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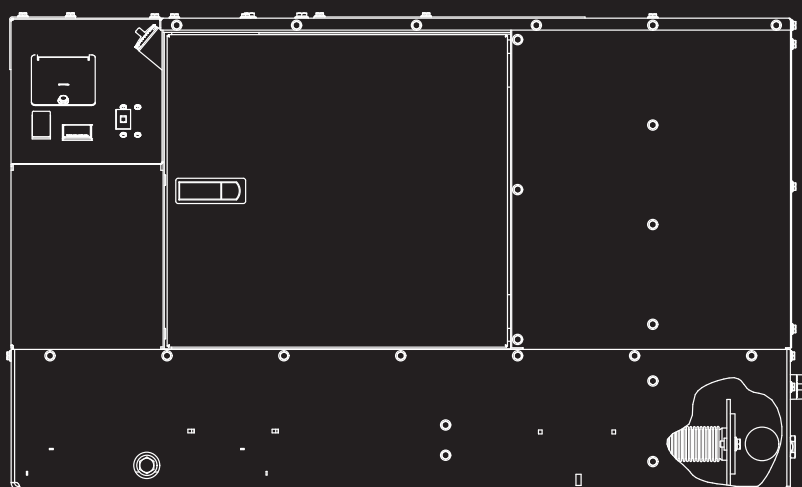


Commercial Mobile Power



Installation Manual

Models HDCAC, HDCAD



California

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.



WARNING



**Do not use this genset on a boat
Such use may violate U. S. Coast Guard
regulations and can result in
severe personal injury or death from
fire, electrocution, or
carbon monoxide poisoning**

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Safety Precautions

Thoroughly read the **OPERATOR'S MANUAL** before operating the genset. Safe operation and top performance can only be obtained 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.*

Electricity, fuel, exhaust, moving parts and batteries present hazards which can result in severe personal injury or death.

GENERAL PRECAUTIONS

- Keep children away from the genset.
- Do not use evaporative starting fluids. They are highly explosive.
- To prevent accidental or remote starting while working on the genset, disconnect the negative (–) battery cable at the battery.
- Let the engine cool down before removing the coolant pressure cap or opening the coolant drain. Hot coolant under pressure can spray out and cause severe burns.
- 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.
- Make sure all fasteners are secure and torqued properly.

- Do not work on the genset when mentally or physically fatigued or after consuming alcohol or drugs.
- You must be trained and experienced to make 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 U. S. state and federal agencies as causing cancer or reproductive toxicity. Do not ingest, inhale, or contact used oil or its vapors.
- Ethylene glycol, used as engine antifreeze, is toxic to humans and animals. Clean up spills and dispose of used engine coolant in accordance with local environmental regulations.
- Keep multi-class ABC fire extinguishers handy. Class A fires involve ordinary combustible materials such as wood and cloth; Class B fires, combustible and flammable liquid fuels and gaseous fuels; Class C fires, live electrical equipment. (ref. NFPA No. 10)
- Genset installation and operation must comply with all applicable local, state and federal codes and regulations.

GENERATOR VOLTAGE IS DEADLY

- Generator electrical output connections must be made by a trained and experienced electrician in accordance with applicable codes.
- The genset must not be connected to the public utility or any other source of electrical power. Back-feed could lead to electrocution of utility personnel 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, stand on a dry wooden platform or rubber insulating mat and use tools with insulated handles.

ENGINE EXHAUST IS DEADLY

- Learn the symptoms of carbon monoxide poisoning in this manual.
- Never sleep in the vehicle while the genset is running unless the vehicle 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 working or living spaces or compartments.
- Make sure there is ample fresh air when operating the genset in a confined area.

DIESEL FUEL IS COMBUSTIBLE

- 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 flames, 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.
- Do not smoke.
- To reduce arcing when disconnecting or reconnecting battery cables, always disconnect the negative (–) battery cable first and reconnect it last.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- 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, and other moving parts.

FLAMMABLE VAPOR CAN CAUSE A DIESEL ENGINE TO OVERSPEED

Flammable vapor can cause a diesel engine to overspeed and become difficult to stop, resulting in possible fire, explosion, severe personal injury and death. ***Do not operate a diesel-powered genset where a flammable vapor environment can be created by fuel spill, leak, etc.*** The owners and operators of the genset are solely responsible for operating the genset safely.

Introduction

ABOUT THIS MANUAL

This manual is a guide for the installation of the HDCAC and HDCAD Series of generator sets (gensets). Proper installation is essential for top performance. Read through this manual before starting the installation.

This manual addresses the following aspects of the installation:

- Location and Mounting
- Exhaust Connections
- Fuel Connections
- Electrical Connections (AC power output, control and battery)
- Startup
- Testing the Cooling System

⚠ 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 *This genset is not a life support system. It can stop without warning. Children, persons with physical or mental limitations, and pets could suffer personal injury or death. A personal attendant, redundant power or an alarm system must be used if genset operation is critical.*

⚠ CAUTION *Unauthorized modifications or replacement of fuel, exhaust, air intake or speed control system components that affect engine emissions are prohibited by law in the State of California.*

See the Operator’s Manual for operation and maintenance and the Service Manual for service.

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 builder of the vehicle 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 installation. These sets meet the basic requirements of the Standard for Safety for Engine Generator Sets for Recreational Vehicles, ANSI/RVIA EGS-1. They are suitable for installation in accordance with:

- NFPA No. 70, Article 551—Recreational Vehicles and RV Parks
- NFPA No. 501C—Recreational Vehicles

Federal, State and local codes, such as the California Administrative Code—Title 25 (RV installation), might also be applicable. Installation codes and recommendations can change from time-to-time and are different in different countries, states and municipalities. It is recommended that the standards in Table 1 be obtained for reference.

TABLE 1. REFERENCE CODES AND STANDARDS

NFPA Nos. 70 & 501C	National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210
ANSI/RVIA-EGS-1	Recreational Vehicle Industry Association 14650 Lee Road Chantilly, VA 22021
California Administrative Code—Title 25, Chapter 3	State of California Documents Section P.O. Box 1015 North Highlands, CA 95660
CAN/CSA-Z240 Recreational Vehicles	Canadian Standards Association Housing and Construction Materials Section 178 Rexdale Blvd. Rexdale, Ontario, Canada M9W 1R3

Location and Mounting

COACH INSTALLATIONS

Typical genset locations on a coach are illustrated in Figure 1. See Figures 4 through 7 (genset outline drawings) for the dimensions of the genset and the locations of the mounting bolt holes, inlet and outlet air openings, oil drain plug, service access doors and connection points (fuel, battery, remote control, AC, exhaust). See your Onan dealer for a large-scale outline drawing and a floor template to locate the opening cutouts.

⚠WARNING *The genset support structure must be designed and installed to support and restrain the dynamic weight of the genset. Failure to do so can result in the genset dropping onto the roadway causing property damage, severe personal injury and death.*

When locating and mounting the genset:

1. Orient the genset so that the operator's console will be outboard and accessible. There should be enough space to easily start and stop the genset and withdraw the coolant system fill hose through the access opening on the console.
2. Provide access to the service access doors on the front (Figure 5) and top (Figure 6) of the genset.
3. Provide access for battery, fuel, remote control and AC connections.
4. Provide at least 1/2 inch (12.5 mm) clearance to the top and 1/4 inch (6.4 mm) clearance to the sides of the genset. At these clearances, minimum compartment dimensions are:
Height: 27.5 inches (697.1 mm)
Width: 25 inches (633.8 mm)
Length: 43.2 inches (1097 mm)
5. Provide a vapor-tight, fire-resistive barrier between the genset and the interior of the vehicle. Use approved materials (26 gauge galvanized steel or equivalent). See the NEC (NFPA 70) and California Title 25 for details.

⚠WARNING *EXHAUST GAS IS DEADLY. Construct a suitable vapor barrier of approved materials between the genset and vehicle interior to keep out exhaust gas.*

6. Provide cutout openings in a compartment floor that are at least as large as the cooling and combustion air inlet and outlet openings in the bottom of the genset (shaded areas in Figure 4). Frame cross members must not cut across the openings.
7. Make sure that vehicle components located below the genset, including the genset exhaust tailpipe, will not interfere with draining engine oil.
8. Provide protection from direct road splash if the genset is located behind a road wheel or the front grill of the vehicle.
9. Make sure the genset clears the ground by at least 12 inches (305 mm) to reduce the amount of dust pulled in by the cooling fan.
10. Support the genset on a structure able to resist the dynamic weight of the genset: ± 3 g-force (± 1986 lbf) vertical and ± 1 g-force (± 662 lbf) horizontal. Use four 3/8-16 UNC bolts to secure the genset to the floor or frame.

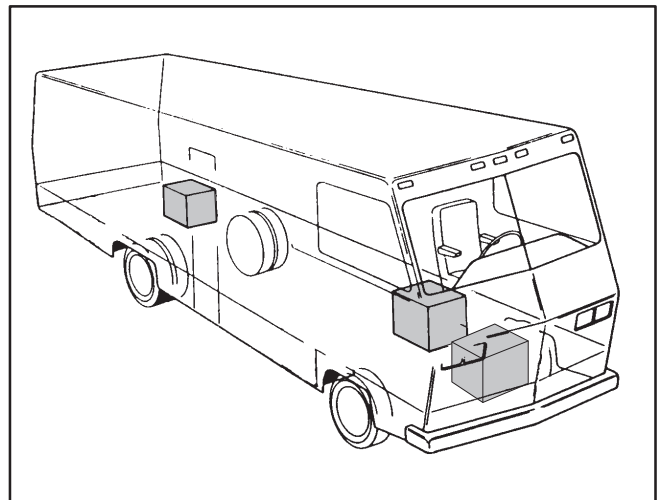


FIGURE 1. TYPICAL COACH LOCATIONS

OTHER INSTALLATIONS

The genset cooling system was designed to allow continuous full-load operation in ambient temperatures of 40° C (104° F). Air recirculation or inlet or outlet restrictions can cause overheating. Cooling in each kind of application must be confirmed by test (Page 20).

