

Operation and Installation

Mobile Generator Sets



Models:

7CC061

ISO 9001
KOHLER
GENERATORS
INTERNATIONALLY REGISTERED

KOHLER[®]
POWER SYSTEMS

TP-5821 10/96a

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

A generator set, like any other electromechanical device, can pose potential dangers to life and limb if improperly maintained or operated. The best way to prevent accidents is to be aware of potential dangers and act safely. Please read and follow the safety precautions and instructions below to prevent harm to yourself and others. This manual contains several types of safety precautions and instructions which are explained below. **SAVE THESE INSTRUCTIONS.**

Safety decals affixed to the generator set in prominent places advise the operator or service technician of potential hazards and how to act safely. The decals are reproduced in this publication to improve operator recognition. Replace missing or damaged decals.

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 important but not hazard related.

Accidental Starting



Accidental starting.
Can cause severe injury or death.

Disconnect battery cables before working on generator set (disconnect negative lead first and reconnect it last).

Disabling generator set. Accidental starting can cause severe injury or death. Disconnect battery cables (remove negative lead first and reconnect it last) to disable generator set before working on the generator set or connected equipment. The generator set can be started by the remote start/stop switch unless this precaution is followed.

Battery



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

Use protective goggles and clothes. Battery acid can cause permanent damage to eyes, burn skin, and eat holes in clothing.

Battery acid. Sulfuric acid in batteries can cause severe injury or death. Sulfuric acid in battery can cause permanent damage to eyes, burn skin, and eat holes in clothing. Always wear splash-proof safety goggles when working near the battery. If battery acid is splashed in the eyes or on 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 flame or spark to occur near a battery at any time, particularly when it is charging. Avoid touching terminals with tools, etc., to prevent burns and sparks that could cause an explosion. Remove wristwatch, rings, and any other jewelry before handling battery. Never connect negative (-) battery cable to positive (+) connection terminal of starter solenoid. Do not test battery condition by shorting terminals together. Sparks could ignite battery gases or fuel vapors. Ventilate any compartment containing batteries to prevent accumulation of explosive gases. To avoid sparks, do not disturb battery charger connections while battery is being charged. Always turn battery charger off before disconnecting battery connections. Remove negative lead first and reconnect it last when disconnecting battery.

Engine Backfire/Flash Fire




Fire.
Can cause severe injury or death.

Do not smoke or permit flame or spark to occur near fuel or fuel system.

Servicing fuel system. A flash fire can cause severe injury or death. Do not smoke or permit flame or spark to occur near carburetor, fuel line, fuel filter, fuel pump, or other potential sources of spilled fuel or fuel vapors. Catch all fuel in a suitable container when removing fuel line or carburetor.

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

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. Never operate the generator set inside a building unless the exhaust gas is piped safely outside. Never operate in any area where exhaust gas could accumulate and seep back inside a potentially occupied building or vehicle. Be careful when parking your vehicle to avoid obstructing the exhaust outlet. The exhaust gases must discharge freely to prevent carbon monoxide from deflecting into the vehicle. Avoid breathing exhaust fumes when working on or near the generator set. Carbon monoxide is particularly dangerous because it is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short period of time.

Carbon monoxide symptoms. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is a poisonous gas which is 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, affected persons should seek fresh air immediately. They should remain active. They should not sit, lie down, or fall asleep. Alert others to the possibility of carbon monoxide poisoning. If the condition of affected persons does not improve within minutes of breathing fresh air, they should seek medical attention.

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 exhaust tail pipe. Carbon monoxide can cause severe nausea, fainting, or death. Install exhaust system tail pipe so discharged exhaust gases will not be drawn into vehicle interior through windows, doors, air conditioners, etc. Do not use flexible tail piping because it could crack and allow lethal exhaust fumes to enter the vehicle.

Inspecting exhaust system. Carbon monoxide can cause severe nausea, fainting, or death. In addition to routine exhaust system inspection, install a carbon monoxide detector. Consult your coach builder or dealer for approved detector installation. Inspect your detector before each generator set use.

Fuel System

WARNING



Explosive fuel vapors.
Can cause severe injury or death.

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

Fuel system. Explosive fuel vapors can cause severe injury or death. All fuels are highly explosive in a vapor state. Use extreme care when handling and storing fuels. Store fuel 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 since spilled fuel may ignite on contact with hot parts or from ignition spark. Do not smoke or permit flame or spark to occur near sources of spilled fuel or fuel vapors. Keep fuel lines and connections tight and in good condition. Do not replace flexible fuel lines with rigid lines. Use flexible sections to avoid breakage caused by vibration. Do not operate generator set in the presence of fuel leaks, fuel accumulation, or sparks. Repair systems before resuming generator set operation

Draining 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 fuel system. Wipe up all spilled fuel after draining system.

Hazardous Noise




CAUTION





Hazardous noise.
Can cause loss of hearing.

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

Hazardous Voltage/ Electrical Shock

 WARNING	
	
<p>Hazardous voltage. Can cause severe injury or death.</p> <p>Operate generator set only with all guards and electrical enclosures in place.</p>	<p>Moving rotor.</p>

 WARNING

<p>Hazardous voltage. Backfeed to utility system can cause severe injury, death, or property damage.</p> <p>Connect generator set to building electrical system only through an approved device and after building main switch is open.</p>

Grounding generator set. Hazardous voltage can cause severe injury or death. Electrocutation is possible whenever electricity is present. Open main circuit breakers of all power sources before servicing equipment. Configure the installation to electrically ground the generator set and electrical circuits when in use. Never contact electrical leads or appliances when standing in water or on wet ground, as the chance of electrocution is increased under such conditions.

Short circuits. Hazardous voltage 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 adjustments are made. Remove wristwatch, rings, and jewelry before servicing equipment.



Testing voltage regulator. Hazardous voltage can cause severe injury or death. High voltage is present at the voltage regulator heat sink. Do not touch voltage regulator heat sink when testing or electrical shock will occur.

(PowerBoost™, PowerBoost™ III, and PowerBoost™ V voltage regulator models only.)



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


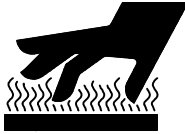
Electrical backfeed to utility. Hazardous backfeed voltage can cause severe injury or death. Connect generator set to building/campground electrical system only through an approved device and after building/campground main switch is open. Backfeed connections can cause serious injury or death to utility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

Heavy Equipment

 WARNING

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

Hot Parts

 WARNING

<p>Hot coolant and steam. Can cause severe injury or death.</p> <p>Before removing pressure cap, stop generator set and allow it to cool. Then loosen 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 generator set until it is allowed to cool.</p>



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

Servicing exhaust system. Hot parts can cause severe injury or death. Do not touch hot engine parts. An engine becomes hot while running and exhaust system components become extremely hot.

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

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

Moving Parts

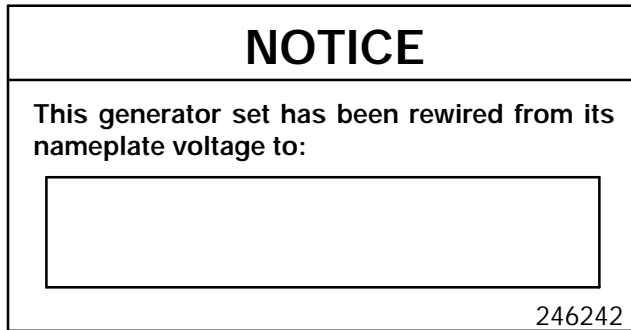
⚠ WARNING	
	
Hazardous voltage. Can cause severe injury or death.	Moving rotor.
Operate generator set only with all guards and electrical enclosures in place.	

⚠ WARNING	
	
Rotating parts. Can cause severe injury or death.	
Do not operate generator set without all guards, screens, and covers in place.	

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

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

Notice



NOTICE

Voltage reconnection! Affix notice to generator set after reconnecting to a voltage different than the nameplate. Order voltage reconnection decal 246242 from authorized service distributors/dealers.

NOTICE

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

NOTICE

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

NOTICE

Canadian installations only:

For standby service connect output of 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 (U.S.C.G.) requirements and must not be used for marine applications. Use only generator sets specified for marine use in marine installations. U.S.C.G. Regulation 33CFR183 requires a generator set to be ignition protected when used in a gasoline-fueled environment.

Introduction

All information in this publication represents data available at time of printing. 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.

Service Assistance

For sales and service in the U.S.A. and Canada, check the yellow pages of the telephone directory under the heading GENERATORS– ELECTRIC for an authorized service distributor/dealer or call 1-800-544-2444.

For sales and service outside the U.S.A. and Canada, contact your local distributor.

For further information or questions, contact the company directly at the following address or number:

KOHLER CO., Kohler, Wisconsin 53044 U.S.A.
Phone: 414-565-3381
Fax: 414-459-1646 (U.S.A. Sales)
414-459-1614 (International)

To ensure supply of correct parts or information, make note of the following identification numbers in the spaces provided:

GENERATOR SET

MODEL, SPEC, and SERIAL numbers are found on the nameplate attached to the generator set.

Model No. _____

Specification No. _____

Serial No. _____

GENERATOR SET ACCESSORIES

An alternate nameplate inside the junction box identifies factory-installed generator set accessories.

Accessory Nos. _____

ENGINE

The engine serial number is found on the engine nameplate.

Engine Serial No. _____

Routine Service Parts

Your Kohler generator distributor/dealer has a complete listing of parts for your generator set. Contact your distributor/dealer for service.

Part Description	Kohler Part No.
Air cleaner element	258577
Oil filter	322422
Metal-type fuel filter element	322536
Plastic-type fuel filter (supplied loose)	322056
Alternator V-belt	322456
Black spray paint	221292

Section 1. Specifications

General Specifications

	7CCO61 (In-line Radiator with Suction Fan)
Dimensions: Length x Width x Height– in. (mm)	34.68 (881) x 18.68 (475) x 25.96 (659)
Weight– lbs. (kg)	482 (219)
Air Requirements:	
Combustion– cfm (m ³ /min.)	25 (0.71)
Cooling– cfm	1050 (29.7)
Fuel Inlet Size– in. (mm)	5/16 (8)
Fuel Return Size– in. (mm)	3/16 (5)

Fuel Consumption	Diesel– gph (Lph)			
Load	25%	50%	75%	100%
7CCO61	0.34 (1.3)	0.44 (1.7)	0.57 (2.2)	0.79 (3.0)

DERATION: All units are rated 1.0 power factor. The kilowatts of the generator set will decrease 3.5% for each 1,000 feet (305 meters) above 500 feet (152 meters) above sea level and 1% for each 10°F (5.5°C) above 85°F (30°C).

Engine

The chart below includes some general engine specifications. Refer to the appropriate service section and the engine service manual for specific service details.

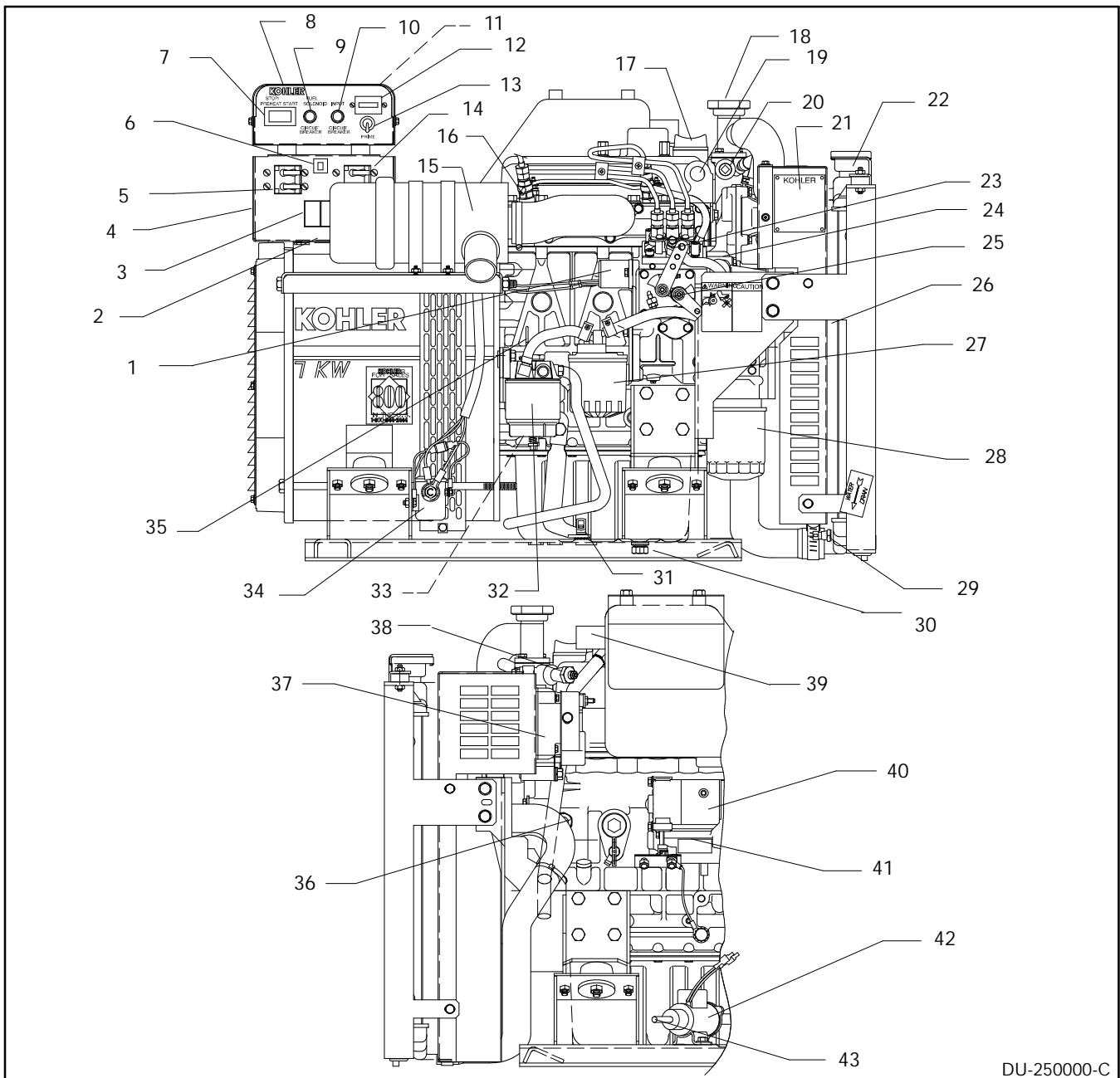
	7CC061
Manufacturer	Kubota
Model	D905BG-2
Type	Water-cooled, 4-cycle diesel engine
Number Cylinders	3
Firing Order	1-2-3
Compression Ratio	22:1
Displacement– cu.in. (cu. cm.)	54.86 (898)
Rated Horsepower (60 Hz)	12.6
RPM (60 Hz)	1800
Bore– in. (mm)	2.83 (72)
Stroke– in. (mm)	2.90 (73.6)
Combustion System	Indirect injection
Valve Clearance (cold)– in. (mm)	0.0057-0.0072 (0.145-0.185)
Cylinder Block Material	Cast iron
Cylinder Head Tightening Torque– ft. lbs (Nm)	47.0-50.6 (63.7-68.6)
Cylinder Head Material	Cast iron
Connecting Rod	Forged carbon steel
Piston Rings	2 compression/1 oil
Main Bearings	Replaceable sleeve
Governor	Mechanical
Lubrication System	Pressure
Oil Capacity (with filter)– qts. (L)	5.4 (5.1)
Oil Type (API)	MIL-L-2104C, or API classification CC, CD, or CE
Oil Pressure– psi (kPa)	25-64 (172-441)
Fuel Recommendation	Diesel fuel no. 2-D (ASTM D975)
Alternative Fuel Types*	JP8, Jet A, Jet A1, DF No. 1, JP5
Fuel Injection Pump	Bosch MD
Battery Voltage	12
Battery Ground	Negative
Battery Recommendation (min.)	800 cold cranking amps
Starter Motor	Gear-reduction type
Cooling System	Liquid (unit mounted radiator)
Cooling System Capacity– qts. (L)	2.44 (2.3)
Air Cleaner	Dry paper element
Cold Weather Starting Aids	Glow plugs
Air Restriction Limit:	
Initial– in. (mm) of water	7.9 (200)
After Use– in. (mm) of water	19.7 (500)
Back Pressure Limit (maximum)– in. (mm) of water at 1800 RPM	21.4 (544)

* Combined power loss may be as high as 15% from published H.P. curves.

Generator

	7CC061 (Single Phase)
Rated kW	7.0
Frequency– Hz	60
Rated Voltage	120/240 volt, 3 wire, single phase
Rated Amps (120/240 Volt)	29.2
Stator Resistance (ohms)** Leads:	
1-2, 3-4, 33-44	0.13
55-33	1.60
B1-B2	0.08
Rotor Resistance (ohms)**	3.9
Excitation Method	Static brush type
Overbolt Torque– ft. lbs. (in. lbs.)	25 (300)
Voltage Regulator Type	PowerBoostä IIIE
Voltage Regulation	±2%
Frequency Regulation	±5%
Insulation (Rotor and Stator)	Class 155, epoxy varnish, vacuum impregnated
Winding Material	Copper
Bearing (Number and Type)	1, replaceable ball
Circuit Protection:	
Controller	10-amp circuit breaker
AC Output	(2) 30-amp 2-pole circuit breakers
Voltage Regulator	10-amp circuit breaker
Fuel Solenoid	10-amp circuit breaker
Customer-Supplied Receptacles (Ground Fault Circuit Interrupter)	30-amp circuit breaker

** Most ohmmeters will not give accurate readings when measuring less than 1 ohm. The stator can be considered good if a low resistance reading (continuity) is obtained and there is no evidence of shorted windings (discoloration). Do not confuse a low resistance reading with a reading indicating a shorted winding.



DU-25000-C

- | | |
|---|--|
| 1. Fuel solenoid | 23. Fuel injection pump |
| 2. Voltage regulator (inside junction box) | 24. Oil fill |
| 3. Circuit breaker #3 (for customer-supplied receptacles) | 25. Mechanical governor |
| 4. Junction box | 26. In-line radiator |
| 5. Circuit breaker #1 (main) | 27. Fuel filter |
| 6. Voltage regulator circuit breaker | 28. Oil filter |
| 7. Start/stop-preheat switch | 29. Coolant drain |
| 8. Controller | 30. Oil drain |
| 9. Fuel solenoid circuit breaker | 31. Ground connection |
| 10. Input circuit breaker | 32. Fuel/water separator |
| 11. Remote connection (at rear of controller) | 33. Negative battery connection (far side) |
| 12. Hourmeter | 34. Glow plug relay |
| 13. Fuel prime switch | 35. Oil check |
| 14. Circuit breaker #2 (customer-supplied lights) | 36. Low oil pressure sender and switch |
| 15. Air cleaner | 37. Battery charging alternator (behind guard) |
| 16. Fuel return connection point | 38. High water temperature sender |
| 17. Oil fill | 39. Exhaust outlet |
| 18. Coolant fill | 40. Starter |
| 19. Lifting eye | 41. Positive battery connection |
| 20. High water temperature switch | 42. Fuel pump (located on non-service side) |
| 21. Generator nameplate | 43. Fuel inlet connection point |
| 22. Pressure cap at radiator | |

Figure 1-1. Service View of 7CC061

Section 2. Operation

To ensure continued satisfactory operation, check the following items before each startup and at regular intervals.

Prestart Checklist

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

Air Inlets. Keep clean and unobstructed.

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

Coolant Level. For cooling systems equipped with a coolant recovery tank, check coolant level at tank after the engine has cooled.

