

Operation

Commercial and Recreational Mobile Generator Sets



Model:

7.5EOR/EORZ

10EOR/EORZ

15EOR/EORZ

20EOR/EORZ

KOHLER[®]
POWER SYSTEMS

ISO 9001
KOHLER
GENERATORS
INTERNATIONALLY REGISTERED

TP-6061 3/00

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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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.**

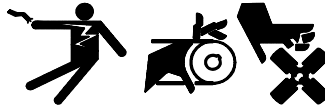
NOTICE

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. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Disconnect the power to the battery charger, if equipped. (2) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

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 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

| |
|--|
|  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.

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 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 or vehicle. Do not obstruct the exhaust outlet when parking your vehicle. The exhaust gases must discharge freely to prevent carbon monoxide from deflecting into the vehicle.

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


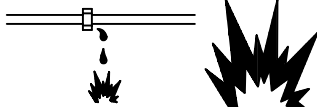
If experiencing any of these symptoms and carbon monoxide poisoning is possible, seek fresh air immediately and remain active. Do not sit, lie down, or fall asleep. Alert others to the possibility of carbon monoxide poisoning. Seek medical attention if the condition of affected persons does not improve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

Copper tubing exhaust systems. Carbon monoxide can cause severe nausea, fainting, or death. Do not use copper tubing in diesel exhaust systems. Sulfur in diesel exhaust causes rapid deterioration of copper tubing exhaust systems, resulting in exhaust leakage.

Installing the exhaust tail pipe. Carbon monoxide can cause severe nausea, fainting, or death. Install the exhaust system tail pipe to prevent the drawing of discharged exhaust gases into the vehicle interior through windows, doors, air conditioners, and other openings. Do not use flexible tail piping because it could crack and allow lethal exhaust fumes to enter the vehicle.

Inspecting the exhaust system. Carbon monoxide can cause severe nausea, fainting, or death. For the safety of the vehicle's occupants, install a carbon monoxide detector. Consult the coach builder or dealer for approved detector location and installation. Inspect the detector before each generator set use. In addition to routine exhaust system inspection, test the carbon monoxide detector per the manufacturer's instructions and keep the detector operational at all times.

Fuel System

| |
|--|
|  WARNING |
|  |
| 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.

Draining the fuel system. Explosive fuel vapors can cause severe injury or death. Spilled fuel can cause an explosion. Use a container to catch fuel when draining the fuel system. Wipe up spilled fuel after draining the system.

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/ Electrical Shock

| | |
|--|---|
|  WARNING | |
|  |  |
| Hazardous voltage. Moving rotor. 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 severe injury, death, or property damage. | |
| Connect the generator set to the building's electrical system only through an approved device and after the building's main switch is opened. | |

Grounding electrical equipment. Hazardous voltage can cause severe injury or death. Electrocutation 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.

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*)


Engine block heater. Hazardous voltage can cause severe injury or death. The engine block heater can cause electrical shock. Remove the engine block heater plug from the electrical outlet before working on the block heater electrical connections.


Electrical backfeed to the utility. Hazardous backfeed voltage can cause severe injury or death. Connect the generator set to the building/campground electrical system only through an approved device and after the building/campground main switch is opened. Backfeed connections can cause serious injury or death to utility personnel working on power lines and/or personnel near the work area. Some states and localities prohibit unauthorized connection to the utility electrical system. Install a transfer switch to prevent interconnection of the generator set power and other sources of power.

Heavy Equipment

| |
|---|
| ⚠ WARNING |
|  |
| <p>Unbalanced weight. Improper lifting can cause severe injury or death and equipment damage.</p> <p>Do not use lifting eyes. Use slings under the skid to balance and lift the generator set.</p> |

Hot Parts

| |
|--|
| ⚠ WARNING |
|  |
| <p>Hot coolant and steam. Can cause severe injury or death.</p> <p>Before removing the pressure cap, stop the generator set and allow it to cool. Then loosen the pressure cap to relieve pressure.</p> |

| |
|--|
| ⚠ WARNING |
|  |
| <p>Hot engine and exhaust system. Can cause severe injury or death.</p> <p>Do not work on the generator set until it cools.</p> |

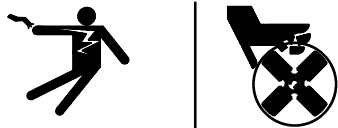
Checking the coolant level. Hot coolant can cause severe injury or death. Allow the engine to cool. Release pressure from the cooling system before opening the pressure cap. To release pressure, cover the pressure cap with a thick cloth and then slowly turn the cap counterclockwise to the first stop. Remove the cap after pressure has been completely released and the engine has cooled. Check the coolant level at the tank if the generator set has a coolant recovery tank.

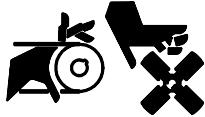
Servicing the exhaust system. Hot parts can cause severe injury or death. Do not touch hot engine parts. The engine and exhaust system components become extremely hot during operation.

Combustible materials. Fire can cause severe injury or death. A hot exhaust system can ignite adjacent combustible materials. Do not locate electrical wiring, fuel lines, or combustible materials above the exhaust muffler. Exercise caution when parking your vehicle to prevent the exhaust system and hot exhaust gases from starting grass fires.

Combustible materials. Fire can cause severe injury or death. A hot generator set can ignite debris in the compartment. Keep the compartment and generator set clean and free of debris and combustible materials to minimize the possibility of fire. Do not block the fuel/oil drain opening in the generator set mounting tray. Cut a corresponding hole in the subfloor, if used, for the drain opening.

Moving Parts

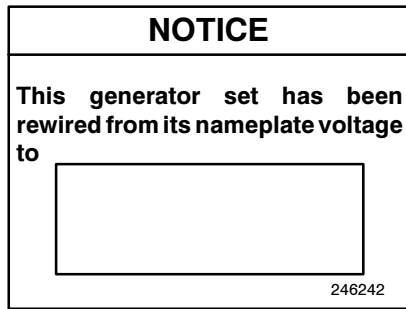
| |
|--|
| ⚠ WARNING |
|  |
| <p>Hazardous voltage. Moving rotor. Can cause severe injury or death.</p> <p>Operate the generator set only when all guards and electrical enclosures are in place.</p> |

| |
|--|
| ⚠ WARNING |
|  |
| <p>Rotating parts. Can cause severe injury or death.</p> <p>Operate the generator set only when all guards, screens, and covers are in place.</p> |

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 thru-bolt when making adjustments or servicing the generator set. Rotate the crankshaft manually in a clockwise direction only. Turning the crankshaft bolt or rotor thru-bolt 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.

NOTICE

This generator set does not comply with United States Coast Guard (USCG) requirements and must not be used for marine applications. For marine installations use only generator sets specified for marine use. USCG Regulation 33CFR183 requires that a generator set must be ignition protected when used in a gasoline-fueled environment.

Notes

This manual provides operation instructions for 7.5–20EOR/EORZ model generator sets.

Refer to the engine service manual for generator set engine service information.

x:in:001:001

Information in this publication represents data available at the time of print. Kohler Co. 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 at the

beginning of this manual. 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 an authorized service distributor/dealer to keep equipment in top condition.

Before installing a mobile generator set, obtain the most current installation manual from your local distributor/dealer. Only qualified persons should install the generator set.

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Service Assistance

Service Information

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

To locate a local authorized distributor/dealer inside the U.S.A. and Canada

- Look on the product or in 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

To locate a local authorized distributor/dealer outside the U.S.A. and Canada

- Look on the product or in the information included with the product
- Consult the telephone directory under the heading Generators—Electric
- Visit the Kohler Generator Division web site at www.kohlergenerators.com
- Contact the nearest regional office

Africa, Europe, Middle East

London Regional Office
Langley, Slough, England
Phone: (44) 1753-580-771
Fax: (44) 1753-580-036

Australia

Australia Regional Office
Queensland, Australia
Phone: (617) 3893-0061
Fax: (617) 3893-0072

China

China Regional Office
Shanghai, People's Republic of China
Phone: (86) 21-6482 1252
Fax: (86) 21-6482 1255

India, Bangladesh, Sri Lanka

India Regional Office
Bangalore, India
Phone: (91) 80-2284270
(91) 80-2284279
Fax: (91) 80-2284286

Japan

Japan Regional Office
Tokyo, Japan
Phone: (813) 3440-4515
Fax: (813) 3440-2727

Latin America

Latin America Regional Office
Lakeland, Florida, U.S.A.
Phone: (941) 619-7568
Fax: (941) 701-7131

South East Asia

Singapore Regional Office
Singapore, Republic of Singapore
Phone: (65) 264-6422
Fax: (65) 264-6455

Maintenance and Service Parts/Related Literature

Maintenance and Service Parts

Figure 1 identifies maintenance and service parts for your generator set. Obtain a complete list of maintenance and service parts from your authorized generator distributor/dealer.

| Part Description | Models | | | |
|--------------------------------|-------------|------------|------------|------------|
| | 7.5EOR/EORZ | 10EOR/EORZ | 15EOR/EORZ | 20EOR/EORZ |
| Air filter element | 278858 | | A-226955 | |
| Battery charging fuse (10 amp) | 223316 | | | |
| Black spray paint | 221292 | | | |
| Fuel filter element | 229715 | | 252765 | |
| Input fuse (15 amp) | 283645 | | | |
| Oil filter | 229678 | 229841 | | |
| Voltage regulator fuse (8 amp) | 226935 | | | |

Figure 1 Maintenance and Service Parts

xin:001:004

List of Related Literature

Figure 2 identifies related literature available for the generator sets covered in this manual. Only trained and qualified personnel should install or service the generator set.

| Literature Type | Literature No. |
|-----------------------------------|----------------|
| Engine Service Manual (7.5-15EOR) | TP-5876 |
| Engine Service Manual (20EOR) | TP-6067 |
| Installation Manual | TP-6062 |
| Operation Manual (Engine) | TP-5968 |
| Operation Manual (Generator) | TP-6061 |
| Parts Catalog* (7.5/10 kW) | TP-6072 |
| Parts Catalog* (15/20 kW) | TP-5607 |
| Service Manual (Generator) | TP-6073 |

* One manual combines generator and engine information.

