Installation

Marine Generator Sets

Models:

5/7.3E & 4/6EF
5/7.3ECD & 4/6EFCD
10/13/15EG & 9/11EFG
10/13/15EGD & 9/11EFGD
13/15EGZ
13/15EGZD
15/20C & 12.5/17.5CF

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED

KOHLER® POWER SYSTEMS

TP-5982 4/07g

Table of Contents

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

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

DANGER

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

WARNING

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

CAUTION

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

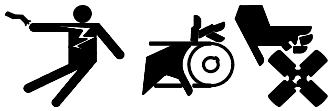
NOTICE

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

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

Accidental Starting

WARNING



Accidental starting.
Can cause severe injury or death.

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

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Place the generator set start/stop switch in the STOP position. (2) Disconnect the power to the battery charger, if equipped. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

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

Battery

WARNING

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

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

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

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

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

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

Engine Backfire/Flash Fire

⚠ WARNING

Fire.
Can cause severe injury or death.

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

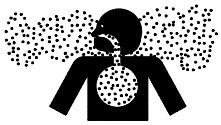
Servicing the backfire flame arrester. A sudden backfire can cause severe injury or death. Do not operate the generator set with the backfire flame arrester removed.

Combustible materials. A sudden flash fire can cause severe injury or death. Do not smoke or permit flames or sparks near the generator set. Keep the compartment and the generator set clean and free of debris to minimize the risk of fire. Catch fuels in an approved container. Wipe up spilled fuels and engine oil.

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

Exhaust System

⚠ WARNING



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

The exhaust system must be leakproof and routinely inspected.

Carbon monoxide symptoms. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is a poisonous gas present in exhaust gases. Carbon monoxide poisoning symptoms include but are not limited to the following:

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

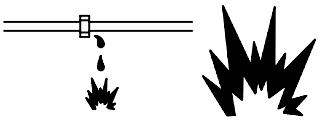
If experiencing any of these symptoms and carbon monoxide poisoning is possible, seek fresh air immediately and remain active. Do not sit, lie down, or fall asleep. Alert others to the possibility of carbon monoxide poisoning. Seek medical attention if the condition of affected persons does not improve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

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

Operating the generator set. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Use the following precautions when installing and operating the generator set. Do not install the exhaust outlet where exhaust can be drawn in through portholes, vents, or air conditioners. Avoid overloading the craft. If the generator set exhaust discharge outlet is near the waterline, water could enter the exhaust discharge outlet and close or restrict the flow of exhaust. Never operate the generator set without a functioning carbon monoxide detector. Be especially careful if operating the generator set when moored or anchored under calm conditions because gases may accumulate. If operating the generator set dockside, moor the craft so that the exhaust discharges on the lee side (the side sheltered from the wind). Always be aware of others, making sure your exhaust is directed away from other boats and buildings.

Fuel System

⚠ WARNING



Explosive fuel vapors.
Can cause severe injury or death.

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

⚠ WARNING

Explosion.
Gasoline vapors can cause explosion and severe injury or death.

Before starting the generator set, operate the blower 4 minutes and check the engine compartment for gasoline vapors.

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

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

Gasoline—Store gasoline only in approved red containers clearly marked GASOLINE.

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

Installing the fuel system. Explosive fuel vapors can cause severe injury or death. Fuel leakage can cause an explosion. Do not modify the tank or the propulsion engine fuel system. Equip the craft with a tank that allows one of the two pickup arrangements described in the installation section. The tank and installation must conform to USCG Regulations.

Pipe sealant. Explosive fuel vapors can cause severe injury or death. Fuel leakage can cause an explosion. Use pipe sealant on all threaded fittings to prevent fuel leakage. Use pipe sealant that resists gasoline, grease, lubrication oil, common bilge solvents, salt deposits, and water.

Ignition-protected equipment. Explosive fuel vapors can cause severe injury or death. Gasoline vapors can cause an explosion. USCG Regulation 33CFR183 requires that all electrical devices (ship-to-shore transfer switch, remote start panel, etc.) must be ignition protected when used in a gasoline and gaseous-fueled environment. The electrical devices listed above are not ignition protected and are not certified to operate in a gasoline and gaseous-fueled environment such as an engine room or near fuel tanks. Acceptable locations are the wheelhouse and other living areas sheltered from rain and water splash.

Hazardous Noise

⚠ CAUTION

Hazardous noise.
Can cause hearing loss.

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

Engine noise. Hazardous noise can cause hearing loss. Wear hearing protection when near an operating generator set. Prolonged exposure to noise levels greater than 85 dBA can cause permanent hearing loss.

Hazardous Voltage/ Electrical Shock

⚠ WARNING

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

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

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

Disconnecting the electrical load. Hazardous voltage can cause severe injury or death. Disconnect the generator set from the load by turning off the line circuit breaker or by disconnecting the generator set output leads from the transfer switch and heavily taping the ends of the leads. High voltage transferred to the load during testing may cause personal injury and equipment damage. Do not use the safeguard circuit breaker in place of the line circuit breaker. The safeguard circuit breaker does not disconnect the generator set from the load.

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

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

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

Testing live electrical circuits. Hazardous voltage or current can cause severe injury or death. Have trained and qualified personnel take diagnostic measurements of live circuits. Use adequately rated test equipment with electrically insulated probes and follow the instructions of the test equipment manufacturer when performing voltage tests. Observe the following precautions when performing voltage tests: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Do not touch the enclosure or components inside the enclosure. (4) Be prepared for the system to operate automatically. *(600 volts and under)*

Hot Parts

⚠ WARNING

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

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

⚠ WARNING

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

Do not work on the generator set until it cools.

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

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

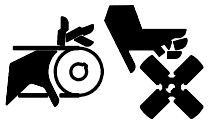
Moving Parts

⚠ WARNING

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

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

⚠ WARNING



Rotating parts.
Can cause severe injury or death.

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

⚠ WARNING

Airborne particles.
Can cause severe injury or blindness.

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

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

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

Sound shield removal. Exposed moving parts can cause severe injury or death. The generator set must be operating in order to perform some scheduled maintenance procedures. Be especially careful if the sound shield has been removed, leaving the belts and pulleys exposed. *(Sound-shield-equipped models only)*

Notice

NOTICE

This generator set has been rewired from its nameplate voltage to

246242

NOTICE

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

NOTICE

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

NOTICE

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

NOTICE

Electrostatic discharge damage. Electrostatic discharge (ESD) damages electronic circuit boards. Prevent electrostatic discharge damage by wearing an approved grounding wrist strap when handling electronic circuit boards or integrated circuits. An approved grounding wrist strap provides a high resistance (about 1 megohm), *not a direct short*, to ground.

NOTICE

Fuse replacement. Replace fuses with fuses of the same ampere rating and type (for example: 3AB or 314, ceramic). Do not substitute clear glass-type fuses for ceramic fuses. Refer to the wiring diagram when the ampere rating is unknown or questionable.

NOTICE

Saltwater damage. Saltwater quickly deteriorates metals. Wipe up saltwater on and around the generator set and remove salt deposits from metal surfaces.

Notes

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

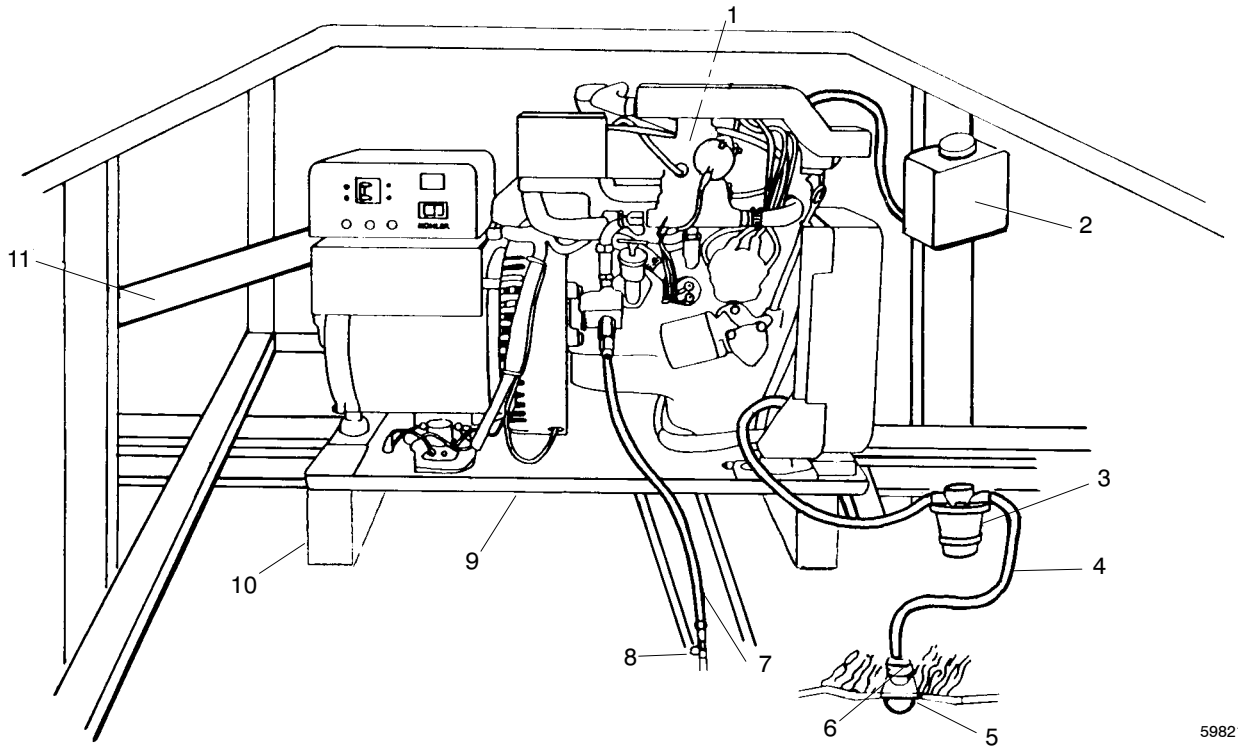
The safe and successful operation of a marine power system depends primarily on the installation. See Figure 1-1 or Figure 1-2. Use this manual as a guide to install the marine generator set. For operating instructions, refer to the operation manual.

Note: Only qualified persons should install the generator set.

Marine generator set installations must comply with all applicable regulations and standards.

The installer is responsible for improper installations resulting in penalties from noncompliance with CARB or EPA emission standards.

Refer to each model's specification sheet for details. Use the spec sheets as a guide in planning your installation. Use current dimension drawings and wiring diagrams.



1. Heat exchanger
2. Coolant recovery tank
3. Seawater strainer*
4. Raw water line
5. Intake through-hull strainer
6. Seacock*
7. Fuel line*
8. Worm clamps
9. Mounting tray
10. Mounting base
11. Exhaust line*

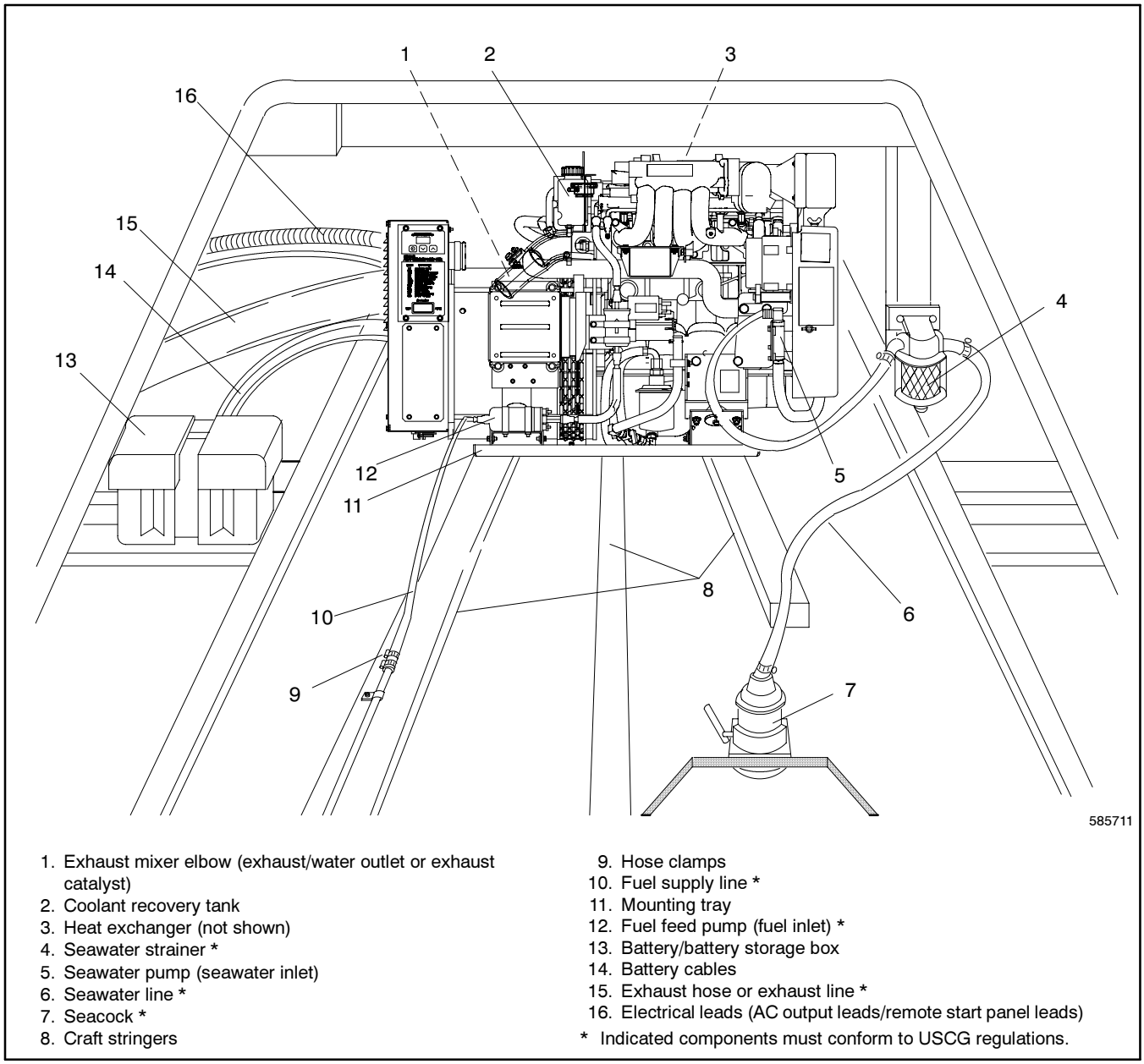
* Indicates components must conform to USCG regulations.

Figure 1-1 Typical Location and Mounting, 5/7.3E, 4/6EF, 15/20C, and 12.5/17.5CF Models

Note: See text for complete explanation of installation requirements.

Note: Connection points vary by model, consult the ADV in Section 7 for each model's locations.

Note: Use two hose clamps on each end of all flexible exhaust hose connections.



1. Exhaust mixer elbow (exhaust/water outlet or exhaust catalyst)
2. Coolant recovery tank
3. Heat exchanger (not shown)
4. Seawater strainer *
5. Seawater pump (seawater inlet)
6. Seawater line *
7. Seacock *
8. Craft stringers
9. Hose clamps
10. Fuel supply line *
11. Mounting tray
12. Fuel feed pump (fuel inlet) *
13. Battery/battery storage box
14. Battery cables
15. Exhaust hose or exhaust line *
16. Electrical leads (AC output leads/remote start panel leads)

* Indicated components must conform to USCG regulations.

Figure 1-2 Typical Generator Set Location and Mounting, 10/13/15EG and 9/11EFG Models Shown; 5/7.3ECD, 4/6EFCD,10/13/15EGD, 9/11EFGD, 13/15EGZ, and 13/15EGZD Models are Similar

Note: See text for complete explanation of installation requirements.

Note: Connection points vary by model, consult the ADV in Section 7 for each model's locations.

Note: Use two hose clamps on each end of all flexible exhaust hose connections.

2.1 General Considerations

The key to installation is location. Before making final plans for locating a generator set, consider the following subsections on this page concerning the set and the proposed location.

Installation Location Considerations

1. Choose a location that allows adequate space for cooling and exhaust system installation, fuel system installation, ventilation, and service access to the generator set (engine and generator).

2. Use craft stringers or other available structural members capable of supporting the generator set's weight.

3. Seal the generator set compartment from the cabin to prevent exhaust gases and fuel vapors from entering the cabin.

See the current generator set specification sheet or Section 7 of this manual for generator set dimensions and weights. See Section 1 for a typical installation.

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2.2 Location

Locate the generator set to allow easy service access to the generator set's engine, controller, cooling, and fuel system components. The engine compartment is often the ideal location for the generator set if the propulsion engine(s) does not obstruct access to the generator set and controller.

Marine Generator Set Installations in European Union Member Countries

This generator set is specifically intended and approved for installation below the deck in the engine compartment. Installation above the deck and/or outdoors would constitute a violation of European Union Directive 2000/14/EC noise emission standard.

Allow clearance for vibration and cooling during operation. Allow a minimum of 38 mm (1.5 in.) clearance on all sides (top, front, rear, and sides) of a generator set without an optional sound shield. Refer to the instruction sheet for minimum clearances for sound-shielded units. Also, allow space for the power takeoff (PTO) option, if equipped.

2.3 Mounting

Craft stringers generally provide the best support for a generator set. Kohler Co. recommends mounting the generator set on a flat board attached to the craft stringers. Ensure that the structural members for mounting can support the generator set weight and withstand vibration. The generator set includes vibration mounts and a mounting tray; if desired, install additional vibration isolating pads underneath the generator set's base. Use the four mounting holes in the mounting tray to mount the generator set securely to the craft.

Position the generator set so it will not adversely alter the craft's performance. Mount the generator set as high as possible to avoid contact with bilge splash and lower-lying vapors and to allow for a downward pitch of the exhaust line toward the exhaust outlet.

For angular operating limits, consult the operation manual.

Notes

3.1 Ventilation

Engine combustion, generator cooling, and expulsion of flammable and lethal fumes require ventilation. Provide ventilation compliant with USCG regulations governing the sizing of vents and other considerations.

As a rule, size each inlet- and outlet-vent area to a minimum of 13 sq. cm/30.5 cm (2 sq. in. per ft.) of the craft's beam. Should this rule conflict with USCG regulations, follow USCG regulations. For applications with screened inlets, double the size of the hull/deck openings. Extend the vent ducts to bilges to expel heavier-than-air fumes.

For generator sets mounted in the engine compartment, increase the air flow to allow for the generator set's requirements. Install UL-listed, ignition-protected blowers in the outlet vents and wire them to operate before starting the engine(s). Install optional detection devices to cause alarm, warning, or engine shutdown should dangerous fumes accumulate in the compartment.

⚠ WARNING

Explosion.
Gasoline vapors can cause explosion and severe injury or death.

Before starting the generator set, operate the blower 4 minutes and check the engine compartment for gasoline vapors.

See the current generator set specification sheet for air requirements. The air intake silencer/cleaner provides combustion air to the engine. Do not compromise the recommended minimum clearance of 38 mm (1.5 in.) between a duct opening and enclosure wall. The engine/generator performance will be adversely affected if the installer neglects these guidelines. Follow these guidelines to optimize generator set performance. See Figure 3-1 for allowable intake restriction.

Note: ISO 3046 derates apply. See Appendix C.

Model	Normal Intake Restriction*
5/7.3E and 4/6EF	0.03 psi (0.79 in. H_2O)
5/7.3ECD and 4/6EFCD	
10/13/15EG, 9/11EFG, 10/13/15EGD, 9/11EFGD, 13/15EGZ, and 13/15EGZD	0.36 psi (10 in. H_2O)
15/20C and 12.5/17.5CF	0.01 psi (0.29 in. H_2O)
* Clean backfire flame arrestor.	

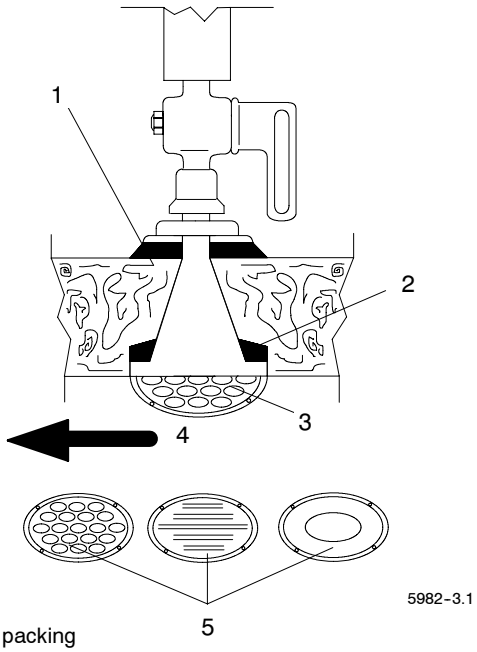
Figure 3-1 Intake Restriction

3.2 Cooling System Components

Design the marine generator set cooling system to include the following features.

3.2.1 Intake Through-Hull Strainer (Seacock Cover)

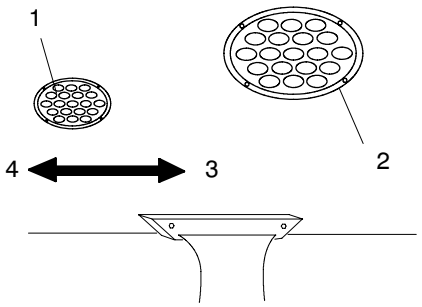
Install a screened intake through-hull strainer to prevent entry of foreign objects. Use perforated, slotted-hole, or unrestricted-hole design strainers. See Figure 3-2 for examples of typical strainers. The inner diameter of the strainer opening must be equal to or greater than the inner diameter of water line hose to the seawater pump.



1. Inside packing
2. Outside packing
3. Seacock cover
4. Direction of vessel movement
5. Typical intake through-hull strainers

Figure 3-2 Seacock Installation

Do not align the strainer (in relation to the direction of travel) with any other through-hull intakes. See Figure 3-3. Flush mount the recommended through-hull strainer. Install slotted-hole design strainers with the slots parallel to the direction of the vessel's movement.



Note: Position the intakes in relation to the vessel's travel so neither is in the wake of the other.

1. Generator set intake
2. Intake
3. Aft (rearward)
4. Fore (forward)

Figure 3-3 Intake Strainer Installation

Do not use a speed scoop or cup design intake through-hull strainer because it can cause a ramming effect and force water upward, past the seawater pump, and into the engine cylinders when the vessel is moving and the generator set is shut down.

