OPERATION MANUAL

RGEN12, RGEN17/18

RESIDENTIAL GENERATOR SET
XP-6515 4/09a

This manual provides operation and maintenance instructions for models RGEN12 and RGEN17/18 generator sets.

Generator sets are approved for use in stationary standby applications in locations served by a reliable utility power source. Have a Lennox dealer who is approved to sell and install Lennox generator sets (hereinafter referred to as a Lennox dealer) install the generator set. Refer to XP-6514, Installation Instructions, for installation instructions.

Information in this publication represents data available at the time of print. The manufacturer reserves the right to change this publication and the products represented without notice and without any obligation or liability whatsoever.

Read this manual and carefully follow all procedures and safety precautions to ensure proper equipment operation and to avoid bodily injury. Read and follow the Safety Precautions and Instructions section. Keep this manual with the equipment for future reference.

The equipment service requirements are very important to safe and efficient operation. Inspect the parts often and perform required service at the prescribed intervals. Obtain service from a Lennox dealer to keep equipment in top condition.

RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE

Shipping and Packing List

1 – Generator Set

Check equipment for shipping damage. If you find any damage, immediately contact the last carrier.

506088-01

Table of Contents

California Proposition 65

⚠ WARNING

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

Product Identification Information

Product identification numbers determine service parts. Record the product identification numbers in the spaces below immediately after unpacking the products so that the numbers are readily available for future reference. Record field-installed kit numbers after installing the kits.

Generator Set Identification Numbers

Record the product identification numbers from the generator set nameplate(s).

Model Designation _____

Specification Number _____

Serial Number _____

Accessory Number	Accessory Description

Controller Identification

Record the controller description from the generator set operation manual, spec sheet, or sales invoice.

Controller Description _____

Engine Identification

Record the product identification information from the engine nameplate.

Manufacturer _____

Model Designation _____

Serial Number _____

IMPORTANT SAFETY INSTRUCTIONS. Electromechanical equipment, including generator sets, transfer switches, switchgear, and accessories, can cause bodily harm and pose life-threatening danger when improperly installed, operated, or maintained. To prevent accidents be aware of potential dangers and act safely. Read and follow all safety precautions and instructions. SAVE THESE INSTRUCTIONS.

This manual has several types of safety precautions and instructions: Danger, Warning, Caution, and Notice.

DANGER

Danger indicates the presence of a hazard that ***will cause severe personal injury, death***, or ***substantial property damage***.

WARNING

Warning indicates the presence of a hazard that ***can cause severe personal injury, death,*** or ***substantial property damage***.

CAUTION

Caution indicates the presence of a hazard that ***will*** or ***can cause minor personal injury*** or ***property damage***.

NOTICE

Notice communicates installation, operation, or maintenance information that is safety related but not hazard related.

Safety decals affixed to the equipment in prominent places alert the operator or service technician to potential hazards and explain how to act safely. The decals are shown throughout this publication to improve operator recognition. Replace missing or damaged decals.

Accidental Starting

WARNING

Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or connected equipment, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

Battery

WARNING

Sulfuric acid in batteries.
Can cause severe injury or death.

Wear protective goggles and clothing. Battery acid may cause blindness and burn skin.

WARNING

Explosion.
Can cause severe injury or death.
Relays in the battery charger cause arcs or sparks.

Locate the battery in a well-ventilated area. Isolate the battery charger from explosive fumes.

Battery electrolyte is a diluted sulfuric acid. Battery acid can cause severe injury or death. Battery acid can cause blindness and burn skin. Always wear splashproof safety goggles, rubber gloves, and boots when servicing the battery. Do not open a sealed battery or mutilate the battery case. If battery acid splashes in the eyes or on the skin, immediately flush the affected area for 15 minutes with large quantities of clean water. Seek immediate medical aid in the case of eye contact. Never add acid to a battery after placing the battery in service, as this may result in hazardous spattering of battery acid.

Battery acid cleanup. Battery acid can cause severe injury or death. Battery acid is electrically conductive and corrosive. Add 500 g (1 lb.) of bicarbonate of soda (baking soda) to a container with 4 L (1 gal.) of water and mix the neutralizing solution. Pour the neutralizing solution on the spilled battery acid and continue to add the neutralizing solution to the spilled battery acid until all evidence of a chemical reaction (foaming) has ceased. Flush the resulting liquid with water and dry the area.

Battery gases. Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flames or sparks to occur near a battery at any time, particularly when it is charging. Do not dispose of a battery in a fire. To prevent burns and sparks that could cause an explosion, avoid touching the battery terminals with tools or other metal objects. Remove all jewelry before servicing the equipment. Discharge static electricity from your body before touching batteries by first touching a grounded metal surface away from the battery. To avoid sparks, do not disturb the battery charger connections while the battery is charging. Always turn the battery charger off before disconnecting the battery connections. Ventilate the compartments containing batteries to prevent accumulation of explosive gases.

Battery short circuits. Explosion can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage. Disconnect the battery before generator set installation or maintenance. Remove all jewelry before servicing the equipment. Use tools with insulated handles. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery. Never connect the negative (-) battery cable to the positive (+) connection terminal of the starter solenoid. Do not test the battery condition by shorting the terminals together.

Engine Backfire/Flash Fire

⚠ WARNING

Fire.
Can cause severe injury or death.

Do not smoke or permit flames or sparks near fuels or the fuel system.

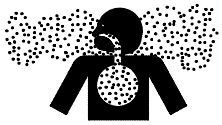
Servicing the air cleaner. A sudden backfire can cause severe injury or death. Do not operate the generator set with the air cleaner removed.

Servicing the fuel system. A flash fire can cause severe injury or death. Do not smoke or permit flames or sparks near the carburetor, fuel line, fuel filter, fuel pump, or other potential sources of spilled fuels or fuel vapors. Catch fuels in an approved container when removing the fuel line or carburetor.

Combustible materials. A fire can cause severe injury or death. Generator set engine fuels and fuel vapors are flammable and explosive. Handle these materials carefully to minimize the risk of fire or explosion. Equip the compartment or nearby area with a fully charged fire extinguisher. Select a fire extinguisher rated ABC or BC for electrical fires or as recommended by the local fire code or an authorized agency. Train all personnel on fire extinguisher operation and fire prevention procedures.

Exhaust System

⚠ WARNING



Carbon monoxide.
Can cause severe nausea, fainting, or death.

The exhaust system must be leakproof and routinely inspected.

Generator set operation. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Avoid breathing exhaust fumes when working on or near the generator set. Never operate the generator set inside a building. Never operate the generator set where exhaust gas could seep inside or be drawn into a potentially occupied building through windows, air intake vents, or other openings.

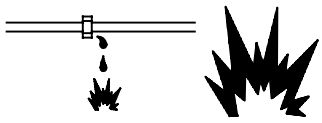
Carbon monoxide symptoms. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is a poisonous gas present in exhaust gases. Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Carbon monoxide poisoning symptoms include but are not limited to the following:

- Light-headedness, dizziness
- Physical fatigue, weakness in joints and muscles
- Sleepiness, mental fatigue, inability to concentrate or speak clearly, blurred vision
- Stomachache, vomiting, nausea

If experiencing any of these symptoms and carbon monoxide poisoning is possible, seek fresh air immediately and remain active. Do not sit, lie down, or fall asleep. Alert others to the possibility of carbon monoxide poisoning. Seek medical attention if the condition of affected persons does not improve within minutes of breathing fresh air.

Fuel System

⚠ WARNING



Explosive fuel vapors.
Can cause severe injury or death.

Use extreme care when handling, storing, and using fuels.

Gas fuel leaks. Explosive fuel vapors can cause severe injury or death. Fuel leakage can cause an explosion. Check the LP vapor gas or natural gas fuel system for leakage by using a soap and water solution with the fuel system test pressurized to 6–8 ounces per square inch (10–14 inches water column). Do not use a soap solution containing either ammonia or chlorine because both prevent bubble formation. A successful test depends on the ability of the solution to bubble.

Hazardous Noise

⚠ CAUTION

Hazardous noise.
Can cause hearing loss.

Never operate the generator set without a muffler or with a faulty exhaust system.

Engine noise. Hazardous noise can cause hearing loss. Generator sets not equipped with sound enclosures can produce noise levels greater than 105 dBA. Prolonged exposure to noise levels greater than 85 dBA can cause permanent hearing loss. Wear hearing protection when near an operating generator set.

Hazardous Voltage/ Moving Parts

⚠ WARNING

Hazardous voltage. Moving parts.
Can cause severe injury or death.

Operate the generator set only when all guards and electrical enclosures are in place.

⚠ WARNING

Hazardous voltage.
Backfeed to the utility system can cause property damage, severe injury, or death.

If the generator set is used for standby power, install an automatic transfer switch to prevent inadvertent interconnection of standby and normal sources of supply.

⚠ CAUTION

Welding the generator set.
Can cause severe electrical equipment damage.

Never weld components of the generator set without first disconnecting the battery, controller wiring harness, and engine electronic control module (ECM).

Grounding electrical equipment. Hazardous voltage can cause severe injury or death. Electrocution is possible whenever electricity is present. Ensure you comply with all applicable codes and standards. Electrically ground the generator set, transfer switch, and related equipment and electrical circuits. Turn off the main circuit breakers of all power sources before servicing the equipment. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

Welding on the generator set. Can cause severe electrical equipment damage. Before welding on the generator set perform the following steps: (1) Remove the battery cables, negative (–) lead first. (2) Disconnect all engine electronic control module (ECM) connectors. (3) Disconnect all generator set controller and voltage regulator circuit board connectors. (4) Disconnect the engine battery-charging alternator connections. (5) Attach the weld ground connection close to the weld location.

Connecting the battery and the battery charger. Hazardous voltage can cause severe injury or death. Reconnect the battery correctly, positive to positive and negative to negative, to avoid electrical shock and damage to the battery charger and battery(ies). Have a qualified electrician install the battery(ies).

Short circuits. Hazardous voltage/current can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage**.** Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove all jewelry before servicing the equipment.

Electrical backfeed to the utility. Hazardous backfeed voltage can cause severe injury or death. Install a transfer switch in standby power installations to prevent the connection of standby and other sources of power. Electrical backfeed into a utility electrical system can cause severe injury or death to utility personnel working on power lines.

⚠ WARNING

Airborne particles.
Can cause severe injury or blindness.

Wear protective goggles and clothing when using power tools, hand tools, or compressed air.

Heavy Equipment

⚠ WARNING

Unbalanced weight.
Improper lifting can cause severe injury or death and equipment damage.

Do not use lifting eyes.
Lift the generator set using lifting bars inserted through the lifting holes on the skid.

Hot Parts

⚠ WARNING

Hot engine and exhaust system. Can cause severe injury or death.

Do not work on the generator set until it cools.

Servicing the exhaust system. Hot parts can cause severe injury or death. Do not touch hot engine parts. The engine and exhaust system components become extremely hot during operation.

Servicing the engine heater. Hot parts can cause minor personal injury or property damage. Install the heater before connecting it to power. Operating the heater before installation can cause burns and component damage. Disconnect power to the heater and allow it to cool before servicing the heater or nearby parts.

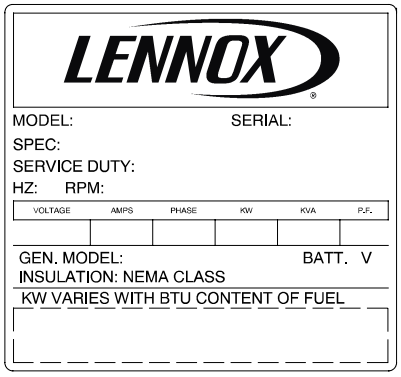
Notice

NOTICE

Canadian installations only. For standby service connect the output of the generator set to a suitably rated transfer switch in accordance with Canadian Electrical Code, Part 1.

