Installation Manual

Cummins **Onan**

Performance you rely on.™

RV Generator Set

KY (Spec J–N)

English – Original Instructions 9–2012 981–0621 (Issue 9)

⚠ WARNING: ⚠

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or 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 be obtained only when equipment is operated and maintained properly.

Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards shall remove, dismantle and dispose of the generator set. See Service manual.

Some generator set installation procedures present hazards that can result in severe personal injury or death. Only trained and experienced personnel with knowledge of fuels, electricity, and machinery hazards should perform generator set installation procedures.

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

⚠ DANGER ***Used to alert you to an lethal hazard against which you must take steps to prevent severe personal injury or death, as when you are in the vicinity of High Voltage equipment.***

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

⚠ CAUTION ***Used to alert you to a hazard or unsafe practice that 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 preforming 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 fire extinguishers handy.
- 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 durning 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 to 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.
- Use personal protective equipment when performing maintenance operations such as glasses, gloves, etc.

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 ap-

proved 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.

BATTERY GAS IS EXPLOSIVE

- Wear splash–proof safety glasses.
- Do not smoke or permit flames or sparks to occur near the battery at any time.
- 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

- 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.

ENGINE EXHAUST IS DEADLY!

- Learn the symptoms of carbon monoxide poisoning in this manual and never occupy the vehicle while the genset is running unless the vehicle is equipped with a working carbon monoxide detector.
- Prior to every startup and after every eight hours of running, all carbon monoxide detectors must be tested and confirmed to be working in accordance with the manufacturer's instructions or owners manual.
- The exhaust system must be installed in accordance with the genset Installation Manual. Engine cooling air must not be used for heating the working or living space or compartment.

THE HAZARDS OF CARBON MONOXIDE

⚠WARNING ***Engine–driven generators can produce harmful level of carbon monoxide that can injury or kill you.***

ONLY YOU CAN PROTECT YOURSELF FROM CO POISONING!

- Watch constantly for people near the exhaust of the generator set while it is running.
- Make sure exhaust cannot enter the living quarters through a window, vent or door.
- Make sure all CO detectors or audible alarms are working properly.
- Pay attention to the signs of CO poisoning.
- 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.

SUBSTANCE HAZARDOUS TO HEALTH

Generator sets use substances, and emit and create wastes that can cause health risks. Generator set operators must use appropriate personal protective equipment (such as clothing, gloves, protective glasses/goggles, and respiration equipment) when exposed to fuel, oil, coolant, wet batteries, grease, cleaning agents, or other substances exposed to lungs, eyes, or skin. use appropriate containers for transport, storage, and disposal of waste substances. Follow local regulations for disposal and recycling.

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 switches and all other sources of ignition well away.
- Fuel lines must be secured, free of leaks and separated or shielded from electrical wiring.
- Leaks can lead to explosive accumulations of gas. Natural gas rises when released and can accumulate under hoods and inside housings and buildings. LPG sinks when released and can accumulate inside housings and basements and other below-grade spaces. Prevent leaks and the accumulation of gas.

PROPANE

This product is also known as C_3H_8 or liquified propane gas. It consists of predominantly C_3 Hydrocarbons (propane and prepane) with typically < 50 ppm of ethyl mercaptan or other odorizing agent added to assist leak detection. Contains <0.1% 1, 3 butadeine. Hazardous components include c3–4 rich, petroleum distillate.

The substance has an initial boiling point of –42.1°C, a flash point of –104°C (PMCC), and a vapor pressure of 7.5 bar at 15°C.

Keep container below 50°C. The substance should not be used for any other purpose without contacting the manufacturer or supplier. Installers, operators and maintainers are likely to encounter this substance. When doubt exists as to correct handling of procedure, contact supplier.

HAZARDOUS REACTIONS

This liquid is extremely flammable (F+). Readily forms an explosive air–vapor mixture at ambient temps. Avoid smoking, heat sources, such as welding and naked flames, sparks and static electricity build–up. Thermal decomposition products are hazardous, containing CO_x compounds.

The vapor is explosive. High vapor concentrations can cause respiratory irritation, dizziness, nausea, and loss of consciousness. Excessive and prolonged exposure to the mist can cause chronic inflammatory reaction of the lungs and form of pulmonary fibrosis.

Vapor is heavier than air and may travel to remote sources of ignition. Liquid leaks generate large volumes of flammable vapor (approx 250:1).

Avoid strong oxidizing agents, e.g. chlorates which may be used in agriculture

Cold burns (frost bite) will result from skin/eye contact with liquid. Toxicity following single exposure to high level of propane is of low order.

PROTECTIVE MEASURES

Ensure good ventilation and avoid heat sources. Observance of good housekeeping rules will ensure general safety. Do not smoke.

When working on, or testing, injection equipment, special care is required. Use eye protection at all times.

Adopt a high standard of personal hygiene. In the case of skin contact, flush with water to normalize temperature. Use gloves and overalls, and eye protection goggles. Use oil impervious gloves and avoid contamination inside the gloves. If overalls become contaminated, discontinue use and clean thoroughly. Contaminated clothing should be removed, soaked with water, and laundered before reuse.

No special respiratory precautions are necessary in normal use.

STORAGE/TRANSPORT

Store and transport only in correctly marked containers. Keep containers closed when not in use. Keep cool, out of sunlight and away from naked flames. Electrical continuity is required between the transport and storage vessels during product transfer.

In case of leak clear people away from area to a safe place. DO NOT operate electrical equipment unless flame proof. Summon emergency services and treat or refer casualties as necessary.

Extinguish all naked lights – AVOID MAKING SPARKS! Try to stop flow of product. Cover drains and dispense vapor with water spray. Note: Vapor may collect in confined spaces.

EMERGENCY ACTION

- Fire
  Extinguishing media:
  Large fire – None. Product flow must be stopped and container cooled by water spray. Water fog should be used to assist approach to source of the fire.
  Small fire – foam/dry powder, CO_2
  Avoid making sparks. Fire fighters to sue self–contained breathing apparatus. Keep fire exposed containers cool, using water fog/spray. Prevent run–off from entering waterway, drains and drinking water supplies. Every precaution must be taken to keep containers cool to avoid the possibility of a boiling liquid expanding vapor explosion (BLEVE).

- Ingestion: Not applicable
- Inhalation (of vapor)
  Remove from further exposure. Obtain medical assistance immediately.
- Eyes
  Cold burns should be flushed with water to normalize temperature. Cover burns with sterile dressings. Do not use ointments or powders. Obtain medical assistance as necessary.
- Skin
  Cold burns should be flushed with water to normalize temperature. Cover burns with sterile dressings. Do not use ointments or powders. Obtain medical assistance as necessary.
- Spillage: See Storage/Transport (Section 5. 7. 3)

PETROL (UK) / GASOLINE

This product is also known as petrol (UK) or gasoline. It can be clear liquid with slight tan or yellow color with a characteristic mild odor. It is a complex combination of hydrocarbons consisting of primarily of parafins, napthlenes, aromic and olefinic hydrocarbons having carbon numbers predominantly between C4 and C12.

The substance has an initial boiling point of 25–220°C, a flash point greater than <–40°C, and a vapor pressure between 0.5 – 1 bars and has negligible solubility in water.

It is used as a fuel for off–road petrol powered vehicles and stationary engines, and can be found in fuel tanks, pipes and injection systems. The substance should not be used for any other purpose without contacting the manufacture or supplier. Installers, operators and maintainers are likely to encounter this substance.

HAZARDOUS REACTIONS

This liquid is extremely flammable. Avoid smoking, heat sources, such as welding and naked flames, sparks and static electricity build–up. Thermal decomposition products are hazardous, containing CO_x, NO_x and SO_x compounds.

The vapor is explosive. High vapor concentrations can result in central nervous system and respiratory depression with subsequent loss of consciousness. Where ventilation is poor or temperatures high, vapor production may be a hazard. Excessive and prolonged exposure to the mist can cause chronic inflammatory reaction of the lungs and form of pulmonary fibrosis.

Avoid strong oxidizing agents, e.g. chlorates which may be use in agriculture.

Petrol is slightly irritating to the skin and has a defatting action. Toxicity following single exposure to high level of petrol is of low order. Prolonged, repeated skin contact may de–fat the skin resulting in possible skin irritation and dermatitis. In some cases warty, cancerous growths have occurred. This product contains benzene (<1%) which is classified as a carcinogen. Exposure to Benzene may result in blood disorders such as anaemia and leukemia. Toxic to aquatic organisms, may cause long–term adverse effects in aquatic environment.

PROTECTIVE MEASURES

Ensure good ventilation and avoid heat sources. Observance of good housekeeping rules will ensure general safety. Do not smoke. Avoid breathing mist.

When working on, or testing, injection equipment, special care is required to avoid perforation of skin by high pressure fuel. Use eye protection in the event of suspected high pressure leak.

Adopt a high standard of personal hygiene. In the case of skin contact, wash well with soap and water.

Use glove and overalls, and eye protection goggles if there is a risk of splashing. Use oil impervious gloves and avoid contamination inside the gloves. If overalls become contaminated, discontinue use and clean thoroughly. Contaminated clothing should be removed, soaked with water, and laundered before use.

No special respiratory precautions are necessary in normal use.

DO NOT use as a solvent for removing dirt/grease etc, from skin.

STORAGE/TRANSPORT

Store and transport only in correctly marked containers. Keep containers closed when not in use. Keep cool, out of sunlight and away from naked flames. Electrical continuity is required between the transport and storage vessels during product transfer.

Contain leak/spill with sand, earth or other suitable material, and prevent entry of substance into drainage/sewerage system, water–courses and land. Dispose of unwanted or absorbed substance through an authorized contractor to a licensed site.

Inform local and fire authorities should the product reach waterways, drains etc.

EMERGENCY ACTION

- Fire
  Extinguishing media:
  Large fire – Foam/water fog. Never use water jet.
  Small fire – foam/dry powder, AAAF,CO_2, sand, earth.
  Avoid making sparks. Fire fighters to sue self–contained breathing apparatus. Keep fire exposed containers cool, using water fog/spray. Prevent run–off from entering waterway, drains and drinking water supplies.
- Ingestion
  Do not induce vomiting. Wash the mouth out with water, and send to hospital immediately.
- Inhalation (of vapor)
  Remove from further exposure. Obtain medical assistance immediately.
- Aspiration (inhalation of liquid)
  If, following ingestion of gas oil, vomiting occurs, there is danger of aspiration into the lungs. This would cause intense local irritation and chemical pneumonitis that can be fatal. Obtain immediate medical assistance.
- Eyes
  Irrigate copiously with water or preferably eye–wash solution for at least five minutes. If irritation persists seek medical advice.
- Skin
  Wash thoroughly with soap and water. Change clothing if necessary.
  If high pressure injection has occurred prompt surgical attention is required.
- Spillage
  Absorb using sand, earth or other suitable material. Dispose of unwanted or absorbed flammable material as directed under Storage/ Transport (Section 5.7.3). In the event of a major spillage, only trained personnel wearing self contained breathing apparatus should handle the spill. Any spillage or leak should be treated as a major fire/explosion hazard. If vehicles present, switch off engines.

LUBRICATION OIL – PREMIUM BLUE E

15W40

Also known as oil, lube oil, sump oil, new oil is dark, viscous liquid with a slight, characteristic odor. The base oil contains: distillates (petroleum), solvent–dewaxed heavy paraffinic. It is not classified as dangerous according to Directive 1999/45/EC and its amendments, and is not classified according to the EU regulations.

It has a boiling point greater than 150°C, a flash point Open Cup of 220°C (Cleveland), and is insoluble in cold water.

It is used in engine lubricant oil systems, sump pan and filters, make–up tanks and piping systems as a lubrication oil for use in wide range of diesel engines operating under severe conditions. Installers, operators and maintainers are likely to encounter this product.

HAZARDOUS REACTIONS

This product is stable although slightly re–active with oxidizing agents. Results of decomposition are carbon oxides (CO, CO_2) and water.

Although harmful if swallowed or aspirated (breathed in), repeated or prolonged exposure is not know to aggravate medical conditions.

Used oil may contain harmful combustion by–products and unburnt fuel that will cause skin reactions as detailed for fuel. Particular care must be taken if oil form a severely overheated engine is handled – use impervious gloves, lab coat and safety glasses.

Do not breath vapor/spray.

PROTECTIVE MEASURES

Ensure good ventilation and avoid heat sources.

Adopt a high standard of personal hygiene. In case of skin contact, wash thoroughly with soap and water.

Use safety glasses, impervious gloves and lab coat. Avoid contamination inside the gloves. If overalls become contaminated, discontinue use and clean thoroughly.

No special respiratory precautions are necessary in normal use. Do not breath vapor/spray when handling hot materials.

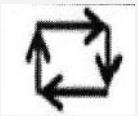
STORAGE/TRANSPORT

Store and transport only in correctly marked containers. Keep containers tightly sealed when not in use. Keep in cool, well ventilated area, out of sunlight and away from naked flames. Store well away from food – stuffs and drinking water.

Wear splash goggles, full suit, boots and gloves. Absorb leak/spill with inert material and dispose of unwanted or absorbed substance through an authorized contractor to a licensed site. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Generator Set Warning Labels

Warning signs are provided on the generator set at or near the point of risk. To avoid injury, always take the necessary precautions – as indicated on the sample signs shown below:

	Caution / Warning. Indicates a risk of personal injury.
	Caution / Warning of Temperature Hazard. Indicates a risk of personal injury from high temperature.
	Caution / Warning of High Voltage Hazard. Indicates a risk of personal injury from electric shock/electrocution.
	Caution / Warning. Indicates a risk of personal injury from equipment that may be subject to automatic starting or remote starting.
	Caution / Warning. Indicates to read Operator manual for additional information.
	Caution / Warning of Belt and Rotating Part Hazard. Indicates a risk of personal injury from entanglement in moving parts.
	Caution / Warning of Pressure Hazard. Indicates a risk of personal injury from pressurized fluids.

