Onan

Installation Manual

BGE-BGEL

and

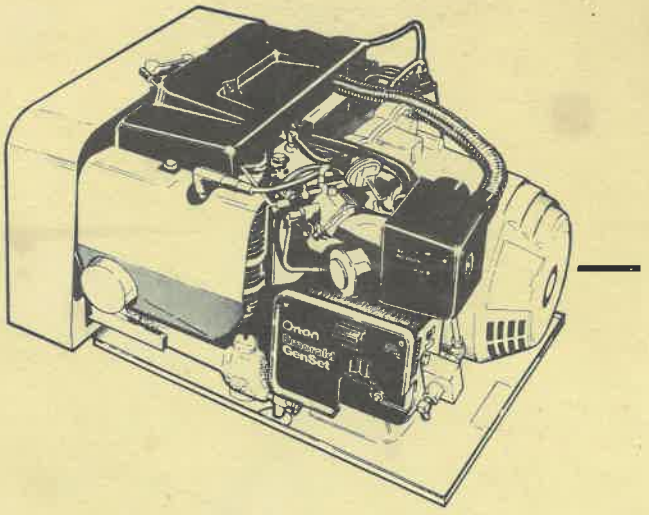
NHE-NHEL

GenSets

RV Electric Generating Set

(BGE Spec F, BGEL Spec E, NHE Spec D, NHEL Spec D)

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



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Safety Precautions

Before operating the generator set, read the Operator's Manual and become familiar with it and your equipment. **Safe and efficient operation can be achieved only if the equipment 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 and explosion 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.
- 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 starting.
- 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 near moving parts, or jewelry while working on electrical equipment. 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.
- 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.

Table of Contents

Introduction

Each RV generator set must be installed properly if it is to operate reliably, quietly, and most importantly - safely. Therefore, read the entire manual and housing/exhaust kit instructions before starting the installation. This manual details installation procedures for the Onan BGE/NHE and BGEL/NHEL generator sets. For operation and maintenance procedures, refer to the Operator's Manual which accompanies each unit.

Listed and certified, this generator set meets or exceeds all requirements of the National Electrical Code, Article 551 (NFPA 70) as well as ANSI/RVIA Standard EGS-1, and CSA Bulletin 946. Recreational vehicle installations MUST comply with these specifications as well as ANSI 119.2, Standard for Recreational Vehicles. The recreational vehicle manufacturer and generator set installer MUST also comply with any local codes such as California Administrative Code Title 25, which pertains to the generator set installation.

LPG: The propane fuel supply lines MUST comply with all requirements of NFPA 501C Section 3-5, paragraphs 1.1 and 1.2 as well as Canadian Gas Association Bulletin B149.2-78. The installer must review and comply with all applicable codes regarding fuel tanks, supply lines, and pressure testing complete system for leaks after installation is complete and PRIOR to initial operation of the generator set.

US testing (NCTI) and CSA certification applies to 60 Hz models only.

Requirements to be considered prior to the installation are listed below. Each is covered in the following text or associated kit instructions.

- Level and supportive mounting surface.
- Adequate cooling air.
- Discharge of circulated air.
- Discharge of exhaust gases.
- Electrical connections.
- Fuel installation.
- Accessibility for maintenance and service.
- Noise levels.

