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Onan *Mobile GenSet*

Installation Manual

HDKCA, HDKCB



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 properly operated and maintained.

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 that will result in severe personal injury or death.*

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

⚠ CAUTION *alerts you to a hazard or unsafe practice that 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.

ENGINE EXHAUST IS DEADLY

- Inspect for exhaust leaks at every startup and after every eight hours of running.
- Learn the symptoms of carbon monoxide poisoning in the genset Operator's Manual.
- Never sleep in the vehicle while the genset is running unless the vehicle is equipped with a working carbon monoxide detector.
- Do not operate the genset when the vehicle is parked in a confined space, such as a garage.
- Disable the automatic genset starting feature (AGS) of an inverter-charger or other automatic starting device before storing the vehicle or parking it in a garage or other confined space.
- The exhaust system must be installed in accordance with the genset Installation Manual.
- Engine cooling air must not be used for heating the vehicle.

GENERATOR VOLTAGE IS DEADLY

- Disable the automatic genset starting feature (AGS) of an inverter-charger or other automatic starting device before servicing the genset.
- 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 shore power (utility). Back-feed to shore power can cause electrocution 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.

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.

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.
- 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.

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.

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.

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 readily at hand. Class A fires involve ordinary combustible materials such as wood and cloth. Class B fires involve combustible and flammable liquids and gaseous fuels. Class C fires involve live electrical equipment. (ref. NFPA No. 10)
- Genset installation and operation must comply with all applicable local, state and federal codes and regulations.

1. Introduction

ABOUT THIS MANUAL

⚠ 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.*

This manual is a guide for the installation of the generator sets (gensets) listed on the front cover. Proper installation is essential for top performance. Read through this manual before starting the installation. Leave this manual with the vehicle.

This manual addresses the following aspects of the installation:

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

See the Operator's Manual for operation and maintenance instructions.

Note: **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.

OUTLINE DRAWINGS

See the Outline Drawing (Page A-2) for installation details: mounting bolt hole locations, connection points (fuel, battery, exhaust, remote control, AC output), sizes and types of fittings, cooling air openings, weight, service access points and overall dimensions. See your Onan dealer for a large-scale Outline Drawing and full-size floor cutout template.

INSTALLATION CODES AND STANDARDS FOR SAFETY

⚠ CAUTION *The RV Genset Warranty applies only when the genset is installed in a Recreational Vehicle.*

The installer 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 gensets 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:

- ANSI A1192 (NFPA No. 501C)—Recreational Vehicles
- NFPA No. 70, Article 551—Recreational Vehicles and RV Parks
- CSA Electrical Bulletin 946—Requirements for Internal Combustion Engine-Driven Electric Generators for Use in Recreational Vehicles

Federal, State and local codes, such as the California Administrative Code—Title 25 (RV installation), could also apply. 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 1-1 be obtained for reference.

TABLE 1-1. REFERENCE CODES AND STANDARDS

| | |
|--|---|
| Code of Federal Regulations, Title 49: Chapter III and Chapter V | Superintendent of Documents P. O. Box 371954 Pittsburgh, PA 15250-7954 |
| NFPA No 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 Bulletin 946 | Canadian Standards Association Housing and Construction Materials Section 178 Rexdale Blvd. Rexdale, Ontario, Canada M9W 1R3 |

2. Location, Mounting, and Ventilation

LOCATION

Typical genset locations on a vehicle are illustrated in Figure 2-1.

1. Provide access to the operator's console, front and top service access doors, oil drain (bottom) and coolant drain (lower left front) so that all periodic maintenance can be performed in accordance with the Operator's Manual.
2. Provide access for connecting and disconnecting fuel lines, battery cables, remote control wiring and AC wiring.
3. Make sure that frame cross members, exhaust tail pipes and other equipment do not cross underneath the oil drain plug or air intake and discharge openings. These are the crosshatched areas on the Outline Drawing (Page A-2).
4. Make sure the genset clears the ground by at least 12 inches (305 mm) to provide adequate ventilation and reduce the amount of dust pulled in by the cooling fan.
5. Protect the air inlets in the bottom of the genset from road splash, especially when the genset is located in line with the road wheels. It is preferable to mount the genset in front of, rather than behind, the road wheels.
6. Provide vapor-resistive and fire-resistive barrier between the genset and the interior of the vehicle. Use approved materials (26 gauge galvanized steel or equivalent). See NFPA 1192 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.*

7. A genset compartment must be large enough to provide at least 1/2 inch (12.5 mm) clearance at the top of the genset and 1/4 inch (6.4 mm) clearance at the sides. These minimum clearances apply to the thermal or acoustic insulation with which the compartment may be lined.
8. Acoustic/thermal insulation and adhesive must be Classified as "Self-Extinguishing" at not less than 200°F (90°C). Do not line the bottom of the compartment with insulation, which absorbs spilled fuel and oil.

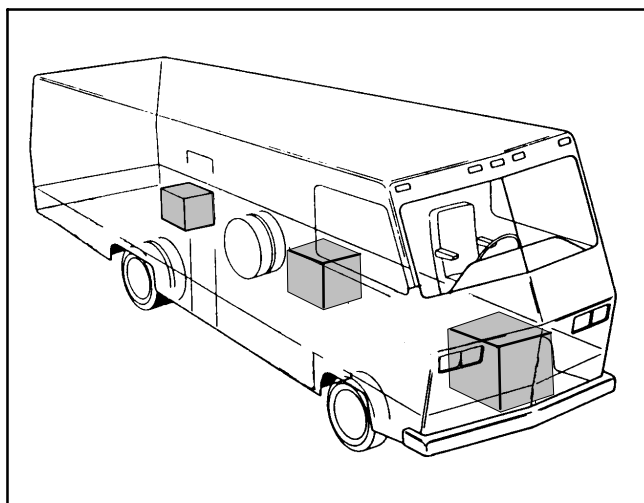


FIGURE 2-1. TYPICAL GENSET LOCATIONS

MOUNTING

Support the genset on a structure able to resist the dynamic weight of the genset: ± 3 g-force vertical and ± 1 g-force horizontal. See *Section 7. Specifications* for the weight of the genset. Use four Grade 5, 3/8-16 UNC screws to secure the genset vibration isolating sub-frame to the floor or frame. Torque the screws to 35 lb-ft (41 N-m).

A vibration isolator kit is available for models that do not have the external vibration isolators and frame illustrated in Figure 2-2. Follow the instructions in the vibration isolator kit.

⚠ 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.*

VENTILATION

Unrestricted air flow for cooling, ventilation and combustion is essential for proper genset performance and service life (Figure 2-2). The air intake and discharge openings are in the bottom of the genset. These are the crosshatched areas on the Outline Drawing (Page A-2). See also HOT AIR RECIRCULATION TEST (Page 6-1).

If the genset is installed on a floor, cut out openings in the floor that are at least as large as the openings in the genset. The openings must line up so that the air can flow straight through the space between the genset opening and the floor cutout opening. *If necessary, duct the hot discharge air through the floor to prevent recirculation inside the compartment.*

Make sure frame cross members, exhaust tail pipes and other equipment do not cross underneath the air intake and discharge openings. *Do not block the air inlet and outlet openings with screens, expanded metal or the like; they restrict air flow and could cause the genset to overheat.*

Note: Note: The hot air discharges away from the end of the genset at a slight angle to reduce recirculation (Figure 2-2). This space must also be free of frame cross members, exhaust tail pipes and other equipment that could deflect the discharged air back into the air intake openings.