Introduction

ABOUT THIS MANUAL

This manual is a guide for the installation of the KY Series of generator sets (gensets). Proper installation is essential for safe, reliable and quite operation. Read through this manual before starting the installation. Keep this manual and the Operator's Manual with the other vehicle manuals.

This manual addresses the following aspects of 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 ***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.***

⚠WARNING ***This genset is not "ignition protected" and shall not be used in a flammable vapor environment.***

⚠ 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 RV or work 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
- ANSI A119.2 (NFPA No. 501C)—Recreational Vehicles
- 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), might also be applicable. Installation codes and recommendations can change from time-to-time and are different in different countries, states and municipalities. Obtain the standards in Table 1 for reference.

TABLE 1. REFERENCE CODES AND STANDARDS

NFPA No. 70 NFPA N0. 501C	National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210
ANSI A119.2 ANSI/RVIA-EGS-1 FMVSS 301	Recreational Vehicle Industry Association 14650 Lee Road Chantily, 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

NOISE

Generator sets emit noise. As noise level and time of exposure increase, risk of hearing damage increases. The Specifications page in the Operator manual states noise level for this generator set. Select and use personal hearing protection appropriate for your exposure to generator set noise.

Note for use in countries where compliance to the EU Noise directive is required: This generator set has not been evaluated and is not marked for use in open air. Install the generator set in accordance with the Installation manual. Obey local noise restrictions when you operate the generator set.

ELECTROMAGNETS COMPATIBILITY

Generator sets emit and receive electromagnetic (radio frequency) energy. If the generator set affects operation of nearby devices, or nearby devices affect generator set operation, increase the distance between them.

Note for use in countries where compliance to the ENCL directive is required: This generator set has been evaluated for use in residential, commercial, and light industrial environments.

TYPICAL GENSET

Figure 1 illustrates a typical genset. See OUTLINE DRAWING (Page 34) for installation details: mounting bolt hole locations, connection points (fuel, battery, remote control, AC output and exhaust), sizes and types of fittings, inlet and outlet air openings, weight and overall dimensions, etc. See Pages 35, 36 and 37 for details of the underfloor mounting kits available. See your Onan dealer for large-scale copies of the drawings and for a full-size floor template for floor opening cutouts.

⚠ CAUTION ***Do not tip the genset forward or oil will spill into the breather. Tip the genset backwards to loosen the shipping skid bolts.***

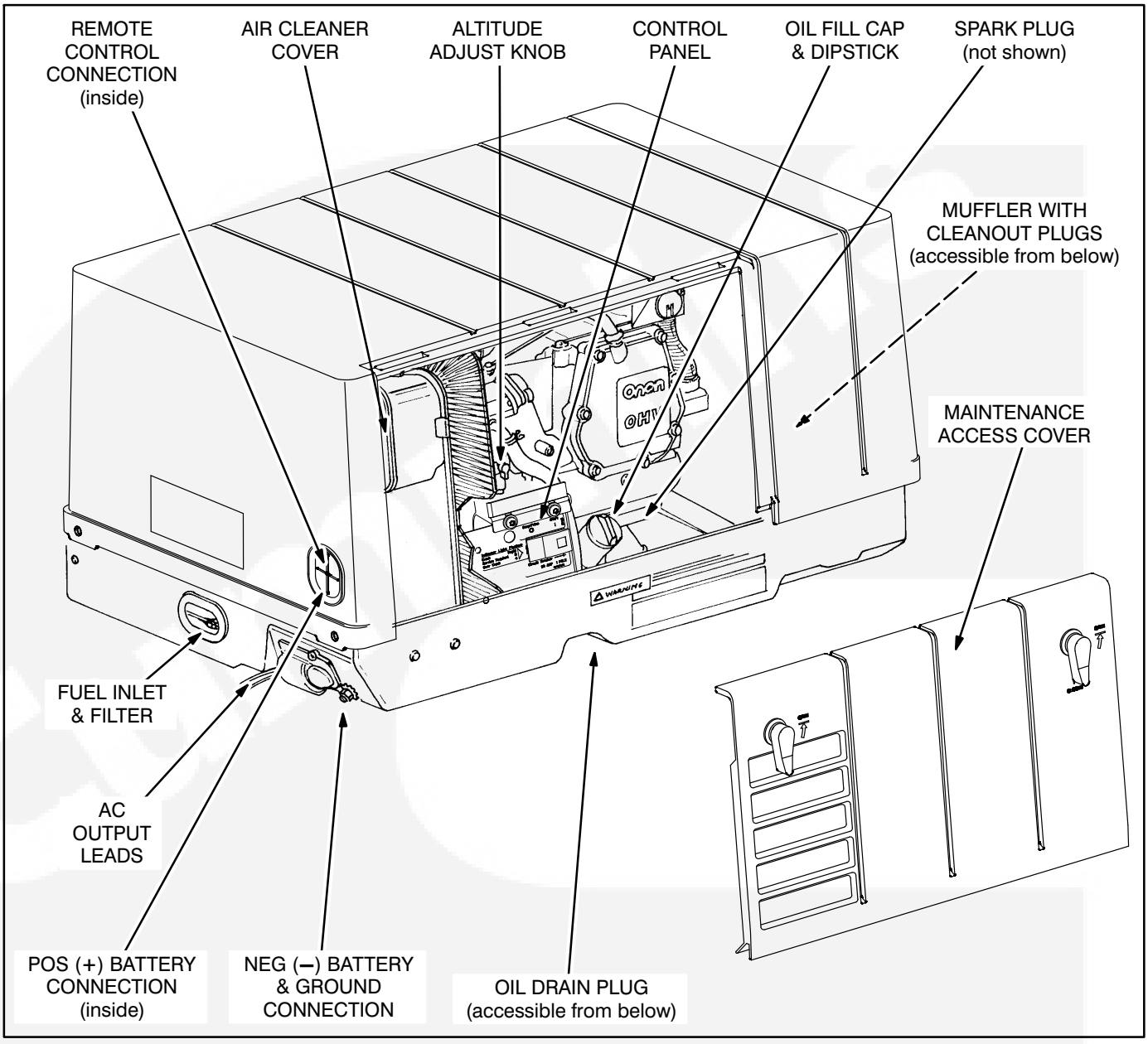


FIGURE 1. TYPICAL GENSET

Location, Mounting and Enclosure

The location, mounting and enclosure of a genset must be such that mounting is secure, engine exhaust and fuel vapors are prevented from entering the vehicle, rain and road debris are prevented from entering the genset, and ready access is afforded for operating the genset and performing periodic maintenance. See Figure 2 for typical genset locations.

1. The genset support structure must be able to resist the dynamic weight of the genset: cyclical vertical forces of ± 561 lbs (± 3 g) and cyclical horizontal forces of ± 187 lbs (± 1 g). Secure the genset with six 5/16-18 NC bolts. The bolts must protrude at least 1-1/2 threads beyond the base pan weld nuts but not more than 1/2 inch (13 mm), to avoid interference.

   ⚠WARNING ***The genset can fall from the vehicle if the supporting structure is weak and cause severe personal injury or death. Design the structure carefully, follow applicable mounting kit instructions and torque mounting bolts properly.***

2. The genset can be mounted on or below the vehicle floor:

   A. **Below-Floor Mounting** – Use one of the mounting kits available from Onan (Page 35, 36 or 37). Follow the instructions in the kit and use Underfloor Template 539-1535 to locate the assembly. A plywood or particle board floor must be reinforced with steel to resist the dynamic weight of the genset (Item 1). Do not mount the genset within the approach or departure angles of the vehicle or below the axle line (Figure 7). If the floor is of combustible material such as wood, install a barrier of 26 gauge galvanized steel or equivalent between the floor and the genset.

   ⚠WARNING ***FIRE IS DEADLY! Install a fire-resistive barrier of approved materials between the floor and the genset.***

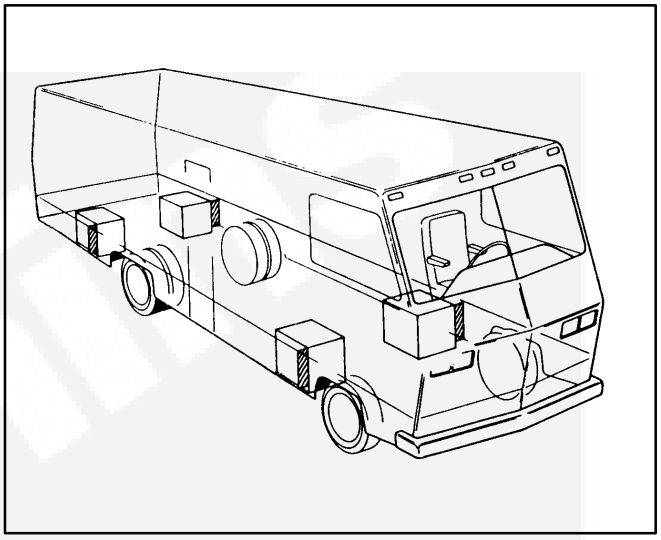


FIGURE 2. TYPICAL GENSET LOCATIONS

B. **Above-Floor Compartment Mounting**– Construct a vapor-tight, fire-resistive compartment of 26 gauge galvanized steel or equivalent to isolate the genset from the vehicle interior. Do not duct genset cooling air, which can include exhaust gases, into the vehicle for heating.

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

3. Locate or shield the genset cooling air openings (Figure 3) from direct rain, road splash and debris thrown up by the road wheels.
4. Provide ready access for fuel and battery connections and all periodic maintenance procedures (Figure 1). When mounting the genset on a floor, use Compartment Template 539-1546 to locate the cutout for the oil drain. Do not route the exhaust tailpipe underneath the oil drain.

   ⚠WARNING ***A hot exhaust tailpipe can ignite oil drain spills causing severe personal injury or death. Do not route the exhaust tailpipe underneath the oil drain.***
5. The genset must not share a compartment or ventilation with batteries or fuel tanks. An operating genset can ignite flammable vapors.
6. Genset cooling air (Figure 3) must not be obstructed.
   A. Generally, the effect of natural convection in ventilating flammable vapors and engine heat after shutdown is better the higher the compartment air inlet. This should be especially noted when fuel vapor lock is an issue.
   B. A free-air inlet size of at least 40 in^2 (258 cm^2) is required. 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 obtain the minimum free-air inlet size.

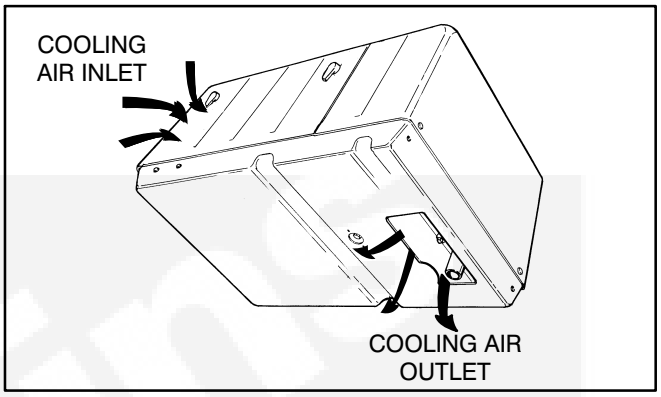


FIGURE 3. GENSET COOLING AIR INLET AND OUTLET OPENINGS

C. Unless the compartment air inlet lines up directly with the genset air inlet, a clearance of at least 1-1/2 inch (38 mm) is required at the front of the genset for air to get to the genset inlet. (Staggering a compartment side opening or pulling the air up under the skirt of the vehicle will reduce line-of-sight noise but requires the extra clearance in front.)

D. When mounting the genset on a floor, use Compartment Template 539-1546 to locate the cutout for the cooling air outlet. The floor must not block off any portion of the genset cooling air outlet or cause recirculation of hot air back into the genset air inlet.

E. Make sure the space below the genset cooling outlet is unobstructed for at least 6 inches (152 mm) and open on at least three sides.

7. See the outline drawing (Page 34) for the minimum inside dimensions of a genset compartment. If the compartment has acoustic insulation (Figure 4), increase the minimum compartment dimensions by the thicknesses of the insulation panels. The following minimum clearances are required between the genset and the compartment or its insulation:

   A. At least 1 inch (25 mm) clearance is required in the space on the left side for fuel, AC output, battery and remote control connections (Page 11).

   B. At least 1/4 inch (6 mm) clearance is required on the sides and 1 inch (25.4 mm) on top.

   C. At least 1-1/2 inch (38 mm) clearance is required in front if the compartment air inlet does not line up directly with the genset air inlet (Item 6. C).

8. Acoustic insulation and adhesive (Figure 4) 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.

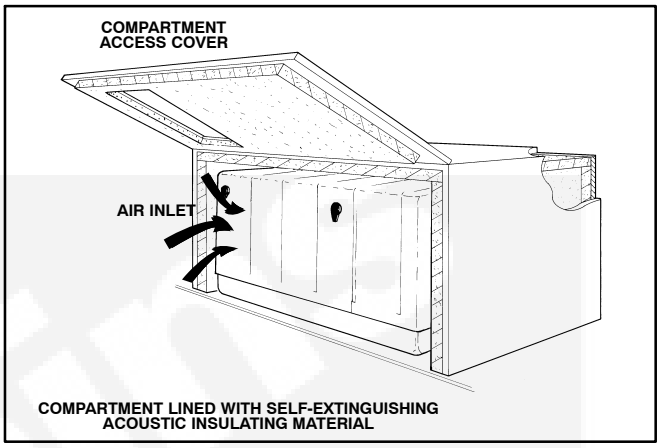


FIGURE 4. COMPARTMENT WITH ACOUSTIC INSULATION

Exhaust Connections

The genset is equipped with a U.S. Forest Service approved 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 use of unapproved parts is the responsibility of the person performing the modification or installing the unapproved parts. Contact an Onan dealer for approved exhaust system parts.

