Operation and Installation

Commercial/Residential Generator Sets



Models:

8.5RMY 11RMY

Controller: Relay



KOHLER .
POVVER SYSTEMS_

TP-5865 2/99a

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.

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Notes

Safety Precautions and 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. 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.

A 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 acid. Sulfuric acid in batteries can cause severe injury or death. Sulfuric acid in the battery can cause blindness and burn skin. Always wear splashproof safety goggles when working near the battery. 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 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. To prevent burns and sparks that could cause an explosion, avoid touching the battery terminals with tools or other metal objects. Remove wristwatch, rings, and other jewelry before handling 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. Sparks could ignite the battery gases or fuel vapors. Ventilate the compartments containing batteries to prevent accumulation of explosive gases. 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. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Engine Backfire/Flash Fire



Fire.
Can cause severe injury or death.

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

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.

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

Exhaust System



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 unless the exhaust gas is piped safely outside. Never operate the generator set where exhaust gas could accumulate and seep back inside a potentially occupied building.

Carbon monoxide symptoms. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is a poisonous gas present in exhaust gases. 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



Explosive fuel vapors.
Can cause severe injury or death.

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

The fuel system. Explosive fuel vapors can cause severe injury or death. Vaporized fuels are highly explosive. Use extreme care when handling and storing fuels. Store fuels in a well-ventilated area away from spark-producing equipment and out of the reach of children. Never add fuel to the tank while the engine is running because spilled fuel may ignite on contact with hot parts or from sparks. Do not smoke or permit flames or sparks to occur near sources of spilled fuel or fuel vapors. Keep the fuel lines and connections tight and in good condition. Do not replace flexible fuel lines with rigid lines. Use flexible sections to avoid fuel line breakage caused by vibration. Do not operate the generator set in the presence of fuel leaks, fuel accumulation, or sparks. Repair fuel systems before resuming generator set operation.

Explosive fuel vapors can cause severe injury or death. Take additional precautions when using the following fuels:

Propane (LP)—Adequate ventilation is mandatory. Because propane is heavier than air, install propane gas detectors low in a room. Inspect the detectors per the manufacturer's instructions.

Natural Gas—Adequate ventilation is mandatory. Because natural gas rises, install natural gas detectors high in a room. Inspect the detectors per the manufacturer's instructions.

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 (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.

LP liquid withdrawal fuel leaks. Explosive fuel vapors can cause severe injury or death. Fuel leakage can cause an explosion. Check the LP liquid withdrawal gas fuel system for leakage by using a soap and water solution with the fuel system test pressurized to at least 90 psi (621 kPa). 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

A CAUTION

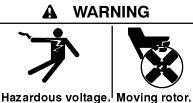


Hazardous noise. Can cause hearing loss.

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/ Electrical Shock



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

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



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.

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

High voltage test. Hazardous voltage can cause severe injury or death. Follow the instructions of the test equipment manufacturer when performing high-voltage tests on the rotor or stator. An improper test procedure can damage equipment or lead to generator set failure.

Installing the battery charger. Hazardous voltage can cause severe injury or death. ungrounded battery charger may cause electrical shock. Connect the battery charger enclosure to the ground of a permanent wiring system. As an alternative, install an equipment grounding conductor with circuit conductors and connect it to the equipment grounding terminal or the lead on the battery charger. Install the battery charger as prescribed in the equipment manual. Install the battery charger in compliance with local codes and ordinances.

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 wristwatch, rings, and jewelry before servicing the equipment.

Testing the voltage regulator. Hazardous voltage can cause severe injury or death. High voltage is present at the voltage regulator heat sink. To prevent electrical shock do not touch the voltage regulator heat sink when testing the voltage regulator. (PowerBoost™, PowerBoost™ III, and PowerBoost™ V voltage regulator models only)

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 serious injury or death to utility personnel working on power lines.

Heavy Equipment



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



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

Do not work on the generator set until it cools.

Servicing the generator. Hot parts can cause severe injury or death. Avoid touching the generator set field or exciter armature. When shorted, the generator set field and exciter armature become hot enough to cause severe burns.

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.

Moving Parts



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



Rotating parts.

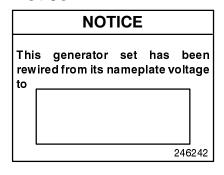
Can cause severe injury or death.

Operate the generator set only when all guards, screens, and covers are in place.

Tightening the hardware. Flying projectiles can cause severe injury or death. Loose hardware can cause the hardware or pulley to release from the generator set engine and can cause personal injury. Retorque all crankshaft and rotor hardware after servicing. Do not loosen the crankshaft hardware or rotor thrubolt when making adjustments or servicing the generator set. Rotate the crankshaft manually in a clockwise direction only. Turning the crankshaft bolt or rotor thrubolt counterclockwise can loosen the hardware.

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.

Notice



NOTICE

Voltage reconnection. Affix a notice to the generator set after reconnecting the set to a voltage different from the voltage on the nameplate. Order voltage reconnection decal 246242 from an authorized service distributor/dealer.

NOTICE

Hardware damage. The engine and generator set may use both American Standard and metric hardware. Use the correct size tools to prevent rounding of the bolt heads and nuts.

NOTICE

When replacing hardware, do not substitute with inferior grade hardware. Screws and nuts are available in different hardness ratings. To indicate hardness, American Standard hardware uses a series of markings, and metric hardware uses a numeric system. Check the markings on the bolt heads and nuts for identification.

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.

All information in this publication represents data available at time of print. Kohler Co. reserves the right to change this literature and the products represented without incurring obligation.

Read through 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 at the beginning of this manual. Keep this manual with equipment for future reference.

Equipment service requirements are minimal but are very important to safe and efficient operation; therefore, inspect parts often and perform required service at the prescribed intervals. An authorized service distributor/dealer should perform required service to keep equipment in top condition.

California Emission Certification

If your engine/generator has the identification label, it is certified for operation in the state of California.

IMPORTANT ENGINE INFORMATION THIS ENGINE CONFORMS TO U.S. EPA PHASE 1 AND £19983 CALIFORNIA EMISSION CONTROL REGULATIONS FOR ULGE ENGINES
DISPLACEMENT: FAMILY: = BUILD DATE :
REFER TO OWNERS MANUAL FOR SAFETY, MAINTENANCE SPECS AND ADJUSTMENTS. FOR SALES AND SERVICE IN US/CANADA CALL: 1-800-544-2444
THIS ENGINE CERTIFIED ON
KOHLER. POWER SYSTEMS

* Utility Lawn and Garden Equipment

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

This engine is certified with engine modifications.

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Service Assistance

Please contact a local authorized distributor or dealer for sales, service, or other information about Kohler Generator Division products.

To locate a local authorized distributor or dealer

- Look on the product or the information included with the product
- Consult the Yellow Pages under the heading Generators—Electric
- Visit the Kohler Generator Division web site at www.kohlergenerators.com
- Call 1-800-544-2444 (inside the U.S.A. and Canada) or 920-565-3381 (outside the U.S.A. and Canada)

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 ic generator set namepla: Model Number	dentification numbers from the te(s).
Specification Number	
Serial Number	
Accessory Number	Accessory Description
Engine	e Identification
=	entification information from the
Manufacturer	
Model Number	
Serial Number	

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1.1 Introduction

The spec sheets for each generator set provide specific generator and engine information. Refer to the respective spec sheet for data not supplied in this manual. Consult the generator set service manual, installation manual, engine operation manual, and engine service manual for additional specifications.

1.2 Generator

The generator has Kohler's PowerBoost™ voltage regulation system, which provides instant response to load changes.

PowerBoost[™] is a unique system that ensures reliable motor starting and consistent voltage levels.

PowerBoost™ 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. 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.
- Parts subjected to the most wear and tear made from precision-formulated cast iron.