Do not add coolant to a hot engine. Wait until engine has cooled. Adding coolant to a hot engine can cause the cylinder block or cylinder head to crack.

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

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

Fuel Level. Keep tank(s) full to ensure adequate fuel supply.

Oil Level. Maintain oil level at or near full but not over.

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.

Exercising the Generator

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

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.

Relay Controller

Depending on application, locate the Kohler relay controller at the set or at a location remote from the generator. Kohler Co. offers remote harnesses for the controller in 7.5- and 15-foot (2.3- and 4.6-meter) lengths. If the generator set has automatically stopped due to high water temperature (230° F/110° C) or low oil pressure (7 psi/48.3 kPa or less), correct the cause before restarting the set.

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

1. **Generator Start/Stop-Preheat Switch** serves the dual function of generator operation and generator preheat. When pressed to the preheat position, the preheat switch aids in cold-weather starting. Refer to Start/Stop and Preheating procedures following.
2. **Fuel Solenoid Circuit Breaker (10 amp)** protects the fuel solenoid circuitry.
3. **Controller Circuit Breaker (10 amp)** protects the controller circuitry against damage if a short develops in the engine wiring system or the wiring to the remote start/stop switch.
4. **Remote Switch Connection** (located at rear of controller). Connect the remote start/stop switch to

operate the generator set at a location remote from the set. Make controller connections through the plug connector at the rear of the unit.

5. **Hourmeter** records total generator set operating hours for reference in service schedule.
6. **Prime Switch** turns on electric fuel pump.

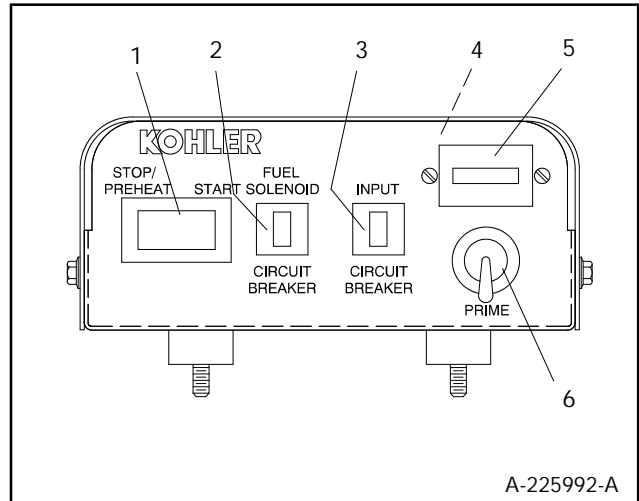
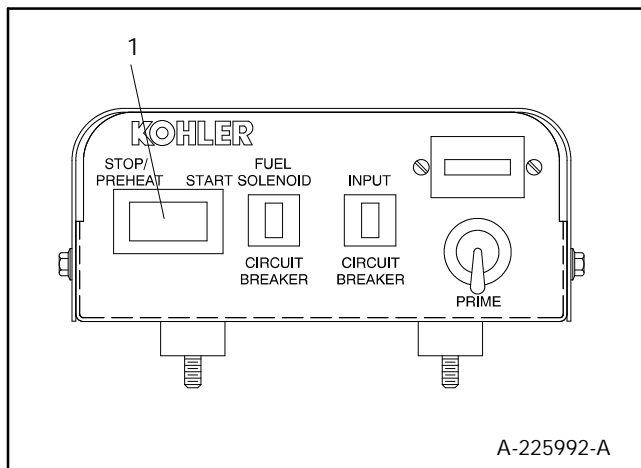


Figure 2-1. Controller

Starting Procedure

The generator includes a preheat feature. Place controller start switch in stop-preheat position for the amount of time shown in Figure 2-3 before attempting to start the generator set. This provides energizing of the glow plugs. Do not energize preheat feature for more than 20 seconds or damage may occur. See Figure 2-2 for location. Move the start/stop switch into the start position and hold in this position until the engine is running; then release. 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 service distributor/dealer for repair. Failure to follow these guidelines may result in damage to the starter motor.



1. Preheat switch

Figure 2-2. Preheat Switch Location

Ambient Temperature	Preheating Time
Above 23°F (-5°C)	Approx. 5 Seconds
Below 23°F (-5°C)	Approx. 10 Seconds
Limit of Continuous Use	20 Seconds

Figure 2-3. Preheating Time

NOTE

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.

See Figure 2-4 for cold-start procedure.

-25°F (-32°C) Cold Starting Procedure	
Preheat Time	20 Seconds
Crank Time	15 Seconds
Repeat preheat and crank cycle if necessary	

Note: Use arctic engine oil and fuel per engine manufacturer's recommendation. Do not operate the unit at elevated temperatures when using arctic oil and fuel.

Figure 2-4. Cold Starting Procedure

NOTE

Severe engine damage may occur on indirect fuel-injected engine if using ether or any other starting fluid to assist in starting the unit under cold conditions.

Stopping Procedure

Whenever possible, allow a brief cooling period by running the set at low or no load for a few minutes just prior to shutdown. To stop, push the switch into the stop-preheat position. If the generator set shuts down automatically, identify and correct the problem before attempting to restart.

NOTE

Do not place start/stop-preheat switch in stop-preheat position for more than 20 seconds or damage may occur to the preheat feature.

Coolant System Filling

The low-profile coolant system of the 7CCO61-Mobile generator set provides a compact design but requires a coolant recovery system to ensure that the system remains full of coolant. Also, fill the cooling system with fluid before placing the unit into service.

Because of the configuration of the system and its extremely low profile, fill the system with coolant *very slowly* to allow air to escape fully from the radiator and the engine block. After filling the coolant system, some air may still remain trapped in the system. Often, after starting the unit and running for approximately 10 to 15 minutes after filling, a shutdown may occur or the unit may continue to run but will not start at the next attempt. If either of these conditions occur, the shutdown may occur because of low coolant level in the radiator. As a remedy for this, add one to two cups of coolant to the radiator. Ensure connection of the coolant recovery tank to the system, as it is an integral and required part of the cooling system. Once the unit has been refilled after the initial fill, the coolant recovery system will replace the last small amounts of air, which remain trapped in the cooling system, with coolant.

Often, when troubleshooting the unit, many customers overlook the low coolant level and the low fuel level as possible causes for a shutdown. Any time a unit shuts down and customers cannot find any other cause, check for a low fuel or low coolant level condition. On a hot unit, remove the radiator pressure cap from the engine very slowly to release hot coolant into the coolant recovery tank.



WARNING



**Hot coolant and steam.
Can cause severe injury or death.**

Before removing pressure cap, stop generator set and allow it to cool. Then loosen pressure cap to relieve pressure.

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

At the scheduled maintenance intervals, check the coolant while cold at the coolant recovery tank, as well as at the pressure cap prior to starting the unit for its maintenance. Add coolant at the pressure cap if it is not completely full. Add coolant to the recovery tank to bring the level up to the appropriate mark.

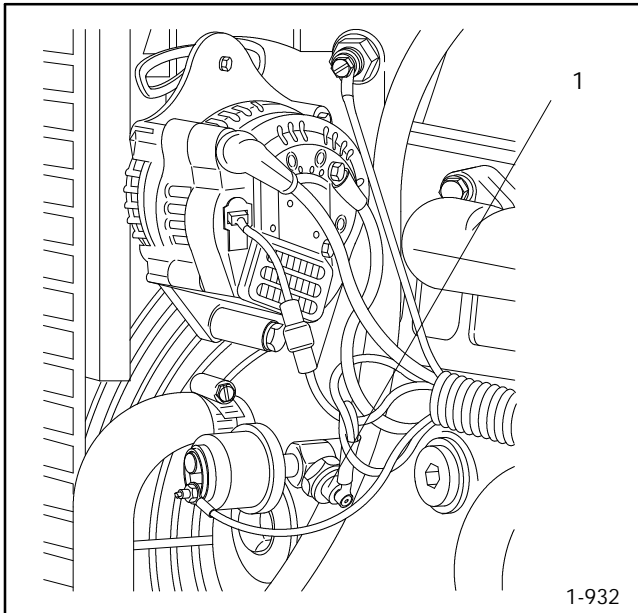
Fault Shutdowns

Low Oil Pressure Shutdown Switch

The low oil pressure (LOP) shutdown feature protects the engine against internal damage if the oil pressure drops below 7 psi (48.3 kPa) due to an oil pump fault or other engine malfunction. The LOP shutdown does not protect the set from damage due to 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. Figure 2-5 shows the LOP shutdown switch.

NOTE

This is not a low oil *level* shutdown. Maintain correct oil level for the low oil pressure shutdown switch to function.



1. Low oil pressure switch

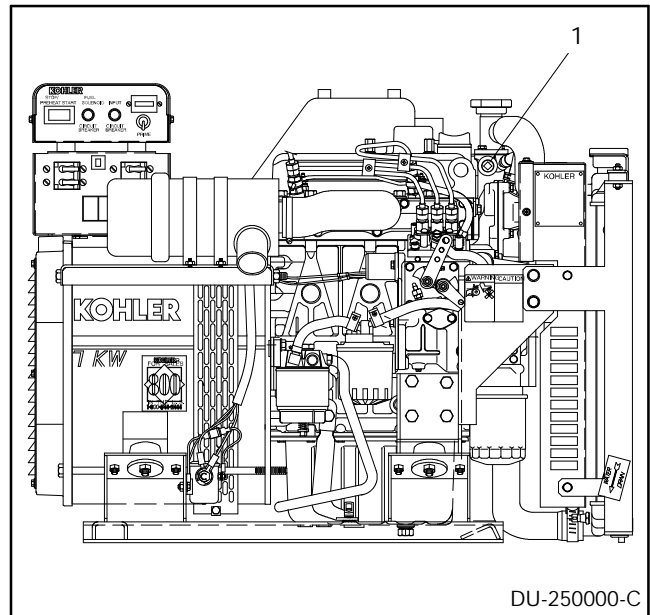
Figure 2-5. Low Oil Pressure Shutdown Switch

High Water Temperature Shutdown Switch

The generator set also contains a high water temperature (HWT) shutdown switch. See Figure 2-6. The unit will automatically shut down when the engine coolant temperature exceeds 230°F (110°C). Correct the cause of the shutdown before restarting the generator.

NOTE

This is not a low coolant level switch. Maintain correct coolant level for the high water temperature shutdown switch to function.



1. High water temperature switch

Figure 2-6. High Water Temperature Shutdown Switch

Section 3. Scheduled Maintenance

General

Schedule routine maintenance using the service schedule provided on the following pages and the hourmeter located on the generator controller. If subjecting the generator to extreme operating conditions, service the unit more frequently. The following pages include instructions to perform most of the scheduled services. Perform the items in the service schedule marked with an asterisk (*) more often if operating the generator set in dirty, dusty conditions. Have items identified with two asterisks (**) performed by an authorized Kohler service distributor/dealer. Usually, the generator set owner does not have tools and instruments required for these additional steps. Therefore, return the set periodically to an authorized service distributor/dealer for complete servicing and tune-up. The benefits of such service include improved performance and continuous satisfactory operation during a long trouble-free service life.

NOTE

Perform the items listed in the service schedule at the designated intervals for the life of the generator. For example, an item to be serviced Every 100 Hours or 3 Months must also be serviced after 200 Hours or 6 Months, 300 Hours or 9 Months, etc. The generator will eventually accumulate enough hours to warrant a complete overhaul. The exact time at which extensive service will be necessary cannot be predicted. However, rough operation, lack of power, and excessive oil use indicate serious generator set problems. As part of a preventive maintenance program, service the engine (clean cylinder head, inspect valves, check compression, etc.) and generator (replace bearing, inspect wiring, remove debris, etc.) at the earliest indication that a serious problem exists.

Service Schedule

Perform Service at Intervals Indicated (X)	Before Starting	Every 1 Month or Hours as Noted	Every 3 Months or Hours as Noted	Every 6 Months or Hours as Noted	Yearly or Hours as Noted
FUEL SYSTEM					
Check the fuel level	X				
Fill the fuel tank	X				
Check the fuel pipes and clamps		X (50 Hrs)			
Remove sediment from the fuel tank				X (500 Hrs)	
Replace the fuel filter element (metal spin-on type)				X (500 Hrs)	
Remove sediment from the fuel/water separator		X (50 Hrs) Break-in period		X (Replace element at 600 Hrs)	
Check governor operation and adjust as necessary**					X (500 Hrs)
Check the nozzle injection pressure**					X (1000 Hrs)
Check and/or replace fuel filter (plastic in-line type)			X (100 Hrs)		
LUBRICATION SYSTEM					
Check the oil level in the crankcase	X				
Replace the oil in the crankcase*		X (50 Hrs) Break-in period	X (250 Hrs)		
Replace the oil filter element*		X (50 Hrs) Break-in period	X (250 Hrs)		
COOLING SYSTEM					
Check coolant level	X				
Check water pipes and clamps			X (100 Hrs)		
Adjust the tension of the water pump V-belt		X (50 Hrs) Break-in period	X (100 Hrs)		
Change coolant					X (1000 Hrs)
Clean radiator fins, inspect hoses			X (100 Hrs)		
AIR CLEANER, ETC.					
Replace the air cleaner element*				X (300 Hrs)	
Clean the breaker pipe*				X (300 Hrs)	

* Service more frequently if operated in dusty areas.

** Performed by an authorized service distributor/dealer.

Service Schedule (Continued)

Perform Service at Intervals Indicated (X)	Before Starting	Every 1 Month or Hours as Noted	Every 3 Months or Hours as Noted	Every 6 Months or Hours as Noted	Yearly or Hours as Noted
ELECTRICAL SYSTEM					
Check the electrolyte level in the battery			X (300 Hrs)		
Check the electrical connections			X (300 Hrs)		
Check the battery specific gravity			X (300 Hrs)		
Adjust battery charging alternator V-belt			X (100 Hrs)		
CYLINDER HEAD, ETC.					
Check for leakage of water and oil	X				
Retighten all major nuts and bolts		X (50 Hrs) Break-in period			X (500 Hrs)
Check mounting bolts and vibromounts for tightness					X (500 Hrs)
Retighten the cylinder head bolts**					X (1000 Hrs)
Adjust intake exhaust valve clearance**					X (800 Hrs)
GENERATOR					
Blow dust out of generator*					X (500 Hrs)
Clean slip rings and inspect brushes**					X (500 Hrs)

* Service more frequently if operated in dusty areas.

** Performed by an authorized service distributor/dealer.

Lubrication System

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

Oil Selection

The selection of engine oil is very important to a diesel engine. If using an unsuitable oil or neglecting an oil change, damage and a shorter engine life may result. Oil must meet the American Petroleum Institute (API) classification of CC, CD or CE. Avoid mixing different brands of oils and lubricants; oils of different manufacturers may be incompatible and deteriorate when mixed. Figure 3-1 lists the recommended SAE viscosity designations for given temperature ranges in which the generator set will be operated.

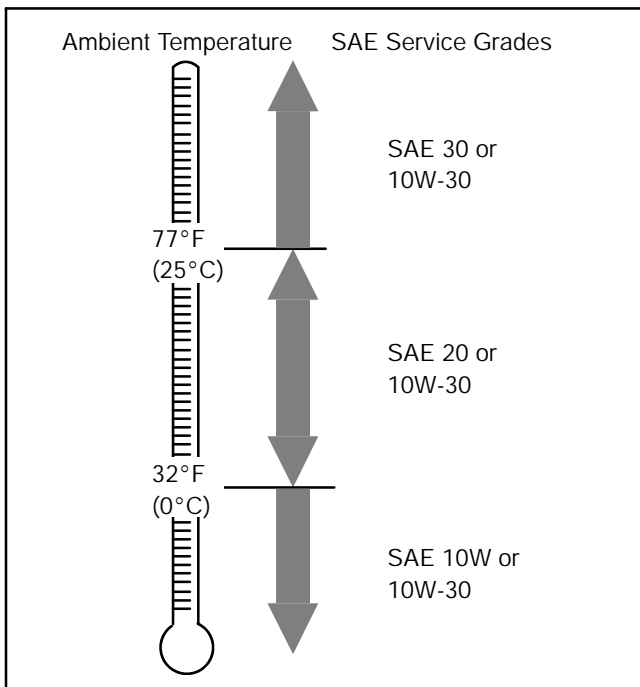


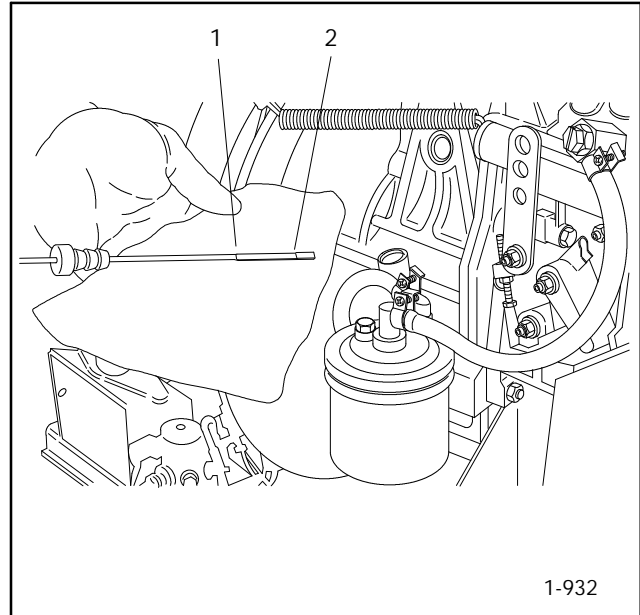
Figure 3-1. Engine Oil Selection

NOTE

Failure to observe these standards may cause inadequate oil pressure and cold-starting difficulties.

Oil Check

Check crankcase oil level daily or before each start to ensure a safe-range oil level. To check oil level, remove oil dipstick and wipe dipstick clean (see Figure 3-2). Reposition dipstick in crankcase and push it all the way down into the tube. Remove dipstick and check the level. Oil level must read between the MIN and MAX marks on dipstick. Do not operate set if oil level exceeds the MAX mark or registers below the MIN mark on dipstick.



1. MAX level
2. MIN level

Figure 3-2. Oil Level Check

NOTE

Do not check oil level when operating the set. Stop the engine and keep on a level surface when checking oil. Obtain the most accurate oil reading by shutting down the generator and waiting several minutes before checking oil.

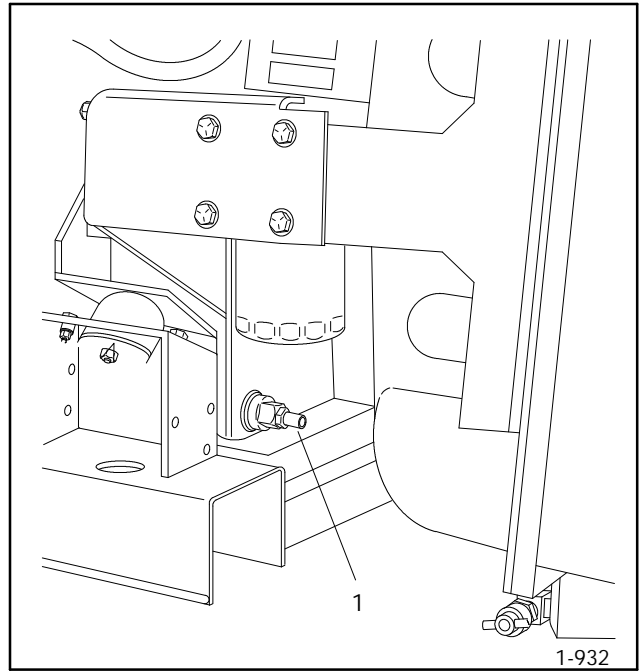
Oil Change

Change oil at the intervals specified in the service schedule. Change oil more frequently under dirty, dusty conditions. Change oil while the engine is still warm.

