at least 2.0V measured?

Yes ____	No ____
Continue.	The shut-down relay has failed. Replace it.

6. With the engine cool, check the continuity of the temperature switch by measuring across the pins of the connector.

Is there continuity?

Yes ____	No ____
The temperature switch has failed. Replace it.	The temperature switch is OK. Problems with starting are within the engine. See the engine manufacturer's information.

Result The temperature switch has now been checked.

6 Troubleshooting Engine Starting (no crank, no start)

6.1 Preparing for Diagnostic Procedures

Tools required

All procedures can be accomplished with the following tools:

- Multimeter (volt/ohm meter)
- General hand tools (ratchet set, screwdrivers, etc.)

Before contacting Wacker Neuson

Complete the following information before contacting Wacker Neuson Service:

1. Perform the diagnostic procedures in this packet.
2. Fill in the information where requested or place a check mark next to the result that applies on the following pages and below.
3. Technician name:_____
4. Company name:_____
5. Phone:_____
6. Machine serial number:_____Hour meter:_____
7. List the issue(s) you are having:

   _____

   _____

   _____

   _____

   _____

8. Contact Wacker Neuson Service via fax or phone with the information gathered.

6.2 Troubleshooting Sequence

On Light Towers with the Kohler engine, electric power to the starter solenoid **(y)** is fed from the battery **(p)**, through the key switch **(r)** to the engine controller.

When troubleshooting a no-crank, no-start condition, do so in the sequence listed below.

Task	See topic	No.
1. Check the battery and ground wiring.	*Checking the Battery and Ground Wiring*	6.3
2. Check power to the starter solenoid and engine controller.	*Checking Power to the Starter Solenoid and to the Controller*	6.4

6.3 Checking the Battery and Ground Wiring

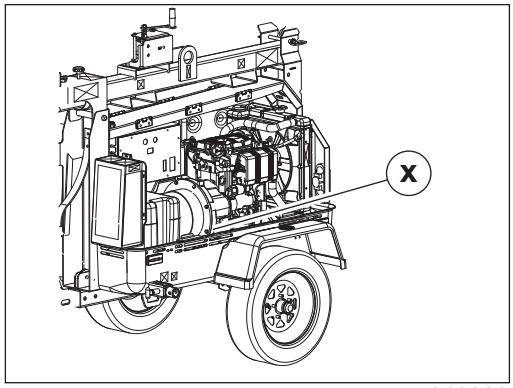
Requirements

- Multimeter

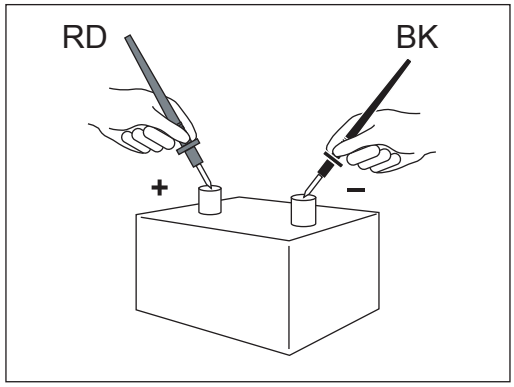
Procedure

Perform the procedure below to check the battery and ground wiring.

1. If applicable, check that the emergency stop button is in the out (deactivated position).
2. Open the side panel and locate the battery **(x)**.



wc_gr010920



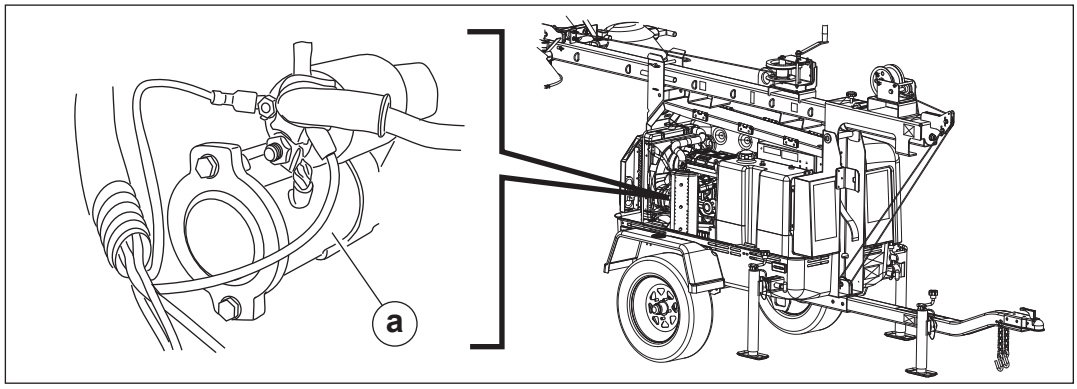
wc_gr006879

3. Measure the DC voltage across the battery posts.

Is at least 12 VDC measured?

Yes ____	No ____
Continue.	Replace or recharge the battery.

4. Locate the starter **(a)**.



wc_gr010921

5. Measure the DC voltage between the starter's positive terminal and the battery's negative terminal.

This procedure continues on the next page.

Continued from the previous page.

Is at least 12 VDC measured?

Yes ____	No ____
Continue.	Check the connections of the large red wire between the battery and the starter. Repair the wire as necessary.

6. Measure the DC voltage between the starter positive terminal and engine ground.

Is at least 12 VDC measured?

Yes ____	No ____
Continue.	Check the connections of the ground wires between the battery and the machine frame. Repair the wires as necessary.

7. Hold the key to the START position and measure the DC voltage between the starter positive terminal and engine ground while the starter attempts to crank the engine.

Is at least 10.5 VDC measured?

Yes ____	No ____
The battery is OK. Problems are within the engine. See the engine manufacturer's information.	Replace or recharge the battery.

Result The battery and ground wiring have now been checked.

6.4 Checking Power to the Starter Solenoid and to the Controller

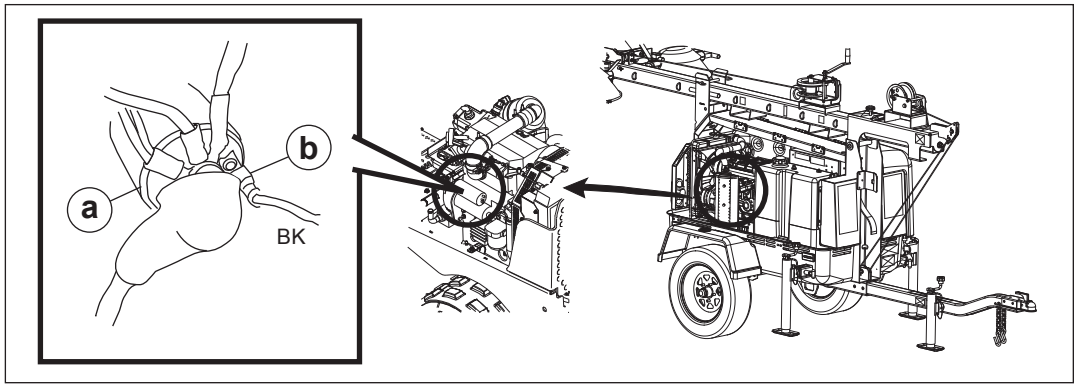
Requirements

- Multimeter
- Fully charged battery

Procedure

Perform the procedure below to check power to the starter solenoid.

1. Locate the starter solenoid **(a)**.



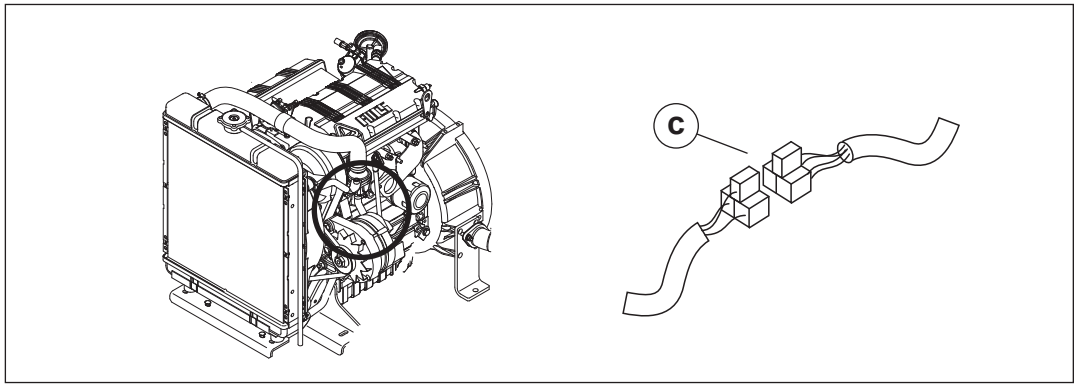
wc_gr011163

2. Check that the black (BK) wire **(b)** is connected to the starter solenoid. If it is disconnected, reconnect it and retry starting the engine. Otherwise, continue.
3. Turn the key to the ON position. While the key is in the ON position, measure the DC voltage between the BK wire and ground.

Is at least 12 VDC measured?

Yes ____	No ____
The starter solenoid is receiving power. Problems with the engine not cranking are within the engine. See the engine manufacturer's information.	The starter solenoid is not receiving power. Continue.

4. Check the connection of the three blue wires to the starter solenoid. If they are disconnected, reconnect them and try starting the engine. Otherwise, continue.
5. Check the connection of the connector **(c)** near the alternator. If it is disconnected, reconnect it and try starting the engine. Otherwise, continue.



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This procedure continues on the next page.

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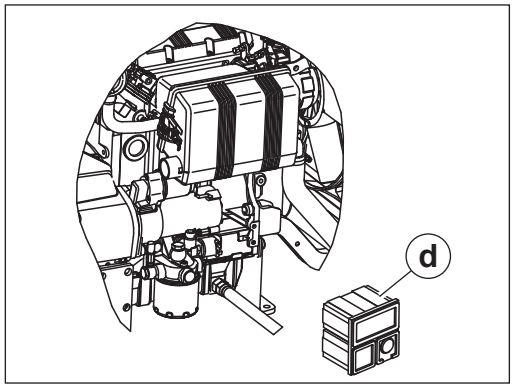
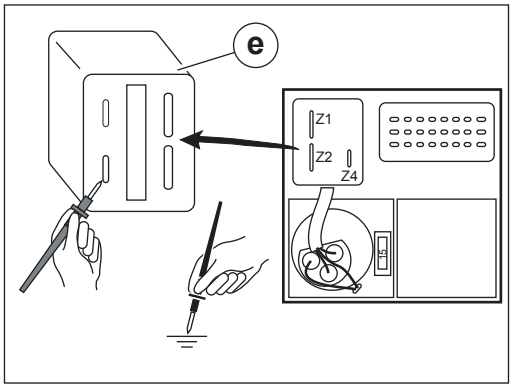
6. Disconnect the fasteners that hold the controller **(d)** to the machine. Check that the 24-pin connector is connected. If it is not, reconnect it and try starting the engine. Otherwise, continue.



wc_gr011156



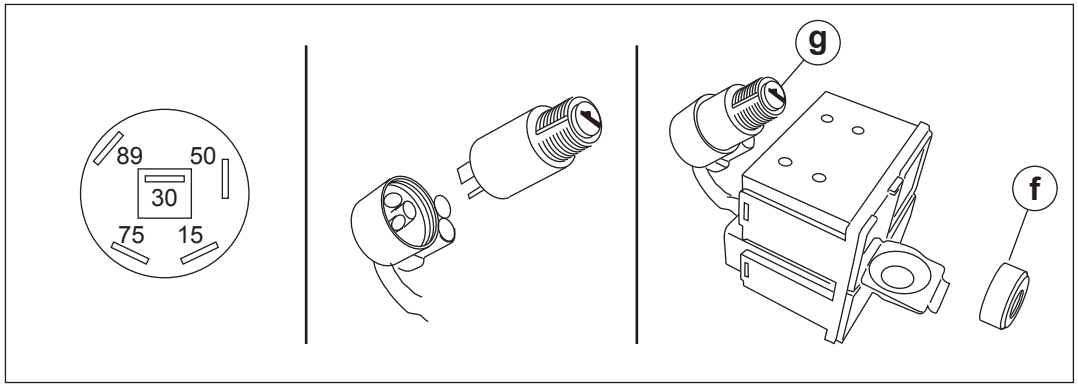
wc_gr011157

7. On the back of the controller, disconnect the connector **(e)** from the relay.
8. Measure the DC voltage between each blue wire and ground.

Is approximately 12 VDC measured in each case?

Yes ____	No ____	Your reading
The controller is receiving power. Continue.	Check the continuity and connections of the blue wires. Replace the blue wires as needed.	

9. Unscrew the cap **(f)** and remove the key switch **(g)** from the control panel.



wc_gr011158

10. Check the function of the key switch as shown below.

Key Position	Continuity between terminals
OFF	None
ON	30–75–15
START	30–50-15

Does the key switch have the correct continuity?

Yes ____	No ____
The key switch is functioning. The control panel has failed; replace it.	The key switch has failed. Replace it.

7 Troubleshooting Engine Starting (crank, no start)

7.1 Preparing for Diagnostic Procedures

Tools required

All procedures can be accomplished with the following tools:

- Multimeter (volt/ohm meter)
- General hand tools (ratchet set, screwdrivers, etc.)

Before contacting Wacker Neuson

Complete the following information before contacting Wacker Neuson Service:

1. Perform the diagnostic procedures in this packet.
2. Fill in the information where requested or place a check mark next to the result that applies on the following pages and below.
3. Technician name:_____
4. Company name:_____
5. Phone:_____
6. Machine serial number:_____Hour meter:_____
7. List the issue(s) you are having:

   _____

   _____

   _____

   _____

   _____

8. Contact Wacker Neuson Service via fax or phone with the information gathered.

7.2 Troubleshooting Sequence

On Light Towers with Kohler engines, when troubleshooting a crank, no-start condition, do so in the sequence listed below.

Task	See topic	No.
1. Check fuel in tank.	—	—
2. Check the 15A fuse.	*Checking the 15A Fuse*	7.3
3. Check the power to the fuel solenoid.	*Checking Power to the Fuel Solenoid*	7.4
4. Check the power to the glow plugs.	*Checking Power to the Glow Plugs*	7.5
5. Check the glow plugs.	*Checking a Glow Plug*	7.6

7.3 Checking the 15A Fuse

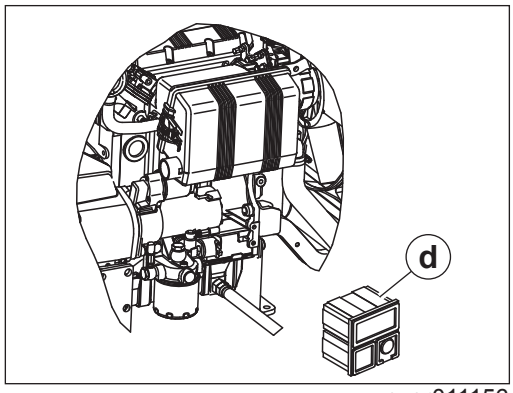
Requirements

- Engine stopped
- Multimeter

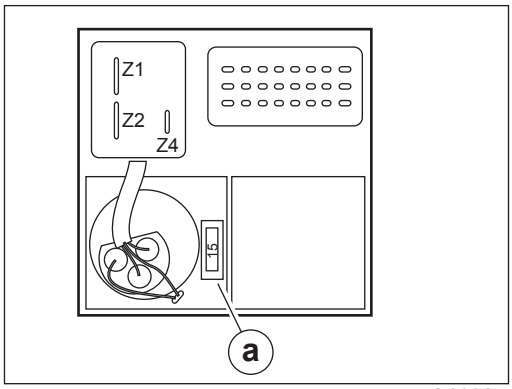
Procedure

Perform the procedure below to check the 15A fuse.

1. Disconnect the fasteners that hold the engine controller **(d)** to the machine.



wc_gr011156



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2. The 15A fuse is located on the back of the controller. Check the condition of the 15A fuse **(a)**.

Is the 15A fuse OK?

Yes ____	No ____
Continue.	Replace the 15A fuse with one of like size and rating.

3. Check the condition of the purple wire on the outgoing side of the fuse.

Is the purple wire OK?

Yes ____	No ____
The engine controller has failed. Replace the engine controller.	Repair or replace the purple wire. Re-install the engine controller.

Result

The 15A fuse has now been checked.

7.4 Checking Power to the Fuel Solenoid

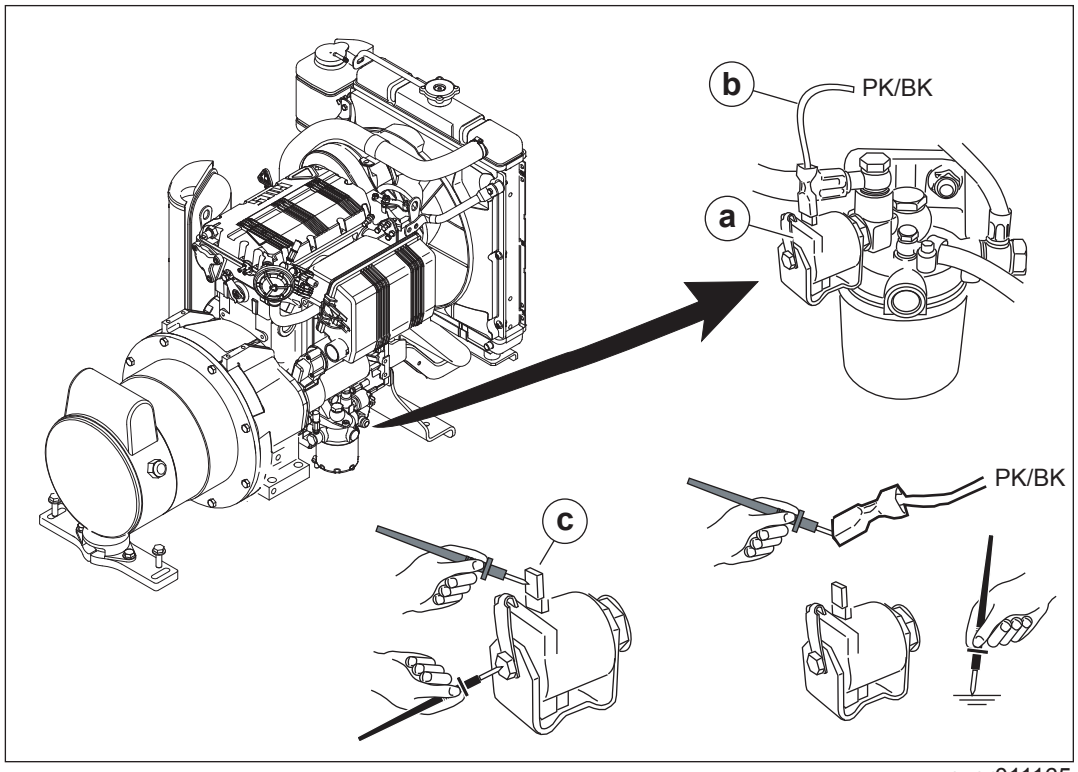
Requirements

- Fully charged battery
- Multimeter

Procedure

Perform the procedure below to check power to the fuel solenoid.

1. Locate the fuel solenoid **(a)**.



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2. Check that the pink/black (PK/BK) **(b)** wire running to the fuel solenoid is connected. If it is not, reconnect it and try to start the engine. Otherwise, continue.
3. Disconnect the pink/black (PK/BK) **(b)** from the fuel solenoid.
4. Turn the key to the ON position.
5. Measure the DC voltage between the PK/BK wire and ground.

Is approximately 12V measured?

Yes ____	No ____
Continue.	Check the condition of the PK/BK wire. Repair it as needed. If it is OK and there is no voltage measured, the controller has failed. Call Wacker Neuson Service.

This procedure continues on the next page.

Continued from the previous page.

6. Check the resistance of the fuel solenoid coil by measuring the resistance between the terminal of the fuel solenoid and then of the fuel solenoid.

Is 15–25 ohms measured?

Yes ____	No ____	Your reading
The fuel solenoid should be functioning. Problems with fuel getting to the engine are within the engine. See the engine manufacturer's information.	The fuel solenoid has malfunctioned. Replace the fuel solenoid.	

The fuel solenoid has now been checked. If the problem has not been resolved, continue with the next topic.

7.5 Checking Power to the Glow Plugs

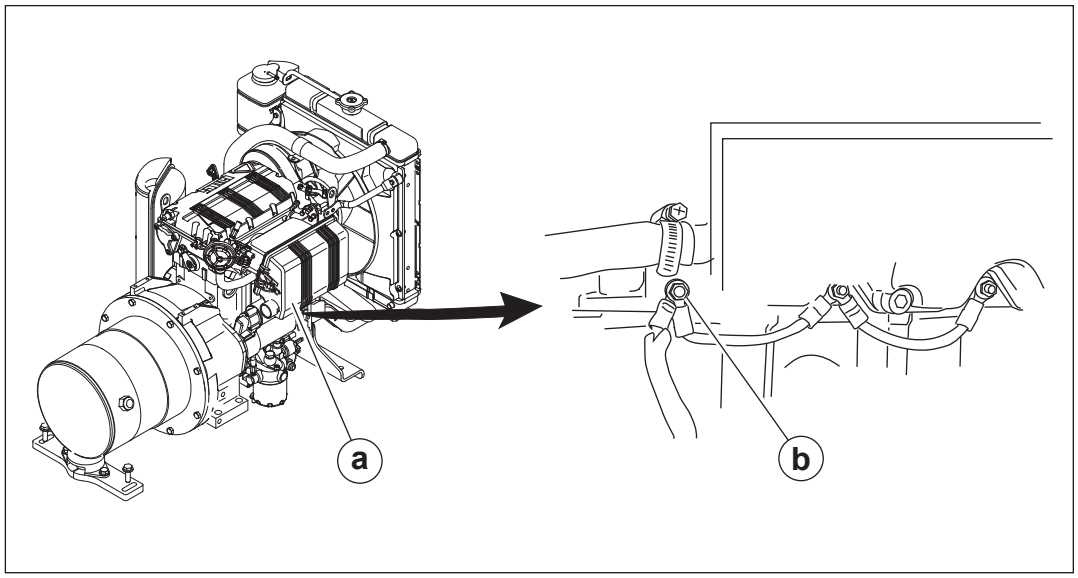
Requirements

- Fully charged battery
- Multimeter

Procedure

Perform the procedure below to check power to the glow plugs.

1. Remove the air filter cover **(a)**.



wc_gr011166

2. Check that the black wire **(b)** is connected. If it is not, reconnect it and try to start the engine. Otherwise, continue.
3. Turn the key to the ON position.
4. While the preheat light is illuminated, measure the DC voltage between the black wire and ground.

Is approximately 9.8V measured?

Yes ____	No ____
The glow plugs are receiving power.	Check the condition of the black wire. Repair it as needed. If it is OK and there is no voltage measured, the controller has failed. Call Wacker Neuson Service.

Result

Power to the glow plugs has now been checked. If the problem has not been resolved, continue with the next topic.

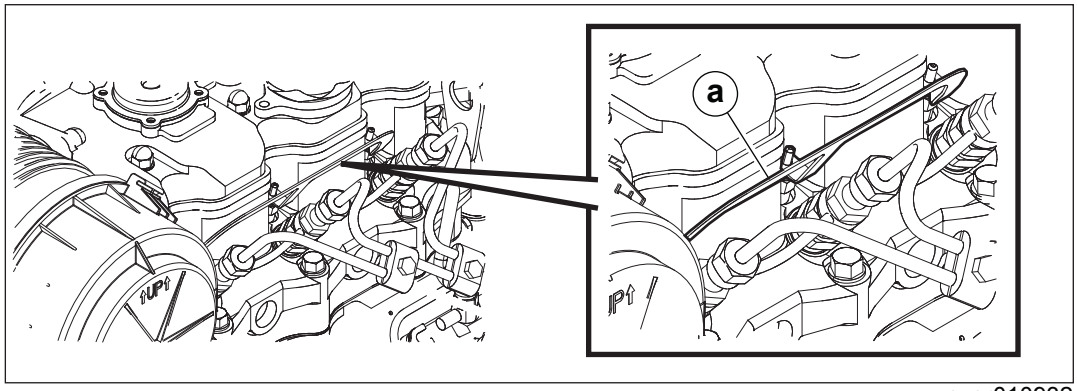
7.6 Checking a Glow Plug

Requirements
- Multimeter
- Engine cool

Procedure Perform the procedure below to check the function of the glow plugs.

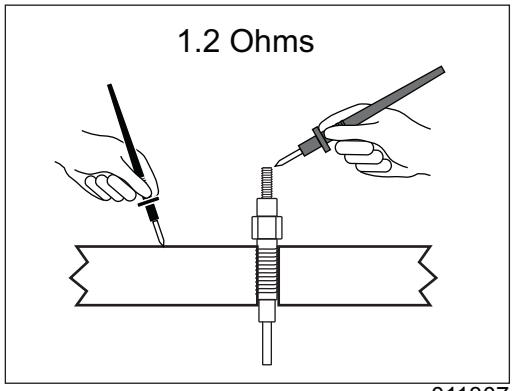
WARNING
Burn hazard. Glow plugs become extremely hot when the engine is running.
► Do not remove the glow plugs when conducting this test.

1. Locate the glow plugs.



wc_gr010932

2. Disconnect the bar **(a)** that connects the glow pugs.
3. Measure the resistance between the end of a glow plug and engine ground. Measure all glow plugs.



wc_gr011307

Is approximately 1.2 ohms measured for each?

Yes ____	No ____
The glow plugs are OK.	The glow plug has failed. Replace all glow plugs.

Result The glow plugs have now been checked.

8 Kohler Engine Shut-down Conditions

8.1 List of Kohler Engine Shut-down Conditions

There are three conditions that will cause the Kohler engine to shut down.

- Loss of oil pressure
- High coolant temperature
- Charge system failure

Note: *An air filter restriction does not shut down the engine. During an air restriction condition, the air filter restriction indicator on the engine controller illuminates.*

8.2 Diagnosing the Oil Pressure Circuit

Requirements

- Mechanical oil pressure gauge
- Engine oil level OK

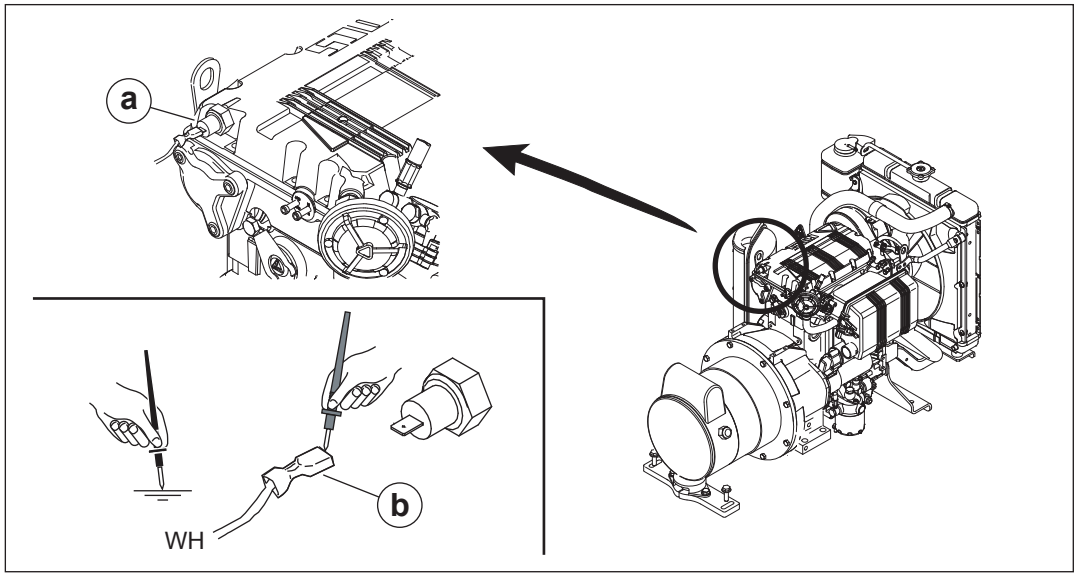
Background

The oil pressure switch is normally closed. When the engine is running, oil pressure inside the engine opens the contacts of the oil pressure switch. If oil pressure falls to a level where the contacts close, the engine will stop. A built-in timer within the engine controller allows the engine cranking (starting) process.

Procedure

Perform the procedure below to check the oil pressure circuit.

1. Check the engine oil level. Add oil if necessary.
2. Locate the oil pressure switch **(a)**.



wc_gr011167

3. Disconnect the WH wire **(b)**.
4. Check for continuity between the WH wire and ground.

Does the WH wire have continuity to ground?

Yes ____	No ____
Check the WH wire for a short to ground. If the WH wire is shorted to ground, repair or replace it. If the WH wire is OK, there may be a problem with the engine controller. Call Wacker Neuson Service.	Continue.

5. Remove the oil pressure switch and install an oil pressure gauge.

This procedure continues on the next page.

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6. Start the engine and check the oil pressure.

Does the engine hold sufficient pressure?

Yes ____	No ____
The oil pressure switch has failed. Replace it.	There is a problem within the engine. See the manufacturer's information.

Result The oil pressure circuit has now been checked.

8.3 Checking the Temperature (Dual Function) Switch

Requirements

- Engine coolant level full
- Engine stopped and cool

Background

The temperature switch is a dual-function switch. One side of the switch is a thermistor which detects coolant temperature. The other side acts as an on-off switch.

The engine controller sends a 5 VDC signal to the thermistor side of the temperature switch via the red wire. There is a voltage drop across the thermistor which is determined by the temperature of the coolant. As the temperature decreases, the resistance increases. The variation in resistance causes a variation in the voltage drop. The engine controller varies the duration of time that power is sent to the glow plugs based on this voltage drop. The colder it is, the longer the engine controller sends power to the glow plugs.

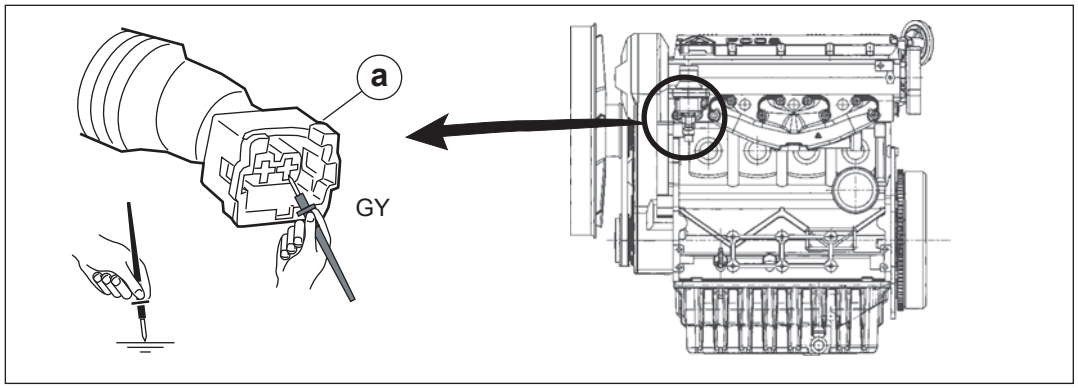
Temp. °C	-30	-20	0	+20	+40	+60	+80	+100	+120
Resistance Ohms	12000	7000	2800	1350	750	490	360	300	270

The other side of the temperature switch is normally open. When the engine exceeds normal operating temperature (110°C ±3 (230°F ±6), the contacts of the temperature switch close. This sends a signal to the engine controller to cut power to the fuel solenoid and the engine stops. During an over-temperature condition, the temperature light on the engine controller illuminates.

Procedure

Perform the procedure below to check the temperature switch.

1. With the engine stopped and cool, check the coolant level. Add coolant if necessary. Refilling the radiator with coolant may be all that is necessary. Start the engine and retry operation. If the engine still shuts down due to an over-temperature condition, continue.
2. Locate the temperature switch **(a)** and disconnect it.



wc_gr011168

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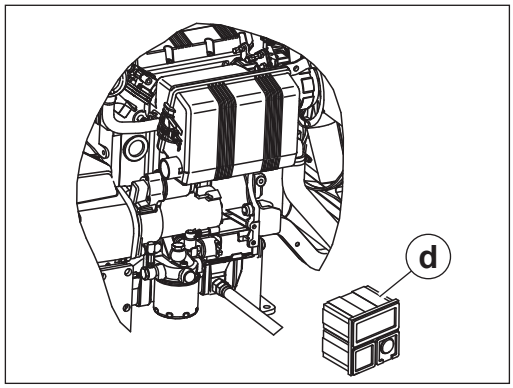
3. Check for continuity between the GY wire of the connector and ground.

Is there continuity?

Yes ____	No ____
Check the GY wire for short to ground. Repair or replace it as necessary. If the GY wire is OK, continue.	Continue with step 6.

4. Disconnect the fasteners that hold the engine controller **(d)** to the machine. Do not disconnect the wiring from the engine controller.



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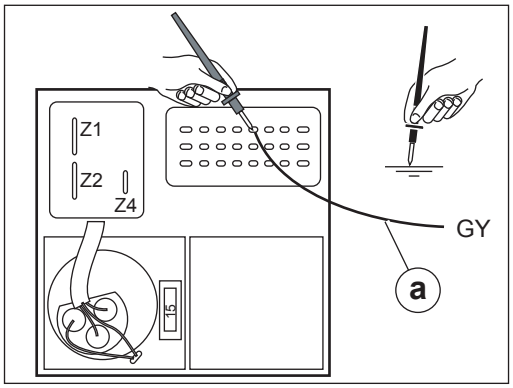


wc_gr011169

5. With the key in the ON position, probe the GY wire on the back of the engine controller. Check for continuity to ground.

Is there continuity?

Yes ____	No ____
The engine controller has failed. Call Wacker Neuson Service.	The temperature switch may have failed. Continue.

6. Remove the temperature switch from the machine.

7. Check the on-off side of the temperature switch for short to ground. To do so, connect a multimeter between the spade terminal where the GY wire connects and the threaded portion of the temperature switch.

Is it shorted to ground?

Yes ____	No ____
The temperature switch has failed. Replace it.	Continue.

8. Check the other side of the temperature switch for the resistance. To do so, connect a multimeter between the spade terminal where the RD wire connects and the threaded portion of the temperature switch.

At 22°C (72°F) is approximately 1000 ohms measured?

Yes ____	No ____
The temperature switch is OK.	The temperature switch has failed. Replace it.

This procedure continues on the next page.

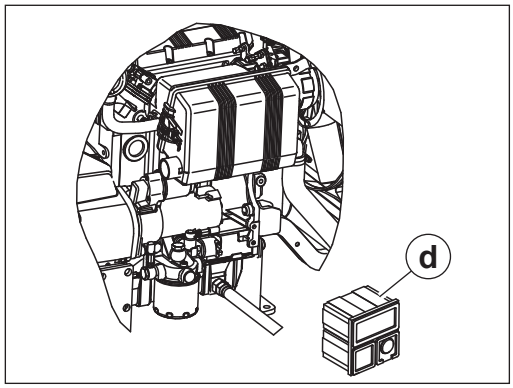
Continued from the previous page.

9. Check for continuity between the RD wire of the connector and ground.

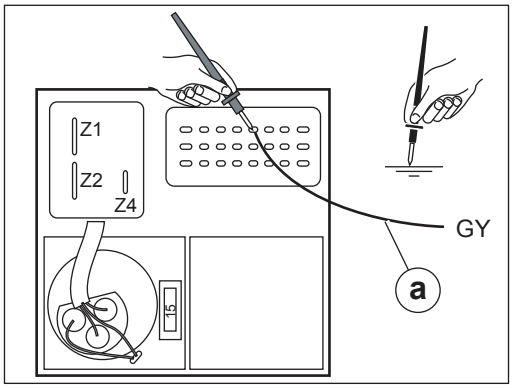
Is there continuity?

Yes ____	No ____
Check the RD wire for short to ground. Repair or replace it as necessary. If the RD wire is OK, continue.	Continue with step 10.

10. Disconnect the fasteners that hold the engine controller **(d)** to the machine. Do not disconnect the wiring from the engine controller.



wc_gr011156



wc_gr011169

11. With the key in the ON position, probe the RD wire on the back of the engine controller. Check for continuity to ground.

Is there continuity?

Yes ____	No ____
The engine controller has failed. Call Wacker Neuson Service.	The RD wire and engine controller are OK.

Result The temperature switch has now been checked.
Reassemble the machine.

8.4 Clearing a Recharging System Fault

Requirements

- Fully charged battery
- Battery tester

Background

The engine controller includes a system that detects a low voltage condition in the battery. When this condition exists for a period of longer than 3 seconds, the engine controller stops the engine, and the alternator indicator (battery recharge indicator) illuminates.

Procedure

Perform the procedure below to clear the recharging system fault.

1. Cycle the key on and off.
2. If the condition persists, recharge or replace the battery.
3. If the battery does not remain charged,
   a. Check the wiring to the alternator.
   b. Test the charging system.
   c. Replace the alternator if necessary.

Result

The recharge system has now been cleared.

8.5 Checking the Air Restriction Indicator Switch

Requirements

- Clean air filter installed
- Engine stopped and cool

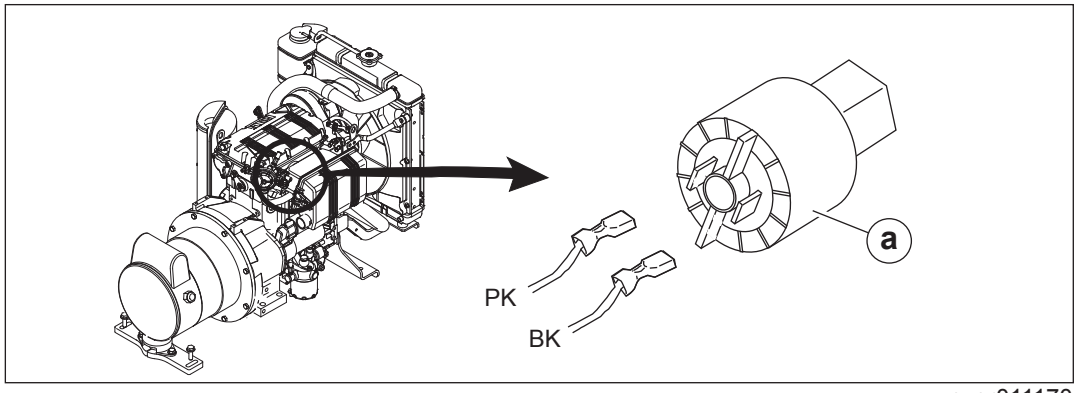
Background

The engine controller sends a 12V signal to the air restriction indicator switch. If this signal finds a path to ground, the air filter restriction indicator on the engine controller blinks. The air restriction indicator switch is normally open. When the air flow is too low, the contacts on the air restriction indicator switch close, the signal voltage from the engine controller has a path to ground, and the air filter restriction indicator on the engine controller illuminates.

Procedure

Perform the procedure below to check the air restriction indicator switch.

1. Check the air filter. Replace it if it is dirty.
2. Start the engine. If the air filter restriction indicator on the engine controller blinks, continue.
3. Locate the air restriction indicator switch **(a)** and disconnect it.



wc_gr011170

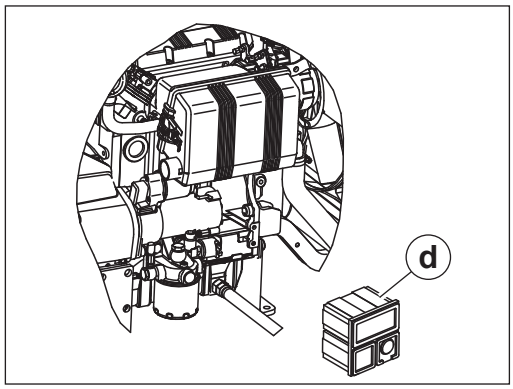
Does the air filter restriction indicator on the engine controller blink?

Yes ____	No ____
Check the PK wire for short to ground. Repair or replace it as necessary. If the PK wire is OK, continue.	The air restriction indicator switch has failed. Replace it.

This procedure continues on the next page.

Continued from the previous page.

4. Disconnect the fasteners that hold the engine controller **(d)** to the machine. Do not disconnect the wiring from the engine controller.



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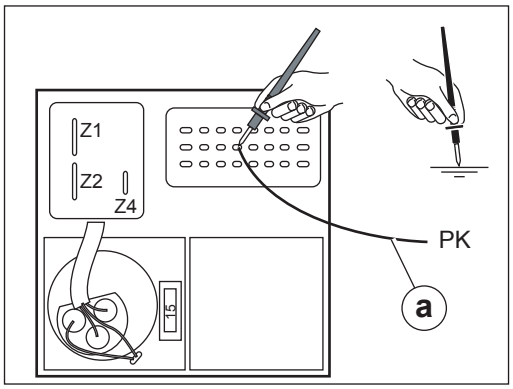


wc_gr011171

5. With the key in the ON position, probe the PK wire on the back of the engine controller. Check for continuity to ground.

Is there continuity?

Yes ____	No ____
The engine controller has failed. Call Wacker Neuson Service.	The engine controller is not the source of the problem.

6. With the key in the ON position, probe the BK wire on the back of the engine controller. Check for continuity to ground.

Is there continuity?

Yes ____	No ____
The engine controller is not the source of the problem.	The engine controller has failed. Call Wacker Neuson Service.

Result

The air restriction indicator switch has now been checked.
Reassemble the machine.

9 Troubleshooting Engine Starting (no crank, no start)

9.1 Preparing for Diagnostic Procedures

Tools required

All procedures can be accomplished with the following tools:

- Multimeter (volt/ohm meter)
- General hand tools (ratchet set, screwdrivers, etc.)

Before contacting Wacker Neuson

Complete the following information before contacting Wacker Neuson Service:

1. Perform the diagnostic procedures in this packet.
2. Fill in the information where requested or place a check mark next to the result that applies on the following pages and below.
3. Technician name:_____
4. Company name:_____
5. Phone:_____
6. Machine serial number:_____Hour meter:_____
7. List the issue(s) you are having:

   _____

   _____

   _____

   _____

   _____

8. Contact Wacker Neuson Service via fax or phone with the information gathered.

9.2 Troubleshooting Sequence

On Light Towers with Kubota engines, when troubleshooting a no-crank, no-start condition, do so in the sequence listed below.

Task	See topic	No.
1. Check the battery and ground wiring.	*Checking the Battery and Ground Wiring*	9.3
2. Check power to the starter solenoid and engine controller.	*Checking the Key Switch and Power to the Starter Solenoid*	9.4

9.3 Checking the Battery and Ground Wiring

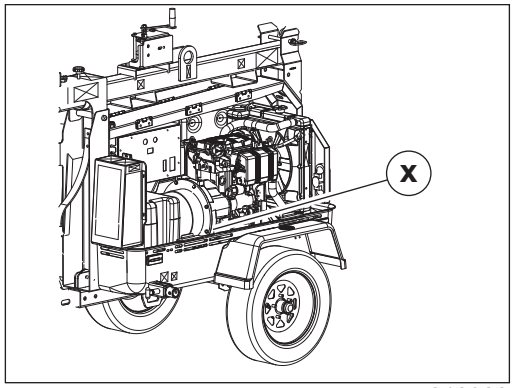
Requirements

- Multimeter

Procedure

Perform the procedure below to check the battery and ground wiring.

1. If applicable, check that the emergency stop button is in the out (deactivated position).
2. Open the side panel and locate the battery **(x)**.



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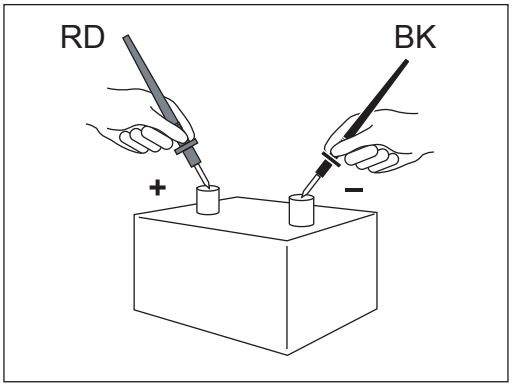


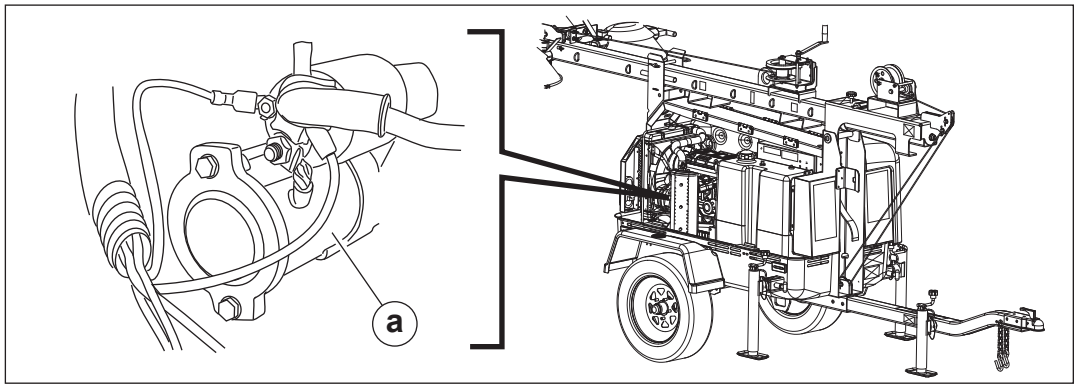
wc_gr006879

3. Measure the DC voltage across the battery posts.

Is at least 12 VDC measured?

Yes ____	No ____
Continue.	Replace or recharge the battery.

4. Locate the starter **(a)**.



wc_gr010921

5. Measure the DC voltage between the starter's positive terminal and the battery's negative terminal.

This procedure continues on the next page.

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Is at least 12 VDC measured?

Yes ____	No ____
Continue.	Check the connections of the large red wire between the battery and the starter. Repair the wire as necessary.

6. Measure the DC voltage between the starter positive terminal and engine ground.

Is at least 12 VDC measured?

Yes ____	No ____
Continue.	Check the connections of the ground wires between the battery and the machine frame. Repair the wires as necessary.

7. Hold the key to the START position and measure the DC voltage between the starter positive terminal and engine ground while the starter attempts to crank the engine.

Is at least 10.5 VDC measured?

Yes ____	No ____
The battery is OK. Problems are within the engine. See the engine manufacturer's information.	Replace or recharge the battery.

Result The battery and ground wiring have now been checked.

9.4 Checking the Key Switch and Power to the Starter Solenoid

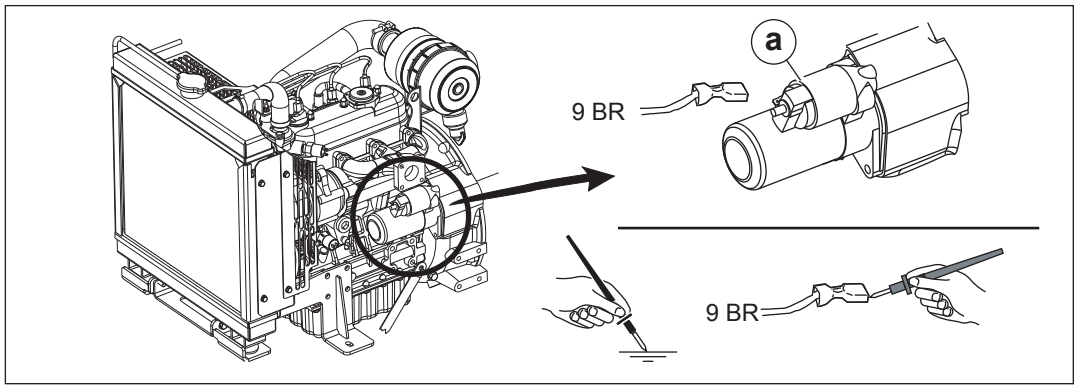
Requirements

- Multimeter
- Fully charged battery

Procedure

Perform the procedure below to check power to the starter solenoid.