Do not use hull designs incorporating sea chests or other designs that provide a positive pressure to the raw water pump for the intake through-hull strainers. A positive pressure will force water past the raw water pump and into the engine. A sea chest is a concave molded-in-the-hull chamber that aligns to the direction of travel. A sea chest configuration applies a positive pressure similar to a scoop-type through-hull strainer.

3.2.2 Seacock

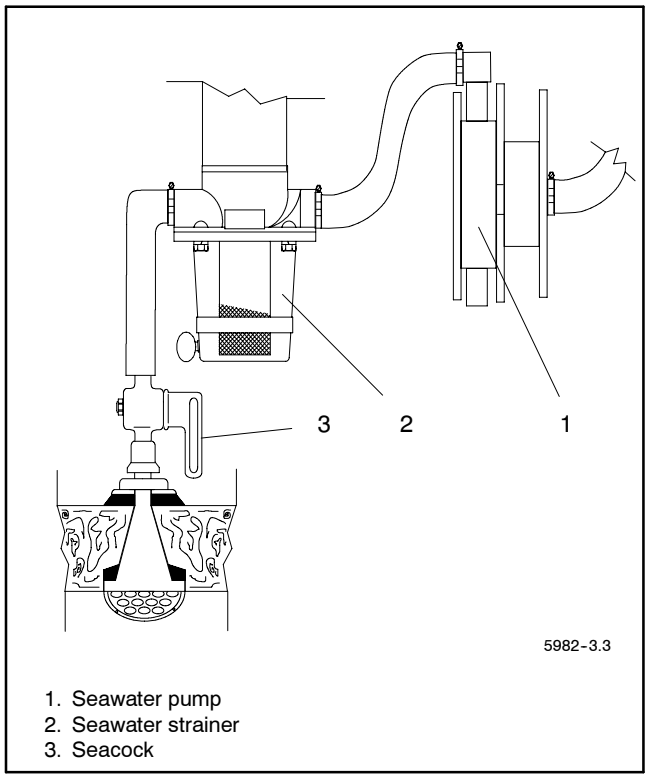
Mount the seacock to the hull, assemble it to the intake, and ensure that it is accessible for operation. Figure 3-2 shows a typical seacock installation.

Avoid overcaulking the seacock. Excess caulk reduces water flow and, in some cases, develops a barrier that can force water upward, past the seawater pump, and into the engine cylinders when the vessel is moving and the generator set is shut down.

3.2.3 Seawater Strainer

Mount the seawater strainer to the seacock or permanent structure at a point not higher than the seawater pump. Ensure that the strainer is accessible for service. See Figure 3-4 for a typical installation.

Note: Some seawater strainers include a seacock and an intake through-hull strainer.



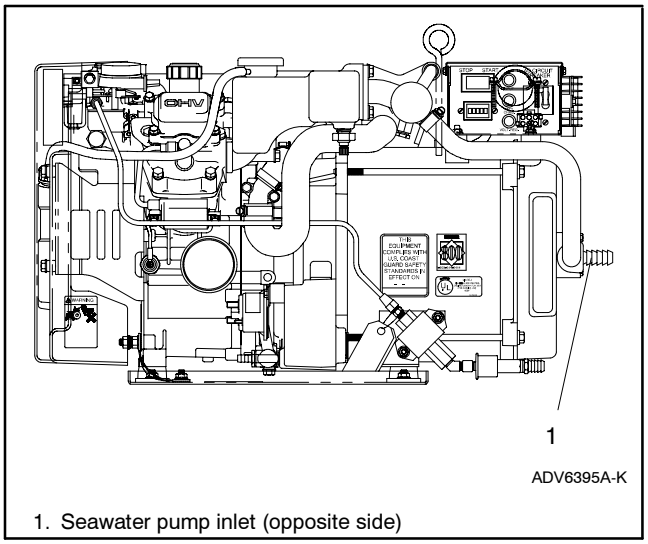
1. Seawater pump
2. Seawater strainer
3. Seacock

Figure 3-4 Seawater Strainer Installation

3.2.4 Water lines

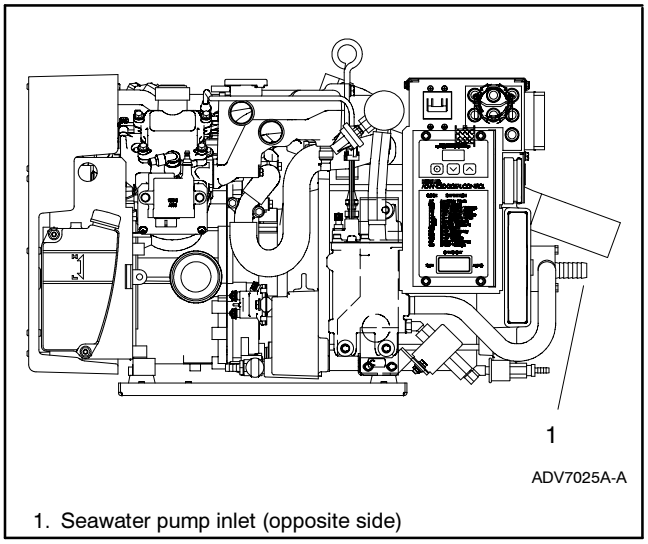
Water lines from the seacock to the engine-driven seawater pump are usually constructed of flexible hose or copper tubing. Use a flexible section of hose for connection to the seawater pump to allow for vibrational motion of the generator set during operation. Support a nonflexible water line within 102 mm (4 in.) of its connection to the flexible section.

Keep the seawater hose as straight and short as possible. If the hose is too long, usually over 4.6 m (15 ft.), water draw problems may occur. See Section 7, Installation Drawings, for the inlet water line hose size and the seawater connection to the seawater pump inlet. Avoid running the inlet pipe above the generator. See Figure 3-5, Figure 3-6, Figure 3-7, Figure 3-8, or Figure 3-9 for the seawater connection to the seawater pump inlet.



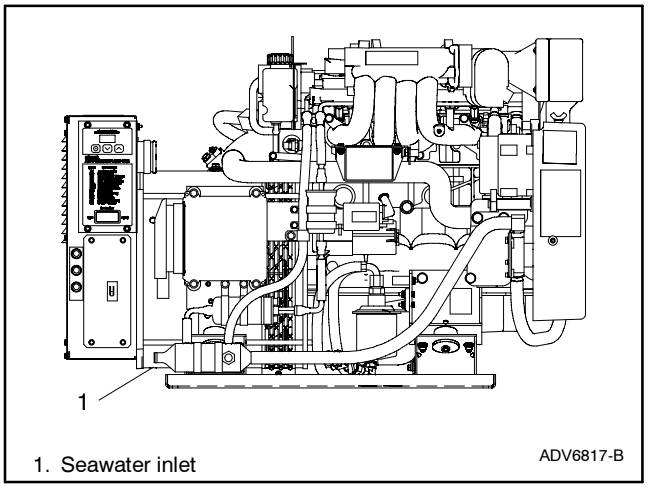
1. Seawater pump inlet (opposite side)

Figure 3-5 Seawater Inlet Connection, 5/7.3E and 4/6EF Models



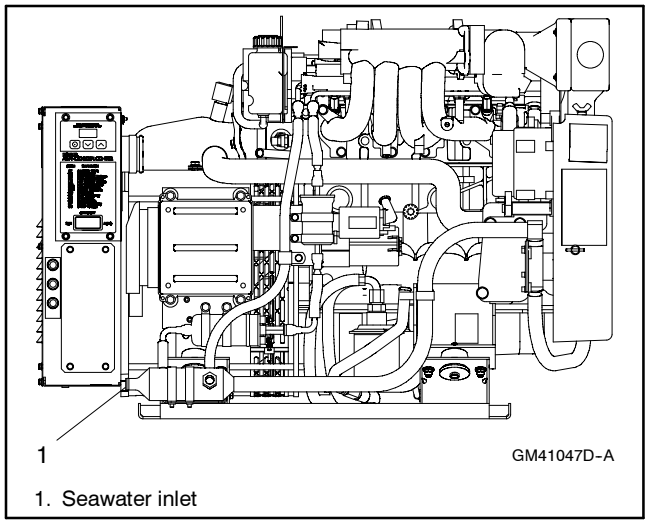
1. Seawater pump inlet (opposite side)

Figure 3-6 Seawater Inlet Connection, 5/7.3ECD and 4/6EFCD Models



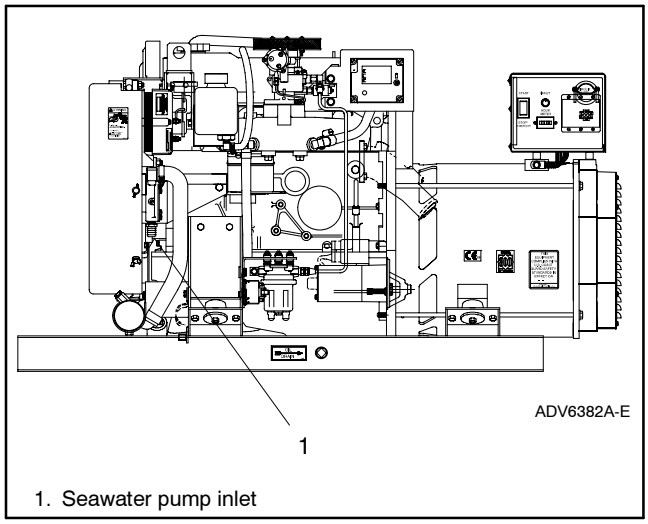
1. Seawater inlet

Figure 3-7 Seawater Inlet Connection, 10/13/15EG, 9/11EFG, and 13/15EGZ Models



1. Seawater inlet

Figure 3-8 Seawater Inlet Connection, 10/13/15EGD, 9/11EFGD, and 13/15EGZD Models



1. Seawater pump inlet

Figure 3-9 Seawater Inlet Connection, 15/20C and 12.5/17.5CF Models

3.2.5 Closed Heat Exchanger

Closed heat exchanger cooling is the best alternative for most applications. See Figure 3-10 for a typical installation. Provide service accessibility for the heat exchanger pressure cap.

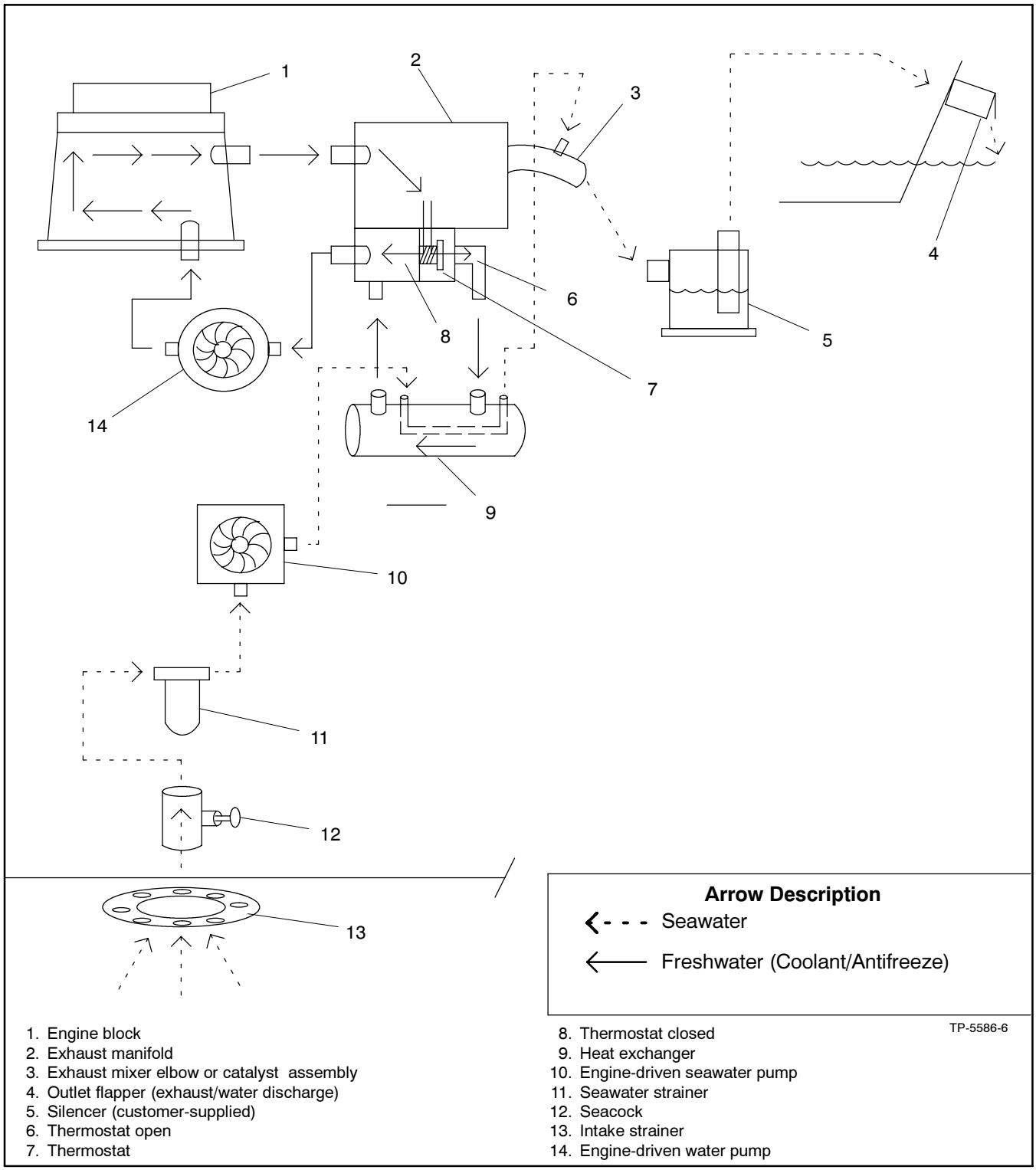
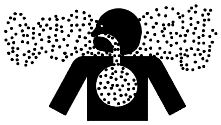


Figure 3-10 Typical Closed/Heat Exchanger Cooling System Installation

⚠ WARNING



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

The exhaust system must be leakproof and routinely inspected.

Carbon monoxide symptoms. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is a poisonous gas present in exhaust gases. Carbon monoxide poisoning symptoms include but are not limited to the following:

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

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

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

Operating the generator set. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Use the following precautions when installing and operating the generator set. Do not install the exhaust outlet where exhaust can be drawn in through portholes, vents, or air conditioners. Avoid overloading the craft. If the generator set exhaust discharge outlet is near the waterline, water could enter the exhaust discharge outlet and close or restrict the flow of exhaust. Never operate the generator set without a functioning carbon monoxide detector. Be especially careful if operating the generator set when moored or anchored under calm conditions because gases may accumulate. If operating the generator set dockside, moor the craft so that the exhaust discharges on the lee side (the side sheltered from the wind). Always be aware of others, making sure your exhaust is directed away from other boats and buildings.

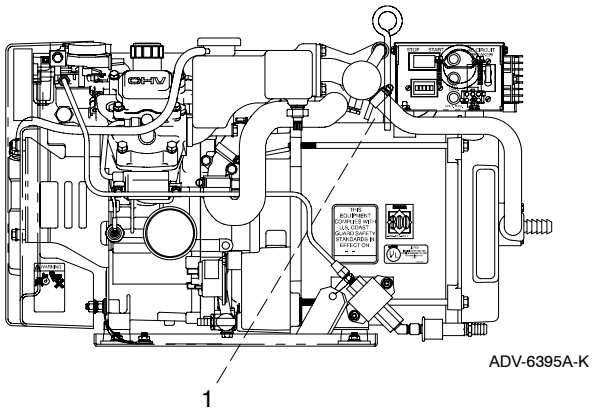
Note: Should any information regarding installation conflict with USCG regulations, follow USCG regulations.

4.1 Exhaust Lines

Use water-cooled exhaust lines in all marine installations. Use a 51-mm (2-in.) inside diameter hose. Keep the lines as short and straight as possible. NFPA 302 Fire Protection Standard for Pleasure and Commercial Motor Craft, Clause 4-3, recommends using two corrosion-resistant hose clamps with a minimum width of 13 mm (1/2 in.) on each end of the flexible exhaust hose connections. Kohler Co. requires a downward pitch of at least 13 mm per 30.5 cm (0.5 in. per running foot). Use a flexible exhaust hose that conforms to UL Standard 1129 for the engine wet exhaust components between the mixer elbow or catalyst assembly and the exhaust outlet.

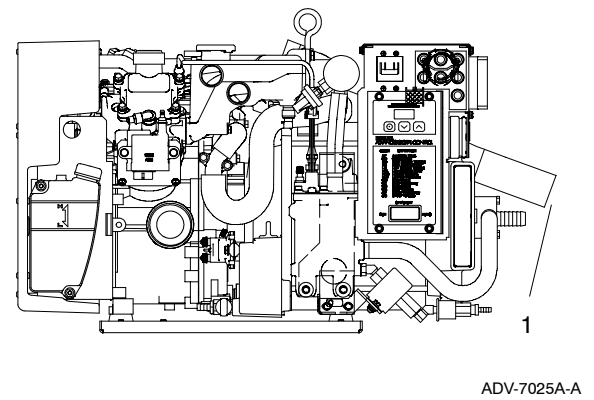
4.2 Exhaust Systems

Mount the silencer independently to eliminate stress on the exhaust system and the exhaust manifold/mixer elbow or catalyst assembly. See Section 7, Installation Drawings, for the mixer elbow or catalyst assembly water line hose size. See Figure 4-1, Figure 4-2, Figure 4-3, Figure 4-4, or Figure 4-5 for the exhaust connection to the mixer elbow or catalyst assembly. Provide an adequate hose length from the exhaust mixer elbow or catalyst assembly to the silencer to allow for generator set movement.



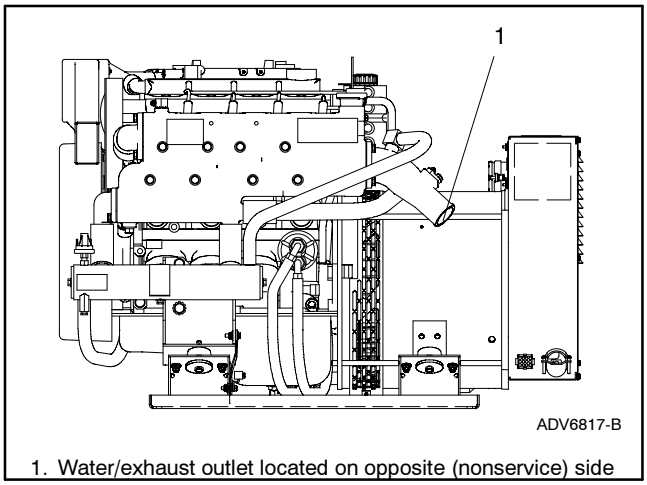
1. Water/exhaust outlet located on opposite (nonservice) side

Figure 4-1 Mixer Elbow/Exhaust Connection, 5/7.3E and 4/6EF



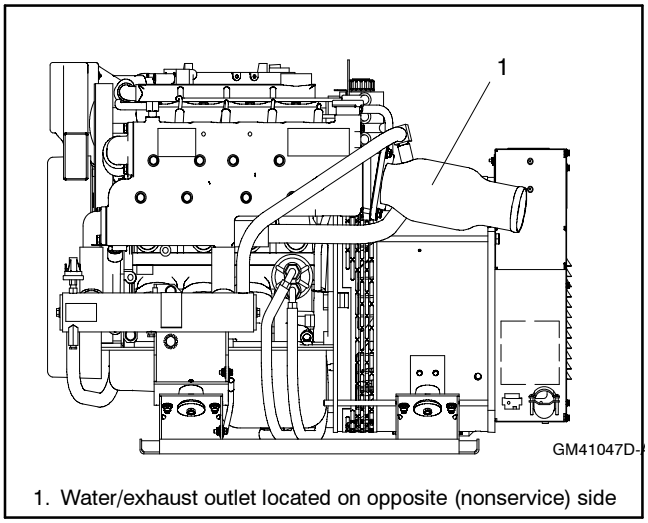
1. Water cooled exhaust outlet

Figure 4-2 Water Cooled Exhaust Outlet, 5/7.3ECD and 4/6EFCD



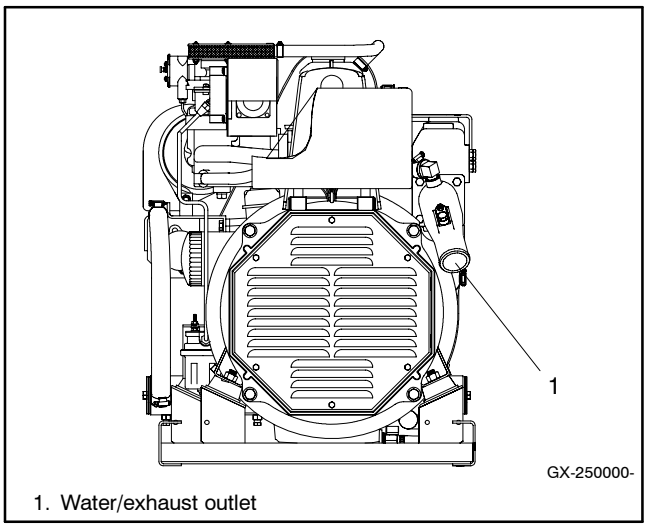
1. Water/exhaust outlet located on opposite (nonservice) side

Figure 4-3 Mixer Elbow/Exhaust Connection, 10/13/15EG, 9/11EFG, and 13/15EGZ



1. Water/exhaust outlet located on opposite (nonservice) side

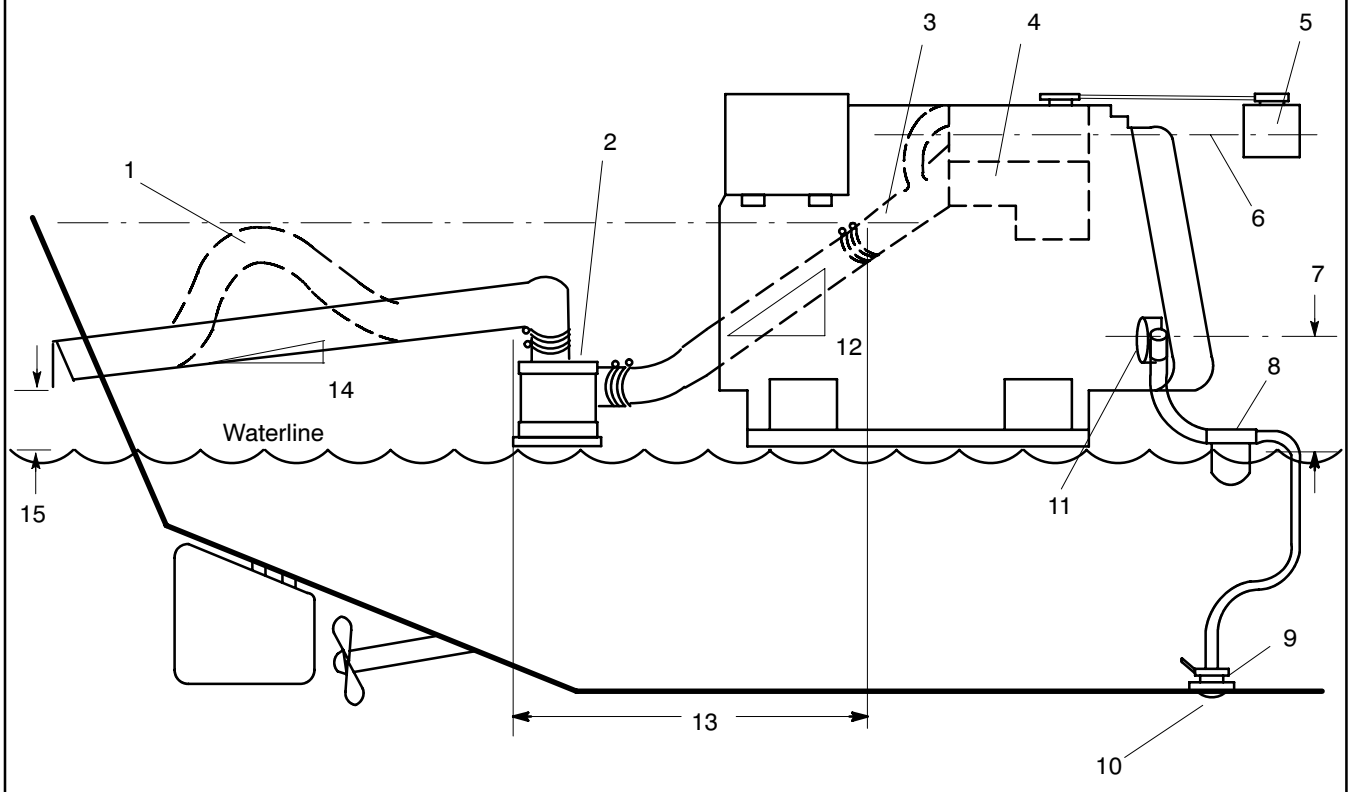
Figure 4-4 Catalyst Assembly/Exhaust Connection, 10/13/15EGD, 9/11EFGD, and 13/15EGZD



1. Water/exhaust outlet

Figure 4-5 Mixer Elbow/Exhaust Connection, 15/20C and 12.5/17.5CF

Locate the exhaust outlet at least 10 cm (4 in.) above the waterline when the craft is loaded to maximum capacity. Install an exhaust port with flap at the exhaust (transom) outlet to prevent water backup in following seas or when moving astern (backward). A lift in the exhaust piping before exiting the boat prevents backwash. See Figure 4-6, Item 1. Support the exhaust lines to prevent the formation of water pockets.