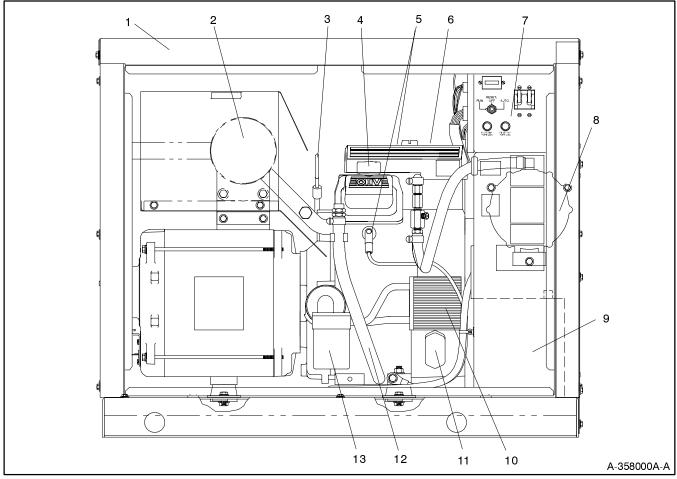
1.4 Controller

The generator set has a relay controller. For a specific description of the controller, see Section 2—Operation. Controller features include the following:

- Fault shutdowns
 - Overcrank
 - Overspeed
 - o Pressure, low oil
- Running time meter
- Switches and standard features
 - Switch, run/reset-off/auto (engine start)
 - o Cranking, cyclic

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1.5 Service View



- 1. Generator set housing
- 2. Muffler3. Oil check
- 4. Oil fill
- 5. Spark plugs6. Air cleaner7. Controller

- 8. Gas regulator assembly
- 9. Engine starting battery10. Engine oil cooler
- 11. Engine battery charge regulator12. Oil drain hose13. Oil filter

Figure 1-1. Generator Set Service View

TP-5865 2/99 2 Specifications

2.1 Prestart Checklist

To ensure continued satisfactory operation, check the following items before each startup and at regular intervals. Refer to the engine service manual for specific service procedures.

Air Cleaner. Keep the air cleaner element clean. Install the element to keep unfiltered air from entering the engine.

Battery. Ensure tight battery connections. Maintain a full battery electrolyte level.

Exhaust System. Keep the exhaust outlet clear. Keep the silencer and piping tight and in good condition.

Inspect exhaust system components for cracks and corrosion (exhaust manifold, exhaust line, flexible exhaust, clamps, silencer, and outlet pipe).

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

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

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 the Generator

Run the generator set under load once each week for one hour. Perform this exercise in the presence of an operator if the generator set does not have an automatic transfer switch with an exercise option.

The operator should perform all prestart checks before starting the exercise procedure. While the generator set is running, listen for a smooth-running engine and visually inspect the generator set to ensure there are no fluid or exhaust leaks.

Start the generator set according to the starting procedure in the controller section of this manual.

2.3 Controller Features

Refer to Figure 2-1 and the following descriptions to identify controller components.

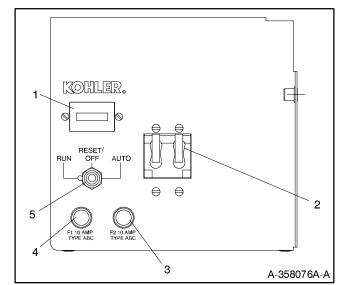
Hourmeter. The hourmeter records generator set operating hours for reference in maintenance scheduling.

AC Circuit Breaker. The circuit breaker trips when a fault is detected in the AC output circuit. See Section 4—Troubleshooting to determine the cause of the fault. After correcting the fault, place the AC circuit breaker in the ON position to reset it.

Controller Input Fuse (10 amp). The fuse protects the generator set controller circuitry. If the generator set will not crank and the battery and/or connections are intact, the controller fuse may be blown. Contact an authorized Kohler service distributor/dealer if the fuse blows repeatedly.

Voltage Regulator Fuse (10 amp). The fuse protects the voltage regulator circuitry. The generator set shuts down if this fuse blows. See Section 2.5.1.

Generator Master Switch (Run/Rest-Off/Auto). The switch functions as the controller reset and generator set operation switch. Refer to the Starting, Stopping, and Controller Resetting procedure in this section.



- 1 Hourmeter
- 2 AC circuit breaker
- 3. Voltage regulator fuse
- 4. Controller fuse
- 5 Generator master switch

Figure 2-1. Controller Features

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2.4 Controller Operation

2.4.1 Starting

Place the controller or remote Start/Stop switch in the RUN position until the engine starts. If the engine fails to start after three 8-second attempts, the generator set stops cranking because of overcrank fault shutdown. Wait for the engine to come to a complete stop before attempting a restart. Place the switch in the RESET/OFF position and then to the RUN position.

After a fault shutdown, leave the generator master switch in the RESET/OFF position for 3 to 5 seconds before attempting to restart the generator set.

NOTE

Do not crank the engine continuously for more than 30 seconds at a time. Allow a 60-second cooldown period between cranking attempts if the engine does not start. If the generator set does not start after three attempts, see Section 4—Troubleshooting for possible causes.

2.4.2 Stopping

1. Disconnect the load from the generator set by opening the line circuit breaker and allow the generator set to run without load for 5 minutes.

NOTE

Run the generator set at no load for 5 minutes prior to stopping to ensure adequate cooling of the set.

2. Place the controller or remote start/stop switch in the RESET/OFF position. The generator set shuts down.

2.4.3 Fault Shutdowns

The generator set shuts down automatically under the following fault conditions and cannot be restarted until the fault condition is corrected. Do not attempt restart until the fault has been corrected. Do not attempt to restart the generator set until the fault has been corrected. The shutdown switches automatically reset when the problem is corrected or the generator set cools (if overheating was the fault).

After a fault shutdown, leave the generator master switch in the RESET/OFF position for a couple of seconds before attempting to restart the generator set.

Overcrank. Shutdown occurs after 30 to 60 seconds of continuous cranking.

Overspeed. The generator set shuts down immediately if governed frequency exceeds 70 Hz (2100 rpm) on 50 and 60 Hz models.

Low Oil Pressure. Shutdown occurs approximately 8 seconds after fault. Fault occurs when the engine oil pressure drops below the specified limit.

NOTE

Low oil pressure shutdown does not protect against low oil level. Check the engine oil level.

NOTE

If the cause of a low oil pressure shutdown is not corrected, the generator set can be restarted (after controller reset) and will run approximately 8 seconds before shutting down again. See the Resetting Fault Shutdown procedure following.

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2.5 Circuit Protection

A line circuit breaker sized for the generator output interrupts the generator output in the event of an overload or short circuit in the wiring between the alternator and components. 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 there is no output voltage. See Figure 2-2 for the circuit breaker ratings.

NOTE

If the generator set circuit breaker trips repeatedly, see Section 4—Troubleshooting for possible causes.

Model	C.B. Rating
8.5/11RMY	50 amp

Figure 2-2. Controller Circuit Breaker Rating

A replaceable 10-amp fuse protects the controller circuitry. Check the controller fuse if the generator set will not crank and the battery and/or connections appear correct. Replace the fuse. If the fuse blows again, see Section 4—Troubleshooting for possible causes.

2.5.1 Voltage Regulator Fuse

A replaceable 10-amp fuse protects the voltage regulator circuitry. The generator set shuts down if the fuse blows. Typically with this condition, the generator set starts and then shuts down in 8 seconds. If this fuse blows again after replacement, see Section 4—Troubleshooting for possible causes. See Figure 2-1 for the location of the voltage regulator fuse.

2.6 Controller Resetting Procedure (following fault shutdown)

Use the following procedure to restart the generator set after a fault shutdown. Reset the controller and correct the fault before resetting the generator set.