INSTALLATION CODES AND SAFETY RECOMMENDATIONS

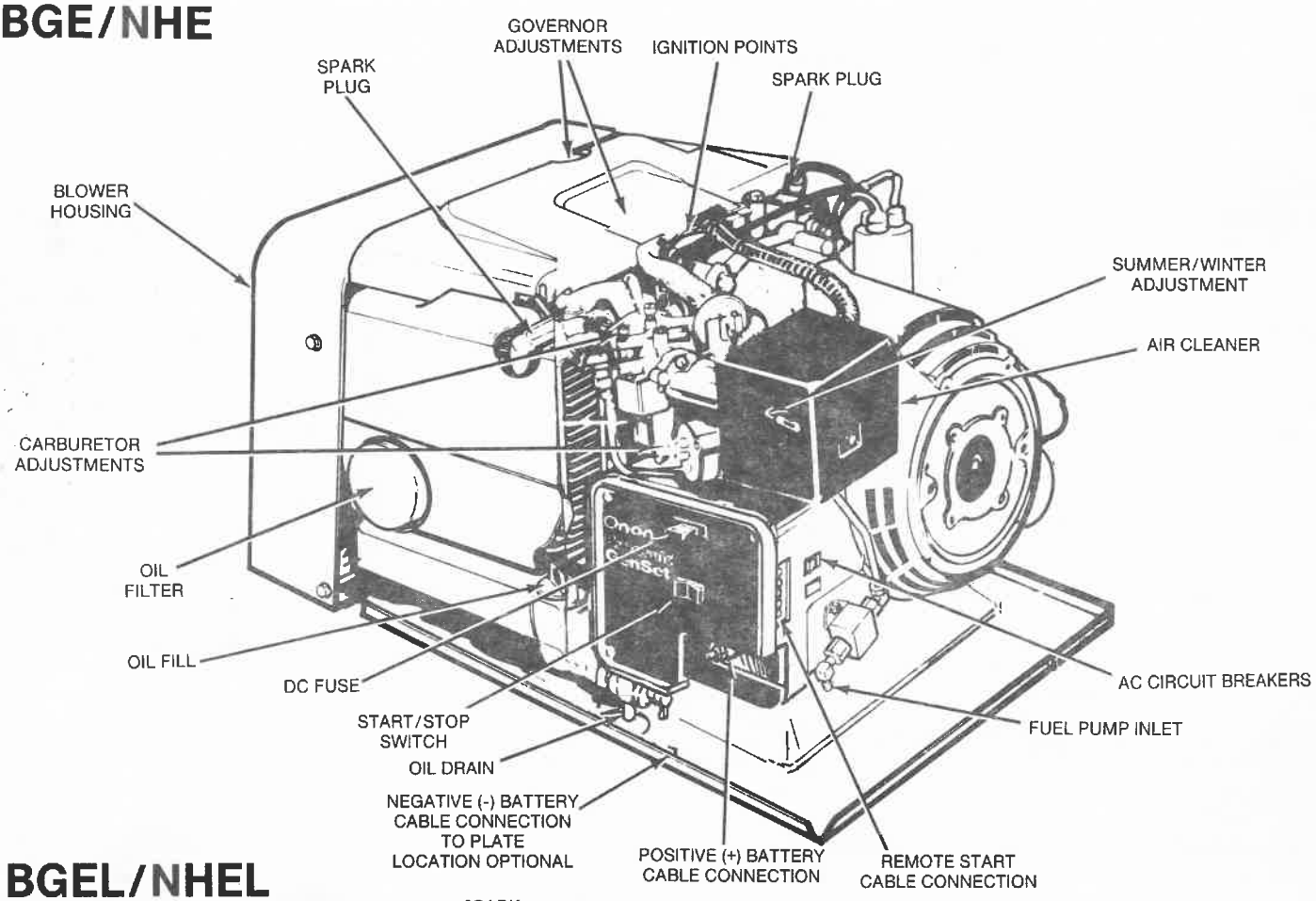
The following list of installation codes and safety recommendations pertains to the installation and operation of this RV generator set. The address of each agency is listed so that you can obtain a copy for your own use.

1. ANSI-A119.2 ANSI/RVIA-EGS-1	Recreational Veh. Industry Assoc. 14650 Lee Road Chantilla VA 22021
2. NFPA 70 (N.E.C.) NFPA-501C	National Fire Protection Assoc. 470 Atlantic Ave. Boston MA 02210
3. CSA Electrical Bulletin #946	Canadian Standards Association 178 Rexdale Blvd. Rexdale Ont. Canada M9W 1R3
4. California Administrative Code - Title 25 Chapter 3	State of California Documents Section P.O. Box 1015 North Highlands CA 95660