Nameplate

The following illustration shows a typical generator set nameplate. Copy the model, serial, and specification numbers from the nameplate into the spaces provided in the product information section on the inside front cover of this manual. See Figure 1-1 or Figure 1-2 for the nameplate location.



Emission Compliance, RGEN12

All model RGEN12 generator sets with multi-fuel systems are emission-certified.

An engine or generator set with the following identification label is certified to meet Small Off-Road Engine emission standards for EPA/CARB.

Figure 1 Emissions Label, RGEN12 Engine (CH740)

This engine/generator is certified to operate using natural gas or propane fuel.

The Emission Compliance Period referred to on the Emission Control or Air Index label indicates the number of operating hours for which the engine has been shown to meet CARB emission requirements. The following table provides the engine compliance period (in hours) associated with the category descriptor found on the certification label.

Emission Compliance Period, Hour			
CARB	Moderate, 125	Intermediate, 250	Extended, 500

Figure 2 RGEN12

Refer to the certification label for engine displacement.

The exhaust emission control system for the CH 740 engine is EM.

Emission Compliance, RGEN17/18

The RGEN17/18 generator set engine is certified to meet emission regulations for U.S. EPA phase 2 small off-road engines and CA 2006 and later LSI engines (large spark-ignited engines at or below 1 liter).

Figure 3 Engine Identification Label, RGEN17/18

The Emission Compliance Period referred to on the engine identification label indicates the number of operating hours for which the engine has been shown to meet EPA emission requirements. The engine compliance period (in hours), associated with the Category A descriptor found on the certification label, is 1000 hours.

Refer to the certification label for engine displacement.

The exhaust emission control system for the CH980 engine is EM.

1.1 Specifications

The generator set specification sheets provide specific generator and engine information. Refer to the spec sheet for data not supplied in this manual. Consult the generator set service manual, engine operation manual, and engine service manual for additional specifications. Obtain copies of the latest spec sheets, manuals, diagrams, and drawings from a Lennox dealer.

1.2 Generator

The generator uses a unique voltage regulation system, which provides instant response to load changes.

This unique voltage regulation system ensures reliable motor starting and consistent voltage levels. It utilizes a voltage excitation system that employs a winding independent of the main output windings to provide excitation voltage.

1.3 Engine

The generator set has a four-cycle, twin cylinder, air-cooled Kohler® engine. The engine operates on clean-burning natural gas or propane (LP) vapor. Engine features include:

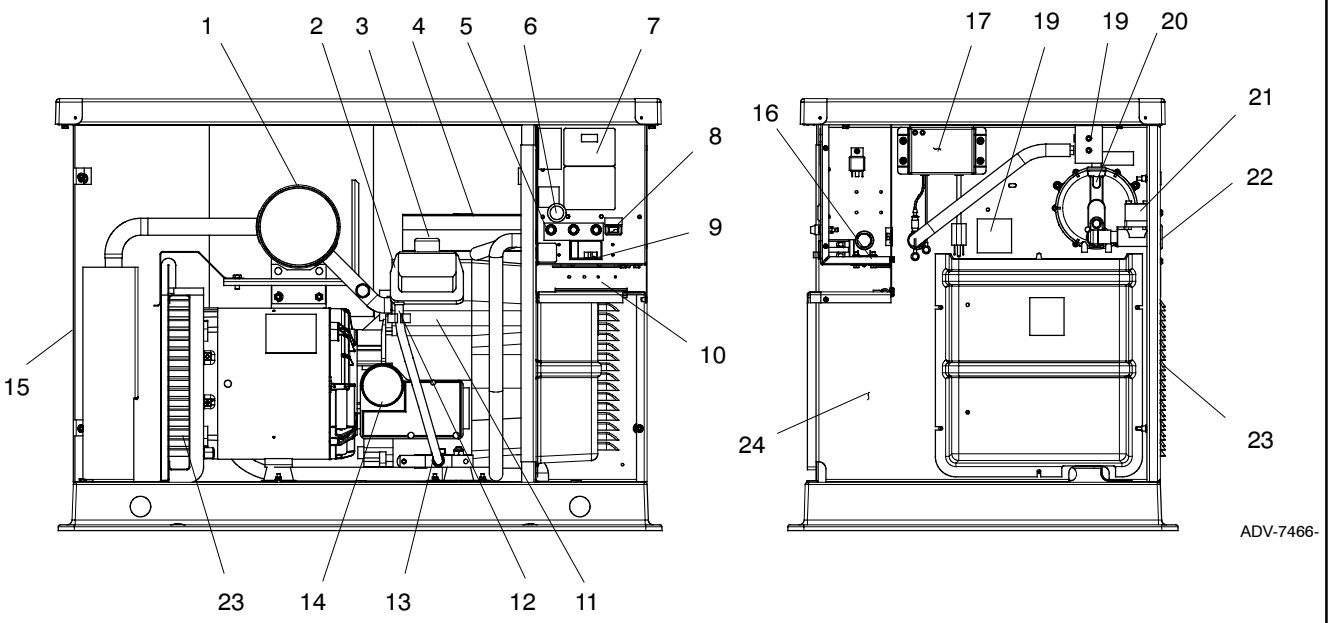
- Efficient overhead valve design and full pressure lubrication for maximum power, torque, and reliability under all operating conditions.
- Dependable, maintenance-free electronic ignition.
- Precision-formulated cast iron construction of parts subjected to the most wear and tear.
- Field-convertible multi-fuel systems that allow fuel changeover from natural gas to LP vapor (and vice-versa) while maintaining CARB emission certification.
- Digital spark advance optimizes ignition timing for the selected fuel.

1.4 Controller

Controller features include the following:

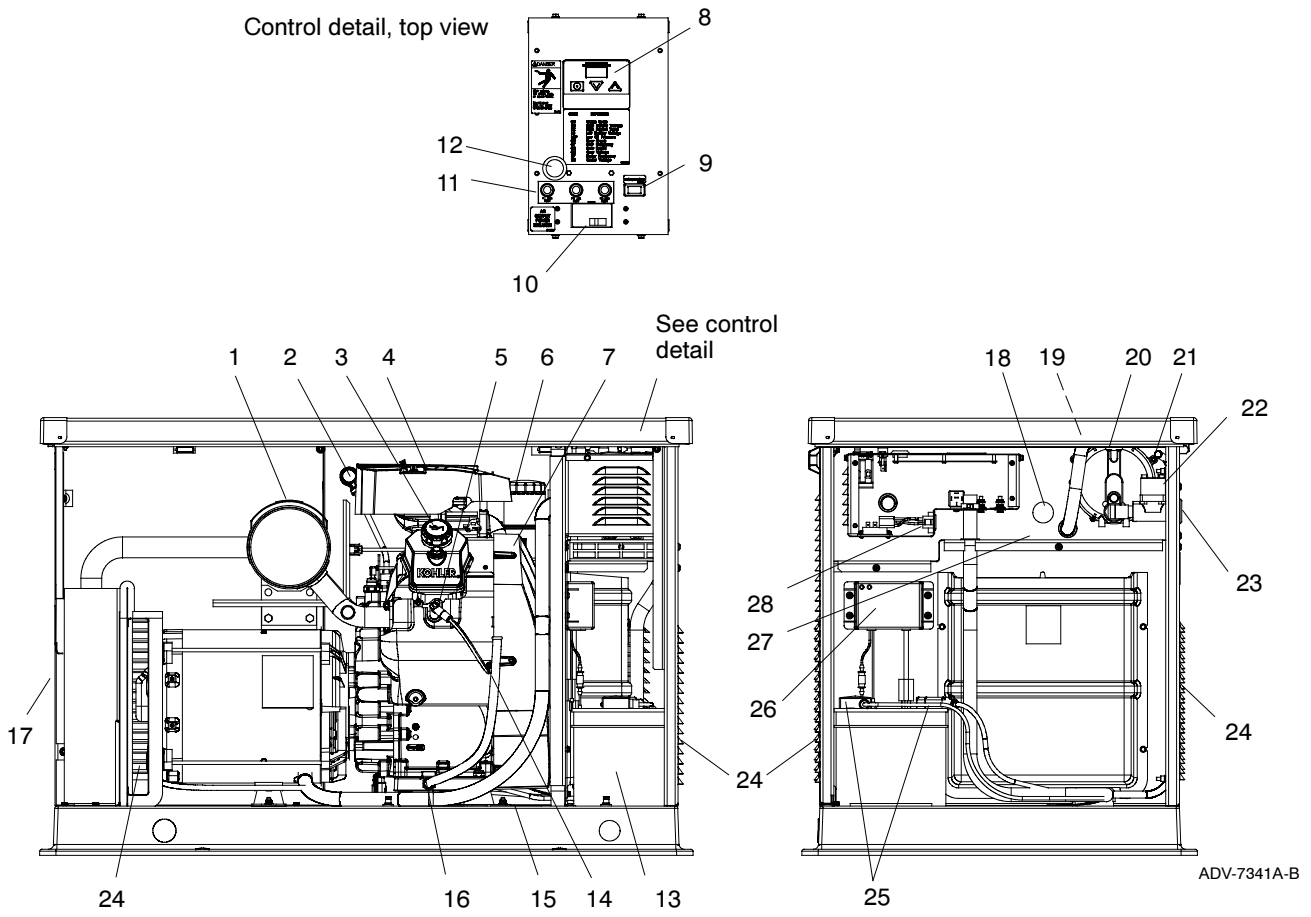
- Compact controller
- Integrally mounted to the generator set
- LED display:
  - Engine runtime, hours
  - AC voltage
  - Frequency (Hz)
  - Battery voltage
  - Crank cycle status
  - Setup information
  - Application software version
- LED display communicates faults:
  - High battery voltage
  - High engine temperature
  - Low battery voltage
  - Low oil pressure
  - Overcrank safety
  - Overfrequency
  - Overspeed
  - Overvoltage
  - Underfrequency
  - Undervoltage
- Membrane keypad for configuration and adjustment
  - Password-protected user access to menus
  - Voltage, gain, and speed adjustment
  - System configuration (system voltage/frequency settings and generator set model)
- Remote two-wire start/stop capability
- Digital isochronous governor to maintain steady-state speed at all loads
- Digital voltage regulation: ±1.5% RMS no-load to full-load
- Automatic start for programmed cranking cycle
- Master control switch mounted on the junction box: Run/Off-Reset/Auto
- Upgradeable application software

1.5 Generator Set Components



1. Muffler
2. Oil check
3. Oil fill
4. Air cleaner
5. Fuses
6. RS-232 connector (for application program updates)
7. Controller user interface (see Figure 2-1)
8. Generator set master switch (RUN-OFF/RESET-AUTO)
9. Load circuit breaker
10. Field-connection terminal block location
11. Spark plug locations (both sides)
12. Oil drain hose
13. Oil drain valve
14. Oil filter
15. Exhaust
16. Equipment ground
17. Battery charger
18. DSAI lead location
19. Fuel block
20. Gas regulator assembly
21. Fuel solenoid valve
22. Fuel inlet
23. Air intake
24. Engine starting battery location (battery purchased separately)

Figure 1-1 Generator Set Components, RGEN12



1. Muffler
2. Oil check
3. Oil fill
4. Air cleaner
5. Spark plug locations (both sides)
6. Oil filter
7. Oil cooler location
8. Controller user interface
9. Generator set master switch (RUN-OFF/RESET-AUTO)
10. Line circuit breaker
11. Fuses
12. RS-232 connector (for application program updates)
13. Engine starting battery location (battery purchased separately)
14. Oil drain hose
15. Nameplate location (on base)
16. Oil drain valve
17. Exhaust outlet
18. Carburetor heater access opening
19. LP fuel orifice location (inside hose fitting)
20. Gas regulator assembly
21. DSAI leads
22. Fuel solenoid valve
23. Fuel inlet
24. Air intake
25. Battery cables
26. Battery charger
27. Field-connection terminal block location
28. 120 VAC receptacles for battery charger and optional carburetor heater

Figure 1-2 Generator Set Components, RGEN17/18

Section 2 Operation

2.1 Prestart Checklist

To ensure continued satisfactory operation, perform the following checks or inspections before or at each startup, as designated, and at the intervals specified in the service schedule. In addition, some checks require verification after the unit starts.