1. Stop the generator set.
2. Place a container below the oil drain and open the oil-drain valve. See Figure 3-3. Allow sufficient time for the old oil to drain completely. Close the oil-drain valve. Dispose of used engine oil in an environmentally safe manner.
3. Remove either oil-fill cap. One is located on the rocker-arm cover and one is located near the fuel injector pump. See Figure 3-4.
4. If replacing the engine oil filter, see Oil Filter on the following page.
5. Fill crankcase with proper amount and type of oil; see Figure 3-5 and Oil Selection on the previous page.
6. Replace the oil fill cap. Start the generator set and check for oil leaks.
7. Stop the generator set. Remove the dipstick and wipe clean; reinsert as far as possible and remove to check oil level. Add oil, as necessary, to bring level up to the MAX mark.

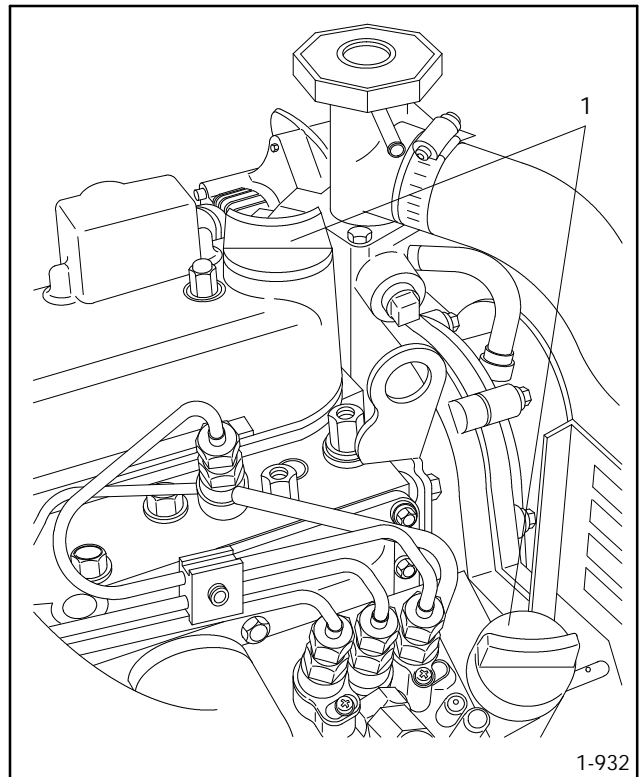
NOTE

Too high of an oil level causes high oil consumption and carbonizing of the engine. Low oil level will cause engine damage.



1. Oil drain

Figure 3-3. Oil Drain Location



1. Oil fill

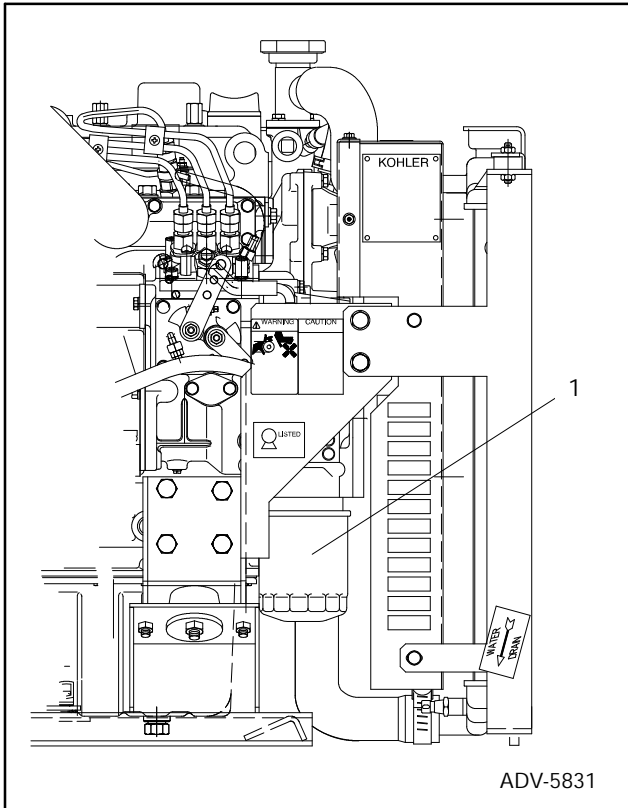
Figure 3-4. Oil Fill Locations

Model	Oil Capacity (with Filter) qts. (L)
7CCO61	5.4 (5.1)

Figure 3-5.

Oil Filter

Replace the oil filter at the intervals specified in the service schedule. Change more frequently if operating in dirty, dusty conditions. See Figure 3-6 and refer to the following procedure.



1. Oil filter

Figure 3-6. Oil Filter Location

1. With oil system drained, loosen oil filter by turning with a filter wrench in a counterclockwise direction. Use rags to clean up spilled oil. Remove and discard.
2. Clean contact surface on oil filter adapter.
3. Lightly lubricate the gasket surface of the new oil filter with the fresh engine oil. Thread oil filter onto adapter until gasket makes contact; hand tighten an additional one-half turn.
4. Replace engine oil. See Oil Change section on the previous page for proper oil capacity.
5. Start the generator set and check for oil leaks.
6. Stop the generator set. Remove dipstick and wipe clean. Reinsert as far as possible and remove to check oil level. Add oil as necessary to bring level up to the MAX level.

Fuel System

Specification

Use a clean, good quality No. 2-D (DIN 51 601) diesel fuel oil. The fuel must meet the requirements of the American Society of Testing and Materials (ASTM) diesel fuel classification D975 (Federal Specification W-F-800a). Cleanliness of the fuel is especially important on diesel engines which have easily clogged, precision fuel injectors and pumps. See Figure 3-7.

Location	Specification	Fuel Type
United States	ASTM/D975	No. 2-D Diesel
United Kingdom	BS2869	Class A1

Other considerations:

Sulfur content Less than 0.5%
 Sediment/water content Not to exceed 0.05%
 Cetane number 45 minimum
 Flash point At least 125°F (52°C)
 Alternative fuel types* JP8, Jet A, Jet A1, DF No. 1, JP5

* Combined power loss may be as high as 15% from published H.P. curves.

Figure 3-7. Fuel Types

NOTE

Never store diesel fuel in galvanized containers; diesel fuel and the galvanized coating react chemically to produce flaking which quickly clogs filters or causes failure of the fuel pump or injectors. Do not run the generator set out of fuel; air will be drawn into the fuel lines and the entire system will have to be bled before restarting the unit.

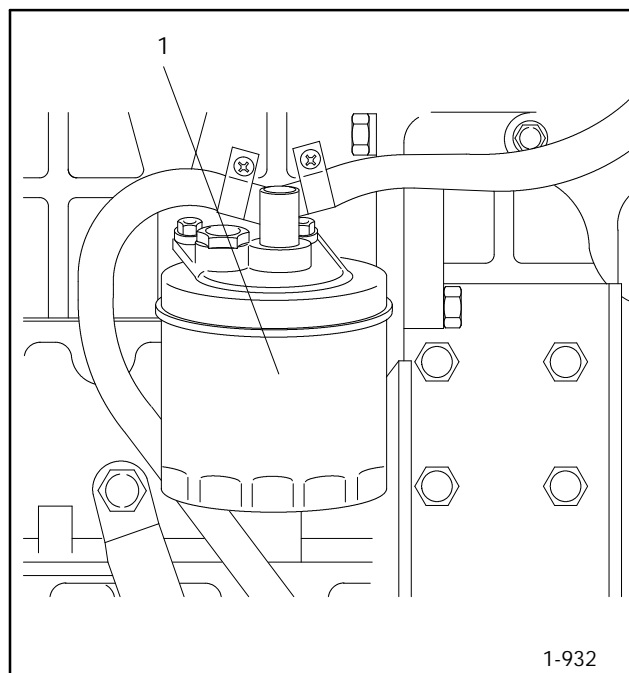
NOTE

Avoid storing fuel over long periods of time. Take special precautions to keep all dirt, water, and other contaminants out of the fuel. Storage tanks containing diesel fuel contaminated with water may cause the growth of microbes. The presence of microbes will form a slime which clogs fuel filters and lines.

Fuel Filter (Metal Spin-On Type)

The fuel filter serves to remove water and dirt contained in the fuel. Do not attempt to clean the paper fuel filter element. The quality and condition of the fuel used determines the fuel filter's useful life. Under normal conditions, replace the fuel filter element at the intervals specified in the Service Schedule. See Figure 3-8 for location and use the following procedure to service the fuel filter.

1. Stop the generator set.
2. Loosen the fuel filter by turning in a counterclockwise direction. Use rags to clean up spilled fuel oil. Remove and discard filter.
3. Clean contact surface on the fuel filter adapter.
4. Lightly lubricate the gasket surface of the new fuel filter with fresh fuel oil. Thread the fuel filter onto the adapter until the gasket makes contact; hand tighten an additional one-half turn.
5. See Bleeding section following.



1. Fuel filter

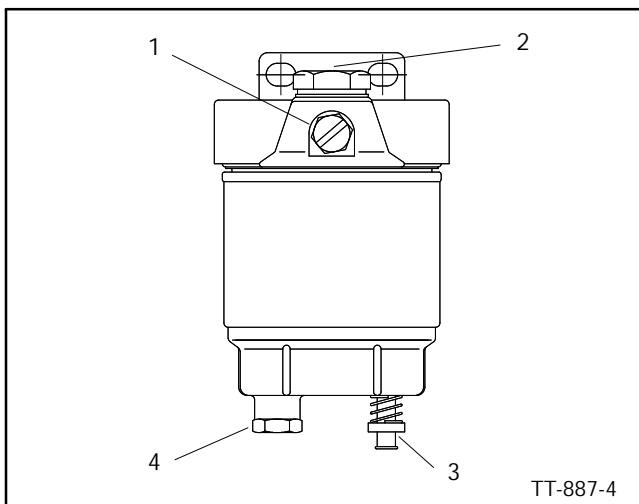
Figure 3-8. Fuel Filter Location

Fuel Filter (Plastic In-Line Type Supplied Loose)

The fuel filter, supplied loose with the unit, serves as a preliminary source to remove dirt and metal particles from the fuel system before they reach the electric fuel pump. If debris clogs the fuel filter, the generator may be difficult to start or may run rough. The quality of the diesel fuel used and the amount of debris entering the fuel system when refueling determines the service life of the fuel filter. As part of a regular maintenance program, check and/or replace the fuel filter at the interval specified in the Service Schedule. Do not clean the fuel filter. Replace the fuel filter if encountering fuel starvation or poor engine performance.

Fuel/Water Separator

The fuel/water separator drains off accumulated water and traps fuel oil sediment. At the specified interval in the Service Schedule, remove the water drain plug located at the bottom of the water separator and allow the water to flow into a suitable container. See Figure 3-9. When complete, replace water drain plug. Drain off only the water as fuel oil will continue to flow from this point. At the specified interval, replace the water separator element. To replace element use the following procedure and see Figure 3-10.



1. Air bleed screw
2. Centerbolt
3. Drain valve
4. Drain plug

Figure 3-9. Draining and Changing Water Filter

1. Close fuel valve at nearest point to water separator inlet fitting or at fuel tank.
2. Remove water drain plug (or push-up drain valve) and allow water and fuel oil to flow into a suitable container.

NOTE

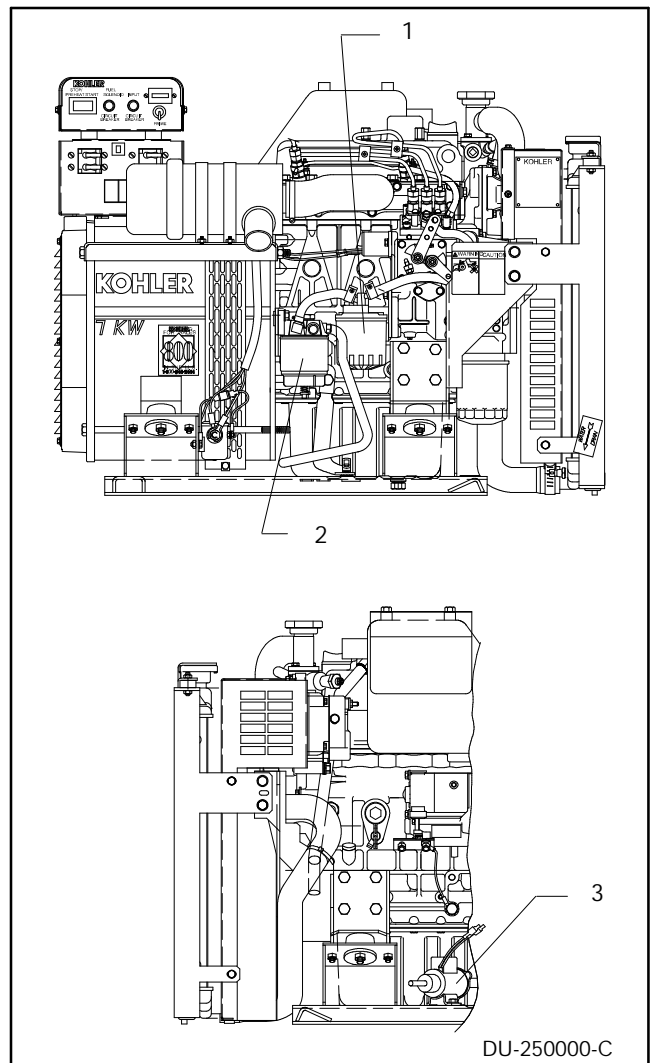
Depending upon the location of fuel valve, a considerable amount of fuel oil may drain out.

3. Remove centerbolt and remove fuel/water separator element from mounting head with bowl connected.
4. Remove the bowl from the fuel/water separator element. Wipe excess fuel oil from the bowl and O-ring. Do not discard bowl or O-ring.
5. Inspect components for wear or damage. Replace parts as necessary.
6. Lubricate the O-ring with clean diesel fuel or motor oil and replace in the bowl.
7. Replace bowl onto a new fuel/water separator element.

NOTE

Kohler service replacement fuel/water separator element part number is 225259.

8. Lubricate fuel/water separator element top seal with clean diesel fuel or motor oil.
9. Fill bowl/element assembly with clean fuel. Replace bowl/element onto fuel/water separator mounting head. Tighten centerbolt to 65 in. lbs. (7.3 Nm).
10. Replace water drain plug (if removed) and close vent.
11. Remove air bleed screw from the fuel/water separator.
12. Open fuel valve on water separator inlet fitting or at fuel tank.
13. After fuel oil fills water separator and air is displaced, fuel oil (free of air bubbles) will flow from the air bleed hole. Replace air bleed screw.
14. If other fuel system components were removed and/or replaced, air may have entered the fuel system. If this happens, the engine may experience starting difficulty and/or erratic operation which requires bleeding of the fuel system. See Bleeding the Fuel System section following.



1. Fuel filter
2. Fuel/water separator
3. Fuel pump (non-service side)

Figure 3-10. Fuel/Water Separator Location

Bleeding the Fuel System

If the generator set engine runs out of fuel, develops air leaks in the suction side of the fuel system, or if the fuel filter was replaced, bleed the entire system to prevent starting failures and/or erratic operation. See Figure 3-11 and refer to the following procedure.

1. With generator set stopped, disconnect lead 5 from the starter motor to disable cranking during the bleeding procedure.
2. Fill the fuel tank.
3. Loosen the small vent screw on the fuel filter a few turns.
4. Using prime switch on the controller, operate the fuel pump until fuel, free from air bubbles, flows from this point. Tighten vent screw.
5. Loosen the line connection (bleed point) at fuel injection pump inlet.
6. Using the prime switch on the controller, operate the fuel pump until fuel, free from air bubbles, flows from this point. Tighten line connection.
7. Reconnect lead 5 to the starter motor.

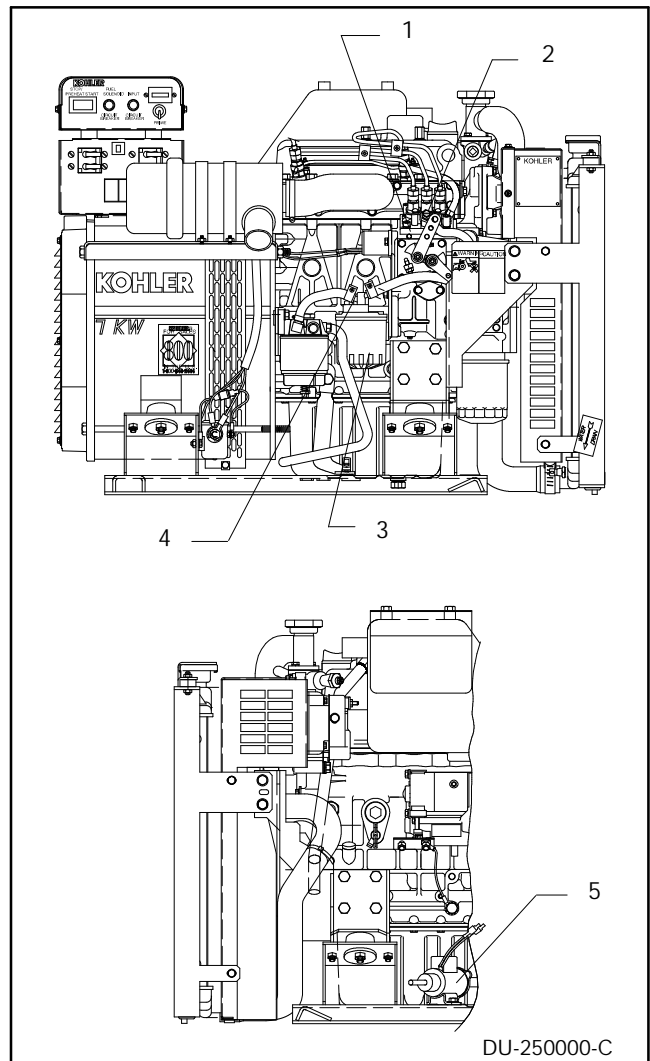
WARNING



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

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

Draining 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 fuel system. Wipe up all spilled fuel after draining system.

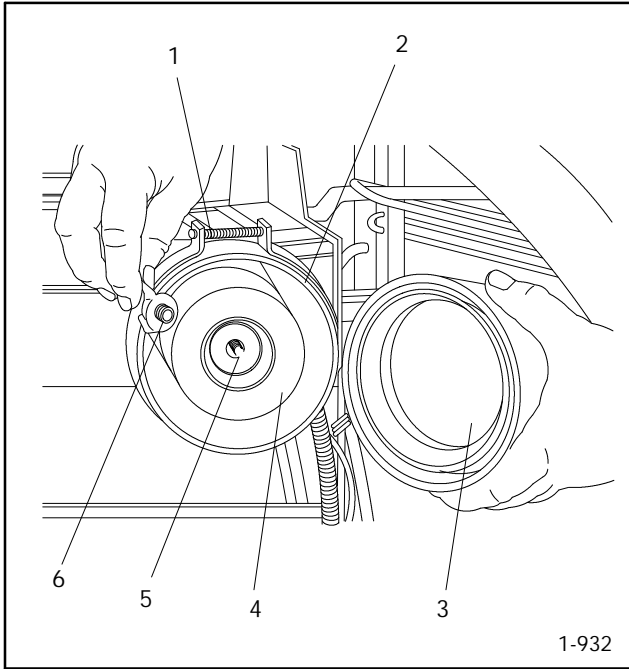


1. Fuel injection pump
2. Line connection (bleed point)
3. Fuel filter
4. Vent screw
5. Electric fuel pump (non-service side)

Figure 3-11. Bleeding Fuel System

Air Cleaner Service

Replace the air cleaner's paper element at the interval specified in the Service Schedule; change more frequently if operating under dirty, dusty conditions. Operating the generator set with a dirty air cleaner element may cause engine damage and increased fuel consumption. At the time of service, clean the air cleaner breather pipe and remove all dust and foreign matter from the air cleaner housing. See Figure 3-12 and refer to the following procedure.