Figure 2 Generator Set Literature

xin:001:005

Notes

Section 1 Service Views

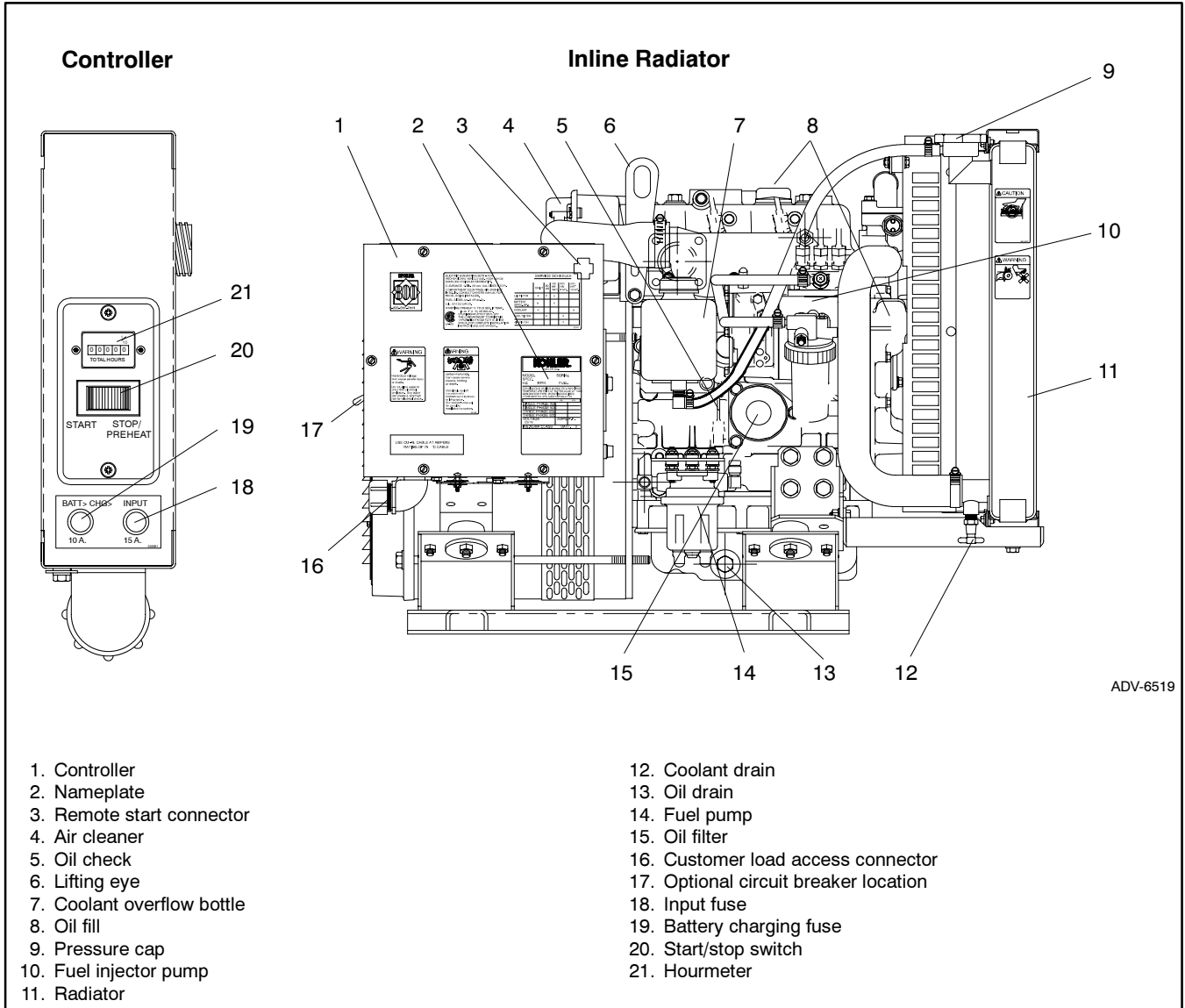


Figure 1-1 7.5-10 kW Service View (Inline Radiator Model Shown)

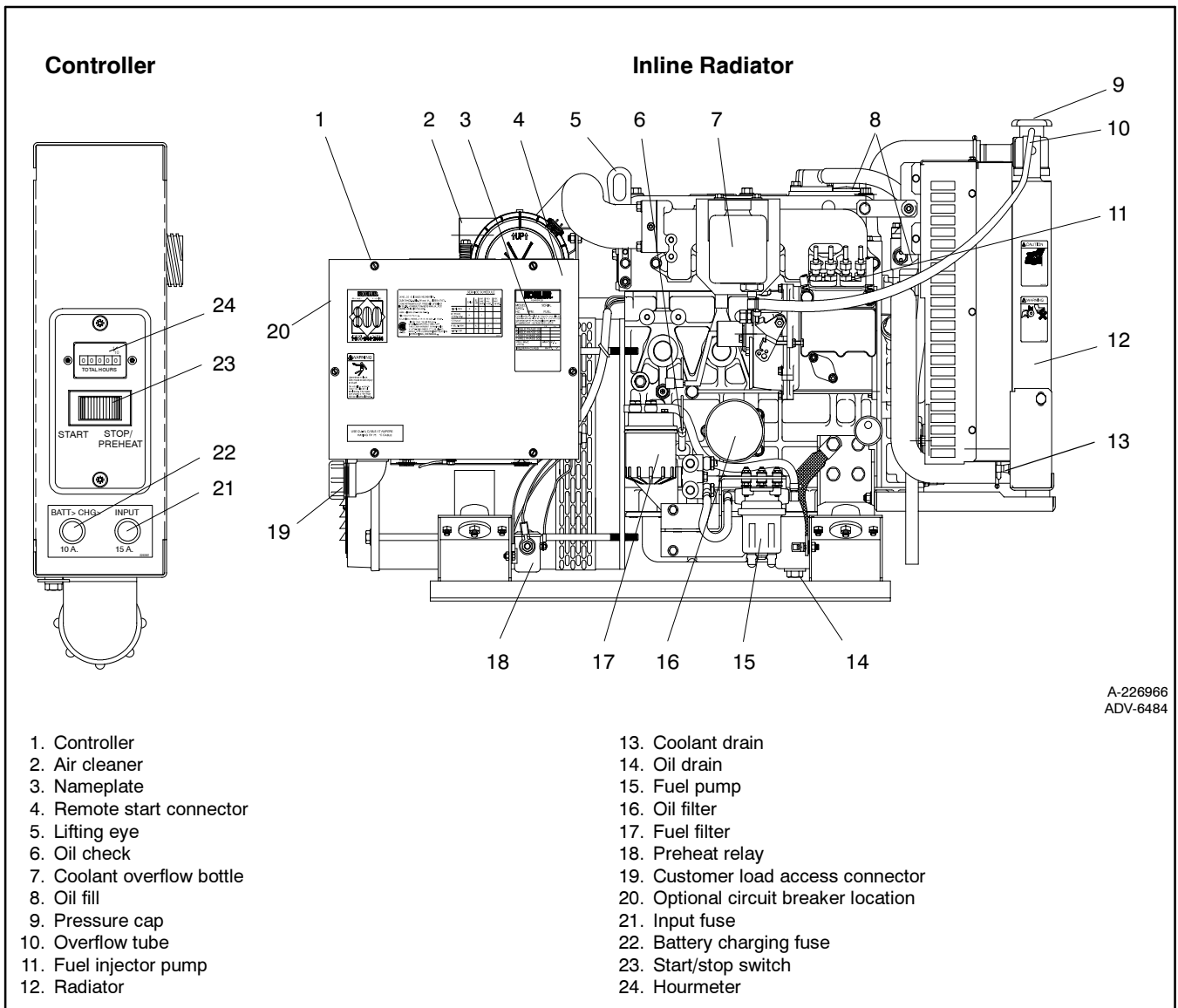


Figure 1-2 15-20 kW Service View (Inline Radiator Model Shown)

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.

Coolant Level. Check the coolant level according to the cooling system maintenance information.

Note: Block heater damage. The block heater will fail if the energized heater element is not immersed in coolant. Fill the cooling system before turning on the block heater. Run the engine until it is warm, and refill the radiator to purge the air from the system before energizing the block heater.

Drive Belts. Check the belt condition and tension of the radiator fan, water pump, and battery charging alternator belt(s).

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

Inspect the exhaust system components for cracks and corrosion (exhaust manifold, exhaust line, exhaust clamps, and muffler).

- Check for corroded or broken metal parts and replace them as needed.
- Check for loose, corroded, or missing clamps and hangers. Tighten or replace the exhaust clamps and/or hangers as needed.
- Check that the exhaust outlet is unobstructed.
- Check the exhaust gas color. If the exhaust is blue or black, contact your local distributor/dealer.

- Visually inspect for exhaust leaks. Check for carbon or soot residue on exhaust components. Carbon and soot residue indicates an exhaust leak. Seal leaks as needed.
- Ensure that the carbon monoxide detector is (1) in the vehicle, (2) functional, and (3) energized whenever the generator set operates.

Fuel Level. Check the fuel level and keep the tank(s) full to ensure adequate fuel supply.

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.

x:op:001:002:a

2.2 Angular Operation

See Figure 2-1 for angular operation limits for units covered in this manual.

| Continuous | Intermittent— 3 minutes or less |
|----------------------------------|------------------------------------|
| 25° | 30° |
| Maximum value for all directions | |

Figure 2-1 Angular Operation

m:op:001:004

2.3 Exercise the Generator Set

Operate the generator set under load once each week for one hour with an operator present.

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.

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2.4 Start and Stop Procedure

Note: Starter motor cooldown. Do not crank engine continuously for more than 10 seconds at a time. Allow a 60-second cooldown period between cranking attempts if the engine does not start. If the unit fails to start after three attempts, contact an authorized Kohler distributor/dealer for repair. Failure to follow these guidelines may result in starter motor burnout.

Note: Engine restart. If the engine starts and then stops, allow the engine to come to a complete stop before making a restart attempt. If the flywheel ring gear is still rotating when the starter pinion gear is engaged, the pinion gear will clash which may damage the ring gear teeth.