1. If the back of the genset is mounted against a wall, and the other three sides are not restricted, a minimum of 11 inches (28cm) bottom clearance is required from air inlet and air outlet openings. (Figure 2)
2. Orient the genset so that the operator's console will be outboard and accessible. There should be enough space to easily start and stop the genset and withdraw the coolant system fill hose through the access opening on the console.
3. The maximum allowable inlet air duct restriction is 0.8 inch water column (WC) when there is no restriction to outlet air.
4. The maximum allowable outlet air duct restriction is 0.7 inch water column (WC) when there is no restriction to inlet air.

5. Total duct restriction may not exceed 0.5 inch WC when both inlet and outlet ducts are provided.

6. See Figures 3 through 7 for dimensions and mounting holes and follow Steps 1 through 10 on Page 5 for mounting.

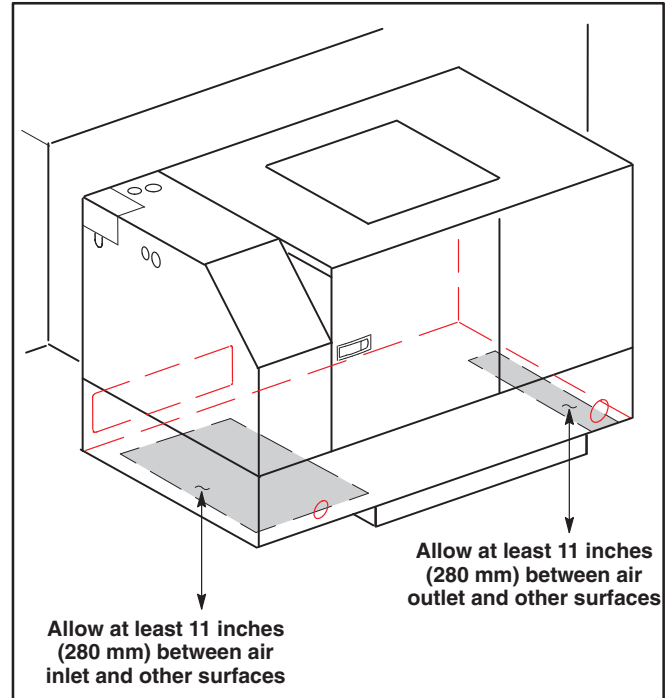


FIGURE 2. MOUNTING EXAMPLE

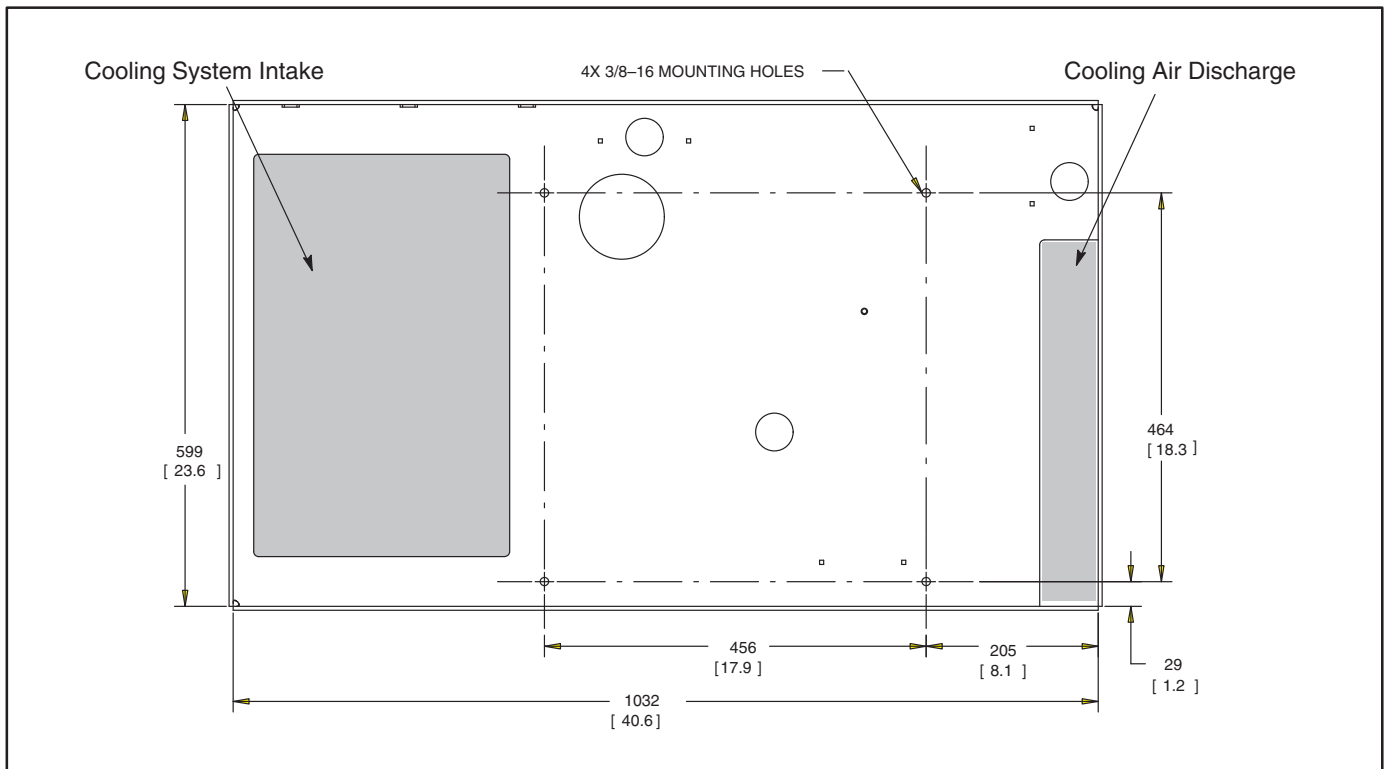
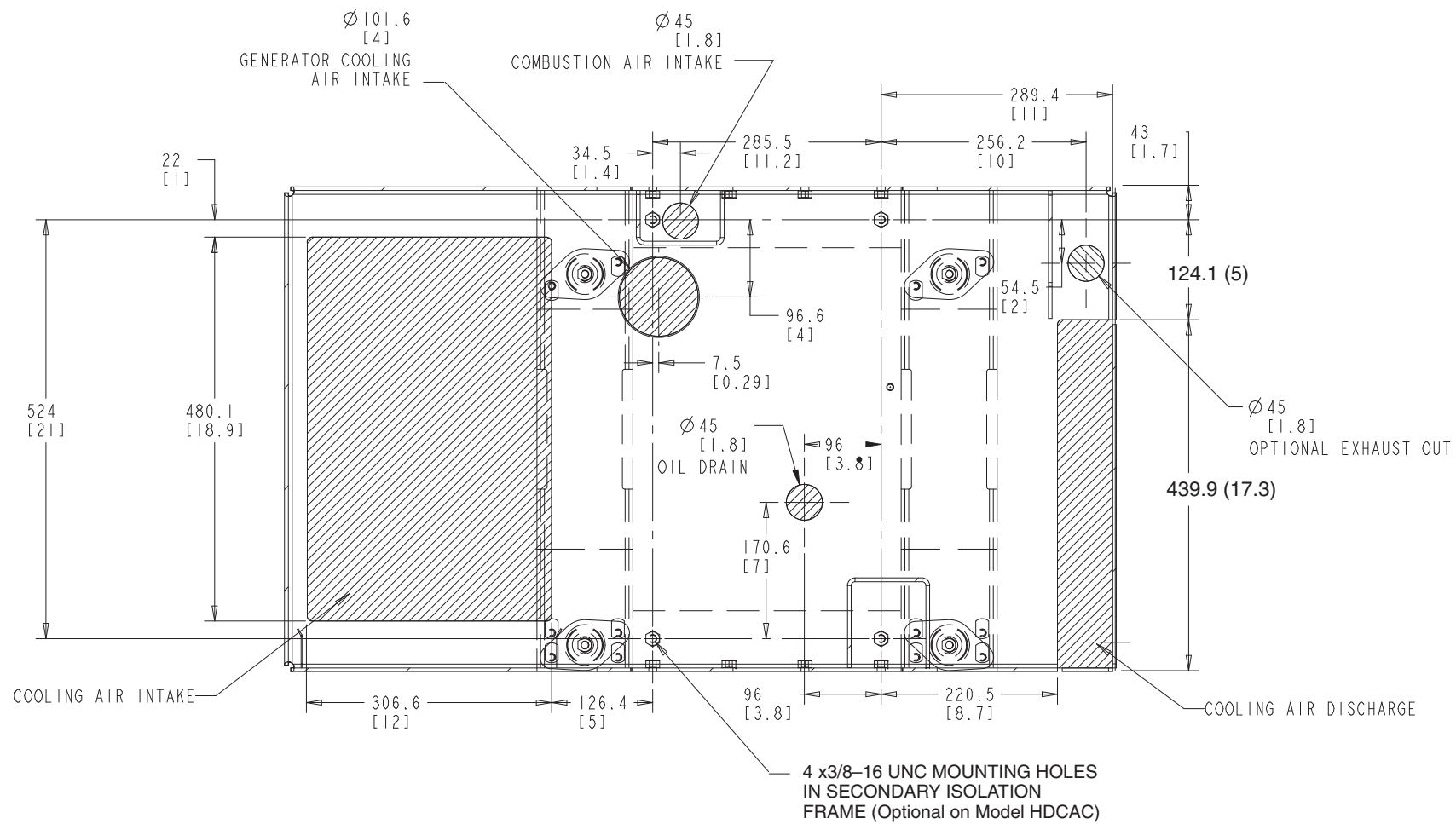