1. Slight lift improves silencing (keep below level of exhaust manifold outlet) and prevents water backwash into silencer
2. Silencer (customer supplied)
3. Exhaust mixer elbow or catalyst assembly
4. Heat exchanger (locations vary by model)
5. Coolant recovery tank (located on unit on some models)
6. Locate coolant recovery tank at same height as heat exchanger
7. Maximum seawater pump lift of 1 m (3 ft.)
8. Seawater strainer
9. Seacock
10. Intake strainer
11. Engine-driven seawater pump
12. Minimum exhaust hose pitch of 1.3 cm per 30.5 cm (0.5 in. per ft.)
13. Maximum distance between silencer and exhaust mixer elbow or catalyst assembly of 3 m (10 ft.)
14. Minimum exhaust hose pitch of 1.3 cm per 30.5 cm (0.5 in. per ft.)
15. Minimum exhaust outlet distance above waterline of 10 cm (4 in.)

Note: Data applies to both rear- and side-exhaust installations.

Figure 4-6 Typical Above Waterline Installation

Exhaust system guidelines for various generator set locations follow. Information and illustrations of stern- (rear) exhaust installations also apply to side-exhaust installations. Where exhaust lines require passage through bulkheads, use port- (left) or starboard- (right) side exhaust outlets. This is especially true of applications in which long exhaust lines to the transom (rear) could cause excessive back pressure. See Figure 4-7 for allowable back pressures.

Model	Allowable Exhaust Back Pressure
5/7.3E and 4/6EF	< 1.42 psi (3 in. Hg)
5/7.3ECD and 4/6EFCD	
10/13/15EG, 9/11EFG, 10/13/15EGD, 9/11EFGD, 13/15EGZ and 13/15EGZD	< 1.47 psi (3 in. Hg)
15/20C and 12.5/17.5CF	< 2.94 psi (6 in. Hg)

Figure 4-7 Allowable Exhaust Back Pressures

4.2.1 Above Waterline Installation

In addition to considerations described earlier, install a customer-supplied silencer with the silencer's outlet at a maximum of 3 m (10 ft.) horizontally from the center of the engine's exhaust outlet. See Figure 4-6. Mount a typical silencer with the inlet and outlet horizontal and with drain plug down. Use a pitch of at least 13 mm per 30.5 cm (0.5 in. per running foot). Some silencers require two supporting brackets or hanger straps for installation to stringers or other suitable structures. Follow the instructions provided with the silencer. Locate any lift in the exhaust line, used to improve silencing, below the engine exhaust manifold outlet.

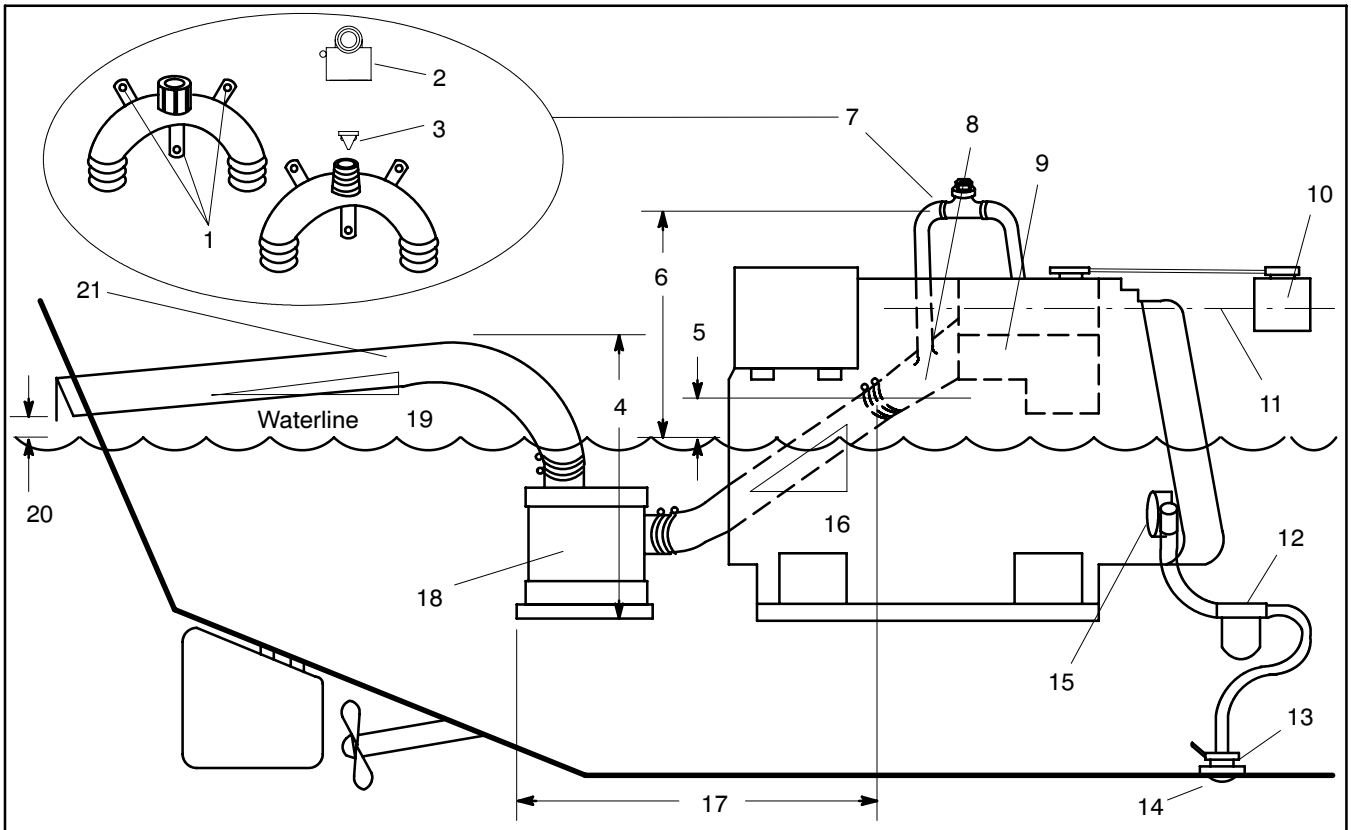
Note: Use two hose clamps on each end of all flexible exhaust hose connections.

Note: Read the text for a complete explanation of dimensions and other installation considerations.

4.2.2 Mid/Below Waterline Installation

Follow USCG regulations for installing an antisiphon provision to prevent raw water entry into the engine. Use the siphon break if the exhaust manifold outlet is located less than 23 cm (9 in.) above the waterline when the craft is loaded to maximum capacity. Install the siphon break at least 31 cm (1 ft.) above the waterline. To install, see the instructions provided with the siphon break kit. See Figure 4-8.

Note: Failure to properly install a siphon break will cause engine damage and may void warranty.



1. Mounting base
2. Retaining cap
3. Reed valve assembly
4. Maximum silencer vertical lift of 1.2 m (4 ft.)
5. Exhaust mixer elbow or catalyst assembly distance above the waterline; if less than 23 cm (9 in.), a siphon break is required.
6. Minimum siphon break distance above the waterline of 30.5 cm (1 ft.)
7. Siphon break
8. Exhaust mixer elbow or catalyst assembly
9. Heat exchanger (locations vary by model)
10. Coolant recovery tank (located on unit on some models)
11. Indicates coolant recovery tank at same height as heat exchanger
12. Seawater strainer
13. Seacock
14. Intake strainer
15. Engine-driven seawater pump
16. Minimum exhaust hose pitch of 1.3 cm per 30.5 cm (0.5 in. per ft.)
17. Maximum distance between silencer and exhaust mixer elbow or catalyst assembly of 3 m (10 ft.)
18. Silencer (customer supplied)
19. Minimum exhaust hose pitch of 1.3 cm per 30.5 cm (0.5 in. per ft.)
20. Minimum exhaust outlet distance above waterline of 10 cm (4 in.)
21. Exhaust hose size: 5cm (2 in.) ID

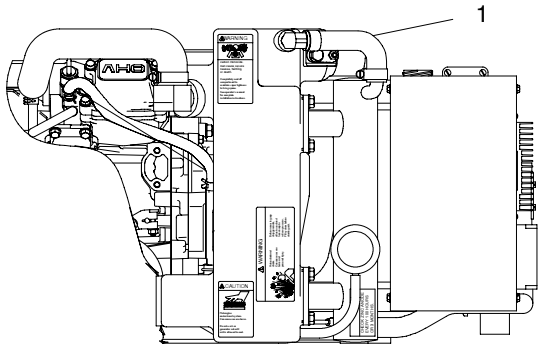
Note: Data applies to both rear- and side-exhaust installations.

Figure 4-8 Typical Mid and Below Waterline Installation

Locate the siphon break above the highest point in the exhaust line between the heat exchanger and the exhaust mixer or catalyst. See Figure 4-9, Figure 4-10, Figure 4-11, Figure 4-12, or Figure 4-13 for siphon break connection. Support the siphon break and hoses to maintain their position and function. Mount the siphon break directly vertical of its connection to the generator set where possible. Otherwise, allow a slight offset to clear stringers or other permanent structures. Protect the siphon break air inlet from dirt and debris.

Mount a typical silencer's base no more than 1.2 m (4 ft.) below the highest point in the exhaust line. Attach a separate wood mounting base to the hull stringers or other suitable structures. Use silencer manufacturer's recommendation for securing the silencer to the hull. Mount the silencer with outlet not more than 3 m (10 ft.) horizontally from the engine exhaust manifold outlet. Use a USCG-type certified marine exhaust hose.

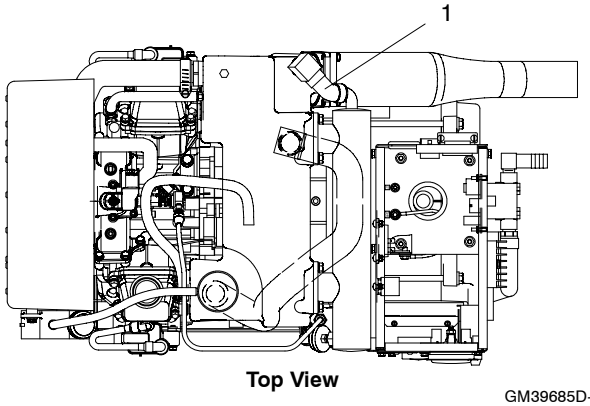
Note: Use two hose clamps on each end of all flexible exhaust hose connections. Read the text for a complete explanation of dimensions and other installation considerations.



Top View GY-250000-

1. Connect siphon break and hardware

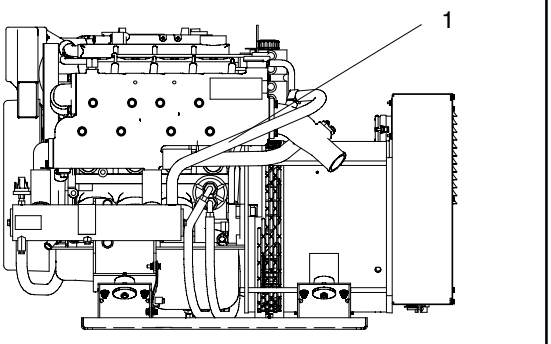
Figure 4-9 Siphon Break Connection, 5/7.3E and 4/6EF



Top View GM39685D-

1. Connect siphon break and hardware

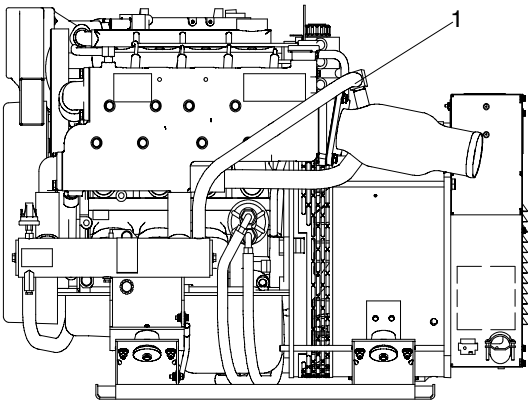
Figure 4-10 Siphon Break Connection, 5/7.3ECD and 4/6EFCD



Nonservice-Side View

1. Connect siphon break and hardware GM34482D-

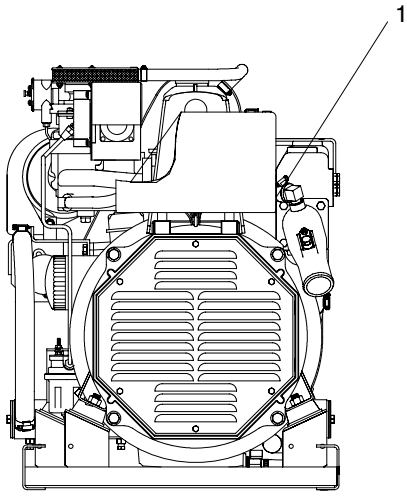
Figure 4-11 Siphon Break Connection, 10/13/15EG, 9/11EFG, and 13/15EGZ



Nonservice-Side View GM41047D-A

1. Connect siphon break and hardware

Figure 4-12 Siphon Break Connection, 10/13/15EGD, 9/11EFGD, and 13/15EGZD



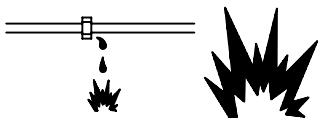
Generator-End View GX-250000-

1. Connect siphon break and hardware

Figure 4-13 Siphon Break Connection, 15/20C and 12.5/17.5CF

Notes

⚠ WARNING



Explosive fuel vapors.
Can cause severe injury or death.

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

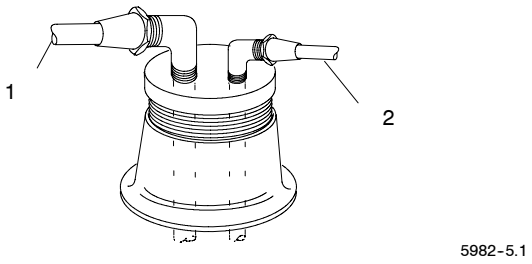
Installing the fuel system. Explosive fuel vapors can cause severe injury or death. Fuel leakage can cause an explosion. Do not modify the tank or the propulsion engine fuel system. Equip the craft with a tank that allows one of the two pickup arrangements described in the installation section. The tank and installation must conform to USCG Regulations.

Note: Fuel systems must conform to USCG regulations.

5.1 Fuel Tank

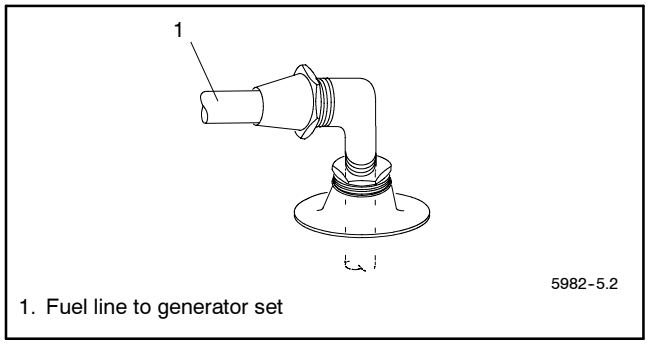
Most marine generator sets draw fuel from the same fuel tank as the craft's propulsion engine(s). If the tank's fuel pickup opening allows a multiple diptube, use a multiple diptube arrangement. See Figure 5-1. The multiple diptube arrangement incorporates a shorter diptube for the generator set and a longer diptube for the propulsion engine. With this arrangement, the generator set runs out of fuel before the propulsion engine during a low fuel supply situation. The alternate tank should have a smaller, separate pickup opening for a single diptube. See Figure 5-2.

Note: Do not tee into the main propulsion engine.



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

Figure 5-1 Multiple Diptube Arrangement



1. Fuel line to generator set

Figure 5-2 Single Diptube Arrangement

Installations with the fuel tank located above the generator set's carburetor require an auxiliary fuel shutoff valve. Close the fuel shutoff valve when not operating the generator set to prevent fuel leakage.

5.2 Fuel Inlet Line

Use a flexible hose section to connect the metallic line from the fuel tank to the engine's fuel pump. USCG regulations require that metallic lines have a wall thickness of at least 0.74 mm (0.029 in.). Use seamless annealed copper, copper/nickel, or copper tubing. The flexible section allows vibrational motion of the generator set during operation. Use USCG type A hose, marked and tagged according to regulations, for the flexible section. Support the metallic line within 102 mm (4 in.) of its connection to the flexible section.

See Figure 5-3 for ID sizes of customer-supplied fuel lines to connect to the fuel pump. Route the fuel lines from the fuel tank in a gradual incline to the engine. Do not exceed the height of the generator set and do not run the fuel lines above the generator set.

See Section 7, Installation Drawings, for fuel feed pump inlet connection.

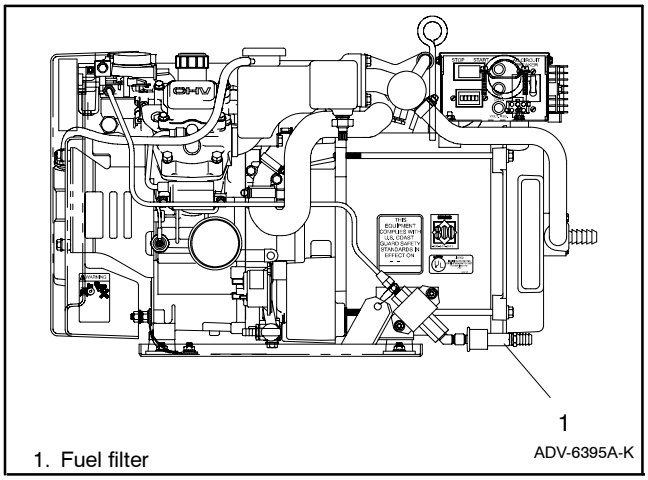
Model	Fuel Line ID, mm (in.)
5/7.3E and 4/6EF	6 (0.25)
5/7.3ECD and 4/6EFCD	
10/13/15EG, 9/11EFG, 10/13/15EGD, 9/11EFGD, 13/15EGZ, and 13/15EGZD	8 (0.31)
15/20C and 12.5/17.5CF	9.5 (0.375)

Figure 5-3 Fuel Line Sizes

5.3 Fuel Filters or Strainers

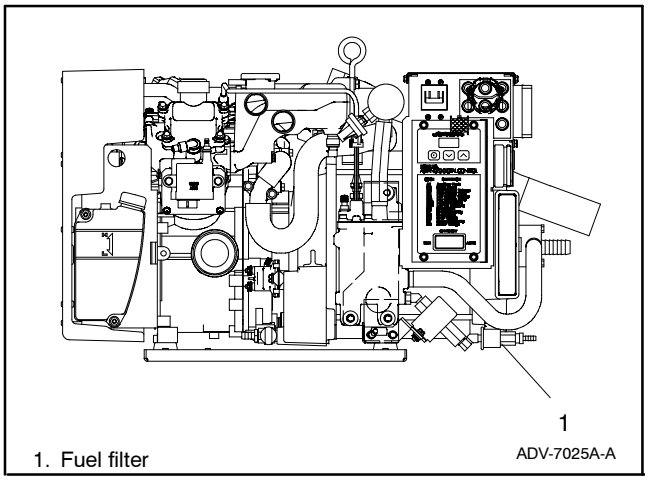
5.3.1 5/7.3E, 4/6EF, 5/7.3ECD, 4/6EFCD, 10/13/15EG, 9/11EFG, 13/15EGZ, 10/13/15EGD, 9/11EFGD, and 13/15EGZD Models

These generator sets are shipped with a fuel filter. No additional fuel filter or strainer is required. See Figure 5-4, Figure 5-5, Figure 5-6, and Figure 5-7.