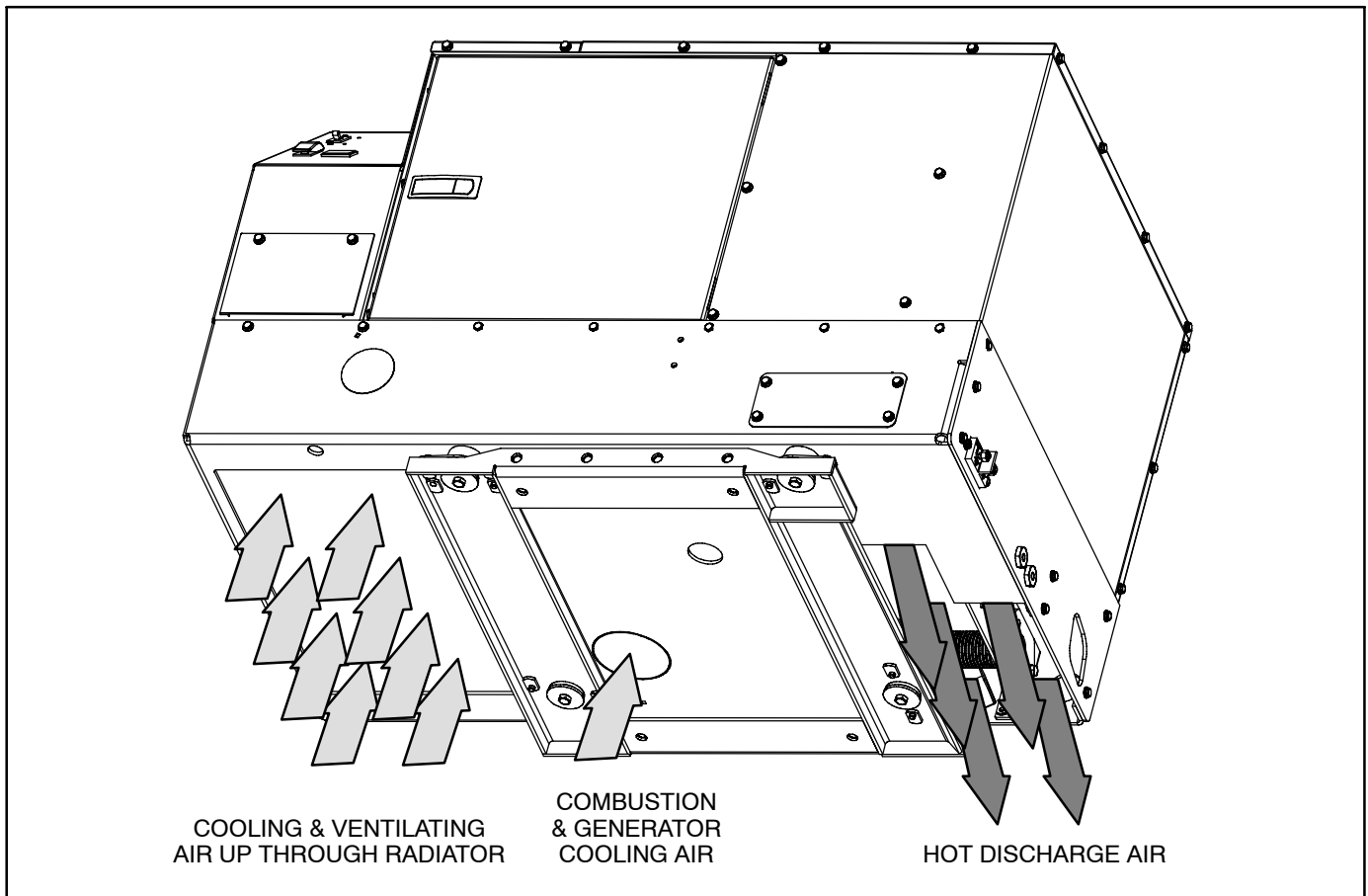


FIGURE 2-2. COOLING, VENTILATION AND COMBUSTION AIR FLOWS

3. 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 3-4) or route it such that it is likely to be damaged (Figure 3-5). Use approved materials and parts only.***

⚠ 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.***

MUFFLER

The muffler is mounted inside the genset housing. It

has a USDA (Forest Service) spark arrestor and meets RVIA EGS-1 construction requirements.

Figure 3-1 illustrates the flanged exhaust outlet and the clearance openings for rear and side tail pipe connections. See the Outline Drawing (Page A-2) for the dimensions of the exhaust outlet flange.

A genset without a properly installed and maintained spark arresting exhaust system can cause a forest fire. It is illegal on federal lands. Liability for damage, injury and warranty expense due to the modification of the exhaust system or to the use of unapproved parts is the responsibility of the person performing the modification or installing the unapproved parts. Contact an Onan distributor for approved exhaust system parts.

Note: Block the side and rear exhaust exit openings in the base if the genset is mounted in an enclosure and the *Hot Air Recirculation Test* (Page 6-1) indicates there is recirculation that could cause the genset to overheat.

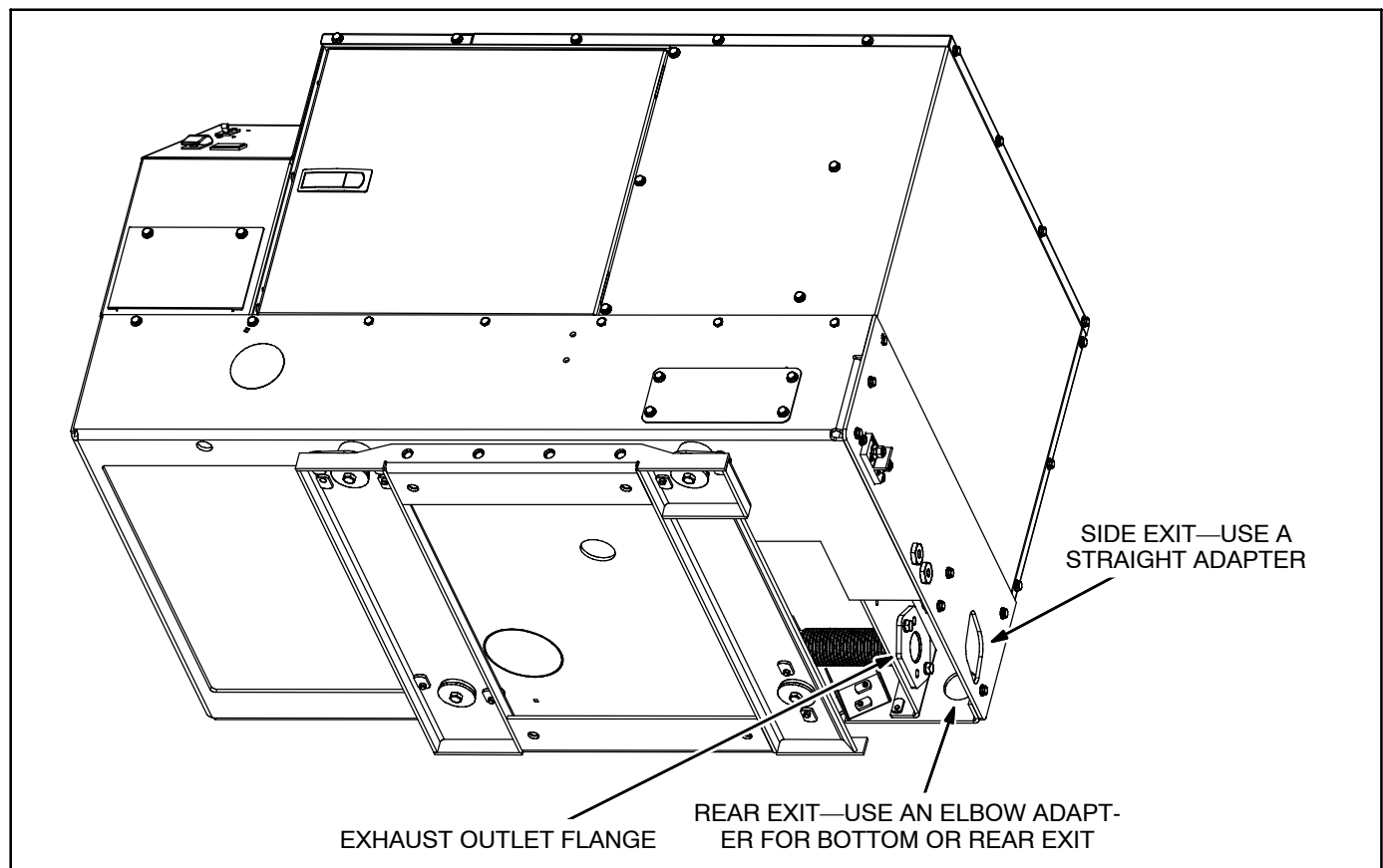


FIGURE 3-1. EXHAUST CONNECTIONS AT GENSET

TAILPIPE

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 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 M8 x 1.25 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 3-2.
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 3-3). Support the end of the tailpipe such that it cannot be pushed inward and up under the skirt of the vehicle by backing up into a curb or other obstacle.

Note: Do not terminate the tailpipe underneath a slide-out room (Figure 3-5), unless the bottom of the slide-out, including skirts and moldings, is at least 3 feet above the end of the tailpipe.

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 or terminate it below or near a fuel fill opening.
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 3-4.