FIGURE 3. MOUNTING HOLES—FLOOR PLAN

FIGURE 4. GENSET OUTLINE—FLOOR PLAN



FLOOR PLAN – SECTION C-C

DIMENSIONS ARE IN MILLIMETERS (INCHES)

500-3163
500-3295

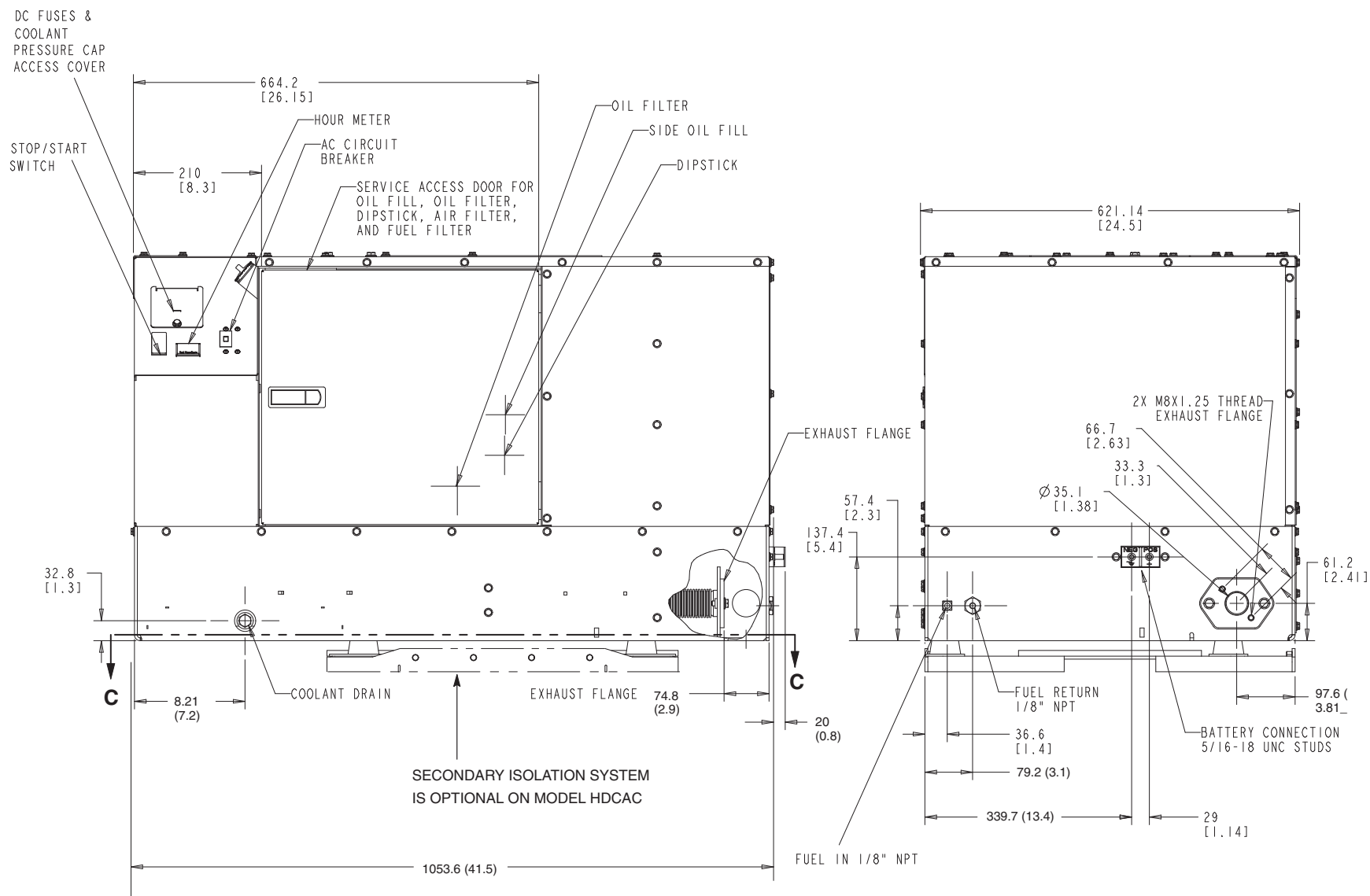
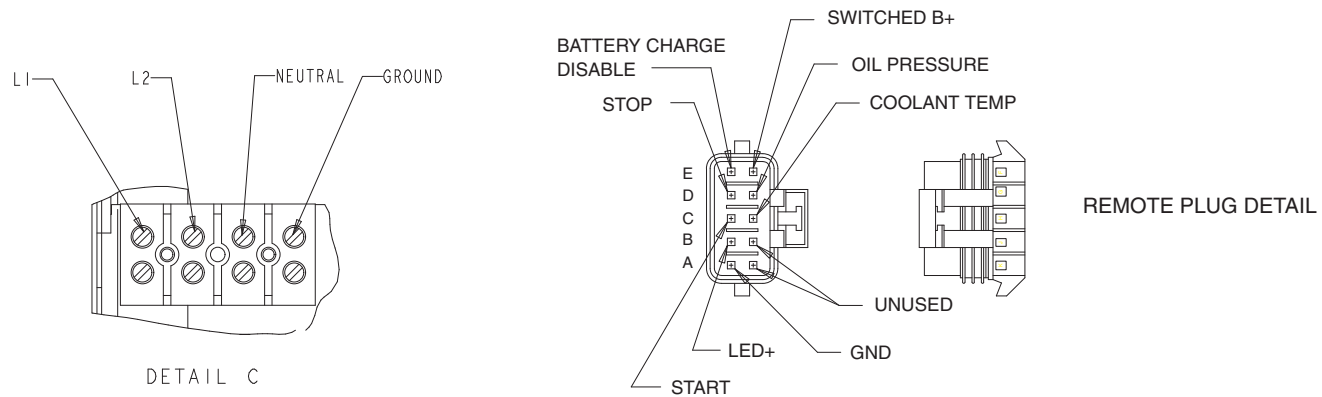
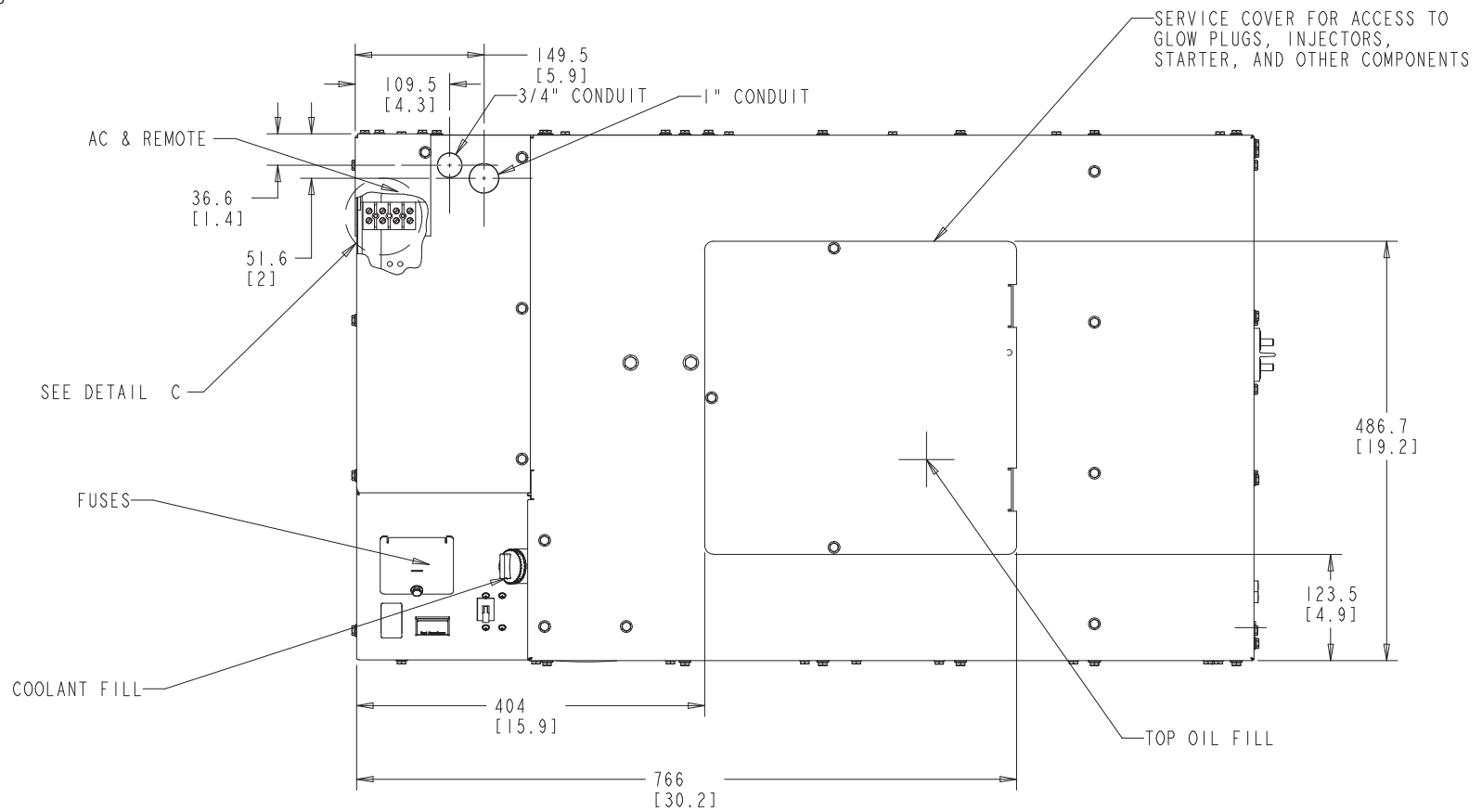