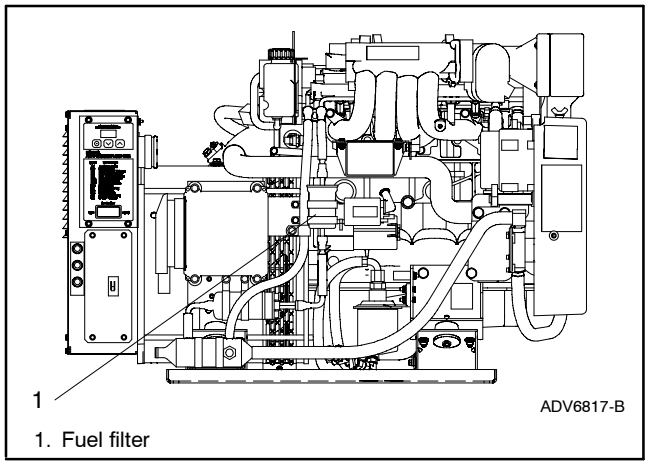
1. Fuel filter

Figure 5-4 Fuel Filter Location on 5/7.3E and 4/6EF Models



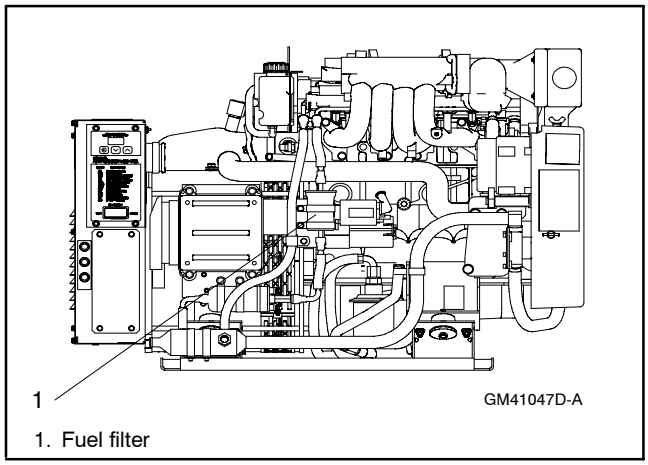
1. Fuel filter

Figure 5-5 Fuel Filter Location on 5/7.3ECD and 4/6EFCD Models



1. Fuel filter

Figure 5-6 Fuel Filter Location on 10/13/15EG, 9/11EFG, and 13/15EGZ Models



1. Fuel filter

Figure 5-7 Fuel Filter Location on 10/13/15EGD, 9/11EFGD, and 13/15EGZD Models

5.3.2 15/20C and 12.5/17.5CF Models

Conform to USCG regulations regarding inline fuel filters or strainers. Independently mount the inline fuel filter or strainer to the craft's structure. Ensure accessibility for servicing without removing permanent structures.

Note: Fuel filter/strainer installation. Support each fuel filter and strainer on the engine or boat structure independent of its fuel-line connections unless the fuel filter or strainer is inside a fuel tank.

5.4 Antisiphon Device Installation

Install antisiphon devices when a fuel line section lies below the highest point of the fuel tank. Install an antisiphon device as follows:

- Use a spring-loaded check valve (tested to function with the installation's siphon head) or an electrically operated shutoff valve (UL ignition-protected tested to USCG regulations) that can operate manually as the antisiphon device.
- Install the check valve above the fuel tank's highest point.
- Secure the check valve to the craft's structure, ensuring accessibility without removing permanent structures.
- Locate the fuel-line section between the tank and check valve above the fuel tank's highest point. Install an electric shutoff valve at the fuel tank's fuel-withdrawal fitting.
- Wire the shutoff valve to open whenever cranking or running the generator set.

Antisiphon holes drilled into fuel diptubes within the fuel tank are unreliable antisiphon devices because they become ineffective when restricted by dirt or gum.

5.5 Fuel Pump Lift and Fuel Consumption

See Figure 5-8 for fuel pump lift capabilities. Consult current generator set specification sheets for generator set fuel consumption rates.

Model	Fuel Pump Lift, m (ft.)
5/7.3E and 4/6EF	0.9 (3)
5/7.3ECD and 4/6EFCD	
10/13/15EG, 9/11EFG, 10/13/15EGD, 9/11EFGD, 13/15EGZ, and 13/15EGZD	
15/20C and 12.5/17.5CF	1.2 (4)

Figure 5-8 Fuel Pump Lift Capabilities (Max.)

5.6 Fuel System Bleed Procedure, 5/7.3ECD and 4/6EFCD Models

Before placing the generator set into service for the first time, bleed air from the fuel system in order to reduce rough running or vapor lock.

⚠ WARNING

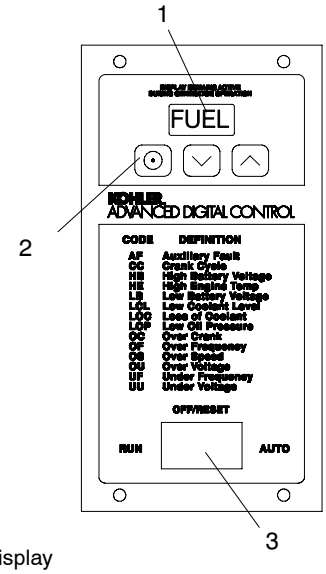
Fire.
Can cause severe injury or death.

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

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

Fuel System Bleed Procedure

1. Press and hold the Select button on the ADC. See Figure 5-9.
2. While holding the Select button, move the generator set master switch into the RUN position. See Figure 5-9.
3. Keep holding the Select button until step 6. The ADC software version and then FUEL will appear on the ADC's LED display. See Figure 5-9.



1. LED display
2. Select button (use for setup and adjustment only)
3. Generator set master switch

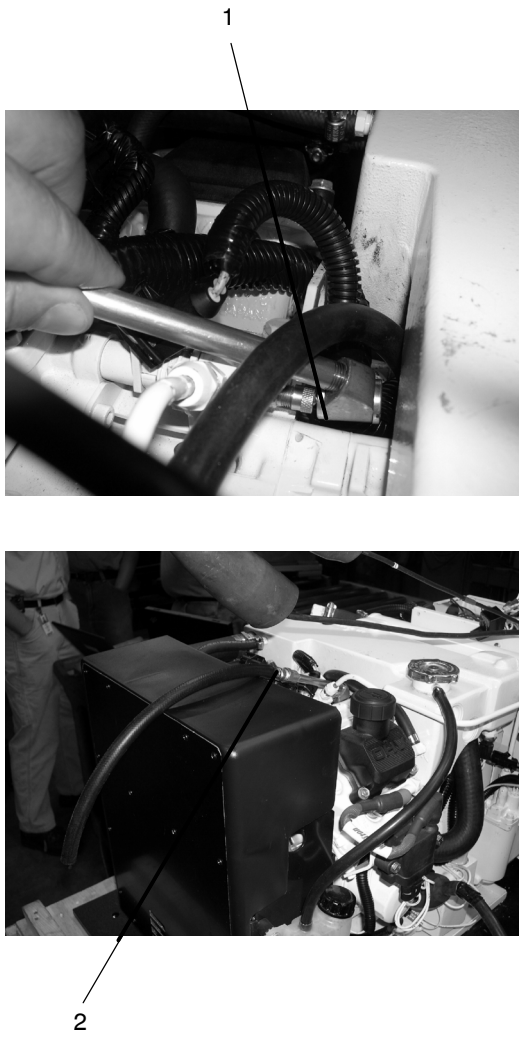
Figure 5-9 ADC 2100 Control

4. Remove the cap from the location shown in Figure 5-10.

5. Hold the bleed tool (part number GM46327) onto the bleed point to remove air from the line.

6. When fuel begins to drip from the hose (on the bleed tool), release the Select button and replace the cap.

   Note: Use a container at the end of the bleed tool's hose to catch the fuel. Dispose of fuel in an environmentally safe manner.



1. Bleed point (with the cap removed)
2. Bleed tool (with fuel drain hose attached)

Figure 5-10 Bleed Location

⚠ WARNING

Explosion.
Gasoline vapors can cause explosion and severe injury or death.

Before starting the generator set, operate the blower 4 minutes and check the engine compartment for gasoline vapors.

Ignition-protected equipment. Explosive fuel vapors can cause severe injury or death. Gasoline vapors can cause an explosion. USCG Regulation 33CFR183 requires that all electrical devices (ship-to-shore transfer switch, remote start panel, etc.) must be ignition protected when used in a gasoline and gaseous-fueled environment. The electrical devices listed above are not ignition protected and are not certified to operate in a gasoline and gaseous-fueled environment such as an engine room or near fuel tanks. Acceptable locations are the wheelhouse and other living areas sheltered from rain and water splash.

⚠ WARNING

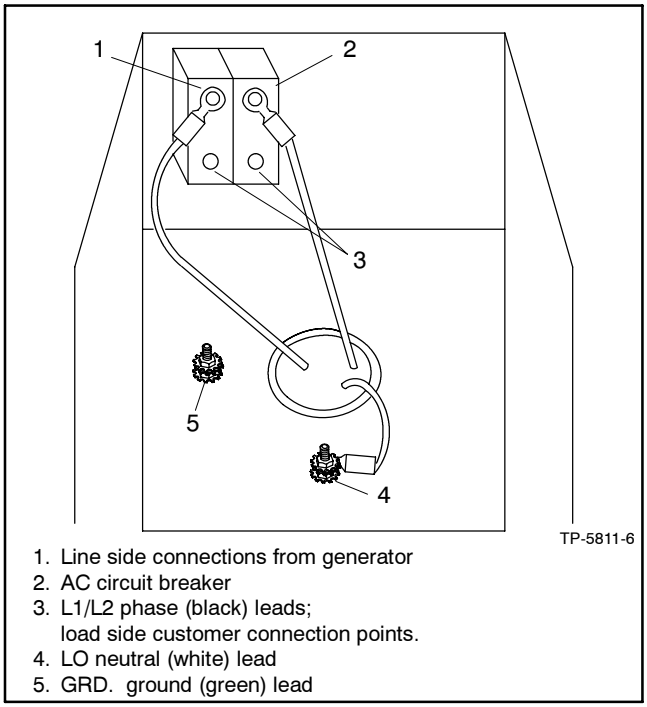
Hazardous voltage. Moving rotor. Can cause severe injury or death.

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

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

6.1 AC Voltage Connections

Make AC connections to the generator set inside the controller box (5/7.3E, 4/6EF, 15/20C, and 12.5/17.5CF models) or inside the junction box (5/7.3ECD, 4/6EFCD, 10/13/15EG, 9/11EFG, 10/13/15EGD, 9/11EFGD, 13/15EGZ, and 13/15EGZD models). Typically, the generator set connects to a ship-to-shore transfer switch that allows the use of shore/utility power when docked or generator set power when docked or at sea. The wiring then connects to a main circuit breaker box (panel board) that distributes branch circuits throughout the craft. See Figure 6-1 for AC voltage connections to the generator set. See Section 8 for reconnection of the generator set.



1. Line side connections from generator
2. AC circuit breaker
3. L1/L2 phase (black) leads; load side customer connection points.
4. LO neutral (white) lead
5. GRD. ground (green) lead

Figure 6-1 AC Voltage Connections in Controller Box

6.2 Circuit Protection

The AC circuit breakers protect the generator set from extreme overload. AC circuit breakers (optional) trip when they detect a fault in the output circuit.

For circuit breaker application and selection information, contact an authorized distributor/dealer.

After correcting the fault, reset AC circuit breaker(s) by placing them in the ON position. Restart the unit. The unit's voltage configuration determines circuit breaker selection.

Note: Circuit breaker ampere rating and availability are subject to change.

6.2.1 Circuit Breaker Considerations

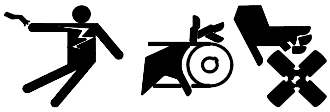
Mounting location. Mount the circuit breakers in the generator set controller (5/7.3E, 4/6EF, 15/20C, and 12.5/17.5CF models) or inside the junction box (5/7.3ECD, 4/6EFCD, 10/13/15EG, 9/11EFG, 10/13/15EGD, 9/11EFGD, 13/15EGZ, and 13/15EGZD models).

Sizing. Use the generator set voltage/frequency configuration to determine the circuit breaker amperage. If the circuit breaker was sized for one voltage configuration and later the generator set is reconnected to a different voltage, change the circuit breaker accordingly to provide optimum protection.

Note: Ignition-protected circuit breakers. Use only ignition-protected circuit breakers on marine gasoline generator sets. See CFR 33, Part 183.410, for ignition-protection requirements. Do not use standard circuit breakers.

Have a qualified electrician or technician install circuit breakers and reconnect the generator set. Comply with all governing standards and codes.

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

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

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Place the generator set start/stop switch in the STOP position. (2) Disconnect the power to the battery charger, if equipped. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

⚠ WARNING

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

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

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

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

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

Note: Voltage/frequency adjustable. Some four-lead generator sets are not voltage/frequency adjustable. To determine adjustment possibilities, check the model's specification sheet or service manual. If you are reconnecting the generator set from a single voltage to a dual-voltage configuration (example: from 120 volt to 120/240 volt) or a dual voltage to a single voltage (example: from 120/240 volt to 120 volt) with the same primary voltage, do not adjust the voltage/frequency adjustment. Adjust the voltage/frequency for frequency changes or setting changes of the primary voltage (example: from 120 volt to 100 volt).

6.2.2 Circuit Breaker Installation

1. Turn the generator set off and disconnect the generator set engine starting battery, negative (−) lead first.

2. Remove the controller cover screws and remove the access cover.

3. Remove screws and nuts to remove the circuit breaker cover plate. Save the mounting hardware.

4. Install the circuit breaker from the inside of the cutout panel and mount it using existing screws. Position the circuit breaker with ON in the normal upright position or to the left side. Cover the cutout opening, if applicable, with the circuit breaker coverplate. Use existing screws and nuts.

5. See Section 8 for voltage reconnection.

   Note: Voltage reconnection. Some four-lead generator sets are not voltage adjustable. To determine adjustment possibilities, check the model specification sheet.

6. Install insulation boots over stator lead terminals if the kit includes insulation boots.

   Note: See Section 8 for wiring instructions.

   Note: 10/13/15EG, 10/13/15EGD, 13/15EGZ and 13/15EGZD models are available with a two-pole circuit breaker with a dual-voltage system (120/240 volt, 60 Hz, 3-wire configuration). The **10EG and 10EGD models** are also available with a single-pole circuit breaker (120 volt, 60 Hz, 2-wire configuration).

7. Make the recommended connections for the following reconnection systems using circuit breakers.

   Two-pole circuit breaker with a single-voltage system (example: 120 volt, 3-wire). Attach stator leads marked 2 and 4 to the side of the circuit breaker marked LINE. Install the jumper lead across the LINE side of circuit breaker terminals (see Section 8). Attach stator leads 1 and 3 to L0.

   Single-pole circuit breaker with a single-voltage system (example: 120 volt, 2-wire). Attach stator leads marked 2 and 4 to the side of the circuit breaker marked LINE (see Section 8). Attach stator leads 1 and 3 to L0.

   Two-pole circuit breaker with a dual-voltage system (example: 120/240 volt, 3-wire). Attach stator leads marked 1 and 4 to the side of the circuit breaker marked LINE. Do not use a jumper lead (see Section 8). Attach stator leads 2 and 3 to L0.

   Models without ADC 2100:
   Single-pole circuit breaker with a 240-volt, 2-wire, single-voltage system. Attach the stator lead marked 2 to the side of the circuit breaker marked LINE (see Section 8). Bolt together leads 1 and 4 and tape the leads to insulate them from ground. Attach the stator lead marked 3 to L0.

   Models with ADC 2100:
   Single-pole circuit breaker with a 240-volt, 2-wire, single-voltage system. Attach the stator lead marked 1 to the side of the circuit breaker marked LINE (see Section 8). Bolt together leads 2 and 3 and tape to insulate from ground. Attach the stator lead marked 4 to L0.

8. Connect the stator lead(s) used for neutral connection to the L0 stud. See the illustrations in Section 8.

9. Connect the side of the circuit breaker marked LOAD to the ship-to-shore switch or craft wiring. Attach insulation boots to black leads if the kit includes insulation boots. With a single-pole circuit breaker, use one black lead (L1). With a two-pole circuit breaker use two black leads, L1 and L2. Connect the neutral white lead to the L0 stud. Connect the equipment ground green lead to GRD. stud.

   Note: Wire material. Use stranded copper for all wiring. Use wire gauges and insulation, conductor temperature ratings, sheath stripping, conductor support and protection, conductor terminals and splices, and overcurrent protection (circuit breakers, fuses) that conform to standards and codes.

   Note: Conform to USCG Regulations CFR33, Part 183 (pleasurecraft) and CFR46 (commercial craft) for marine applications.

   Note: Wire protection. Use rubber grommets and cable ties as necessary to protect and secure wiring from sharp objects, the exhaust system, and any moving parts.

10. Replace the controller cover or circuit breaker box access panel.

11. Reconnect the generator set engine starting battery, negative (−) lead last.

12. Make voltage or frequency adjustments according to Section 8.

6.3 ADC 2100 Continuous Power Mode Jumper (10/13/15EG and 9/11EFG Models)

Note: The P7 jumper was available on generator sets with serial numbers before 2051415.

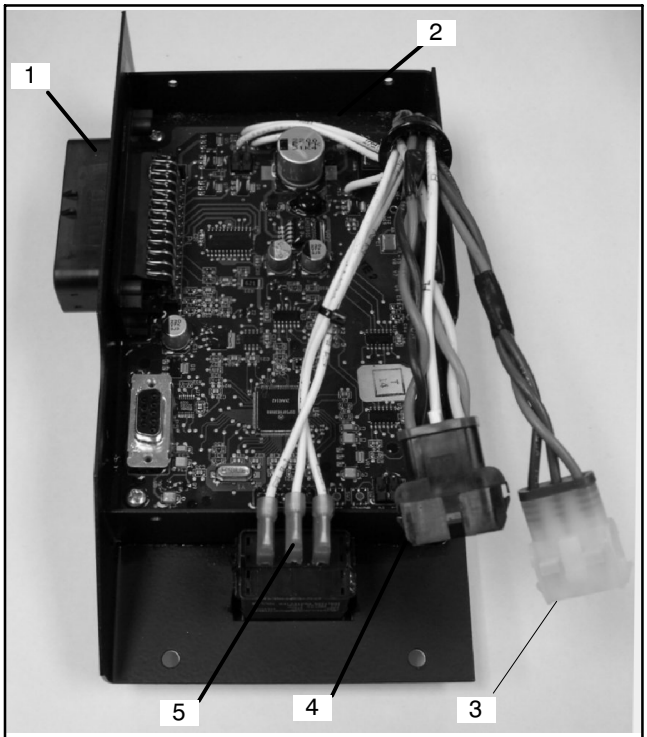
A jumper on connector P7 on the back of the controller causes the controller to remain powered at all times. Controllers are shipped from the factory with the jumper connected. Disconnecting the jumper causes the controller to auto power down 48 hours after the generator set shuts down. See the wiring diagram and schematic drawing in the operation manual.

Note: Be advised that the ADC consumes 250 mA when the master switch is in the AUTO position with the jumper connected. If you do not plan to use your generator set for a long period of time, Kohler recommends moving the master switch to the OFF/RESET position (0 mA draw). Remote communications require an active (powered-up) controller.

Note: For most applications, it is not necessary to disconnect the continuous power mode jumper.

Procedure to disconnect the continuous power mode jumper (optional)

1. Prevent the generator set from starting.
   a. Move the generator set master switch to the OFF/RESET position.
   b. Disconnect power to the battery charger, if equipped.
   c. Disconnect the generator set engine starting battery, negative (-) lead first.
2. Remove the controller from the generator set.
   a. Disconnect the engine wiring harness connector P1 plug (35-pin) from the controller. Disconnect the J15 and J16 connectors. See Figure 6-2.
   b. Remove the controller from the generator set housing in order to access the back of the controller.
3. Remove the controller's back cover to access the jumper.
   a. Note the labels on the three leads connected to the generator set master switch for reconnection later. Disconnect the leads at the pink connectors. See Figure 6-2.
   b. Remove the cover screws and remove the controller's back cover. See Figure 6-2.
4. Locate the P7 connector near the top of the controller. See Figure 6-2. Remove the jumper from pins 1 and 2 of the P7 connector. If the P7 connector has three pins, connect the jumper across pins 2 and 3 for storage.



1. Engine wiring harness connector plug (P1)
2. Continuous power mode jumper location (P7)
3. J15 connector
4. J16 connector
5. Generator set master switch connectors

Figure 6-2 Advanced Digital Control Connections (Shown with Back Cover Removed)

5. Replace the controller's back cover and secure the cover screws.
6. Reconnect the three pink connectors to the generator set master switch.
7. Reconnect the J15 and J16 connectors.
8. Reconnect the engine wiring harness connector P1 plug (35-pin) to the controller.
9. Reconnect the generator set engine starting battery, negative (-) lead last.
10. Reconnect power to the battery charger, if equipped.
11. Place the generator set master switch in the AUTO position.

6.4 Installation in Steel or Aluminum Vessels

Installation of a generator set in a vessel constructed of a material capable of conducting current (e.g., steel or aluminum) is subject to considerations not normally encountered in fiberglass or wood vessels. These differences include equipment grounding, grounding of neutral conductors, ground-fault protection, and isolation of galvanic currents.

The scope of these topics is too extensive to be fully discussed here. Consult your local marine authority for more information.

Before installing the generator set, check the available wiring diagrams in the operation manual to become familiar with the electrical system.

6.5 Installation Regulations

The U.S. Coast Guard governs generator set installation in U.S. pleasurecraft and commercial vessels. Refer to the applicable regulations below:

U.S. Pleasurecraft Installation Regulations

Title 33CFR, Chapter I, U.S. Coast Guard, Part 183

1. Subpart I, Electrical Equipment
2. Subpart J, Fuel Systems

U.S. Commercial Vessel Installation Regulations

Title 46CFR, Chapter I, U.S. Coast Guard

1. Part 111, Electrical Systems
2. Part 182, Machinery Installation

m:sc:001:001

6.6 Battery

Batteries and their installation must conform to USCG Regulations 183.420 (a) through (g). Provide generator sets with batteries separate from the propulsion engines whenever possible. The starting/charging systems of both the generator set and the engine must have a common negative (−) ground.

