

# Onan

## Installation Manual

### KV GenSet

#### RV Electric Generator Set



**This manual must be given to the customer,  
along with the Operator's Manual**



# Safety Precautions

Before operating the generator set, read the Operator's Manual and become familiar with it and the equipment. **Safe and efficient operation can be achieved only if the unit is properly operated and maintained.** Many accidents are caused by failure to follow fundamental rules and precautions.

The following symbols, found throughout this manual, alert you to potentially dangerous conditions to the operator, service personnel, or the equipment.

**⚠ DANGER** *This symbol warns of immediate hazards which will result in severe personal injury or death.*

**⚠ WARNING** *This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.*

**⚠ CAUTION** *This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.*

**FUEL AND FUMES ARE FLAMMABLE.** Fire, explosion, and personal injury can result from improper practices.

- DO NOT fill fuel tanks while engine is running. Fuel contact with hot engine or exhaust is a potential fire hazard.
- DO NOT SMOKE OR USE AN OPEN FLAME near the generator set or fuel tank.
- Fuel lines must be adequately secured and free of leaks. Fuel connection at the engine should be made with an approved flexible, non-conductive line. Do not use copper piping on flexible lines as copper will work harden and become brittle.
- Be sure all fuel supplies have a positive shutoff valve.

**GASOLINE AND LPG FUEL MAY BE ACCIDENTALLY IGNITED BY ELECTRICAL SPARKS,** presenting the hazard of fire or explosion, which can result in severe personal injury or death. When installing the generator set:

- Do not tie electrical wiring to fuel lines.
- Do not run electrical lines and fuel lines through the same compartment openings.
- Keep electrical and fuel lines as far apart as possible.
- Place a physical barrier between fuel lines and electrical lines wherever possible.
- If electrical and fuel lines must pass through the same compartment opening, make certain that they are physically separated by running them through individual channels, or by passing each line through a separate piece of tubing.
- DO NOT SMOKE while servicing batteries. Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by electrical arcing or by smoking.

## EXHAUST GASES ARE DEADLY

- Never sleep in the vehicle with the generator set running unless vehicle is equipped with an operating carbon monoxide detector.
- Provide an adequate exhaust system to properly expel discharged gases. Inspect exhaust system daily for leaks per the maintenance schedule. Ensure that exhaust manifolds are secure and not warped. Do not use exhaust gases to heat a compartment.
- Be sure the unit is well ventilated.

## MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Before starting work on the generator set, disconnect batteries. This will prevent accidental arcing.

- Keep your hands away from moving parts.
- Make sure that fasteners on the generator set are secure. Tighten supports and clamps, keep guards in position over fans, drive belts, etc.
- Do not wear loose clothing or jewelry while working on generator sets. Loose clothing and jewelry can become caught in moving parts. Jewelry can short out electrical contacts and cause shock or burning.
- If adjustment must be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

## ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Disconnect starting battery before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling electrical equipment.
- Use extreme caution when working on electrical components. High voltages can cause injury or death.
- Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag open switches to avoid accidental closure.
- DO NOT CONNECT GENERATOR SET DIRECTLY TO ANY BUILDING ELECTRICAL SYSTEM. Hazardous voltages can flow from the generator set into the utility line. This creates a potential for electrocution or property damage. Connect only through an approved device and after building main switch is open. Consult an electrician in regard to emergency power use.

## GENERAL SAFETY PRECAUTIONS

- Have a fire extinguisher nearby. Maintain extinguisher properly and become familiar with its use. Extinguishers rated ABC by the NFPA are appropriate for all applications. Consult the local fire department for the correct type of extinguisher for various applications.
- Hot coolants under pressure can cause severe personal injury. DO NOT open a radiator pressure cap while the engine is running. Stop the engine and carefully bleed the system pressure.
- Benzene and lead, found in some gasoline, have been identified by some state and federal agencies as causing cancer or reproductive toxicity. When checking, draining or adding gasoline, take care not to ingest, breathe the fumes, or contact gasoline.
- Used engine oils have been identified by some state or federal agencies as causing cancer or reproductive toxicity. When checking or changing engine oil, take care not to ingest, breathe the fumes, or contact used oil.
- Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and engine damage, which presents a potential fire hazard.
- DO NOT store anything in the generator compartment such as oil or gas cans, oily rags, chains, wooden blocks, portable propane cylinders, etc. A fire could result or the generator set operation (cooling, noise and vibration) may be adversely affected. Keep the compartment floor clean and dry.
- Do not work on this equipment when mentally or physically fatigued, or after consuming any alcohol or drug that makes the operation of equipment unsafe.

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# Section 1. Introduction

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## GENERAL

This manual provides installation guidelines for the Onan MicroLite™ (KV) generator sets. The generator set must be installed properly to operate reliably, quietly, and safely. Read this entire manual before starting installation.

MicroLite is a trademark of the Onan Corporation

For operation and maintenance procedures, see the Operator's Manual #981-0129 that accompanies each set.

When properly installed, this generator set meets or exceeds the following requirements:

- National Electrical Code, Article 551
- ANSI/RVIA EGS-1 - 1986, Generator Set Standard
- ANSI A119.2/NFPA 501C Standard for Recreational Vehicles
- NFPA 58 Standard for the Storage and Handling of Liquefied Petroleum Gases
- CSA Electrical bulletin 946

The RV manufacturer and/or the set installer must comply with local codes such as California administrative Code title 25, which applies to generator set installation. The RV installer bears sole responsibility for the selection of the appropriate generator set, installation design, and installation.

Consider the following requirements before installing the set. Each topic is covered in the following text.

- Level and supportive mounting surface
- Adequate cooling air
- Adequate fresh induction air
- Discharge of circulated air
- Noise levels
- Accessibility for maintenance and service
- Exhaust connections
- Fuel supply
- Electrical connection

## INSTALLATION CODES AND SAFETY RECOMMENDATIONS

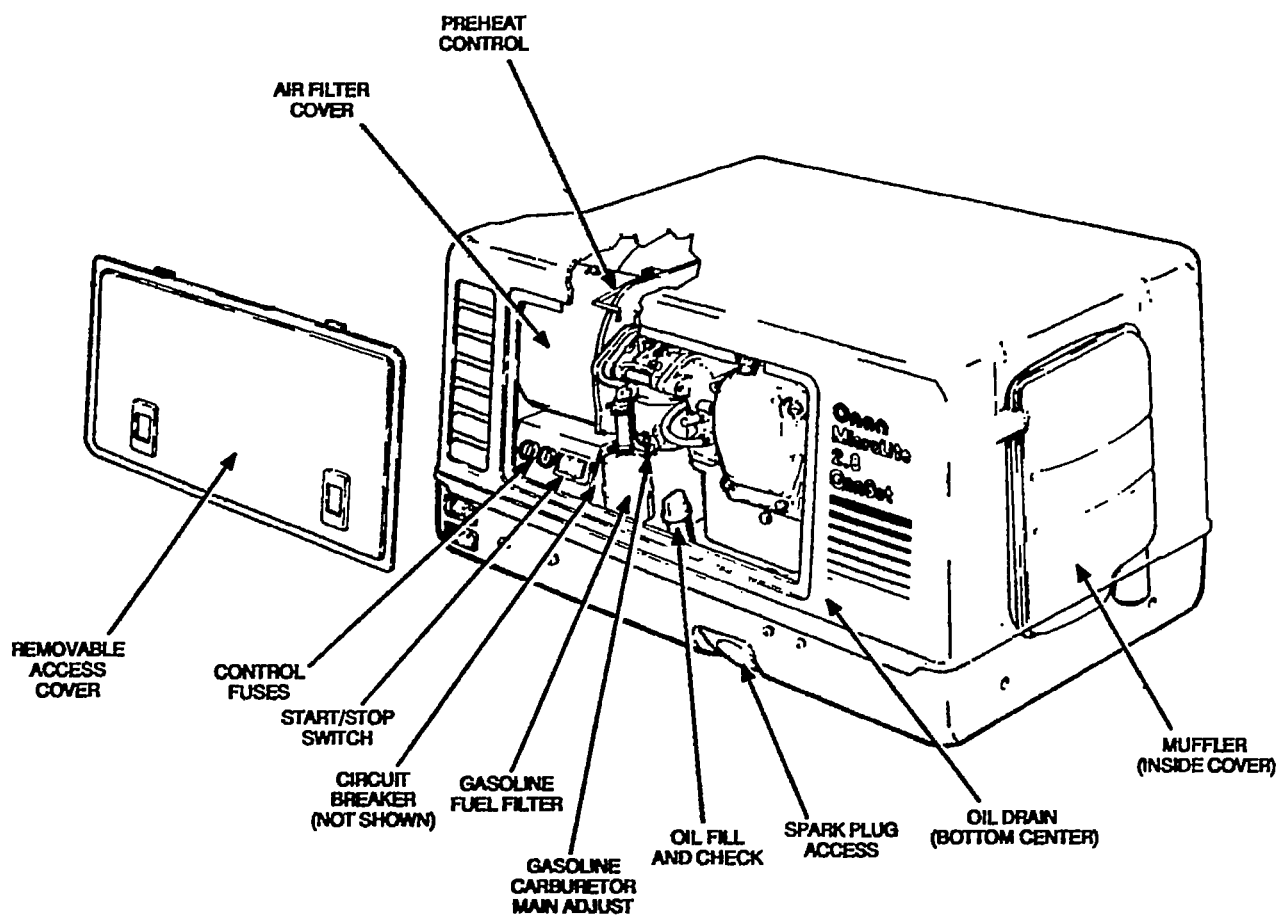
The following list of Installation Codes and Safety Recommendations applies to the installation and operation of RV generator sets. The address of each agency is listed so that copies of the codes may be obtained for reference. Installation codes and recommendations are subject to change, and may vary by location or over time. The RV manufacturer and the genset installer bear sole responsibility for following all applicable codes and regulations.

- |   |   |
|---|---|
| 1. ANSI-A119.2<br>FMVSS 301                                     | Recreational Vehicle<br>Industry Association<br>14650 Lee Road<br>Chantilly VA 22021  |
| 2. NFPA 70 (N.E.C.)<br>NFPA-501C<br>NFPA 58                     | National Fire Protection<br>Association<br>470 Atlantic Avenue<br>Boston MA 02210   |
| 3. CSA Electrical<br>Bulletin #946                              | Canadian Standards<br>Association, Housing and<br>Construction Materials<br>Section<br>178 Rexdale Blvd.<br>Rexdale, Ontario, Canada<br>M9W 1R3 |
| 4. California<br>Administrative<br>Code - Title 25<br>Chapter 3 | State of California<br>Documents Section<br>P.O. Box 1015<br>North Highlands CA<br>95660  |

This manual contains information that is subject to change. For this reason, use only the installation manual supplied with the generator set for the installation.

**⚠WARNING** *Incorrect installation, service, or replacement of parts can result in severe personal injury, death and/or equipment damage. Service personnel must be qualified to perform electrical and/or mechanical component installation.*

**⚠WARNING** Operation of the generator set with the access cover removed can result in severe personal injury or equipment damage. Hot components are exposed when the access cover is removed and generator set cooling air does not circulate properly. Do not operate the generator set with the access cover removed.



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FIGURE 1-1. MICROLITE™ (KV) GENERATOR SET

# Section 2. Specifications

TABLE 2-1. SPECIFICATIONS FOR GASOLINE-FUELED MODELS

GASOLINE MODELS	1.7 KV	2.0 KV	2.2 KV	2.8 KV
<b>GENERATOR DETAILS</b>				
Type	Onan, Revolving Field, 2-Pole		Onan, Revolving Field, 2-Pole	
Frequency (Hertz)	50	50	60	60
Power (Watts)	1700	2000	2200	2800
Voltage	240	220	120	120
Current (Amperes)	7.1	9.1	18.3	23.3
<b>ENGINE DETAILS</b>				
Engine	Onan GH-200		Onan GH-200	
Fuel	Gasoline		Gasoline	
Engine Oil Capacity	1 qt (0.95 L)		1 qt (0.95 L)	
Battery Requirements:				
Battery Size	12-Volt		12-Volt	
Cold Cranking Amps	360		360	
Spark Plug Gap	0.025 in. (0.64 mm)		0.025 in. (0.64 mm)	
Average Fuel Consumption:				
No Load	0.2 gph (0.8 L/h)	0.2 gph (0.8 L/h)	0.2 gph (0.8 L/h)	0.2 gph (0.8 L/h)
Half Load	0.21 gph (0.8 L/h)	0.23 gph (0.9 L/h)	0.28 gph (1.0 L/h)	0.3 gph (1.1 L/h)
Full Load	0.33 gph (1.3 L/h)	0.4 gph (1.5 L/h)	0.35 gph (1.3 L/h)	0.43 gph (1.6 L/h)
<b>GENERATOR SET DETAILS</b>				
Dimensions:				
Height	12.2 in. (310 mm)		12.2 in. (310 mm)	
Width	16.42 in. (417 mm)		16.42 in. (417 mm)	
Length	24.0 in. (609.5 mm)		24.0 in. (609.5 mm)	
Weight	113 lb (51 kg)		113 lb (51 kg)	
Air Requirements:				
Combustion	10.4 ft <sup>3</sup> /min (0.3 m <sup>3</sup> /min)		12.5 ft <sup>3</sup> /min (0.35 m <sup>3</sup> /min)	
Engine/Generator Cooling	250 ft <sup>3</sup> /min (7.1 m <sup>3</sup> /min)		300 ft <sup>3</sup> /min (8.5 m <sup>3</sup> /min)	

The 60 Hertz models are listed by C.S.A. and the U.S. Testing Company.