2.4.1 Controls and Indicators

The following table describes the controller components and indicators.

| Name | Description |
|-------------------------------|--|
| Start/stop switch | The switch starts and stops the generator set. |
| AC circuit breaker (optional) | The circuit breaker trips when a fault occurs in the output circuit. During maintenance of coach wiring, the circuit breaker disconnects the generator set. |
| Input fuse | Protects the controller circuitry and the generator DC wiring in the event of a short circuit. |
| Battery charging fuse | Protects the battery charging circuitry. |
| Remote start connector | A 6-pin connector on the controller back panel allows connection of optional remote start kits and operation of the generator set at a location remote from the set. |
| Hourmeter | The meter records total generator set operating hours for reference in maintenance scheduling. |

2.4.2 Start the Generator Set

The following procedure describes the actions required to start the generator set.

1. **Preheat/cold weather starts.** During cold weather starts, below -5°C (23°F), place the controller start/stop switch in STOP/PREHEAT position for 15–20 seconds before attempting to start the generator set to energize the air heater coil. Do not energize the preheat feature for more than 30 seconds or damage to the preheat feature may occur.
2. **Starting.** Hold the generator set controller start/stop switch or the remote start/stop switch in the START position until the unit starts.

2.4.3 Remote Panel Gauge Operation

If the generator set has an optional remote panel with gauges, observe the gauges upon engine startup. If gauge readings are not within the ranges specified in the table below, contact an authorized service distributor/dealer.

| Gauge | Normal Operating Range |
|---|------------------------|
| Oil pressure kPa (psi) | 276-414 (40-60)* |
| Water temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$) | 77-91 (170-195) |
| DC voltmeter | 12-14 volts |

* 50 Hz models show a lower pressure range.

2.4.4 Stop the Generator Set

The following table describes the actions required to stop the generator set.

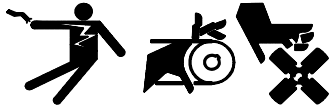
1. **Cooldown.** Run the generator set at no load for 5 minutes to ensure adequate engine cooldown.
2. **Stopping.** Place the controller start/stop switch or remote start/stop switch in the STOP position.

Note: Do not place the start/stop-preheat switch, if equipped, in the STOP/PREHEAT position for more than 30 seconds or damage to the preheat feature may occur.

Section 3 Scheduled Maintenance

3.1 General Maintenance

WARNING

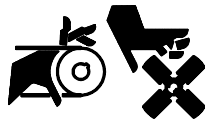


Accidental starting. Can cause severe injury or death.

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 equipment connected to the set, disable the generator set as follows: (1) Disconnect the power to the battery charger, if equipped. (2) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

WARNING



Rotating parts. Can cause severe injury or death.

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

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.

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 distributor/dealer perform generator set service.

Engine Service. Perform generator set engine service at the intervals specified by the engine operation manual.

Generator Set Service. Perform generator set service at the intervals specified by the generator set operation manual.

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

Routine Maintenance. Refer to the following generator set service schedule, the engine service schedule, and the hourmeter located on the generator set controller to determine when to schedule routine maintenance. Service more frequently generator sets that are subject to extreme weather or dusty or dirty conditions.

Service Log. Use the Operating Hour Service Log located in the back of this manual to document performed services.

Service Schedule. Perform maintenance on each item in the service schedule at the designated intervals for the life of the generator set. For example, an item requiring service every 100 hours or 3 months also requires service after 200 hours or 6 months, 300 hours or 9 months, and so on.

3.2 Service Schedule

| Perform Service at Intervals Indicated (X) | Reference Section | Before Starting | After 50 Hrs | Every 150 Hrs | Every 300 Hrs | Every 500 Hrs |
|--|-------------------|-----------------|---------------------|---------------|---------------|---------------|
| FUEL SYSTEM | | | | | | |
| Check the fuel level and fill as necessary | 3.4 | X | | | | |
| Check the fuel pipes and clamps * | | | X | | | |
| Remove sediment from the fuel tank | | | | X | | |
| Check the fuel injection timing * | | | | | | X |
| Replace the fuel filter element (metal spin-on type) | 3.4 | | First 50 Hours X | | X | |
| Check the governor operation and adjust as necessary * | | | | | | X |
| Check the nozzle injection pressure * | | | | | | 1000 Hrs. |
| Check the injection condition | | | | | X | |
| Check and/or replace inline fuel filter | 3.4 | | | X | | |
| LUBRICATION SYSTEM | | | | | | |
| Check the crankcase oil level and add oil as necessary | 3.3 | X | | | | |
| Replace the oil in the crankcase | 3.3 | | First 50 Hours X | X | | |
| Replace the lube oil filter element | 3.3 | | X | | X | |
| COOLING SYSTEM | | | | | | |
| Check the coolant level and fill as necessary | 3.7 | X | | | | |
| Check water pipes, clamps, and hoses | | | | X | | |
| Flush the cooling system * | 3.7.3 | | | | | X |
| ELECTRICAL SYSTEM | | | | | | |
| Verify operation of the gauges, if equipped | 2.4.3 | X | | | | |
| Keep the battery charged and in good condition † | | | X | | | |
| Check the electrical connections | | X | | | | |
| Adjust the tension of the alternator V-belt * | 3.8 | | | X | | |
| INTAKE/EXHAUST SYSTEM | | | | | | |
| Replace the air cleaner element | 3.5 | | | | X | |
| Check the crankcase breather pipe for obstructions * | | | | | X | |
| Inspect the complete exhaust system and components * | 2.1 | | | | | X |
| ENGINE SYSTEM | | | | | | |
| Check for water, fuel, coolant, and oil leakage | | X | X | | | |
| Retighten any loose nuts and bolts * | | | First 50 Hours X | | | X |
| Adjust the valve clearance * | | | | | X | |
| GENERATOR | | | | | | |
| Test run the generator set | 2.3 | | X Weekly | | | |
| Blow the dust out of the generator | | | | | | X |
| Clean slip rings and inspect brushes, if equipped * | | | | | | X |
| * Have authorized service distributor/dealer perform this service. | | | | | | |
| † Consult the battery manufacturer's instructions. | | | | | | |

3.3 Lubrication System

See the Service Schedule for oil change and oil filter replacement intervals. See Section 1, Service Views, for the oil drain, oil check, oil fill, and oil filter locations.

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3.3.1 Oil Specifications

Use oil that meets the American Petroleum Institute (API) classification of CD, CC/CD, or CC. Using unsuitable oil or neglecting an oil change may result in engine damage and a shorter engine life. See Figure 3-1 for the recommended Society of Automotive Engineers (SAE) viscosity designation for various operating temperature ranges.

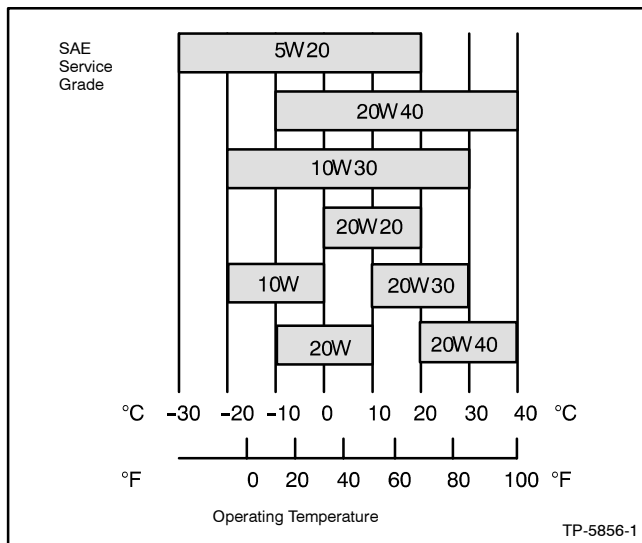


Figure 3-1 Engine Oil Selection

3.3.2 Oil Change Procedure

Whenever possible, drain the oil while the generator set is still warm.

1. Drain the oil.

- Place the generator start/stop switch in the STOP position.
- Disconnect the power to the battery charger, if equipped.
- Disconnect the generator set engine starting battery, negative (-) lead first.

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- Place an oil collection container below the oil drain and remove the oil drain plug.
- Allow time for the engine oil to drain completely.
- Replace the oil drain plug.

2. Replace the oil filter.

- Remove the oil filter by rotating it counterclockwise with an oil filter wrench.
- Clean the sealing surface of the oil filter adapter.
- Apply a light coat of clean oil to the rubber seal of the new oil filter.
- Install the new oil filter following the instructions provided with the filter.

3. Fill with oil.

For oil selection and capacity see Figure 3-1 and Figure 3-2.

| Model | L (Qt.) |
|-------|-----------|
| 7.5 | 2.3 (2.4) |
| 10 | 5.2 (5.5) |
| 15/20 | 5.8 (6.1) |

Figure 3-2 Oil Capacity with Filter

4. Check for oil leaks.

- Check that the generator start/stop switch is in the STOP position.
- Reconnect the generator set engine starting battery, negative (-) lead last.
- Reconnect the power to the battery charger, if equipped.
- Start the generator set and check for leaks around the oil filter and oil drain plug.

3.3.3 Oil Level

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

3.4 Fuel System

In most installations, both the generator set and the vehicle's engine operate from a common fuel tank with a dual dip tube arrangement. The generator set's dip tube may be shorter than the vehicle's engine's dip tube. With this arrangement, fuel may not be available to the generator set when the fuel supply is low. See Figure 3-3 for a fuel system schematic.

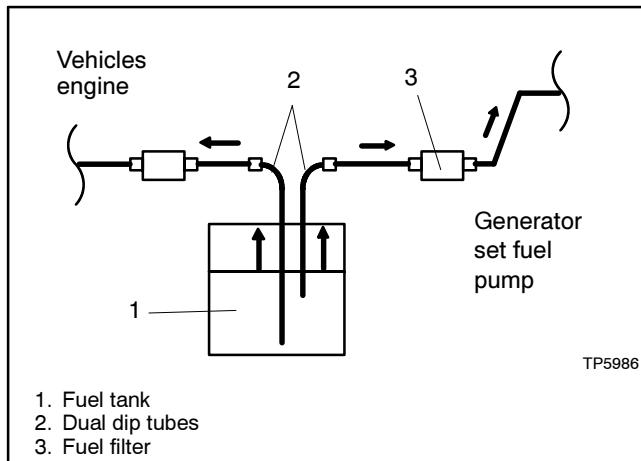


Figure 3-3 Fuel System Schematic, Typical

3.4.1 Fuel Specifications

Use clean, good quality diesel fuel oil with a cetane number of 45 or greater. Clean fuel prevents diesel fuel injectors and pumps from clogging.

| Fuel Recommendation | |
|---------------------|---|
| United States | ISO 8217 DMA, BS 2869, Part 1 Class A1 or Part 2 Class A2 |
| United Kingdom | BS 2869-1983, Part 2 Class A2 |
| Germany | DIN 51 601-1978 |

Note: Avoid storing fuel for more than one month. Take special precautions to keep all dirt, water, and other contaminants out of the fuel to prevent the growth of microbes. Microbes form slime that clogs the fuel filter and lines.