1. Locate the starter solenoid **(a)**.



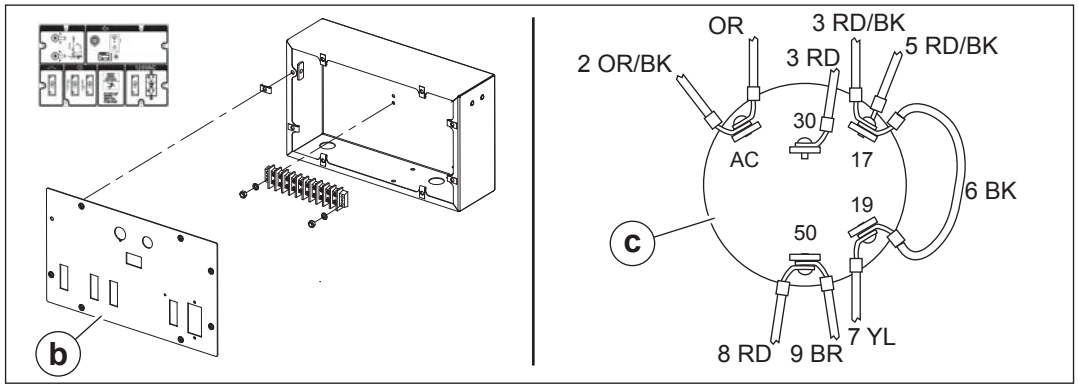
wc_gr011194

2. Check that the brown (9 BR) wire is connected to the starter solenoid. If it is disconnected, reconnect it and retry starting the engine. Otherwise, continue.
3. Turn the key to the START position. While the key is in the START position, measure the DC voltage between the brown (9 BR) wire and ground.

Is at least 10 VDC measured?

Yes ____	No ____
The starter solenoid is receiving power. Problems with the engine not cranking are within the engine. See the engine manufacturer's information.	The starter solenoid is not receiving power. Continue.

4. Remove the control panel **(b)**.



wc_gr011195

5. Locate the key switch **(c)**.

This procedure continues on the next page.

Continued from the previous page.

6. Check the connections of all the wires connected to the key switch. Tighten any loose connections.
7. Measure the DC voltage between the 3 RD wire (terminal 30) and ground.

Is at least 10.5 VDC measured?

Yes ____	No ____
Continue.	Replace or repair the 3 RD wire.

8. Turn the key to the START position and measure the DC voltage between terminal 50 and ground.

Is at least 10.5 VDC measured?

Yes ____	No ____
Continue.	The key switch has failed. Replace it.

9. Check the condition and continuity of 9 BR. Repair or replace it as necessary.

Result Power to the starter solenoid has now been checked.

10 Troubleshooting Engine Starting (crank, no start)

10.1 Preparing for Diagnostic Procedures

Tools required

All procedures can be accomplished with the following tools:

- Multimeter (volt/ohm meter)
- General hand tools (ratchet set, screwdrivers, etc.)

Before contacting Wacker Neuson

Complete the following information before contacting Wacker Neuson Service:

1. Perform the diagnostic procedures in this packet.
2. Fill in the information where requested or place a check mark next to the result that applies on the following pages and below.
3. Technician name:_____
4. Company name:_____
5. Phone:_____
6. Machine serial number:_____Hour meter:_____
7. List the issue(s) you are having:

   _____

   _____

   _____

   _____

   _____

8. Contact Wacker Neuson Service via fax or phone with the information gathered.

10.2 Troubleshooting Sequence

Background

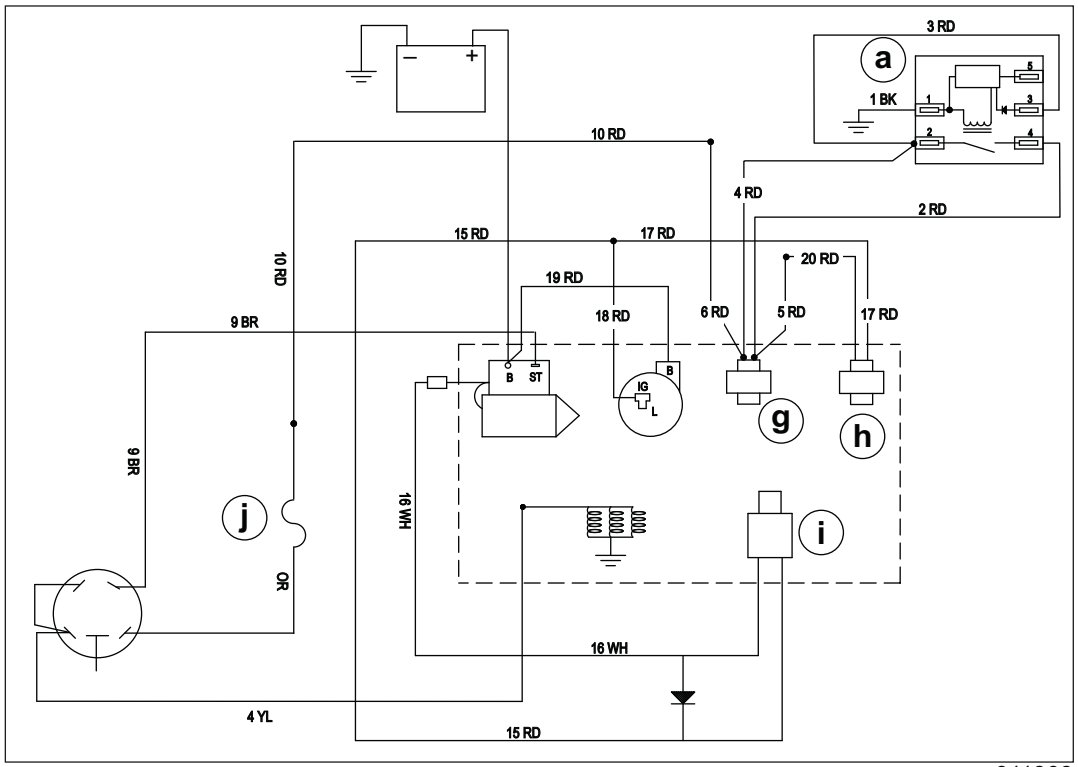
On Light Towers with Kubota engines, the fuel solenoid includes a “pull” and a “hold” circuit. The pull circuit (wire #16 WH) is powered when the key is in START position. The hold circuit is powered when the key is the START and ON positions. The hold side of the circuit runs from the 15A fuse **(j)** to the oil pressure switch **(g)**, to the shut-down timer relay **(a)**, to the temperature switch **(h)**, and finally to the fuel solenoid **(i)**.

If your machine starts, but shuts down right away, check the oil pressure switch. See topic *Checking the Oil Pressure Switch*.

When troubleshooting a crank no-start condition, do so in the sequence listed below.

Task	See topic	No.
1. Check fuel in tank.	—	—
2. Check the oil level.	—	—
3. Check the 15A fuse.	*Checking the 15A Fuse*	10.3
4. Check power to the fuel solenoid.	*Checking Power to the Fuel Solenoid*	10.4
5. Check the shut-down timer relay.	*Checking the Shut-Down Timer Relay*	10.5
6. Check power to the temperature switch.	*Checking the Temperature Switch*	10.6
7. Check the glow plugs.	Checking A Glow Plug	10.7

Reference graphic



wc_gr011303

10.3 Checking the 15A Fuse

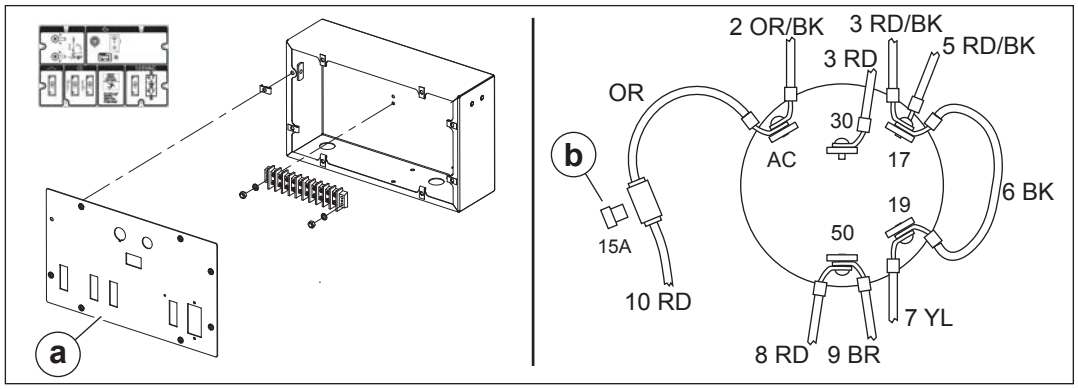
Requirements

- Multimeter
- Functioning key switch

Procedure

Perform the procedure below to check the 15A fuse.

1. Remove the control panel **(a)** and locate the 15A fuse **(b)**.



wc_gr011200

2. Check the condition of the 15A fuse **(b)**. Replace it if it is blown.

Result

The 15A fuse has now been checked. If the problem has not been resolved, continue with the next topic.

10.4 Checking Power to the Fuel Solenoid

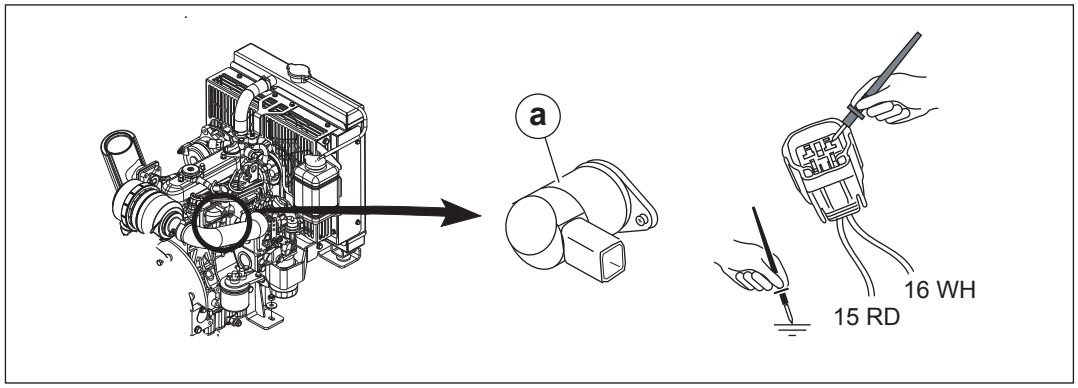
Requirements

- Fully charged battery
- Functioning key switch
- Functioning 15A fuse
- Multimeter

Procedure

Perform the procedure below to check power to the fuel solenoid.

1. Locate the fuel solenoid **(a)**. If it is disconnected, reconnect it and retry starting the engine. Otherwise, continue.



wc_gr011211

2. Attempt to start the engine by holding the key in the START position.

Does the engine run while the key is held in the START position?

Yes ____	No ____
The pull circuit is receiving power. Continue with step 6.	Continue with step 3.

3. Disconnect the fuel solenoid.
4. Turn the key to the START position; then, while the engine is cranking, measure the DC voltage between wire #16 WH and ground.

Is at least 10 VDC measured?

Yes ____	No ____
The fuel solenoid has failed. Replace it.	Continue.

5. Set the key switch to the OFF position.
6. Turn the key to the START position; then, while the engine is cranking, measure the DC voltage between wire #15 RD and ground.

Is at least 10 VDC measured?

Yes ____	No ____
The fuel solenoid is receiving power. If the engine doesn't start, see the engine manufacturer's service manual.	The fuel solenoid is not receiving power. Continue troubleshooting by checking power to the by-pass relay.

Result

Power to the fuel solenoid has now been checked. If the problem has not been resolved, continue with the next topic.

10.5 Checking the Shut-down Timer Relay

Requirements

- Fully charged battery
- Functioning key switch
- Functioning 15A fuse
- Multimeter

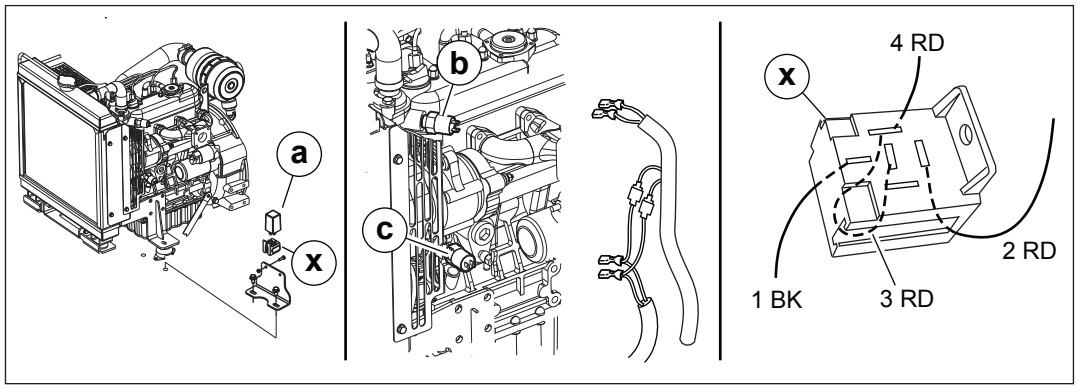
Background

The shut-down timer relay allows electric current to bypass the oil pressure switch during engine startup. The oil pressure switch is normally open. When the contacts are open (at startup or during a low pressure condition) current does not reach the fuel solenoid, and the machine stops (or does not start). When the engine is running, oil pressure inside the engine closes the contacts of the oil pressure switch, and the engine runs. The shut-down timer relay allows for current to reach the fuel solenoid during the cranking process when normally the contacts of the oil pressure switch are open.

Procedure

Perform the procedure below to check the shut-down timer relay.

1. Locate the shut-down timer relay **(a)** mounted on the tub floor near the engine.



wc_gr011201

2. Disconnect the shut-down timer relay from the base **(x)**. Check the connections of all wires connected to the base. Repair or reconnect any disconnected wires.
3. Set the key switch to the ON position.
4. Measure the DC voltage between terminal 2 (where wire #4 RD is connected) and ground.

Is at least 10 VDC measured?

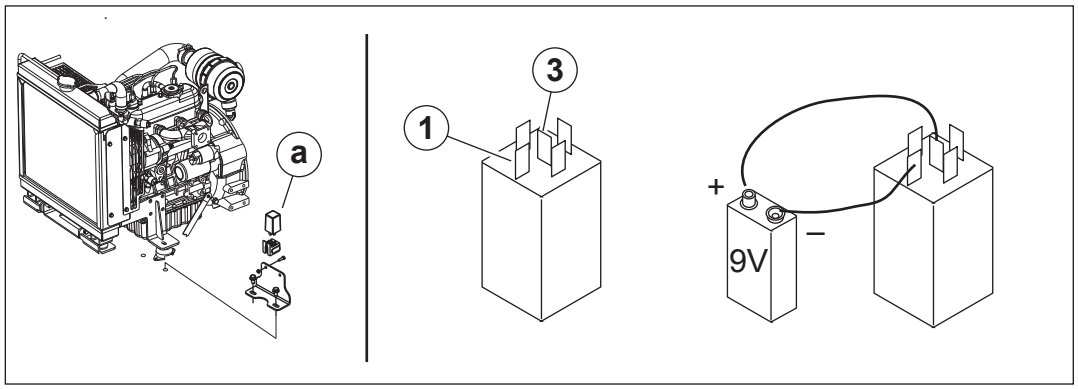
Yes ____	No ____
Continue.	#4 RD wire has failed. Trace wire #4 RD back to wire #6 RD, back to wire #10 RD, and back to the fuse. Repair or replace the wiring.

5. Set the key switch to the OFF position.
6. Check the connection of wire #1 BK to ground. Repair the connection if necessary.
7. Check the connection of wire #4 RD (terminal 2 of the connector) to the oil pressure switch. Repair the connection if necessary.

This procedure continues on the next page.

Continued from the previous page.

8. Remove the shut-down timer relay **(a)**.



wc_gr011209

9. Connecting a 9V or a 12V power source to the shut-down timer relay will determine if the switching portion of the relay is working.

   To connect the battery, connect the positive side of the power source to terminal 3, negative to terminal 1. An audible “click” should be heard immediately. Then, after a period of approximately 15 seconds, a second “click” should be heard.

   To confirm your results, connect a multimeter to terminals 2 and 4. Then, reconnect the battery. There should be continuity between terminals 2 and 4 immediately. Then, after a period of approximately 15 seconds, the continuity should be lost.

Does the shut-down timer relay perform as stated above?

Yes ____	No ____
The shut-down timer relay is functioning.	The shut-down timer relay has malfunctioned. Repair or replace it.

Result The shut-down timer relay has now been checked.

10.6 Checking the Temperature Switch

Requirements

- Fully charged battery
- Multimeter

Background

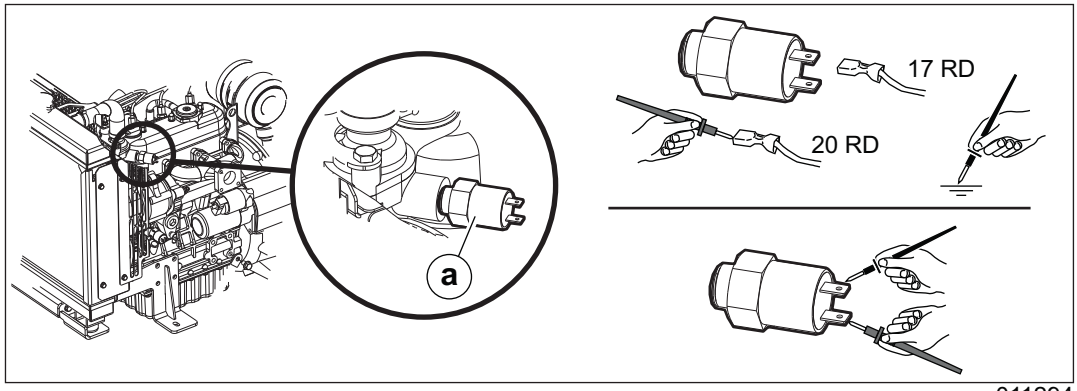
The temperature switch is normally closed. When the engine exceeds normal operating temperature (approximately 107°C (225°F)), the contacts of the temperature switch open. This cuts the power to the fuel solenoid and the engine stops.

Procedure

Perform the procedure below to check the temperature switch.

WARNING
Burn hazard. Hot engine coolant can cause severe burns.
► Allow engine to cool before performing this procedure.

1. Locate the temperature switch **(a)**. Check that the wiring is connected. If the wiring is not connected, reconnect it and try starting the engine again. Otherwise, continue.



wc_gr011294

2. Disconnect the wires from the temperature switch.
3. Set the key to the ON position and check the DC voltage between wire #20 RD and ground.

Is at least 10 VDC measured?

Yes ____	No ____
Continue.	The temperature switch is not receiving power. Check the condition of wire #20 RD back to wire # 5 RD at the oil pressure switch, then back to the shut-down timer relay wire #2 RD.

4. Check continuity across the two terminals of the temperature switch.

Is there continuity across the terminals?

Yes ____	No ____
The temperature switch is not the source of the problem.	The temperature switch has failed. Replace it.

Result

The temperature switch has now been checked. If the problem has not been resolved, continue with the next topic.

10.7 Checking a Glow Plug

Requirements

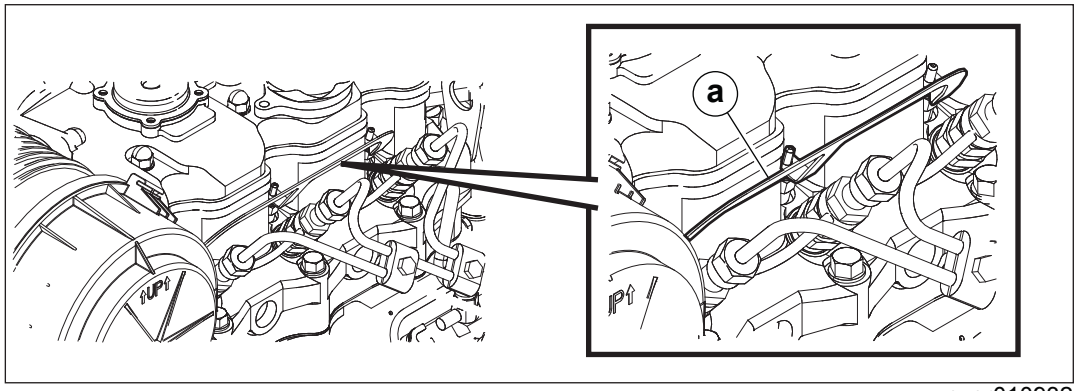
- Multimeter
- Engine cool

Procedure Perform the procedure below to check the function of the glow plugs.

WARNING
Burn hazard. Glow plugs become extremely hot when the engine is running.

► Do not remove the glow plugs when conducting this test.

1. Locate the glow plugs.



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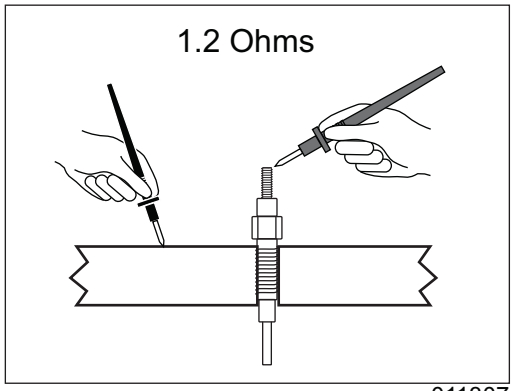
2. Disconnect the bar **(a)** that connects the glow pugs.
3. Measure the resistance between the end of a glow plug and engine ground. Measure all glow plugs.



wc_gr011307

Is approximately 1.2 ohms measured for each?

Yes ____	No ____
The glow plugs are OK.	The glow plug has failed. Replace all glow plugs.

Result The glow plugs have now been checked.

10.8 Checking the Oil Pressure Switch

Requirements

- Mechanical oil pressure gauge
- Engine oil level OK
- Multimeter
- Engine cold

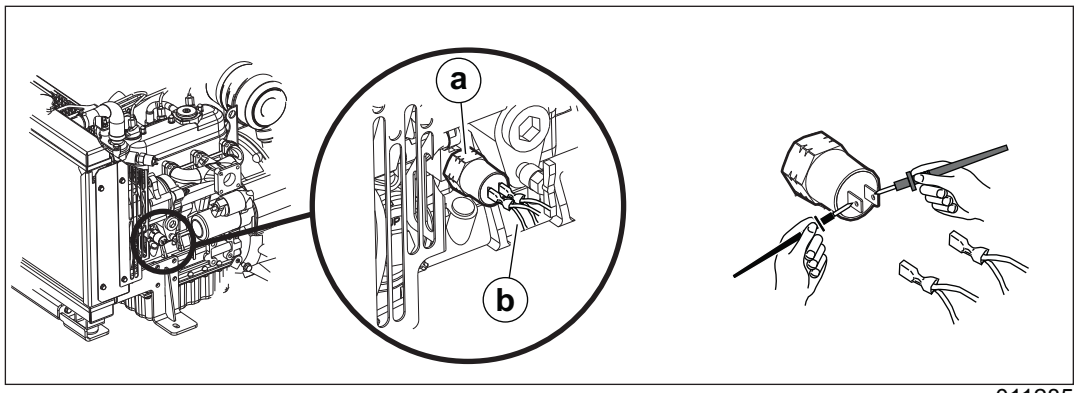
Background

The oil pressure switch is normally open. When the contacts are open (at startup or during a low-pressure condition), power does not reach the fuel solenoid, and the machine stops (or does not start). When the engine is running, oil pressure inside the engine closes the contacts of the oil pressure switch, the fuel solenoid is energized, and the engine runs.

Procedure

Perform the procedure below to check the oil pressure switch.

1. Locate the oil pressure switch **(a)**.



wc_gr011285

2. Disconnect the wiring **(b)**.
3. When the engine is cold, check for continuity across the terminals of the oil pressure switch.

Is there continuity across the terminals?

Yes ____	No ____
The oil pressure switch has failed. Replace the oil pressure switch.	Continue.

4. Remove the oil pressure switch and install an oil pressure gauge.
5. Start the engine and check the engine oil pressure.

Does the engine hold sufficient pressure?

Yes ____	No ____
The oil pressure switch has failed. Replace the oil pressure switch.	There is a problem within the engine. See the manufacturer's information.

Result

The oil pressure switch has now been checked.

11 Troubleshooting the Lights

11.1 Preparing for Diagnostic Procedures

Tools required

All procedures can be accomplished with the following tools:

- Multimeter (volt/ohm meter)
- General hand tools (ratchet set, screwdrivers, etc.)
- Diesel tachometer

Procedure sequence

Follow the sequence below to diagnose Light Tower lighting problems.

1. Perform the diagnostic procedures in this packet.
2. Fill in the information where requested.
3. Contact Wacker Neuson Service via fax or phone with the information gathered.

Before contacting Wacker Neuson

Complete the following information before contacting Wacker Service.

- Technician name: _____
- Company name: _____
- Phone: _____
- Machine serial number: _____ Hour meter: _____
- List the issue(s) you are having: _____

_____

_____

_____

_____

Before starting

Before starting the diagnostic procedures, complete the following tasks:

- Determine the internal resistance of your meter. To do so:
  1. Adjust your meter to read resistance (Ohms scale).
  2. Touch the meter's probes together and read the meter's display.
  Remember to subtract the internal value from all resistance readings you make while testing the machine.

11.2 Determining Where to Start

To determine where to start troubleshooting the lighting system:

1. Check the condition of the lamp (bulb).
2. Check engine rpm.
   See topic 11.3 *Checking Engine RPM*. Adjust the engine rpm as needed. This may be the only step required.
3. Check the voltage at the main terminal strip inside the control panel.
   See topic 11.4 *Checking Voltage at the Main Terminal Strip.* The voltage measured will determine the path for troubleshooting. Refer to the appropriate table below.

If 120V is measured:	See topic:	No.
1. Check the circuit breakers.	*Checking the Circuit Breakers*	11.5
2. Check the power to the ballast terminal strip.	*Checking Power to the Ballast Terminal Strip(s)*	11.6
3. Check the ballast transformer.	*Checking a Ballast Transformer*	11.7
4. Check outgoing voltage from the ballast capacitor.	*Checking a Ballast Capacitor*	11.8
5. Check the wiring to the light fixture.	*Checking the Wiring to the Light Fixture(s)*	11.9
6. Check the light fixture.	*Checking a Light Fixture*	11.10

If 120V is not measured:	See topic:	No.
1. Flash the generator.	*Restoring Rotor Magnetism (Flashing) / Checking Rotor Winding*	11.11
2. Check the excitation capacitor.	*Checking the Excitation Capacitor*	11.12
3. Check the stator windings and the excitation winding.	*Checking the Stator Windings*	11.13
4. Check the rotor diodes.	*Checking the Diodes (older)* *Checking the Diodes (newer)*	11.14 11.15
5. Check the rotor windings.	*Checking the Rotor Windings*	11.19

11.3 Checking Engine RPM

Requirements

- Clean air, fuel, and oil filters
- Diesel tachometer or multimeter with hertz capabilities

Procedure

Follow the procedure below to check the engine rpm.

1. Start the engine.
2. Use a diesel tachometer or multimeter to determine engine rpm. If necessary, adjust engine rpm (no load) to 60.0–62.0 Hz (1800–1860 rpm) for 60 Hz machines, and 50.0–52.0 Hz (1500–1575 rpm) for 50 Hz machines.
3. Stop the engine.

11.4 Checking Voltage at the Main Terminal Strip

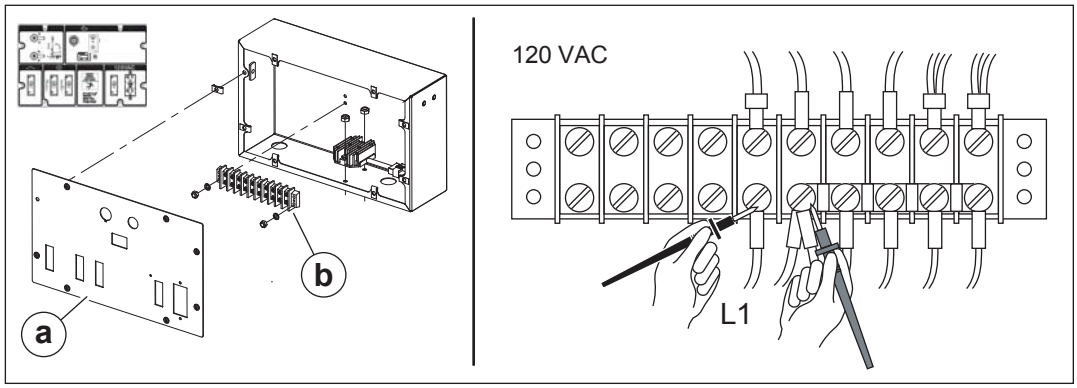
Requirements

- Engine must run at correct rpm
- Multimeter
- All circuit breakers in OFF position.

Procedure

Perform the procedure below to check voltage at the main terminal strip.

1. Begin this procedure with the engine stopped.
2. Open the control panel **(a)** and locate the main terminal strip **(b)**.



wc_gr010944

WARNING

Electric shock hazard. High voltage exists inside the control panel at main terminal strip and at the circuit breakers when the engine is running. High voltage can cause severe injury or death.

► Do not touch the main terminal strip or the circuit breakers when the engine is running.

► Wear appropriate arc flash protection equipment when doing this procedure.

3. Start the engine.
4. For machines with only 120V receptacles, continue with step 5. For machines with 120V and 240V receptacles, continue with step 6.
5. Measure the AC voltage between L1 and any neutral terminal of the main terminal strip. Is 110–130 VAC measured?

Yes ____	No ____	Your reading
The generator is functioning. Troubleshoot the circuitry to the lights. See topic *Checking the Main Circuit Breaker.*	If approximately 6.0–9.0 VAC is measured, flash the generator. See topic *Restoring Rotor Magnetism (Flashing) / Checking Rotor Winding.* If you measured 0 VAC, troubleshoot the generator. See topic *Checking the Excitation Capacitor.*	

This procedure continues on the next page.

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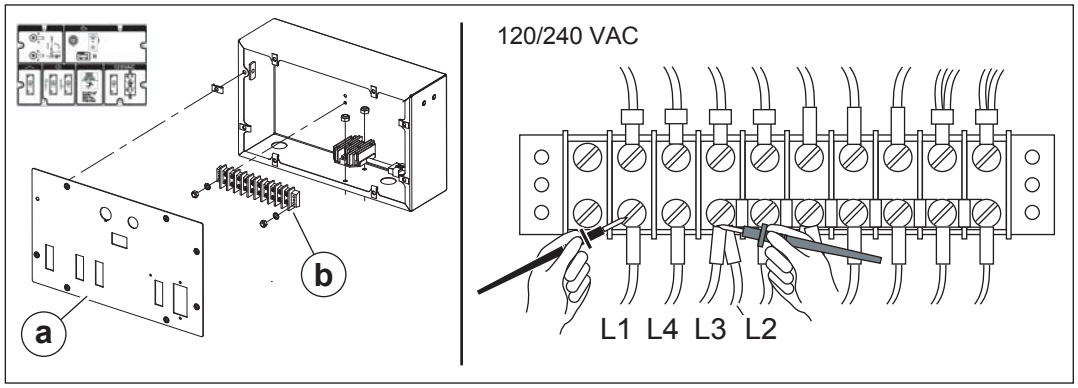
6. Measure the AC voltage between L1 and any neutral terminal of the main terminal strip. Also measure the AC voltage between L4 and any neutral terminal of the main terminal strip.



wc_gr010946

Is 110–130 VAC measured?

Yes ____	No ____	Your reading
The generator is functioning. Troubleshoot the circuitry to the lights. See topic *Checking the Main Circuit Breaker*.	If approximately 6.0–9.0 VAC is measured, flash the generator. See topic *Restoring Rotor Magnetism (Flashing) / Checking Rotor Winding.* If you measured 0 VAC, troubleshoot the generator. See topic *Checking the Excitation Capacitor*.	

11.5 Checking the Circuit Breakers

Requirements

- Power to main terminal strip is OK
- Multimeter

Procedure

Perform the procedure below to check the circuit breakers.

1. Begin this procedure with the engine stopped.
2. Open the control panel.
3. Check the wiring between the main terminal strip and the main circuit breaker. Also check the wiring between the main circuit breaker and the two light bank circuit breakers. Tighten the connections or repair the wiring as needed.

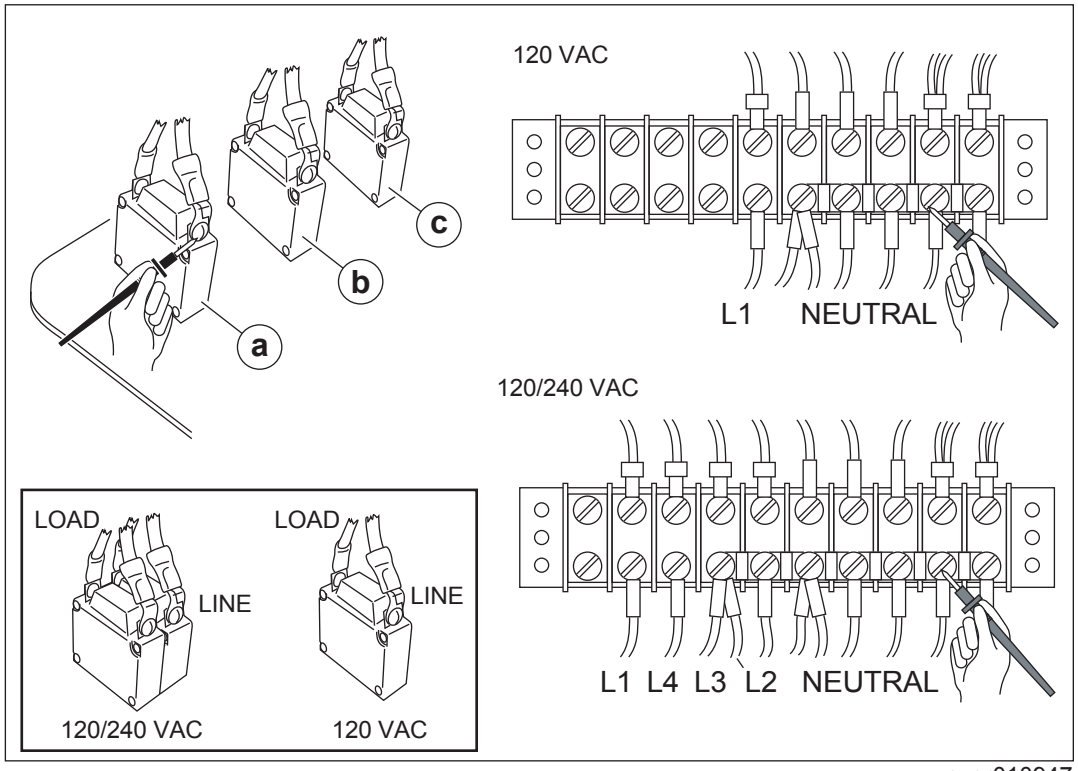
WARNING

Electric shock hazard. High voltage exists inside the control panel at the main terminal strip and at the circuit breakers when the engine is running. High voltage can cause severe injury or death.

► Do not touch the main terminal strip or the circuit breakers when the engine is running.

► Wear appropriate arc flash protection equipment when doing this procedure.

4. Start the engine.
5. Measure the AC voltage between the incoming side (line) of the main circuit breaker **(a)** and neutral (any neutral terminal of the main terminal strip).



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This procedure continues on the next page.

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Is 110–130 VAC measured?

Yes ____	No ____	Your reading
Continue.	The wiring to the main circuit breaker has failed. Stop the engine. Repair or replace the wiring.	

6. Set the main circuit breaker to the ON position.
7. Measure the AC voltage between the outgoing side (line) of the main circuit breaker **(a)** and neutral (any neutral terminal of the main terminal strip).

Is 110–130 VAC measured?

Yes ____	No ____	Your reading
Continue.	The main circuit breaker has failed. Stop the engine. Repair or replace the wiring.	

8. Measure the AC voltage between the incoming side (line) of each light bank circuit breaker **(b** and **c)** and neutral (any neutral terminal of the main terminal strip).

Is 110–130 VAC measured?

Yes ____	No ____	Your reading
Continue.	The wiring to the circuit breaker has failed. Stop the engine. Repair or replace the wiring.	

9. Set the light bank circuit breakers to the ON position.
10. Measure the AC voltage between the outgoing side (load) of each light bank circuit breaker **(b** and **c)** and neutral (any neutral terminal of the main terminal strip).

Is 110–130 VAC measured?

Yes ____	No ____	Your reading
The circuit breakers are OK.	The light bank circuit breaker has failed. Stop the engine. Repair or replace the wiring.	

Result

The circuit breakers have now been checked.
If the problem has not been resolved, continue with the next topic.

11.6 Checking Power to the Ballast Terminal Strip(s)

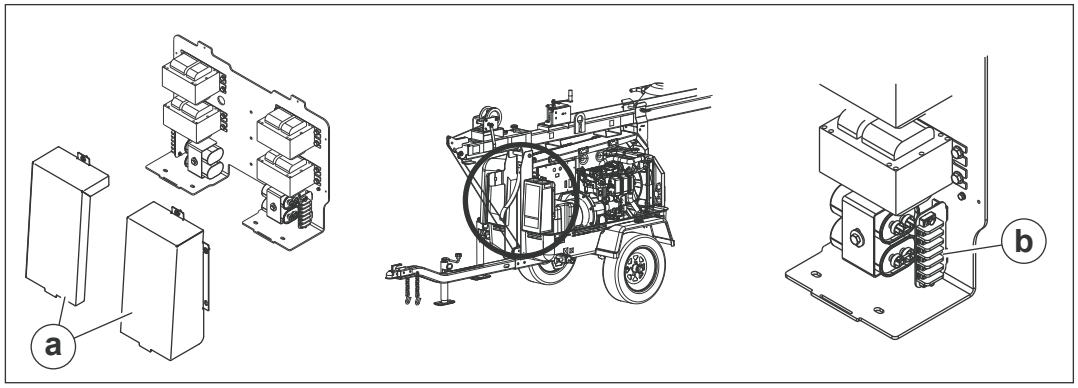
Requirements

- All circuit breakers OK
- Multimeter

Procedure

Perform the procedure below to check power to the ballast terminal strip(s).

1. Begin this procedure with the engine stopped.
2. Remove the covers **(a)** from the machine to access the ballast terminal strip(s) **(b)**.



wc_gr011215

3. Check the wiring between the ballast terminal strip(s) and its corresponding circuit breaker. Reconnect or repair the wiring as needed.

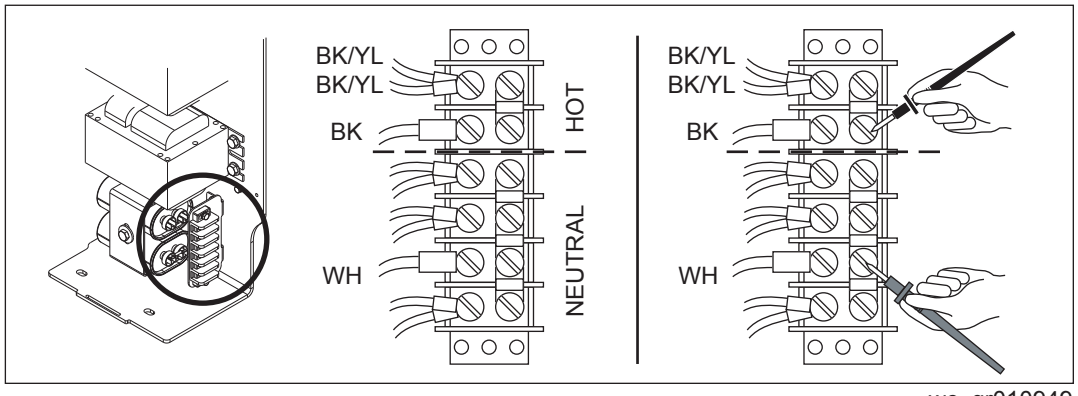
WARNING

Electric shock hazard. High voltage exists under at the capacitors and ballast terminal strip(s) when the engine is running. High voltage can cause severe injury or death.

► Do not touch the ballast terminal strip(s) or capacitors when the engine is running.

► Wear appropriate arc flash protection equipment when doing this procedure.

4. Start the engine.
5. Set the main and light bank circuit breakers to the ON position.
6. Measure the AC voltage between the black wire and the white wire.



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Is at least 108 VAC measured?

Yes ____	No ____	Your reading
Continue.	Stop the engine and repair or replace the white wire and/or the black wire.	

7. Measure the AC voltage between the black wire and each wire connected to the NEUTRAL side of the ballast terminal strip(s).

Is at least 108 VAC measured in each case?

Yes ____	No ____	Your reading
Power is reaching the ballast terminal strip(s).	Stop the engine and repair the neutral wires between the ballast terminal strip(s) and the main terminal strip.	

8. Measure the AC voltage between the terminal where the two black/yellow wires are connected and any wire connected to the NEUTRAL side of the ballast terminal strip(s).

Is at least 108 VAC measured?

Yes ____	No ____	Your reading
Power is being sent to the ballast transformers.	Stop the engine and repair the jumper between the hot terminals.	

Result

Power to the ballast terminal strips has now been checked.
If the problem has not been resolved, continue with the next topic.

11.7 Checking a Ballast Transformer

Requirements

- All circuit breakers are OK
- Multimeter

Background

The output voltage of the ballast transformer is proportional to the input. The generator supplies the ballast transformer with 120 VAC ±10%. Thus, the range of voltage supplied by the generator to the ballast transformer is: 108–132 VAC. On functioning transformers, this input range of voltage yields the output range of 380–517 VAC.

Procedure

Perform the procedure below to check the function of a ballast transformer.

1. Begin this procedure with the engine stopped.

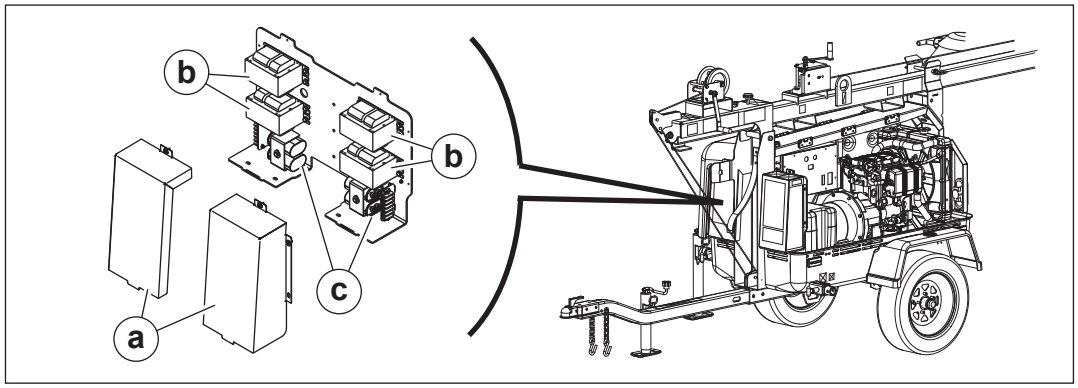
WARNING

Electric shock hazard. High voltage exists under the covers at the ballast transformers, ballast capacitors, and short terminal strip(s) when the engine is running. High voltage can cause severe injury or death.

► Do not touch the ballast transformers, short terminal strip(s), or the ballast capacitors when the engine is running.

► Wear appropriate arc flash protection equipment when doing this procedure.

2. Remove the covers **(a)** from the machine to access the ballast transformers **(b)** and the ballast capacitors **(c)**.



wc_gr010953

3. Check the condition of the wiring from the ballast transformers to the short terminal strip(s). Repair the wiring as necessary.
4. Check the connections and condition of the wiring between the ballast transformers and the ballast capacitors. Repair the wiring as necessary.

This procedure continues on the next page.

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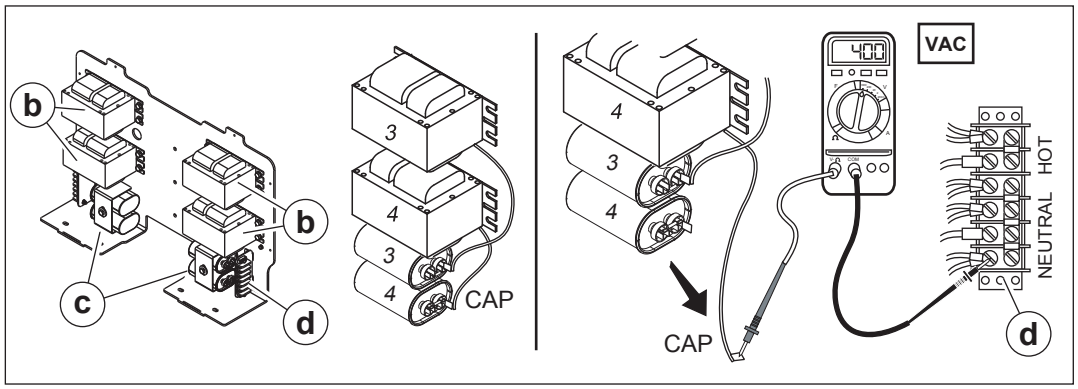
5. Disconnect the transformer **(b)** from the ballast capacitor **(c)**. This is the wire marked “CAP”.



wc_gr010956

6. Position the “CAP” wire away from the machine. Connect the red lead of a multimeter to the “CAP” wire. Connect the black lead of the multimeter to any of the neutral terminals on the short terminal strip **(d)**.
7. Start the engine.
8. Set the main circuit breaker to the ON position.
9. Set the light bank circuit breakers to the ON position.
10. Read the AC voltage on the multimeter.

Is 370–410 VAC displayed?

Yes ____	No ____	Your reading
The ballast transformer is functioning. Stop the engine.	The “CAP” wire of the ballast transformer has failed. Or, the ballast transformer has failed. Stop the engine and repair or replace the “CAP” wire or the ballast transformer.	

Result

The ballast transformer has now been checked. Repeat the test for any other ballast transformer in question.
If the problem has not been resolved, continue with the next topic.

11.8 Checking a Ballast Capacitor

Requirements

- Ballast transformer checks OK
- Jumper wire and multimeter

Procedure

Perform the procedure below to check the function of the ballast capacitor.

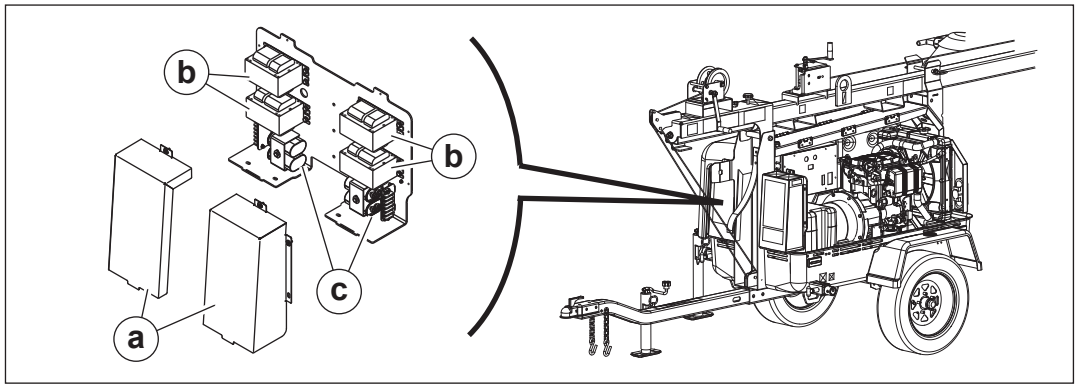
1. Begin this procedure with the engine stopped.

WARNING
Electric shock hazard. High voltage exists at the ballast transformers, ballast capacitors, and the short terminal strip(s) when the engine is running. High voltage can cause severe injury or death.

► Do not touch the ballast transformers, the ballast capacitors, or the short terminal strip(s) when the engine is running.

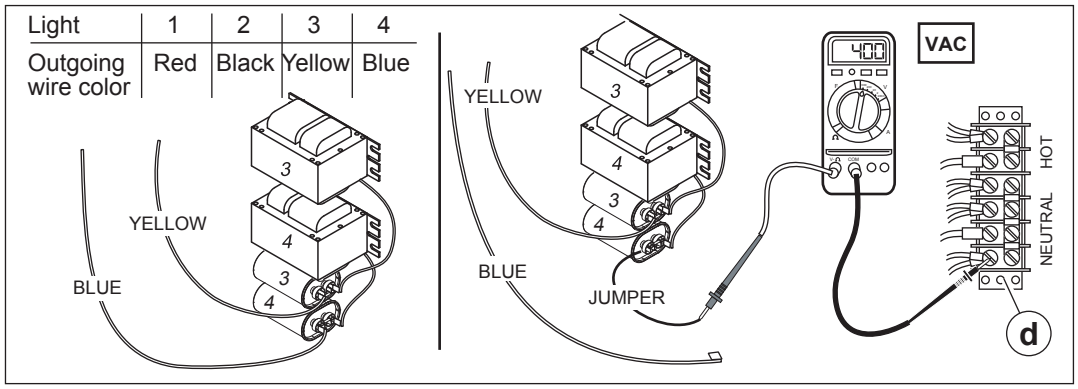
► Wear appropriate arc flash protection equipment when performing this procedure.

