



Installation Guide

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SAFETY PRECAUTIONS

A generator set can be potentially dangerous if not properly maintained and operated. The best safeguard against a dangerous situation is education, good judgment and common sense. For safe trouble free operation of your generator set some general precautions are listed below. Be sure to read, understand and follow these precautions. Please call Power Technology Southeast with any concerns you may have with your generator set.

1) **HOT PIPING**: An engine and exhaust system may get extremely hot while running. Do not work on a generator set until it has sufficiently cooled.

2) **DANGEROUS FUELS**: Use extreme caution when handling, storing and using fuels. All fuels are highly explosive in a vaporous state. Be sure to store fuel in a well ventilated area away from spark producing equipment. Keep fuels and all chemicals out of the reach of children. Never add fuel to the tank while the engine is running. Spilled fuel may ignite on contact with hot parts or from ignition spark. Always keep fuel lines and connections tight and in good condition. Don't replace flexible fuel lines with rigid lines. If you notice any fuel leakage, fuel accumulation or electrical sparks, **DO NOT OPERATE THE GENERATOR SET.**

3) **EXPLOSIVE BATTERY GASES**: The gases generated by a battery being charged are highly explosive. Do not smoke or permit any flames or sparks to occur near a battery at any time, especially when it is being charged. Avoid contact between terminals with tools to prevent sparks and possible burns. Always remove wristwatch, rings, or other jewelry before handling a battery. Any compartment containing batteries should be well ventilated to prevent the accumulation of explosive gases. To avoid sparks never disturb the battery charging connections while the battery is being charged. Always turn off the battery charger before disconnecting terminal clips.

4) **ELECTROCUTION**: Failure to install a generator set with an electrical system consistent with governing regulations and standards is UNLAWFUL and may cause ELECTROCUTION of vehicle occupants. Your generator set must not be used to "Back Feed" by connecting it to a building or outdoor electrical circuit. Back feeding can cause serious injury or death to utility personnel working to repair a power outage and may also seriously injure persons in your vehicle. Unauthorized connections are unlawful in some states and/or localities. A transfer switch must be installed to prevent interconnection of the generator set power and outside power.

5) **MOVING PARTS**: Keep hands, feet, and clothing away from belts and related pulleys when unit is running. Replace guards, covers, and screens before operating the generator set. Serious personal injury may occur from contact with moving parts.

- 6) **HIGH VOLTAGE:** Remember the function of a generator set is to produce electricity. Wherever electricity is present there is a potential danger of electrocution. Apply the same precautions to the vehicles electrical appliances as you would for any home appliance. Keep away from electrical circuits and wiring while the generator set is running. Have electrical service performed only by qualified electricians. Be sure any unauthorized person; especially children are denied access to the generator set. Keep the compartment door securely latched or locked at all times. Be sure the generator is properly grounded. Never touch electrical leads or appliances with wet hands, or when standing on wet ground.
- 7) **EXPLOSION:** Never connect the negative (-) battery cable to the positive (+) connection terminal of the starter solenoid, or test the battery by shorting terminals together. This could ignite fuel vapors or cause the battery to explode. To disconnect the battery remove the negative battery cable first and reconnect it last. Do not modify the fuel tank or propulsion engine fuel system. Your vehicle must be equipped with a fuel pick-up arrangement as described in the Fuel system section of this manual. Fuel tank and installation must conform to applicable regulations.
- 8) **HOT COOLANT:** Allow engine to cool and release pressure from the cooling system before opening the radiator pressure cap. To release the pressure, cover the radiator cap with a thick cloth then turn it slowly counterclockwise to the first stop. After the pressure is released and the engine has cooled, remove the cap.
- 9) **LETHAL EXHAUST GAS:** When installing an exhaust system position the tail pipe end so that the discharged gases may not be drawn into the vehicle interior through windows, doors, air conditioners, etc. The engine powering your generator set discharges deadly carbon monoxide as part of the exhaust gas when running. It is essential that the exhaust system be leak proof and routinely inspected.
- 10) **EXCESSIVE NOISE:** Never operate the generator set without an adequate muffler or with a faulty exhaust system. Exposure to excessive noise can lead to a hearing impairment.
- 11) **ELECTRICAL SHOCK:** A battery can cause electrical burns and shocks. Use reasonable care when working near the battery to avoid electrical connections by contacting the battery terminals with tools. Remove wristwatch, rings and all jewelry when working on the generator set.
- 12) **BACKFIRE:** A sudden backfire can cause serious burns. Do not operate your generator set without its air cleaner in place.
- 13) **FLASH FIRE:** A sudden flash fire can cause serious burns. To avoid the possibility of a flash fire do not smoke or permit a flame or spark to occur near the carburetor, fuel lines, fuel filter, fuel pump or other potential source of spilled fuel or vapors.

