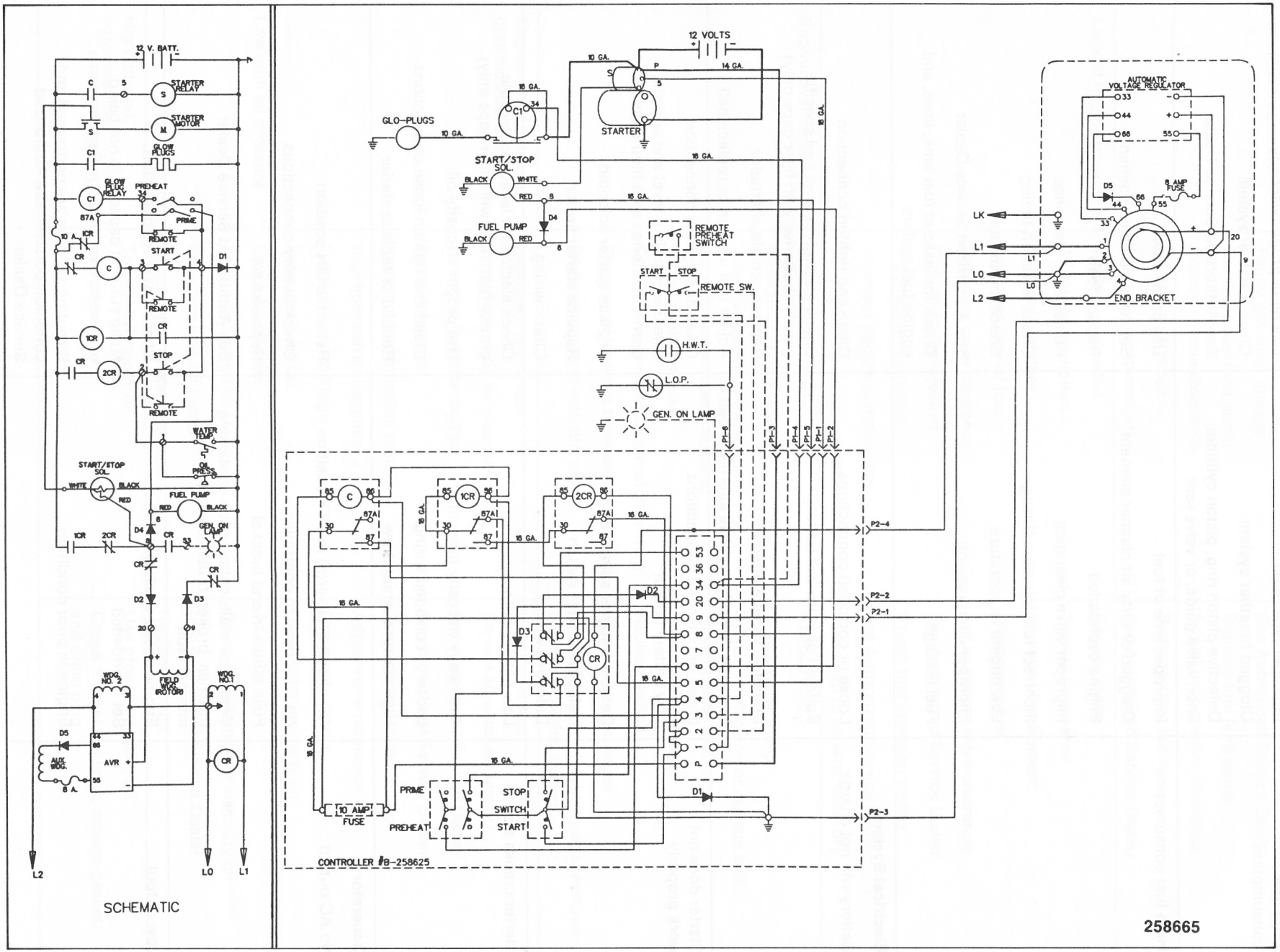
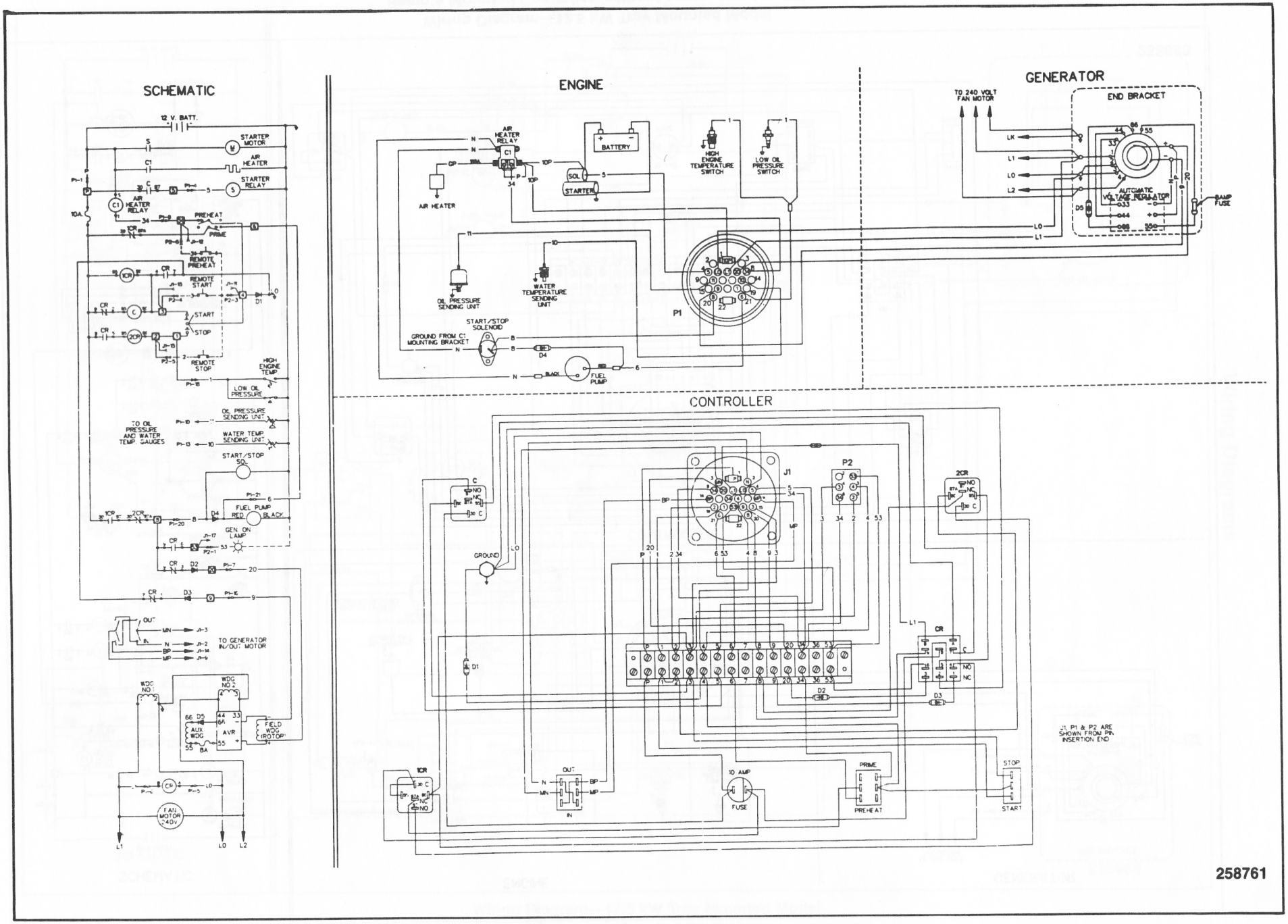