Air Cleaner. Check for a clean and installed air cleaner element to prevent unfiltered air from entering the engine.

Air Inlets. Check for clean and unobstructed air inlets.

Battery. Check for tight battery connections. Consult the battery manufacturer's instructions regarding battery care and maintenance.

Exhaust System. Check for exhaust leaks and blockages. Check the muffler condition and check for tight exhaust system connections.

Inspect the exhaust system components for cracks, leaks, and corrosion.

- Check for corroded or broken metal parts and replace them as needed.
- Check that the exhaust outlet is unobstructed.

Oil Level. Maintain the oil level at or near, not over, the full mark on the dipstick.

Operating Area. Check for obstructions that could block the flow of cooling air. Keep the air intake area clean. Do not leave rags, tools, or debris on or near the generator set.

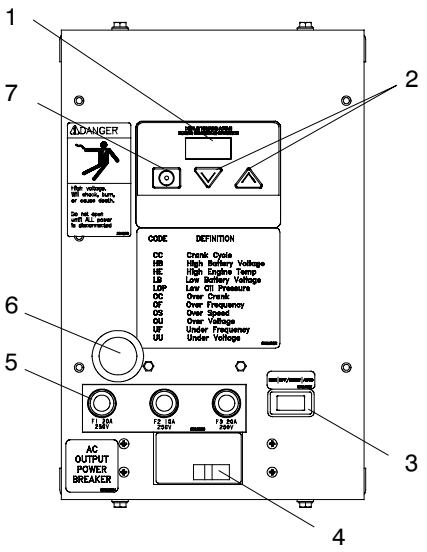
2.2 Exercising Generator Set

Operate the generator set without load once each week for 20 minutes. If the generator set is not connected to an automatic transfer switch (ATS) with an exercise option, exercise the unit in the presence of an operator.

The operator should perform all of the prestart checks before starting the exercise procedure. Start the generator set according to the starting procedure in the controller section of this manual. While the generator set is operating, listen for a smooth-running engine and visually inspect the generator set for fluid or exhaust leaks. Check the air inlets and outlets and remove any items restricting the air flow.

2.3 Controls and Indicators

Figure 2-1 illustrates the user interface and other items on the generator set junction box. Figure 2-2 describes the controls and indicators.



1. LED display
2. Up and down arrow buttons
3. Generator set master switch
4. Line circuit breaker
5. Fuses
6. RS-232 connector (for application program upgrade)
7. Select button (use for setup and adjustment only)

Figure 2-1 Controls

2.3.1 LED Display

The LED display is activated by a start or RUN command as follows:

- Move the master switch to RUN.
- With the master switch in AUTO, send a remote start command (close the remote start contact across leads 3 and 4).

The LED display indicates generator set status as shown in Figure 2-2. When the generator set is running, engine runtime hours are shown unless the arrow buttons are used to step through the other displays as described in Section 2.3.2.

When the master switch is in AUTO, the display turns off 48 hours after generator set shutdown. See Section 2.4, Controller Power.

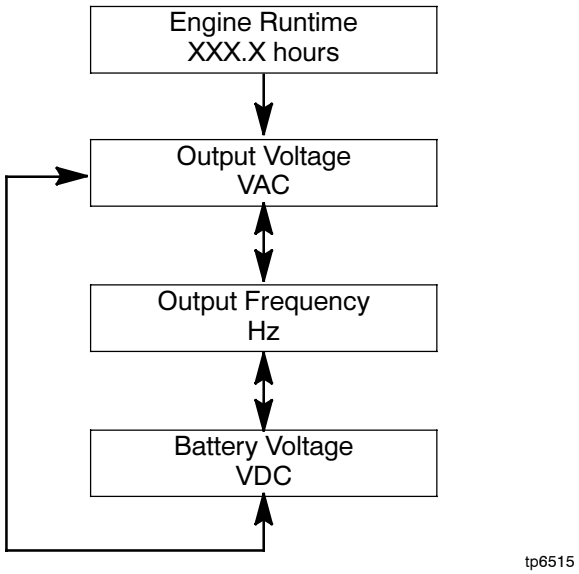
Control or Indicator	Item	Description
LED display	Runtime hours	Displays total generator set runtime hours while the generator set is running and when no other codes are displayed.
	Metering display	Displays AC voltage (output), frequency, and battery voltage. Press the up or down arrow when runtime hours are displayed to step through these displays.
	Crank indication	Displays CC_1, CC_2, or CC_3 to indicate the first, second, or third attempt to start the engine. The last digit flashes during the crank cycle rest periods.
	Software version number	The software version number (v#.##) is displayed when entering configuration mode. See the installation manual.
	Fault codes	Flashes a 2- or 3-letter fault code to indicate various fault conditions. See Section 2.6.
Keypad	Select and arrow buttons	Use the arrow buttons to step through the data displays. See Figure 2-3. The keypad is also used for controller setup and adjustment. The setup and adjustment functions are password-protected. Have setup and adjustments performed only by a Lennox dealer.
Generator set master switch	Three-position switch	Switch functions as the generator set operation and controller reset switch.

Figure 2-2 Controls and Indicators

2.3.2 Controller Keypad

The three buttons on the controller keypad are Select, Up, and Down.

When the generator set is running, the up and down arrow buttons can be used to step through system data displays as shown in Figure 2-3. After 10 seconds, the display returns to engine runtime hours.



1. Generator set master switch in AUTO
2. Step through using up or down arrow buttons
3. After 10 seconds, display returns to runtime hours

Figure 2-3 Data Displays

The buttons on the controller keypad are also used for system configuration and adjustment. The system configuration is factory-set and should not require changes under normal operating conditions. Contact a Lennox dealer or service technician if adjustments are required.

2.3.3 Generator Set Master Switch

The generator set master switch is located on the junction box below the user interface. The master switch positions are RUN, OFF/RESET, and AUTO. See Section 2.5 for operation instructions.

2.4 Controller Power

The controller is powered by the generator set engine starting battery.

Note: The generator sets are equipped with factory-installed battery chargers to prevent battery discharge. The battery charger must be connected to utility power.

2.4.1 Standby Mode

When the generator set master switch is in the AUTO position and the engine is not running, the controller is in standby mode. Engine runtime hours are shown on the display. A remote start signal (contact closure) will start and run the generator set.

The controller can be set to go into sleep mode if there is no start signal for 48 hours.

2.4.2 Sleep Mode

Controllers with application code version 1.13 or higher are shipped with the sleep mode disabled and J1939 communication enabled. The controller will remain in standby mode whenever the master switch is in AUTO and the engine is not running.

Note: The battery charger must be connected to utility power to prevent battery discharge.

Communication parameter Cn can be changed to disable communication and enable the sleep mode if remote communication is not required. See Installation Manual XP-6514 for instructions to set parameter Cn.

Sleep Mode. If the controller communication is disabled and the generator set master switch is in the AUTO position, the controller powers down automatically after 48 hours of inactivity. The controller display is dark and battery draw is minimized. A remote start signal (from a transfer switch or a remote start/stop switch connected to controller leads 3 and 4) reactivates the controller. Moving the generator set master switch to the RUN position also activates the controller.

2.5 Generator Set Operation

2.5.1 Starting Generator Set

Local Starting

Move the generator set master switch to the RUN position to immediately start the generator set.

Auto (Automatic) Starting

Move the generator set master switch to the AUTO position to allow startup by an automatic transfer switch (ATS) or remote start/stop switch, if equipped. Close a contact across engine start leads 3 and 4 to signal the controller to start the generator set.

Crank Cycle

The controller attempts to start the generator set three times (three crank cycles, 15 seconds crank and 15 seconds off). See Figure 2-2 for display information during the crank cycle. If the generator set does not start in three attempts, the system shuts down on an overcrank fault. See Section 2.6.

2.5.2 Stopping Generator Set

Local Stopping

1. Run the generator set with no load for at least 2 minutes to ensure adequate engine cooldown.
2. Move the generator set master switch to the OFF/RESET position. The engine stops.

Automatic Stopping

With the generator set master switch in the AUTO position, open the contact across engine start leads 3 and 4 to signal the generator set to stop.

An automatic transfer switch (ATS) connected to controller leads 3 and 4 operates as follows:

1. The ATS disconnects the load from the generator set.
2. If the ATS is equipped with an engine cooldown time delay, the generator set continues to run for a preset engine cooldown time.

   Note: There is no engine cooldown time delay on the controller.

3. The ATS opens the connection between controller leads 3 and 4. The generator set shuts down. The controller enters standby mode and displays engine runtime hours.

2.6 Faults

2.6.1 Shutdowns

Under the fault shutdown conditions listed in Figure 2-4, the generator set shuts down automatically and the controller displays a fault code. The generator set cannot be restarted until the fault condition is corrected and the controller is reset. See Section 2.6.3 to reset the controller after a fault shutdown.

The shutdown switches on the generator set will automatically reset when the problem is corrected. For example, the high engine temperature switch resets automatically when the generator set cools. However, the fault does not clear until the controller is reset.

2.6.2 Warnings

The controller displays a fault code but the generator set does not shut down on a high battery voltage warning or a low battery voltage warning. The controller resets automatically after a battery voltage fault condition is corrected.

2.6.3 Resetting Controller after a Fault Shutdown

Always identify and correct the cause of a fault shutdown before resetting the controller. Check the fault code displayed on the controller and refer to Figure 2-4 to identify and correct the fault condition before proceeding.

Use the following procedure to reset the generator set controller after a fault shutdown.

1. Move the generator set master switch to OFF/ RESET.
2. Disconnect the generator set from the load using the line circuit breaker or ATS. See the safety precautions at the beginning of this manual before proceeding.
3. Identify and correct the cause of the fault shutdown. See the safety precautions at the beginning of this manual before proceeding. Refer to Section 5, Troubleshooting.
4. Start the generator set by moving the generator set master switch to RUN. Test operate the generator set to verify that the cause of the shutdown has been corrected.
5. Move the generator set master switch to OFF/ RESET.
6. Reconnect the generator set to the load using the line circuit breaker or ATS.
7. Move the generator set master switch to the AUTO position for startup by remote transfer switch or remote start/stop switch.

   Note: The controller's LED display remains off until an engine start command is received.