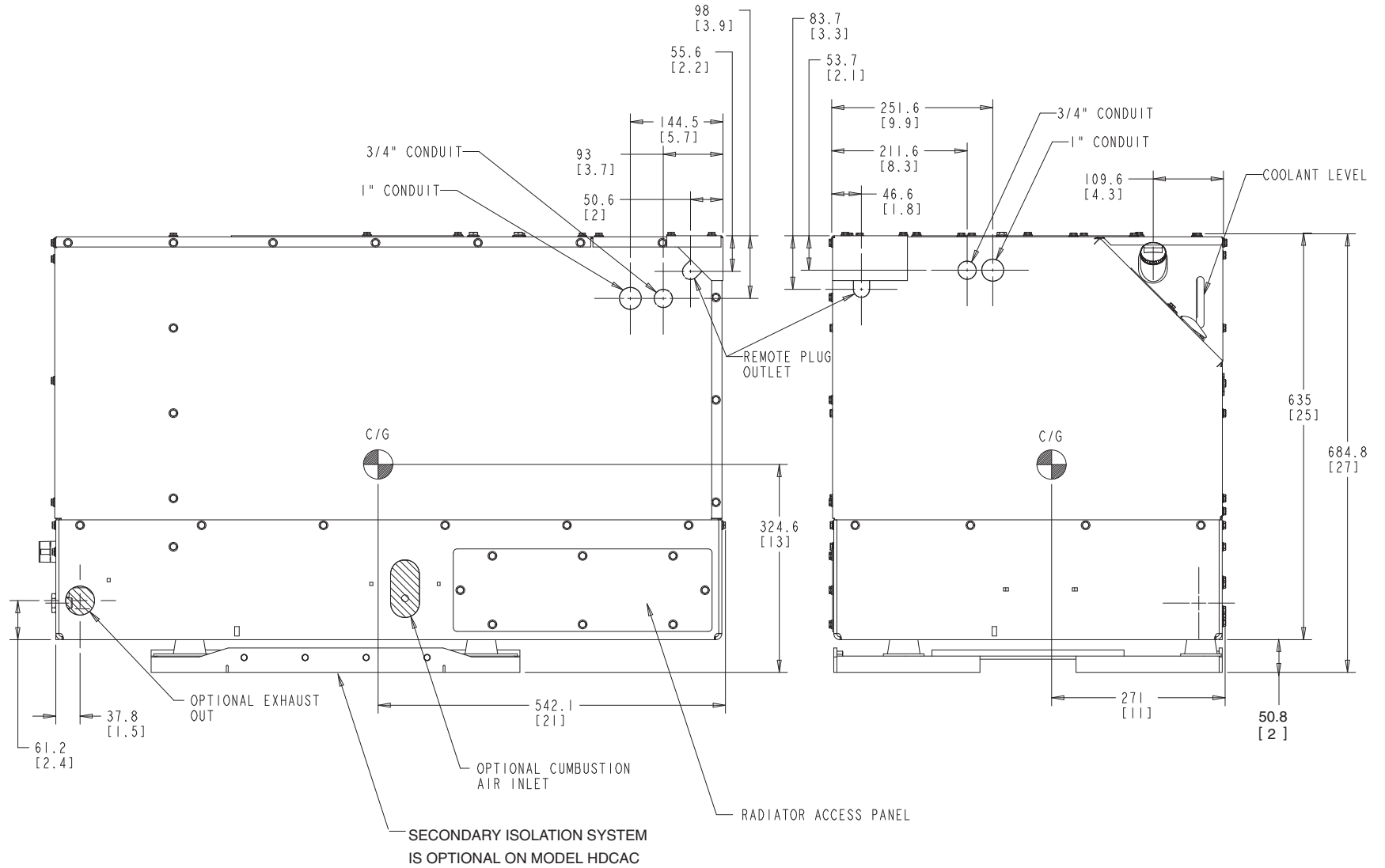
FIGURE 5. GENSET OUTLINE—FRONT AND RIGHT-SIDE VIEWS



DIMENSIONS ARE IN MILLIMETERS (INCHES)

FIGURE 6. GENSET OUTLINE—TOP VIEW

FIGURE 7. GENSET OUTLINE—BACK AND LEFT-SIDE VIEWS



DIMENSIONS ARE IN MILLIMETERS (INCHES)

Exhaust Connections

The exhaust system must be gas-tight and designed to limit entry of exhaust gases into the vehicle.

⚠WARNING ***EXHAUST GAS IS DEADLY! To keep exhaust gases from entering the vehicle do not terminate the exhaust tailpipe underneath the vehicle or closer than specified to openings into the vehicle (Figure 11) or route it such that it is likely to be damaged (Figure 12). Use approved materials and parts only.***

The muffler is mounted inside the genset housing and has a flanged outlet opening (Figure 8). The

genset outline drawings (Figures 2 through 5) show the dimensions of the exhaust flange and the locations of the tailpipe clearance holes.

The muffler meets the requirements of the U.S. Forest Service as a spark-arrest muffler. (Failure to provide and maintain a spark arrester can be a violation of the law.) Liability for damage, injury and warranty expense due to the modification of the exhaust system or due to the use of unapproved parts becomes the responsibility of the person performing the modification or installing the unapproved parts. Contact an Onan distributor for approved exhaust system parts.

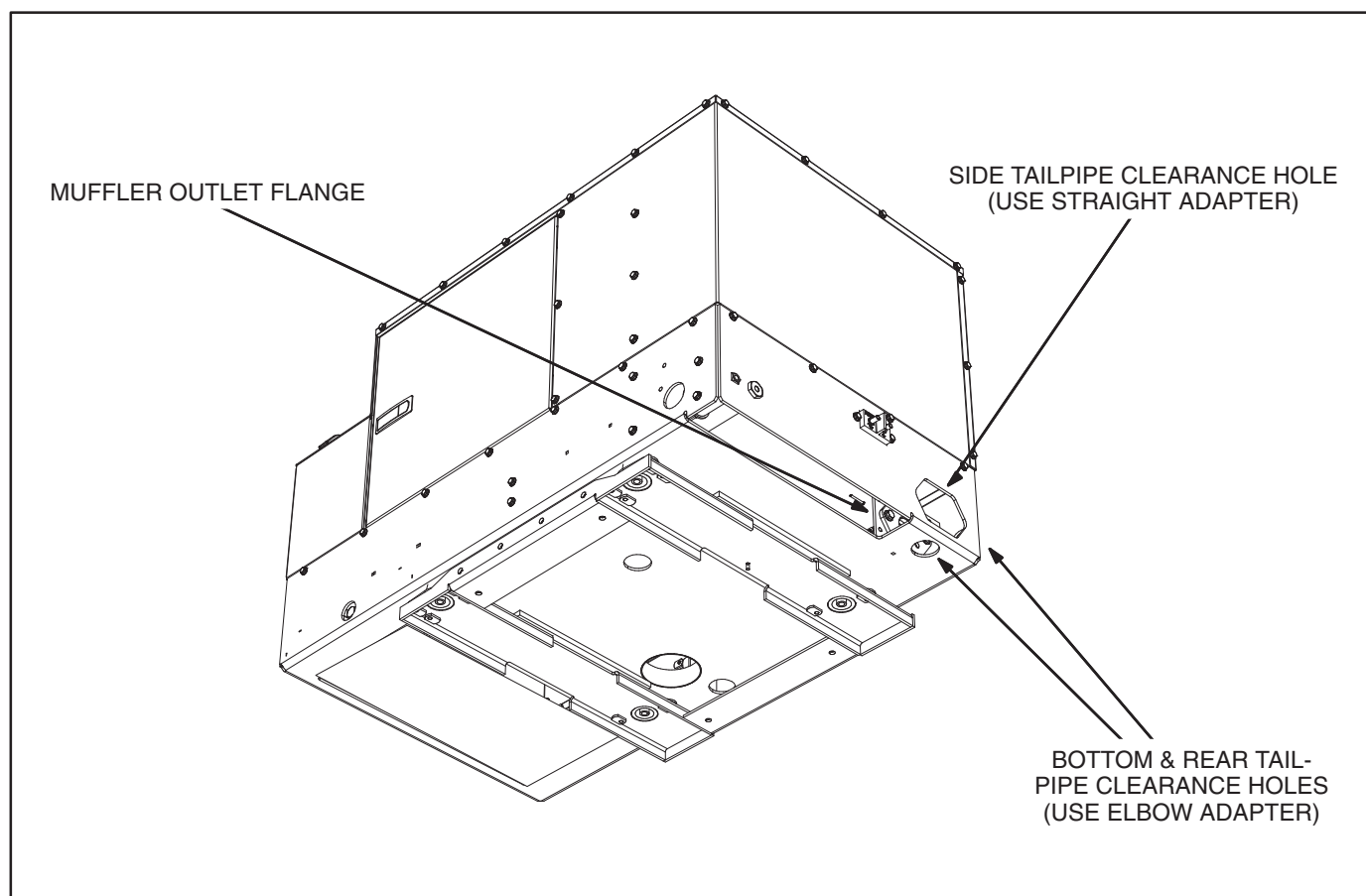


FIGURE 8. EXHAUST CONNECTIONS AT GENSET

Tailpipe adapter kits are separately available. Use a straight adapter for a tailpipe routed through the side clearance hole. Use an elbow adapter for a tailpipe routed through the rear clearance hole or up from below. When connecting and routing the tailpipe:

1. Use 1-3/8 inch ID, 18-gauge aluminized steel tubing or equivalent for the tailpipe. (Do not use flexible pipe. Flexible pipe is not gas tight or durable.)
2. Secure the tailpipe or adapter flange to the muffler flange with a gasket and two stainless steel M8x1.25 bolts, which are supplied.
3. Use U-bolt muffler clamps to connect sections of tailpipe. It is recommended that the overlapping pipe be slotted as shown in Figure 9.
4. Use automotive-type tailpipe hangers every 2 to 3 feet (0.6 to 0.9 m). Attach the hangers to steel framework, not to wood or other combustible material.
5. Do not terminate the tailpipe underneath the vehicle. Extend it a minimum of 1 inch (25 mm) beyond the perimeter of the vehicle (Figure 10). Support the end of the tailpipe such that it cannot be pushed inward and up under the skirt of the vehicle.
6. Do not route the tailpipe such that it will interfere with draining engine oil or coolant or restrict the air inlet.
7. Do not route the tailpipe closer than 3 inches (76 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).
8. Do not route the tail pipe near fuel lines or fuel tanks.
9. Do not terminate the tailpipe such that it is closer than 6 inches (153 mm) to any opening into the vehicle interior (door, window, vent). See Figure 11.

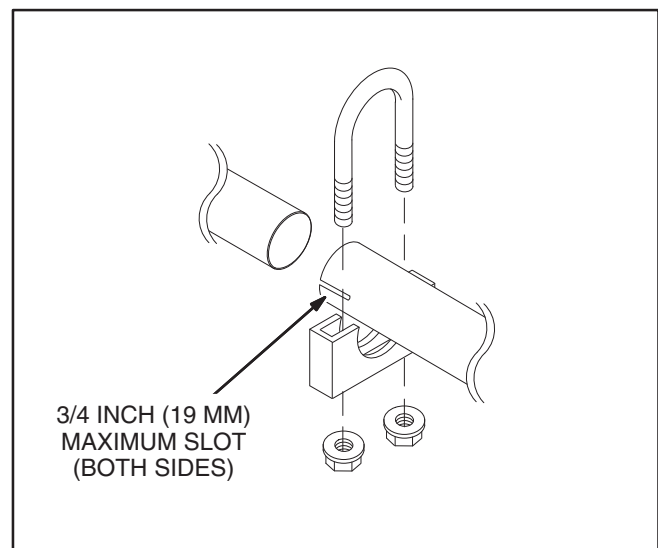


FIGURE 9. EXHAUST TAILPIPE CONNECTIONS

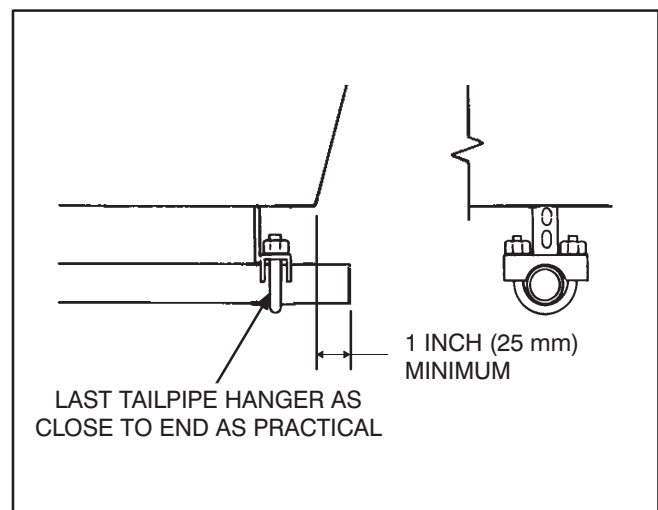


FIGURE 10. TERMINATING THE EXHAUST TAILPIPE

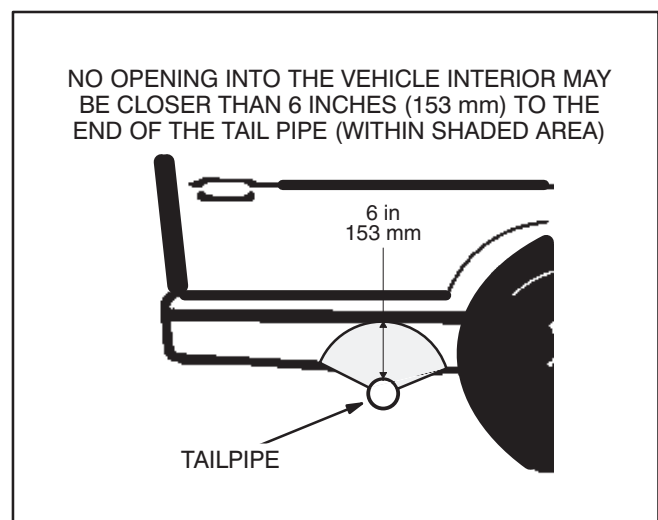


FIGURE 11. MINIMUM DISTANCES TO OPENINGS

10. Route the tailpipe such that it will not likely be struck when the vehicle is moving. At least keep it out of the approach and departure angles of the vehicle and above the axle clearance line (Figure 12).

⚠ CAUTION *Interconnecting the engine exhaust systems will allow exhaust condensates and soot to migrate into the engine that is idle, causing engine damage.*

11. Do not connect the genset to the vehicle engine exhaust system.

⚠ CAUTION *Excessive back pressure can cause loss of performance and engine damage.*

Exhaust back pressure under full load must not exceed 2 inches (51 mm) water column (WC) as measured within 6 inches (154 mm) of the muffler outlet flange.

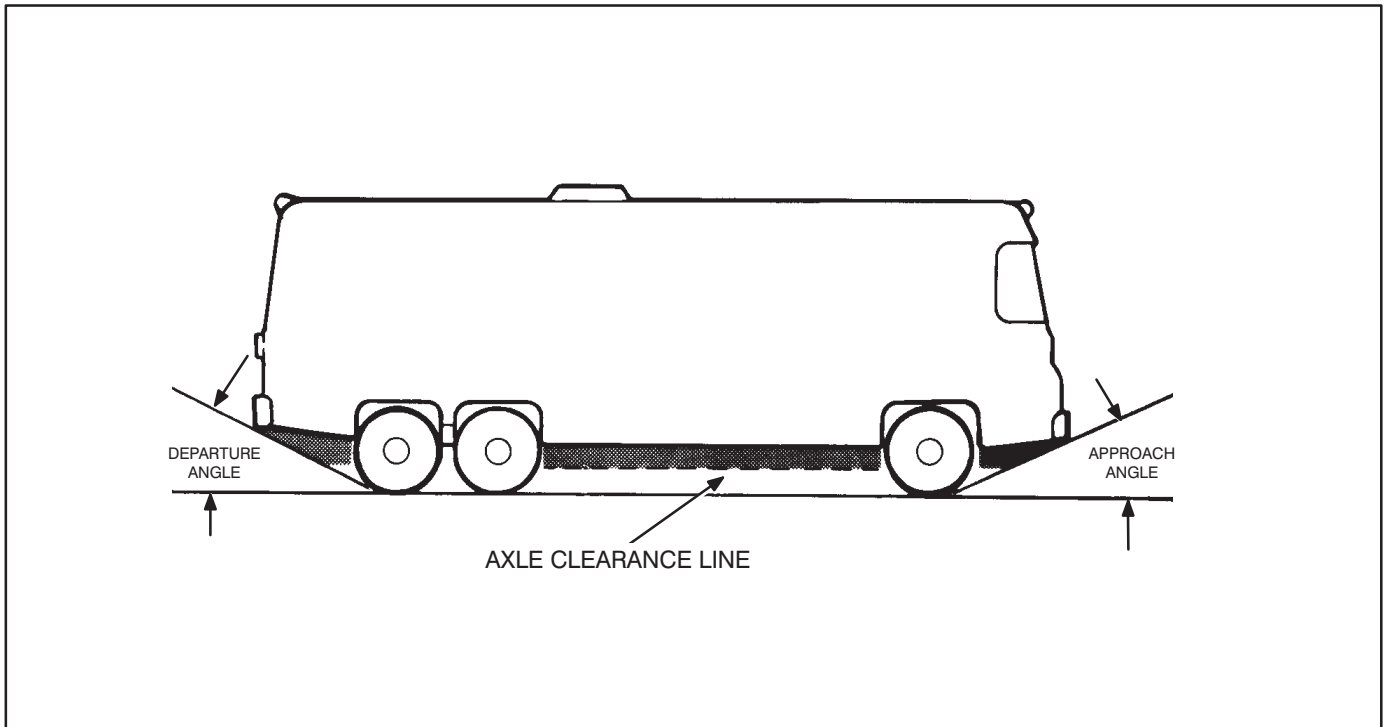


FIGURE 12. APPROACH AND DEPARTURE ANGLES AND AXLE CLEARANCE LINE

Fuel Connections

⚠ WARNING *Diesel fuel is a combustible and can cause severe personal injury or death. Do not smoke or allow any flame, spark, pilot light, arc-producing equipment, electrical switch or other ignition source around fuel or fuel components, or in areas sharing ventilation. Keep a type ABC fire extinguisher handy.*

Do not interconnect genset and vehicle engine fuel lines. Follow the vehicle chassis manufacturer's instructions when making connections to the vehicle engine fuel tank.