2. Remove the covers **(a)** from the machine to access the ballast transformers **(b)** and the ballast capacitors **(c)**.



wc_gr010953

3. Disconnect the wire from the outgoing terminal of the ballast capacitor (of the light in question.). Note that a wire with a unique color runs to each light: red to light 1; black to light 2; yellow to light 3; and blue to light 4.



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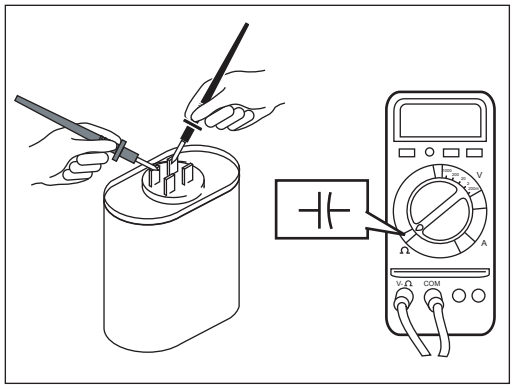
4. Using a jumper wire, connect the red lead of a multimeter to the outgoing side of the ballast capacitor. Connect the black lead of the multimeter to any of the neutral terminals on the short terminal strip **(d)**.Start the engine.
5. Set the main circuit breaker and the circuit breaker of the light in question to the ON position.
6. Read the AC voltage on the multimeter.

Is 380–517 VAC displayed?

Yes ____	No ____	Your reading
Continue.	The ballast capacitor has failed. Shut down the engine. Replace the ballast capacitor.	

7. Set the circuit breaker of the light in question to the OFF position.
8. Check each capacitor in the same manner.
9. To confirm a malfunctioning capacitor. Disconnect it and measure its capacitance. A functioning capacitor will measure:
   - 24±0.8 µF (micro Farads) for 60 Hz Light Towers
   - 30±1.0µF (micro Farads) for 50 Hz Light Towers



wc_gr010988

10.Reassemble the machine when finished.

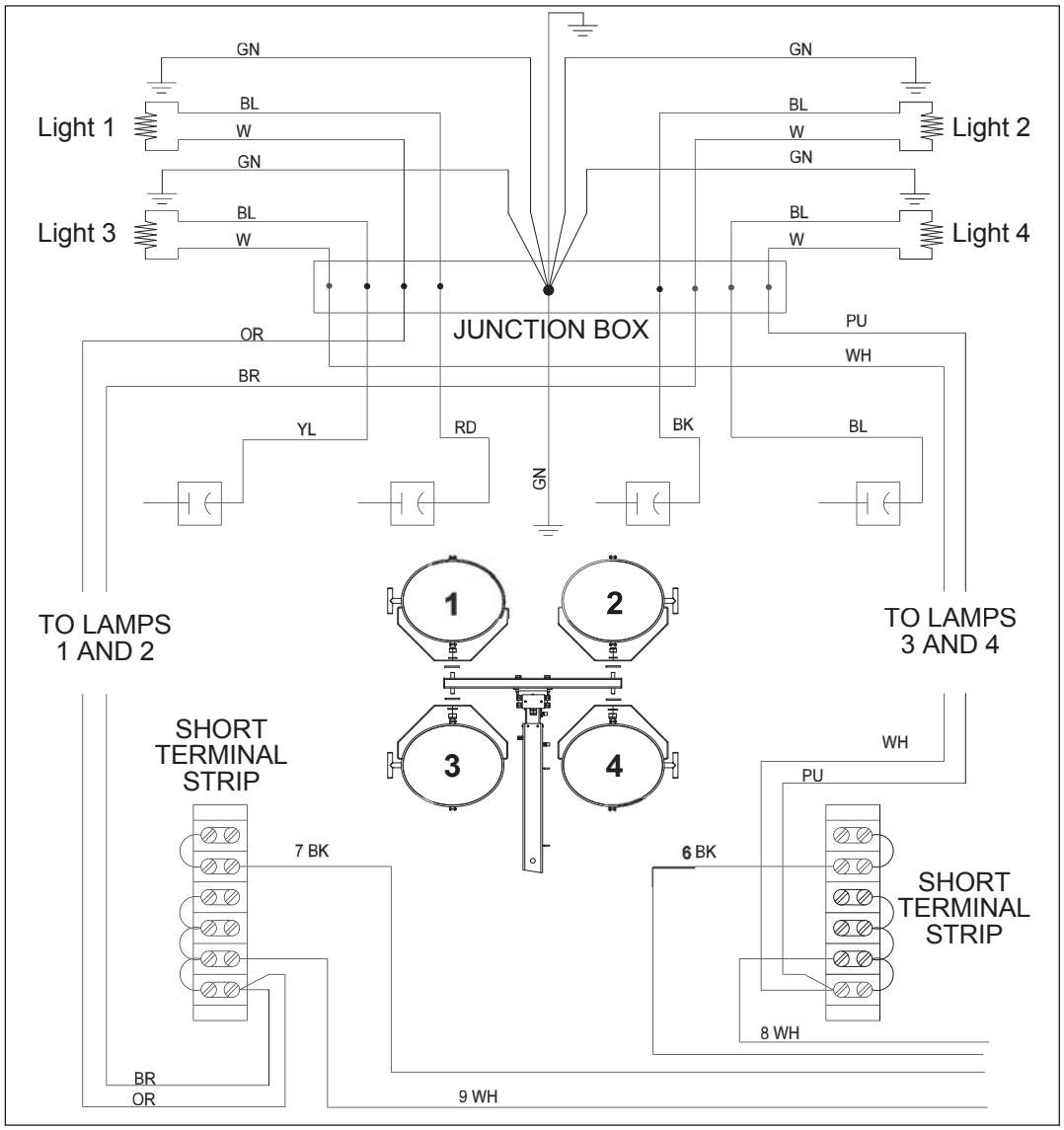
Result The ballast capacitors have now been checked. If the problem has not been resolved, continue with the next topic.

11.9 Checking the Wiring to the Light Fixture(s)

Requirements

- Engine stopped
- Multimeter
- Ballast capacitors check OK

Reference graphic



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Procedure

Perform the procedure below to check the wiring to the light fixture(s).

This procedure continues on the next page.

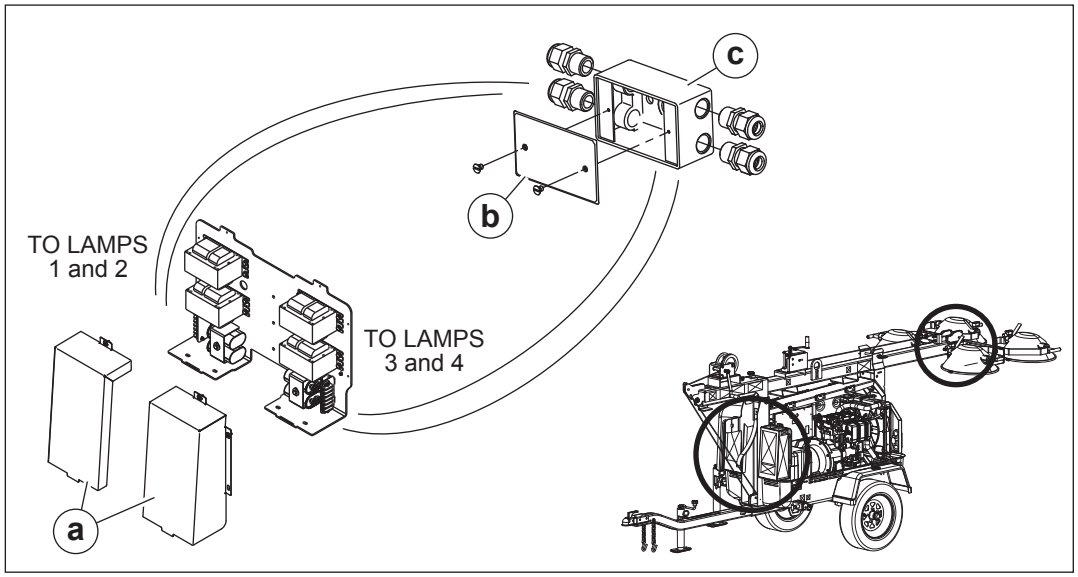
Continued from the previous page.

1. Begin this procedure with the engine stopped.

WARNING
Electric shock hazard. The wiring to the light fixtures carries high voltage when the engine is running. High voltage can cause severe injury or death.

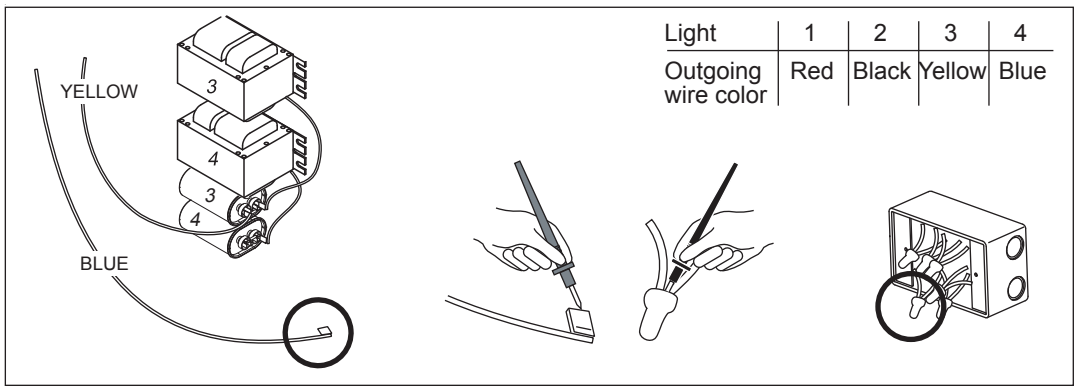
► Stop the engine before performing this procedure.

2. Remove the covers **(a)** from the machine to access the ballast capacitors.



wc_gr010979

3. Remove the cover **(b)** from the junction box **(c)**.
4. Disconnect the wires of the light in question from both its ballast capacitor and the short terminal strip.



wc_gr010994

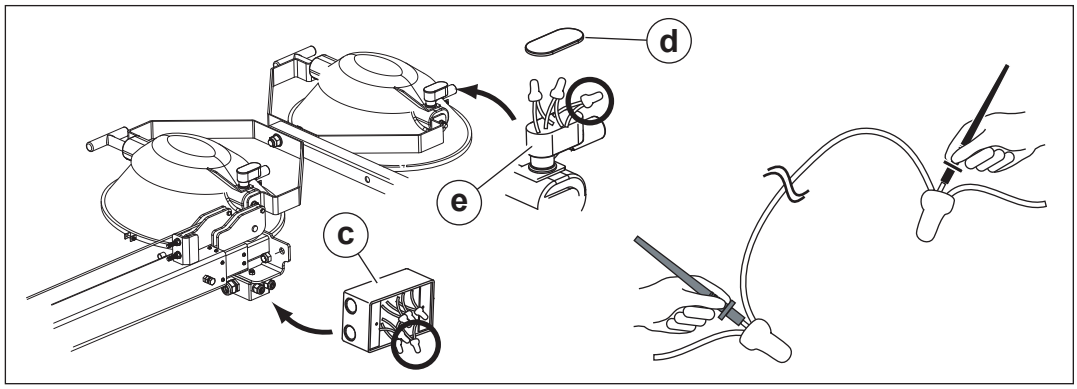
5. Check the continuity of the hot wire (red, black, yellow, or blue) that runs between the junction box **(c)** and the capacitor. Do so by probing the wires at the connectors; do not disconnect or cut the wires.
6. Check the continuity of the neutral wire that runs between the junction box and the short terminal strip.

This procedure continues on the next page.

Do the wires have continuity?

Yes ____	No ____
Continue.	The wires have failed. Repair or replace the wires.

7. Remove the cover **(d)** of the terminal box **(e)** of the light in question.



wc_gr010997

8. Check the continuity of the black hot wire that runs between the junction box **(c)** and the terminal box of the light. Do so by probing the wires at the connectors; do not disconnect or cut the wires.

Do the wires have continuity?

Yes ____	No ____
The wires are OK. Problems with the light are in the fixture or the lamp.	The wires have failed. Repair or replace the wires.

Result

The wiring to the light fixtures has now been checked.

If the problem has been resolved, reassemble the machine.

If the problem has not been resolved, leave the machine terminal box disassembled and continue with the next topic.

11.10 Checking a Light Fixture

Requirements

- Engine stopped
- Multimeter
- Wiring to light fixture has been checked

Procedure

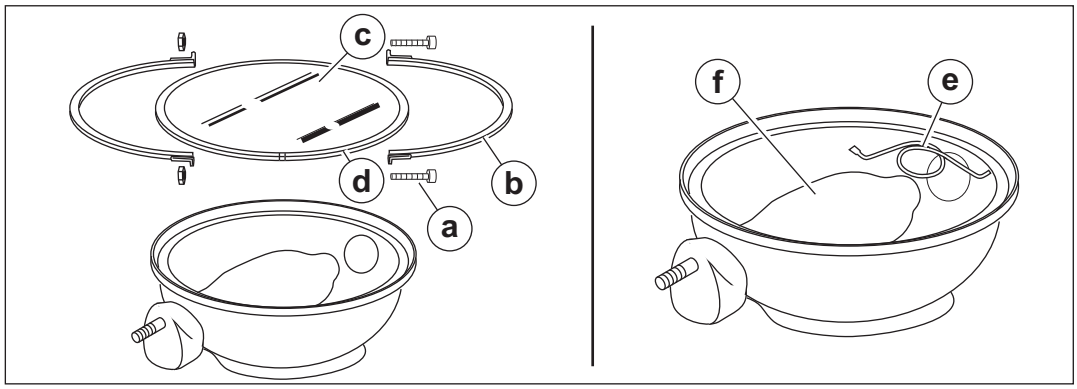
Perform the procedure below to check a light fixture.

1. Perform this procedure with the engine stopped.

WARNING
Electric shock hazard. High voltage is present at the fixture when the engine is running. High voltage can cause severe injury or death.

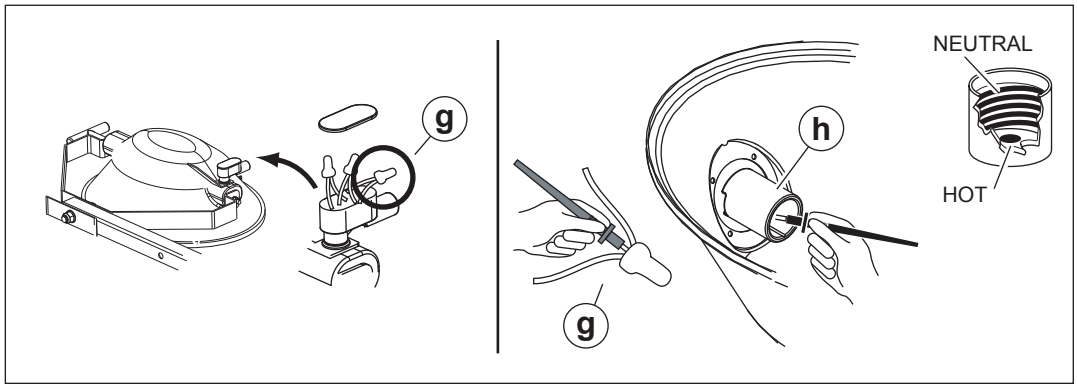
► Stop the engine before performing this procedure.

2. Disassemble the light fixture. To do so:
   a. Remove the screws **(a)** that hold the flange rings **(b)** and remove the flange rings.



wc_gr005881

   b. Remove the lens **(c)** with the gasket **(d)** attached.
   c. Remove the fasteners that hold one side of the lamp stabilizer **(e)**. Then, move the lamp stabilizer to the side to access the lamp.
   d. Unscrew the lamp **(f)** from the fixture.
3. Test the continuity of the wires **(g)** between the fixture **(h)** and the fixture terminal box.



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This procedure continues on the next page.

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Is there continuity in all cases?

Yes ____	No ____
The fixture is functioning.	The fixture has failed. Replace it.

4. Reassemble the machine.

Result The light fixture has now been checked.

11.11 Restoring Rotor Magnetism (Flashing) / Checking Rotor Winding

Requirements

- Source of 12 VDC or 9 VDC
- Two 14-gauge jumper cables

Background

If you measured less than 10 VAC at the main circuit breaker, the generator may have lost its residual magnetism. Try restoring the magnetism (flashing) to the generator before conducting in-depth tests. Flashing the generator serves three purposes: 1) it restores rotor magnetism; 2) it confirms a working rotor (diodes and windings); and 3) it can reveal a bad excitation capacitor. By flashing the generator with a known DC voltage, a predictable output voltage is produced. For example, using a 12V battery produces an output voltage of 20–30 VAC per winding; using a 9V battery produces 8–11 VAC per winding. Flash the generator before disassembling it.

Procedure

Perform the procedure below to flash the generator.

1. Begin this procedure with the engine stopped.

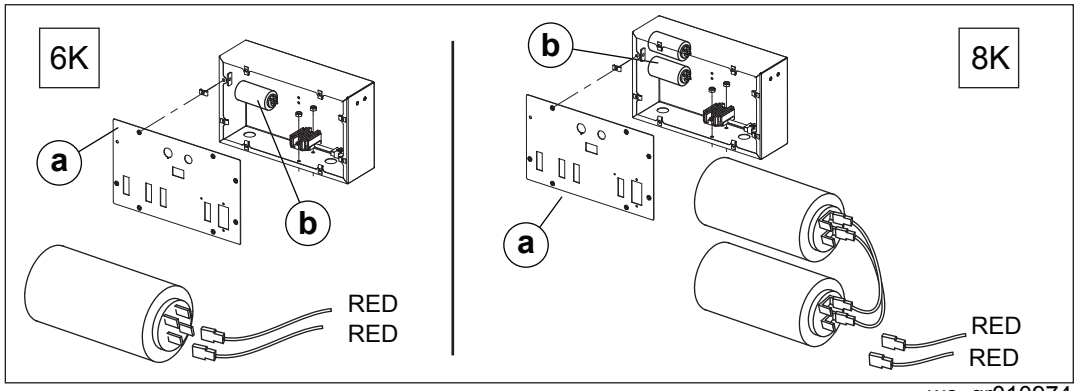
WARNING

Electric shock hazard. High voltage exists inside the control panel at the long terminal strip and at the circuit breakers when the engine is running. High voltage can cause severe injury or death.

► Do not touch the long terminal strip or the circuit breakers when the engine is running.

► Wear appropriate arc flash protection equipment when doing this procedure.

2. Open the control panel **(a)** and locate the excitation capacitor **(b)**.



wc_gr010974

3. Disconnect the red wires from the excitation capacitor.

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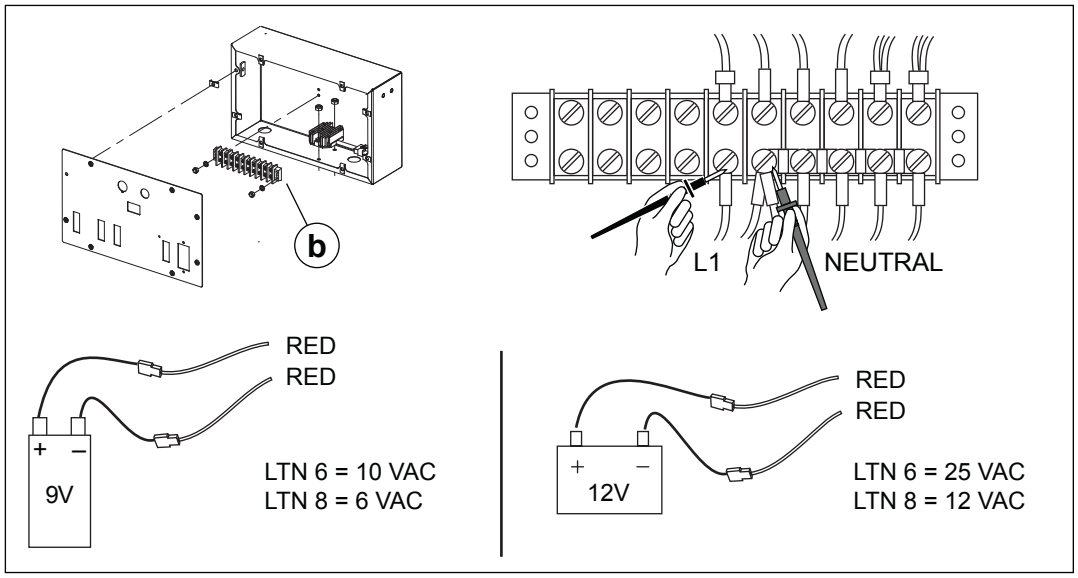
WARNING
Explosion hazard. Batteries can emit explosive hydrogen gas.
► Keep all sparks and flames away from the battery.

4. Using 14-gauge or larger wire, connect two jumper wires to a battery, one to each terminal. Once connected to the battery, do not allow the two jumpers to touch each other.
5. Start the engine.
6. Connect the jumper wires to the red wires—connect either jumper wire to either red wire. This is a non-polar connection.
7. Measure the AC voltage between L1 and any neutral terminal of the main terminal strip.



wc_gr010962

Is 8-11 VAC measured when using a 9V battery, or 20–30 VAC when using a 12V? (On LTN 8: 5–7 VAC using 9V battery; 11–13 VAC using a 12V battery)

Yes ____	No ____	Your reading
The generator is functioning. Stop the engine. Disconnect the jumpers, first at the capacitor wires, then at the battery. Reconnect the excitation capacitor and retry operation. If it still doesn't function, check the excitation capacitor. See topic *Checking the Excitation Capacitor.*	Stop the engine and continue troubleshooting. See topic *Checking Stator Windings*.	

Result The generator has now been flashed and the rotor winding checked.

11.12 Checking the Excitation Capacitor

Requirements

- Engine stopped
- Control panel open

Procedure

Perform the procedure below to check the excitation capacitor.

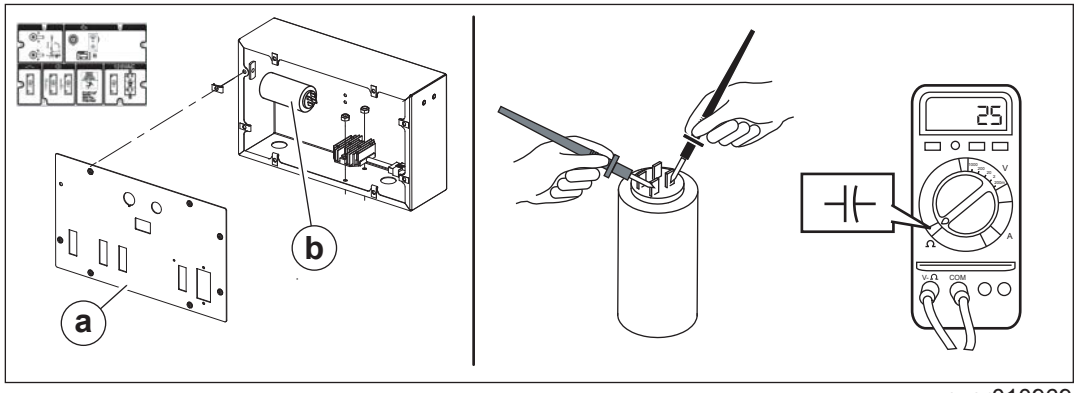
1. Perform this procedure with the engine stopped.

WARNING
Electric shock hazard. High voltage exists inside the control panel at the main terminal strip and at the circuit breakers when the engine is running. High voltage can cause severe injury or death.

► Do not touch the main terminal strip or the circuit breakers when the engine is running.

► Stop the engine before performing this procedure.

2. Remove the control panel cover **(a)**.



wc_gr010969

3. Remove the red wires from the excitation capacitor **(b)**. Then, discharge it by placing the blade of an insulated screwdriver across the terminals of the capacitor.
4. Using a multimeter set to the Farad (F) or capacitance scale, measure the capacitor's capacitance.

Does the excitation capacitor measure 25±1.3 µF (micro Farads)?

Yes ____	No ____	Your reading
The excitation capacitor is OK.	The excitation capacitor has failed. Replace it.	

Result

The excitation capacitor has now been checked.

If the problem has not been resolved, continue with the next topic.

11.13 Checking the Stator Windings

Requirements

- Control panel open
- Multimeter

Procedure

Perform the procedure below to check the stator windings.

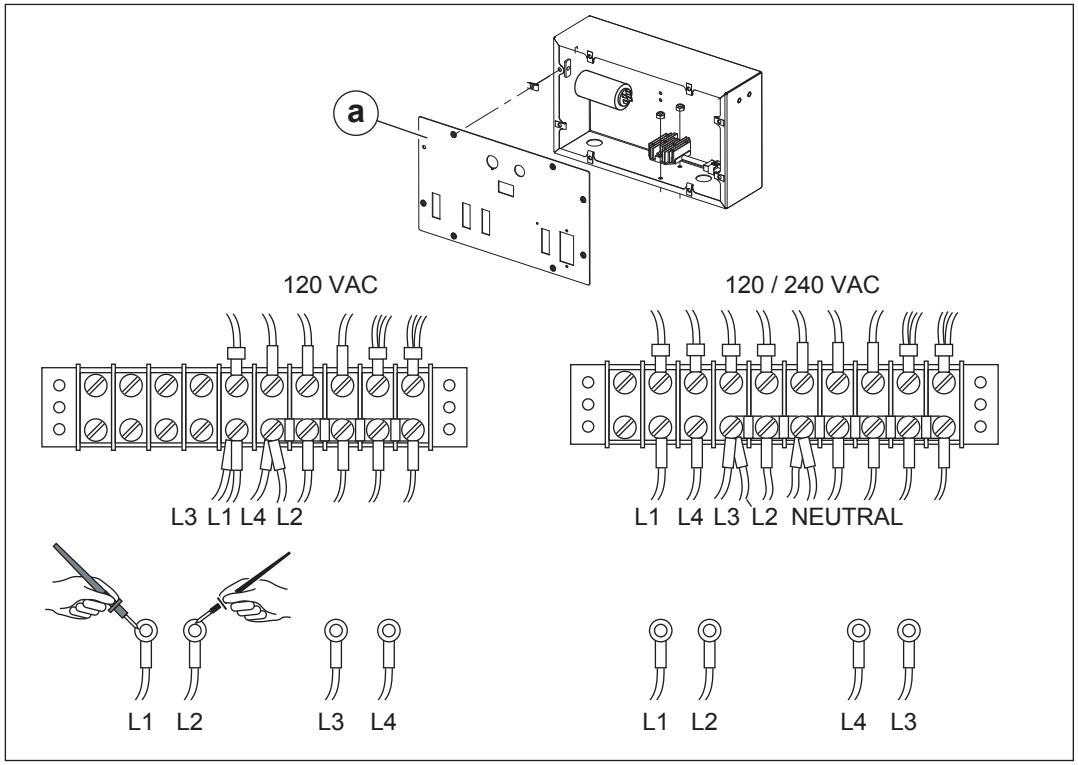
1. Perform this procedure with the engine stopped.

WARNING
Electric shock hazard. High voltage exists inside the control panel at the main terminal strip and at the circuit breakers when the engine is running. High voltage can cause severe injury or death.

► Do not touch the main terminal strip or the circuit breakers when the engine is running.

► Stop the engine before performing this procedure.

2. Remove the control panel cover **(a)**.



wc_gr010971

3. Remove the four generator wires L1, L2, L3, and L4 from the main terminal strip.

This procedure continues on the next page.

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4. Check the internal resistance of your meter by touching the meter's probes together. Subtract this value from the values you measure in upcoming steps.
5. Measure the resistance across L1 and L2; then across L3 and L4.

Is approximately 0.36±0.5 ohms measured in each case?

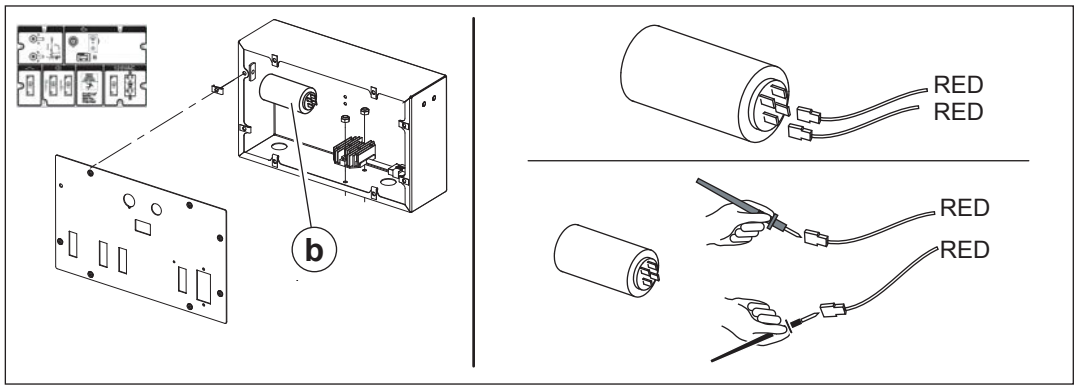
Yes ____	No ____	Your reading
Continue.	The stator windings have failed. Replace the stator.	

6. Check the continuity to ground between each wire and the neutral terminals of the main terminal strip.

Is there continuity in any case?

Yes ____	No ____	Your reading
The stator windings have failed. Replace the stator.	Continue.	

7. Disconnect the two red wires from the generator capacitor **(b)**.



wc_gr010973

8. Measure the resistance across the two red wires.

Is approximately 2.0±0.5 ohms measured?

Yes ____	No ____	Your reading
Continue.	The stator windings have failed. Replace the stator.	

9. Check the continuity to ground between each red wire and the neutral terminals of the main terminal strip.

Is there continuity in any case?

Yes ____	No ____	Your reading
The stator windings have failed. Replace the stator.	The stator windings have are OK.	

10. Reconnect the stator windings.

Result The stator windings have now been checked.

11.14 Removing the Stator

Requirements

- Engine stopped and cool
- Fuel tank and control panel removed
- Small scissors jack or equivalent

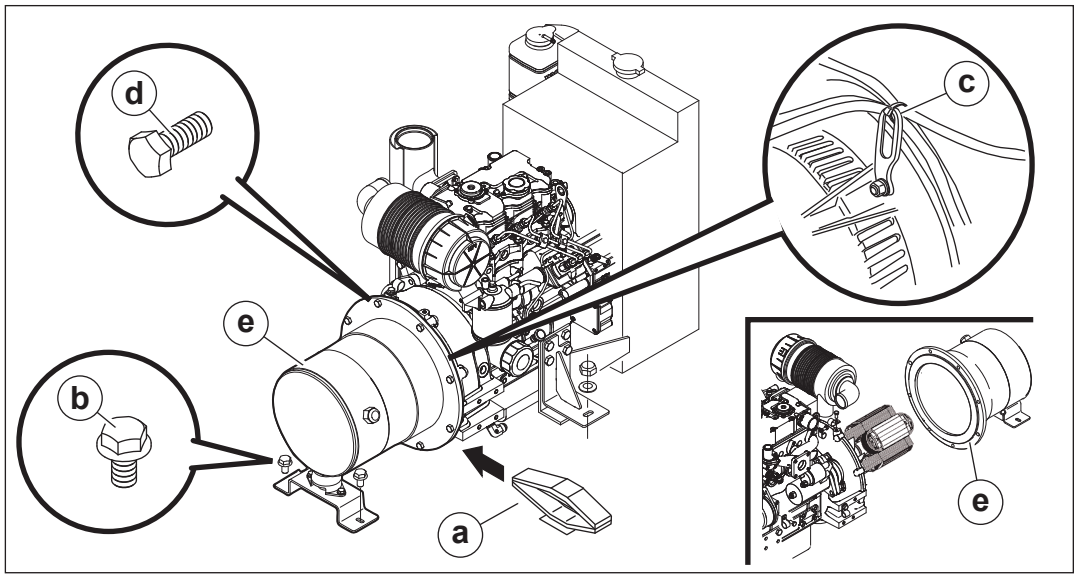
Background

The stator is part of the outer housing of the generator. The rotor sits inside the stator. The rotor is connected directly to the engine. When the stator is removed, the rotor is exposed and becomes accessible for testing.

Procedure

Perform the procedure below to remove the stator.

1. Remove the fuel tank.
2. Remove the control panel from its mounting bracket. Do not disconnect its wiring from the generator.
3. Support the engine, near the generator, with a scissors jack **(a)** or equivalent.



wc_gr011050

4. Remove the screws **(b)** that hold the generator support bracket to the machine.
5. Remove the lifting eye **(c)** with the wires and harnesses still attached to it.
6. Remove the screws **(d)** that hold the generator to the engine.
7. Using pry bars or flat head screw drivers, pry the stator **(e)** from the engine's bell housing. Then, slide the stator off of the rotor. Set it aside inside the machine frame so that the rotor is accessible.

Note: *The stator will still be connected to the control panel. The rotor is now accessible. If you need to completely remove the stator, continue with step 8.*

Note: *Additional support for the rotor may be necessary after the stator has been removed.*

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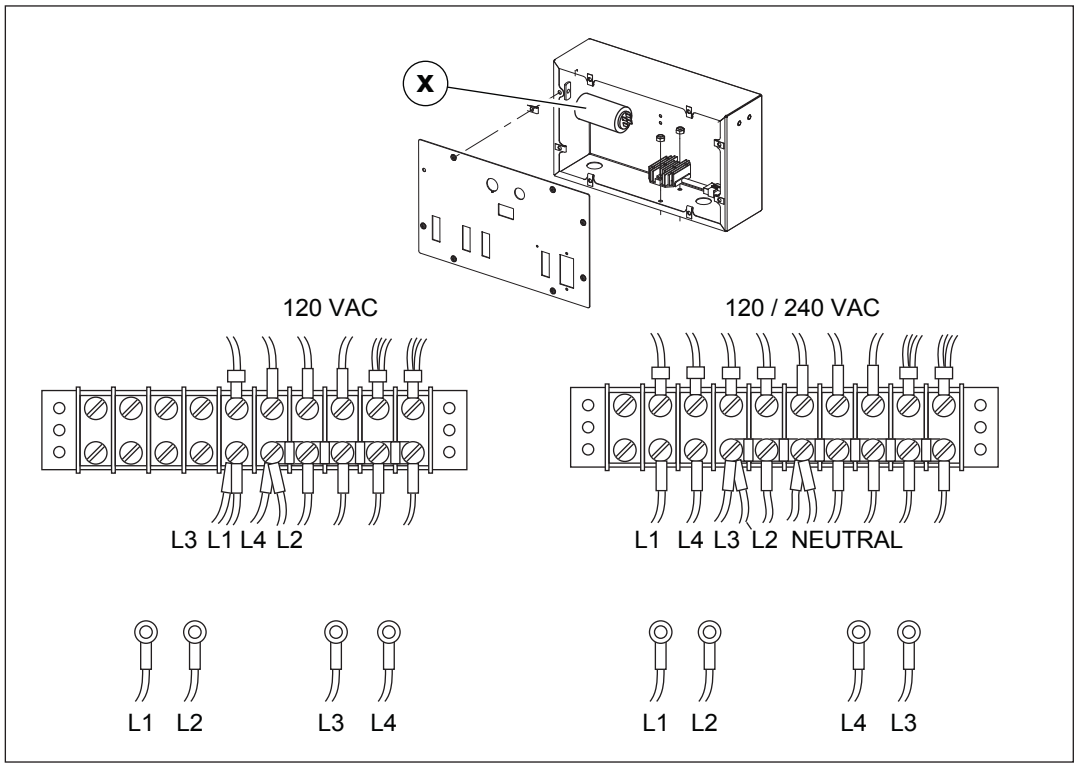
8. Disconnect the stator wires running to the excitation capacitor **(x)**.



wc_gr011121

9. Disconnect the stator winding wires from the main terminal strip.
10. Pull the wiring from the control panel.

Result The procedure to remove the stator is now complete.

11.15 Checking the Diodes (older)

Requirements
- Stator removed
- Multimeter

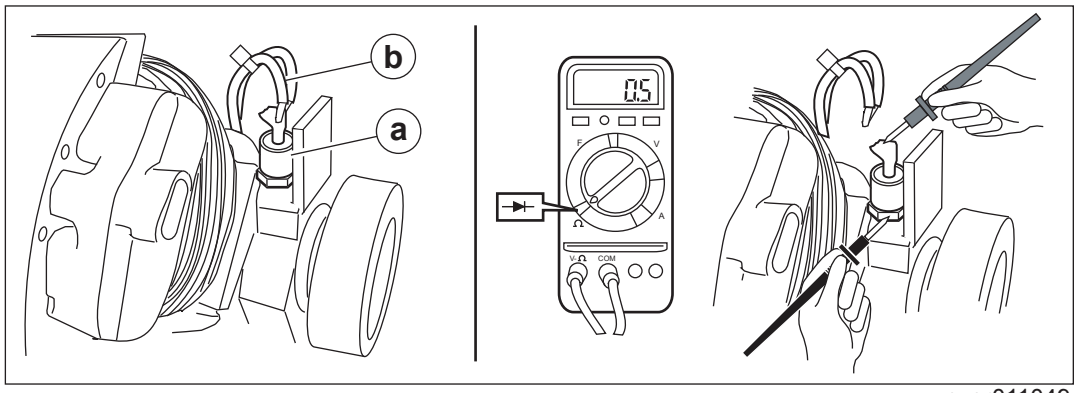
Background

There are two diodes on the rotor assembly. The stator must be removed from the rotor in order to check the function of the diodes. When checking, be sure to check both diodes.

Procedure

Perform the procedure below to check the diodes.

1. Remove the stator.
2. Locate the diodes **(a)** on the end of the rotor.



wc_gr011049

3. Unsolder the two wires **(b)** from the terminal end of each diode.
4. Using the diode setting on the multimeter, check the diodes. To do so, place the multimeter's black probe on the base of the diode and the red probe on the terminal end of the diode; there should be between 0.4–0.5 VDC measured. Reverse the multimeter probes and measure again. This reading should be open.

Do the diodes perform as stated above?

Yes ____	No ____
The diodes are functioning. Solder the wires back onto the diodes.	The diodes are not functioning. Replace both diodes.

Result

The diodes have now been checked.

Leave the diodes disconnected and check the rotor windings before soldering the wires back on. See topic *Checking the Rotor Windings*.

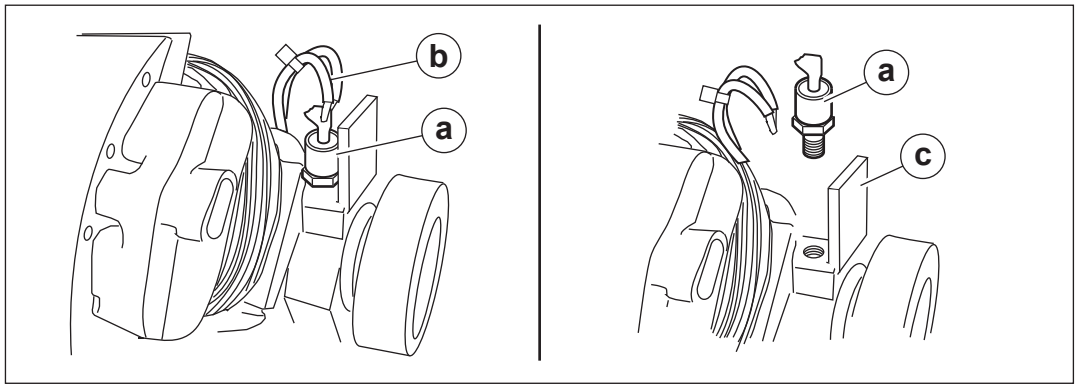
11.16 Replacing a Diode (older)

Requirements
- Stator removed
- Solder, flux, and soldering iron

Background
There are two diodes on the rotor assembly. The stator must be removed from the rotor in order to remove the diodes. If one diode is bad, replace both diodes.

Procedure
Perform the procedure below to replace a diode.

1. Remove the stator.
2. Locate the diodes **(a)** on the end of the rotor.



wc_gr011045

3. Unsolder the two wires **(b)** from the terminal end of each diode.
4. Unscrew the diode **(c)** from the rotor.

Note: *The heat sink* **(d)** *may need to be bent slightly in order to remove and install the diode. If you do so, be sure to bend it back to its original position.*

5. Screw the new diode into the rotor.
6. Solder the wires to the diode.
7. Replace the other diode in the same manner.

Result
The diodes have now been replaced.

11.17 Checking the Diodes (newer)

Requirements
- Stator removed
- Multimeter

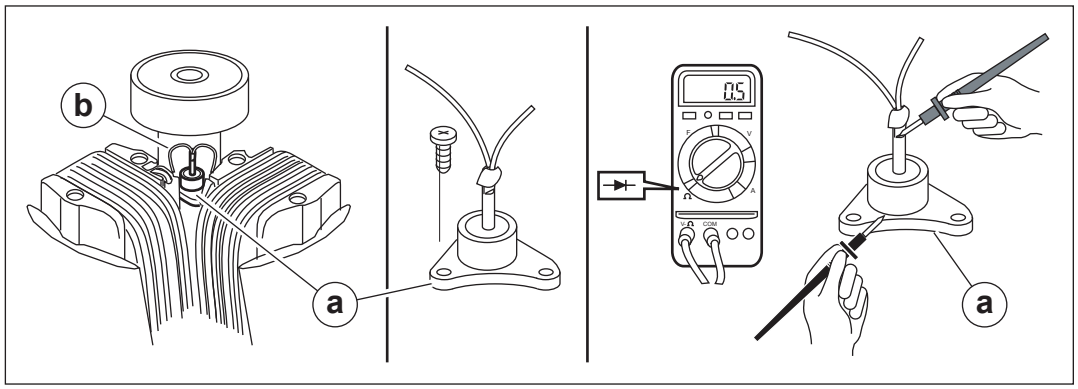
Background

There are two diodes on the rotor assembly. The stator must be removed from the rotor in order to check the function of the diodes. When checking, be sure to check both diodes.

Procedure

Perform the procedure below to check the diodes.

1. Remove the stator.
2. Locate the diodes **(a)** on the end of the rotor.



wc_gr011046

3. Remove the screws that hold the diode to the rotor.

Note: *Do not unsolder the wires from the diode.*

4. Using the diode setting on the multimeter, check the diodes. To do so, place the multimeter's black probe on the base of the diode and the red probe on the terminal end of the diode; there should be between 0.4–0.5 VDC measured. Reverse the multimeter probes and measure again. This reading should be open.

Do the diodes perform as stated above?

Yes ____	No ____
The diodes are functioning. Solder the wires back onto the diodes.	The diodes are not functioning. Replace both diodes.

Result

The diodes have now been checked.

Check the rotor windings before soldering the wires back on. See topic *Checking the Rotor Windings*.

11.18 Replacing a Diode (newer)

Requirements

- Stator removed
- Solder, flux, and soldering iron

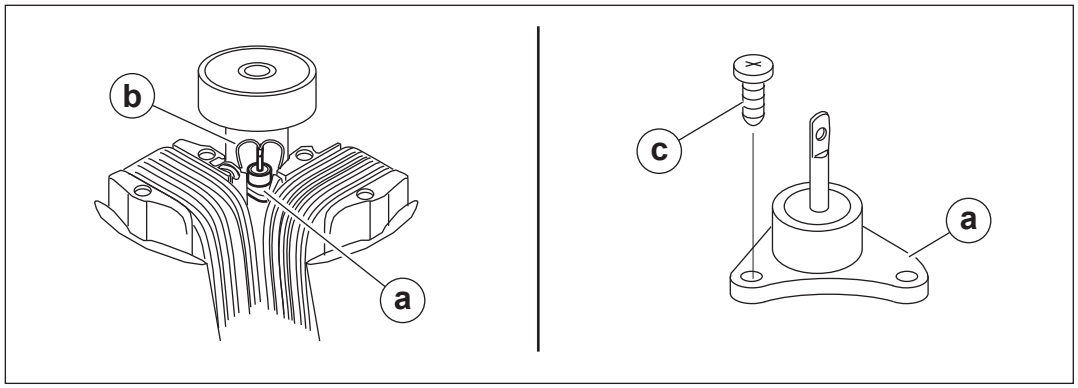
Background

There are two diodes on the rotor assembly. The stator must be removed from the rotor in order to remove the diodes. If one diode is bad, replace both didoes.

Procedure

Perform the procedure below to replace a diode.

1. Remove the stator.
2. Locate the diodes **(a)** on the end of the rotor.



wc_gr011047

3. Unsolder the two wires **(b)** from the terminal end of each diode.
4. Remove the screws **(c)** that hold the diode.
5. Mount the new diode into the rotor.
6. Solder the wires to the diode.
7. Replace the other diode in the same manner.

Result

The diodes have now been replaced.

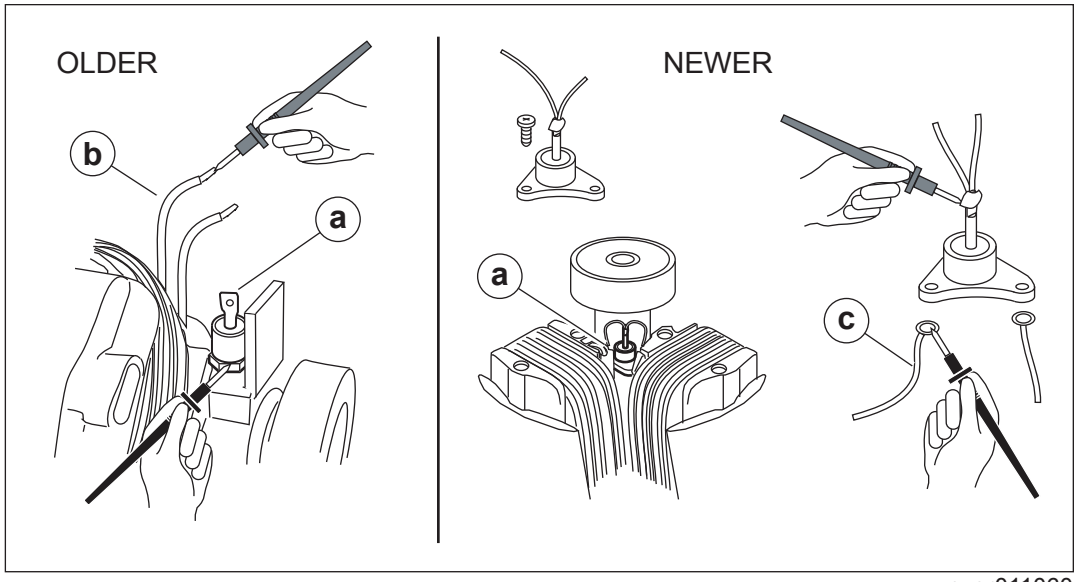
11.19 Checking the Rotor Windings

Requirements
- Stator removed
- Diodes disconnected

Background There are four windings in the rotor. Two windings are connected to each diode.

Procedure Perform the procedure below to check the rotor windings.

1. Remove the stator.
2. Locate the diodes **(a)** on the end of the rotor.



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3. Disconnect the diodes. To do so:
   On older machines, unsolder the two wires **(b)** from the terminal end of each diode.
   On newer machines, remove the screws the hold the diode and remove the diode from the rotor—keep the wires soldered to the diode.
4. Measure the resistance of each winding. To do so:
   On older machines, measure between each wire and the base of the diode.
   On newer machines, measure between each wire with the ring terminal **(c)** and the terminal end of the diode.

Is 2.0 ± 1 ohms measured in each case?

Yes ____	No ____	Your reading
The rotor windings are OK.	The rotor has failed. Replace it.	

Result The rotor windings have now been checked.

12 Troubleshooting the Power Winch

12.1 Troubleshooting the Power Winch

Requirements
- Tower lowered
- Engine stopped

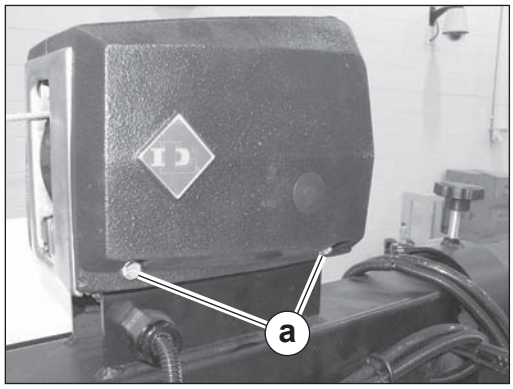
Important Be sure the machine's battery is fully charged (approximately 12V).

Procedure Perform the procedure below to troubleshoot the power winch.