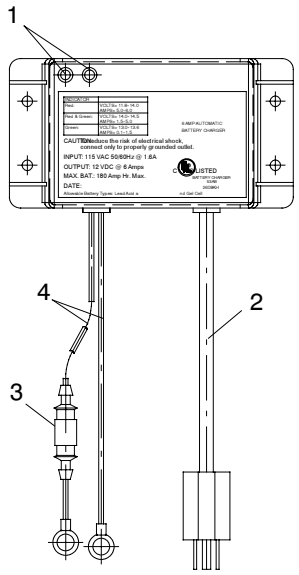
Code	Fault	Description	Check
AF	Auxiliary fault input shutdown	Not used.	—
HE	High engine temperature shutdown	Shutdown occurs if the engine coolant temperature exceeds the maximum temperature for more than 5 seconds. This function becomes active after the engine reaches the crank disconnect speed.	Check for blocked air inlets and exhaust outlets.
LOP	Low oil pressure shutdown	Shutdown occurs if a low oil pressure condition exists for more than 5 seconds. This function becomes active 30 seconds after the engine has reached crank disconnect speed (30 second inhibit). **Note:** The low oil pressure shutdown does not protect against low oil level. Check the oil level at the engine.	Check for leaks in the lubrication system. Check the oil level and add oil if the level is low.
OC	Overcrank shutdown	Shutdown occurs after 3 unsuccessful starting attempts. The crank cycle is set for three starting attempts of 15 seconds cranking and 15 seconds rest.	Check the fuel supply, spark plug, and battery. Check for loose connections. Contact a Lennox dealer for service if problem continues.
	Locked rotor	The generator set also shuts down on OC if no engine rotation is sensed during cranking. Shuts down 3 seconds after the fault is detected.	
OF	Overfrequency shutdown	Shutdown occurs when the governed frequency exceeds 110% of the system's frequency setpoint for more than 5 seconds. This function becomes active 10 seconds after engine start (10 second inhibit).	Contact a Lennox dealer for service if problem continues.
OS	Overspeed shutdown	Shutdown occurs if the engine speed exceeds 110% of the normal running speed for more than 0.3 seconds.	Contact a Lennox dealer for service if problem continues.
OU	Overvoltage shutdown	Shutdown occurs if the voltage exceeds 120% of the system nominal voltage for more than 2 seconds.	Contact a Lennox dealer for service if problem continues.
UF	Underfrequency shutdown	Shutdown occurs if the governed frequency falls below 54 Hz for more than 5 seconds. Shutdown also occurs if the governed frequency falls below 56.5 Hz for more than 60 seconds. This function becomes active 10 seconds after engine start. (10 second inhibit).	Reduce the load and restart the generator set. Contact a Lennox dealer for service if problem continues.
UU	Undervoltage shutdown	Shutdown occurs if the voltage falls below 80% of the nominal system voltage for more than 10 seconds.	Reduce the load and restart the generator set. Contact a Lennox dealer for service if problem continues.
HB	High battery voltage warning	Fault code is displayed if the engine starting battery voltage rises above 16 VDC for more than 30 seconds when the engine is running. Not operative during the engine crank cycle, this fault condition does not inhibit engine starting. The fault condition clears when the battery voltage returns to an acceptable level.	Check the battery rating and condition. Check the battery charger operation.
LB	Low battery voltage warning	Fault code is displayed if the engine starting battery voltage falls below 11 VDC for more than 30 seconds when the engine is not running. Not operative during the engine crank cycle, this fault condition does not inhibit engine starting. The fault condition clears when the battery voltage returns to an acceptable level.	Check the battery rating and condition. Check the battery charger operation. Charge or replace the battery.

Figure 2-4 Controller Fault Codes

2.7 Battery Charger

The generator set is equipped with a 6-amp float/equalize battery charger to maintain the engine starting battery. The charger's power cord must be connected to a 120 VAC power source. Figure 2-5 illustrates the battery charger.

The battery charger uses an AGS 10 inline fuse. The fuse is located in the battery lead. See Figure 2-5.



1. LED indicators
2. AC power cord
3. Fuse
4. Battery leads, 12 VDC

Figure 2-5 6-Amp Float/Equalize Battery Charger

2.7.1 Battery Charger Operation

Figure 2-6 illustrates the three-stage charging method. Red and green LEDs indicate charger operation. The chart in Figure 2-7 describes the LED indicator operation during each stage of the charging process.

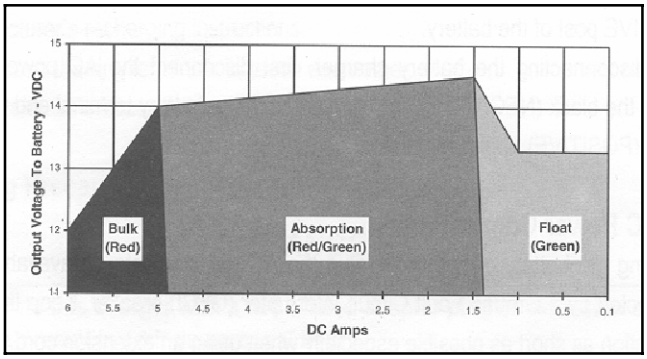
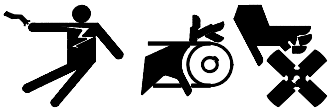


Figure 2-6 Charging Method

Display	Operating Condition
Red ON Green OFF	When the red LED is on, it indicates the battery is discharged and the battery charger is recharging at the BULK rate (stage 1). This charging rate is 6 amps. While the red LED is on, the voltage measured (with the battery charger on) will be 11.8–14 volts. If the red LED stays on for more than 24 hours, refer to Section 5.4 in this manual.
Red ON Green ON	When both the green and the red LEDs are on, the battery charger is charging at an ABSORPTION rate of between 1.5 and 5 amps (stage 2). This mode of charging gradually tops off your battery, and reduces harmful sulfating. While both LEDs are on, the voltage measured (with the battery charger on) should be approximately 14.0–14.5 VDC. If both LEDs stay on longer than 24 hours, refer to Section 5.4 in this manual.
Red OFF Green ON	When the green LED is on, the battery charger is charging at a FLOAT or MAINTENANCE rate of less than 1.5 amps (stage 3). Your battery is now 90% charged and ready for use. This float charging current will gradually decrease to as low as 0.1 amps as the battery reaches 100% charge. It will now be kept at full charge without overcharging. If the green LED stays on when your battery is known to be low, refer to Section 5.4 in this manual.

Figure 2-7 Battery Charger LED Indicator Functions

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or connected equipment, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

⚠ WARNING

Hot engine and exhaust system.
Can cause severe injury or death.

Do not work on the generator set until it cools.

Servicing the exhaust system. Hot parts can cause severe injury or death. Do not touch hot engine parts. The engine and exhaust system components become extremely hot during operation.

⚠ WARNING

Hazardous voltage. Moving parts.
Can cause severe injury or death.

Operate the generator set only when all guards and electrical enclosures are in place.

Servicing the generator set when it is operating. Exposed moving parts can cause severe injury or death. Keep hands, feet, hair, clothing, and test leads away from the belts and pulleys when the generator set is running. Replace guards, screens, and covers before operating the generator set.

3.1 Routine Maintenance

Refer to the following service schedule and the runtime hours displayed on the controller display to schedule routine maintenance. Have a Lennox dealer service the generator set at the designated intervals in the service schedule for the life of the generator set. Service units subject to extreme weather, long operating hours, or dusty or dirty conditions more frequently.

Contact a Lennox dealer for parts.

3.2 Service Schedule, RGEN12

System Component or Procedure	See Section	Procedure					Frequency
		Visually Inspect	Check	Change	Clean	Test	
Fuel							
Flexible lines and connections		X		R			Quarterly
Main tank supply level			X				Weekly
Fuel piping		X					Yearly
Lubrication	3.3						
Oil level		X	X				8 hours or before use
Crankcase breather hose		X					Yearly or 500 hours
Change oil				X			Yearly or 100 hours
Replace filter				X			Yearly or 200 hours
Cooling	3.6						
Air ducts, louvers			X		X		Yearly
Exhaust Line	3.7						
Leakage		X	X				Weekly
Insulation, fire hazards		X					Yearly
Obstructions or combustible materials near exhaust outlet		X					Weekly
DC Electrical System	3.8						
Battery charger operation, charge rate (if equipped)		X					Monthly
Remove corrosion, clean and dry battery and rack		X			X		Yearly
Clean and tighten battery terminals and inspect boots		X	X				Yearly
Battery electrolyte level and specific gravity *			X				Yearly
AC Electrical System							
Tighten control and power wiring connections			X				Yearly
Remote control system, if equipped						X	Monthly
Visible wear or damage		X					Quarterly
Wire abrasions where subject to motion		X	X				Six Months
Wire-cable insulation condition		X					3 Years or 500 hours
Engine and Mounting							
Visible wear or damage		X					Weekly
Air cleaner and precleaner service	3.5			R			Yearly or 100 hours
Spark plugs	3.4			X			Yearly or 300 hours
Replace stepper motor coupling and bushing				D			500 hours
Generator							
Visible wear or damage		X					Quarterly
Exercise generator set						X	Weekly
Brushes and collector ring		D			D		Yearly
Measure and record resistance readings of windings with insulation tester (Megger®, with SCR assembly or rectifier and load leads disconnected) *						D	3 Years
General Condition of Equipment							
Evidence of vibration, leakage, excessive noise, temperature, or deterioration		X	X		X		Weekly
Interior of sound enclosure		X			X		Quarterly

* Not necessary for maintenance-free batteries.

D Lennox dealer only
X Action
R Replace as necessary

Megger® is a registered trademark of Biddle Instruments.

3.3 Lubrication System

See Section 3.2, Service Schedule, for oil change and oil filter replacement intervals. See Section 1.5 for the oil drain, oil check, oil fill, and oil filter locations.

For extended operation, check the oil level every 8 hours. Maintain the oil level at or near, not over, the full mark on the dipstick.

3.3.1 Low Oil Pressure Shutdown

The low oil pressure shutdown feature protects the engine against internal damage if the oil pressure drops below 24.1 kPa ±13.8 kPa (3.5 psi ±1.5 psi) because of oil pump failure or other malfunction. The shutdown feature does not protect against damage caused by operating with the oil level below the safe range; it is not a low oil level shutdown. Check the oil level regularly, and add oil as needed.

3.3.2 Oil Check

The generator set is shipped with oil. Before operating a new generator set, check the engine oil in the crankcase. See Section 1.5, Generator Set Components. Verify that the oil level is at the F mark on the dipstick. Add oil that has a viscosity appropriate for the climate. See Section 3.3.3, Engine Oil Recommendation.

Do not check the oil level when the generator set is running. Shut down the generator set and wait several minutes before checking the oil level.

3.3.3 Engine Oil Recommendation

Use API (American Petroleum Institute) Service Class SG, SH, or SJ synthetic oil. Synthetic oil oxidizes and thickens less than other oils and leaves the engine intake valves and pistons cleaner. Select the viscosity based on the air temperature at the time of operation. See Figure 3-1.

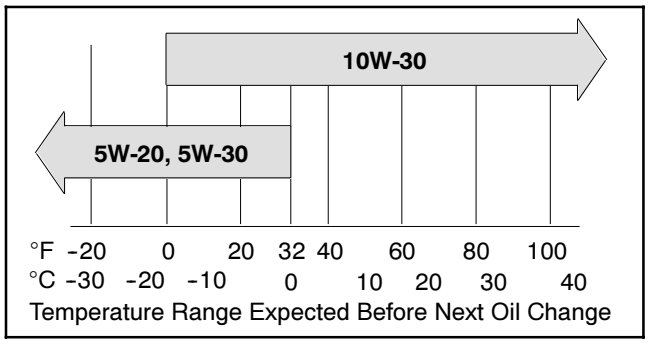


Figure 3-1 Engine Oil Selection

3.3.4 Oil Change Procedure

Drain the oil while it is still warm.