⚠WARNING

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

BGE/NHE



BGEL/NHEL

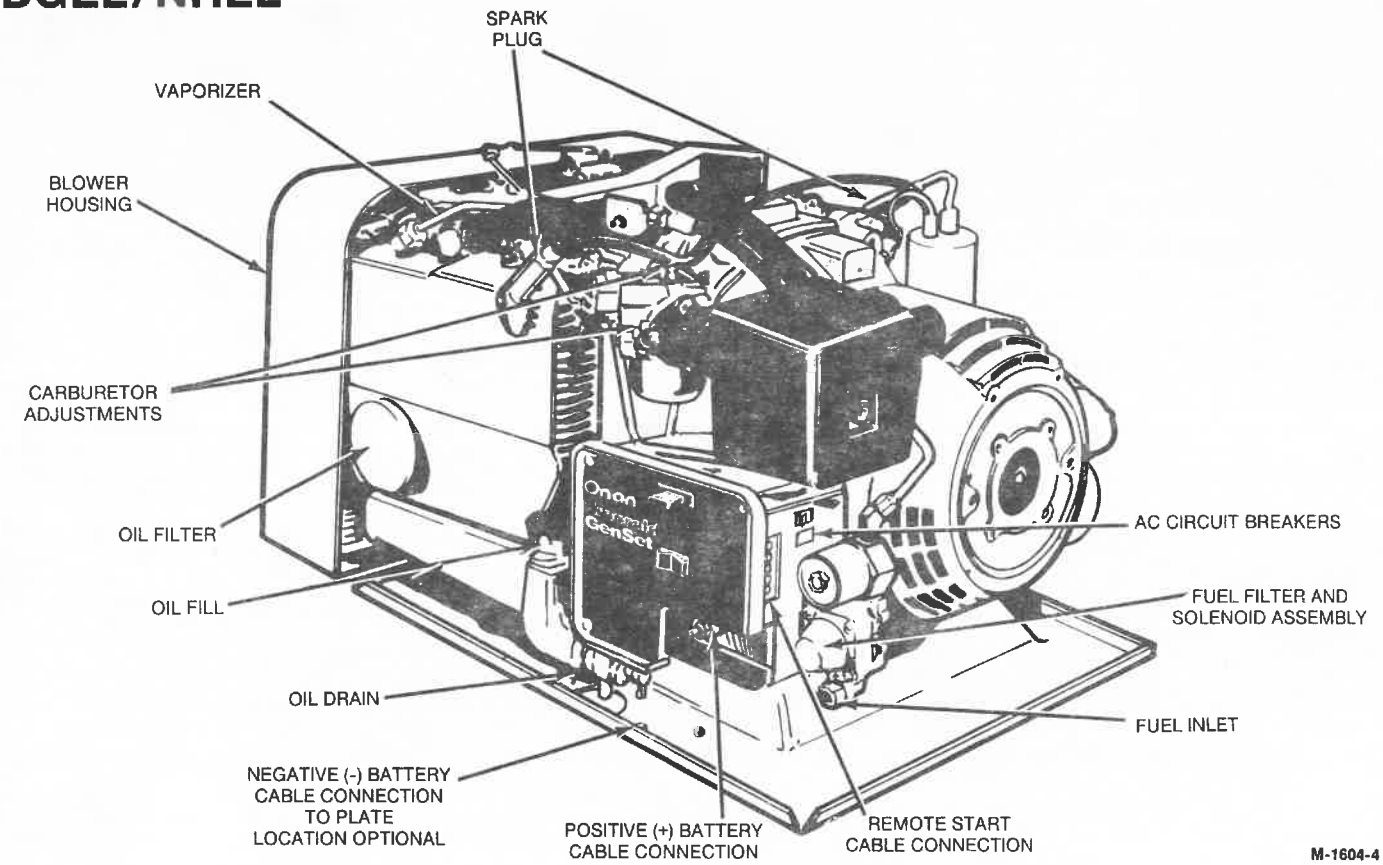


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FIGURE 1. TYPICAL EMERALD GENERATOR SETS

General Specifications

ENGINE

Onan opposed 2-cylinder, 4-cycle, air-cooled, gasoline-fueled for the BGE/NHE models and propane-fueled for the BGEL/NHEL models. Front-mounted control with remote start capability, negative ground, 12-volt, automotive-type starter.