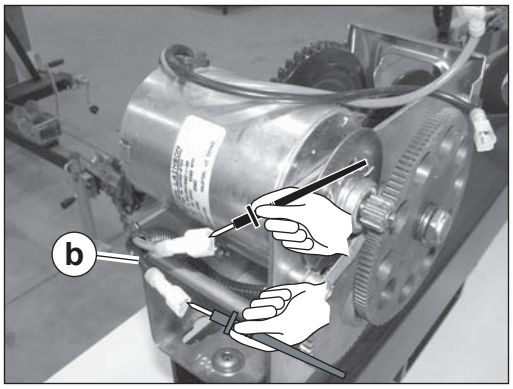
1. Lower the tower.
2. Lower the tower assembly into the cradle.
3. Stop the engine.

CAUTION
Pinching hazard.
► Use extreme care when operating the winch with its cover removed.

4. Remove the four screws **(a)** that hold the cover of the winch and remove the cover.



wc_gr011135



wc_gr011137

5. Disconnect the red and black wires at the motor **(b)**.
6. Place the appropriate winch switch in the up or down position, and check for battery voltage (approximately 12) between the red and black wires.

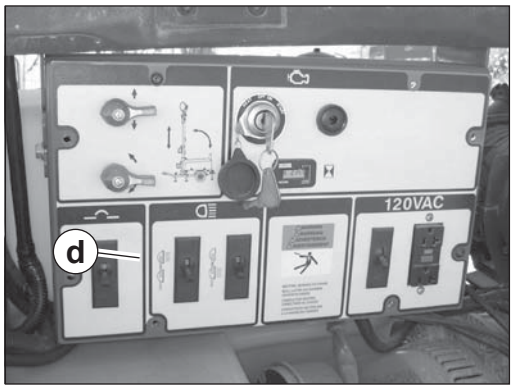
Is approximately 12 VDC measured?

Yes ____	No ____
The power winch is receiving the correct voltage. Thus, the power winch should operate. If power winch does not operate, replace it.	Continue.

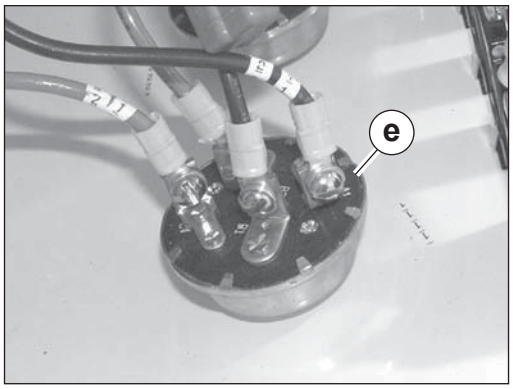
This procedure continues on the next page.

Continued from the previous page.

7. Remove the control panel **(d)** from the control box.



wc_gr011138



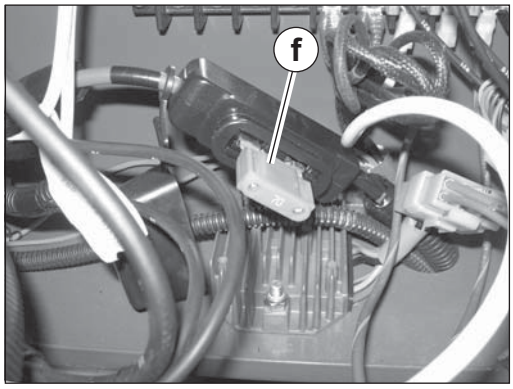
wc_gr011139

8. Check for battery voltage (approximately 12V) between terminals B1 and B2 of the winch switch **(e)**.

Is approximately 12 VDC measured?

Yes ____	No ____
If 12V is measured, the winch switch is receiving the correct voltage. Thus, the power winch switch should operate. Check for battery voltage between terminals A1 and A2 for both the up and the down positions of the winch switch. If the winch switch does not operate, replace it.	Continue.

9. Locate the 70A fuse **(f)**. Check for battery voltage between the output side of the fuse and ground.



wc_gr011136

Is approximately 12 VDC measured?

Yes ____	No ____
If 12V is measured at the output side of the 70A fuse but not at the winch switch, the wiring between the 70A fuse and the winch switch has failed; repair or replace the wiring.	Continue.

This procedure continues on the next page.

Continued from the previous page.

10.Check for battery voltage between the input side of the 70A fuse and ground.

Is approximately 12 VDC measured?

Yes ____	No ____
If 12V is measured between the input side and ground but not the output side and ground, the 70A fuse has failed; replace it.	If 12V is not measured, the wiring from the starter solenoid or the wiring from the battery to the starter solenoid has failed. Check the wiring and repair or replace it as necessary.

Result The procedure to troubleshoot the power winch is now complete.

12.2 Replacing the Cable and Power Winch

Requirements

- Mast lowered
- Engine stopped

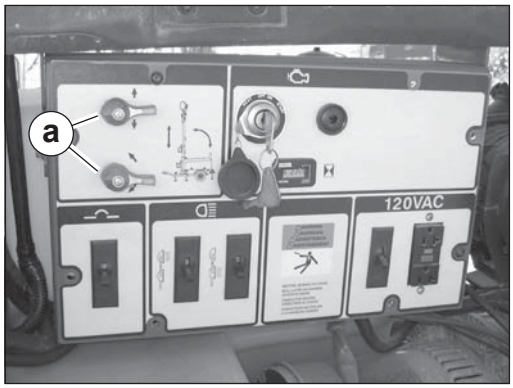
Removal

Perform the procedure below to remove the cable and the power winch.

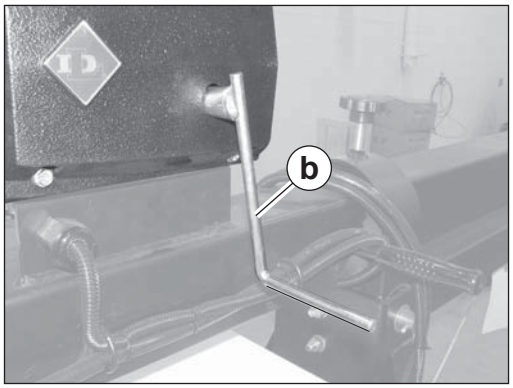
1. Lower the tower and tilt the mast assembly into the cradle.
2. Stop the engine.

CAUTION
Pinching hazard.
► Use extreme care when operating the winch with its cover removed.

3. Remove the four screws that hold the winch cover and remove the winch cover.

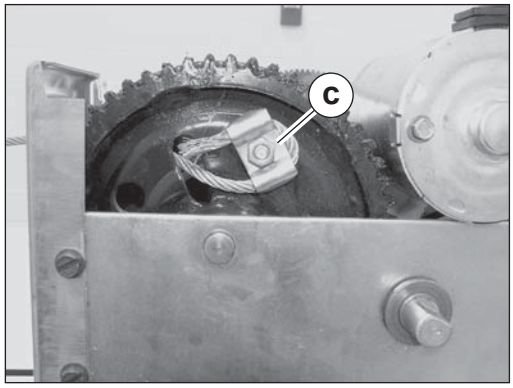


wc_gr011140

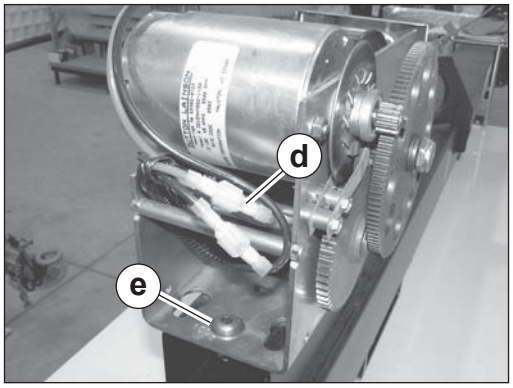


wc_gr011141

4. Using the appropriate switch **(a)** or the auxiliary handle **(b)**, run the winch so that all remaining cable is unwound from the spool. Do not run the winch for periods of longer than four minutes. Allow the winch to cool if necessary.
5. Position the spool so that the retaining clamp **(c)** is accessible. Loosen the screw that holds the clamp and the cable, then remove the cable from the spool.



wc_gr011142



wc_gr011143

6. To remove the winch, disconnect the motor wires **(d)**. Then, remove the screws **(e)** which secure the winch to the machine and remove the winch.

This procedure continues on the next page.

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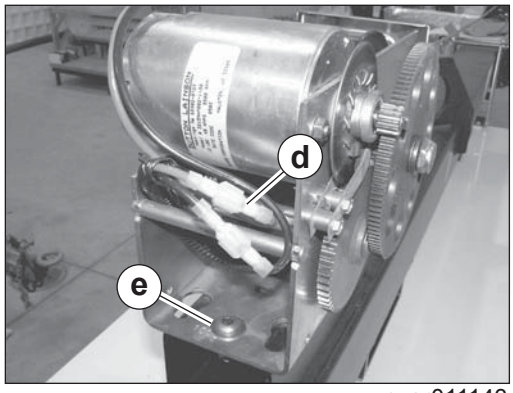
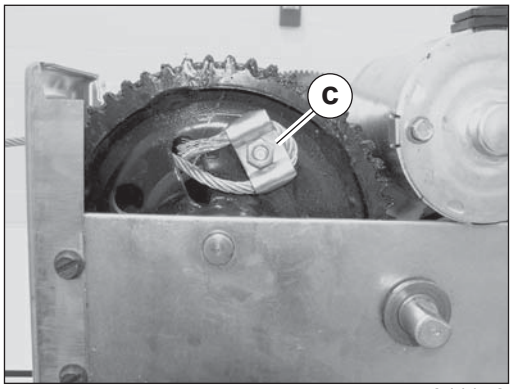
Installation

Perform the procedure below to install the cable and the power winch.

1. Position the winch on the machine and secure it with the screws **(e)**. Then, connect the motor wires **(d)**.



wc_gr011143



wc_gr011142

2. Secure the cable to the spool using the cable clamp **(c)** and screw. Be sure to secure the cable in both sides of the clamp.
3. Use the appropriate switch or auxiliary handle to wind up the cable.
4. Re-install the cover using the four screws.

Result

The procedure to replace the cable and power winch is now complete.

13 Disassembly and Reassembly

13.1 Tools Required for Disassembly/Assembly Procedures

It is up to the mechanic to use common sense and good judgment in tool selection to reduce the risk of injury while repairing the machine.

In cases where a special tool is required, the special tool is listed in the requirements portion of the procedure.

Before substituting another tool or procedure from those recommended in this manual, the mechanic must be satisfied that neither personal injury nor damage to the machine will result due to the substitution.

13.2 Information Regarding Replacement Parts

The repair procedures contained in this manual do not include part numbers.

For replacement parts information, refer to the Parts Book originally supplied with the machine.

If the original Parts Book has been lost, a replacement may be ordered from Wacker Neuson.

When ordering a replacement Parts Book, please list the model number, item number, revision level, and serial number of the machine.

Parts Books are also available on the Wacker Neuson Web site. See www.wackerneuson.com.

13.3 Information Regarding Threadlocking Compounds

Background Due to the heavy vibration inherent in this type of equipment, the repair and service procedures described in this manual specify the use of threadlocking compounds. These compounds should be used where indicated to prevent the fasteners from becoming loose.

Brands Although Loctite® is referred to throughout this manual, any equivalent brand of sealant such as Hernon®, Prolock, or Omnifit may be used. For a complete list of recommended sealing and locking compounds, refer to the *Use of Threadlockers and Sealants* chart at the end of this manual.

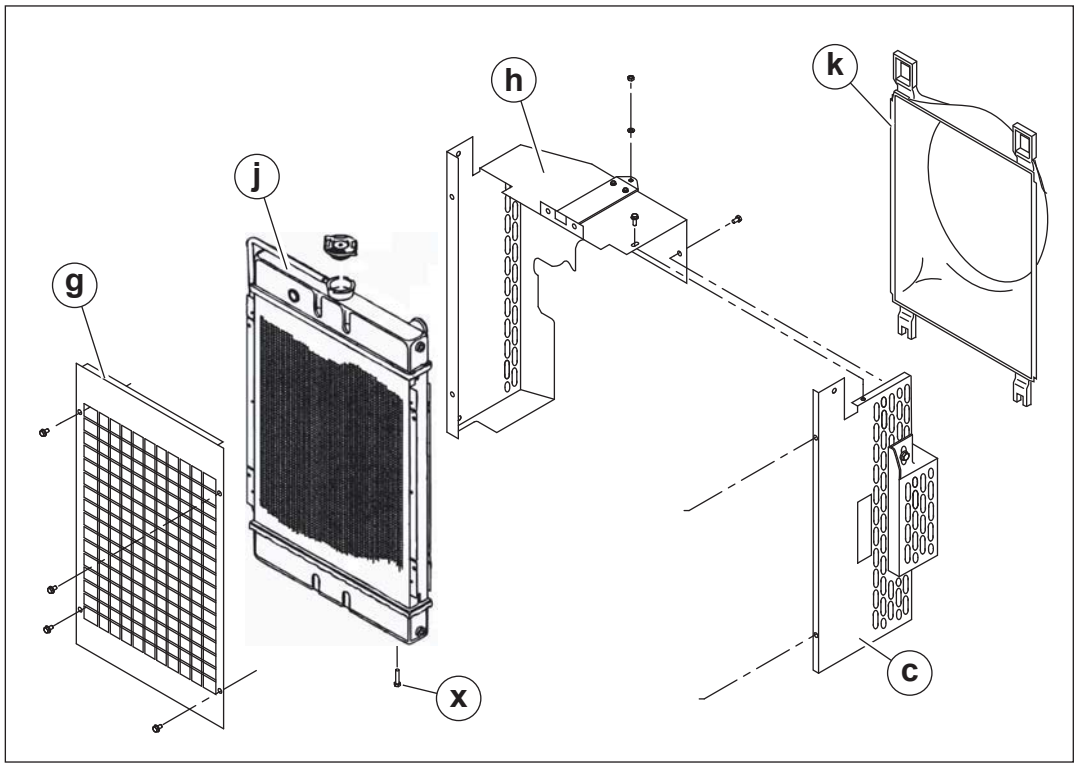
Applying threadlockers Clean the screw threads and wipe off any oil or grease before applying a threadlocking compound.

13.4 Removing the Radiator—CAT

Requirements

- Radiator drained
- Plastic or other appropriate sheeting to catch draining coolant
- Two 3-liter containers

Reference graphic

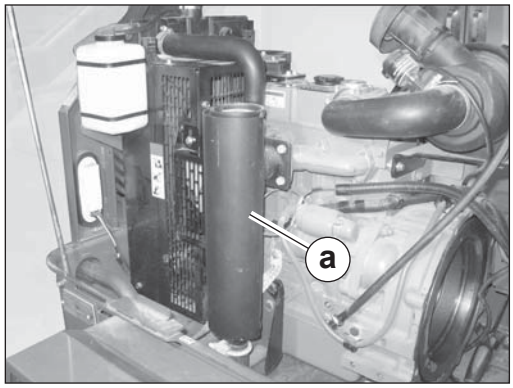


wc_gr011084

Procedure

Perform the procedure below to remove the radiator.

1. Remove the muffler **(a)**.



wc_gr011065

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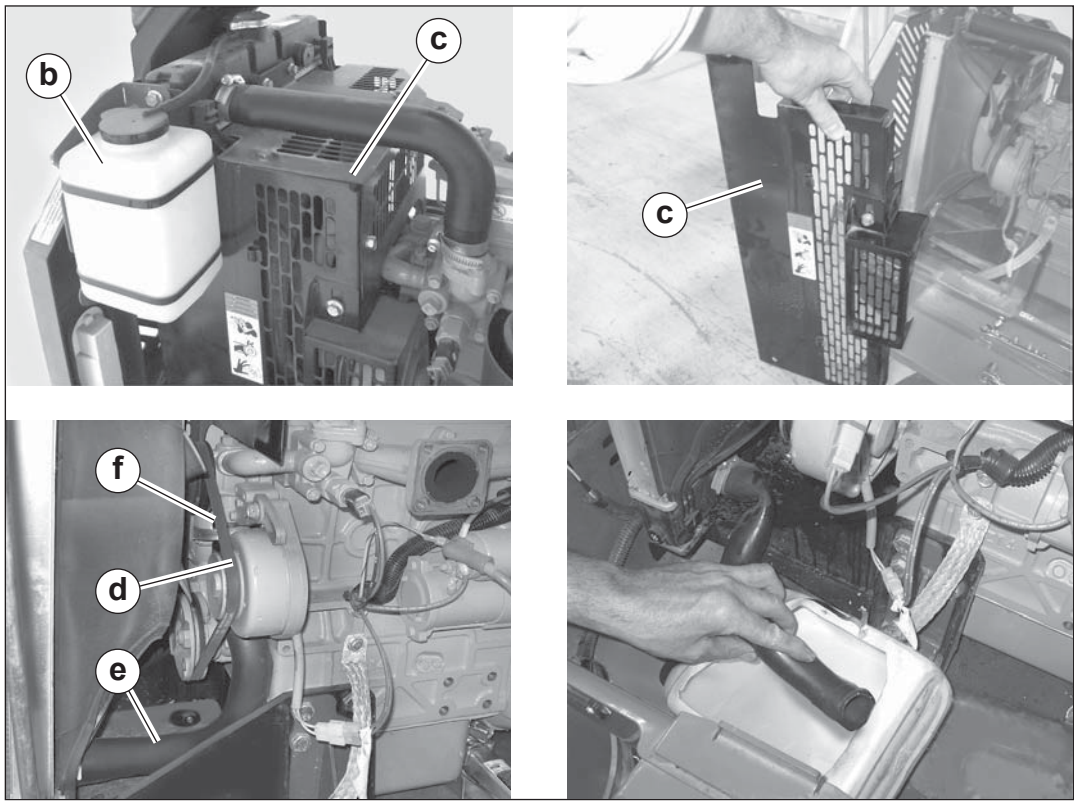
2. Remove the overflow bottle **(b)** and the side shroud **(c)**.



wc_gr011085

3. Remove the belt **(d)** to gain access to the lower radiator hose **(e)**.
4. Place a container next to the radiator.

WARNING
Burn hazard. Coolant can contain alkali.
► Avoid contact with skin and eyes.

5. Hold a second container below the engine housing outlet **(f).** Loosen the clamp and disconnect the lower radiator hose. Catch the coolant as it drains from the engine housing outlet. At the same time, place the open end of the lower radiator hose into the first container and let the coolant drain completely.

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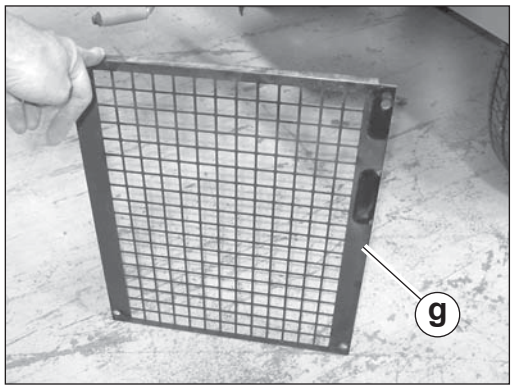
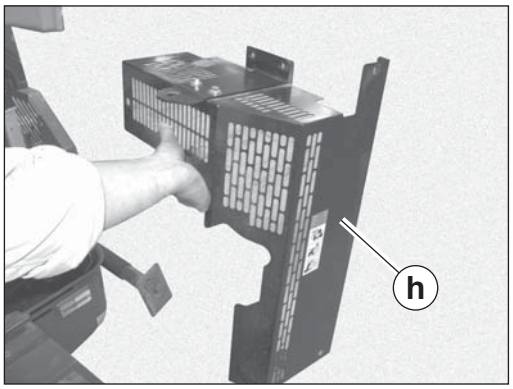
6. Remove the front grill **(g)**.

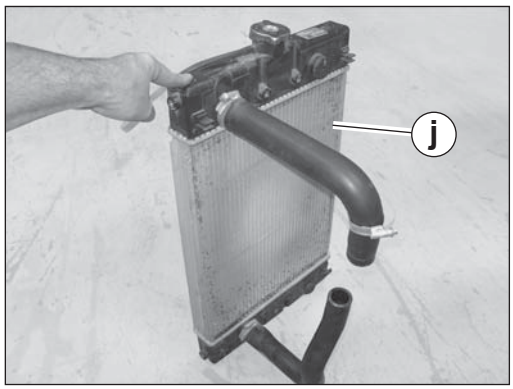


wc_gr011069

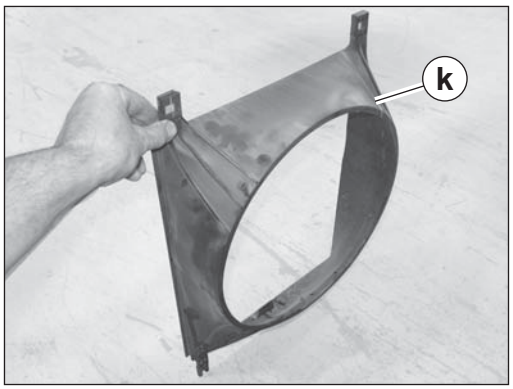


wc_gr011070

7. Remove the side shroud **(h)**.
8. Remove the screws that hold the radiator to the mounting bracket.
9. Separate the radiator from the air shroud **(k)**.
10. Remove the radiator from the machine **(j)**.



wc_gr011071



wc_gr011083

11. Remove the air shroud **(k)** from the machine.

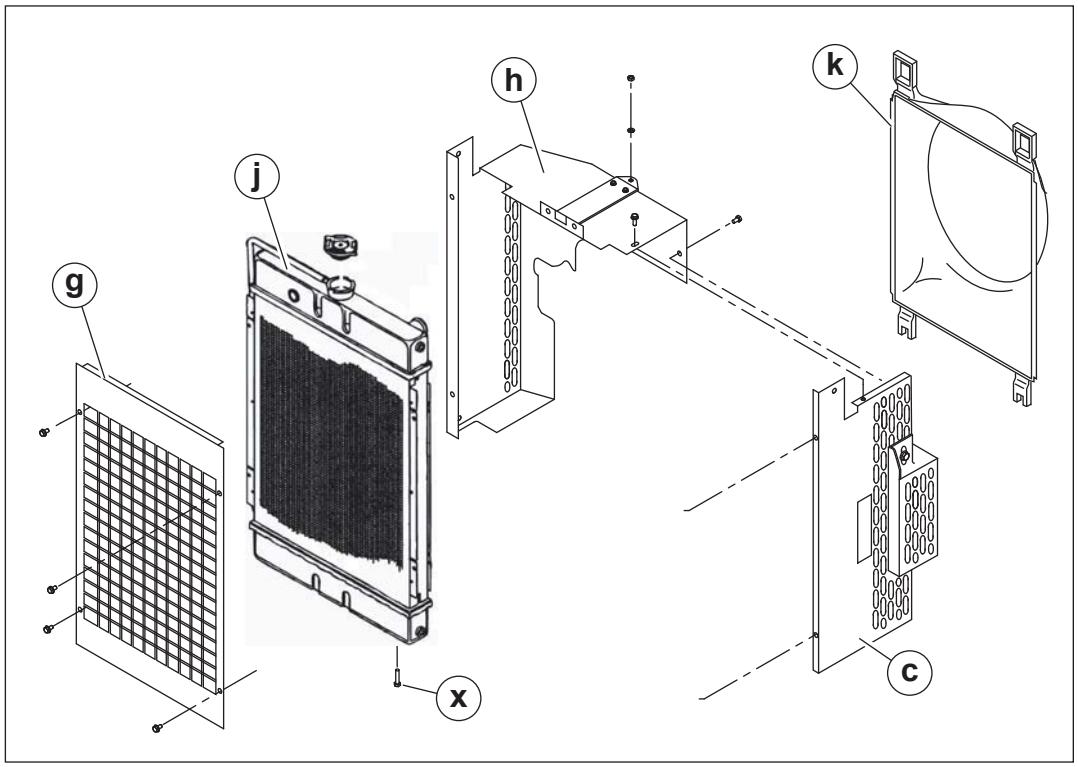
Result The procedure to remove the radiator is now complete.

13.5 Installing the Radiator—CAT

Requirements

- Fresh coolant
- Plastic or other appropriate sheeting to catch draining coolant

Reference graphic

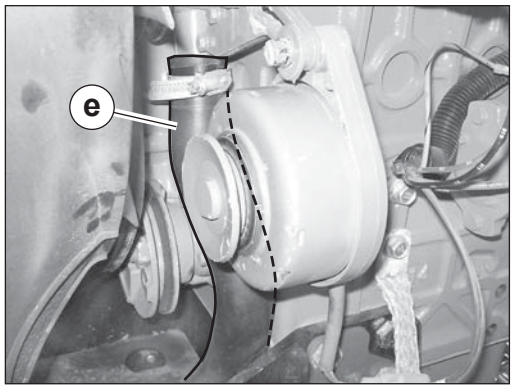


wc_gr011084

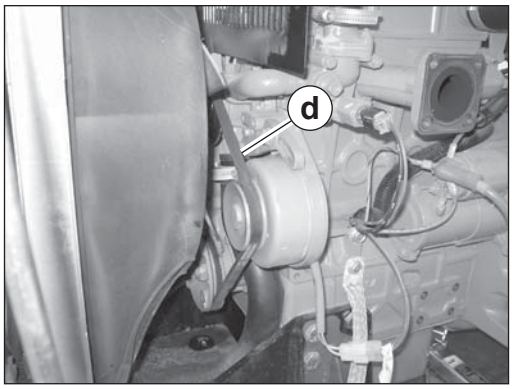
Procedure

Perform the procedure below to remove the radiator.

1. Set the air shroud into the machine.
2. Set the radiator **(j)** into the machine and connect the air shroud to it.
3. Re-install the lower hose **(e)**.



wc_gr011068



wc_gr011067

4. Reconnect the belt **(d)** and set the belt tension.
5. Install the radiator to the mounting bracket with two screws **(x)**.

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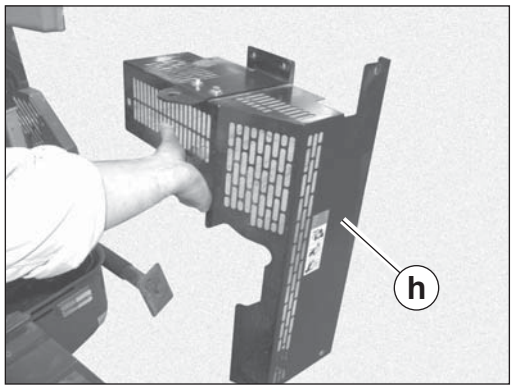
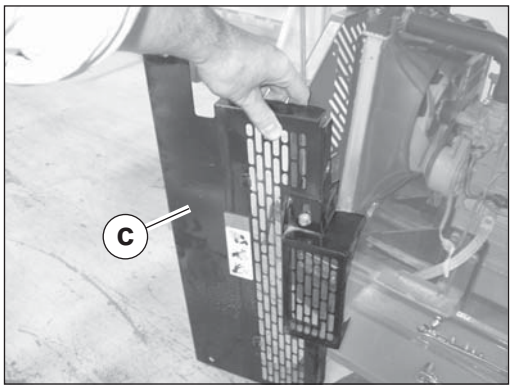
6. Install the side shroud **(h)**.

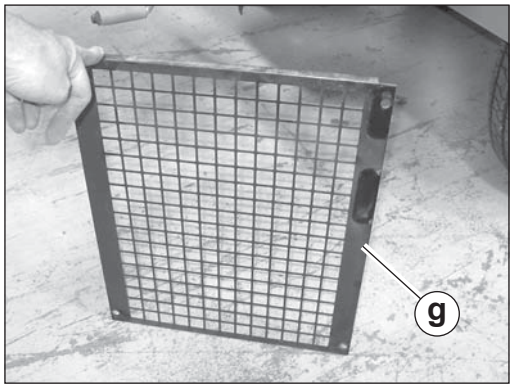


wc_gr011070

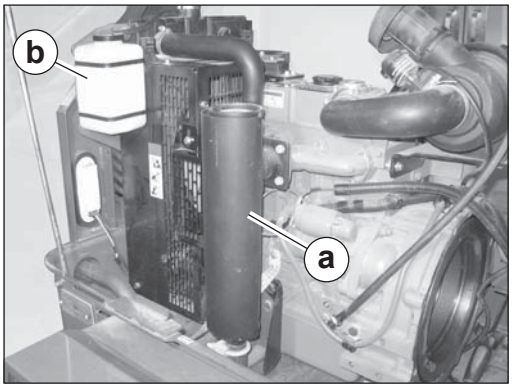


wc_gr011066

7. Install the opposite side shroud **(c)**.
8. Install the grill **(g)**.



wc_gr011069



wc_gr011086

9. Install the overflow bottle **(b)** and the muffler **(a)**.
10. Fill the radiator with coolant.

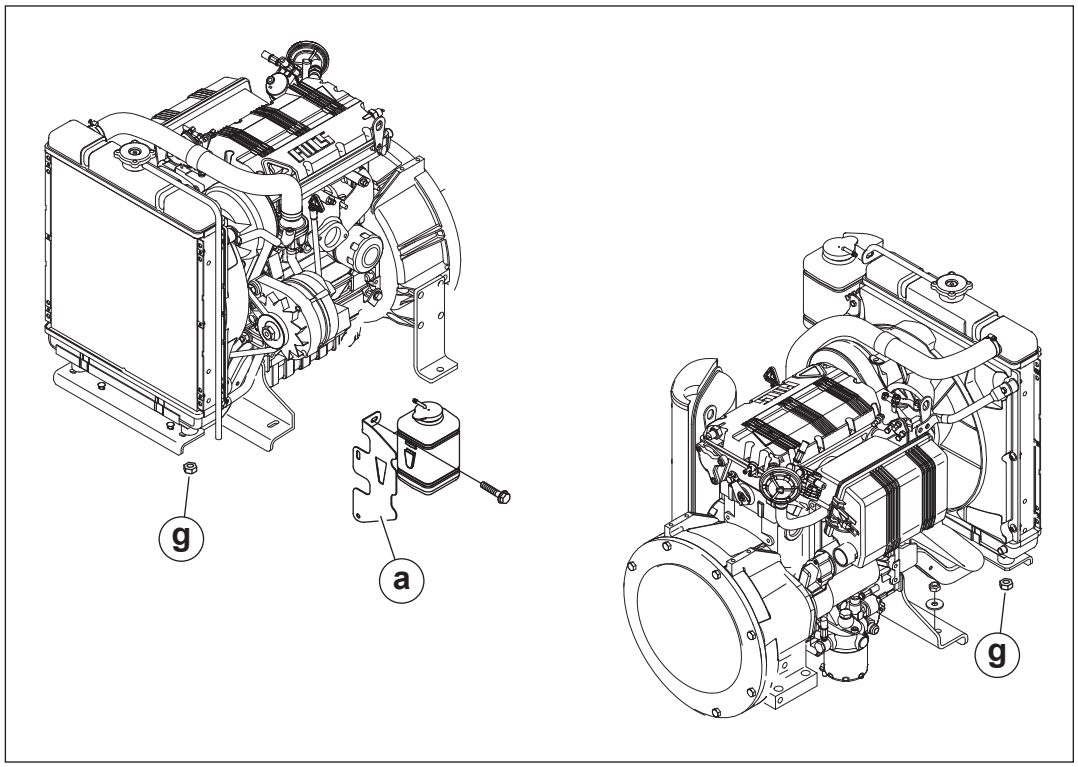
Result The procedure to install the radiator is now complete.

13.6 Removing the Radiator—Kohler

Requirements

- Radiator drained
- Plastic or other appropriate sheeting to catch draining coolant
- Two 3-liter containers

Reference graphic



wc_gr011172

Procedure

Perform the procedure below to remove the radiator.

WARNING
Burn hazard. Coolant can contain alkali.
► Avoid contact with skin and eyes.

1. Drain the coolant.
2. Remove the overflow bottle **(a)**.

This procedure continues on the next page.

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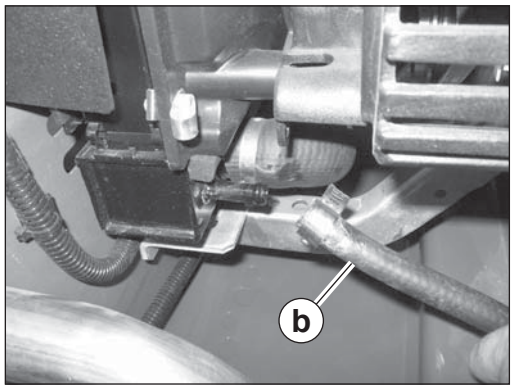
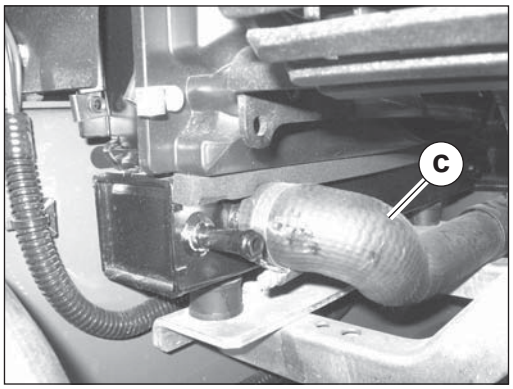
3. Remove the lower thinner radiator hose **(b)**.

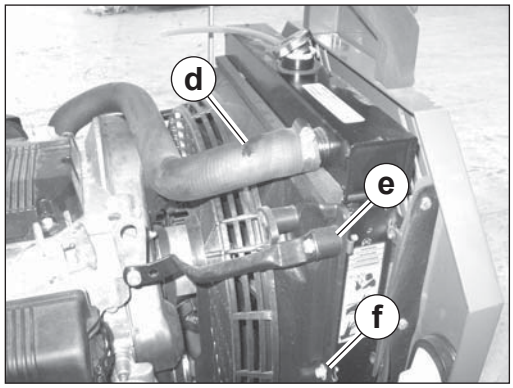


wc_gr011173

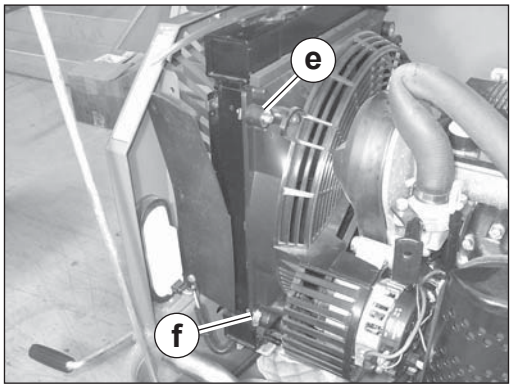


wc_gr011174

4. Remove the lower larger radiator hose **(c)**.
5. Remove the upper radiator hose **(d)**.



wc_gr011175



wc_gr011176

6. Remove the shockmounts **(e)** and the screws that hold the fan cover **(f)**.
7. Remove the nuts **(g)** that hold the radiator to the machine and remove the radiator.

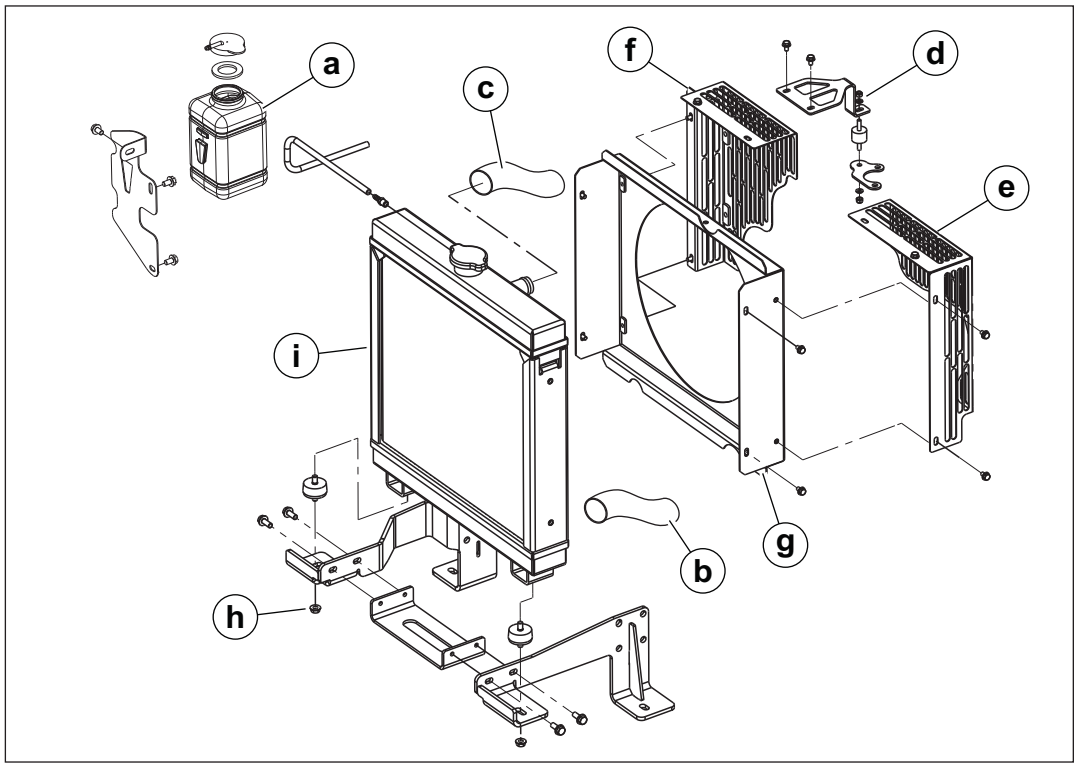
Result The procedure to remove the radiator is now complete.

13.7 Removing the Radiator—Kubota

Requirements

- Radiator drained
- Plastic or other appropriate sheeting to catch draining coolant
- Container to catch draining coolant

Reference graphic



wc_gr011326

Procedure Perform the procedure below to remove the radiator.

WARNING
Burn hazard. Coolant can contain alkali.
► Avoid contact with skin and eyes.

1. Drain the coolant.
2. Remove the overflow bottle **(a)**.

This procedure continues on the next page.

Continued from the previous page.

3. Remove the lower radiator hose **(b)**.
4. Remove the upper radiator hose **(c)**.
5. Remove the bracket **(d)**.
6. Remove the panel **(e)** and the panel **(f)**.
7. Remove the shroud **(g)**.
8. Remove the nuts **(h)** that hold the radiator to the machine and remove the radiator **(i)**.

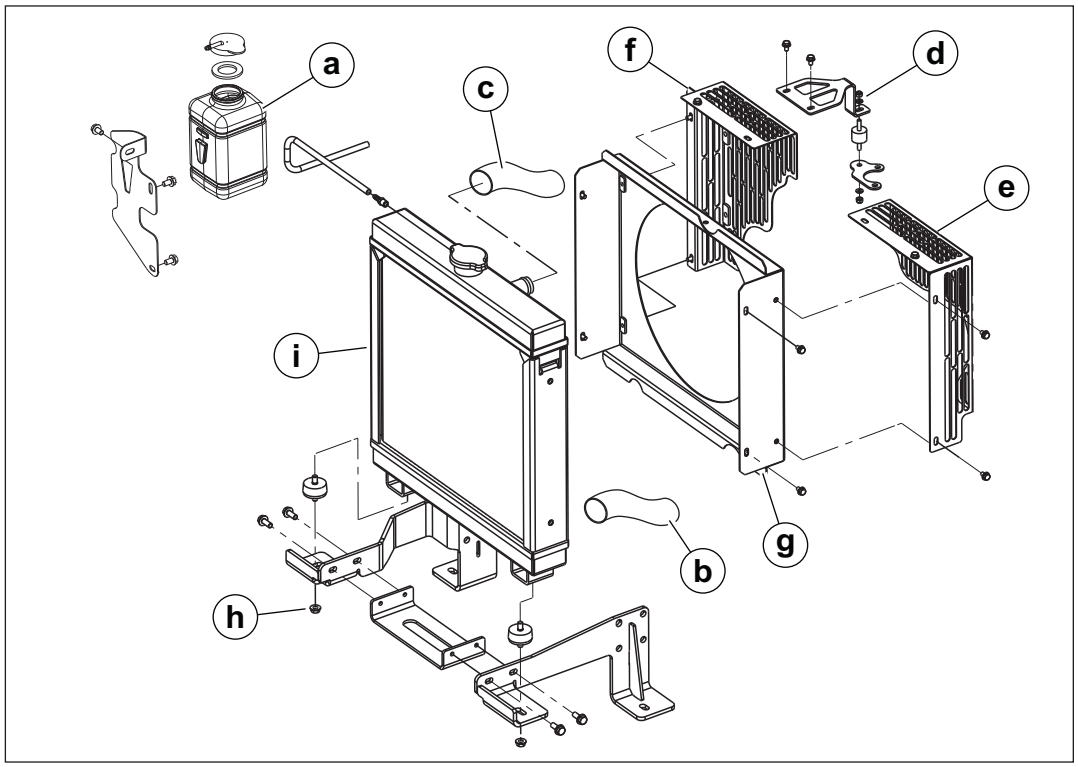
Result The procedure to remove the radiator is now complete.

13.8 Installing the Radiator—Kubota

Requirements

- Fresh coolant
- Plastic or other appropriate sheeting to catch coolant

Reference graphic



wc_gr011326

Procedure

Perform the procedure below to install the radiator.

WARNING
Burn hazard. Coolant can contain alkali.

► Avoid contact with skin and eyes.

1. Set the radiator **(i)** in place and secure it with nuts **(h)**.
2. Install the shroud **(g)**.
3. Install the panel **(e)** and the panel **(f)**.
4. Install the bracket **(d)**.
5. Install the upper radiator hose **(c)**.
6. Install the lower radiator hose **(b)**.
7. Install the overflow bottle **(a)**.
8. Fill the radiator with coolant.

Result

The procedure to remove the radiator is now complete.

13.9 Removing the Fuel Tank

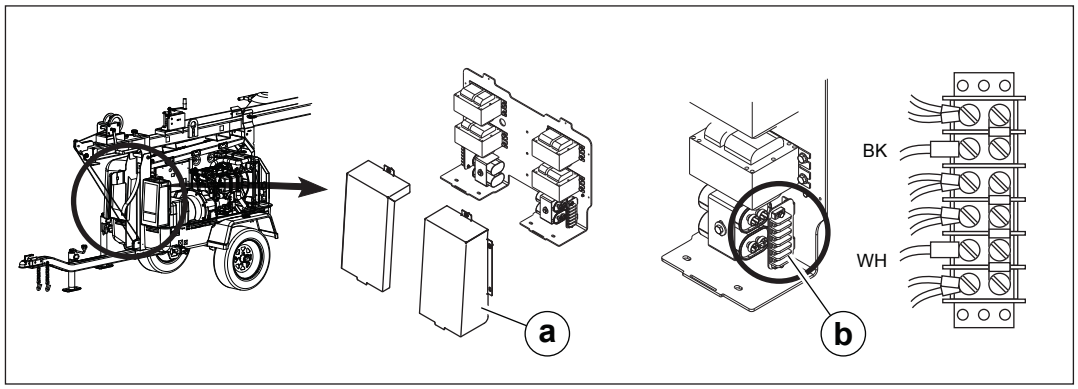
Requirements

- Engine stopped and cool
- Fuel tank drained

Procedure

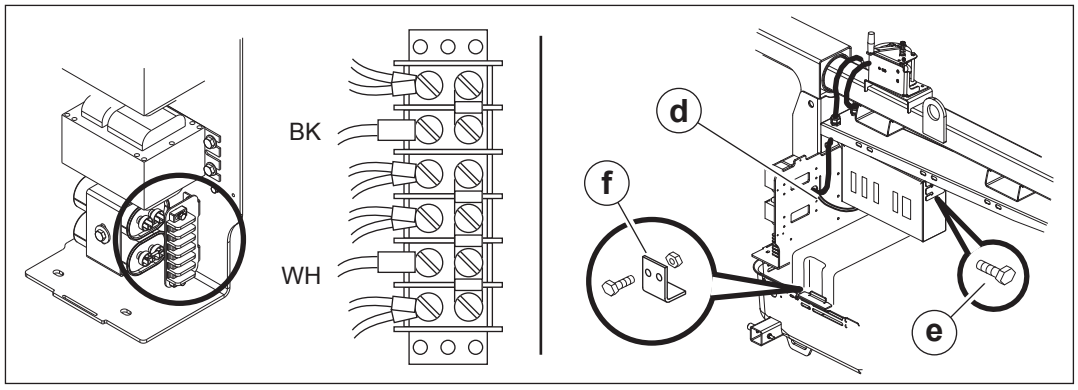
Perform the procedure below to remove the fuel tank.

1. Disconnect and remove the battery.
2. Drain the fuel tank.
3. Disconnect the supply hose and the return hose from the top side of the fuel tank.
4. Remove the covers **(a)** from the machine to access the ballast terminal strip(s) **(b)**.



wc_gr011394

5. Disconnect the black wire (BK) and the white wire (WH) from each ballast terminal strip.



wc_gr011035

6. Pull the loom **(d)**, that covers the black and white wire, through the bulkhead.
7. Remove the screws **(e)** that hold the control panel and set the control panel aside. This creates working space for removing the fuel tank.
8. Remove the brackets **(f)**.
9. Remove the fuel tank from the machine.

Result

The procedure to remove the fuel tank is now complete.

13.10 Installing the Fuel Tank

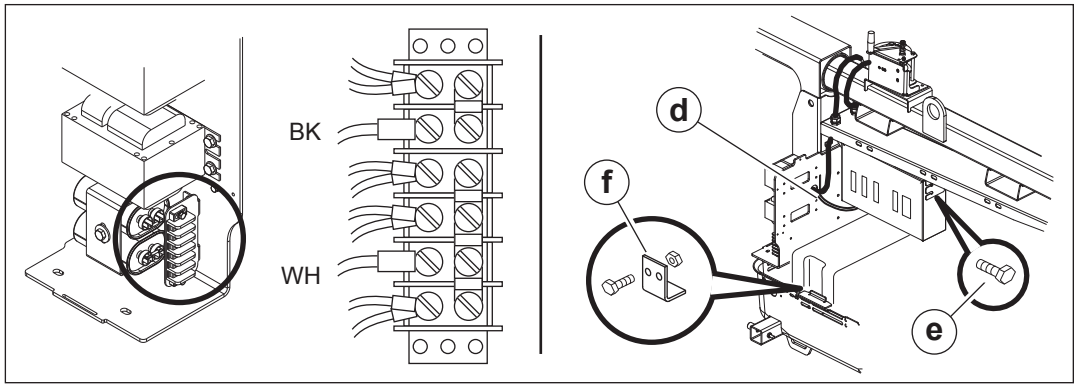
Requirements

- Assistant
- Fuel tank drained

Procedure

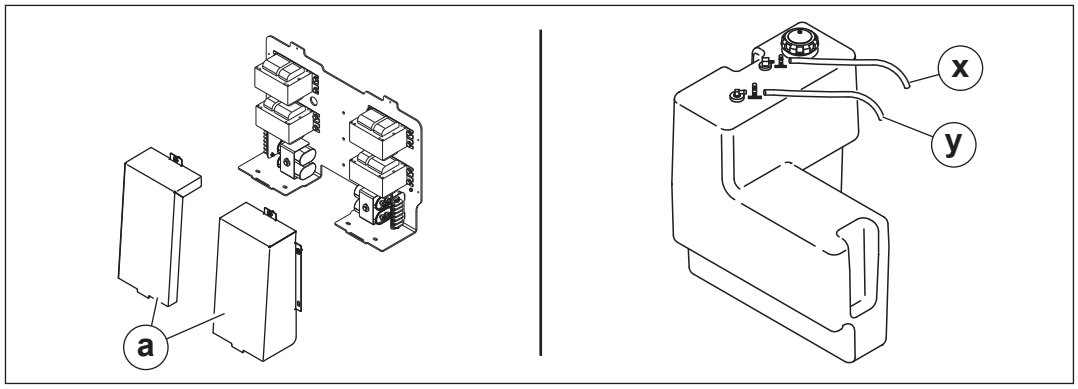
Perform the procedure below to install the fuel tank.

1. With the help from an assistant, set the fuel tank into the machine.
2. Install the brackets **(f)** to hold the fuel tank.



wc_gr011035

3. Mount the control panel with screws **(e)**.
4. Thread the loom **(d)** through the bulkhead and connect the black wire (BK) and the white wire (WH) from each ballast terminal strip.
5. Re-install the covers **(a)**.



wc_gr011127

6. Reconnect the supply hose **(x)** and the return hose **(y)** to the fuel tank.
7. Reconnect the battery.
8. Fill the fuel tank.

Result

The procedure to install the fuel tank is now complete.

