



# Installation Manual

Cummins **Onan**

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## Marine Generator Set

MKY

 **WARNING:** 

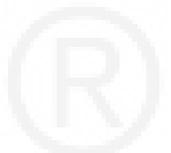
THE ENGINE EXHAUST FROM THIS PRODUCT  
CONTAINS CHEMICALS KNOWN TO THE STATE  
OF CALIFORNIA TO CAUSE CANCER, BIRTH  
DEFECTS OR OTHER REPRODUCTIVE HARM.



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# Safety Precautions

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Thoroughly read the **OPERATOR'S MANUAL** before operating the genset. Safe operation and top performance can be obtained only when equipment is operated and maintained properly.

The following symbols in this manual alert you to potential hazards to the operator, service person and equipment.

**⚠ DANGER** alerts you to an immediate hazard which will result in severe personal injury or death.

**⚠ WARNING** alerts you to a hazard or unsafe practice which can result in severe personal injury or death.

**⚠ CAUTION** alerts you to a hazard or unsafe practice which can result in personal injury or equipment damage.

When equipped with an integral or add-on Automatic Generator Starting System (AGS) control, exhaust carbon monoxide (CO), electric shock, and moving parts hazards are possible due to unexpected starting. Turn off AGS whenever performing maintenance or service, when the vehicle is stored between uses, is awaiting service, or is parked in a garage or other confined area.

## GENERAL PRECAUTIONS

- Keep ABC fire extinguishers handy.
- Keep children away from the genset.
- Make sure all fasteners are secure and torqued properly.
- To prevent accidental or remote starting while working on the generator set, press the Stop button and disconnect the battery cables at the batteries to prevent starting during maintenance and service. (Always disconnect negative [-] first and reconnect last to prevent sparks between tools and vehicle frame.)
- Keep the genset and its compartment clean. Excess oil and oily rags can catch fire. Dirt and gear stowed in the compartment can restrict cooling air.

- Before working on the genset, disconnect the negative (-) battery cable at the battery to prevent starting.
- Use caution when making adjustments while the genset is running—hot, moving or electrically live parts can cause severe personal injury or death.
- Used engine oil has been identified by some state and federal agencies as causing cancer or reproductive toxicity. Do not ingest, inhale, or contact used oil or its vapors.
- Benzene and lead in some gasolines have been identified by some state and federal agencies as causing cancer or reproductive toxicity. Do not ingest, inhale or contact gasoline or its vapors.
- Do not work on the genset when mentally or physically fatigued or after consuming alcohol or drugs.
- Carefully follow all applicable local, state and federal codes.

## GENERATOR VOLTAGE IS DEADLY!

- Generator output connections must be made by a qualified electrician in accordance with applicable codes.
- The genset must not be connected to the public utility or any other source of electrical power. Connection could lead to electrocution of utility workers and damage to equipment. An approved switching device must be used to prevent interconnections.
- Use caution when working on live electrical equipment. Remove jewelry, make sure clothing and shoes are dry and stand on a dry wooden platform.

## ENGINE EXHAUST IS DEADLY!

- Disable the automatic genset feature (AGS) of an inverter-charger or other automatic starting device before servicing the genset to avoid electric shock from an unexpected start.
- Learn the symptoms of carbon monoxide poisoning in this manual and never sleep in the boat while the genset is running unless the boat

is equipped with a working carbon monoxide detector.

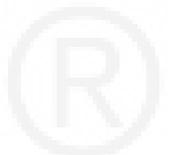
- The exhaust system must be installed in accordance with the genset Installation Manual. Engine cooling air must not be used for heating a cabin or other compartment.
- Inspect for exhaust leaks at every startup and after every eight hours of running.
- Make sure there is ample fresh air when operating the genset in a confined area.
- See *The Hazards of Carbon Monoxide* (Page 4). FUEL is FLAMMABLE AND EXPLOSIVE
- Do not smoke or turn electrical switches ON or OFF where fuel fumes are present or in areas sharing ventilation with fuel tanks or equipment. Keep flame, sparks, pilot lights, arc-producing equipment and all other sources of ignition well away.
- Fuel lines must be secured, free of leaks and separated or shielded from electrical wiring.

## **BATTERY GAS IS EXPLOSIVE**

- Wear safety glasses and do not smoke while servicing batteries.
- When disconnecting or reconnecting battery cables, always disconnect the negative (-) battery cable first and reconnect it last to reduce arcing.

## **MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH**

- Disable the automatic genset starting feature (AGS) of an inverter-charger or other automatic starting device before servicing the genset to avoid unexpected starting.
- Do not wear loose clothing or jewelry near moving parts such as PTO shafts, fans, belts and pulleys.
- Keep hands away from moving parts.
- Keep guards in place over fans, belts, pulleys, etc.



# The Hazards of Carbon Monoxide

Most people know not to run a car in the garage. Many people know about the threat of carbon monoxide poisoning in the house. But few people are aware that this invisible killer is even more dangerous aboard a boat.

Engine-driven generators can produce harmful levels of carbon monoxide that can injure or kill you. The nature of boating is such that you can be harmed by this poisonous gas despite good generator set maintenance and proper ventilation.

## WHAT IS CARBON MONOXIDE POISONING?

Carbon Monoxide (CO) is an odorless and colorless gas. You cannot see it or smell it. Red blood cells, however, have a greater affinity for CO than for Oxygen. Therefore, exposure even to low levels of CO for a prolonged period can lead to asphyxiation (lack of oxygen) resulting in death. Mild effects of CO poisoning include eye irritation, dizziness, headaches, fatigue and the inability to think clearly. More extreme symptoms include vomiting, seizures and collapse.

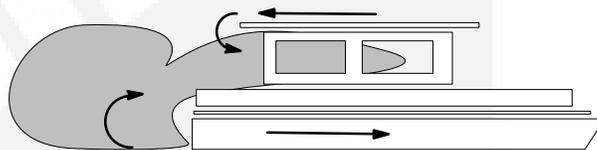
## WHAT ARE THE SPECIAL RISKS OF CO ON PONTOON BOATS?

Depending on air temperature and wind, CO can accumulate between the pontoons, under an overhanging deck or rear swimming platform and in and around the boat. A swimmer can be exposed to lethal levels of CO when the genset is running. Passengers on deck and in the living quarters can also be exposed, especially when the boat is docked, beached or tied to a neighboring boat.

The risk of exposure to CO can be multiplied greatly by the “station wagon” effect, obstructions that block exhaust dissipation, and infiltration from neighboring boats. To protect against all three situations,

Onan recommends that reliable CO detectors be installed on your boat.

- **The Station Wagon Effect** – A boat pushes aside the air through which it is moving, causing a zone of low pressure in the back of the boat and cabins into which exhaust gases can be drawn (see figure). A breeze across an anchored boat can have the same effect. Opening doors and windows so that air can flow through the boat can reduce the effect.



- **Obstructions** – Anchoring near a large object such as a boat house or sea wall or in a confined space such as a canyon can cause exhaust gases to accumulate in and around the boat despite good generator set maintenance and proper ventilation. Don't run the generator set when anchored in such places.
- **Exhaust from Neighboring Boats** – When boats are anchored in close quarters exhaust from neighboring boats can accumulate in and around yours.

## ONLY YOU CAN PROTECT YOURSELF FROM CO POISONING!

- Watch constantly for swimmers when the generator set is running.
- Make sure exhaust cannot get under the deck, between pontoons or enter the living quarters through a window, vent or door.
- Make sure all CO detectors are working.
- Pay attention to the signs of CO poisoning.
- Check the exhaust system for corrosion, obstruction and leaks each time you start the generator set and every eight hours if you run it continuously.

# Introduction

## ABOUT THIS MANUAL

This manual is a guide for the installation of the MKY Series of generator sets (gensets) in an enclosure on the deck of a pontoon boat. Proper installation is essential for safe, reliable and quiet operation. Read through this manual before starting the installation.

- Location, Mounting and Enclosure
- Exhaust Connections
- Fuel Connections
- Electrical Connections
- Startup

**⚠WARNING** *Improper installation can result in severe personal injury, death and equipment damage. The installer must be qualified to perform the installation of electrical and mechanical equipment.*

**⚠WARNING** *Gensets present hazards of asphyxiation, electrocution and fire. Because these hazards vary depending on many vessel-related factors, THIS UNIT MAY BE INSTALLED ONLY ON PONTOON BOATS. THE INSTALLATION MUST BE IN STRICT CONFORMANCE WITH THESE INSTRUCTIONS.*

**⚠WARNING** *Because wind, temperature, adjacent boats or structures and other environmental factors can affect exhaust gas travel, Onan strongly recommends installing a CO detector at the same time as this genset.*

For operation and maintenance see the Operator's Manual and for service the Service Manual.

**Note:** Manuals are updated from time-to-time to reflect changes in the equipment and its specifications. For this reason, only the copy of the installation manual supplied with the genset should be used as a guide for the installation.

## INSTALLATION CODES AND STANDARDS FOR SAFETY

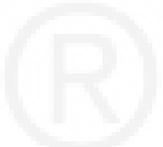
The pontoon boat builder bears sole responsibility for the selection of the appropriate genset, for its proper installation and for obtaining approvals from the authorities (if any) having jurisdiction over the boat.

As of the date of the publication of this manual no specific standards are known to exist for the installation of these gensets in the type of application outlined in this manual.

It is recommended, however, that the codes and installation standards in Table 1 be obtained for reference as a guide for the application and installation of the genset.

**TABLE 1. REFERENCE CODES AND STANDARDS**

NFPA No. 70 ( <i>National Electrical Code</i> ) and No. 302 ( <i>Pleasure and Commercial Motor Craft</i> )	National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210
USCG Code of Federal Regulations (CFR) Title 33, Chapter I, Part 183 & Title 46, Chapter I, Sub-Part 58.10-5	U. S. Government Printing Printing Office Washington, D. C. 20404
ABYC Standards and Recommended Practices for Small Craft	American Boat and Yacht Council, Inc. P. O. Box 747 Millersville, MD 21108



## TYPICAL GENSET

Figure 1 illustrates a typical genset. See OUTLINE DRAWING (Page 20) for installation details: mounting bolt hole locations, connection points (fuel, bat-

tery, remote control, AC output and exhaust), sizes and types of fittings, inlet and outlet air openings, weight and overall dimensions, etc. See your Onan dealer for large-scale copies of the drawings.

