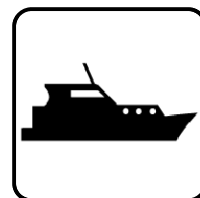


Installation

Marine Generator Sets



Models:

6EKOD
9-11EKOZD
5EFKOD
7-9EFKOZD

AMP
A SAIM Group Company

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9001
KOHLER
POWER SYSTEMS
NATIONALLY REGISTERED

KOHLER
Power Systems

TP-6773 8/17c

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Safety Precautions and Instructions

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

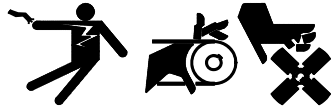
Caution indicates the presence of a hazard that **will or can cause minor personal injury or property damage.**

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) 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.

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) Press the generator set on/off button to shut down the generator set. All indicator lamps dim. (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.

Engine Backfire/Flash Fire

 WARNING

Risk of 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 fuel injection system, 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 fuel system.

Servicing the air cleaner. A sudden backfire can cause severe injury or death. Do not operate the generator set with the air cleaner/silencer 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 is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Carbon monoxide poisoning symptoms include but are not limited to the following:

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

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

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. Never operate the generator set without a functioning carbon monoxide detector. Inspect the detector before each generator set use.

Operating the generator set. Carbon monoxide can cause severe nausea, fainting, or death. 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.

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

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

Hazardous Noise

⚠ CAUTION

Hazardous noise. Can cause hearing loss. Never operate the generator set without a muffler or with a faulty exhaust system.

Hazardous Voltage/ Moving Parts

⚠ WARNING

Hazardous voltage. Moving parts. Can cause severe injury or death. Operate the generator set only when all guards and electrical enclosures are in place.

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.

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

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.

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

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

Section 1 Introduction

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

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The safe and successful operation of a marine power system depends primarily on the installation. See Figure 1-1. Use this manual as a guide to install the

marine generator set. For operating instructions, refer to the operation manual.

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

Use the specification sheets as a guide in planning your installation. Use current dimension drawings and wiring diagrams.

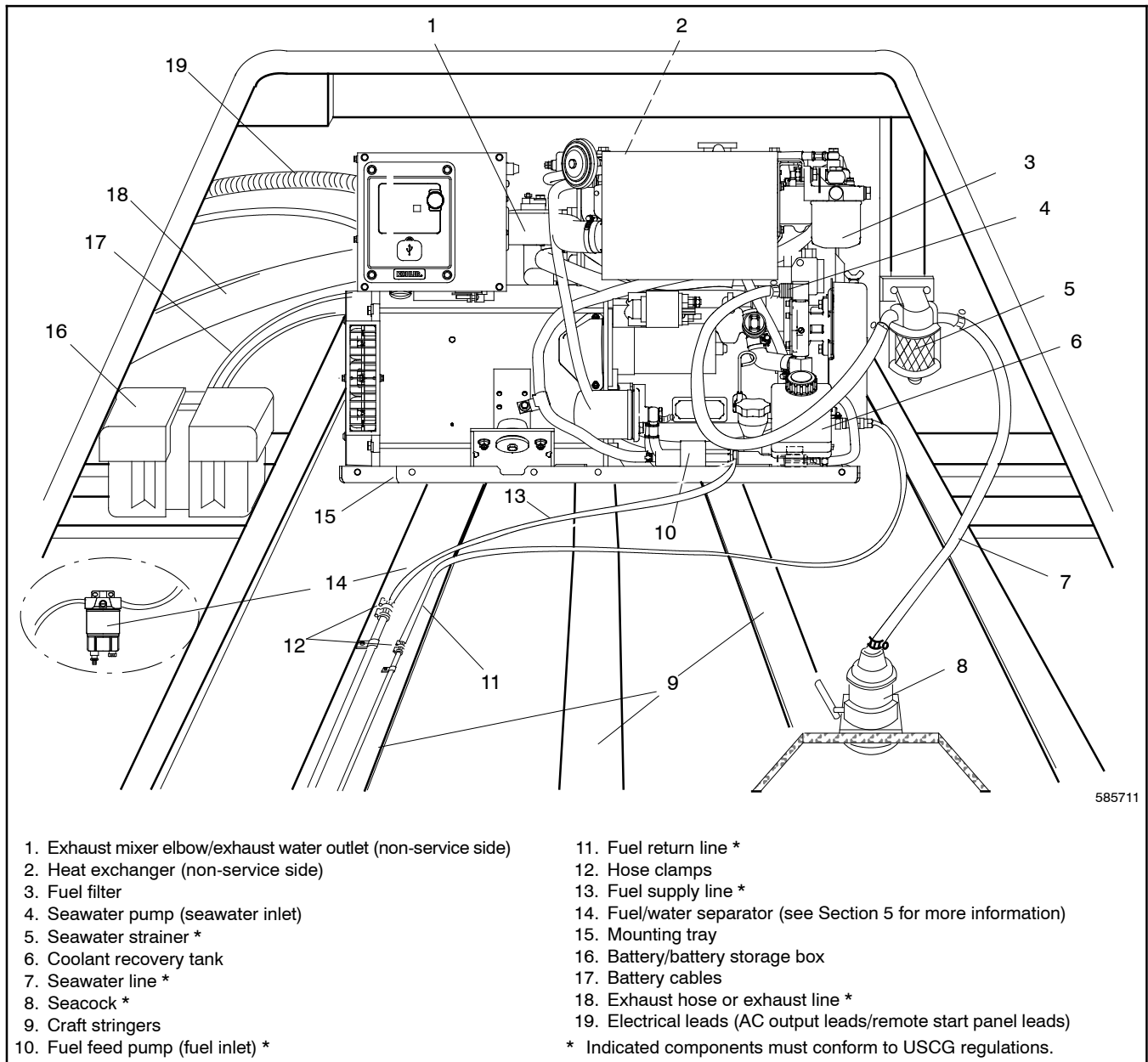


Figure 1-1 Typical Generator Set Location and Mounting (Without Sound Shield)

Note: See text for complete explanation of installation requirements.

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

Notes

Section 2 Location and Mounting

2.1 General Considerations

The key to installation is location. Before making final plans for locating a generator set, consider the following.

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's engine room 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 Figure 1-1 for a typical installation.

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

Mount the generator set as high as possible to avoid contact with bilge splash and lower-lying vapors and to allow for downward pitch of the exhaust line toward the exhaust outlet.

Kohler Co. recommends mounting the generator set on a flat board attached to the craft stringers. Craft stringers generally provide the best generator set support. Ensure that the structural members can support the generator set's weight and withstand its vibration.

The generator set includes vibration mounts and a mounting tray or skid. 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.

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 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 (4 sq. in. per ft.) 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 optional detection devices to cause alarm, warning, or engine shutdown should dangerous fumes accumulate in the compartment.

See the generator set specification sheet that shipped with the generator set 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 decline if you compromise these guidelines. See Figure 3-1 for allowable intake restriction.

Note: ISO 3046 derates apply. See Appendix C.

Model	Allowable Intake Restriction, ≤ kPa (in. H ₂ O)
6EKOD and 9/11EKOZD	2.5 (10)
5EFKOD and 7/9EFKOZD	1.5 (6)

Figure 3-1 Combustion Air Intake Restriction

3.2 Cooling System Components

The marine generator set's cooling system requires the following components.

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 the water-line hose to the seawater pump.

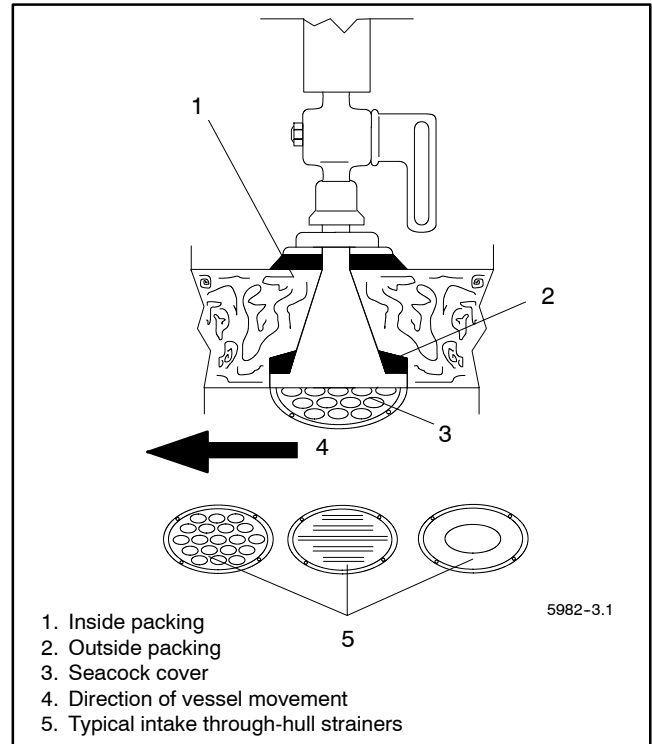


Figure 3-2 Seacock Installation

Do not align the strainer (in relation to the craft's 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.

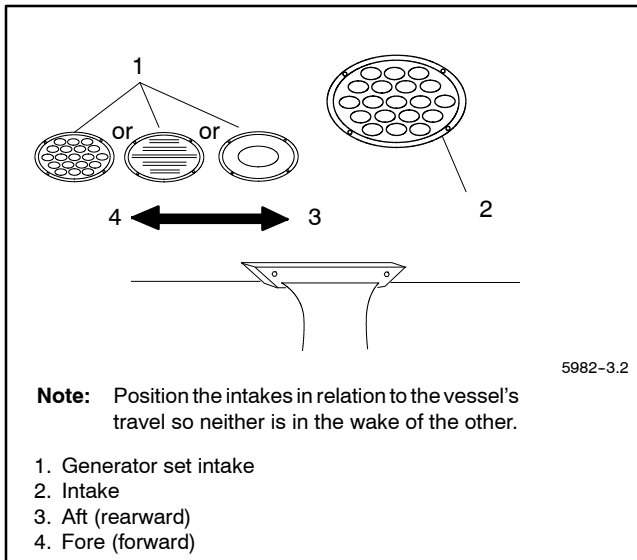


Figure 3-3 Intake Strainer

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 hulls incorporating sea chests or other designs that provide a positive pressure to the raw water pump for the intake through-hull strainers. Positive pressure forces 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 vessel's direction of travel. A sea chest configuration applies 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 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.

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

Maximum seawater inlet pressure at the seawater pump is 34.5 kPa (5 psi). Excessive pressure will cause water ingestion.

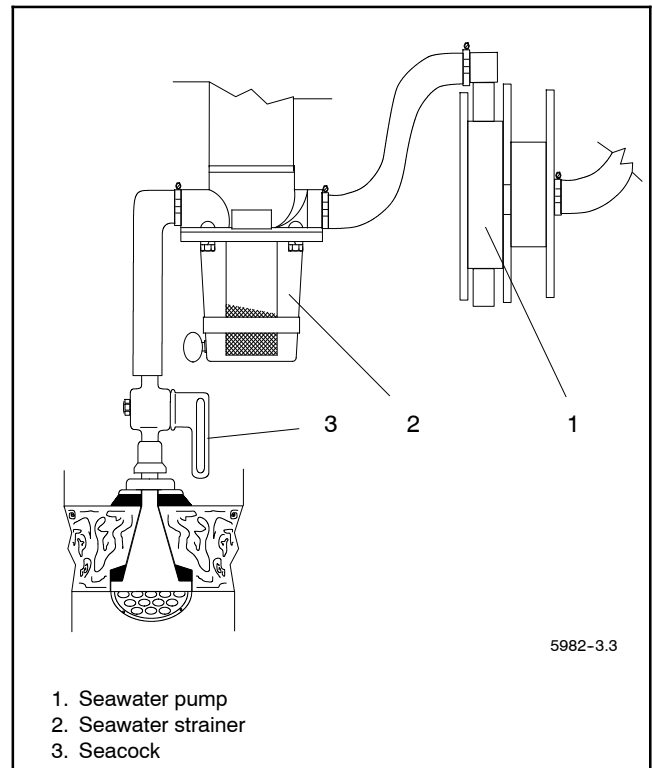


Figure 3-4 Seawater Strainer

3.2.4 Water Lines

Water lines from the seacock to the engine-driven seawater pump are usually constructed of flexible hose. Connect a flexible section of hose to the seawater pump to allow the generator set to vibrate 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 suction problems may occur. See Section 7 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 for the seawater hose connection to the seawater pump inlet.

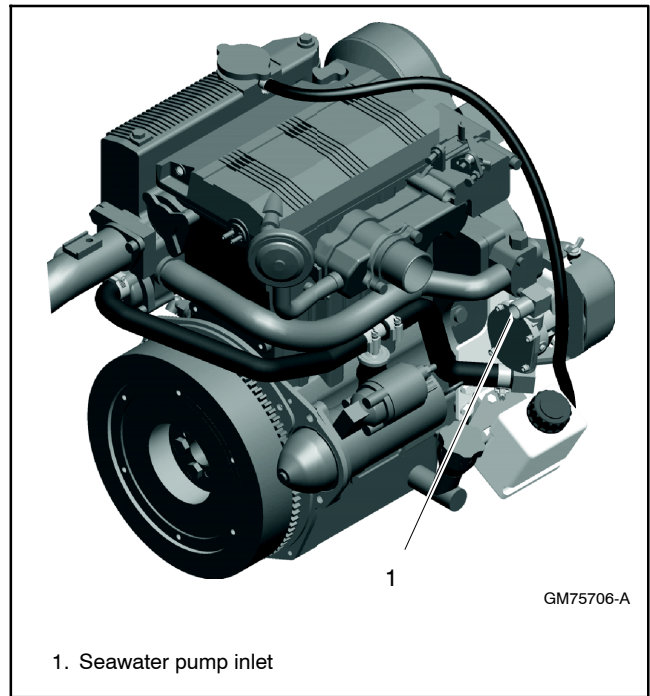


Figure 3-5 Seawater Inlet Connection (Located at the Inlet to the Seawater Pump), Typical

3.2.5 Closed Heat Exchanger

A closed heat exchanger is the best cooling method for most applications. See Figure 3-6 for a typical installation. Provide space to access the water-cooled exhaust manifold pressure cap.