NOTE

If the fault is not corrected, the generator set will start and then shut down in 8 seconds.

- Place the generator set master switch in the RESET/OFF position. See the Safety Precautions and Instructions at the beginning of this manual before proceeding.
- 2. Disconnect the generator set from load using the line circuit breaker or automatic transfer switch.
- Place the generator set master switch in the RUN position to restart the generator set. Refer to Section 4—Troubleshooting for possible causes of fault shutdown.
- Place the generator set master switch in the RESET/OFF position.
- 5. Correct the cause of the fault shutdown.
- Place the generator set master switch in the RUN or AUTO position for startup.

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Notes

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Section 3. Scheduled Maintenance

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.



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.



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.

Alternator service. Under normal operating conditions the generator set alternator does not require scheduled service. Refer to the service schedule for items that require maintenance.

Engine service. Perform generator set engine service at the intervals specified by the engine service literature. Contact an authorized Kohler service distributor/dealer to obtain engine service literature.

Generator set service. If the generator set operates under dusty or dirty conditions, use *dry* compressed air to blow dust out of the generator. With the generator set running, direct the stream of air in through the cooling slots at the generator end.

Generator set service. See the Safety Precautions and Instructions at the beginning of this manual before attempting to service, repair, or operate the generator set. Have an authorized Kohler service distributor/dealer perform all generator service.

Routine maintenance. Refer to the service schedule following and the hourmeter located on the generator set controller to schedule routine maintenance. Service units subject to extreme weather, long operating hours, or dusty or dirty conditions more frequently.

Service schedule. Perform maintenance on each item in the service schedule at the designated interval for the life of the generator set.

Tools. Tools and instruments used to perform some maintenance items are not generally available to the generator set owner. Therefore, have service performed by an authorized distributor/dealer.

Tune-ups. Have the generator set tuned-up by an authorized distributor/dealer. Tune-ups improve performance and ensure continuous satisfactory operation during a long, trouble-free service life.

All generator sets have emission-certified engine. Emission-certified engines are fitted with carburetors that have no possible adjustments.

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3.1 Service Schedule

Perform the items listed in the service schedule at the designated intervals for the life of the generator set. For example, an item serviced every 100 hours or 3 months

must also be serviced after 200 hours or 6 months, 300 hours or 9 months and so on. Rough operation, lack of power, and excessive oil use indicate serious generator set problems.

System—Component		Procedure				Frequency
 Follow procedures and frequencies indicated in the engine manufacturer's maintenance manual. If not indicated, follow this service schedule. Some items may not pertain to specific generator sets. X Action R Replace as necessary 	Visually Inspect	Check	Change	Clean	Test	W=Weekly M=Monthly Q=Quarterly S=Six Months Y=Yearly No.=Hours
FUEL						
Flexible lines and connections	Х		R			W
Main tank supply level		Х				W
Fuel piping	Х					Y
LUBRICATION						
Oil level	Х	Х				W
Crankcase breather	Х		Х			Y or 500
Change oil			Х			Y or 100
Replace filter*			Х			Y or 200
COOLING						
Air cleaner to room/enclosure		Х				W
Air ducts, louvers		Х		Х		Υ
EXHAUST LINE						
Leakage	Х	Х				W
Insulation, fire hazards	Х					Υ
Flexible connector(s)	Х					Υ
Hangers and supports	Х					Υ
DC ELECTRICAL SYSTEM						
Battery charger operation, charge rate	Х					M
Remove corrosion, clean and dry battery and rack	Х			Х		Υ
Clean and tighten battery terminals	Х	Х				Υ
Tighten DC electrical connections		Х				Υ
AC ELECTRICAL SYSTEM						
General inspection	Х					W
Wire abrasions where subject to motion	Х	Х				Q
Safety and alarm operation		Х			Х	S
Tighten control and power wiring connections		Х				Υ
Wire-cable insulation breakdown	Х	İ	ĺ	İ		3 Y or 500

^{*} Consult your local distributor/dealer for service.

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[†] Consult the battery manufacturer's instructions.

Service Schedule, continued

System—Component		Pr	ocedure			Frequency
 Follow procedures and frequencies indicated in the engine manufacturer's maintenance manual. If not indicated, follow this service schedule. Some items may not pertain to specific generator sets. X Action R Replace as necessary 	Visually Inspect	Check	Change	Clean	Test	W=Weekly M=Monthly Q=Quarterly S=Six Months Y=Yearly No.=Hours
ENGINE AND MOUNTING						
General inspection	Х					W
Air cleaner service			R			Y or 500
Spark plugs			Х			Y or 500
REMOTE CONTROL SYSTEM, ETC.						
Compartment condition	Х			Х		W
Remote control					Х	M
Run generator set					Х	M
GENERATOR						
General inspection	Х					W
Rotor and stator	Х			Х		Υ
Measure and record resistance readings of windings with insulation tester (Megger, with SCR assembly or rectifier disconnected)					Х	Y
Blow dust out of generator*	Х			Х		2 Y or 300
GENERAL CONDITION OF EQUIPMENT Any condition of vibration, leakage, noise, temperature, or deterioration	х	x		Х		W
Interior of equipment room or outdoor weather housing	Х			Х		W

^{*} Consult your local distributor/dealer for service.

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3.2 Lubrication System

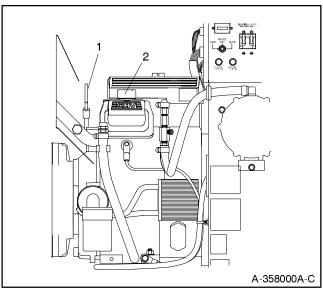
The engine has a positive pressure lubrication system and low oil pressure shutdown.

3.2.1 Low Oil Pressure Shutdown

The low oil pressure shutdown feature protects the engine against internal damage if the oil pressure drops below $3\,1/2\,\mathrm{psi}\pm1\,1/2\,\mathrm{psi}$ (24.1 kPa $\pm\,13.8\,\mathrm{kPa}$) because of oil pump failure or other malfunction. It does not protect against damage because of 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 to protect against running out of oil.

3.2.2 Oil Check

The generator set is shipped with oil. Before operating a new generator set check the engine oil in the crankcase. Verify the oil level is at the F mark on the dipstick. Add oil having a viscosity appropriate for the climate. Do not check the oil level when operating the generator set. Obtain the most accurate oil reading by shutting down the generator set and waiting several minutes before checking the oil. See Figure 3-1.



- 1. Oil check
- 2. Oil fill

Figure 3-1. Oil Fill and Oil Check

3.2.3 Engine Oil Recommendation

Use synthetic oil of API (American Petroleum Institute) Service Class SG or SH. Synthetic oil has less oxidation or thickening, and deposit accumulation on the engine intake valves and pistons. Select the viscosity based on the air temperature at the time of operation. See Figure 3-2.

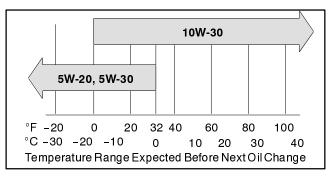


Figure 3-2. Engine Oil Selection

3.2.4 Oil and Filter Change

See Figure 3-2 for oil viscosity. Whenever possible, drain the oil while it is still warm.

- Place the generator set master switch in the OFF position.
- 2. Disconnect the generator set engine starting battery, negative (-) lead first.
- 3. Remove the housing service side panel.
- 4. Place an oil drain bucket along the side of the engine.
- 5. Remove the oil drain hose from the clip.

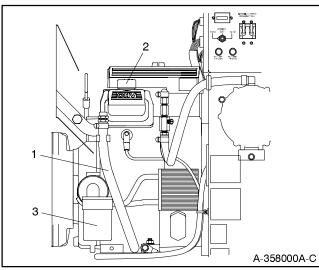
NOTE

Dispose of all waste materials (engine oil, fuel, filter, etc.) in an environmentally safe manner. Contact a local authority for correct procedures and disposal location.

