



# Installation Manual

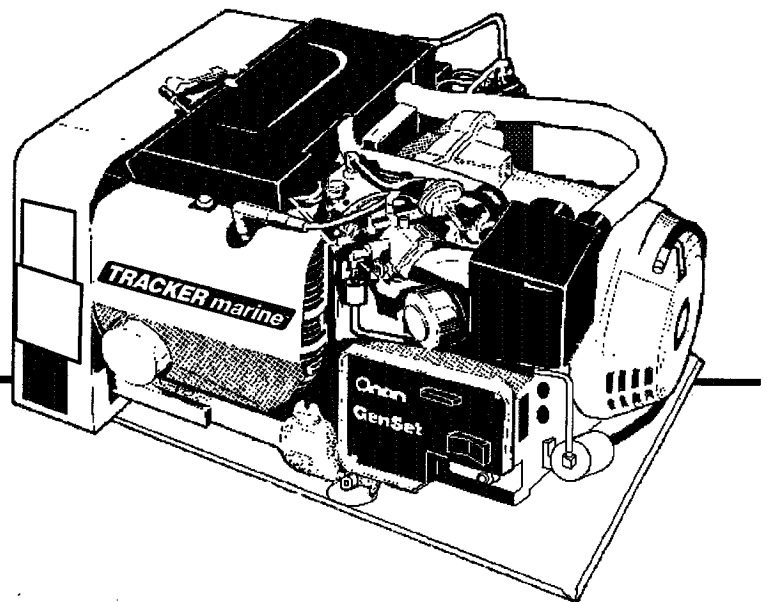
for

***TRACKER marine™***

**GenSets**

**Electric Generating Sets**

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965-0626

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# Safety Precautions

Before operating the generator set, read the Operator's Manual and become familiar with it and the equipment. **Safe and efficient operation can be achieved only if the unit is properly operated and maintained.** Many accidents are caused by failure to follow fundamental rules and precautions.

The following symbols, found throughout this manual, alert you to potentially dangerous conditions to the operator, service personnel, or the equipment.

**⚠ DANGER** *This symbol warns of immediate hazards which will result in severe personal injury or death.*

**⚠ WARNING** *This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.*

**⚠ CAUTION** *This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.*

**FUEL AND FUMES ARE FLAMMABLE.** Fire, explosion, and personal injury can result from improper practices.

- DO NOT fill fuel tanks while engine is running. Fuel contact with hot engine or exhaust is a potential fire hazard.
- DO NOT SMOKE OR USE AN OPEN FLAME near the generator set or fuel tank.
- Fuel lines must be adequately secured and free of leaks. Fuel connection at the engine should be made with an approved flexible, non-conductive line. Do not use copper piping on flexible lines as copper will work harden and become brittle.
- Be sure all fuel supplies have a positive shutoff valve.

**GASOLINE MAY BE ACCIDENTALLY IGNITED BY ELECTRICAL SPARKS, presenting the hazard of fire or explosion, which can result in severe personal injury or death. When installing the generator set:**

- Do not tie electrical wiring to fuel lines.
- Do not run electrical lines and fuel lines through the same compartment openings.
- Keep electrical and fuel lines as far apart as possible.
- Place a physical barrier between fuel lines and electrical lines wherever possible.
- If electrical and fuel lines must pass through the same compartment opening, make certain that they are physically separated by running them through individual channels, or by passing each line through a separate piece of tubing.
- DO NOT SMOKE while servicing batteries. Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by electrical arcing or by smoking.

## EXHAUST GASES ARE DEADLY

- Never sleep in the pontoon boat with the generator set running unless pontoon boat is equipped with an operating carbon monoxide detector.
- Provide an adequate exhaust system to properly expel discharged gases. Inspect exhaust system daily for leaks per the maintenance schedule. Make sure that exhaust manifolds are secure and not warped. Do not use exhaust gases to heat a compartment.
- Be sure the unit is well ventilated.

## MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Before starting work on the generator set, disconnect batteries. This will prevent accidental arcing.
- Keep your hands away from moving parts.

- Make sure that fasteners on the generator set are secure. Tighten supports and clamps, keep guards in position over fans, exhaust system, etc.
- Do not wear loose clothing or jewelry while working on generator sets. Loose clothing and jewelry can become caught in moving parts. Jewelry can short out electrical contacts and cause shock or burning.
- If adjustment must be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

## ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Disconnect starting battery before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling electrical equipment.
- Do not make adjustments in the control panel or on engine with unit running. High voltages are present. Work that must be done while unit is running should be done only by qualified service personnel standing on dry surfaces to reduce shock hazard. Use extreme caution when working on electrical components.
- Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag open switches to avoid accidental closure.
- DO NOT CONNECT THE GENERATOR SET TO THE PUBLIC UTILITY OR TO ANY OTHER ELECTRICAL POWER SYSTEM. Electrocution or damage to property can occur at a site remote from the boat where line or equipment repairs are being made if the set is connected to the power system. An approved transfer switch must be used if more than one power source is to be made available to service the boat.

## GENERAL SAFETY PRECAUTIONS

**⚠ WARNING** *DO NOT perform any generator set maintenance or adjustments unless pontoon boat is in 'dry dock'. Review all fuel and electrical safety precautions. Failure to heed this warning can result in severe personal injury or death, or property damage.*

- Have a fire extinguisher nearby. Maintain extinguisher properly and become familiar with its use. Extinguishers rated ABC by the NFPA are appropriate for all applications. Consult the local fire department for the correct type of extinguisher for various applications.
- Benzene and lead, found in some gasoline, have been identified by some state and federal agencies as causing cancer or reproductive toxicity. When checking, draining or adding gasoline, take care not to ingest, breathe the fumes, or contact gasoline.
- Used engine oils have been identified by some state or federal agencies as causing cancer or reproductive toxicity. When checking or changing engine oil, take care not to ingest, breathe the fumes, or contact used oil.
- Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and engine damage, which presents a potential fire hazard.
- DO NOT store anything in the generator compartment such as oil or gas cans, oily rags, chains, wooden blocks, portable propane cylinders, etc. A fire could result or the generator set operation (cooling, noise and vibration) might be adversely affected. Keep the compartment floor clean and dry.
- Do not work on this equipment when mentally or physically fatigued, or after consuming any alcohol or drug that makes the operation of equipment unsafe.

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# Section 1. Introduction

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## GENERAL

This manual provides installation guidelines for the *Tracker marine*™ generator sets, provided by Onan®, installed in an enclosure on the deck of Tracker pontoon boats. A genset cannot be operated reliably, quietly, and safely unless it is installed correctly. Read this entire manual before starting installation.

For operation and maintenance procedures, see the Operator's Manual, publication 965-0132, that accompanies each set.

**As of date of publication, no specific standards exist for the Onan generator set model being specified in the type of application outlined in this manual.**

**The pontoon boat manufacturer and/or the set installer must comply with all local codes, Coast Guard regulations, and the installer bears sole responsibility for the selection of the appropriate generator set, installation design, and installation.**

Consider the following requirements before installing the set. Each topic is covered in the following text.

- Level and supportive mounting surface
- Adequate cooling air
- Adequate fresh induction air
- Discharge of circulated air
- Electrical connections
- Fuel installation
- Accessibility for maintenance and service
- Noise levels
- Discharge of exhaust gases

## INSTALLATION CODES AND SAFETY RECOMMENDATIONS

The following list of Installation Codes and Safety Recommendations can aid the installation and operation of generator sets. The address of each agency is listed so that copies of the codes may be obtained for reference. Installation codes and recommendations are subject to change, and can vary by location or over time. The pontoon boat manufacturer and the genset installer bear

sole responsibility for following all applicable codes and regulations. It is suggested that you obtain copies of the following standards if you build for the U.S. domestic market:

- |  |   |
|--|---|
| 1. ANSI-A119.2<br>FMVSS 301  | Recreational Vehicle<br>Industry Association<br>14650 Lee Road<br>Chantilly VA 22021  |
| 2. NFPA 70 (N.E.C.)<br>NFPA-501C<br>NFPA 58                              | National Fire Protection<br>Association<br>470 Atlantic Avenue<br>Boston MA 02210   |
| 3. NFPA 302<br>"Pleasure and<br>Commercial<br>Motor Craft"               | National Fire Protection<br>Batterymarch Park<br>Quincy MA 02269  |
| 4. CSA Electrical<br>Bulletin #946                                       | Canadian Standards<br>Association, Housing and<br>Construction Materials<br>Section<br>178 Rexdale Blvd.<br>Rexdale, Ontario, Canada<br>M9W 1R3 |
| 5. California<br>Administrative<br>Code - Title 25<br>Chapter 3          | State of California<br>Documents Section<br>P.O. Box 1015<br>North Highlands CA<br>95660  |
| 6. USCG Code of<br>Federal Regula-<br>tions (CFR) Titles<br>33 and 46    | U.S. Government Printing<br>Printing Office<br>Washington D.C. 20404  |
| 7. ABYC "Standards<br>and Recommend-<br>ed Practices For<br>Small Craft" | American Boat and Yacht<br>Council, Inc.<br>P.O. Box 747<br>Millersville MD 21108   |

**This manual contains information that is subject to change. For this reason, use only the installation manual supplied with the generator set for the installation.**

**⚠WARNING Incorrect installation, service, or replacement of parts can result in severe personal injury, death and/or equipment damage. Service personnel must be qualified to perform electrical and/or mechanical component installation.**