13.11 Removing the Stator

Requirements

- Engine stopped and cool
- Fuel tank and control panel removed
- Small scissors jack or equivalent

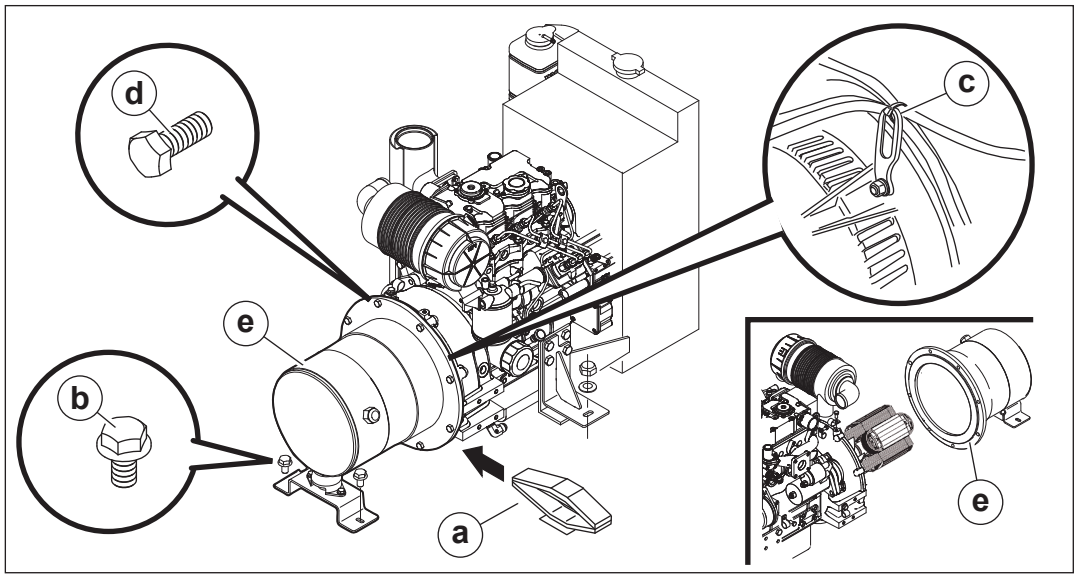
Background

The stator is part of the outer housing of the generator. The rotor sits inside the stator. The rotor is connected directly to the engine. When the stator is removed, the rotor is exposed and becomes accessible for testing.

Procedure

Perform the procedure below to remove the stator.

1. Remove the fuel tank.
2. Remove the control panel from its mounting bracket. Do not disconnect its wiring from the generator.
3. Support the engine, near the generator, with a scissors jack **(a)** or equivalent.



wc_gr011050

4. Remove the screws **(b)** that hold the generator support bracket to the machine.
5. Remove the lifting eye **(c)** with the wires and harnesses still attached to it.
6. Remove the screws **(d)** that hold the generator to the engine.
7. Using pry bars or flat head screw drivers, pry the stator **(e)** from the engine's bell housing. Then, slide the stator off of the rotor. Set it aside inside the machine frame so that the rotor is accessible.

Note: *The stator will still be connected to the control panel. The rotor is now accessible. If you need to completely remove the stator, continue with step 8.*

Note: *Additional support for the rotor may be necessary after the stator has been removed.*

This procedure continues on the next page.

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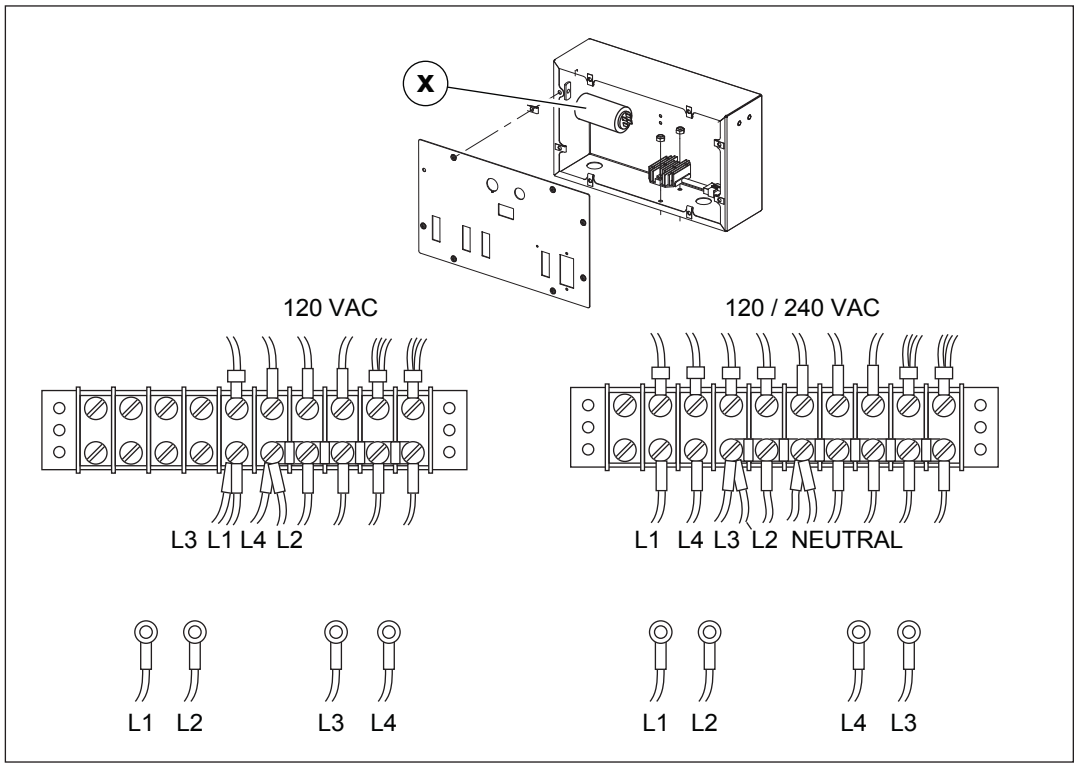
8. Disconnect the stator wires running to the excitation capacitor **(x)**.



wc_gr011121

9. Disconnect the stator winding wires from the main terminal strip.
10. Pull the wiring from the control panel.

Result The procedure to remove the stator is now complete.

13.12 Installing the Stator

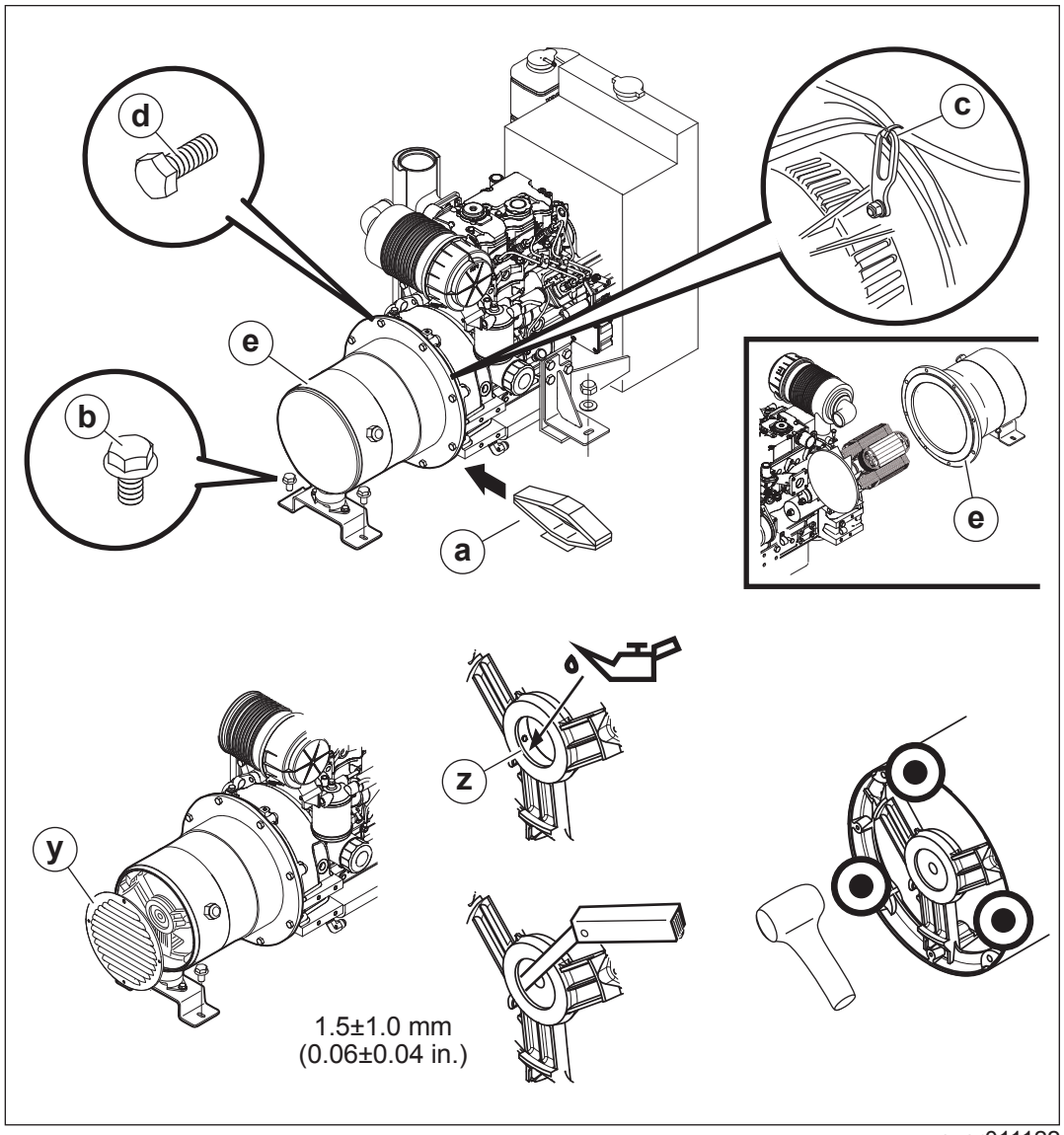
Requirements

- Loctite 243 or equivalent
- Feeler gauges

Procedure

Perform the procedure below to install the stator.

1. Support the engine, near the generator, with a scissors jack **(a)** or equivalent.



wc_gr011122

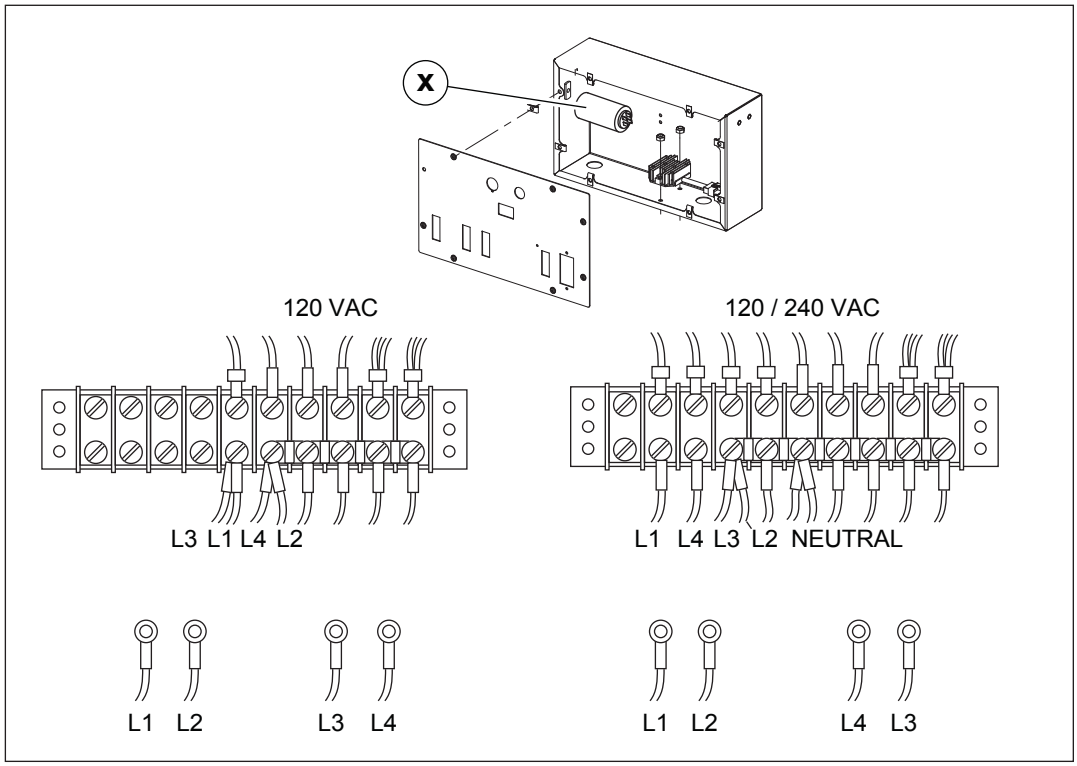
2. Remove the end cover **(y)** from the stator.
3. Apply a thin coat of oil to the surface **(z)** of the bearing carrier.
4. Slide the stator **(e)** over the rotor and up to the bell housing of the engine. Connect the stator to the engine with screws **(d)**. Use Loctite 243 on the screws and torque them to 31 Nm (23 ft.lbs.).

Note: *There must be 1.5 ± 1.0 mm of axial gap between the rotor bearing and the bearing holder of the stator bracket.*

This procedure continues on the next page.

Continued from the previous page.

5. To relieve stress, strike the stator several times at the 12:00, 4:00, and 8:00 o'clock positions with a dead blow hammer.
6. Check for binding by manually turning the engine.
7. Install the screws **(b)** that hold the generator support bracket to the machine. Torque the screws to 35 Nm (26 ft.lbs.).
8. Install the lifting eye **(c)**, the wires, and harnesses.
9. Thread the wiring into the control panel.
10. Connect the stator wires to the excitation capacitor **(x)**.



wc_gr011121

11. Connect the stator winding wires to the main terminal strip.
12. Install the fuel tank.
13. Install the control panel.

Result The procedure to install the stator is now complete.

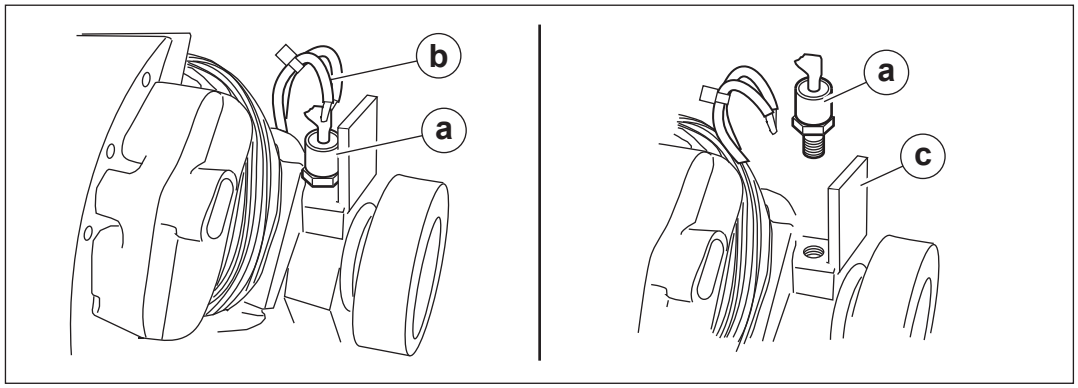
13.13 Replacing a Diode (older)

Requirements
- Stator removed
- Solder, flux, and soldering iron

Background
There are two diodes on the rotor assembly. The stator must be removed from the rotor in order to remove the diodes. If one diode is bad, replace both diodes.

Procedure
Perform the procedure below to replace a diode.

1. Remove the stator.
2. Locate the diodes **(a)** on the end of the rotor.



wc_gr011045

3. Unsolder the two wires **(b)** from the terminal end of each diode.
4. Unscrew the diode **(c)** from the rotor.

Note: *The heat sink* **(d)** *may need to be bent slightly in order to remove and install the diode. If you do so, be sure to bend it back to its original position.*

5. Screw the new diode into the rotor.
6. Solder the wires to the diode.
7. Replace the other diode in the same manner.

Result
The diodes have now been replaced.

13.14 Replacing a Diode (newer)

Requirements

- Stator removed
- Solder, flux, and soldering iron

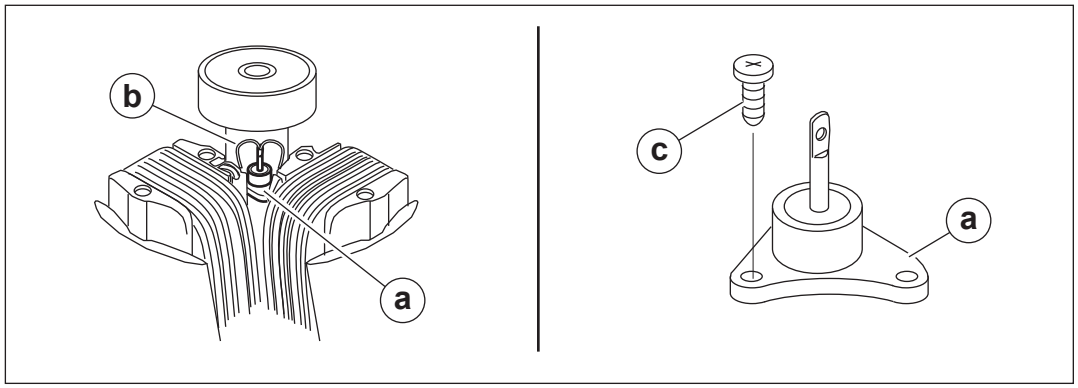
Background

There are two diodes on the rotor assembly. The stator must be removed from the rotor in order to remove the diodes. If one diode is bad, replace both didoes.

Procedure

Perform the procedure below to replace a diode.

1. Remove the stator.
2. Locate the diodes **(a)** on the end of the rotor.



wc_gr011047

3. Unsolder the two wires **(b)** from the terminal end of each diode.
4. Remove the screws **(c)** that hold the diode.
5. Mount the new diode into the rotor.
6. Solder the wires to the diode.
7. Replace the other diode in the same manner.

Result

The diodes have now been replaced.

13.15 Removing the Doors and the Spine

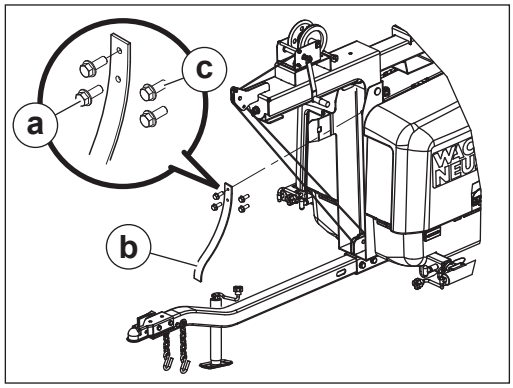
Requirements

- Stator removed
- Radiator removed

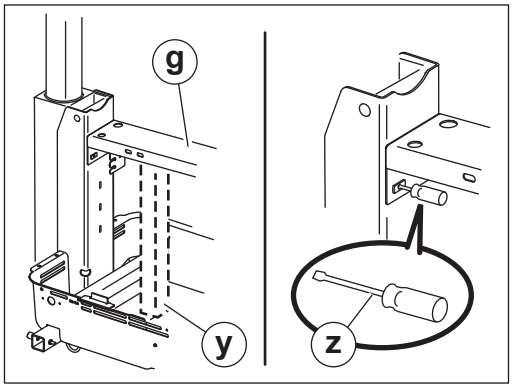
Procedure

Perform the procedure below to remove the doors and the spine.

1. Remove the stator.
2. Remove the radiator.
3. Position the outriggers.
4. Remove the screws **(a)** that hold the spring **(b)**, then remove the screws **(c)** that hold the spine to the machine.

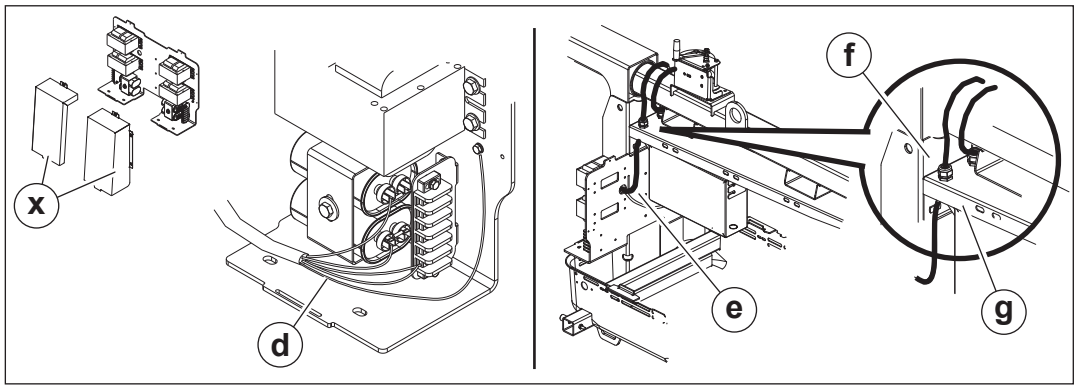


wc_gr011093



wc_gr011099

5. Temporarily support the spine **(g)** by installing a brace **(y)** or by inserting a screwdriver **(z)** or similar tool as shown.
6. Tilt the tower to the upright position.
7. Remove the covers **(x)** from the machine to access the ballast.



wc_gr011094

8. Disconnect the wires **(d)** from the short terminal strip (and ground) that lead to the lights.
9. Pull the wiring harness **(e)** through the bulkhead.
10. Loosen the lock nut **(f)** and pull the harness from the spine **(g)**.

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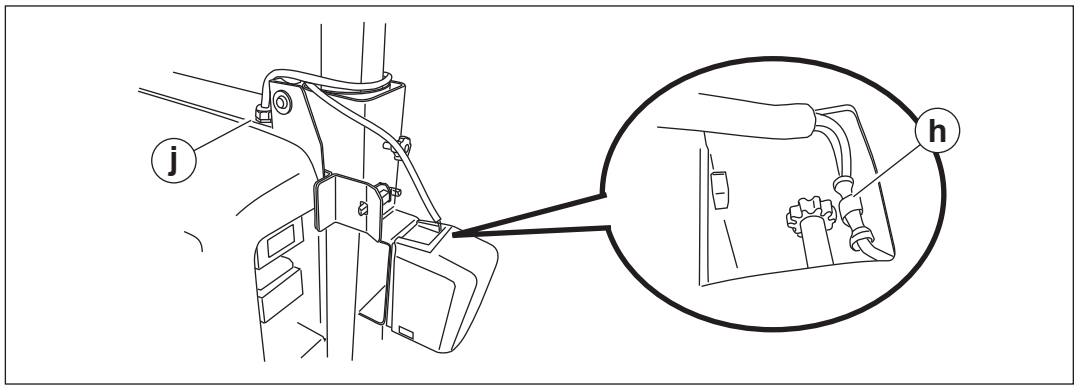
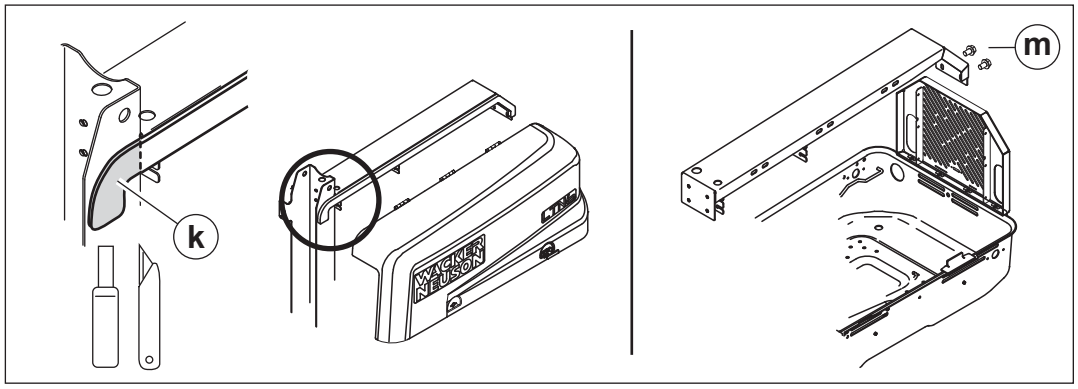
11.On machines with power winches, disconnect the wiring **(h)** from both winches.



wc_gr011098

12.Loosen the lock nut **(j)** and pull the harness from the spine.

13.Carefully scrape the gasket **(k)** from the tower, or cut the gasket at the junction point of the spine and the tower.



wc_gr011100

14.Remove the remaining two screws **(m)** that hold the spine to the machine.

15.Using an appropriate crane, or with the help of an assistant, lift the spine (with doors still attached) off the machine.

Result The procedure to remove the doors and the spine is now complete.

13.16 Installing the Doors and the Spine

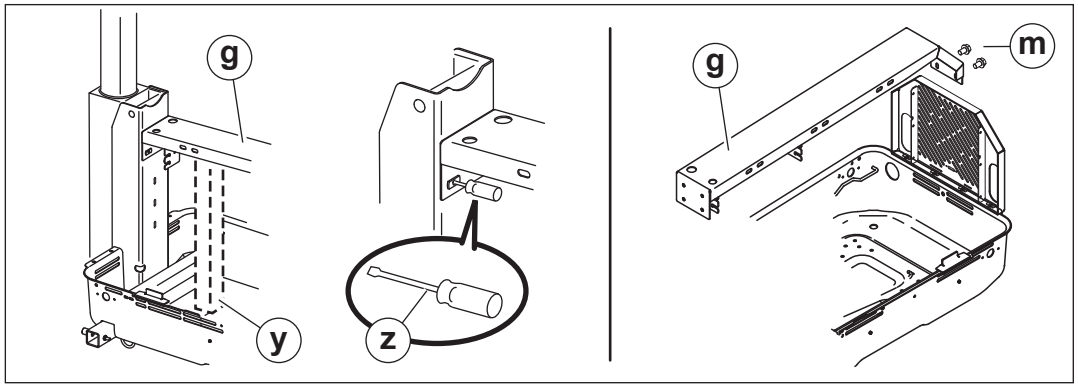
Requirements

- Torque wrench
- Appropriate crane or hoist
- Spray adhesive or silicone

Procedure

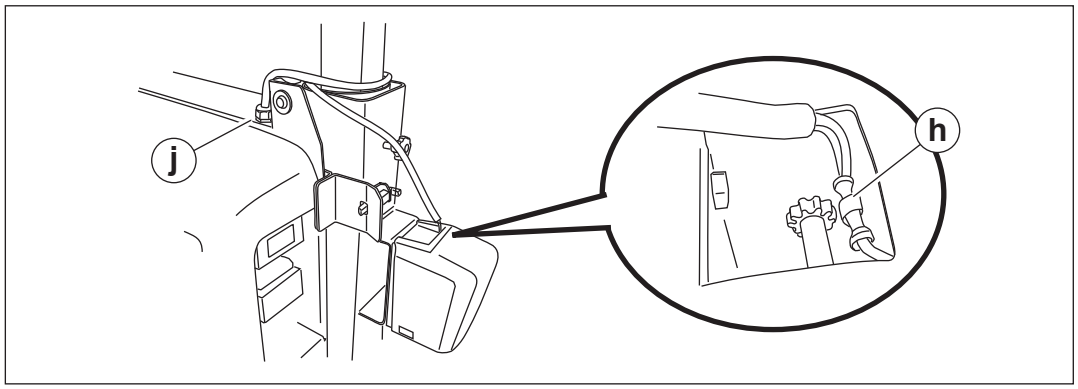
Perform the procedure below to install the doors and the spine.

1. Using an appropriate crane, or with the help of an assistant, lift the spine (with doors still attached) onto the machine.
2. Temporarily support the spine **(g)** by installing a brace **(y)** or by inserting a screwdriver **(z)** or similar tool as shown.



wc_gr011112

3. Install the two screws **(m)** that hold the spine to the machine.Torque the screws to 58 Nm (43 ft.lbs.).
4. On machines with power winches, thread the harness through the spine and secure it with the lock nut **(j)**.



wc_gr011098

5. Reconnect the wiring **(h)** to both winches.

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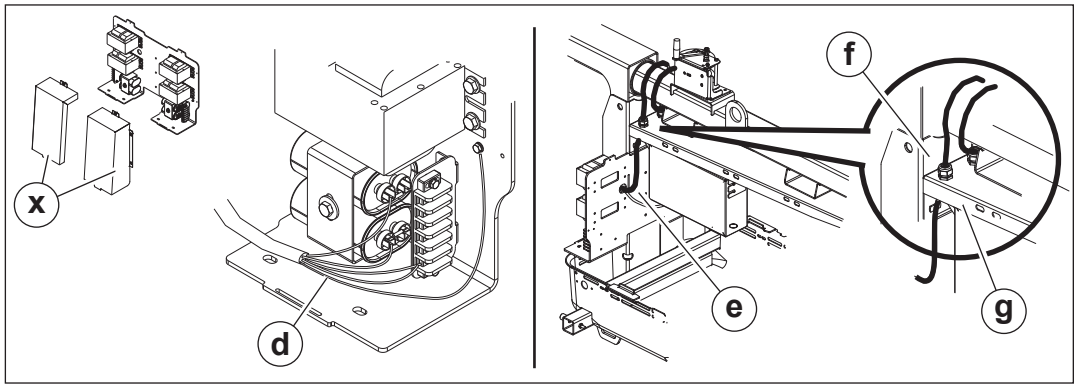
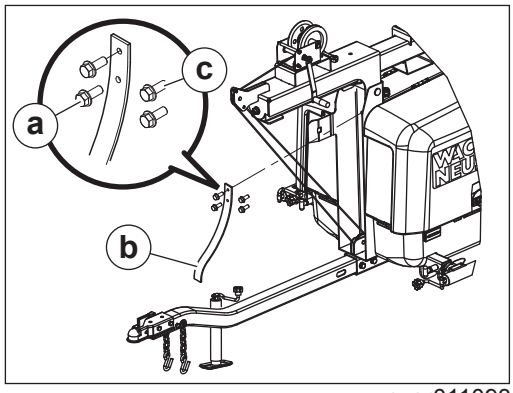
6. Thread the wiring harness through the spine **(g)** and secure it with the lock nut **(f)**.

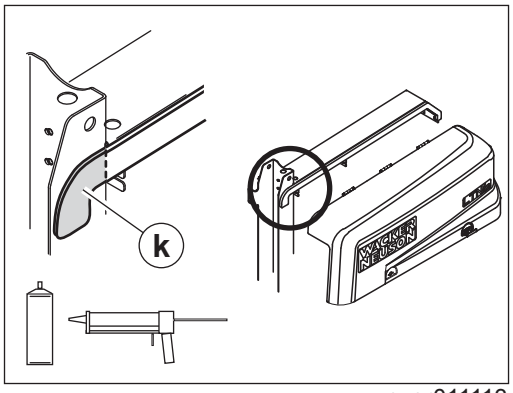


wc_gr011094

7. Thread the wiring harness **(e)** through the bulkhead to the short terminal strip. Reconnect the wires **(d)**.
8. Install the covers **(x)**.
9. Tilt the tower to the horizontal position.
10. Install the screws **(a)** that hold the spring **(b)** and the screws **(c)** that hold the spine to the machine. Torque the screws to 58 Nm (43 ft.lbs.).



wc_gr011093



wc_gr011113

11. Reattach the gasket **(k)** using spray adhesive. Or, if the gasket was cut, apply a bead of silicone at the junction point of spine and the tower.
12. Re-install the radiator.
13. Re-install the stator.

Result The procedure to install the doors and the spine is now complete.

13.17 Removing the Engine—CAT

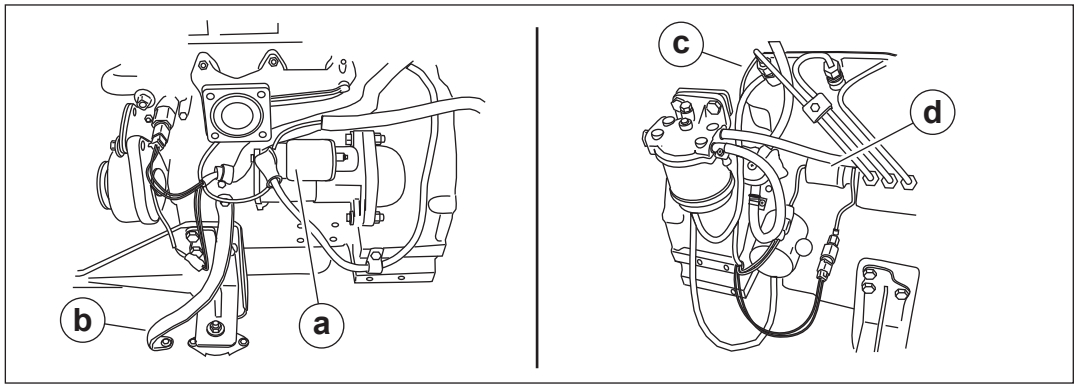
Requirements

- Doors and spine removed
- Engine lift or crane

Procedure

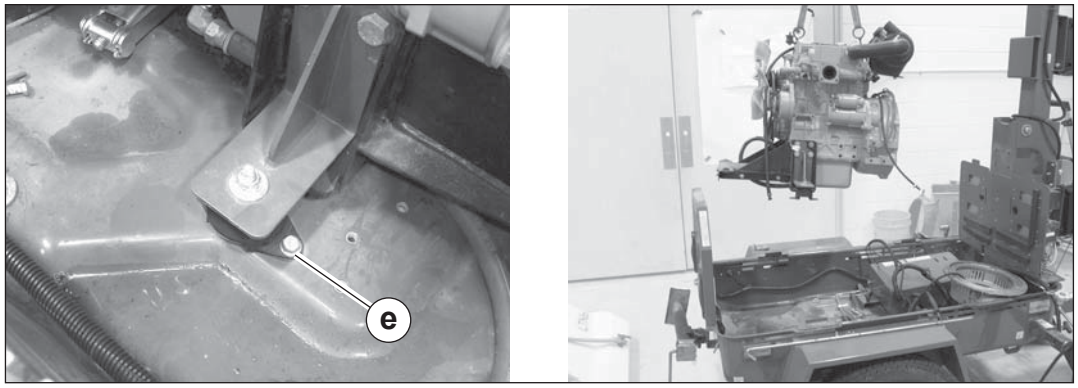
Perform the procedure below to remove the engine.

1. Remove the doors and the spine.
2. Remove the radiator.
3. Remove the muffler.
4. Mark, then disconnect, the electrical components from the engine — for example, disconnect the starter **(a)**, the ground strap **(b)**, the glow plugs **(c)**,and the fuel solenoid **(d)**, etc.



wc_gr011105

5. Check and clear any obstructions that may be still in the tub — for example, fuel lines, control panel, and stator assembly.
6. Remove the screws **(e)** that hold the engine to the tub.



wc_gr011109

7. Using an appropriate lift or crane, lift the engine up and out of the tub.

Result

The engine has now been removed.

13.18 Installing the Engine—CAT

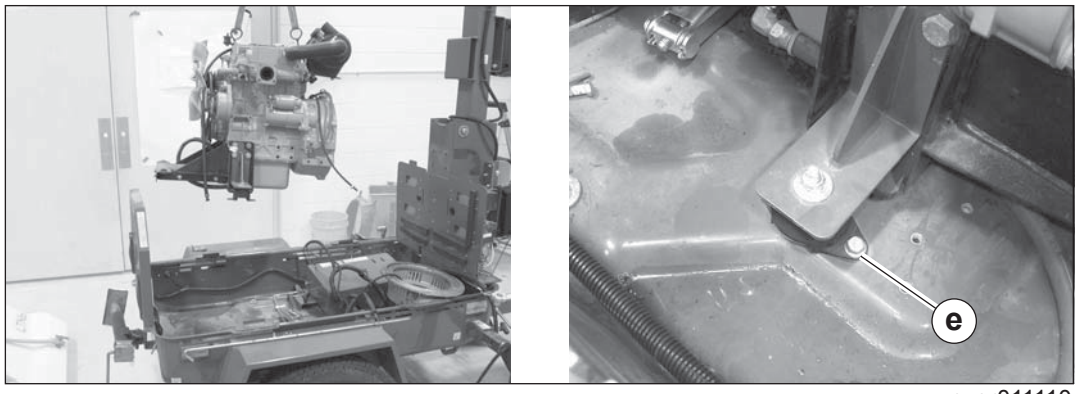
Requirements

- Torque wrench
- Loctite 243 or equivalent
- Engine lift or crane

Procedure

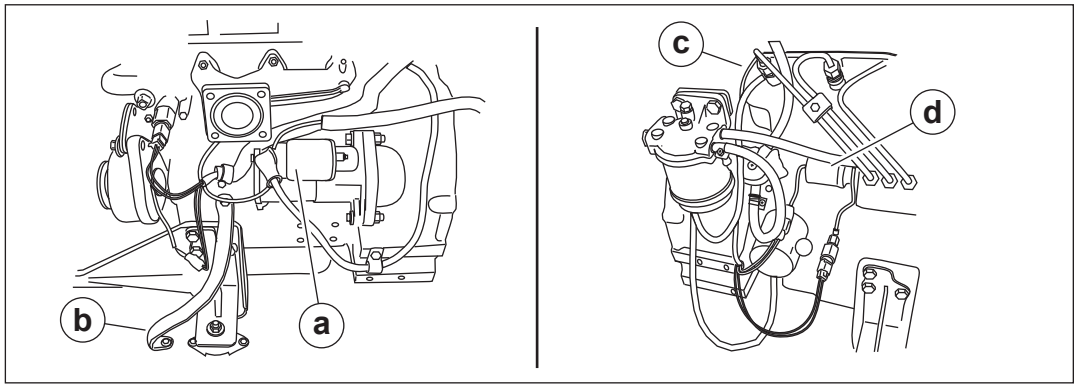
Perform the procedure below to install the engine.

1. Using an appropriate lift or crane, set the engine into the tub.



wc_gr011110

2. Install the screws **(e)** that hold the engine to the tub. Torque the screws to 35 Nm (26 ft.lbs.).
3. Reconnect the electrical components to the engine — for example, disconnect the starter **(a)**, the ground strap **(b)**, the glow plugs **(c)**,and the fuel solenoid **(d)**, etc.



wc_gr011105

4. Re-install the doors and the spine.
5. Re-install the radiator.
6. Re-install the muffler.

Result

The engine has now been installed.

13.19 Removing the Engine—Kohler

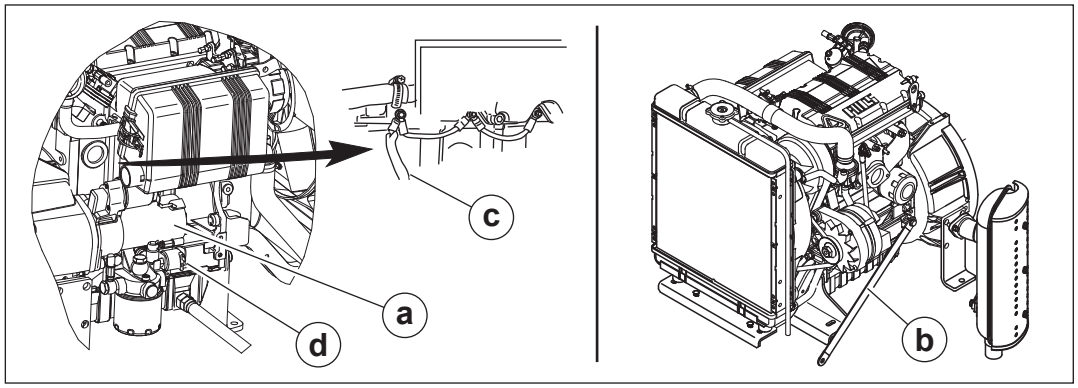
Requirements

- Doors and spine removed
- Engine lift or crane

Procedure

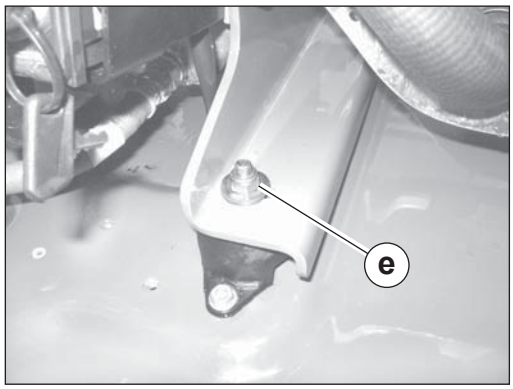
Perform the procedure below to remove the engine.

1. Remove the doors and the spine.
2. Remove the radiator.
3. Remove the muffler.
4. Mark, then disconnect the electrical components from the engine — for example, disconnect the starter **(a)**, the ground strap **(b)**, the glow plugs **(c)**,and the fuel solenoid **(d)**, etc.



wc_gr011181

5. Check and clear any obstructions that may be still in the tub — for example, fuel lines, control panel, and stator assembly.
6. Remove the screws **(e)** that hold the engine to the tub.



wc_gr011182

7. Using an appropriate lift or crane, lift the engine up and out of the tub.

Result

The engine has now been removed.

13.20 Installing the Engine—Kohler

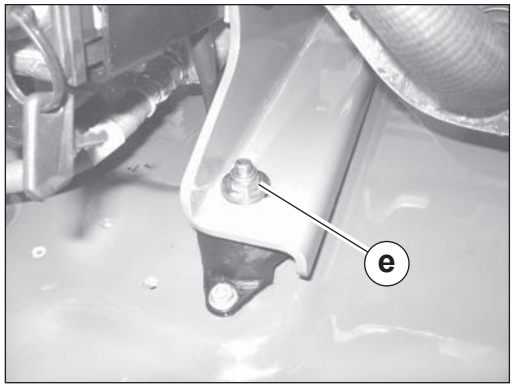
Requirements

- Torque wrench
- Engine lift or crane

Procedure

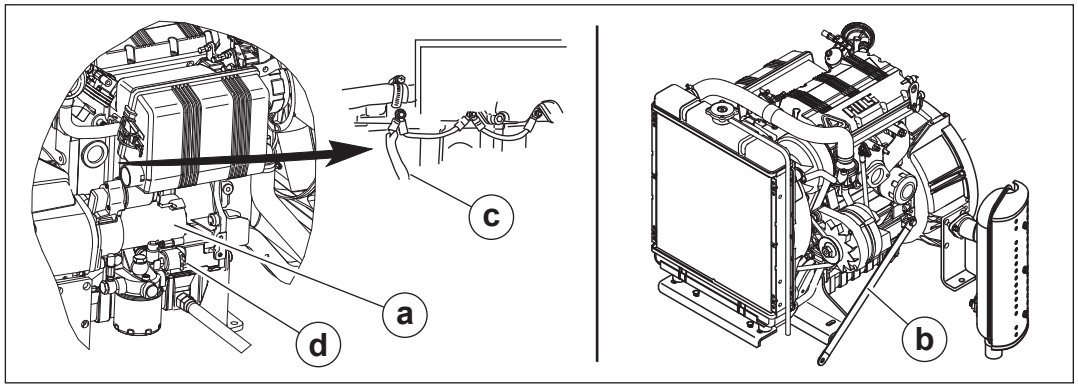
Perform the procedure below to install the engine.

1. Using an appropriate lift or crane, set the engine into the tub.
2. Install the screws **(e)** that hold the engine to the tub.



wc_gr011182

3. Remove the doors and the spine.
4. Reconnect the electrical components to the engine — for example, connect the starter **(a)**, the ground strap **(b)**, the glow plugs **(c)**,and the fuel solenoid **(d)**, etc.



wc_gr011181

5. Install the radiator.
6. Install the muffler.

Result

The engine has now been installed.

13.21 Removing the Rotor

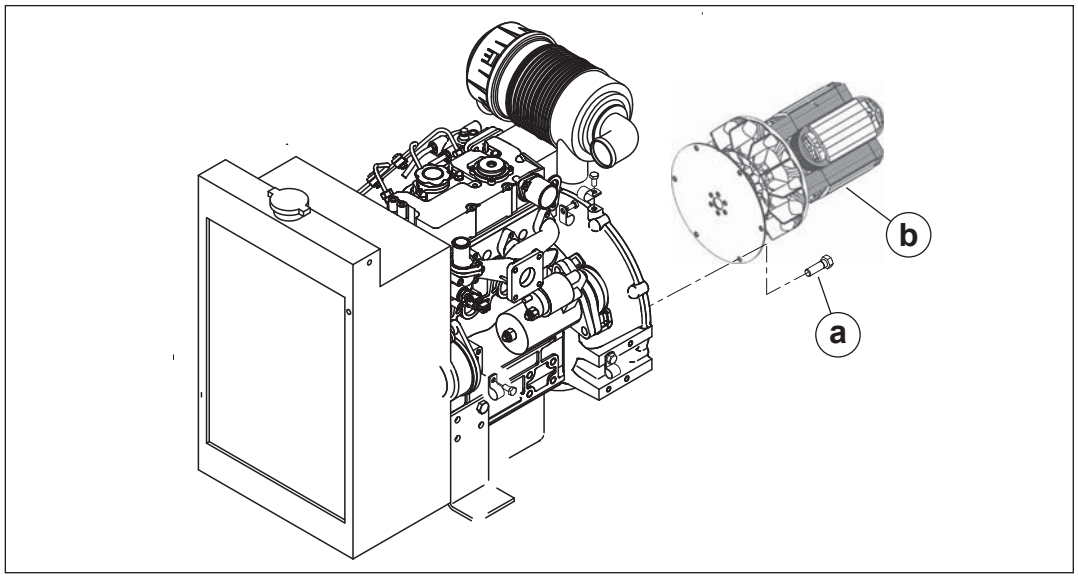
Requirements

- Machine stopped
- Stator removed

Procedure

Perform the procedure below to remove the rotor.

1. Remove the stator.



wc_gr011120

2. Remove the screws **(a)** and remove the rotor assembly **(b)** from the machine.

Result

The rotor is now removed.

13.22 Installing the Rotor

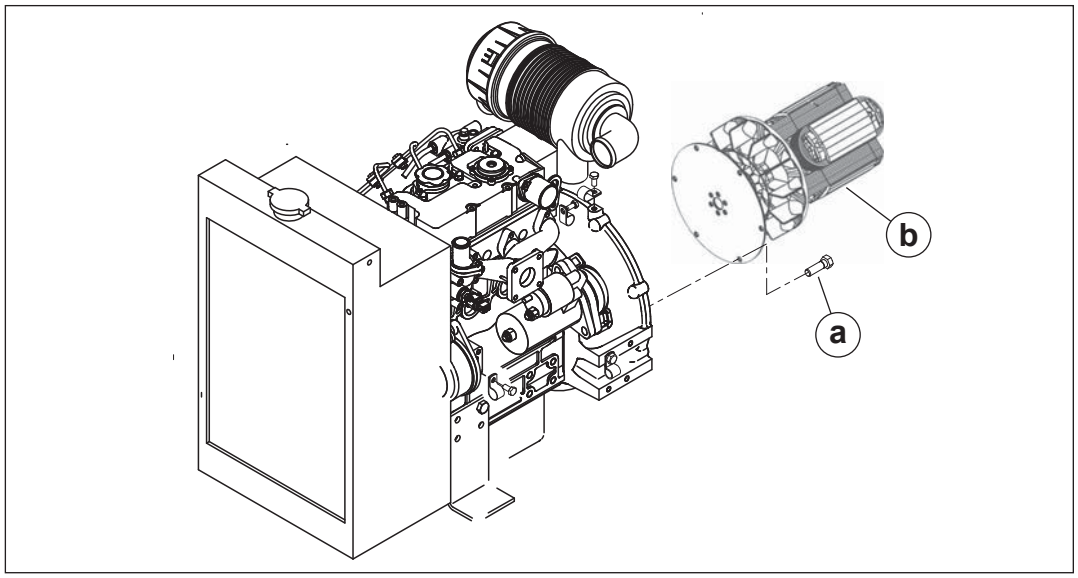
Requirements

- Torque wrench
- Loctite 243 or equivalent

Procedure

Perform the procedure below to install the rotor.

1. Install the rotor assembly **(b)** with the screws **(a)**. Use Loctite 243 on the screws and torque them (in a pattern) to 21 Nm (15 ft.lbs.).



wc_gr011120

2. Install the stator.

Result

The rotor is now installed.