- 6. Remove the cap from the end of the oil drain hose. See Figure 3-3.
- Lower the oil drain hose into the oil drain bucket and open the drain valve to allow the oil to drain.
 Allow several minutes for the oil to drain completely.
- Remove the oil filter by rotating the filter counterclockwise with an oil filter wrench. See Figure 3-3.
- 9. Apply a light coat of clean oil to the rubber seal of the new oil filter and install the filter.

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- 10. Close the oil drain valve.
- 11. Replace the cap on the end of the oil drain hose and reinsert the oil drain hose into the clip on the engine. See Figure 3-3.
- 12. Add new oil of specified weight and grade.
- 13. Check that the generator master switch is in the OFF position.
- 14. Reconnect the generator set engine starting battery, negative (-) lead last.
- 15. Start the generator set and check for leaks around the oil filter.
- 16. Stop the generator set and tighten the filter to stop leaks, if required.
- 17. Reinstall the housing side panel.



- 1. Oil drain hose
- Oil fill
 Oil filter
 - Figure 3-3. Engine Service Side

3.3 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.
- Remove the spark plug and check its condition. Replace the spark plug if it is worn or if its reuse is questionable.
- Check the spark plug gap using a wire feeler gauge. Adjust the gap to 0.040 in. (1.02 mm) by carefully bending the ground electrode. See Figure 3-4 and Figure 3-5.

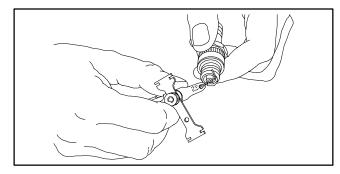


Figure 3-4. Checking the Spark Plug Gap

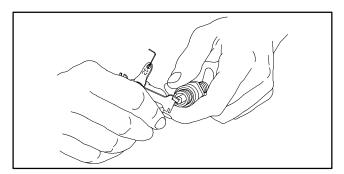
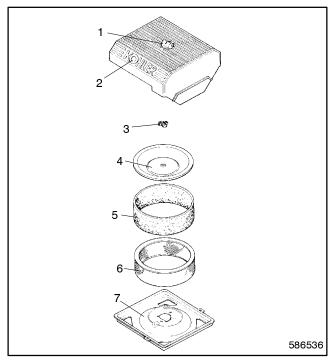


Figure 3-5. Adjusting the Spark Plug Gap

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3.4 Air Cleaner Element and Precleaner

The engine has a replaceable, high-density paper air cleaner element with an oiled, foam precleaner. See Figure 3-6.



- 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 3-6. 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.

3.4.1 Precleaner Service

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, if equipped.

- 3. 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.
- 4. Saturate the precleaner with new engine oil. Squeeze out all of the excess oil.
- 5. Reinstall the precleaner over the paper element.
- Reinstall the air cleaner cover. Secure the cover with the cover retaining knob.
- Reconnect the power to the battery charger, if equipped.
- 8. Reconnect the generator set engine starting battery, negative (-) lead last.

3.4.2 Paper Element Service

Replace the paper element as indicated 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, if equipped.
- 3. Disconnect the generator set engine starting battery, negative (-) lead first.
- 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 use 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. 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 the dirt drops into the intake throat. Check the condition of the rubber seal on the air cleaner stud and replace the seal if necessary.

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- 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, if equipped.
- 11. Reconnect the generator set engine starting battery, negative (-) lead last.

3.5 Cooling System

To prevent generator set damage caused by overheating, keep the housing cooling inlets and outlets clean and unobstructed at all times. See Figure 3-7.

A fan in the alternator draws cooling air into the housing through the alternator cooling slots and expels it at the engine alternator adapter. Fins on the engine flywheel direct cooling air past the fins of the cylinder heads and forces warm air into the compartment.

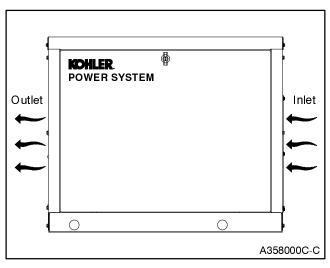


Figure 3-7. Cooling Air Inlet and Outlet

3.6 Fuel System

The fuel system is factory adjusted for natural gas or LP vapor. The fuel system utilizes a fuel solenoid valve to control the fuel flow to the fuel pressure regulator. The fuel regulator reduces fuel pressure as fuel passes to the fuel-control valve. The carburetor receives fuel in a gaseous state and mixes it with intake air for consumption by the engine.

3.7 Exhaust System

Remove 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 safe distance from the exhaust system.

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

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

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3.8 Battery

Use a 12-volt battery with a rating of 670 cold cranking amps at 0°F minimum. When using a maintenance-free battery, it is not necessary to check the specific gravity or electrolyte level. Perform these procedures at the intervals specified in the service schedule. A negative ground system is used. Battery connections are shown on the wiring diagrams. Make sure the battery is correctly connected and terminals are tight.

Generator sets used as a standby to utility power, which are not used regularly, require an external battery charger to keep the starting battery fully charged. Observe battery polarity when connecting battery the to the generator set.

NOTE

The generator set will not start and possible circuit board damage may result if the battery connections are made in reverse.





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

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

A 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 acid. Sulfuric acid in batteries can cause severe injury or death. Sulfuric acid in the battery can cause blindness and burn skin. Always wear splashproof safety goggles when working near the battery. 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 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. To prevent burns and sparks that could cause an explosion, avoid touching the battery terminals with tools or other metal objects. wristwatch, rings, and other jewelry before handling 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. Sparks could ignite the battery gases or fuel vapors. Ventilate the compartments containing batteries to prevent accumulation of explosive gases. To avoid sparks, do not disturb the battery charger connections while the battery is Always turn the battery charger off before disconnecting the battery connections. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

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3.8.1 Cleaning

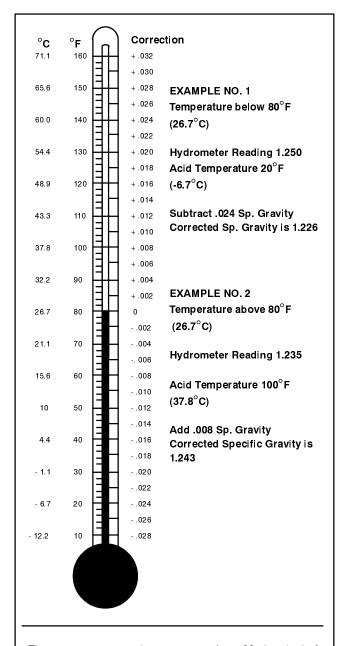
Keep the battery clean by wiping it with a damp cloth. Keep all the electrical connections dry and tight. If corrosion is present, disconnect cables from the battery and remove corrosion with a wire brush. Clean the battery and cables with a solution of baking soda and water. Be careful that cleaning solution does not enter battery cells. When cleaning is complete, flush the battery and cables with clean water and wipe with a dry cloth. Coat the terminals with petroleum jelly or other nonconductive grease after the battery cables are reconnected.

3.8.2 Checking the Electrolyte Level

It is not possible to check the electrolyte level of a maintenance-free battery. For nonmaintenance-free batteries, check the electrolyte level before each startup. Remove the filler caps and verify that the electrolyte level is up to the bottoms of the filler holes. Refill as necessary with distilled water or clean tap water. DO NOT add fresh electrolyte. Tighten all the filler caps.