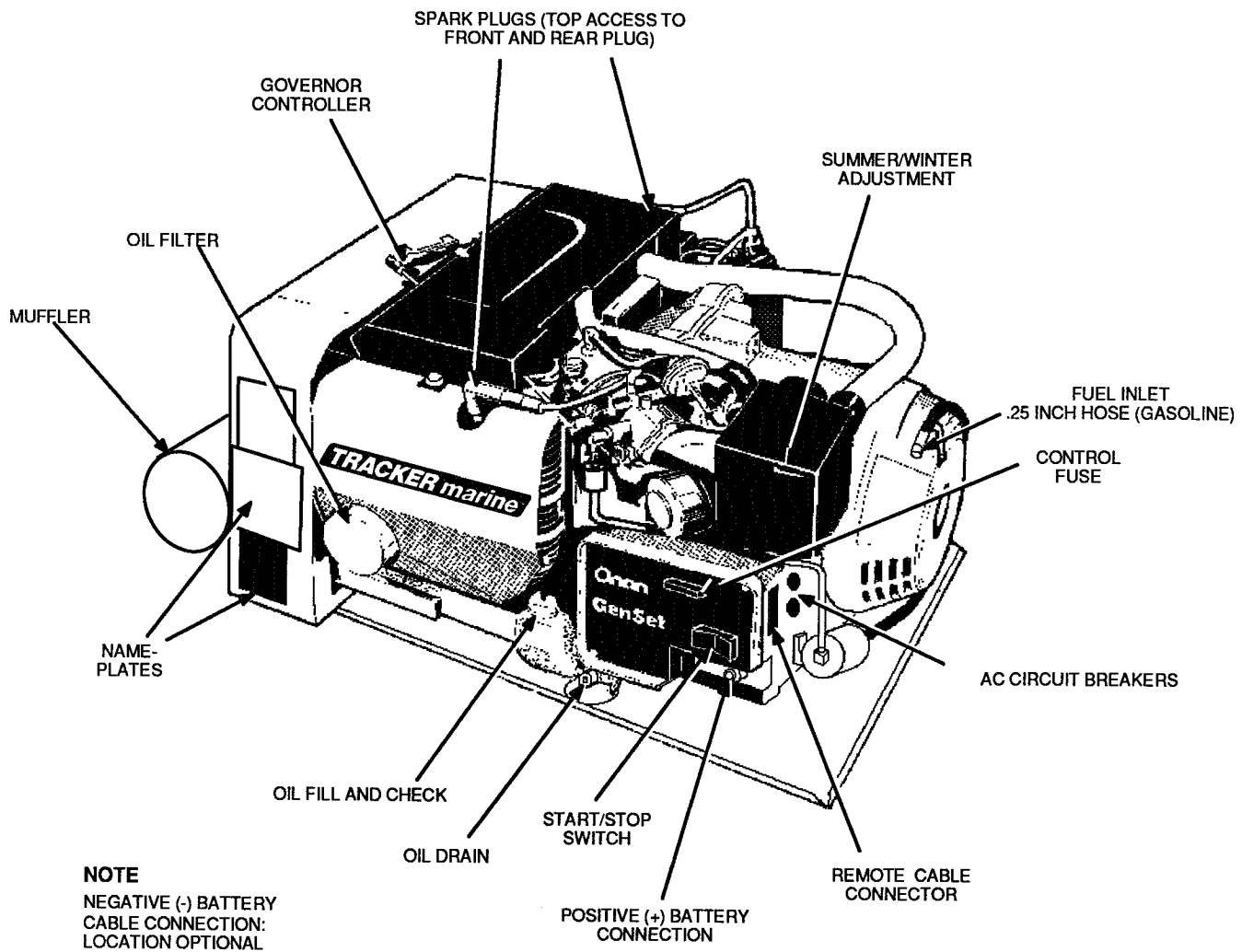


FIGURE 1-2. *TRACKER* GENERATOR SET

# Section 2. General Specifications

<b>TRACKER MODEL</b>	<b>BGE</b>
<b>GENERATOR DETAILS</b>	
Power (Watts)	4000
Voltage	120 VAC
Current (Amperes)	33.3
<b>ENGINE DETAILS</b>	
Engine Speed	1800 RPM
Engine Oil Capacity (Includes Filter)	4 qt. (3.8 L)
Fuel	Gasoline (Unleaded)
Fuel Inlet Connection	1/4 in. barb fitting
Average Fuel Consumption:	
No Load	0.4 gph (1.5 Lph)
Half Load	0.6 gph (2.3 Lph)
Full Load	0.9 gph (3.4 Lph)
Battery Requirements:	
Battery	One, 12-volt
Cold Cranking Amps	360
<b>GENERATOR SET DETAILS</b>	
Weight	204 lb (92.5 kg)
Height	14.0 in. (356 mm)
Length	25.3 in. (643 mm)
Width	18.8 in. (478 mm)
Control Fuse	10 Ampere
Air Requirement	480 ft <sup>3</sup> /min 13.6 m <sup>3</sup> /min

# Section 3. Mounting

## GENERAL

The *Tracker* generator sets are designed for compartment mounting only, and use the set tray for support. Carefully follow the instructions in this section. **Read this entire manual and exhaust kit and other kit instructions before installing the genset.**

## COMPARTMENT MOUNT

In a compartment mount, the set is installed on a frame that is part of the pontoon boat. This frame must be constructed according to safety-approved specifications (see Compartment Construction in this section).

Make the access opening large enough to remove the set onto the main floor of the pontoon boat. Allow extra clearance to access the following components:

- Oil fill
- Oil drain
- Oil filter
- Oil dipstick
- Air cleaner element
- Spark plugs
- Carburetor
- Start/Stop switch
- Circuit breaker
- DC fuse

Minimum compartment dimensions are shown in Figure 3-1. Clearances between the generator set and the compartment are included in these dimensions.

To minimize noise, line the entire genset compartment with a 1/2 to 1 inch (12.7 to 25.4 mm) thickness of self-extinguishing acoustical material, rated for 250° F (121° C) minimum. Adjust the compartment height, width and depth dimensions to fit the acoustical material. See Figures 3-1 and 3-2.

Allow for air intake (through the exterior wall) and discharge at the bottom of the generator set. Air inlets to the set compartment must not allow dirt, rocks, water, or slush to reach the set during towing, storage or operation. Minimize dust and moisture entrance into the com-

partment. Make certain to protect the generator, control, choke, and governor areas. Use baffles to protect certain areas. (See *Ventilation and Acoustics* section.)

## Compartment Construction

1. Install the generator set in its own compartment. See Figures 3-1 and 3-2 for genset dimensional data, and Figures 3-3 and 3-4 for recommended compartment location and design.
2. Separate the generator set compartment from the pontoon boat interior, area between pontoons, and fuel supply with a vapor-tight wall.
3. Line the compartment walls with 26-gauge galvanized steel or a material of comparable strength and fire resistance (see NFPA 70, NEC and California Title 25 for complete details).

**⚠ WARNING** *Exhaust gases present the hazard of severe personal injury or death. Make the compartment walls and floor vapor-tight to the interior of the pontoon boat and the area between the pontoons to prevent exhaust fumes from entering.*

4. Construct the compartment floor to prevent oil, fuel or water accumulation. Provide openings in the compartment floor according to the Compartment Floor Plan, Figure 3-2.

Do NOT use absorbent soundproofing material on the compartment floor. The floor should have as few openings as possible, to reduce the noise level.

5. Secure the set mounting tray to the support frame, using four 3/8-16 UNC grade 5 screws (bottom mounting). See Figures 3-1 and 3-2. Torque 3/8 in. mounting screws to 35 ft lbs (47 N•m).

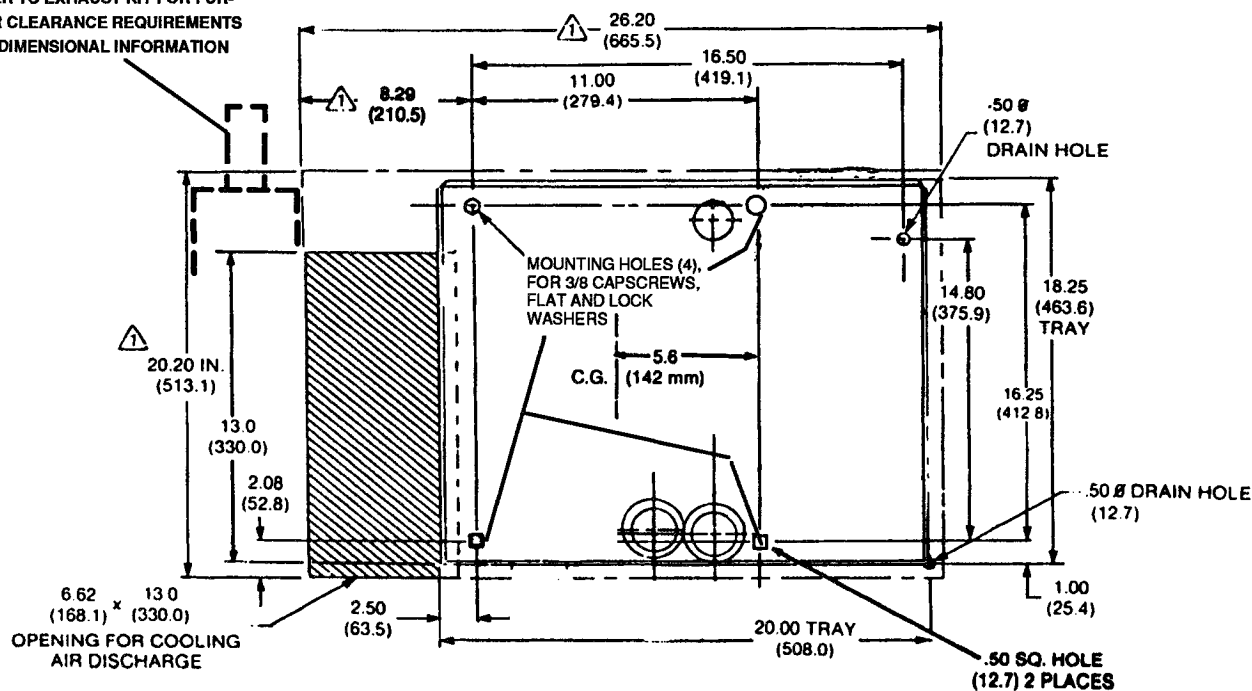
**⚠ CAUTION** *If the unit mounting plate is not fastened securely to the pontoon boat compartment, road vibrations (when trailering) can damage the generator set components. Use screws long enough for at least 1-1/2 threads to extend into the compartment cross-bars.*