Wiring Diagram—12.5 kW Tray Mounted Model
Generator Mounted Controller



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Wiring Diagram—12.5 kW Tray Mounted Model
Remote Mounted Controller (with accessory plug P2)

INSTALLATION

Introduction

Use this section as a guide when installing a generator set in the recreational vehicle, then refer to the Operation Manual section for specific service instructions. When installing an RV generator set, the installation must comply with CURRENT standards of (1) ANSI/RVIA EGS-1, (2) ANSI A 119.2/NFPA 501 C and (3) applicable articles of ANSI/NFPA 70, National Electrical Code. Generator set installation must also comply with state and local requirements.

⚠ WARNING

MARINE APPLICATION! RV 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 requires a generator set to be "ignition protected" when used in a gasoline-fueled environment.

General Information

This information section covers the Kohler RV generator set models listed below. To determine which model is involved, check the model number found on the nameplate attached to the frame of the generator being installed. Follow all instructions to insure proper installation.

Model No.	Engine No.	Volts	Hz	kW	Phase
12.5CCO67	Yanmar 4TN82-U (early models) 4TN82-R (later models)	120/240	60	12.5	1

Features

Generator sets feature Yanmar 4TN82-U or 4TN82-R diesel engines, rotating field alternating current generator, and relay controllers. Each generator is directly connected to the engine for permanent alignment. Each controller includes a START/STOP switch for test operating the set at the controller. Early model controllers (without accessory plug P2) require that remote operating controls be connected to the terminal strip inside the controller. Later model controllers include an accessory plug (P2) for connecting the remote switch, preheat switch, and generator "ON" lamp wiring harness. All Kohler RV sets are mounted on a steel mounting tray for quick installation to the frame of the vehicle. After the set is attached to the frame, and the coach supplied radiator and hose connections are installed, all that is usually required to make it operational is to connect fuel line, remote switch, load leads, battery terminals, exhaust system, add coolant, and add oil as needed to the crankcase to bring the level up to the full mark. Consult the Specification Chart below to aid in the installation.

NOTE

When selecting and installing radiator, consult Kohler Co., Generator Division, Product Applications Dept., Kohler, WI, 53044, Telephone (414) 565-3381 for recommendations and instructions.

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:

Specifications

Specifications	Model 12.5CC067-RV
Radiator Type	Remote
Weight (Dry)	742 lbs. (336.6 kg)
Length — Overall	49 In. (1245 mm)
Width — Overall	26-5/8 In. (676 mm)
Height — Overall	27-3/4 In. (705 mm)
Air Requirements — Total	2000 CFM (56628 L/min.)
Fuel Inlet Connection Size	1/4 In. (6.4 mm)
Battery Voltage	12 Volts
Battery Recommendation (Minimum)	500 Cold Crankings Amps., 100 Amp. Hr.
Battery Cranking Current	170 Amps.
Battery Ground	Negative
Fuel Consumption (% Load) gph (Lph)	
25%	.52 gph (1.97 Lph)
50%	.69 gph (2.61 Lph)
75%	.88 gph (3.33 Lph)
100%	1.13 gph (4.28 Lph)
Fuel Recommendation	ASTM/D975 No. 1-D or No. 2-D Diesel Oil

1. ELECTRICAL LOAD: Does the set selected have adequate capacity to handle the load?
2. COMPARTMENT SIZE: Will there be sufficient room around the set to maintain minimum clearances?
3. AIR REQUIREMENTS: Are the compartment air inlets and outlets sized to allow adequate circulation of air for cooling and combustion?
4. COMPARTMENT FLOOR: Is the compartment floor strong enough to support the weight of the generator set?
5. COOLING SYSTEM: Is the cooling system large enough to cool the generator?
6. FUEL SYSTEM: Is the system properly designed to prevent fuel starvation of either the main engine or generator set engine?
7. EXHAUST SYSTEM: Will the system meet all safety requirements after installation?
8. ELECTRICAL CONNECTIONS: Will all systems, (battery, load, and remote switch) when connected, be compatible with vehicle system?