3.8.3 Checking the Specific Gravity

It is not possible to check the specific gravity of a maintenance-free battery. For nonmaintenance-free batteries, use a battery hydrometer to check the specific gravity of the electrolyte in each battery cell. While holding the hydrometer vertically, read the number on the glass bulb at the top of the electrolyte level. Use the correction table in Figure 3-8 if the hydrometer used does not have a correction table. Determine the specific gravity and electrolyte temperature of the battery cells. Locate the temperature in Figure 3-8 and adjust the specific gravity by the amount shown. The battery is fully charged if the specific gravity is 1.260 at an electrolyte temperature of 80°F (26.7°C). difference between specific gravities of each cell should not exceed ±0.01. The battery should be charged if the specific gravity is below 1.215 at an electrolyte temperature of 80°F (26.7°C).



The temperature correction amounts to about .004 (4 points) of specific gravity for each 10°F (5.5°C) change in temperature.

Figure 3-8. Specific Gravity Temperature Correction

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3.9 Storage Procedure

Perform the following steps if the generator set is out of service for three months or longer.

3.9.1 Engine Oil

- 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 the engine crankcase with an oil having a viscosity appropriate for the particular climate.
- 5. Run the generator set for a few minutes to distribute the clean oil.
- 6. Stop the generator set.

3.9.2 Fuel

- 1. With the generator set running, shut off the gas supply.
- 2. Run the generator set until the engine stops from lack of fuel.

3.9.3 Cylinder Lubrication

- 1. Remove the spark plugs.
- 2. Pour approximately one tablespoon of engine oil into each spark plug hole.
- 3. Crank the engine two or three revolutions to lubricate the cylinders.
- 4. Reinstall the spark plugs.

3.9.4 Exterior Preparation

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

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Section 4. Troubleshooting

When troubles occur, do not overlook simple causes that might seem too obvious to be considered. A starting problem, for example, could be attributed to an empty fuel tank. As a general aid in diagnosing common

problems, refer to the troubleshooting chart in Figure 4-1 and Figure 4-2. If the trouble cannot be corrected through routine servicing, contact an authorized service distributor/dealer for assistance.

Problem	Possible Cause	Corrective Action
The generator set does not crank.	Weak or dead battery	Recharge or replace; check battery charger operation. Check battery charging circuit (circuit breaker, module, and wiring), if equipped.
	Reversed or poor battery connections	Check the connections.
	Blown fuse in controller	Replace the fuse.
	Defective starter solenoid	Test the function.
	Defective start/stop switch (master switch)	Test the function.
	Generator master switch in OFF position	Move the master switch to the RUN position.
The generator set	Incorrect fuel	Replace the fuel.
cranks but does not	No fuel	Add fuel; check the fuel control circuit.
start, starts hard, lacks power, or	Clogged air cleaner	Clean and/or replace the air cleaner
operates erratically.	Weak or dead battery	Recharge or replace the battery.
r ,	Defective fuel valve	Check the fuel valve for functioning.
	Defective fuel regulator	Check the function of the fuel regulator.
	Faulty ground (-) connection	Clean and tighten the ground connections
	Faulty spark plugs	Replace and regap the spark plugs.
	Defective ignition system	Check the ignition coil, module, and wiring.
	Loose spark plug wire connection	Check the spark plug wires.
	Insufficient fuel pressure	Check the fuel pressure.
	Engine malfunction	Troubleshoot the engine.
	Low oil pressure shutdown switch	Check the oil level, oil pressure, and check switch for functioning.
	Incorrect carburetor adjustment	Adjust the carburetor.
	Carbon buildup on cylinder heads	Service the cylinder heads.
	Incorrect engine timing (signal)	Check the air gap of the ignition pickup.

Figure 4-1. General Troubleshooting Chart

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Problem	Possible Cause	Corrective Action
No AC output	AC circuit breaker in the OFF position	Place 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	Correct the cause of the short circuit.
	Voltage regulator fuse blown	Replace the fuse.
	Internal generator problem	Contact the distributor/dealer.
Low output or excessive	Overloaded generator set	Reduce the load.
drop in voltage	Engine speed too low	Check the governor.
	Faulty/misadjusted voltage regulator	Check the voltage regulator adjustment and/or test the voltage regulator.
	Internal generator problem	Contact the distributor/dealer.
High output voltage (or	Loose voltage regulator connections	Check the connections.
high frequency)	Governor misadjusted (high frequency)	Check the governor
	Faulty voltage regulator	Check the voltage regulator adjustment and/or the test voltage regulator
	Internal generator problem	Contact the distributor/dealer
Generator set stops suddenly	Low oil pressure shutdown	Check the oil level, oil pressure, and switch for functioning.
	Out of fuel	Add fuel.
	Overcrank shutdown	Reset the controller. If overcrank fault reoccurs, troubleshoot the generator and/or controller.
	Blown fuse in controller	Replace the fuse. If the fuse blows again, troubleshoot the controller.
	Engine malfunction	Troubleshoot the engine.
	Overspeed shutdown	Reset the controller. If the generator set overspeeds again, troubleshoot the generator and controller.
	Overvoltage shutdown, if equipped	Troubleshoot the generator and controller.
	Generator master switch in OFF/RESET position	Move the switch to the correct position (RUN or AUTO).

Figure 4-2. General Troubleshooting Chart, continued

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5.1 Voltage Reconnection

The reconnection procedure explains voltage reconnections only. Adjust the governor and voltage regulator at the time of frequency adjustment.

The following information illustrates the reconnection of 4-lead generator sets. In all cases, follow the National Electrical Code (NEC) guidelines.

Refer to the following procedure and the connection schematics. Follow all the safety precautions and instructions at the beginning of this manual and in the text below while performing the reconnection procedure.

NOTE

Order voltage reconnection decal 246242 from an authorized service distributor/dealer and affix the decal to the generator set after reconnecting to a voltage different from the nameplate.



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.



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

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

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 wristwatch, rings, and jewelry before servicing the equipment.

5.2 Four-Lead (Single-Phase) Generator Sets

The following information illustrates the reconnection of 4-lead generator sets. Always follow the National Electrical Code (NEC) guidelines.

5.2.1 Factory Connections—110/220 Volt 50 Hz or 120/240 Volt 60 Hz

Generator sets are available from the factory connected for 110/220 Volt 50 Hz or 120/240 Volt 60 Hz. See Figure 5-1 for the factory connections.

Leads L1 and L2 are of different phases. Never connect leads L1 and L2 together. After connection adjust the voltage regulator to obtain the desired voltage.

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NOTE

Use a circuit breaker manufacturer's two-pole circuit breaker. Two single-pole circuit breakers do not conform to NEC requirements when supplying a 220 or 240 volt load. This is true even if they are mechanically attached together.

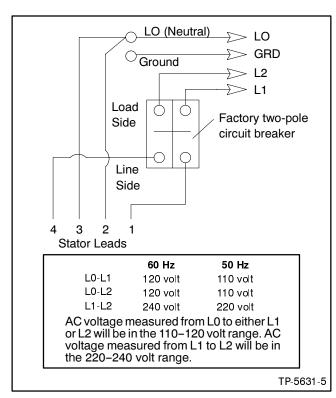


Figure 5-1. 110/220 and 120/240 Volt, 3-Wire Configurations

5.2.2 Reconnection Options

The following reconnections can be made using the factory two-pole circuit breaker provided. It is the responsibility of the individual performing the reconnection to meet all the electrical codes.

See Figure 5-2 for four-lead reconnectable (single-phase) generator set voltage options.

60 Hz	50 Hz
120 Volt	110 Volt
120/240 Volt	110/220 Volt
240 Volt	220 Volt

Figure 5-2. Four-Lead, Single-Phase Generator Set Voltage Connection Options

110 and 120 Volt Configurations

When connecting stator phase leads, size output lead (L1) accordingly. Use a jumper lead with the same ampere rating as the output lead L1 on the side of the circuit breaker shown. After connection adjust the voltage regulator to obtain the desired voltage.