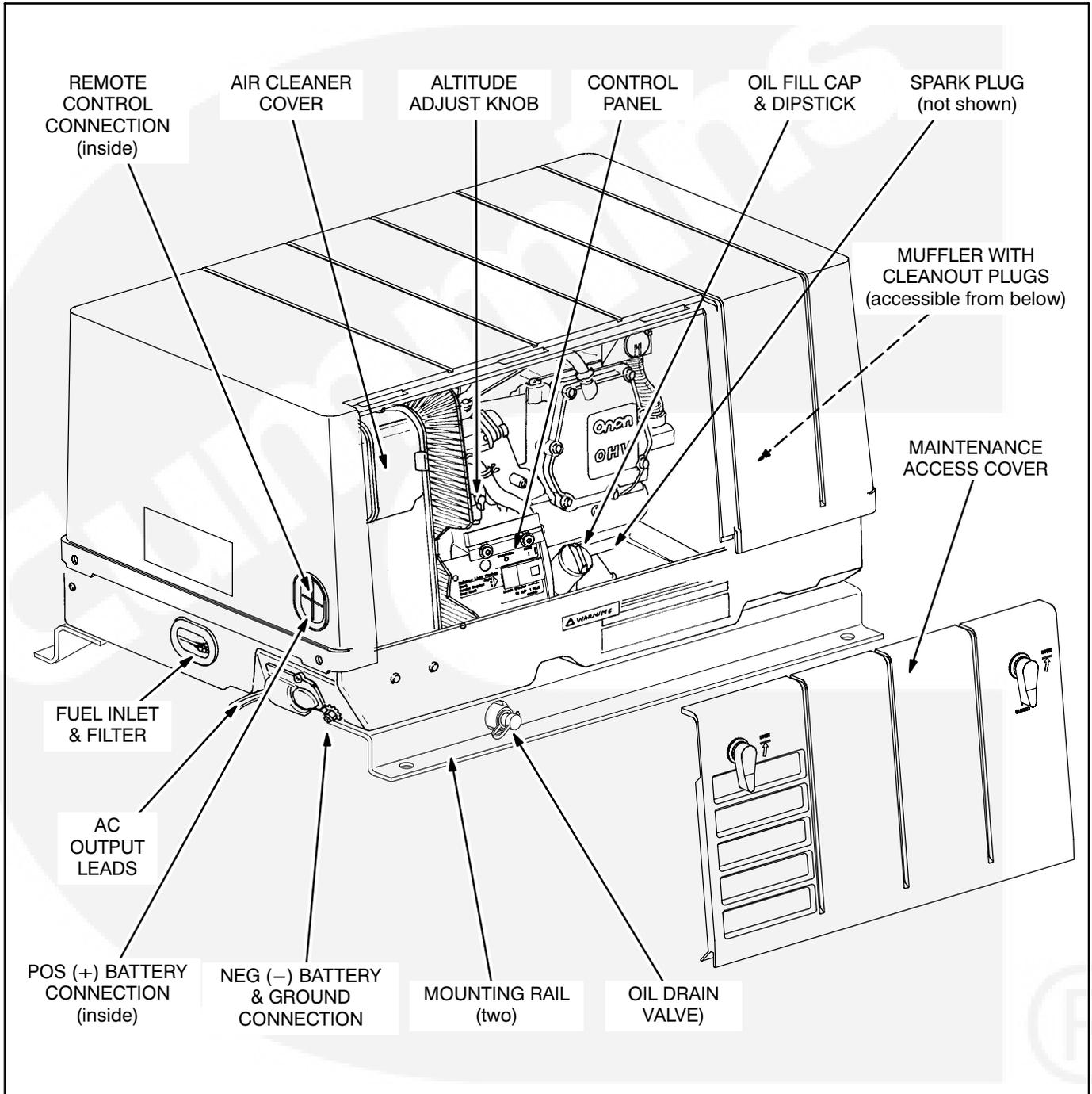


FIGURE 1. TYPICAL GENSET

# Location, Mounting and Enclosure

The genset must be isolated from the boat cabin to prevent the entrance of engine exhaust, gasoline vapors and noise. A genset enclosure, adjacent bulkheads or other boat equipment must not obstruct genset cooling air openings or interfere with operation or maintenance. Figure 2 illustrates deck locations for easy access and good dispersal of exhaust gases.

1. Support the genset on a structure able to resist the dynamic weight of the genset: cyclic forces of at least  $\pm 561$  lbs ( $\pm 3$  g-force) vertical and  $\pm 187$  lbs ( $\pm 1$  g-force) horizontal.
2. Gensets with 2 inch (50.8 mm) high mounting rails (Figure 1) are for mounting directly on a flat surface such as the deck. **The rails provide the clearance necessary for discharging genset cooling air out either end of the space between the genset, floor and rails (Figure 4).** Gensets not so equipped must be mounted on rails at least 2 inches (50.8 mm) high to provided for proper genset cooling.
3. If the genset is built into the boat cabin, a vapor-tight, fire-resistive barrier between the genset and the interior of the cabin must be provided. (Use 26 gauge galvanized steel or equivalent.) Do not use genset cooling air to heat the cabin.

**⚠ WARNING EXHAUST GAS AND FIRE ARE DEADLY. — Install a vapor-tight and fire-resistive barrier of approved materials between the genset and the cabin interior. — Do not duct genset cooling air into the cabin for heating.**

4. An operating genset can ignite flammable vapors. It must not share a compartment or ventilation with batteries or fuel tanks. Follow USCG regulations for ventilation (Code of Federal Regulations, Section 183, Subpart K, Ventilation) to create an installation that is “open to the atmosphere.” (Proper ventilation also alleviates high post-shutdown compartment temperatures and the nuisance of fuel vapor lock.)

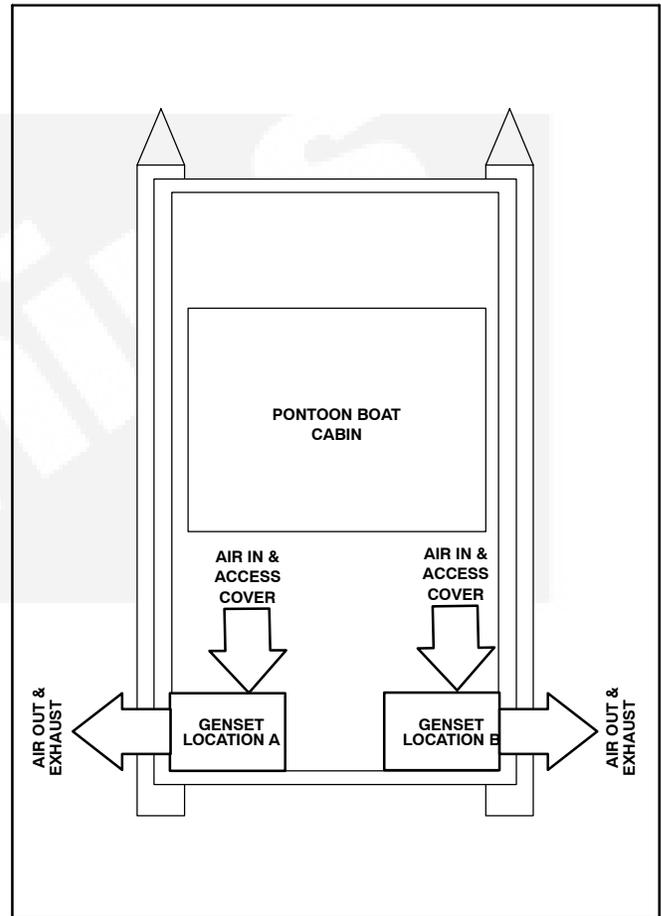
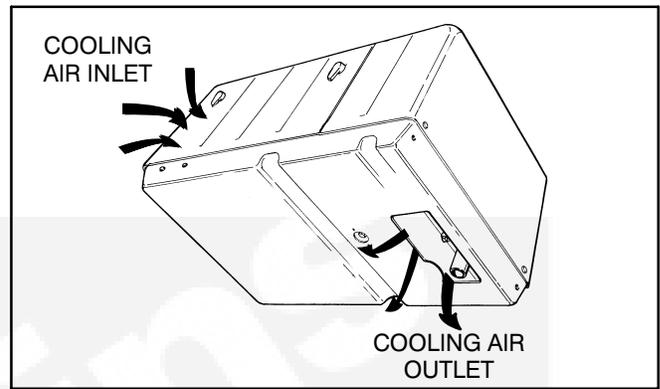
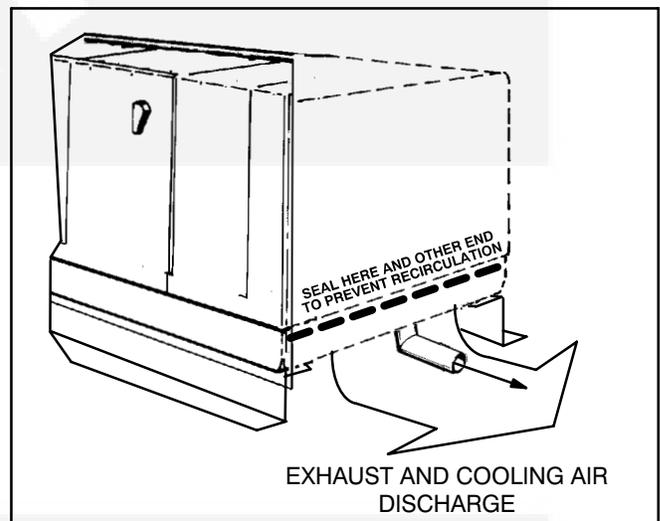