Each of these installation considerations are covered in detail on the following pages.

Electrical Load

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 that the capacity is ample to meet demands without possible overloading.

Lighting Load

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 set 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 set AC circuit.

The lighting load is usually not too heavy in mobile installations; however, it must be accurately calculated to prevent overloading which could occur, for example, if all lights happened to be on when the air conditioner or other motor loads start up.

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" or 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 perhaps the most common type of motor loads for generator sets in recreational vehicles. The starting characteristics of the different makes of air conditioners vary greatly — one particular 12,000 Btu unit has, for example, 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 the unit is started.

The trend seems to be toward larger capacity air conditioners and the use of more than one unit in larger vehicles. Simultaneous starting of two units can present problems if the capacity is marginal. Because of the variation in starting characteristics of the various makes of air conditioners, no definite statements are made in this publication regarding multiple-motor starting capabilities of the mobile generator sets covered. 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 Table 2-1. Use this as a guide when selecting generator set capacity requirements involving motor loads. See Table 2-2 for generator set capabilities regarding air conditioners. Capabilities will vary according to "Kilowatt Derating" following. For specific information regarding simultaneous starting of two or more motors, contact Kohler Co., Generator Division, Product Applications Dept., Kohler, WI 53044, Telephone (414) 565-3381.

Motor Requirements	1/4 hp	1/3 hp	1/2 hp	3/4 hp	1 hp	2 hp	3 hp
Starting (In-Rush)	750	1000	1500	2000	3300	4000	5000
Running Watts	350	400	600	750	1100	2000	3000

Table 2-1. Motor Requirements

Model	Radiator Type	Wattage	Will Operate Air Conditioner of Size Indicated	"Power to Spare" for Lighting Appliances, Tools
12.5CCO67	Remote	12,500	Three 13,500 Btu	6000 Watts

Table 2-2. Air Conditioner Ratings

Appliance Loads

Generator sets in recreational vehicles are often used to furnish AC for appliances such as TV, stereo, electric water heaters, etc. With the exception of the resistance-type loads such as the water heater, requirements for appliances are usually low. Such loads must not, however, be overlooked when figuring total requirements. Reserve capacity should be available for anticipated appliance loads to avoid overloading of a set. The average power requirements of some common electrical appliances are listed in Table 2-3.

Electrical Appliance	Rating (Watts)
Blanket	50-250
Blender	600
Dryer, Hair	500-1200
Fan, Air Circulating	25-100
Fan, Furnace	270
Heater, Space	750-1500
Heater, Water	1500
Pan, Frying	1200
Percolator, Coffee	650
Radio	50-100
Television	300-750
Toaster	750-1200

Table 2-3. Appliance Ratings

Kilowatt Derating

All units are rated at 1.0 power factor. The kilowatts of the generator set will decrease 3.5% per 1,000 ft. (305 m) above 500 ft. (152 m) above sea level. Derate 1% for every 10° F (5.5° C) above 85° F (30° C).

Compartment Size

When planning compartment size requirements, allow the minimum clearances for cooling of the generator set as shown in Table 2-4.

NOTE

Since the sets are flexibly mounted, the minimum clearances will assure that the sides of the compartment and the set will not rub while the set is in operation or while the vehicle is in transit.

Front	1-1/2" (38 mm)
Side	1-1/2" (38 mm)
Top	1-1/2" (38 mm)
Rear	1-1/2" (38 mm)

Table 2-4. Minimum Clearance Requirements

The thickness of insulating and sound deadening material used to line the compartment must be taken into consideration when planning clearances. If necessary, enlarge the compartment so minimum clearance requirements are maintained. The generator set must be securely fastened to avoid unwanted movement from vibration and road shock. On a typical installation, the mounting tray is supported on the ends by angle iron and has a full door for service access. The same number of bolts as mounting holes in the tray must be used to secure the tray to the support structure.

When designing the compartment, allow sufficient room for the set to be easily removed when major service is required. See Figure 2-1. Also keep in mind that the compartment door must have air intake openings having a free area of equal to or greater than that specified under "Air Requirements" following.

Make sure that the compartment is vapor tight and completely sealed off from the inside of the vehicle to prevent exhaust or other items from entering the vehicle.

Line the compartment with a good sound deadening material. The material selected must be fireproof or highly resistant to fire. An available type of 3-layer foam material does a very efficient job of absorbing sound. This type material is easily cut to size with scissors and can be quickly installed using special fire retardant adhesive which bonds the material to almost any surface that is clean and dry. Other materials, such as fiberglass insulation with heat barrier, have also been used successfully in mobile installations.