1. Eyebolt/clamp
2. Base
3. Cover
4. Element
5. Air cleaner mounting stud
6. Wing nut

Figure 3-12. Air Cleaner Components

1. Loosen eyebolt and clamp enough to remove the air cleaner cover.
2. Remove wing nut and slide air cleaner element from the mounting stud.
3. Clean the dry element by tapping edges on a hard surface. Replace if damaged or very dirty.

NOTE

Do not attempt to clean the dry-type element in any liquid or with compressed air as this will damage the paper filter material.

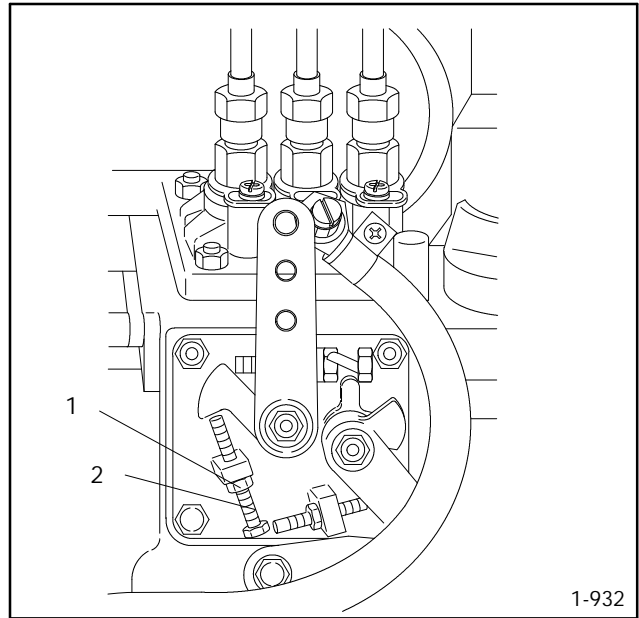
4. Wipe dirt or dust accumulation from cover and base.
5. Check tightness of all clamps at inlet/outlet connections.
6. Install air cleaner element on the mounting stud. Tighten wing nut making sure parts fit properly.
7. Position cover with arrow up; place clamp over base and cover, and tighten eyebolt.

Governor

The centrifugal, mechanical-type governor serves to keep the engine speed constant by automatically adjusting the amount of fuel supplied to the engine according to changes in the load. The governor requires no regular service. The factory adjusts the governor and further adjustment is not needed unless encountering greatly varying load conditions or if poor governor control develops after extended usage.

This set operates at 60-63 Hz, 1800 rpm under full load and 1890 rpm under no load.

To check the speed, use a hand-held tachometer or frequency meter. See Figure 3-13. Loosen the locking nut on the speed-adjusting screw. Turn the screw in a clockwise direction to increase speed (and frequency) or in a counterclockwise direction to decrease speed. Tighten the locknut to secure screw at new setting.



1. Locking nut
2. Speed adjusting screw

Figure 3-13. Governor

Cooling System

WARNING



Hot coolant and steam. Can cause severe injury or death.

Before removing pressure cap, stop generator set and allow it to cool. Then loosen pressure cap to relieve pressure.

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

To prevent the inconvenience of having the generator set shut down or become damaged due to overheating, keep the cooling air inlets to the system clean and unobstructed at all times. Inspect the exterior of the radiator for obstructions; remove all dirt and foreign material with a soft brush or cloth (to avoid damaging radiator fins). Check all hoses and connections for leaks and replace any cracked, frayed, or worn hoses. When making coolant level checks, check condition of the radiator cap rubber seal; replace if cracked or deteriorating. Remove dirt and other debris from the radiator cap and filler neck.

Coolant capacity for the 7CCO61 model is 2.44 quarts (2.3 L). The radiator bottom tank and the engine block

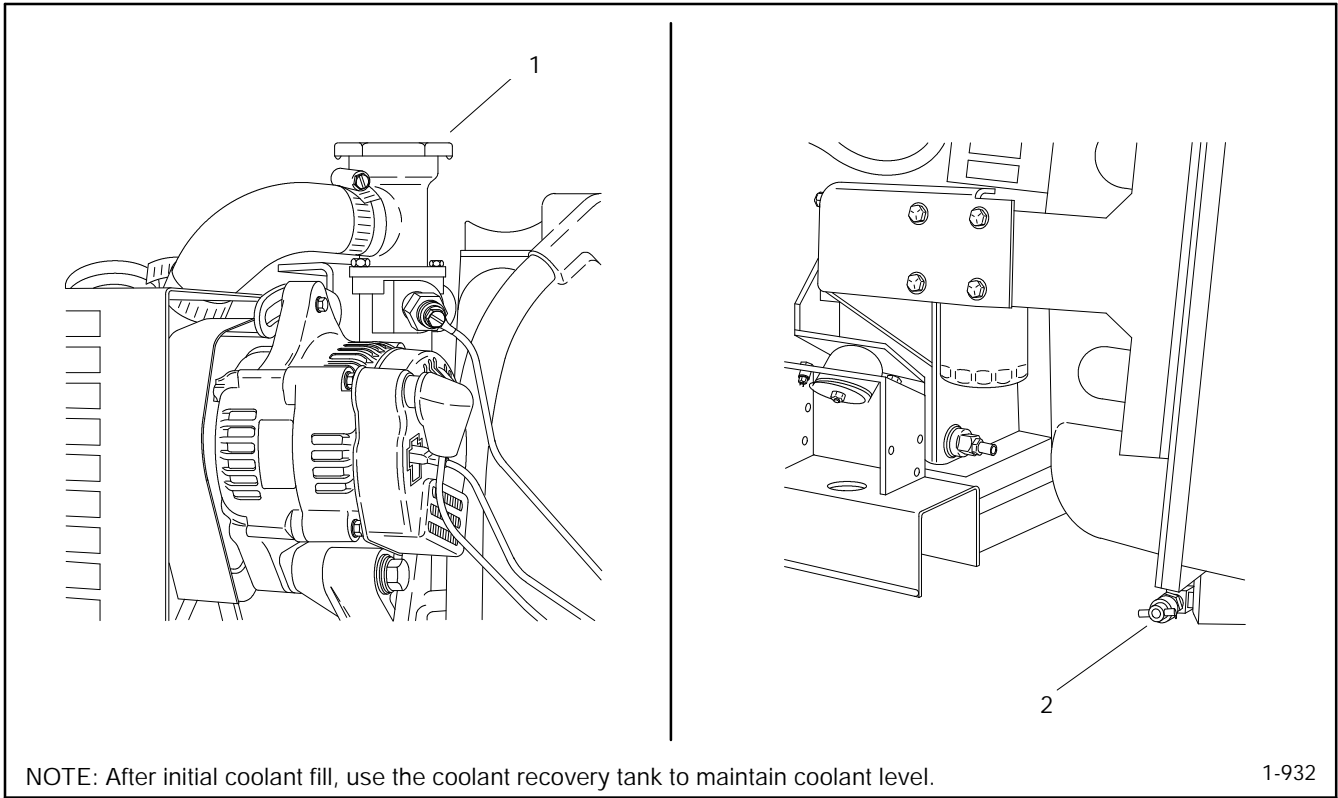
contain coolant drain petcocks. When draining the coolant, remove the radiator cap and open the block drain located near the flywheel housing and the radiator drain; this will allow the entire system to drain and prevent air pockets from forming and restricting coolant passage in the block. To refill the cooling system, close the drain petcock and fill the radiator to the proper level with the recommended coolant mixture. See Figure 3-14 for coolant fill and drain locations. Replace the radiator cap and operate the engine until the thermostat opens and the radiator upper hose becomes hot. Stop the engine and allow to cool. Add coolant to the radiator to just below the overflow tube on the filler neck. Replace the radiator cap.

A coolant solution of 50% ethylene glycol and 50% clean, softened water is required to inhibit corrosion, prevent freezing to -34°F (-37°C), and to improve cooling. Use antifreeze that contains a rust inhibitor. Change coolant according to the Service Schedule. Do not use alcohol or methanol antifreeze or mix them with the coolant. Do not add coolant to an engine that has overheated until the engine has cooled. Adding coolant to an extremely hot engine can cause a cracked block or cylinder head.

Check coolant level frequently and add antifreeze solution as needed to maintain level just below the overflow tube and at the min. level in the coolant recovery tank when cold (max. when hot).

NOTE

Pay special attention when checking for proper coolant level. After draining a radiator, it takes some time before complete refill of all air cavities take place.





1. Initial coolant fill

2. Coolant drain in radiator

Figure 3-14. Initial Coolant Fill and Coolant Drain Locations

Drive Belt

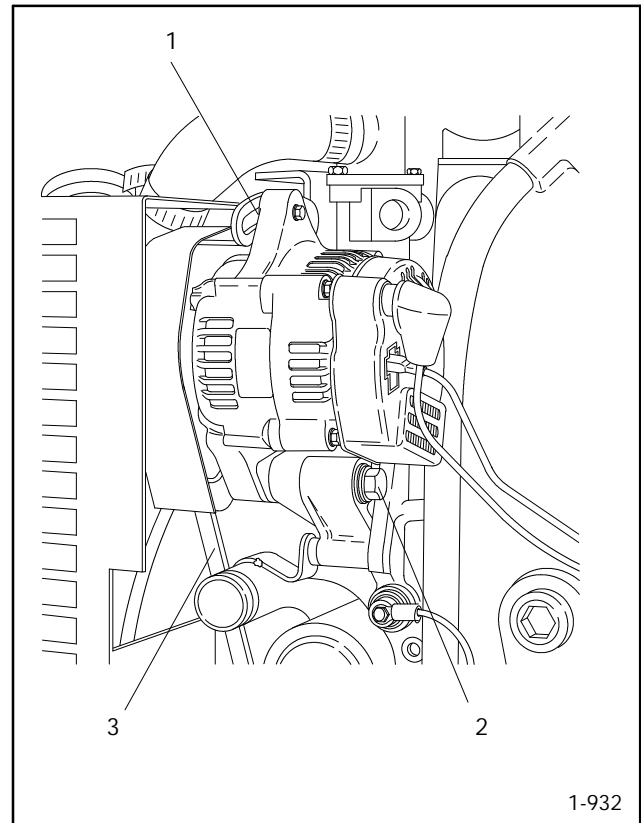
The alternator, fan, and water pump are belt driven. Keep the drive belt properly adjusted at all times since a loose drive belt causes the belt to overheat and also results in improper operation of belt-driven components. Overtightening the belt may cause excessive wear on the alternator and water pump bearings, as well as premature belt wear. See Belt Tension following.

⚠ WARNING	
	
Hazardous voltage.	Moving rotor.
Can cause severe injury or death.	
Operate generator set only with all guards and electrical enclosures in place.	

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

Belt Tension

Adjust the belt tension according to the following procedure so that the belt can be depressed about 0.28 to 0.35 in. (7 to 9 mm) with about 22 lbs. (10 kg) of force. See Figure 3-15.



1. Adjusting screw
2. Pivot screw
3. Fan belt

Figure 3-15. Belt Tension

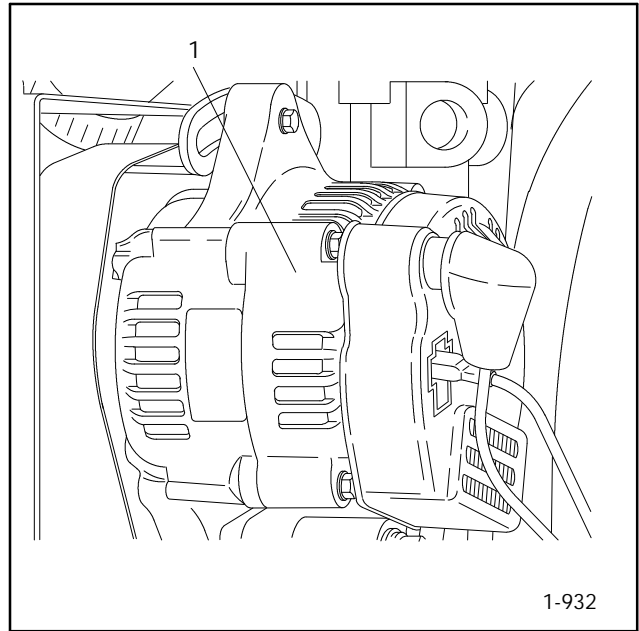
1. Disconnect battery, negative lead first.
2. Loosen pivot and adjusting screws. See Figure 3-15 for location.
3. While prying battery-charging alternator outward, tighten adjusting screw.
4. Tighten pivot screw.
5. Recheck and adjust as necessary.
6. Reconnect battery, negative lead last.

NOTE

Check fan belt for cracks or tears and replace if necessary.

Battery Charging

The generator includes a 20-amp, belt-driven battery charging alternator. See Figure 3-16. It is attached to the engine block by a bracket and serves to keep the battery constantly charged. Observe battery polarity when connecting the battery to the generator set. The alternator requires no maintenance other than maintaining belt tension. To adjust the alternator belt tension, see Belt Tension.



1. Battery charging alternator

Figure 3-16. Battery Charging Alternator

Battery

⚠ WARNING



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

Use protective goggles and clothes. Battery acid can cause permanent damage to eyes, burn skin, and eat holes in clothing.

Battery acid. Sulfuric acid in batteries can cause severe injury or death. Sulfuric acid in battery can cause permanent damage to eyes, burn skin, and eat holes in clothing. Always wear splash-proof safety goggles when working near the battery. If battery acid is splashed in the eyes or on 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 flame or spark to occur near a battery at any time, particularly when it is charging. Avoid touching terminals with tools, etc., to prevent burns and sparks that could cause an explosion. Remove wristwatch, rings, and any other jewelry before handling battery. Never connect negative (-) battery cable to positive (+) connection terminal of starter solenoid. Do not test battery condition by shorting terminals together. Sparks could ignite battery gases or fuel vapors. Ventilate any compartment containing batteries to prevent accumulation of explosive gases. To avoid sparks, do not disturb battery charger connections while battery is being charged. Always turn battery charger off before disconnecting battery connections. Remove negative lead first and reconnect it last when disconnecting battery.

Use a 12-volt battery with a rating of at least 800 cold cranking amps/100 amp hour. When using a maintenance-free battery, it is not necessary to check the specific gravity or electrolyte level. Otherwise perform these procedures at the intervals specified in the service schedule. The unit uses a negative-ground system. See the wiring diagrams in Section 5 for battery connections. Keep the battery connected and terminals tight.

NOTE

The generator set will not start if the battery connections are made in reverse.

Cleaning

Keep battery clean by wiping it with a damp cloth. Keep all electrical connections dry and tight. If observing corrosion, disconnect cables from battery and remove corrosion with a wire brush. Clean battery and cables with a solution of baking soda and water. Do not allow cleaning solution to enter battery cells. After cleaning, flush battery and cables with clean water and wipe with a dry cloth. After reconnecting the battery cables, coat terminals with petroleum jelly or other nonconductive grease.

Checking Electrolyte Level

Check the level of electrolyte before each startup. Remove filler caps and check to see that electrolyte level is up to bottoms of filler holes. See Figure 3-17. Refill as necessary with distilled water or clean tap water. Do not add fresh electrolyte! Keep filler caps tight.

NOTE

If using a maintenance-free battery, it is not necessary to check the specific gravity or electrolyte level.

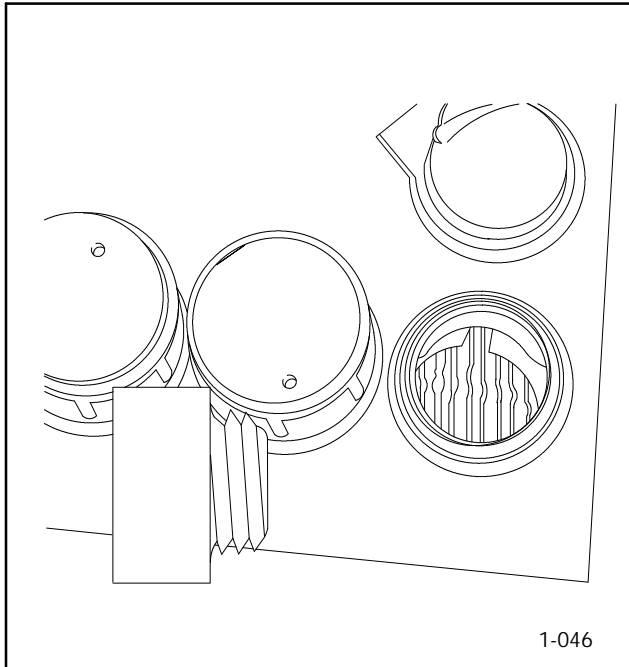


Figure 3-17. Battery Electrolyte Level

Checking Specific Gravity

Use a battery hydrometer to check the specific gravity of the electrolyte in each battery cell. While holding the hydrometer vertical, read the number on the glass bulb at the top of the electrolyte level. If the hydrometer used does not have a correction table, use the one in Figure 3-18. Determine specific gravity and electrolyte temperature of battery cells. Locate temperature in Figure 3-18 and adjust specific gravity by amount shown. The battery is fully charged if the specific gravity is 1.260 at an electrolyte temperature of 80°F (26.7°C). The difference between specific gravities of each cell should not exceed ± 0.01 . Charge the battery if the specific gravity is below 1.215 at an electrolyte temperature of 80°F (26.7°C).