- 14) **FIRE HAZARD:** Be careful when parking your vehicle to prevent grass fires from being started by hot exhaust gases or exhaust system. Keep away from hot engine and generator parts to avoid burning yourself. Keep the generator set and compartment clean and free of debris, especially combustible materials. Never store fuel, oil or rags in the generator compartment.
- 15) **MARINE APPLICATION:** commercial generator sets do not comply with United States Coast Guard (USCG) requirements. They must not be used for marine applications. Use only generator sets specified for marine use in a marine application.
- 16) **UNIT STARTS WITHOUT NOTICE:** To prevent accidental starting on the units with remote start / stop switch, always disconnect the battery by removing the negative (-) terminal first and then the positive (+). Always disconnect the unit in this manner before working on the generator or *any equipment connected to it.*
- 17) **LOOSE COMPONENTS:** Periodically check for and tighten any fasteners that may have become loose from vibration or road shock. Serious damage may possibly occur if components become dislodged or misaligned.

GENERATOR INSTALLATION in MOBILE APPLICATIONS INTRODUCTION

Use this section as a guide when installing a generator set in any vehicle, and then refer to the appropriate operation section for specific instructions. The installation of a mobile generator set shall comply with current standards of ANSI / RVIA EGS-1, NFPA 1192 / ANSI A 119.2, ANSI / NFPA 70, NFPA 551 and applicable articles of the National Electrical Code. Generator set installations must also comply with state and local requirements.

MARINE APPLICATION

Commercial generator sets do not comply with United States Coast Guard (USCG) requirements and must not be used for marine applications. Use only generator sets specified for marine use in marine installations. USCG regulation (33CFR183)

(Consult the Cut sheet of your Model Generator for Requirements)

INSTALLATION FACTORS

Each generator set is received as a unit except for the optional exhaust system components, which are shipped loose for assembly after the set is installed in the vehicle. When preplanning the installation, the following factors must be considered.

1. **COMPARTMENT SIZE:** Will there be sufficient room around the set to maintain the minimum clearance of one inch?
2. **AIR REQUIREMENTS:** Are the compartment air inlets and outlets sized to allow adequate circulation of air for cooling and combustion?
3. **COMPARTMENT FLOOR:** Is the compartment floor strong enough to support the weight of the generator set?
4. **FUEL SYSTEM:** Is the fuel system properly designed to prevent fuel starvation of either the main engine or generator engine? Are the fuel lines proper size?
5. **EXHAUST SYSTEM:** Will the exhaust system keep heat away from cool air inlets and meet all safety requirements after installation?
6. **ELECTRICAL CONNECTIONS:** Will all systems, (battery, load and remote switch) be compatible with the vehicles system?

GENERATOR COMPARTMENT SIZE

In planning the size of the generator compartment or bay allow for the minimum clearance necessary to adequately cool the generator set. The thickness of insulation and sound deadening material used to line the compartment must be taken into consideration when planning this clearance. To maintain minimum clearance it may be necessary to enlarge the compartment. The generator set must be securely fastened to avoid unwanted movement from vibration and road shock. Be sure to utilize all mounting holes in the basepan to secure the generator to the vehicle support structure. The generator is easily removed from the vehicle if a slide rack is incorporated into the support structure. When designing the compartment allow sufficient access for routine maintenance and for removal when major service is required. Also keep in mind that the compartment door must have air intake opening having a free area equal to or greater than vapor tight and completely that specified under the "Air Requirements" section of this guide. Make sure that the compartment is sealed off from the inside of the vehicle to prevent exhaust or other items from entering the vehicle. Avoid road splash and the possibility of igniting combustible materials beneath the vehicle by enclosing all unnecessary free space beneath the generator compartment. Line the compartment with a good sound deadening material. The material selected must be fireproof or highly fire resistant.

COMPARTMENT FRAMING

The generator must be bolted to a metal frame (NOT WELDED), which is either bolted or welded to the frame of the vehicle. This frame must be designed to withstand a minimum force of 5Gs in any direction. The frame must support the entire base plate around the outer perimeter and center section. Additional framing may be required if excessive vibration occurs.