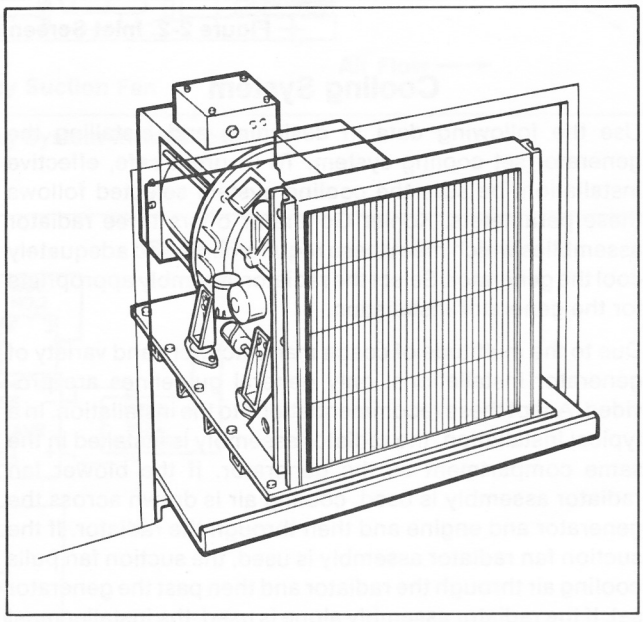

Figure 2-1. Slide Tray Feature for Complete Removal

Air Requirements

Each engine is equipped with a high water temperature shutdown switch which will automatically shut down the set in the event operating temperatures climb too high. To prevent the generator set from shutdown, make sure the compartment openings are large enough to allow ade-

quate circulation of cooling air. The minimum **free air** opening in the compartment door is shown in Table 2-5. Remember, louvers, screens, and protective decorative grill work definitely restrict the effective air flow. Even a simple, relatively open mesh screen, as shown in Figure 2-2 will restrict air flow as much as 45%. The intake opening must be increased to compensate for such restrictions.

Minimum Air Openings		
Model	**Inlet**	**Outlet**
12.5CCO67-RV (Remote Radiator)	350 Sq. In. (2258 Sq. Cm.)	700 Sq. In. (4516 Sq. Cm.)

Table 2-5. Compartment Door Air Opening

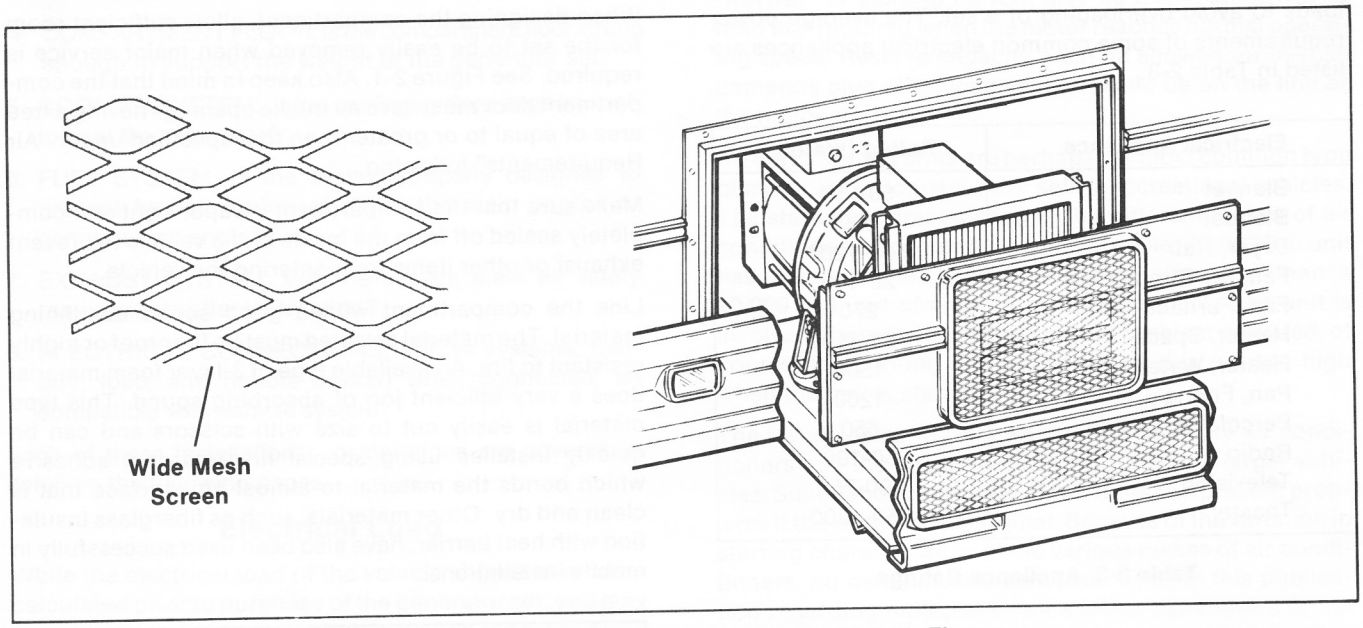

Figure 2-2. Inlet Screen and Louvers Restrict Air Flow

Cooling System

Use the following data in designing and installing the generator set cooling system. To insure a safe, effective installation, be sure the cooling system selected follows these perameters. Kohler Generator offers three radiator assemblies which meet these requirements and adequately cool the generator. Select the radiator assembly appropriate for the generator installation.