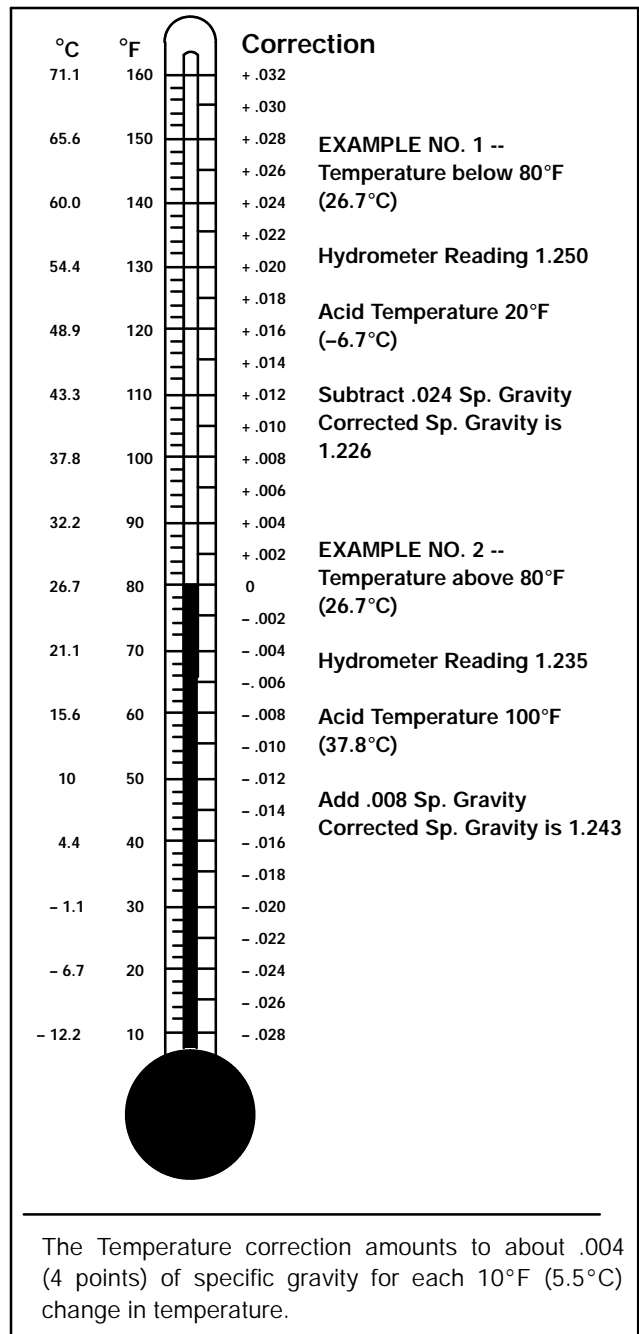
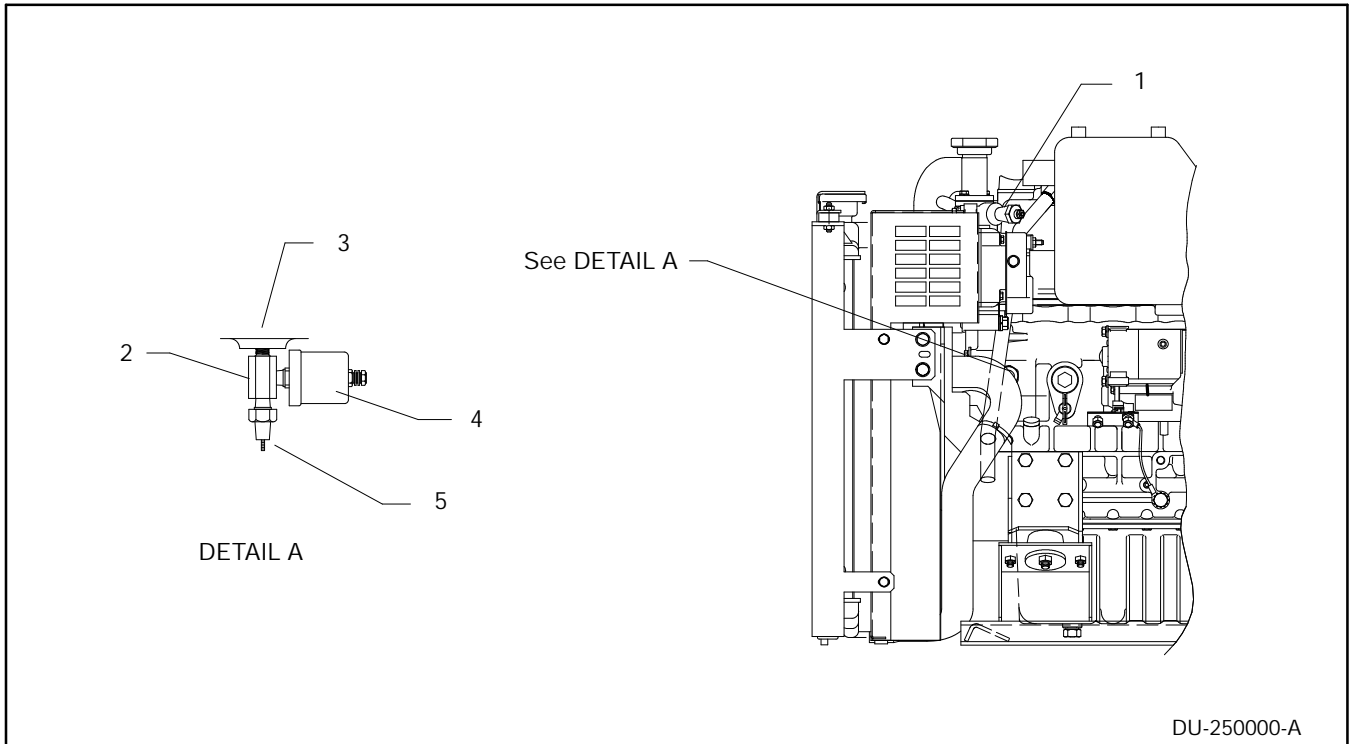


Figure 3-18. Specific Gravity Temperature Correction

Gauge Connections

The 7CCO61 generator set includes sending devices for connection to the oil pressure and water temperature gauges. Figure 3-19 shows the locations of the oil pressure and water temperature senders.

See Four-Meter Panel Installation in Section 6 for gauge connections. Also, refer to the wiring diagrams in Section 5. Use insulink or similar connectors at all spliced connections to ensure reliable operation of the senders and gauges.



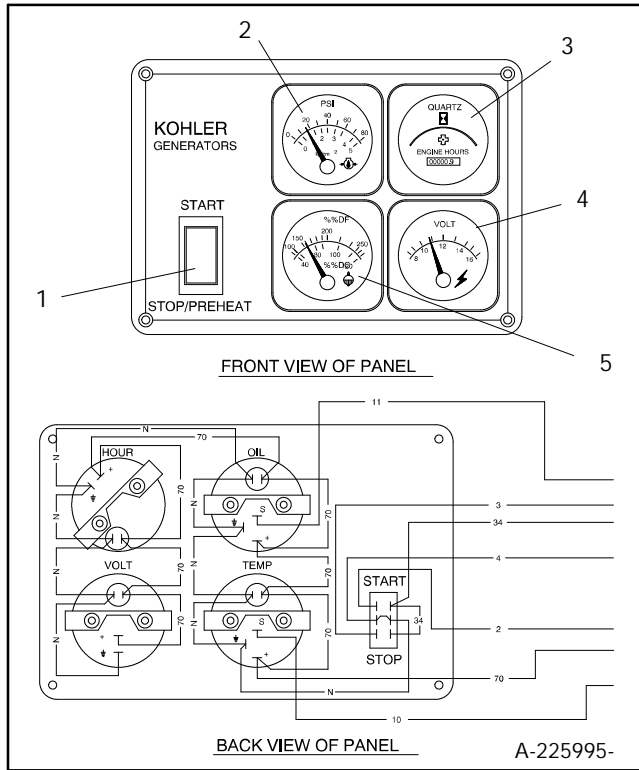
- 1. Water temperature sender
- 2. Adapter
- 3. Engine block

- 4. Oil pressure sender
- 5. Oil pressure switch

Figure 3-19. Engine Temperature & Oil Pressure Senders

Four-Meter Panel

The four-meter panel allows starting/stopping from a location remote of the generator set. DC voltmeter, engine oil pressure gauge, water temperature gauge, and generator running time hourmeter illuminate. The generator set comes equipped with an AC wiring harness with 7-pigtail leads for connection to the panel. See Figure 3-20 for panel features.



1. Start/stop switch
2. Engine oil pressure
3. Hourmeter
4. Voltmeter
5. Water temperature

Figure 3-20. Panel Features



**Accidental starting.
Can cause severe injury or death.**

Disconnect battery cables before working on generator set (disconnect negative lead first and reconnect it last).

Disabling generator set. Accidental starting can cause severe injury or death. Disconnect battery cables (remove negative lead first and reconnect it last) to disable generator set before working on the generator set or connected equipment. The generator set can be started by the remote start/stop switch unless this precaution is followed.

Four-Meter Panel Features

1. **Start/Stop-Preheat Switch.** Rocker-type switch used to start, stop, and preheat generator set.

NOTE

Do not place start/stop-preheat switch in stop-preheat position for more than 20 seconds or damage may occur to preheat feature. See Section 2– Starting Procedure.

2. **DC Voltmeter** measures voltage of starting battery(ies). Normal battery operating range is 12-14 volts. Check battery manufacturer's recommendation for correct operating voltage.
3. **Engine Oil Pressure Gauge** measures engine oil pressure.

NOTE

During engine break-in period, the engine sometimes produces high oil pressure readings.

4. **Water Temperature Gauge** measures engine coolant temperature.
5. **Hourmeter** records total generator set operating hours for reference in maintenance scheduling.

NOTE

If installing this kit on a generator set already in service, the hourmeter on the controller will have accumulated hours and therefore, reflect a different reading than the panel hourmeter. Use the same hourmeter each time when scheduling maintenance.

Wattage Requirements

If exceeding the rated capacity of the generator, the circuit breaker(s) located in the controller will trip to protect the generator wiring against damage. A short in the AC circuit in the vehicle or having too many tools/lights on at the same time may result in an overload condition. If the circuit breaker(s) trips, the set may continue to run but there will be no AC output to the protected circuit. Before resetting the circuit breaker(s), turn off some of the tools and lights inside the vehicle to bring the load down within the rated limits of the set. If this is done and the circuit breaker(s) trips again after being reset, a short circuit is indicated. In this event, turn off the set and have a qualified electrician locate and correct the cause of the short circuit.

The following chart lists average wattage requirements of some common mobile tools and motor loads. Use these figures to calculate the total load on your set to avoid the inconvenience of having the circuit breaker trip due to overload. The lighting load is easily determined by adding the wattage rating of each bulb in the circuit. Check the nameplate rating on motors in your vehicle for exact wattage requirements.

Construction Tools	Motor Starting Watts	Running Watts
Air Compressor (Small)	1500	725
Air Compressor 3/4 hp	4000+	2000
Drill, 1/4 in.	500	250
Drill, 3/8 in.	600	350
Drill, 1/2 in.	800	600
Grinder 1/2 hp	1500	1200
Hammer, Demolition	2000	1800
Hammer, HD Rotary	1500	1200
Paint Sprayer (Airless)	400	240
Polisher, Orbit	500	360
Power Paint Roller	120	90
Power Plane	600	450
Router	900	700
Saw, Circular 6 1/2 in.	2200	1000
Saw, Circular 7 1/4 in.	2500	1200
Saw, Table 10 in.	4000	1500
Saw, Sabre (Worm Drive)	2500	1200
Sander, Belt	1500	600
Sander, Finishing	900	360
Screwdriver, Power	1000	530
Shear, 12 gauge	1800	720
Soldering Gun	-	250
Vacuum Cleaner, Wet/Dry	1500	1260
Wrench, Impact 1/2 in.	2000	840

Figure 3-21. Construction Tool Average Wattage Ratings

NOTE

Motor driven equipment generally takes 2 to 3 times the listed running amperage or wattage to start the motor. Always check the tool or motor nameplate to be sure.

Generator Service

General

Under normal conditions, generator service will not be required on a regular basis. If operating under dusty and

dirty conditions, use dry compressed air to blow dust out of the generator at frequent intervals. Do this with the generator set operating and direct the stream of air in through the cooling slots at the end of the generator.

Storage Procedure

If taking your generator set out of service for a considerable length of time (2 months or more), perform the following steps to preserve the set before placing it in storage.

1. Drain the oil (while warm) from the crankcase then refill with regular grade oil. See Section 3, Oil Selection in this manual.
2. Drain the fuel from the fuel tank to prevent accumulated moisture from mixing with the fuel.
3. Check the engine coolant protection. See Cooling System in Section 3 for additional information.
4. Disconnect battery (negative lead first) and place in storage.
5. Seal all openings in the engine with non-absorbent adhesive tape. Mask off all areas to be used for electrical contact.
6. Clean exterior surface of the generator. Spread a light film of oil over unpainted metallic surfaces which could rust or corrode.

Section 4. Troubleshooting

When troubles occur, don't overlook simple causes. An empty fuel tank can cause a starting problem. Keep all electrical connections secure. Remember the battery negative must have a good ground. The following charts list some common problems. If procedures in this

manual do not correct the problem, take the generator set to a service distributor/dealer. Tell the service distributor/dealer personnel exactly what happened when the problem occurred and any adjustments made to the set.

Engine

Problem	Possible Cause	Corrective Action
Engine hard to start or will not start	Weak or dead battery	Recharge or replace
	Battery connections made in reverse	Correct
	Faulty ground	Clean and retighten
	Circuit breaker tripped	Reset
	Out of fuel	Replenish
	Improper type of fuel	Use proper type of fuel; consult fuel supplier
	Fault shutdown	Check low oil pressure and high water temperature shutdown switches
	Clogged fuel filter	Replace filter element
	Air cleaner clogged	Clean or replace element
	Clogged exhaust system	Remove obstruction
	Defective fuel feed pump	Replace fuel feed pump
	Air in fuel system	Bleed air from fuel system
	Improper type of crankcase lube oil	Use proper lube oil
	Water, dirt in fuel system	Drain, flush fuel system and replace fuel
	Dirty or faulty injectors	See authorized service distributor/dealer
	Improper compression	See authorized service distributor/dealer
Injection pump malfunctioning	See authorized service distributor/dealer	
Improper valve clearance	See authorized service distributor/dealer	
Engine knocks	Faulty injector	See authorized service distributor/dealer
	Improper type of fuel	Use proper type of fuel; consult fuel supplier
	Incorrect fuel injection timing	See authorized service distributor/dealer
	Improper cylinder top clearance	See authorized service distributor/dealer
	Defective piston or piston ring	See authorized service distributor/dealer
	Defective crankshaft bearing or piston pin bearing	See authorized service distributor/dealer
	Improper valve clearance	See authorized service distributor/dealer
	Air in injectors	Bleed air in fuel system

Engine (Continued)

Problem	Possible Cause	Corrective Action
Engine runs irregularly or stalls frequently	Vent in fuel tank cap obstructed	Clean cap in solvent, blow dry
	Clogged fuel filter	Replace fuel filter element
	Water, dirt, or air in fuel system	Drain, flush, fill, and bleed air in fuel system
	Dirty or faulty injectors	See authorized service distributor/dealer
	Faulty governor linkage	See authorized service distributor/dealer
	Defective fuel feed pump	Replace fuel feed pump
	Improper valve clearance	See authorized service distributor/dealer
	Improper compression	See authorized service distributor/dealer
Stops suddenly	Out of fuel	Replenish fuel supply
	Air intake restriction	Service air cleaner
	Circuit breaker tripped in controller	Reset circuit breaker
	High water temperature (HWT) shutdown	Check engine coolant level, loose fan belt, radiator obstructions, etc.
	Low oil pressure (LOP) shutdown	Check engine lube oil level
	Defective fuel pump	See authorized service distributor/dealer
	Clogged fuel filter	Replace filter
Lack of engine power	Engine overloaded	Reduce load
	Air intake restriction	Service air cleaner
	Clogged fuel filter	Replace filter element
	Improper type of fuel	Use proper fuel
	Clogged exhaust system	Remove obstruction
	Improper valve clearance	See authorized service distributor/dealer
	Dirty or faulty injectors	See authorized service distributor/dealer
	Incorrect fuel injection timing	See authorized service distributor/dealer
	Improper engine compression	See authorized service distributor/dealer
	Vent in fuel tank cover obstructed	Clean cap in solvent; blow dry
Overfueling (rich)	See authorized service distributor/dealer	
Engine overheats	Engine overloaded	Reduce load
	Defective cooling system	Check water pump
	Loose or defective water pump V-belt	Adjust belt tension or replace belt
	Cooling system needs flushing	Flush cooling system
	Defective thermostat	Replace thermostat
	Defective high water temperature switch	Replace switch
	Cooling water leaks from water passages	Check water passages
	Radiator clogged with dirt or oil	Clean with water soluble grease remover and flush cooling system
	Radiator cap defective	Replace
Cylinder head gasket defective	See authorized service distributor/dealer	

Engine (Continued)

Problem	Possible Cause	Corrective Action
Engine emits black or gray exhaust smoke	Fuel filter clogged	Clean or change
	Overload	Lessen the load
	Improper type of fuel	Use proper fuel
	Clogged or dirty air cleaner	Service air cleaner element
	Defective injection pump	See authorized service distributor/dealer
	Faulty injectors	See authorized service distributor/dealer
	Incorrect fuel injection timing	See authorized service distributor/dealer
	Improper valve clearance	See authorized service distributor/dealer
	Lube oil level too high	Drain out surplus
	Improper lube oil	Use proper viscosity oil
Engine emits white or blue exhaust smoke	Excessive engine oil	Reduce to specified level
	Piston ring and liner worn	See authorized service distributor/dealer
	Incorrect injection timing	See authorized service distributor/dealer
	Improper compression	See authorized service distributor/dealer
Low lube oil pressure	Low lube oil level	Add lube oil
	Improper lube oil viscosity	Drain, fill with proper viscosity oil
	Defective lube oil pump	See authorized service distributor/dealer
	Defective oil pressure switch	Replace switch
	Worn engine components	Rebuild– Consult Engine Service Manual
High lube oil consumption	Too light viscosity oil	Use proper viscosity oil
	Oil leaks	Check for leaks in lines, around gaskets, and drain plug
	Improper type of oil	Use oil of proper viscosity
	Clogged breather system	Clean breather system
	Defective piston ring, piston cylinder liner, valve guide, or valve seat	See authorized service distributor/dealer
High fuel consumption	Improper type of fuel	Use proper fuel
	Clogged or dirty air cleaner element	Service air cleaner element
	Engine overloaded	Reduce load
	Improper valve clearance	See authorized service distributor/dealer
	Incorrect fuel injection timing	Check injection timing
	Low engine temperature	Check thermostat
	Improper compression	See authorized service distributor/dealer
	Fuel leakage	Check for leaks at fuel tank, lines, and engine fuel system

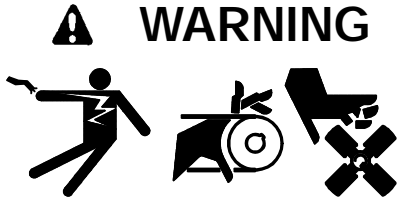
Electrical System

Problem	Possible Cause	Corrective Action
Battery will not charge	Loose or corroded connections	Clean and tighten connections
	Sulfated or worn-out battery	Check electrolyte level and specific gravity (batteries with filler caps only)
	Defective alternator	Replace alternator
	Loose or defective alternator belt	Adjust belt tension or replace belt
Starter does not work properly	Loose or corroded connections	Clean and tighten connections
	Low battery output	Check electrolyte level and specific gravity (batteries with filler caps only)
	Defective starter solenoid	Replace starter solenoid
	Defective starter switch	Replace starter switch
	Defective wiring	Check wiring
Starter cranks slowly	Low battery output	Check electrolyte level and specific gravity (batteries with filler caps only)
	Too heavy viscosity lube oil	Use proper viscosity oil
	Loose or corroded wiring	Clean and tighten loose connections
	High starter current draw	Rebuild or replace starter
	Loose or defective alternator belt	Adjust belt tension or replace belt

Generator

Problem	Possible Cause	Corrective Action
No AC output	AC circuit breaker(s) in off position	Reset to on position
	No DC power to controller	Check battery connections
	Circuit breaker tripped	Reset circuit breaker
	AC circuit breaker tripping due to overload on generator set	Reduce load (see Wattage Requirements)
	Short circuit in output circuit causing breaker to trip	Reset– if it trips repeatedly, stop set and contact authorized service distributor/dealer
	General malfunction such as faulty component or other internal fault	See authorized service distributor/dealer
Low output or excessive drop in voltage	Engine speed too low	See authorized service distributor/dealer
	Generator overloaded	Reduce load
Engine in poor condition		If performing routine services and condition persists, see authorized service distributor/dealer




Section 5. Wiring Diagrams



Accidental starting.
Can cause severe injury or death.

Disconnect battery cables before working on generator set (disconnect negative lead first and reconnect it last).

Disabling generator set. Accidental starting can cause severe injury or death. Disconnect battery cables (remove negative lead first and reconnect it last) to disable generator set before working on the generator set or connected equipment. The generator set can be started by the remote start/stop switch unless this precaution is followed.