**TABLE 2-2. SPECIFICATIONS FOR LPG-FUELED MODELS**

<b>LPG MODELS</b>	<b>2.0 KV</b>	<b>2.5 KV</b>
<b>GENERATOR DETAILS</b>		
Type	Onan, Revolving Field, 2-Pole	Onan, Revolving Field, 2-Pole
Frequency (Hertz)	50	60
Power (Watts)	2000	2500
Voltage	220	120
Current (Amperes)	9.1	20.8
<b>ENGINE DETAILS</b>		
Engine	Onan GH-200	Onan GH-200
Fuel	LPG - Vapor (11 inches W.C.)	LPG - Vapor (11 inches W.C.)
Engine Oil Capacity	1 qt (0.95 L)	1 qt (0.95 L)
Battery Requirements:		
Battery Size	12-Volt	12-Volt
Cold Cranking Amps	360	360
Spark Plug Gap	0.025 in. (0.64 mm)	0.025 in. (0.64 mm)
Average Fuel Consumption:		
No Load	0.2 gph (0.8 L/h)	0.2 gph (0.8 L/h)
Half Load	0.3 gph (1.14 L/h)	0.34 gph (1.29 L/h)
Full Load	0.45 gph (1.7 L/h)	0.55 gph (2.08 L/h)
<b>GENERATOR SET DETAILS</b>		
Dimensions:		
Height	12.2 in. (310 mm)	12.2 in. (310 mm)
Width	16.42 in. (417 mm)	16.42 in. (417 mm)
Length	24.0 in. (609.5 mm)	24.0 in. (609.5 mm)
Weight	110 lb (50 kg)	110 lb (50 kg)
Air Requirements:		
Combustion	10.4 ft³/min (0.3 m³/min)	12.5 ft³/min (0.35 m³/min)
Engine/Generator Cooling	250 ft³/min (7.1 m³/min)	300 ft³/min (8.5 m³/min)

The 60 Hertz models are listed by C.S.A. and the U.S. Testing Company.



# Section 3. Mounting

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## GENERAL

MicroLite™ generator sets are designed for either compartment mount or underfloor mounting. Choose the appropriate manual section and carefully follow the instructions. **Read this entire manual and the exhaust kit and other applicable kit instructions before installing the generator set.**

## COMPARTMENT MOUNT

In a compartment mount, the set is installed in a frame that is part of the vehicle. This frame must be constructed according to safety-approved specifications (see Compartment Construction in this section).

Unless the set will be removed from underneath the vehicle, make the access opening large enough to remove the set. Allow extra clearance for removal of the access cover and for spark plug removal. See Figure 1-2.

Minimum compartment dimensions are shown in Figure 3-1. Clearances between the generator set and the compartment are included in these dimensions.

Allow for air intake at the side of the set and air discharge at the bottom of the set. Air inlets to the set compartment must not allow dirt, rocks, water, or slush to reach the set. Minimize dust and salt entrance into the compartment. (See *Ventilation* section.)

### Compartment Construction

1. Install the generator set in its own compartment. Allow a minimum of 11 inch (25.4 mm) spacing at the front of the set and a minimum of 1/4 inch (6.4 mm) clearance on the sides, back and top of the set. See Figures 3-1 and 3-2.
2. If any part of the compartment is above the vehicle floor, separate the compartment area from the living quarters and fuel supply with vapor-tight walls.

3. Line the compartment walls with 26-gauge galvanized steel or a material of comparable strength and fire resistance (see NFPA 70, NEC and California Title 25 for complete details).

**⚠ WARNING** *Exhaust gases present the hazard of severe personal injury or death. Make the compartment walls vapor-tight to the interior of the vehicle to prevent exhaust fumes from entering the living quarters.*

4. Construct a compartment floor that will prevent oil, fuel or water accumulation. Provide openings in the compartment floor according to the Compartment Floor Plan, Figure 3-2.

Do NOT use absorbent soundproofing material on the compartment floor. The floor should have as few openings as possible, to reduce the noise level.

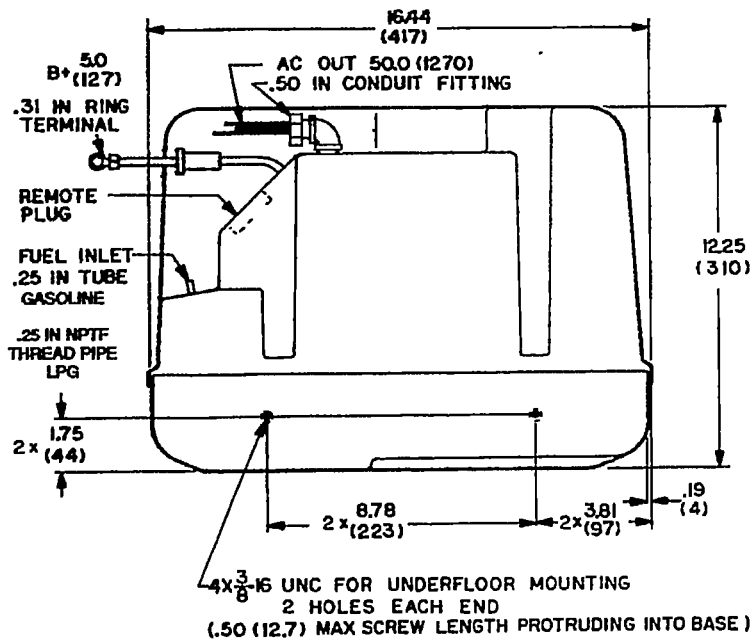
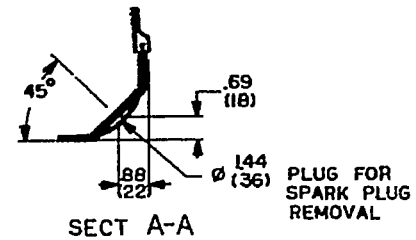
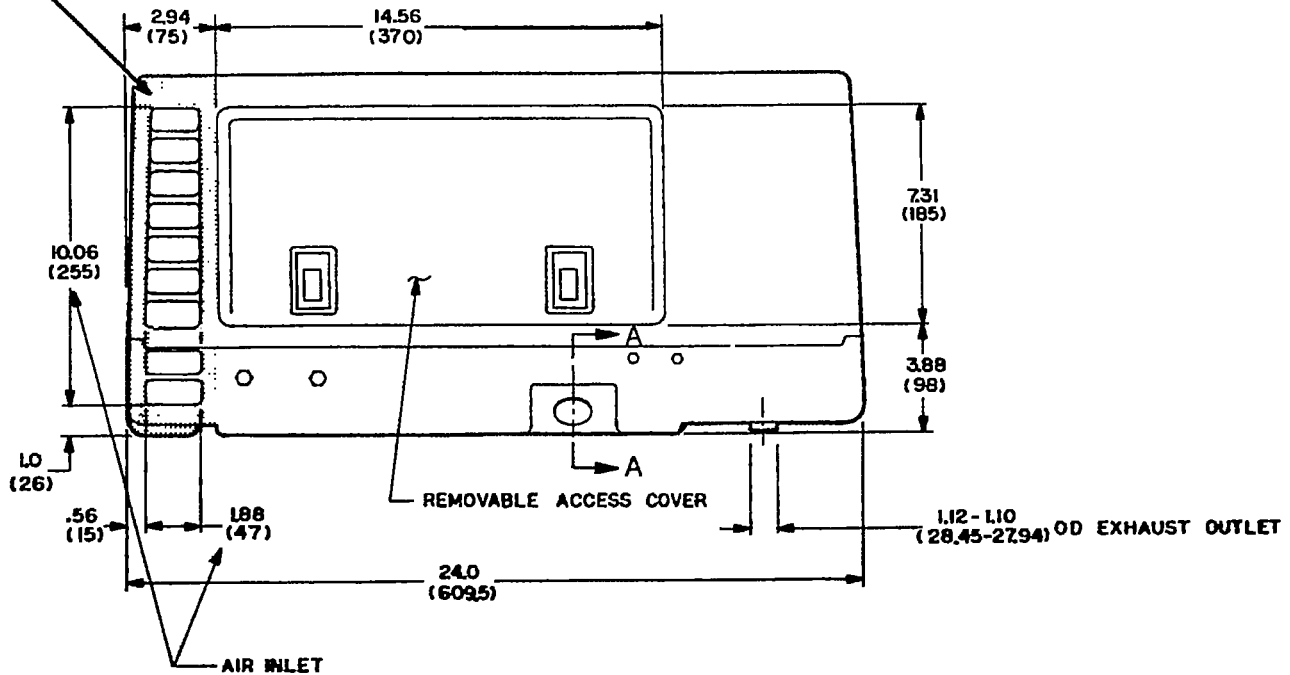
5. Equip the base with an oil drain hole to the outside of the compartment. Do not mount the exhaust pipe below the oil drain hole.

**⚠ WARNING** *Fire presents the hazard of severe personal injury or death. Do not position the exhaust pipe directly below a drain hole. Hot exhaust can ignite fuel or oil.*

6. Secure the generator set mounting base to the support frame, using four 3/8-16 UNC grade 5 screws. The mounting bolts must not extend more than 1/2 inch (13 mm) into the base. See Figures 3-1 and 3-2. Torque 3/8 inch mounting screws to 35 ft lbs (47 N•m).

**⚠ CAUTION** *If the mounting base is not fastened securely to the vehicle compartment, road vibrations will damage the generator set components. Use screws long enough for at least 1-1/2 threads to extend through the weld nut. The mounting bolts must not extend more than 1/2 inch (13 mm) into the base.*

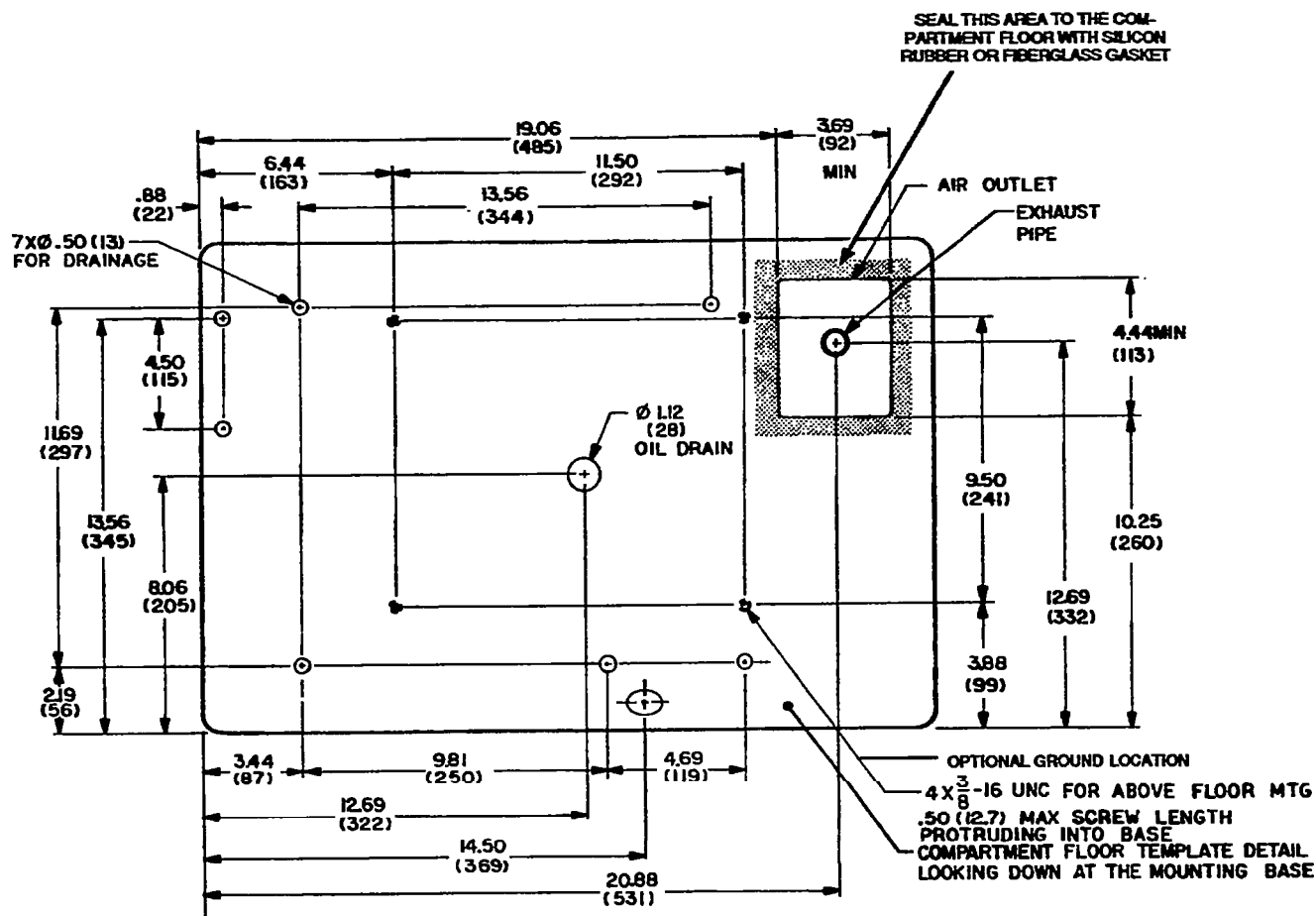
SEAL THIS AREA TO THE COMPARTMENT DOOR IF AIR INLET IS THRU COMPARTMENT DOOR



- NOTES:
1. DIMENSIONS IN ( ) ARE MILLIMETERS
  2. MIN UNIT CLEARANCE FROM COMPARTMENT SURFACES:
- |                    |                    |                     |
|--------------------|--------------------|---------------------|
| TOP                | .25                | (6.3)               |
| ENGINE END         | .25                | (6.3)               |
| GEN END            | .25                | (6.3)               |
| SERVICE SIDE       | 1.00               | (25.4)              |
| BACKSIDE           | .25                | (6.3)               |
| MIN FREE AIR INLET | 24 in <sup>2</sup> | 155 cm <sup>2</sup> |
| UNIT WEIGHT        | 113 lb             | 51 kg               |

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FIGURE 3-1. COMPARTMENT MOUNT OUTLINE



- NOTES:
1. DIMENSIONS IN ( ) ARE MILLIMETERS
  2. MIN UNIT CLEARANCE FROM COMPARTMENT SURFACES:
- |              |      |        |
|--------------|------|--------|
| TOP          | .25  | (6.3)  |
| ENGINE END   | .25  | (6.3)  |
| GEN END      | .25  | (6.3)  |
| SERVICE SIDE | 1.00 | (25.4) |
| BACKSIDE     | .25  | (6.3)  |

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FIGURE 3-2. COMPARTMENT FLOOR PLAN

## UNDER-FLOOR MOUNT

In an under-floor installation, the generator set is mounted below the floor and outside the passenger compartment of the vehicle. This type of installation must comply with the Installation Codes and Safety Recommendations (see *Introduction* section). Read this section for general application information, and study the proper under-floor housing/exhaust kit instructions for more information on under-floor installations.