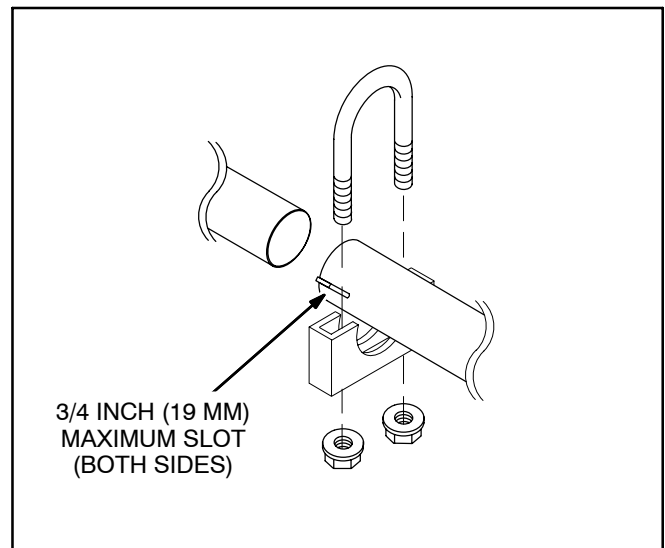


FIGURE 3-2. EXHAUST TAILPIPE CONNECTIONS

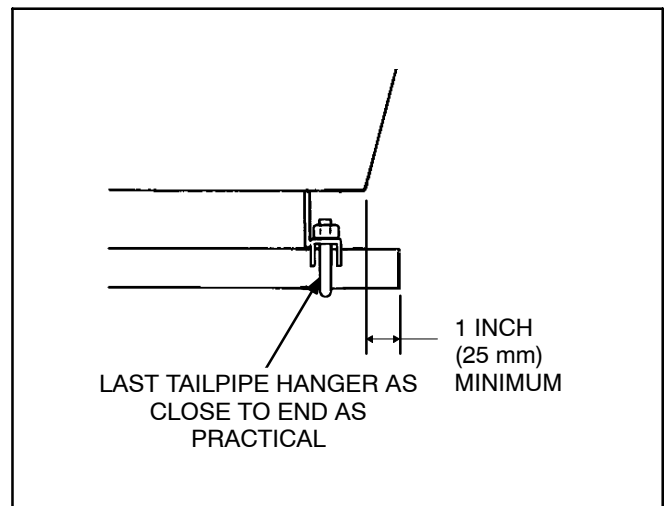


FIGURE 3-3. TERMINATING THE EXHAUST TAILPIPE

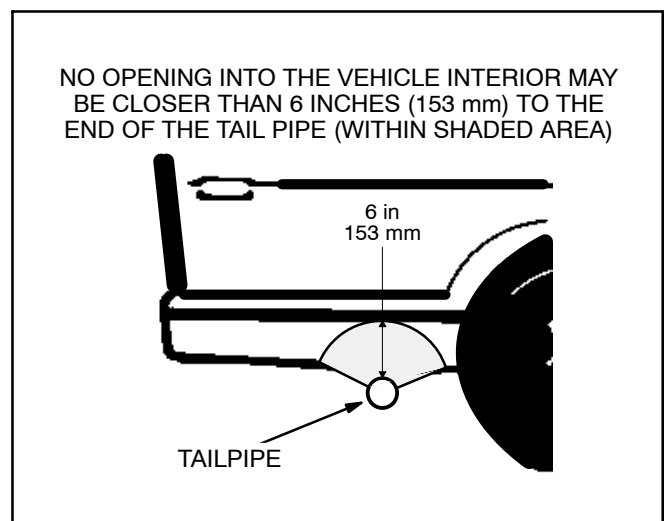


FIGURE 3-4. MINIMUM DISTANCES TO OPENINGS

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 3-5).

⚠ 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.*

12. 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.

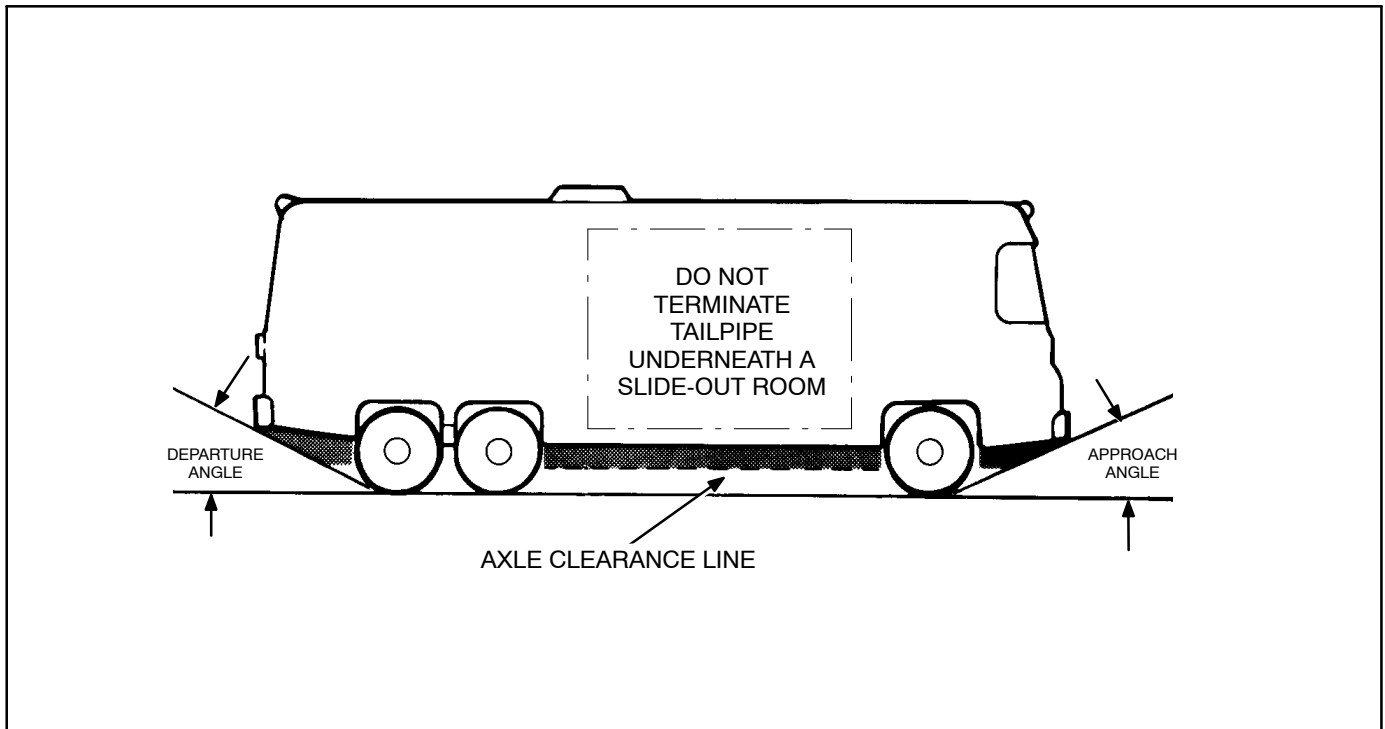


FIGURE 3-5. APPROACH AND DEPARTURE ANGLES AND AXLE CLEARANCE LINE

4. 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 4-1 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.