1. **Drain the oil.**

   a. Place the generator set master switch in the OFF position.

   b. Disconnect the power to the battery charger.

   c. Disconnect the generator set engine starting battery, negative (–) lead first.

   d. Remove the housing side panel.

   e. Remove the oil drain hose from its retaining clip. Remove the cap from the oil drain hose and lower the hose into an oil collection container.

   f. Open the oil drain valve on the engine.

   g. Allow time for the engine oil to drain completely.

   h. Close the oil drain valve.

   i. Replace the cap on the oil drain hose. Replace the oil drain hose in its retaining clip.

2. **Replace the oil filter.**

   a. Remove the oil filter by rotating it counterclockwise with an oil filter wrench.

   b. Clean the gasket sealing surface of the oil filter adapter.

   c. Apply a light coat of clean oil to the rubber seal of the new oil filter.

   d. Install the new oil filter following the instructions provided with the filter.

   Note: Dispose of all waste materials (engine oil, fuel, filter, etc.) in an environmentally safe manner.

3. **Fill with oil.**

   a. Remove the oil fill cap and fill the engine to the F mark on the dipstick. The engine oil capacity is 1.9 L (2.0 qt.). See Section 3.3.3, Engine Oil Recommendation, for oil selection.

   b. Reinstall the dipstick and the oil fill cap.

   c. Check that the generator set master switch is in the OFF position.

d. Reconnect the generator set engine starting battery, negative (–) lead last.

e. Reconnect the power to the battery charger.

f. Start and run the generator set for a minute to allow the oil pressure to reach the operating range.

g. Stop the generator set, wait 1 minute, and then recheck the oil level. Add oil to bring the level up to the F mark on the dipstick.

4. **Check for leaks.**

   a. Check for oil leaks.

   b. Fix leaks and recheck the oil level.

   c. Reinstall the housing side panel.

3.4 Spark Plugs

Reset the spark plug gap or replace the plugs with new plugs as necessary.

1. Clean the area around the base of the spark plug to keep dirt and debris out of the engine.

2. Remove the spark plug and check its condition. Replace the spark plug if it is worn or if its reuse is questionable.

3. Check the spark plug gap using a wire feeler gauge. Adjust the gap to 0.76 mm (0.030 in.) by carefully bending the ground electrode. See Figure 3-2 and Figure 3-3.

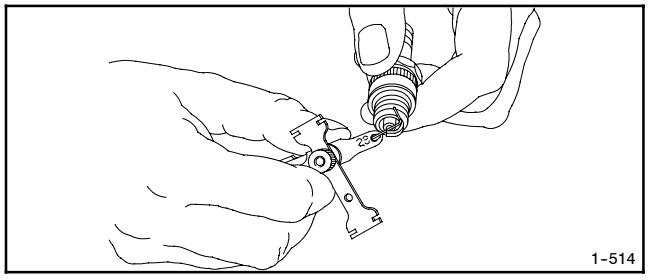


Figure 3-2 Checking the Spark Plug Gap

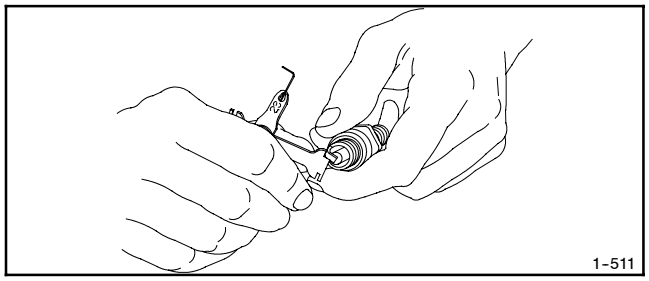
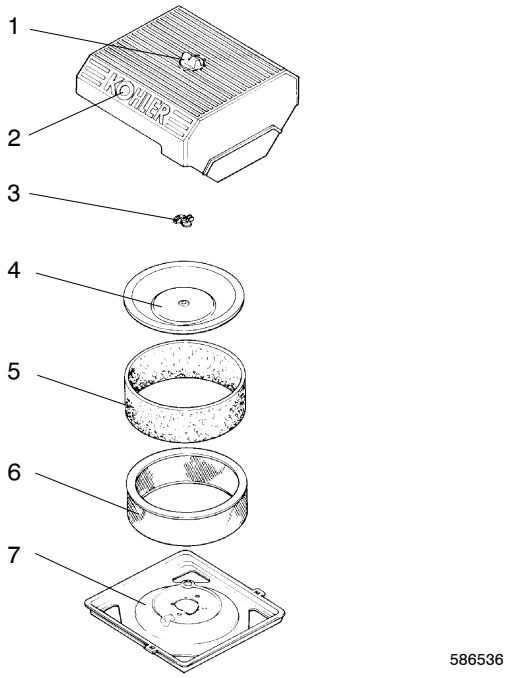


Figure 3-3 Adjusting the Spark Plug Gap

3.5 Air Cleaner Element and Precleaner

The engine has a replaceable high-density paper air cleaner element with an oiled foam precleaner. See Figure 3-4.



1. Cover knob
2. Air cleaner cover
3. Element cover nut
4. Element cover
5. Foam precleaner
6. Air cleaner element
7. Air cleaner base

Figure 3-4 Air Cleaner Components

Check for a buildup of dirt and debris around the air cleaner system. Keep this area clean.

Note: Operating the engine with loose or damaged air cleaner components could allow unfiltered air into the engine causing premature wear and failure.

3.5.1 Precleaner Service

Use the following procedure to wash and reoil the precleaner as indicated in the service schedule. Wash and reoil the precleaner more often under extremely dusty or dirty conditions.

1. Place the generator set master switch in the OFF/ RESET position.
2. Disconnect the power to the battery charger.
3. Disconnect the battery, negative (-) lead first.
4. Loosen the cover retaining knob and remove the cover. Remove the precleaner from the paper element. Wash the precleaner in warm water with detergent. Rinse the precleaner thoroughly until all traces of detergent are eliminated. Squeeze out excess water (do not wring). Allow the precleaner to air dry.
5. Saturate the precleaner with new engine oil. Squeeze out all of the excess oil.
6. Reinstall the precleaner over the paper element.
7. Reinstall the air cleaner cover. Secure the cover with the cover retaining knob.
8. Reconnect the power to the battery charger.
9. Reconnect the generator set engine starting battery, negative (-) lead last.

3.5.2 Paper Element Service

Use the following procedure to replace the paper element at the intervals specified in the service schedule. Replace the paper element more often under extremely dusty or dirty conditions.

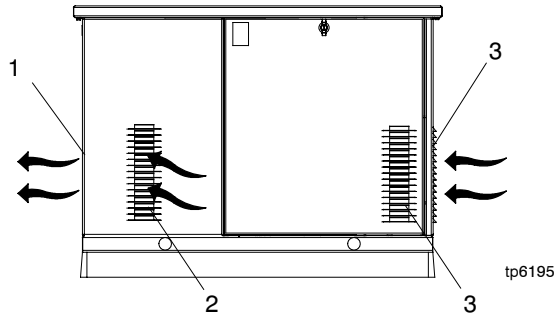
1. Place the generator set master switch in the OFF/ RESET position.
2. Disconnect the power to the battery charger.
3. Disconnect the generator set engine starting battery, negative (-) lead first.
4. Loosen the cover retaining knob and remove the cover.
5. Remove the element cover nut, element cover, and the paper element with precleaner.
6. Remove the precleaner from the paper element.

   Note: Do not wash the paper element or clean it with pressurized air, as this will damage the element.
7. Replace the element if it is dirty, bent, or damaged.
8. Check the air cleaner base. Make sure it is secure and not bent or damaged. Also check the element cover for damage and fit. Replace all damaged air cleaner components. Remove any loose dirt or debris from the air cleaner base. Wipe the base carefully so that no dirt drops into the intake throat. Check the condition of the rubber seal on the air cleaner stud and replace the seal if necessary.
9. Reinstall the paper element, precleaner, element cover, element cover nut, and the air cleaner cover. Secure the cover with the cover retaining knob.
10. Reconnect the power to the battery charger.
11. Reconnect the generator set engine starting battery, negative (-) lead last.

3.6 Cooling System

The engine fan draws cooling air through the openings in the sides and end near the battery. The alternator fan draws cooling air through openings on the side walls of the enclosure. The cooling air mixes with the engine exhaust and is discharged at the exhaust outlet. See Figure 3-5. To prevent generator set damage caused by overheating, keep the housing cooling inlets and outlets clean and unobstructed at all times.

Note: Do not block the generator set cooling air inlets or mount other equipment above them. Overheating and severe generator damage may occur.



1. Exhaust outlet
2. Alternator air intake (both sides)
3. Engine air intake

Figure 3-5 Cooling Air Intake and Exhaust

3.7 Exhaust System

Remove all combustible materials from the exhaust location. Combustible materials include building materials as well as natural surroundings. Keep dry field grass, foliage, and combustible landscaping material a minimum of 1.5 m (5 ft.) from the exhaust outlet.

Periodically inspect the exhaust system components (exhaust manifold, exhaust line, flexible exhaust, clamps, silencer, and outlet pipe) for cracks, leaks, and corrosion.

- Check for corroded or broken metal parts and replace them as needed.
- Check for loose, corroded, or missing clamps and hangers. Tighten or replace clamps and/or hangers as needed.
- Check for and remove loose insulation in the exhaust duct.
- Check that the exhaust outlet is clear.

3.8 Battery

⚠ WARNING

Sulfuric acid in batteries.
Can cause severe injury or death.

Wear protective goggles and clothing. Battery acid may cause blindness and burn skin.

Battery electrolyte is a diluted sulfuric acid. Battery acid can cause severe injury or death. Battery acid can cause blindness and burn skin. Always wear splashproof safety goggles, rubber gloves, and boots when servicing the battery. Do not open a sealed battery or mutilate the battery case. If battery acid splashes in the eyes or on the skin, immediately flush the affected area for 15 minutes with large quantities of clean water. Seek immediate medical aid in the case of eye contact. Never add acid to a battery after placing the battery in service, as this may result in hazardous spattering of battery acid.

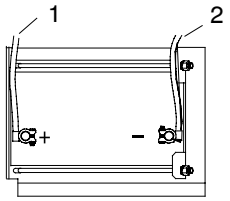
Battery acid cleanup. Battery acid can cause severe injury or death. Battery acid is electrically conductive and corrosive. Add 500 g (1 lb.) of bicarbonate of soda (baking soda) to a container with 4 L (1 gal.) of water and mix the neutralizing solution. Pour the neutralizing solution on the spilled battery acid and continue to add the neutralizing solution to the spilled battery acid until all evidence of a chemical reaction (foaming) has ceased. Flush the resulting liquid with water and dry the area.

Battery gases. Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flames or sparks to occur near a battery at any time, particularly when it is charging. Do not dispose of a battery in a fire. To prevent burns and sparks that could cause an explosion, avoid touching the battery terminals with tools or other metal objects. Remove all jewelry before servicing the equipment. Discharge static electricity from your body before touching batteries by first touching a grounded metal surface away from the battery. To avoid sparks, do not disturb the battery charger connections while the battery is charging. Always turn the battery charger off before disconnecting the battery connections. Ventilate the compartments containing batteries to prevent accumulation of explosive gases.