FIGURE 2. RECOMMENDED LOCATIONS

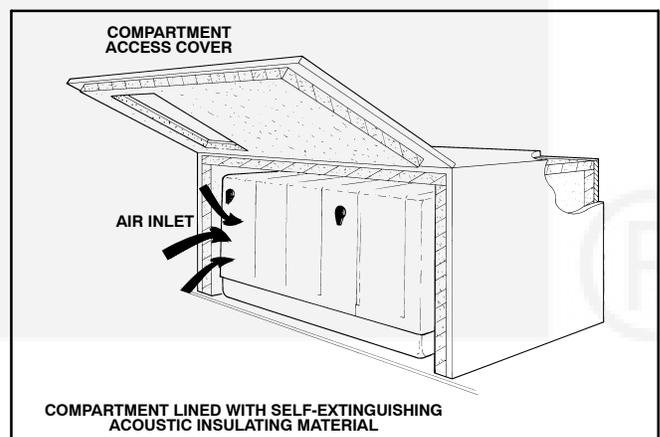
5. The genset must be located or shielded such that it is not wetted by rain, spray or waves at any boat speed or load.
6. The genset must be equipped with an accessible drain valve (Figure 1) or crankcase pump for periodic oil changes if the crankcase oil drain plug is not accessible after installation.
7. The spark arrestor cleanout plugs must be accessible for periodic cleaning (Figure 8).
8. The genset can be damaged by overheating if the compartment causes recirculation of warm air from the air outlet into the air inlet (Figure 3). The compartment should seal off one end or the other of the space between the floor, genset and mounting rails. All cooling air and exhaust should discharge out the other end and be sealed off from the compartment (Figure 4).
9. A minimum free-air inlet of 40 in<sup>2</sup> (258 cm<sup>2</sup>) is required for genset cooling. Grilles, louvers and other kinds of decorative treatments for air openings are restrictive. Contact the manufacturer of the decorative assembly or material to find out how large an opening is required to provide the minimum free-air area.
10. Size a genset enclosure or compartment such that:
  - A. There is access to the fuel, AC output, battery and remote control connections on the left side of the genset (Figure 1). At least 1 inch (25 mm) clearance is required.
  - B. There is clearance all around. At least 1/4 inch (6 mm) is required around the sides of the genset and 1 inch (25.4 mm) at the top. The clearances apply to acoustic insulation as well (Figure 5).
  - C. There is at least 1-1/2 inch (38 mm) clearance at the front of the compartment if the compartment air inlet does not line up with the genset air inlet. (Staggering the openings to reduce line-of-sight noise usually results in a larger compartment.)
11. Acoustic insulation and adhesive (Figure 5) should be Classified as “Self-Extinguishing” at not less than 200°F (90°C). Do not line the bottom of the compartment with insulation—insulation absorbs spilled fuel and oil.



**FIGURE 3. GENSET COOLING AIR INLET AND OUTLET OPENINGS**



**FIGURE 4. TYPICAL DISCHARGE OF EXHAUST AND COOLING AIR**



**FIGURE 5. COMPARTMENT WITH ACOUSTIC INSULATION**

# Exhaust Connections

The exhaust system must be gas-tight and designed to prevent entry of exhaust gases into the boat cabin or under the boat (between the pontoons).

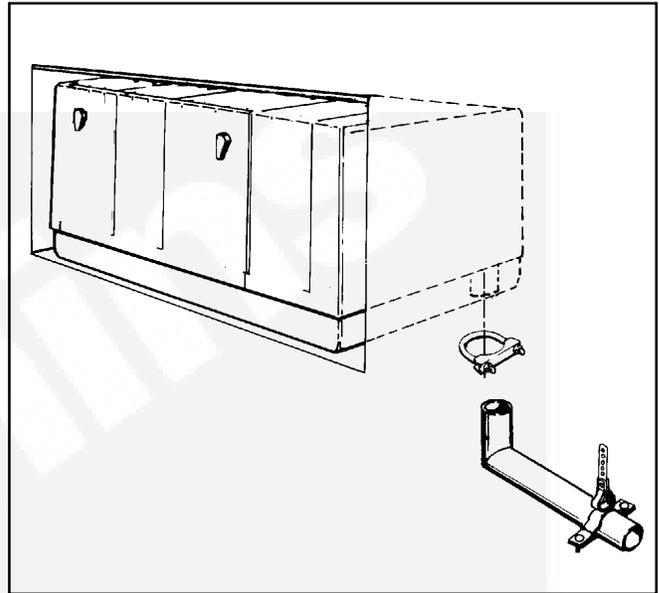
**⚠WARNING** ***EXHAUST GAS IS DEADLY! Do not terminate the exhaust tailpipe underneath the boat (between the pontoons) or near swimming platforms, slides or ladders or where exhaust could enter through doors, windows or vents. Use approved materials and parts only.***

The genset is equipped with a muffler that is approved by the U.S. Forest Service and other codes as a spark-arrest muffler. (Failure to provide and maintain a spark arrestor can be a violation of the law.) Liability for damage, injury and warranty expense due to the modification of the exhaust system or to the use of unapproved parts becomes the responsibility of the person performing the modification or installing the unapproved parts. Contact an Onan dealer for approved exhaust system parts.

The muffler is mounted inside the genset. It has a tailpiece, accessible through the bottom air discharge opening, to which the customer-supplied tailpipe is to be clamped (Figure 6). When routing and connecting the tailpipe:

1. Use 18-gauge 1-1/8 inch I. D. aluminized steel tubing or material of equivalent heat and corrosion resistance for the tailpipe. (Do not use flexible pipe; it is neither gas tight nor durable.) Clamp the tailpipe to the muffler tailpiece with an automotive-type U-bolt muffler clamp. Support a tailpipe longer than 1-1/2 feet (457 mm) near its end and at intervals of 3 feet (900 mm) or less. Use automotive-type tailpipe hangers. Attach the hangers to metal framework, not to wood or other combustible material.

See OUTLINE DRAWING (Page 20) for the location of a 5/16-18NC threaded hole in the base of the genset for attaching a tailpipe hanger. The length of the screw used must be such that it will not extend more than 1/2 inch (12 mm) into the genset.

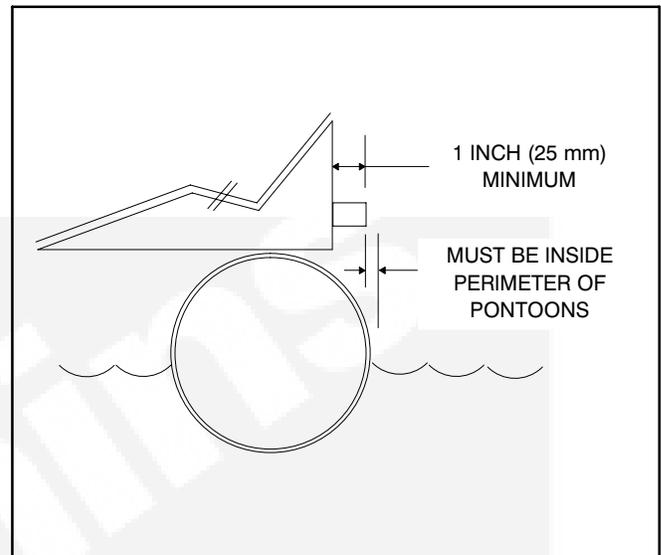


**FIGURE 6. EXHAUST CONNECTIONS AT GENSET**

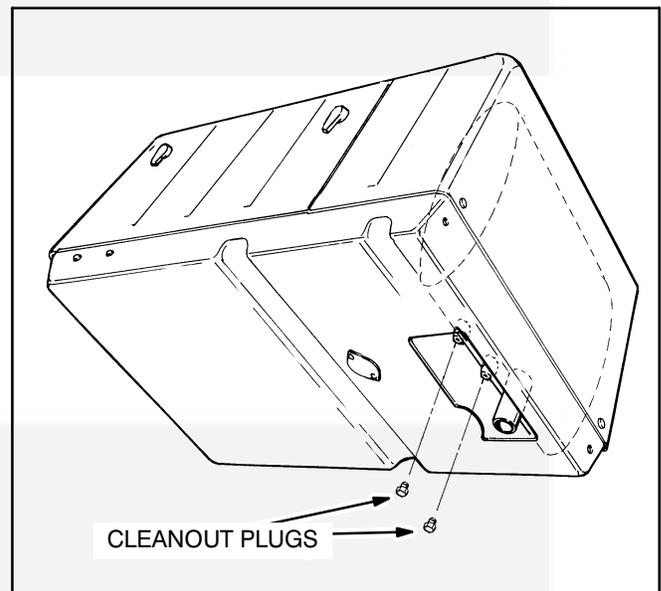
2. Do not route the tailpipe closer than 9 inches (229 mm) to combustible material (wood, felt, cotton, organic fibers, etc.) unless it is insulated or shielded. The temperature rise (above ambient) on adjacent combustible material must not exceed 117°F (65°C).
3. Do not route the tailpipe such that it will interfere with draining engine oil or restrict the air outlet.
4. Do not route the tail pipe near fuel lines or fuel tanks.
5. Do not terminate the tailpipe underneath the boat. Extend it a minimum of 1 inch (25 mm) beyond the perimeter of the boat deck (Figure 7) but inside the perimeter of the pontoons, for protection against damage from piers and other boats.
6. Do not terminate the tailpipe such that it is closer than 6 inches (153 mm) to any opening into the boat interior (door, window, vent).
7. Make sure a tailpipe deflector will not cause excessive back pressure.

**⚠ CAUTION** *Excessive back pressure can cause engine damage.*

8. The spark arrestor cleanout plugs must be accessible for periodic spark arrestor cleaning (Figure 8). See the OUTLINE DRAWING (Page 20) for the locating dimensions.