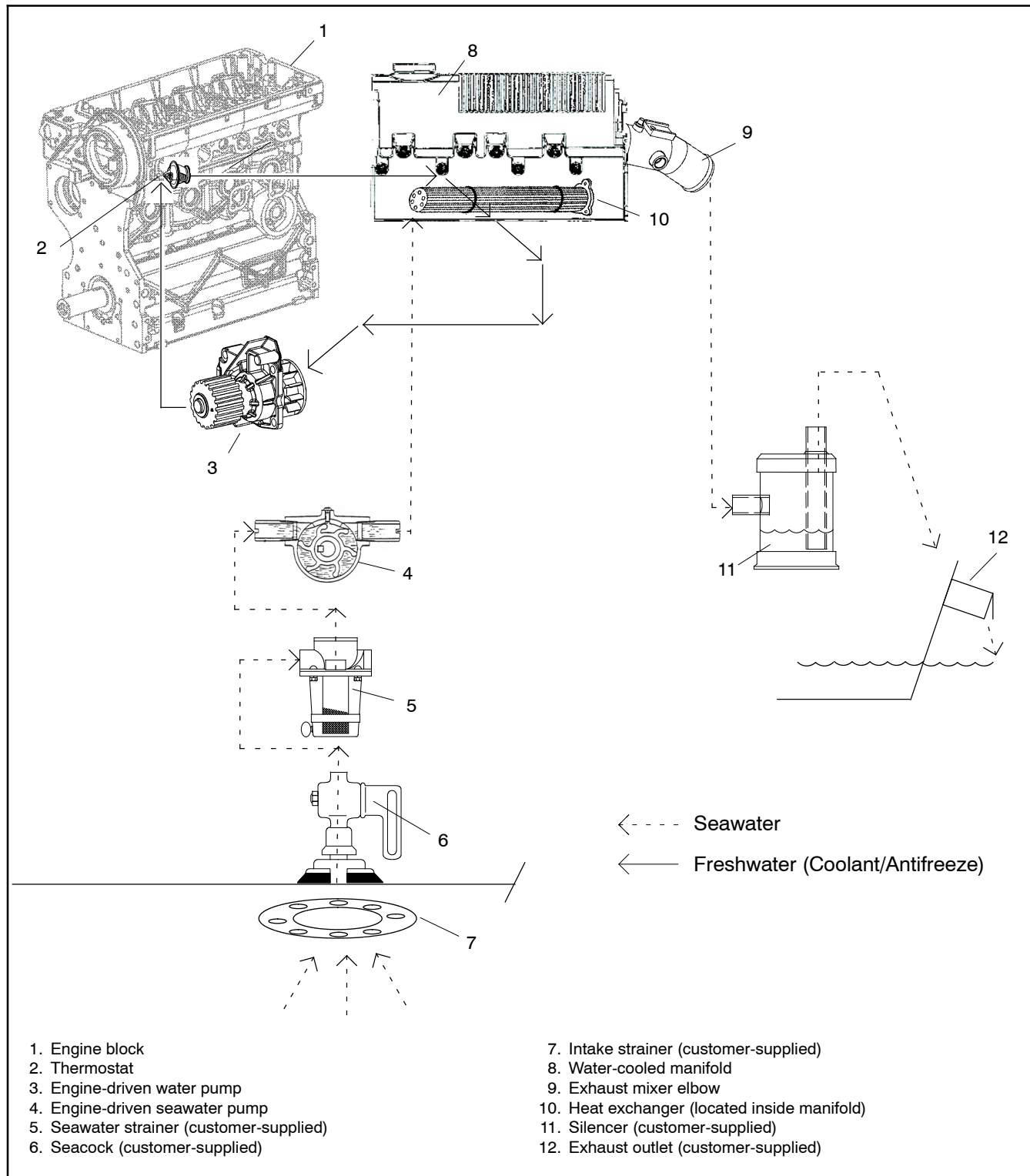
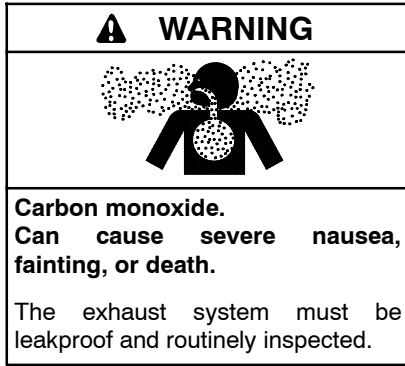


Figure 3-6 Typical Closed/Heat Exchanger Cooling System



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

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

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

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. Never operate the generator set without a functioning carbon monoxide detector. Inspect the detector before each generator set use.

Operating the generator set. Carbon monoxide can cause severe nausea, fainting, or death. 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: Do not use copper tubing in diesel exhaust systems. Sulfur in diesel exhaust causes rapid deterioration of copper tubing exhaust systems, resulting in exhaust/water leakage.

4.1 Types

Kohler® generator sets covered in this manual use either wet or dry exhaust systems. Dry exhaust systems are common in commercial applications. See the engine manual for specifications.

4.2 Exhaust Lines

Use water-cooled exhaust lines in all marine installations. 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 (1/2 in. per running foot). Use a flexible exhaust hose that conforms to UL Standard 1129 for the engine's wet exhaust components between the mixer elbow and the exhaust outlet.

4.3 Exhaust System Location, Mounting, and Installation

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

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

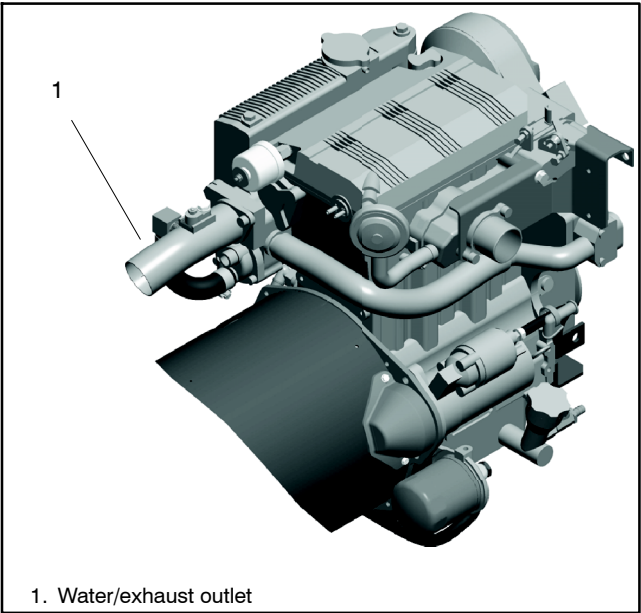


Figure 4-1 Mixer Elbow/Exhaust Connection, Typical

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 the 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 the piping exits the craft prevents backwash. See Figure 4-3, item 1. Support the exhaust lines to prevent the formation of water pockets.

Exhaust system installation 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, also in applications in which long exhaust lines to the transom (rear) could cause excessive back pressure. See Figure 4-2 for allowable back pressures.

Model	Allowable Exhaust Back Pressure, ≤ kPa (in. H ₂ O)
6EKOD and 9EKOZD	5.3 (21.3)
5EFKOD and 7EFKOZD	4.3 (17.3)
11EKOZD (1 and 3 Phase)	8.7 (34.9)
9EFKOZD (1 and 3 Phase)	7.1 (28.5)

Figure 4-2 Allowable Exhaust Back Pressures

4.3.1 Above-Waterline Installation

Install a customer-supplied silencer with the silencer's outlet at a maximum of 3 m (10 horizontal ft.) from the center of the engine's exhaust outlet. See Figure 4-3. Mount a typical silencer with the inlet and outlet horizontal and with the drain plug down. Use an exhaust

hose pitch of at least 13 mm per 30.5 cm (0.5 in. per running foot). Some silencers require two support brackets or hanger straps for installation to stringers or other suitable structure. Follow the instructions provided with the silencer. Install any lift (see Figure 4-3, item 1) in the exhaust line below the engine exhaust manifold outlet.

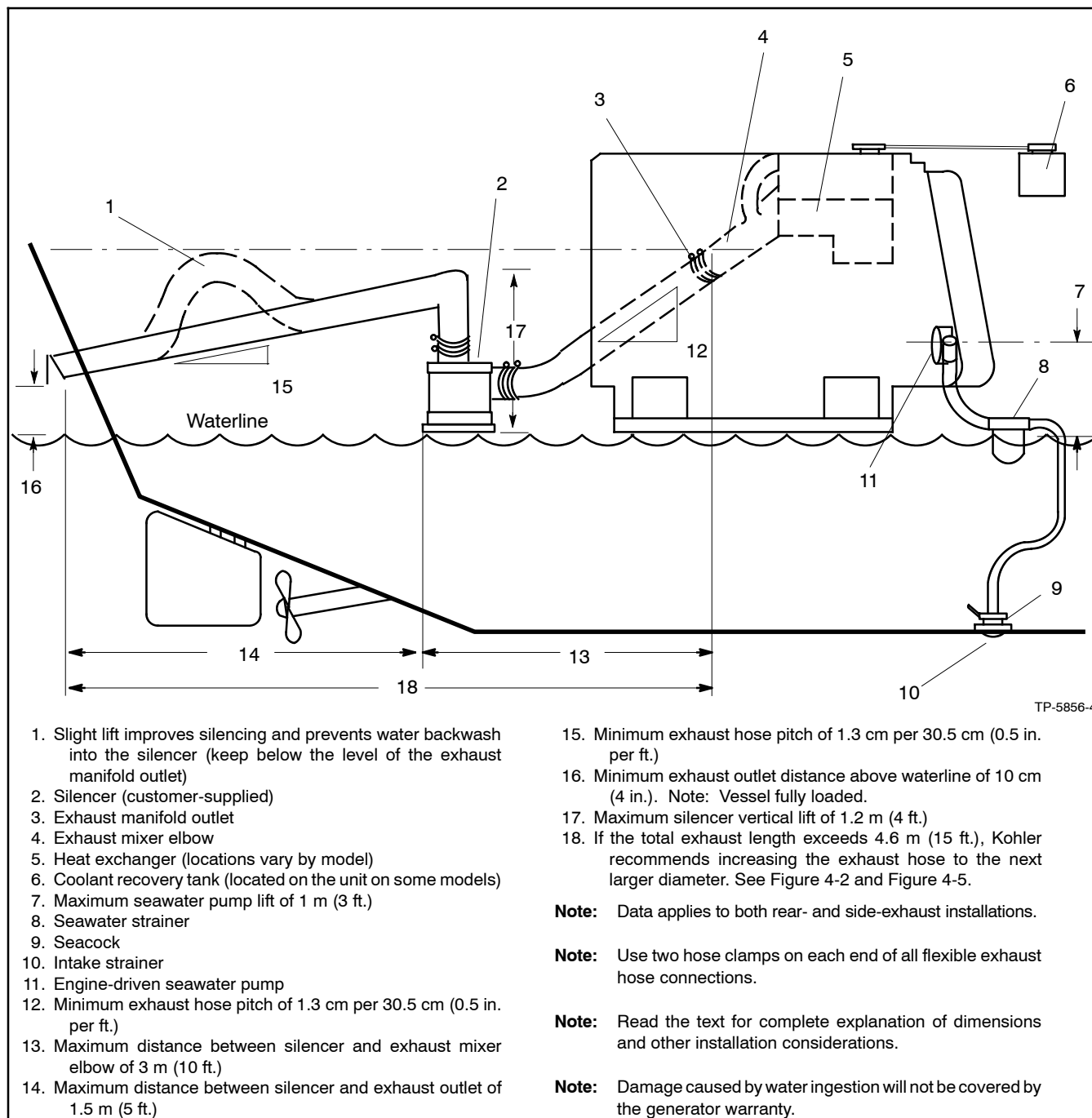


Figure 4-3 Typical Above-Waterline Installation

4.3.2 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 using the instructions provided with the siphon break kit.

Note: An improperly installed siphon break will cause engine damage and may void the warranty.

Install the siphon break above the highest point in the exhaust line between the heat exchanger and the exhaust mixer. See Figure 4-4 for the siphon break connection. Support the siphon break and hoses to maintain their position and function. Allow a slight offset to clear the stringers or other permanent structures. Protect the siphon break air inlet from dirt and debris.

Note: To prevent water leakage on the generator set, do not mount the siphon break directly over the generator set.

Note: Ensure that the siphon break's cap is tight before operating the generator set.

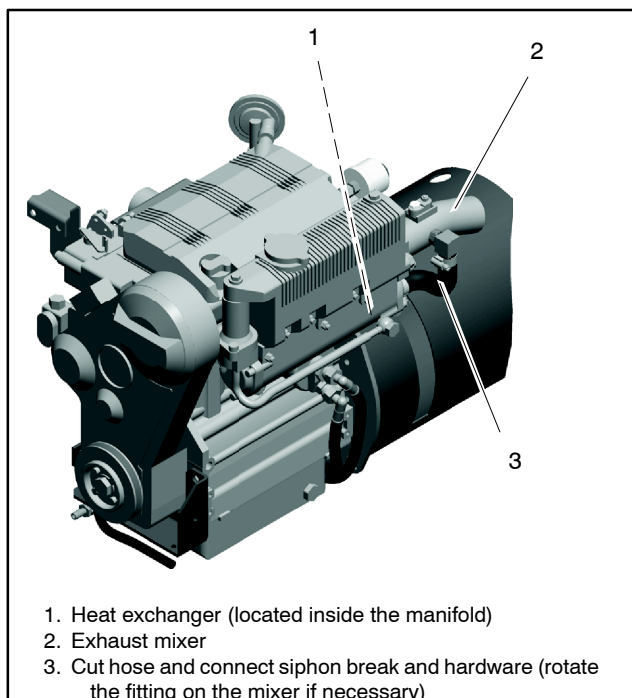


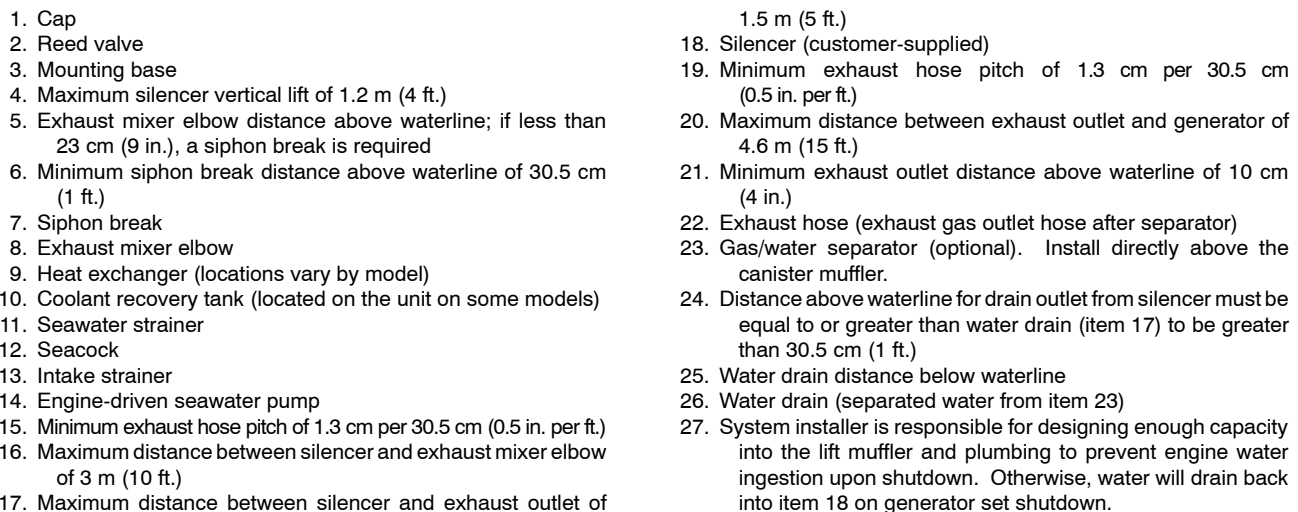
Figure 4-4 Siphon Break Connection, Typical

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 the silencer manufacturer's recommendation for securing the silencer to the hull. Mount the silencer with the outlet not more than 3 m (10 horizontal ft.) from the engine's exhaust manifold outlet. Use a USCG-type certified marine exhaust hose.