Battery short circuits. Explosion can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage. Disconnect the battery before generator set installation or maintenance. Remove all jewelry before servicing the equipment. Use tools with insulated handles. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery. Never connect the negative (-) battery cable to the positive (+) connection terminal of the starter solenoid. Do not test the battery condition by shorting the terminals together.

Refer to this section for general battery information and maintenance. Also consult the battery manufacturer's instructions for battery maintenance.

All generator set models use a negative ground with a 12-volt engine electrical system. Consult the generator set nameplate for the engine electrical system voltage. Consult the generator spec sheet for battery capacity recommendations for replacement purposes. Wiring diagrams provide battery connection information. See Figure 3-6 for typical battery connections.



EZ-273000-J

1. To positive (+) terminal on starter solenoid.
2. To ground (-) terminal on or near starter motor.

Figure 3-6 12-Volt Engine Electrical System Single Starter Motor, Typical Battery Connection

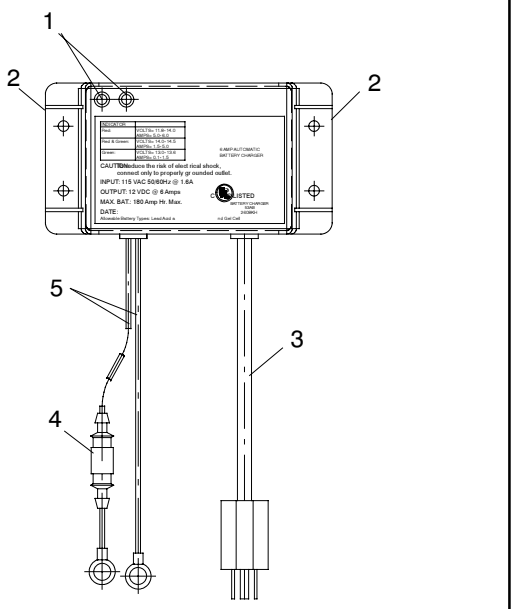
Clean the battery and cables and tighten battery terminals using the service schedule recommendations. To prevent corrosion, maintain tight, dry electrical connections at the battery terminals. To remove corrosion from battery terminals, disconnect the cables from the battery and scrub the terminals with a wire brush. Clean the battery and cables with a solution of baking soda and water. After cleaning, flush the battery and cables with clean water and wipe them with a dry, lint-free cloth.

After reconnecting the battery cables, coat the battery terminals with petroleum jelly, silicone grease, or other nonconductive grease.

3.9 Battery Charger

The generator set is equipped with a 6-amp float/equalize battery charger to maintain the engine starting battery. The charger's DC leads are factory-wired. Figure 3-7 illustrates the battery charger.

Periodically tighten all connections. No other maintenance on the battery charger is required.



1. LED indicators
2. Mounting flanges
3. AC power cord
4. Fuse
5. Battery leads, 12 VDC

Figure 3-7 6-Amp Float/Equalize Battery Charger

3.10 Circuit Protection

If the generator set circuit breaker trips or the fuses blow repeatedly, see Section 5, Troubleshooting, for possible causes.

3.10.1 Line Circuit Breaker

A line circuit breaker interrupts the generator output in the event of a fault in the wiring between the generator and the load. The line circuit breaker location is shown in Figure 1-1 or Figure 1-2. The circuit breaker rating is 50 amps. If the circuit breaker trips, reduce the load and switch the breaker back to the ON position. With the breaker in the OFF position, the generator set runs but the generator output is disconnected from the load.

3.10.2 Fuses

Two 10-amp and one 20-amp inline fuse are mounted on the controller junction box. See Figure 3-8. Another 10-amp fuse is located in the battery charger lead.

Always identify and correct the cause of a blown fuse before restarting the generator set. Refer to Section 5, Troubleshooting, for conditions that may indicate a blown fuse. Replace blown fuses with identical replacement parts.

Fuse	Label	Part Number	Location
Auxiliary winding	F1	Y1106	Lead 55
Relay interface board	F2	Y1100	Lead PF2
Controller	F3	Y1100	Lead PF1
Battery charger	—	Y1100	Battery charger DC lead. See Figure 3-7.

Figure 3-8 Fuses

3.11 Storage Procedure

Perform the following storage procedure before removing the generator set from service for three months or longer. Follow the engine manufacturer's recommendations for storage, if available.

Note: Run the generator set monthly whenever possible.

3.11.1 Lubricating System

1. Operate the generator set until it reaches operating temperature, or about 15 minutes.
2. Stop the generator set.
3. While the engine is still warm, drain the engine lubrication oil from the engine crankcase.
4. Refill engine crankcase with oil. See Section 3.3.3 for oil recommendations.
5. Run the generator set for a few minutes to distribute the clean oil.
6. Stop the generator set.

3.11.2 Fuel System

1. Start the generator set.
2. With the generator set running, shut off the gas supply.
3. Run the generator set until the engine stops.
4. Place the generator set master switch in the OFF/ RESET position.

3.11.3 Cylinder Lubrication

1. Remove the spark plugs.
2. Pour one tablespoon of engine oil into each spark plug hole. Install the spark plugs and *ground* the spark plug leads. *Do not connect the leads to the plugs.*
3. Toggle the generator set master switch to crank the engine two or three revolutions to lubricate the cylinders.

3.11.4 Exterior Preparation

1. Clean the exterior surface of the generator set.
2. Seal all openings in the engine with nonabsorbent adhesive tape.
3. Mask all areas to be used for electrical contact.
4. Spread a light film of oil over unpainted metallic surfaces to prevent rust and corrosion.

3.11.5 Battery

Perform battery storage last.

1. Place the generator set master switch in the OFF/ RESET position.
2. Disconnect the battery, negative (–) lead first.
3. Clean the battery. Refer to Section 3.8 for the cleaning procedure.
4. Place the battery in a warm, dry location.
5. Connect the battery to a float/equalize battery charger, or charge the battery monthly using a trickle charger. Follow the battery charger manufacturer's recommendations.

⚠ WARNING

Accidental starting.
Can cause severe injury or death.

Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or connected equipment, disable the generator set as follows: (1) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

⚠ WARNING

Hot engine and exhaust system.
Can cause severe injury or death.

Do not work on the generator set until it cools.

Servicing the exhaust system. Hot parts can cause severe injury or death. Do not touch hot engine parts. The engine and exhaust system components become extremely hot during operation.

⚠ WARNING

Hazardous voltage. Moving parts.
Can cause severe injury or death.

Operate the generator set only when all guards and electrical enclosures are in place.

Servicing the generator set when it is operating. Exposed moving parts can cause severe injury or death. Keep hands, feet, hair, clothing, and test leads away from the belts and pulleys when the generator set is running. Replace guards, screens, and covers before operating the generator set.

4.1 Routine Maintenance

Refer to the following service schedule and the runtime hours displayed on the controller display to schedule routine maintenance. Intervals are shown in hours of operation and/or time intervals (i.e. weekly, monthly, quarterly, etc.) Have a Lennox dealer service the generator set at the designated intervals in the service schedule for the life of the generator set. Service units subject to extreme weather, long operating hours, or dusty or dirty conditions more frequently.

Contact a Lennox dealer for parts.

4.2 Service Schedule, RGEN17/18

System Component or Procedure	See Section	Procedure				
		Visually Inspect	Check	Change	Clean	Test
Fuel						
Flexible lines and connections		Q		R		
Main tank supply level			W			
Fuel piping		Y				
Lubrication	4.3					
Oil level			8 or E			
Change oil				Y or 150		
Replace filter				Y or 150		
Crankcase breather hose		Y or 500				
Oil cooler		Y			Y or 100	
Cooling	4.6					
Air ducts, louvers			Y		Y	
Exhaust System	4.7					
Leakage		W	W			
Insulation, fire hazards		Y				
Obstructions or combustible materials near exhaust outlet		W				
DC Electrical System	4.8					
Battery charger operation, charge rate		M				
Remove corrosion, clean and dry battery and rack		Y			Y	
Clean and tighten battery terminals and inspect boots		Y	Y			
Battery electrolyte level and specific gravity *			Y			
AC Electrical System						
Tighten control and power wiring connections			Y			
Remote control system, if equipped						M
Visible wear or damage		Q				
Wire abrasions where subject to motion		6 months	6 months			
Wire-cable insulation condition		3Y or 500				
Engine and Mounting						
Visible wear or damage		W				
Air cleaner service †	4.5		150	300		
Spark plugs	4.4		150	300		
Replace stepper motor coupling and bushing				500 (D)		
Generator						
Visible wear or damage		Q				
Exercise generator set						W
Brushes and collector ring		Y (D)			Y (D)	
Measure and record resistance readings of windings with insulation tester (Megger®, with SCR assembly or rectifier and load leads disconnected)						3Y (D)
General Condition of Equipment						
Evidence of vibration, leakage, deterioration, unusual or excessive noise or temperature		W	W		W	
Interior of sound enclosure		Q			Q	

* Not necessary for maintenance-free batteries.

† Service more frequently under extremely dusty/dirty conditions.

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E Each use
W Weekly
M Monthly
Q Quarterly
Y Yearly

Number = hours of operation
D Lennox dealer only
R Replace as necessary
S/M Service Manual

4.3 Lubrication System

See Section 4.2, Service Schedule, for oil change and oil filter replacement intervals. See Section 1.5 for the oil drain, oil check, oil fill, and oil filter locations.

4.3.1 Low Oil Pressure Shutdown

The low oil pressure (LOP) shutdown feature protects the engine against internal damage if the oil pressure drops below a minimum pressure because of oil pump failure or other malfunction.

Note: The LOP shutdown feature does not protect against damage caused by operating when the oil level is low; it is not a low oil level shutdown. Check the oil level regularly, and add oil as needed.

4.3.2 Oil Check

The generator set is shipped with oil. Before operating the generator set, check the engine oil in the crankcase. See Figure 4-1 for the dipstick location.

Maintain the oil level at or near, not over, the full mark on the dipstick. Add 5W-30 synthetic oil when the oil level is low. See Section 4.3.3, Engine Oil Recommendation.

Check the oil level before each use. For extended operation, check the oil level every 8 hours. Do not check the oil level when the generator set is running. Shut down the generator set and wait several minutes before checking the oil.

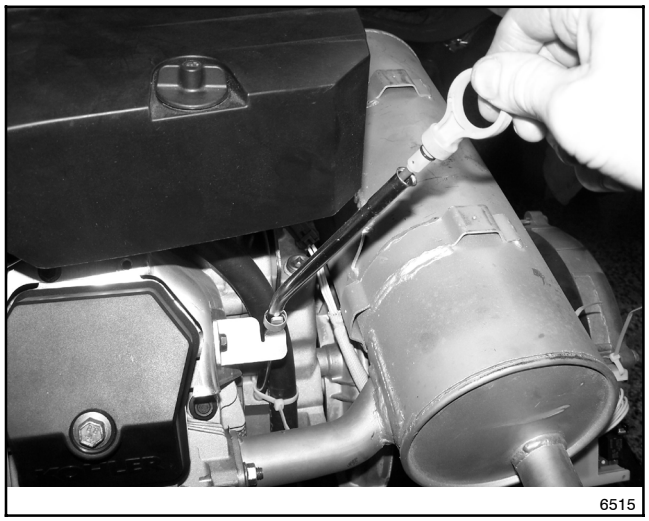


Figure 4-1 Oil Check

4.3.3 Engine Oil Recommendation

Use 5W-30 API (American Petroleum Institute) Service Class SG, SH, or SJ synthetic oil. Synthetic oil oxidizes and thickens less than other oils and leaves the engine intake valves and pistons cleaner.