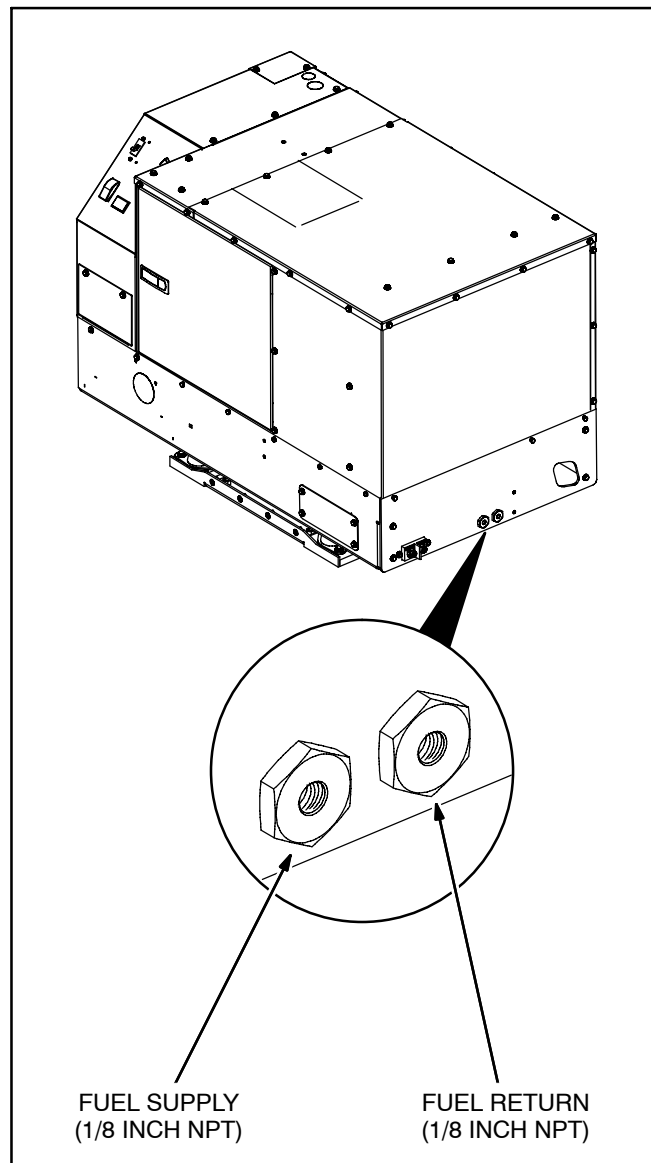


FIGURE 4-1. FUEL CONNECTIONS

5. Electrical Connections

AC POWER OUTPUT

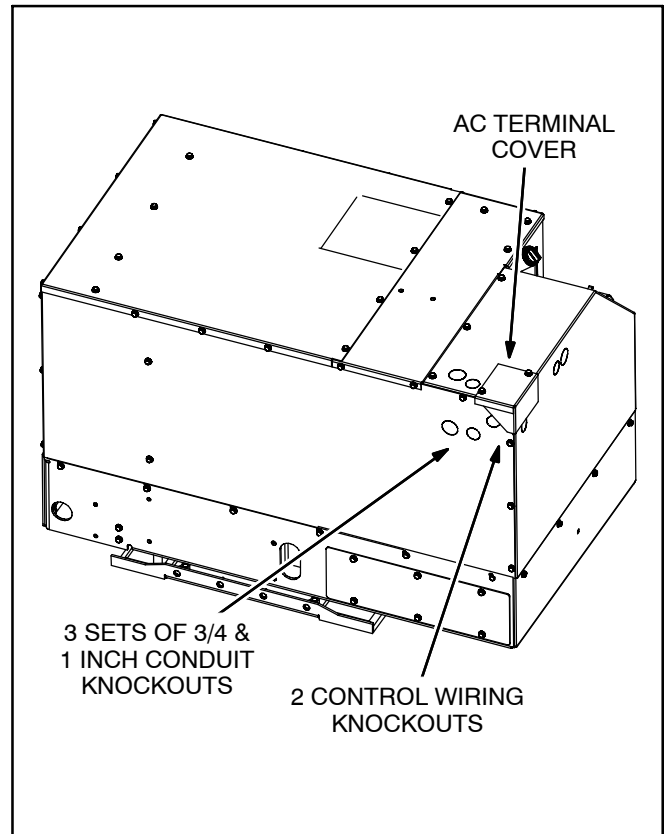
⚠WARNING *Accidental starting of the genset can cause severe personal injury or death. Do not connect the starting battery until so instructed in Installation Review and Startup. Make sure an automatic genset starting system is disabled.*

The genset is equipped with a terminal block and conduit connector knockouts for AC power output connections (Figure 5-1).

Wiring Methods

Follow the National Electrical Code, especially noting the following:

1. Have a trained and experienced electrician supervise and inspect the installation of all AC wiring.
2. Secure only one lead at each AC output terminal. The terminals are suitable for wire sizes up to No. 6 AWG. Torque the terminals to 13 in-lbs (1.5 N-m).
3. Use vibration-proof switches and controls to prevent the opening and closing of circuits while the vehicle is in motion.
4. Use rain-tight conduit, conduit connectors and junction boxes for all exterior wiring.
5. Provide ground fault circuit interrupters (GFCIs) for all convenience power receptacles.



**FIGURE 5-1. ACCESS FOR AC OUTPUT AND
REMOTE CONTROL CONNECTIONS**

6. Seal all conduit openings into the vehicle interior to keep out exhaust gas. Apply silicone rubber or equivalent 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.)

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

7. 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.**

8. Connect the grounding terminal (Terminal TB2-4, Figure 5-2) 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

A vehicle with provisions for connecting utility (shore) power must have an approved device to keep the genset and utility from being interconnected. See Figure 5-2 for typical connections.

⚠WARNING **Interconnecting the genset and the public utility (or any other power source) can lead to electrocution of utility line workers, equipment damage and fire. Use an approved switching device to prevent interconnections.**

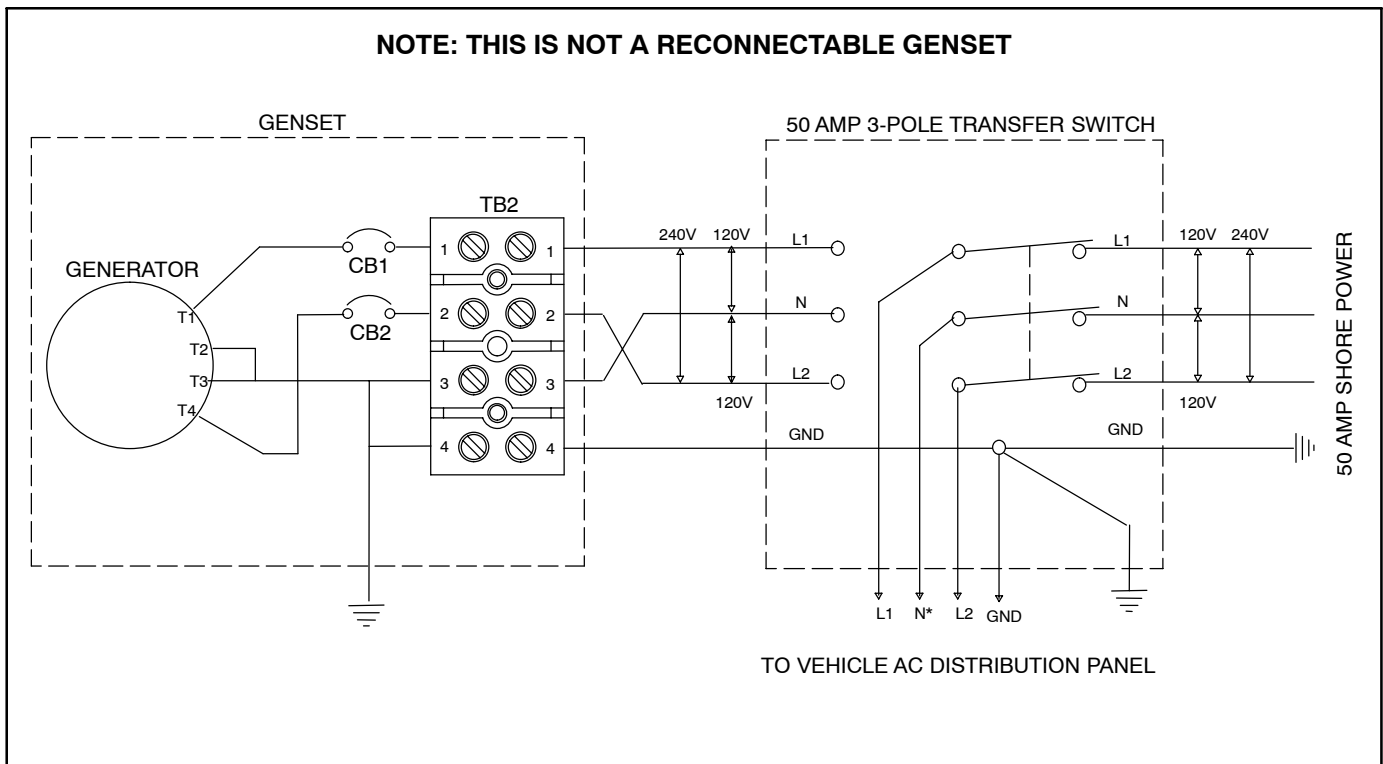


FIGURE 5-2. TYPICAL AC CONNECTIONS

REMOTE CONTROL

Leads for connection to a remote control panel are terminated in a 10-pin sealed connector and are stowed inside the AC terminal enclosure when the

genset leaves the factory. See the Outline Drawing (Page A-2) for details of the connector and its mate. Refer to Figure 5-3 for pin connections. For further reference also see the Wiring Schematic (Page A-1).