USCG Regulation 183.415, Grounding, requires connection of a common conductor to each grounded cranking motor circuit. Size the conductor to match the larger of the engine's two battery cables. Figure 6-3 lists recommended minimum cable sizes for generator set battery connections at various generator set-to-battery distances. Connecting a common conductor to each grounded cranking motor circuit prevents the starting motor current from using alternative electrical paths should the cranking motor ground circuit be restricted or open because of oxidation or loose hardware. Alternative electrical paths include metallic fuel lines that can pose a hazard. See Section 7, Installation Drawings, for battery connections to the generator set.

Models	Required Battery Cable AWG Gauge, Minimum	
	2.5 m (8.3 ft.) from Battery to Generator Set	5 m (16.4 ft.) from Battery to Generator Set
5-7.3E/4-6EF, 5-7.3ECD/4-6EFCD	6	4
10/13/15EG, 9/11EFG, 10/13/15EGD, 9/11EFGD, 13/15EGZ, and 13/15EGZD	6	2
15-20C/12.5-17.5CF	4	2

Figure 6-3 Battery Cable Sizing Recommendations

See Figure 6-4 for minimum cold cranking amps (CCA) recommendations.

12-Volt Starting Battery Size CCA (at -18°C (0°F) or 100 Amp Hr)	
Models	**CCA**
5/7.3E and 4/6EF	260
5/7.3ECD and 4/6EFCD	
10/13/15EG, 9/11EFG, 10/13/15EGD, 9/11EFGD, 13/15EGZ, and 13/15EGZD	600
15/20C and 12.5/17.5CF	630

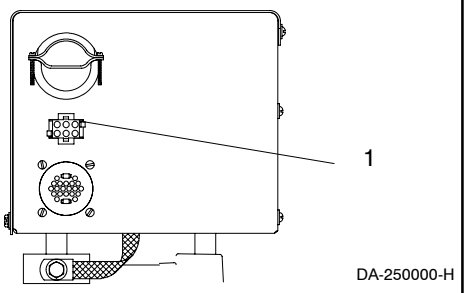
Figure 6-4 Battery Recommendations

6.7 Wiring

Use only stranded copper wire. Conform to USCG Regulations 183.425 through 183.460 for wire gauges and insulation, conductor temperature ratings, sheath stripping, conductor support and protection, conductor terminals and splices, and overcurrent protection (circuit breakers, fuses). Use rubber grommets and cable ties as necessary to protect and secure the wire from sharp objects, the exhaust system, and moving parts.

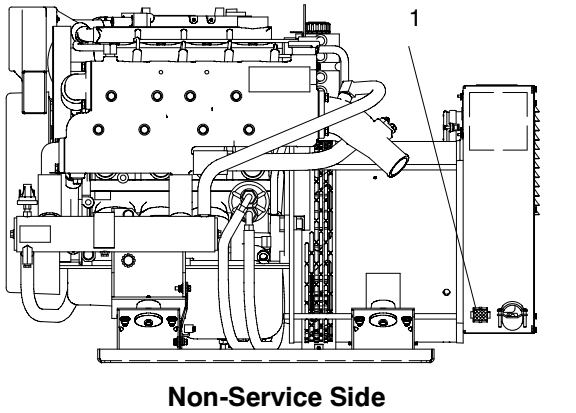
6.8 Remote Start Switch Connection

Kohler Co. offers several remote panels for connection to the generator set. Contact your local Kohler® distributor/dealer for further detailed descriptions. See Figure 6-5, Figure 6-6, Figure 6-7, or Figure 6-8 for the location of the remote start panel connection to the generator set controller. Kohler Co. also offers wiring harnesses in various lengths with a connector keyed to the controller box connector. A pigtail harness is also offered which includes the appropriate connector on one end and has pigtails that the installer can use to connect to a customer-supplied start/stop switch or separate lights and hourmeter. Consult current wiring diagrams, ADVs, and instruction sheets for connection information and details.



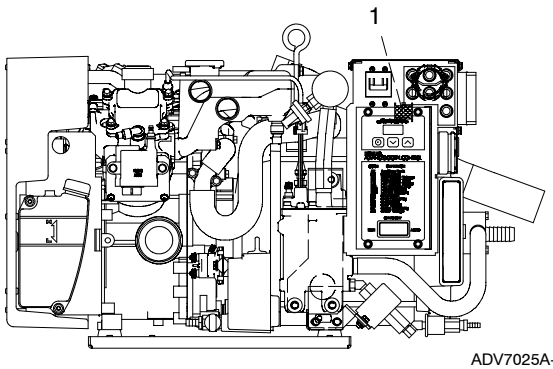
1. Controller remote connector

Figure 6-5 Controller Remote Connector, Typical, 5/7.3E, 4/6EF, 15/20C, and 12.5/17.5CF Models



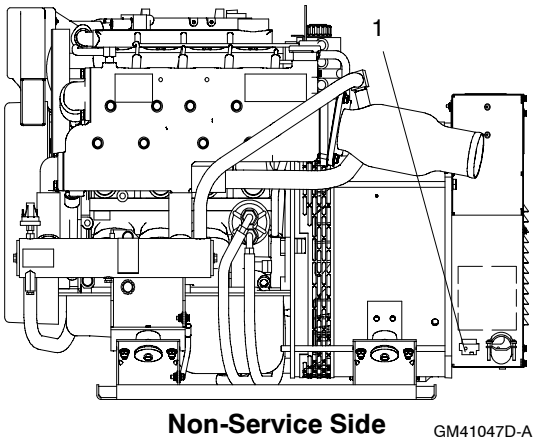
1. Remote interface connector

Figure 6-6 Remote Interface Connector, 10/13/15EG, 9/11EFG, and 13/15EGZ Models



1. Remote interface connector (located on the non-service side)

Figure 6-7 Remote Interface Connector, 5/7.3ECD and 4/6EFCD Models



1. Remote interface connector

Figure 6-8 Remote Interface Connector, 10/13/15EGD, 9/11EFGD, and 13/15EGZD Models

5/7.3ECD, 4/6EFCD, 10/13/15EG, 10/13/15EGD, 13/15/EGZ and 13/15EGZD Models. These models use a 12-pin connector for the remote interface connection. See Figure 6-6, Figure 6-7, or Figure 6-8 for the connector's location. See Figure 6-9 for the correct customer-supplied plug and pin part numbers.

Component	Amp Part No.	Kohler Part No.
Plug	350735-1	229998
Pin	350218-6	241618
Cable Seal	794280-1	GM29252
Interface Seal	794279-1	GM29507
Cavity Plug	770377-1	GM28769

Figure 6-9 Connector Components, 5/7.3ECD, 4/6EFCD, 10/13/15EG, 9/11EFG, 10/13/15EGD, 9/11EFGD, 13/15EGZ, and 13/15EGZD Models

Note: Gauge senders. Gauge senders are available for most generator sets. If using gauges, be sure they are compatible with generator set senders. Gauges/senders are available as a service item from authorized Kohler service distributors/ dealers.

Notes

Section 7 Installation Drawings

Use the drawings in this section for installation purposes. Consult the supplier and verify that the drawings are the most current for your specification. Installation drawings show exhaust outlet locations, fuel inlet connections, siphon break locations, and battery connections. See Figure 7-1 for installation drawing identification.

Model No.	Drawing	Page
5/7.3ECD and 4/6EFCD	ADV-7025A	38
with Sound Shield	ADV-7025B	39
5/7.3E and 4/6EF	ADV-6395A	40
with Sound Shield	ADV-6395B	41
15/20C and 12.5/17.5CF	ADV-6382A	42
with PTO	ADV-6382B	43
10/13/15EG and 9/11EFG	ADV-6817A	44
13/15EGZ with PTO	ADV-6817B	45
10/13/15EGD and 9/11EFGD	ADV-7278A	46
13/15EGZD with PTO	ADV-7278B	47

Figure 7-1 Installation Drawings

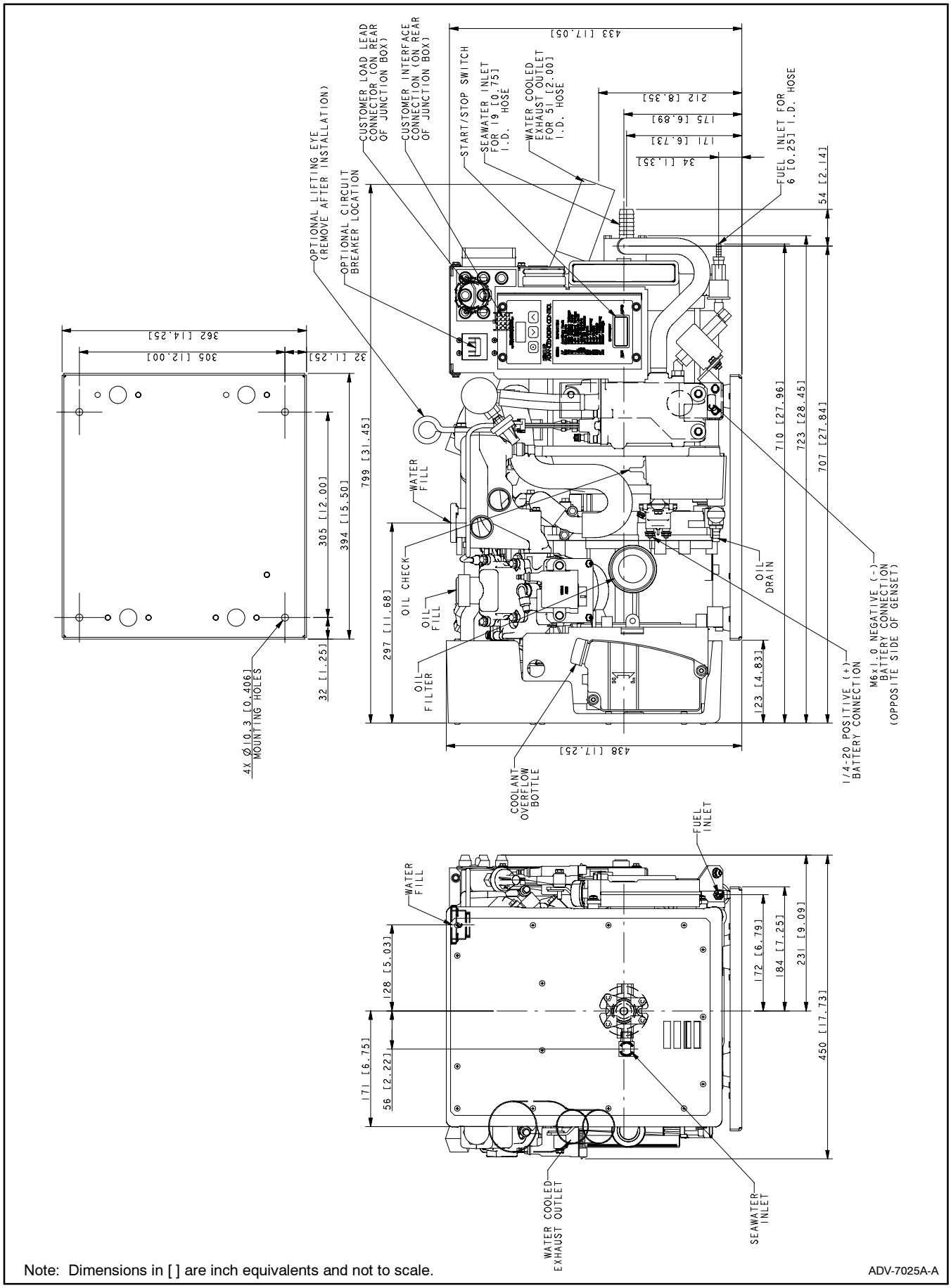


Figure 7-2 Dimension Drawing ADV-7025A-A, 5/7.3ECD and 4/6EFCD Models

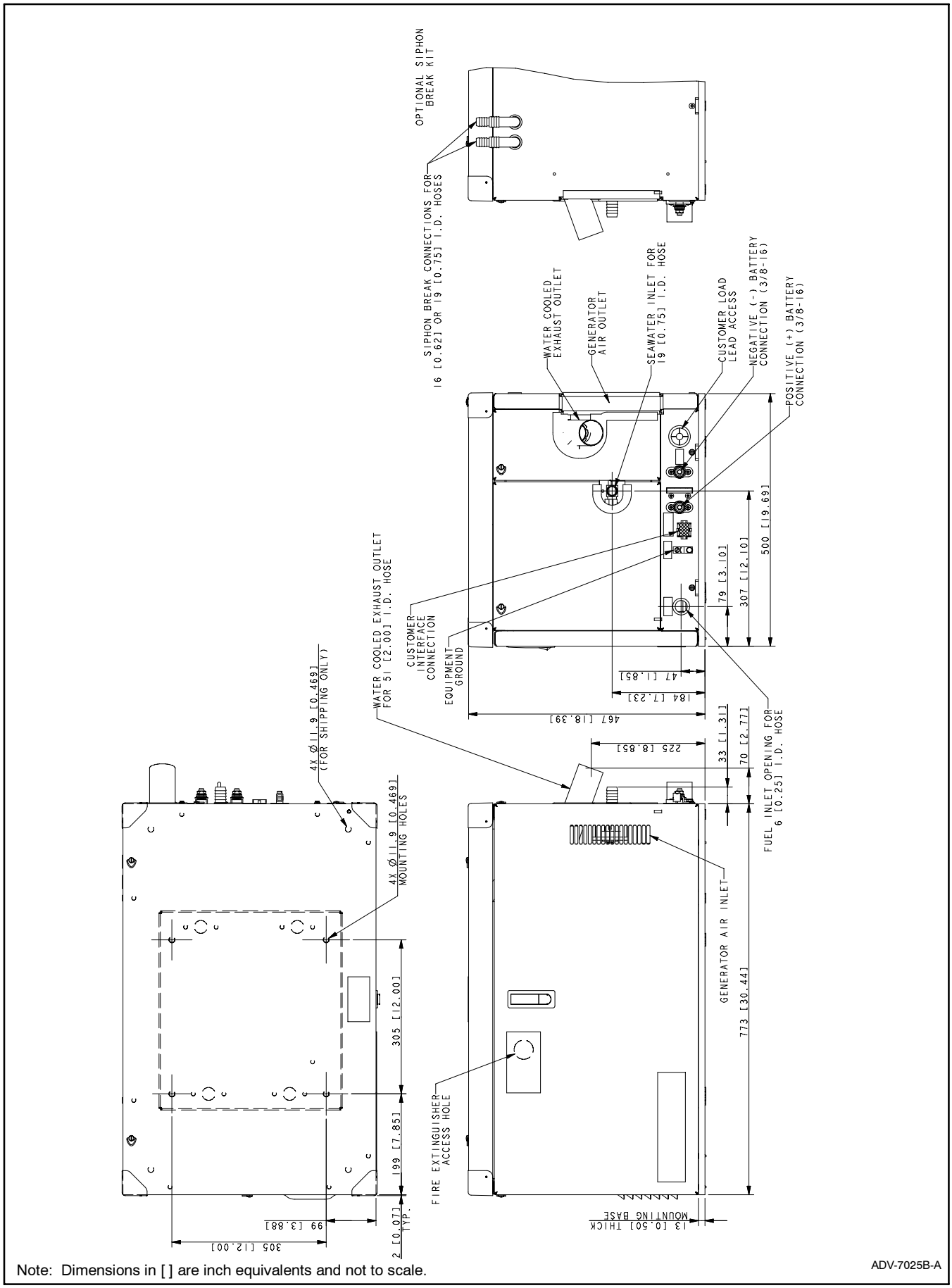
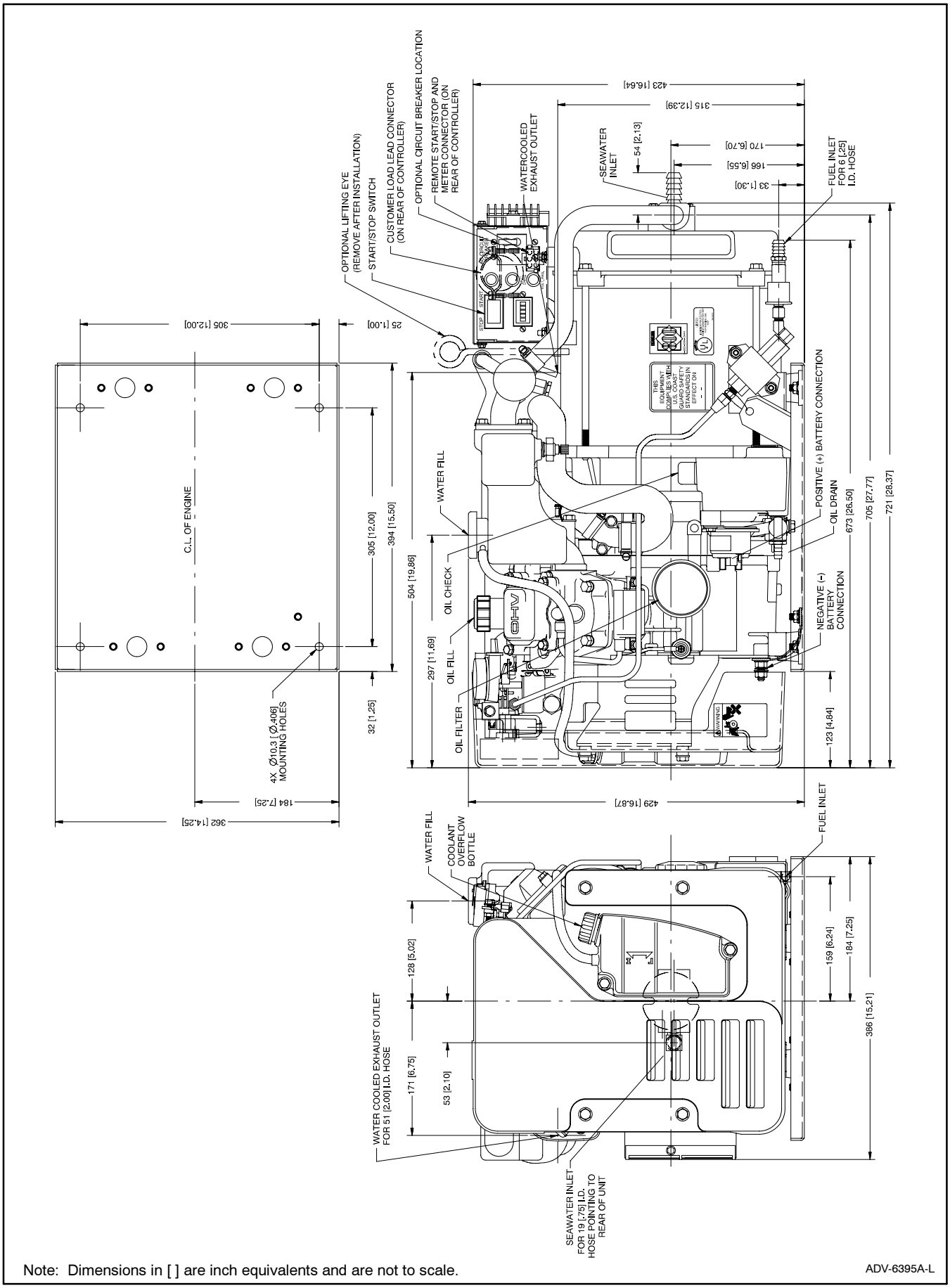


Figure 7-3 Dimension Drawing ADV-7025B-A, Sound Shield 5/7.3ECD and 4/6EFCD Models



Note: Dimensions in [ ] are inch equivalents and are not to scale.