Models without Sound Shield	Models with Sound Shield	Exhaust Hose Diameter mm (in.)
6EKOD/5EFKOD 9EKOZD/7EFKOZD 11EKOZD/9EFKOZD (1 Phase) 11EKOZD/9EFKOZD (3 Phase)	6EKOD/5EFKOD 9EKOZD/7EFKOZD 11EKOZD/9EFKOZD (1 Phase) 11EKOZD/9EFKOZD (3 Phase)	51 (2.0)

Figure 4-5 Exhaust Hose Sizes

Note: Damage caused by water ingestion will not be covered by the generator warranty.



Section 4 Exhaust System 21

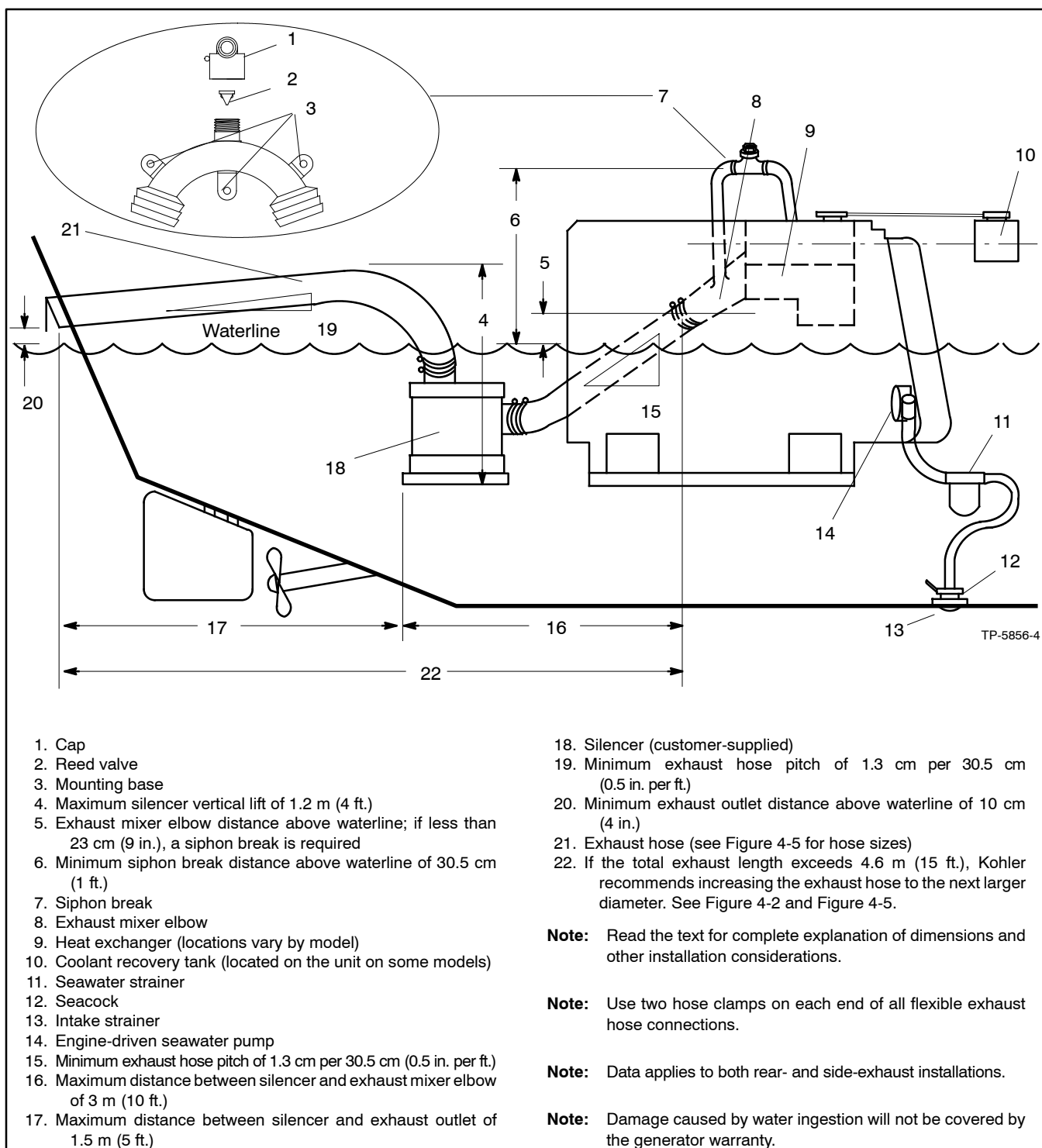


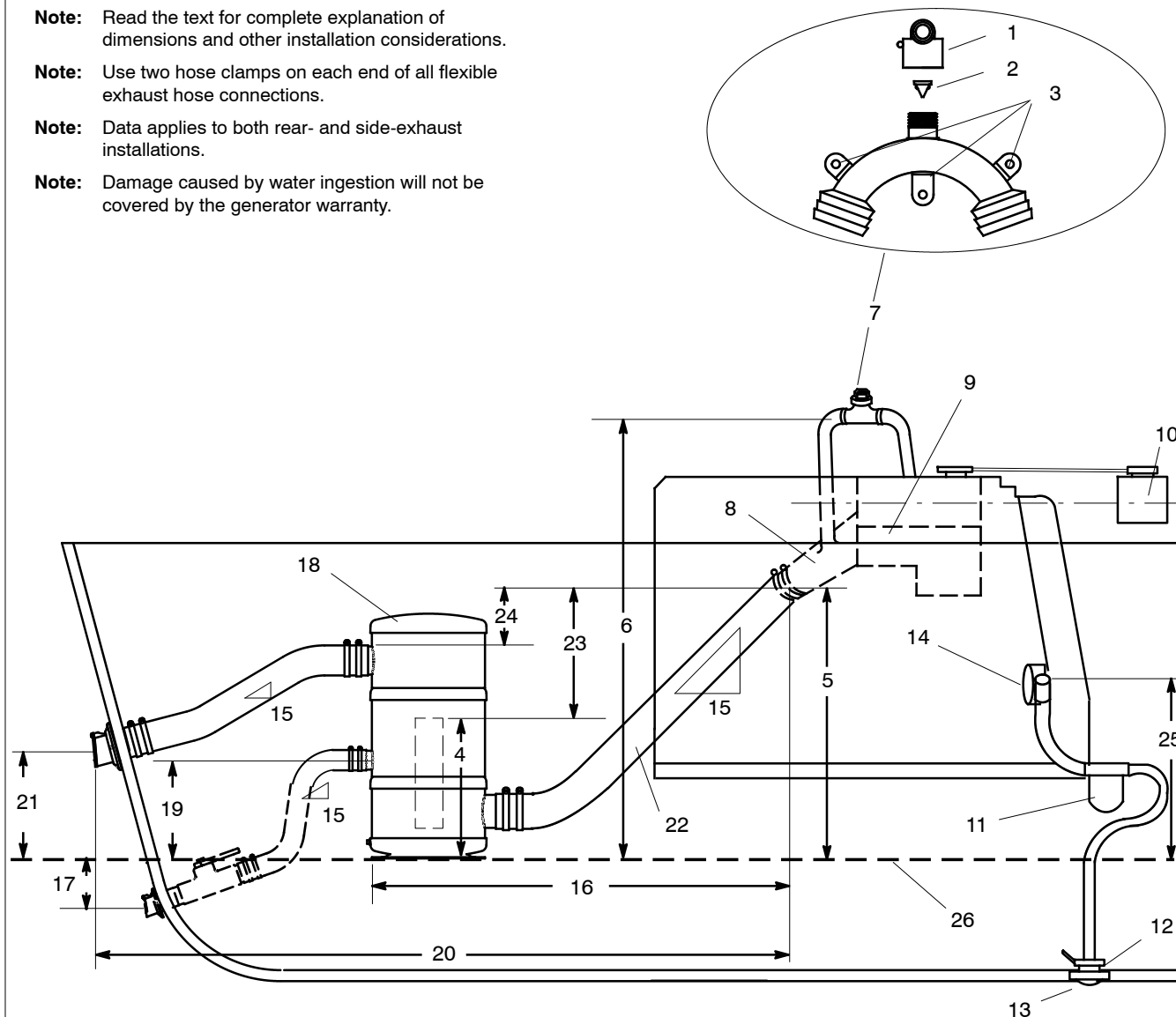
Figure 4-7 Typical Mid- and Below-Waterline Installation

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

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

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

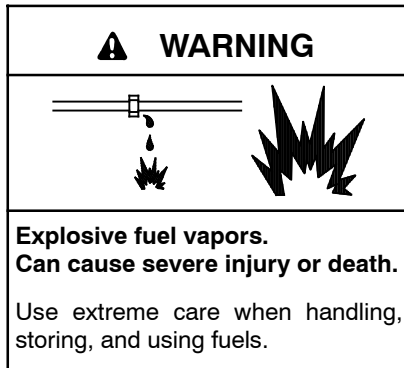
Note: Damage caused by water ingestion will not be covered by the generator warranty.



- | | |
|---|---|
| 1. Cap | 17. Water drain distance below waterline |
| 2. Reed valve | 18. Combination silencer that contains lift muffler and gas water separating sections in single component (customer-supplied) |
| 3. Mounting base | 19. Distance above waterline for drain outlet from silencer must be equal to or greater than water drain (item 17) to be greater than 30.5 cm (1 ft.) |
| 4. Maximum silencer internal vertical lift of 1.2 m (4 ft.) | 20. Exhaust outlet to be diameter appropriate so exhaust back pressure does not exceed limit at engine exhaust manifold |
| 5. Exhaust mixer elbow distance above waterline; if less than 23 cm (9 in.), a siphon break is required | 21. Minimum exhaust outlet distance above waterline of 10 cm (4 in.) |
| 6. Minimum siphon break distance above waterline of 30.5 cm (1 ft.) | 22. Exhaust hose |
| 7. Siphon break | 23. Height of internal lift tube to be below generator exhaust manifold |
| 8. Exhaust mixer | 24. Kohler recommends generator be located at elevation that exhaust mixer elbow is above silencer exhaust outlet |
| 9. Heat exchanger | 25. Seawater pump lift |
| 10. Coolant recovery bottle | 26. Waterline |
| 11. Seawater strainer | |
| 12. Seacock | |
| 13. Intake strainer | |
| 14. Engine-driven seawater pump | |
| 15. Minimum exhaust hose pitch of 1.3 cm per 30.5 cm (0.5 in. per ft.) | |
| 16. Maximum distance between silencer and exhaust mixer elbow of 3 m (10 ft.) | |

Figure 4-8 Exhaust System with Combination Silencer/Gas Water Separator

Notes



Note: 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.

Note: Fuel system installations must conform to USCG Regulations.

Note: 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.

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 dip tube, use a multiple dip tube arrangement. See Figure 5-1. The multiple dip tube arrangement incorporates a shorter dip tube for the generator set and a longer dip tube for the propulsion engine. With this arrangement, the generator set runs out of fuel before the propulsion engine during a low fuel supply situation. Equip the fuel system with a fuel/water separator to remove any accumulated dirt and water.

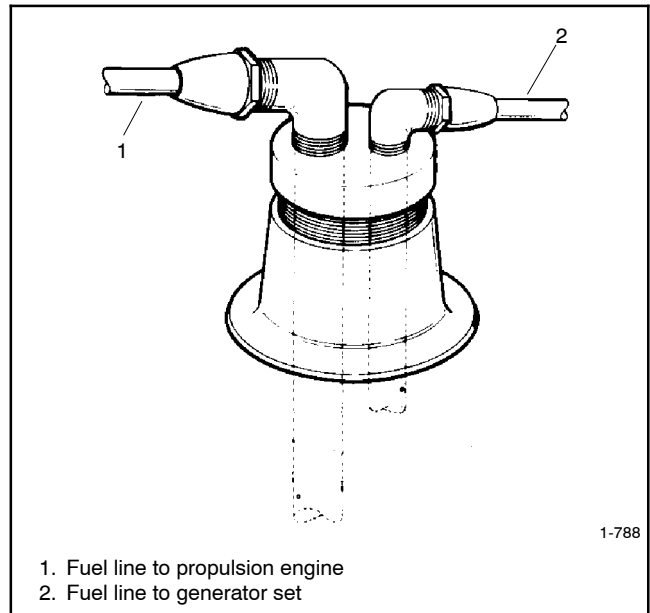


Figure 5-1 Multiple Dip Tube Arrangement

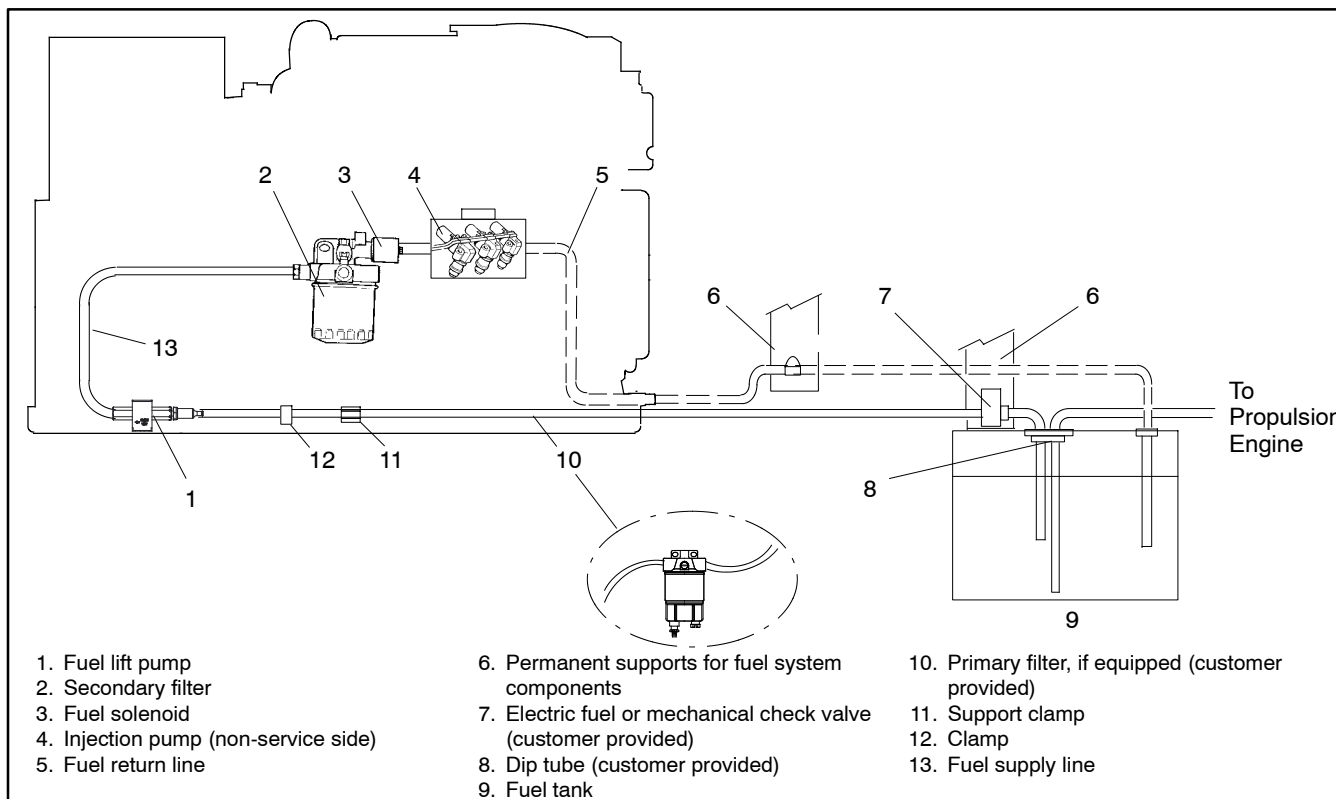


Figure 5-2 Fuel System, Typical

5.2 Fuel Lines

Return the generator set fuel return line to the fuel tank. Locate the fuel return line as far as practical from the fuel pickup to allow the tank fuel to cool the return fuel before delivery back to the fuel injectors. Incoming fuel cools the injectors to achieve maximum engine efficiency.