**FIGURE 7. TERMINATING THE EXHAUST TAILPIPE**



**FIGURE 8. SPARK ARRESTOR CLEANOUT PLUGS**

# Fuel Connections

See the Operator's Manual for recommended fuels and *Specifications* for fuel consumption rates.

**⚠️WARNING** *Gasoline is flammable and explosive and can cause severe personal injury or death. Do not smoke or allow any flame, spark, pilot light, arc-producing equipment, switches or other ignition sources around fuel or fuel components, or in areas sharing ventilation. Keep a type ABC fire extinguisher nearby.*

Either use a separate fuel pickup tube for the genset or a separate fuel tank. Do not connect the genset fuel line to the propulsion engine fuel line. Contact the fuel tank manufacturer regarding multiple fuel pickups on a tank.

**⚠️CAUTION** *Either or both engines could starve for fuel if the genset and propulsion engine fuel lines are interconnected. Always use separate fuel lines or a separate fuel tank for the genset.*

To prevent the genset from running the boat out of fuel, do not extend the genset fuel pickup tube down into the fuel tank as far as the pickup tube for the propulsion engine.

The fuel supply tank filler cap should relieve pressure at not more than 1-1/2 psi to prevent flooding the genset engine with fuel.

**⚠️WARNING** *Excessive fuel pressure can flood the genset causing a fire. Genset fuel supply line pressure must not exceed 1-1/2 psi under any condition.*

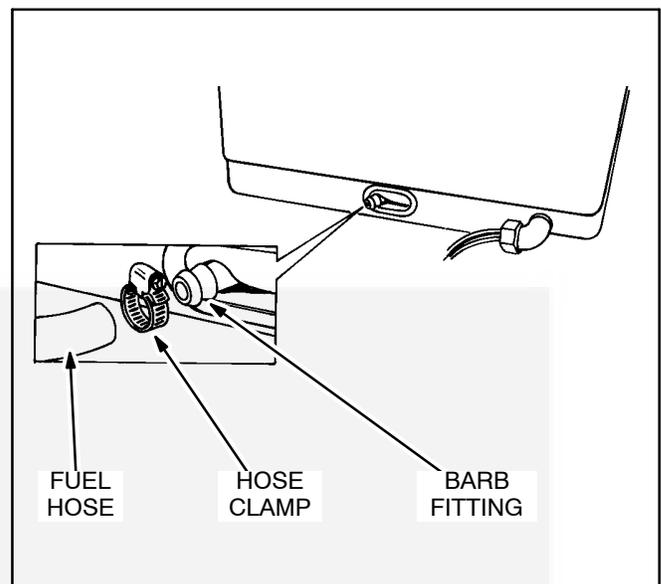
For long runs, copper or hot dip coated seamless steel tubing (ASTM A-254) with double-flared fittings should be used. See Figure 9 for the connec-

tion at the genset. Use 1/4 inch I. D. fuel hose (SAE 30-R7) and a stainless steel hose clamp.

Run the fuel line at or above the top of the fuel tank to reduce the risk of siphoning fuel out of the tank if the line should break. The maximum fuel pump lift is 36 inches (914 mm).

Route fuel lines away from electrical wiring and hot engine exhaust components. Fuel lines should be accessible for inspection and replacement, protected from damage and secured to prevent kinking, contact with sharp edges and chafing due to vibration.

**⚠️WARNING** *Sparks can ignite gasoline, leading to severe personal injury or death. Do not run electrical wiring and fuel lines together. Separate them with conduit or tubing if run through the same opening. Do not tie them together.*



**FIGURE 9. FUEL CONNECTION AT GENSET**

# Electrical Connections

Do not connect the battery cables to the battery until *Installation Review and Startup* (Page 18) to prevent accidental starting of the genset during installation.

**⚠WARNING** *Accidental starting of the genset can cause severe personal injury or death. Do not connect the starting battery until *Installation Review and Startup* (Page 18).*

## GENERATOR CONNECTIONS

The genset is equipped with 126 inch (3.2 m) long AC power output leads which exit through a 1/2 inch trade size conduit connector (Figure 10). See Figure 11 for typical connections.

*If these leads must be replaced by longer leads, make sure their ampacity, as determined by the appropriate chart in the National Electrical Code (NEC), is at least 115 percent of the amps marked on the genset circuit breaker. (Unless 125° C rated wiring is available, heavier gauge wiring may be required to obtain the required ampacity.)*

### Wiring Methods

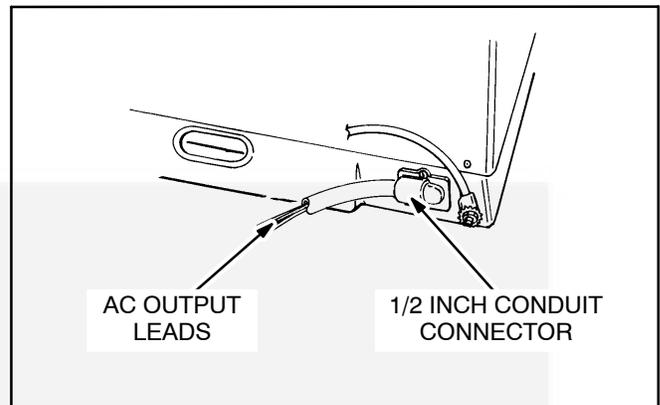
Follow the National Electrical Code, especially noting the following:

1. Have a qualified electrician supervise and inspect the installation of all AC wiring.
2. Install vibration-proof switches and controls that won't open and close circuits when the boat is in motion.
3. Provide ground fault circuit interrupters (GFCIs) for all convenience power receptacles.

4. Route AC wiring, remote control wiring and fuel lines separately.
5. Seal all conduit openings into the boat interior to keep out exhaust gas. Apply silicone rubber or an equivalent type of sealant inside and outside each conduit connector. (Flexible conduit is not vapor-tight and will allow exhaust gas to enter along the wires if not sealed.)
6. Bond the genset and all connected AC and DC equipment and controls to a common grounding point in accordance with applicable codes.

**⚠WARNING** *EXHAUST GAS IS DEADLY! Seal all wiring openings into the boat interior to keep out exhaust gas.*

**⚠WARNING** *Faulty grounding can lead to fire and electrocution, resulting in severe personal injury or death. Grounding must be in accordance with applicable codes.*



**FIGURE 10. AC POWER OUTPUT LEADS**

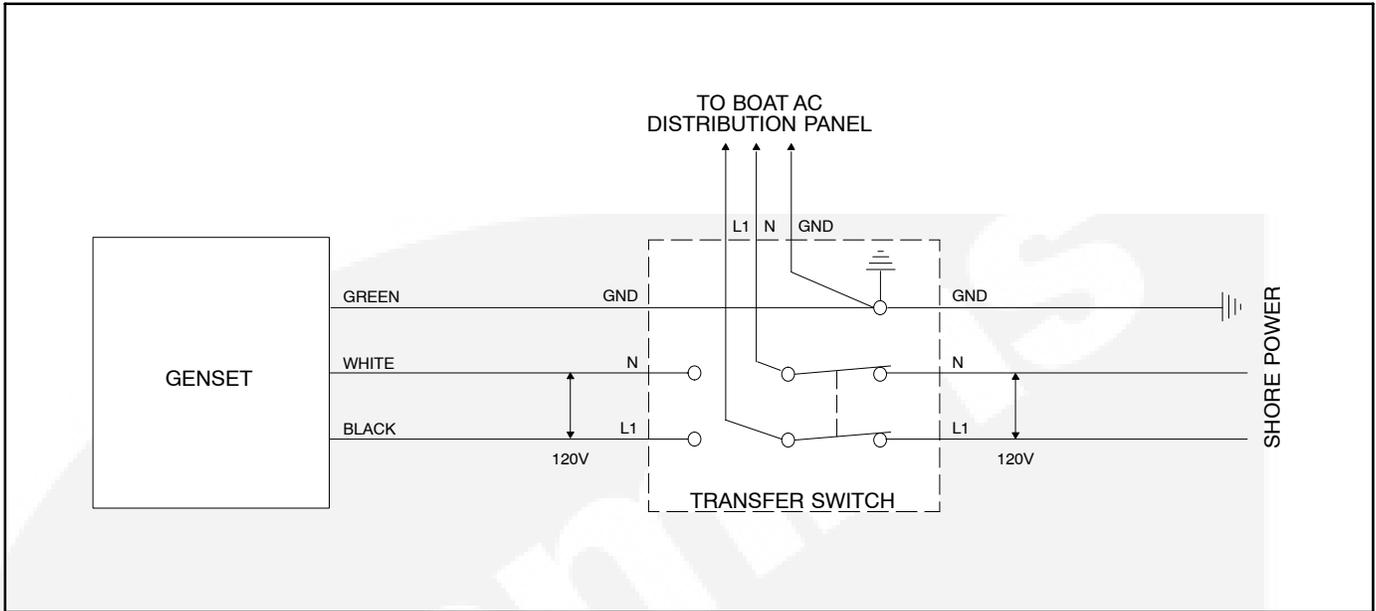


FIGURE 11. TYPICAL CONNECTIONS WITH TRANSFER SWITCH AND SHORE POWER

### Connecting The Boat To Shore Power

When the boat has provision for connecting shore power it must have an approved device to keep the genset and utility from being interconnected. See Figure 11 for typical connections.

**⚠️WARNING** *Interconnecting the genset and the public utility (or any other power source) can lead to the electrocution of personnel working on the utility lines, damage to equipment and fire. An approved switching device must be used to prevent interconnections.*

### Genset Reconnections

Some models are reconnectable for the required voltage in accordance with the appropriate reconnection diagram (Page 23). Remove the control panel for access to the generator leads and circuit breaker terminals.

Check voltage after reconnections and adjust no-load voltage as necessary with the adjustment pot on the control panel (Figure 12).