⚠ CAUTION *Either or both engines could starve for fuel if the genset and vehicle 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 vehicle out of fuel, do not extend the genset fuel pickup tube down into the fuel tank as far as the pickup tube for the vehicle engine.

Fuel lines (supply and return) must have at least a 1/4 inch (6.4 mm) ID. See Figure 13 for connections at the genset.

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 (1 meter).

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.

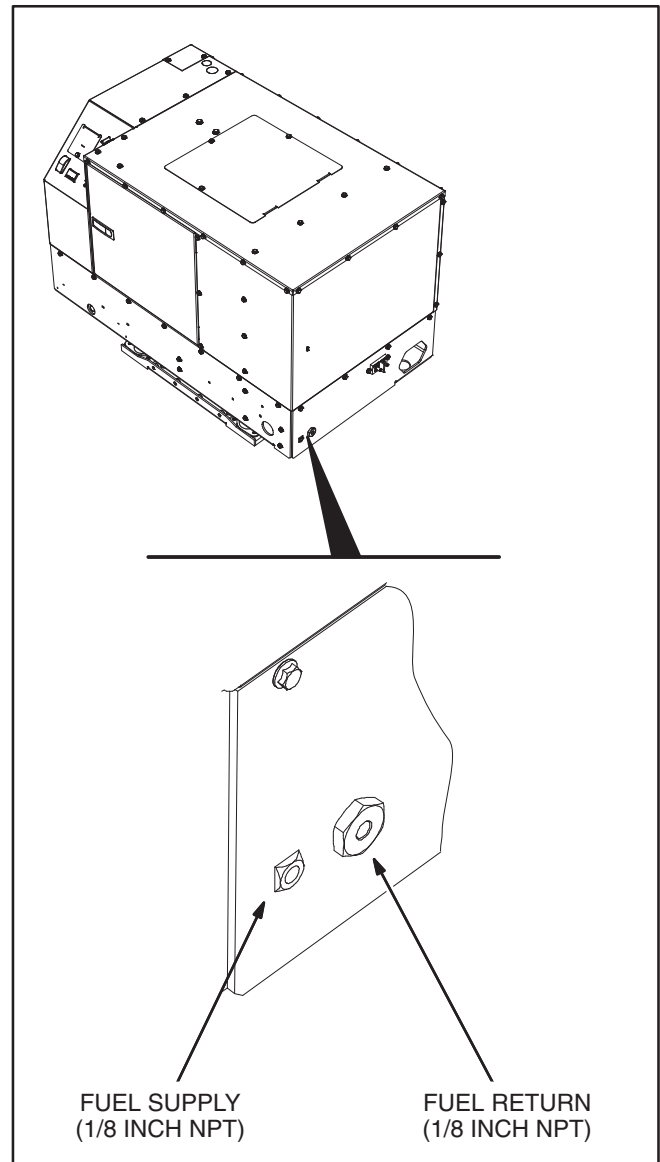


FIGURE 13. FUEL CONNECTIONS

Electrical Connections

To prevent accidental starting of the genset during installation, do not connect the battery cables at the battery until so instructed in *Installation Review and Startup* (Page 19).

⚠️WARNING *Accidental starting of the genset can cause severe personal injury or death. Do not connect the starting battery until so instructed in Installation Review and Startup.*

AC POWER OUTPUT

The genset is equipped with a terminal block and conduit connector knockouts for AC power output connections (Figure 14).

Wiring Methods

See Figure 15 for typical connections. Wiring methods must be in accordance with the applicable codes, such as the National Electrical Code (NFPA No. 70).

1. Secure only one lead at each AC output terminal. The terminals are suitable for wire sizes up to No. 6 AWG.
2. Use vibration-proof switches and controls to prevent the opening and closing of circuits while the vehicle is in motion.
3. Use rain-tight conduit, conduit connectors and junction boxes for all exterior wiring.
4. Use ground fault circuit interrupters (GFCIs) for all branch circuits with convenience power receptacles.
5. Seal all wiring entrance holes into the interior of the vehicle (inside and outside all conduit connectors) to keep out exhaust gas. Use silicone rubber or an equivalent type of sealant.

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

6. Route or protect AC wiring so that it will not be cut or abraded, exposed to hot surfaces or damaged by road debris. Keep AC wiring away from fuel lines and control wiring (see Remote Control).

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

7. Connect the grounding terminal (Terminal TB4-5, Figure 15) in accordance with applicable codes.

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

Connecting the Vehicle to Utility Power

When the vehicle has provision for connecting utility power it must have an approved device to keep the genset and utility from being interconnected. See Figure 15 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.*

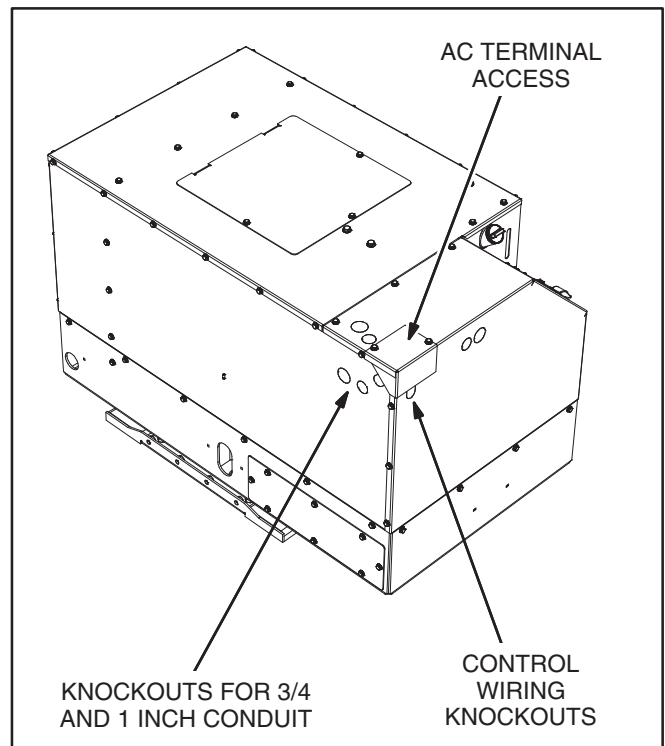


FIGURE 14. ACCESS FOR AC OUTPUT AND REMOTE CONTROL CONNECTIONS

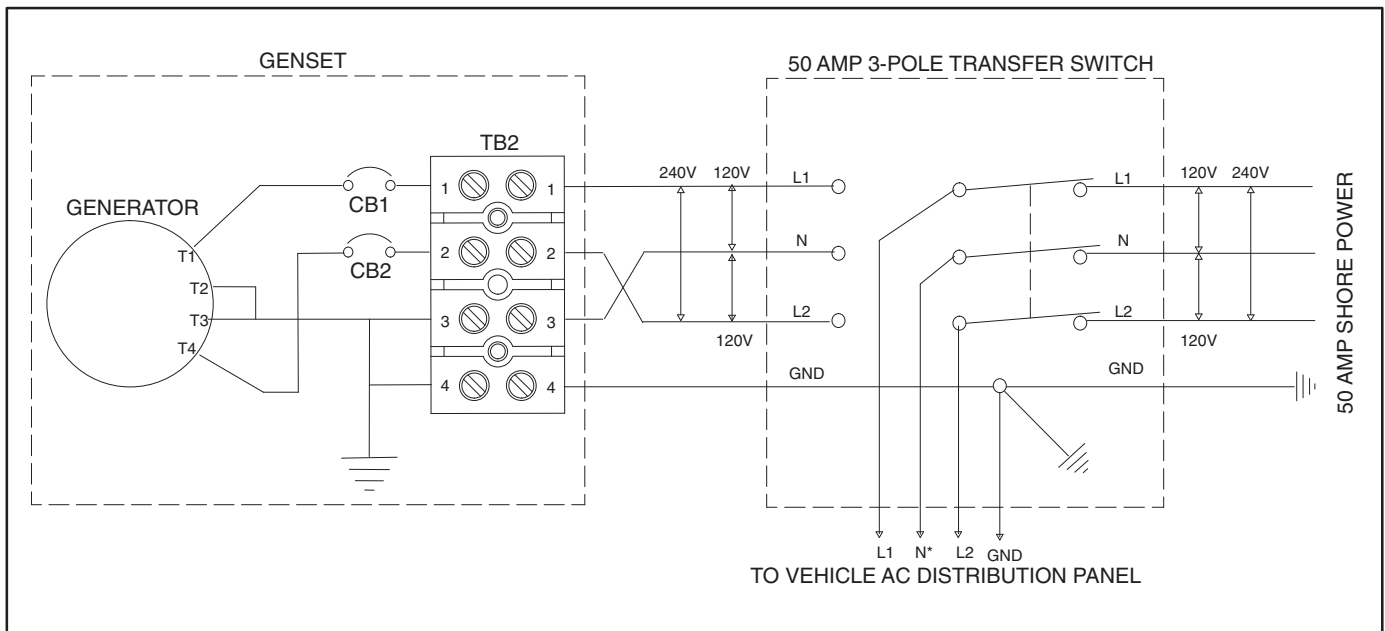


FIGURE 15. TYPICAL AC CONNECTIONS

REMOTE CONTROL

Figure 16 shows the 10-pin plug on the end of the remote control leads and typical connections to a remote control panel. The plug and leads are stowed inside the AC terminal enclosure when the genset is shipped from the factory. Harnesses of various lengths with mating receptacles are available separately.