Due to the multitude of coach manufacturers and variety of generator installations, only general guidelines are provided. Adapt these recommendations to the installation. In a typical installation, the radiator assembly is installed in the same compartment as the generator. If the blower fan radiator assembly is used, cooling air is drawn across the generator and engine and then through the radiator. If the suction fan radiator assembly is used, the suction fan pulls cooling air through the radiator and then past the generator set. If the radiator assembly alone is used, the installer must supply an electric blower or suction fan to circulate the cooling air. See Figure 2-3a. Depending on space limitations, the radiator can be located in front of, adjacent to, or in a ventilated location remote from the engine (maximum distance from generator is 10 ft.). To prevent recirculation of heated air, be sure to maintain a tight seal between the radiator and the discharge chute. Generally, the discharge chute opening should be approximately one and one-half times the size of the radiator core.

NOTE

If the radiator is to be located in a compartment separate from the engine, remember the engine combustion air and heat rejection requirements of the alternator and engine block when designing the cooling system. A supplemental cooling fan capable of 1000 cfm (28.32 m3/min) should be installed to supply air to the generator compartment for these requirements.

Connect radiator fan motor to generator output leads L1 and L2 as shown in Figure 2-3b. If a non-Kohler radiator assembly is installed, be sure the radiator fan motor rotates in the correct direction and is of the proper voltage. To protect against overload and short circuits, it is recommended that fuses (adequate for the motor used) be installed between the fan motor and the L1/L2 connections.

CAUTION

The cooling system fill (radiator or expansion tank) must be the highest point in the cooling system. (See Figure 2-3c). If the cooling system fill is not located as directed, cooling water will not completely fill the engine and result in overheating of the engine and disablement of the high water temperature shutdown switch.

A close relationship exists between cooling system design and generator compartment size. Availability of space is often the determining factor in cooling system design. See "Compartment Size" section of this manual prior to designing and installing generator cooling system.