Note: Do not run the generator set out of fuel because the fuel lines will draw in air and necessitate bleeding the fuel system before restarting the generator set.

3.4.2 Fuel Filter

The quality and condition of the fuel largely determine the filter's useful life. Replace the fuel filter element according to the service schedule. Section 1 shows the location of the fuel filter. There are two types of fuel filtering systems—the spin-on fuel filter and the fuel filter element. Use the applicable procedure below to replace the fuel filter. See Figure 3-4 or Figure 3-5.

Disable the Generator Set:

1. Place the generator set start/stop switch in the STOP position.
2. Disconnect the generator set engine starting battery, negative (-) lead first.
3. Close the fuel supply valve.

Note: Disabling and enabling the generator set applies to both spin-on filters and fuel filter elements.

Spin-on Fuel Filter:

1. Loosen the fuel filter by turning it counterclockwise. Remove the fuel filter and use rags to clean up any spilled fuel oil. Dispose of the fuel filter in an approved manner.
2. Clean the contact surface of the fuel filter adapter.
3. Lightly lubricate the gasket surface of the new fuel filter with fresh fuel oil. Thread the filter onto the adapter until the gasket makes contact; hand-tighten the filter an additional one-half turn. Proceed to step 1, Enable the Generator Set.

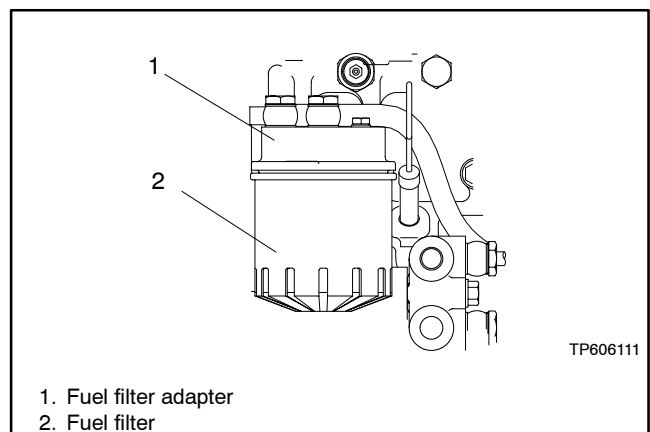


Figure 3-4 Spin-On Fuel Oil Filter

Fuel Filter Element:

1. Remove the retaining ring, filter cup, O-ring, spring, and fuel filter element.
2. Replace the fuel filter element.
3. Reinstall the spring, O-ring, filter cup and retaining ring. Proceed to step 1 under Enable the Generator Set.

Enable the Generator Set:

1. Open the fuel supply valve.
2. Reconnect the generator set engine starting battery, negative (-) lead last.
3. Bleed the fuel system. See Section 3.4.3.

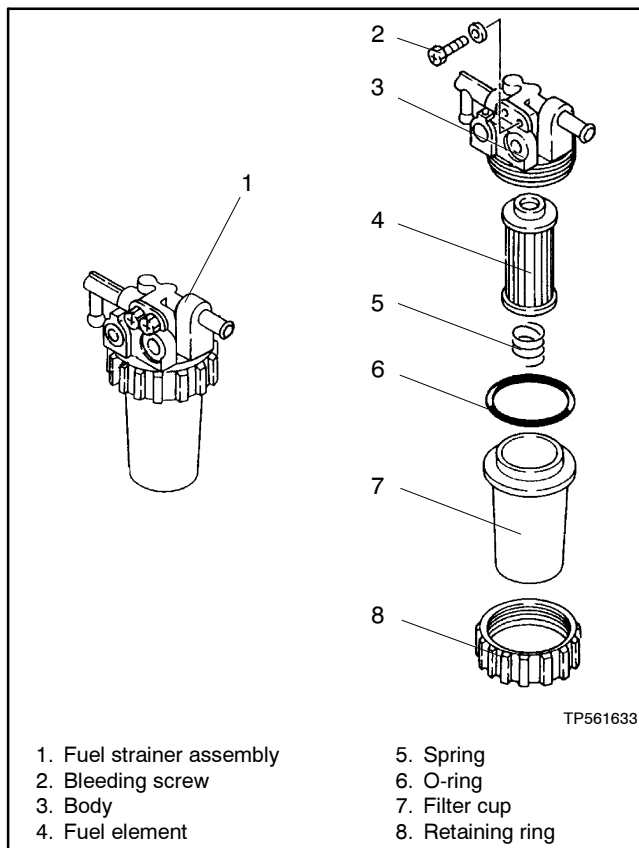


Figure 3-5 Fuel Oil Filter Element

3.4.3 Bleed the Fuel System

Bleed the air from the fuel system to prevent engine starting failures and/or erratic operation. One or more of the following causes air to collect in the fuel system:

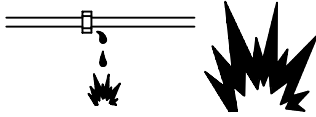
- Operating the generator set until the fuel supply is emptied
- Air leaking from the suction side of the fuel system
- Replacing the fuel filter

Note: Connect the battery during the priming procedure to allow engine cranking. Do not allow the engine/generator to start. To prevent starting, *toggle* the start/stop switch by momentarily placing the start/stop switch in the START position for a few seconds and then placing the switch in the STOP position.

Procedure to Bleed the Fuel System:

1. Fill the fuel tank.
2. Loosen the fuel filter vent screw. See Figure 3-6.
3. Toggle the start/stop switch until fuel, free of air bubbles, flows from the vent screw. Tighten the screw.
4. Loosen the line connection (bleed point) at the fuel injection pump inlet.
5. Toggle the start/stop switch until fuel, free of air bubbles, flows from the vent screw at the line connection on the fuel injection pump inlet. Tighten the connection.

⚠ WARNING



**Explosive fuel vapors.
Can cause severe injury or death.**

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

Draining the fuel system. Explosive fuel vapors can cause severe injury or death. Spilled fuel can cause an explosion. Use a container to catch fuel when draining the fuel system. Wipe up spilled fuel after draining the system.

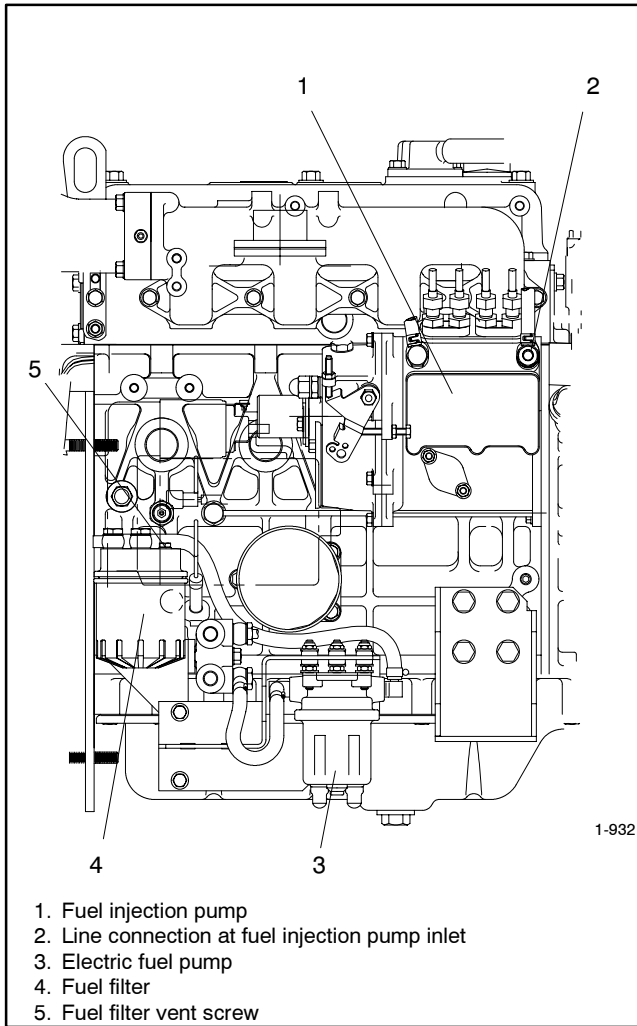


Figure 3-6 Bleeding the Fuel System, Typical

3.5 Air Intake Silencer/Cleaner

At the interval specified in the service schedule, clean or replace, the air intake silencer. Clean it more frequently if the generator operates in dirty, dusty conditions. Follow the procedure described below.

Air Cleaner Service/Replacement Procedure:

A dry-type air cleaner silences and filters the intake air. The air intake silencer assembly connects to the intake manifold via a flexible hose. Refer to Figure 3-7 during this procedure.

1. Release the spring clips to open the housing and remove the air silencer element.
2. Tap the element lightly against a flat surface to dislodge loose surface dirt. Do not clean the element in any liquid or use compressed air as these will damage the filter element.
3. Examine the element and housing for damage. Replace the element or housing if necessary.
4. Wipe the cover and base with a clean rag to remove dirt. Make sure the sealing surfaces fit correctly and reattach the spring clips.