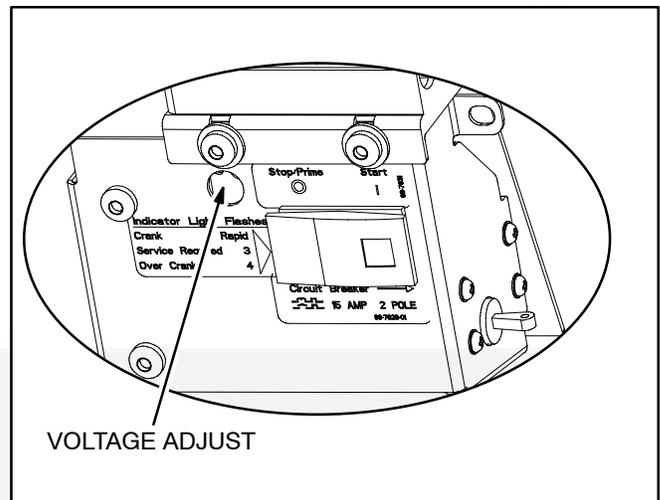


FIGURE 12. AC VOLTAGE ADJUST (50HZ)

## REMOTE CONTROL CONNECTIONS

Onan offers three varieties of remote control panel:

- Remote start/stop switch with status indicator light only (Figure 13).
- Remote start/stop switch with status indicator light and hour meter (Figure 14).
- Remote start/stop switch with status indicator light and DC voltmeter (Figure 15).

The genset has an 8-pin connector for remote control connections (Figure 16). Remote control wiring harnesses in several lengths are available separately. To make connections to a remote control panel:

1. Push the remote control wire harness connector through the entrance hole in the side of the genset housing and snap it together with the genset connector. If the wiring harness is made up by others, insulated 18 AWG copper conductors should be used for distances up to 30 feet (9 meters) and heavier gauge conductors for distances that are greater. Use flexible sheathing to protect remote control wiring. Figure 17 is a schematic of typical remote control connections. It identifies the function of each connector pin number. The remote panel end of each lead should be marked to identify the connector pin number.
2. Route control leads separately from AC power leads to reduce the possibility of erratic operation due to false induced signals.
3. Seal the opening where the leads enter the cabin interior with silicone rubber or an equivalent type of sealant to keep out exhaust gas.

**⚠️WARNING** **EXHAUST GAS IS DEADLY!**  
**Seal all wiring openings into the cabin interior to keep out exhaust gas.**

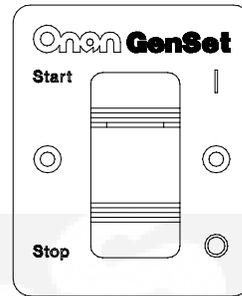


FIGURE 13. REMOTE CONTROL

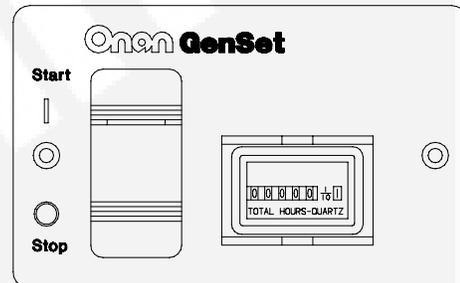


FIGURE 14. REMOTE CONTROL / HOUR METER

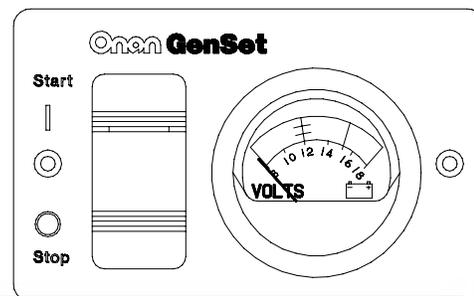


FIGURE 15. REMOTE CONTROL / DC VOLTMETER

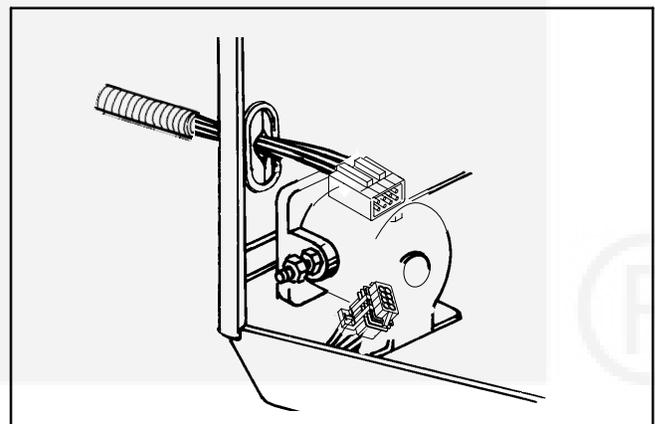


FIGURE 16. REMOTE CONTROL CONNECTOR

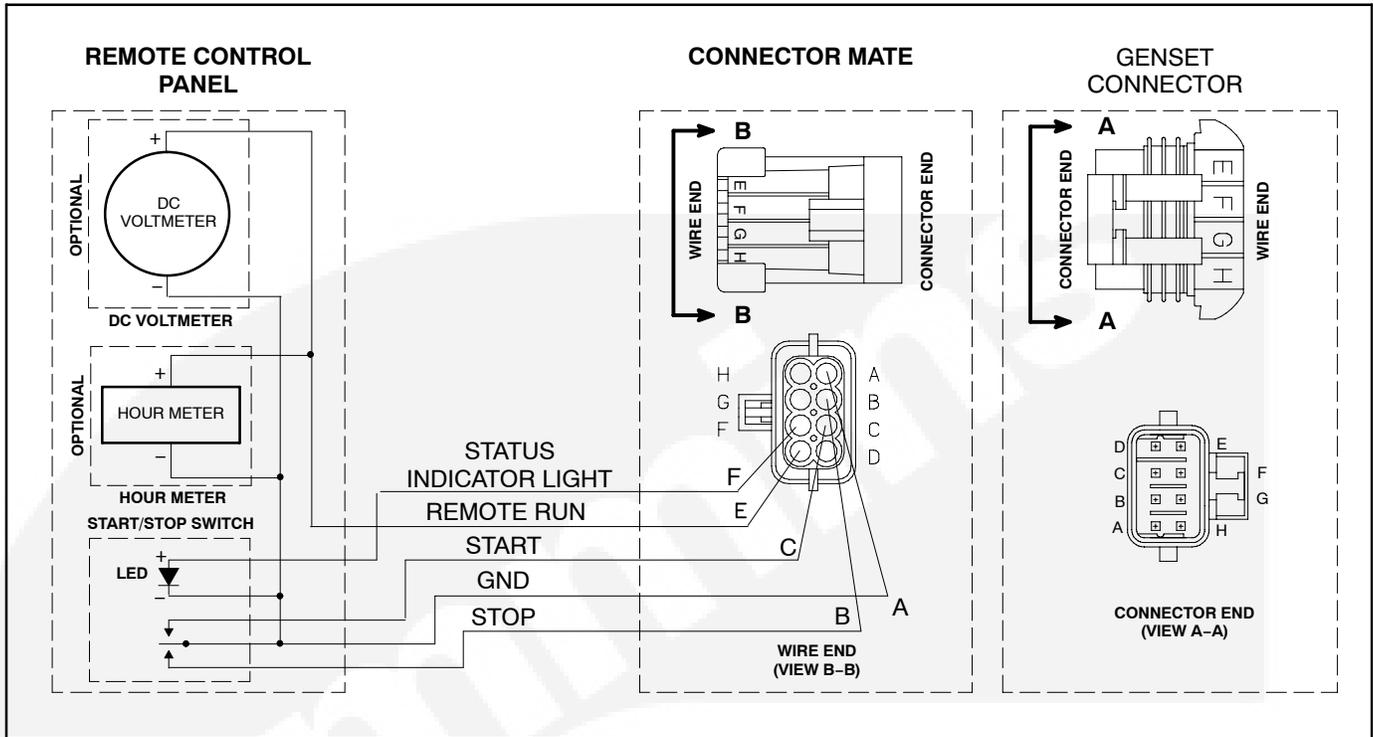


FIGURE 17. SCHEMATIC OF TYPICAL REMOTE CONTROL CONNECTIONS

## BATTERY CONNECTIONS

Do not connect the battery cables to the battery until *Installation Review and Startup* (Page 18) to prevent accidental starting of the genset during installation.

**⚠️WARNING** *Accidental starting of the genset can cause severe personal injury or death. Do not connect the starting battery until Installation Review and Startup (Page 18).*

The genset has a 12 VDC, negative-ground engine control and cranking system. See *Specifications* for the requirements for cranking batteries.

## Battery Compartment

Batteries must be mounted in a separate compartment from that of the genset and away from spark-producing equipment. A compartment must have openings of at least 1.7 square inches (11 square centimeters) at the top and bottom for ventilation of battery gasses. It should be mounted such that spills and leaks will not drip acid on fuel lines, wiring and other equipment that could be damaged.

**⚠️WARNING** *Arcing can ignite the explosive hydrogen gas given off by the battery, causing severe personal injury. The battery compartment must be ventilated and must isolate the battery from spark-producing equipment.*

## Battery Cables

Size battery cables according to Table 2. The current path between the genset and the negative (-) battery terminal must also be able to carry full cranking current without causing excessive voltage drop. It is highly recommended that a full-length cable be used to connect the genset to the negative (-) battery terminal (Figure 18). Note also that codes may require bonding conductors from the genset and the battery to the vehicle frame.

Route battery cables away from fuel lines and hot engine exhaust components. Battery cables should be accessible for inspection and replacement, protected from damage and secured to prevent chafing due to vibration.