GENERATOR

Onan-built, four-pole, revolving field, permanently aligned to engine.

	BGE/BGEL		NHE/NHEL	
Frequency	**50 Hz**	**60 Hz**	**50 Hz**	**60 Hz**
Watts	3500	4000	5000	NHE-6500, NHEL-6300
Volts	110/220 or 120/240	120	110/220 or 120/240	120
Amps	31.8/15.9 or 29.2/14.6	33.3	45.5/22.7 or 41.7/20.8	NHE - 54.2, NHEL - 52.5
Phase	1Ø	1Ø	1Ø	1Ø

GENERATOR SET

Dimensions*	BGE/BGEL	NHE/NHEL
Height	14.0 in. (356 mm)	14.6 in. (371 mm)
Length	25.3 in. (643 mm)	25.3 in. (643 mm)
Width	18.8 in. (478 mm)	21.1 in. (535 mm)
Weight:		
50 and 60 Hz	204 lb (92.5 kg)	230 lb (104 kg)
Air Requirements:		
60 Hz	480 ft³/min (13.6 m³/min)	500 ft³/min (14 m³/min)
50 Hz	400 ft³/min (11.3 m³/min)	417 ft³/min (12 m³/min)

Fuel Inlet Connection	BGE/BGEL AND NHE/NHEL
BGE/NHE	1/4 in. barb fitting
BGEL/NHEL	1/4 in. NPTF
Battery Voltage	12 volts
Recommended Battery Capacity	360 cold cranking amperes
Cranking Current	100 amperes
r/min at:	
60 Hertz	1800
50 Hertz	1500

*Under-Floor mount generator set with compartment housing has slightly larger dimensions. See *Mounting* section.

Mounting

Read the entire manual and housing/exhaust kit instructions before installing the generator set. The generator set is designed for two very different types of installations; conventional compartment mount installations and under-floor mount installations. Choose the appropriate section describing each and carefully follow the instructions given.

CONVENTIONAL COMPARTMENT MOUNT

In a conventional installation the generator set is actually installed on a framework that is part of the recreational vehicle (RV). This framework must be constructed in accordance with the safety-approved specifications contained in the following Compartment Construction section.

Unless generator set is to be removed from underneath, plan the location for an access opening to be large enough to permit set removal. Allow additional clearance for easy access to the oil fill, drain, filter and oil dipstick as well as the air cleaner element, circuit breaker, governor adjustments, carburetor adjustments, Start/Stop switch, and DC fuse. The locations of each are shown in Figure 1.

Design the compartment large enough for the generator set, with 0.6 inch (15 mm) minimum clearance between the generator set and compartment walls and ceiling (and acoustical material, if used). See Figures 2 and 3 for general information when reviewing the following and refer to specific Outline Drawing when performing installation.

Compartment Construction

1. Install the generator set in its own compartment. Separate the compartment area from the living quarters and any fuel supply (gasoline or propane) with a vapor-tight wall. See Figures 2 and 3 (and specific Outline Drawing) for minimum clearances and compartment size.
2. Line the compartment walls with 26-gauge galvanized steel or a material of comparable strength, durability and fire resistance (see NFPA 70, NEC and California Title 25 for complete details).
3. Construct the compartment floor in a manner so as to prevent oil, fuel or water accumulation. Compartment drainage can be accomplished by 1/2 inch (13 mm) diameter holes as shown on the compartment floor drawings, Figure 3.

   ⚠WARNING ***Fire presents the hazard of severe personal injury or death. To prevent a fire hazard, do not position the muffler directly below a drain hole.***

   Do NOT use absorbent sound proofing material on compartment floor. The floor should have minimal openings to reduce sound level.

4. Equip base with an oil drain hole to the outside of compartment. Do not mount the muffler below the oil drain valve.

   ⚠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 vehicle coach.***

5. Secure the generator set mounting plate to support frame using 3/8-16 UNC, grade 5 screws. The back two mounting holes are supplied with weld nuts to facilitate installing screws. The front two holes can be secured with 3/8-16 screws, lockwashers and nuts. The front holes are square to allow use of 3/8-16 cage nuts if desired. See Figure 3.