Wiring Methods:

1. Remove the AC terminal access cover and remove one of the control wiring knockouts.
2. Pull out the remote control connector plug, fit the bushing around the connector leads into the knockout slot and secure the access cover.
3. Snap the connector plug and harness receptacle together.
4. If the harness does not have a plug for connections at the control panel, use solder-type butt connectors and heat-shrink insulation tubing to connect to the wiring from the remote panel. Use insulated 18 AWG copper conductors for the wiring from the remote panel.
5. Keep control leads away from AC power leads to reduce the possibility of erratic operation due to induced signals.

6. Seal the hole where the leads enter the interior of the vehicle to keep out exhaust gas. Use silicone rubber or an equivalent type of sealant.

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

Remote Control Panel:

1. The control switch should be a two-pole, momentary-contact, center-return/center-off type of switch with an indicator light.
2. The engine oil pressure and water temperature gauges should be compatible with the genset. See your Onan dealer for makes and models.
3. The total load connected to **P8-F** (Switched B+) should not exceed 2 amp.
4. The total load connected to **P8-B** (Status Light) should not exceed 2 amp.

Note: To obtain genset status and diagnostics indication, the remote panel status light must be connected to **P8-B**—not to **P8-F**.

Genset Battery Charger Disabling: The genset battery charger can be disabled when another battery charger is active, such as the alternator on the vehicle propulsion engine, by connecting genset connector **P8-D** to **B+** (12 VDC).

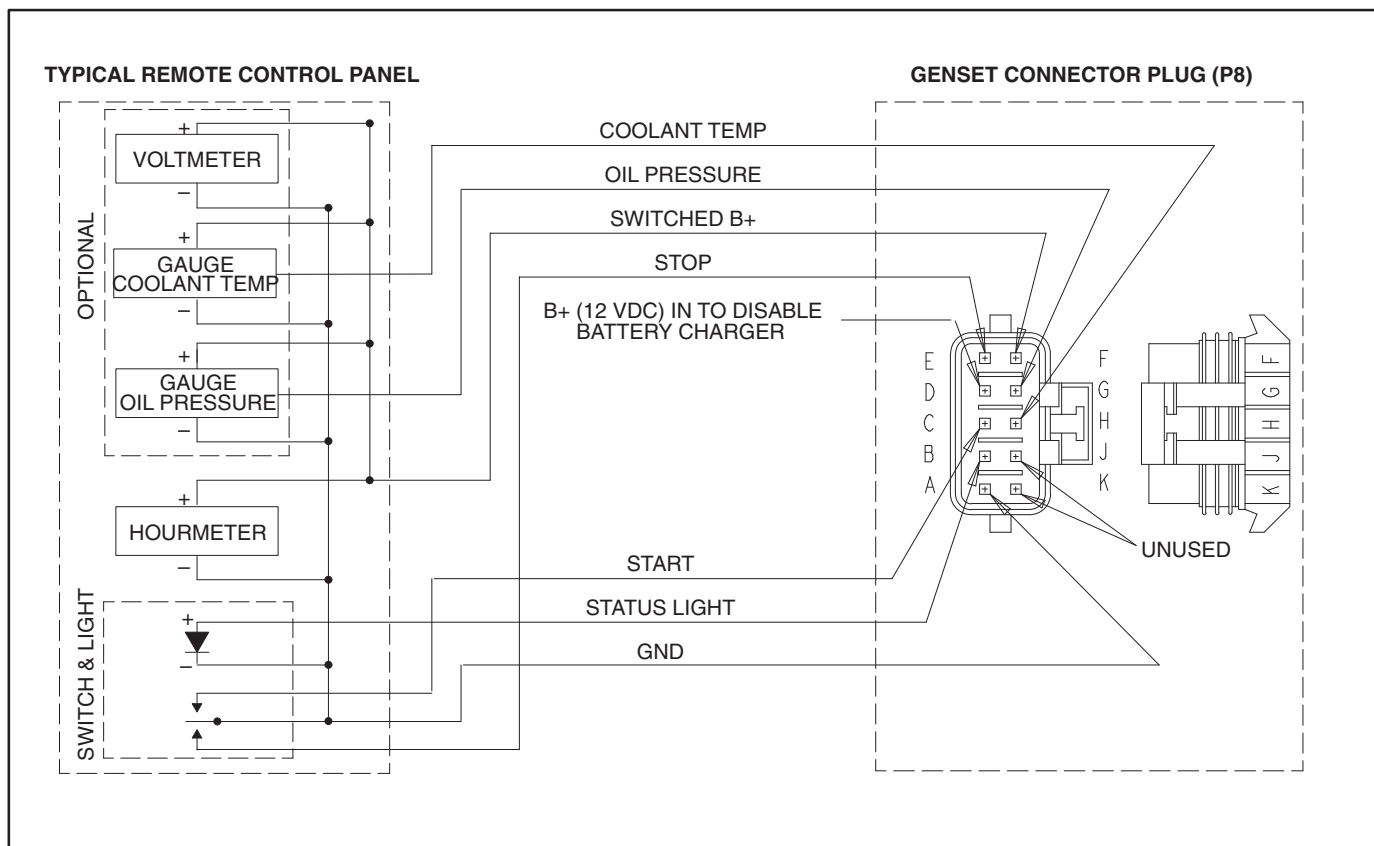


FIGURE 16. REMOTE CONTROL CONNECTOR PLUG AND TYPICAL CONNECTIONS

BATTERIES

To prevent accidental starting of the genset during installation, do not connect the battery cables at the battery until so instructed in *Installation Review and Startup*(Page 19).

⚠ WARNING *Accidental starting of the genset can cause severe personal injury or death. Do not connect the starting battery until so instructed in Installation Review and Startup.*

Battery Capacity

The genset has a 12 VDC, negative-ground control and starting system. See Table 2 for minimum battery capacity requirements.

TABLE 2. MINIMUM BATTERY CAPACITY

Down to 0°F (−17°C)	475 CCA*
Down to −20°F (−29°C)	650 CCA*
* Cold Cranking Amps	

Battery Recharging

The genset is equipped with an engine-driven battery charging alternator.

Battery Compartment

Batteries must be mounted in a separate compartment from that of the genset and away from spark-producing equipment. An enclosed compartment must have openings of at least 1.7 square inches (11 square centimeters) at the top and bottom for ventilation of battery gasses. Batteries 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

Because of the high cranking currents involved, it is highly recommended that a negative (–) battery cable be run with the positive (+) battery cable between the battery and the genset. Size the cables according to Table 3. Total cable length is the sum of the lengths of the positive (+) and negative (–) cables. In other words, total cable length will be approximately twice the distance between the battery and the genset.

Alternatively, use rated cranking current as the basis for calculating battery cable size. Rated cranking current for these gensets is 280 amps at 0° F (–18° C). The cables should be sized so that voltage across the cranking motor terminals will be within 1 volt of the voltage across the battery terminals.

TABLE 3. BATTERY CABLE SIZES FOR AMBIENT TEMPERATURES DOWN TO –20° F (–29° C)

TOTAL CABLE LENGTH, FEET (METRES)	CABLE SIZE, AWG
0 to 15 (0 to 4.5)	0*
16 to 20 (4.5 to 6)	000
* – A total length of up to 25 feet (7.6 meters) may be used in warmer climates or when battery capacity totals at least 1200 CCA (Cold Cranking Amps).	

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.*

Genset Bonding Terminal

The negative (–) battery cable terminal shown in Figure 17 is also the bonding terminal for grounding the genset to the vehicle chassis. If the grounding

cable is also going to carry starter motor current, it must be sized the same as the battery cables.

Connecting Battery and Bonding Cables

Clearly and permanently mark both ends of each battery cable as to its polarity, positive (+) or negative (–). After making sure the battery cables are not connected at the battery, connect the battery and grounding cables to the genset (Figure 17).