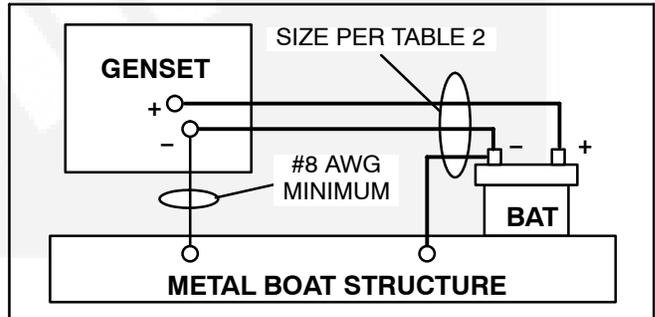
**⚠WARNING** *Routing battery cables with fuel lines can lead to fire and severe personal injury or death. Keep battery cables away from fuel lines.*

Terminate the battery cables with appropriately sized eyelet connectors and connect them to the genset as shown in Figure 19.

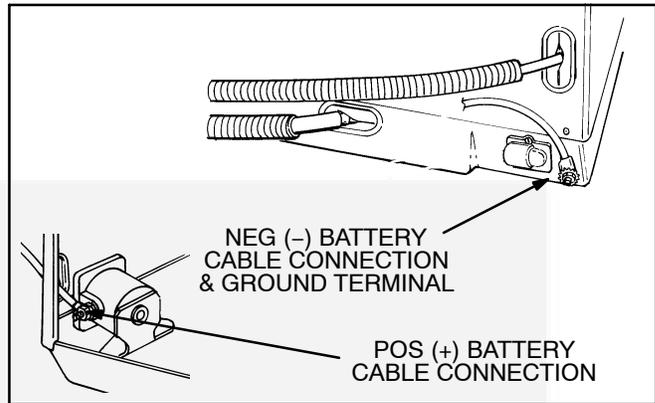
**TABLE 2. BATTERY CABLE SIZES FOR TEMPERATURES DOWN TO -20° F (-29°C)**

TOTAL CABLE LENGTH* FEET (METERS)	CABLE SIZE AWG
0 to 10 (0 to 3)	2**
11 to 15 (3 to 4.5)	0
16 to 20 (4.5 to 6)	000

\* - Add the negative battery cable lengths with the positive battery cable lengths for the total.  
\*\* - A total length of up to 20 feet (6 meters) may be used in warmer climates or when battery capacity totals at least 1000 CCA (Cold Cranking Amps).



**FIGURE 18. FULL-LENGTH CABLE FROM BATTERY NEGATIVE (-) TERMINAL**



**FIGURE 19. BATTERY CABLE CONNECTIONS**

# Specifications

	4MKY	3.6MKY
<b>GENERATOR:</b> 2-Pole Revolving Field, Self-Excited, 1-Phase, Microprocessor Regulated		
Power	4000 watts	3600 watts
Frequency	60 Hertz	50 Hertz
Voltage	120 volts <sup>1</sup>	230 volts <sup>1, 2</sup>
Current	33.3 amperes	15.7 amperes
Speed	3600 rpm	3000 rpm
<b>FUEL CONSUMPTION:</b>		
No load	0.29 gph (1.1 l/h)	0.21 gph (0.79l/h)
Half load	0.48 gph (1.8 l/h)	0.37 gph (1.4 l/h)
Full load	0.71 gph (2.7 l/h)	0.58 gph (2.2 l/h)
<b>ENGINE:</b> 1-Cylinder, 4-Stroke Cycle, Spark-Ignited, OHV, Air Cooled, Mechanically Governed		
Bore	3.11 inch (79 mm)	
Stroke	2.44 inch (62 mm)	
Displacement	18.5 inch <sup>3</sup> (304 cc)	
Compression Ratio	8.5 : 1	
Oil Capacity**	1.6 quart (1.5 l)	
Intake Valve Lash (Cold)	0.002 inch (0.05 mm)	
Exhaust Valve Lash (Cold)	0.002 inch (0.05 mm)	
Spark Plug Tightening Torque	13 lbs-ft (17 N-m)	
Ignition Timing (magneto)	25° BTDC, non-adjustable	
Magneto Air Gap	0.009-0.015 inch (0.23-0.38 mm)	
Spark Plug Gap	0.025 inch (0.64 mm)	
<b>DC SYSTEM:</b>		
Nominal Battery Voltage	12 volts	
Minimum Battery Rating: Cold Cranking Amps (CCA) @ 0°F (-18°C)	450	
Battery Charging Current	-	10 amp, regulated voltage
<b>INSTALLATION:</b>		
Weight of Genset (with engine oil)	187 pounds (85 Kg)	
Minimum Compartment Size (H x D x W) <sup>3</sup>	16.4 inch x 20.6 inch x 30.5 inch (420 mm x 523 mm x 775 mm)	
Minimum Free Air Inlet Area	40 inch <sup>2</sup> (258 cm <sup>2</sup> )	
Muffler Outlet Collar O. D.	1.13 inch	
Fuel Connection	1/4 inch barb fitting for gasoline hose	
1. Also available for 100 volts, with grounded or isolated neutral. 2. Reconnectable. See the Installation Manual. 3. See the Installation Manual for additional considerations when sizing the genset compartment.		

# Installation Review and Startup

## INSTALLATION REVIEW

Before starting the genset inspect the installation and check (✓) each of the following questions if it can be answered "YES". If an item cannot be checked, provision must be made to satisfy the requirement.

- [ ] Is the control panel on the genset easily accessible for starting and stopping the genset and resetting the circuit breaker?
- [ ] Is there easy access for checking and adding engine oil, replacing the spark plug and changing the air filter?
- [ ] Is the genset securely bolted in place?
- [ ] Are all specified clearances provided?
- [ ] Are the air inlet and outlet openings free of obstructions?
- [ ] Is there access for draining engine oil?
- [ ] Are all tailpipe connections tight and all hangers and support straps secure?
- [ ] Does the tailpipe terminate at least 1 inch (25 mm) beyond the perimeter of the vehicle and at least 6 inches (153 mm) away from any opening into the vehicle?
- [ ] Is the genset located outside the vehicle interior or separated by approved vapor-tight and fire-resistive materials?
- [ ] Are all openings into the vehicle, such as for AC wiring, sealed to keep out engine exhaust? Are AC conduit connectors sealed inside and outside?
- [ ] Have all AC connections been inspected and approved?
- [ ] Has a properly sized battery for genset starting and control been installed in a ventilated compartment isolated from the genset?
- [ ] Have properly sized battery cables been installed and secured at sufficient intervals to prevent chaffing and contact with sharp edges, fuel lines and hot exhaust parts?
- [ ] Are all fuel connections tight?

- [ ] Has the fuel line been secured at sufficient intervals to prevent chaffing and contact with sharp edges, electrical wiring and hot exhaust parts?

## STARTUP

When all the items on the Installation Review check list have been checked, connect the battery cables to the battery, positive (+) cable first.

**⚠ WARNING** *Batteries give off explosive gases that can cause severe personal injury. Do not smoke near batteries. Keep flames, sparks, pilot lights, electrical arcs and arc-producing equipment and all other ignition sources well away.*

Read the Operator's Manual and perform the maintenance and pre-start checks instructed. The genset is shipped from the factory with the proper level of engine oil, which should nevertheless be checked before the genset is started. Start and operate the genset, following all the instructions and safety precautions in the Operator's Manual.

**⚠ WARNING** *EXHAUST GAS IS DEADLY! Do not operate the genset when the vehicle is indoors or where exhaust can accumulate.*

Check for fuel and exhaust leaks and unusual noises while the genset is running under full and intermediate loads. Do not place the genset in service until all fuel and exhaust leaks have been fixed and operation is satisfactory.

## HOT AIR RECIRCULATION TEST

A representative installation of the genset must be tested to determine that the genset will not overheat due to recirculation of hot air back into the genset.

### Test Method

1. Complete a representative installation.
2. Set up a load bank to run the genset at rated full-load.
3. Conduct the test at a location where the ambient air temperature will remain between 60°F and 100°F (16°C and 38°C).

**⚠WARNING EXHAUST GAS IS DEADLY! Do not operate the genset when the vehicle is parked indoors or where exhaust can accumulate.**

4. Measure temperatures with thermocouples not heavier than No. 24 AWG (0.21 mm<sup>2</sup>).
  - A.. Measure genset inlet air temperature with one thermocouple tied in the middle of the inlet air grille (Figure 20).
  - B.. Measure ambient air temperature with a shielded thermocouple within 4 feet (1.2 meters) of the genset and at approximately the same height. Make sure the thermocouple will not be affected by warm air discharged from the genset or by sunlight. Use 2 inch diameter white PVC piping at least 6 inches long as a thermocouple shield.
5. Close all compartment doors and run the genset at full-load for at least an hour. Record temperatures at 15 minute intervals until they stabilize. Temperature is considered stable when there is no change in three consecutive read-

ings. Table 2 illustrates how the data can be arranged for recording and analysis.

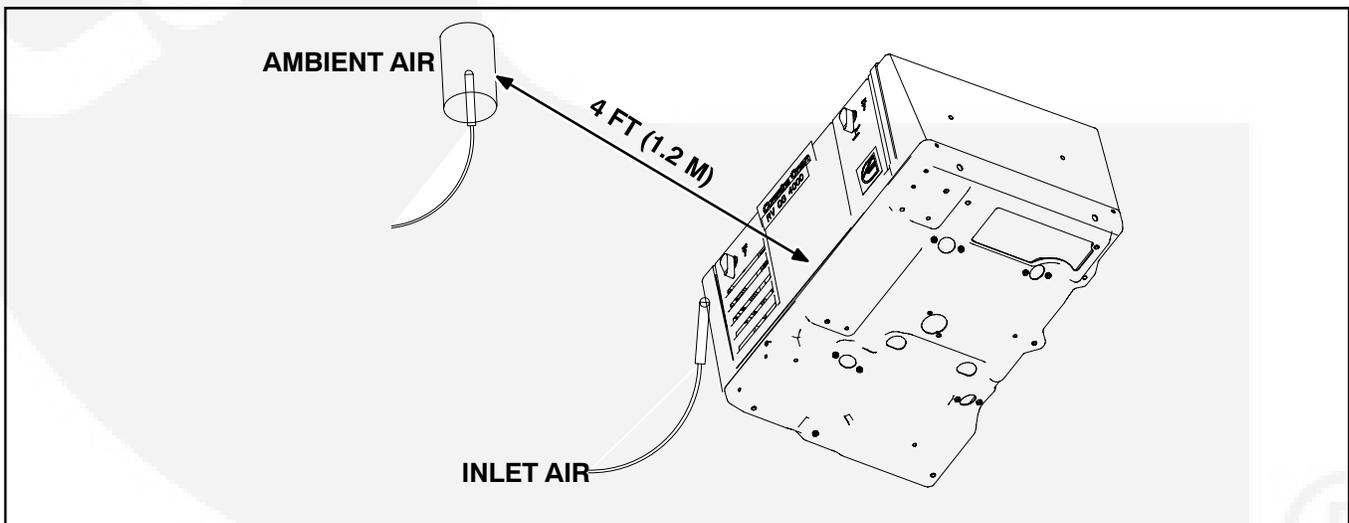
**TABLE 2. TEMPERATURE DATA**

THERMOCOUPLE LOCATION	TEMPERATURE C° (F°)				
	Time Of Reading				
AMBIENT AIR					
INLET AIR					

**Test Requirement**

The rise in inlet air temperature over ambient air temperature must not exceed 15°F (8°C). A rise in inlet air temperature indicates hot air recirculation. If the rise exceeds the requirement, steps must be taken to reduce recirculation to an acceptable level. Review VENTILATION (Page 8).