⚠WARNING ***EXHAUST GAS IS DEADLY! Keep exhaust gases from entering the vehicle. Do not terminate the exhaust tailpipe underneath the vehicle or closer than 6 inches (153 mm) to openings into the vehicle or route it such that it is not protected. Use approved materials only.***

The tailpipe of the generator set will be hot during operation and can cause severe burns. To reduce risk of contact, concentration must be taken and where the tailpipe will be located and routed.

The genset exhaust system must be gas-tight and designed to prevent entry of exhaust gases into the vehicle interior. The muffler is mounted inside the genset and has a collar to which the tailpipe is clamped (Figure 5).

1. Use 18-gauge 1-1/8 inch I. D. aluminized steel tubing or material of equivalent heat and corrosion resistance for the tailpipe. (Straight and elbowed tailpipe kits are available from Onan.) Do not use flexible pipe, which is neither gas tight nor durable. Clamp the tailpipe to the muffler with a U-bolt muffler clamp (available from Onan). 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 (available from Onan). Do not attach the hangers to combustible material such as wood.
2. See OUTLINE DRAWING (Page 34) for the location of a 5/16-18NC threaded hole in the base of the genset for attaching a tailpipe hanger. The bolt must protrude at least 1-1/2 threads beyond the base pan weld nut but not more than 1/2 inch (13 mm), to avoid interference.
3. Use U-bolt muffler clamps (available from Onan) to connect sections of tailpipe. Overlapping pipe should be slotted (Figure 6).

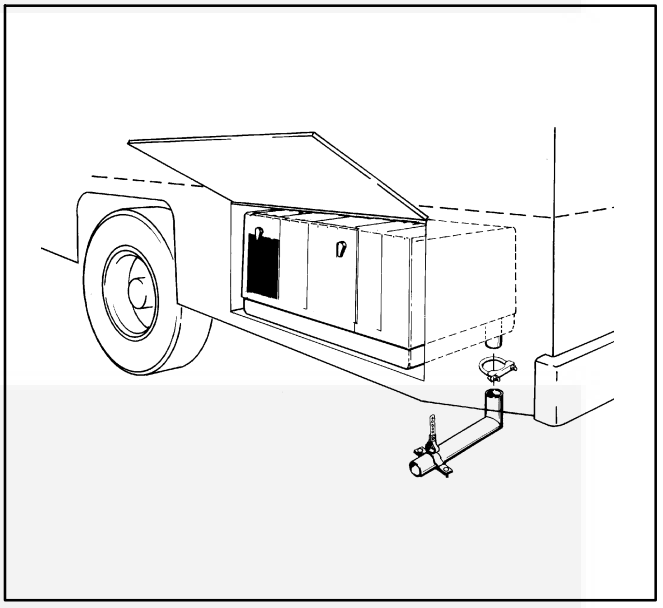


FIGURE 5. TYPICAL TAILPIPE INSTALLATION

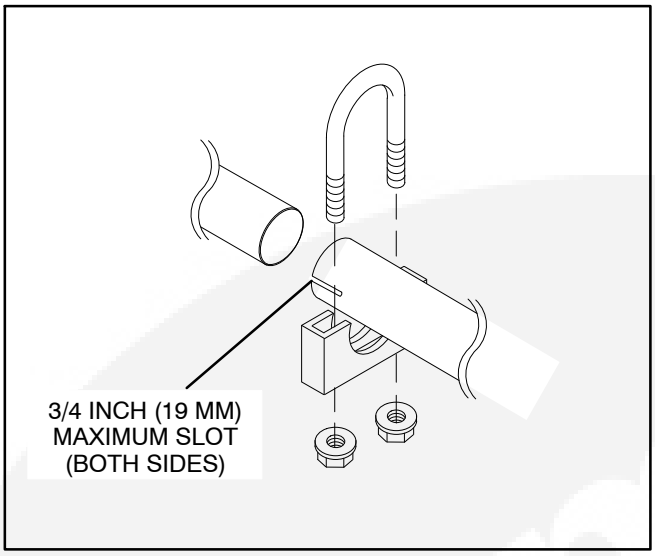


FIGURE 6. EXHAUST TAILPIPE CONNECTIONS

4. Do not route the tail pipe near fuel lines or fuel tanks.
5. 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).
6. Do not route the exhaust tailpipe underneath the oil drain or such that it will restrict the air outlet.

   ⚠WARNING ***A hot exhaust tailpipe can ignite oil drain spills causing severe personal injury or death. Do not route the exhaust tailpipe underneath the oil drain.***
7. To keep the tailpipe from being damaged, do not route it such that it protrudes into the approach or departure angles of the vehicle or below the axle clearance line (Figure 7).
8. Do not interconnect genset and vehicle engine exhaust systems.

   ⚠CAUTION ***Interconnecting engine exhaust systems will lead to migration of exhaust condensate and soot into the idle engine, causing damage.***
9. Do not terminate the tailpipe underneath the vehicle. Extend it a minimum of 1 inch (25 mm) beyond the perimeter of the vehicle (Figure 8). *Support the end of the tailpipe such that it cannot be pushed in and up under the skirt of the vehicle*.
10. Do not terminate the tailpipe such that it is closer than 6 inches (153 mm) to any opening, such as a door, window, vent or unsealed compartment, into the vehicle interior (Figure 9).
11. Make sure a tailpipe deflector will not cause excessive back pressure.

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

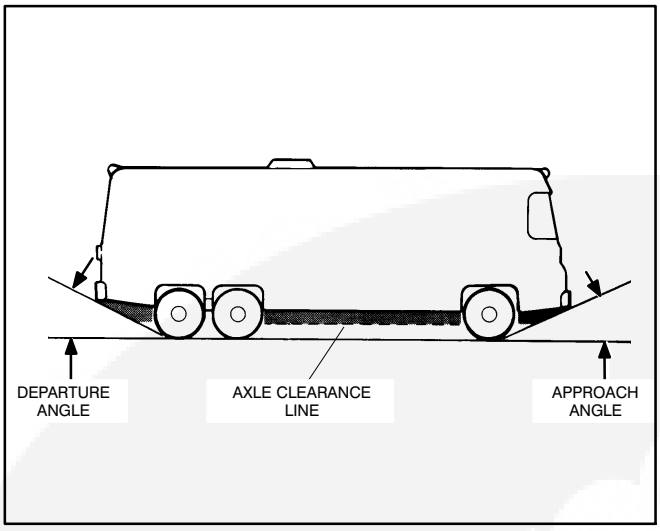


FIGURE 7. VEHICLE CLEARANCES

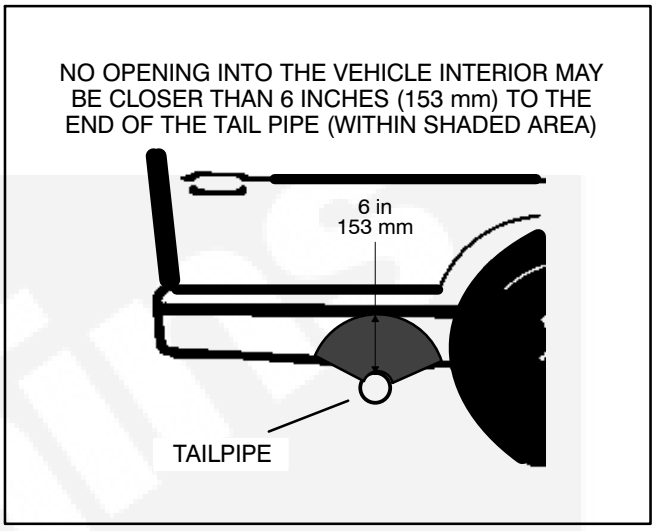


FIGURE 9. MINIMUM DISTANCES TO OPENINGS

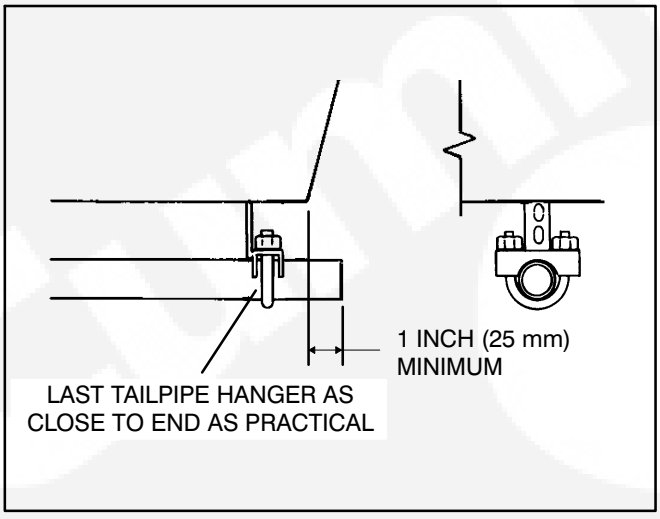


FIGURE 8. TERMINATING THE EXHAUST TAILPIPE

Fuel Connections

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

⚠WARNING ***Gasoline and LPG are 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 an ABC fire extinguisher handy.***

GASOLINE

Onan recommends a separate fuel pickup tube or a separate fuel tank for the genset. The genset must never be connected to the **fuel supply line** of the vehicle engine—either to a high-pressure system (pump in tank), which can overpressurize the genset fuel system, or to a vacuum system (pump on engine), which can cause the genset to starve for fuel. Some vehicle chassis manufacturers allow connections to the **fuel return line** on high pressure fuel systems. Contact the vehicle chassis manufacturer for approval. Fuel line pressure at the point where the genset is connected must not exceed 1-1/2 psi under any condition.

⚠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 separate fuel pickup tube installations:

1. Contact the vehicle chassis manufacturer regarding installation of the second fuel pickup. Do not change or remove the fuel fill tube, fill limiter vent, vapor canister, vapor lines, filler cap or any other part of the fuel system without the approval of the vehicle chassis manufacturer. Doing so could affect vehicle engine operation or vehicle emissions regulation compliance.

2. Terminate the genset pickup above the vehicle pickup to prevent the genset from running the vehicle out of fuel.

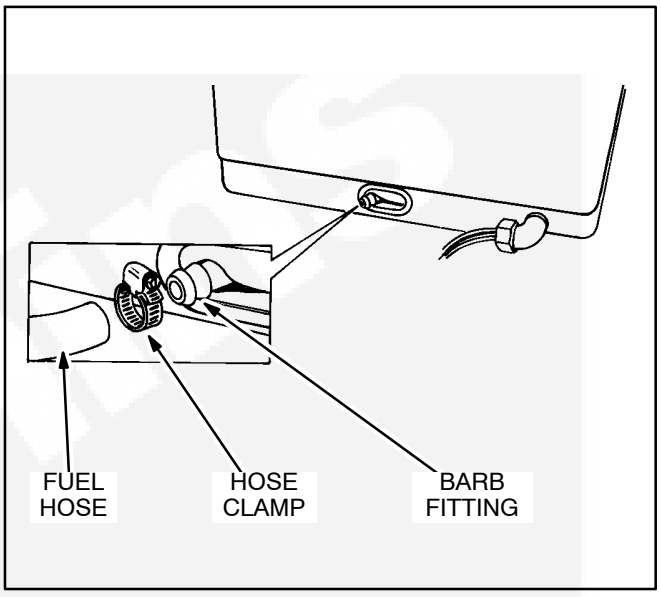


FIGURE 10. GASOLINE FUEL CONNECTION

Note: Federal standards for vehicle fuel tanks may require the installation of an automatic shutoff valve at the genset fuel tank pickup to prevent leakage in the event of a roll-over. Federal standards for vehicle impact, roll-over and emmisions may also apply to a separate genset fuel tank. Check with the vehicle chassis manufacture regarding these standards.

For long runs use copper or hot dip coated seamless steel tubing (ASTM A-254) with double-flared fittings. See Figure 10 for the connection at the genset. Use 1/4 inch I. D. fuel hose (SAE 30-R7) and stainless steel hose clamps.

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 gasoline fuel lines away from electrical wiring and hot engine exhaust components. (Heat can cause fuel vapor lock.) 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.***

EVAPORATIVE SYSTEM INSTALLATION

These instructions cover installation of the generator set fuel evaporative system provided for compliance with the California code of regulations for small off-road equipment effective January 1, 2008 and Federal Small SI regulation effective January 1, 2011.

For safety and compliance, the installation must be in accordance with these instructions.

The instructions apply to the following generator set model:

4KYFA–6747
4KYFA–6817L

Completing the installation of the genset evaporative fuel system is required for all towable or similar generator set applications where on–board gasoline fuel storage is self–contained in the trailer equipment.

It is the responsibility of the towable equipment manufacturer OEM to complete the installation of the evaporative fuel system exactly as specified in the CARB EO & EPA certification for the Cummins Onan product being installed. These requirements are detailed in the procedure below. Any deviations from this installation procedure will forfeit the emission certification on the fuel system and transfer engine evaporative emission certification responsibility to the trailer equipment manufacturer/OEM per CFR 40 Part 1060.

If purchasing a complete or partial fuel system kit or components from a third party fuel system manufacturer, the requirements of this Cummins installation manual shall be met and the system must be verified by the OEM & fuel system supplier as meeting these requirements before completing the installation.

Any construction deviations from these assembly requirements would invalidate the evaporative certification per CFR 40 Part 1060 & Article 1, Chapter 9, Division 3 Title 13 sections 2400 through 2773 and the towable equipment OEM would then be responsible for recertification of the fuel system with California Air Resources Board and US EPA.

Any questions regarding these installation instructions or evaporative emission certification should be directed to Cummins Power Generation for clarification.