 WARNING	
 Hazardous voltage.	 Moving rotor.
Can cause severe injury or death.	
Operate generator set only with all guards and electrical enclosures in place.	

Grounding generator set. Hazardous voltage can cause severe injury or death. Electrocutation is possible whenever electricity is present. Open main circuit breakers of all power sources before servicing equipment. Configure the installation to electrically ground the generator set and electrical circuits when in use. Never contact electrical leads or appliances when standing in water or on wet ground, as the chance of electrocution is increased under such conditions.

**Four-Lead (Single-Phase)
Generator Sets
where Generator Output can be
120/240 Volt, 60 Hz;
or 110/220 Volt, 50 Hz**

Kohler Co. provides the following information to illustrate the connection of generator sets. In all cases, follow the National Electrical Code (NEC).

NOTE

When connecting a generator set to a voltage different than nameplate voltage, place a notice on the unit indicating this change. Authorized Kohler distributors/dealers supply a decal (part no. 246242) to indicate reconnected voltage.

**120/240-Volt (or 110/220-Volt,
100/200-Volt) Configurations– Figure 5-1**

Select a circuit breaker manufactured with a two-pole circuit breaker. Two single-pole circuit breakers do not conform to NEC requirements when supplying a 240-volt (or 220-volt) load. This is true even if they are mechanically attached together. Leads L1 and L2 are different phases; do not connect them together.

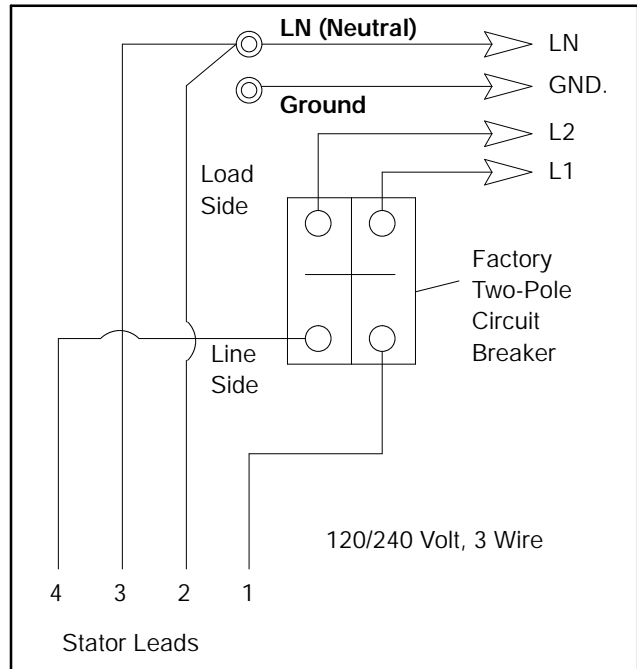
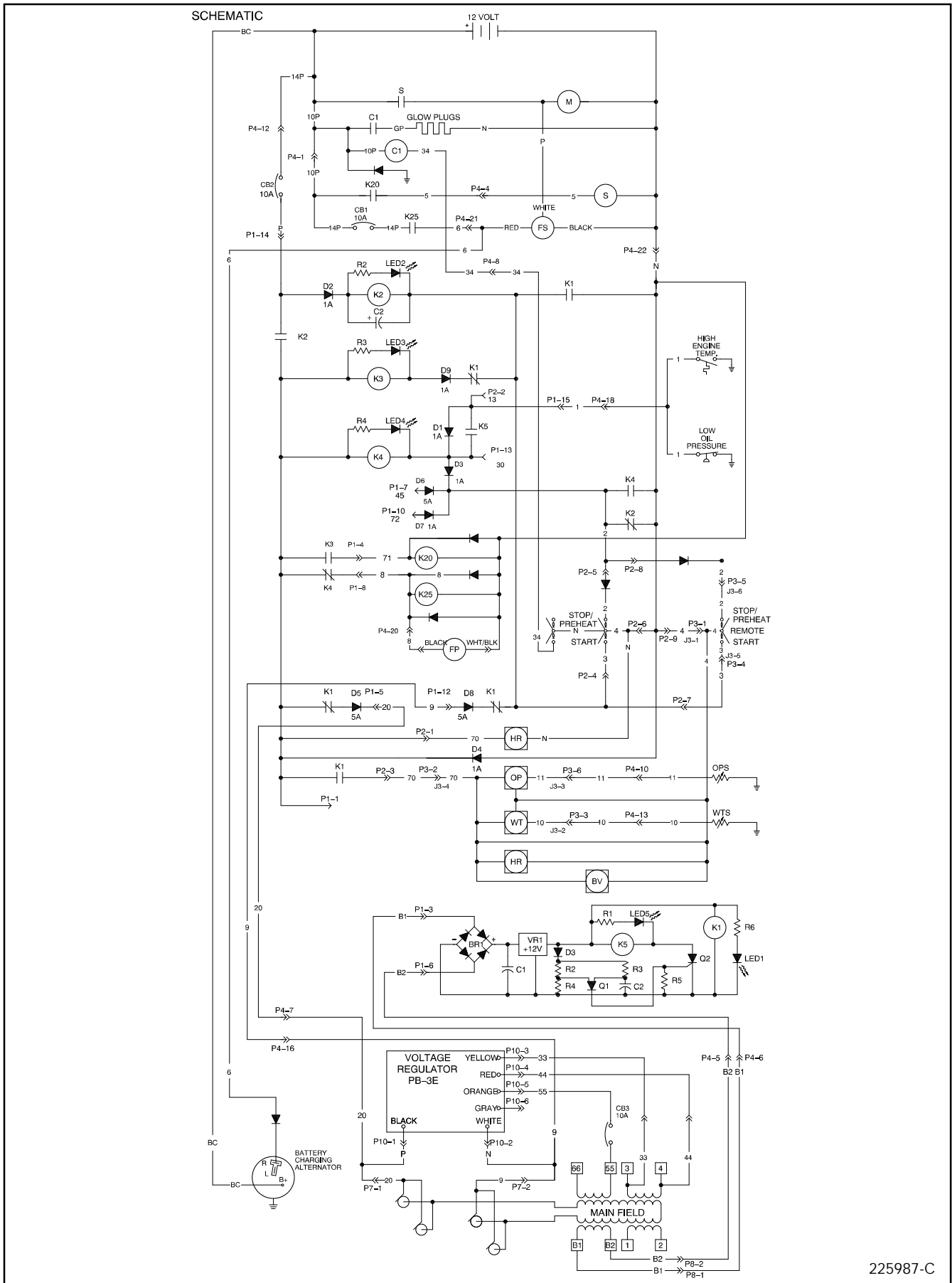


Figure 5-1.

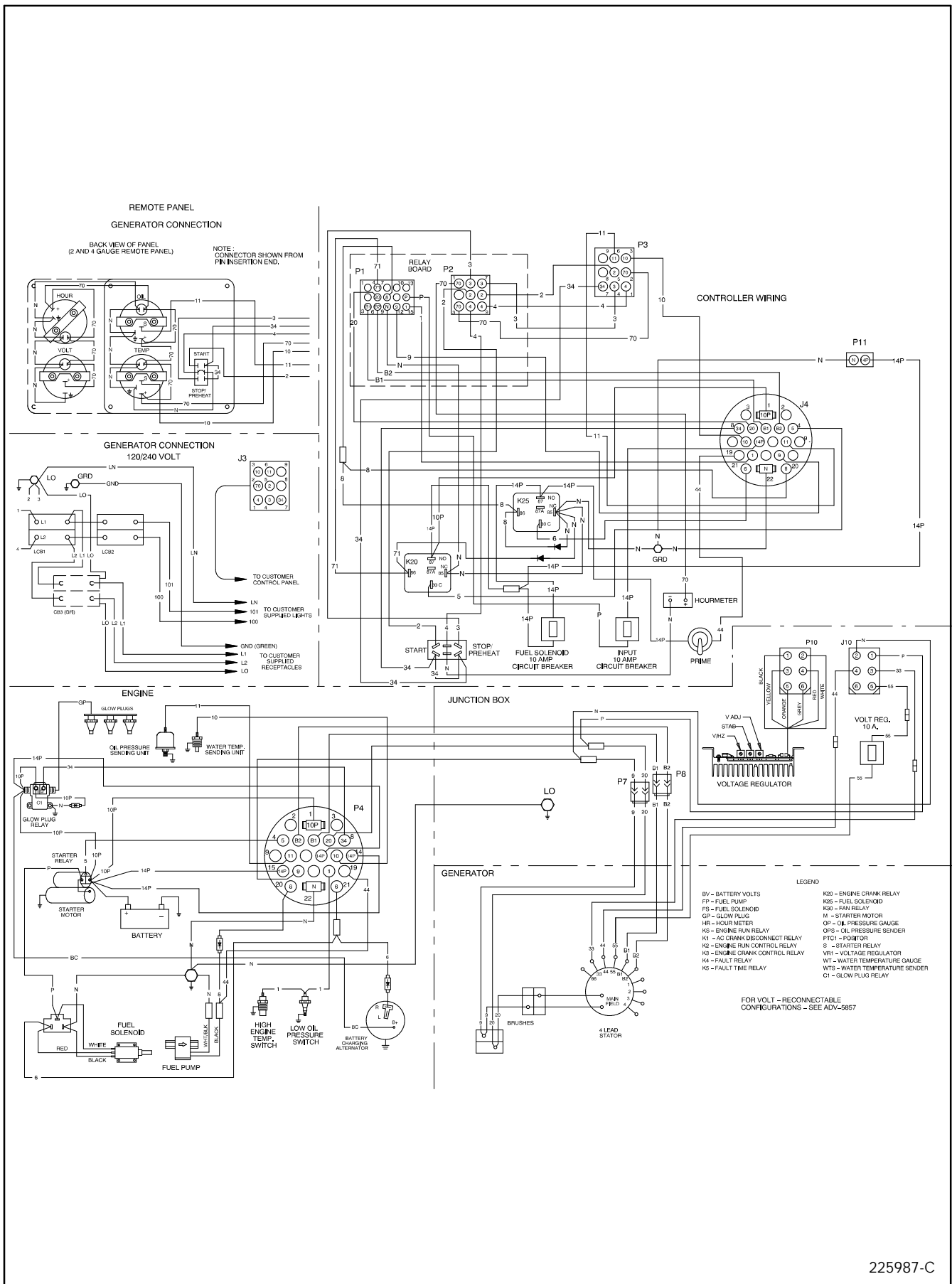
Leads	60 Hz	50 Hz
L0-L1	120 volt	110 volt
L0-L2	120 volt	110 volt
L1-L2	240 volt	220 volt

NOTES



225987-C

Figure 5-2. Wiring Diagram (Schematic) for 7CCO61



225987-C

Figure 5-3. Wiring Diagram (Point-to-Point) for 7CC061

Section 6. Installation

Introduction

Use this section as a guide when installing a generator set in the vehicle; then refer to the operation section for specific service instructions. When installing a mobile generator set, the installation must comply with the Kohler detailed installation instructions. Find any additional requirements in the following two sources: (1)– ANSI A 119.2/NFPA 501 C and (2)– article 551 of ANSI/NFPA 70, National Electrical Code. Generator set installation must also comply with state and local requirements if applicable.

NOTICE

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

General Information

This installation section covers the Kohler generator set model listed in the chart on the next page. Before installing your generator set, verify the model number, found on the nameplate, against the model number included in this manual. Follow all instructions to ensure proper installation.

Features

This generator set features Kubota D905BG-2 diesel engine, rotating-field, alternating-current generator and relay controller. The generator directly connects to the engine for permanent alignment. Each controller includes a start/stop-preheat switch for test operating the set at the controller. After installing the set, perform the following items to make the unit operational:

- Attach exhaust system
- Add radiator coolant. Mount the coolant recovery tank
- Add oil to crankcase until dipstick reads full.
- Connect fuel lines (inlet and return), load leads, and battery terminals
- Connect leads from AC wiring harness to four-meter panel and customer-supplied lights/receptacles

7CCO61 Specifications	
Weight– lbs. (kg)	482 (219)
Length– in. (mm)	34.68 (881)
Width– in. (mm)	18.68 (475)
Height– in. (mm)	25.96 (659)
Radiator Type	In-line
Radiator Fan Type	Suction
Cooling System Capacity– qts. (L)	2.44 (2.3)
Engine Combustion Requirements– cfm (m ³ /min)	25 (0.71)
Engine/Generator Cooling Requirements– cfm (m ³ /min)	1050 (29.7)
Fuel Inlet Connection– in. (mm)	5/16 (8)
Fuel Return Connection– in. (mm)	3/16 (5)
Battery Voltage	12
Battery Recommendation (min.)	800 cold cranking amps
Battery Cranking Current	65 amp hr.
Battery Ground	Negative
Fuel Recommendation	No. 2-D diesel oil (cetane > 45); ASTM D975
Alternative Fuel Types	JP8, Jet A, Jet A1, DF No. 1, JP5
Fuel Consumption– gph (Lph)	
25% Load	0.34 (1.3)
50% Load	0.44 (1.7)
75% Load	0.57 (2.2)
100% Load	0.79 (3.0)

Generator Selection and Wattage Requirements

Consider total wattage requirements (lights, motors, appliances) in selecting a generator set, or sizing wattage requirements when available space and construction may limit the size of the generator set. Refer to Figure 3-21 when figuring wattage requirements.

Installation Factors

Kohler Co. ships each generator set as a unit except for the exhaust system.

When pre-planning the installation, consider the following factors.

1. **Electrical Load.** Does the set selected have adequate capacity to handle the load?
2. **Compartment Size.** Will there be sufficient room around the set to maintain minimum clearances?
3. **Air Requirements.** Are the compartment air inlets and outlets sized to allow adequate circulation of air for cooling and combustion?

4. **Compartment Floor.** Is the compartment floor strong enough to support the weight of the generator set?
5. **Cooling System.** Is the cooling system large enough to adequately cool the generator set?
6. **Fuel System.** Is the fuel system properly designed to prevent fuel starvation of either the main engine or generator set engine?
7. **Exhaust System.** Will the exhaust system meet all safety requirements after installation?
8. **Electrical Connections.** Will all systems (battery, load and remote switch) be compatible with vehicle systems?

The following pages cover each of these installation considerations.

Electrical Load

While the electrical load of the vehicle should have been calculated prior to purchase of the generator set, you may want to recheck the load before installing the set to make sure that the capacity meets demands without possible overloading.

Appliance Loads

Generator sets in mobile vehicles often furnish AC for mechanical tools. Do not overlook such loads when figuring total requirements. Allow reserve capacity for anticipated loads to avoid overloading of the set. See Section 3, Wattage Requirements for the average power requirements of some construction tools.

Compartment Size

When planning compartment size requirements, allow the minimum clearances for cooling of the generator set as shown in Figure 6-1.

NOTE

Since the sets are flexibly mounted, the minimum vibrational clearances will ensure that the sides of the compartment and the set will not rub while the set operates or while the vehicle moves.

Front	1.5 in. (38 mm)
Side	1.5 in. (38 mm)
Top	1.5 in. (38 mm)
Rear	1.5 in. (38 mm)

Figure 6-1. Minimum Clearance Requirements

NOTE

Minimum clearances listed for cooling air circulation. Additional clearance may be required for routine servicing of the generator set.

Take into consideration the thickness of insulating and sound-deadening material used to line the compartment when planning clearances. If necessary, enlarge the compartment to maintain minimum clearance requirements. Securely fasten the generator set to avoid unwanted movement from vibration and road shock. Affix skid-mounted units to a tray for tray mounting or directly to the vehicle frame by the installer. Avoid road splash and the possibility of igniting combustible material beneath the generator.

When designing the compartment, allow sufficient room to easily remove the unit for major service. Also keep in mind that the compartment must have air intake openings having a free area equal to or greater than that specified under "Air Requirements" following.

Line the compartment with a good sound-deadening material. Select fireproof material or material that is highly resistant. An available type of 3-layer foam material does a very efficient job of absorbing sound. This type material easily cuts to size with scissors and quickly installs using special fire-retardant adhesive which bonds to a clean, dry surface.

NOTE

Do not place combustible insulation near exposed exhaust system components.

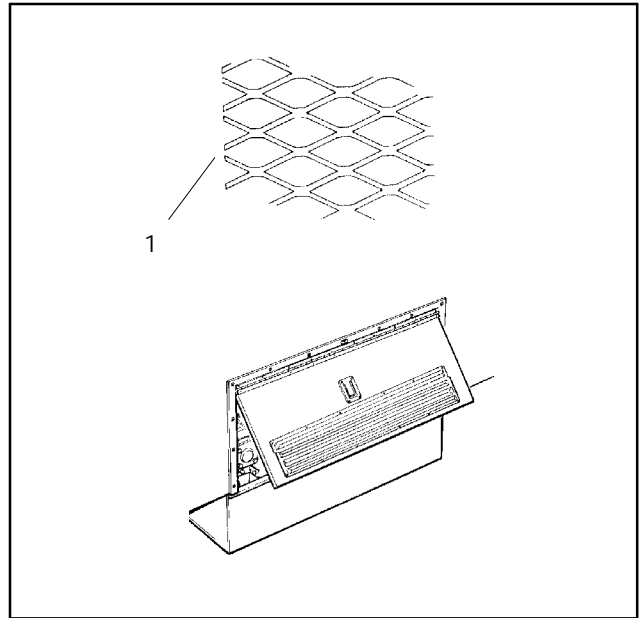
Air Requirements

Each unit contains a high water temperature shutdown switch which automatically shuts down the set if operating temperatures climb too high. To prevent the generator set from shutdown, make sure to have large enough openings in the compartment openings to allow adequate circulation of the cooling air. Figure 6-2 shows the minimum air requirements. Remember, louvers, screens, and protective decorative grill work definitely restrict the effective air flow. Even a simple, relatively open mesh screen, as shown in Figure 6-3, will restrict air flow as much as 45%. Increase the intake opening to compensate for such restrictions.

Model	Air Inlet	Air Outlet
7CCO61	421 (2716)	319 (2058)

**Figure 6-2. Min. Air Requirements
sq. in. (sq. cm.)**

In-line radiator generator sets require two air outlets in the compartment floor, an air inlet in the generator-end wall, and an air inlet in the engine-end wall. Figure 6-4 shows air inlet and discharge openings for in-line radiator-mounted models. Figure 6-5 shows the floor template.



1. Wide-mesh screen

Figure 6-3. Inlet Screen

NOTE

Seal the air inlet perimeters at the engine radiator and generator end bracket against the compartment wall. This ensures that only exterior air is drawn into the generator compartment.