The vehicle structure must be able to support the weight of the generator set (see *Specifications* section). The vehicle manufacturer and/or the installer must provide a structurally sound support frame, using tubing, angle brackets, or steel-reinforced plywood or other composition board. Plywood or particle board can be reinforced with 3-inch (76 mm) or larger washers or a full metal plate.

Line the floor above the set with 26-gauge galvanized steel or a material of comparable strength and fire resistance (see NFPA 70, NEC and California Title 25 for complete details).

### Generator Set Location

Figure 3-3 shows the most common mounting areas for a generator set. Protect the generator set from road splash and debris. If possible, drive the vehicle through mud and slush to test the installation.

Leave a minimum space of 1 inch (25.4 mm) between the generator set and the vehicle skirt for an air inlet. Provide a minimum side, back and top clearance 1/4 inch (6.4 mm).

The bottom air inlet opening to the generator set compartment must not admit dirt, rocks, water or slush. The entrance of dust and salt into the compartment must be minimized. Baffles may be needed to protect certain areas. See the *Ventilation* section of this manual for more detailed information.

**Access Opening:** Provide an access opening to the generator set on the side of the vehicle. Make access large enough to allow for removal of the generator set access cover. Also allow access to the oil drain and spark plug, so the generator set does not have to be removed for servicing these items (see Figure 1-2 for locations).

**Mounting Brackets:** The vehicle must be adapted for use with the under-floor mounting bracket kit. The construction of the vehicle must support the weight of the generator set (see *Specifications* section). It is the manufacturer and/or the installer's responsibility to provide carriage bolts to attach the mounting brackets.

Review the exhaust system kit installation instructions and check the components supplied in the kit. Plan clearances for moving or removing exhaust components when the set is removed for service.

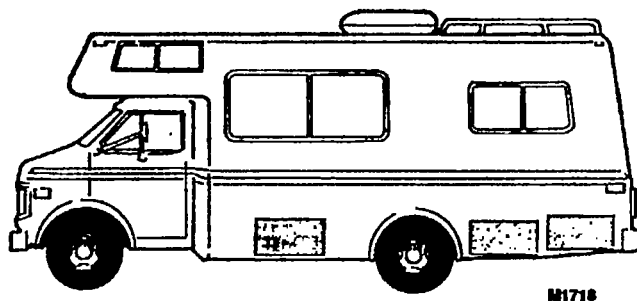


FIGURE 3-3. COMMON GENERATOR SET MOUNTING AREAS

# Section 4. Ventilation

## GENERAL

The most important factors of ventilation for an air cooled generator set are sufficient incoming air (for combustion and cooling) and adequate exhausting of heated air.

A fan draws cooling air through the inlet on the generator end and pushes it across the generator and engine cooling fins. The heated air is expelled through the air outlet on the bottom of the set. See Figure 4-1.

Make certain that nothing obstructs or restricts the air intake and air outlet. Air recirculation must be minimized. If a noise or dust deflector are added to the set, it must be located a minimum of 6 inches (150 mm) below the generator set and it must be open on three sides.

**⚠WARNING** Exhaust gas presents the hazard of severe personal injury or death. Because discharged cooling air can contain deadly exhaust gas, never use discharged cooling air to heat the vehicle.

**⚠WARNING** Operating the generator set with the cover removed can cause equipment damage. Generator set cooling air does not circulate properly with the access cover removed. Do not operate the generator set with the access cover removed.

When designing the air inlet and outlet for the set compartment (see Figures 3-1 and 3-2), allow for the restric-

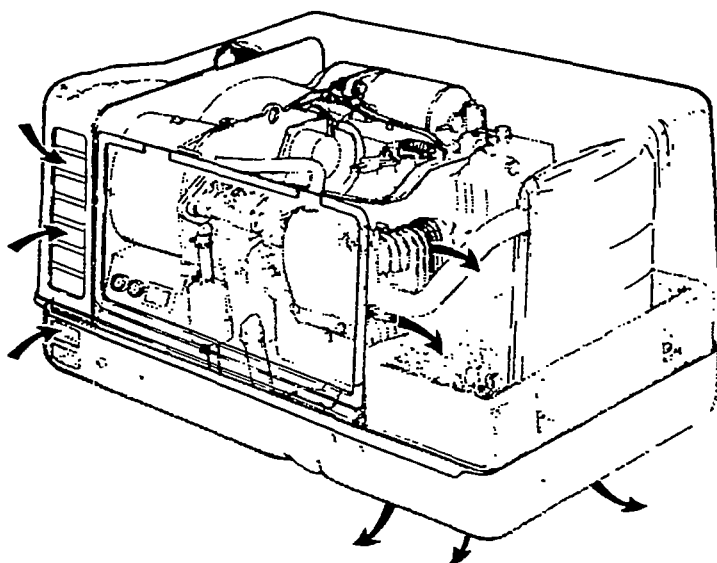
tion of grilles and ductwork: some expanded metal grilles provide as little as 60 percent free air inlet area per square foot. The most efficient grille provides only 90 percent free inlet area per square foot. Obtain the free inlet area of the grille material from the material supplier. Multiply the grille area by the free area percentage to get the free inlet area.

Air ducting must provide a direct free-airflow path to the generator set, with minimal bends. The duct must be smooth and non-restrictive to airflow.

Air inlet openings should be located as high as possible to allow for convection cooling of heated air from the generator set compartment after unit shutdown. Otherwise, hard starting could result from vapor locking, hot combustion air, etc.

**⚠WARNING** Fuel and fuel leakage present the hazard of fire or explosion, which can cause severe personal injury or death. The ventilation system should provide a constant flow of air to expel any accumulation of fuel vapor. The generator set compartment must be vapor-tight to the vehicle interior, to keep fumes from entering the vehicle.

Locating the free air inlet opening in the vehicle skirt or side access door is recommended. If the vehicle skirt does not extend to or below the bottom of the generator set, provide an extension.



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FIGURE 4-1. COOLING AIRFLOW



# Section 5. Exhaust System

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## GENERAL

Plan the exhaust system carefully. A proper installation is not only vapor tight, but is quieter and safer. The exhaust system installation must comply with all applicable standards, local codes and regulations. Study the following recommendations. See the instructions supplied with the exhaust kit for specific mounting procedures.

## MUFFLER RECOMMENDATIONS

The Onan-installed spark arrester muffler is U.S. Forest Service approved and meets code requirements. Failure to provide and maintain a spark arrester can be a violation of the law.

Liability for damage or injury, and warranty expenses due to use of unapproved mufflers or installation modifications becomes the responsibility of the person installing the substitute muffler or performing the modifications. Contact an Onan distributor for approved exhaust system parts.

## EXHAUST INSTALLATION GUIDELINES

Use only Onan-specified exhaust kits. These kits have been designed specifically for use with this generator set. The length of pipe used in the exhaust plumbing must be tailored to each specific vehicle and is critical to the selection of the correct exhaust kit.

Exhaust kits are available for installations requiring exhaust lengths of 18 to 25 inches (457 to 635 mm) and over 25 inches (635 mm). Also an exhaust kit is available for installations with a long vertical drop (up to 8.5 inches (216 mm) for a deep compartment floor. See Figure 5-2.

The exhaust system must be placed no closer than 3 inches (76 mm) from combustible material (wood, felt, cotton, organic fibers, etc.), or be so located, insulated or shielded that it does not raise the temperature of any

combustible material more than 117° F (65° C) above the ambient air inlet temperature.

The exhaust system must extend a minimum 1 inch (25 mm) beyond the perimeter of the vehicle. Do not terminate the exhaust tailpipe under the vehicle. Be aware that any vent, window or opening that can be opened and that is not permanently sealed from the vehicle living space can be an avenue for carbon monoxide. The tailpipe must not terminate so that any vent, window, or opening into the living area is within the triangular area shown in Figure 5-1. This area is defined as an isosceles triangle with a height of 3 feet measured from the center of the tailpipe termination and with a base of 2 feet measured one foot horizontally from the center of the pipe in either direction.

**⚠WARNING** *Exhaust gas presents the hazard of severe personal injury or death. Do not terminate an exhaust pipe under the vehicle. The tailpipe must not terminate so that any vent, window, or opening into the living area is within the triangular area shown in Figure 5-1. Keep all openings closed when the generator set is running.*

To reduce the chance of damaging the tailpipe and emitting exhaust gases under the vehicle, make certain that no part of the exhaust system intrudes into the departure angle or approach angle of the vehicle, unless it is protected by a skid bar or other protection device. The shaded areas in Figure 5-1 illustrate typical mounting locations.

**⚠WARNING** *Exhaust gas presents the hazard of severe personal injury or death. Do not mount any portion of the exhaust system into the approach or departure angle unless it is adequately protected. Use only Onan-specified exhaust equipment with the generator set. Use a sufficient number of hangers to prevent dislocation of the system.*

## TAILPIPE RECOMMENDATIONS

An exhaust tailpipe is not supplied with the generator set because length requirements vary between vehicle manufacturers. Refer to the following recommendations for information and safety considerations.

Use only the Onan-specified exhaust kits. Do not install a tail pipe of less than 18 inches (457 mm) in length. Do not extend the length of the 18 to 25 inch (457 to 635 mm) exhaust kit or vibration damage to the exhaust system will result.

**CAUTION** Failure to follow the exhaust installation guidelines can result in damage to equipment. Use the appropriate exhaust kit and install according to the instructions provided.

Use 1-1/8 inch O.D. 18-gauge aluminized or stainless steel tubing for tailpipe.

**WARNING** Exhaust gas presents the hazard of severe personal injury or death. Do not use flexible exhaust tailpipe, because it can leak or break from road shock or vibration. Do not terminate the exhaust system under the vehicle. Direct exhaust gases away from any window, door, or compartment openings. Do not operate the generator set without an exhaust tailpipe.

Use U-bolt type automotive muffler clamp marked 1-1/4 inch to connect exhaust tailpipe to muffler outlet. Use

double rubber, U-shaped, shock-mounted hangers to support the exhaust system. If the tailpipe extends beyond 1 foot (304 mm) from the generator set, attach an automotive tailpipe hanger for additional support. Also use additional automotive type tailpipe hangers every 2 to 3 feet (.06 to .09 m) of tailpipe run. Support the exhaust system at or near the perimeter of the vehicle to prevent the pipe from being damaged and pushed up under the vehicle skirt. Attach hangers to steel framework, not wood or other floor materials. Refer to Figure 5-2 for typical tailpipe installations.

**CAUTION** Angular mounting of muffler and tailpipe hanger brackets can result in exhaust system damage. Properly mounted hanger brackets will absorb much road shock vibration and prolong the use of exhaust system components. Mount muffler and tailpipe hanger brackets directly above the component supported, not at an angle. Do not twist the rubber sections of any hangers.

**CAUTION** Excessive exhaust back pressure can cause engine damage. If a tailpipe deflector is used, make sure it is large enough to prevent back pressure.

**CAUTION** Water vapor can cause engine damage. Do not connect the generator set exhaust to the vehicle exhaust system, because water vapor from one engine can damage the other.