4.3.4 Oil Change Procedure

Note: Dispose of all waste materials (engine oil, fuel, filter, etc.) in an environmentally safe manner.

Drain the oil while it is still warm.

1. **Drain the oil.**
   a. Place the generator set master switch in the OFF position.
   b. Disconnect the power to the battery charger.
   c. Disconnect the generator set engine starting battery, negative (–) lead first.
   d. Remove the housing side panel.
   e. Clean the area around the dipstick and oil fill cap.
   f. Remove the oil drain hose from its retaining clip. Remove the cap from the oil drain hose and lower the hose into an oil collection container.
   g. Open the oil drain valve on the engine.
   h. Remove the dipstick and oil fill cap. Allow time for the engine oil to drain completely.
   i. Close the oil drain valve. Replace the cap on the oil drain hose. Replace the oil drain hose in its retaining clip.
   j. Replace the dipstick.
2. **Replace the oil filter.**
   a. Clean the area around the oil filter. Remove the oil filter by rotating it counterclockwise with an oil filter wrench.
   b. Clean the gasket sealing surface of the oil filter adapter.
   c. Apply a light coat of clean oil to the rubber seal of the new oil filter.
   d. Install the new oil filter following the instructions provided with the filter.

3. **Fill with oil.**

   a. Fill the engine to the F mark on the dipstick. The engine oil capacity is approximately 2.8 L (3.0 qt.). See Section 4.3.3, Engine Oil Recommendation, for oil selection.

   b. Reinstall the dipstick and the oil fill cap.

   c. Check that the generator set master switch is in the OFF position.

   d. Reconnect the generator set engine starting battery, negative (–) lead last.

   e. Reconnect the power to the battery charger.

   f. Start and run the generator set for a minute to allow the oil pressure to reach operating range.

   g. Stop the generator set, wait 1 minute, and then recheck the oil level. Add oil to bring the level up to the F mark on the dipstick.

4. **Check for leaks.**

   a. Check for oil leaks.

   b. Fix leaks and recheck the oil level.

   c. Reinstall the housing side panel.

4.3.5 Oil Cooler

Inspect and clean the oil cooler at the intervals indicated in the service schedule. The oil cooler must be kept free of debris.

See Figure 4-2 for the oil cooler location. The oil cooler is located under the No. 2 cylinder shroud. Remove the top mounting screw and loosen the two side screws, then lift off the cylinder shroud.

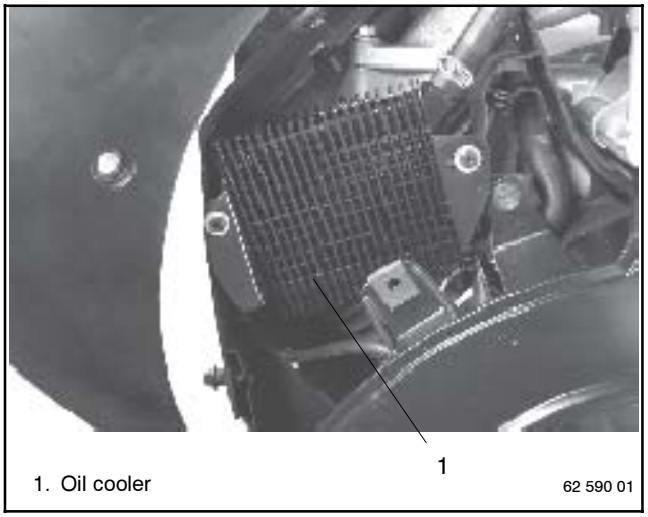


Figure 4-2 Oil Cooler Location

Clean the outside of the oil cooler fins with a brush or with compressed air.

4.4 Spark Plugs

Reset the spark plug gap or replace the plugs with new plugs as necessary.

1. Clean the area around the base of the spark plug to keep dirt and debris out of the engine.

2. Remove the spark plug and check its condition. Replace the spark plug if it is worn or if its reuse is questionable.

3. Check the spark plug gap using a wire feeler gauge. Adjust the gap to 0.76 mm (0.030 in.) by carefully bending the ground electrode. See Figure 4-3 and Figure 4-4.

4. Reinstall the spark plug into the cylinder head. Torque the spark plug to 24.4–29.8 Nm (18–22 ft. lb.)

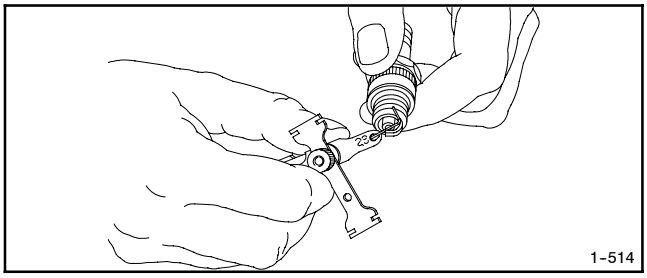


Figure 4-3 Checking the Spark Plug Gap

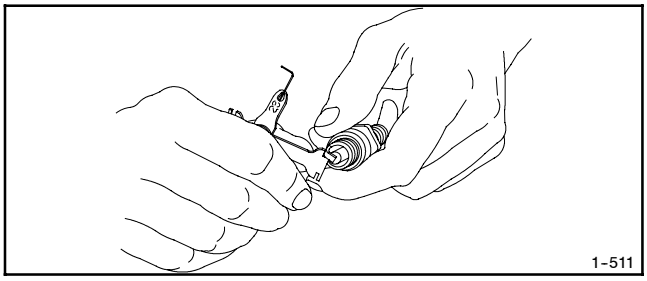
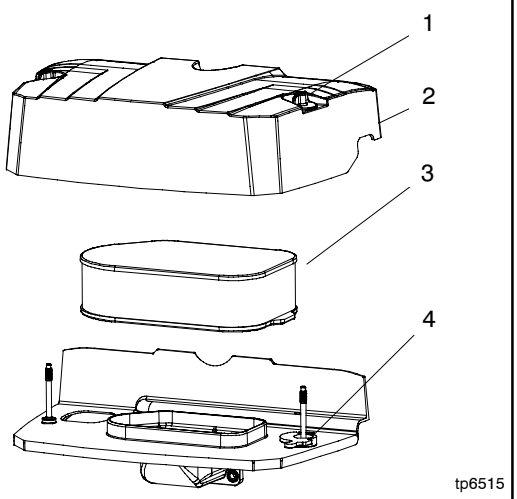


Figure 4-4 Adjusting the Spark Plug Gap

4.5 Air Cleaner Service

The engine is equipped with a replaceable, high density paper air cleaner element. See Figure 4-5.



1. Knobs (qty.2)
2. Cover
3. Paper element
4. Air filter latch

Figure 4-5 Air Cleaner Components

Check the air cleaner daily or before starting the engine. Check for a buildup of dirt and debris around the air cleaner system. Keep this area clean. Also check for loose or damaged components. Replace all bent or damaged air cleaner components.

Note: Operating the engine with loose or damaged air cleaner components could allow unfiltered air into the engine causing premature wear and failure.

Paper Element Service

Replace the paper element at the intervals indicated in the service schedule. See Section 4.2 for the service schedule. See Figure 4-5 for the air cleaner components.

1. Loosen the two cover retaining knobs and remove the cover.

2. Rotate the air filter latch counterclockwise to unlock, then remove the paper element.

3. Do not wash the paper element or use pressurized air, as this will damage the element. Replace a dirty, bent, or damaged element. Handle new elements carefully; do not use if the sealing surfaces are bent or damaged.

4. When servicing the air cleaner, check the air cleaner base and latch. Make sure it is secured and not bent or damaged. Also, check the element cover for damage or improper fit. Replace all damaged air cleaner components.

Note: If any loose dirt or debris fell on the air cleaner base when the element was removed, carefully remove it and wipe the base clean. Be careful that none of it drops into the intake throat.

5. Reinstall the paper element onto the air cleaner base. Make sure the element is flat and properly seated. Rotate the latch clockwise, over the molded lip on the element.

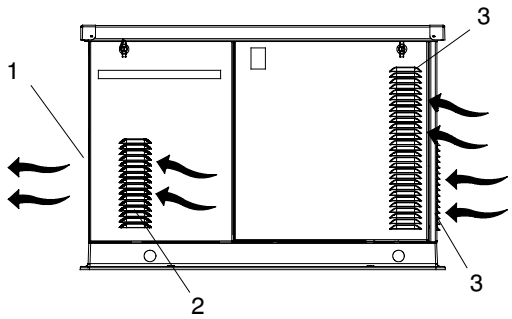
6. Install the air cleaner cover and secure with the two retaining knobs.

7. When element replacement is necessary, order genuine Kohler parts.

4.6 Cooling System

The engine fan draws cooling air through the openings in the sides and end near the battery. The alternator fan draws cooling air through openings on the side walls of the enclosure. The cooling air mixes with the engine exhaust and is discharged at the exhaust outlet. See Figure 4-6. To prevent generator set damage caused by overheating, keep the housing cooling inlets and outlets clean and unobstructed at all times.

Note: Do not block the generator set cooling air inlets or mount other equipment above them. Overheating and severe generator damage may occur.



1. Exhaust outlet
2. Alternator air intake (both sides)
3. Engine air intake

Figure 4-6 Cooling Air Intake and Exhaust

4.7 Exhaust System

Remove all combustible materials from the exhaust location. Combustible materials include building materials as well as natural surroundings. Keep dry field grass, foliage, and combustible landscaping material a minimum of 1.5 m (5 ft.) from the exhaust outlet.

Periodically inspect the exhaust system components for cracks, leaks, and corrosion.

- Check for corroded or broken metal parts and replace them as needed.
- Check that the exhaust outlet is clear.

4.8 Battery

⚠ WARNING

Sulfuric acid in batteries.
Can cause severe injury or death.

Wear protective goggles and clothing. Battery acid may cause blindness and burn skin.

Battery electrolyte is a diluted sulfuric acid. Battery acid can cause severe injury or death. Battery acid can cause blindness and burn skin. Always wear splashproof safety goggles, rubber gloves, and boots when servicing the battery. Do not open a sealed battery or mutilate the battery case. If battery acid splashes in the eyes or on the skin, immediately flush the affected area for 15 minutes with large quantities of clean water. Seek immediate medical aid in the case of eye contact. Never add acid to a battery after placing the battery in service, as this may result in hazardous spattering of battery acid.

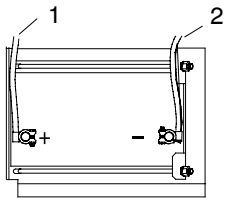
Battery acid cleanup. Battery acid can cause severe injury or death. Battery acid is electrically conductive and corrosive. Add 500 g (1 lb.) of bicarbonate of soda (baking soda) to a container with 4 L (1 gal.) of water and mix the neutralizing solution. Pour the neutralizing solution on the spilled battery acid and continue to add the neutralizing solution to the spilled battery acid until all evidence of a chemical reaction (foaming) has ceased. Flush the resulting liquid with water and dry the area.

Battery gases. Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flames or sparks to occur near a battery at any time, particularly when it is charging. Do not dispose of a battery in a fire. To prevent burns and sparks that could cause an explosion, avoid touching the battery terminals with tools or other metal objects. Remove all jewelry before servicing the equipment. Discharge static electricity from your body before touching batteries by first touching a grounded metal surface away from the battery. To avoid sparks, do not disturb the battery charger connections while the battery is charging. Always turn the battery charger off before disconnecting the battery connections. Ventilate the compartments containing batteries to prevent accumulation of explosive gases.