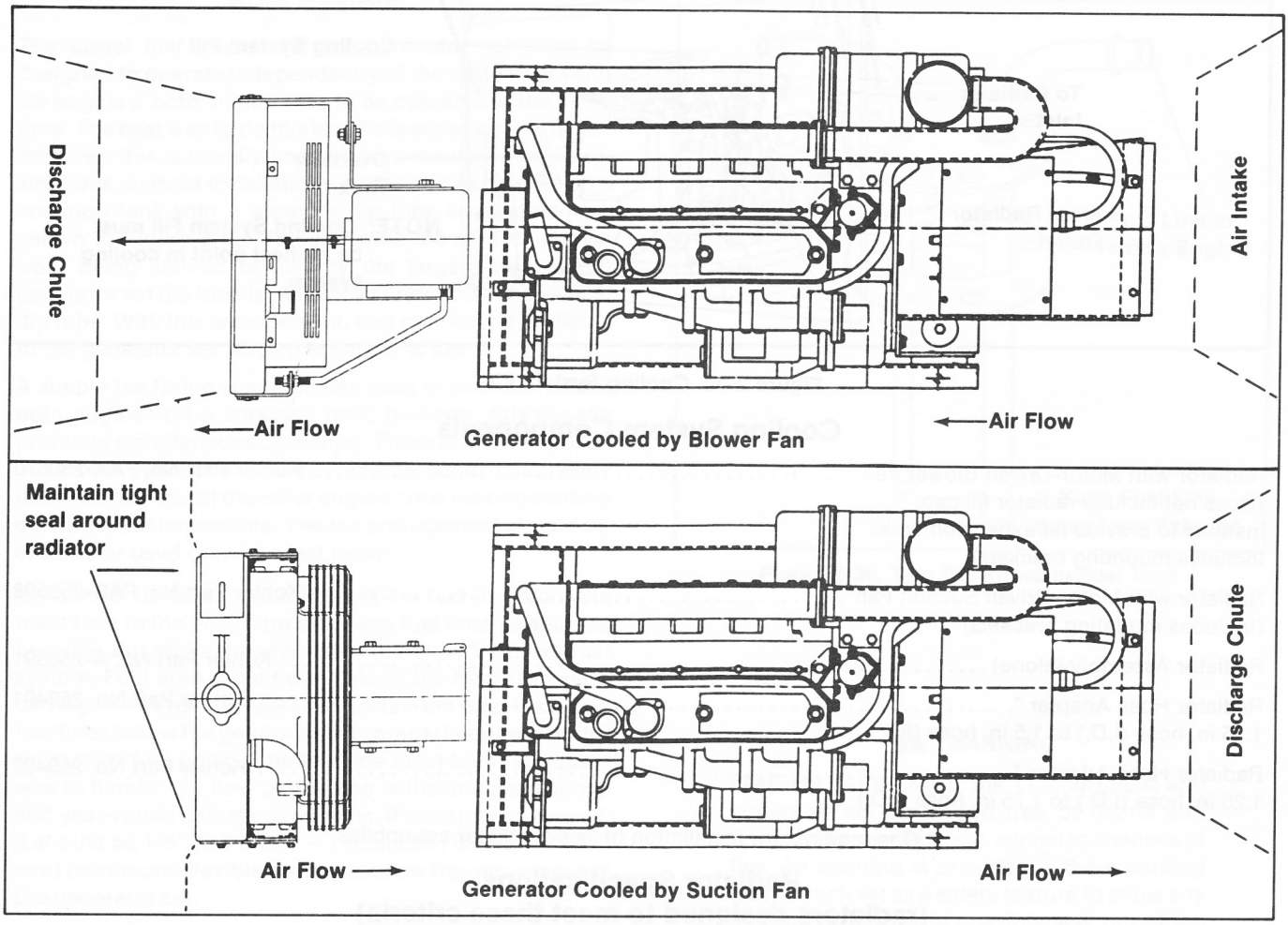

Figure 2-3a. Typical Cooling System Installations

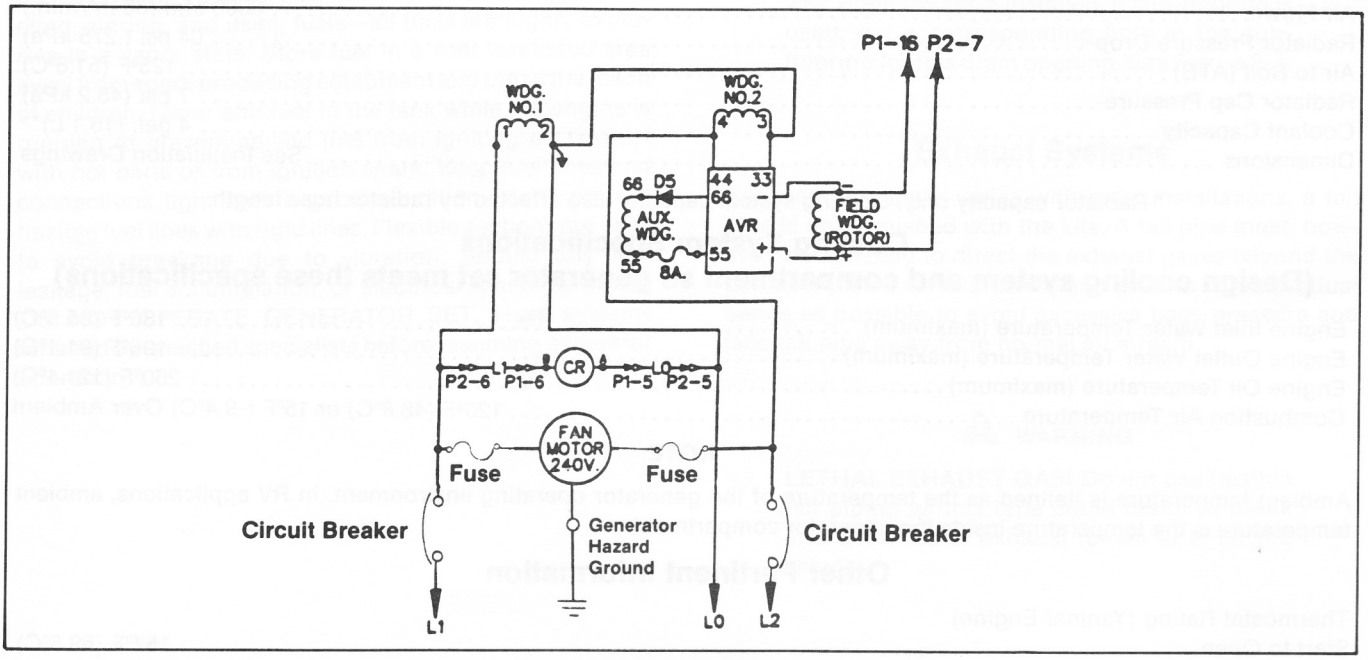

Figure 2-3b. Radiator Fan Electrical Connections

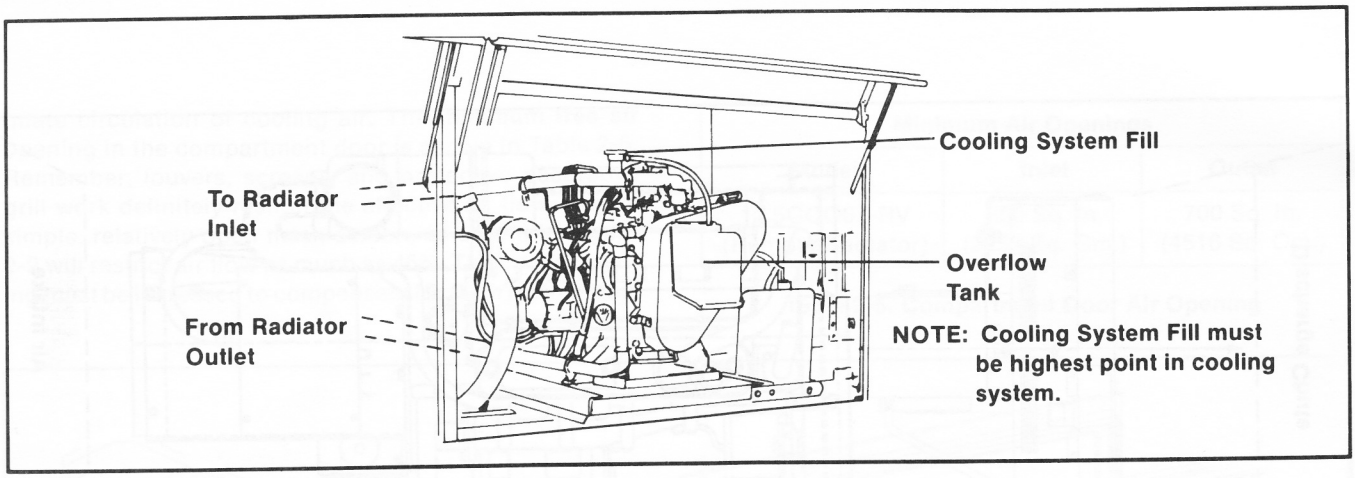

Figure 2-3c. Cooling System Fill

Cooling System Components

Radiator with Motor-Driven Blower Fan (Does not include radiator fill cap; installer to provide fill/expansion tank. Includes mounting brackets) ..... Kohler Part No. PAA-258570

Radiator with Motor-Driven Suction Fan (Includes mounting brackets) ..... Kohler Part No. PAB-258598