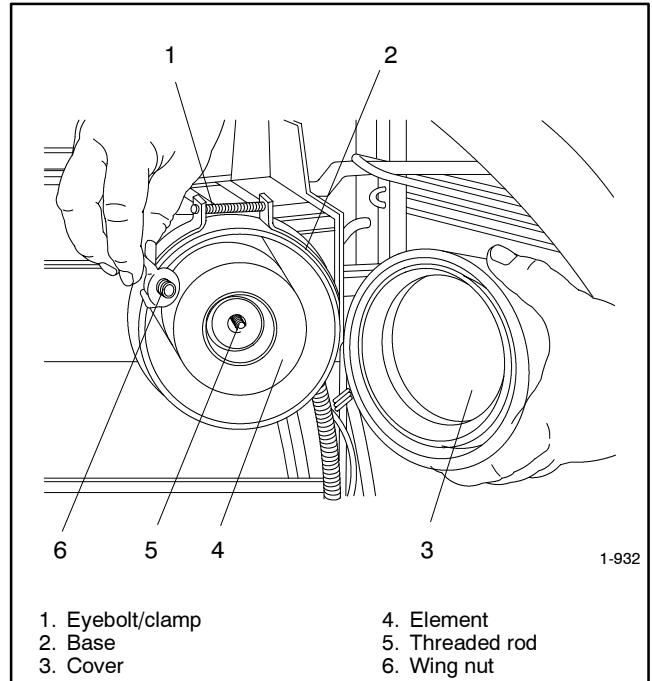
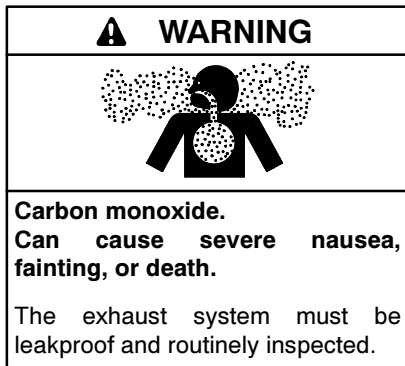


Figure 3-7 Air Cleaner, Typical

3.6 Exhaust System



Inspecting the exhaust system. Carbon monoxide can cause severe nausea, fainting, or death. For the safety of the vehicle's occupants, install a carbon monoxide detector. Consult the coach builder or dealer for approved detector location and installation. Inspect the detector before each generator set use. In addition to routine exhaust system inspection, test the carbon monoxide detector per the manufacturer's instructions and keep the detector operational at all times.

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

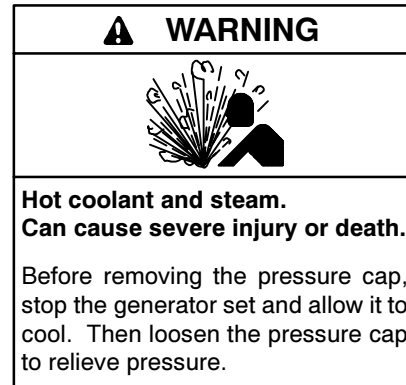
Inspect the exhaust system components for cracks and corrosion (exhaust manifold, exhaust line, exhaust clamps, and muffler).

- Check for corroded or broken metal parts and replace them as needed.
- Check for loose, corroded, or missing clamps and hangers. Tighten or replace the exhaust clamps and/or hangers as needed.
- Check that the exhaust outlet is unobstructed.
- Check the exhaust gas color. If the exhaust is blue or black, contact your local distributor/dealer.
- Visually inspect for exhaust leaks. Check for carbon or soot residue on exhaust components. Carbon and soot residue indicates an exhaust leak. Seal leaks as needed.
- Ensure that the carbon monoxide detector is (1) in the vehicle, (2) functional, and (3) energized whenever the generator set operates.

3.7 Cooling System

The cooling system maintenance information specifically applies to radiator-cooled models. These models use a radiator with a pressure cap and a coolant recovery tank. Refer to Figure 3-8 for coolant capacities.

3.7.1 Check the Cooling System



Note: Block heater damage. The block heater will fail if the energized heater element is not immersed in coolant. Fill the cooling system before turning on the block heater. Run the engine until it is warm, and refill the radiator to purge the air from the system before energizing the block heater.

To prevent generator shutdown or damage because of overheating:

- Check and maintain the coolant level in the coolant recovery tank between the high and low markings.
- Keep the cooling air inlets clean and unobstructed at all times.
- Inspect the radiator's exterior for obstructions and remove dirt and foreign material with a soft brush or cloth to avoid damaging the radiator fins.
- Check the hoses and connections for leaks and replace any cracked, frayed, or spongy hoses.
- Check the condition and tension of the radiator fan and water pump belt(s).
- Remove dirt and other debris from the pressure cap and filler neck. The pressure cap raises the boiling point of the coolant, enabling higher operating temperatures. Check the seal of the pressure cap and replace a cracked or deteriorated cap with one having the same pressure rating. The pressure cap typically has the pressure rating stamped on the cap body.

3.7.2 Drain the Cooling System

The radiator and/or engine block contain coolant drain valve(s) to drain the cooling system. When draining the coolant, remove the radiator's pressure cap; this will allow the entire system to drain and will prevent air pockets from forming and restricting coolant passage to the block.

3.7.3 Flush and Clean the Cooling System

For optimum protection, drain, flush, and refill the cooling system at the intervals listed in the service schedule. Use the instructions of the engine manufacturer per the engine operation manual. If not specified in the engine operation manual, use the following procedure.

Flush and Clean the Cooling System Procedure:

1. Open the radiator and/or engine block coolant drain valve(s) and allow the system to drain completely.
2. Remove the pressure cap to simplify draining.
3. Drain, clean, and flush the coolant recovery tank.
4. Flush the cooling system with clean water.
5. Close the radiator and/or engine block coolant drain valve(s).
6. Fill the cooling system with the recommended coolant.
7. Install the pressure cap.

3.7.4 Fill the Cooling System

See Figure 3-8 for the cooling system capacities.

| Model | Capacity L (Qt.) |
|------------------------|------------------------|
| 7.5 kW inline radiator | 3.8 (4) |
| 7.5 kW remote radiator | Engine only 3.8 (4) |
| 10 kW inline radiator | 4.3 (4.5) |
| 10 kW remote radiator | Engine only 2.5 (2.6) |
| 15 kW inline radiator | 5.5 (5.8) |
| 15 kW remote radiator | Engine only 2.7 (2.85) |
| 20 kW inline radiator | 5.7 (6) |
| 20 kW remote radiator | Engine only 2.7 (2.85) |

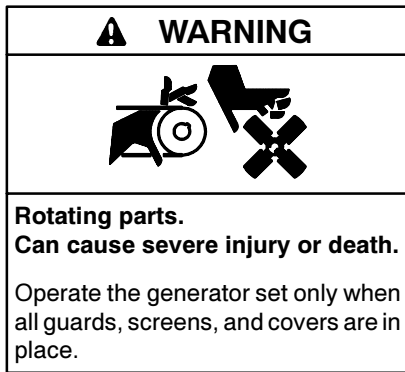
Figure 3-8 Cooling System Capacities

Fill the Cooling System Procedure:

1. Remove the pressure cap.
2. Close the radiator and/or engine block coolant drain valve(s) and tighten the hose clamps.
3. Open air-bleed petcocks, if equipped. Close the air-bleed petcocks when coolant begins to flow from the petcock.
4. Add coolant additives or water pump lubricants per the engine manufacturer's recommendations in the engine operation manual.
5. Fill the radiator with the recommended coolant/antifreeze mixture of 50% ethylene glycol and 50% clean water, to provide freezing protection to -37°C (-34°F) and overheating protection to 129°C (265°F).
6. Install the pressure cap.
7. Operate the generator set until the thermostat opens. The thermostat is open when the upper radiator hose becomes hot.
8. Stop the engine and allow it to cool.
9. Remove the pressure cap.
10. Add coolant to the radiator until the coolant level is just below the overflow tube opening on the filler neck.
11. Install the pressure cap.
12. Replace the coolant in the coolant recovery tank. Fill the coolant recovery tank between the high and low markings on the tank.

Note: Check the coolant level as prescribed in Section 2.1, Prestart Checklist.

3.8 Belt Tension



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.

Check the belt tension at the intervals specified in the service schedule. If the tension is not within specification, adjust as necessary using the following procedure.

Battery Charging Alternator Belt Tensioning Procedure:

1. Stop the generator set.
2. Disconnect the generator set engine starting battery, negative (-) lead first.
3. Remove the belt guard.
4. Check the belt tension at the midpoint of the longest span of the belt using a belt-tensioning tool set to 74.6 Nm (55 ft. lb.). See Figure 3-9. Recheck new belt tension after 10 minutes of operation. If the belt is not within specifications, go to step 5. If the belt is within specifications, go to step 9.

5. Loosen the adjusting arm pivot screw, alternator pivot screw, and alternator adjusting screw.
6. Tighten the alternator screw while prying the alternator outward with a prybar.
7. Tighten the adjusting arm pivot screw and alternator pivot screw.
8. Recheck the belt tension and adjust it if necessary.
9. Replace the belt guard.
10. Reconnect the generator set engine starting battery, negative (-) lead last.

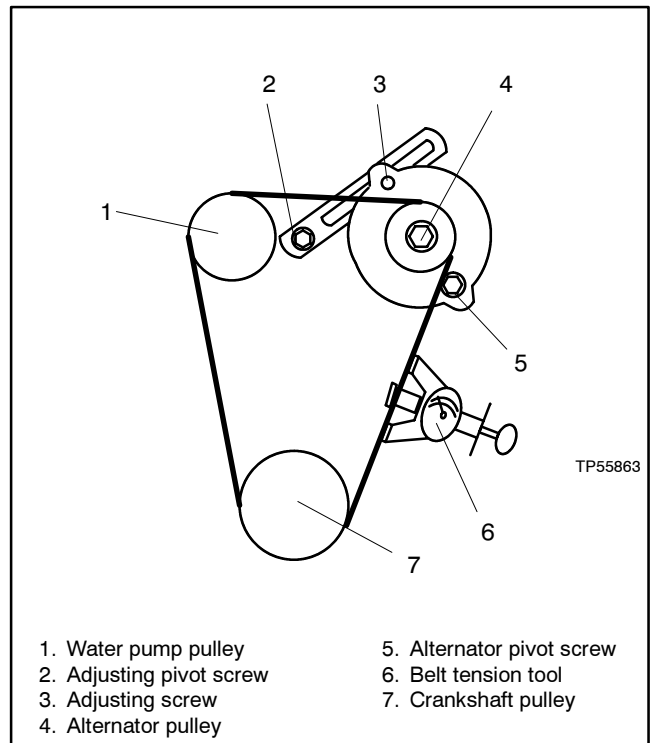


Figure 3-9 Belt Tension Test Location, Typical

3.9 Battery

Consult the battery manufacturer's instructions regarding battery care and maintenance.

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 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.