   ⚠CAUTION ***Road vibrations can cause component damage to generator set if unit mounting plate is not fastened securely to vehicle compartment. Use screws of sufficient length to allow a minimum of 1-1/2 threads to extend through nut to ensure maximum holding power.***

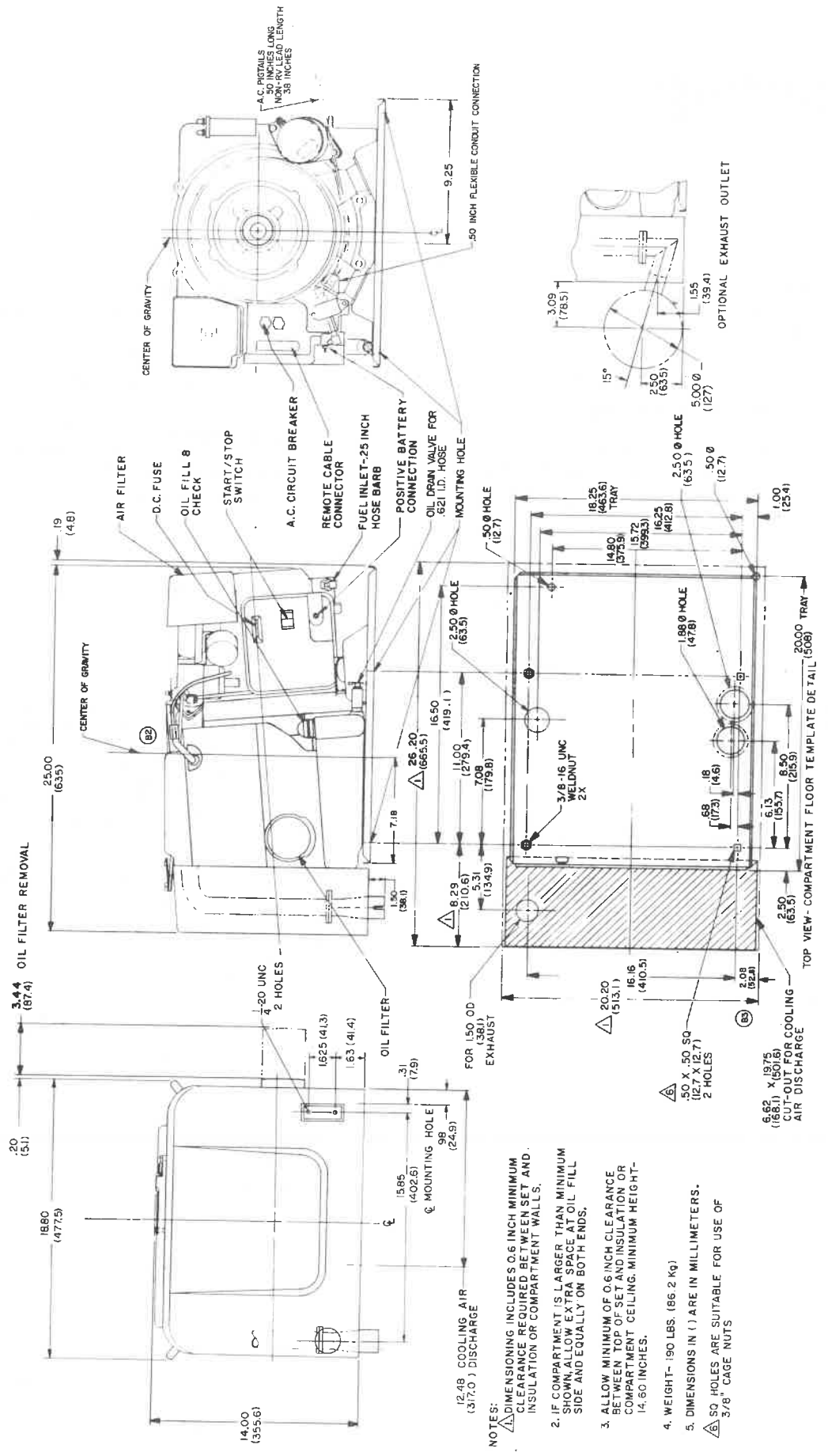

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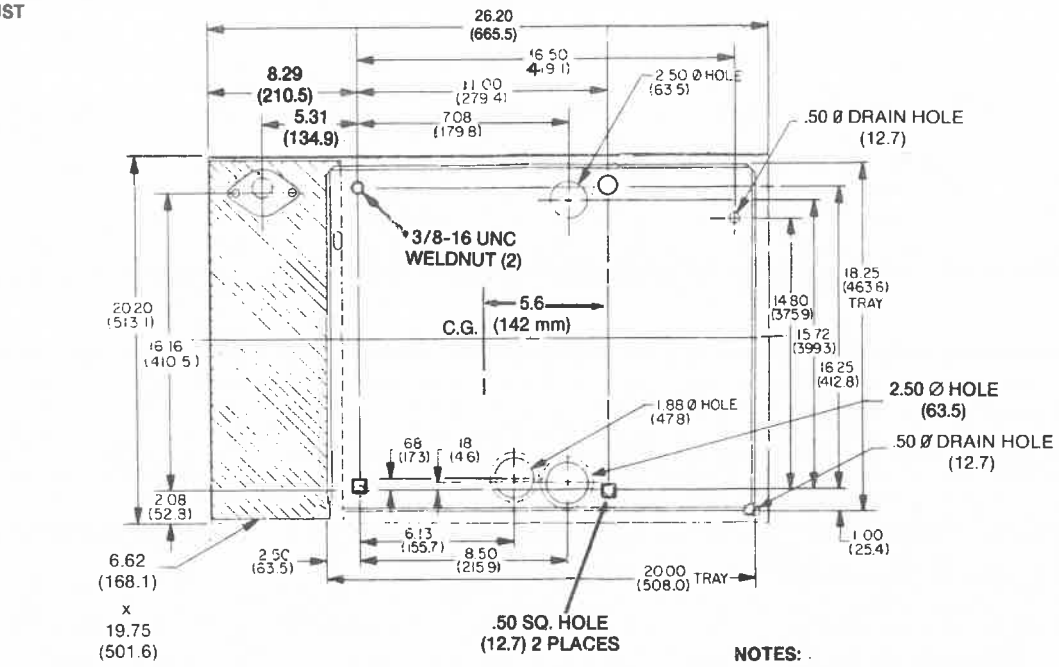
FIGURE 2. COMPARTMENT MOUNT OUTLINE (BGE SHOWN)

CONVENTIONAL COMPARTMENT MOUNT BGE-BGEL WITH DOWN OUT EXHAUST



NOTES:

1. DIMENSIONS INCLUDE 0.6 INCH (15 mm) MINIMUM CLEARANCE REQUIRED BETWEEN SET AND INSULATION OR COMPARTMENT WALLS.
2. IF COMPARTMENT IS LARGER THAN MINIMUM SHOWN, ALLOW EXTRA SPACE AT OIL FILL SIDES AND EQUALLY ON BOTH ENDS.
3. ALLOW MINIMUM OF 0.6 INCH (15 mm) CLEARANCE BETWEEN TOP OF SET AND INSULATION OR COMPARTMENT CEILING. MINIMUM HEIGHT - 14.60 INCHES (371 mm).
4. DIMENSIONS ( ) ARE IN MILLIMETRES.
5. SQUARE HOLES (0.50/12.7) ARE SUITABLE FOR USE OF 3/8 INCH CAGE NUT.