NOTE

Air intake restriction limit:
 7.9 in. (200 mm) of water (initial)
 19.7 in. (500 mm) of water (after use)

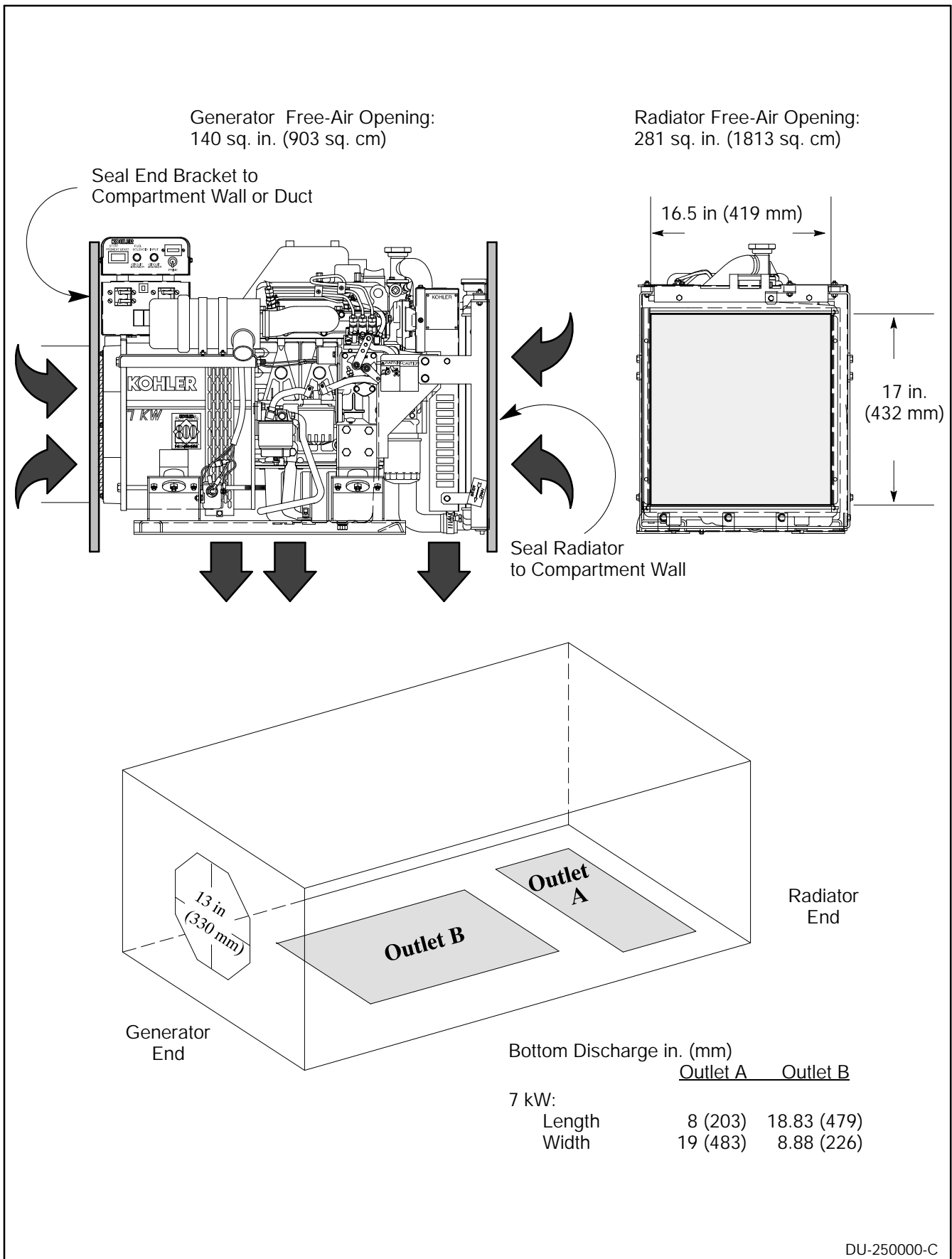


Figure 6-4. Air Flow Requirements– Suction Fan (In-line Radiator)

Fuel System



WARNING



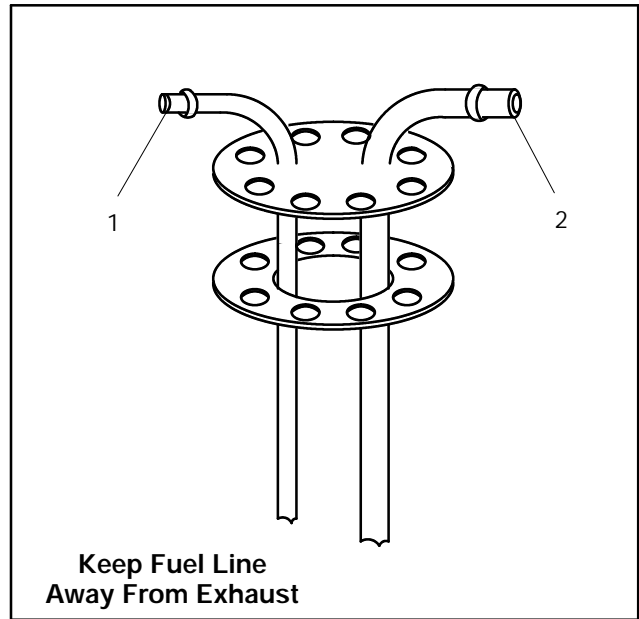
**Explosive fuel vapors.
Can cause severe injury or death.**

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

Fuel system. Explosive fuel vapors can cause severe injury or death. All fuels are highly explosive in a vapor state. Use extreme care when handling and storing fuels. Store fuel 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 since spilled fuel may ignite on contact with hot parts or from ignition spark. Do not smoke or permit flame or spark to occur near sources of spilled fuel or fuel vapors. Keep fuel lines and connections tight and in good condition. Do not replace flexible fuel lines with rigid lines. Use flexible sections to avoid breakage caused by vibration. Do not operate generator set in the presence of fuel leaks, fuel accumulation, or sparks. Repair systems before resuming generator set operation

Draining 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 fuel system. Wipe up all spilled fuel after draining system.

Design the diesel fuel system for the generator set engine to operate independently from the system for the vehicle engine if operating both engines at the same time. To accomplish this, have separate fuel tanks; however, this is usually impractical because of space restrictions. In most installations, both engines operate off a common tank with a separate dip-tube arrangement as shown in Figure 6-6. This prevents the smaller engine from fuel starvation by the larger engine. The generator set dip tube is generally shorter than the vehicle dip tube.



1. Fuel line to generator set
2. Fuel line to vehicle engine

Figure 6-6. Two Dip Tubes in Fuel Tank

Customers sometimes use a simple tee fitting to provide fuel for both engines off a common tank; however, this usually prohibits simultaneous operation. Also the possibility exists that operation of either engine could completely drain the fuel line of the other engine, thus making starting difficult if not impossible. The tee arrangement should not be used.

NOTE

Do not “tee” into fuel injected fuel systems. Use a two dip-tube arrangement for fuel supply. Consult an authorized Kohler service distributor/dealer for further fuel system installation information.

Design the diesel fuel system for the generator set to operate without completely emptying the fuel tank.

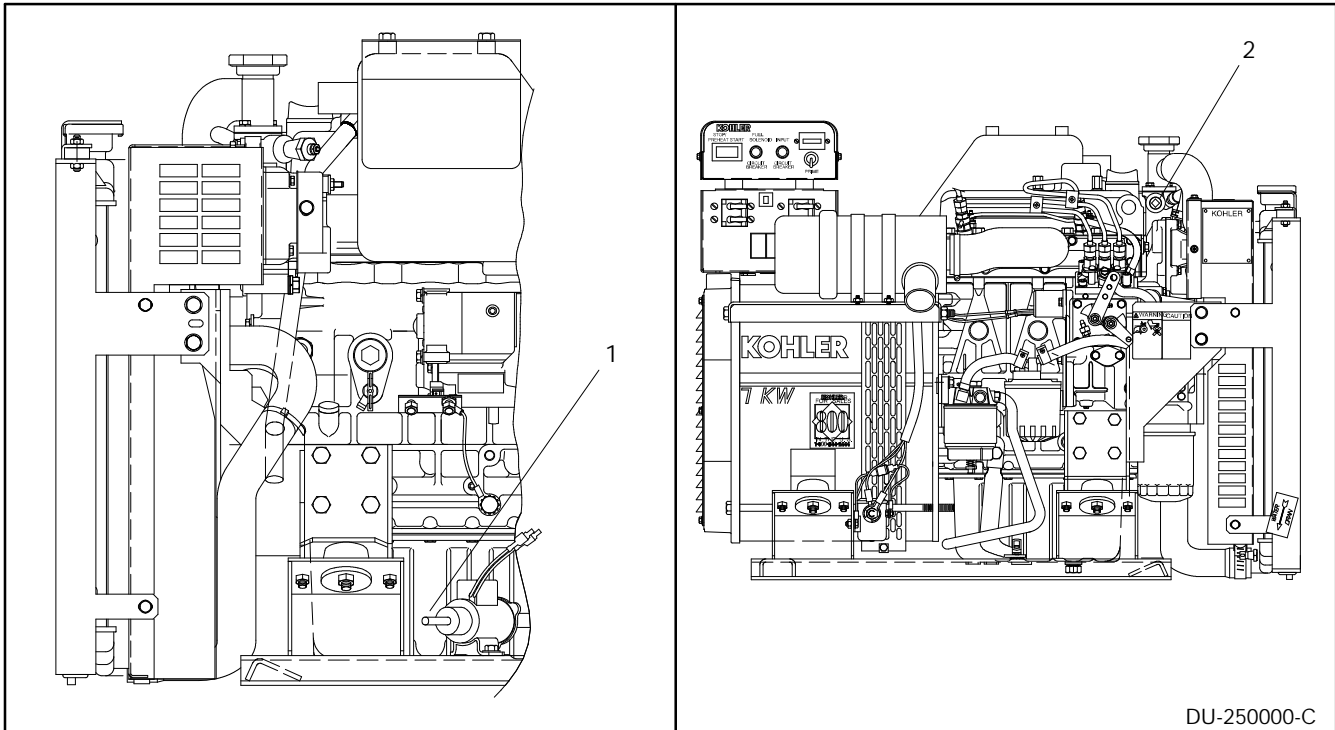
The fuel inlet and return lines (from the fuel tank) must include dip tubes extending to near the bottom of the fuel tank. These allow pick up of fuel and prevents air from entering the system during storage or inoperative periods. Air entering the system will cause drainage and hard starting (requiring fuel system bleeding).

Take care when routing the fuel line from the fuel tank to the generator set. Keep fuel lines as short as possible but maintain adequate clearance from exhaust system. Run fuel lines along the frame or undercarriage. Locate fuel lines below the generator set compartment with entry point near fuel pump [maximum lift of the fuel pump is 1 meter (39 inches)]. The fuel line must be of adequate size to handle the flow of fuel and withstand road shock and year-round climate conditions. If using steel tubing, it should be 5/16 in. (8 mm) I.D. (minimum) with an 8 in. (230 mm) (minimum) flexible section to allow free movement of the generator set. Return line to the fuel tank is 3/16 in. I.D. (5 mm). Locate the fuel return

line as far as practical from the fuel pickup. This will allow return fuel to be cooled by the tank fuel before delivery back to the fuel injectors. Incoming fuel is used to cool the injectors and maximum engine efficiency will be achieved by supplying cool fuel to the engine. Fuel tank capacity and the amount of fuel will affect cooling capability.

Fuel Inlet	5/16 in. (8 mm)
Fuel Return	3/16 in. (5 mm)

Figure 6-7. Fuel Line Sizes



1. Fuel inlet connection (non-service side)

2. Fuel return connection

Figure 6-8. Fuel Inlet and Return Connection

Fuel Lines and Filters

If using metal lines from the fuel tank, a flexible hose section should connect the metal line to the preliminary fuel filter (supplied loose) and flexible hose section to the engine fuel pump (fuel inlet connection). A flexible hose section should connect the metal line from the fuel tank


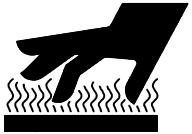
to the engine fuel return connection point. The flexible sections allow vibrational motion of the generator set during operation. See Figure 6-8 for fuel inlet- and return-line connections.

NOTE



Diesel-fueled engines require type B1 hose.

Exhaust Systems

Carefully plan the generator exhaust system to ensure a safe, quiet installation. Make sure the installation complies with all state and local requirements and applicable articles of the codes listed at the beginning of this section (page 6-1).

 WARNING

Hot engine and exhaust system. Can cause severe injury or death. Do not work on generator set until it is allowed to cool.

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

 WARNING

Carbon monoxide. Can cause severe nausea, fainting, or death. The exhaust system must be leakproof and routinely inspected.

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

Generator set operation. Carbon monoxide can cause severe nausea, fainting, or death. Never operate the generator set inside a building unless the exhaust gas is piped safely outside. Never operate in any area where exhaust gas could accumulate and seep back inside a potentially occupied building or vehicle. Be careful when parking your vehicle to avoid obstructing the exhaust outlet. The exhaust gases must discharge freely to prevent carbon monoxide from deflecting into the vehicle. Avoid breathing exhaust fumes when working on or near the generator set. Carbon monoxide is particularly dangerous because it is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short period of time.

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/water leakage.

Due to the different locations of mufflers and piping to these mufflers, follow clearance requirements to protect generator set components and to avoid igniting adjacent combustible materials. Keep a minimum clearance of 1.5 in. (38 mm) between exhaust system parts and fuel system, electrical system, and all combustible components.

Route the exhaust piping through the compartment floor or walls, maintaining minimum clearances and keeping exhaust piping bends to a minimum. Use a tail pipe with as few gradual bends as possible to reduce back pressure; maximum back pressure allowed is 21.4 in. (544 mm) water column at 1800 RPM. The exhaust piping must include an exhaust sleeve or thimble when routed through a combustible wall. Extend tail pipe a minimum of 1 in. (25 mm) past perimeter of vehicle (tail pipe must extend beyond the perimeter of the vehicle body). If the generator tail pipe is located on the same side as the compartment air intake, position tail pipe so exhaust gases will not be recirculated.

Electrical Systems

Battery, load lead, and control panel connections complete the installation. Make final connections to the battery only after making all other connections as this will prevent unintentional starting. The following paragraphs state some specific details on each connection. Refer to the wiring diagram in Section 5 for specific details—qualified electricians should make connections. Securely support or harness all wiring to the generator set to prevent abrasion. Additional support is required to prevent exposure to the exhaust system and drippage of fuel, oil, or grease—provide at least 2" (51 mm) clearance between electrical wiring and hot exhaust parts. Also, do not locate wiring directly below or in close proximity to fuel system parts or oil-fill tube. The following paragraphs cover some other points to consider when making AC load connections.

NOTE

Wiring connections made at the time of installation should be accessible for inspection and servicing.

Battery and Connections

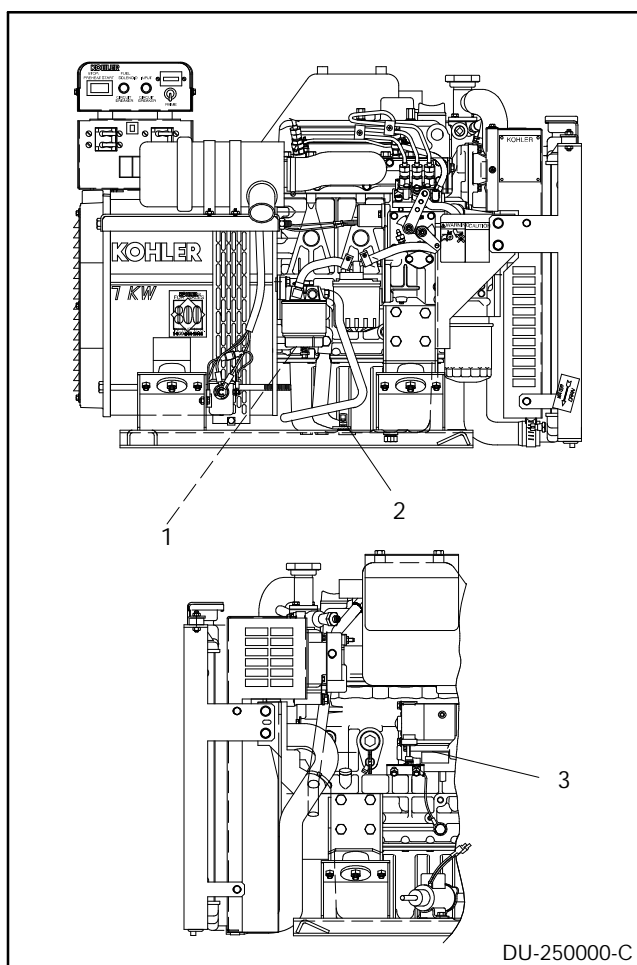
Use a separate 12-volt battery for the generator set. With a separate battery, cables can be kept short which eliminates the problem of excessive voltage drop through long cables. See Figure 6-9 for length and sizes. Refer to Figure 6-11 (View A) for cable connections, making sure to connect a grounding strap between the ground lug on the generator set and frame of the vehicle with this arrangement.

See Figure 6-10 for battery connections to the generator set.

If using the starting battery for the vehicle engine and the generator engine, ground the negative battery terminal to the vehicle frame. Heavy gauge (#4) ground strap must connect the ground lug on the generator set to the vehicle frame as illustrated in Figure 6-11.

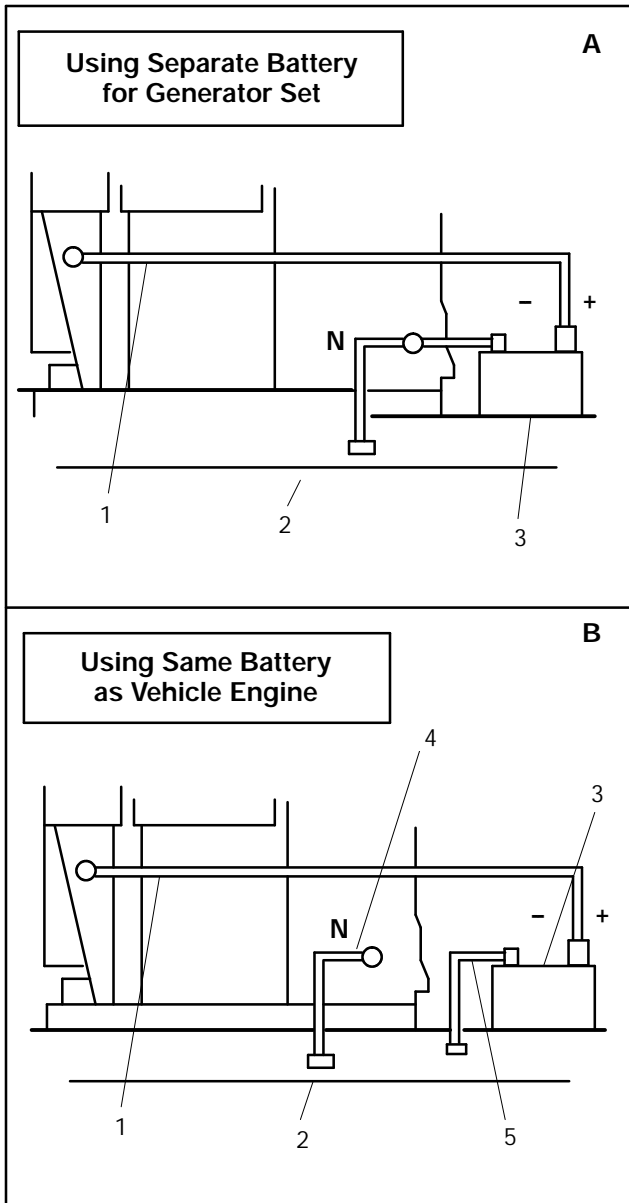
Distance Between Generator Set and Battery—ft. (m)	Cable Size (AWG)		
	At 0°F (-18°C)	At 32°F (0°C)	At 75°F (24°C)
40 (12.2)	00	0	1
30 (9.1)	0	1	2
25 (7.6)	1	2	4
20 (6.1)	2	2	6
15 (4.6)	2	4	6
10 (3.0)	4	6	8
5 (1.5)	6	6	8
2.5 (0.8)	8	8	8

Figure 6-9. Battery Cable Size



1. Battery negative (-) connection (far side)
2. Equipment ground
3. Battery positive (+) connection

Figure 6-10. Battery Connections



1. Battery positive
2. Vehicle frame
3. 12-volt battery
4. Ground strap to vehicle frame
5. Battery negative to vehicle frame

Figure 6-11. Battery Connection Details

NOTE

A ground connection is required between the generator and the vehicle frame even if the battery used to start the generator is not the same as the vehicle.