Radiator Assembly (alone) ..... Kohler Part No. A-258591

Radiator Hose Adapter *, 1.25 in. hose (I.D.) to 1.5 in. hose (I.D.) ..... Kohler Part No. 259491

Radiator Hose Adapter *, 1.25 in. hose (I.D.) to 1.75 in. hose (I.D.) ..... Kohler Part No. 259492

* One required for installation of listed radiator assemblies

Radiator Specifications (radiators designed to meet these criteria)

Water Flow ..... 12 gpm (46 Lpm)
Heat Rejection ..... 1150 Btu/min.
Air Flow ..... 3000 cfm (85 m^3/min.)
Radiator Pressure Drop ..... 04 psi (.275 kPa)
Air to Boil (ATB) ..... 125°F (51.6°C)
Radiator Cap Pressure ..... 7 psi (48.2 kPa)
Coolant Capacity ..... 4 gal. (15.1 L)**
Dimensions ..... See Installation Drawings

** Radiator capacity only. Cooling system capacity also affected by radiator hose length.

Cooling System Specifications (Design cooling system and compartment so generator set meets these specifications)

Engine Inlet Water Temperature (maximum) ..... 186°F (85.5°C)
Engine Outlet Water Temperature (maximum) ..... 196°F (91.1°C)
Engine Oil Temperature (maximum) ..... 250°F (121.1°C)
Combustion Air Temperature ..... 120°F (48.8°C) or 15°F (-9.4°C) Over Ambient

NOTE

Ambient temperature is defined as the temperature of the generator operating environment. In RV applications, ambient temperature is the temperature inside the generator compartment.

Other Pertinent Information

Thermostat Rating (Yanmar Engine)
Start to Open ..... 157°F (69.5°C)
High Water Temperature Switch Rating (Yanmar Engine) ..... 230°F (110°C)
Maximum Distance Radiator to Generator Set ..... 10 ft. (9 m)
Generator Set Dimensions ..... See Installation Drawings

Fuel System

The diesel fuel system for the generator set must be designed to operate independently of the system for vehicle engine if both engines are to be operated at the same time. The best way to do this is to have separate fuel tanks; however, this is usually impractical because of space restrictions. In most installations, both engines operate off a common tank with a separate dip tube arrangement as shown in Figure 2-3c. This prevents the smaller engine from being starved of fuel by the larger engine. The generator set dip tube is generally shorter than the vehicle dip tube. With this arrangement, fuel may not be available to the generator set when fuel supply is low.

A simple tee fitting is sometimes used to provide fuel for both engines off a common tank; however, this usually prohibits simultaneous operation. There is also the possibility that operation of either engine could completely drain the fuel line of the other engine, thus making starting difficult if not impossible. The tee arrangement should be avoided or used only as a last resort.

Care must be taken when routing the fuel line from the main tank to the generator set. Keep fuel lines as short as possible but maintain adequate clearance from exhaust system. Fuel lines must be run along the frame or under carriage — never run fuel lines inside the coach. Locate fuel lines below the generator set compartment with entry point near fuel pump. The fuel line must be of adequate size to handle the flow of fuel and withstand road shock and year-round climate conditions. If steel tubing is used, it should be 1/8" (3.2 mm) I.P. (minimum) with an 8" (203 mm) (minimum) flexible section to allow free movement of the generator set.

⚠ WARNING

DANGEROUS FUELS! Use extreme caution when handling, storing, and using fuels—all fuels are highly explosive in a vapor state. Store fuel in a well-ventilated area away from spark producing equipment and out of the reach of children. Never add fuel to the tank while the engine is running to prevent spilled fuel from igniting on contact with hot parts or from ignition spark. Keep fuel lines and connections tight and in good condition—don't replace flexible fuel lines with rigid lines. Flexible sections are used to avoid breakage due to vibration. Should any fuel leakage, fuel accumulation, or electrical sparks be noted, DO NOT OPERATE GENERATOR SET. Have systems repaired by qualified specialists before resuming generator operation.

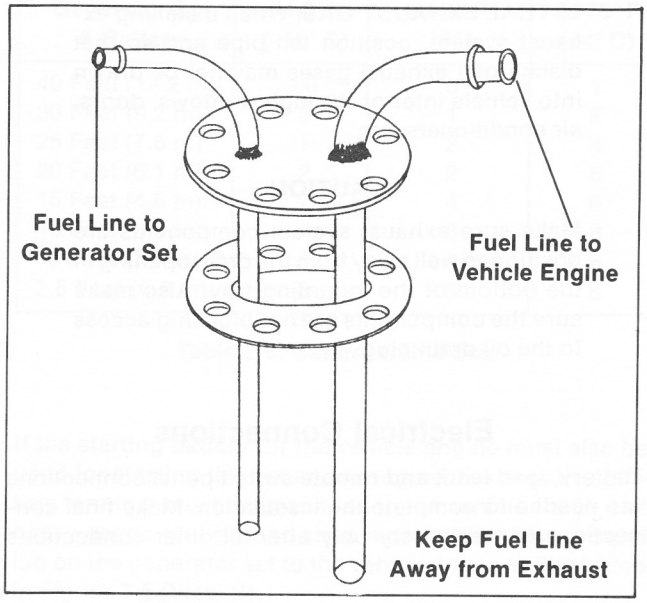

Figure 2-3c. Two Dip Tubes in Fuel Tank

⚠ WARNING

FIRE HAZARD! Keep the compartment and generator set clean and free of debris and combustible materials to minimize chances of fire. An opening is provided in the mounting tray of each set as a safety feature to allow any fuel or oil that might possibly leak out of the system to drain out of the compartment — make sure this opening is not blocked in any way when the set is installed. If sub-flooring is used, cut a corresponding hole in the sub-flooring for this drain opening. See Figure 2-4.