CONVENTIONAL COMPARTMENT MOUNT BGE-BGEL WITH END-MOUNTED MUFFLER

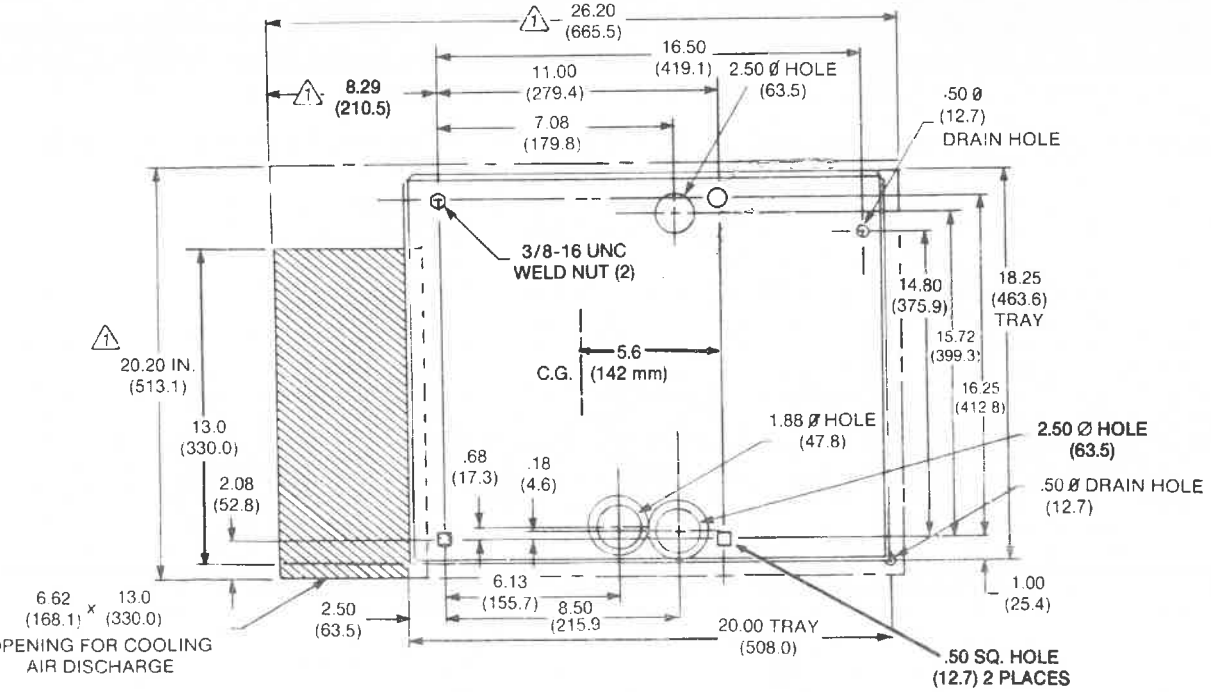


FIGURE 3. COMPARTMENT FLOOR PLAN (BGE/BGEL SHOWN)

UNDER-FLOOR MOUNT

For an under-floor mount installation, the generator set is mounted in a housing below the floor and outside the coach of the recreational vehicle. This housing assembly should be as supplied or reviewed by Onan, and must be installed in accordance with safety approved specifications. Review the following text for general application information, and review the proper housing/exhaust kit instructions for further specifics regarding under-floor mount installations.

The vehicle construction must be able to support the weight of the generator set (see General Specifications). It is the vehicle manufacturer's and the installer's responsibility to provide and assure a structurally sound support frame, by using tubing, angle brackets, or with steel reinforced plywood or other composition board. Reinforcement of plywood or particle board can be with 3 inch (76 mm) or larger washers or a full metal plate.

General

Generator Set Location: When choosing a location for mounting the under-floor mount generator set, consider the following not only for mounting, but for protection of the generator set as well.

Figure 4 shows the most common mounting areas of a RV generator set in a recreational vehicle. If the generator set is mounted on the curb side, location 1 or 2, protect the generator end of the generator set from road splash and debris. If mounted on the driver's side, location 3 or 4, protect the engine end of the generator. (Installation should be verified by a road test in mud and slush). Refer to shaded areas of Figure 4.

Leave an area between the generator set and the recreational vehicle skirt for an air inlet if it is not subjected to road splash. See *VENTILATION* for more detailed information.

Air inlet openings to the generator set compartment must not allow dirt, rock, water, or slush to directly hit the generator set. Dust and salt entrance into the compartment must be minimized. Pay special attention to protection of the generator, control, choke, and governor areas. Baffles might be required to protect certain areas.