# NOTE

REFER TO EXHAUST KIT FOR FURTHER CLEARANCE REQUIREMENTS AND DIMENSIONAL INFORMATION



## NOTES:

1. DIMENSIONS INCLUDE 0.6 INCH (15 mm) MINIMUM CLEARANCE REQUIRED BETWEEN SET AND INSULATION OR COMPARTMENT WALLS.
2. IF COMPARTMENT IS LARGER THAN MINIMUM SHOWN, ALLOW EXTRA SPACE AT OIL FILL SIDES AND EQUALLY ON BOTH ENDS.
3. ALLOW MINIMUM OF 0.6 INCH (15 mm) CLEARANCE BETWEEN TOP OF SET AND INSULATION OR COMPARTMENT CEILING. MINIMUM HEIGHT - 14.60 INCHES (371 mm).
4. DIMENSIONS ( ) ARE IN MILLIMETRES.

FIGURE 3-2. COMPARTMENT FLOOR PLAN

## GENERATOR SET LOCATION

Figure 3-3 shows the preferred mounting location for pontoon boat installations.

**Air Inlet Opening:** Provide an air inlet/access opening to the generator set on the exterior side of the compartment for combustion and cooling air.

The exterior air inlet opening to the generator set compartment must not admit dirt, rocks (or other road debris when being trailered), and help prevent water splash from entering generator set compartment. The entrance of dust and salt into the compartment must be minimized. Baffles may be needed to protect certain areas (i.e., cooling air outlet through floor). See the Ventilation section of this manual for more detailed information.

**Access Opening:** Provide an access opening to the generator set on the inboard side of the compartment. Make it large enough for the generator set removal (including muffler), and to check the following:

- Oil fill
- Oil drain
- Oil filter
- Oil dipstick
- Air cleaner element
- Spark plugs
- Carburetor
- Start/Stop switch

- Circuit breaker
- DC fuse

See Figures 3-1 and 3-2 for dimensional data, and Figures 3-3 and 3-4 for recommended compartment location and design.

**Mounting Clearance:** The compartment door must open the full width of the generator set (including muffler). Refer to the correct outline drawing when installing the set.

**Exhaust Kit:** Review the exhaust system kit installation instructions and check the components supplied in the kit. Plan clearances for shifting or removing exhaust components when the set is removed for inspection or maintenance.

**⚠ CAUTION** *Failure to meet Onan review for modifications of kits or for use of non-Onan kit installations can void the warranty of any kits and/or the generator set. Liability for damage or injury and warranty expenses becomes the responsibility of the person making the modifications.*

**⚠ WARNING** *Genset exhaust contains carbon monoxide, which if inhaled may result in asphyxiation, causing severe personal injury or death. Install a carbon monoxide detector in the living quarters of the pontoon boat when installing the genset.*

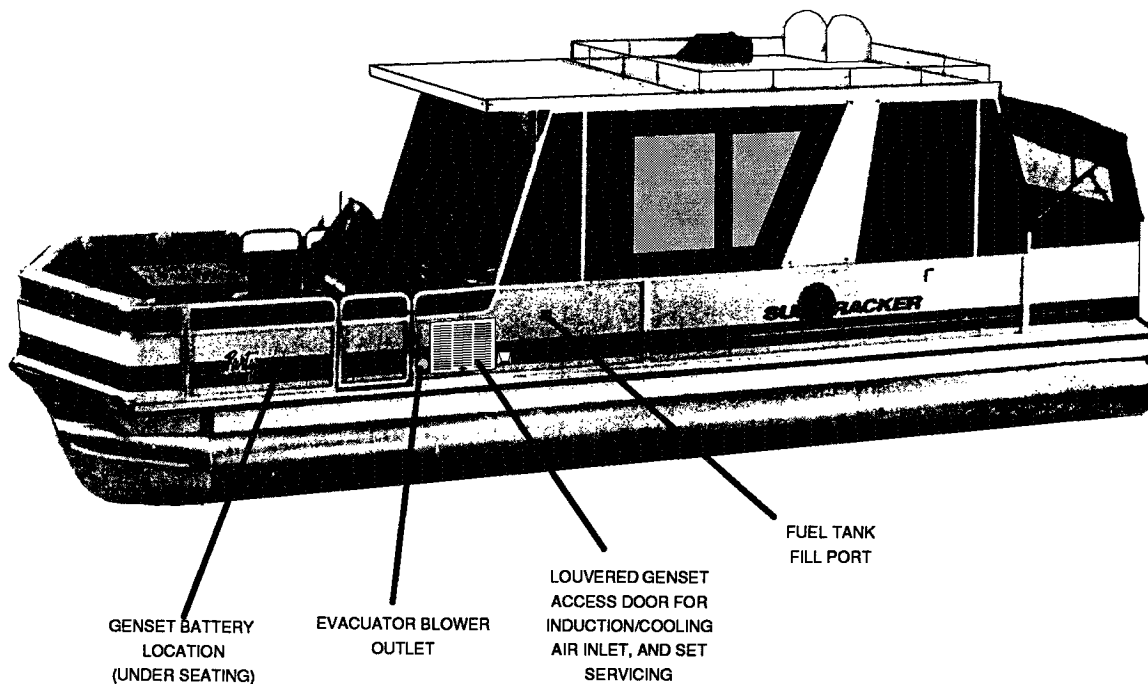


FIGURE 3-3. PREFERRED GENSET MOUNTING LOCATION

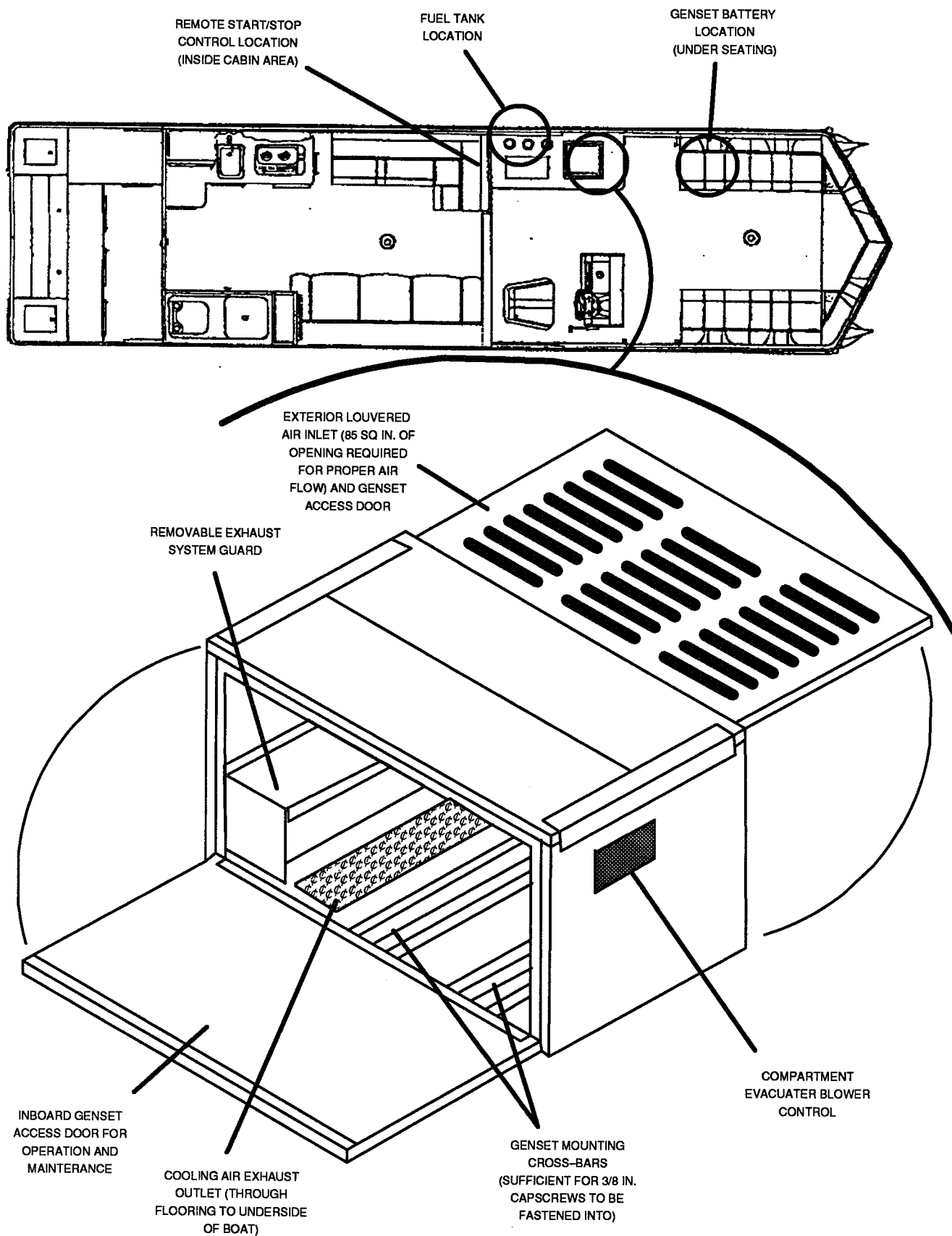


FIGURE 3-4. GENSET COMPARTMENT DESIGN

1

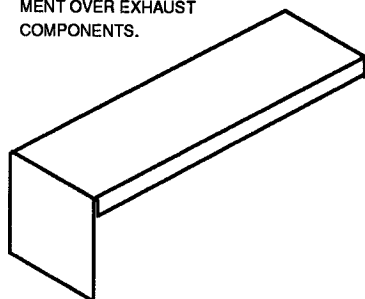
BE SURE TO REVIEW SECTIONS 4 THROUGH 8 TO CONFIRM READINESS OF FUEL SYSTEM, ELECTRICAL SYSTEM, ETC. BEFORE INSTALLING THE GENSET INTO COMPARTMENT.