System Components

The evaporative system consists of the fuel tank, carbon canister, generator set and connecting hoses. Gasoline vapors in the fuel tank accumulate in the carbon canister from which they are drawn into the engine combustion chamber and burned while the generator set is operating.

Fuel Tank

Note: The following specifications apply only to evaporative emissions performance. The installer is also responsible for the selection and installation of the fuel tank to meet other safety and performance requirements that may be applicable.

For compliance with evaporative emissions regulations, the fuel tank shall:

1. Be metal.
2. Have a 9.5 to 35 gallon capacity.
3. Have a permanently tethered cap.
4. Have cap that provides a vapor seal and that audibly signals that the vapor seal has been established.
5. Have a roll-over vent valve with connection for 5/16 inch ID hose. This hose connects to the carbon canister.
6. Have a fill-neck and an anti-spit-back valve if it is a non top-fill tank.
7. Be constructed to meet the requirements of Section 393.67 (joints, fittings and threads) of the Federal Motor Carrier Safety Administration Regulations.
8. Have connections that meet the requirements of the following SAE standards, when applicable: J1231 (Formed Tube Ends for Hose Connections and Hose Fittings), J1508 (Hose Clamp Specifications), J2260 (Nonmetallic Fuel System Tubing with One or More Layers), J2044 (Quick Connector Specification for Liquid Fuel and Vapor/Emissions Systems), and J2599 (Fuel Filler Pipe Assembly Design Practice to Meet Low Evaporative Emission Requirements).

Carbon Canister

Use a Delphi carbon canister shown below. No other carbon canisters are acceptable.

Part Number	Description
17208238	3.1L, 196.5g working capacity
17208262	3.3L, 233.8g working capacity

Mount the canister in an acceptable orientation (Figure 1-1) in accordance with its instructions.

Connect the 5/16 inch hose barb (identified by the fuel pump icon) to the hose from the fuel tank and the adjacent 3/8 inch hose barb to the hose from the generator set. See Figure 1-2.

Note: Use 5/16 inch hose for vapor lines. Use an SAE J2044 quick connect fuel fitting on the canister hose barb or use a soap-free lubricant such as WD40 to slip the hoses on the canister hose barbs. Secure the hoses with Oeitiker® ear-type clamps or equivalent.

To prevent dirt from entering the canister vent when it is mounted in a “dirty” location, connect the 5/8 inch hose barb to a hose terminated outside the living space of the vehicle at a location that is not exposed to road splash or dust. Alternatively, secure Onan Part Number 0148-1343 vent filter to the hose barb.

⚠ CAUTION ***Blockage of the canister vent or vent hose could lead to collapse of system components due to vacuum.***

⚠WARNING ***Do not vent the canister into the vehicle or other confined space where the vapors could accumulate to a flammable level.***

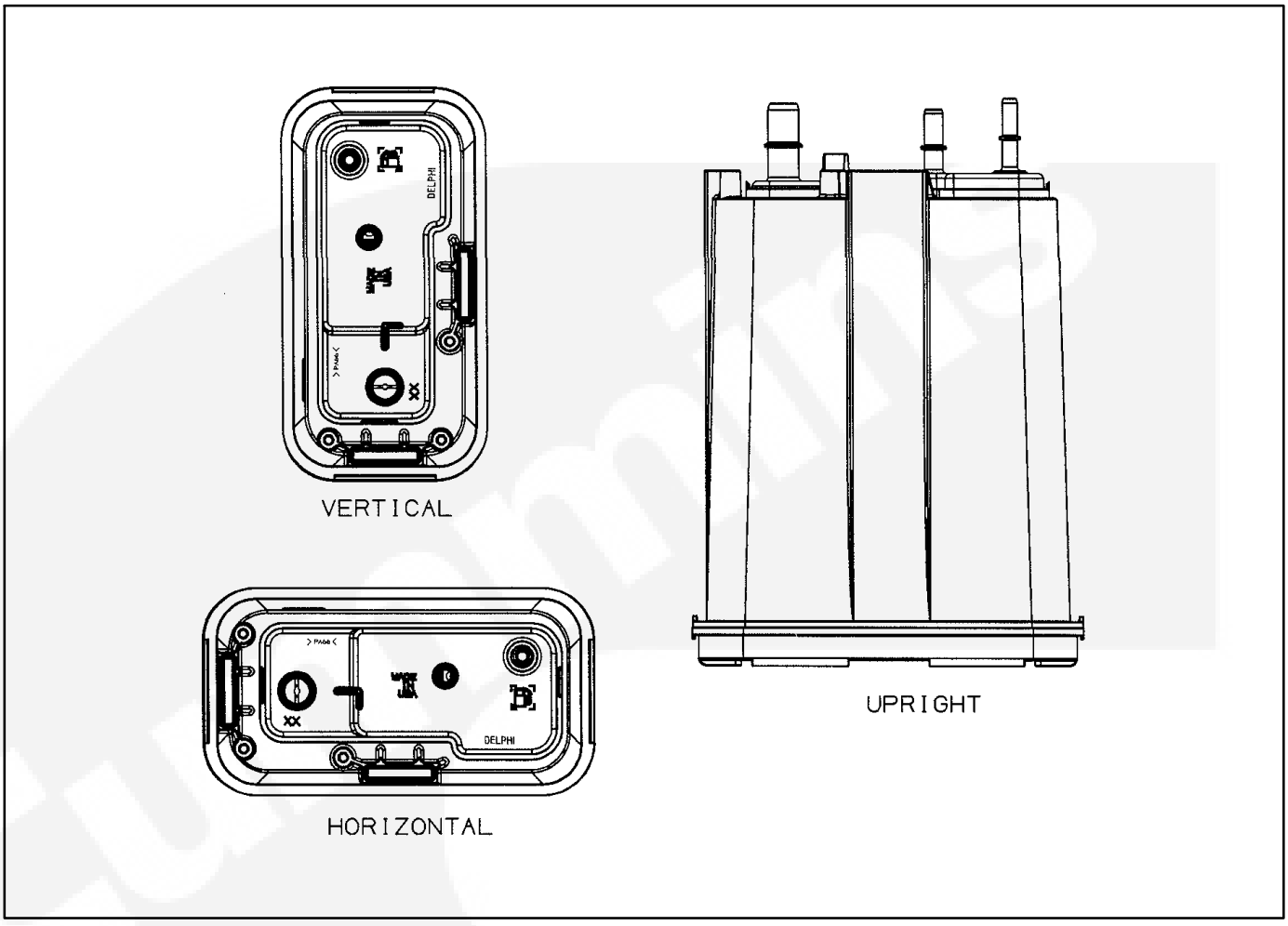


FIGURE 1-1. ACCEPTABLE CANISTER MOUNTING ORIENTATIONS

Generator Set

Connect the 5/16 inch generator set hose barb to the vapor purge hose from the carbon canister. Connect the 1/4 inch hose barb to the fuel supply hose from the fuel tank. See Figure 1-2.

Gasoline Hoses

The fuel hoses used inside the generator set are low permeation fuel hoses which meet Federal and California standards for gasoline evaporative emissions.

The vapor and liquid hoses connecting the fuel tank to the generator set, the fuel tank to the carbon canister and the carbon canister to the generator set must also be low permeation fuel hoses. Low permeation fuel hose is required to meet these requirements for gasoline generator sets sold in or used for commerce in the State of California. The following hose materials are acceptable:

- Avon Automotive “Greenbar” (EO# G-05-018) SAE J30R7
- Avon Automotive “Greenbar 1200” (EO# C-U-05-009) SAE J30R12
- Gates 4219D (EO# C-U-06-002) SAE J30R9
- Gates Barricade (EO# Q−09−019)
- Kubota (EO# C-U-05-003) SAE J30R7
- Mark IV Automotive “Gen 2” (EO# C-U-05-002) SAE J30R7
- Mark IV Automotive “Fluoroperm” (EO# C-U-07-017) SAE J30R9
- Mark IV Automotive “Dayperm” (EO# C-U-06-030) SAE J30R7
- Mark IV Automotive “Dayperm” (EO# G−05−016)
- Mold-Ex Division of SETi, Inc. “SETiFLEX II” (EO# G-05-17A) SAE J30R7
- Parker Hannifin Corp “Super Flex FL−7 series 389XX” (EO# Q−08−013)
- Veyance Technologies Inc. “Goodyear Flexshield” (EO# Q−09−022)

Lubricants used when connecting fuel hoses can leave residues that can clog fuel jets. Only use “soap-free” lubricants such as WD40.

⚠ CAUTION ***When connecting fuel hoses, only use soap-free lubricants such as WD40, which runs through with the fuel without leaving residues that can clog fuel jets.***

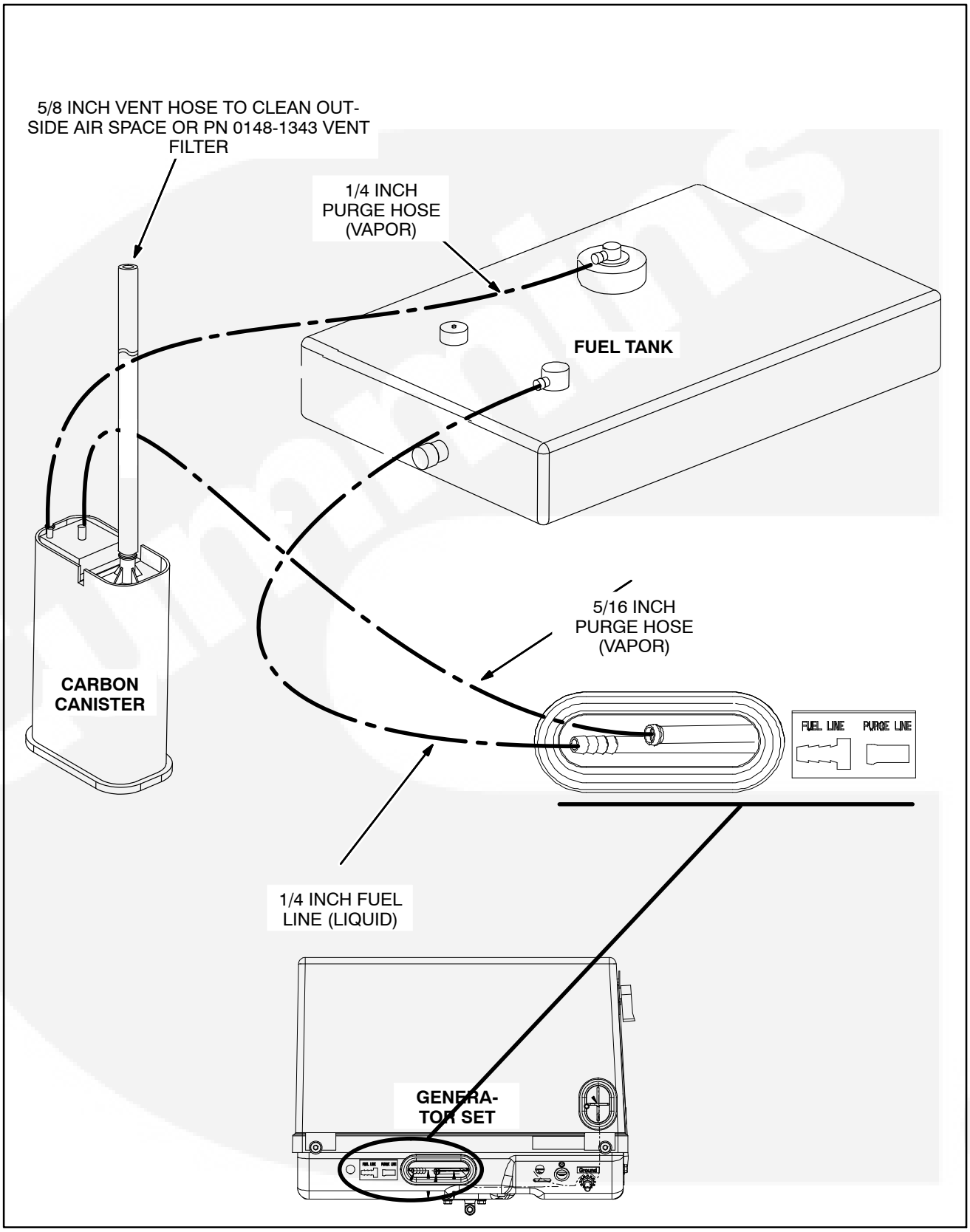


FIGURE 1-2. EVAPORATIVE SYSTEM COMPONENTS

LPG

The Standard for the Storage and Handling of Liquified Petroleum Gases (NFPA No. 58) should be used as a guide for the installation of the LPG fuel system. Figure 11 illustrates a typical LPG fuel system.

⚠WARNING ***LPG is flammable and explosive and can cause asphyxiation. NFPA 58, Section 1.6 requires all persons handling LPG to be trained in proper handling and operating procedures.***

Adjust the gas supply pressure (at the gas inlet of the pressure regulator) to at least 9 inches (229 mm) Water Column (WC). The pressure must not exceed 13 inches (330 mm) WC.

⚠WARNING ***High LPG supply pressure can cause gas leaks which can lead to fire and severe personal injury or death. LPG supply pressure must be adjusted to Specifications by qualified personnel.***

Route LPG 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 LPG, 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.***

Route the LPG vent hose (Figure 11) so that it vents to the outside.

⚠WARNING ***LPG leaks from the vent hose can lead to explosive accumulations inside the genset compartment. Route the LPG vent hose so that it vents to the outside.***

For a long fuel line run, use seamless steel tubing with flared ends. Make flexible hose connections at the fuel tank and at the genset. Use 3/8-inch I.D. fuel line for runs up to 3 feet (0.9 m) and 1/2-inch I.D. up to 15 feet (4.6 m).