Note: Do not tee into the main propulsion engine's fuel line.

Note: Fuel Return Dip Tube (6EKOD/5EFKOD and 9-11EKOZD/7-9EFKOZD Models). Kohler Co. recommends utilizing a fuel return dip tube located below the fuel supply dip tube. This will prevent air from entering the return lines, draining the fuel injection pump, and thus causing starting failure or hard starting of the generator set. The dip tube depth should be at least as deep as the main engine fuel pick-up dip tube.

Under no circumstances should the propulsion engine and generator set share pickup or return lines (through a tee arrangement) that would allow the larger engine to starve fuel from the smaller engine. It is possible that the operation of either engine could completely drain the fuel line of the other engine and make starting difficult.

Use a flexible hose section to connect the metallic line from the fuel tank to the engine's fuel pump inlet connection point. Also, use a flexible hose section to connect the metallic line from the fuel tank to the fuel return connection point. The flexible section allows the generator set to vibrate during operation.

Models: 6EKOD/5EFKOD 9-11EKOZD/7-9EFKOZD	Fuel Line ID Size mm (in.)
Fuel Inlet	9.7 (3/8)
Fuel Return	6.4 (1/4) min.

Figure 5-3 Fuel Line ID Size

See Figure 5-3 for the ID size of the customer-supplied fuel line that connects to the fuel pump and fuel return. 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 route fuel lines above the generator set. Comply with USCG Regulation 46CFR182.20 regarding fuel lines and supports.

See Section 7 for fuel feed pump inlet connection and fuel return line connection.

5.3 Fuel Filters

Conform to USCG Regulations regarding inline fuel filters or strainers.

5.4 Fuel/Water Separator

For 6EKOD/5EFKOD and 9-11EKOZD/7-9EFKOZD models, install a fuel/water separator between the fuel tank and the electric fuel pump. The fuel/water separator must contain a primary filter of 30-50 micron filtration capability, sized for at least 15 gph to allow for the return fuel flow.

5.5 Fuel Pump Lift

See Figure 5-4 for fuel pump lift capabilities.

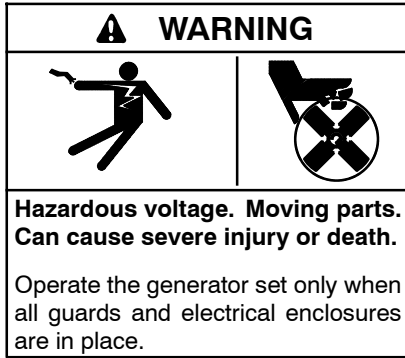
Model	Fuel Pump Lift m (ft.)
6EKOD/5EFKOD	1.2 (4)
9EKOZD/7EFKOZD	
11EKOZD/9EFKOZD (1 ph)	
11EKOZD/9EFKOZD (3 ph)	

Figure 5-4 Fuel Pump Lift

5.6 Fuel Consumption

Consult the current generator set specification sheets for generator set fuel consumption rates.

Notes



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 junction box. 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.

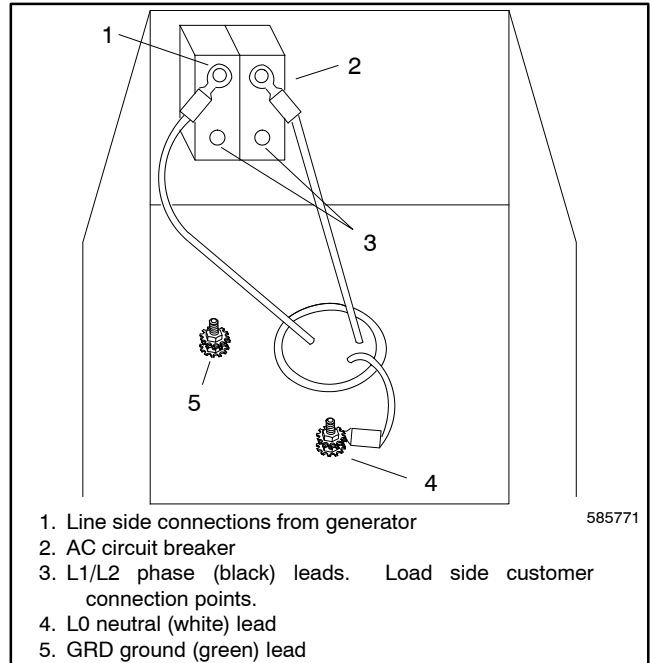


Figure 6-1 AC Voltage Connections in Junction Box

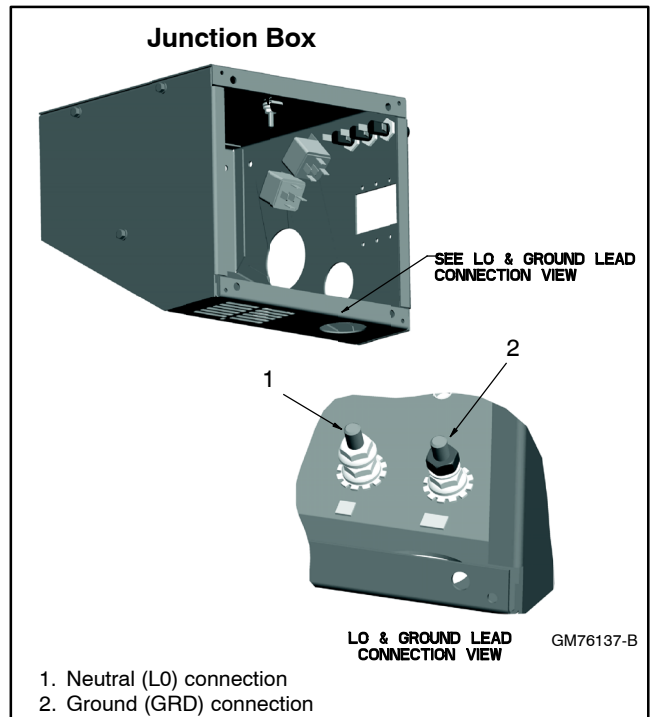


Figure 6-2 Neutral and Ground Connections

6.2 Circuit Protection

The AC circuit breakers (optional) protect the wiring from the AC circuit breakers to the vessel's distribution panel. AC circuit breakers trip when they detect a fault in the output circuit.

After correcting the fault, reset the AC circuit breaker(s) by placing them in the ON position. Restart the unit. Do not start the unit under load. See Figure 6-3 for AC circuit breaker ratings. The unit's voltage configuration determines the 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's junction box. See Section 6.2.2.

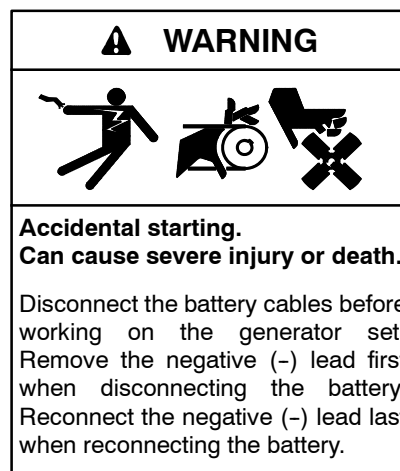
Sizing. Use the generator set voltage/frequency configuration to determine the circuit breaker amperage. If the generator set voltage configuration changes, change the circuit breaker to provide optimum protection.

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

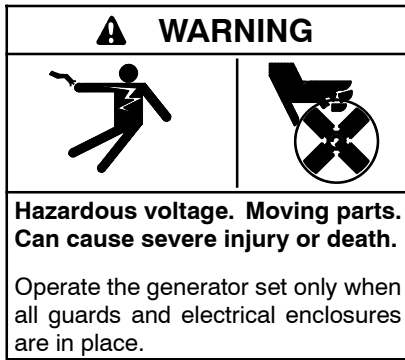
Have a qualified electrician or technician install circuit breakers and reconnect the generator set. Comply with all governing standards and codes.

Amps	Voltage	Number of Poles	Model(s)
18	480	3	9EFKOZD (3 ph.)
20	250	3	11EKOZD (3 ph.)
22	250	2	5EFKOD
23	480	3	11EKOZD (3 ph.)
25	250	2	6EKOD
27	250	1	5EFKOD
30	250	1	7EFKOZD
35	250	1	7EFKOZD
	250	2	7EFKOZD
	480	3	11EKOZD (3 ph.)
40	250	1	9EFKOZD (1 ph.)
	250	3	11EKOZD (3 ph.)
42	250	2	9EKOZD & 9EFKOZD (1 ph.)
50	250	2	11EKOZD (1 ph.)
	250	1	6EKOD
85	250	1	9EKOZD
100	250	1	11EKOZD (1 ph.)

Figure 6-3 AC Circuit Breaker Ratings, Listed By Amps



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) 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.



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

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.

6.2.2 Circuit Breaker Installation

1. Place the generator set master switch in the OFF position.
2. Disconnect the generator set engine starting battery, negative (-) lead first.
3. Remove the screws and remove the access cover.
4. Remove the screws and nuts to remove the circuit breaker cover plate. Save the mounting hardware.
5. Install the circuit breaker from the inside of the cutout panel and mount it using existing screws removed in step 4. Position the circuit breaker with the ON in the normal upright position or to the left side. Cover the cutout opening, if applicable, with the circuit breaker cover plate. Use existing screws to mount the cover plate. See Figure 6-4.
6. See Section 8 for voltage reconnection.

Note: Kohler® marine diesel generator sets are fully frequency adjustable and voltage reconnectable. To determine reconnection options, check the model's specification sheet.

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

Note: See Section 8 for wiring instructions.

8. Make the recommended connections for the following four 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 with Advanced Digital Control IId:

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.

9. Connect the stator lead(s) used for neutral connection to the L0 stud. See the illustrations in Section 8.
10. Connect the side of the circuit breaker marked LOAD to the ship-to-shore switch or craft wiring. Attach insulation boots to the 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: Follow USCG Regulations CFR33, Part 183 (Pleasurecraft) and CFR46 (Commercial Craft) for marine applications.

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

11. Replace the controller cover or circuit breaker box access panel.
12. Reconnect the generator set engine starting battery, negative (-) lead last.
13. Make voltage or frequency adjustments according to Section 8.

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). Refer to the model's specification sheet for reconnection capability.

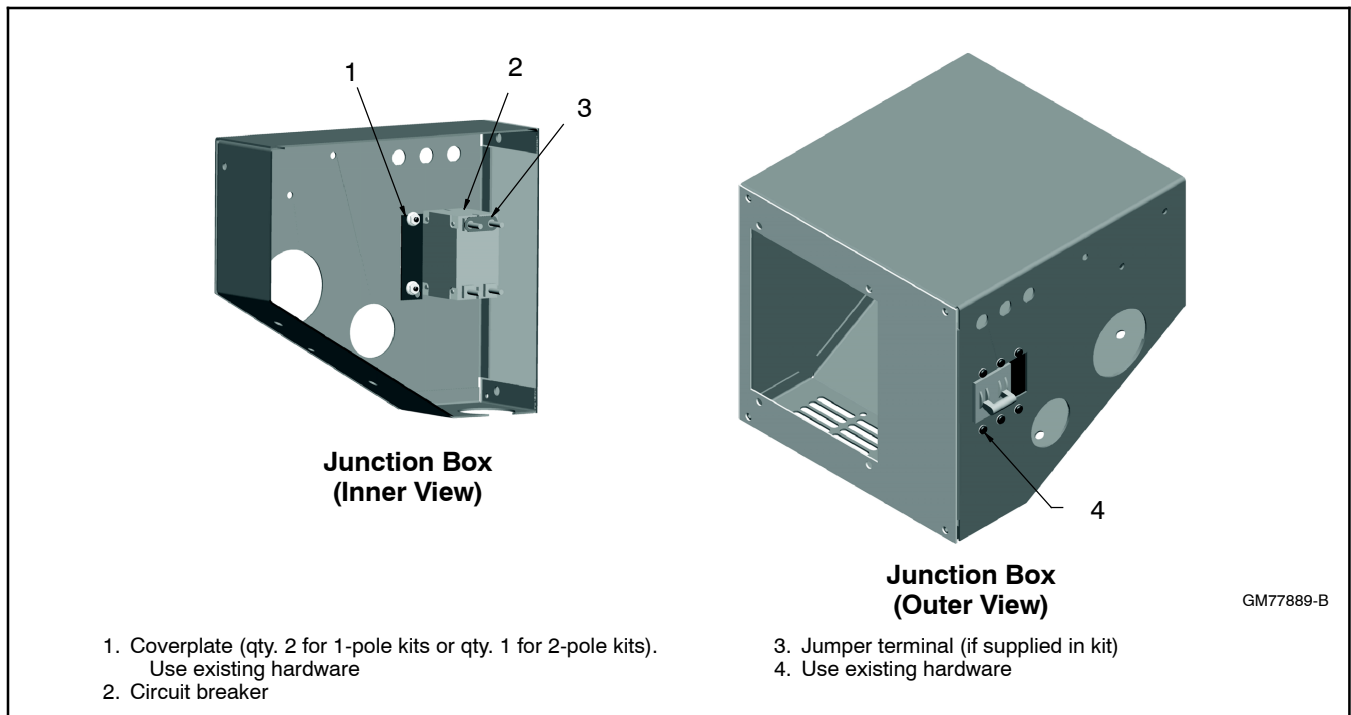


Figure 6-4 Circuit Breaker Mounting

6.3 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.