ADV-6395A-L

Figure 7-4 Dimension Drawing ADV-6395A-L, 5/7.3E and 4/6EF Models

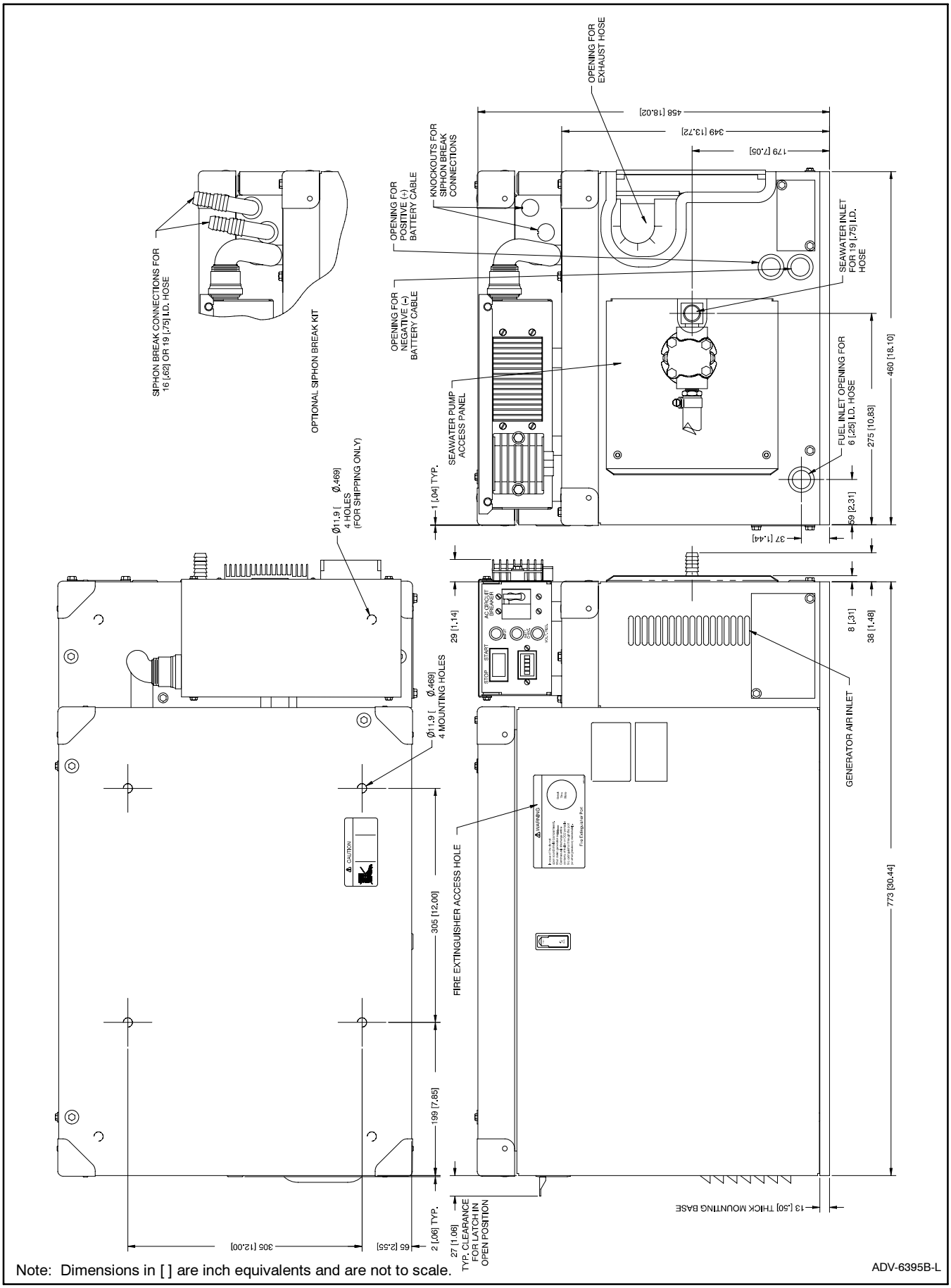


Figure 7-5 Dimension Drawing ADV-6395B-L, Sound Shield 5/7.3E and 4/6EF Models

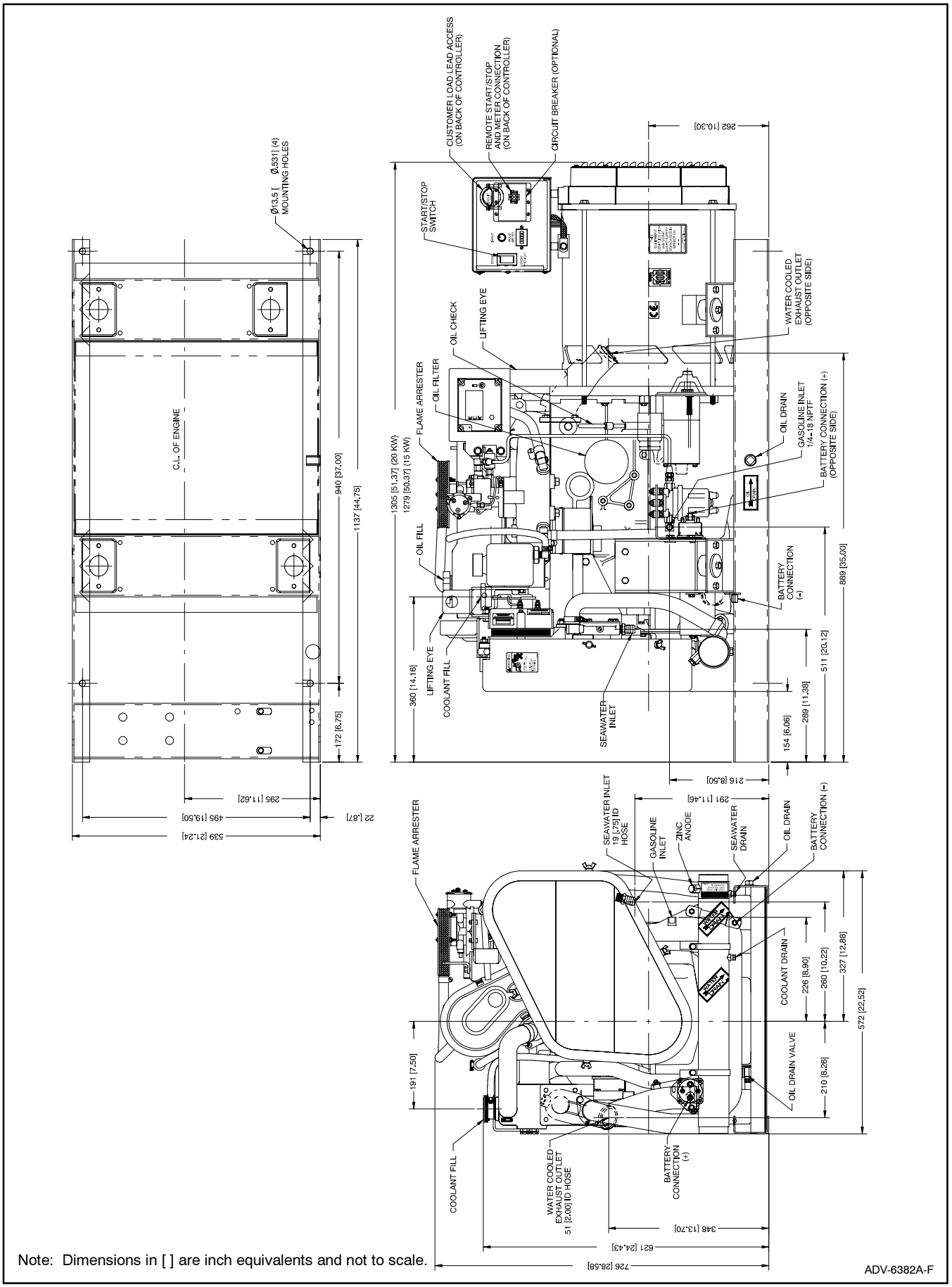


Figure 7-6 Dimension Drawing ADV-6382A-F, 15/20C and 12.5/17.5CF Models

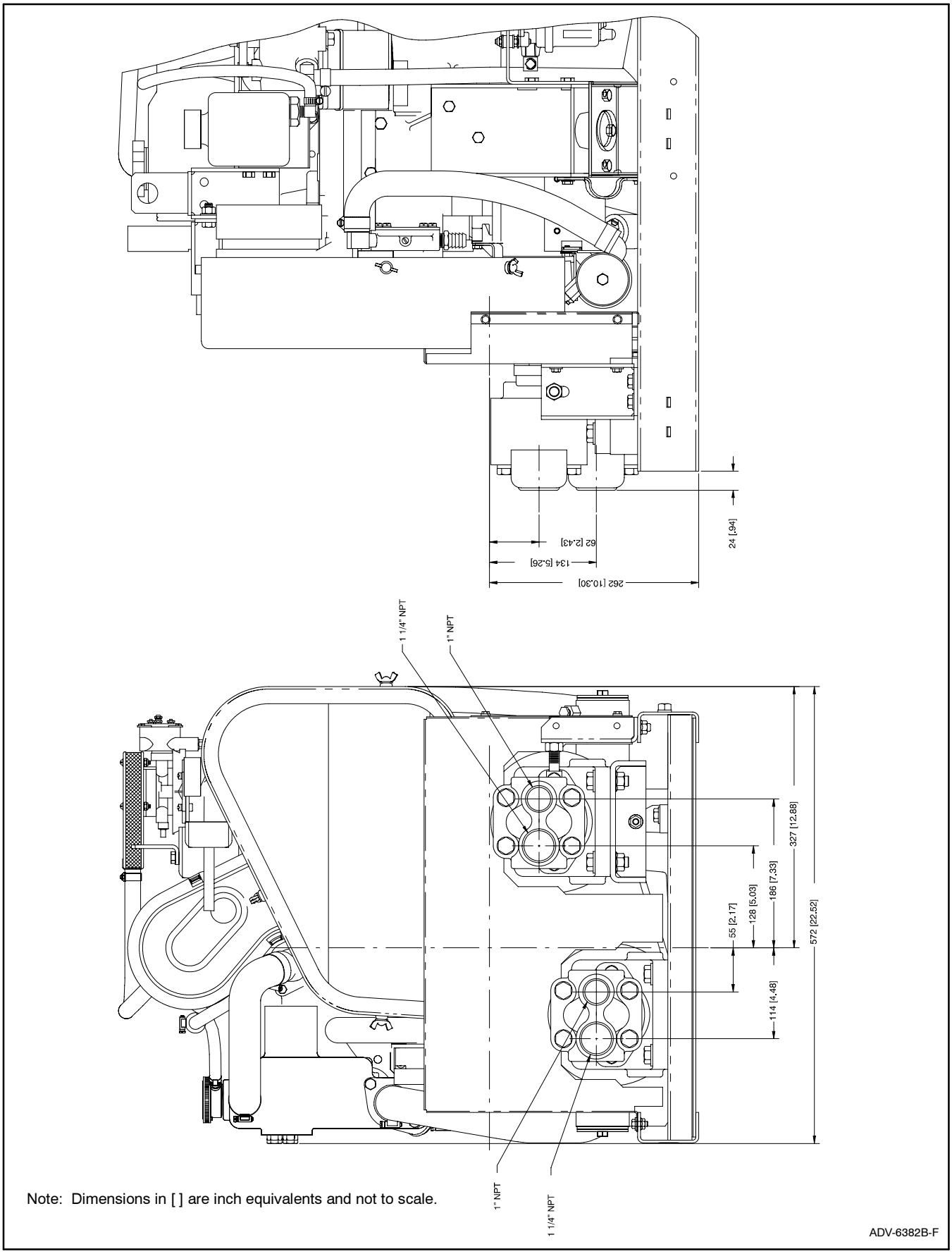


Figure 7-7 Dimension Drawing Hydraulic Pump PTO ADV-6382B-F, 15/20C and 12.5/17.5CF (**Note:** Kohler Co. does not furnish hydraulic pumps.)

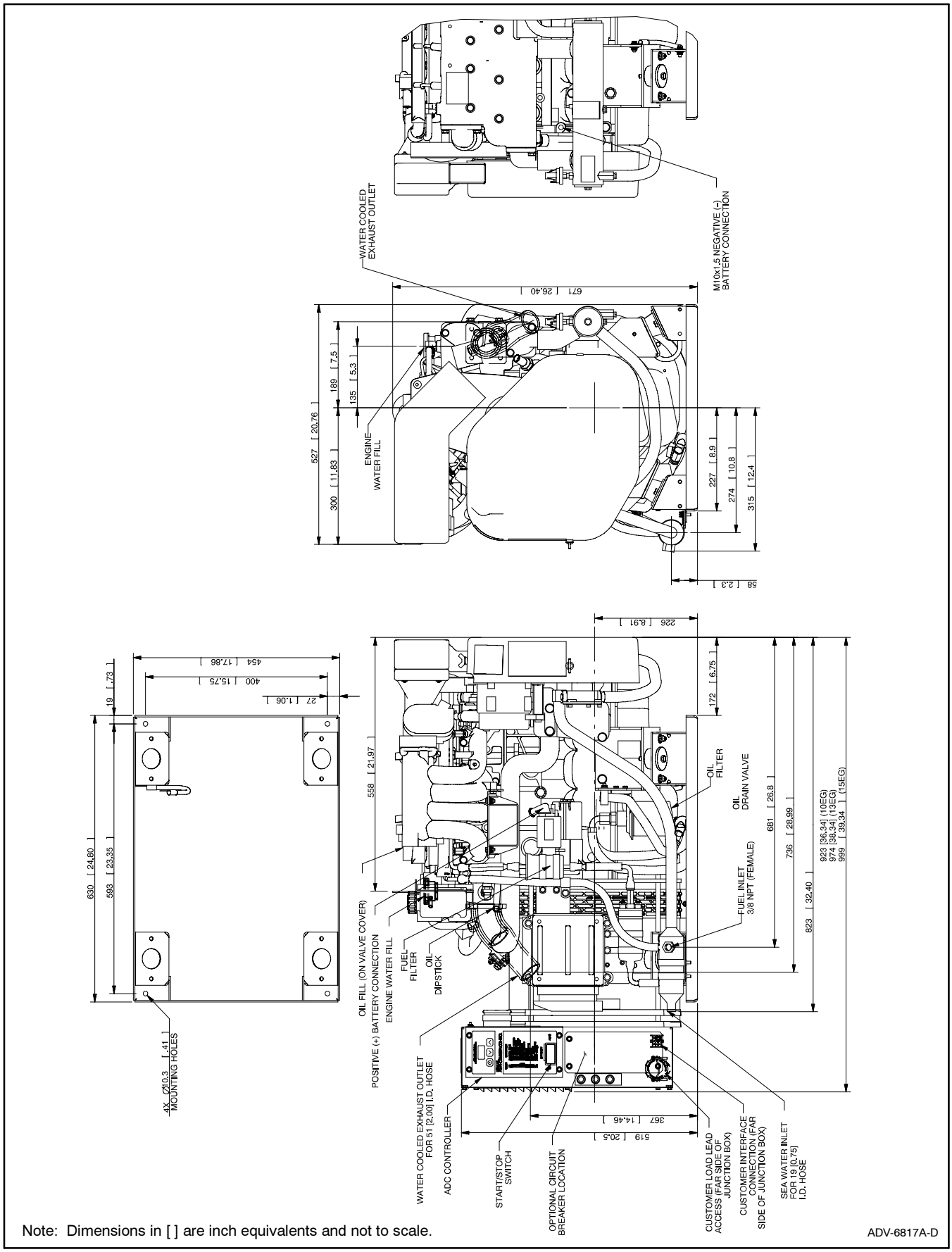


Figure 7-8 Dimension Drawing ADV-6817A-D, 10/13/15EG and 9/11EFG Models

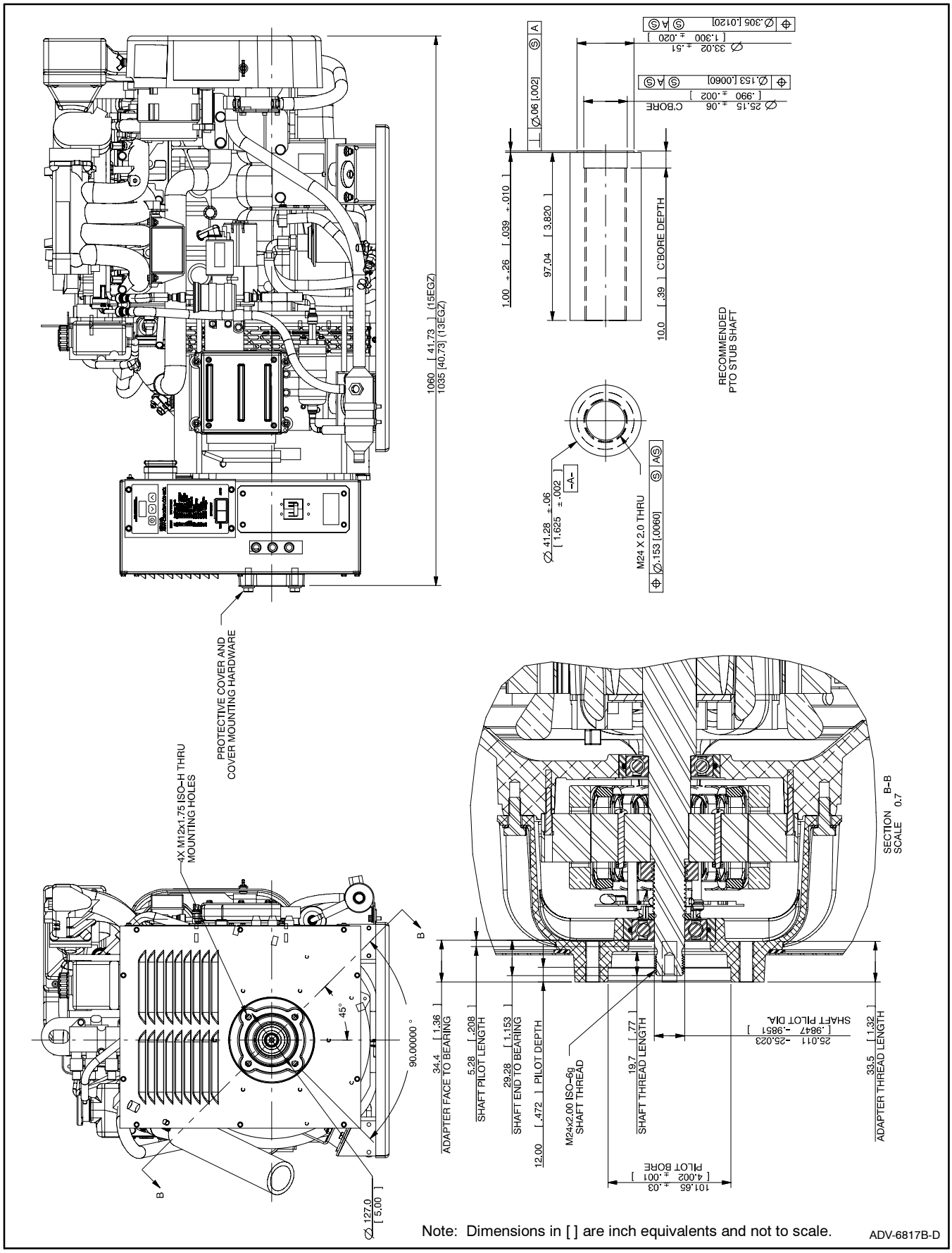
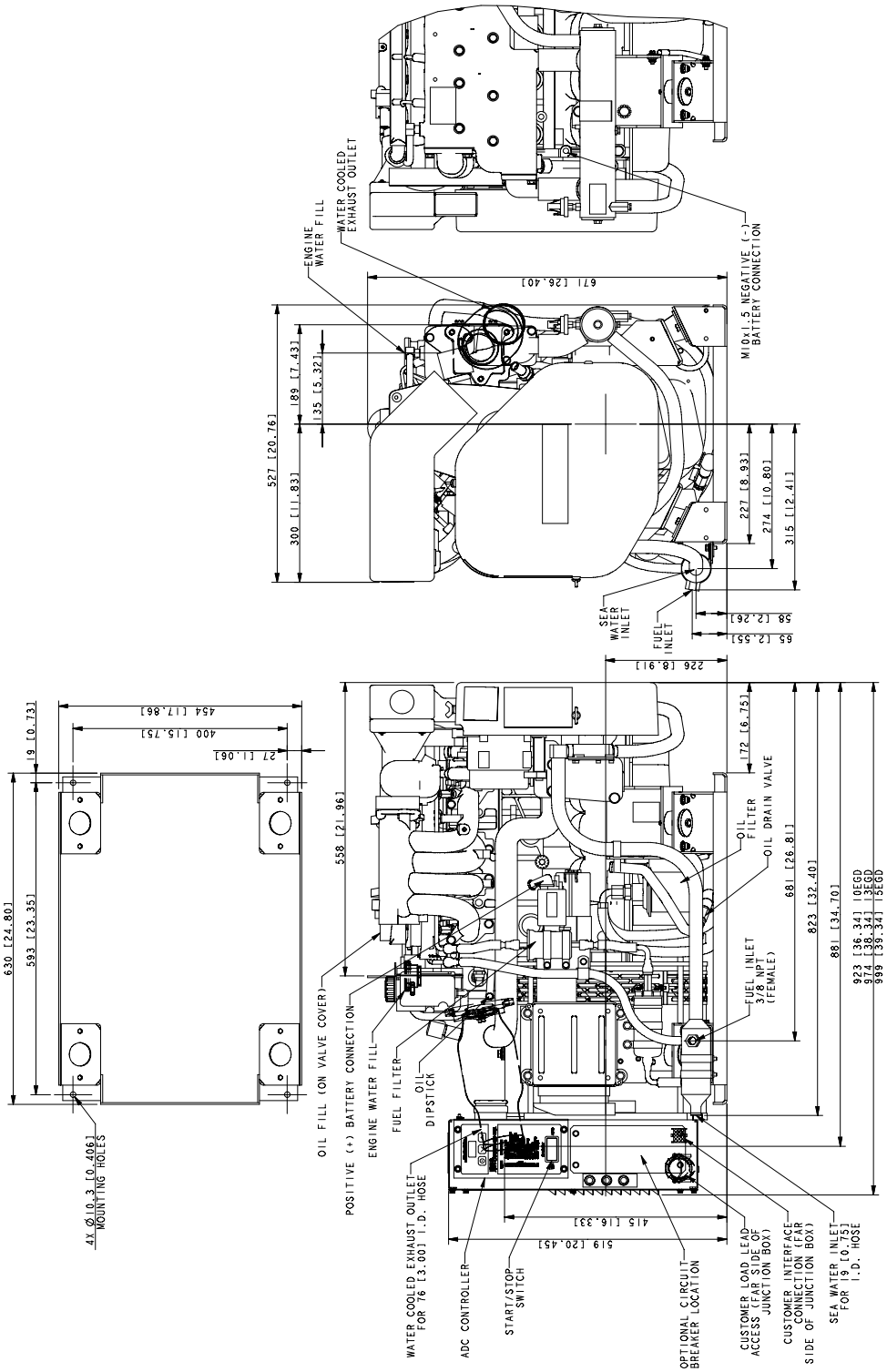


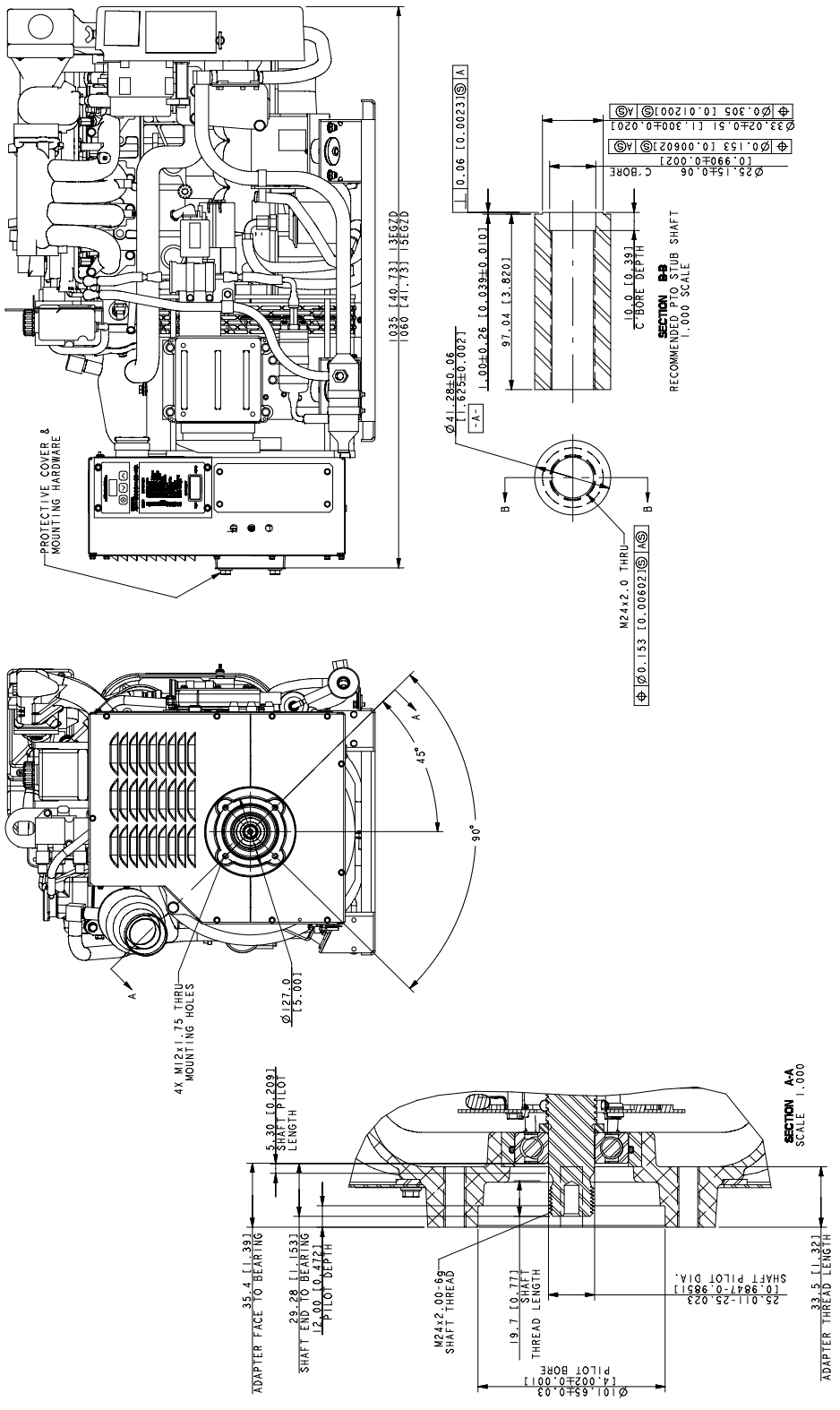
Figure 7-9 Dimension Drawing ADV-6817B-D, 13/15EGZ Model with PTO



Note: Dimensions are in mm [ ] inches and not to scale.