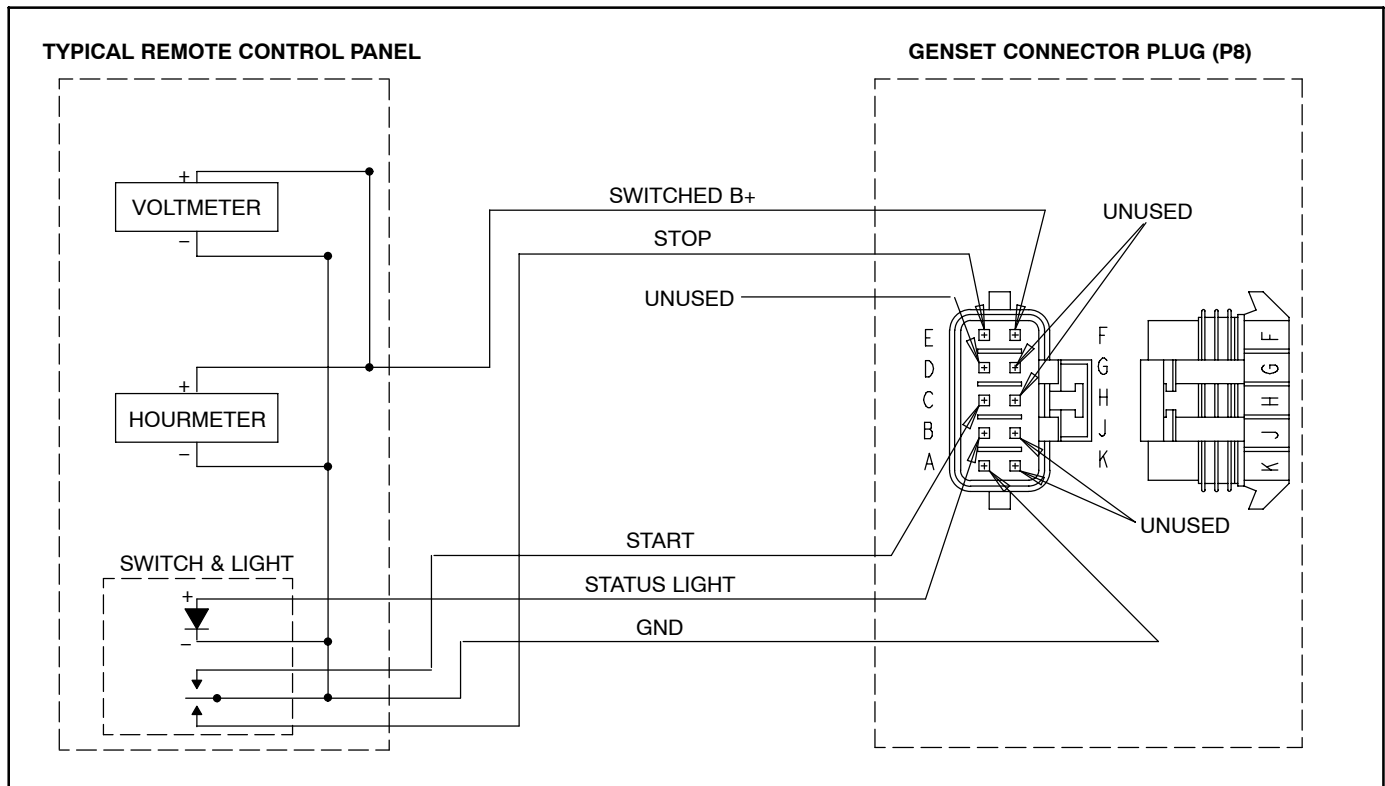


FIGURE 5-3. REMOTE CONTROL CONNECTOR PLUG AND TYPICAL CONNECTIONS

Remote Control Panels

Onan offers harnesses of various lengths with mating receptacles and three remote control kits as follows:

- Remote switch / status lamp (Figure 5-4).
- Remote switch / status lamp and hour meter (Figure 5-5).
- Remote switch / status lamp and DC voltmeter (Figure 5-6).

If another source is used for the remote 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 total load connected to **P2-E** (Switched B+) should not exceed 2 amp.
3. The total load connected to **P2-F** (Status Light) should not exceed 2 amp.

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.

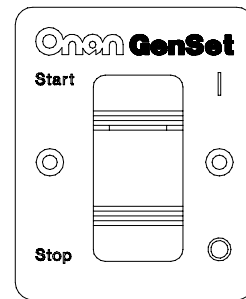


FIGURE 5-4. REMOTE SWITCH

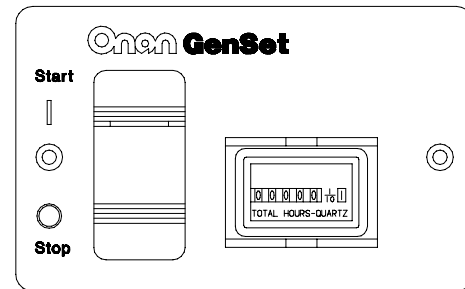


FIGURE 5-5. REMOTE SWITCH / HOUR METER

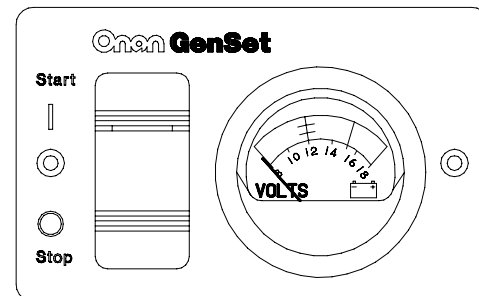


FIGURE 5-6. REMOTE SWITCH / DC VOLTMETER

BATTERIES

To prevent accidental starting of the genset during installation, do not connect the battery cables at the battery until so instructed in *Section 6. Installation Review and Startup* and make sure an automatic genset starting system is disabled.

⚠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. Make sure an automatic genset starting system is disabled.*

Battery Capacity

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

Battery Recharging

An external battery charger will need to be provided to recharge the genset cranking battery.

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

Size battery cables according to Table 5-1. 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 5-7). Note also that codes may require a bonding conductor between the genset and vehicle frame and between the battery and vehicle frame.

If the vehicle frame is used as the path between the negative (-) battery terminal and the genset (Figure 5-8), all frame members in the path of battery cranking currents must have substantial cross sections. The electrical resistance of riveted or bolted frame joints must also be carefully considered, especially if the joints will be exposed to corrosive conditions. A cable sized according to Table 5-1 must be used to connect the frame to the designated negative (-) terminal on the genset (Figure 5-8). ***The genset mounting bolts are not considered adequate means for bonding the genset to the vehicle frame, either for the purpose of carrying cranking currents or for complying with requirements for genset/system grounding.***

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.*

TABLE 5-1. BATTERY CABLE SIZES FOR AMBIENT TEMPERATURES TO -20° F (-29° C)

| TOTAL CABLE LENGTH, FEET (METERS) | 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).

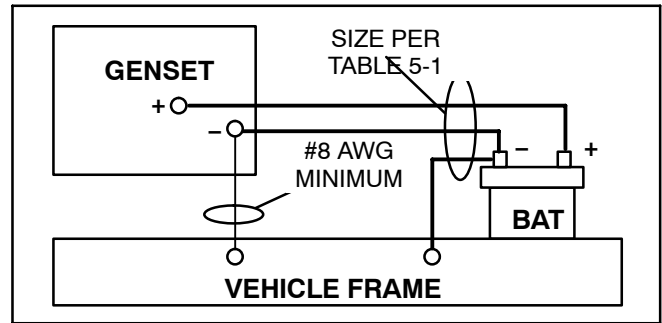


FIGURE 5-7. FULL-LENGTH CABLE FROM BATTERY NEGATIVE (-) TERMINAL

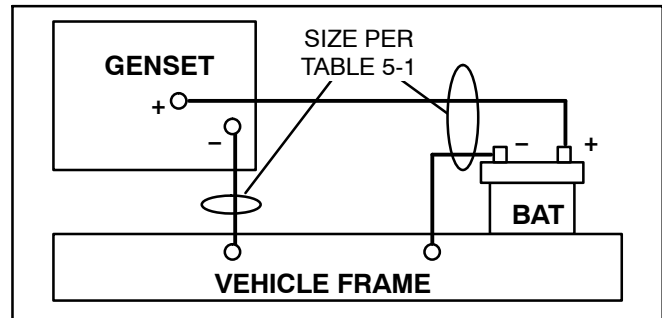


FIGURE 5-8. VEHICLE FRAME AS PATH FROM BATTERY NEGATIVE (-) TERMINAL

Genset Bonding Terminal

The negative (-) battery cable terminal shown in Figure 5-9 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

Terminate the battery cables with ring terminals sized for the 5/16 inch genset terminal screws (Figure 5-9). Permanently mark each end of each cable as to its polarity, positive (+) or negative (-). After making sure the battery cables are not connected at the battery and that an automatic genset starting system is disabled, connect the battery and grounding cables to the genset. Torque the terminals to 7.5 lb-ft (10 N-m).