CONFIRM THAT MOUNTING HOLES ARE IN PROPER POSITION IN CROSS-BARS AND CORRECTLY TAPPED FOR FASTENERS TO BE USED. SEE OUTLINE DRAWING AND EARLIER FIGURES IN THIS SECTION.

2

5

ASSEMBLE THE MUFFLER GUARD INTO COMPARTMENT OVER EXHAUST COMPONENTS.



4

INSTALL THE GENSET INTO COMPARTMENT USING PROPER CAPSCREWS, FLAT AND LOCK WASHERS.

ASSEMBLE THE EXHAUST KIT TO THE GENSET.

3

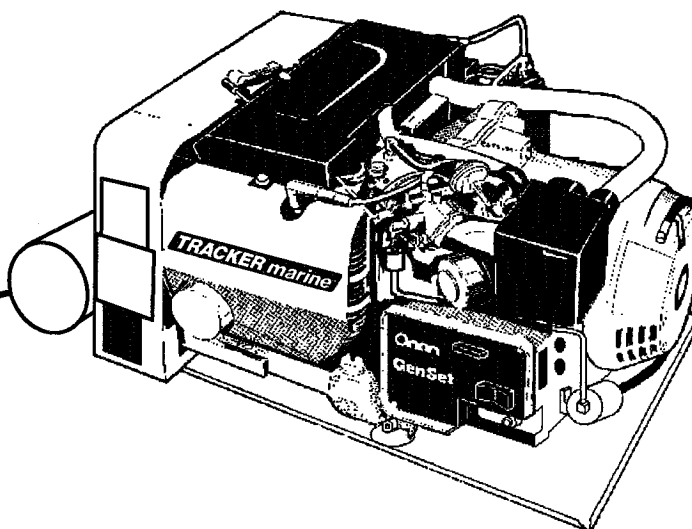


FIGURE 3-5. INSTALLING THE GENSET INTO THE COMPARTMENT

# Section 4. Ventilation and Acoustics

## VENTILATION

Ventilation of the genset requires:

- Sufficient incoming air (for combustion and cooling)
- Adequate exhaust of heated air

A centrifugal fan in a scroll housing on the engine (Figure 4-1) draws air through exterior access door into the set compartment, and through the generator (which has its own cooling fan) over the cooling surfaces of the engine. Then it discharges the heated air through the bottom outlet on the engine end of the set.

Make certain that nothing obstructs or restricts air intake and discharge. Air recirculation must be minimized.

**⚠WARNING** *Exhaust gas presents the hazard of severe personal injury or death. Because discharged cooling air can contain exhaust gas, never use discharged cooling air to heat another space of the boat.*

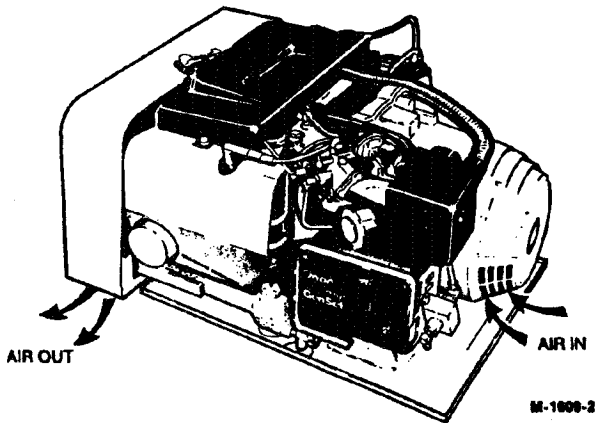


FIGURE 4-1. COOLING SYSTEM

The free air inlet area is critical for proper generator set operation and cooling. A minimum free air inlet area of 85 in<sup>2</sup> (548 cm<sup>2</sup>) with no restrictions is required. Reference: the generator set air discharge rate is 480 ft<sup>3</sup>/min (13.6 m<sup>3</sup>/min).

When designing the air inlet and outlet for the set compartment (see Figure 4-2), allow for the restriction of grilles and ductwork: some expanded metal grilles provide as little as 60 percent free air inlet area per square foot. The most efficient grille provides only 90 percent

free inlet area per square foot. Obtain the free inlet area of the grille material from the material supplier. Multiply the grille area by the free area percentage to get the free inlet area.

Any baffling in the compartment must provide a direct free-airflow path to the generator set, with minimal bends. Baffles must be smooth and non-restrictive to airflow.

Coast Guard Regulations requires the compartment to have at least 15 in.<sup>2</sup> of open area directly exposed to the open atmosphere for each cubic foot of net compartment volume or be ventilated by a power exhaust system as specified in 33 CFR, Section 183.610. Refer to Section 5 (Figure 5-1) for location of Tracker supplied Evacuator Blower.

**⚠WARNING** *Fuel and fuel leakage present the hazard of fire or explosion, which can cause severe personal injury or death. The ventilation system should provide a constant flow of air to expel any accumulation of fuel vapor. The generator set compartment must be vapor-tight, to keep fumes from entering the boat cabin area.*

## ACOUSTICS

For maximum noise reduction, line the entire generator compartment with 1 inch (25.4 mm) thickness of sound absorbing material. Use the following guidelines to construct the housing.

- Make certain that all joints and corners of the compartment are vapor-tight to the cabin of the boat and the area between the pontoons. Lining the compartment is less effective if openings, cracks, doors and joints are not sealed. Seal the compartment door edge to eliminate noise leaks around the door perimeter.
- Cover the back, top and sides of the compartment (not the compartment base) with fiberglass or another self-extinguishing, sound-absorbent material. Sound insulation and adhesive should be rated at 200° F (90° C) minimum.
- A combination of materials can reduce noise more than a single material can. For instance, a sheet of lead combined with a layer of acoustical material is more effective than either alone.

**⚠WARNING** High temperatures in the compartment can present the hazard of fire, which can result in severe personal injury or death. To meet the necessary temperature rise requirements for compartment mounted gensets, the layer of insulation must not reduce the minimum compartment size specified in Figure 3-1.

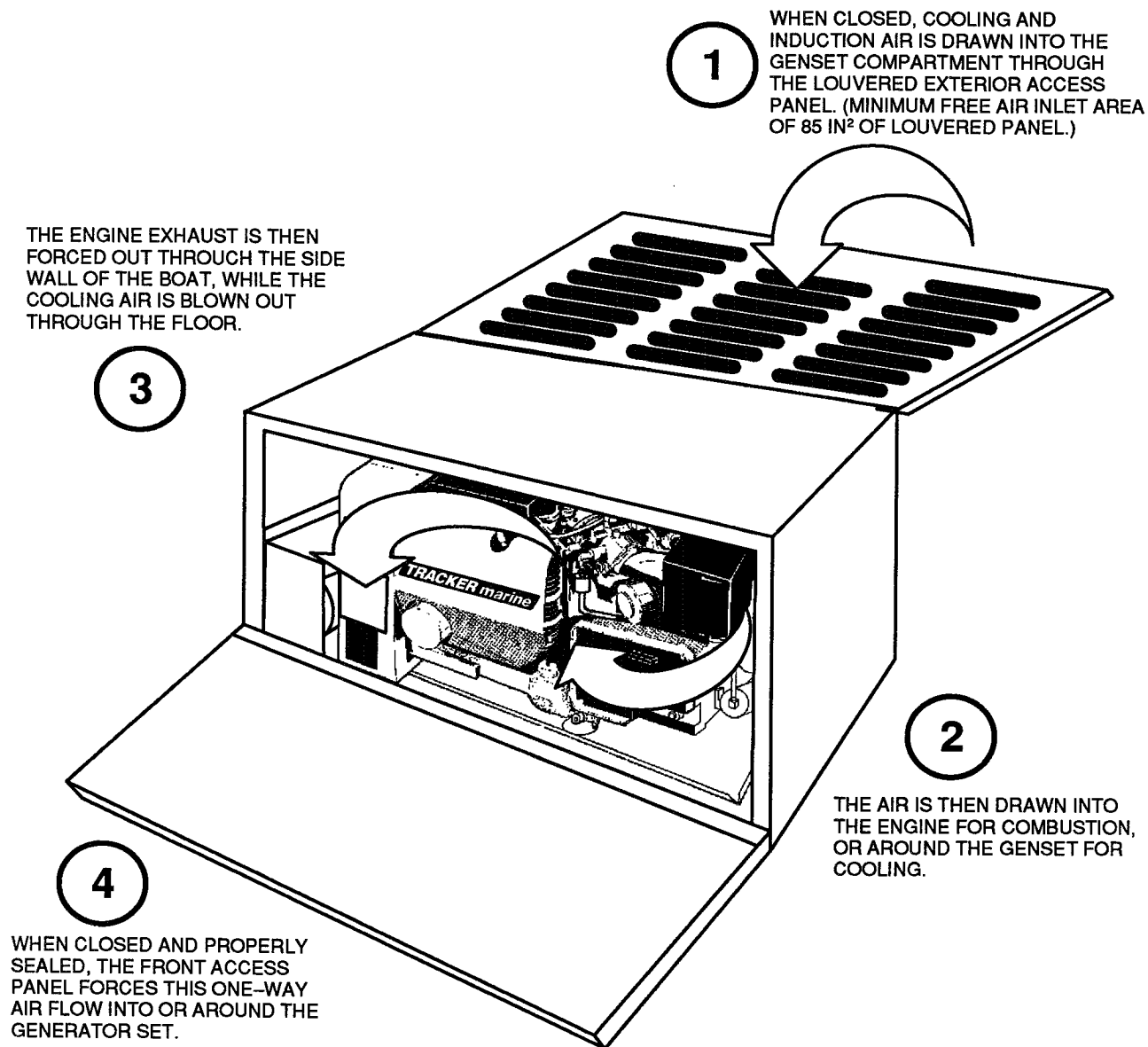


FIGURE 4-2. COMPARTMENT DESIGN RECOMMENDATION

# Section 5. Exhaust System

## GENERAL

Plan the exhaust system carefully. The exhaust system must be vapor-tight. Check all applicable standards, local codes and regulations. Study the following recommendations. See the instructions supplied with the exhaust kit for specific mounting procedures.