ADV-7278A-

Figure 7-10 Dimension Drawing ADV-7278A, 10/13/15EGD and 9/11EFGD Models



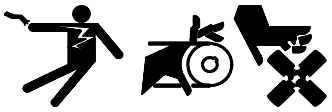
Note: Dimensions are in mm [ ] inches and not to scale.

ADV-7278B-

Figure 7-11 Dimension Drawing ADV-7278B, 13/15EGZD Model with PTO

Notes

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

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

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Place the generator set start/stop switch in the STOP position. (2) Disconnect the power to the battery charger, if equipped. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

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

⚠ WARNING

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

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

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

8.1 Four-Lead Reconnection

The following information illustrates the reconnection of four-lead generator sets. In all cases, conform to the National Electrical Code (NEC).

NOTICE

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

8.1.1 100–120 Volt Configurations

If the installation requires a factory two-pole circuit breaker, do not connect the load-side terminals of the circuit breaker. See Figure 8-1.

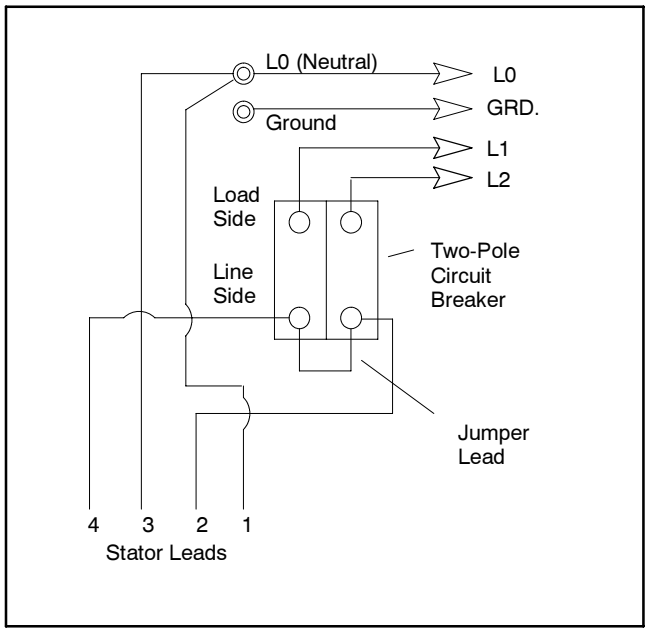
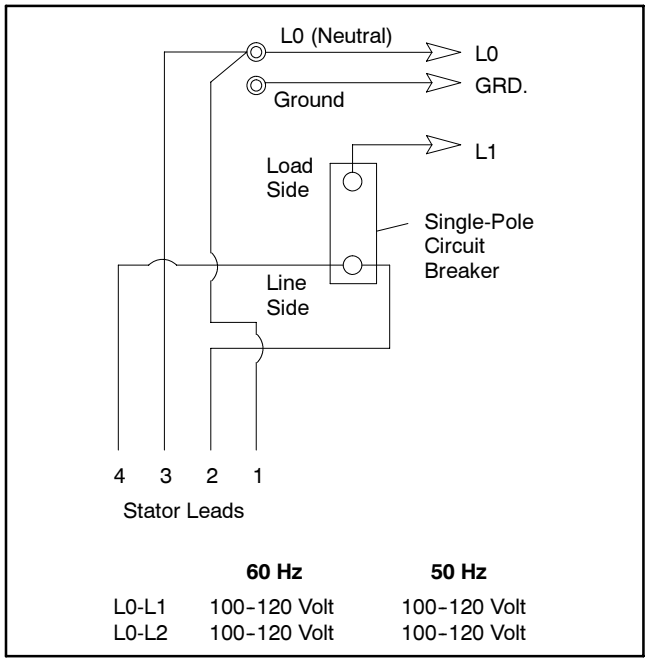


Figure 8-1 100–120 Volt, 3-Wire Configuration ***(Not released for 10/13/15EG, 10/13/15EGD, 13/15EGZ, and 13/15EGZD models)***

If the installation requires a 100–120 volt, 2-wire system, use a single-pole circuit breaker. See Figure 8-2. When connecting stator phase leads together, size the output lead (L1) to handle the amperage. Use a jumper lead on the *line* side of the circuit breaker to balance the load of the generator set.

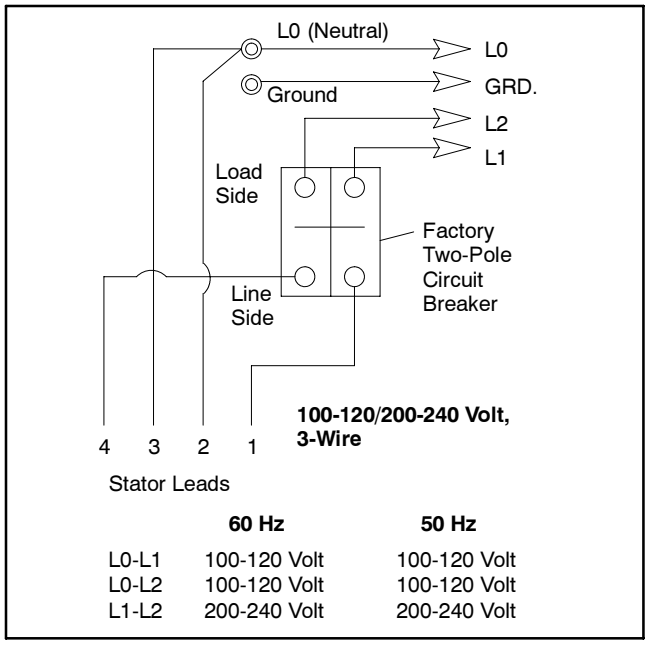


	60 Hz	50 Hz
L0-L1	100–120 Volt	100–120 Volt
L0-L2	100–120 Volt	100–120 Volt

Figure 8-2 100–120 Volt, 2-Wire Configuration ***(Not released for 13/15EG, 13/15EGD, 13/15EGZ, and 13/15EGZD models)***

8.1.2 100–120/200–240 Volt Configurations

The 100–120/200–240 volt configuration does not use a jumper lead. If the unit was originally wired for straight 100–120 volt, 3-wire, remove the jumper lead (see Figure 8-1 for location). Select a two-pole circuit breaker. Application of two single-pole circuit breakers does not conform to NEC requirements for supplying a 200–240 volt load—even if the breakers are mechanically attached. Leads L1 and L2 are for different phases—**never** connect them.

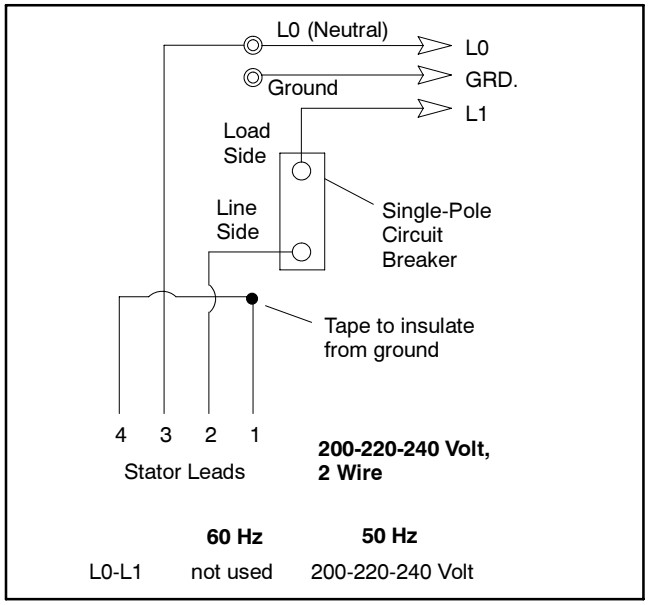


	60 Hz	50 Hz
L0-L1	100-120 Volt	100-120 Volt
L0-L2	100-120 Volt	100-120 Volt
L1-L2	200-240 Volt	200-240 Volt

Figure 8-3 100–120/200–240 Volt, 3-Wire Configuration

8.1.3 200–240 Volt Configurations

The 200–240 volt configuration does not use a jumper lead. If the unit was originally wired for straight 100–120 volt, 3-wire, remove the jumper lead (see Figure 8-1 for location). See Figure 8-4 for models without the ADC 2100 or Figure 8-5 for models equipped with the ADC 2100.



	60 Hz	50 Hz
L0-L1	not used	200-220-240 Volt

Figure 8-4 200–220–240 Volt, 2-Wire Configuration, Models without ADC 2100 ***(Not released for 10/13/15 EG, 10/13/15EGD, 13/15EGZ and 13/15EGZD models)***

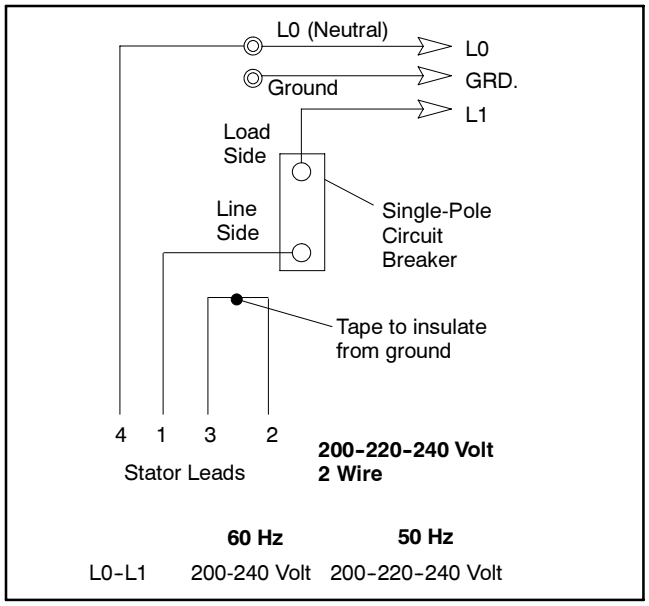


Figure 8-5 200–220–240 Volt, 2-Wire Configuration, Models with ADC 2100

8.2 Voltage Regulator Adjustment (5/7.3E, 4/6EF, 15/20C, and 12.5/17.5CF Models)

⚠ WARNING

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

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

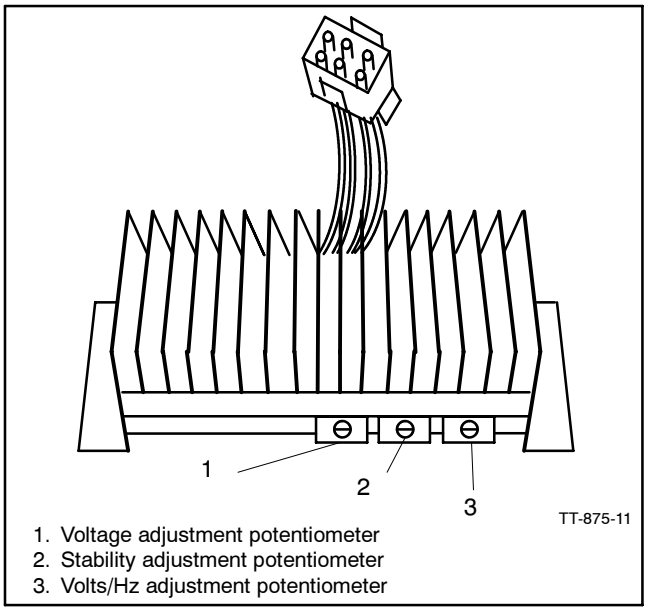
Testing the voltage regulator. Hazardous voltage can cause severe injury or death. High voltage is present at the voltage regulator heat sink. To prevent electrical shock do not touch the voltage regulator heat sink when testing the voltage regulator.
(PowerBoost™, PowerBoost™ III, and PowerBoost™ V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

The voltage regulator is typically located in the controller. Adjustments can be made without removing the voltage regulator. The voltage regulator adjustment procedure applies to both the PowerBoost™ IIIE (Figure 8-6) and PowerBoost™ V (Figure 8-7) voltage regulators.

Note: Broadrange generator sets. The following adjustment procedure is for readjustment of the voltage regulator and governor for broadrange generator sets with mechanical governors.

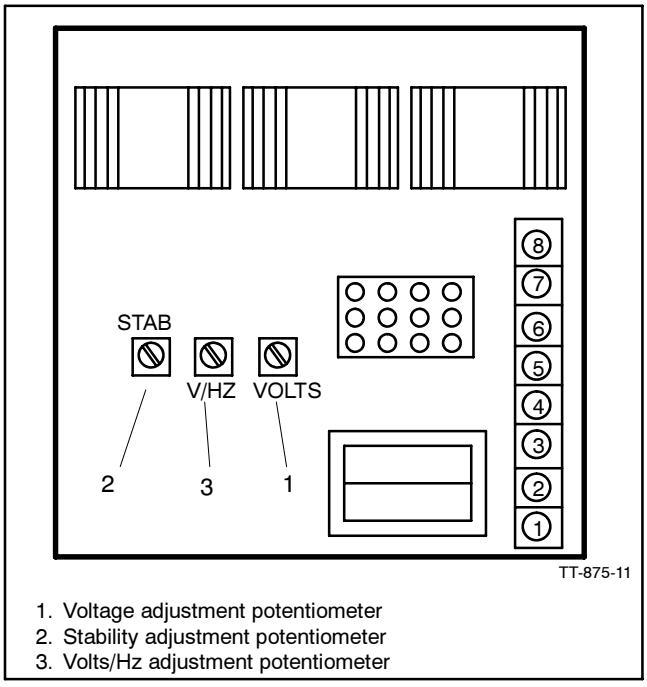
Note: Special tool. Use a frequency meter 50/60 Hz.

Note: Rheostat connection. Connect a customer-provided rheostat across regulator leads/terminals 33 and 66 to adjust the generator output voltage from a location remote from the set. The rheostat (10 kOhms, 1/2-watt minimum) provides a 5-volt adjustment range.



1. Voltage adjustment potentiometer
2. Stability adjustment potentiometer
3. Volts/Hz adjustment potentiometer

Figure 8-6 PowerBoost™ IIIE Voltage Regulator, 5/7.3E and 4/6EF Models



1. Voltage adjustment potentiometer
2. Stability adjustment potentiometer
3. Volts/Hz adjustment potentiometer

Figure 8-7 PowerBoost™ V Voltage Regulator, 15/20C and 12.5/17.5CF Models

Stability Adjust Potentiometer—Fine-tunes the regulator circuitry to reduce light flicker.

Voltage Adjust Potentiometer—Adjusts the generator voltage output within a range of approximately 100–130 volts.

Volts/Hz Adjust Potentiometer—Determines the engine speed (Hz) at which the generator output voltage begins to drop.

Note: For optimum results, apply full load for voltage regulator adjustment.

Voltage Regulator Adjustment Procedure

1. With the generator set off, turn the remote rheostat, if equipped, to midpoint.
2. Turn **voltage, volts/Hz, and stability potentiometers** fully counterclockwise.
3. Connect the voltmeter and the frequency meter to the AC circuit or an electrical outlet.
4. Start the generator set.
5. Rotate the **voltage adjustment potentiometer** clockwise to increase voltage (counterclockwise to decrease the voltage) to the desired output voltage.
6. Rotate the **stability potentiometer** clockwise to minimize light flicker.
7. Readjust **voltage adjustment potentiometer,** if necessary.
8. Adjust the engine speed to desired cut-in frequency (factory setting 57.5-58 Hz for 60 Hz models or 47.5-48 Hz for 50 Hz models) as measured on the frequency meter.
9. Rotate the **volts/Hz adjustment potentiometer** clockwise until the voltage level (as measured on voltmeter) begins to drop. When set to these specifications, the generator attempts to maintain normal output until the engine speed drops below the frequency set in step 5 (as load is applied).
10. Readjust the engine speed to normal (63 Hz/1890 rpm for 60 Hz or 52.5 Hz/1575 rpm for 50 Hz).
11. Readjust **voltage adjustment potentiometer,** if necessary.
12. Readjust **stability potentiometer,** if necessary.
13. Use the remote rheostat, if equipped, to make final voltage adjustments.
14. Stop the generator set.

8.3 ADC 2100 Adjustment (5/7.3ECD, 4/6EFCD, 10/13/15EGD, and 13/15EGZD Models)

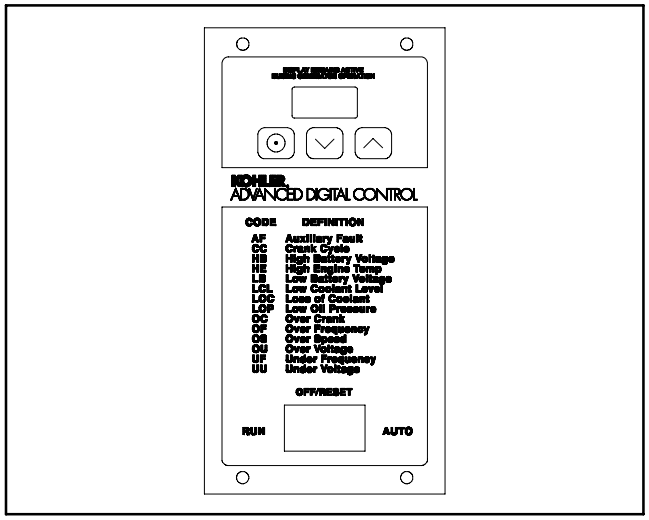


Figure 8-8 Advanced Digital Control (ADC 2100)

The controller is factory-set for the generator set voltage and frequency and normally does not require adjustment. If adjustment is necessary, follow the procedures in this section. Set the system voltage and frequency and then adjust the voltage, gain, and engine speed.

8.3.1 Configuration Mode Time Out

The controller will automatically exit the configuration mode without saving any changes after about 1 minute if no buttons are pressed. Start the configuration procedure over again from the beginning if the controller exits the configuration mode before the settings have been saved.

8.3.2 Controller Software Version Number

The application software for controller operation is factory-loaded onto the Advanced Digital Control. At times, it may be necessary to check the software version number for troubleshooting purposes.

The controller's application software version number is displayed on the LED screen during the key sequence to enter the configuration mode, after the Select button has been pressed and held for about five seconds. For example, 01.00 will be displayed for software version 1.00.

Note: The unit configuration (UC), engine type (EC), and engine data input type (ED) are factory set and should only be changed by an authorized Kohler dealer/distributor. Incorrect settings will make your unit non-functional.

8.3.3 Configuration Mode

Follow the instructions in Figure 8-12 to enter the configuration mode. The settings are shown in Figure 8-9. An X in the Display column in Figure 8-12 indicates a number from 0 to 9.

Press the Select button to step through to the Save mode as shown in Figure 8-14. When SAVE is displayed, press the up arrow to save the new settings or the down arrow to discard the changes and exit the configuration mode without saving.

Pressing the Select button when SAVE is displayed returns to the first parameter, system voltage/frequency (Uu).

Parameter	Setting	Definition	Connect
Unit's system voltage and frequency *	Uu00	Single phase, 2W, 60 Hz, 120 VAC	1 Ph, 2W
		Single phase, 3W, 60 Hz, 120 VAC	1 Ph, 3W
	Uu01	Single phase, 3W, 60 Hz, 120/240 VAC	1 Ph, 3W
	Uu02	Single phase, 3W, 50 Hz, 115/230 VAC	1 Ph, 3W
		Single phase, 2W, 50 Hz, 230 VAC	1 Ph, 2W
	Uu05	Single phase, 2W, 50 Hz, 110 VAC	1 Ph, 2W
		Single phase, 3W, 50 Hz, 110 VAC	1 Ph, 3W
		Single phase, 2W, 50 Hz, 115 VAC	1 Ph, 2W
	Uu07	Single phase, 3W, 50 Hz, 110/220 VAC	1 Ph, 3W
	Uu08	Single phase, 3W, 60 Hz, 100/200 VAC	1 Ph, 3W
	Uu09	Single phase, 3W, 50 Hz, 100/200 VAC	1 Ph, 3W
	Uu12	Single phase, 2W, 50 Hz, 220 VAC	1 Ph, 2W
	Uu13	Single phase, 2W, 50 Hz, 240 VAC	1 Ph, 2W
Unit configuration	Uc00	Marine generator set	
Engine type	Ec03	10/13/15EG and 10/13/15EGD	
	Ec04	5/7.3ECD and 4/6EFCD	
	Ec10 †	13/15EGZ and 13/15EGZD with PTO	
Engine data input types (No magnetic pick-up) §	Ed00	All digital inputs. Required for 5/7.3ECD and 4/6EFCD. Default setting for 10/13/15EG, 10/13/15EGD, 13/15EGZ, and 13/15EGZD with PTO.	
	Ed01	Digital: Low coolant level and low oil pressure Analog: Low coolant temperature	
	Ed02	Digital: Low coolant level and low coolant temperature Analog: Low oil pressure	
	Ed03	Digital: Low coolant level Analog: Low coolant temperature and low oil pressure	
	Ed08	Digital: Low coolant temperature and low oil pressure Analog: Low coolant level	
	Ed09	Digital: Low oil pressure Analog: Low coolant level and low coolant temperature	
	Ed10	Digital: Low coolant temperature Analog: Low coolant level and low oil pressure	
	Ed11	All analog inputs	
Battery Voltage	Bt12	Battery voltage 12 VDC	
Communications	Cn00	No CAN communications	
	Cn01	SAE J1939 (Used for ADC remote digital gauge)	
	Cn02 ‡	SmartCraft™ CAN compatible (Required for 5/7.3ECD and 4/6EFCD models)	

* Check the generator set spec sheet for voltage configurations applicable to each model.
Use voltage/frequency parameters Uu05–Uu13 only with ADC application program version 1.20 or higher.