Do not connect the genset fuel supply line to any appliance fuel supply line. The genset can draw fuel away from other appliances and cause a flame out. To prevent the possibility of flameout, the fuel supply system must be designed to deliver sufficient fuel for normal operation of the genset and other appliances at the expected temperature conditions. It may be necessary to use a separate fuel tank for the genset if sufficient fuel cannot be supplied with a single tank system.

⚠WARNING ***The flameout of an unvented LPG appliance can lead to explosive accumulations of gas inside the vehicle and the danger of severe personal injury or death. Do not connect the genset fuel supply line to any vehicle appliance supply line.***

Upon completing the installation, fill the LPG tank and test every joint and fitting in the LPG supply system using an approved method, such as soap bubbles.

⚠WARNING ***Testing for gas leaks with a flame can cause a fire or explosion that could lead to severe personal injury or death. Use approved methods only.***

Because variations in fuel, altitude and ambient temperature affect performance, it might be necessary to make governor and fuel mixture adjustments once the genset has been installed. See the Service Manual.

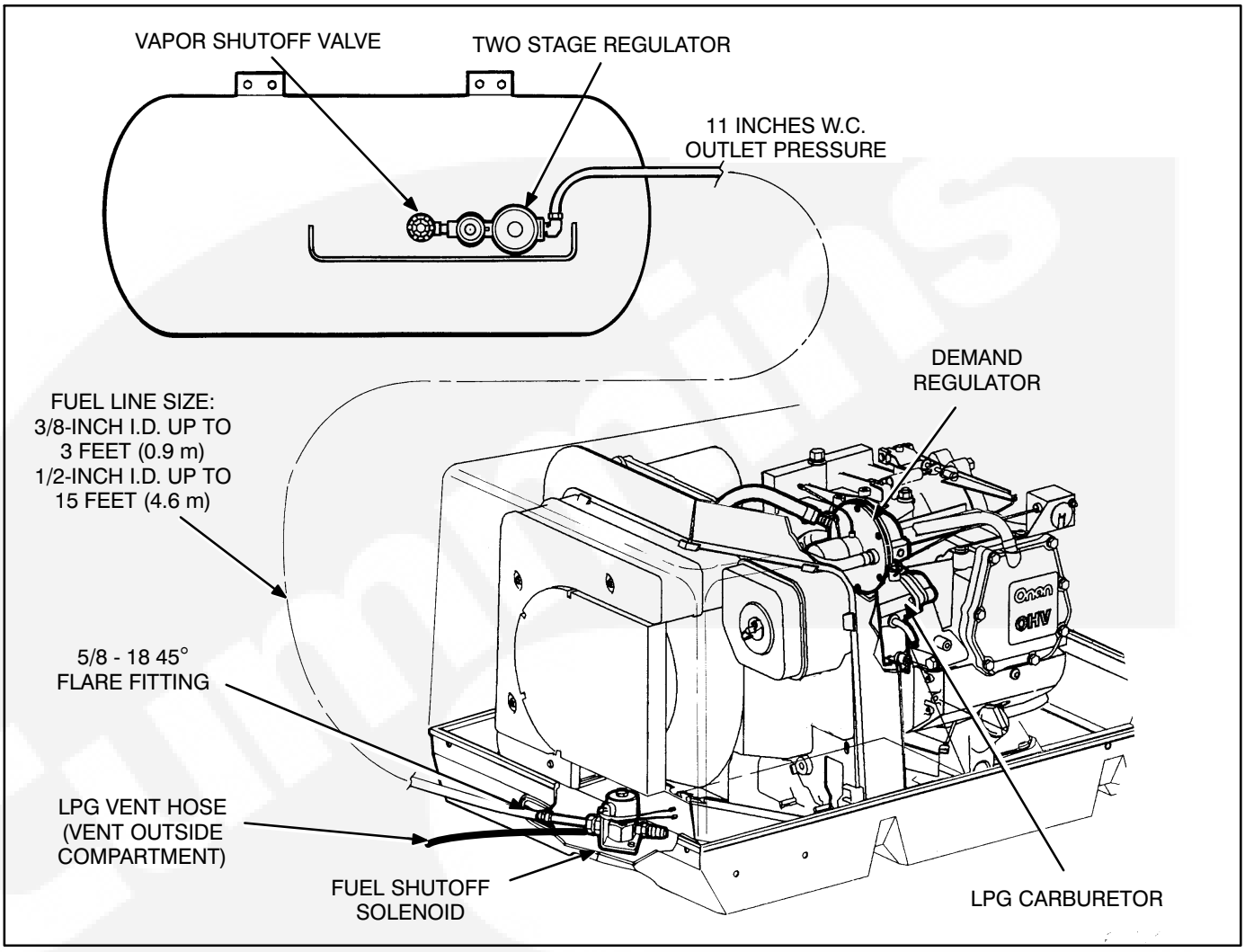


FIGURE 11. TYPICAL LPG VAPOR WITHDRAWAL FUEL SYSTEM

Electrical Connections

Do not connect the battery cables to the battery until *Installation Review and Startup* (Page 32) to prevent accidental starting of the genset during installation.

⚠WARNING ***HAZARDOUS VOLTAGE! Touching uninsulated live parts inside the generator set and connected equipment can result in severe personal injury or death. For your protection, stand on a dry wooden platform or rubber insulating mat, make sure your clothing, and shoes are dry, remove jewelry from your hands and use tools with insulated handles. Secure protective covers when completing installation.***

⚠WARNING ***IMPROPER WIRING can cause fire or electric shock resulting in severe personal injury or death.***

⚠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 32).***

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 12). See Figure 13 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 vehicle 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 vehicle 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.)

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

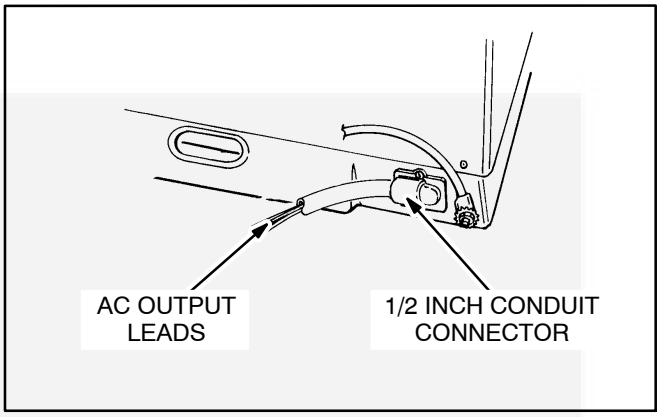


FIGURE 12. AC OUTPUT LEADS AND CONDUIT

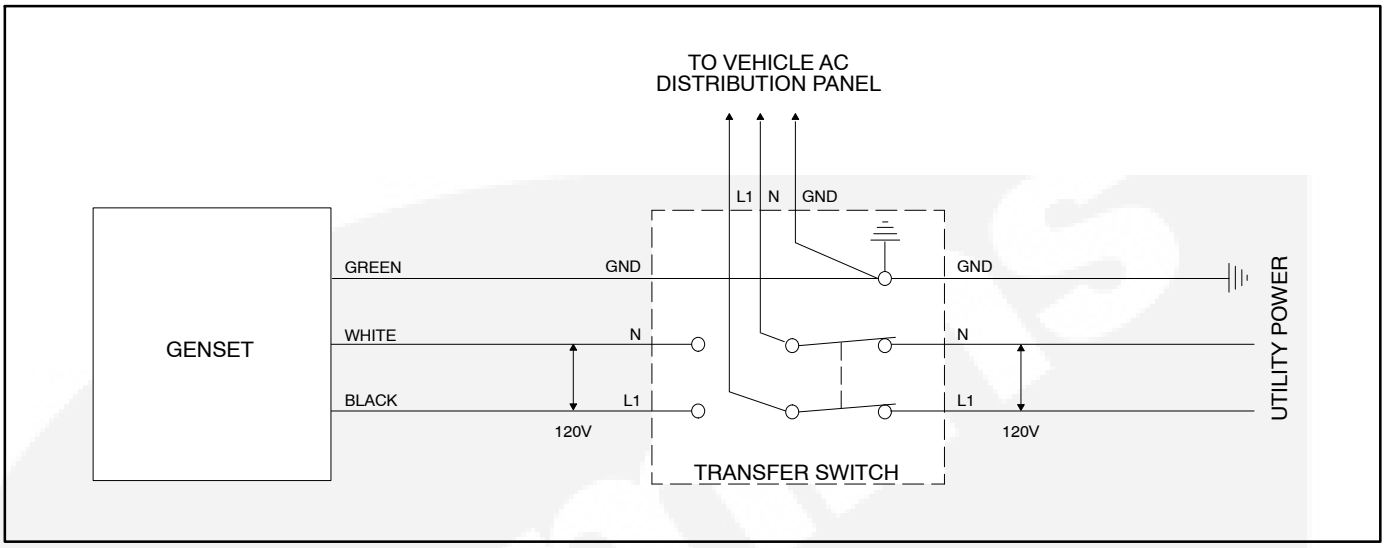


FIGURE 13. TYPICAL CONNECTIONS WITH TRANSFER SWITCH AND UTILITY

6. Bond the genset and all connected AC and DC equipment and controls to a common grounding point in accordance with applicable codes.

   ⚠WARNING ***Faulty grounding can lead to fire and electrocution, resulting in 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 13 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 40). 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 14).

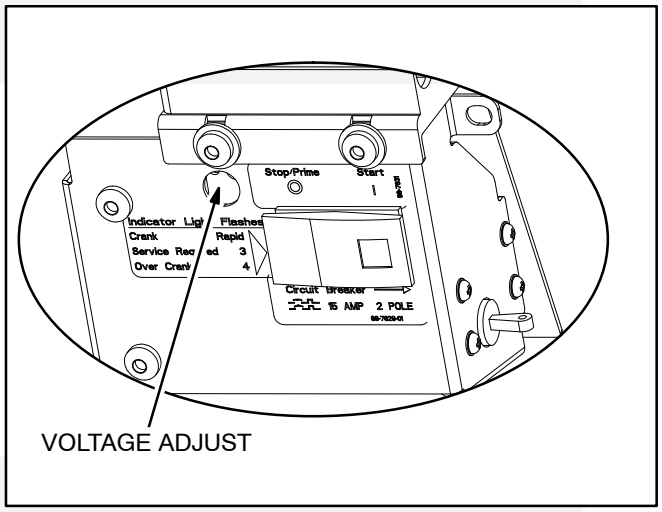


FIGURE 14. AC VOLTAGE ADJUST (50HZ)

REMOTE CONTROL CONNECTIONS

Onan offers three varieties of remote control panel:

- Remote start/stop switch with status indicator light only (Figure 15).
- Remote start/stop switch with status indicator light and hour meter (Figure16).
- Remote start/stop switch with status indicator light and DC voltmeter (Figure17).

The genset has an 8-pin connector for remote control connections (Figure 18). 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 metres) and heavier gauge conductors for distances that are greater. Use flexible sheathing to protect remote control wiring. Figure 19 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 vehicle 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 vehicle interior to keep out exhaust gas.***