Note: Isolated ground kits are available as options for steel- or aluminum-hulled vessels. Consult your local dealer/distributor for more information.

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.

6.4 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

6.5 Battery

Batteries and their installation must conform to USCG Regulations 183.420 (a) through (g). Provide generator sets with batteries separate from the propulsion engine's 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 6-5 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 for locations of the battery connections to the generator set.

	Required Battery Cable (Minimum)			
	2.5 m (8.3 ft.)		5 m (16.4 ft.)	
Battery Voltage	12V	24V	12V	24V
6EKOD/5EFKOD 9EKOZD/7EFKOZD	# 2	----	# 1	----
11EKOZD/9EFKOZD (1 and 3 Phase)	# 2	# 4	# 1/0	# 2

Figure 6-5 Battery Cable Sizing Recommendations

Kohler Co. recommends using one 12-volt battery (or two for 24-volt systems, as the spec requires) to start the generator. See Figure 6-6 for minimum cold cranking amps (CCA) recommendations.

12-Volt Starting Battery Size CCA at -18°C (0°F) or 100 Amp. Hr.	
Models	CCA
6EKOD/5EFKOD	650
9EKOZD/7EFKOZD	
11EKOZD9EFKOZD (1 Phase)	
11EKOZD9EFKOZD (3 Phase)	

Figure 6-6 Battery Recommendations

6.6 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 over-current 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.

6.7 Remote Connection

Kohler Co. offers several remote panels for connection to the generator set. Contact your local Kohler® distributor/dealer for detailed descriptions. See 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 wiring diagrams, ADVs, and instruction sheets for connection information/details.

These models use a 12-pin connector for the remote interface connection. For the connector’s location, see Figure 6-7 (non sound shielded unit) or Figure 6-8 (sound shielded unit). 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

Note: Gauge senders. Gauge senders are available for most generator sets. If using customer-supplied gauges, be sure they are compatible with generator set senders. Contact an authorized Kohler® service distributor/dealer. Gauges and senders are available as service items from an authorized Kohler® service distributor/dealer.

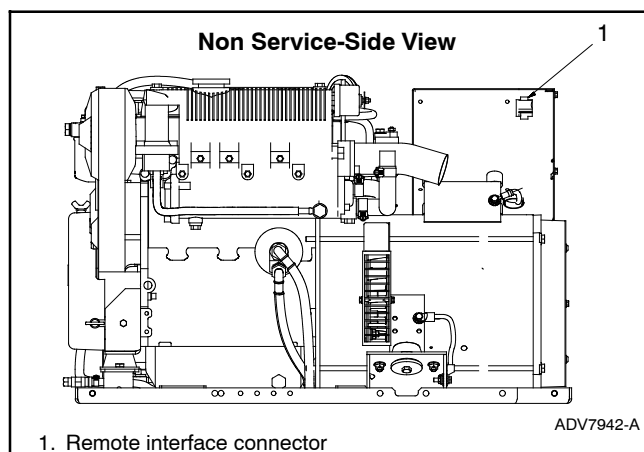


Figure 6-7 Remote Customer Interface Connector, (Shown on a Non-Sound Shielded Unit)

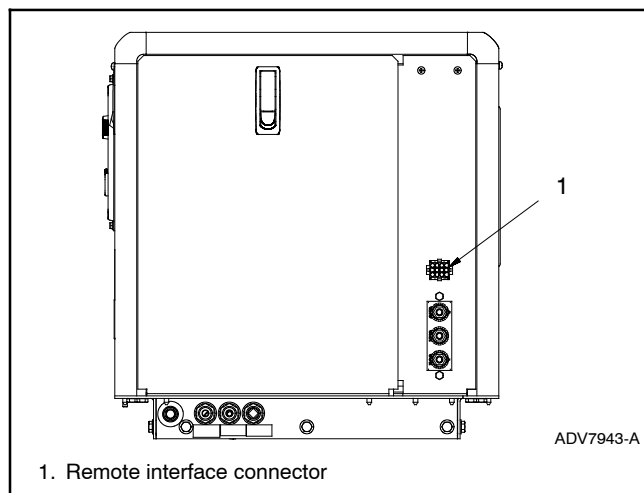


Figure 6-8 Remote Customer Interface Connector, (Shown on a Sound Shielded Unit)

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 specifications. Installation drawings show exhaust outlet locations, fuel inlet and return connections, siphon break locations, and battery connections. See Figure 7-1 for installation drawing identification.

Model No.	Drawing	Page
6EKOD and 5EFKOD (1 phase)	ADV-7941A-C	38
	ADV-7941B-C	39
	with sound shield	42
	with keel cooling	43
9EKOZD and 7EFKOZD (1 phase)	ADV-7942A-C	40
	ADV-7942B-C	41
	with sound shield	42
	with keel cooling	43
11EKOZD and 9EFKOZD (1 and 3 phase)	ADV-7942A-C	40
	ADV-7942B-C	41
	with sound shield	42
	with keel cooling	43

Figure 7-1 Installation Drawings

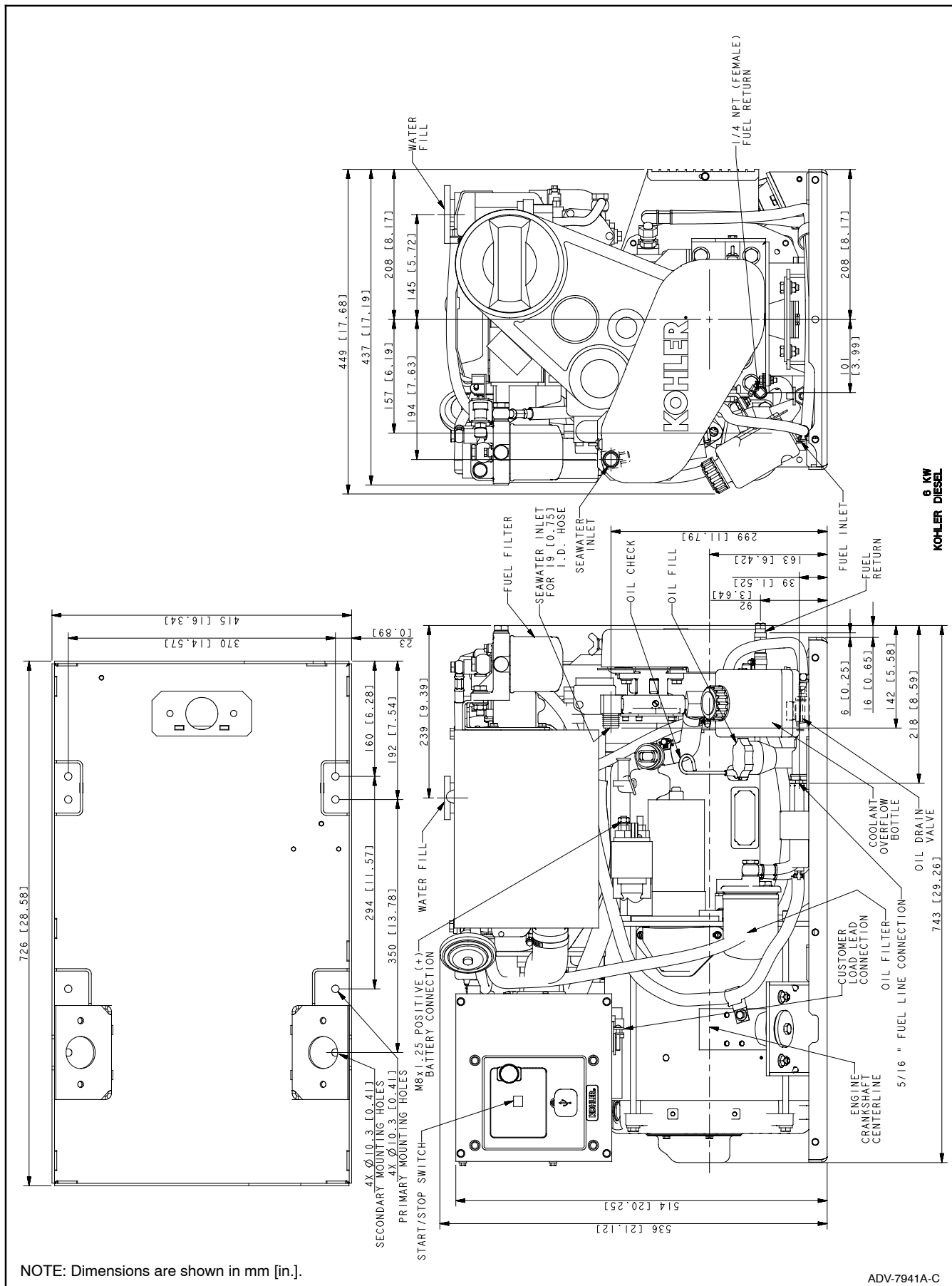


Figure 7-2 Dimension Drawing, 6EKOD and 5EFKOD (Sheet 1 of 2)

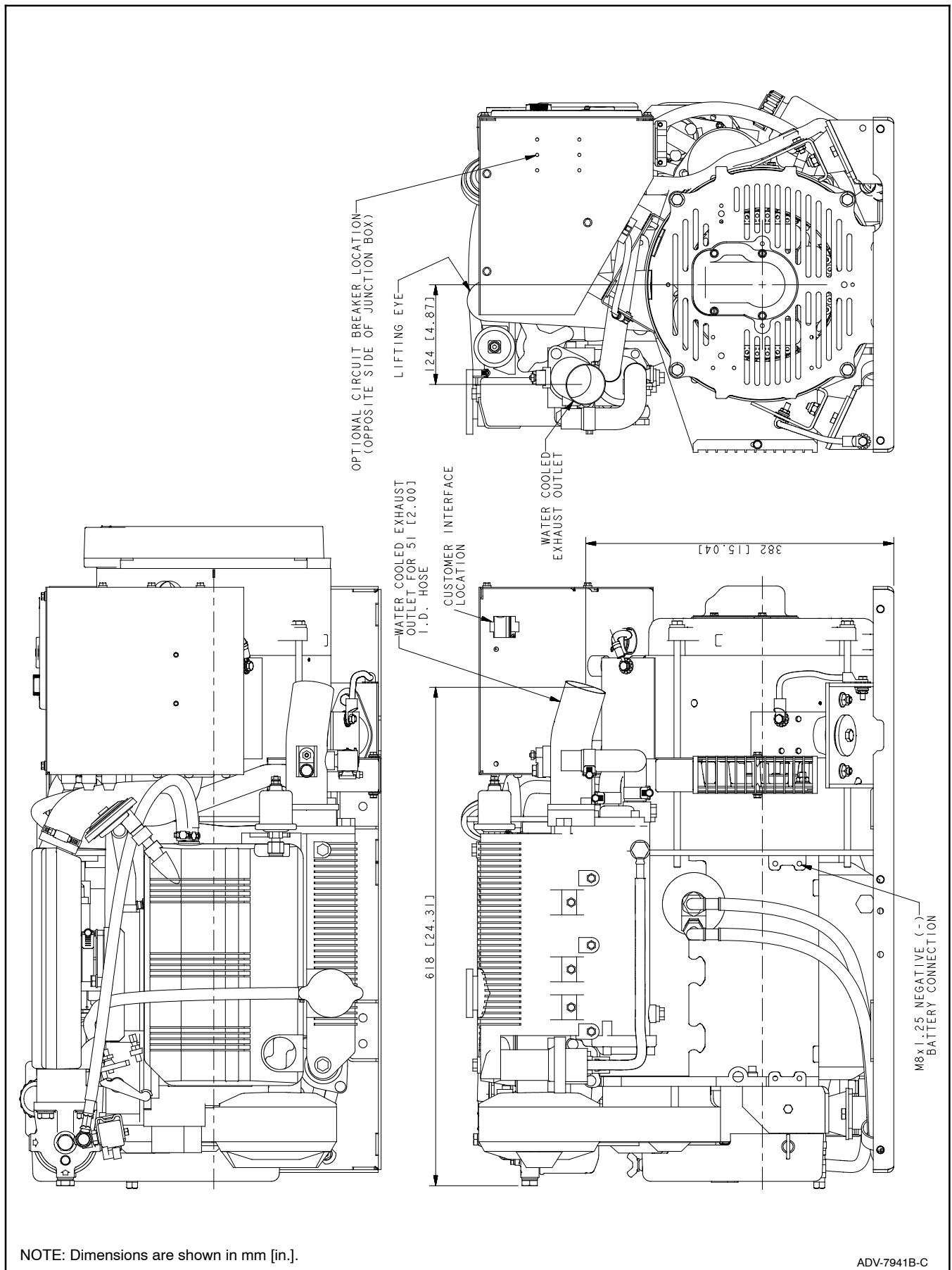


Figure 7-3 Dimension Drawing, 6EKOD and 5EFKOD (Sheet 2 of 2)