AIR REQUIREMENTS

Each engine is equipped with a high water temperature shutdown, which will automatically shut down the set if the operating temperature climbs too high. To prevent the generator set from shutting down make sure the compartment openings are large enough to allow adequate circulation of cooling air. The minimum free air opening in the compartment should be the same area as the radiator core on the generator set. Remember that louvers, screens and protective grills will restrict airflow. A relatively open mesh screen will restrict airflow as much as 45%. The intake opening must be increased to compensate for such restrictions.

FUEL SYSTEM

The diesel fuel system for the generator set must be designed to operate independently from the vehicles main engine if both engines are to be operated at the same time. The best way to do this is to have separate fuel tanks, but this is usually impractical because of space restrictions. In most installations both engines operate from a common fuel tank with separate pick-up tubes for each engine, not a Tee fitting arrangement. This prevents either or both engines from being starved for fuel. The generator set fuel pick-up tube is generally shorter than the vehicles; therefore fuel may not be available to the generator when fuel supply is low. This will prevent the generator from depleting the fuel supply needed by the main engine.

NOTE: Using a simple Tee fitting to supply both engines from a common fuel line is not recommended. This practice may possibly cause a fuel starvation situation to either or both engines. Also, if excessive pressure were to build up in the main supply line it could possibly cause a failure of the generators fuel lines or connectors and a hazardous fuel leak may occur. Care must be taken when routing the fuel line from the main tank to the generator set. Keep the fuel line as short as possible while maintaining adequate clearance from the exhaust system. Fuel lines must be run along the frame side rails or vehicle under carriage. Never run fuel lines inside of the vehicle. Securely fasten the fuel lines with hardware that is recommended for the type of fuel line used. The fuel lines should enter the generator compartment at a point nearest to the generators fuel line connection fittings. Allow for a minimum of eight inches of flexible fuel line to make the connection. Use proper size fuel line (a minimum of 5/16" on units 12KW and below, a minimum of 3/8" on units above 12KW) to accommodate the fuel flow needed. Steel fuel line or high quality fuel hose is recommended, fuel lines must be strong enough to withstand road and climatic conditions.

EXHAUST SYSTEM

Exhaust system components will vary from one installation to another; therefore a muffler and tailpipe may not always be furnished with the Genset. However, it is imperative to install a muffler and tailpipe to reduce exhaust noise and direct exhaust gases beyond the vehicles perimeter and away from the normal head-on air stream. Install a tail pipe with as few bends as possible to prevent excessive backpressure. A properly installed exhaust system must be vapor tight, quiet and completely safe for the vehicle, its occupants and surroundings. The exhaust system components must be approved and properly installed to meet the codes and regulations required by Federal and State agencies .It is the responsibility of the vehicle owner or operator to install and maintain the entire exhaust system in good working condition.

IMPORTANT SAFETY TIPS:

When exhaust system components are not furnished by Power Technology as part of the Genset, the installer is responsible for meeting the following requirements.

- 1) Only use exhaust system components, which do not restrict exhaust flow. A restricted exhaust system will create excessive backpressure and may cause poor engine performance and possible engine damage.
- 2) Muffler shall be fabricated of aluminized steel or other corrosion resistant material and be of a welded or crimp construction integral design of the muffler or provided as a separate add-on item.
- 3) Maintain a minimum of 3 inches (76mm) between the exhaust system components and any surrounding combustible materials. If the minimum clearance cannot be maintained, an insulating shield must be installed to prevent the combustible material from exceeding temperatures of 117°F (65°C) above ambient temperature.

- 4) Extend the exhaust system a minimum of 1 inch (25mm) beyond the vehicles perimeter. Never terminate the exhaust system underneath the vehicle.
- 5) Terminate the exhaust system in a direction, which prevents the exhaust gases from being drawn back into the generator compartment and re-circulated.
- 6) To prevent excessive movement and vibration of the exhaust system, install hangers and clamps designed for use in exhaust systems.
- 7) Never join or tee the generator exhaust system and the vehicle exhaust system together. Doing so may cause excessive back pressure on the generator engine; also condensation from one engine can damage the other engine.