13.23 Removing the Flex Plates and the Fan

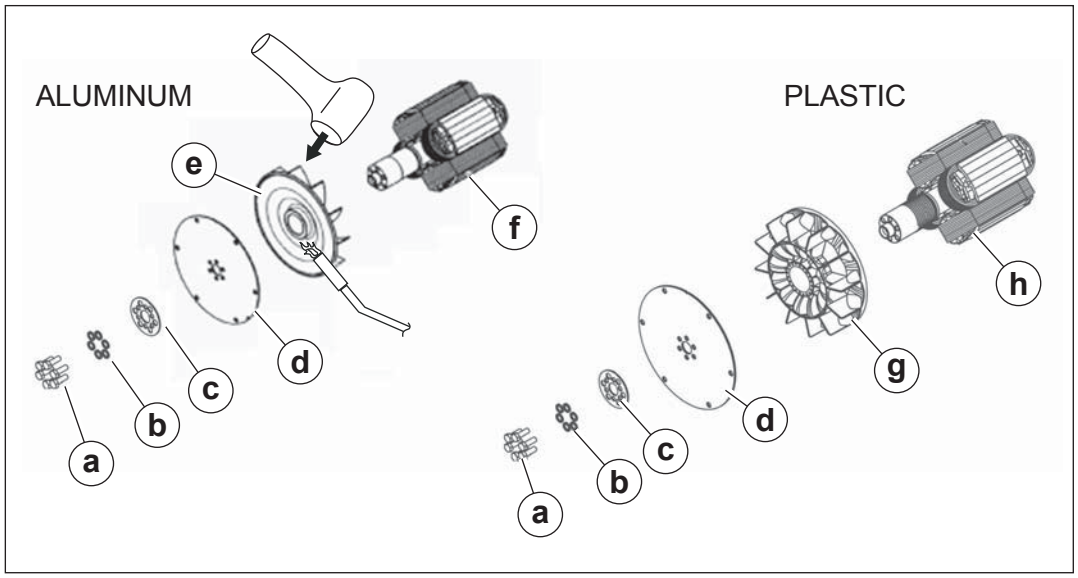
Requirements

- Rotor is removed from main stator housing
- Source of heat
- Rubber mallet

Procedure

Perform the procedure below to remove the flex plates and fan from the rotor.

1. Remove the five screws **(a)**, the washers **(b)**, the spacer **(c)**,and the flex plates **(d)**.



wc_gr011116

2. On machines with aluminum fans, heat the fan hub and tap the fan with a rubber mallet to remove it.
3. On machines with plastic fans, unscrew the fan from the rotor shaft—note there are left-handed threads on the rotor shaft.

Result

The flex plates and the fan are now removed from the rotor.

13.24 Installing the Flex Plates and the Fan

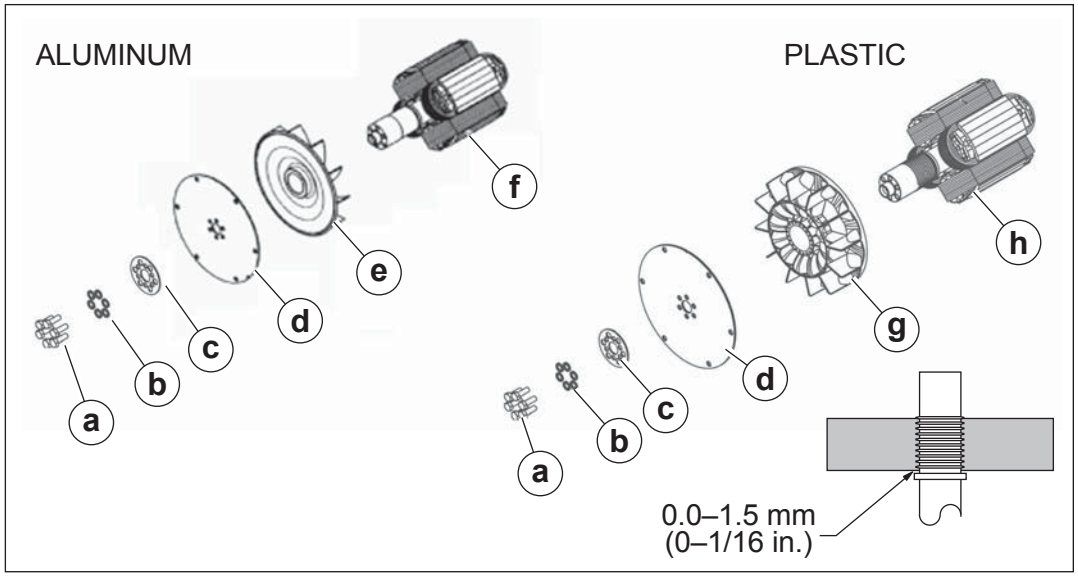
Requirements

- New fan
- Arbor press

Procedure

Perform the procedure below to install the flex plates and fan to the rotor.

1. On machines with aluminum fans **(e)**, use an arbor press and press the fan onto the rotor shaft **(f)**. Press the fan on until it reaches the shoulder of the rotor shaft.
2. On machines with plastic fans **(g)**, screw the fan onto the rotor shaft **(h)**. Do not screw the fan onto the rotor shaft past the shoulder.



wc_gr011117

3. Install the five screws **(a)**, the washers **(b)**, the spacer **(c)**,and the flex plates **(d)**.

Result

The flex plates and the fan are now installed.

13.25 Removing the Tilt Cable

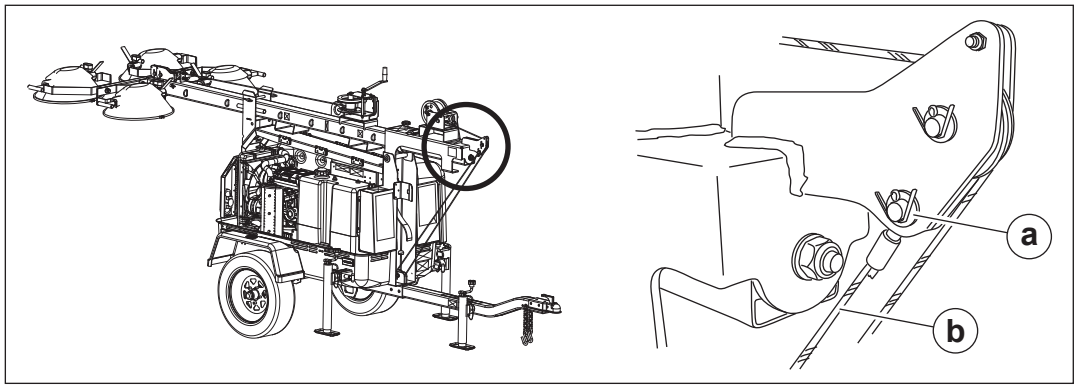
Requirements

- Tower is lowered
- Battery is disconnected

Procedure

Perform the procedure below to remove the tilt cable.

1. Lower the tower into the cradle.
2. Make note of the tilt cable routing for ease of reassembly.
3. Remove the pins **(a)** and disconnect the tilt cable **(b)** from the lower tube.



wc_gr011130

4. Unwind the tilt cable from the tilt winch.

Result

The tilt cable is removed from the machine.

13.26 Installing the Tilt Cable

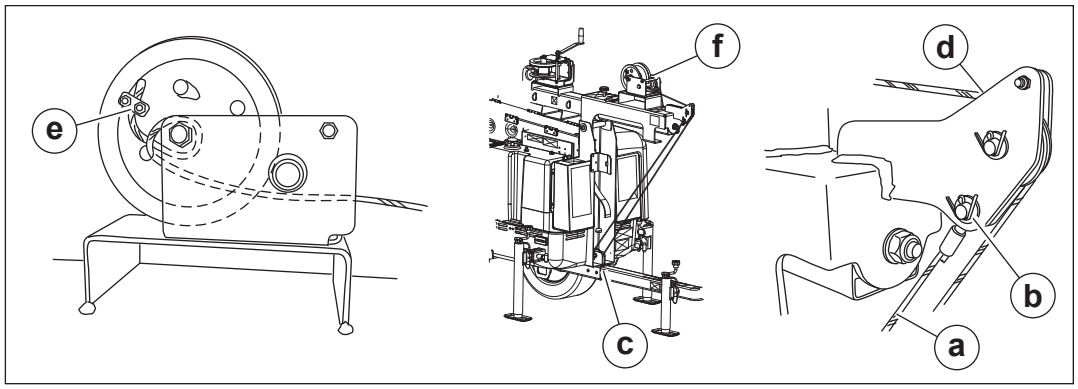
Requirements

- Tower is lowered
- New tilt cable

Procedure

Perform the procedure below to install the tilt cable.

1. Connect the tilt cable **(a)** to the lower tube with pins **(b)**.



wc_gr011131

2. Route the tilt cable through pulley **(c)** and then through pulley **(d)**.
3. Route the tilt cable under the spool of the tilt winch **(f)**, out the hole in the side of the spool, wrap it around the hub, and then connect it to the tilt winch with the cable clamp and two screws **(e)**.
4. Wind the winch to take up the slack in the tilt cable.

Result

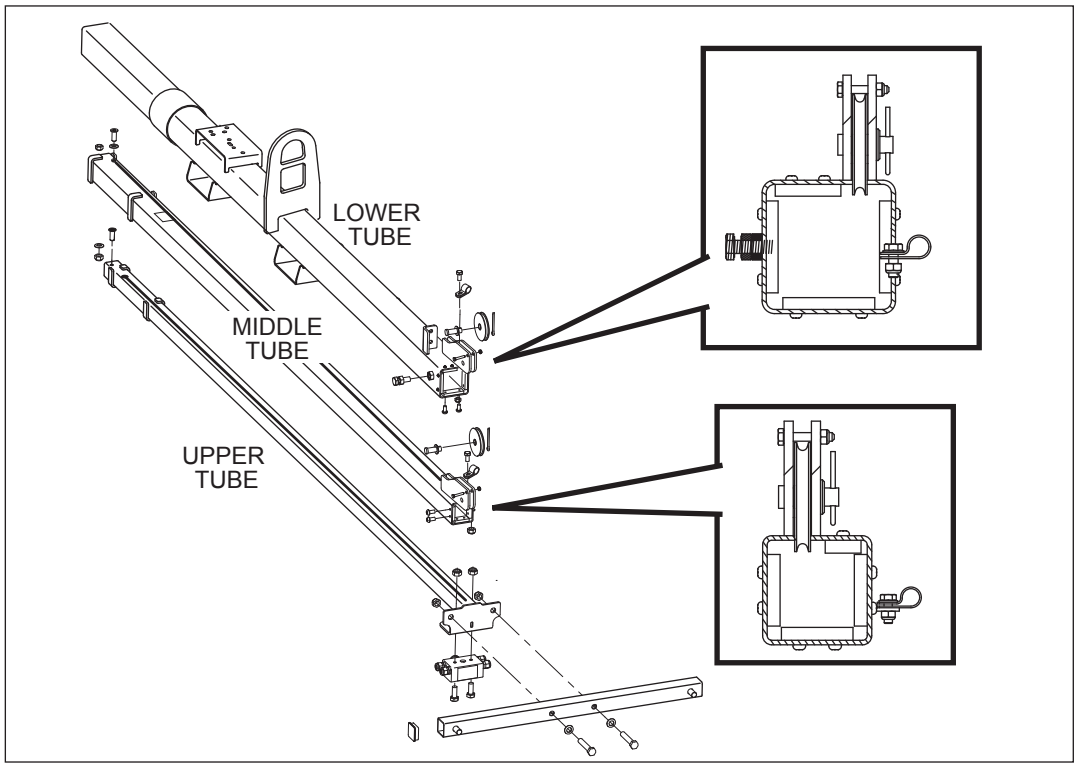
The tilt cable is installed into the machine.

13.27 Removing the Upper Cable

Requirements

- Tower is lowered
- Battery is disconnected

Reference graphic

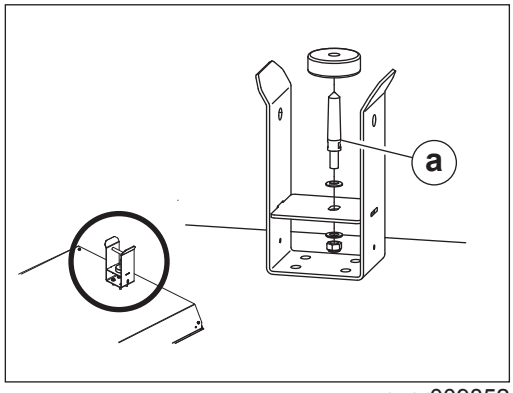


wc_gr009857

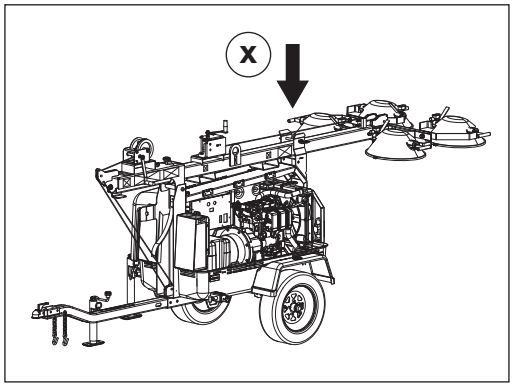
Procedure

Perform the procedure below to remove the upper cable.

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



wc_gr009852



wc_gr011132

2. Lower **(x)** the tower into the cradle.

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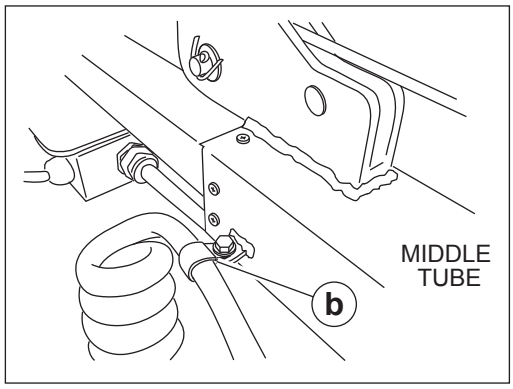
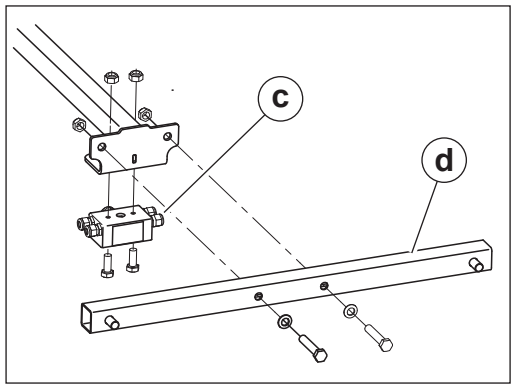
3. Disconnect the cable clamp **(b)** from the middle tube.

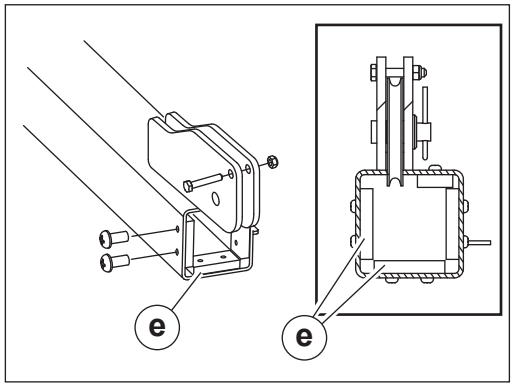


wc_gr009869

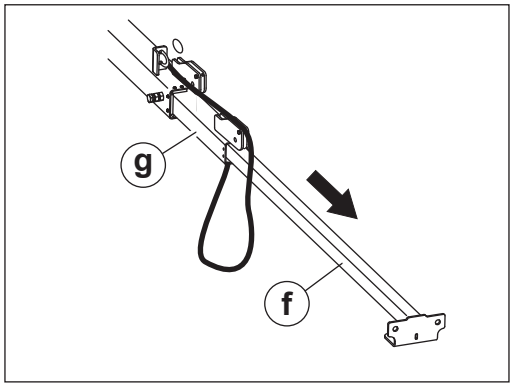


wc_gr009855

4. Remove the terminal box **(c)**. Do not disconnect the wiring inside it.
5. Remove the top bar **(d)** — with lights attached — and put the assembly in a safe place on the floor.
6. Remove all the guide blocks **(e)** from the end of the middle tube.

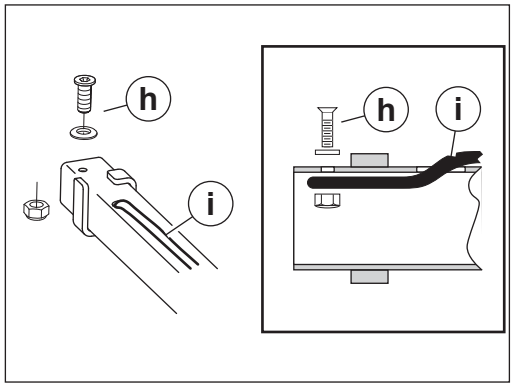


wc_gr009856

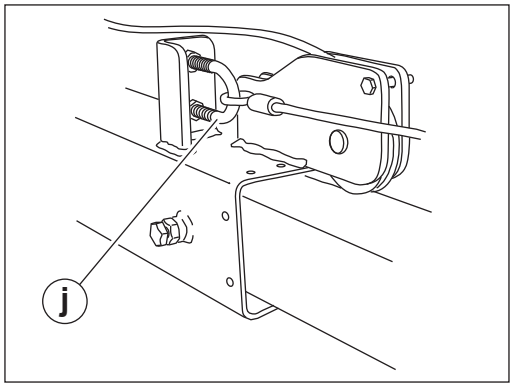


wc_gr009858

7. Pull the upper tube **(f)** from the middle tube **(g)**.
8. Remove the fasteners **(h)** and remove the upper cable **(i)** from the upper tube.



wc_gr009859



wc_gr009861

9. Disconnect the upper cable from the eye bolt **(j)**.

Result The upper cable is removed from the machine.

13.28 Installing the Upper Cable

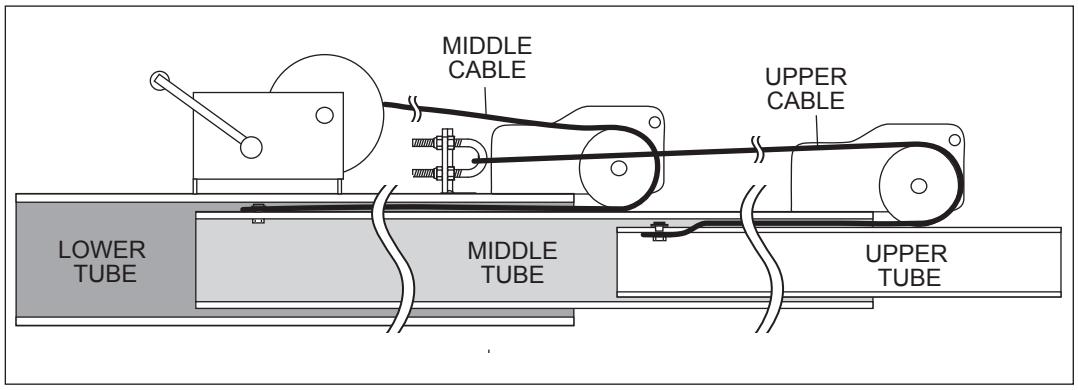
Requirements

- Battery is disconnected
- New upper cable

WARNING
Personal injury hazard. Replacement cable must be the exact length of the original equipment. Using a shorter cable may cause the upper tube to be pulled out of the middle tube when raising the tower if guide blocks are not in place. This may lead to severe bodily harm.

► Do not use cables shorter than the original.

Reference graphic

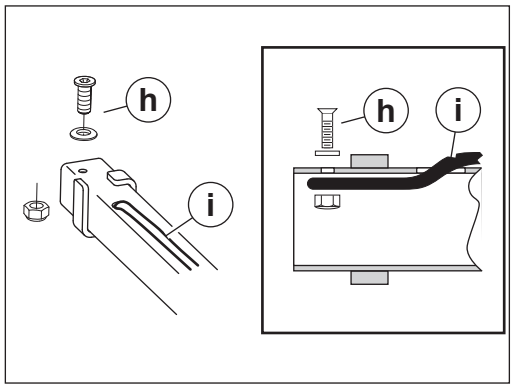


wc_gr009872

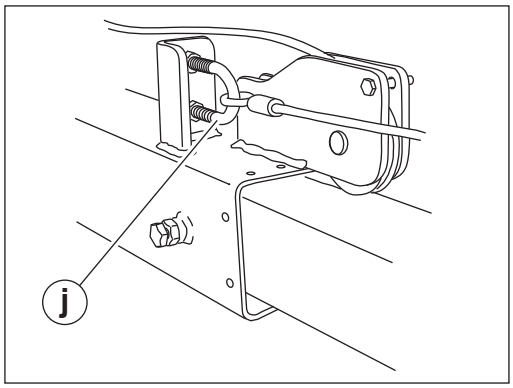
Procedure

Perform the procedure below to install the upper cable.

1. Install the upper cable **(i)** to the upper tube with fasteners **(h)**. Torque the fasteners to 16 Nm (12 ft.lbs.).



wc_gr009859



wc_gr009861

2. Connect the upper cable to the eye bolt **(j)**.

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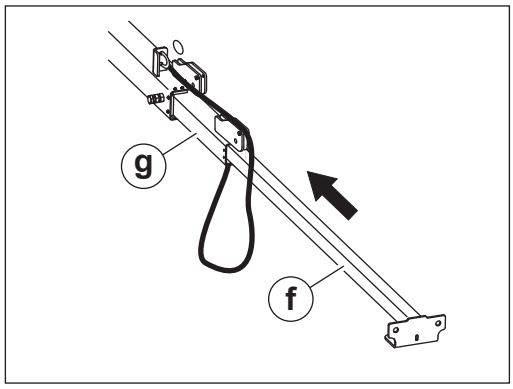
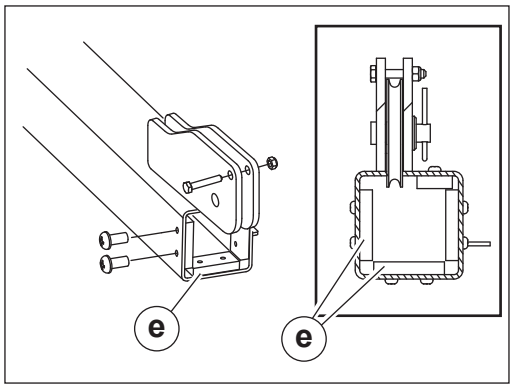
Continued from the previous page.

3. Slide the upper tube **(f)** into the middle tube **(g)**. Guide the upper cable in.



wc_gr009862



wc_gr009856

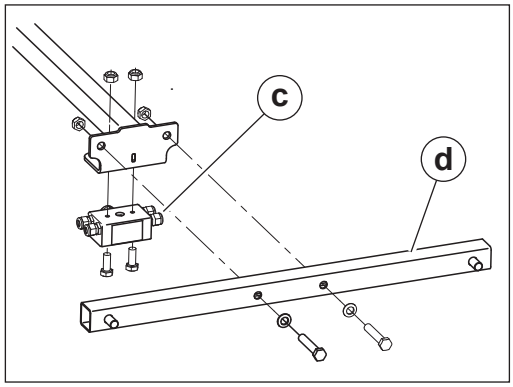
WARNING
Personal injury hazard. Guide blocks must be installed. The guide blocks serve as stops to prevent the upper tube from being pulled out of the middle tube when raising the tower.

► Only raise the tower when the guide blocks are installed correctly.

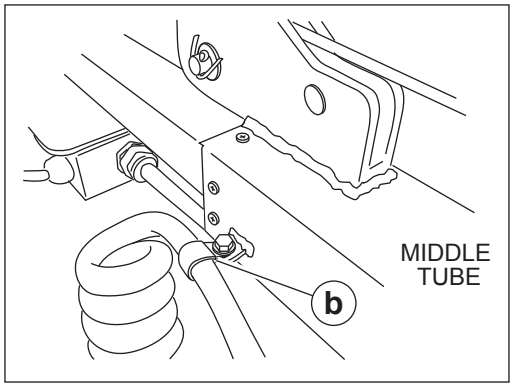
4. Install the guide blocks **(e)** into the end of the middle tube. Do not overtighten the screws. The guide block threads may strip.

NOTICE: Limit re-use of guide blocks to one time. Further re-use may compromise the guide block's ability to hold a screw.

5. Install the top bar **(d)** with lights attached. Torque the fasteners to 83 Nm (61 ft.lbs.).



wc_gr009855



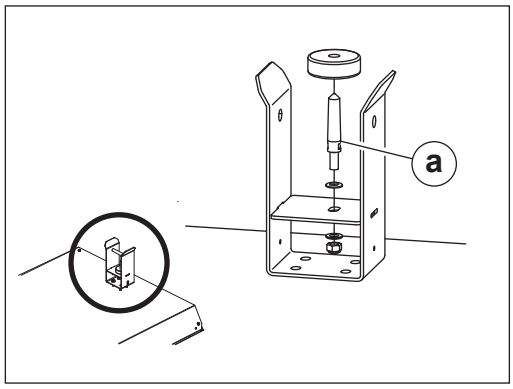
wc_gr009869

6. Install the terminal box **(c)**. Torque the fasteners to 24 Nm (18 ft.lbs.)
7. Attach the cable clamp **(b)** to the middle tube.
8. Raise the tower to the vertical position.

This procedure continues on the next page.

Continued from the previous page.

9. Install the secondary locking pin **(a)** to the cradle. Torque the fasteners to 48 Nm (35 ft.lbs.).



wc_gr009852

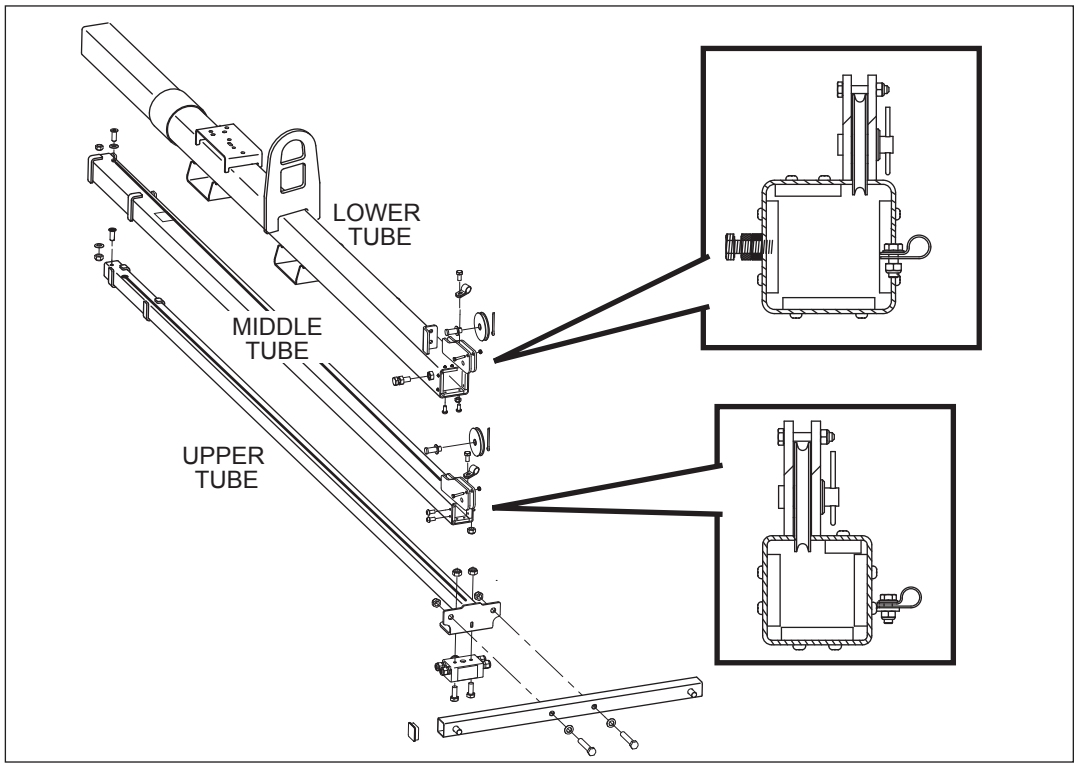
Result The upper cable has now been installed.

13.29 Removing the Middle Cable

Requirements

- Tower is lowered
- Battery is disconnected

Reference graphic

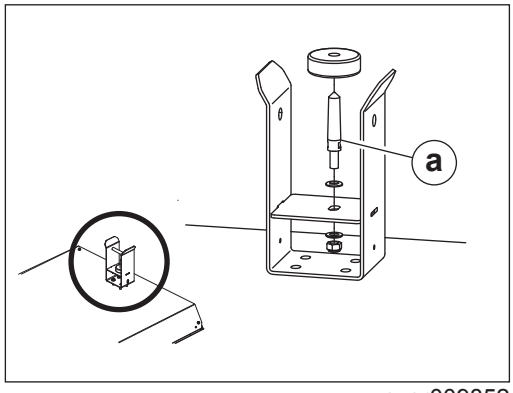


wc_gr009857

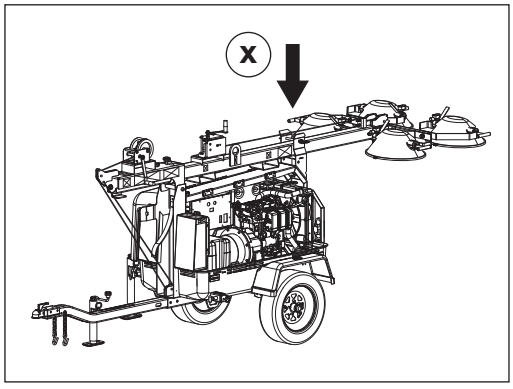
Procedure

Perform the procedure below to remove the middle cable.

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



wc_gr009852



wc_gr011132

2. Lower **(x)** the tower into the cradle.

This procedure continues on the next page.

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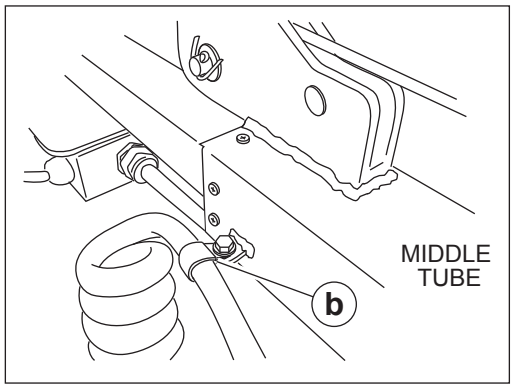
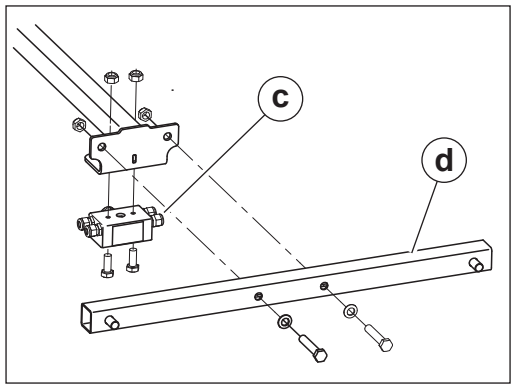
3. Disconnect the cable clamp **(b)** from the middle tube.

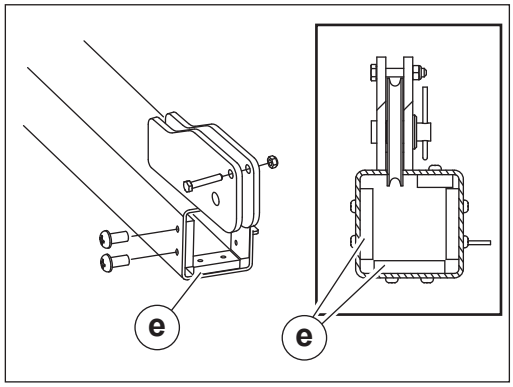


wc_gr009869

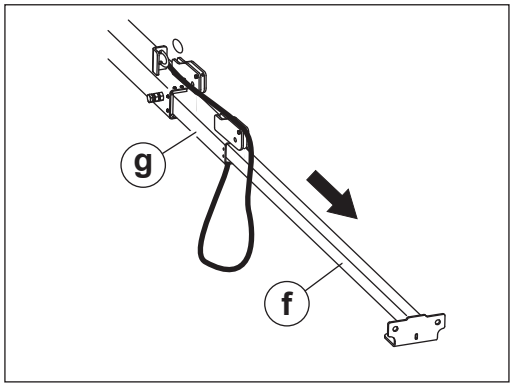


wc_gr009855

4. Remove the terminal box **(c)**. Do not disconnect the wiring inside it.
5. Remove the top bar **(d)** — with lights attached — and set the assembly in a safe place on the floor.
6. Remove all the guide blocks **(e)** from the end of the middle tube.

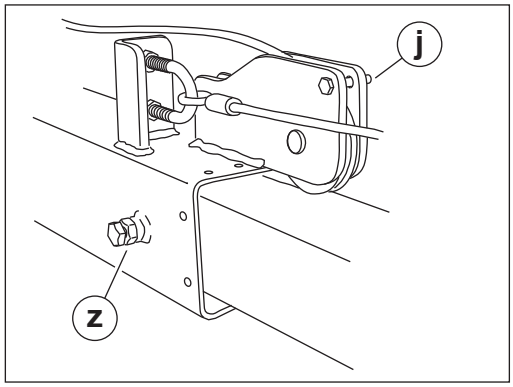


wc_gr009856



wc_gr009858

7. Pull the upper tube **(f)** from the middle tube **(g)** and set it in a safe place.
8. Remove the retaining hardware **(j)** from the lower tube.



wc_gr009863

9. Loosen the locking nut and screw **(z)**.

This procedure continues on the next page.

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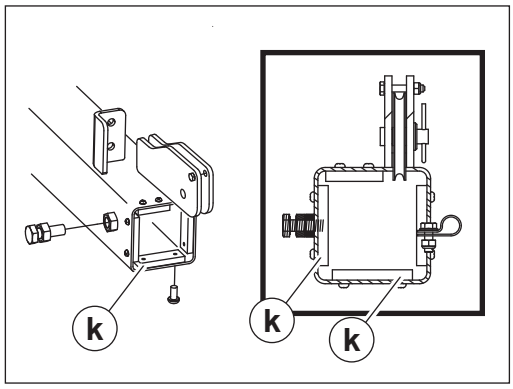
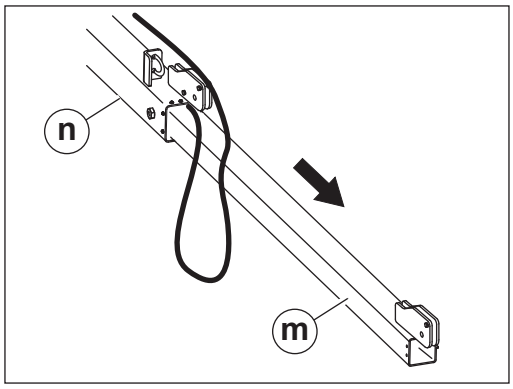
10.Remove all the guide blocks **(k)** from the end of the lower tube.



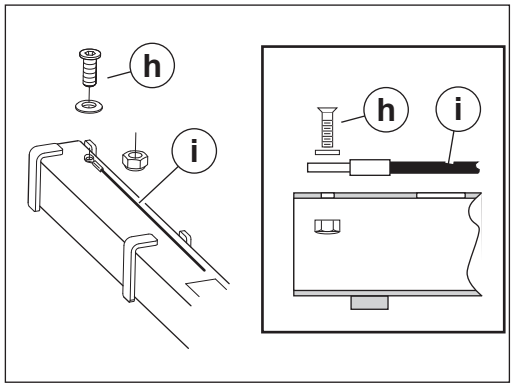
wc_gr009864



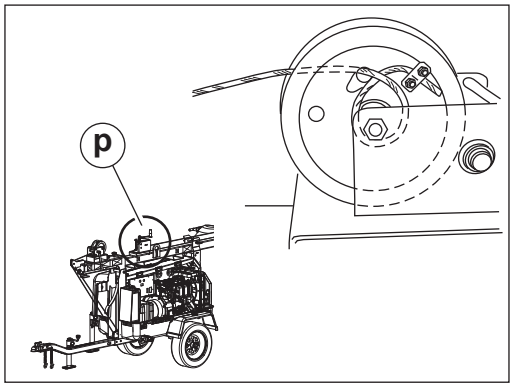
wc_gr009865

11.Pull the middle tube **(m)** from the lower tube **(n)**.

12.Remove the fasteners **(h)** and remove the middle cable **(i)** from the middle tube.



wc_gr009866



wc_gr011134

13.Make note of the routing of the middle cable, then disconnect the middle cable from the telescoping winch **(p)**.

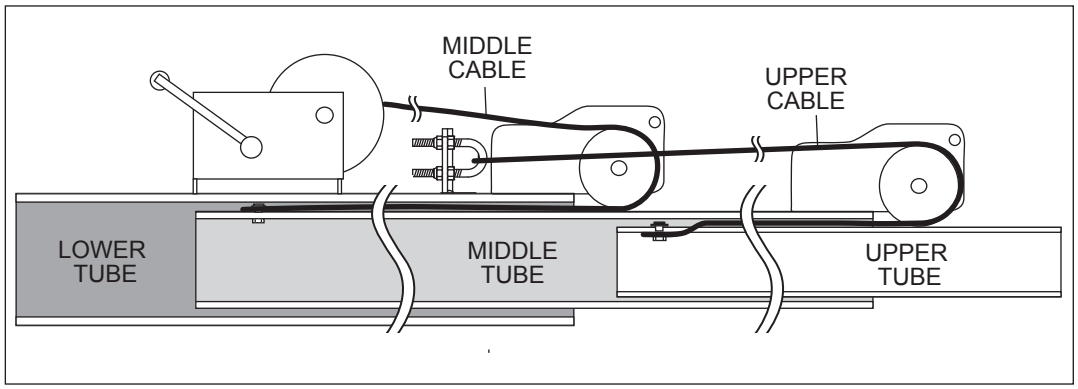
Result The middle cable has now been removed.

13.30 Installing the Middle Cable

Requirements

- Battery is disconnected
- New middle cable

Reference graphic

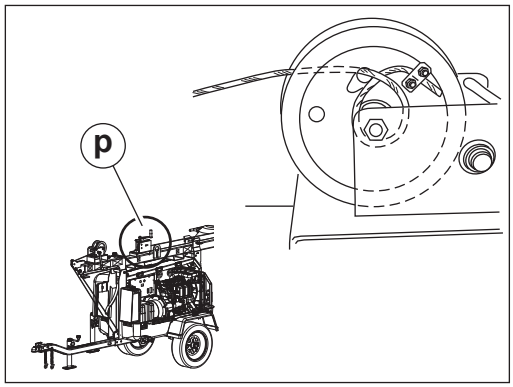


wc_gr009872

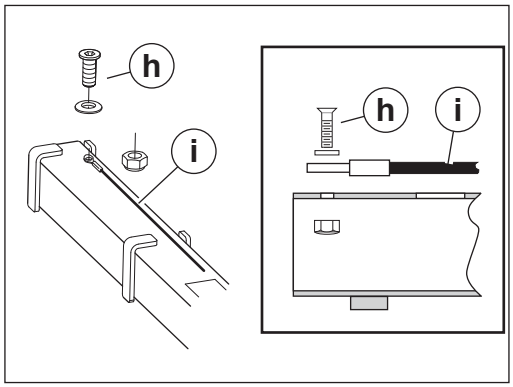
Procedure

Perform the procedure below to install the middle cable.

1. Locate the telescoping winch **(p)**. Route the middle cable through the hole in the spool, then around the hub (between the bracket and the spool), and connect it to the telescoping winch with the cable clamp and two screws.



wc_gr011134



wc_gr009866

2. Connect the other end of the middle cable **(i)** to the middle tube using fasteners **(h)**. Torque the fasteners to 16 Nm (12 ft.lbs.)

This procedure continues on the next page.

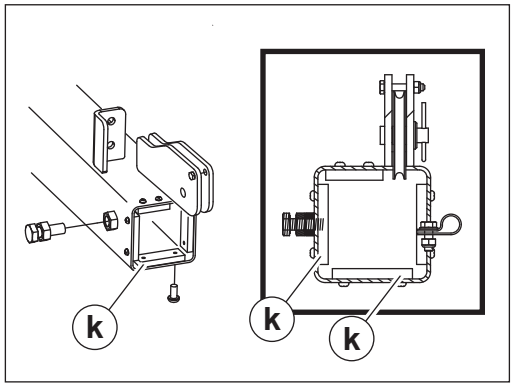
Continued from the previous page.

WARNING
Personal injury hazard. Guide blocks must be installed. The guide blocks serve as stops to prevent the upper tube from being pulled out of the middle tube when raising the tower.

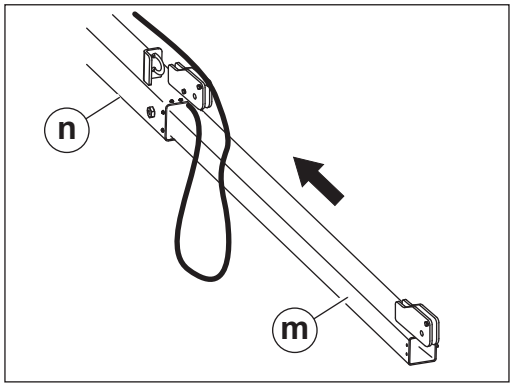
► Only raise the tower when the guide blocks are installed correctly.

3. Install the guide blocks **(k)** to the end of the lower tube. Do not overtighten the screws. The guide block threads may strip.

NOTICE: Limit re-use of guide blocks to one time. Further re-use may compromise the guide blocks' ability to hold the screws.



wc_gr009864



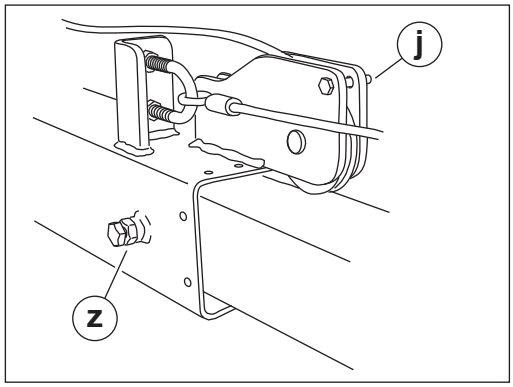
wc_gr009868

4. Slide the middle tube **(m)** into the lower tube **(n)**. Guide the middle cable in.

WARNING
Personal injury hazard. The stop screw and lock nut must be installed. They serve as a stop which prevents the middle tube and the upper tube from being pulled out of the lower tube when raising the tower.

► Do not raise the tower unless the stop screw and lock nut are installed correctly.

5. Install the stop screw and lock nut **(z)**. Ensure that the stop screw prevents the middle tube from being pulled out of the lower tube.



wc_gr009863

6. Attach the retaining hardware **(j)** to the lower tube.

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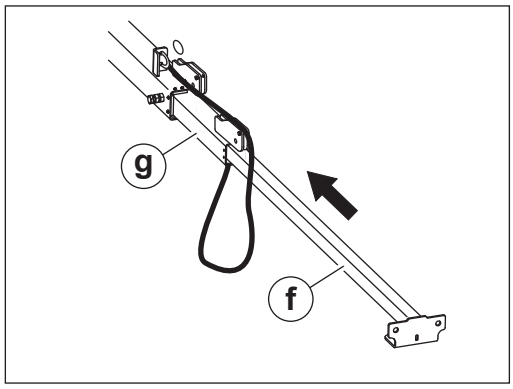
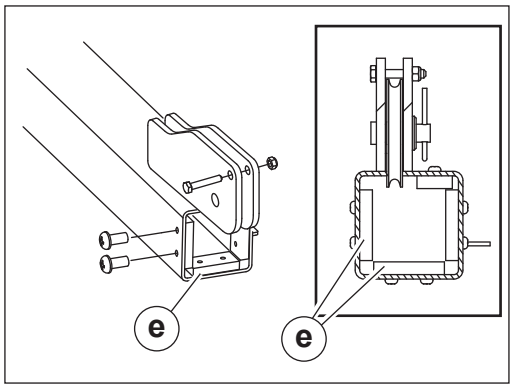
7. Slide the upper tube **(f)** into the middle tube **(g)**. Guide the upper cable in.



wc_gr009862



wc_gr009856

WARNING
Personal injury hazard. Guide blocks must be installed. The guide blocks serve as stops to prevent the upper tube from being pulled out of the middle tube when raising the tower.

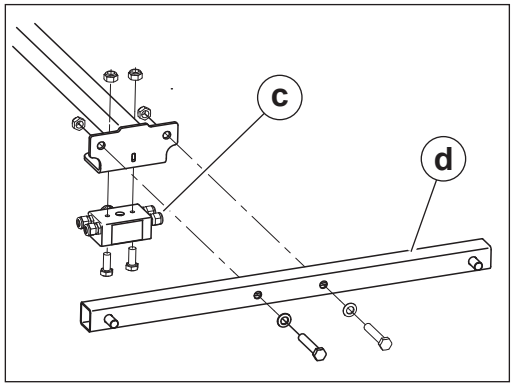
► Only raise the tower when the guide blocks are installed correctly.

8. Install the guide blocks **(e)** into the end of the middle tube. Do not overtighten the screws. The guide block threads may strip.

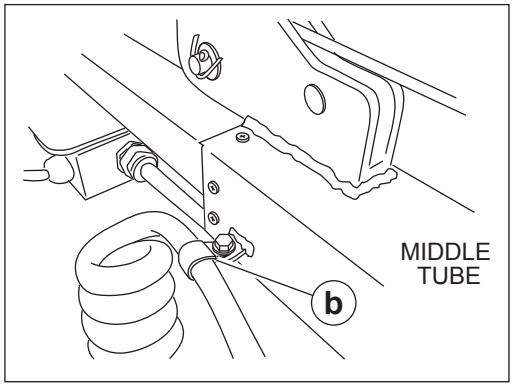
NOTICE: Limit re-use of guide blocks to one time. Further re-use may compromise the guide blocks' ability to hold the screws.

9. Install the top bar **(d)** (with lights attached). Torque the fasteners to 83 Nm (61 ft.lbs.).

10. Install the terminal box **(c)**. Torque the fasteners to 24 Nm (18 ft.lbs.).



wc_gr009855



wc_gr009869

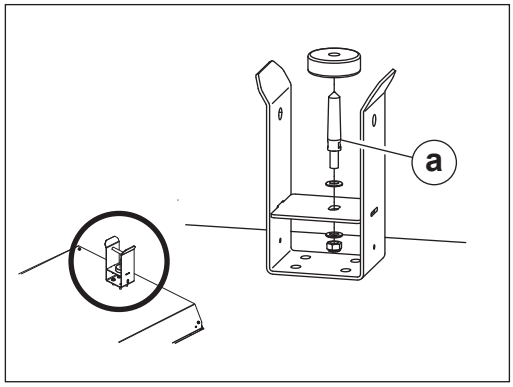
11. Attach the cable clamp **(b)** to the middle tube.

This procedure continues on the next page.

Continued from the previous page.

12. Raise the tower to the vertical position.

13. Install the secondary locking pin **(a)** into the cradle. Torque the fasteners to 48 Nm (35 ft.lbs.).



wc_gr009852

Result The middle cable has now been installed.

13.31 Removing a Ballast Transformer

Requirements

- Engine stopped
- Battery disconnected

Procedure

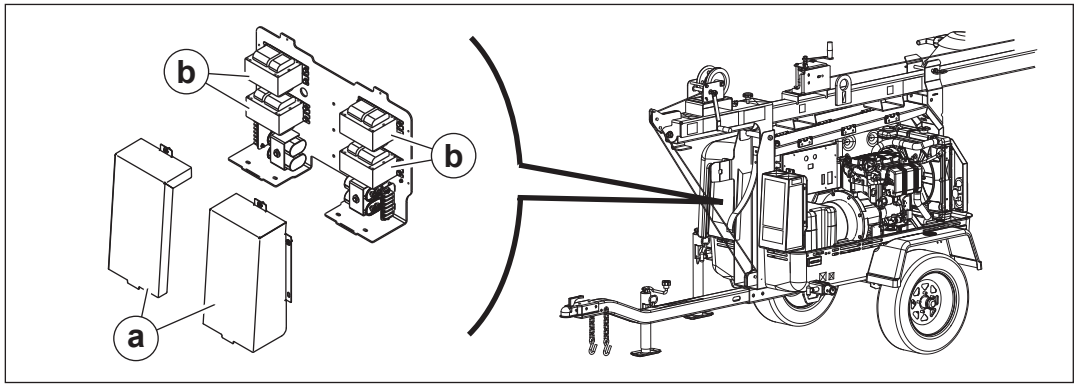
Perform the procedure below to remove a ballast transformer.

1. Stop the engine.

WARNING
Electric shock hazard. High voltage exists under the covers at the ballast transformers, ballast capacitors, and short terminal strip(s) when the engine is running. High voltage can cause severe injury or death.