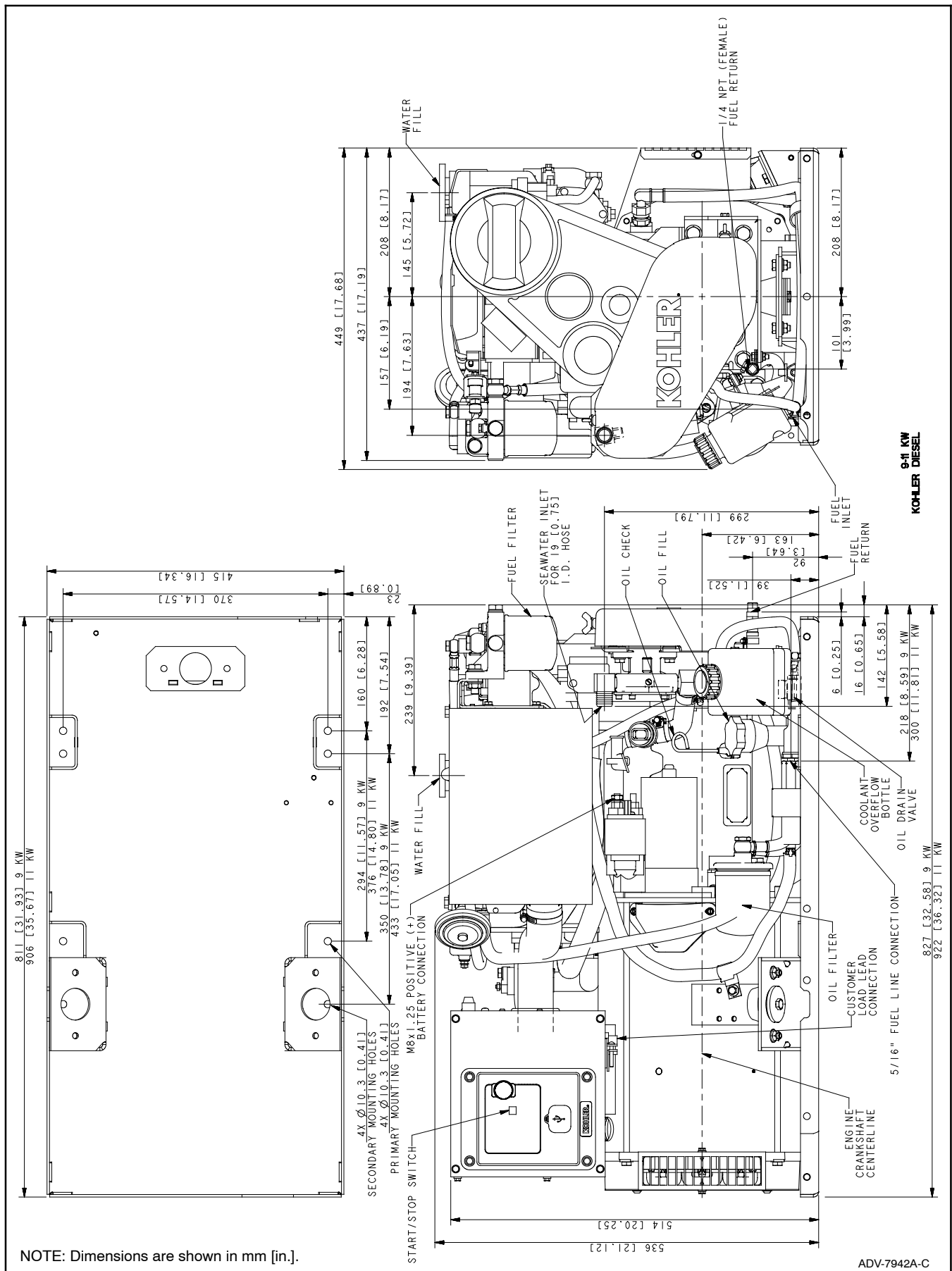


Figure 7-4 Dimension Drawing, 9-11EKOZD and 7-9EFKOZD (Sheet 1 of 2)

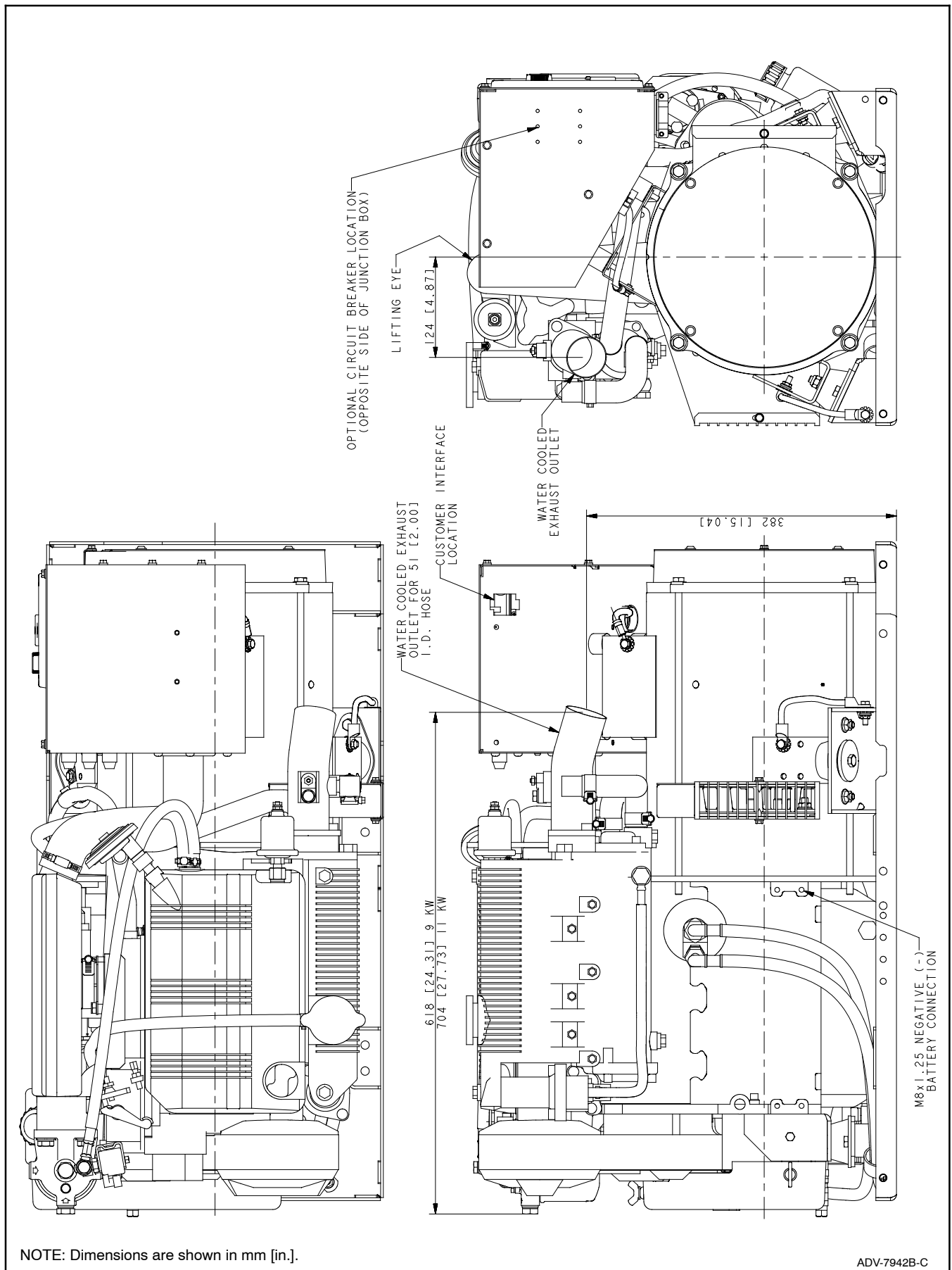


Figure 7-5 Dimension Drawing, 9-11EKOZD and 7-9EFKOZD (Sheet 2 of 2)

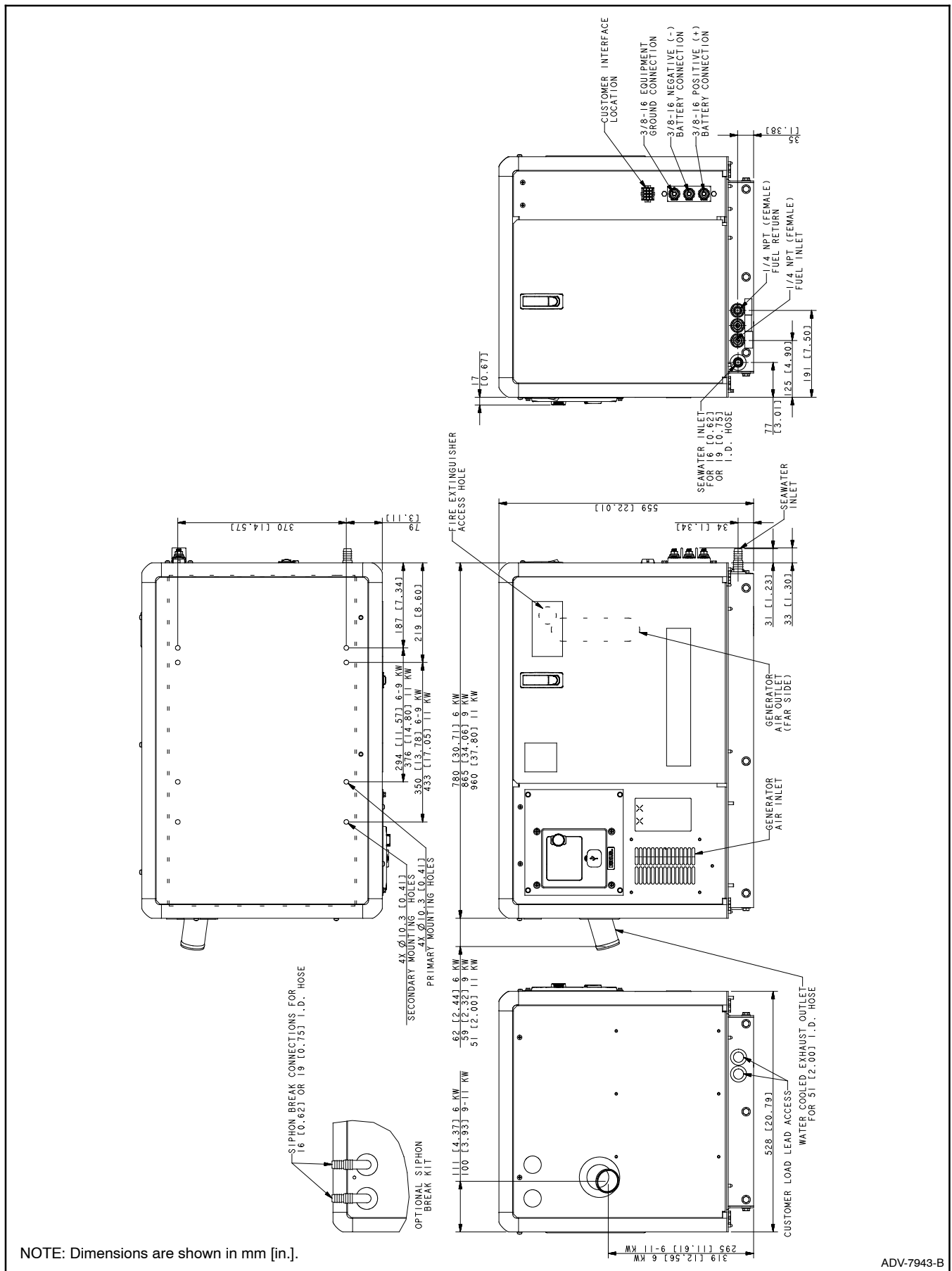
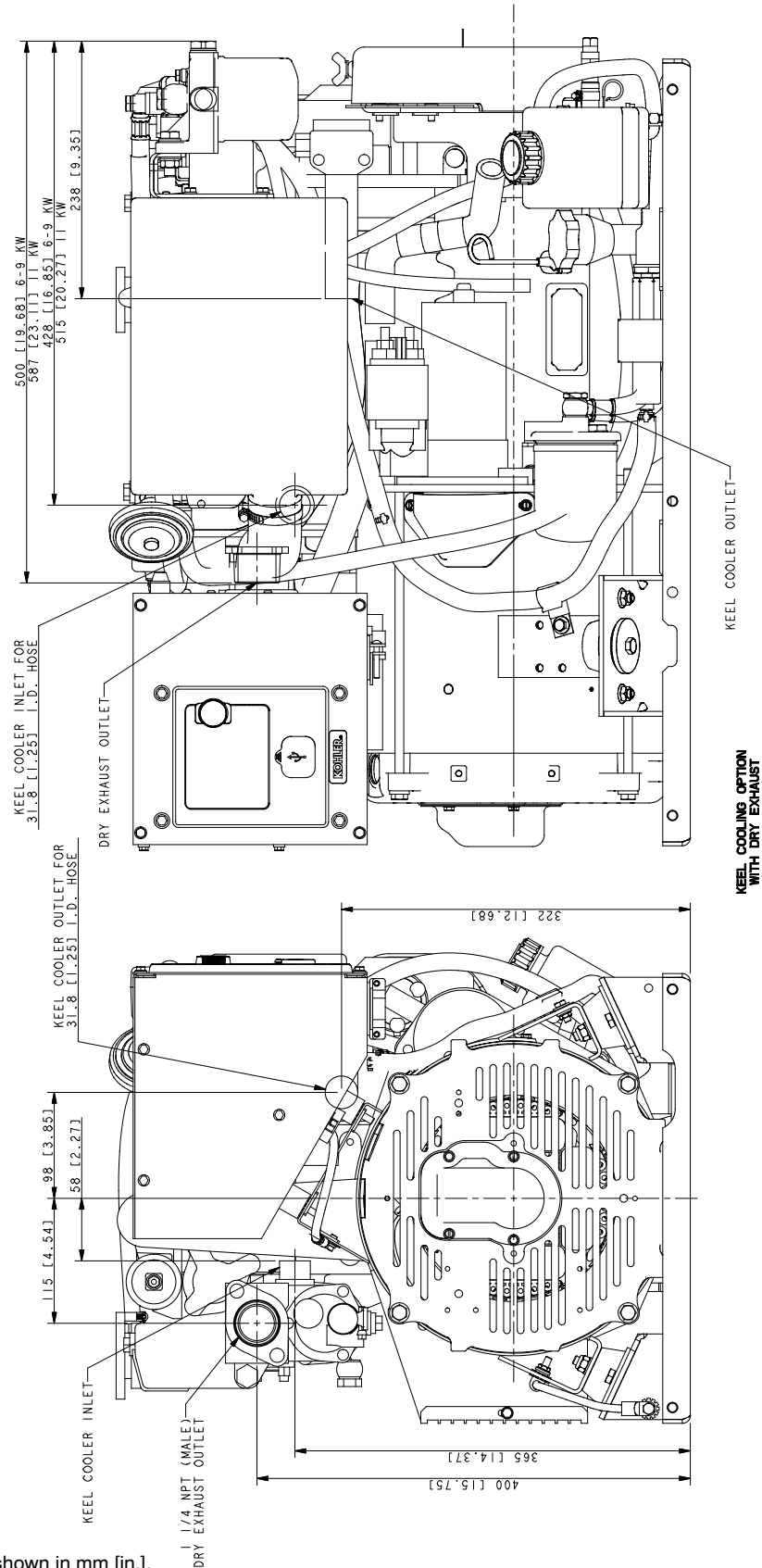


Figure 7-6 Dimension Drawing, 6EKOD/5EFKOD, 9-11EKOZD, and 7-9EFKOZD with Sound Shield



NOTE: Dimensions are shown in mm [in.].

ADV-7944-C

Figure 7-7 Dimension Drawing, 6EKOD/5EFKOD, 9-11EKOZD, and 7-9EFKOZD with Keel Cooling Option with Dry Exhaust

Notes

8.1 Voltage Reconnection

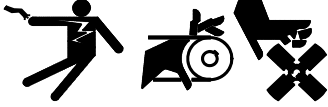
Use the following voltage reconnection procedure to change the voltage of 4- and 12-lead generator sets. Frequency changes require voltage regulator *and* governor adjustments.

Refer to the following procedure and the connection schematics. Follow the safety precautions at the front of this manual and in the procedure text and observe National Electrical Code (NEC) guidelines.