ELECTRICAL CONNECTIONS

All wiring must be applicable with local electrical codes. A qualified licensed electrician must perform all electrical wiring connections. Ground Fault (GFCI) breakers must be installed to protect all vehicle branch circuits. All switches and controls must be securely mounted to prevent damage and accidental opening or closing from vibration, road shock and vehicle motion. Battery, load leads and the remote switch panel connections are necessary for completing the installation. Make final connections to the battery only after all other connections have been made, as this will prevent unintentional starting. Some specific details on each connection are stated in the following paragraphs. Refer to the wiring diagram for specific details. All wiring to the generator set shall be securely supported or harnessed to prevent abrasion. Additional support is required to prevent exposure to the exhaust system and any possible leakage of fuel, oil, or grease. At least 2 inches of clearance must be maintained between electrical wiring and hot exhaust parts. Wiring must not be located directly below or close to the fuel system, oil fill and drain locations. If the coach is equipped with a mechanism for removing the generator set from the compartment such as a mounting base or slide rack, be certain all wiring is long enough to allow for free movement of the generator for servicing. A separate 12-volt battery is recommended for the generator set. With a separate battery, cables should be kept short in length thus eliminating problems with excessive voltage drop. Battery Connections for the genset are located in different locations depending on your model. The following Series of genset have bulkhead connections integrated into the base (SI & SS). PSB series generator sets have an internal battery and have no need for battery connection. Open Power Units have no bulkhead for battery connection, the battery connections must be made at the starter battery post for positive (+) and ground (-) at a near location on the engine's cylinder block. For best connectivity use

AC LOAD LEAD CONNECTIONS

Some generator sets have four color-coded leads. The Black and Red leads (L1 & L2) are hot. The White lead (L0) is neutral and the Green lead is ground. The load leads can be routed directly from the junction box to the vehicle AC circuit or transfer switch connection. All installations require that the load leads be routed through flexible conduit from the generator end bracket to the junction box location. The load lead junction box must be accessible for servicing and inspection. AC load lead (L0) White is always the neutral lead on PTS generator sets. Make sure the neutral of the AC circuit in the vehicle is connected to the (L0) White lead. If equipment ground type plugs and receptacles (3 prong) are used in the vehicle, the green wire must be connected to the chassis ground. On vehicles, which also have provisions for using an outside AC, power source, the neutral lead as well as the Black (L1 & L2) hot leads must be completely isolated from the generator set when power is switched to the outside source.

MOTOR LOADS

When figuring generator set capacity requirements for installation involving motor loads, do not overlook the high current demanded by the motor during start-up. The “In-Rush” of starting current may be 2 to 5 times higher than that required when the motor reaches normal operating speed. Reserve capacity must be allowed for in rush demands plus other loads, which could be on the line as the motor starts. Air conditioning units are the most common type of motor loads for a generator set in a vehicle.

The starting characteristics of the different makes of air conditioners vary greatly. For example, a particular 12,000 BTU unit may have lower starting requirements than a 10,000 BTU unit of another make. When only one unit is involved there is usually no starting problem provided of course the lighting and appliance load is not too high when unit is started. The trend seems to be toward larger capacity air conditioners and the use of more than one unit in larger vehicles. Simultaneously starting two large units can present a problem if the capacity is marginal. Because of the variation in starting characteristics of the different makes of air conditioners, no definite statement can be made in this publication regarding multiple-motor starting capabilities. Delayed starting or use of “easy starting” devices on air conditioner units should be considered whenever simultaneous starting of more than one motor is involved. The starting and running requirements of some motor loads common to mobile applications are listed in the table below. Use this as a guide when selecting generator set capacity requirements involving motor loads. Also note the Kilowatt De-rating factor for generator set capabilities regarding air conditioners. Capabilities will vary according to “Kilowatt De-rating”.

KILOWATT DE-RATING

All single phase units are rated at 1.0 power factor. The Kilowatts of the generator set will decrease 3.5% per 1,000 feet (305m) above 500 feet (152m) above sea level. De-rate 1% for every 10 °F (5.5°C) above 68°F.

ELECTRICAL LOADS

While the electrical load of the vehicle should have been calculated prior to purchase of the generator set, you may want to recheck the load before installing the set to make sure the capacity is ample to meet the demands without possible overloading. The lighting load is usually easiest to calculate in most cases, simply add the wattage of each lamp to be operated off the generator set. Note that in many applications, not all of the lights or lamps are in the generator sets AC circuit. Some are DC powered by the 12-volt battery in the vehicle. Make sure the total includes only lights actually on the generator sets AC circuit. The lighting load is usually not too heavy in mobile installations however it must be accurately calculated to prevent overloading. For example, if all lights are on at the same time and the air conditioner or other motor equipment starts up, this may possibly cause an overload situation.

[For Any Further Questions Please contact customer service at Power Technology Southeast.](#)