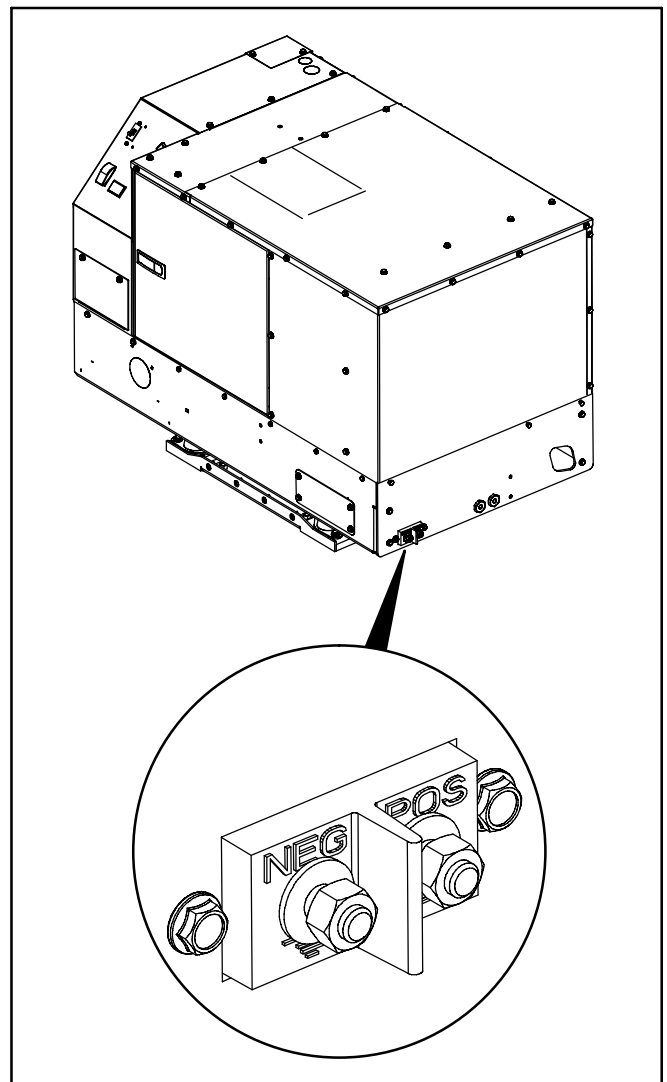


FIGURE 5-9. BATTERY CABLE TERMINALS

6. Installation Review and Startup

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. Conduct the test in a well ventilated space in which carbon monoxide cannot accumulate, but that is protected from cross drafts that could affect temperature measurements.
3. Connect a large, constant load to the genset. If a load bank is available, connect at least 3/4 full load. If not, connect and run the largest combination of constant loads that can be kept on during the test without tripping the genset circuit breaker. For example, run a combination of air conditioners, hair dryers and lights. Make sure the air conditioners stay on and do not cycle during the test.
4. Measure temperatures with thermocouples not heavier than No. 24 AWG (0.21 mm²).
5. Measure genset intake air temperature with one or two thermocouples tied about 1 inch away from the face of the radiator in the intake air opening (Figure 6-1). Make sure the thermocouples don't touch the radiator.
6. 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.

7. Close all genset compartment doors and run the genset for at least 90 minutes. Record temperatures at 15 minute intervals. See Table 6-1 for an example of how the data can be arranged for recording and analysis.

TABLE 6-1. TEMPERATURE DATA

| THERMOCOUPLE LOCATION | TEMPERATURE ° F (° C) | | | | |
|-----------------------|-----------------------|--|--|--|--|
| | Time of Reading | | | | |
| | | | | | |
| AMBIENT AIR | | | | | |
| INLET AIR | | | | | |

Test Requirement

The rise in inlet air temperature over ambient air temperature must not exceed 15° F (8.3° 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 2-2).

⚠ CAUTION *High ambient operating temperatures can reduce maximum genset power if the air temperature rise in this test is on the high end of the acceptable range.*

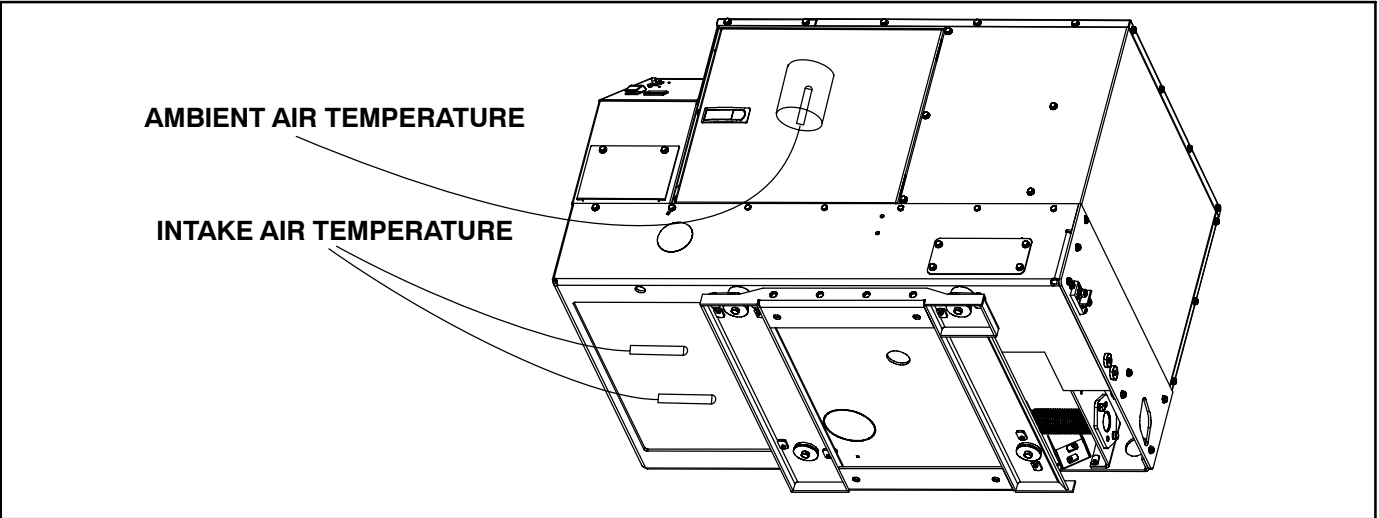


FIGURE 6-1. THERMOCOUPLE LOCATIONS

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?
- [] 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 and not under a slide-out room or near a fuel fill opening?
- [] 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 space of the vehicle and separated by approved vapor 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 road splash?
- [] Does the genset clear the ground by at least 12 inches (305 mm)?
- [] Has the HOT AIR RECIRCULATION TEST been conducted? Are the results acceptable?