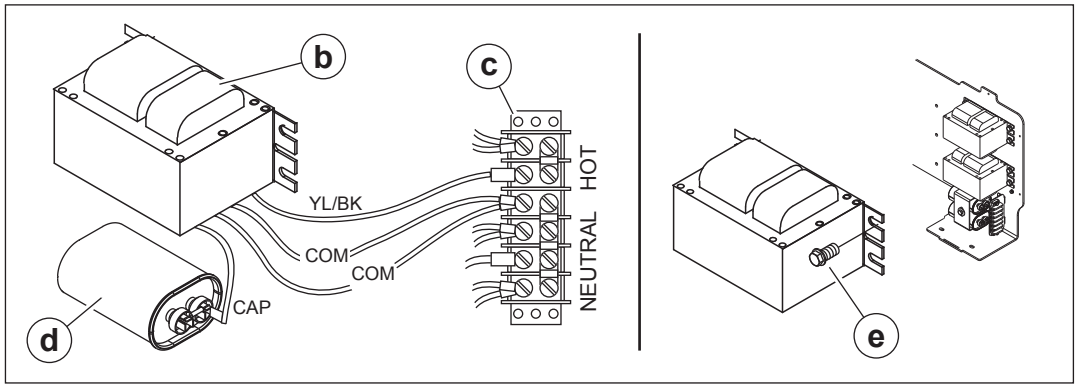
► Stop the engine before performing this procedure.

2. Remove the covers **(a)** from the machine to access the ballast transformers **(b)**.



wc_gr011089

3. Disconnect the wires that run between the ballast capacitor and the short terminal strip **(c)**. Also disconnect the wire running to the capacitor **(d)**.



wc_gr011090

4. Remove the screws **(e)** that hold the ballast transformer to the machine and remove the ballast transformer.

Result

The ballast transformer has now been removed.

13.32 Installing a Ballast Transformer

Requirements

- Torque wrench
- New ballast transformer

Procedure

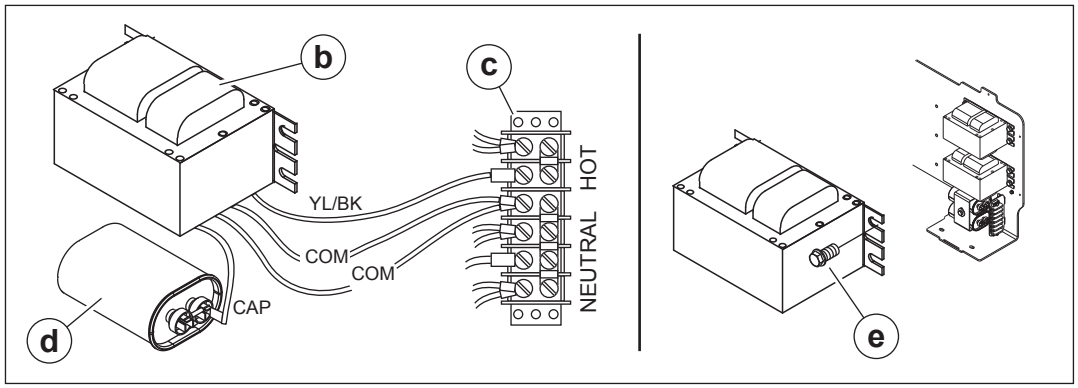
Perform the procedure below to install a ballast transformer.

1. Stop the engine.

WARNING
Electric shock hazard. High voltage exists under the covers at the ballast transformers, ballast capacitors, and short terminal strip(s) when the engine is running. High voltage can cause severe injury or death.

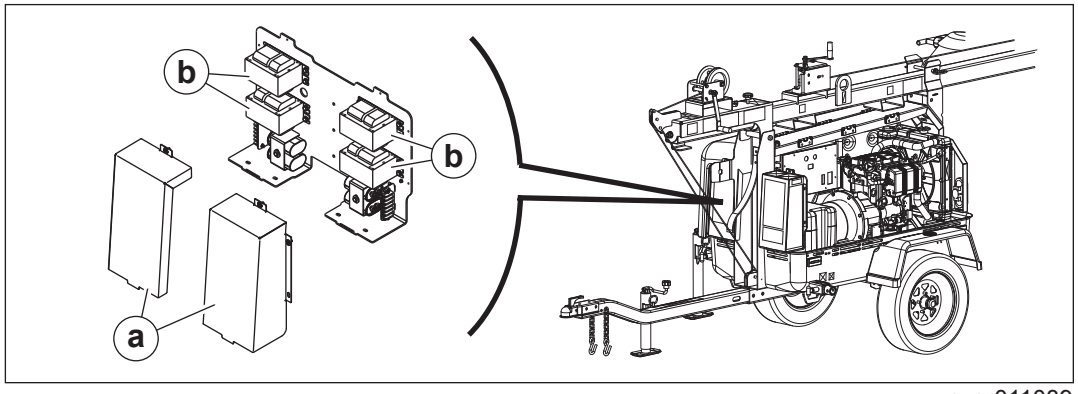
► Stop the engine before performing this procedure.

2. Install the ballast transformer to the machine with screws **(e)**. Torque the screws to 35 Nm (26 ft.lbs.).



wc_gr011090

3. Connect the wires that run between the ballast capacitor and the short terminal strip **(c)**. Also connect the wire running to the capacitor **(d)**.
4. Install the covers **(a)** that protect the ballast transformers **(b)**. Torque the screws to 5 Nm (4 ft.lbs.).



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Result

The ballast transformer has now been installed.

14 Technical Data—LTN6C

14.1 Engine

Engine Power Rating

Net power rating per ISO 3046 IFN. Actual power output may vary due to conditions of specific use.

Machine:		**LTN 6C**
Engine		
Make		Caterpillar
Model		C1.1
Type		3-cylinder, 4-cycle, liquid-cooled diesel
Max. rated power @ rated speed	kW (hp)	11.4 (15.3) @ 1800 rpm
Operating speed (no-load)	rpm	1800
Alternator	V / A / W	12 / 15 / 180
Battery	V/Ah/ccA	12 / 650
Air cleaner	type	Dry-type element
Fuel	type	No. 2 diesel
Fuel tank capacity	L (gal)	123 (32.5)
Fuel consumption	L (gal) / hr.	1.67 (0.44)
Running time	hours	68
Coolant capacity	L (qt)	4.7 (5.0)
Oil specification	type	Cat® DEO™ SAE 10W-30 Cat® DEO™ SAE 15W-40 or equivalent
Oil capacity	L (qt)	2.4 (2.5)

14.2 Generator

Item Number:		**LTN 6C** **0620298 0620118 0620551** **0620555 0620556 0620562** **5200004091**	**LTN 6C** **0620728**
Generator			
Frequency	Hz	60 ± 2	
Continuous output	kW	6.0	
Output	volts/phase	120, 1Ø	120/240, 1Ø
Amps	A	50	
Excitation type		Capacitor / Brushless	
Power factor		1.0	
Voltage regulation - No load to full load	%	± 6.0	
Speed (no-load)	rpm	1800	

14.3 Machine

Operating weight (GVWR)	kg (lb)	795 (1753)
Travel dimensions (l x w x h)	mm (in.)	4600 x 1500 x 1900 (180.4 x 59.3 x 73.2)
Height - tower extended	m (ft)	9 (30)
Lighting system (1000W)		4
Ballast		Coil and core
Max. lighting coverage @ 0.5 ft. candles	m^2 (acres)	Metal halide - 30,400 (7.52)
Sound level at 7 m (23 ft.)	db(A)	68
Tires	size	ST175 / 80D13

14.4 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.

15 Technical Data—LTN 6L

15.1 Engine

Engine Power Rating

Net power rating per ISO 3046 IFN. Actual power output may vary due to conditions of specific use.

Machine		**LTN 6L**
Engine		
Make		Kohler
Model		KDW1003
Type		3-cylinder, 4-cycle, liquid-cooled diesel
Max. power rating @ rated speed	kW (hp)	10.0 (13.4) @ 1800 rpm
Operating speed (no-load)	rpm	1800
Alternator	V / A / W	12 / 45 / 540
Battery	V/Ah/ccA	12 / 650
Air cleaner	type	Dry-type element
Fuel	type	No. 2 diesel
Fuel tank capacity	L (gal)	123 (32.5)
Fuel consumption	L (gal) / hr	1.71 (0.45)
Running time	hours	67
Coolant capacity	L (qt)	4.7 (5.0)
Oil specification	type	AGIP SINT 2000 5W-40 API SJ / CF 4 ACEA A3-96 B3-96 MIL-L-46152 D/E
Oil capacity	L (qt)	2.4 (2.5)

15.2 Generator

Item Number:		**LTN 6L 0620297 0620117 0620550 0620553 0620554 0620561**	**LTN 6L 0620727**
Generator			
Frequency	Hz	60 ± 2	
Continuous output	kW	6.0	
Output	volts/ phase	120, 1Ø	120/240, 1Ø
Amps	A	50	
Excitation type		Capacitor / Brushless	
Power factor		1.0	
Voltage regulation - no load to full load	%	± 6.0	
Speed (no-load)	rpm	1800	

15.3 Machine

Operating weight (GVWR)	kg (lb)	768 (1693)
Travel Dimensions (l x w x h)	mm (in.)	4600 x 1500 x 1900 (180.4 x 59.3 x 73.2)
Height - tower extended	m (ft)	9 (30)
Lighting system (1000W)		4
Ballast		Coil and core
Max. lighting coverage @ 0.5 ft. candles	m^2 (acres)	Metal halide - 30,400 (7.52)
Sound level at 7 m (23 ft.)	db(A)	67
Tires	size	ST175 / 80D13

15.4 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.

Notes

16 Technical Data—LTN 6/8K

16.1 Engine

Engine Power Rating

Net power rating per ISO 3046 IFN. Actual power output may vary due to conditions of specific use.

Machine		LTN 6K, LTN 6K-V	LTN 8K, LTN 8K-V
Engine			
Make		Kubota	
Model		D1005	D1105
Type		3-cylinder, 4-cycle, liquid-cooled diesel	
Max. rated power @ rated speed	kW (hp)	9.8 (13.1) @ 1800 rpm	11.5 (15.4) @ 1800 rpm
Operating speed (no-load)	rpm	1800	
Alternator	V / A / W	12 / 15 / 180	
Battery	V/Ah/ccA	12 / 650	
Air cleaner	type	Dry-type element	
Fuel	type	No. 2 diesel	
Fuel tank capacity	L (gal)	123 (32.5)	
Fuel consumption	L (gal) / hr	2.35 (0.61)	3.07 (0.80)
Running time	hours	53.3	40.6
Coolant capacity	L (qt)	5.78 (4.7)	
Oil capacity	L (qt)	3.5 (3.7)	
Oil grade	SAE / API	15W40 / CF or higher	

16.2 Generator

Machine:		LTN 6K, LTN 6K-V	LTN 8K, LTN 8K-V
Frequency	Hz	60	
Continuous output	kW	6.0	8.0
Output	volts/phase	120/240, 1Ø	
Amps	A	50	
Excitation type		Capacitor / Brushless	
Power factor		1.0	
Voltage regulation - No load to full load	%	± 6.0	
Speed (no-load)	rpm	1800	

16.3 Machine

Model:		LTN 6K	LTN 8K
Operating weight (GVWR)	kg (lbs)	804 (1772))	825 (1820)
Travel dimensions (l x w x h)	mm (in.)	4600 x 1500 x 1900 (180.4 x 59.3 x 72.3)	
Height - tower extended	m (ft)	9 (30)	
Lighting system (1000W)		4	
Ballast		Coil and core	
Max. lighting coverage @ 5 ft. candles (54 lux)	m^2 (ft^2)	1204 (12,960)	
Sound level at 7 m (23 ft.)	db(A)	68	70
Tires	size	ST175 / 80D13	

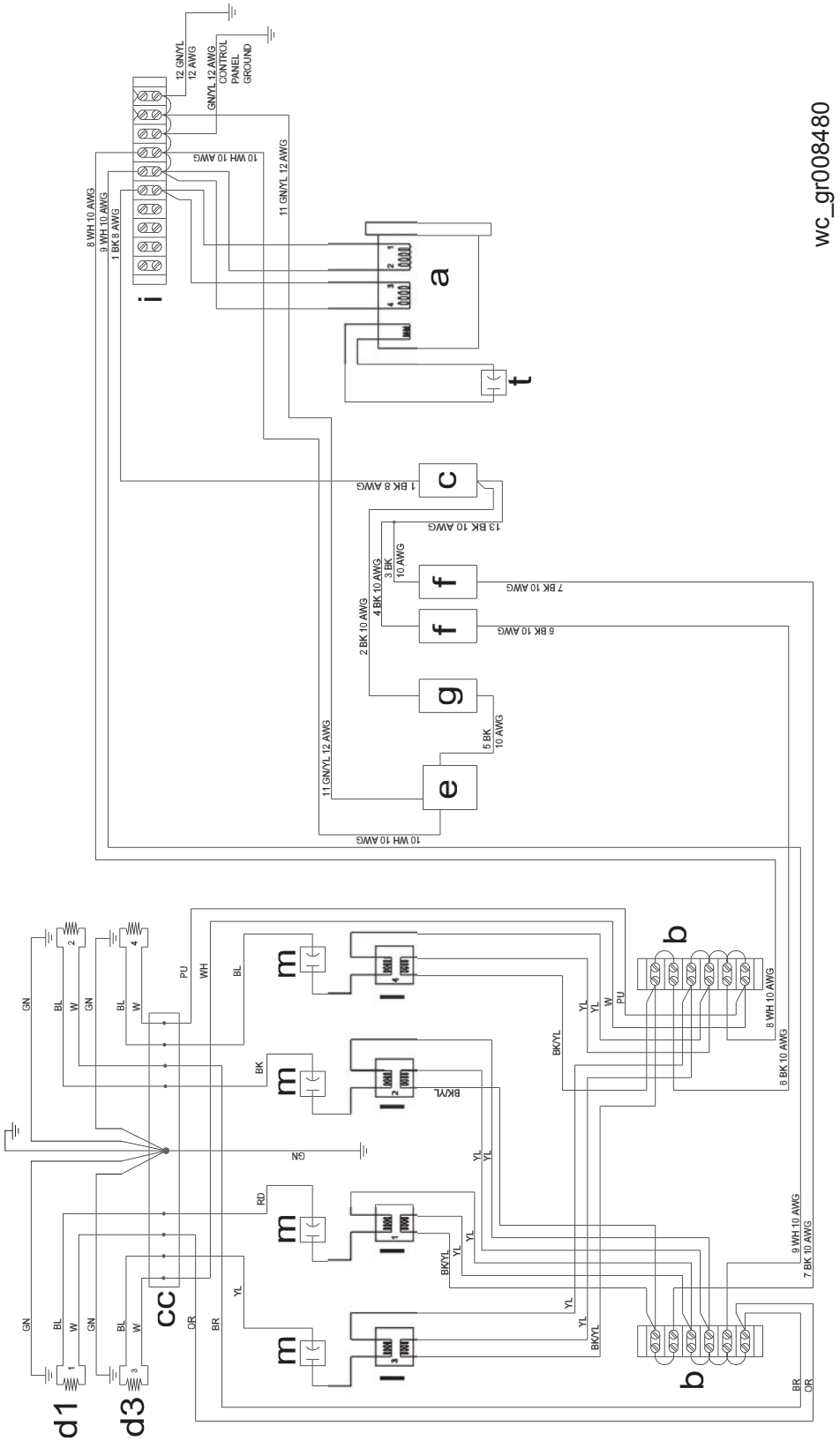
16.4 Radiation Compliance

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.

17 Schematics—LTN 6C

17.1 Lighting Schematic—120V

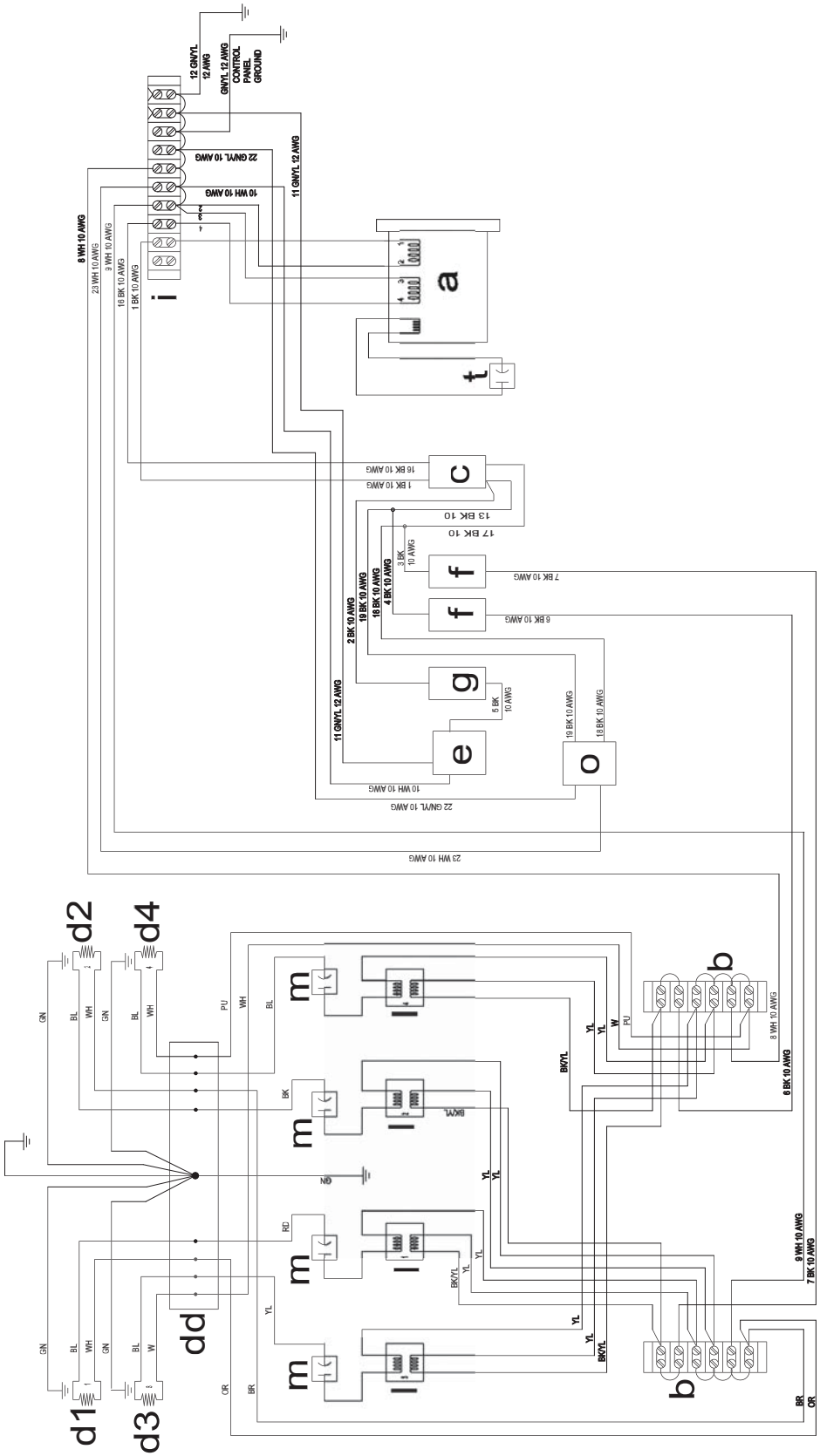


17.2 Components

Ref.	Description	Ref.	Description
a	Generator	**g**	Circuit breaker, 20A
b	Terminal strip (short)	**i**	Terminal strip (long)
c	Main circuit breaker, 50A	**l**	Transformers
d	Floodlights	**m**	Capacitors, 24 mF
e	Receptacle, 120V	**t**	Capacitor, 25 mF
f	Circuit breaker, 30A	**cc**	Junction box

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

17.3 Lighting Schematic—120/240V



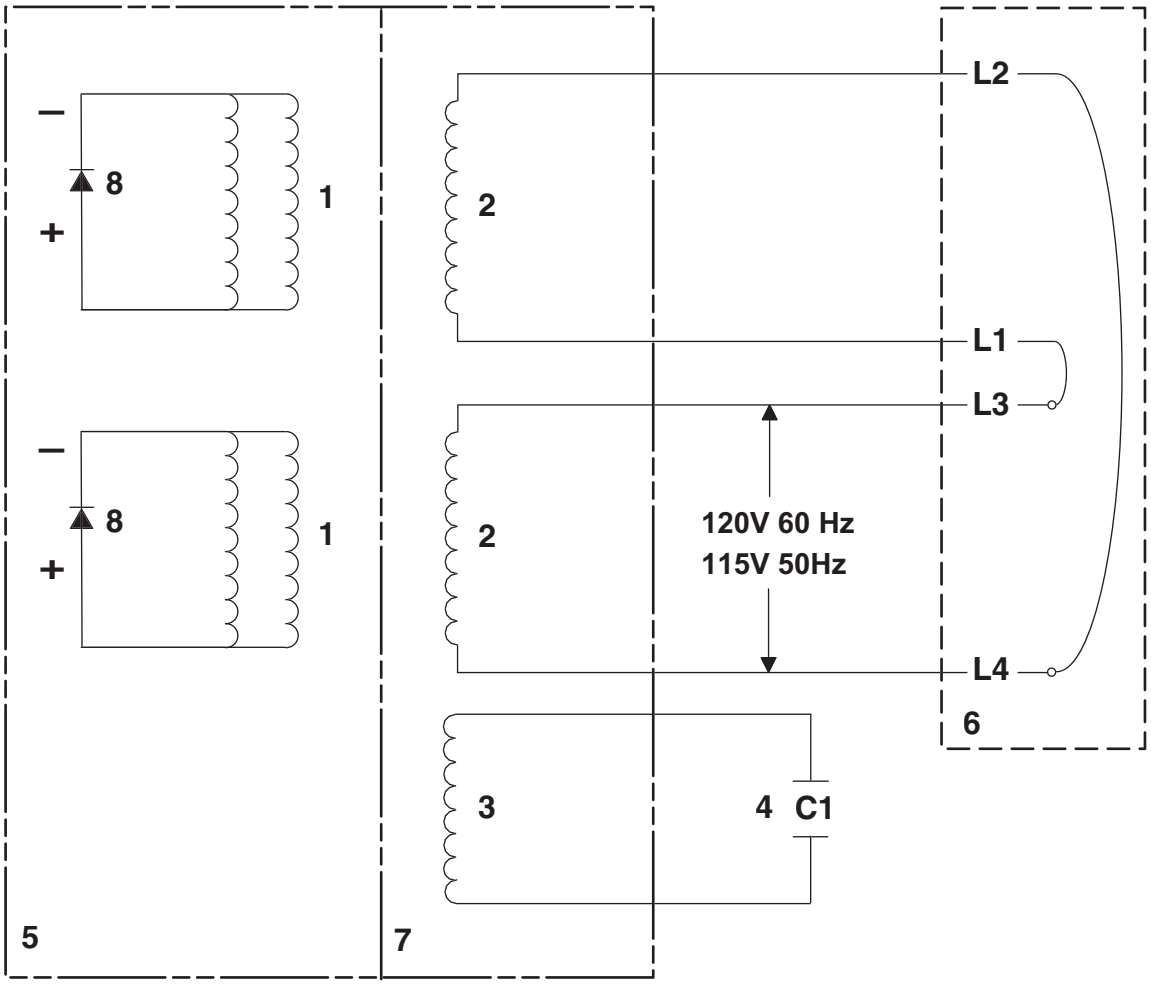
17.4 Components

Ref.	Description	Ref.	Description
a	Generator	**i**	Terminal strip (long)
b	Terminal strip (short)	**l**	Transformers
c	Main circuit breaker, 25A	**m**	Capacitors, 24 mF
d	Floodlights	**o**	Receptacle, 120/240V
e	Receptacle, 120V	**t**	Capacitor, 25 mF
f	Circuit breaker, 30A	**dd**	Junction box
g	Circuit breaker, 20A	**—**	—

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

17.5 Generator Capacitor Excitation Schematic

(115 - 120V)



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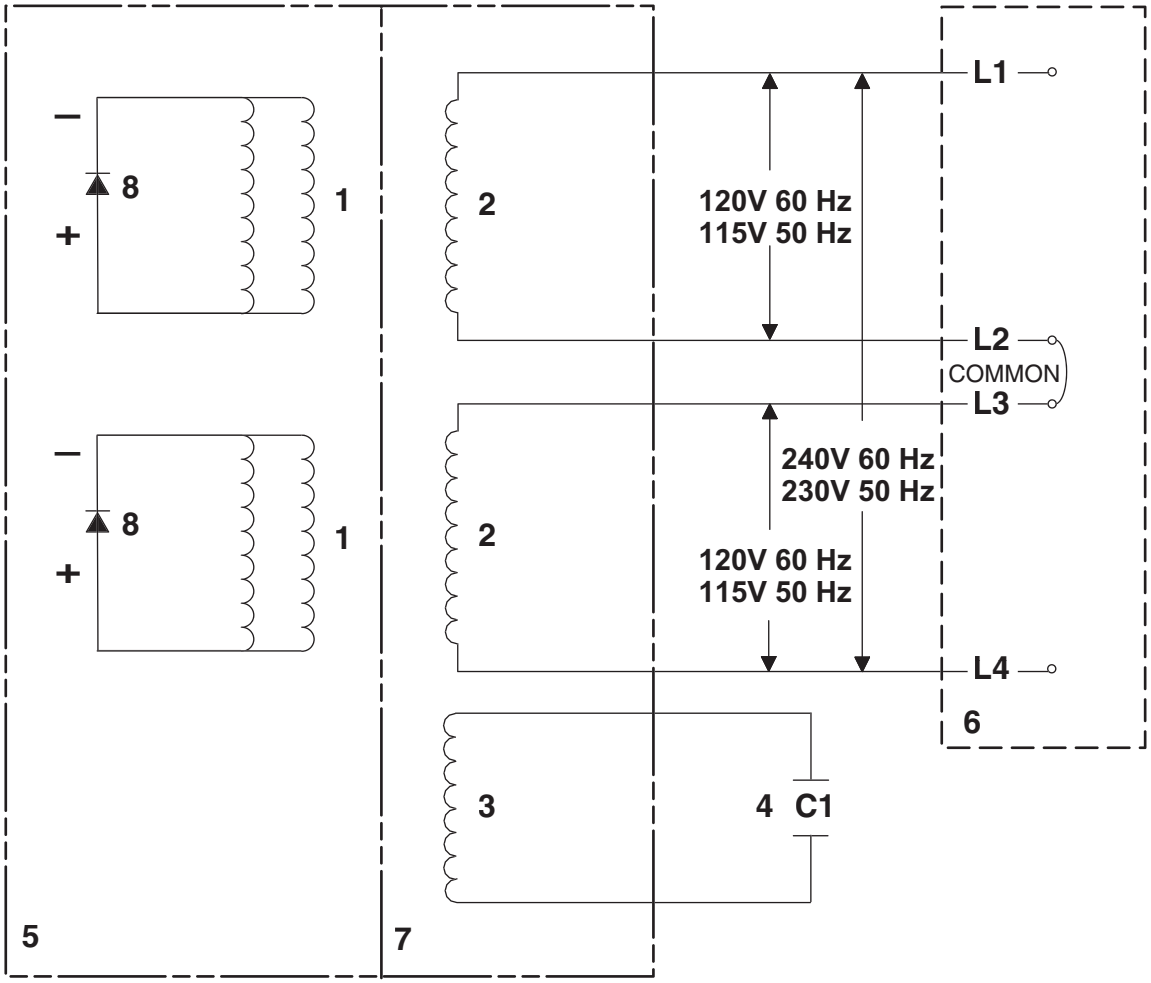
Ref.	Description	Ref.	Description
1	Rotor winding	5	Rotor
2	Stator winding	6	Terminal block
3	Excitation winding	7	Stator
4	Capacitor	8	Diode

17.6 Generator Capacitor Excitation Schematic

(115-120V / 230-240V)



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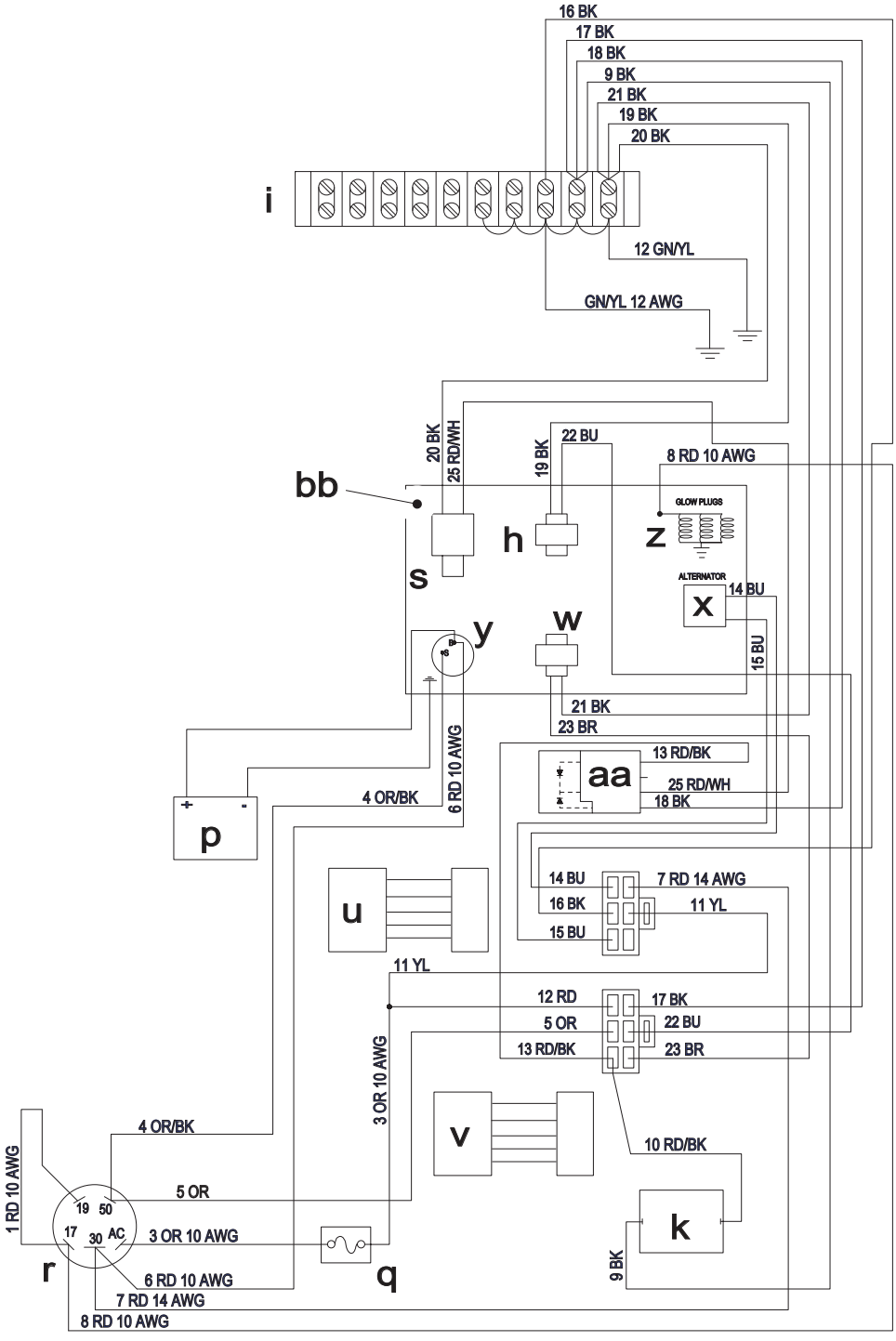
Ref.	Description	Ref.	Description
1	Rotor winding	5	Rotor
2	Stator winding	6	Terminal block
3	Excitation winding	7	Stator
4	Capacitor	8	Diode

17.7 Engine Wiring



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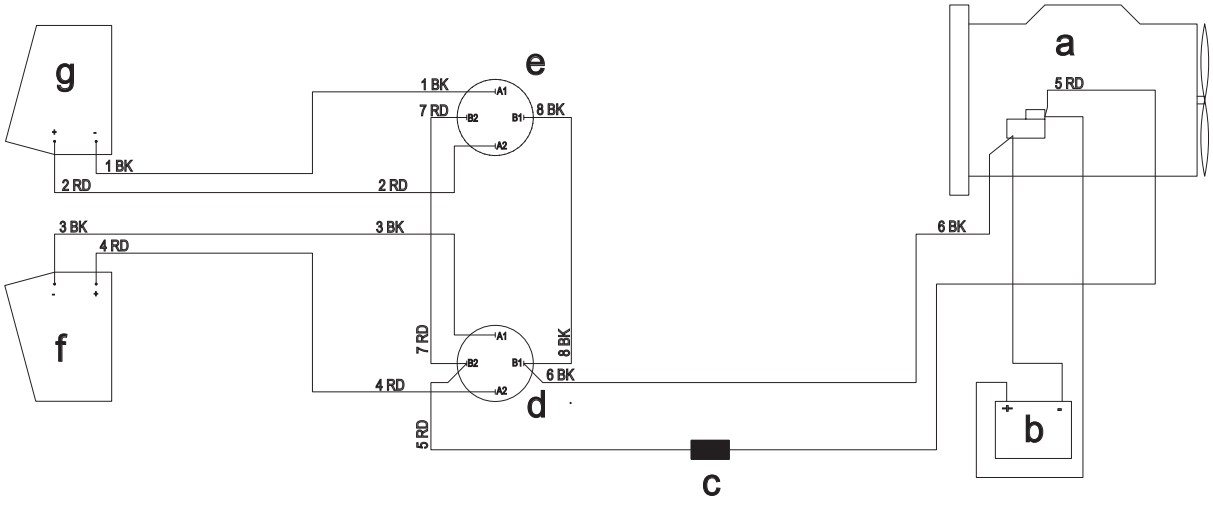
17.8 Components

Ref.	Description	Ref.	Description
h	Coolant temperature sensor	**u**	Voltage regulator
i	Terminal strip (long)	**v**	Shutdown relay
k	Hour meter	**w**	Oil switch
p	Battery	**x**	Alternator
q	15A fuse	**y**	Starter
r	Ignition switch	**aa**	Diode
s	Fuel solenoid	**bb**	Engine

17.9 Power Winch Schematic



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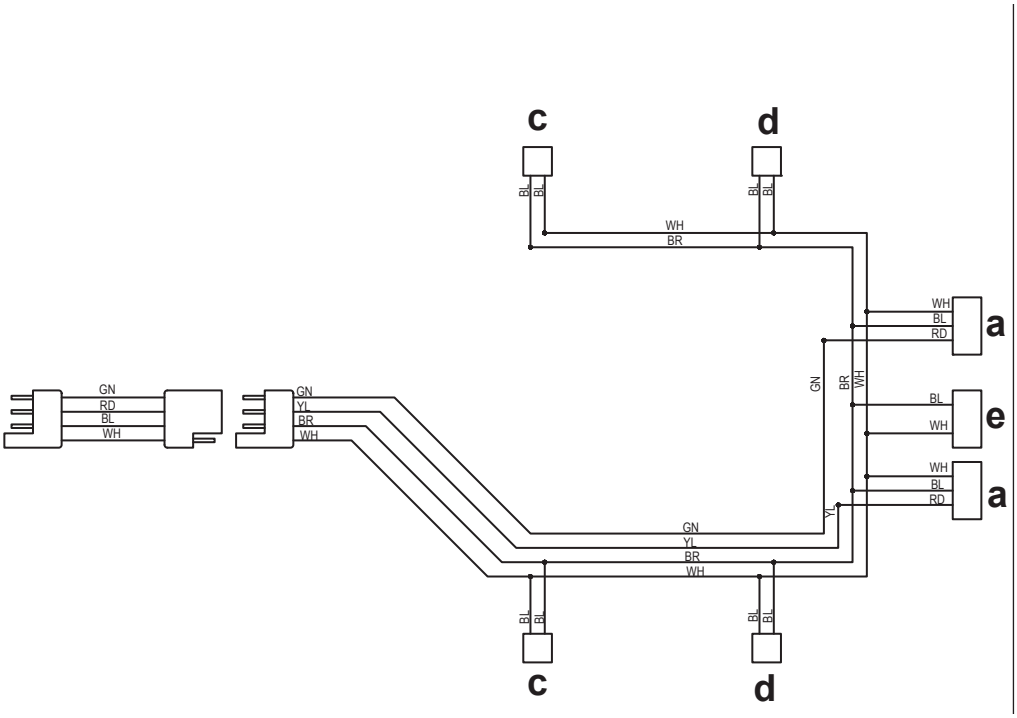
Ref.	Description	Ref.	Description
a	Engine	**e**	Telescope switch
b	Battery	**f**	Tilt winch
c	70A blade fuse	**g**	Telescope winch
d	Tilt switch		

17.10 Trailer Wiring

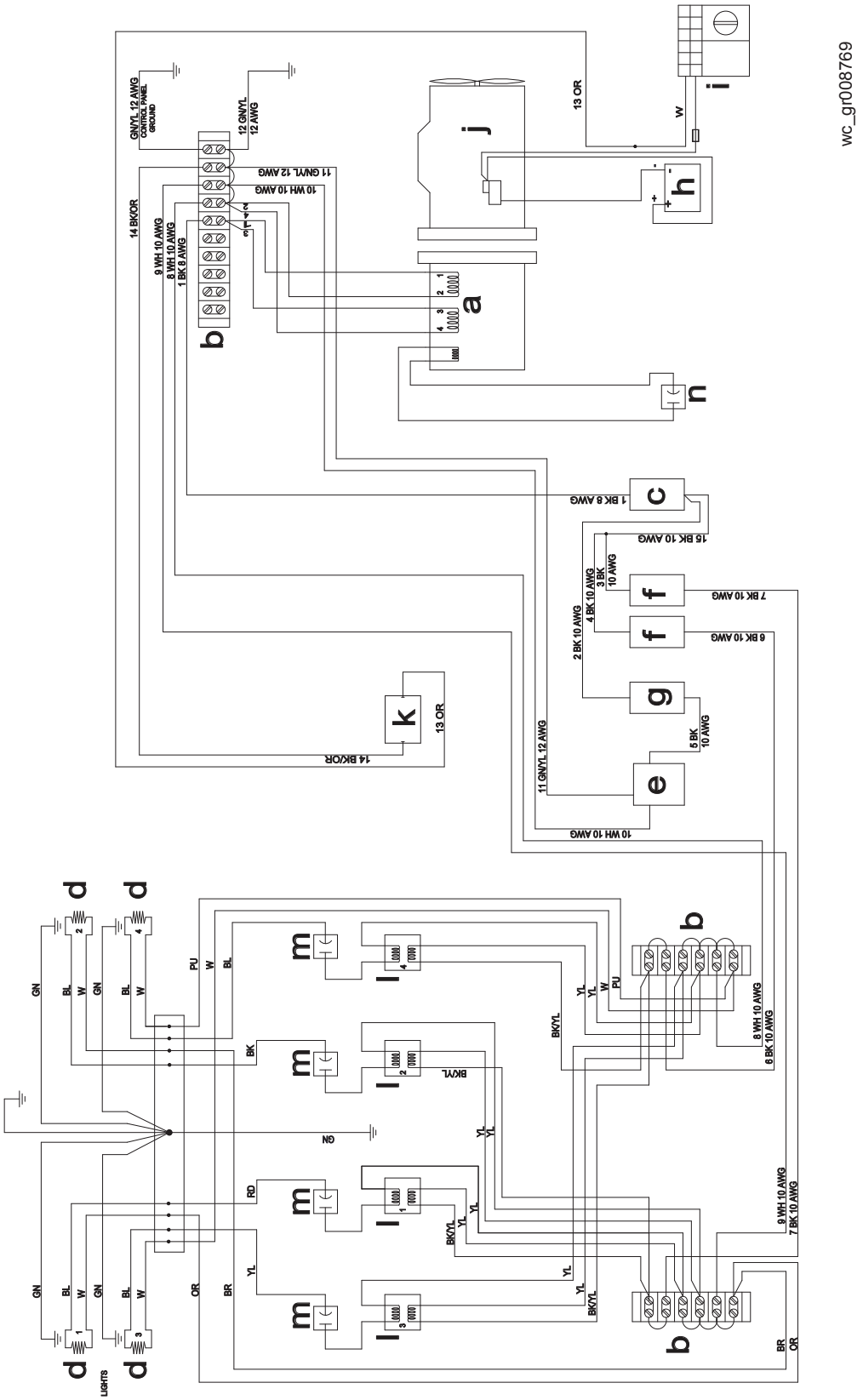


Ref.	Description	Ref.	Description
a	Right stop, turn and tail light	**d**	Side light, red
b	Left stop, turn and tail light	**e**	License plate light
c	Side light, amber		

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

18 Schematics—LTN 6L

18.1 Lighting Schematic—120V

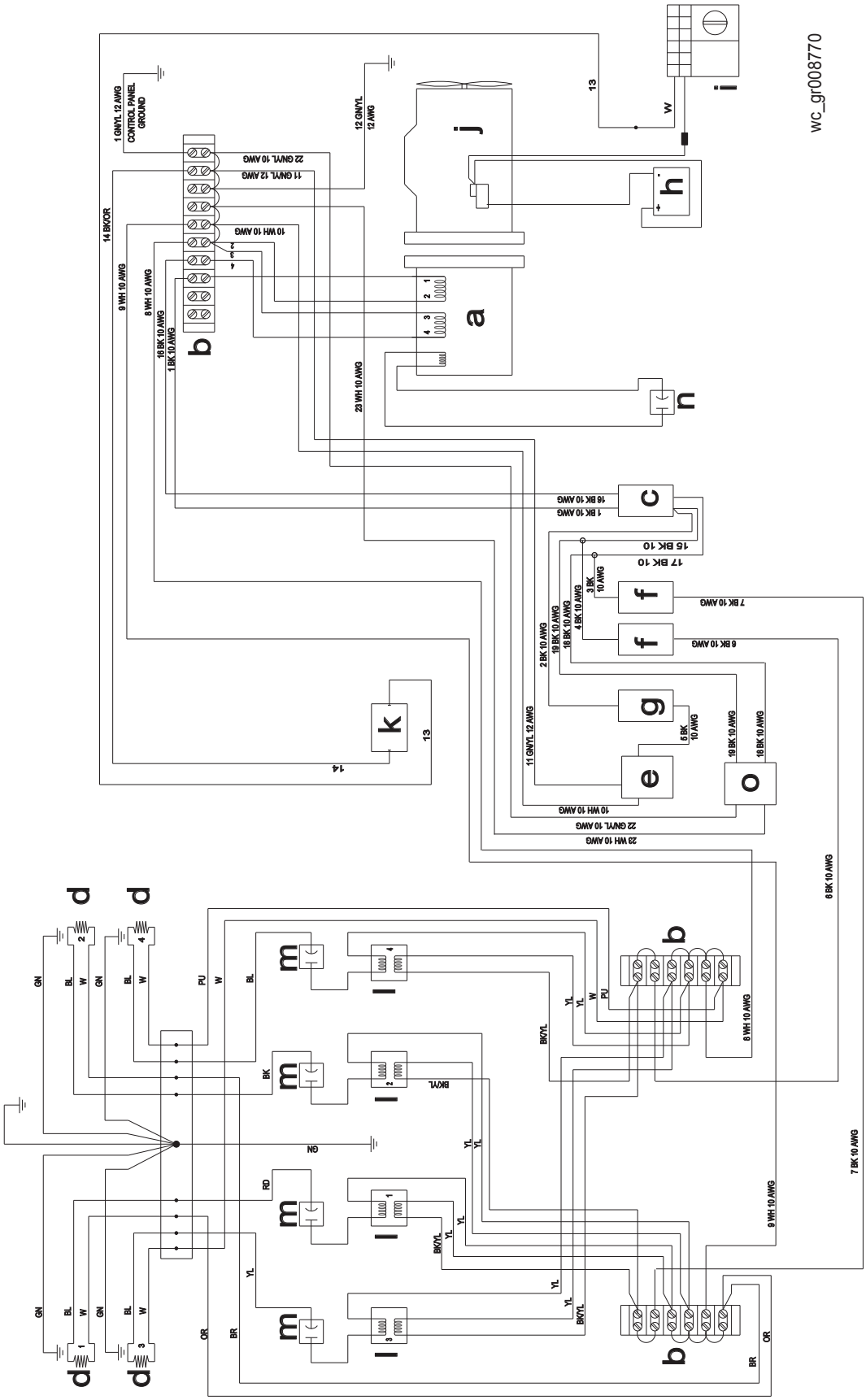


18.2 Components—120V

Ref.	Description	Ref.	Description
a	Generator	**h**	Battery
b	Terminal strip	**i**	Engine control panel
c	Main circuit breaker, 50 Amp	**j**	Engine
d	Floodlights	**k**	Hour meter
e	Receptacle, 120V	**l**	Transformers
f	Circuit breaker, 30 Amp	**m**	Capacitors, 24 mF
g	Circuit breaker, 20 Amp	**n**	Capacitor, 25 mF

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

18.3 Lighting Schematic—120V/240V

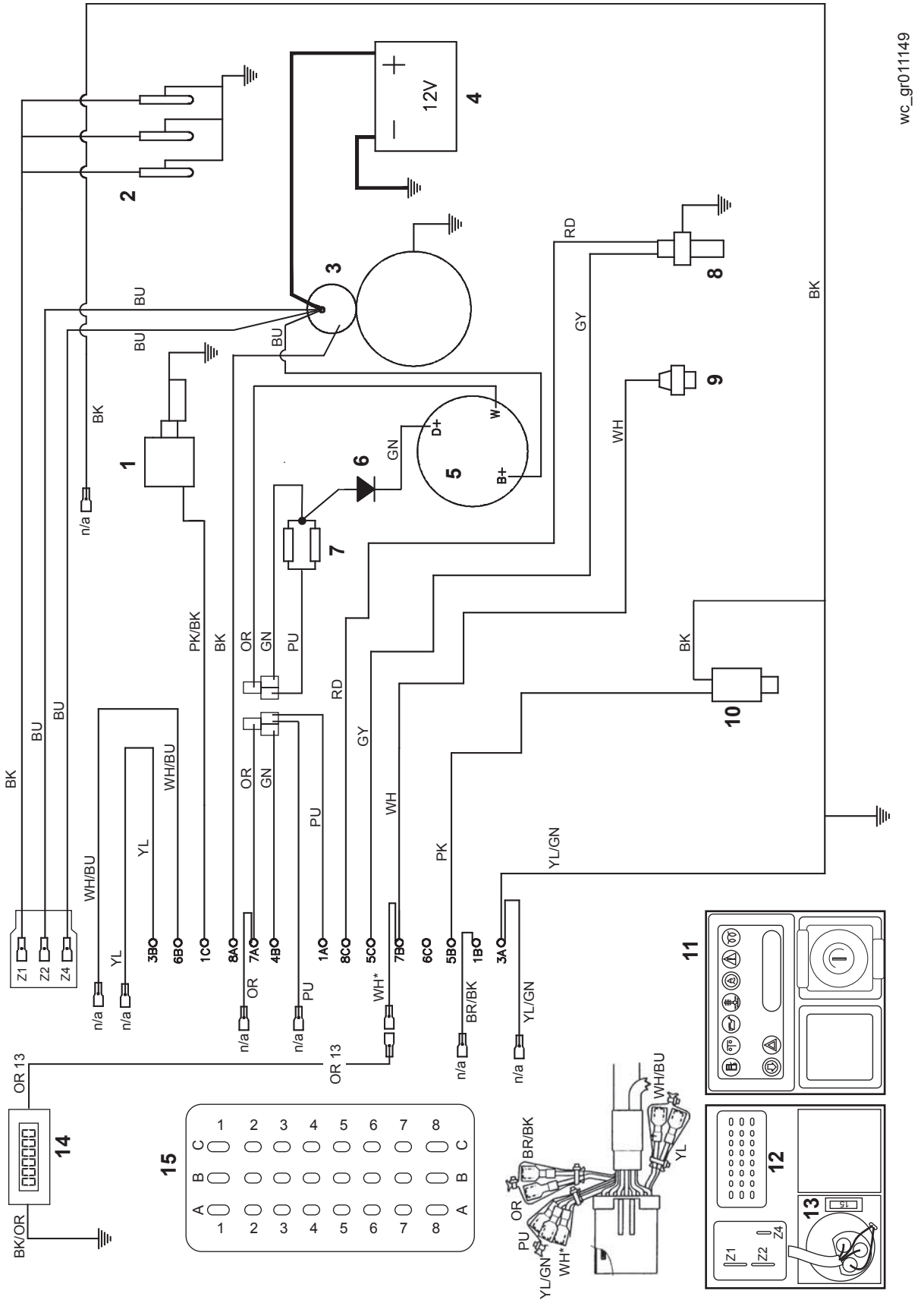


18.4 Components—120V/240V

Ref.	Description	Ref.	Description
a	Generator	**i**	Engine control panel
b	Terminal strip	**j**	Engine
c	Main circuit breaker, 25A	**k**	Hour meter
d	Floodlights	**l**	Transformers
e	Receptacle, 120V	**m**	Capacitors, 24 mF
f	Circuit breaker, 30A	**n**	Capacitor, 25 mF
g	Circuit breaker, 20A	**o**	Receptacle, 120/240V
h	Battery	**–**	—

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

18.5 Engine Wiring Rev > 133

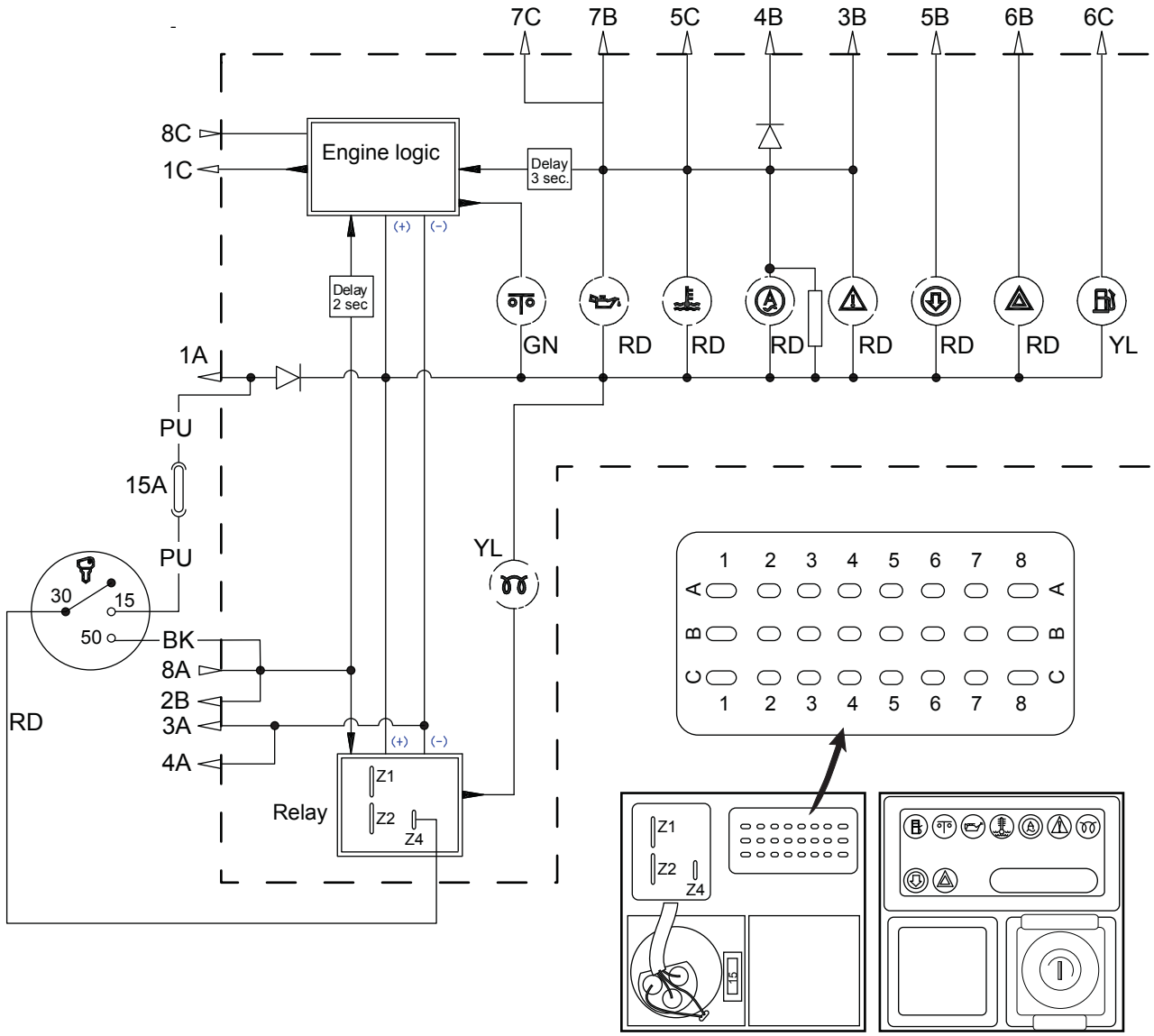


18.6 Components Rev > 133

Ref.	Description	Ref.	Description
1	Fuel solenoid	9	Low oil pressure switch (normal closed type)
2	Glow plugs	10	Air filter restriction switch (normal open type)
3	Starter motor	11	Engine controller
4	Battery	12	24-pin connector (controller side)
5	Alternator	13	15A Fuse
6	Diode	14	Hourmeter
7	Resistors	15	24-pin connector (harness side)
8	Dual function sensor Coolant temperature/glow plug timer	—	—

Not used (n/a) auxiliary wires	
Wire color	**Description**
BR/BK	Signal for water temperature
OR	Signal for engine rpm indicator
PU	Battery (+) when key in ON position
YL/GN	Negative (–) earth
YL	Protected socket available for engine stop in an emergency
WH/BU	Socket available for emergency indicator socket.