Exhaust Systems

Because the length varies with most installations, a tail pipe is not furnished with the kits. A tail pipe must, however, be installed to direct the exhaust gases beyond the perimeter of the vehicle. Use a tail pipe with as few gradual bends as possible to avoid excessive back pressure and face tail pipe away from normal air stream.

⚠ WARNING

LETHAL EXHAUST GAS! Do not use flexible tail piping as this type could crack or break and allow lethal exhaust fumes to enter the vehicle.

⚠ WARNING

LETHAL EXHAUST GAS! When installing exhaust system, position tail pipe end so that discharged exhaust gases may not be drawn into vehicle interior through windows, doors, air conditioners, etc.

CAUTION

Make sure exhaust system components are positioned well away from the drain opening in the bottom of the mounting tray. Also make sure the components are not blocking access to the oil drain plug.

Electrical Connections

Battery, load lead, and remote switch panel connections are needed to complete 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 — connections should be made only by qualified electricians. 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 drippage of fuel, oil, or grease — at least 2" (51 mm) clearance must be provided between electrical wiring and hot exhaust parts. Also, wiring must not be located directly below or in close proximity to fuel system parts or oil fill locations. Some other points to consider when making AC load connections are covered in the following.

NOTE

Wiring connections made at the time of installation should be accessible for inspection and servicing.

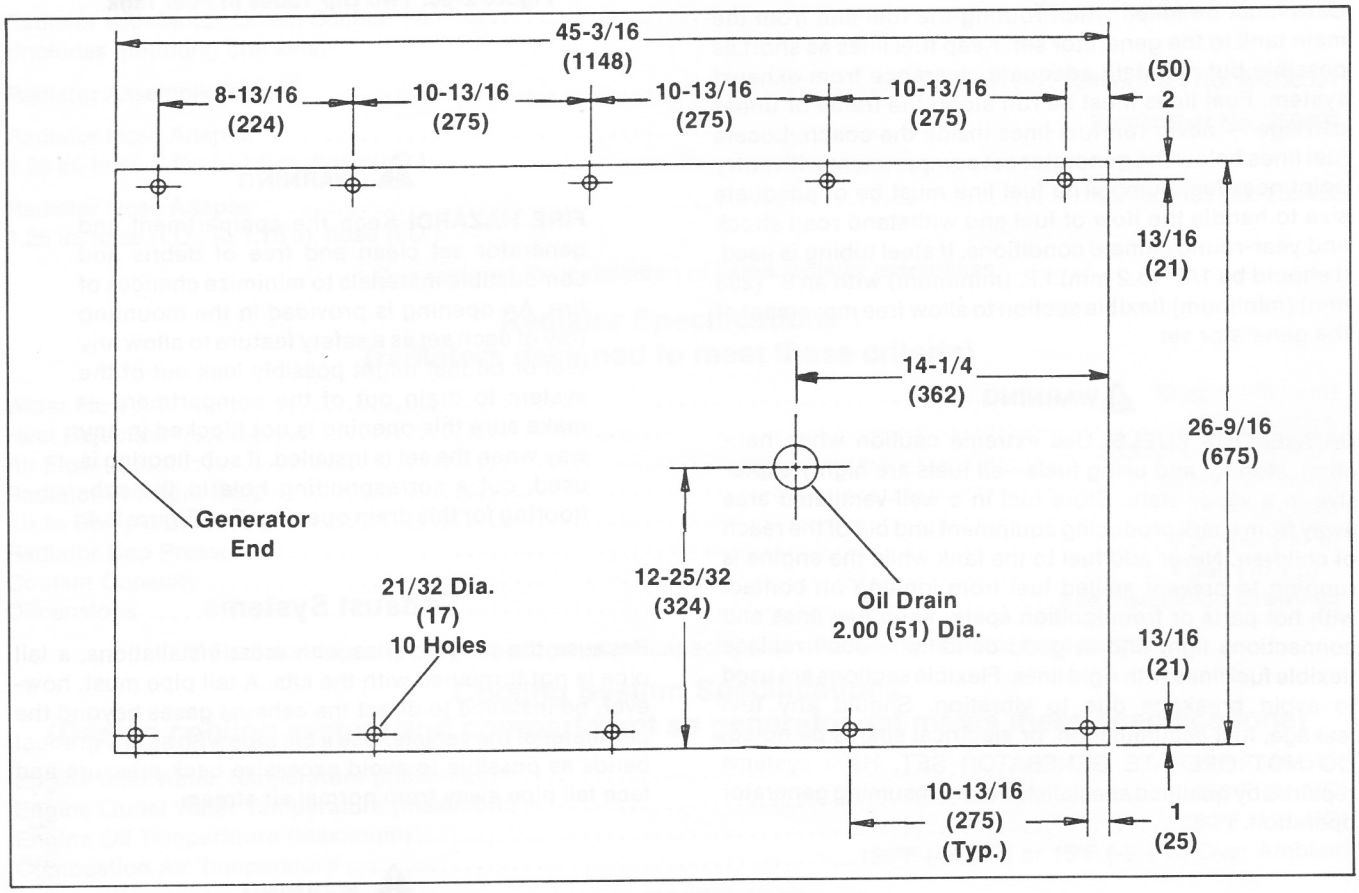

Figure 2-4. Floor Template