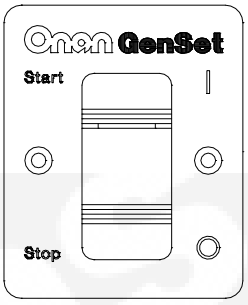


FIGURE 15. REMOTE CONTROL

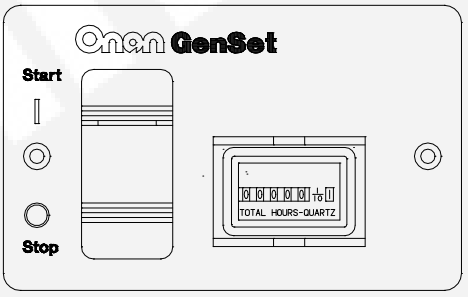


FIGURE 16. REMOTE CONTROL / HOUR METER

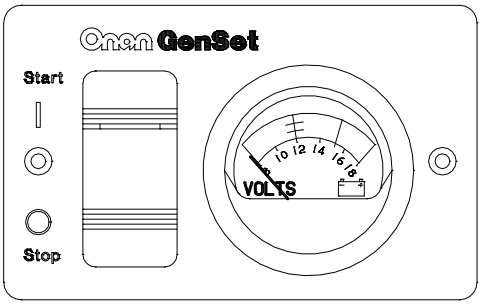


FIGURE 17. REMOTE CONTROL / DC VOLTMETER

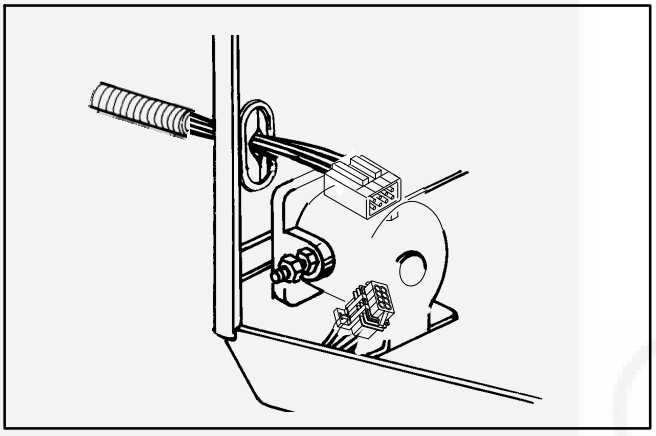


FIGURE 18. REMOTE CONTROL CONNECTOR

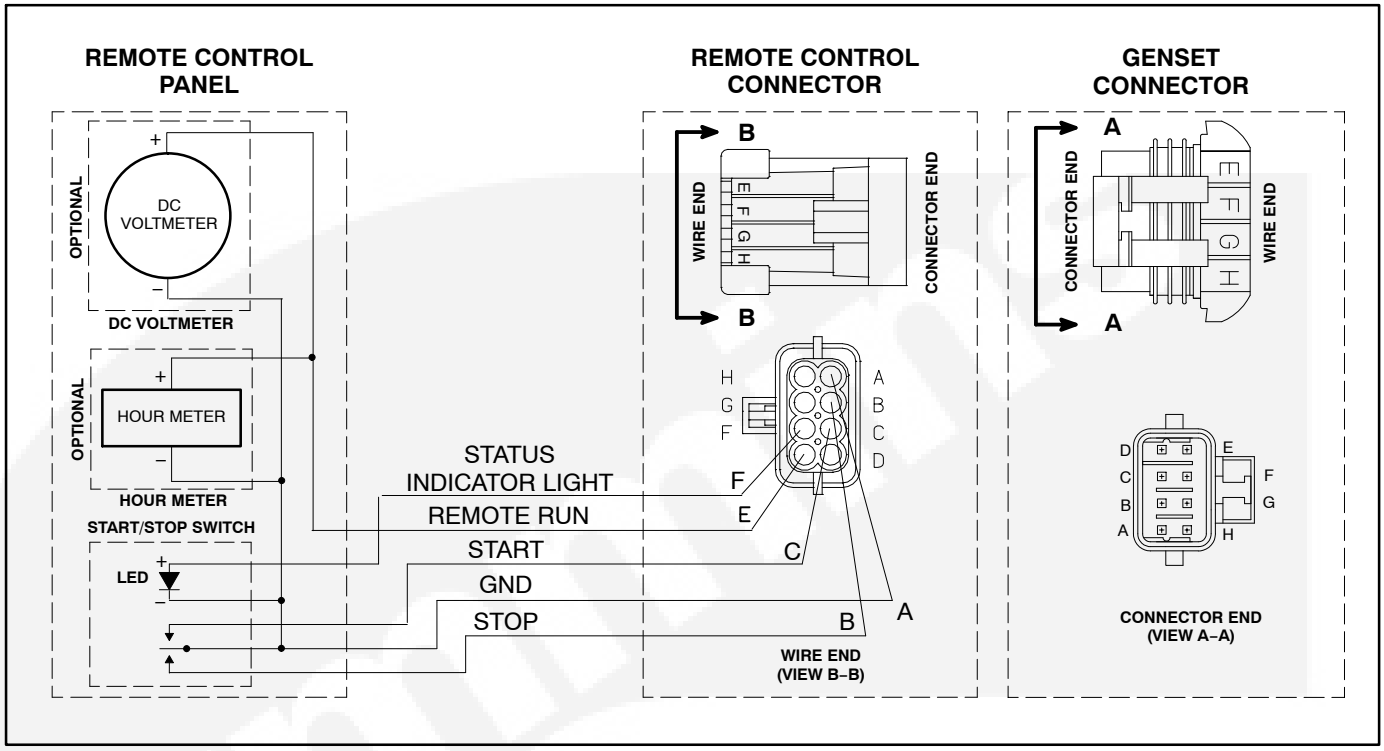


FIGURE 19. SCHEMATIC OF TYPICAL REMOTE CONTROL CONNECTIONS

BATTERY CONNECTIONS

Do not connect the battery cables to the battery until *Installation Review and Startup* (Page 32) 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 32).***

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 centimetres) 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 20). Note also that codes may require bonding conductors from the genset and the battery to the vehicle frame.

If a full-length negative (–) cable is not run from the battery (Figure 21), all vehicle frame members in the path of battery cranking currents must have substantial crossections. 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 must be used to connect the frame to the designated negative (–) terminal on the genset (Figure 21). The cable must be sized according to Table 2. ***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.***

Terminate the battery cables with appropriately sized eyelet connectors and connect them to the genset as shown in Figure 22.

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

TOTAL CABLE LENGTH* FEET (METERS)	CABLE SIZE AWG
0 to 45 (0 to 13.7)	2**
46 to 60 (14 to 18.3)	0
61 to 80 (18.6 to 24.4)	00

* – Battery cable lengths are total lengths from battery to the generator back to the battery and when using a total of 1000CCA (Cold Cranking Amps).

** – 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).

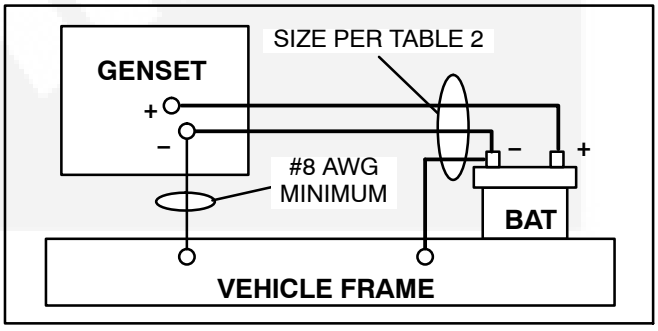


FIGURE 20. FULL-LENGTH CABLE FROM BATTERY NEGATIVE (–) TERMINAL

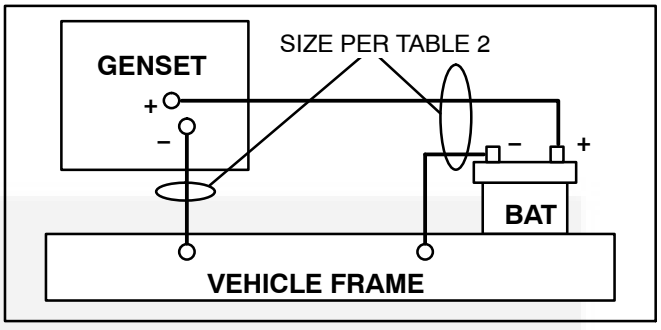


FIGURE 21. VEHICLE FRAME AS PATH FROM BATTERY NEGATIVE (–) TERMINAL

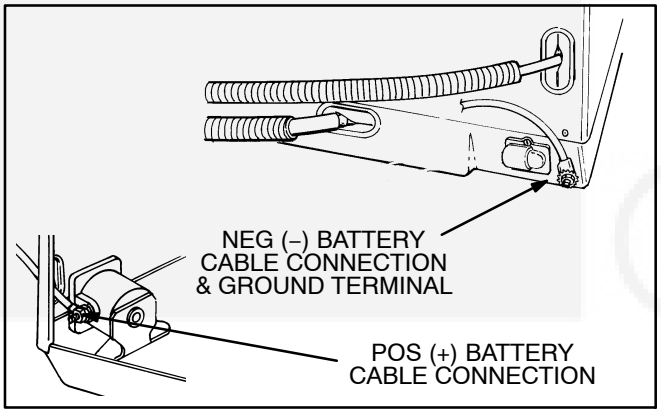


FIGURE 22. BATTERY CABLE CONNECTIONS

Specifications

	GASOLINE MODELS		LPG MODELS	
	4KY	**3.6KY**	**3.6KY**	**3.3KY**
GENERATOR: 2-Pole Revolving Field, Self-Excited, 1-Phase, Microprocessor Regulated				
Power	4000 watts	3600 watts	3600 watts	3300 watts
Frequency	60 Hertz	50 Hertz	60 Hertz	50 Hertz
Voltage	120 volts[1]	230 volts[1, 2]	120 volts	230 volts[2]
Current	33.3 amperes	15.7 amperes	30 amperes	14.3 amperes
Speed	3600 rpm	3000 rpm	3600 rpm	3000 rpm
FUEL CONSUMPTION:				
No load Half load Full load	0.29 gph (1.1 l/h) 0.48 gph (1.8 l/h) 0.71 gph (2.7 l/h)	0.21 gph (0.79l/h) 0.37 gph (1.4 l/h) 0.58 gph (2.2 l/h)	1.5 lbs/h (0.7 kg/h) 2.2 lbs/h (1.0 kg/h) 3.3 lbs/h (1.5 kg/h)	1.1 lbs/h (0.5 kg/h) 2.0 lbs/h (0.9 kg/h) 2.9 lbs/h (1.3 kg/h)
ENGINE: 1-Cylinder, 4-Stroke Cycle, Spark-Ignited, OHV, Air Cooled, Mechanically Governed				
Bore	3.11 inch (79 mm)		3.11 inch (79 mm)	
Stroke	2.44 inch (62 mm)		2.44 inch (62 mm)	
Displacement	18.5 inch^3 (304 cc)		18.5 inch^3 (304 cc)	
Compression Ratio	8.5 : 1		8.5 : 1	
Oil Capacity	1.6 quart (1.5 l)		1.6 quart (1.5 l)	
Intake Valve Lash (Cold)	0.002 inch (0.05 mm)		0.002 inch (0.05 mm)	
Exhaust Valve Lash (Cold)	0.002 inch (0.05 mm)		0.002 inch (0.05 mm)	
Spark Plug Tightening Torque	13 lbs-ft (17 N-m)		13 lbs-ft (17 N-m)	
Ignition Timing (magneto)	25° BTDC, non-adjustable		25° BTDC, non-adjustable	
Magneto Air Gap	0.009-0.015 inch (0.23-0.38 mm)		0.009-0.015 inch (0.23-0.38 mm)	
Spark Plug Gap	0.025 inch (0.64 mm)		0.020 inch (0.51 mm)	
DC SYSTEM:				
Nominal Battery Voltage	12 volts		12 volts	
Min. Battery Rating: Cold Cranking Amps (CCA) @ 0° F (–18° C)	450		450	
Battery Charging Current	–	10 amp (regulated)	–	10 amp (regulated)
INSTALLATION:				
Weight (with engine oil)	174 pounds (79 Kg)	184 pounds (84 Kg)	174 pounds (79 Kg)	184 pounds (84 Kg)
Minimum Compartment Size (H x D x W)[3]	14.4 inch x 20 inch x 30.5 inch (366 mm x 508 mm x 775 mm)		14.4 inch x 20 inch x 30.5 inch (366 mm x 508 mm x 775 mm)	
Minimum Free Air Inlet Area	40 inch^2 (258 cm^2)		40 inch^2 (258 cm^2)	
Muffler Outlet Collar O. D.	1.13 inch		1.13 inch	
Fuel Connection	1/4 inch barb fitting for gasoline hose		5/8-18UNC, SAE 45° Flare Fitting	
LPG Vapor Supply Pressure	–		9-13 inch (228-330 mm) Water Column (WC)	

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).

   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^2).

   A. Measure genset inlet air temperature with one thermocouple tied in the middle of the inlet air grille (Figure 18).

   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 readings. 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 verifiy Cooling for generators that use both air and liquid cooling systems.***

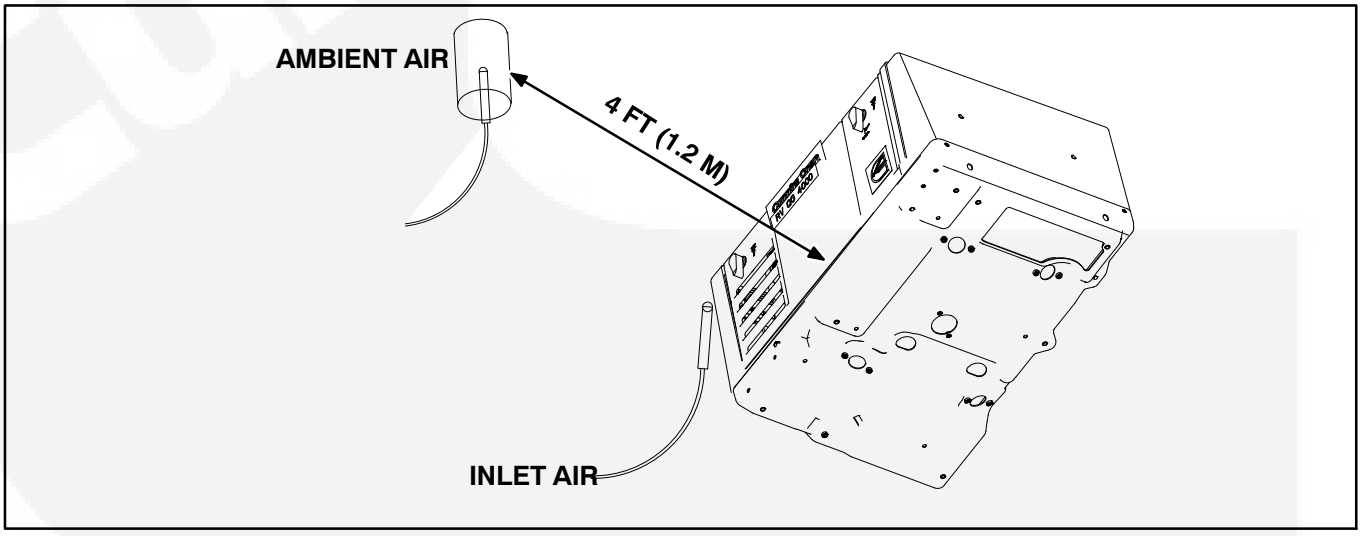


FIGURE 23. THERMOCOUPLE LOCATIONS FOR HOT AIR RECIRCULATION TEST

NOTES:

1. PRIMARY DIMENSIONS ARE MILLIMETERS.

2. COMPARTMENT ACCESS SHALL ALLOW REMOVAL AND REPLACEMENT OF SERVICE DOOR AND ACCESS TO THE FOLLOWING SERVICEABLE COMPONENTS:

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

3. 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^2 40IN^2

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

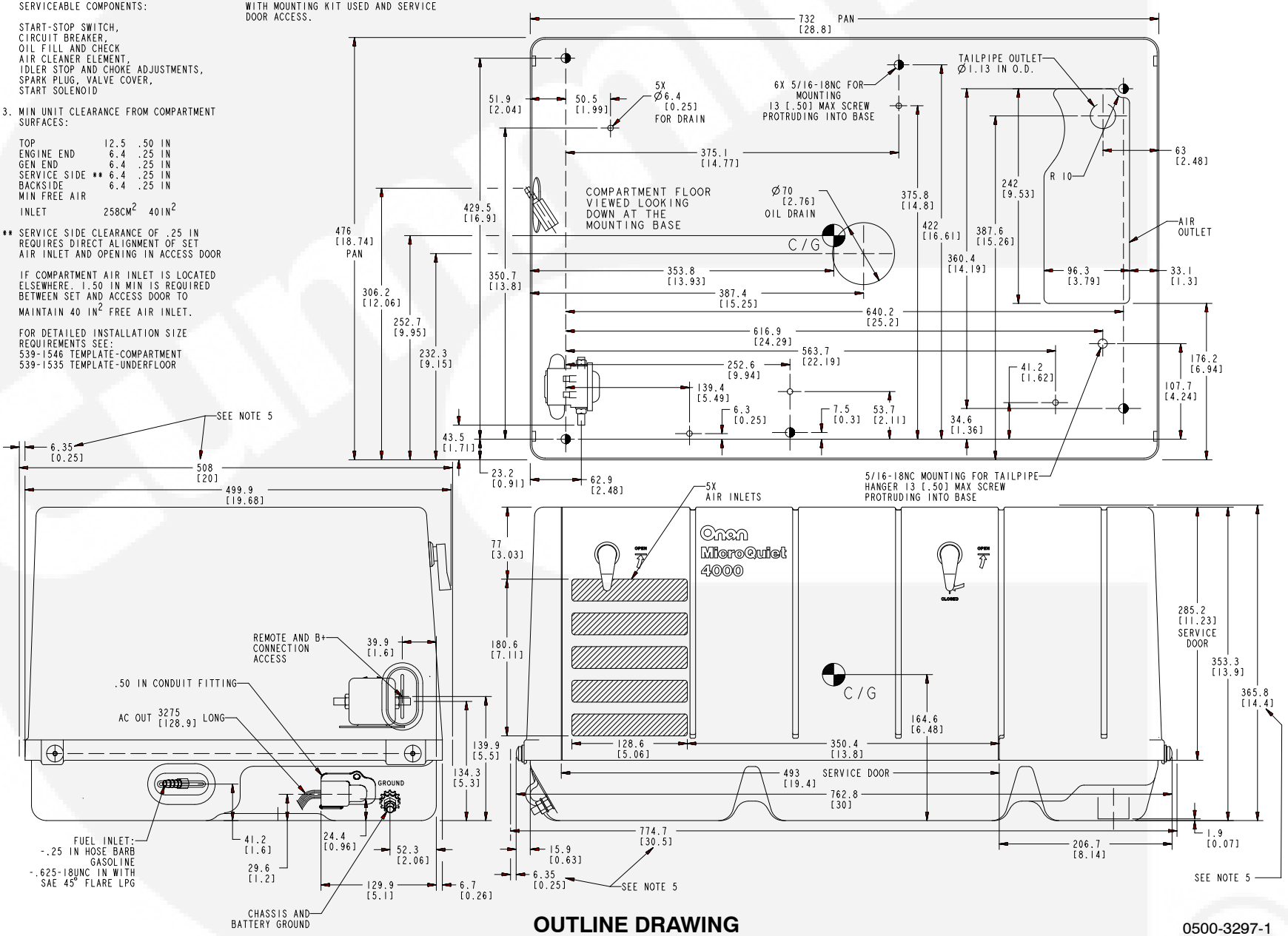
   IF COMPARTMENT AIR INLET IS LOCATED ELSEWHERE. 1.50 IN MIN IS REQUIRED BETWEEN SET AND ACCESS DOOR TO MAINTAIN 40 IN^2 FREE AIR INLET.

   FOR DETAILED INSTALLATION SIZE REQUIREMENTS SEE:
   539-1546 TEMPLATE-COMPARTMENT
   539-1535 TEMPLATE-UNDERFLOOR

4. UNIT WEIGHT WITH OIL:

   60 HZ 79 KG 174 LBS
   50 HZ 84 KG 184 LBS

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



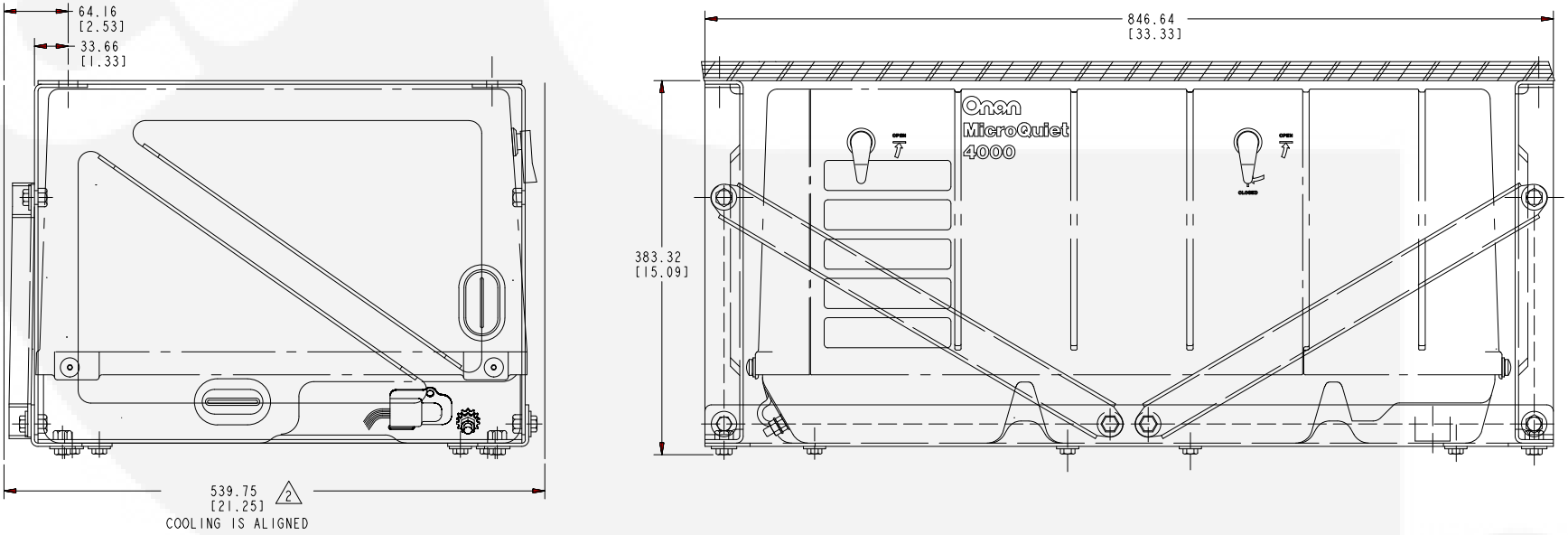
OUTLINE DRAWING

0500-3297-1

NOTES:

1. THIS KIT 403-3608, IS DESIGNED TO ADAPT THE STANDARD MICROQUIET 4000 KY SERIES GENSET (BEGIN SPEC J) TO A RIGID UNDERFLOOR HANGING KIT.

2. MINIMUM INSTALLATION WIDTH IS 21.25 IN AND VARIES WITH SERVICE DOOR AND INLET COOLING HOLE ACCESS. SEE TEMPLATE 539-1535-01



STANDARD RIGID UNDERFLOOR MOUNTING KIT (403-3608)

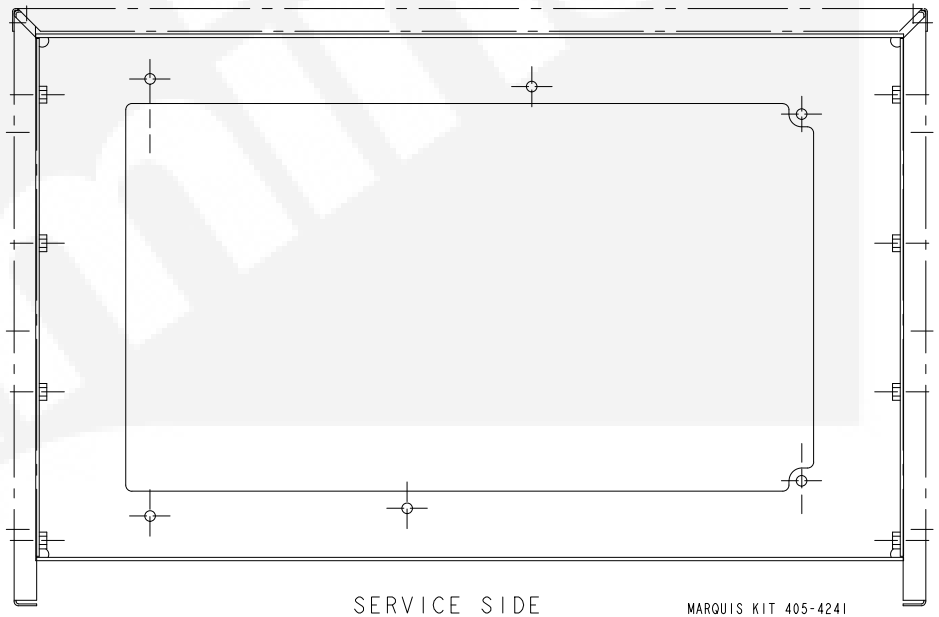
0500-3297-2

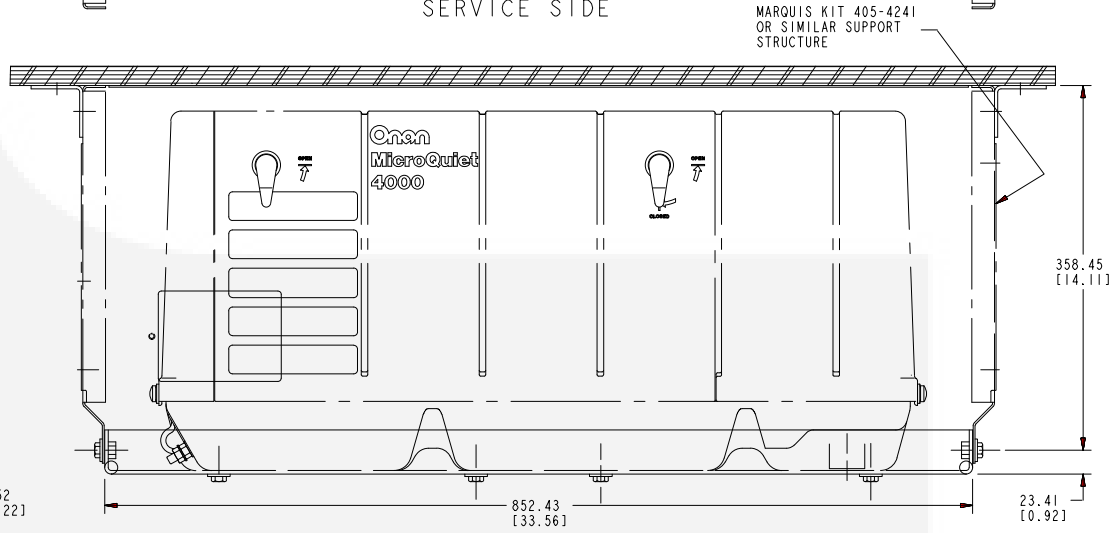
NOTES:

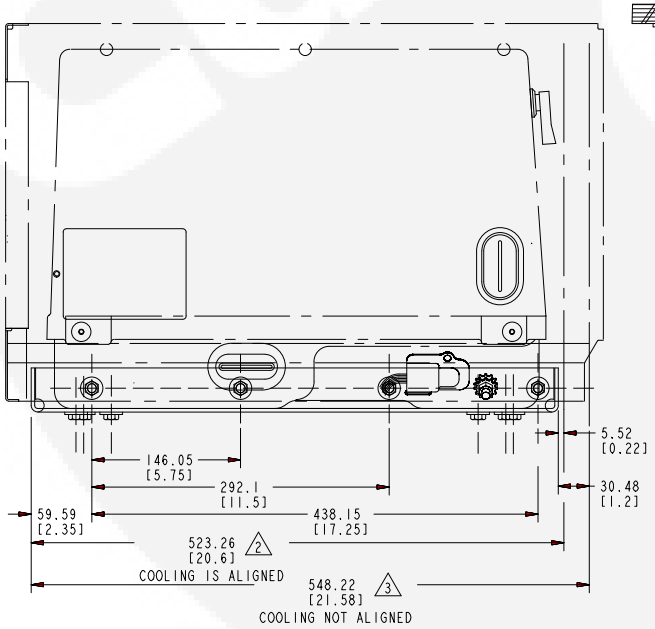
1. THIS KIT 0403-3630, IS DESIGNED TO ADAPT THE MICROQUIET SERIES GENSET (BEGIN SPEC J) TO THE BOLT PATTERN ON THE SIDES OF A MARQUIS BASE PAN.

2. MINIMUM INSTALLATION WIDTH IS 20.60 IN IF GENSET INLET COOLING HOLES ARE ALIGNED WITH VEHICLE ACCESS DOOR COOLING HOLES.