NOTE

Electrical Codes: The 110 and 120 Volt reconnection configurations require a jumper lead on one end of the circuit breaker. This configuration is acceptable per the National Electrical Code, NFPA #70. Never jumper both the line and load ends of the circuit breaker. A jumper on both the line and load ends violates the National Electrical Code by paralleling the breaker poles. On occasion local electrical inspectors have objected to a jumper on the load side of the circuit breaker. It is the responsibility of the individual who is reconnecting the output to make certain the reconnection satisfies the local inspector. The purchase and installation of a single pole breaker to replace the two-pole breaker may be necessary. Kohler Co. will not pay for single-pole breaker installations, or the cost of a single-pole breaker conversion.

NOTE

Jumper Sizing: Use a jumper lead with the same ampere rating as the output lead L1 on the side of the circuit breaker shown.

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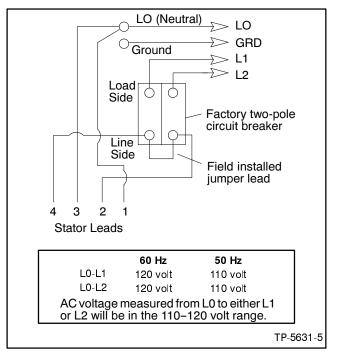


Figure 5-3. 110 and 120 Volt, 3-Wire Configurations

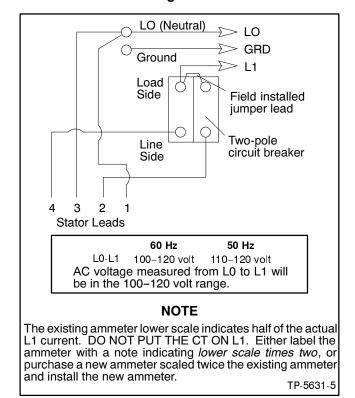


Figure 5-4. 110 and 120 Volt, 2-Wire Configurations

220 and 240 Volt Configuration

A jumper lead is not used. After connection adjust the voltage regulator to obtain the desired voltage.

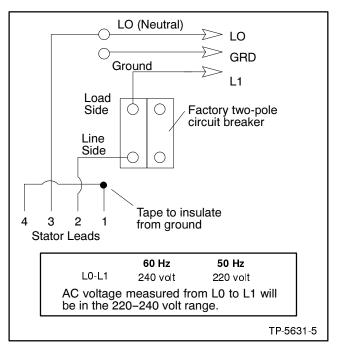


Figure 5-5. 220 and 240 Volt, 2-Wire Configurations

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6.1 General

At the time of print, this manual applied to the model numbers and specification (spec) numbers following. On occasion this manual may be applicable to specs not listed below, such as when similar new specs are created prior to the updated reprint or in cases where the manual is deemed an acceptable substitute for a manual under development.

Use the Wiring Diagram Cross-Reference to determine the correct version number for a given model number and spec number. Find that version number in the Controller Wiring Diagrams Reference and determine the wiring diagrams by choosing the type of controller on the unit. Wiring diagram pages are numbered and arranged in numerical sequence by the numeric part of the alphanumeric part number.

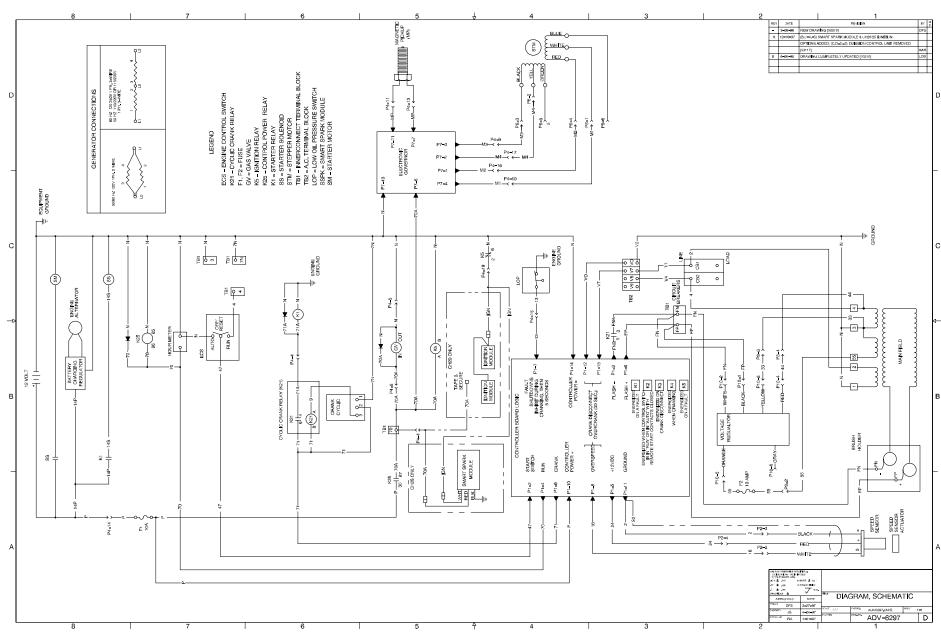
6.2 Wiring Diagram Cross-Reference

Model No.	Spec. No.	Wiring Diagram Version No.
8.5RMY	195007, 195013	1
11 RMY	195008, 195012	1

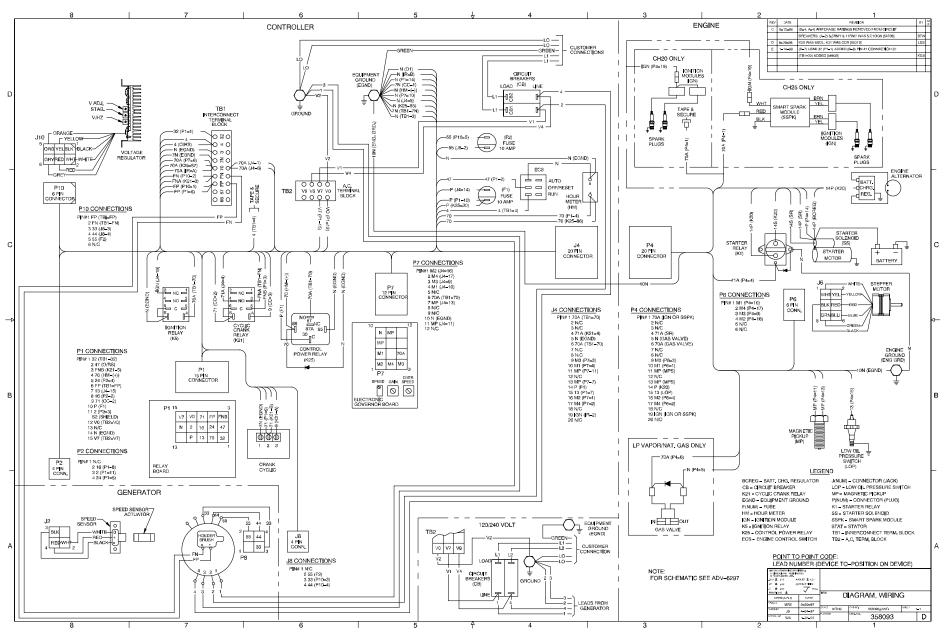
6.3 Controller Wiring Diagrams Reference

Controller Description	Version 1	Pg
Relay Controller		
Point-to-Point Wiring Diagram		
1 phase	358093-E	25
Schematic Diagram		
1 phase	ADV-6297-B	24

TP-5865 2/99 Wiring Diagrams 23



Relay Controller, Schematic Diagram, 1 Phase, ADV-6297-B



Relay Controller, Point-to-Point Wiring Diagram, 1 Phase, 358093-E

Notes

26 Wiring Diagrams TP-5865 2/99

7.1 General

Installation must comply with the installation instructions. Install the generator set to comply with state and local requirements.