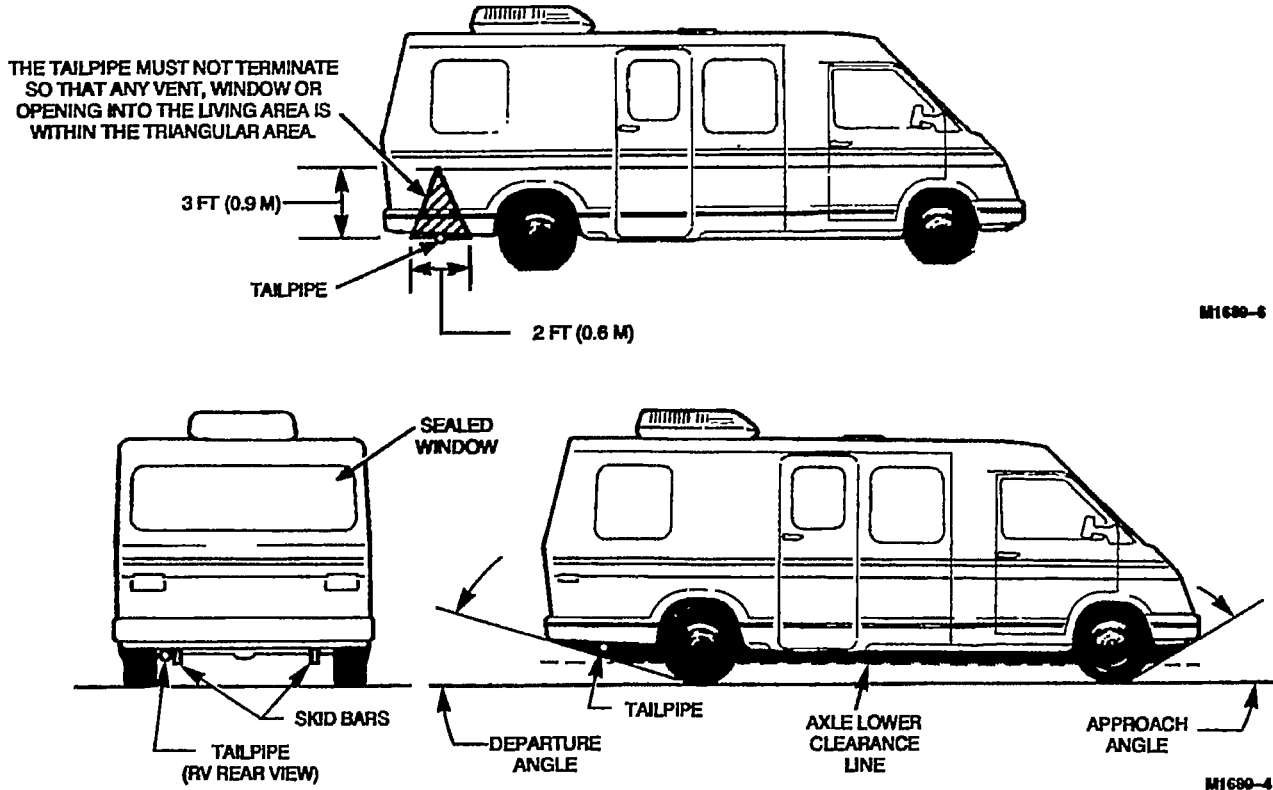
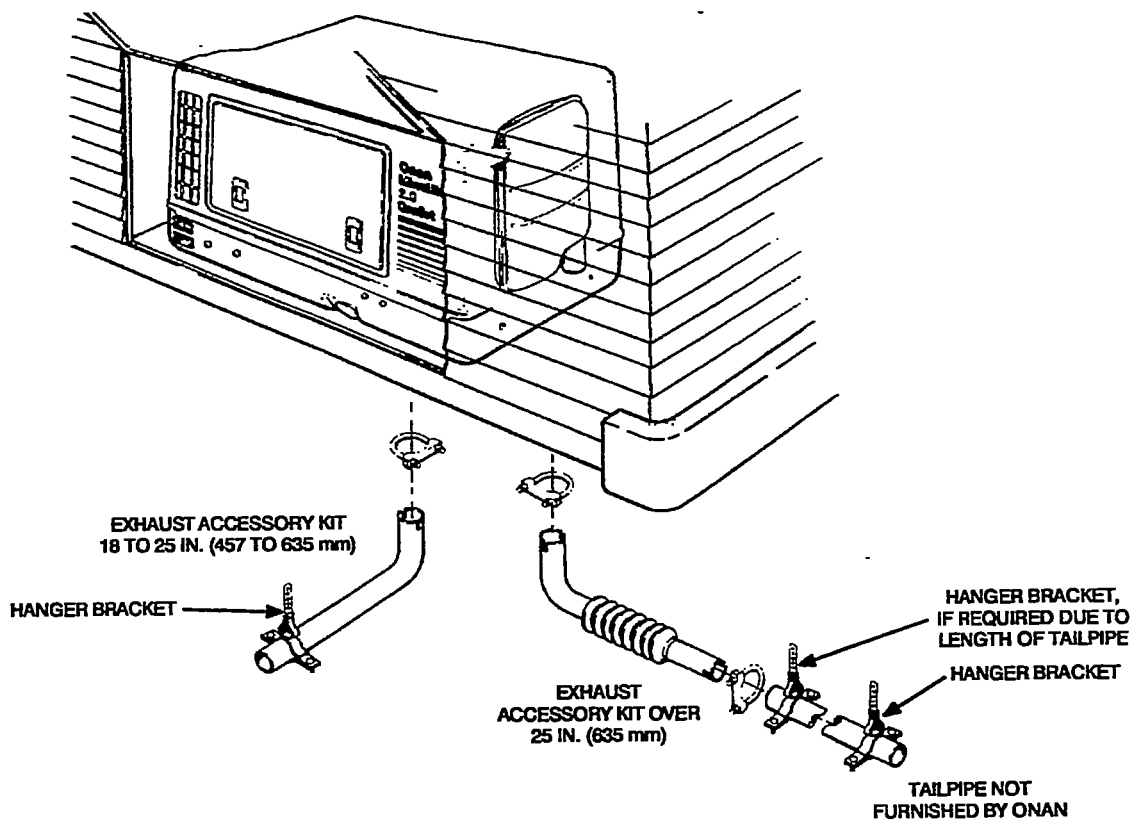
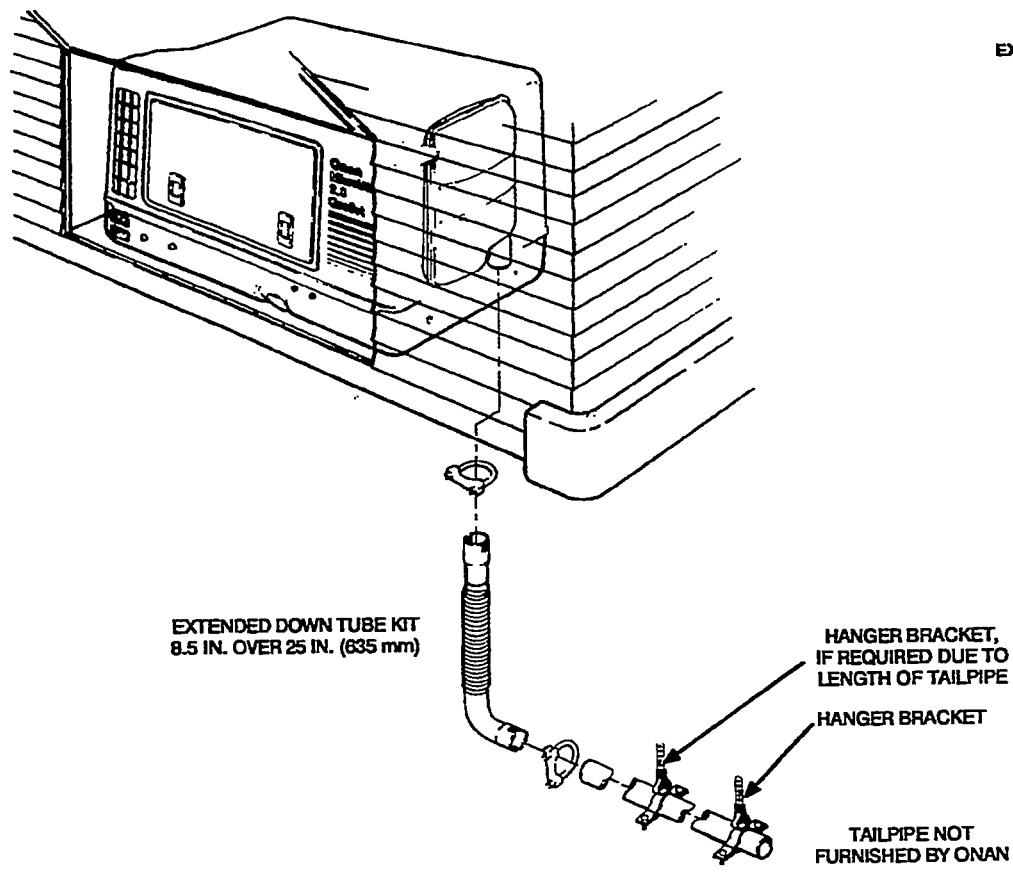


FIGURE 5-1. TAILPIPE INSTALLATION





EXS1170



EXS1170-4

FIGURE 5-2. EXHAUST SYSTEM EXAMPLES FOR COMPARTMENT MOUNT INSTALLATIONS



# Section 6. Fuel System

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## GENERAL

This section describes fuel system installations for recreational vehicles and travel trailers.

**⚠WARNING** *Fuel presents the hazard of fire or explosion that can result in severe personal injury or death. Do not smoke or allow any flame, spark, pilot light, arc-producing equipment or other ignition sources around fuel or fuel components, or in the installation area. Keep a type ABC fire extinguisher nearby. The ventilation system must provide a constant flow of air to expel any accumulation of fuel vapor while the vehicle is in transit. Compartments must be vapor-tight to the vehicle interior to prevent any fumes from entering these areas.*

**⚠WARNING** *Gasoline and LPG fuel may be accidentally ignited by electrical sparks, presenting the hazard of fire or explosion, which can result in severe personal injury or death. For this reason, when installing the generator set:*

- *Do not tie electrical wiring to fuel lines.*
- *Do not run electrical lines and fuel lines through the same compartment openings.*
- *Keep electrical and fuel lines as far apart as possible.*
- *Place a physical barrier between fuel lines and electrical lines wherever possible.*
- *If electrical and fuel lines must pass through the same compartment opening, make certain that they are physically separated by running them through individual channels, or by passing each line through a separate piece of tubing.*

## GASOLINE FUEL SYSTEM

### Fuel System Provisions

On some vehicles, the generator set can share the vehicle fuel supply tank with the vehicle engine. Connection to the vehicle fuel tank must be made according to the chassis (vehicle) manufacturer's detailed instructions. See *Fuel Line Installation*, in this section.

Onan recommends a separate fuel pickup tube or a separate fuel tank. Connection with the vehicle fuel line is not recommended.

The generator set has a fuel shutoff valve as a safety feature. If the vehicle fuel tank becomes pressurized (3 psi

maximum), the positive fuel shutoff prevents the set from being flooded when the set is not running.

Travel trailer installations can use an optional remote fuel tank to supply fuel to the generator set. See *Remote Fuel Tank*.

Onan recommends installing an in-line manual fuel shut-off valve, to close the fuel line when the set is removed for service. If use of contaminated fuel is possible, an in-line fuel filter should be used.

### Recommended Fuel

Use clean, fresh unleaded gasoline. (Leaded regular may be used if necessary.) Unleaded fuel promotes longer service intervals, longer spark plug life, and less carbon clean-out maintenance. Leaded fuel increases deposits on the cylinder heads, which cause power loss. These deposits must be removed periodically.

**⚠WARNING** *Fuel presents the hazard of fire or explosion that can cause severe personal injury or death. Never fill the fuel tank when the engine is hot or is running. Do not permit any flame, spark, pilot light, cigarette or other ignition source near the fuel system.*

### Fuel Consumption

Generator set fuel consumption varies proportionately to differing electrical loads. Refer to the *Specifications* section for approximate fuel consumption at no load, half load, and full load.

### Fuel Line Installation

**Mounted Fuel Tank:** Vehicle fuel systems operate at a specified fuel pressure. For this reason, do not change or remove the fuel fill tube, fill limiter vent, vapor canister, vapor lines, filler cap and all parts of the fuel system without the approval of the vehicle manufacturer. Check the filler cap to make sure that the pressure vacuum relief valve functions properly: replace it if necessary.

If a separate connection is not supplied for the generator, add a second fuel pickup in the tank. This pickup should not extend below the bottom 1/4 of the tank, so the vehicle will run after the generator runs out of fuel.

Do not tee off the vehicle fuel pickup line. This may cause the generator set or the vehicle engine to run poorly. Consult the vehicle manufacturer for information on shared fuel supplies. Unauthorized fuel system modifications can cause dangerous operating conditions.

**⚠ WARNING** *Gasoline presents the hazard of explosion or fire, which can result in severe personal injury or death. Do not connect the generator set fuel line to the pressurized part of the vehicle fuel system. Flooding of the generator set engine and compartment can occur, resulting in a fire hazard.*

**⚠ CAUTION** *Connecting the generator set fuel line with a tee to the main fuel line can result in the generator set starving for fuel when the vehicle is operated at highway speeds. The generator set fuel pump has neither the capacity nor the power to overcome the draw of the vehicle engine fuel pump. For this reason, use a separate fuel line to the generator set, or use a separate fuel tank.*

Install an approved flexible non-metallic (non-conductive) fuel line between the vehicle fuel system and the generator set, to absorb vibration. Flexible fuel line must be long enough to allow generator set movement, to prevent binding, stretching or breaking. Onan recommends seamless steel tubing and flared connections for long runs between the fuel tank and the flexible connector to the generator set.

Run fuel lines at the same height as the top level of the tank, to a point as close to the engine as possible. This reduces the danger of fuel siphoning out of the tank if the line should break.

Keep fuel lines away from hot engine or exhaust areas, to reduce the chance of vapor lock. Fuel lines should be accessible and protected from damage. Use metal straps without sharp edges to secure fuel lines. Do not run fuel lines where they may contact sharp or rough surfaces, or where they may be kinked, pinched, chaffed, or struck.

**Remote Fuel Tank:** A remote fuel tank can be used in travel trailer and other special installations. Fill the tank with the recommended fuel and connect generator set fuel line to the tank using quick disconnect fittings. Route the fuel line away from any hot exhaust system components, moving parts, sharp or abrasive surfaces, and road hazards. Do not locate the fuel supply more than 3 feet (914 mm) below the generator set to prevent exceeding the fuel pump lift capacity.