Battery short circuits. Explosion can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage. Disconnect the battery before generator set installation or maintenance. Remove all jewelry before servicing the equipment. Use tools with insulated handles. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery. Never connect the negative (-) battery cable to the positive (+) connection terminal of the starter solenoid. Do not test the battery condition by shorting the terminals together.

Refer to this section for general battery information and maintenance. Also consult the battery manufacturer's instructions for battery maintenance.

All generator set models use a negative ground with a 12-volt engine electrical system. Consult the generator set nameplate for the engine electrical system voltage. Consult the generator spec sheet for battery capacity recommendations for replacement purposes. Wiring diagrams provide battery connection information. See Figure 4-7 for typical battery connections.



1. To positive (+) terminal on starter solenoid.
2. To ground (-) terminal on or near starter motor.

Figure 4-7 12-Volt Engine Electrical System Single Starter Motor, Typical Battery Connection

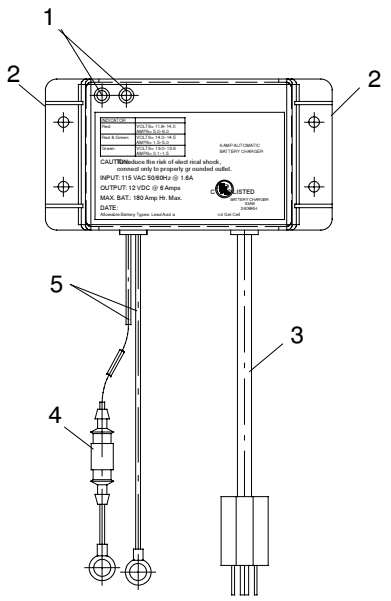
Clean the battery and cables and tighten battery terminals using the service schedule recommendations. To prevent corrosion, maintain tight, dry electrical connections at the battery terminals. To remove corrosion from battery terminals, disconnect the cables from the battery and scrub the terminals with a wire brush. Clean the battery and cables with a solution of baking soda and water. After cleaning, flush the battery and cables with clean water and wipe them with a dry, lint-free cloth.

After reconnecting the battery cables, coat the battery terminals with petroleum jelly, silicone grease, or other nonconductive grease.

4.9 Battery Charger

The generator set is equipped with a 6-amp float/equalize battery charger to maintain the engine starting battery. Figure 4-8 illustrates the battery charger.

The charger's DC leads are factory-wired. Periodically tighten all connections.



1. LED indicators
2. Mounting flanges
3. AC power cord
4. Fuse
5. Battery leads, 12 VDC

Figure 4-8 6-Amp Float/Equalize Battery Charger

4.10 Circuit Protection

If the generator set circuit breaker trips or the fuses blow repeatedly, see Section 5, Troubleshooting, for possible causes.

4.10.1 Line Circuit Breaker

A line circuit breaker interrupts the generator output in the event of a fault in the wiring between the generator and the load. The line circuit breaker location is shown in Figure 1-2. The circuit breaker rating is shown in Figure 4-9. If the circuit breaker trips, reduce the load and switch the breaker back to the ON position. With the breaker in the OFF position the generator set runs but the generator output is disconnected from the load.

Model	Circuit Breaker Rating, Amp
RGEN17	70
RGEN18	80

Figure 4-9 Line Circuit Breaker Rating

4.10.2 Fuses

Three panel-mounted fuses protect the alternator and electrical controls. See Section 1.5 for fuse locations. Another 10-amp fuse protects the battery charger. See Figure 4-8 for the battery charger fuse location.

See Figure 4-10 for fuse part numbers. Always identify and correct the cause of a blown fuse before restarting the generator set. Refer to Section 5, Troubleshooting, for conditions that may indicate a blown fuse. Replace blown fuses with identical replacement parts.

Fuse	Rating, Amp	Label	Part Number
Auxiliary winding	20	F1	Y1106
Relay interface board	10	F2	Y1100
Controller	10	F3	Y1100
Battery charger	10	—	Y1100

Figure 4-10 Fuses

4.11 Storage Procedure

Perform the following storage procedure before removing the generator set from service for three months or longer. Follow the engine manufacturer's recommendations for storage, if available.

Note: Run the generator set monthly whenever possible.

4.11.1 Lubricating System

1. Operate the generator set until it reaches operating temperature, or about 15 minutes.
2. Stop the generator set.
3. While the engine is still warm, drain the engine lubrication oil from the engine crankcase.
4. Refill engine crankcase with oil. See Section 4.3.3 for oil recommendations.
5. Run the generator set for a few minutes to distribute the clean oil.
6. Stop the generator set.

4.11.2 Fuel System

1. Start the generator set.
2. With the generator set running, shut off the gas supply.
3. Run the generator set until the engine stops.
4. Place the generator set master switch in the OFF/ RESET position.

4.11.3 Cylinder Lubrication

1. Remove the spark plugs.
2. Pour one tablespoon of engine oil into each spark plug hole. Install the spark plugs and *ground* the spark plug leads. *Do not connect the leads to the plugs.*
3. Toggle the generator set master switch to crank the engine two or three revolutions to lubricate the cylinders.

4.11.4 Exterior Preparation

1. Clean the exterior surface of the generator set.
2. Seal all openings in the engine with nonabsorbent adhesive tape.
3. Mask all areas to be used for electrical contact.
4. Spread a light film of oil over unpainted metallic surfaces to prevent rust and corrosion.

4.11.5 Battery

Perform battery storage last.

1. Place the generator set master switch in the OFF/ RESET position.
2. Disconnect the battery, negative (–) lead first.
3. Clean the battery.
4. Place the battery in a warm, dry location.
5. Connect the battery to a float/equalize battery charger, or charge the battery monthly using a trickle charger. Follow the battery charger manufacturer's recommendations.

Section 5 Troubleshooting

5.1 Introduction

Use the following charts to diagnose and correct common problems. First check for simple causes such as a dead engine starting battery, loose connections, or an open circuit breaker. The charts include a list of common problems, possible causes of the problem, and recommended corrective actions.

If the procedures in this manual do not explain how to correct the problem, contact a Lennox dealer. Maintain a record of repairs and adjustments performed on the equipment. Use the record to help describe the problem and repairs or adjustments made to the equipment.

5.2 Controller Troubleshooting

Figure 5-1 contains troubleshooting, diagnostic, and repair information for the controller.

5.3 Generator Set Troubleshooting

Figure 5-2 contains generator set troubleshooting, diagnostic, and repair information. Check for loose connections before replacing parts.

Fault Codes

The digital control displays fault codes to aid in troubleshooting. Fault codes, descriptions, and recommended actions are listed in Section 2.6.

If a fault code is displayed, identify and correct the cause of the fault condition. Then reset the controller. See Section 2.6.3.

Problem	Possible Cause	Corrective Action
Controller LED display is off	No power to the controller:	
	Controller fuse (F3) is blown.	Replace the fuse. If the fuse blows again, contact a Lennox dealer.
	Low or no battery voltage.	Check connections. Check the engine starting battery and battery charger. See Figure 5-3.
	Generator set master switch is in the OFF/RESET position.	Move generator set master switch to the AUTO or RUN position. In AUTO, the display will not turn on until the first start command is received.
	The controller is in sleep mode. See Section 2.4.2.	Controller display will activate when a remote start command is received or the generator set master switch is moved to the RUN position. Use the remote switch to start generator set and activate the controller display, if desired. See Section 2.4. Controllers with application code version 1.13 or higher can be configured to enable or disable the sleep mode. See the generator set Installation Manual for instructions.

Figure 5-1 Troubleshooting Chart

Problem	Possible Cause	Corrective Action
The generator set does not crank.	Fault shutdown	Check for a fault code on the controller display. See Section 2.6.
	Battery weak or dead	Check power to the battery charger. Recharge or replace the battery.
	Battery charger fuse blown	Replace the fuse. Contact a Lennox dealer for service if fuse blows repeatedly.
	Battery connections reversed or poor	Check the connections.
	Fuse F2 blown	Replace the fuse. Contact a Lennox dealer for service if fuse blows repeatedly.
	Fuse F3 blown	Replace the fuse. Contact a Lennox dealer for service if fuse blows repeatedly.
	Generator set master switch in the OFF position	Move the master switch to AUTO for remote start or to RUN for local start.
The generator set cranks but does not start, starts hard, lacks power, or operates erratically.	Air cleaner clogged	Clean and/or replace the air cleaner.
	Battery weak or dead	Check power to the battery charger. Recharge or replace the battery.
	Battery connection poor	Clean and tighten the battery connections.
	Spark plug wire connection loose	Check the spark plug wires.
	Low oil pressure shutdown	Check the oil level.
	Fuel pressure insufficient	Check the fuel supply and valves.
	Engine malfunction	Contact a Lennox a Lennox dealer.
No AC output.	AC circuit breaker in the OFF position	Place the circuit breaker in the ON position.
	AC circuit breaker tripping because of overload	Reduce the load on the generator set.
	AC circuit breaker tripping because of short circuit	Contact a Lennox dealer for service.
	Auxiliary winding fuse (F1) blown	Replace the fuse. Contact a Lennox dealer for service if fuse blows repeatedly.
Low output or excessive drop in voltage.	Generator set overloaded	Reduce the load.
Generator set stops suddenly.	Low oil pressure shutdown	Check the oil level.
	Out of fuel	Check fuel supply.
	Overcrank shutdown	Reset the controller. If the overcrank fault occurs again, contact a Lennox dealer.
	Controller fuse (F3) blown	Replace the fuse. If the fuse blows again, contact the a Lennox dealer.
	Overspeed shutdown	Reset the controller. If the overspeed fault occurs again, contact a Lennox dealer.
	Generator set master switch in the OFF/RESET position	Move the switch to the correct position (RUN or AUTO).
	Remote stop command received from a remote switch or ATS	Check the remote switch position.
	Engine malfunction	Contact a Lennox dealer.
	Auxiliary winding fuse (F1) blown	Replace the fuse. Contact a Lennox dealer for service if fuse blows repeatedly.

Figure 5-2 General Troubleshooting Chart

5.4 Battery Charger Troubleshooting

Use the battery charger's LED indicators and the table in Figure 5-3 to troubleshoot battery charger operation problems.

Problem	Cause	Solution
Red LED stays on for more than 24 hours	One or more inoperative or damaged cells.	Load test the battery and replace, if necessary
	Battery charger has reduced its output voltage below the normal level due to a DC overload or a DC short.	Remove the source of the overload or short. Disconnect the battery charger's black (NEGATIVE) ring terminal from the battery. Reapply AC power and the green LED only should now light.
	Onboard DC systems are drawing more current than the battery charger can replace.	Turn off all DC equipment while charging.
Red and green LEDs stay on for more than 24 hours	Onboard DC systems are drawing between 1.5 and 5 amps.	Turn off all DC equipment while charging.
	One or more inoperative or damaged cells.	Load test the battery and replace, if necessary
	Extremely low AC voltage at the battery charger.	Apply a higher AC voltage source or reduce the length of the extension cord.
Green LED stays on when the battery is known to be low	Open DC output fuse.	Replace AGS-10 fuse.
	Faulty or contaminated terminal connections.	Clean and tighten or repair all terminal connections.
	One or more inoperative or damaged cells.	Load test the battery and replace, if necessary.
Neither of the LEDs turn on when the AC power is applied	No AC power available at the battery charger.	Connect AC power or reset the AC breaker on the main panel.
	Component failure.	Replace battery charger.

Figure 5-3 Battery Charger Troubleshooting