Use the specifications and drawings provided here only in the initial planning. Use the respective spec sheets, dimension drawings, and wiring diagrams for installation. Contact an authorized service distributor/dealer for the most current information.

7.2 Air Requirements

The generator set requires correct air flow for cooling and combustion. The louvers on the ends of the weather housing provide the cooling and combustion air. Do not block or otherwise interfere with the function of these openings.

If the generator set is to be mounted indoors, maintain the air flow shown in the spec sheet. Install appropriately sized vents in the building. Use an air duct flange to provide the connection to duct the heated air to the outside of the building.

Inspect the air inlet and outlet openings inside and outside the weather housing to ensure that debris is not blocking the free air flow.

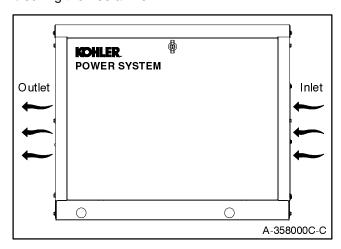


Figure 7-1. Cooling Air Intake and Exhaust

7.3 Exhaust Requirements

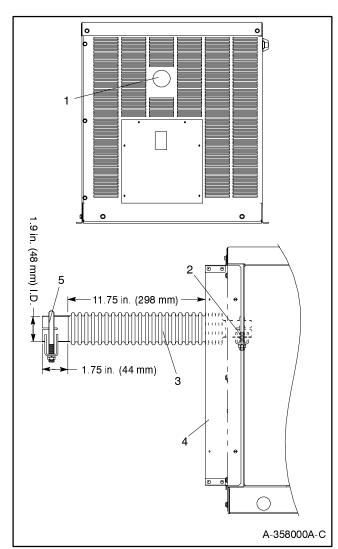
The exhaust system is complete for generator sets installed outdoors.

For generator sets installed inside a building, pipe the exhaust outside. Use the available flexible exhaust kit and duct flange kit. See Figure 7-2. Correctly size any extension added to the exhaust outlet so it does not

affect the maximum allowable back pressure of the engine. The total length and number of bends in the exhaust system may have an effect on the back pressure. Locate the exhaust outlet to prevent entry by rodents and birds. Use a rain cap when the exhaust outlet is directed upward.

NOTE

The flexible exhaust connector must be installed without any bends.



- 1. Muffler outlet
- 2. Clamp, 1.25 in. (32 mm)
- 3. Flexible exhaust connector
- 4. Air outlet duct flange
- 5. Clamp, 2.0 in. (51 mm)

Figure 7-2. Exhaust Outlet—Alternator End

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7.4 Weight

The weight of the generator set determines the type of base construction at the site. Most generator sets are mounted on concrete at the ground level. Small generator sets such as these can be installed on a simple concrete slab, precast base, or other material as long as the generator set is secured and does not move while operating.

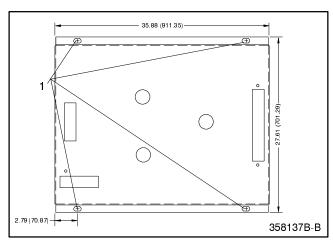
7.5 Generator Set Inspection

Complete a thorough inspection of the generator set. Check for the following:

- Inspect the generator set for loose or damaged parts or wires. Repair or tighten prior to installation.
- 2. Check the engine oil. Fill, if necessary, with the recommended make and grade of oil.

7.6 Mounting

See Figure 7-3 for the typical mounting surface details and dimensions. A level concrete surface is recommended for mounting. If mounting the generator set on a structure, seal up the bottom of the unit using marine plywood to ensure design cooling air flow and restrict the entry of debris and/or wildlife through the bottom of the skid.



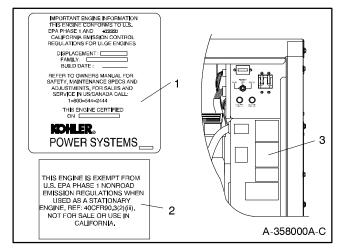
1. Base mounting holes

Figure 7-3. Generator Set Base—Top View

7.7 Fuel System

The generator set has an emission-certified engine. Emission-certified engines are fitted with carburetors that have no possible adjustments. See Figure 7-4 for the location of the C.A.R.B. decal.

The fuel system of a emission certified generator set is set at the factory for the specified fuel and sealed to prevent adjustments.



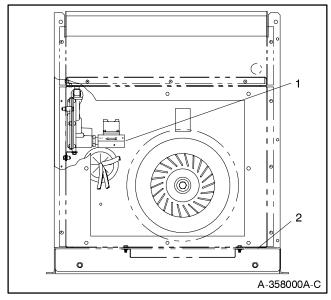
- 1. Emission certified decal
- 2. Emission exempt decal
- 3. Decal location

Figure 7-4. Emission Decal Location

The fuel system of a nonemission certified generator sets is adjustable to run on either LP gas or natural gas. Contact the local service distributor/dealer for fuel adjustments.

Comply with the local and state codes regarding the correct storage of fuel. Because of the scope of the topic involving variable climate conditions and geographical considerations, contact an authorized service distributor/dealer for fuel system planning and installation. Protect all of the fuel lines from machinery or equipment contact, adverse weather conditions, and environmental damage.

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- 1. Fuel inlet connection, 1/2 NPT
- 2. Fuel line entry area

Figure 7-5. Fuel Supply Line—Engine End

Ensure that the natural gas pipe size meets size specifications in the Figure 7-6 chart. Measure the pipe length from the gas utility pressure regulator (7-11 in. water column output pressure) to the end of the pipe where it connects to the fuel inlet. Compare the length with the chart in Figure 7-6. Replace piping longer than the listed maximum length with the specified pipe length before proceeding.

NOTE

The utility gas meter flow rate (Btu/hr) must be sufficient to accommodate the generator set and other gas consuming appliances. Contact the natural gas utility for information or a gas meter upgrade.

Pipe Size	8.5RMY Maximum Pipe Length	11RMY Maximum Pipe Length
3/4 in. NPT	60 ft. (18.3 m)	30 ft. (9.2 m)
1 in. NPT	200 ft. (61 m)	95 ft. (29.0 m)
1-1/4 in. NPT	300 ft. (91.5 m)	225 ft. (68.6 m)
Max. BTU/Hr	132,000	199,000

Figure 7-6. Maximum Natural Gas Pipe Length

Contact the local LP provider for LP installation information.

7.8 Electrical Connections

7.8.1 Accessory Electrical Connections

Some accessories can be connected to the generator set, including a run relay and common fault relay. Contact an authorized service distributor/dealer for a list of other accessories.

Most accessories operate on 12 volts DC and some may require AC line voltage. Follow the installation instructions provided with each kit. Use separate conduit for AC and DC leads to reduce the possibility of electrical interference. Verify that the leads and conduit do not interfere with the operation of the generator set or obstruct the service areas. Verify that the electrical installation complies with the National Electrical Code (NEC) and is done by a licensed electrician. Follow all applicable local and state codes. See Section 6—Wiring Diagrams for more information regarding generator set electrical connections.

7.8.2 AC Load Lead Connections

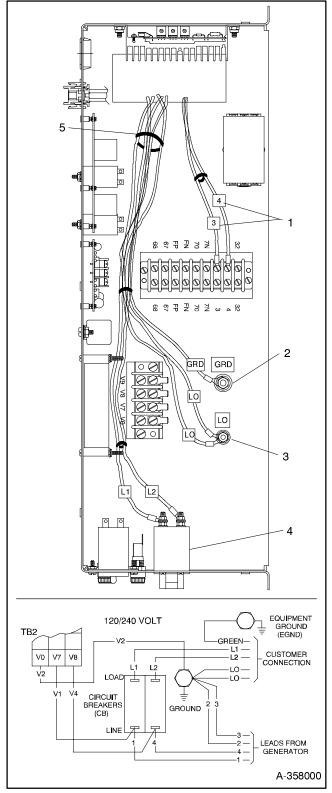
Make the AC output lead connections in the controller compartment where the AC circuit breaker is located. Route the building distribution panel or transfer switch leads through the bottom of the generator set or flexible conduit directly to the AC circuit breaker box. Verify that the leads and conduit do not interfere with the operation of the generator set or obstruct the service areas. Verify that the electrical installation complies with the National Electrical Code (NEC) and is done by a licensed electrician. Follow all applicable local and state codes. See Figure 7-7 and Section 6—Wiring Diagrams for the generator set electrical connections.