## MUFFLER RECOMMENDATIONS

The Onan spark arrester muffler is U.S. Forest Service approved. Failure to provide and maintain a spark arrester may violate the law.

Liability for damage or injury, and warranty expenses due to use of unapproved mufflers or installation modifications becomes the responsibility of the person installing the substitute muffler or performing the modifications. Contact an Onan distributor for approved exhaust system parts.

## EXHAUST INSTALLATION GUIDELINES

The exhaust system must be placed no closer than 3 inches (76 mm) from combustible material (wood, felt, cotton, organic fibers, etc.), or be so located, insulated or

shielded that it does not raise the temperature of any combustible material more than 117° F (65° C) above the ambient air inlet temperature.

The exhaust system must extend a minimum 1 inch (25 mm) beyond the perimeter of the boat and baffled downward.

**⚠ CAUTION** *Excessive exhaust back pressure can cause engine damage. Check the tailpipe deflector frequently to make sure it is not damaged from tying up to docks.*

Do not terminate the exhaust tailpipe under the boat or near any vent, window or opening that can be opened and that is not permanently sealed from the cabin which can be avenues for carbon monoxide.

**⚠ WARNING** *Exhaust gas presents the hazard of severe personal injury or death. Do not terminate an exhaust pipe under the boat.*

**⚠ WARNING** *Failure to provide for directing exhaust overboard (not between pontoons), away from openable windows and doors, may result in asphyxiation, causing severe personal injury or death.*

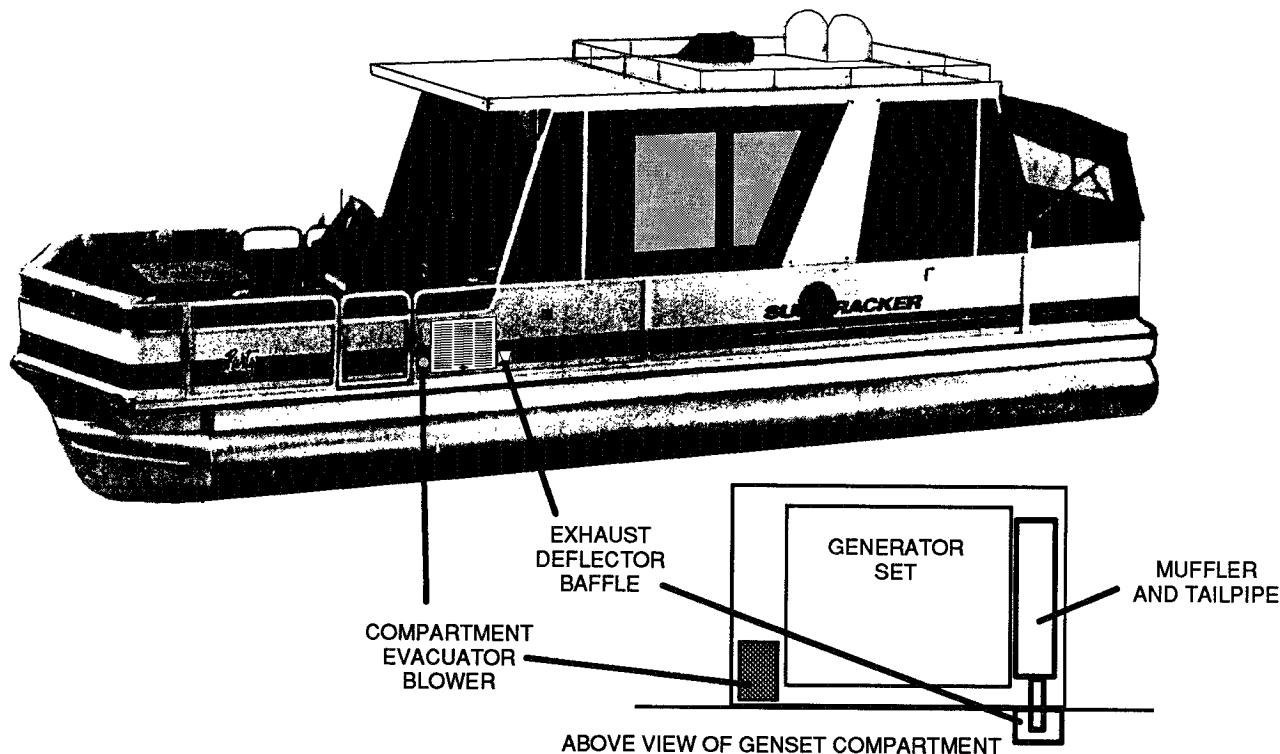


FIGURE 5-1. GENSET EXHAUST SYSTEM

# Section 6. Fuel System

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## GENERAL

This section describes fuel system recommendations. Review section 3, regarding compartment construction and a vapor-tight barrier between the fuel tank and generator set.

**⚠WARNING** *Fuel presents the hazard of fire or explosion which can result in severe personal injury or death. Do not smoke or allow any flame, spark, pilot light, arc-producing equipment or other ignition sources around fuel or fuel components, or in the installation area. Keep a type ABC fire extinguisher nearby. The ventilation system must provide a constant flow of air to expel any accumulation of fuel vapor while the generator set is in use. Compartments must be vapor-tight to prevent any fumes from entering the cabin interior.*

## FUEL SYSTEM

### Fuel System Provisions

On some boats, the genset can share the fuel supply tank with the boat propulsion engine. Connection to the boat fuel tank must be made according to the chassis (boat) manufacturer's detailed instructions. See *Fuel Line Installation*, in this section.

Onan recommends a separate fuel pickup tube or a separate fuel tank. Connection with the boat fuel line is not recommended.

The genset has a fuel shutoff valve as a safety feature. If the boat fuel tank becomes pressurized (3 psi maximum), the positive fuel shutoff prevents the set from being flooded when the set is not running.

The genset uses an in-line fuel filter to stop contaminants before reaching engine. Onan also recommends an in-line manual fuel shutoff valve, to close the fuel line if the set is removed for service.

### Recommended Fuel

Use clean, fresh unleaded gasoline. (Leaded regular can be used if necessary.) Unleaded fuel promotes longer service intervals, longer spark plug life, and less carbon clean-out maintenance. Leaded fuel increases deposits on the cylinder heads, which cause power loss. These deposits must be removed periodically. Unleaded

gas may be used after leaded gas only if these deposits are removed.

**⚠WARNING** *Fuel presents the hazard of fire or explosion that can cause severe personal injury or death. Never fill the fuel tank when the engine is hot or is running. Do not permit any flame, spark, pilot light, cigarette or other ignition source near the fuel system.*

**⚠CAUTION** *Lead deposits can cause engine damage if they are not removed before using unleaded gasoline. Do not alternate between leaded (regular) and unleaded gasoline.*

### Fuel Consumption

Generator set fuel consumption varies proportionately to differing electrical loads. Refer to the *Specifications* section for approximate fuel consumption at no load, half load, and full load.

### Fuel Line Installation

The propulsion engine fuel system may operate at a different fuel pressure than the generator set. For this reason, do not change or remove the fuel fill tube, fill limiter vent, vapor canister, vapor lines, filler cap or any parts of the fuel system without the approval of the boat manufacturer. Check the filler cap to make sure that the pressure vacuum relief valve functions properly: replace it if necessary.

If a separate connection is not supplied for the generator, add a second fuel pickup in the tank. This pickup should not extend below the bottom 1/4 of the tank, so the boat will run after the generator runs out of fuel.

Do not connect directly to the boat fuel line. This may cause the genset or the boat engine to run poorly. Consult the boat manufacturer for information on shared fuel supplies. Unauthorized fuel system modifications might cause dangerous operating conditions.

**⚠WARNING** *Gasoline presents the hazard of explosion or fire, which can result in severe personal injury or death. Do not connect the generator set fuel line to a pressurized part of the boat fuel system. Flooding of the generator set engine and compartment can occur, resulting in a fire hazard.*



**⚠ CAUTION** *The generator set may starve for fuel when the boat is operated at high speeds or loads if its fuel line is connected to the main fuel line with a tee. The generator set fuel pump has neither the capacity nor the power to overcome the draw of some propulsion engine fuel pumps. For this reason, use a separate fuel line to the generator set, or a separate fuel tank.*

Install an approved flexible non-metallic (non-conductive) fuel line between the boat fuel system and the generator set to absorb vibration. Flexible fuel line must be long enough to allow generator set movement, to prevent binding, stretching or breaking. Onan recommends seamless steel tubing and flared connections for long runs between the fuel tank and the flexible connector to the generator set.

Run fuel lines at the same height as the top level of the tank, to a point as close to the engine as possible. This reduces the danger of fuel siphoning out of the tank if the line should break.