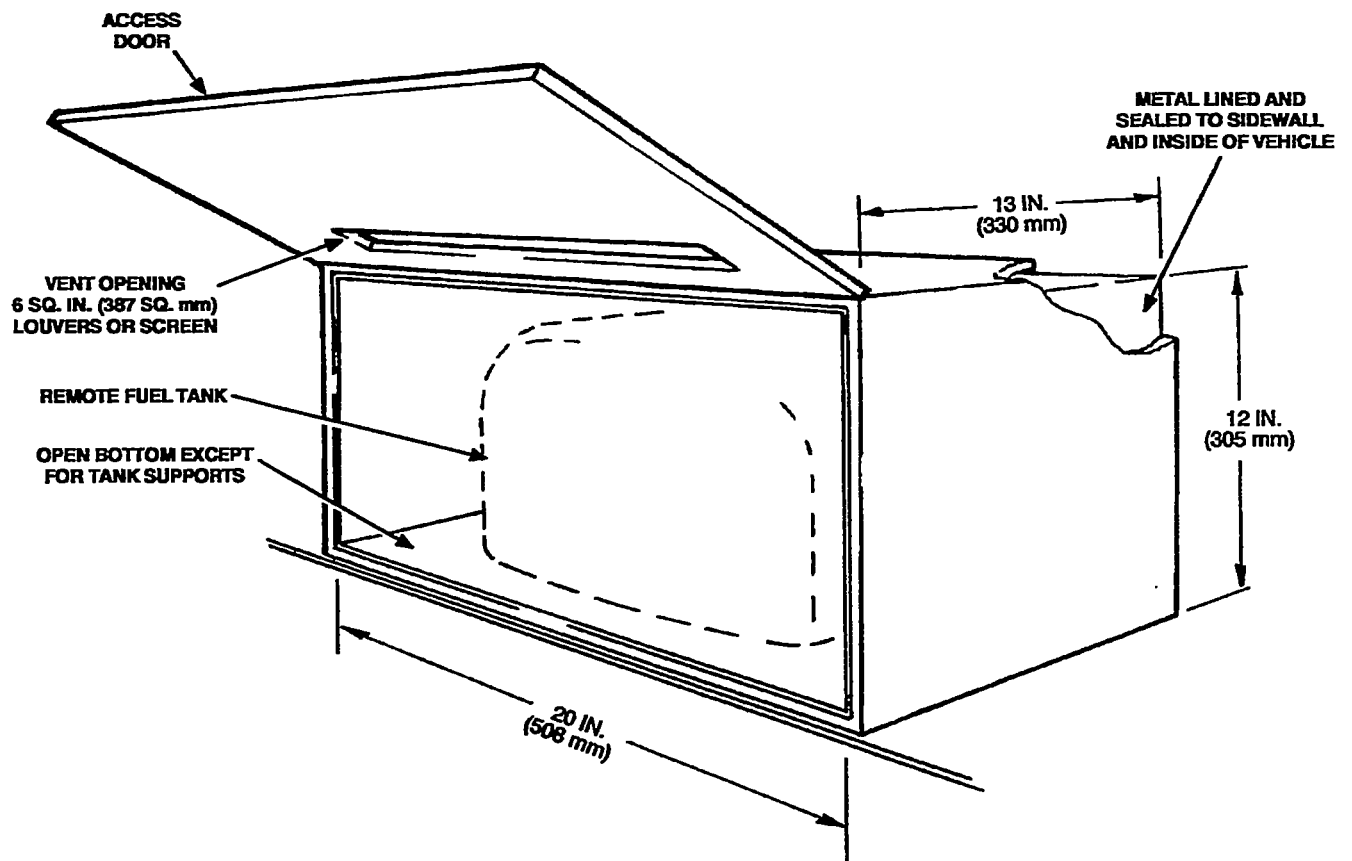
Observe all applicable codes and regulations for storage, transporting and handling of remote fuel tanks. The fuel tank must be installed in its own compartment. The compartment must be vapor tight from the interior of the vehicle and the compartment must be fire resistant. See Figure 6-1 for minimum compartment dimensions for the optional Onan remote fuel tank.

The compartment must be vented to prevent the accumulation of fuel fumes. Provide an open bottom in the compartment and provide a minimum of 6 sq. in. (387 sq. mm) of opening in the top of the access door.

The fuel system must be designed so that fuel leakage could not contact electrical or exhaust system components. Maintain at least 6 inches (152 mm) clearance between the fuel system and any unshielded exhaust system component.

The fuel tank must be securely fastened inside the compartment. Mounting straps can be used to secure the tank.

**⚠ WARNING** *Fuel presents the hazard of fire or explosion that can cause severe personal injury or death. Do not store or transport a remote fuel tank inside a vehicle. Observe all applicable codes and regulations for storage, transporting, and handling of remote fuel tanks.*



FS1839c

**FIGURE 6-1. TYPICAL REMOTE FUEL TANK COMPARTMENT**

## LPG FUEL SYSTEM

### Fuel System Provisions

LPG set operation is highly sensitive to variations in altitude, temperature, and fuel BTU content. For this reason, the fuel system may need to be adjusted after installation. Refer to the Service Manual if adjustments are required.

### Recommended Fuel

Use commercial propane or HD-5 grade LPG in a mixture of at least 90 percent propane. Propane fuels other than HD-5 may contain more than 2.5 percent butane, and may cause poor engine starting in low temperatures (below 32° F or 0° C).

### Fuel Consumption

Generator set fuel consumption varies proportionately to differing electrical loads. Refer to the *Specifications* section for approximate fuel consumption at no load, half load, and full load.

### Propane Fuel Lines and Supply Tank

**⚠WARNING** *LP gas (Propane) presents the hazard of fire or explosion that can cause severe personal injury or death. Do not permit any flame, spark, pilot light, cigarette, or other ignition source near the fuel system. Keep an ABC type fire extinguisher nearby.*

Review all codes that apply to LPG generator set installation. Paragraph 3-6.1 (Gas Piping Systems) of NFPA Pamphlet 501C deals specifically with LPG fuel lines, but does not cover all applicable codes and regulations.

Obtain this pamphlet by writing to the address listed in the beginning of this manual.

Mount a manual shutoff valve on the fuel supply tank.

When installing the fuel lines, keep these factors in mind:

- Install LPG fuel lines to be accessible, but protected from damage.
- Use metal straps without sharp edges to secure fuel lines.
- Keep fuel lines away from hot engine or exhaust.
- Do not run fuel lines next to electrical wiring.

### Testing Fuel System for Leaks

Before operating the set, test the LPG fuel system for leaks. Testing must conform to procedures listed in NFPA-58, or to the UL recommended test procedure, as follows:

After assembly and before initial operation, all fuel system connections, hose, valves, regulators, and fittings must be tested and proven free of leaks using a soap-and-water (or equivalent) solution while the system is under gas or air pressure of at least 90 psi (620 kPa).

Other approved methods of detecting leaks may be used if appropriate. This test shall NOT be made with a flame.

**⚠WARNING** *LPG fuel presents the hazard of explosion or fire which can result in severe personal injury or death. Do not smoke or allow any flame, spark, pilot light, arc-producing equipment or other ignition sources around fuel or fuel components.*

# Section 7. Electrical Connections

## GENERAL

This section covers installing the generator set electrical system for:

- Connecting the load
- Connecting a remote control (if used)
- Connecting the battery

Connect the battery last, to avoid accidentally starting or short-circuiting the set during installation. Connect the positive (+) battery cable first and the negative (-) battery cable last to reduce the risk of arcing.

**⚠WARNING** *Accidentally starting the generator set during installation can cause severe personal injury or death. Do not connect the starting battery until instructed to do so in the Initial Starts and Checks section.*

The wiring must meet all applicable electrical codes. For this reason, a qualified electrician should install and inspect the wiring.

Mount switches and controls securely, to prevent damage from vibration and road shocks. All switches must be vibration-proof to prevent accidental opening or closing while the vehicle is in motion.

## AC WIRING

### Wire Types

The leads attached to the generator set output must have a current rating not less than 115 percent of the nameplate current rating of the generator set. The Onan-supplied AC feeder conductor insulation is rated at 125°C. Wires connected to the Onan feeder conductors must either meet this insulation rating, or be a larger size (see National Electrical Code, NFPA 70).

Use stranded wire for all load connections. Load wiring must be appropriately sized and insulated for the specified current rating. Grounding must comply with all codes.

### Conduit

Install the generator load conductors in a flexible metallic conduit. Cut the conduit to length, leaving extra wire for the junction box connections. Connecting wires must be correctly sized and insulated for the current rating. Round off or cover the ends of the conduit, to prevent its sharp edges from cutting the insulation.

Run the conduit so that it does not interfere with the movement of the set. Use waterproof conduit wherever it is exposed to the elements.

To reposition the 90° conduit fitting, loosen the locking nut (toothed ring), turn fitting counterclockwise to desired location, and retighten locking nut.

Seal all openings made for conduit, so exhaust or fuel vapor cannot enter the living quarters. Flexible metal conduit must be sealed internally at the end where it terminates inside the junction box or panel board (flexible conduit is not vapor-tight along its length).

**⚠WARNING** *Exhaust gas and fuel fumes present the hazard of severe personal injury or death. To prevent exhaust gas and fuel fumes from entering the vehicle interior, seal all openings made for conduit, wiring, etc. Also seal the wiring within the conduit itself. Use a silicone/rubber based sealant.*

### Wiring Disconnect Method

There must be no chance that an outside power source be connected to the generator set. Feeder conductors from the set compartment must terminate in a 120-volt double-pole, double-throw, positive-off switching device mounted ahead of the vehicle distribution panel; or they must connect to a generator set receptacle box. Figures 7-1 and 7-2 show examples of the wire connection.

### Line Circuit Breaker

The generator set has a line circuit breaker mounted on the side of the control panel. The breakers provide short circuit and overload protection for the generator.

### Load Connections

The generator output voltage and maximum current rating are specified on the generator nameplate.

Load wiring must be appropriately sized and insulated for the specified current rating. Grounding procedure must comply with codes.

A lead to be connected to an output feeder conductor shall not be more than two AWG sizes smaller than the output lead conductor and the insulation shall be:

- Rubber (with braid), neoprene, or thermoplastic, with a wall thickness of at least 0.030 inch (0.76 mm).
- Other material having the same or better electrical and mechanical properties.

**⚠WARNING** Electrical shock can cause severe personal injury or death. Use only approved power supply assemblies. Never remove the grounding pin from assemblies. Incorrect ground or no ground can cause the vehicle to become electrically "hot". Equip the vehicle with adequate Ground-Fault Circuit Protection devices to meet the National Electrical Code (NFPA 70, 551-9[C]) and for personal safety.

**⚠WARNING** Gasoline fuel presents the hazard of fire or explosion, which can result in severe personal injury or death. Do not tie electrical wiring to fuel lines.

**⚠WARNING** Gasoline and LPG fuel may be accidentally ignited by electrical sparks, presenting the hazard of fire or explosion, which can result in severe personal injury or death. For this reason, when installing the generator set:

- Do not tie electrical wiring to fuel lines.
- Do not run electrical lines and fuel lines through the same compartment openings.
- Keep electrical and fuel lines as far apart as possible.
- Place a physical barrier between fuel lines and electrical lines wherever possible.
- If electrical and fuel lines must pass through the same compartment opening, make certain that they are physically separated by running them through individual channels, or by passing each line through a separate piece of tubing.