⚠ CAUTION *Reversing battery connections can lead to battery charger failure.*

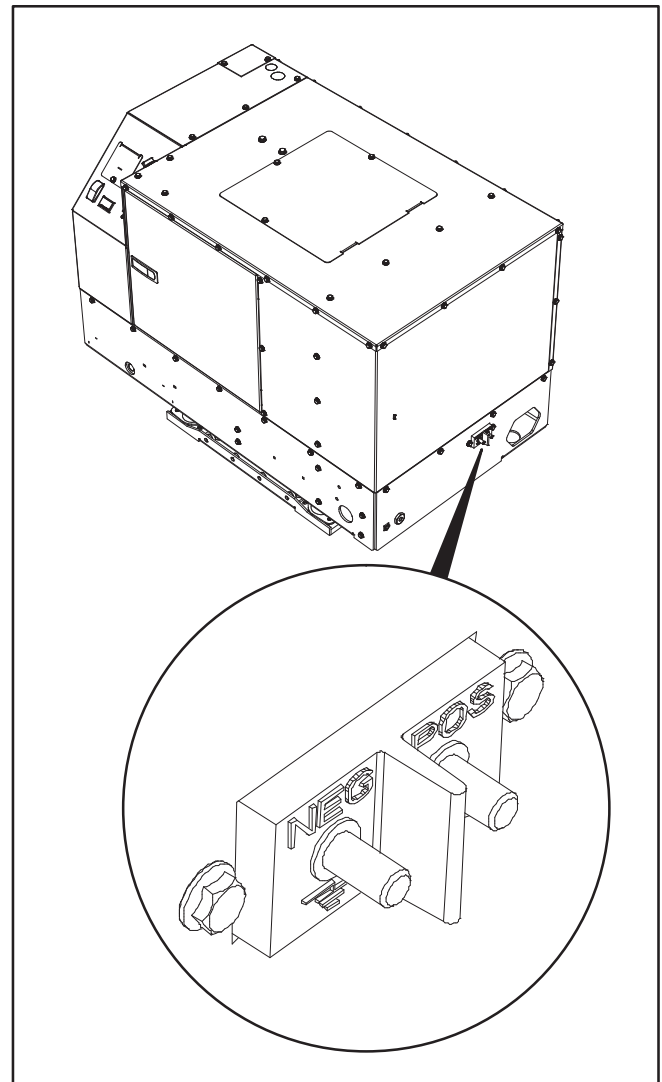


FIGURE 17. BATTERY CABLE TERMINALS

Installation Review and Startup

INSTALLATION REVIEW

Before starting the genset inspect the installation and check off (✓) each of the following questions if it can be answered "YES". If a question cannot be checked off, review the appropriate section in the manual.

- [] Is the operator's console easily accessible for starting and stopping the genset, resetting circuit breakers and checking and adding engine coolant?
- [] Is the genset securely bolted in place?
- [] Is there clearance all around the genset?
- [] Are the cooling and combustion air inlet and outlet openings free of obstructions (shaded areas in Figure 2)?
- [] Is there easy access for draining the engine oil?
- [] Is there easy access for draining the engine coolant?
- [] Is there easy access for changing the air filter, checking oil level and adding oil?
- [] Is there easy access (through the top service access cover) for cleaning out the spark-arrest muffler?
- [] 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 tailpipe routed such that it is not likely to be struck while the vehicle is moving?
- [] Is the genset located outside the interior (living) space of the vehicle and separated by approved vapor-tight and fire-resistive materials?
- [] Are all wiring holes into the vehicle interior (inside and outside conduit connectors) sealed to keep out exhaust gas?
- [] Have the AC output connections been made properly.
- [] Have properly sized batteries and battery cables been installed?
- [] Have the battery cables been secured at sufficient intervals to prevent chaffing and contact with sharp edges, fuel lines and hot exhaust parts?

- [] Is the genset bonding terminal (negative [–] battery cable terminal) properly grounded to the vehicle chassis?
- [] Are all fuel connections tight?
- [] Have the fuel lines been secured at sufficient intervals to prevent chaffing and contact with sharp edges, electrical wiring and hot exhaust parts?
- [] Is the genset protected from direct road splash?
- [] Does the genset clear the ground by at least 12 inches (305 mm)?

STARTUP

When all installation requirements have been met, connect the battery cables to the battery, positive (+) cable first.

⚠ WARNING *Arcing at battery terminals or in light switches or other equipment, and flames or sparks, can ignite battery gas causing severe personal injury—Ventilate battery area before working on or near battery—Wear safety glasses—Do not smoke—Switch work light ON or OFF away from battery—Stop genset and disconnect charger before disconnecting battery cables—Disconnect negative (–) cable first and reconnect last.*

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

⚠ WARNING *EXHAUST GAS IS DEADLY! Do not operate the genset when the vehicle is indoors unless there is ample fresh air ventilation.*

Check for fuel, coolant and exhaust leaks and unusual noises while the genset is running under full and intermediate loads. To calculate electrical loads see POWERING EQUIPMENT in the Operator's Manual. Do not place the genset in service until all leaks have been fixed and operation is satisfactory.

COOLING SYSTEM TEST

Explanation

The cooling system was designed to allow continuous full-load operation in ambient temperatures of 40° C (104° F). Air recirculation or inlet or outlet restrictions can cause overheating and must be considered during application. A cooling test under full-load, measuring ambient air and engine coolant outlet temperatures, should be run to confirm the cooling capability of the genset in each application. The goal is to achieve a Limiting Ambient Temperature of at least 40° C (104° F), where:

LAT = Limiting Ambient Temperature

T_{\max} = 107° C (225° F). (The nominal engine shut-down temperature is 110° C [230° F]. Experience has shown that a margin of 3° C [5° F] is necessary to account for variations in senders, engine heat rejection, etc.)

T_{test} = Measured engine coolant outlet temperature (Table 4)

T_{amb} = Measured ambient temperature (Table 4)

$$\text{LAT} = T_{\max} - T_{\text{test}} + T_{\text{amb}}$$

If the goal for LAT of 40° C (104° F) is not met, cooling air recirculation, air inlet and/or air outlet restriction must be reduced in the installation.

Method

1. Complete a representative installation.
2. Use a load bank that can be adjusted to load the genset to its rated full-load.
3. Conduct the test at a location where the ambient air temperature will be equal to or greater than 21° C (70° F), to make sure that the engine coolant thermostat opens sufficiently.
4. Measure temperatures with thermocouples not heavier than No. 24 AWG (0.21 mm²).
 - A. Measure engine coolant outlet temperature at the outlet of the thermostat, making sure the bead of the thermocouple is cen-

tered in the coolant. The thermocouple wire can be routed between the hose and the thermostat outlet fitting without causing leaks.

- 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. For accurate test results, the coolant system must be free of air. Before starting the test:
 - A. Add coolant as necessary.
 - B. Expel air by adding and removing loads while the genset is running.
 - C. Stop the genset to let the engine cool down so that the system can refill from the coolant recovery tank (which must be properly installed and filled).
 6. Run the genset under full-load and record temperatures at 15 minute intervals until they stabilize. Temperature is considered stable when there is no change in three consecutive temperature readings at 15 minute intervals. See Table 4 for an example of how the data can be arranged for recording and analysis.
 7. Calculate LAT using the test data in the formula. As an example:
$$\text{LAT} = 107^{\circ} \text{C}_{\max} - 95^{\circ} \text{C}_{\text{test}} + 30^{\circ} \text{C}_{\text{amb}} = 42^{\circ} \text{C}$$

TABLE 4. TEMPERATURE DATA

THERMOCOUPLE LOCATION	TEMPERATURE C° (F°)				
	Time Of Reading				
AMBIENT AIR (T_{amb})					
ENGINE COOLANT (T_{test})					

Specifications

	Model HDCAC	Model HDCAD
GENSET CONTROLLER: Integrated Microprocessor Based Engine and Generator Controller		
GENERATOR: Single-Bearing, 4-Pole Rotating Field, 1800 RPM		
Power (@ 1.0 power factor)	10,000 W	12,000 W
Voltage	120 / 240	120 / 240
Frequency	60 Hz	60 Hz
Number of Phases	1	1
Current	83.3 / 41.7 amps	100 / 50 amps
Line Circuit Breaker	2-pole, 45 amp	2-pole, 50 amp
FUEL CONSUMPTION:		
No-load	0.11 gph (0.41 lph)	0.11 gph (0.41 lph)
Half-load	0.62 gph (2.34 lph)	0.75 gph (2.84 lph)
Full-load	1.10 gph (4.16 lph)	1.33 gph (5.03 lph)
ENGINE: 3-Cylinder In-Line, Water-Cooled, Indirect-Injection, 4-Stroke Cycle Diesel		
Bore	3.27 in (83 mm)	
Stroke	3.62 in (92 mm)	
Displacement	91 in ³ (1,496 cc)	
Compression Ratio	22 : 1	
Fuel Injection Timing (BTDC)	19°	
Firing Order	1–3–2	
Cylinder Compression Test	370 psi (2.55 mPa) minimum @ 250 rpm	
Fuel Nozzle Injection Pressure	1900 psi (13.1 mPa)	
Valve Lash: Intake & Exhaust (cold)	0.008 in (0.20 mm)	
Oil Capacity (with filter)	6.7 quart (6.3 liter)	
Cooling System Capacity	6.1 quart (5.8 liter)	
DC SYSTEM:		
Nominal Battery Voltage	12 volts	
Minimum Battery Capacity CCA (Cold Cranking Amps)	475 amps down to 0° F (–17° C) 650 amps down to –20° F (–29° C)	
Max. Regulated Charging Current	20 amps	
Fuse F1 (control circuit)	15 amp mini-bayonet	
Fuse F2 (starter circuit)	15 amp mini-bayonet	
WEIGHT: 660 lbs (300 kg)		
SIZE (L x W x H): 41.4 x 24.5 x 27 in (105 x 62 x 68.6 cm)		
SOUND LEVEL: 69 dB(A) @ 10 ft (3m) & 54 dB(A) @ 50 ft (15m)—in “free field site” @ half load		



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