**⚠CAUTION High ambient operating temperatures could reduce maximum genset power output if the air temperature rise measured in this test is on the high end of the acceptable range. This guide is for air flow testing only and does not completely verify Cooling for generators that use both air and liquid cooling systems.**



**FIGURE 20. THERMOCOUPLE LOCATIONS FOR HOT AIR RECIRCULATION TEST**

NOTES:

- PRIMARY DIMENSIONS ARE IN MILLIMETERS.
- COMPARTMENT ACCESS SHALL ALLOW REMOVAL AND REPLACEMENT OF SERVICE DOOR AND ACCESS TO THE FOLLOWING SERVICEABLE COMPONENTS.

START-STOP SWITCH, FUSE, CIRCUIT BREAKER, OIL FILL AND CHECK AIR CLEANER ELEMENT, IDLER STOP AND CHOKE ADJUSTMENTS, SPARK PLUG, VALVE COVER, START SOLENOID

- MIN UNIT CLEARANCE FROM COMPARTMENT SURFACES:

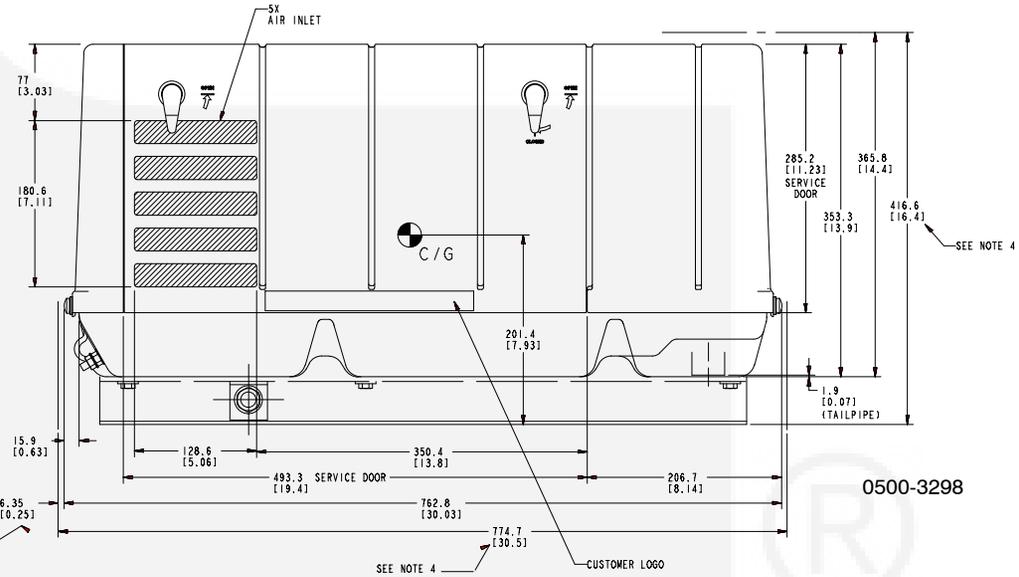
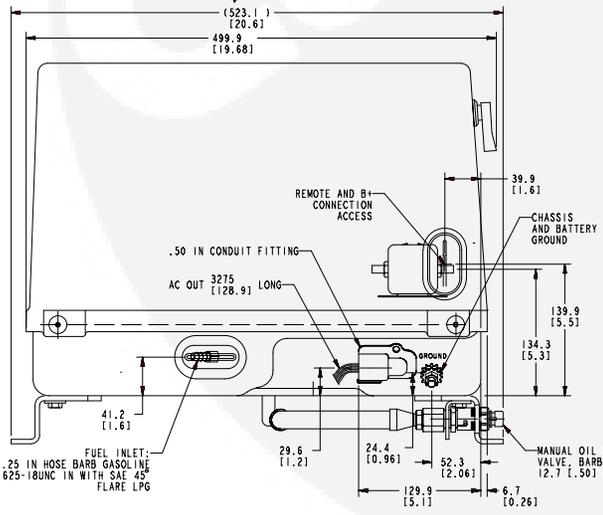
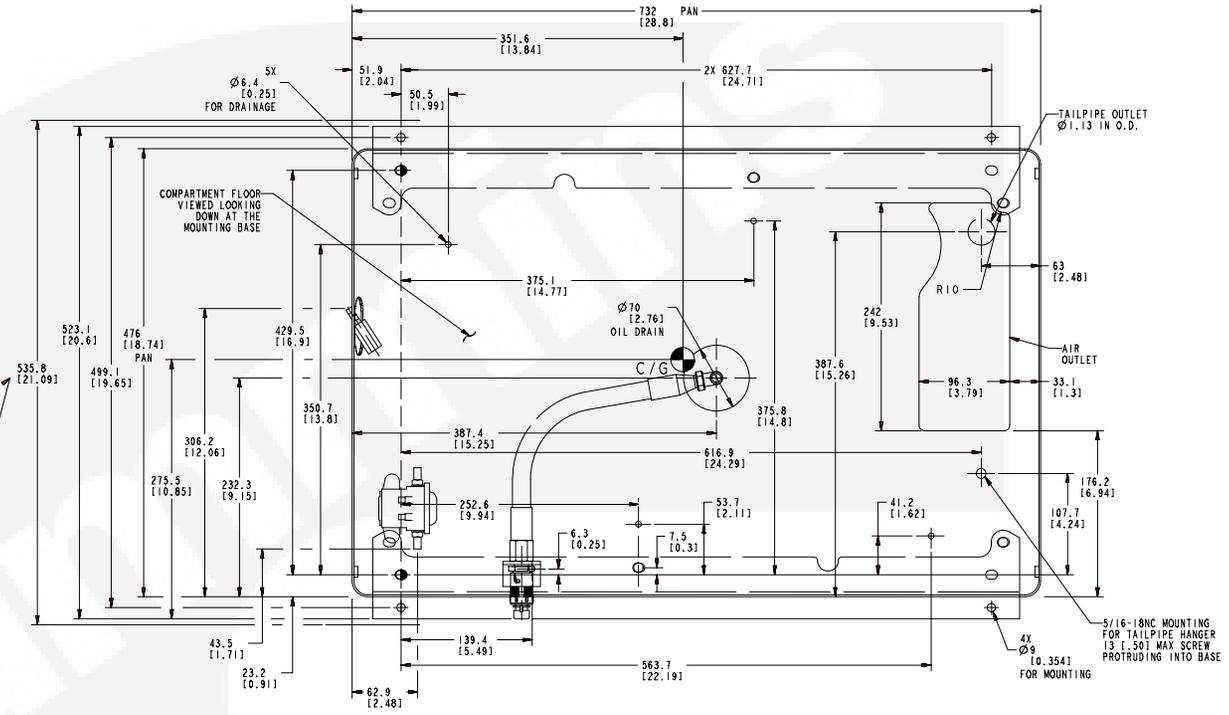
TOP	12.5	.50	IN
ENGINE END	6.4	.25	IN
GEN END	6.4	.25	IN
SERVICE SIDE **	6.4	.25	IN
BACKSIDE	6.4	.25	IN
MIN FREE AIR			
INLET	258CM <sup>2</sup>	40IN <sup>2</sup>	
UNIT WEIGHT WITH OIL	187	LB	

- SERVICE SIDE CLEARANCE OF .25 IN REQUIRES DIRECT ALIGNMENT OF SET AIR INLET AND OPENING IN ACCESS DOOR.

IF COMPARTMENT AIR INLET IS LOCATED ELSEWHERE, 1.50 IN MIN IS REQUIRED BETWEEN SET AND ACCESS DOOR TO MAINTAIN 40 IN<sup>2</sup> FREE AIR INLET.