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.***

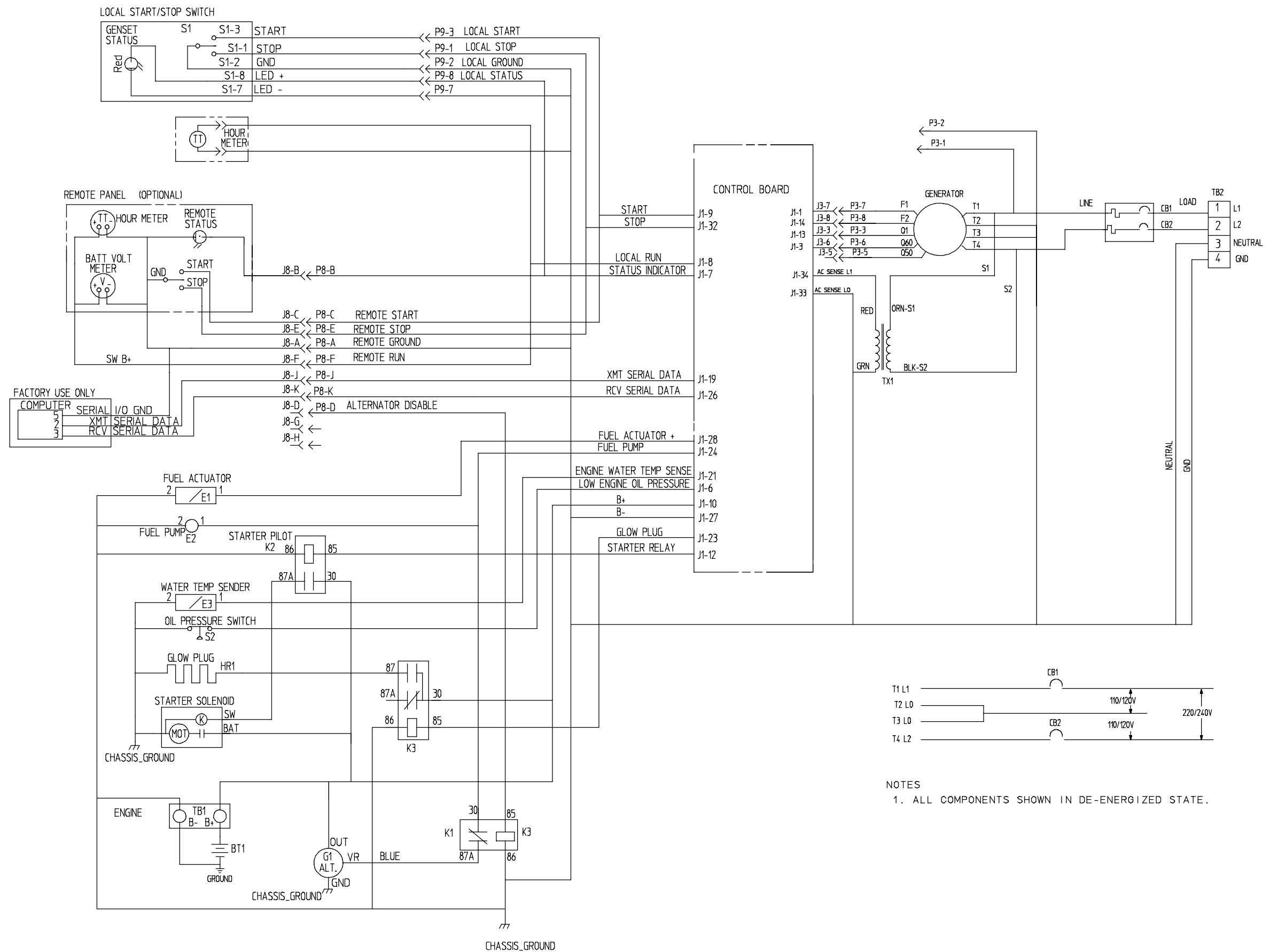
Read through the Operator's Manual and perform the maintenance and pre-start checks instructed. The genset is shipped from the factory with proper levels of engine oil and coolant, which should nevertheless be checked before the genset is started. Start and operate the genset, following all the instructions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

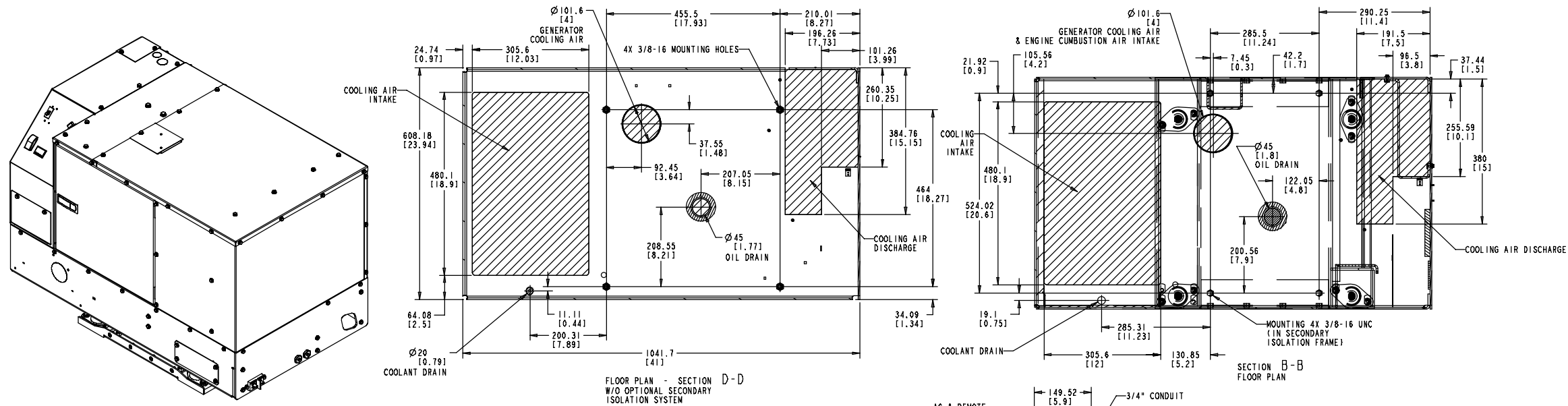
Check for fuel, coolant and exhaust leaks and unusual noises while the genset is running under full and intermediate loads. To calculate electrical loads see POWERING EQUIPMENT in the Operator's Manual. Do not place the genset in service until all leaks have been fixed and operation is satisfactory.

7. Specifications

| MODEL: | HDKCA | HDKCB |
|--|--|--------------------|
| GENSET CONTROL: Integrated Microprocessor-Based Engine and Generator Controller | | |
| GENERATOR: Single-Bearing, 4-Pole Rotating Field, 1800 RPM | | |
| Power (@1.0 power factor) | 10,000 W | 12,500 W |
| Voltage | 120 / 240 | 120 / 240 |
| Frequency | 60 Hz | 60 Hz |
| Number of Phases | 1 | 1 |
| Current | 41.7 amps per leg | 52.1 amps per leg |
| Line Circuit Breaker | 2-pole, 45 amp | 2-pole, 50 amp |
| FUEL CONSUMPTION: | | |
| No-load | 0.11 gph (0.4 lph) | 0.11 gph (0.4 lph) |
| Half-load | 0.48 gph (1.8 lph) | 0.48 gph (1.8 lph) |
| Full-load | 1.01 gph (3.8 lph) | 1.2 gph (4.5 lph) |
| ENGINE: 3-Cylinder In-Line, Water-Cooled, Indirect-Injection (IDI), 4-Stroke Cycle Diesel | | |
| Bore | 3.43 in (87 mm) | |
| Stroke | 3.64 in (92.4 mm) | |
| Displacement | 100.5 in ³ (1,647 cc) | |
| Compression Ratio | 22.6 : 1 | |
| Fuel Injection Timing (BTDC) | 14.5° | |
| Firing Order | 1–3–2 | |
| Fuel Nozzle Injection Pressure | 1991 psi (13.731 mPa) | |
| Cylinder Compression Test | 370 psi (2.55 mPa) minimum | |
| Valve Lash: Intake & Exhaust (cold) | 0.0071 to 0.0087 in (0.18 to 0.22 mm) | |
| Oil Capacity (with filter) | 5.9 quart (5.6 liter) | |
| Cooling System Capacity | 6.6 quart (6.2 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) | |
| Battery Recharging | Installer must provide for battery charging | |
| WEIGHT: | 775 lbs (351 kg) | 794lbs (360 kg) |
| SIZE (L x W x H): 41.4 x 24.5 x 27 in (105 x 62 x 68.6 cm) | | |
| SOUND LEVEL: 68 dB(A) @ 10 ft (3m) & 54 dB(A) @ 50 ft (15m)—in “free field site” @ half load | | |



CONTROL SCHEMATIC



NOTES:

- PRIMARY DIMENSIONS ARE MILLIMETERS. DIMENSIONS IN [] ARE INCHES.
- COMPARTMENT SHALL ALLOW OPENING AND CLOSING OF SERVICE ACCESS DOOR AND ACCESS TO THE FOLLOWING COMPONENTS: START-STOP SWITCH, CIRCUIT BREAKER, COOLANT FILL AND CHECK, AND COOLANT DRAIN.
- MINIMUM UNIT CLEARANCE FROM COMPARTMENT SURFACES:

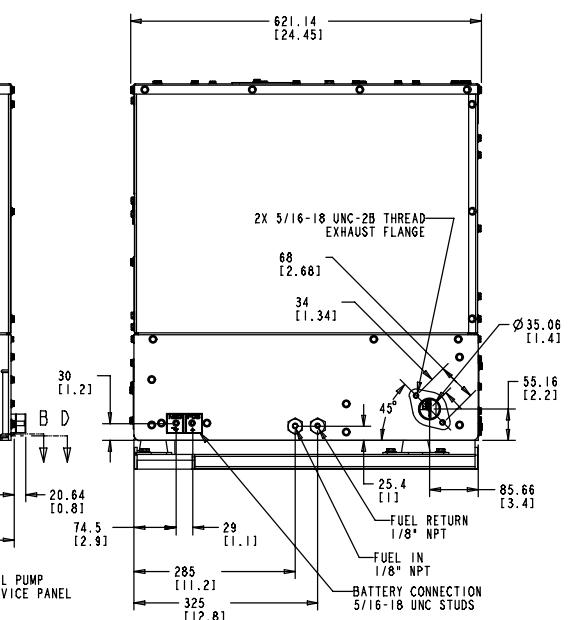
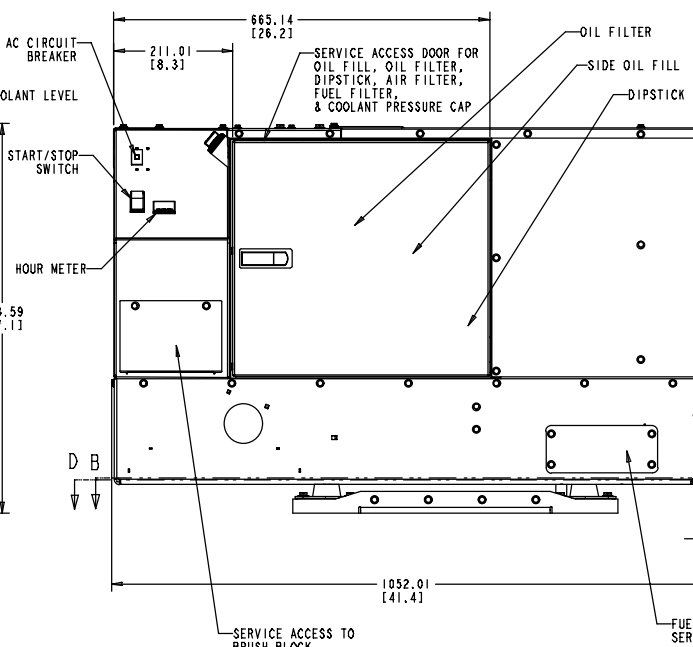
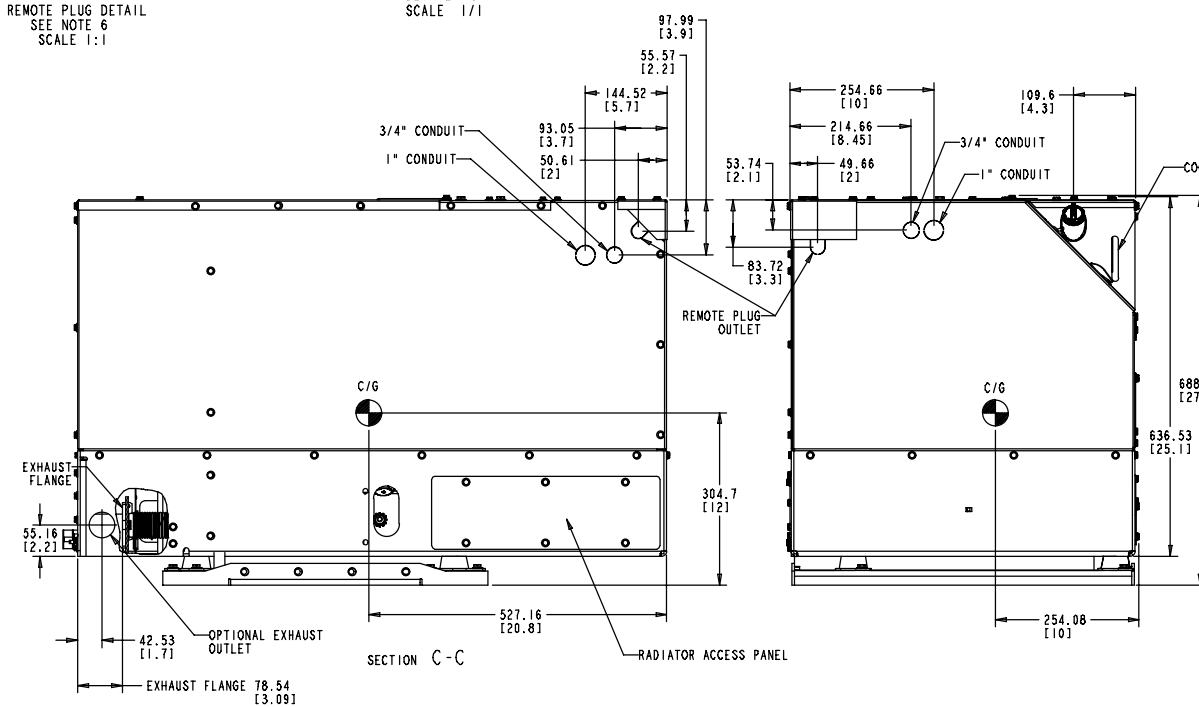
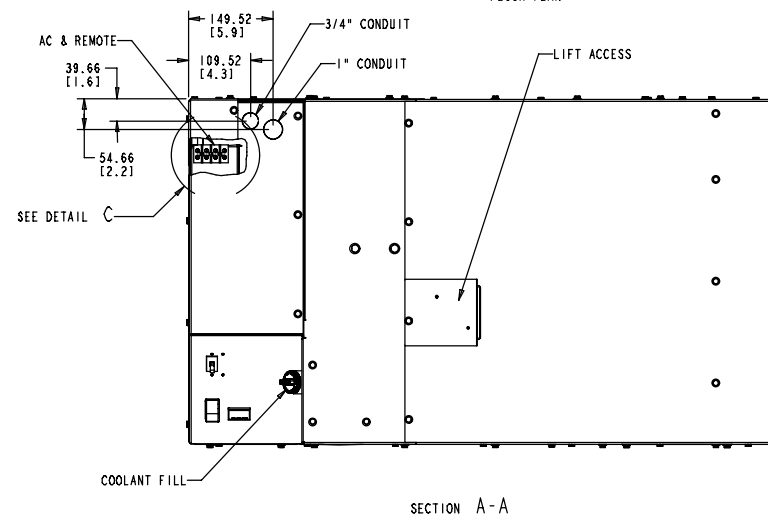
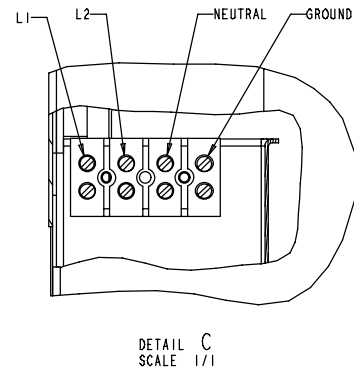
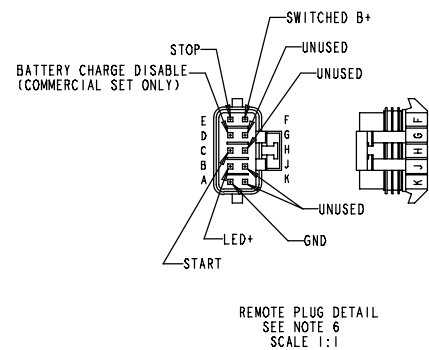
| | TOP | ALL SIDES |
|--|-------------|------------|
| | 12.5 [0.50] | 6.4 [0.25] |
- MINIMUM INSTALLATION SIZE IS 697.1 [27.5] HIGH X 633.8 [25] WIDE X 1097 [43.2] LONG AND VARIES WITH MOUNTING KIT USED AND SERVICE DOOR ACCESS.
- MATES WITH PACKARD METRI-PACK™ CONNECTOR

| DESCRIPTION | QTY | PACKARD PART NO. | ONAN PART NO. |
|--------------|-----|------------------|---------------|
| CONNECTOR | 1 | 12045808 | 323-1710 |
| PLUG-CAVITY | 3 | 12059168 | 323-1712 |
| SEAL CABLE | 7 | 12048086 | 323-1708 |
| TERMINAL | 7 | 12045773 | 323-1707 |
| HOUSING-LOCK | 1 | 12176336 | 323-1719 |

THESE TERMINALS AND HOUSING ARE DESIGNED TO BE USED WITH 18-22 GAUGE WIRE ONLY. SEE ACCESSORY CATALOG FOR COMPLETE MATING HARNESSSES.

6. UNIT WEIGHT:

10 kw - 351 KG [775 lbs]
12.5 kw - 360 KG [794 lbs]



OUTLINE DRAWING



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