Keep fuel lines away from hot engine or exhaust areas, to reduce the chance of vapor lock. Fuel lines should be accessible and protected from damage. Use metal straps without sharp edges to secure fuel lines. Do not run fuel lines where they can contact sharp or rough surfaces, or where they can be kinked, pinched, chaffed, or struck.

**⚠ WARNING** *Gasoline and LPG fuel might be accidentally ignited by electrical sparks, presenting the hazard of fire or explosion, which can result in severe personal injury or death. For this reason, when installing the generator set:*

- *Do not tie electrical wiring to fuel lines.*
- *Do not run electrical lines and fuel lines through the same compartment openings.*
- *Keep electrical and fuel lines as far apart as possible.*
- *Place a physical barrier between fuel lines and electrical lines wherever possible.*
- *If electrical and fuel lines must pass through the same compartment opening, make certain that they are physically separated by running them through individual channels, or by passing each line through a separate piece of tubing.*

# Section 7. Electrical Connections

## GENERAL

Installing the genset electrical system means:

- Connecting the load
- Connecting the battery
- Connecting a remote control (if used)

Connect the battery last, to avoid accidentally starting or short-circuiting the set during installation. Connect the positive (+) battery cable first and the negative (-) battery cable last to reduce the risk of arcing.

**⚠WARNING** *Accidentally starting the generator set during installation can cause severe personal injury or death. Do not connect the starting battery until instructed to do so in the Installation Checks and Start-Up section.*

All wiring must meet local electrical codes. For this reason, a qualified electrician should install and inspect the wiring.

Mount switches and controls securely, to prevent damage from vibration and road shocks while trailering. All switches must be vibration-proof to prevent accidental opening or closing while the vehicle is in motion.

**⚠WARNING** *Gasoline can be accidentally ignited by electrical sparks, presenting the hazard of fire or explosion, which can result in severe personal injury or death. For this reason, when installing the generator set:*

- *Do not tie electrical wiring to fuel lines.*
- *Do not run electrical lines and fuel lines through the same compartment openings.*
- *Keep electrical and fuel lines as far apart as possible.*
- *Place a physical barrier between fuel lines and electrical lines wherever possible.*
- *If electrical and fuel lines must pass through the same compartment opening, make certain that they are physically separated by running them through individual channels, or by passing each line through a separate piece of tubing.*

## AC WIRING

### Wire Types

The leads attached to the genset output must have a current rating not less than 115 percent of the nameplate current rating of the genset. The Onan-supplied AC feeder conductor insulation is rated at 125°C. Wires connected to the Onan feeder conductors must either meet this insulation rating, or be a larger size (see National Electrical Code, NFPA 70).

Use stranded wire for all load connections. Load wiring must be appropriately sized and insulated for the specified current rating. Grounding must comply with all codes.

### Conduit

Install the generator load conductors in a flexible metallic conduit. Cut the conduit to length, leaving extra wire for the junction box connections. Connecting wires must be correctly sized and insulated for the current rating. Round off or cover the ends of the conduit, to prevent its sharp edges from cutting the insulation.

Run the conduit so that it does not interfere with the movement of the set. Use waterproof conduit wherever it is exposed to the elements.

Seal all openings made for conduit, so exhaust or fuel vapor cannot enter the cabin area. Flexible metal conduit must be sealed internally at the end where it terminates inside the junction box or panel board (flexible conduit is not vapor-tight along its length).

**⚠WARNING** *Exhaust gas and fuel fumes present the hazard of severe personal injury or death. To prevent exhaust gas and fuel fumes from entering the cabin interior, seal all openings made for conduit, wiring, etc. Also seal the wiring within the conduit itself. Use a silicone/rubber based sealant.*

### Wiring Disconnect Method

There must be no chance that an outside power source might be connected to the generator set. Feeder conductors from the set compartment must terminate in a 120-volt double-pole, double-throw, positive-off switching device mounted ahead of the boat distribution panel: or they must connect to a generator set recep-

tacle box. Figures 7-1 and 7-2 show examples of the wire connection. Figure 7-3 shows the genset wiring diagram and schematic.

## Line Circuit Breaker

The generator set has line circuit breakers mounted on the side of the control panel. The breakers provide short circuit and overload protection for the generator.

## Load Connections

The generator output voltage and maximum current rating are specified on the generator nameplate.

Load wiring must be appropriately sized and insulated for the specified current rating. Grounding procedure must comply with codes.

A lead to be connected to an output feeder conductor shall not be more than two AWG sizes smaller than the output lead conductor and the insulation shall be:

- Rubber (with braid), neoprene, or thermoplastic, with a wall thickness of at least 0.030 inch (0.76 mm).
- Other material having the same or better electrical and mechanical properties.

**⚠ WARNING** *Electrical shock can cause severe personal injury or death. Use only approved power supply assemblies. Never remove the grounding pin from assemblies. Incorrect ground or no ground can cause the boat chassis to become electrically "hot". Equip the boat with adequate Ground-Fault Circuit Protection devices to meet the National Electrical Code (NFPA 70, 551-9[C]) and for personal safety.*

**⚠ WARNING** *Gasoline fuel presents the hazard of fire or explosion, which can result in severe personal injury or death. Do not tie electrical wiring to fuel lines.*