Perform battery storage after all other storage procedures.

Battery Storage Procedure:

1. Place the generator set start/stop switch in the STOP position.
2. Disconnect the battery(ies), negative (-) lead first.
3. Clean the battery. Consult the battery manufactures instructions.
4. Place the battery in a cool, dry location.
5. Connect the battery to a float/equalize battery charger or charge it monthly with a trickle battery charger. Refer to the battery charger manufacturer's recommendations.

Note: Maintain a full charge to extend battery life.

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3.10 Storage Procedure

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

Note: Run the generator set once monthly whenever possible.

3.10.1 Lubricating System

Prepare the engine lubricating system for storage as follows:

1. Run the generator set for a minimum of 30 minutes to bring it to normal operating temperature.
2. Stop the generator set.
3. Change the oil and oil filter. See Section 3.3.2.
4. Run the generator set for 30 minutes to distribute the clean oil.
5. Stop the generator set.

3.10.2 Cooling System

Prepare the cooling system for storage as follows:

1. Check the coolant freeze protection using a coolant tester.
2. Add or replace coolant as necessary to ensure adequate freezing protection. See Section 3.7.
3. Run the engine for 30 minutes to redistribute added coolant.
4. Stop the generator set.

3.10.3 Fuel System

Prepare the fuel system for storage as follows:

Diesel-Fueled Engines

1. Fill the fuel tank with #2 diesel fuel.
2. Condition the fuel system with compatible additives.
3. Change the fuel filter/separator and bleed the fuel system.

3.10.4 Exterior

1. Clean the exterior surface of the generator set.
2. Spread a light film of oil over unpainted metallic surfaces to prevent rust and corrosion.

Notes

Section 4 General Troubleshooting

This section contains generator set troubleshooting, diagnostic, and repair information.

Use the following chart to diagnose and correct common problems. First check for simple causes such as a dead engine starting battery or an open circuit breaker. The chart includes a list of common problems, possible causes of the problem, recommended corrective actions, and references to detailed information or repair procedures.

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

The following table groups generator set faults and suggests likely causes and remedies. The table also refers you to more detailed information including sections of this manual, the generator set service manual (S/M), the generator set installation manual (I/M), and the engine service manual (Engine S/M) to correct the indicated problem.

Notes

| Probable Causes | Trouble Symptoms | | | | | | | | | | | Section/ Publication Reference | Actions | | |
|-----------------|---|---|---------------------------|-----------------------------|------------------------------|---------------------------|-------------------------|------------------|-----------------------|-----------------------------|--|--------------------------------------|---------|--|---|
| | Generator set does not crank | Generator set cranks but does not start | Generator set starts hard | No or low generator voltage | Generator set stops suddenly | Generator set lacks power | Generator set overheats | Low oil pressure | High fuel consumption | Excessive or abnormal noise | | | | | |
| Engine | Air cleaner clogged | x | x | | | | | | | | | | | | Clean or replace. |
| | Engine overload | | | | | x | | | | x | | | | | Reduce electrical load. See the installation manual for wattage requirements. |
| | Compression weak | x | x | | | | | | | | | | | | Check the compression.* |
| | Exhaust system leak | | | | | | | | | | | | | | Inspect the exhaust system. Replace the inoperative exhaust system components.* |
| | Exhaust system not securely installed | | | | | | | | | | | | | | Inspect the exhaust system. Tighten the loose exhaust system components.* |
| | Governor inoperative | | | x | x | | | | | | | | | | Adjust the governor.* |
| Lube | Valve clearance incorrect | | | | | | | | | | | | | | Adjust the valves.* |
| | Excessive vibration | | | | | | | | | | | | | | Tighten all loose hardware. |
| | Incorrect crankcase oil type for ambient temperature | x | x | | | | | | | | | | | | Change the oil. Use oil with a viscosity suitable for the operating climate. |
| | Oil level low | | | | | | | | | | | | | | Restore the oil level. Inspect the generator set for oil leaks. |
| | Low oil pressure shutdown | x | | | | | | | | | | | | | Check the oil level. |
| | Battery connections loose, corroded, or incorrect | x | x | | | | | | | | | | | | Verify that the battery connections are correct, clean and tight. |
| Electrical | Battery weak or dead | x | x | | | | | | | | | | | | Recharge or replace the battery. |
| | Starter/starter solenoid inoperative | x | | x | | | | | | | | | | | Replace the starter or starter solenoid. |
| | Engine harness twist-lock connector not locked tight | x | | | | x | | | | | | | | | Disconnect the engine harness twist-lock connector then reconnect it to the controller. |
| | High water temperature switch inoperative | | | | | x | | | | | | | | | Replace the inoperative switch. |
| | Fault shutdown | | | | | x | | | | | | | | | Reset the fault switches and troubleshoot the controller. |
| | Voltage regulator inoperative or out of adjustment | | | | | x | | | | | | | | | Replace the voltage regulator fuse. Excite the main field separately.* |
| Control | Inoperative controller circuit board | x | x | | | | | | | | | | | | Replace the controller circuit board. |
| | Tripped controller circuit breaker | x | | | | | | | | | | | | | Reset the controller circuit breaker. |
| | Controller fault | | | | | | | | | | | | | | Troubleshoot the controller.* |
| | Blown controller fuse | x | x | | | | | | | | | | | | Replace the blown controller fuse. If the fuse blows again, troubleshoot the controller.* |
| | Inoperative controller start/stop switch | x | | | | | | | | | | | | | Replace the start/stop switch. |
| | Low coolant level | | | | | | | | | | | | | | Restore coolant to normal operating level. |
| Cooling | Inoperative cooling water pump | | | | | | | | | | | | | | Tighten or replace the belt. Replace the water pump. |
| | High temperature shutdown | | | | | | | | | | | | | | Allow the engine to cool down. Then troubleshoot the cooling system. |
| | Low coolant level shutdown, if equipped | | | | | | | | | | | | | | Restore coolant to normal operating level. |
| | Inoperative thermostat | | | | | | | | | | | | | | Replace the thermostat. |
| | Air in fuel system (diesel only) | | | | | | | | | | | | | | Bleed the diesel fuel system. |
| | Fuel tank empty or fuel valve shut off | | | | | | | | | | | | | | Add fuel and move the fuel valve to the ON position. |
| Fuel | Inoperative fuel feed or injection pump (diesel only) | x | x | | | | | | | | | | | | Rebuild or replace the injection pump.* |
| | Fuel or fuel injectors dirty or faulty (diesel only) | | | | | | | | | | | | | | Clean, test, and/or replace the inoperative fuel injector. |
| | Fuel filter restriction | | | | | | | | | | | | | | Clean or replace the fuel filter. |
| | Inoperative fuel solenoid | | | | | | | | | | | | | | Troubleshoot the fuel solenoid.* |
| | Fuel injection timing out of adjustment (diesel only) | | | | | | | | | | | | | | Adjust the fuel injection timing.* |
| | Open AC output circuit breaker | | | | | | | | | | | | | | Reset the breaker and check for AC voltage at the generator side of the circuit breaker. |
| Generator | Transfer switch main power contacts in the OFF position | x | | | | | | | | | | | | | Turn the switch to the auto position. |
| | Open wiring, terminals, or pin in the exciter field | | | | | | | | | | | | | | Check for continuity. |
| | Inoperative main field (rotor) (open or grounded) | | | | | | | | | | | | | | Test and/or replace the rotor.* |
| | Inoperative stator (open or grounded) | | | | | | | | | | | | | | Test and/or replace the stator.* |
| | Excessive vibration | | | | | | | | | | | | | | Tighten loose components.* |
| | | | | | | | | | | | | | | | |

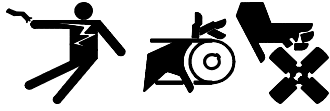
* Have authorized service distributor/dealer perform this service.

Figure 4-1 General Troubleshooting Chart

Notes

Section 5 Wiring Diagrams

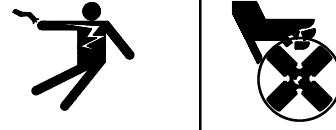
⚠ WARNING



**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.

⚠ WARNING



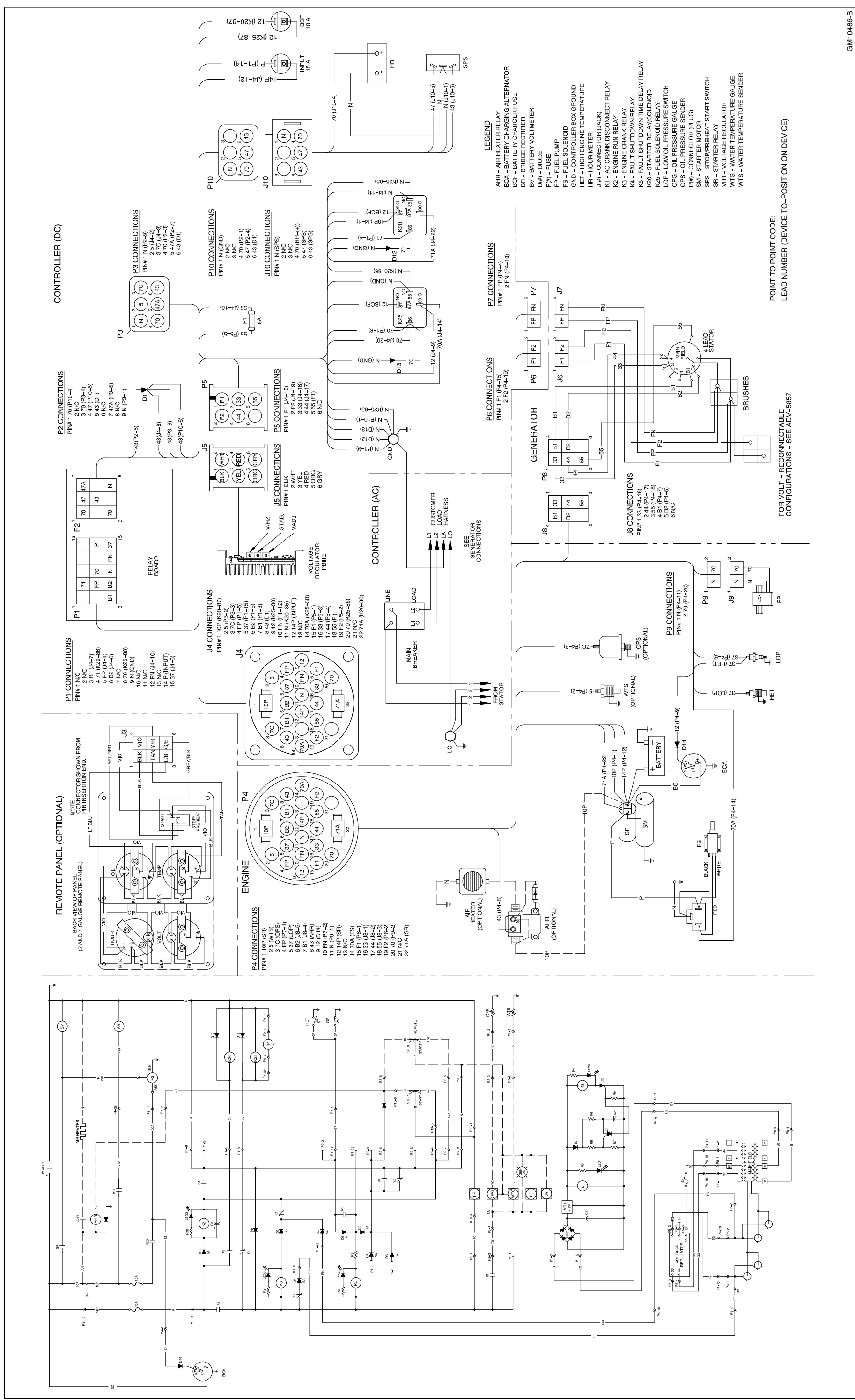
**Hazardous voltage. Moving rotor.
Can cause severe injury or death.**