18.7 Control Panel Wiring Rev > 133



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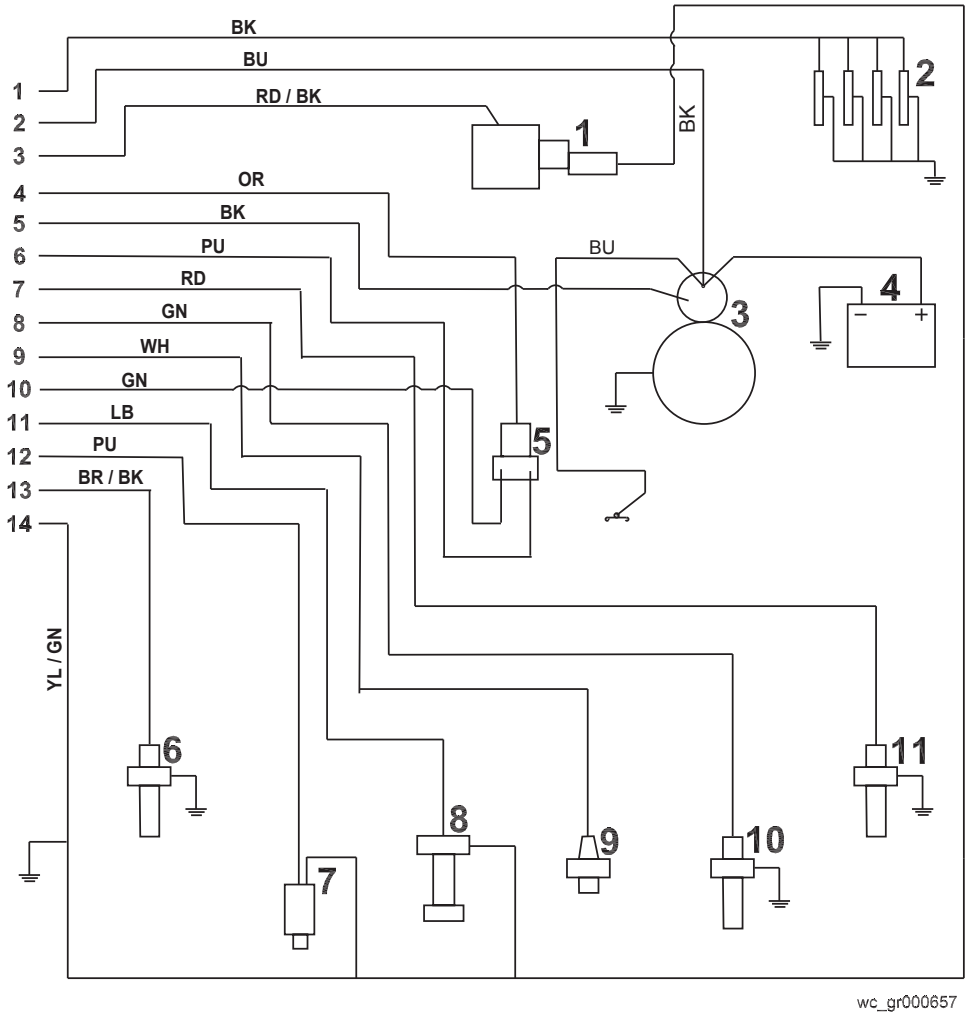
18.8 Components Rev > 133

Pin	Function	Pin	Function
1A	Power supply	**5A**	Water thermometer Not used by Wacker Neuson
1B	Water thermometer (aux.) Not used by Wacker Neuson	**5B**	Air cleaner
1C	Fuel solenoid	**5C**	Coolant high temperature switch
2A	Not used by Wacker Neuson	**6A**	Normally closed Not used by Wacker Neuson
2B	Start (50) (aux.) Not used by Wacker Neuson	**6B**	Alarm
2C	Normally closed Not used by Wacker Neuson	**6C**	Low fuel level Not used by Wacker Neuson
3A	Ground	**7A**	Signal
3B	Warning	**7B**	Oil pressure (source of power for hour meter
3C	Normally closed	**7C**	Normally closed Not used by Wacker Neuson
4A	Ground (aux.) Not used by Wacker Neuson	**8A**	Start (50)
4B	Alternator	**8B**	Normally closed Not used by Wacker Neuson
4C	Normally closed Not used by Wacker Neuson	**8C**	Coolant thermistor for glowplug timer

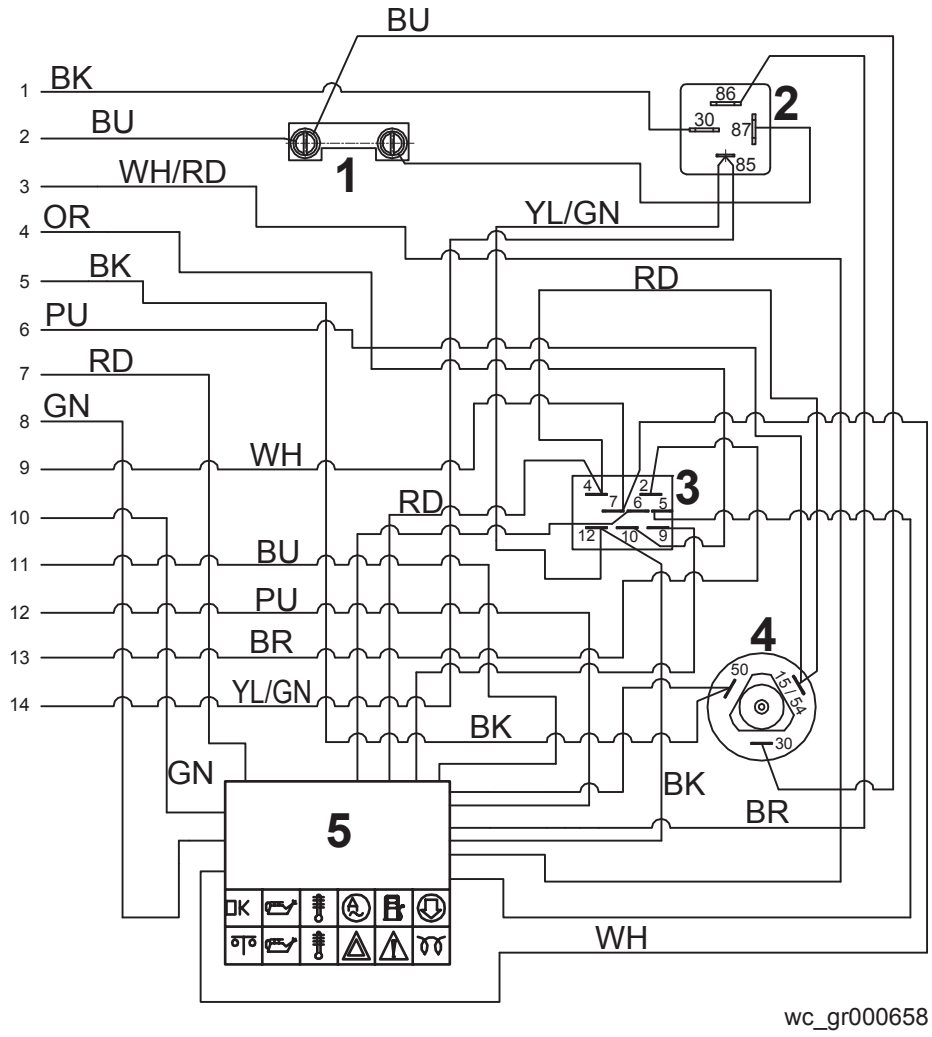
18.9 Engine Wiring Rev < 134



18.10 Components Rev < 134

Ref.	Description	Ref.	Description
1	Fuel solenoid	**7**	Air filter restriction indicator (normal open type)
2	Glow plugs	**8**	Low fuel level switch (not used, normal open type)
3	Starter motor	**9**	Low oil pressure switch (normal closed type)
4	Battery	**10**	Coolant high temperature switch (normal open type)
5	Alternator connector	**11**	Coolant temperature thermistor (for preheat relay)
6	Coolant temperature sending unit (not used, for remote temperature gauge or LED)		

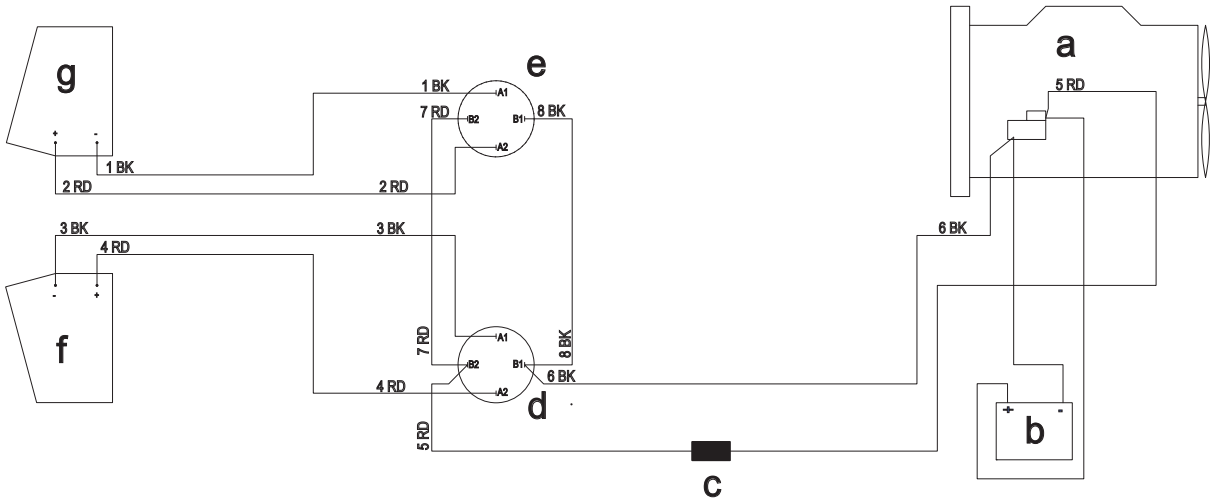
18.11 Control Panel Wiring Rev < 134



18.12 Components Rev < 134

Ref.	Description	Ref.	Description
1	System fuse, 50 Amp	4	Key switch
2	Glow plug load relay	5	L.E.D. Indicator lamp assembly
3	Auxiliary terminals (rear view)	—	—

18.13 Power Winch Schematic



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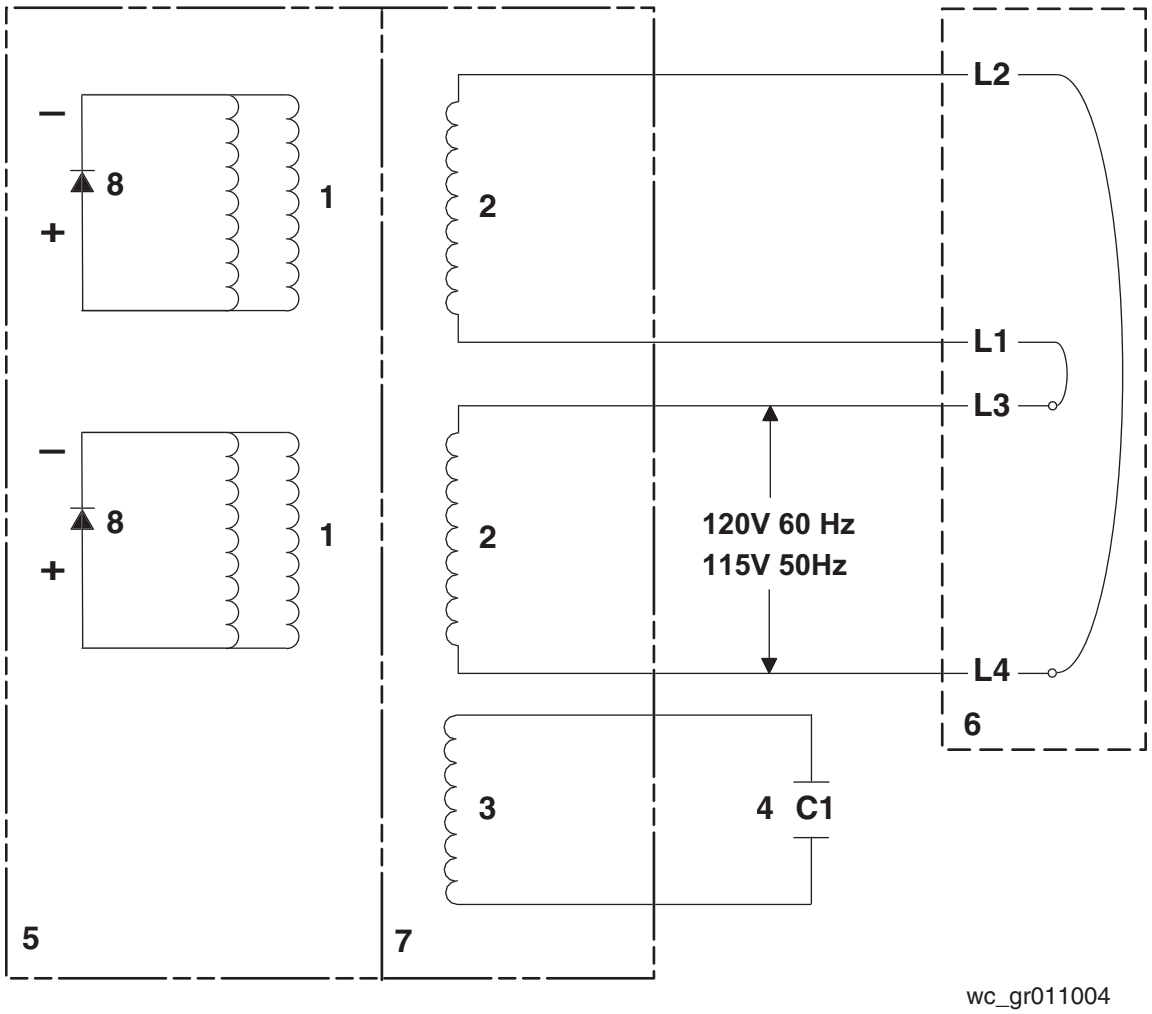
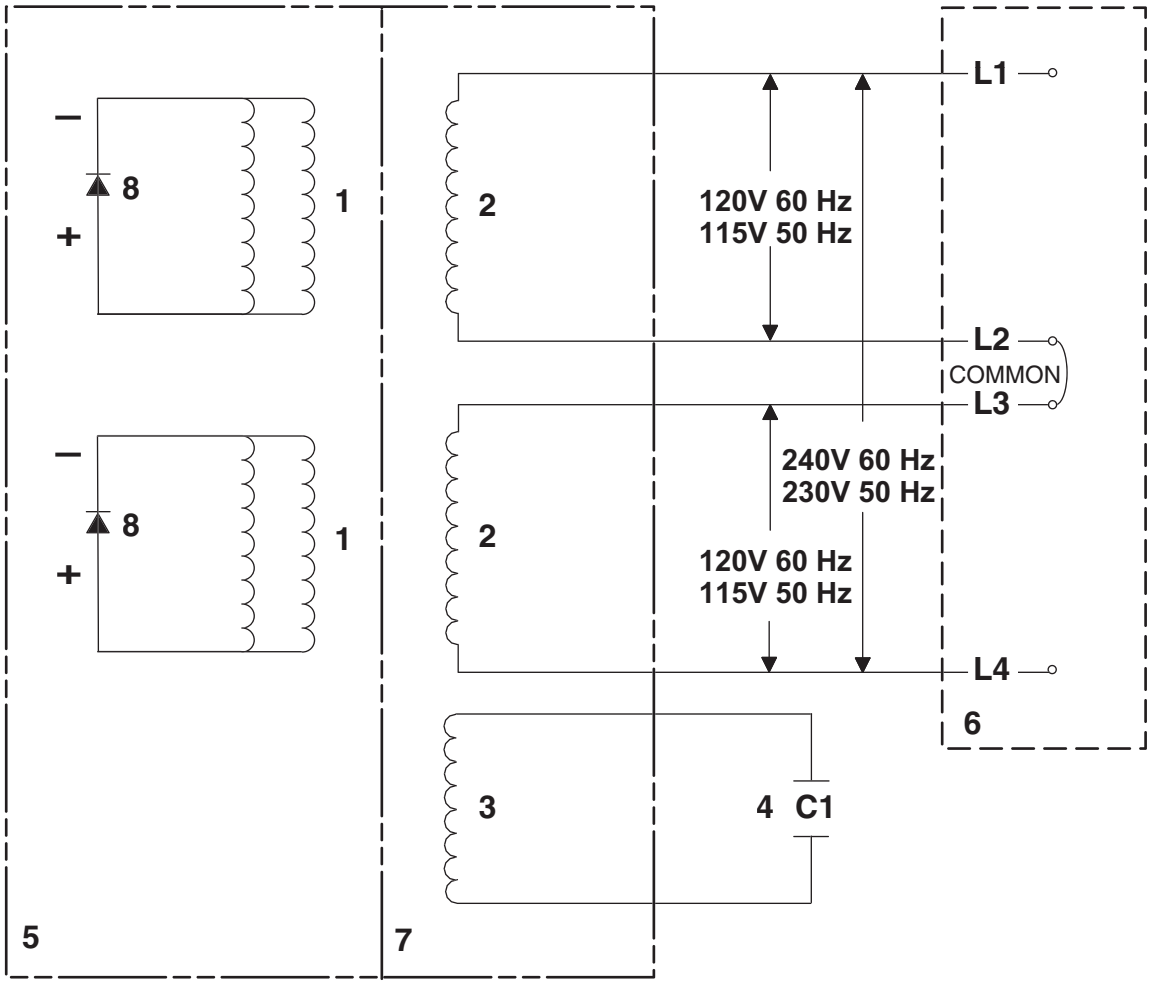
Ref.	Description	Ref.	Description
a	Engine	**e**	Telescope switch
b	Battery	**f**	Tilt winch
c	70A blade fuse	**g**	Telescope winch
d	Tilt switch		

18.14 Generator Capacitor Excitation Schematic—120V



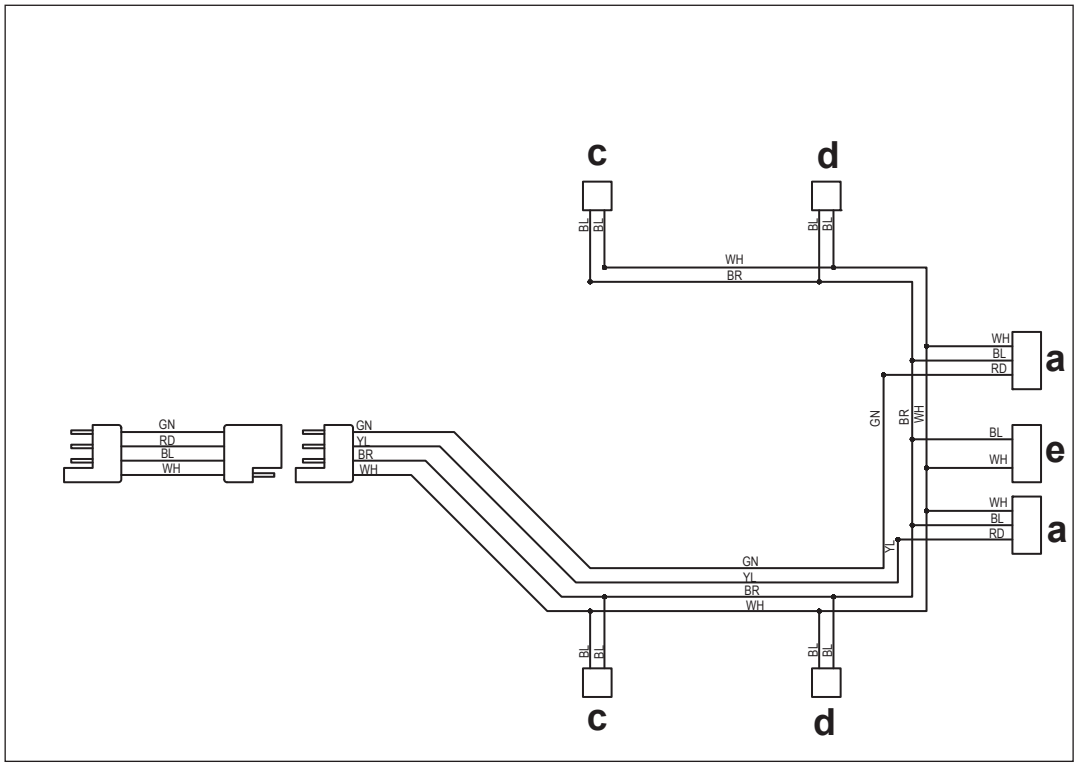
Ref.	Description	Ref.	Description
1	Rotor	4	Capacitor
2	Stator	5	Generator/Terminal block
3	Excitation coils	6	Control box, lights

18.15 Generator Capacitor Excitation Schematic—120V/240V



Ref.	Description	Ref.	Description
1	Rotor	4	Capacitor
2	Stator	5	Generator/Terminal block
3	Excitation coils	6	Control box, lights

18.16 Trailer Wiring



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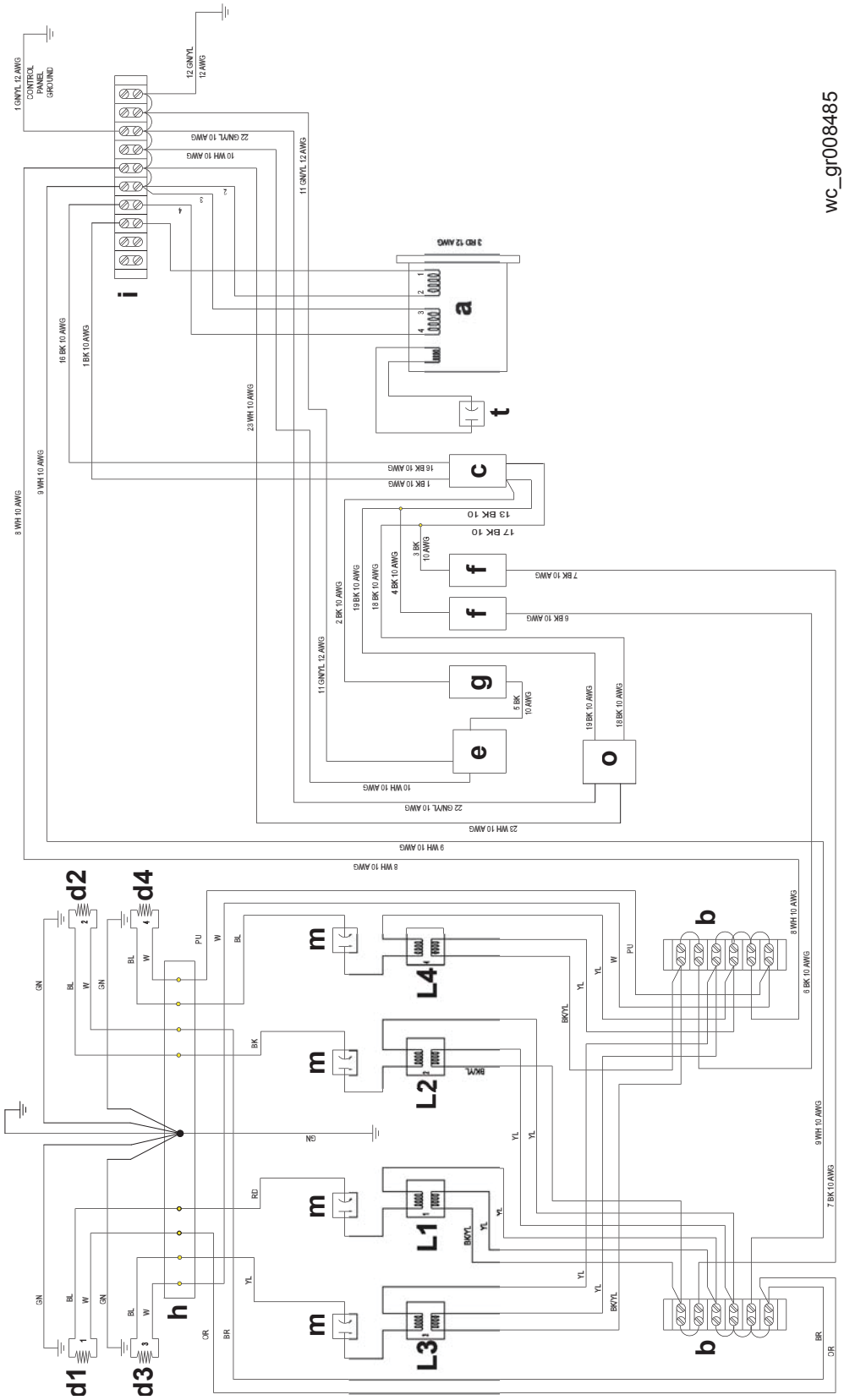
Ref.	Description	Ref.	Description
a	Right stop, turn and tail light	**d**	Side light, red
b	Left stop, turn and tail light	**e**	License plate light
c	Side light, amber		

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

19 Schematics—LTN 6K / LTN 8K

19.1 Lighting Schematic—LTN 6K

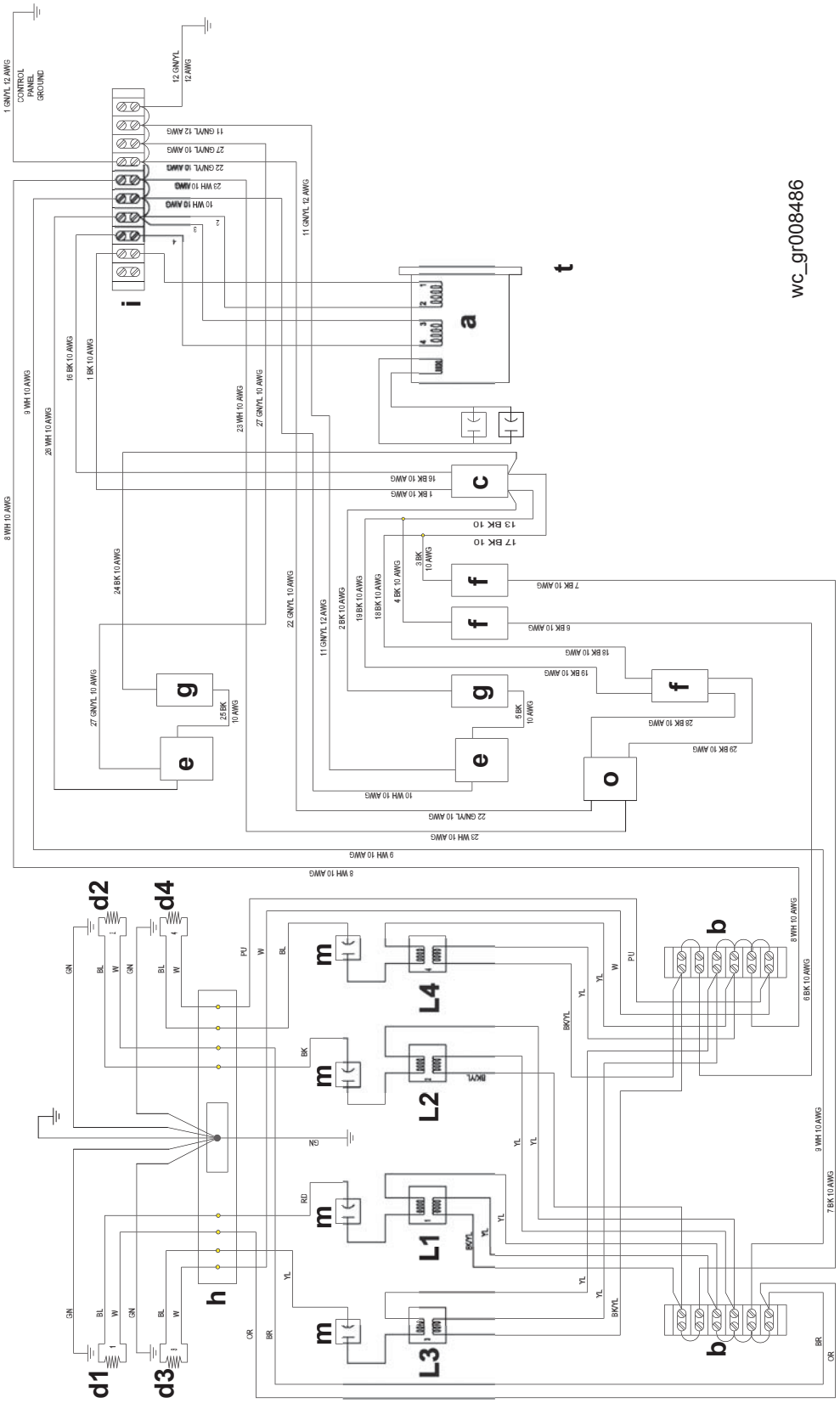


19.2 Components—LTN 6K

Ref.	Description	Ref.	Description
a	Generator	**h**	Junction box
b	Terminal strip (short)	**i**	Terminal strip (long)
c	Main circuit breaker	**L**	Transformers
d	Floodlights	**m**	Capacitors, 24 mF
e	Receptacle, 120V GFI	**o**	Receptacle, 120/240V 30A
f	Circuit breaker, 30A	**t**	Capacitor, generator excitation
g	Circuit breaker, 20A	**—**	—

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

19.3 Lighting Schematic—LTN 8K

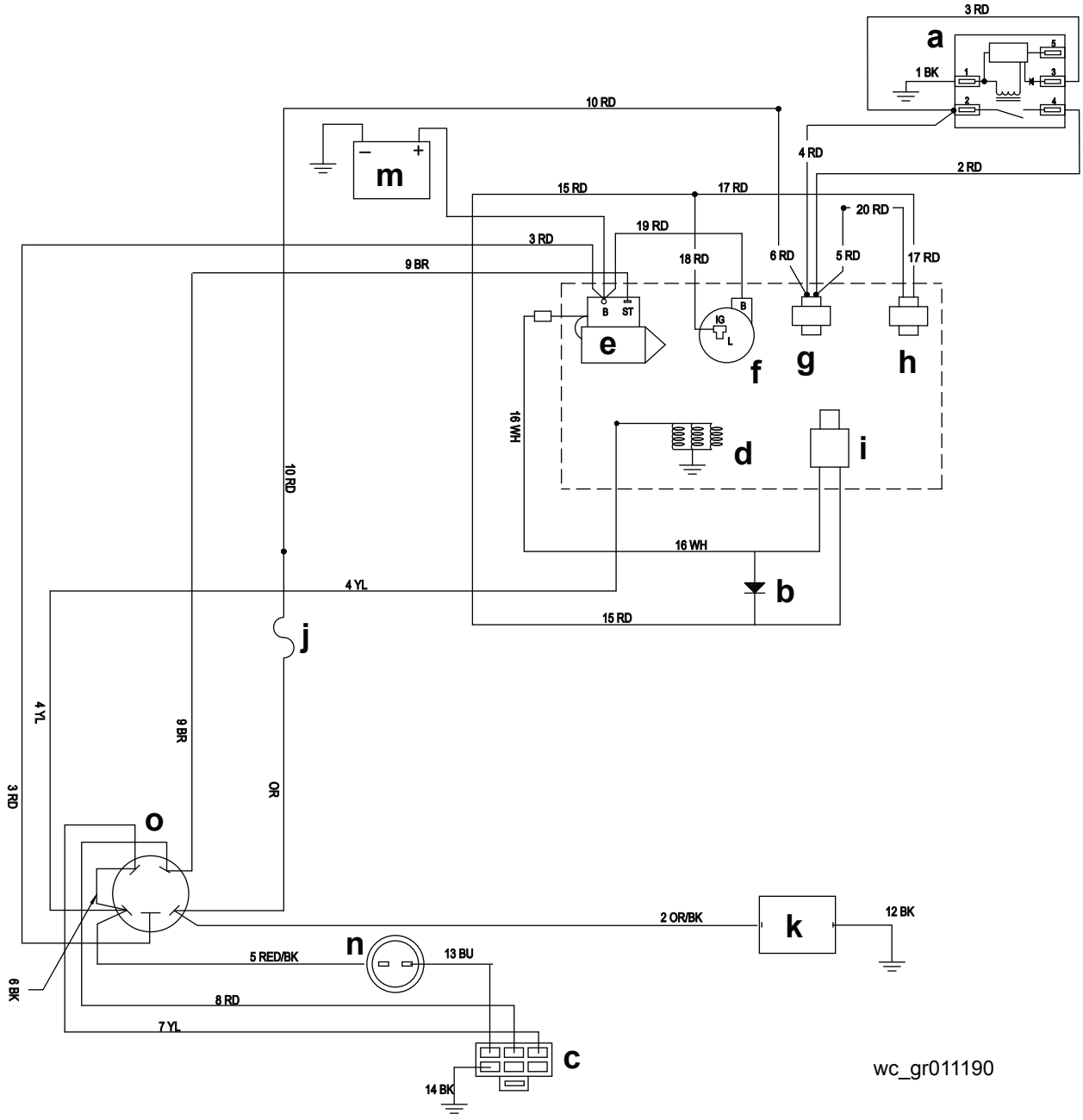


19.4 Components—LTN 8K

Ref.	Description	Ref.	Description
a	Generator	**h**	Junction box
b	Terminal strip (short)	**i**	Terminal strip (long)
c	Main circuit breaker	**L**	Transformers
d	Floodlights	**m**	Capacitors, 24 mF
e	Receptacle, 120V GFI	**o**	Receptacle, 120/240V 30A
f	Circuit breaker, 30A	**t**	Capacitor, generator excitation
g	Circuit breaker, 20A	**—**	—

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

19.5 Engine Wiring



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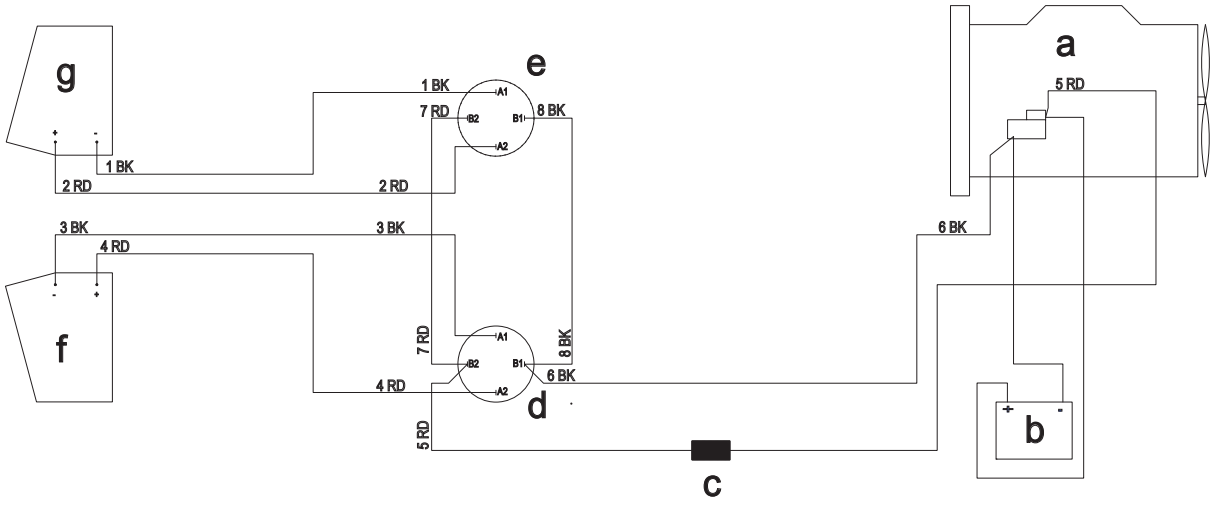
19.6 Components

Ref.	Component	Ref.	Component
a	Shut-down relay	**h**	Coolant sensor
b	Diode	**i**	Fuel solenoid
c	Glow plug timer	**j**	15A fuse
d	Glow plugs	**k**	Hour meter
e	Starter	**m**	Battery
f	Alternator	**n**	Glow plug indicator
g	Oil switch	**o**	Key switch

19.7 Power Winch Schematic



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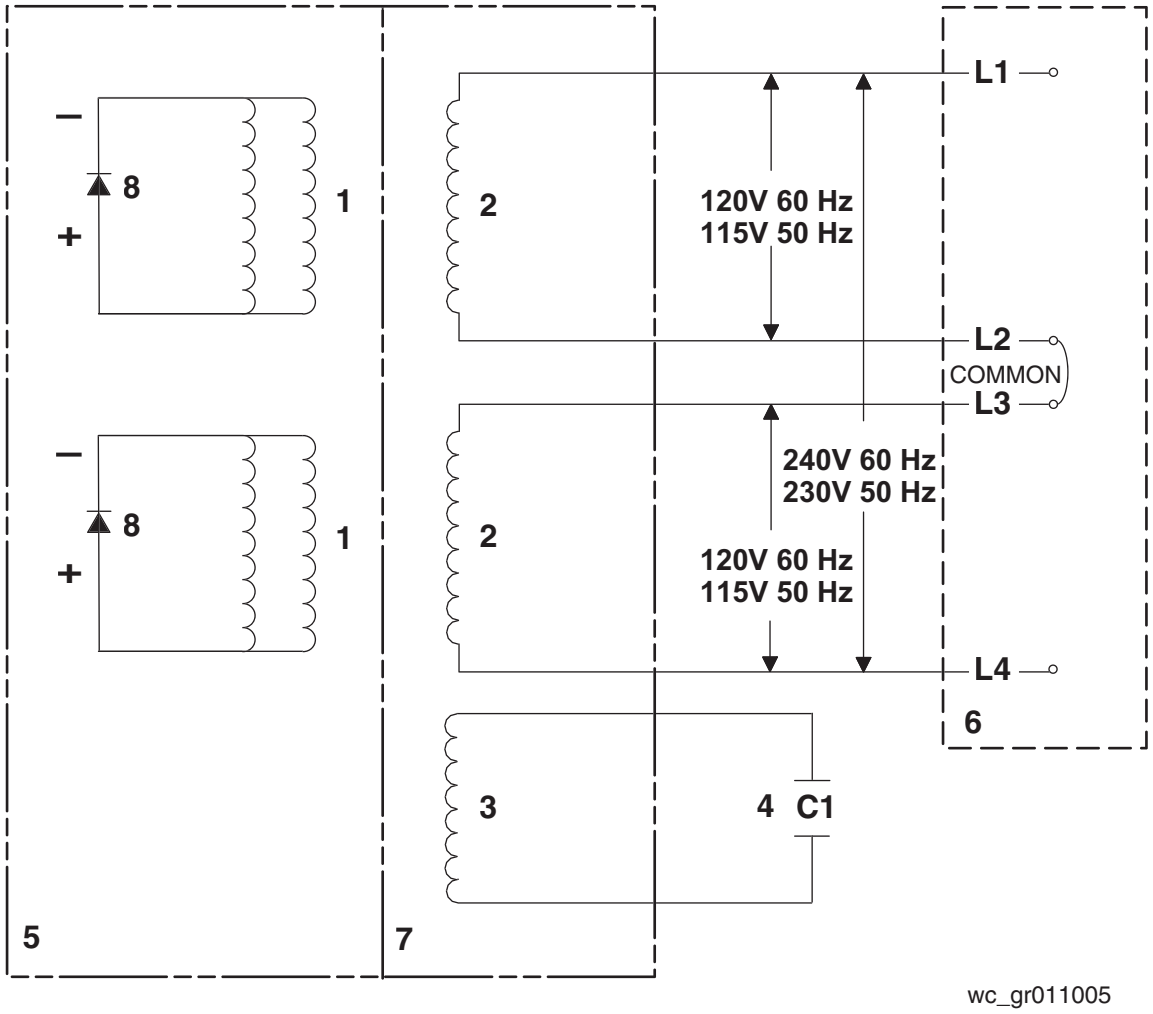
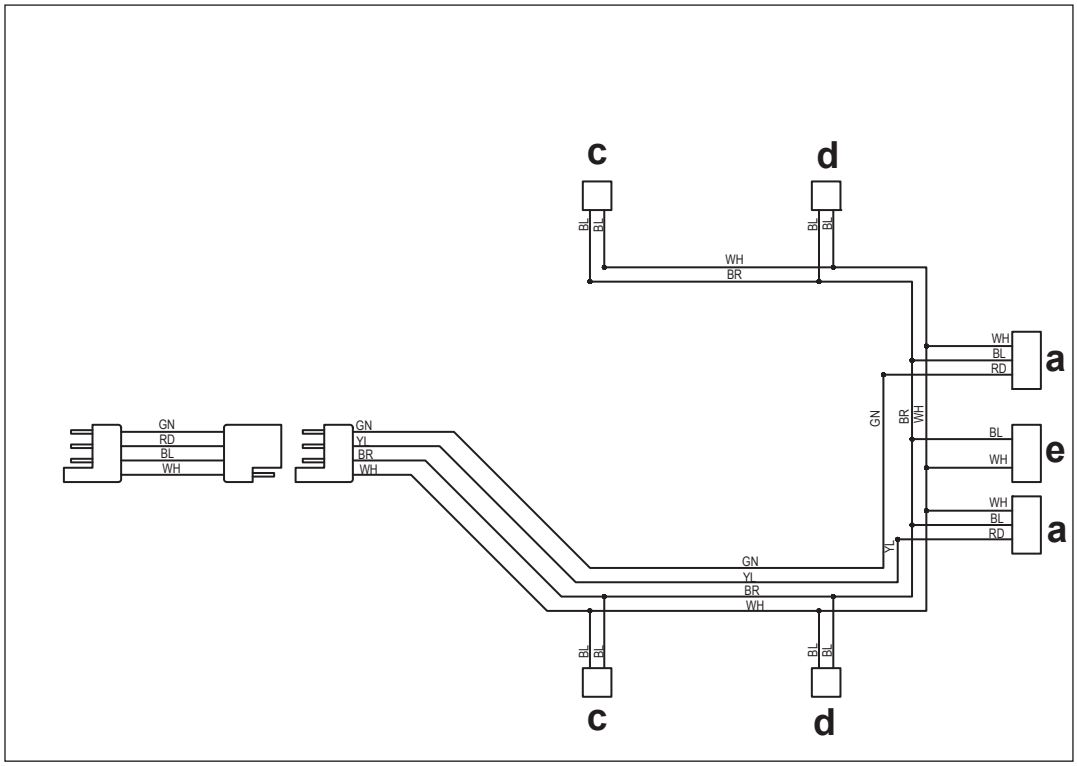
Ref.	Description	Ref.	Description
a	Engine	**e**	Telescope switch
b	Battery	**f**	Tilt winch
c	70A blade fuse	**g**	Telescope winch
d	Tilt switch		

19.8 Generator Capacitor Excitation Schematic



Ref.	Description	Ref.	Description
1	Rotor	4	Capacitor
2	Stator	5	Generator/Terminal block
3	Excitation coils	6	Control box, lights

19.9 Trailer Wiring



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Ref.	Description	Ref.	Description
a	Right stop, turn and tail light	**d**	Side light, red
b	Left stop, turn and tail light	**e**	License plate light
c	Side light, amber		

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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