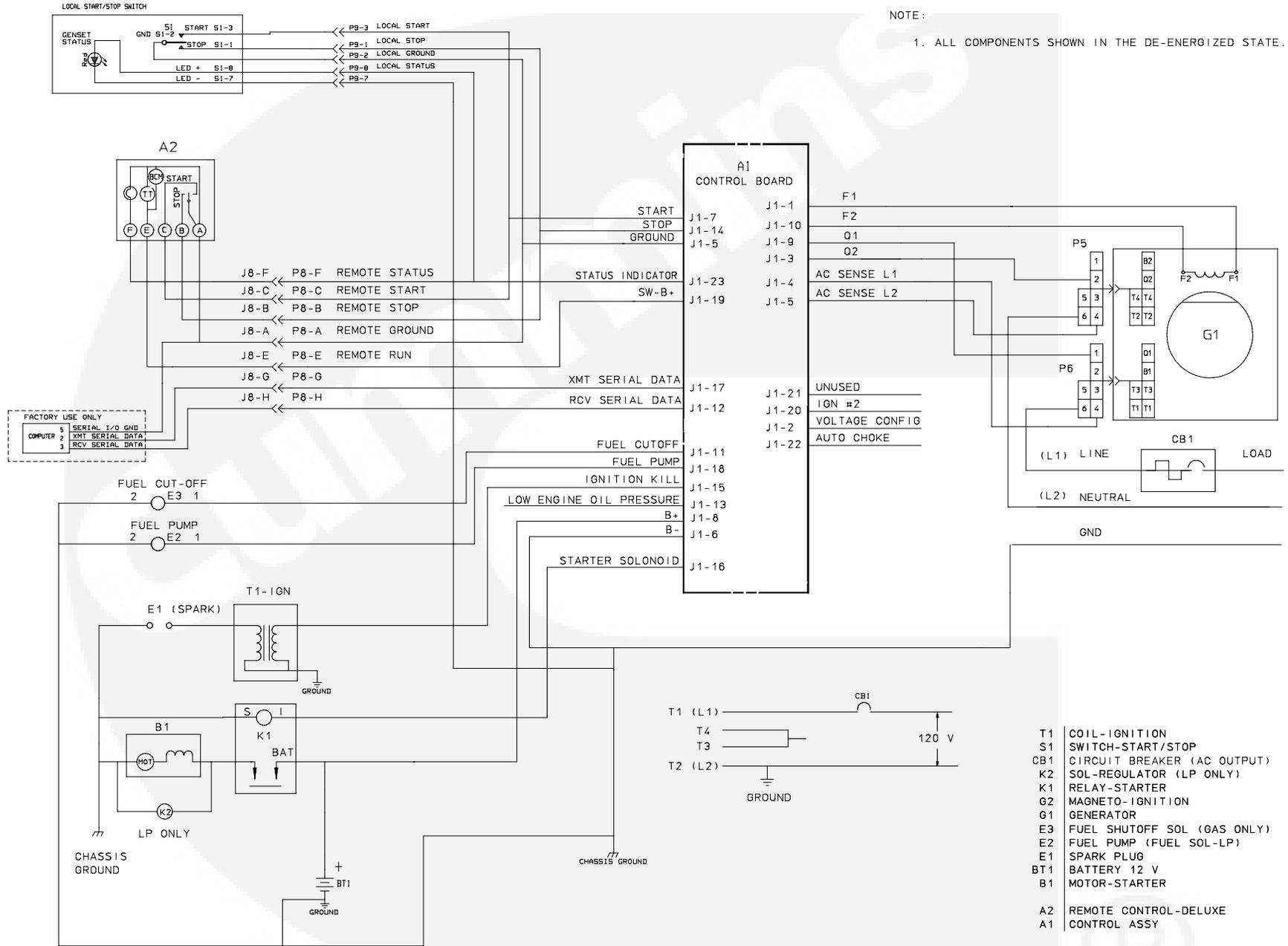
FOR DETAILED INSTALLATION SIZE REQUIREMENTS SEE: 539-1546 TEMPLATE-COMPARTMENT

- MINIMUM INSTALLATION SIZE IS 14.4 X 20 X 30.5 INCHES AND VARIES WITH MOUNTING KIT USED AND SERVICE DOOR ACCESS.

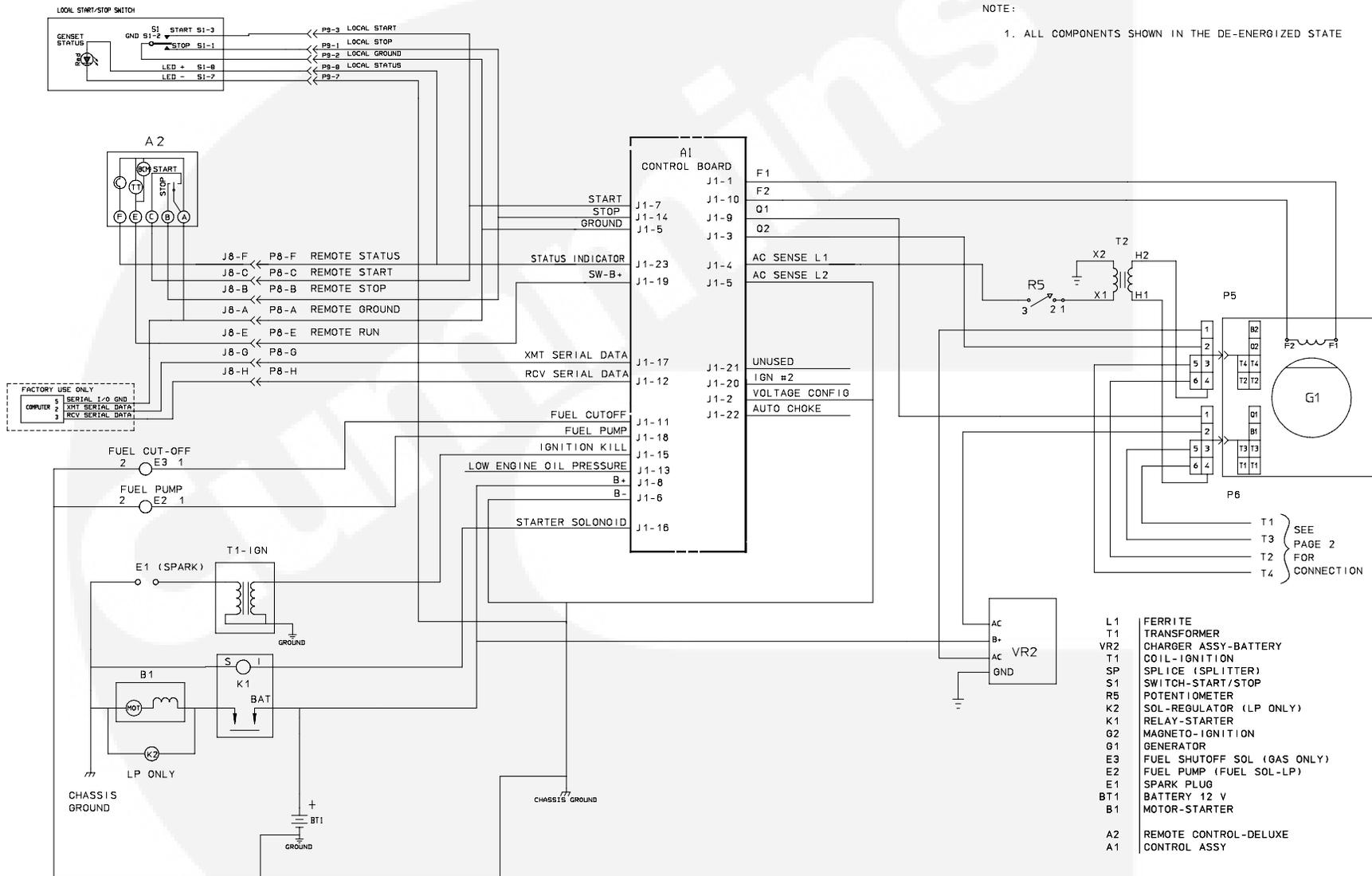


OUTLINE DRAWING

0500-3298

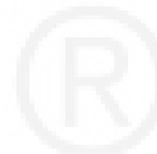


WIRING DIAGRAM—60 HZ



WIRING DIAGRAM—50 HZ

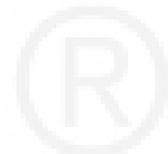
0611-1268-1

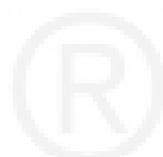


FROM:	TO:								
	3 WIRE 100/200, 110/220 OR 120/240V NEUTRAL GROUNDED		NEUTRAL ISOLATED		2 WIRE 100, 110 OR 120V NEUTRAL GROUNDED		NEUTRAL ISOLATED		
				2 WIRE 200, 220 OR 240V LINE TO GND=200 OR 220V NEUTRAL GROUNDED		LINE TO GND=100 OR 110V NEUTRAL GROUNDED		NEUTRAL ISOLATED	
T1-LINE T2-LINE T3-LINE T4-LINE	CB1-LINE GROUND GROUND CB2-LINE	CB1-LINE SPLITTER SPLITTER CB2-LINE	CB1-LINE GROUND CB2-LINE GROUND	CB1-LINE SPLITTER CB2-LINE SPLITTER	SPLITTER GROUND CB1-LINE SPLITTER	CB1-LINE GROUND GROUND CB2-LINE	CB1-LINE SPLITTER SPLITTER CB2-LINE	CB1-LINE GROUND GROUND CB2-LINE	CB1-LINE SPLITTER SPLITTER CB2-LINE
CB1-LOAD (L1) NEUTRAL(N) CB2-LOAD (L2) GROUND (GND)	CB1-LOAD GROUND CB2-LOAD GROUND	CB1-LOAD SPLITTER CB2-LOAD GROUND	CB1-LOAD GROUND CB2-LOAD GROUND	CB1-LOAD SPLITTER CB2-LOAD GROUND	CB1-LOAD GROUND OPEN GROUND	CB1-LOAD OPEN CB2-LOAD GROUND	CB1-LOAD OPEN CB2-LOAD GROUND	CB1-LOAD OPEN CB2-LOAD GROUND	CB1-LOAD OPEN CB2-LOAD GROUND
SPECIAL INSTRUCTIONS	SPLITTER NOT USED				CONNECT L1-L2 AT JUNCTION BOX SPLITTER NOT USED	CONNECT L1-L2 AT JUNCTION BOX		SPLITTER NOT USED	
100    120V 200    240V	L1-N, L2-N L1-L2	L1-N, L2-N L1-L2	L1-N, L2-N L1-L2	(L1,L2)-N N/A	(L1,L2)-N N/A	N/A L1-N	N/A L1-L2	N/A L1-L2	N/A L1-L2
RECONNECTION DIAGRAMS									

0611-1268-2

RECONNECTION DIAGRAMS





**Onan**

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