† 13/15EGZ models with PTO require application program version 1.21 or higher.

§ Setting the Ec parameter automatically selects the appropriate Ed parameter for the standard data input types for that engine. Change this parameter if optional senders are installed.

‡ Smartcraft® settings for ADC code version 2.xx only, for models 5/7.3ECD and 4/6EFCD

SmartCraft™ is a trademark of Mercury Marine, a division of Brunswick Corporation.

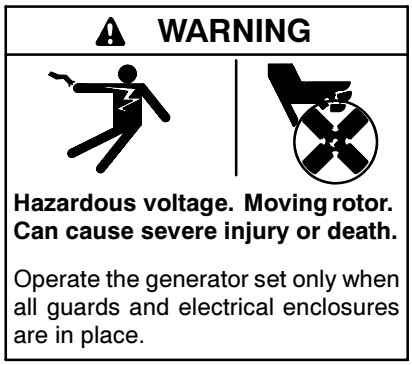
Figure 8-9 Controller Parameters

8.3.4 Adjusting the Voltage, Gain, Volts/Hz, and Engine Speed

After setting the system voltage, check the output voltage and adjust, if necessary, using the following procedures. Follow the instructions in Figure 8-15 to adjust the voltage, gain, volts/Hz, and governor gain while the engine is running. An X in the Display column in Figure 8-15 indicates a number from 0 to 9. Use the up arrow to increase a setting or the down arrow to decrease the setting. Pressing the Select button when SAVE is displayed returns to the first parameter, voltage adjust (1P).

Note: A digital multimeter that measures voltage and frequency is required for these adjustments.

8.3.5 Voltage Adjustment



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

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

Voltage Adjustment Procedure

1. With the generator set off, connect a digital voltmeter to the output leads or an electrical outlet on the load side of the generator set. Set the meter to measure voltage.
2. Start the generator set by moving the generator set master switch to the RUN position.
3. Use the ADC controller to adjust the voltage (parameter 1P) until the output voltage reaches the desired value. See Figure 8-10.

Measured Voltage, VAC	Approximate Voltage Change per Step, VAC	
	Coarse Adjust	Fine Adjust
85–132	5	0.5
180–251	7	0.7

Figure 8-10 Voltage Adjustment

4. Adjust the voltage stability (gain, parameter 2P) to minimize light flicker.
5. Readjust the voltage, if necessary.

Volts per Hertz (Hz) Adjustments

The cut-in frequency is preset for 58Hz (60Hz system) or 48Hz (50Hz system). When the frequency falls below the cut-in, output voltage is reduced to relieve the engine. The amount of the voltage reduced is set by the 3P parameter. Monitor engine speed and output voltage as loads are applied.

- If there is excessive droop in engine speed and little droop in voltage, increase the 3P value.
- If there is little engine speed droop but excessive voltage droop, decrease the 3P value.

The amount of voltage droop is approximately 0.5% of system voltage for each step of 3P, including each cycle (Hz) below the cut-in frequency.

3P	Voltage Droop for Each Engine Below Cut–in Frequency
0	0
1	0.5%
2	1.0%
3	1.5%
4	2.0%
5	2.5%
6	3.0%
7	3.5%
8	4.0%
9	4.5%

Figure 8-11 Voltage Droop Adjustments

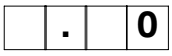
1. Readjust the voltage stability (gain, parameter 2P), if necessary.
2. Readjust the voltage (parameter 1P), if necessary.
3. Stop the generator set.

Controller Configuration Mode *(Use with Figure 8-9, Controller Parameters)*:

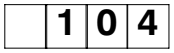
Hold the Select button:

Display:

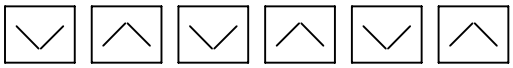
Move the generator set master switch to the RUN position. (The generator set engine will not start.)

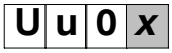


Wait about 5 seconds until the display shows the program version number. (The number may be different than the one shown here.)



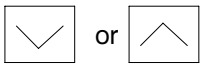
Press the down arrow key and then the up arrow key 3 times to enter the configuration mode. (This is the controller "password.")





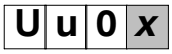
Now release the Select button.

Press:

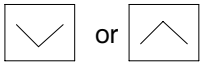


or

To set the voltage/frequency setting see Figure 8-9.

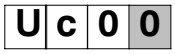


To step to the next parameter, unit configuration Uc.

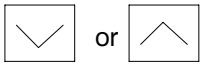


or

To set the unit configuration setting to Uc00, if necessary.

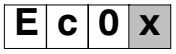


To step to the next parameter, engine type Ec.

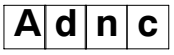


or

To set the engine type, if necessary.



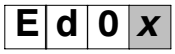
To step to the next parameter, advanced configuration mode or save mode selection.



Now either save your settings or enter the Advanced Configuration Mode to set the engine data inputs, battery voltage, and communications.

Press:

To enter advanced configuration mode.
Go to Figure 8-13.



OR:

or

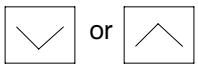
To proceed to the save mode without entering the advanced configuration mode.
Go to Figure 8-14.

Note: Shaded boxes show which number in the controller display changes when the up or down arrow key is pressed. *"x"* denotes any number from 0 to 9.

Figure 8-12 Configuration Mode (System Voltage/Frequency, Unit Configuration, and Engine Type Parameters)

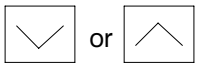
Pressing the up arrow key at the Adnc display (See Figure 8-12) puts you into the Advanced Configuration Mode.

Press:



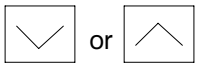
To set the engine data input type. **E d 0 *x***

To enter battery voltage selection mode.



To toggle between 12 and 24 VDC. **12-volt models** **B t 1 2**

To enter communications selection mode.



To set the communications parameter. **C n 0 *x***

To enter SAVE mode. **Go to Figure 8-14.** **S A V E**

Note: Shaded boxes show which number in the controller display changes when the up or down arrow key is pressed. *"x"* denotes any number from 0 to 9.

Figure 8-13 Advanced Configuration Mode (Engine Data Input Types, Battery Voltage, and Engine Communications)

There are 3 options when the display says SAVE: **S A V E**
Press:

To return to the first parameter, system voltage/frequency Uu, to check or change settings before saving. See Figure 8-12. **U u 0 *x***

or

To save changes. **Y E S**

or

To discard changes without saving. **n o**

"Yes"or "no" flashes when the up or down arrow is pressed and then the controller exits the configuration mode. The display returns to the runtime hours. ***x x x x***

Note: Be sure to save your settings before exiting the configuration mode. The controller reverts to the last *saved* settings when the master switch is moved to the OFF/RESET position.

* *x* in the runtime hours display above denotes any number from 0 to 9.

Figure 8-14 Save Mode (After Configuring Generator Set Parameters)

Output Voltage Adjustment Mode:

Display :*

Move the generator set master switch to the RUN position. The generator set engine starts and the controller display shows the engine runtime hours.

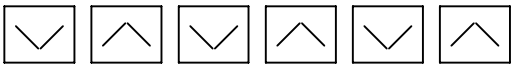
x	x	x	x

Hold:

Wait about 5 seconds until the display changes from runtime hours to the program version number.

	x.	x	x

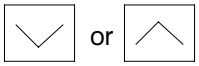
Press the down arrow key and then the up arrow key 3 times to enter the adjustment mode. (This is the controller "password.")



1	P	x	x

The controller is now in the voltage coarse adjustment mode.

Press:

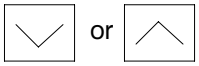


To raise or lower the voltage in large increments (approximately 5–7 volts per step).

1	P	x	x

To enter fine voltage adjustment mode.

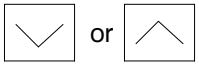
1	P	x	x



To raise or lower the voltage in smaller increments (approximately 0.5–0.7 volts per step).

To enter coarse voltage stability (gain) adjustment mode.

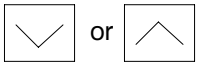
2	P	x	x



To raise or lower the voltage stability (gain) in large increments.

To enter fine voltage stability (gain) adjustment mode.

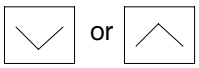
2	P	x	x



To raise or lower the voltage stability (gain) in smaller increments.

To enter volts/Hz adjustment mode.

3	P	0	x



To raise or lower the volts/Hz: 0.5% per step 00=0; 09= 4.5%.

See Figure 8-14 to save.

* Shaded boxes show which character in the controller display changes for each adjustment. *"x"* in the examples above denotes any number from 0 to 9. The actual values may vary from model-to-model.

TP6196

Figure 8-15 Output Voltage Adjustments

Appendix A Abbreviations

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

A, amp	ampere
ABDC	after bottom dead center
AC	alternating current
A/D	analog to digital
ADC	advanced digital control; analog to digital converter
adj.	adjust, adjustment
ADV	advertising dimensional drawing
Ah	amp-hour
AHWT	anticipatory high water temperature
AISI	American Iron and Steel Institute
ALOP	anticipatory low oil pressure
alt.	alternator
Al	aluminum
ANSI	American National Standards Institute (formerly American Standards Association, ASA)
AO	anticipatory only
APDC	Air Pollution Control District
API	American Petroleum Institute
approx.	approximate, approximately
AQMD	Air Quality Management District
AR	as required, as requested
AS	as supplied, as stated, as suggested
ASE	American Society of Engineers
ASME	American Society of Mechanical Engineers
assy.	assembly
ASTM	American Society for Testing Materials
ATDC	after top dead center
ATS	automatic transfer switch
auto.	automatic
aux.	auxiliary
avg.	average
AVR	automatic voltage regulator
AWG	American Wire Gauge
AWM	appliance wiring material
bat.	battery
BBDC	before bottom dead center
BC	battery charger, battery charging
BCA	battery charging alternator
BCI	Battery Council International
BDC	before dead center
BHP	brake horsepower
blk.	black (paint color), block (engine)
blk. htr.	block heater
BMEP	brake mean effective pressure
bps	bits per second
br.	brass
BTDC	before top dead center
Btu	British thermal unit
Btu/min.	British thermal units per minute
C	Celsius, centigrade
cal.	calorie
CAN	controller area network
CARB	California Air Resources Board
CB	circuit breaker
cc	cubic centimeter
CCA	cold cranking amps
ccw.	counterclockwise
CEC	Canadian Electrical Code
cert.	certificate, certification, certified
cfh	cubic feet per hour
cfm	cubic feet per minute
CG	center of gravity
CID	cubic inch displacement
CL	centerline
cm	centimeter
CMOS	complementary metal oxide substrate (semiconductor)
cogen.	cogeneration
com	communications (port)
coml	commercial
Coml/Rec	Commercial/Recreational
conn.	connection
cont.	continued
CPVC	chlorinated polyvinyl chloride
crit.	critical
CRT	cathode ray tube
CSA	Canadian Standards Association
CT	current transformer
Cu	copper
cUL	Canadian Underwriter's Laboratories
CUL	Canadian Underwriter's Laboratories
cu. in.	cubic inch
cw.	clockwise
CWC	city water-cooled
cyl.	cylinder
D/A	digital to analog
DAC	digital to analog converter
dB	decibel
dB(A)	decibel (A weighted)
DC	direct current
DCR	direct current resistance
deg., °	degree
dept.	department
DFMEA	Design Failure Mode and Effects Analysis
dia.	diameter
DI/EO	dual inlet/end outlet
DIN	Deutsches Institut fur Normung e. V. (also Deutsche Industrie Normenausschuss)
DIP	dual inline package
DPDT	double-pole, double-throw
DPST	double-pole, single-throw
DS	disconnect switch
DVR	digital voltage regulator
E, emer.	emergency (power source)
ECM	electronic control module, engine control module
EDI	electronic data interchange
EFR	emergency frequency relay
e.g.	for example (*exempli gratia)*
EG	electronic governor
EGSA	Electrical Generating Systems Association
EIA	Electronic Industries Association
EI/EO	end inlet/end outlet
EMI	electromagnetic interference
emiss.	emission
eng.	engine
EPA	Environmental Protection Agency
EPS	emergency power system
ER	emergency relay
ES	engineering special, engineered special
ESD	electrostatic discharge
est.	estimated
E-Stop	emergency stop
etc.	et cetera (and so forth)
exh.	exhaust
ext.	external
F	Fahrenheit, female
fglass.	fiberglass
FHM	flat head machine (screw)
fl. oz.	fluid ounce
flex.	flexible
freq.	frequency
FS	full scale
ft.	foot, feet
ft. lb.	foot pounds (torque)
ft./min.	feet per minute
ftp	file transfer protocol
g	gram
ga.	gauge (meters, wire size)
gal.	gallon
gen.	generator
genset	generator set
GFI	ground fault interrupter
GND, ⏚	ground
gov.	governor
gph	gallons per hour
gpm	gallons per minute
gr.	grade, gross
GRD	equipment ground
gr. wt.	gross weight
H x W x D	height by width by depth
HC	hex cap
HCHT	high cylinder head temperature
HD	heavy duty
HET	high exhaust temp., high engine temp.
hex	hexagon
Hg	mercury (element)
HH	hex head
HHC	hex head cap
HP	horsepower
hr.	hour
HS	heat shrink
hsg.	housing
HVAC	heating, ventilation, and air conditioning
HWT	high water temperature
Hz	hertz (cycles per second)
IC	integrated circuit
ID	inside diameter, identification
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IMS	improved motor starting
in.	inch
in. H_2O	inches of water
in. Hg	inches of mercury
in. lb.	inch pounds
Inc.	incorporated
ind.	industrial
int.	internal
int./ext.	internal/external
I/O	input/output
IP	iron pipe
ISO	International Organization for Standardization
J	joule
JIS	Japanese Industry Standard

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

Appendix B Generator Selection and Wattage Requirements

General Wattage Requirements

Consider total wattage requirements (lights, motors, appliances) when selecting a generator set, or when sizing wattage usage in which available space and construction limit the size of the generator set.

Motor Loads

When figuring generator set capacity requirements for loads that include electric motors, consider the high current demanded by the motors during startup. The inrush or starting current is typically 2 to 3 times higher than that required when the motor reaches normal operating speed. Allow reserve for inrush demands plus other loads that could be on the line as the electric motor starts. Use Figure 1 as a guide when selecting generator set capacity requirements involving motor loads.

Motor, HP	Starting (Inrush) Watts	Running Watts
1/4	750	330
1/3	1000	400
1/2	1500	600
3/4	2000	750
1	3300	1100
2	4000	2000
3	5000	3000

Figure 1 Motor Requirements

Appliance Loads

Generator sets often furnish AC for appliances such as TVs, stereos, and electric water heaters. Except for resistance-type loads such as the water heater, requirements for appliances are usually low. Do not overlook such loads when figuring total requirements. Allow reserve capacity for anticipated appliance loads to avoid overloading a generator set.

Lighting Load

To calculate the lighting load, add the wattage of each generator set-operated lamp. Note that not all of the lights or lamps are on the generator set AC circuit—some are DC powered by a 12-volt battery. Ensure that the calculated total wattage includes only lights actually on the generator set AC circuit.

Air Conditioners

The starting characteristics of air conditioners vary greatly—for example, one 12,000 Btu unit has lower starting requirements than a 10,000 Btu unit of another variety. When using only one unit, there is usually no starting problem provided that the lighting and appliance load is not too high when starting the generator set.

Simultaneous starting of two air conditioning units, however, can present problems if the generator set capacity is marginal. Because of the variation in starting characteristics among air conditioners, this publication makes no statements regarding multiple-motor starting capabilities of the generator set covered. Consider delayed starting or the use of easy-starting devices on air conditioner units whenever simultaneously starting more than one motor.

See Figure 2 for typical air conditioner requirements. The requirements vary among different manufacturers.

	Air Conditioner Size (Btu)								
	7,000		9,000		12,000		16,000		24,000
Voltage	115	230	115	230	115	230	115	230	230
Full load amps	9.3	4.8	9.9	5.0	11.8	6.3	16.3	8.0	11.6
Rated load amps	7.7	4.0	7.0	3.5	8.9	4.8	13.0	6.2	10.2
Locked rotor amps	34.0	20.0	40.0	20.0	50.0	31.0	75.0	36.0	56.0
Starting (inrush) watts	3910	4600	4600	4600	5750	7130	8630	8280	12,900
Running watts	886	920	805	805	1020	1100	1500	1430	2350

Figure 2 Typical Marine Air Conditioner Requirements (60 Hz)

Appendix C Generator Set Output Ratings Procedure

General

Kohler Co. develops the kilowatt output rating of a Kohler marine genset based upon the calculations specified in ISO 3046 and ISO 8528-1. The calculations *correct* for environmental variables encountered in a genset installation. Figure 3 outlines the calculations. Figure 4 contains examples of how heat variables affect genset ratings.

Generator Output $_{corrected}$ = Generator Output $_{observed}$ x Correction Factor
Output power is expected to be within ±5% of the specified rating when corrected to reference conditions. Correction factors are determined using the following formulas:
1. For naturally aspirated spark-ignition engines using gaseous fuel: C.F. = [1.175 (29.2 / Dry Barometer in. Hg)$^{0.86}$ (Temperature °F + 460/537)$^{0.55}$ − 0.175] x Alternator Efficiency $_{Reference}$ / Alternator Efficiency $_{Observed}$
2. For naturally aspirated spark-ignition engines burning gasoline: C.F. = [1.175 (29.2 / Dry Barometer in. Hg)^{1} (Temperature °F + 460/537)$^{0.5}$ − 0.175] x Alternator Efficiency $_{Reference}$ / Alternator Efficiency $_{Observed}$
Reference conditions: Temperature: 77°F; Pressure: 29.2 in. Hg dry barometer. Kohler sound shield increases ambient intake air approx. 12°F. Approximate derates: Temperature: approximately 1% per 10°F (turbocharged engines have a greater derate); Pressure (altitude): approximately 4% per 1000 ft. (1 in. Hg)

Figure 3 Generator Output

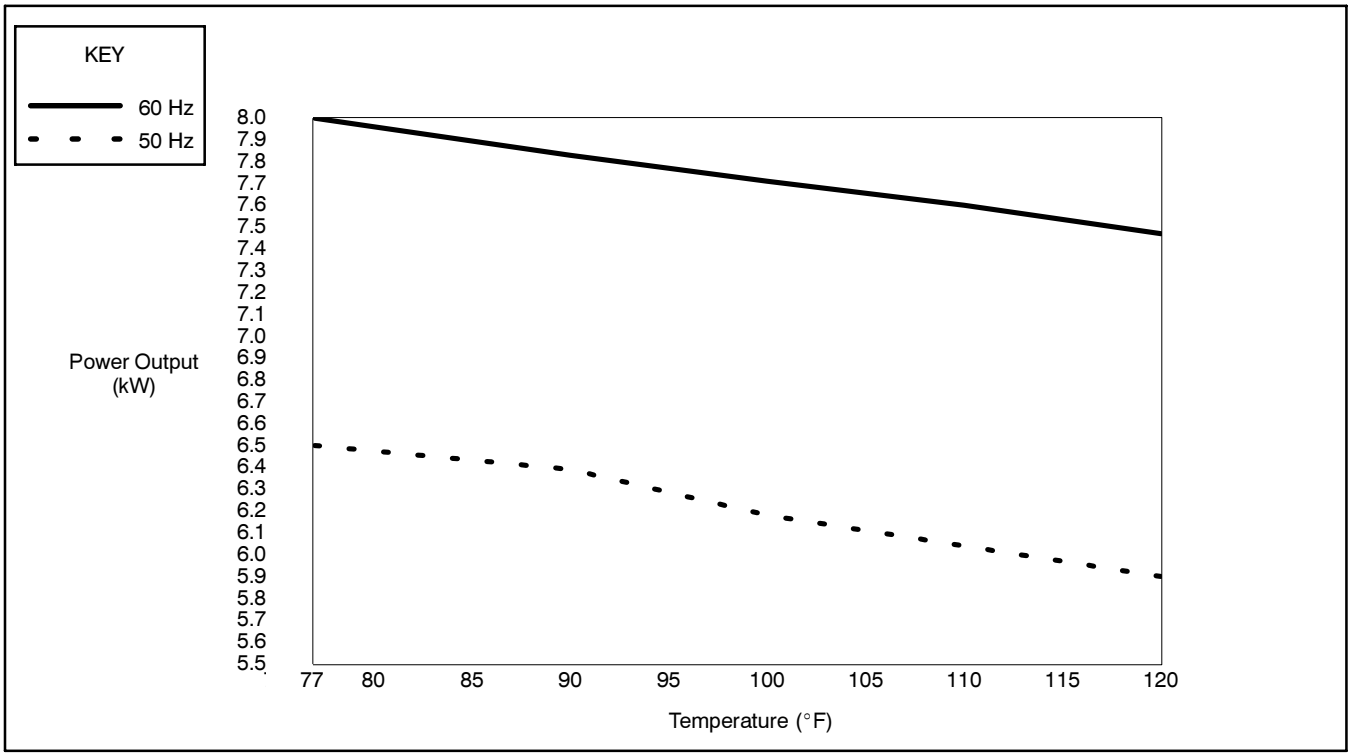


Figure 4 Example: 8EOZ/6.5EFOZ kW Derates (ISO 3046/ISO 8258-1)

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