3. MINIMUM INSTALLATION WIDTH IS 21.58 IN IF VEHICLE ACCESS DOOR DOES NOT HAVE ALIGNMENT OF THE COOLING HOLES.







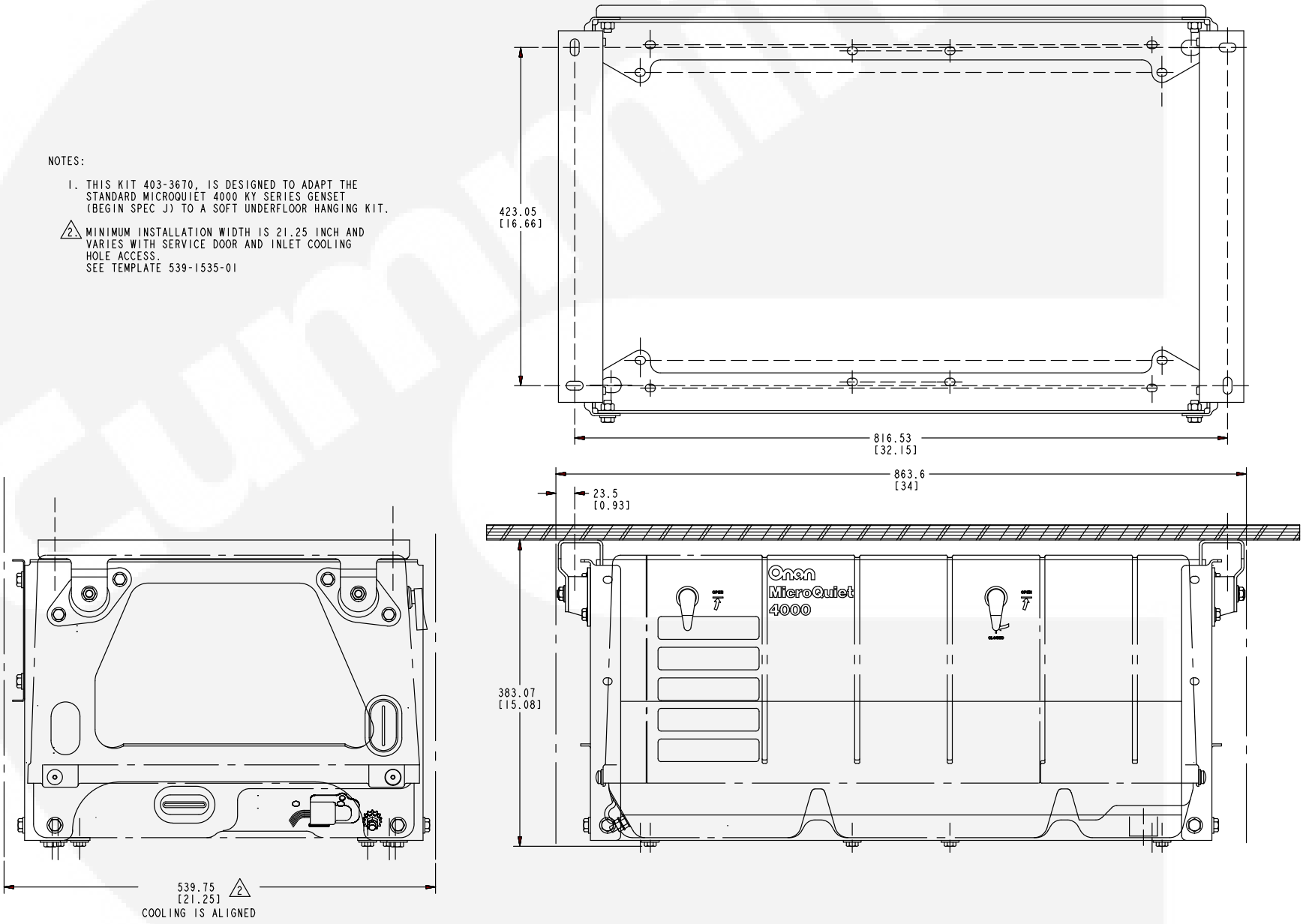
UNDERFLOOR BASE KIT (403-3630)

0500-3297-3

NOTES:

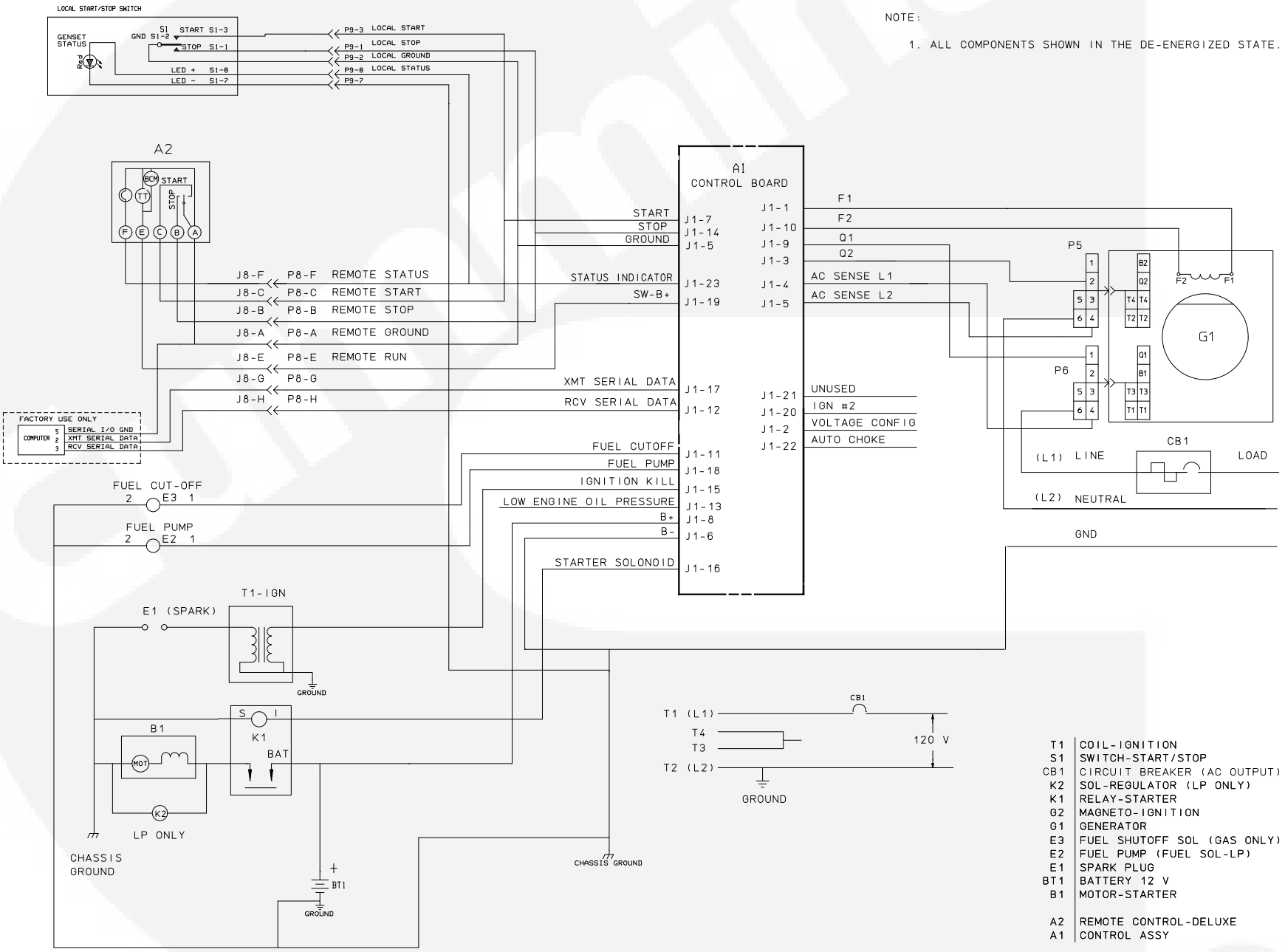
1. THIS KIT 403-3670, IS DESIGNED TO ADAPT THE STANDARD MICROQUIET 4000 KY SERIES GENSET (BEGIN SPEC J) TO A SOFT UNDERFLOOR HANGING KIT.

2. MINIMUM INSTALLATION WIDTH IS 21.25 INCH AND VARIES WITH SERVICE DOOR AND INLET COOLING HOLE ACCESS. SEE TEMPLATE 539-1535-01



SOFT UNDERFLOOR MOUNTING KIT (403-3670)

0500-3297-4



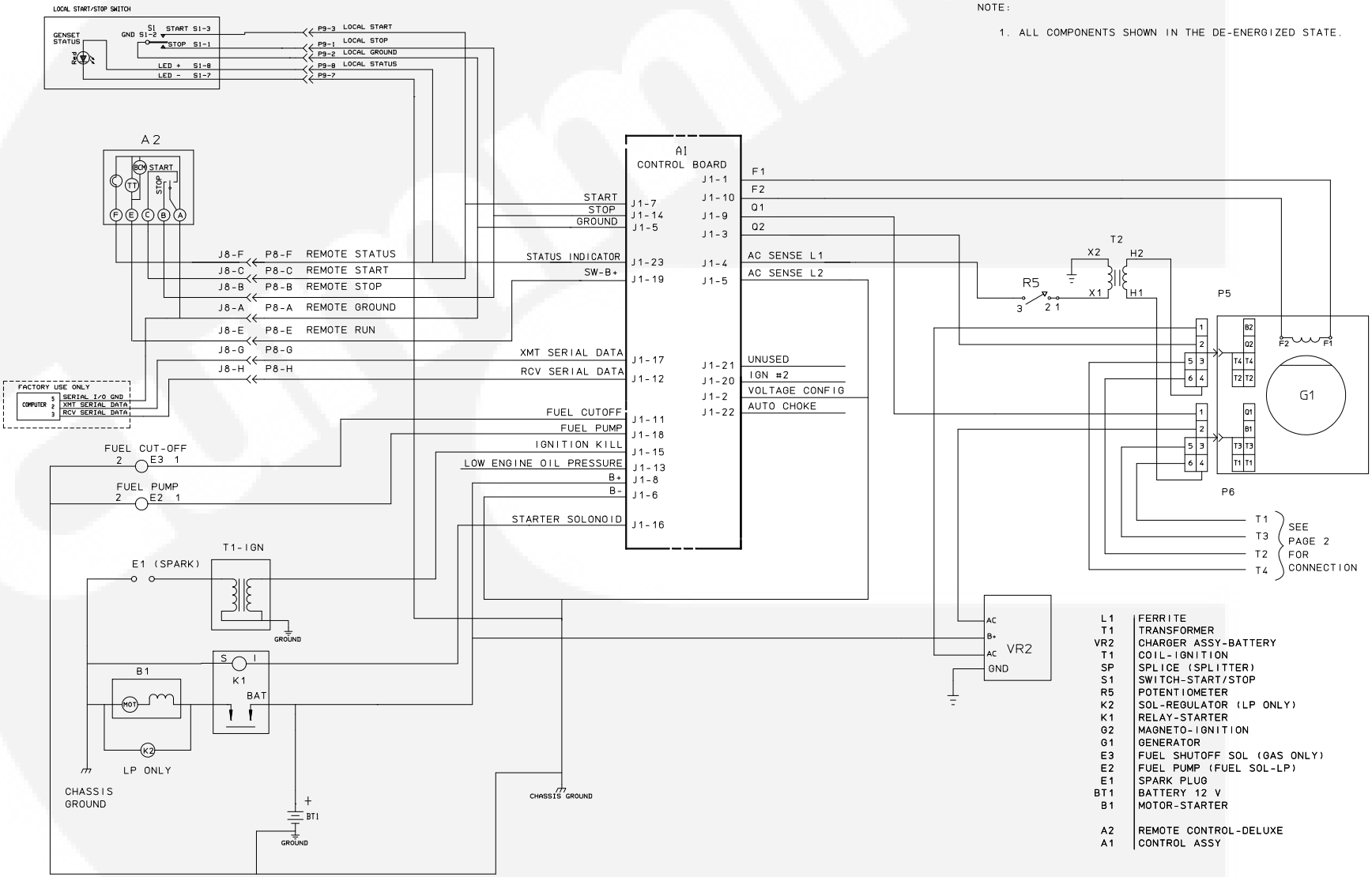
NOTE:

1. ALL COMPONENTS SHOWN IN THE DE-ENERGIZED STATE.

T1	COIL-IGNITION
S1	SWITCH-START/STOP
CB1	CIRCUIT BREAKER (AC OUTPUT)
K2	SOL-REGULATOR (LP ONLY)
K1	RELAY-STARTER
G2	MAGNETO-IGNITION
G1	GENERATOR
E3	FUEL SHUTOFF SOL (GAS ONLY)
E2	FUEL PUMP (FUEL SOL-LP)
E1	SPARK PLUG
BT1	BATTERY 12 V
B1	MOTOR-STARTER
A2	REMOTE CONTROL-DELUXE
A1	CONTROL ASSY

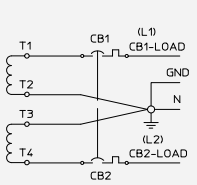
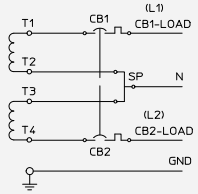
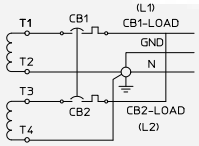
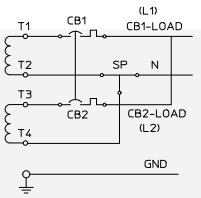
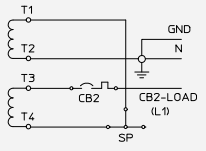
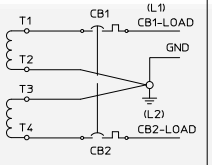
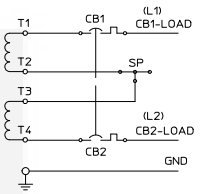
WIRING DIAGRAM—60 HZ

0611-1267



WIRING DIAGRAM—50 HZ

0611-1268-1

FROM:	TO:						
	3 WIRE 100/200, 110/220 OR 120/240V		2 WIRE 100, 110 OR 120V		2 WIRE 200, 220 OR 240V		
	NEUTRAL GROUNDED	NEUTRAL ISOLATED	NEUTRAL GROUNDED	NEUTRAL ISOLATED	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-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
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,L2)-N N/A	(L1,L2)-N N/A	N/A L1-N	N/A L1-L2	N/A L1-L2
RECONNECTION DIAGRAMS							

RECONNECTION DIAGRAMS

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