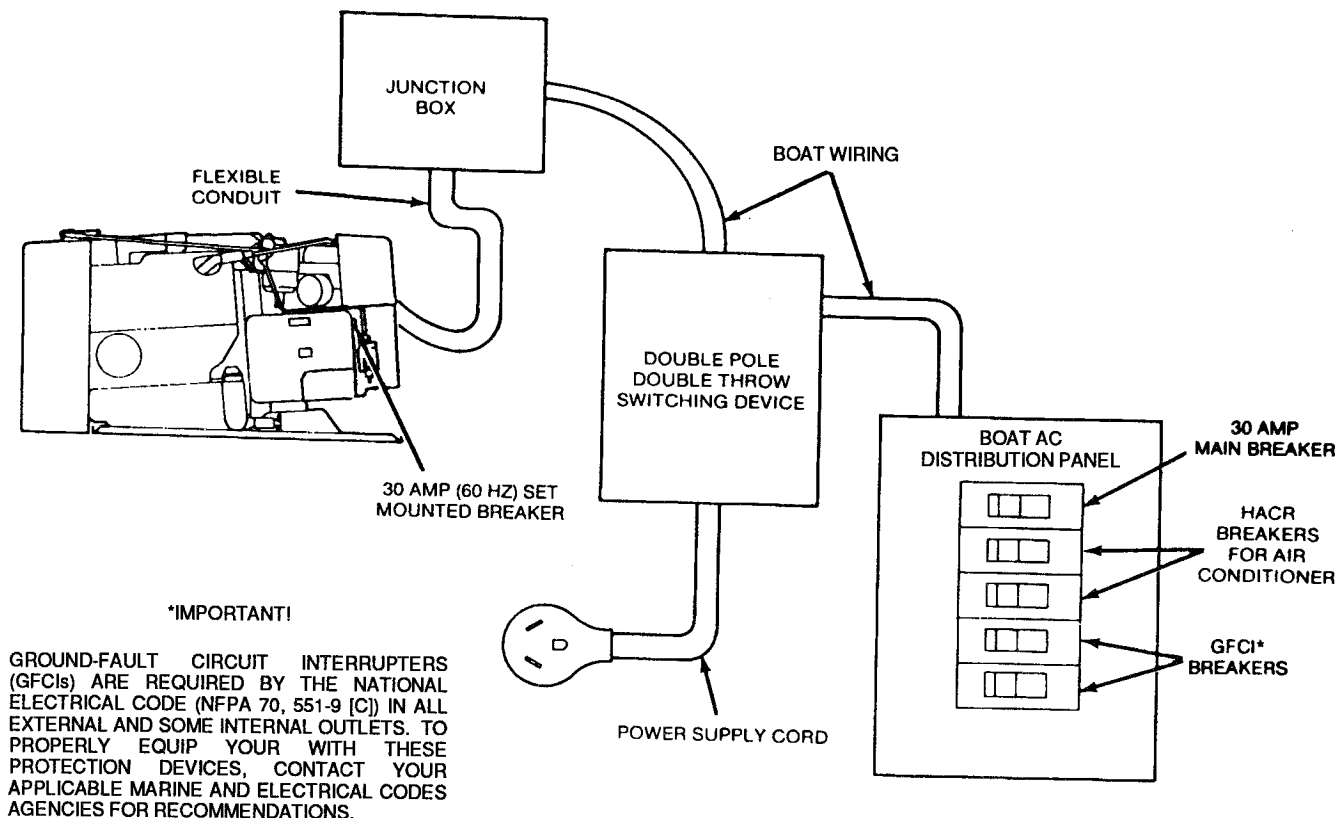


FIGURE 7-1. SWITCHING DEVICE WIRING FOR UTILITY POWER

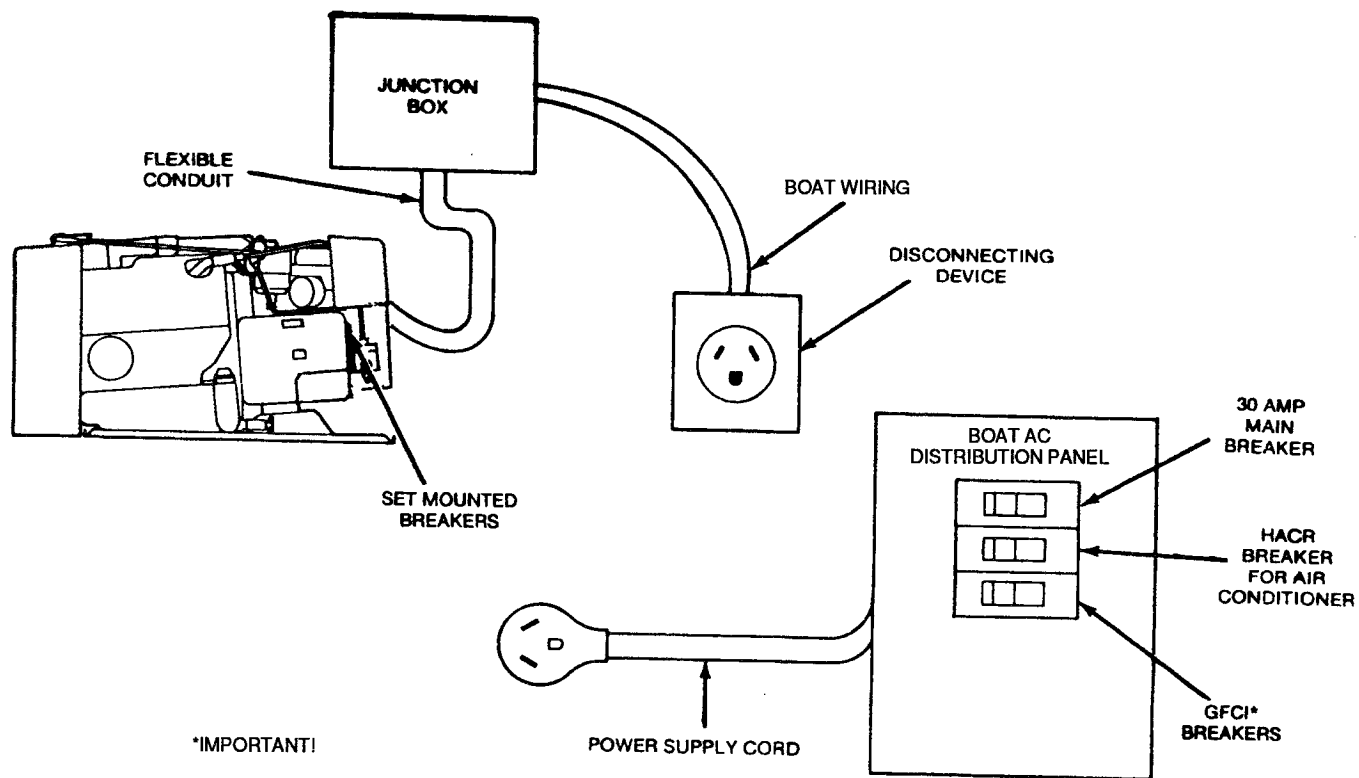
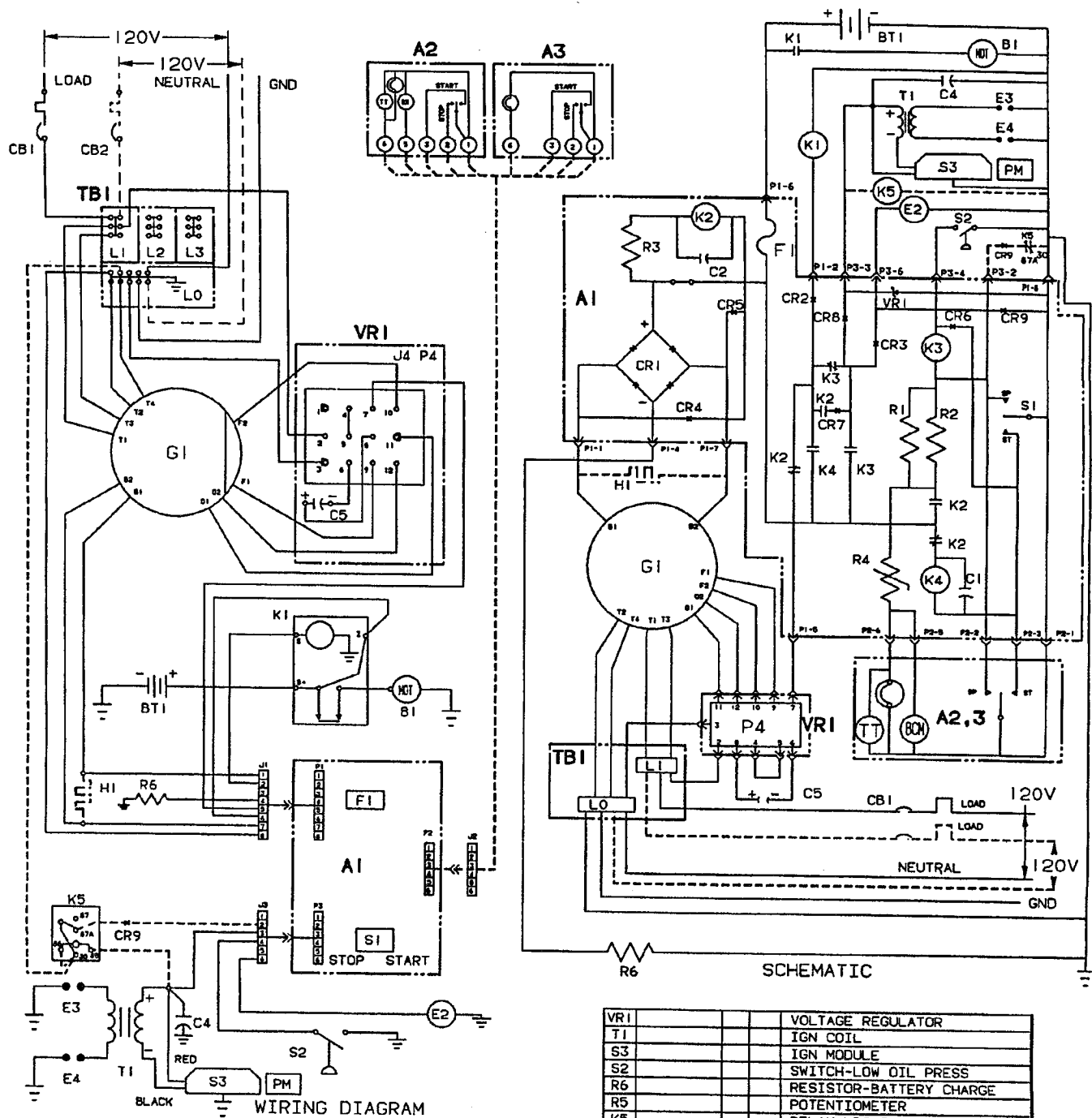


FIGURE 7-2. USING UTILITY POWER CORD FOR SWITCHING



ITEM	PART NO.	QTY	DESCRIPTION OR MATERIAL
VR1			VOLTAGE REGULATOR
T1			IGN COIL
S3			IGN MODULE
S2			SWITCH-LOW OIL PRESS
R6			RESISTOR-BATTERY CHARGE
R5			POTENTIOMETER
K5			RELAY-LPG ONLY
K1			RELAY-START SOLENOID
H1			CHOKE-GASOLINE ONLY
G1			GENERATOR
F1			FUSE-SLOW BLOW 5A
E3,4			SPARK PLUGS
E2			FUEL PUMP OR FUEL SOL
CR9			RECTIFIER-LPG ONLY
CB1,2			CIRCUIT BREAKER (AC OUTPUT)
C4,5			CAPACITOR
BT1			BATTERY 12V
B1			STARTER MOTOR
A3			REMOTE CONTROL-STANDARD
A2			REMOTE CONTROL-DELUXE
A1 300-3091-02	C	REF	CONTROL ASSY-NHE/NHEL
A1 300-3091-01	C	REF	CONTROL ASSY-BGE/BGEL

NO. 611-1190  
REV. B  
MODIFIED

FIGURE 7-3. 60 HZ GENERATOR SET WIRING DIAGRAM/SCHEMATIC

## DC WIRING

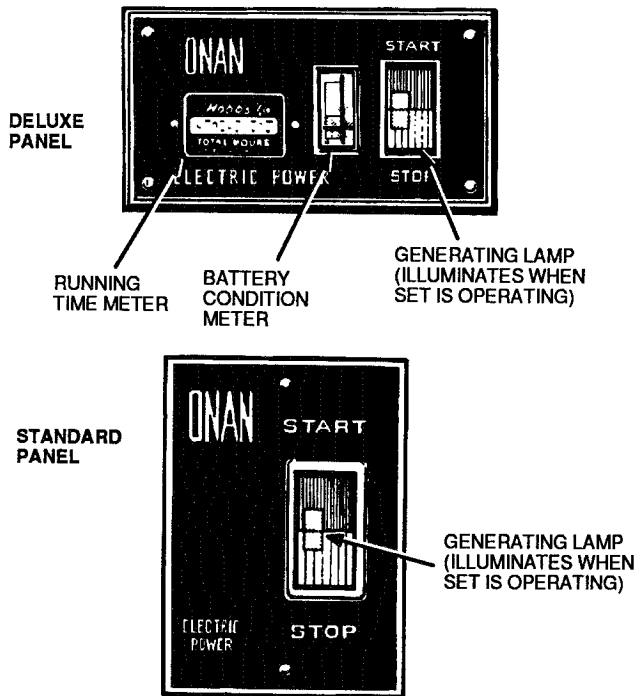
### Remote Control (Option)

Onan offers optional remote control kits which may be connected to the genset (Figure 7-4). The Standard Remote Control includes a start/stop switch and an indicator lamp. The Deluxe Remote Control has these items plus a running time meter and a battery condition meter.

A remote control connector plug is located on the right side of the control housing. Contact an Onan dealer for the proper remote connector plug and wiring harness lead assembly.

Location of the remote control can vary by application or personal preference (see Figure 3-4 for recommended location inside pontoon boat cabin area). See the kit instructions supplied with the remote control for more installation information and important safety precautions.