⚠ WARNING



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

Use protective goggles and clothes. Battery acid can cause permanent damage to eyes, burn skin, and eat holes in clothing.

Battery gases. Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flame or spark to occur near a battery at any time, particularly when it is charging. Avoid touching terminals with tools, etc., to prevent burns and sparks that could cause an explosion. Remove wristwatch, rings, and any other jewelry before handling battery. Never connect negative (-) battery cable to positive (+) connection terminal of starter solenoid. Do not test battery condition by shorting terminals together. Sparks could ignite battery gases or fuel vapors. Ventilate any compartment containing batteries to prevent accumulation of explosive gases. To avoid sparks, do not disturb battery charger connections while battery is being charged. Always turn battery charger off before disconnecting battery connections. Remove negative lead first and reconnect it last when disconnecting battery.

AC Load Lead Connections

Each set has four color-coded load leads. The black leads (L1 and L2) are hot, the white lead (L0) is neutral, and the green lead is the hazard ground. The load leads can be routed directly from the junction box to the vehicle AC circuit or transfer-switch connection. All installations require that the load leads be routed through flexible conduit from the generator end bracket to the junction box location. The load lead junction box must be accessible for servicing and inspection.

NOTE

Keep load lead circuit away from the generator, specifically fuel and exhaust system components.

NOTE

All field-supplied wiring must be capable of withstanding temperatures of 167°F (75°C).

AC load lead L0 (white or gray) is always the neutral lead on Kohler generator sets. Make sure the neutral of the

AC circuit in the vehicle is connected to the lead L0 (white or gray). If equipment ground-type plugs and receptacles (3-pronged) are used in the vehicle, the green wire must be connected to the U-shaped pin. On vehicles which also have provisions for using an outside AC power source, the neutral as well as the hot (or black) leads must be completely isolated from the generator set when power is switched to the outside source. See Figure 6-12.

NOTE

A triple-pole, double-throw transfer switch rated for the calculated load of the vehicle must be used to transfer the load from one source to the other. Install a ground-fault circuit interrupter in the wiring system to protect all branch circuits.

NOTE

The AC load circuit of the generator set must be protected by a circuit breaker(s) against overload or short circuit.

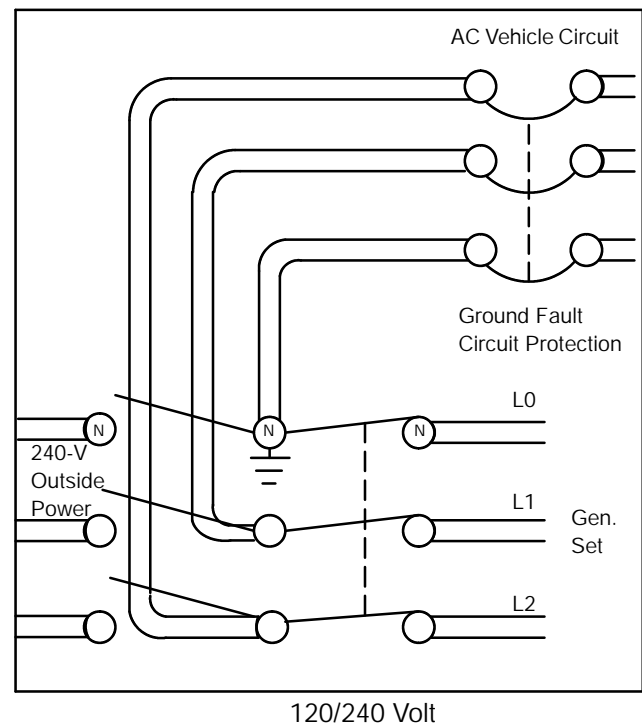
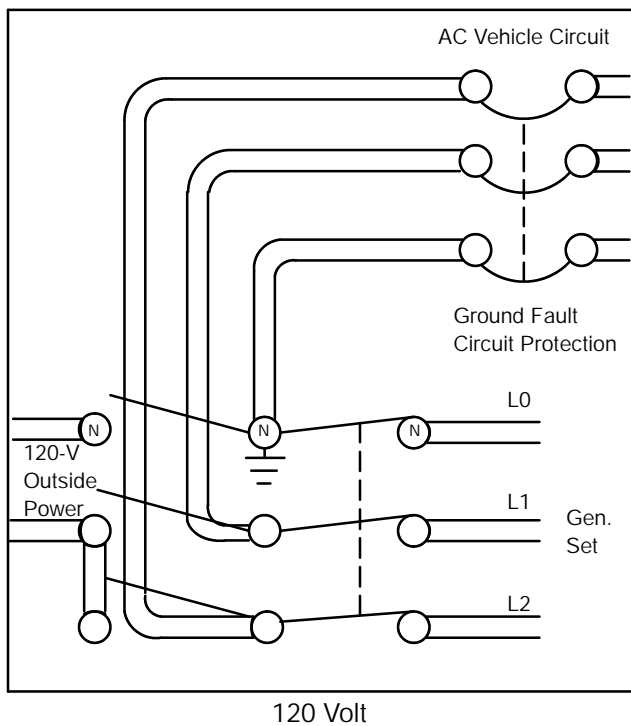


Figure 6-12. Transfer Switch Connections, 3-Wire AC Circuit

Four-Meter Panel Installation

1. Disconnect battery, negative (-) lead first.
2. Determine where in the vehicle to mount the panel. The length of the wiring harness and the size of the panel (including mounting depth) limits this decision. See Figure 6-13 for mounting dimensions. The minimum mounting clearance beyond the panel is 4 in. (102 mm).

3. Connect the pigtail leads from the AC wiring harness (located at the back of the junction box) to the remote panel leads using insulink to connect. Mount the panel using four screws (not supplied). See Figure 6-14 and Section 5 for the panel assembly wiring.
4. Reconnect battery, negative (-) lead last. Start/stop generator set using controller switch and remote switch. Monitor gauges for correct function. Stop generator set.

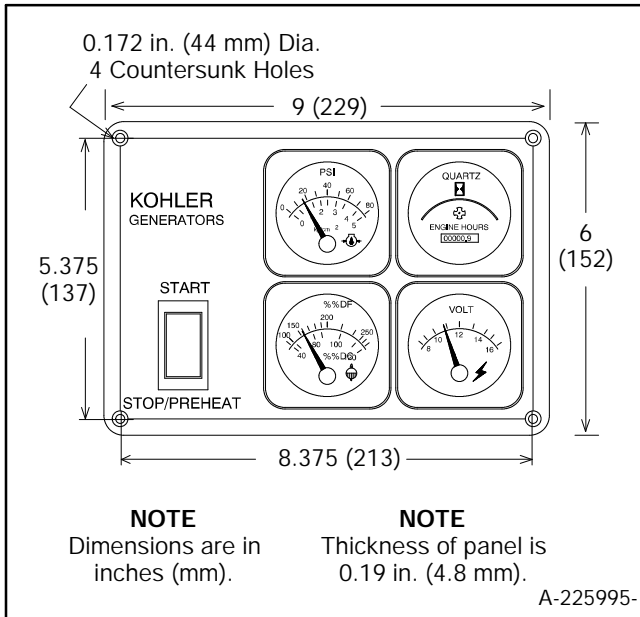


Figure 6-13. Meter Panel Dimensions

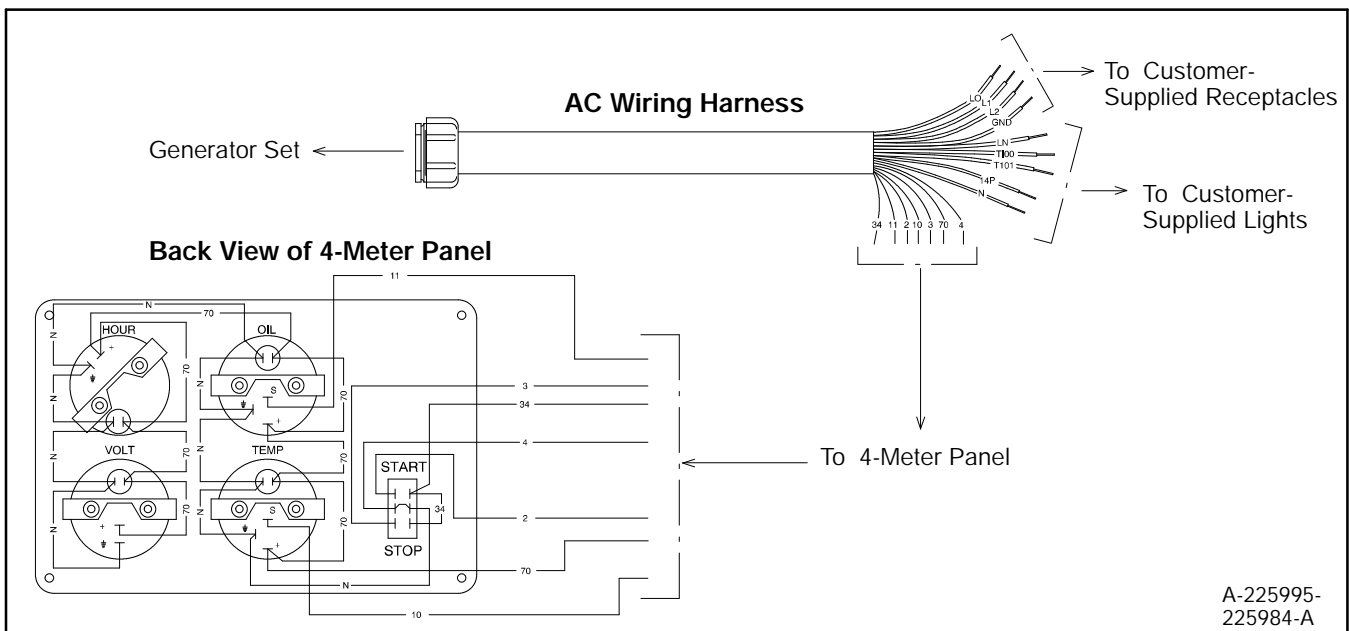


Figure 6-14. Electrical Connections

Section 7. Installation Drawings

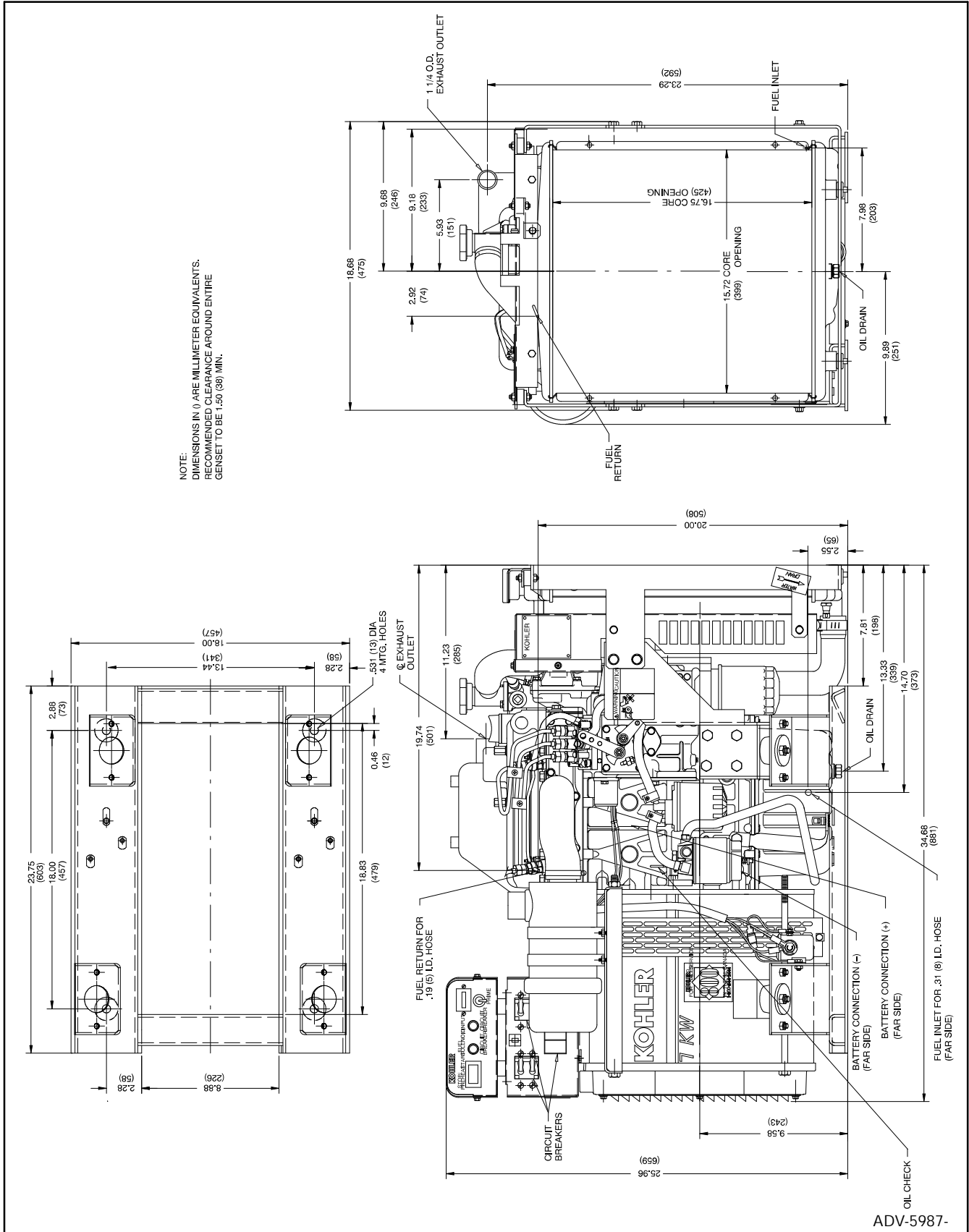


Figure 7-1. 7CCO61 In-line Radiator, Single-Phase Model

Appendix A. Glossary of Abbreviations

Abbreviations are used throughout this manual. Normally they will appear in the text in complete form with the abbreviation following in parentheses the first time they are used. After that they will appear in the

abbreviated form. The commonly used abbreviations are shown below. Some items may not apply to this application.

Abbreviation	Description	Abbreviation	Description
ABDC	after bottom dead center	CWC	city-water cooled
AC	alternating current	cyl.	cylinder
AISI	American Iron and Steel Institute	dB	decibel
AHWT	anticipatory high water temp.	dBA	decibels (A weighted)
ALOP	anticipatory low oil pressure	DC	direct current
AM	amplitude modulation	DCR	direct current resistance
amp	ampere	deg.	degree
amps	amperes	dept.	department
ANSI	American National Standard Institute	dia.	diameter
API	American Petroleum Institute	DIN	Deutsches Institut fur Normung e. V. (also Deutsche Industrie Normenausschuss)
approx.	approximate, approximately	e.g.	example given
A/R	as required, as requested	EIA	Electronic Industries Association
A/S	as supplied, as stated, as suggested	EMI	electromagnetic interference
ASA	American Standards Association (former name of ANSI)	EPA	Environmental Protection Agency
ASME	American Society of Mechanical Engineers	etc.	et cetera, (and so forth)
assy.	assembly	ext.	external
ASTM	American Society for Testing Materials	°F	Fahrenheit degree
ATDC	after dead top center	fl. oz.	fluid ounce(s)
aux.	auxiliary	FM	frequency modulation
A/V	audio-visual	ft.	foot, feet
AWG	American Wire Gage	ft. lbs.	foot pound(s)
AWM	appliance wiring material	fs	full scale
BBDC	before bottom dead center	ga.	gauge (meters wire size)
BDC	before dead center	gal./gals.	gallon, gallons
BHP	brake horsepower	gph	gallons per hour
bmep	brake mean effective power	gpm	gallons per minute
BTDC	before top dead center	gr.	grade
Btu	British thermal unit	grd.	ground
°C	Celsius degree	HCHT	high cylinder head temperature
cc	cubic centimeter	HET	high exhaust temperature
CCA	cold cranking amps	Hg.	mercury (element)
CEC	Canadian Electrical Code	H ₂ O	water
cfh	cubic feet per hour	HP	horsepower
cfm	cubic feet per minute	hr, hrs	hour, hours
CID	cubic inch displacement	HWT	high water temperature
cm	centimeter, centimeters	Hz	hertz (cycles per second)
cmm	cubic meters per minute	ID	inside diameter
co.	company	IEEE	Institute of Electrical and Electronic Engineers
cont'd.	continued	in.	inch, inches
CPVC	chloropoly vinyl chloride	inc.	incorporated
CRT	cathode ray tube	in. lbs.	inch pounds
CSA	Canadian Standards Association	int.	internal
CT	current transformer	int.-ext.	internal-external
cu. in.	cubic inch (es)		

Abbreviation	Description
ISO	International Standards Organization
J	joule, joules
JIS	Japanese Industry Standard
kg	kilogram, kilograms
kg/cm ²	kilograms per square centimeter
kgm	kilogram meter(s)
kJ	kilojoules (btu cal)
km	kilometer, kilometers
kPa	kiloPascal, kiloPascals
kph	kilometers per hour
kV	kilovolt
kVA	kilovolt amperes
kW	kilowatt, kilowatts
kWH	kilowatt hour
L	liter, liters
LxWxH	length x width x height
LED(s)	light emitting diode(s)
lb., lbs.	pound, pounds
L/hr.	liter per hour, liters per hour
L/min.	liter(s) per minute
LOP	low oil pressure
LP	liquified petroleum
LWT	low water temperature
m	meter, meters
m ³	cubic meter, cubic meters
max.	maximum
MCM	one thousand circular mils.
meggar	megohmmeter
MHz	megahertz
mi.	mile, miles
mil	one one-thousandth of an inch
min.	minimum
misc.	miscellaneous
mJ	milli joule(s)
MJ	mega joule(s)
mm	millimeter
m ³ /min	cubic meters per minute
MPa	megaPascal
mpg	miles per gallon
mph	miles per hour
MS	military standard
mW	milliwatt(s)
MW	megawatt(s)
N/A	not available
NBS	National Bureau of Standards
N.C.	normally closed
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
Nm	Newton meter(s)
N.O.	normally open
no., nos.	number, numbers
NPT	National Standard taper pipe thread per general use

Abbreviation	Description
N/R	not required
OC	overcrank
OD	outside diameter
OEM	original equipment manufacturer
OS	overspeed
O/S	oversize
OSHA	Occupational Safety and Health Act
OV	overvoltage
oz.	ounce, ounces
PF	power factor
PMG	permanent magnet generator
pot	potentiometer
ppm	parts per million
psi	pounds per square inch
pt., pts.	pint, pints
PVC	polyvinyl chloride
qt., qts.	quart, quarts
qty.	quantity
ref.	reference
RFI	radio frequency interference
r.h.m.	round-head machine (screw)
rms	root means square
RPM	revolutions per minute
RTV	room temperature vulcanization
SAE	Society of Automotive Engineers
SCR	silicon controlled rectifier
sec.	second, seconds
spec, specs	specification
sq.	square
sq. cm.	square centimeters
sq. in.	square inch(es)
tach	tachometer
TDC	top dead center
tech. pub.	technical publications
temp.	temperature
TIF	telephone influence factor
TP, TPs	technical publications
turbo	turbocharger
UHF	ultrahigh frequency
UNC	Unified coarse thread (was NC)
UNF	Unified fine thread (was NF)
UL	Underwriter's Laboratories, Inc.
U/S	undersize
U.S.A.	United States of America
V	volt, volts
vac	volts alternating current
vdc	volts direct current
VHF	very high frequency
W	watt, watts

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