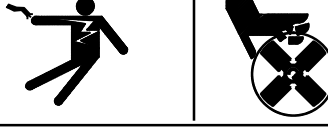
NOTICE

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.

Note: Equipment damage. Verify that the voltage ratings of the transfer switch, line circuit breakers, and other accessories match the selected line voltage.

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

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.

Voltage Reconnection Procedure

1. Stop the generator set.
2. Turn the controller pushbutton/rotary selector dial until it stops at the Volt Select menu. See Figure 8-1.

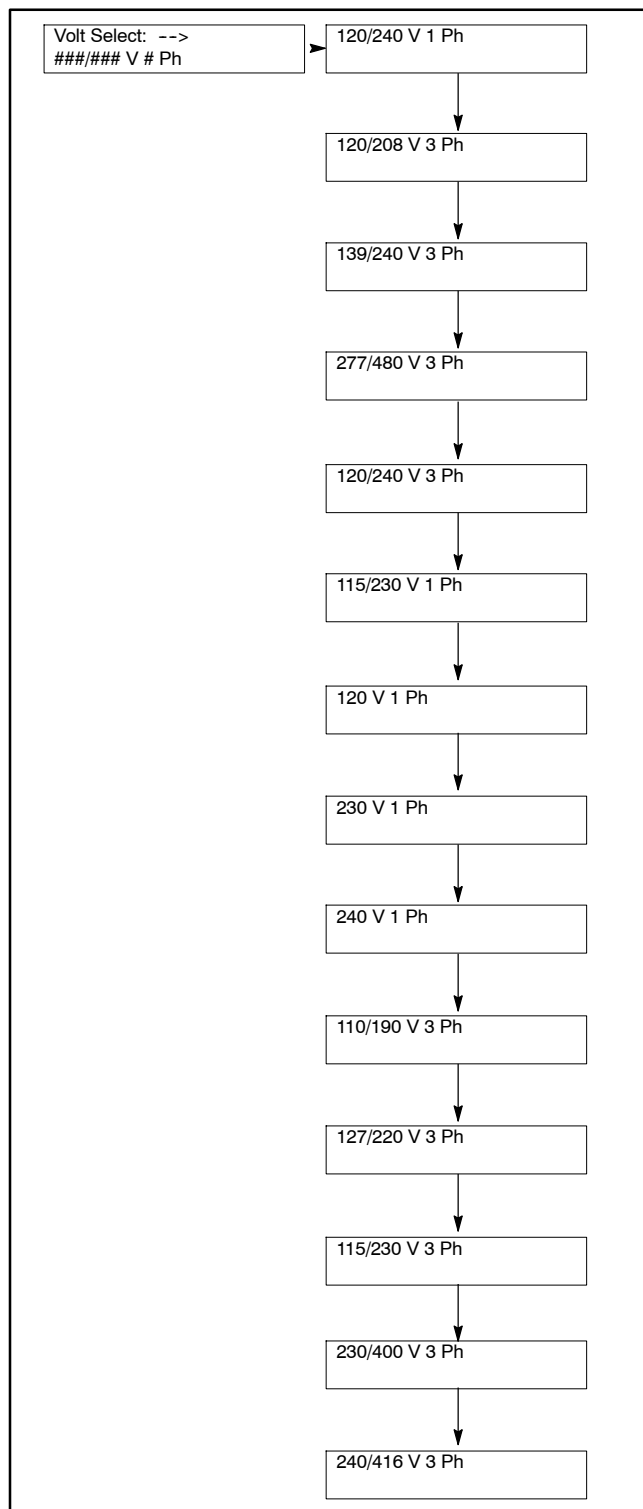


Figure 8-1 Volt Select Menu

3. Press the selector dial and the voltage selection option (second line on the display) will start to flash.
4. Turn the selector dial clockwise or counterclockwise until the desired voltage selection option appears.
5. Press the selector dial. The second line on the display will stop flashing and the new voltage will appear.
6. Disconnect the generator set engine starting battery, negative (-) lead first. Disconnect power to the battery charger (if equipped).
7. Use Figure 8-2, Figure 8-3, Figure 8-4, Figure 8-5, or Figure 8-8 to determine the generator set voltage configuration. Note the original voltage and reconnect as needed.
8. Reconnect the battery, negative lead last.
9. Start the generator set. Check the digital display for correct voltages using the section on Generator Metering included in the Operation Manual.
10. Stop the generator set after completing the voltage adjustments.

8.2 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.

8.2.1 100-120-Volt Configurations

If the installation requires a factory two-pole circuit breaker, do not connect the load-side terminals of the circuit breaker together; see Figure 8-2. If the installation requires a 100-120-volt, 2-wire system, use a single-pole circuit breaker. See Figure 8-3. 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.

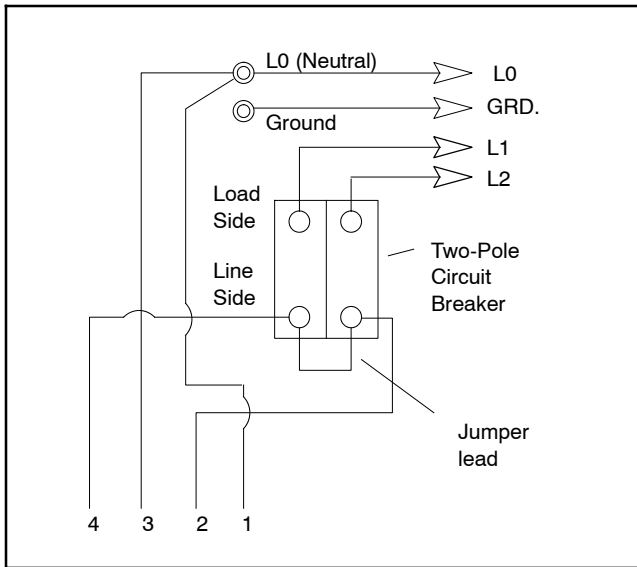


Figure 8-2 100-120-Volt, 3-Wire Configuration

8.2.2 100-120/200-240-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 8-2 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 together. Leads L1 and L2 are for different phases; *never* connect them together.

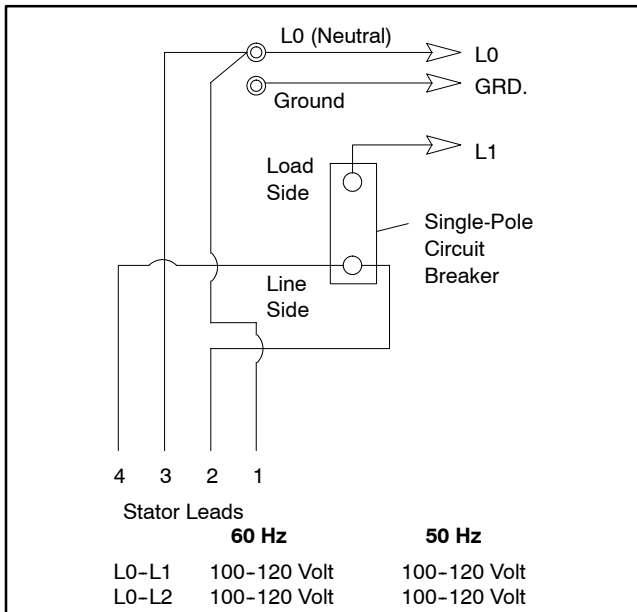


Figure 8-3 100-120-Volt, 2-Wire Configuration

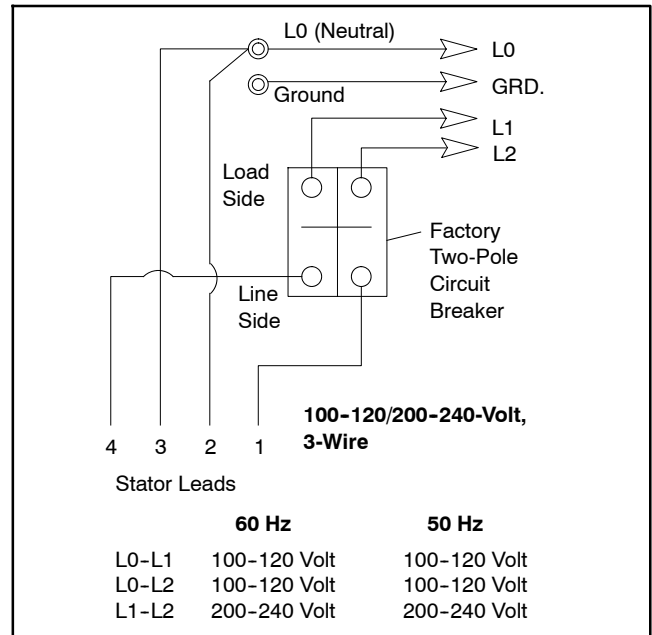


Figure 8-4 100-120/200-240-Volt, 3-Wire Configuration

8.2.3 200-240-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 8-2 for location). See Figure 8-5 for EOZD/EFOZD models equipped with the ADC 2100.

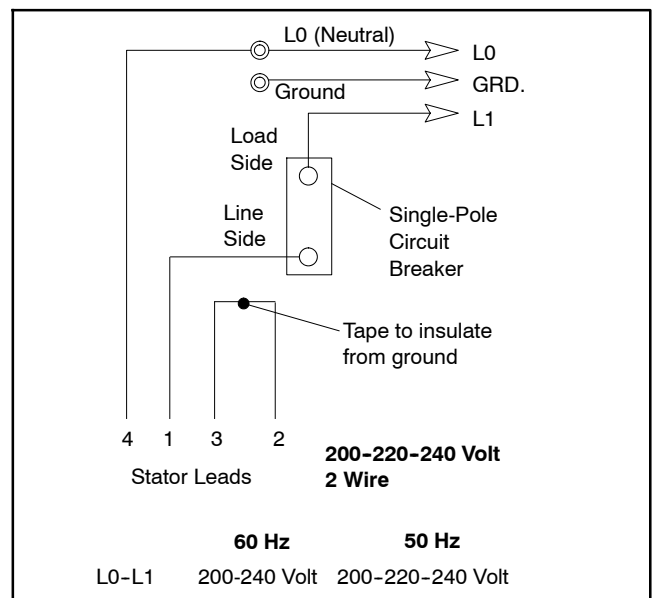


Figure 8-5 200-220-240-Volt, 2-Wire Configuration for *Models with ADC II*

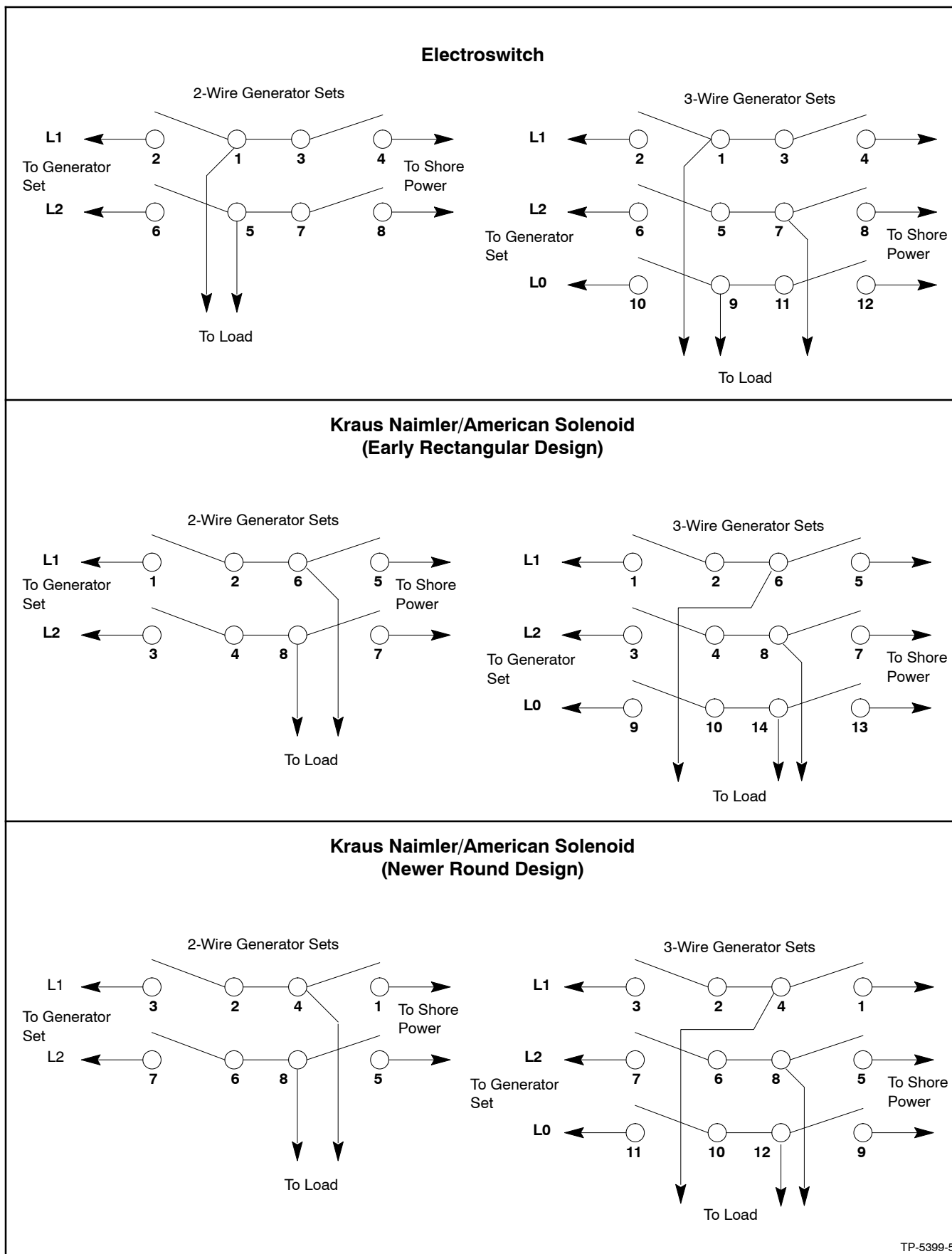


Figure 8-6 Marine Manual (Ship-to-Shore) Transfer Switch

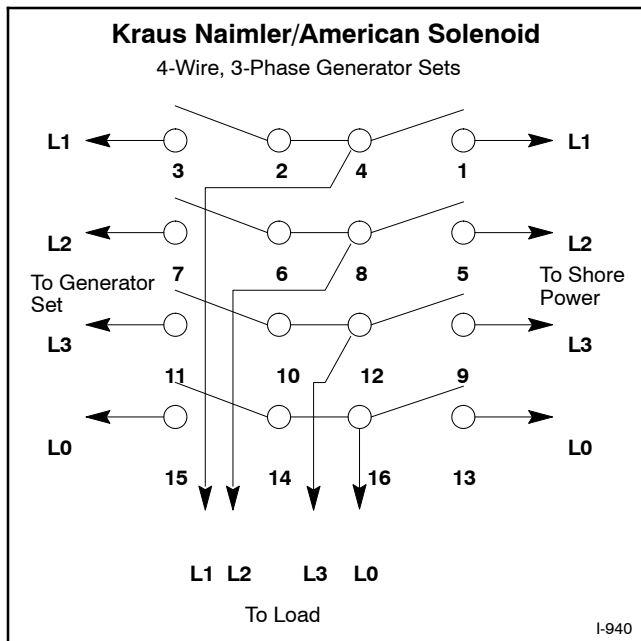


Figure 8-7 Marine Manual (Ship-to-Shore) Transfer Switch, continued

8.3 Twelve-Lead Reconnection

The reconnection procedure details voltage reconnections only. If the generator set requires frequency changes, adjust the governor and voltage regulator. See the generator set service manual for information regarding frequency adjustment.