Be sure to seal all openings made for wiring so exhaust or fuel vapors cannot enter the living quarters. If flexible metal conduit is used it must be sealed internally at the end where it terminates. Flexible metal conduit is not vapor tight along its length due to its construction.



ES1684s-1

FIGURE 7-4. REMOTE CONTROL PANELS

**⚠ WARNING** *Inhalation of exhaust gas or ignition of fuel vapor can cause severe personal injury or death. Be sure to vapor-seal flexible metal conduit and all openings made during installation of the generator set with a silicone/rubber based sealant.*

### Batteries and Connections

The generator set requires a 12-volt battery with a rating of 360 cold-cranking amps. A larger capacity battery will be required if it powers other boat accessories. Onan does not recommend that the boat starting battery be used to operate the generator set. Doing this can discharge the battery under some operating conditions.

The starter draws 60 to 100 amperes current at 72°F (22°C). The inrush current is 300 to 400 amperes.

For reliable cold weather starting, the voltage drop from the battery terminals to the generator set starter should not exceed 0.12 volts per 100 amperes of current while the genset is cranking. Refer to the following tables to determine cable size and battery rating.

TABLE 7-1. CABLES FOR COLD WEATHER STARTING TO -20°F (-29°C)

*CABLE LENGTH IN FEET (METRES)	CABLE SIZE
0-10 (0-3)	2**
11-15 (3-4.5)	0
16-20 (4.5-6)	000

\* Distance from battery to set.

\*\* For warm weather operation, #2 cable can be acceptable up to 20 feet (6.1 m).

TABLE 7-2. COLD CRANKING AMPS FOR MINIMUM 12-VOLT BATTERY\*

ABOVE 32° F (0° C)	BELOW 32° F (0° C)
360 Cold Cranking Amps (Approx. 70 amp/hour)	450 Cold Cranking Amps (Approx. 95 amp/hour)

\* Larger capacity batteries may be required if battery is also used to power other boat accessories.

## Battery Compartment

Mount the battery in its own compartment, away from the generator set and any spark-producing device. For ventilation, provide the compartment with an opening at least 1.7 in<sup>2</sup> (11 cm<sup>2</sup>) at the top and 1.7 in<sup>2</sup> (11 cm<sup>2</sup>) at the bottom.

Mount the battery on a rigid support structure, where leaks and accidental spills cannot damage the generator set, fuel lines, and wiring.

**⚠WARNING** *Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries give off explosive gas, install the battery in a separate compartment from the generator set and away from all flames, pilot light, arcing, or spark-producing devices.*

## Battery Connections

Make sure that the frame (ground) connection (major frame member if possible) is secure enough to minimize electrical resistance. Avoid making this connection at a weld or mechanical joint. On short cable runs, one negative battery cable may be connected between the genset and battery, rather than separate cables to chassis ground.

Route the battery cables between the set and its starting battery. Make sure that the cables are long enough, but do not connect them to the battery until instructed to do so in the *Installation Checks and Start-Up* section of this manual. Provide adequate support for the battery cables to avoid abrasion wear due to vibrations, when the boat is trailered.

**Positive (+) Battery Cable:** This cable connects to the start solenoid. Assemble the B+ terminal boot cover supplied in the accessory kit onto the generator end of the cable. Connect the B+ cable end to the starter solenoid terminal, tighten securely, and wire tie a terminal boot in place over the connection to insulate it.

**⚠CAUTION** *Failure to protect the B+ terminal can result in personal injury and/or equipment damage if an electrical short to the control casting occurs. See that the terminal connection is secure and that the boot protector is held properly in place.*

**Negative (-) Battery Cable:** Connects to the mounting plate. Use the same size cable for both positive and negative battery connections. Connect the negative (-) cable securely to a mounting plate fastener.

**⚠WARNING** *Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries give off explosive gas, always disconnect the negative (-) cable first, and connect it last to reduce the risk of arcing.*

# Section 8. Initial Start and Checks

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## **⚠WARNING**

### **EXHAUST GAS IS DEADLY!**

*Exhaust gases contain carbon monoxide, an odorless and colorless gas. Carbon monoxide is poisonous and can cause unconsciousness and death. Symptoms of carbon monoxide poisoning can include:*

- *Dizziness*
- *Nausea*
- *Headache*
- *Weakness and Sleepiness*
- *Throbbing in Temples*
- *Muscular Twitching*
- *Vomiting*
- *Inability to Think Coherently*

**IF YOU OR ANYONE ELSE EXPERIENCE ANY OF THESE SYMPTOMS, GET OUT INTO THE FRESH AIR IMMEDIATELY. If symptoms persist, seek medical attention. Shut down the unit and do not operate until it has been inspected and repaired.**

**Never sleep in boat cabin area with the generator set running unless the cabin interior is equipped with an operating carbon monoxide detector. Protection against carbon monoxide inhalation also includes proper exhaust system installation and visual and audible inspection of the complete exhaust system at the start of each generator set operation.**

## **PRE-START CHECKS**

Before starting the generator set, perform these steps:

1. Perform the Installation Review described in this section.
2. Add oil to the engine. See the Operator's Manual (publication 965-0132) for the oil type and quantity.
3. Check that battery terminals and cable connectors are clean and dry. Connect the positive (+) battery cable to the POS (+) battery post first, then connect the negative (-) battery cable to the NEG (-) battery post. Always connect the negative (-) battery cable last to reduce the risk of arcing.

**⚠WARNING** *Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries produce explosive gas, do not smoke or allow any arc-producing devices in the battery area. Do not disconnect cables from the battery while the generator set is cranking or running. This causes arcing and can result in an explosion.*

4. See the Operator's Manual, and note the features of the individual system. Open the fuel supply valves to the generator set.

## **INITIAL START-UP/INSPECTION**

### **Start Generator Set at Unit Control**

**⚠WARNING** *Exhaust gas presents the hazard of severe personal injury or death. Do not operate the generator set inside any room or building.*

1. Move the Start/Stop switch to the START position. The engine should crank and start. The unit might need more cranking at initial start than at subsequent starts to prime the fuel system. If the genset fails to start, see the *Troubleshooting Guide* in the Operator's Manual.
2. After the set starts, check for fuel leaks. If any leaks are found, stop the set immediately, close off the fuel supply and have the leak(s) repaired. Make sure that the fuel lines do not touch anything that can damage them.

**⚠WARNING** *Fuel presents the hazard of explosion or fire which can result in severe personal injury or death. If a fuel leak is found, stop the generator set, and have the leak repaired immediately.*



**⚠WARNING** *A hot generator set can cause severe burns. Always allow the generator set to cool before performing service.*

3. Examine the exhaust system for leaks. If any leaks are found, stop the set and have the exhaust system repaired immediately.

**⚠WARNING** *Exhaust gas presents the hazard of severe personal injury or death. Do not operate the generator set if it is excessively noisy. Have it inspected and repaired immediately by an authorized Onan service center.*

4. Perform the Break-In Procedure described in the Operator's Manual.
5. Move the unit Start/Stop switch to the STOP position to stop the genset.

#### **Start Generator Set at Remote Control**

1. Move the Remote Start/Stop switch to the START position. The engine should crank and start. If it

does not, see the *Troubleshooting Guide* in the Operator's Manual. Check all remote control connections, repair if necessary, and restart the set.

2. After the genset starts, check the battery condition meter (if equipped) to confirm its proper operation.
3. See the Operator's Manual for procedures to test set operation.
4. Operate the set with a normal load, monitoring fuel supply connections, exhaust system, set performance, and quality of noise reduction. If set performance is not acceptable, see the Service Manual for adjustment procedures, or contact an authorized Onan service center for assistance. If any genset systems require adjustment, disconnect the starting battery to prevent accidental start-up.

**⚠WARNING** *Accidental starting of the generator set during maintenance procedures can cause severe personal injury or death. Disconnect the generator set starting battery, negative (-) cable first, before performing maintenance.*

## INSTALLATION REVIEW

**⚠WARNING** *Incorrect installation, service, or parts replacement can result in severe personal injury, death, and/or equipment damage. Installing personnel must be qualified to perform electrical and mechanical component installations and service.*

Prior to initial start up of the generator set, check each of the following items. For a proper installation, each answer must be yes: if not, that aspect of the installation should be reworked or provision made to satisfy the requirement.

1. Is the exhaust deflector mounted over tailpipe?
2. Does the exhaust system extend to the perimeter of the pontoon boat, and does it not terminate below an openable window, door, or vent? Is the exhaust deflector baffle securely mounted over exhaust pipe end (outside of pontoon wall) and not restricting exhaust air flow?
3. Are all required exhaust clamps, hangers, and support straps in place per the Exhaust System section of this manual and the kit instructions?
4. Do the exhaust system hanger straps have double U-shaped rubber isolators?
5. Is the compartment metal-lined and sealed around all edges?
6. Is a flexible section of non-conducting fuel line installed between the fuel inlet and the fuel line from the tank?
7. Does the installation allow 1/2 inch (13 mm) free movement of the generator set on its mounts?
8. Are all fuel connections and hose clamps tight?
9. Are air inlet and exhaust openings clear and sufficiently sized (see Mounting section) for proper airflow?
10. Is the generator set protected from direct road splash from vehicle wheels (when being trailered)?
11. Can the following routine maintenance items be performed?
  - Change oil and filter
  - Adjust carburetor
  - Start/stop the unit
  - Change air filter
  - Operate AC circuit breakers
  - Change spark plugs
12. Are fuel lines and electrical wires run separately?
13. Are wiring holes into the inside of boat cabin (including the inside of AC conduit) sealed to prevent passage of exhaust gases?
14. Has a rubber boot been installed on battery plus (+) lead at the start solenoid connection in the control?
15. Are all electrical leads connected and protected, and is the conduit adequately supported?



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