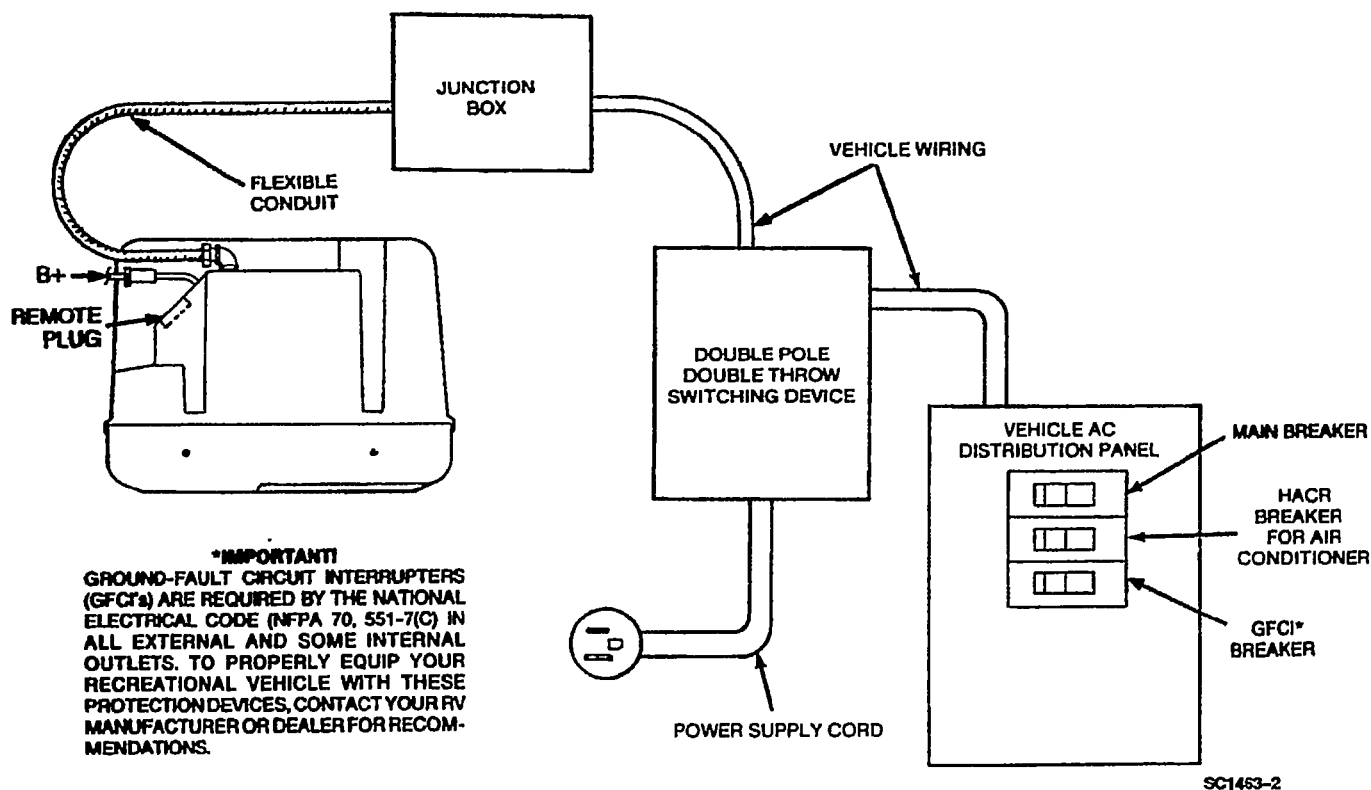


FIGURE 7-1. SWITCHING DEVICE WIRING FOR UTILITY POWER



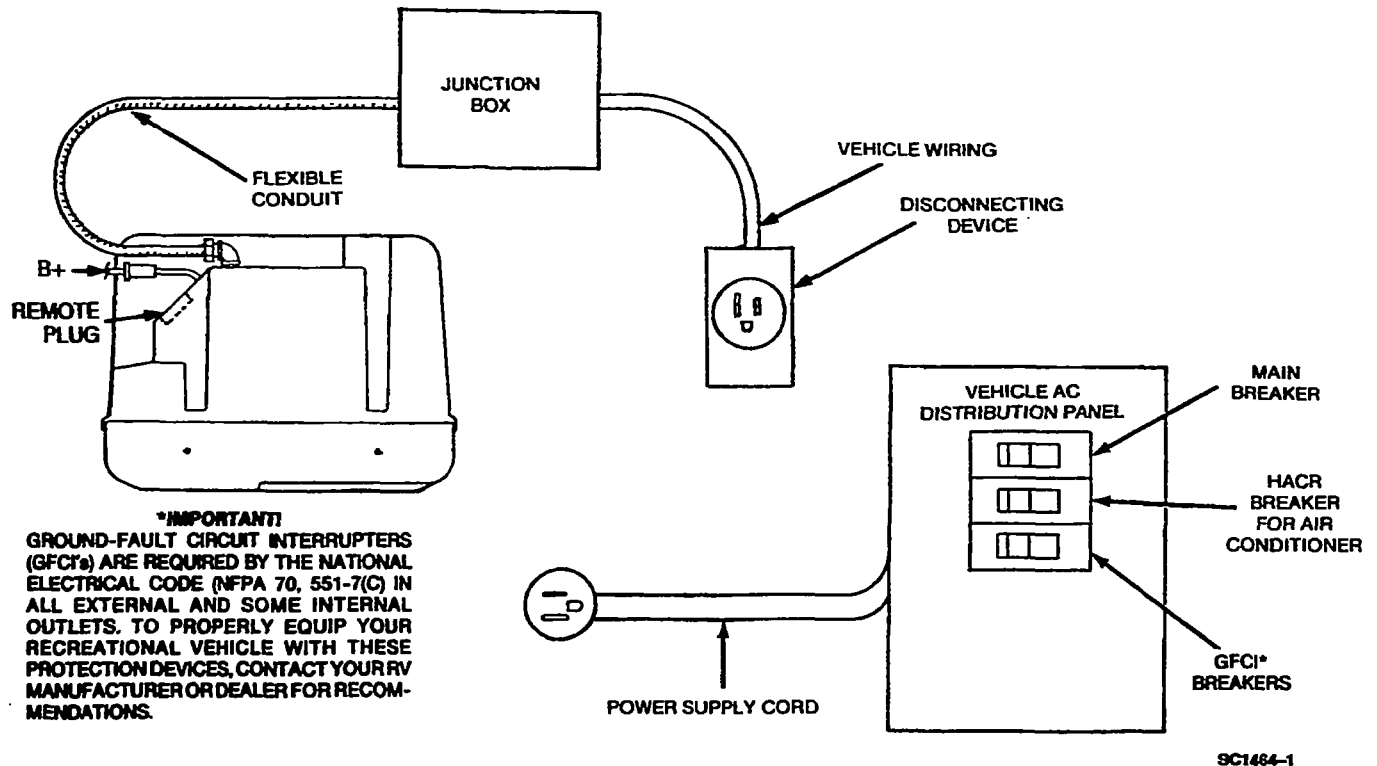


FIGURE 7-2. UTILITY POWER CORD FOR SWITCHING

## DC WIRING

### Remote Control (Option)

Onan offers optional remote control kits that can be connected to the generator set (Figure 7-3). The Standard Remote Control includes a start/stop switch and an indicator lamp. The Deluxe Remote Control has these items plus a running time meter and a battery condition meter.

A remote control connector plug is located at the left rear side of the housing. Contact an Onan dealer for the proper remote connector plug and wiring harness lead assembly.

Location of the remote control can vary by application. See the kit instructions supplied with the remote control for more installation information and important safety precautions.

Be sure to seal all openings made for wiring so exhaust or fuel vapors cannot enter the living quarters. If flexible metal conduit is used it must be sealed internally at the end where it terminates. Flexible metal conduit is not vapor tight along its length due to its construction.

**⚠ WARNING** *Inhalation of exhaust gas or ignition of fuel vapor can cause severe personal injury or death. Be sure to vapor-seal flexible metal conduit and all openings made during installation of the generator set with a silicone/rubber based sealant.*

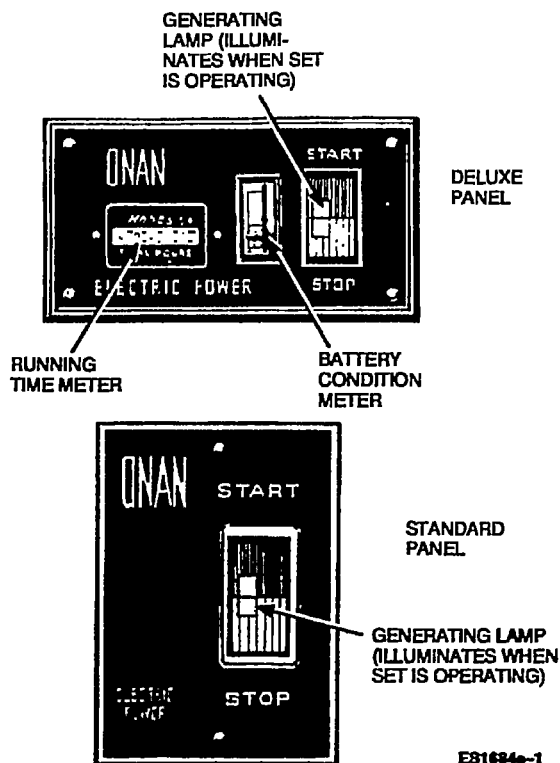


FIGURE 7-3. REMOTE CONTROL PANELS

### Starting Battery and Cable Selections

The generator set requires a 12-volt battery with a rating of 360 cold-cranking amps. A larger capacity battery could be required if it powers other coach accessories. Onan does not recommend that the vehicle starting battery be used to operate the generator set. Doing this might discharge the battery under some operating conditions.

For reliable cold weather starting, the voltage drop from the battery terminals to the generator set starter should not exceed 0.12 volts per 100 amperes of current while the generator set is cranking. Refer to Table 7-1 to determine cable size.

TABLE 7-1. CABLES FOR COLD WEATHER STARTING TO -20°F (-29°C)

*CABLE LENGTH IN FEET (METRES)	CABLE SIZE
0-15 (0-4.5)	2**
16-20 (4.5-6)	00

\* - Distance from battery to set.

\*\* - For warm weather operation, #2 cable can be acceptable up to 20 feet (6.1 m).

### Battery Compartment

Mount the battery in its own compartment, away from the generator set and any spark-producing device. For ventilation, provide the compartment with an opening at least 1.7 in<sup>2</sup> (11 cm<sup>2</sup>) at the top and 1.7 in<sup>2</sup> (11 cm<sup>2</sup>) at the bottom.

Mount the battery on a rigid support structure, where leaks and accidental spills cannot damage the generator set, fuel lines, and wiring.

**⚠ WARNING** Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries give off explosive gas, install the battery in a separate compartment from the generator set and away from all flames, pilot light, arcing, or spark-producing devices.

### Battery Connections

Make sure that the frame (ground) connection (major frame member if possible) is secure enough to minimize electrical resistance. Avoid making this connection at a weld or mechanical joint. On short cable runs, one negative battery cable can be connected between the generator set and battery, rather than separate cables to chassis ground.

Route the battery cables between the set and its starting battery. Make sure that the cables are long enough, but do not connect them to the battery until instructed to do so in the *Initial Start and Checks* section of this manual. Provide adequate support for the battery cables to avoid abrasion wear due to vibrations, when the vehicle is in transit.

**Positive (+) Battery Cable:** This cable connects to the wire harness B+ lead with the ring terminal with the mounting hardware provided. Assemble the B+ terminal boot cover supplied in the accessory kit onto the generator end of the cable. Tighten B+ connection securely, and wire tie the terminal boot in place over the connection to insulate it.

**⚠ CAUTION** Failure to protect the B+ terminal can result in personal injury and/or equipment damage if an electrical short occurred. See that the terminal connection is secure and that the boot protector is held properly in place. If necessary secure leads to prevent abrasion.

**Negative (-) Battery Cable:** Connects to the mounting base. Use the same size cable for both positive and negative battery connections. Connect the negative (-) cable securely to a mounting base fastener. Check to confirm that good electrical ground connection is made.

# Section 8. Initial Start and Checks

## **⚠WARNING**

### **EXHAUST GAS IS DEADLY!**

*Exhaust gases contain carbon monoxide, an odorless and colorless gas. Carbon monoxide is poisonous and can cause unconsciousness and death. Symptoms of carbon monoxide poisoning can include:*

- *Dizziness*
- *Nausea*
- *Headache*
- *Weakness and Sleepiness*
- *Throbbing in Temples*
- *Muscular Twitching*
- *Vomiting*
- *Inability to Think Coherently*

**IF YOU OR ANYONE ELSE EXPERIENCE ANY OF THESE SYMPTOMS, GET OUT INTO THE FRESH AIR IMMEDIATELY. If symptoms persist, seek medical attention. Shut down the unit and do not operate until it has been inspected and repaired.**

**Never sleep in vehicle with the generator set running unless the vehicle interior is equipped with an operating carbon monoxide detector. Protection against carbon monoxide inhalation also includes proper exhaust system installation and visual and audible inspection of the complete exhaust system at the start of each generator set operation.**

1-RV

## **PRE-START CHECKS**

Before starting the generator set, perform these steps:

1. Perform the Installation Review described in this section.
2. Add oil to the engine. See the Operator's Manual (publication 981-0129) for the oil type and quantity.
3. Check that battery terminals and cable connectors are clean and dry. Connect the positive (+) battery cable to the POS (+) battery post first, then connect the negative (-) battery cable to the NEG (-) battery post. Always connect the negative (-) battery cable last to reduce the risk of arcing.

**⚠WARNING** *Batteries present the hazard of explosion, which can result in severe personal injury. Because batteries produce explosive gas, do not smoke or allow any arc-producing devices in the battery area. Do not disconnect cables from the battery while the generator set is cranking or running. This causes arcing and can result in an explosion.*

4. See the Operator's Manual, and note the features of the individual system. Open the fuel supply valves to the generator set.

## **INITIAL STARTING AND CHECKS**

**⚠WARNING** *Exhaust gas presents the hazard of severe personal injury or death. Do not operate the generator set inside any room or building.*

### **Start Generator Set at Unit Control**

1. Move the Start/Stop switch to the START position. The engine should crank and start. The unit may need more cranking at initial start than at subsequent starts, to prime the fuel system. If the genset fails to start, see the *Troubleshooting Guide* in the Operator's Manual.
2. After the set starts, check for fuel leaks. If any leaks are found, stop the set immediately, close off the fuel supply and have the leak(s) repaired. Make sure that the fuel lines do not touch anything that can damage them.

**⚠WARNING** *Fuel presents the hazard of explosion or fire that can result in severe personal injury or death. If a fuel leak is found, stop the generator set, and have the leak repaired immediately.*

**⚠WARNING** *A hot generator set can cause severe burns. Always allow the generator set to cool before performing service.*

3. Examine the exhaust system for leaks. If any leaks are found, stop the set and have the exhaust system repaired immediately.

**⚠WARNING** *Exhaust gas presents the hazard of severe personal injury or death. Inspect the exhaust system audibly and visually. With the generator set running, momentarily open the access cover to inspect the muffler. Do not operate the generator set if it is excessively noisy. Have any leaks repaired immediately.*

4. Perform the Break-In Procedure described in the Operator's Manual.
5. Move the unit Start/Stop switch to the STOP position to stop the generator set.

### **Start Generator Set at Remote Control**

1. Move the Remote Start/Stop switch to the START position. The engine should crank and start. If it does not, see the *Troubleshooting Guide* in the Op-

erator's Manual. Check all remote control connections, repair if necessary, and restart the set.