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

Reconnect the stator leads of the generator set to change output phase or voltage. Refer to the following procedure and connection schematics. Follow all safety precautions at the front of this manual and in the text during the reconnection procedure.

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.

Twelve-Lead Reconnection Procedure

1. Place the generator master switch in the OFF position.
2. Disconnect generator set engine starting battery, negative (-) lead first.
3. Disconnect power to battery charger, if equipped.
4. Use Figure 8-8 to determine the generator set voltage configuration. Note the original voltage and reconnect the generator set as needed.

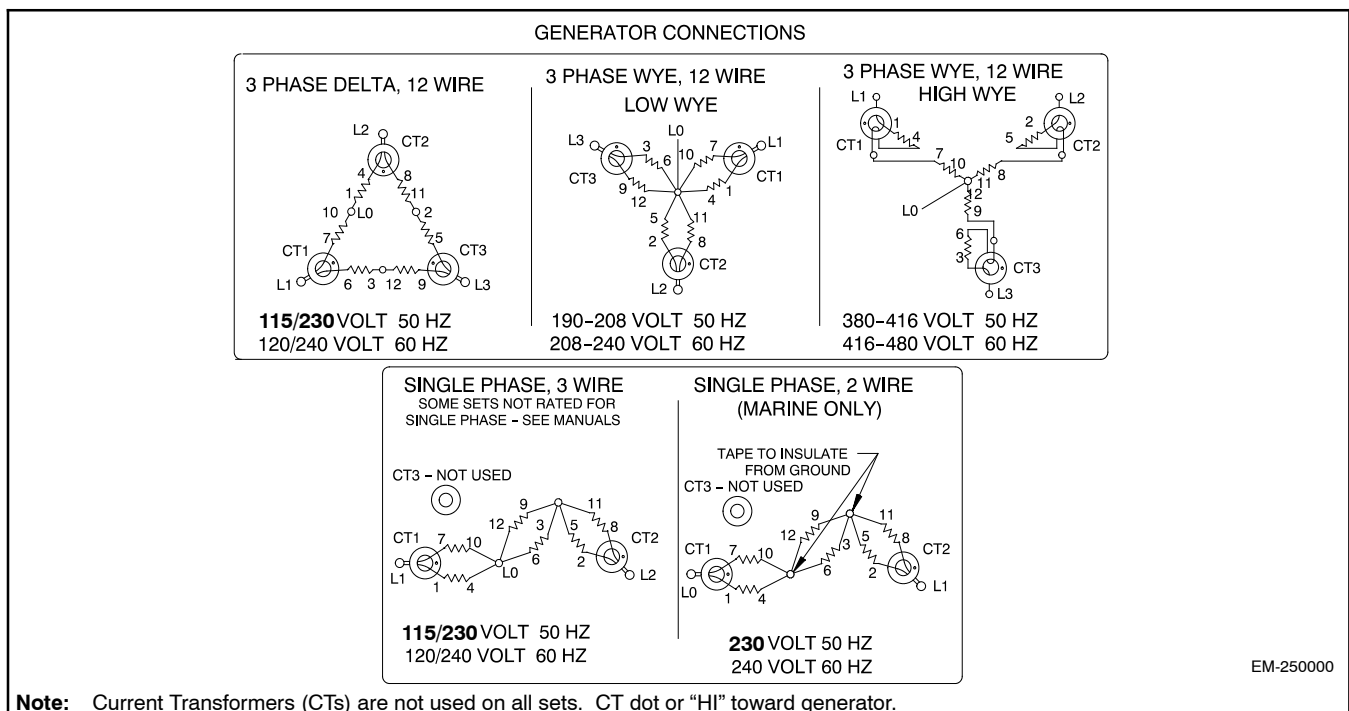


Figure 8-8 Generator Reconnection

Notes

Appendix A Generator Selection and 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.

Motors

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 2-3 times higher than that required when the motor reaches normal operating speed. Allow reserve for inrush demands plus other loads which 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

Lighting

To calculate 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. Make sure the calculated total wattage includes only lights actually on the generator set AC circuit.

Air Conditioners

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

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 use of easy-starting devices on air conditioner units whenever simultaneously starting more than one motor.

See Figure 2 for typical air conditioner requirements. Information will vary with manufacturer.

Appliances

Generator sets often furnish AC for appliances such as TV, stereo, electric water heater, etc. With the exception of the 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.

Air Conditioner Size (Btu/Hr.)									
	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 B Abbreviations

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

A, amp	ampere	CG	center of gravity	fglass.	fiberglass
ABDC	after bottom dead center	CID	cubic inch displacement	FHM	flat head machine (screw)
AC	alternating current	CL	centerline	fl. oz.	fluid ounce
A/D	analog to digital	cm	centimeter	flex.	flexible
ADC	analog to digital converter	CMOS	complementary metal oxide substrate (semiconductor)	freq.	frequency
adj.	adjust, adjustment	cogen.	cogeneration	FS	full scale
ADV	advertising dimensional drawing	Com	communications (port)	ft.	foot, feet
AHWT	anticipatory high water temperature	conn.	connection	ft. lbs.	foot pounds (torque)
AISI	American Iron and Steel Institute	cont.	continued	ft./min.	feet per minute
ALOP	anticipatory low oil pressure	CPVC	chlorinated polyvinyl chloride	g	gram
alt.	alternator	crit.	critical	ga.	gauge (meters, wire size)
Al	aluminum	CRT	cathode ray tube	gal.	gallon
ANSI	American National Standards Institute (formerly American Standards Association, ASA)	CSA	Canadian Standards Association	gen.	generator
AO	anticipatory only	CT	current transformer	genset	generator set
API	American Petroleum Institute	Cu	copper	GFI	ground fault interrupter
approx.	approximate, approximately	cu. in.	cubic inch	GND, 	ground
AR	as required, as requested	cw.	clockwise	gov.	governor
AS	as supplied, as stated, as suggested	CWC	city water-cooled	gph	gallons per hour
ASE	American Society of Engineers	cyl.	cylinder	gpm	gallons per minute
ASME	American Society of Mechanical Engineers	D/A	digital to analog	gr.	grade, gross
assy.	assembly	DAC	digital to analog converter	GRD	equipment ground
ASTM	American Society for Testing Materials	dB	decibel	gr. wt.	gross weight
ATDC	after top dead center	dBA	decibel (A weighted)	H x W x D	height by width by depth
ATS	automatic transfer switch	DC	direct current	HC	hex cap
auto.	automatic	DCR	direct current resistance	HCHT	high cylinder head temperature
aux.	auxiliary	deg., °	degree	HD	heavy duty
A/V	audiovisual	dept.	department	HET	high exhaust temperature
avg.	average	dia.	diameter	hex	hexagon
AVR	automatic voltage regulator	DI/EO	dual inlet/end outlet	Hg	mercury (element)
AWG	American Wire Gauge	DIN	Deutsches Institut für Normung e. V. (also Deutsche Industrie Normenausschuss)	HH	hex head
AWM	appliance wiring material	DIP	dual inline package	HHC	hex head cap
bat.	battery	DPDT	double-pole, double-throw	HP	horsepower
BBDC	before bottom dead center	DPST	double-pole, single-throw	hr.	hour
BC	battery charger, battery charging	DS	disconnect switch	HS	heat shrink
BCA	battery charging alternator	DVR	digital voltage regulator	hsg.	housing
BCI	Battery Council International	E, emer.	emergency (power source)	HVAC	heating, ventilation, and air conditioning
BDC	before dead center	EDI	electronic data interchange	HWT	high water temperature
BHP	brake horsepower	EFR	emergency frequency relay	Hz	hertz (cycles per second)
blk.	black (paint color), block (engine)	e.g.	for example (<i>exempli gratia</i>)	IC	integrated circuit
blk. htr.	block heater	EG	electronic governor	ID	inside diameter, identification
BMEP	brake mean effective pressure	EGSA	Electrical Generating Systems Association	IEC	International Electrotechnical Commission
bps	bits per second	EIA	Electronic Industries Association	IEEE	Institute of Electrical and Electronics Engineers
br.	brass	EI/EO	end inlet/end outlet	IMS	improved motor starting
BTDC	before top dead center	EMI	electromagnetic interference	in.	inch
Btu	British thermal unit	emiss.	emission	in. H ₂ O	inches of water
Btu/min.	British thermal units per minute	eng.	engine	in. Hg	inches of mercury
C	Celsius, centigrade	EPA	Environmental Protection Agency	in. lbs.	inch pounds
cal.	calorie	EPS	emergency power system	Inc.	incorporated
CARB	California Air Resources Board	ER	emergency relay	ind.	industrial
CB	circuit breaker	ES	engineering special, engineered special	int.	internal
cc	cubic centimeter	ESD	electrostatic discharge	int./ext.	internal/external
CCA	cold cranking amps	est.	estimated	I/O	input/output
ccw.	counterclockwise	E-Stop	emergency stop	IP	iron pipe
CEC	Canadian Electrical Code	etc.	et cetera (and so forth)	ISO	International Organization for Standardization
cfh	cubic feet per hour	exh.	exhaust	J	joule
cfm	cubic feet per minute	ext.	external	JIS	Japanese Industry Standard
		F	Fahrenheit, female	k	kilo (1000)
				K	kelvin
				kA	kiloampere
				KB	kilobyte (2 ¹⁰ bytes)

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

Appendix C Generator Set Output Ratings Procedure

Kohler Co. develops the kilowatt output rating of a Kohler® marine generator set based upon the calculations specified in ISO 3046 and ISO 8528-1. The calculations *correct* for environmental variables encountered in a

generator set installation. Figure 1 outlines the calculations. Figure 2 contains examples of how heat variables affect generator set ratings.

<i>Generator Output_{corrected} = Generator Output_{observed} x Correction Factor</i>	
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 compression-ignition engines (power limited by excess air): C.F. = $[1.175 (29.2 / \text{Dry Barometer in. Hg})^1 (\text{Temperature } ^\circ\text{F} + 460/537)^{-.75} - .175]$ x Alternator Efficiency _{Reference} / Alternator Efficiency _{Observed}
2.	For turbocharged compression ignition engines: C.F. = $[1.175 (29.2 / \text{Barometer}_{\text{Observed}} \text{ in. Hg})^{-.7} (\text{Temperature } ^\circ\text{F} + 460/537)^2 - .175]$ x Alternator Efficiency _{Reference} / Alternator Efficiency _{Observed}
3.	For turbocharged and intercooled compression ignition engines: C.F. = $[1.175 (29.2 / \text{Barometer}_{\text{Observed}} \text{ in. Hg})^{-.7} (\text{Temperature } ^\circ\text{F} + 460/537)^{1.2} - .175]$ 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 1 Generator Output

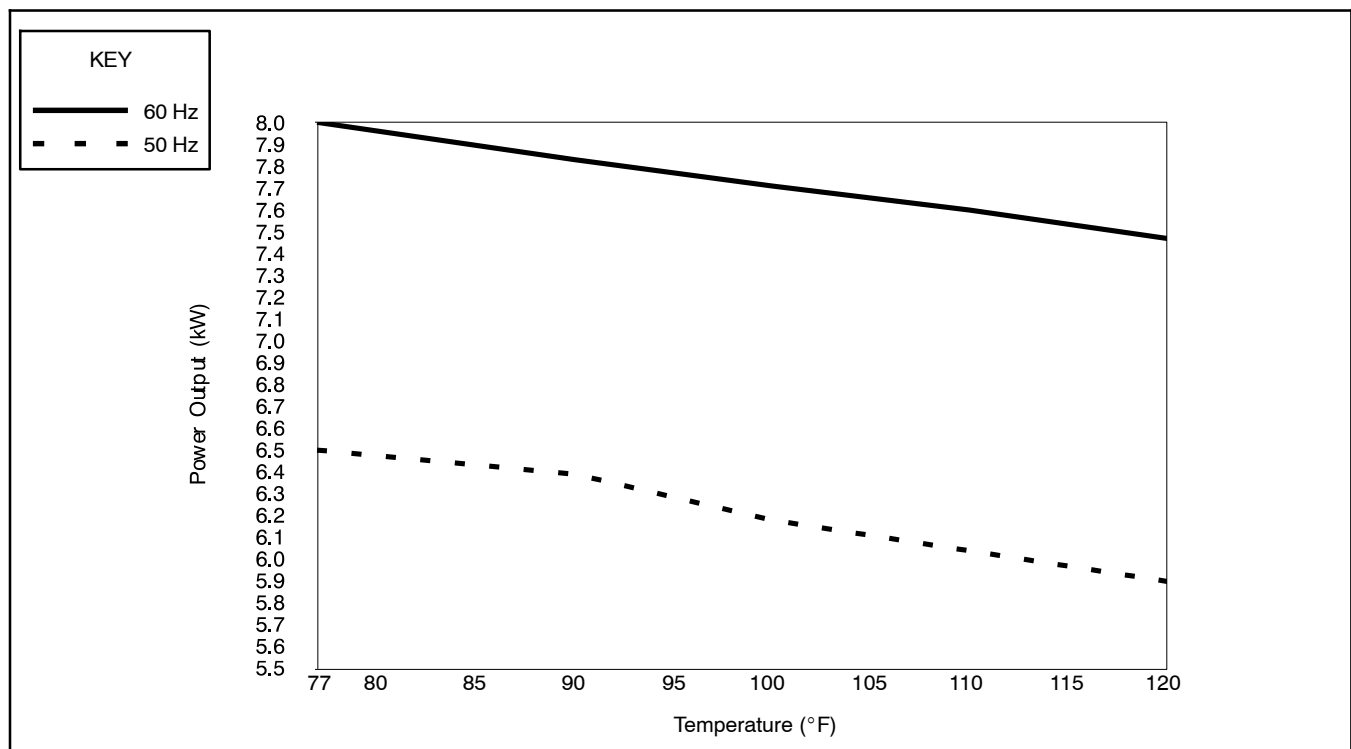


Figure 2 Example: 6.5EFOZ/8EOZ kW Derates (ISO 3046/ISO 8258-1)

TP-6773 8/17c

Original Instructions (English)

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