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

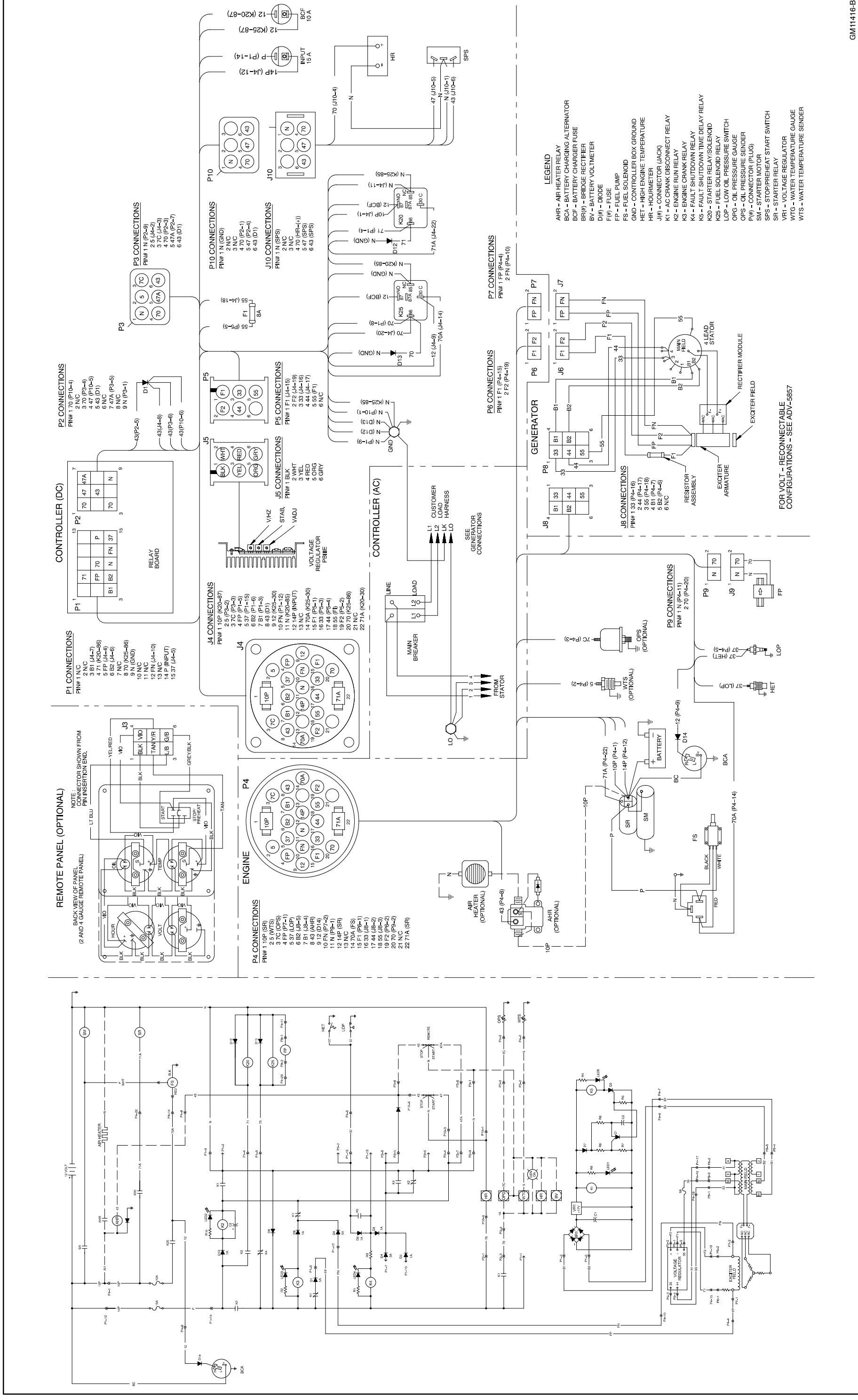
Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Disconnect the power to the battery charger, if equipped. (2) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

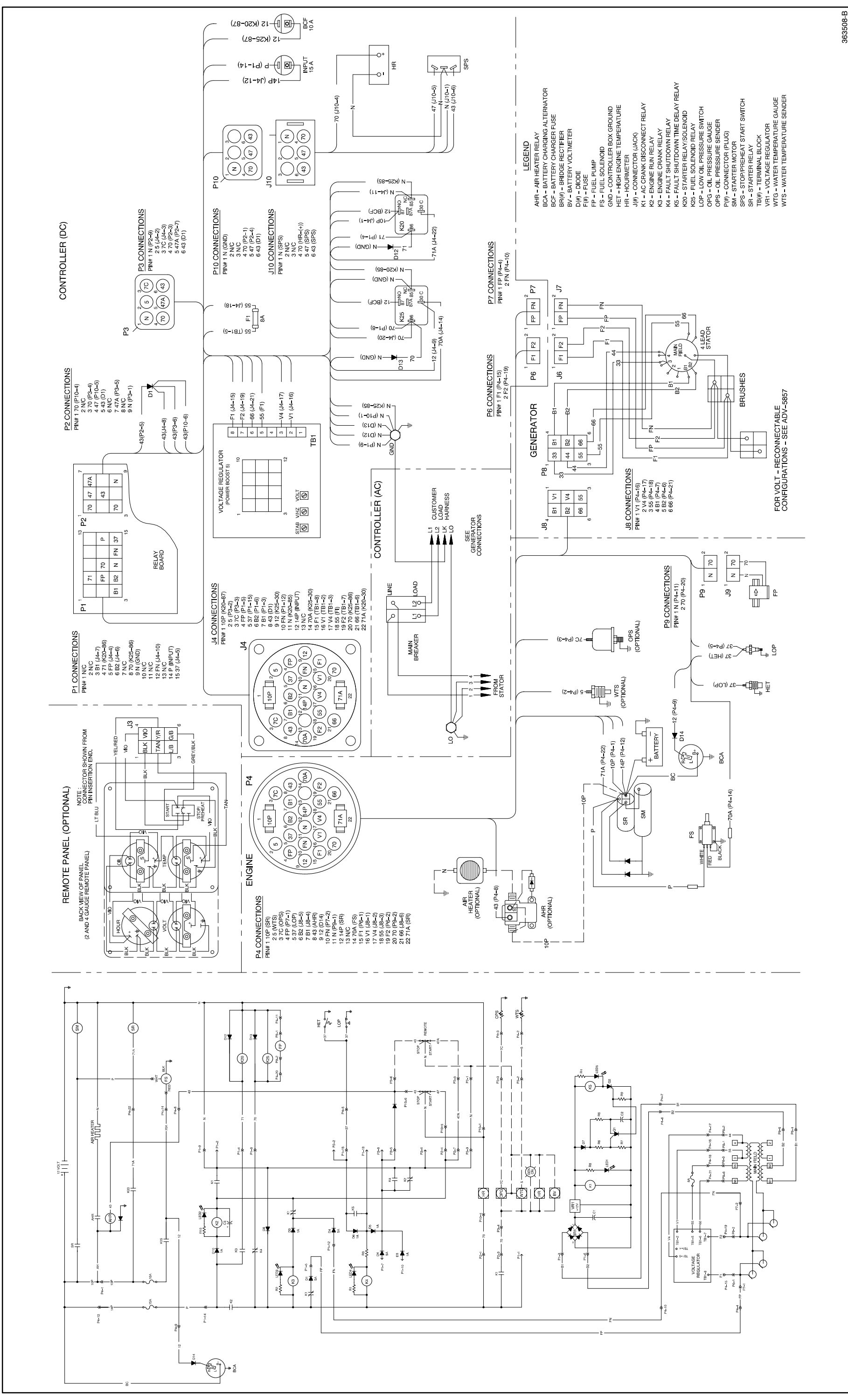
Notes

5.1 7.5/10EOR 1 Phase



5.2 7.5/10EORZ 1 Phase





Appendix A Abbreviations

The following list contains abbreviations that may appear in this publication.