- Connect the L1/L2 black leads to the AC circuit breaker load side.
- Connect the L0 white leads to the neutral stud.
- 3. Connect the green lead to the equipment ground.

NOTE

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.

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- 1. ATS engine start lead connections
- 2. Ground terminal
- 3. L0 terminal
- 4. Circuit breaker
- 5. AC load leads

Figure 7-7. Controller—Top View

7.8.3 Prestart Installation Check

Review the entire installation section. Inspect all the wiring and connections to ensure that the generator set is ready for operation. Check that there are no obstructions to the air inlet and outlet.

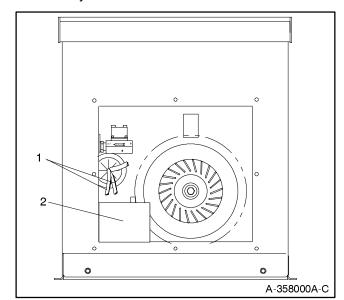
Complete the prestart checklist supplied with the warranty and registration forms and return the checklist to the distributor/dealer or mail directly to Kohler Co.

7.8.4 Battery

Make the engine starting battery connections before starting the generator set. See Figure 7-8.

Mount the battery in the housing below the fuel regulator. Standard battery cables provide easy connection to the battery.

- 1. Ensure that the starting battery is fully charged before placing the battery in service.
- 2. Clean the battery posts and/or adapters if necessary.
- 3. Install the battery post adapters.
- 4. Install the battery in the housing.
- Verify that the controller master switch is in the OFF position.
- 6. Connect the positive (+) lead to the engine starting battery.
- 7. Connect the negative (-) lead to the engine starting battery.



- 1 Battery cables
- 2. Engine starting battery

Figure 7-8. Battery Location—Engine End

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Appendix A. Glossary of Abbreviations

Abbreviations are used throughout this manual. Normally in the text they will appear in complete form with the abbreviation following in parenthesis the first time they are used. After that they will appear in the abbreviated form. The commonly used abbreviations are shown below.

AC	alternating current	nal / nals	s. gallon, gallons	NBS	National Bureau of Standards
AISI	American Iron and Steel Institute	gph	gallons per hour	N.C.	normally closed
Amp	ampere	gpm	gallons per minute	NEC	National Electrical Code
	·		grade	NEMA	National Electrical
Amps ANSI	amperes American National Standard	gr grd	ground	INLIVIA	Manufacturers Association
ANSI	Institute	gra. HCHT	high cylinder head temperature	NFPA	National Fire Protection
API	American Petroleum Institute	HET	• ,	INFFA	Association
		ПЕТ	high exhaust (or engine)	Nlm	
approx.	approximate, approximately	11-	temperature	Nm	Newton meter, Newton meters
A/R	as required, as requested	Hg	mercury (element)		number, numbers
A/S	as supplied, as stated,	H ₂ O	water	NPT	National Standard taper pipe
404	as suggested	HP	horsepower	NI/D	thread per general use
ASA	American Standards Association	hr, hrs	hour	N/R	not required
ASME	American Society of Mechanical	Hz	hertz (cycles per second)	00	overcrank
	Engineers	ID	inside diameter	OD	outside diameter
assy	assembly	IEEE	Institute of Electrical and	OEM	original equipment manufacturer
ASTM	American Society for Testing		Electronic Engineers	OS O/O	overspeed, oversize
4.	Materials	in.	inch(es)	O/S	oversize
ATDC	after top dead center	inc.	incorporated	OSHA	Occupational Safety and Health
aux.	auxiliary	in lbs.	inch pounds	O) /	Act
AWG	American Wire Gauge	int.	internal	OV	overvoltage
AWM	appliance wiring material	int -ext	internal-external	OZ.	ounce, ounces
BBDC	before bottom dead center	ISO	International Standards	PF	power factor
BDC	before dead center		Organization	PMG	permanent magnet generator
BHP	brake horsepower	J	joule, joules	pot.	potentiometer
bmep	brake mean effective pressure	JIS	Japanese Industry Standard	ppm	parts per million
Btu	British thermal unit	kg	kilogram, kilograms	psi	pounds per square inch
°C	Celsius degree	kg/cm ²	kilograms per square centimeter	pt., pts.	pint, pints
CC	cubic centimeter	kgm	kilogram meter(s)	PVC	polyvinyl chloride
CCA	cold cranking Amps.	kJ	kilojoules (btu cal)	qt., qts.	quart, quarts
CEC	Canadian Electrical Code	km	kilometer, kilometers	qty.	quantity
cfh	cubic feet per hour	kPa	kiloPascal, kiloPascals	ref.	reference
cfm	cubic feet per minute	kph	kilometers per hour	RFI	radio frequency interference
CID	cubic inch displacement	kV	kilovolt	r.h.m.	round-head machine (screw)
cm	centimeter, centimeters	kVA	kilovolt amperes	rms	root mean square
cmm	cubic meters per minute	kW	kilowatt, kilowatts	RPM	revolutions per minute
CO.	company	kWH	kilowatt hour		room temperature vulcanization
cont'd.	continued	L	liter, liters	SAE	Society of Automotive Engineers
CSA	Canadian Standards Association	LxWxH	length x width x height	SCR	silicon-controlled rectifier
CT	current transformer	LED(s)	light emitting diode	sec.	second, seconds
cu. in.	cubic inch, cubic inches	lb., lbs.	pound, pounds	spec	specs, specification
cyl.	cylinder	L/hr.	liter per hour, liters per hour	sq.	square
dB	decibel	L/min	liter(s) per minutes	sq. cm	square centimeters
dBA	decibels (A weighted)	LOP	low oil pressure	sq. in.	square inch, square inches
DC	direct current	LP	liquefied petroleum	tach	tachometer
DCR	direct current resistance	m	meter, meters	TDC	top dead center
deg.	degree	m ³	cubic meter, cubic meters	tech pub	technical publications
dept.	department	max.	maximum	temp.	temperature
dia.	diameter	MCM	one thousand circular mils.	TIF	telephone influence factor
e.g.	example given	megger	megohmmeter	TP, TPs	technical publications
EΙΑ	Electronic Industries Association	MHz	megahertz	turbo	turbocharger
EMI	electromagnetic interference	mi.	mile, miles	UHF	ultrahigh frequency
EPA	Environmental Protection	mil	one one-thousandth of an inch	UNC	Unified coarse thread (was NC)
	Agency	min.	minimum	UNF	Unified fine thread (was NF)
etc.	et cetera (and so forth)	mJ	millijoule, millijoules	UL	Underwriter's Laboratories, Inc.
ext.	external	MJ	mega joule, mega joules	U/S	undersize
°F	Fahrenheit degree	mm	millimeter, millimeters	U.S.A.	United States of America
fl. oz	fluid ounce, fluid ounces	m³/min	cubic meters per minute	V	volt, volts
FM	frequency modulation	MPa	megaPascal	vac	volts alternating current
ft.	foot, feet	mW	milliwatt, milliwatts	vdc	volts direct current
ft. lbs.	foot pound, foot pounds	MW	megawatt, megawatts	VHF	very high frequency
ga.	gauge (meters, wire size)	N/A	not available or not applicable	W	watt, watts
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