2. After the genset starts, check the battery condition meter (if equipped) to confirm its proper operation.
3. See the Operator's Manual for procedures to test set operation.
4. Operate the set with a normal load, monitoring fuel supply connections, exhaust system, set performance, and quality of noise reduction. If set performance is not acceptable, see the Service Manual for adjustment procedures, or contact an authorized Onan service center for assistance. If any generator set system requires adjustment or repair, disconnect the starting battery, negative (-) cable first, to prevent accidental start-up.

**⚠WARNING** *Accidental starting of the generator set during maintenance procedures can cause severe personal injury or death. Disconnect the generator set starting battery, negative (-) cable first, before performing maintenance.*

## **INSTALLATION REVIEW**

Prior to initial start up of the generator set, check each of the following items. For a safe and effective installation, each answer must be yes: if not, that aspect of the installation should be reworked or provision made to satisfy the requirement.

1. If the exhaust system is run into the angle of approach or departure (see Figure 5-1), is it protected from bottoming out by use of skid bars, rollers, etc.?
2. Does the exhaust system extend beyond the perimeter of the vehicle a minimum of 1 inch (25 mm)?
3. Is the exhaust pipe terminated away from windows, vents, or other openings that might allow exhaust gases to enter, or be pulled in when the vehicle is in motion? Refer to the *Exhaust System* section.
4. Is the exhaust system secure and are all connections tight? Are all required exhaust clamps, hangers, and support straps in place per the *Exhaust System* section of this manual and the kit instructions?
5. Is the compartment metal-lined and sealed around all edges?
6. Is a flexible section of non-conducting fuel line installed between the fuel inlet and the fuel line from the tank?
7. Are all fuel connections and hose clamps tight?
8. Are air inlet and exhaust openings clear and sufficiently sized (see *Mounting* section) for proper airflow?
9. Is the generator set protected from direct road splash from vehicle wheels?
10. Can the following routine maintenance items be performed?
  - Change oil
  - Adjust carburetor
  - Start/stop the unit
  - Change air filter
  - Governor adjustment
  - Operate AC circuit breaker
  - Change spark plug
11. Are fuel lines and electrical wires run separately?
12. Are wiring holes into the inside of coach (including the inside of AC conduit) sealed to prevent passage of exhaust gases?
13. Has a rubber boot been installed on battery positive (+) lead at the connection?
14. Are all electrical leads connected and protected, and is the conduit adequately supported?
15. Has the crankcase oil been added to the engine and is the oil level correct? Refer to the *Maintenance* section of the Operator's manual.



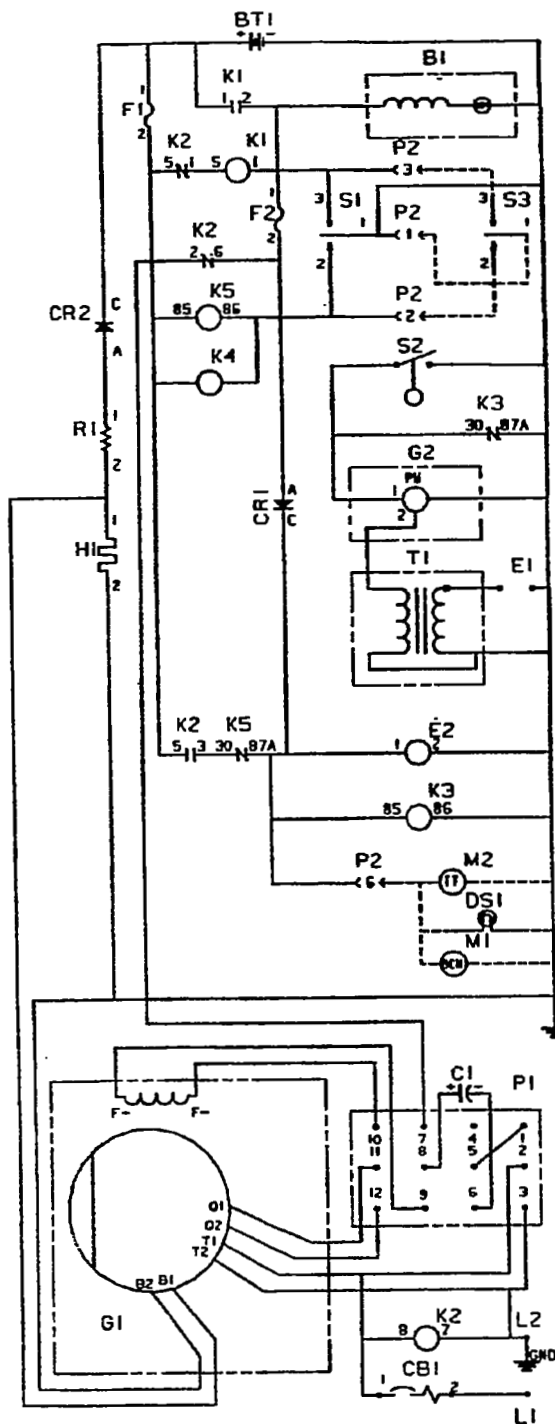
# Section 9. Wiring Diagrams

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<b>DRAWING NO.</b>	<b>DESCRIPTION</b>	<b>PAGE</b>
610-0375 .....	Wiring Diagram - Gasoline-Fueled MicroLite (60 Hertz) .....	9-2
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610-0379 .....	Wiring Diagram - LPG-Fueled MicroLite (60 Hertz) .....	9-6
610-0379 .....	Wiring Schematic - LPG-Fueled MicroLite (60 Hertz) .....	9-7
610-0381 .....	Wiring Diagram - LPG-Fueled MicroLite (50 Hertz) .....	9-8
610-0381 .....	Wiring Schematic - LPG-Fueled MicroLite (50 Hertz) .....	9-9







K5	35				RELAY-FUEL STOP
K4	34				SOLENOID-THROTTLE
K3	33				RELAY-IGNITION STOP
Z	32				
T1	30				SPICE
S3	29				IGNITION COIL
S2	28				SWITCH-START/STOP REMOTE
S1	27				SWITCH-LOW OIL LEVEL
R1	26				SWITCH-START/STOP
P2	25				RESISTOR-CHARGING
P1	24				PLUG-REMOTE
M2	23				PLUG-VOLTAGE REGULATOR
M1	22				METER-TOTAL RUN TIME
K2	21				METER-BATTERY CONDITION
K1	20				START DISCONNECT RELAY
H1	19				START SOLENOID
G2	18				CHOKE
G1	17				MAGNETO-IGNITION
F1,F2	16				GENERATOR
E2	15				FUSE
E1	14				FUEL PUMP
DS1	13				SPARK PLUG
CR2	12				LAMP-REMOTE
CR1	11				
CB1	10				DIODE
C1	9				DIODE
BT1	8				CIRCUIT BREAKER
B1	7				CAPACITOR
A2	6				BATTERY
A1	5				STARTER MOTOR
	4				DELUX REMOTE CONTROL
	3				STANDARD REMOTE CONTROL
	2				
	1				

FIGURE 9-2. Wiring Schematic 610-0375 - Gasoline-Fueled MicroLite (60 Hertz)

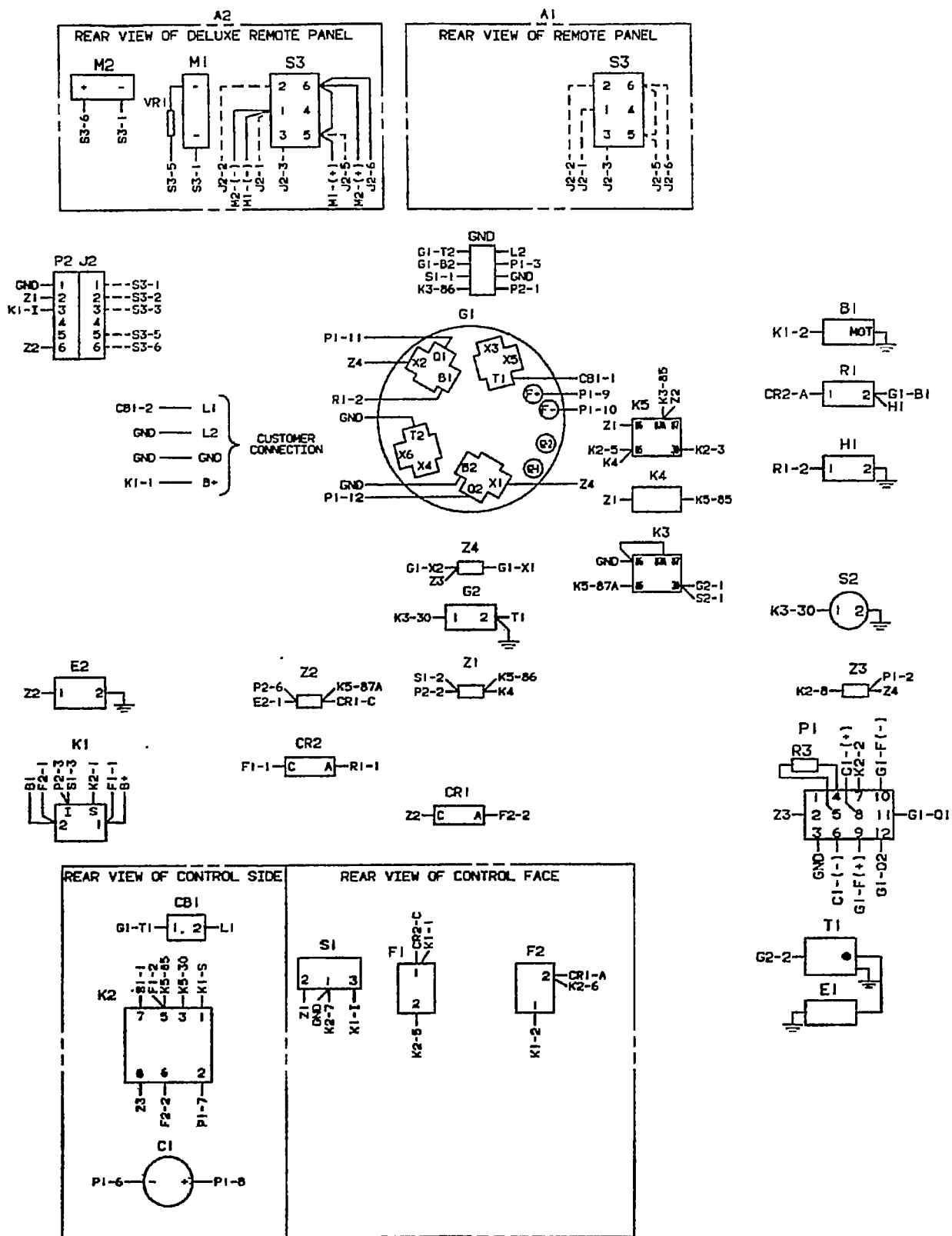


FIGURE 9-3. Wiring Diagram 610-0376 - Gasoline-Fueled MicroLite (50 Hertz)