| | | | | | |
|-----------|--|----------|--|----------------------|---|
| A, amp | ampere | cfm | cubic feet per minute | exh. | exhaust |
| ABDC | after bottom dead center | CG | center of gravity | ext. | external |
| AC | alternating current | CID | cubic inch displacement | F | Fahrenheit, female |
| A/D | analog to digital | CL | centerline | fglass. | fiberglass |
| ADC | analog to digital converter | cm | centimeter | FHM | flat head machine (screw) |
| adj. | adjust, adjustment | cmm | cubic meters per minute | fl. oz. | fluid ounce |
| ADV | advertising dimensional drawing | CMOS | complementary metal oxide substrate (semiconductor) | flex. | flexible |
| AHWT | anticipatory high water temperature | cogen. | cogeneration | freq. | frequency |
| AISI | American Iron and Steel Institute | COM | communications (port) | FS | full scale |
| ALOP | anticipatory low oil pressure | conn. | connection | ft. | foot, feet |
| alt. | alternator | cont. | continued | ft. lbs. | foot pounds (torque) |
| Al | aluminum | CPVC | chlorinated polyvinyl chloride | ft./min. | feet per minute |
| ANSI | American National Standards Institute (formerly American Standards Association, ASA) | crit. | critical | g | gram |
| AO | anticipatory only | CRT | cathode ray tube | ga. | gauge (meters, wire size) |
| API | American Petroleum Institute | CSA | Canadian Standards Association | gal. | gallon |
| approx. | approximate, approximately | CT | current transformer | gen. | generator |
| AR | as required, as requested | Cu | copper | genset | generator set |
| AS | as supplied, as stated, as suggested | cu. in. | cubic inch | GFI | ground fault interrupter |
| ASE | American Society of Engineers | cw. | clockwise | gnd. | ground |
| ASME | American Society of Mechanical Engineers | CWC | city water-cooled | gov. | governor |
| assy. | assembly | cyl. | cylinder | gph | gallons per hour |
| ASTM | American Society for Testing Materials | D/A | digital to analog | gpm | gallons per minute |
| ATDC | after top dead center | DAC | digital to analog converter | gr. | grade, gross |
| ATS | automatic transfer switch | dB | decibel | gr. wt. | gross weight |
| auto. | automatic | dBA | decibel (A weighted) | H x W x D | height by width by depth |
| aux. | auxiliary | DC | direct current | HC | hex cap |
| A/V | audio/visual | DCR | direct current resistance | HCHT | high cylinder head temperature |
| avg. | average | deg., ° | degree | HD | heavy duty |
| AVR | automatic voltage regulator | dept. | department | HET | high exhaust temperature |
| AWG | American Wire Gauge | dia. | diameter | hex | hexagon |
| AWM | appliance wiring material | DI/EO | dual inlet/end outlet | Hg | mercury (element) |
| bat. | battery | DIN | Deutsches Institut für Normung e. V. (also Deutsche Industrie Normenausschuss) | HH | hex head |
| BBDC | before bottom dead center | DIP | dual inline package | HHC | hex head cap |
| BC | battery charger, battery charging | DPDT | double-pole, double-throw | HP | horsepower |
| BCA | battery charging alternator | DPST | double-pole, single-throw | hr. | hour |
| BCI | Battery Council International | DS | disconnect switch | HS | heat shrink |
| BDC | before dead center | DVR | digital voltage regulator | hsg. | housing |
| BHP | brake horsepower | E, emer. | emergency (power source) | HVAC | heating, ventilation, and air conditioning |
| blk. | black (paint color), block (engine) | EDI | electronic data interchange | HWT | high water temperature |
| blk. htr. | block heater | EFR | emergency frequency relay | Hz | hertz (cycles per second) |
| BMEP | brake mean effective pressure | e.g. | for example (<i>exempli gratia</i>) | IC | integrated circuit |
| bps | bits per second | EG | electronic governor | ID | inside diameter, identification |
| br. | brass | EGSA | Electrical Generating Systems Association | IEC | International Electrotechnical Commission |
| BTDC | before top dead center | EIA | Electronic Industries Association | IEEE | Institute of Electrical and Electronics Engineers |
| Btu | British thermal unit | EI/EO | end inlet/end outlet | IMS | improved motor starting |
| Btu/min. | British thermal units per minute | EMI | electromagnetic interference | in. | inch |
| C | Celsius, centigrade | emiss. | emission | in. H ₂ O | inches of water |
| cal. | calorie | eng. | engine | in. Hg | inches of mercury |
| CARB | California Air Resources Board | EPA | Environmental Protection Agency | in. lbs. | inch pounds |
| CB | circuit breaker | EPS | emergency power system | Inc. | incorporated |
| cc | cubic centimeter | ER | emergency relay | ind. | industrial |
| CCA | cold cranking amps | ES | engineering special, engineered special | int. | internal |
| ccw. | counterclockwise | ESD | electrostatic discharge | int./ext. | internal/external |
| CEC | Canadian Electrical Code | est. | estimated | I/O | input/output |
| cfh | cubic feet per hour | E-Stop | emergency stop | IP | iron pipe |
| | | etc. | et cetera (and so forth) | ISO | International Organization for Standardization |
| | | | | J | joule |
| | | | | JIS | Japanese Industry Standard |
| | | | | k | kilo (1000) |
| | | | | K | kelvin |

| | | | | | |
|----------------------|--|-----------|---|-------------|---|
| kA | kiloampere | mtg. | mounting | rms | root mean square |
| KB | kilobyte (2 ¹⁰ bytes) | MW | megawatt | rnd. | round |
| kg | kilogram | mW | milliwatt | ROM | read only memory |
| kg/cm ² | kilograms per square centimeter | μF | microfarad | rot. | rotate, rotating |
| kgm | kilogram-meter | N, norm. | normal (power source) | rpm | revolutions per minute |
| kg/m ³ | kilograms per cubic meter | NA | not available, not applicable | RS | right side |
| kHz | kilohertz | nat. gas | natural gas | RTV | room temperature vulcanization |
| kJ | kilojoule | NBS | National Bureau of Standards | SAE | Society of Automotive Engineers |
| km | kilometer | NC | normally closed | scfm | standard cubic feet per minute |
| kOhm, kΩ | kilo-ohm | NEC | National Electrical Code | SCR | silicon controlled rectifier |
| kPa | kilopascal | NEMA | National Electrical Manufacturers Association | s, sec. | second |
| kph | kilometers per hour | NFPA | National Fire Protection Association | SI | <i>Système international d'unites</i> , International System of Units |
| kV | kilovolt | Nm | newton meter | SI/EO | side in/end out |
| kVA | kilovolt ampere | NO | normally open | sil. | silencer |
| kVAR | kilovolt ampere reactive | no., nos. | number, numbers | SN | serial number |
| kW | kilowatt | NPS | National Pipe, Straight | SPDT | single-pole, double-throw |
| kWh | kilowatt-hour | NPSC | National Pipe, Straight-coupling | SPST | single-pole, single-throw |
| kWm | kilowatt mechanical | NPT | National Standard taper pipe thread per general use | spec, specs | specification(s) |
| L | liter | NPTF | National Pipe, Taper-Fine | sq. | square |
| LAN | local area network | NR | not required, normal relay | sq. cm | square centimeter |
| L x W x H | length by width by height | ns | nanosecond | sq. in. | square inch |
| lb. | pound | O/C | overcrank | SS | stainless steel |
| lbm/ft ³ | pounds mass per cubic feet | OD | outside diameter | std. | standard |
| LCB | line circuit breaker | OEM | original equipment manufacturer | stl. | steel |
| LCD | liquid crystal display | O/F | overfrequency | tach. | tachometer |
| ld. shd. | load shed | opt. | option, optional | TD | time delay |
| LED | light emitting diode | O/S | oversize, overspeed | TDC | top dead center |
| Lph | liters per hour | OSHA | Occupational Safety and Health Administration | TDEC | time delay engine cooldown |
| Lpm | liters per minute | O/V | overvoltage | TDEN | time delay emergency to normal |
| LOP | low oil pressure | oz. | ounce | TDES | time delay engine start |
| LP | liquefied petroleum | p., pp. | page, pages | TDNE | time delay normal to emergency |
| LPG | liquefied petroleum gas | PA | packed accessory | TDOE | time delay off to emergency |
| LS | left side | PC | personal computer | TDON | time delay off to normal |
| L _{wa} | sound power level, A weighted | PCB | printed circuit board | temp. | temperature |
| LWL | low water level | pF | picofarad | term. | terminal |
| LWT | low water temperature | PF | power factor | TIF | telephone influence factor |
| m | meter, milli (1/1000) | ph. | phase | TIR | total indicator reading |
| M | mega (10 ⁶ when used with SI units), male | PHC | Phillips head crimplite (screw) | tol. | tolerance |
| m ³ | cubic meter | PHH | Phillips hex head (screw) | turbo. | turbocharger |
| m ³ /min. | cubic meters per minute | PHM | pan head machine (screw) | typ. | typical (same in multiple locations) |
| mA | milliampere | PLC | programmable logic control | U/F | underfrequency |
| man. | manual | PMG | permanent magnet generator | UHF | ultrahigh frequency |
| max. | maximum | pot | potentiometer, potential | UL | Underwriter's Laboratories, Inc. |
| MB | megabyte (2 ²⁰ bytes) | ppm | parts per million | UNC | unified coarse thread (was NC) |
| MCM | one thousand circular mils | PROM | programmable read only memory | UNF | unified fine thread (was NF) |
| meggar | megohmmeter | psi | pounds per square inch | univ. | universal |
| MHz | megahertz | pt. | pint | U/S | undersize, underspeed |
| mi. | mile | PTC | positive temperature coefficient | UV | ultraviolet |
| mil | one one-thousandth of an inch | PTO | power takeoff | U/V | undervoltage |
| min. | minimum, minute | PVC | polyvinyl chloride | V | volt |
| misc. | miscellaneous | qt. | quart | VAC | volts alternating current |
| MJ | megajoule | qty. | quantity | VAR | voltampere reactive |
| mJ | millijoule | R | replacement (emergency) power source | VDC | volts direct current |
| mm | millimeter | rad. | radiator, radius | VFD | vacuum fluorescent display |
| mOhm, mΩ | milliohm | RAM | random access memory | VGA | video graphics adapter |
| MOhm, MΩ | megohm | RDO | relay driver output | VHF | very high frequency |
| MOV | metal oxide varistor | ref. | reference | W | watt |
| MPa | megapascal | rem. | remote | WCR | withstand and closing rating |
| mpg | miles per gallon | RFI | radio frequency interference | w/ | with |
| mph | miles per hour | RH | round head | w/o | without |
| MS | military standard | RHM | round head machine (screw) | wt. | weight |
| m/sec. | meters per second | rly. | relay | xfmr | transformer |
| MTBF | mean time between failure | | | | |
| MTBO | mean time between overhauls | | | | |

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