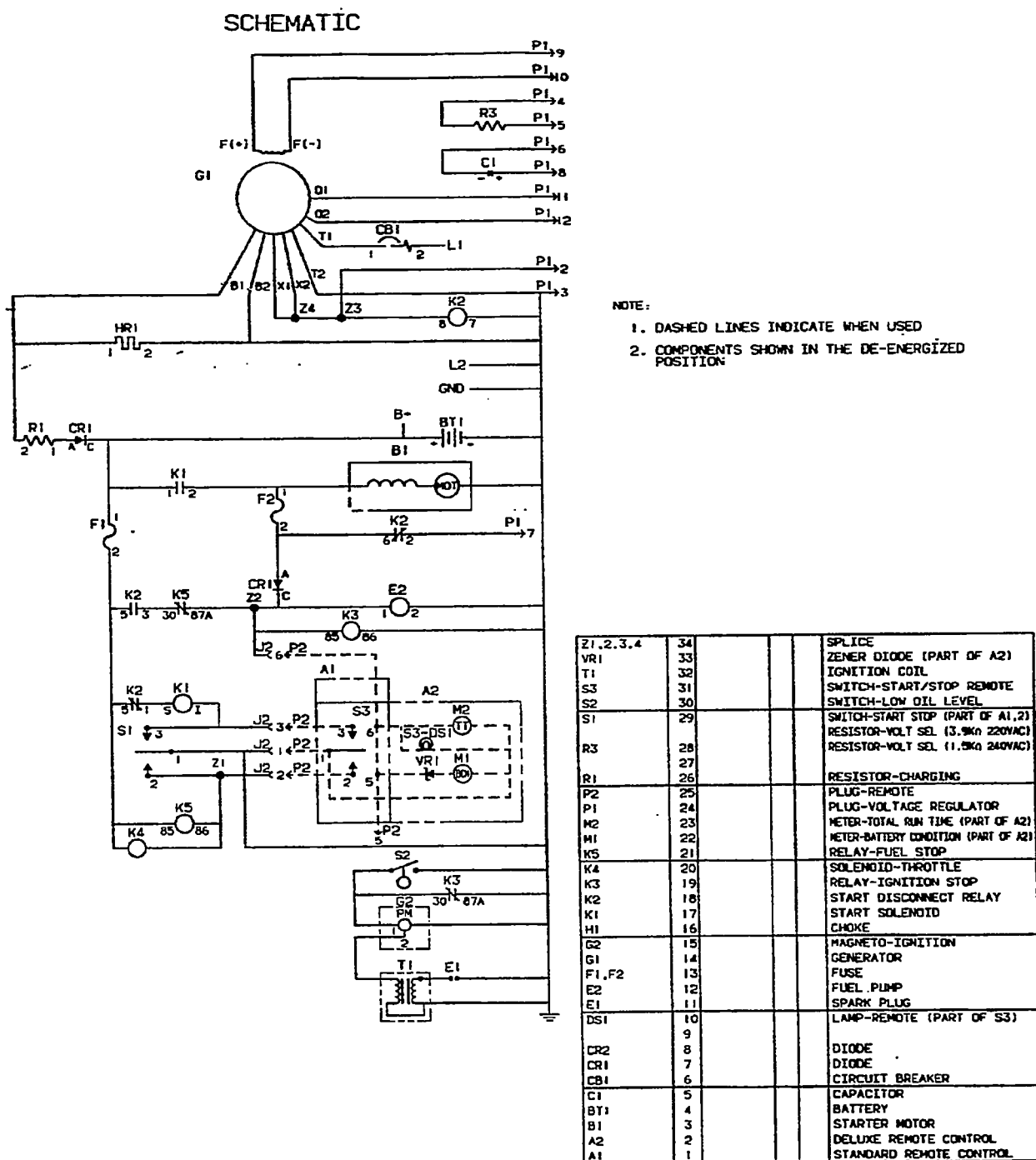
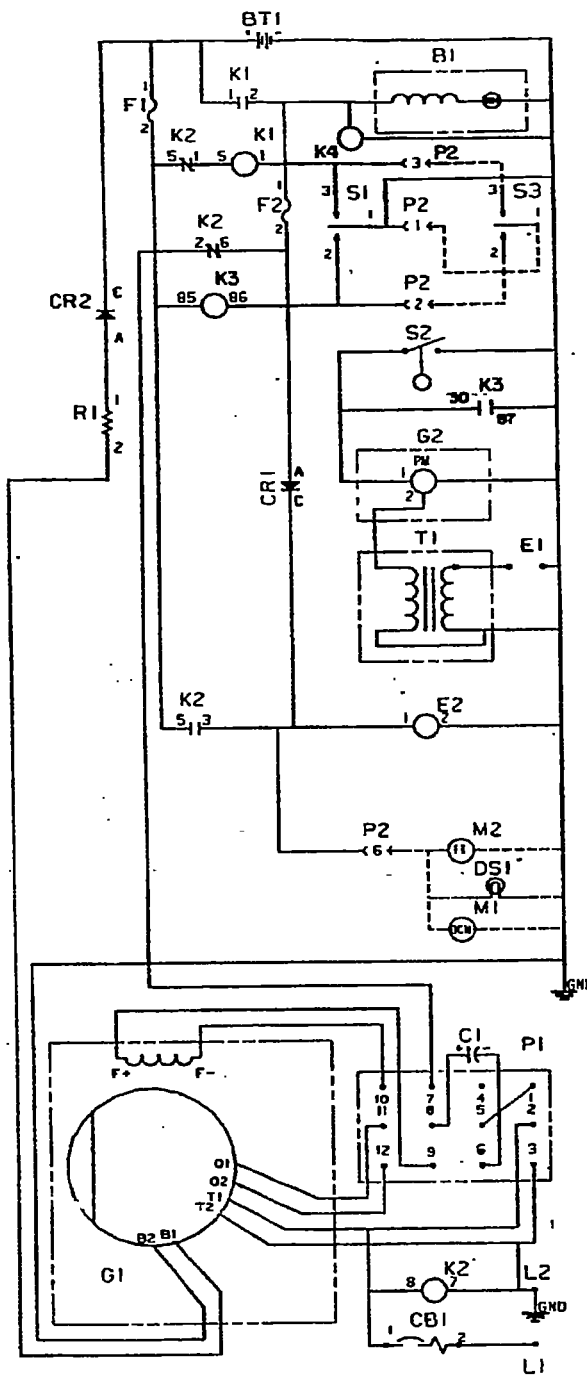


FIGURE 9-4. Wiring Schematic 610-0376 - Gasoline-Fueled MicroLite (50 Hertz)





K3	35				
K4	34				
Z	33				
T1	32				RELAY-FUEL STOP
S3	31				SOLENOID-PRIMING
S2	30				
S1	29				SPLICE
R1	28				IGNITION COIL
P2	27				SWITCH-START/STOP REMOTE
P1	26				SWITCH LOW OIL LEVEL
M2	25				SWITCH-START/STOP
M1	24				RESISTOR-CHARGING
K2	23				PLUG-REMOTE
K1	22				PLUG-VOLTAJE REGULATOR
G2	21				METER-TOTAL RUN TIME
G1	20				METER BATTERY CONDITION
F1,F2	19				START DISCONNECT RELAY
E2	18				START SOLENOID
E1	17				
DS1	16				MAGNETO-IGNITION
CR2	15				GENERATOR
CR1	14				FUSE
CB1	13				
C1	12				FUEL SOLENOID
BT1	11				SPARK PLUG
B1	10				LAMP-REMOTE
A2	9				
A1	8				DIODE
	7				DIODE
	6				CIRCUIT BREAKER
	5				CAPACITOR
	4				BATTERY
	3				STARTER MOTOR
	2				DELUX REMOTE CONTROL
	1				STANDARD REMOTE CONTROL

FIGURE 9-6. Wiring Schematic 610-0379 - LPG-Fueled MicroLite (60 Hertz)

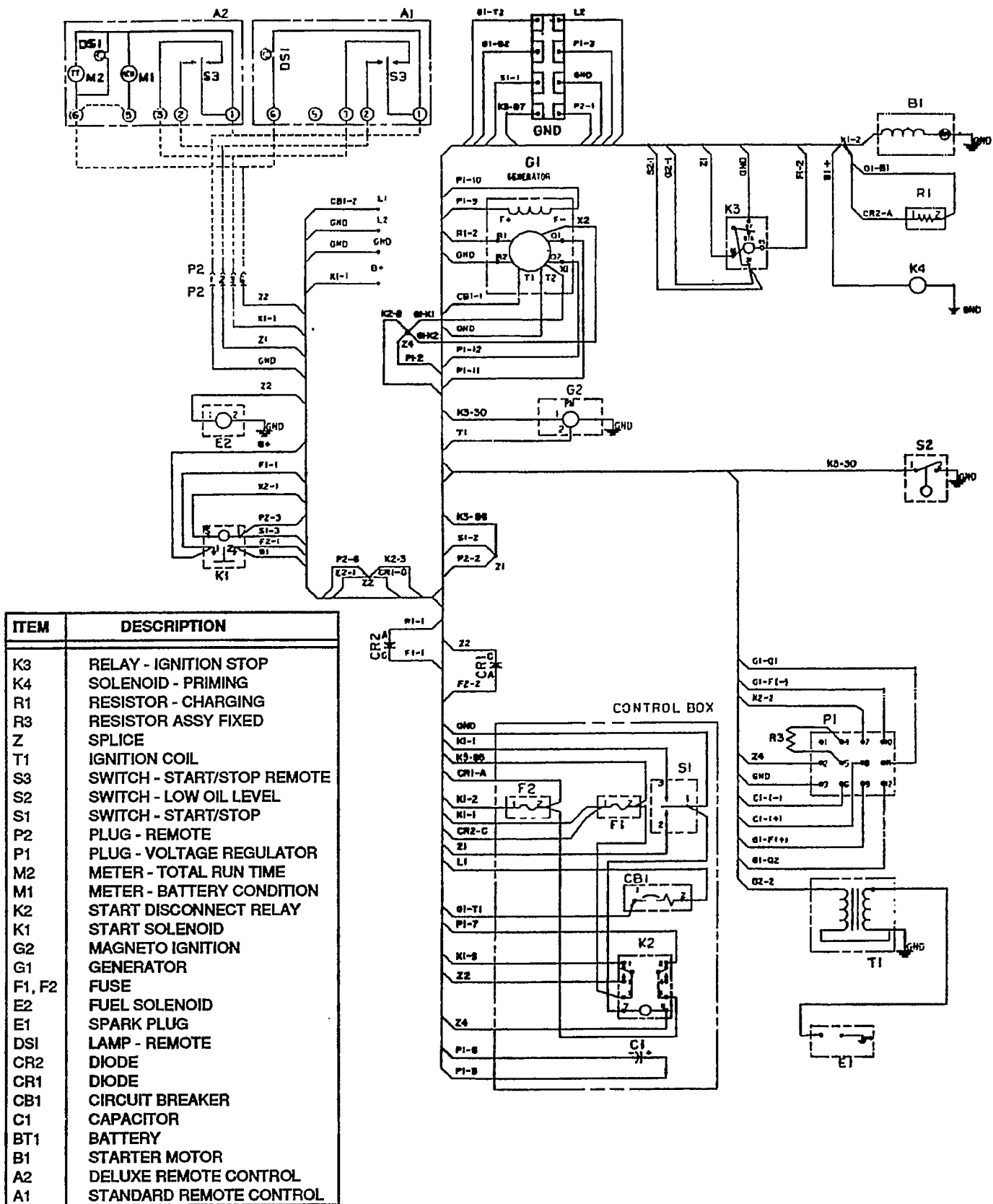
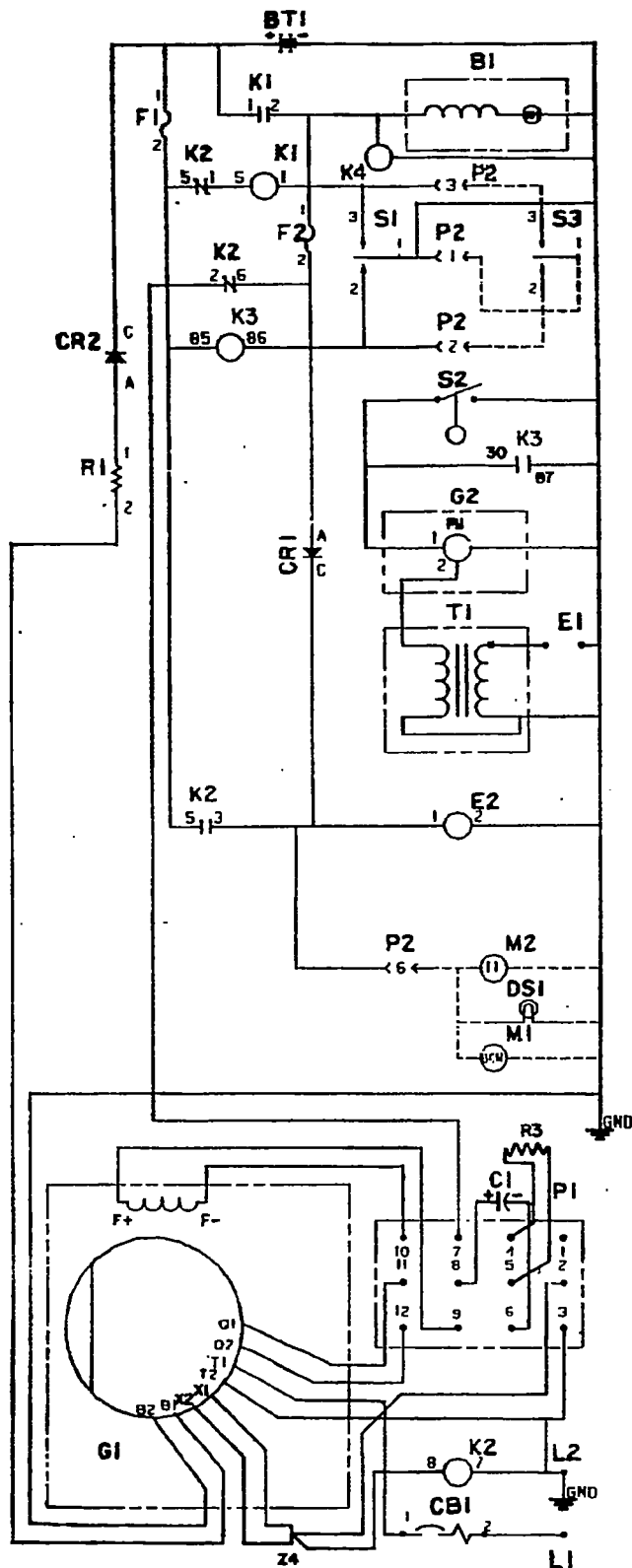


FIGURE 9-5. WIRING DIAGRAM 610-0381 - LPG-FUELED MICROLITE (50 HERTZ)



ITEM	DESCRIPTION
K3	RELAY - IGNITION STOP
K4	SOLENOID - PRIMING
R1	RESISTOR - CHARGING
R3	RESISTOR ASSY FIXED
Z	SPLICE
T1	IGNITION COIL
S3	SWITCH - START/STOP REMOTE
S2	SWITCH - LOW OIL LEVEL
S1	SWITCH - START/STOP
P2	PLUG - REMOTE
P1	PLUG - VOLTAGE REGULATOR
M2	METER - TOTAL RUN TIME
M1	METER - BATTERY CONDITION
K2	START DISCONNECT RELAY
K1	START SOLENOID
G2	MAGNETO IGNITION
G1	GENERATOR
F1, F2	FUSE
E2	FUEL SOLENOID
E1	SPARK PLUG
DS1	LAMP - REMOTE
CR2	DIODE
CR1	DIODE
CB1	CIRCUIT BREAKER
C1	CAPACITOR
BT1	BATTERY
B1	STARTER MOTOR
A2	DELUXE REMOTE CONTROL
A1	STANDARD REMOTE CONTROL

FIGURE 9-6. WIRING SCHEMATIC 610-0381 - LPG-FUELED MICROLITE (50 HERTZ)













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