Access Opening: Provide an access opening on the side of the recreational vehicle for the generator set. Make it large enough to allow for checking or adding oil, for adjusting governor and carburetor, and for access to the control panel and AC circuit breaker. The opening should also provide access for oil and air filter replacement so that the generator set does not have to be lowered for these procedures. See Figure 1 for locations.

Mounting Clearance: If the compartment door does not open the full width of the generator set and to the bottom of the vehicle skirt, provide 2 inches (51 mm) minimum between the tray and the skirt of the recreational vehicle. This distance allows lowering the generator set without hitting the vehicle skirt. Figure 5 shows basic dimensions of the under-floor mount generator set. Refer also to specific Outline Drawing when performing installation.

Housing Assembly

The recreational vehicle must be adapted for the under-floor housing. The construction of the vehicle must support the weight of the generator set. It is the vehicle manufacturer's responsibility to provide a structurally sound frame and carriage bolts or equal to attach the housing kit.

⚠CAUTION ***Failure to meet Onan review for modifications of housing kits or for non-Onan kit housing installations may void intent of NCTI/CSA approval. Liability for damage or injury and warranty expenses becomes the responsibility of the person making the modifications.***

Use template supplied with housing kit to insure that panels are installed square to each other. Failure to mount panels square may result in spark plug breakage.

Review the exhaust system kit installation instructions and component parts. Plan clearances for movement or removal of exhaust components when generator set is lowered for inspection/maintenance purposes.

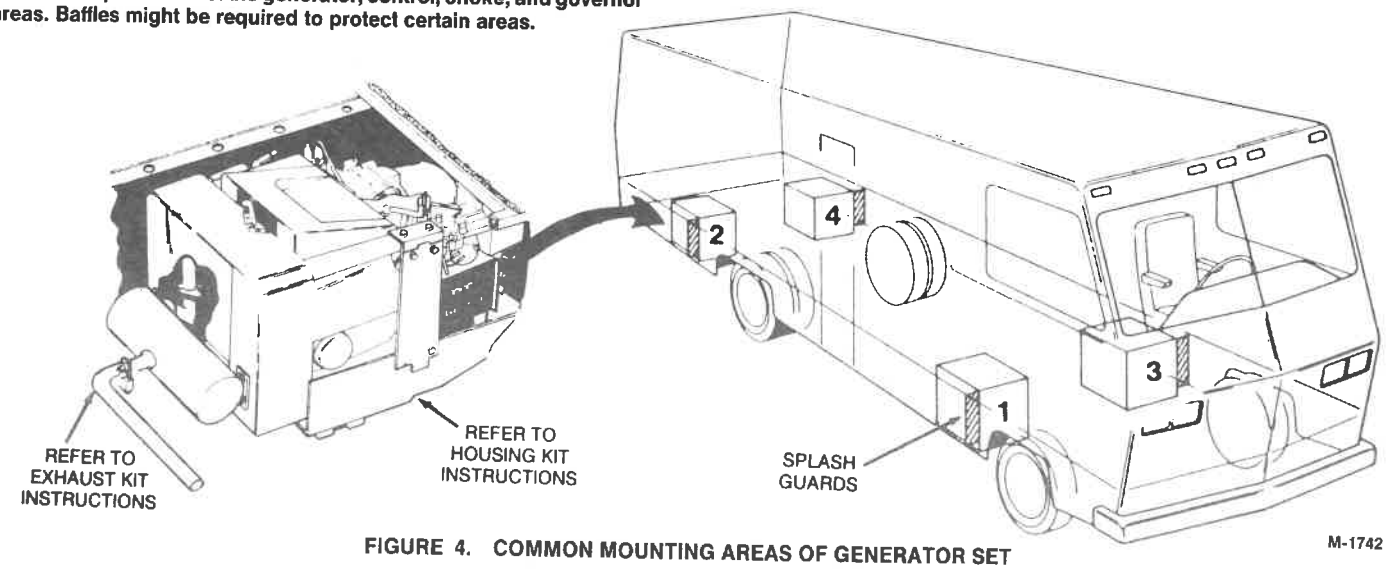


FIGURE 4. COMMON MOUNTING AREAS OF GENERATOR SET

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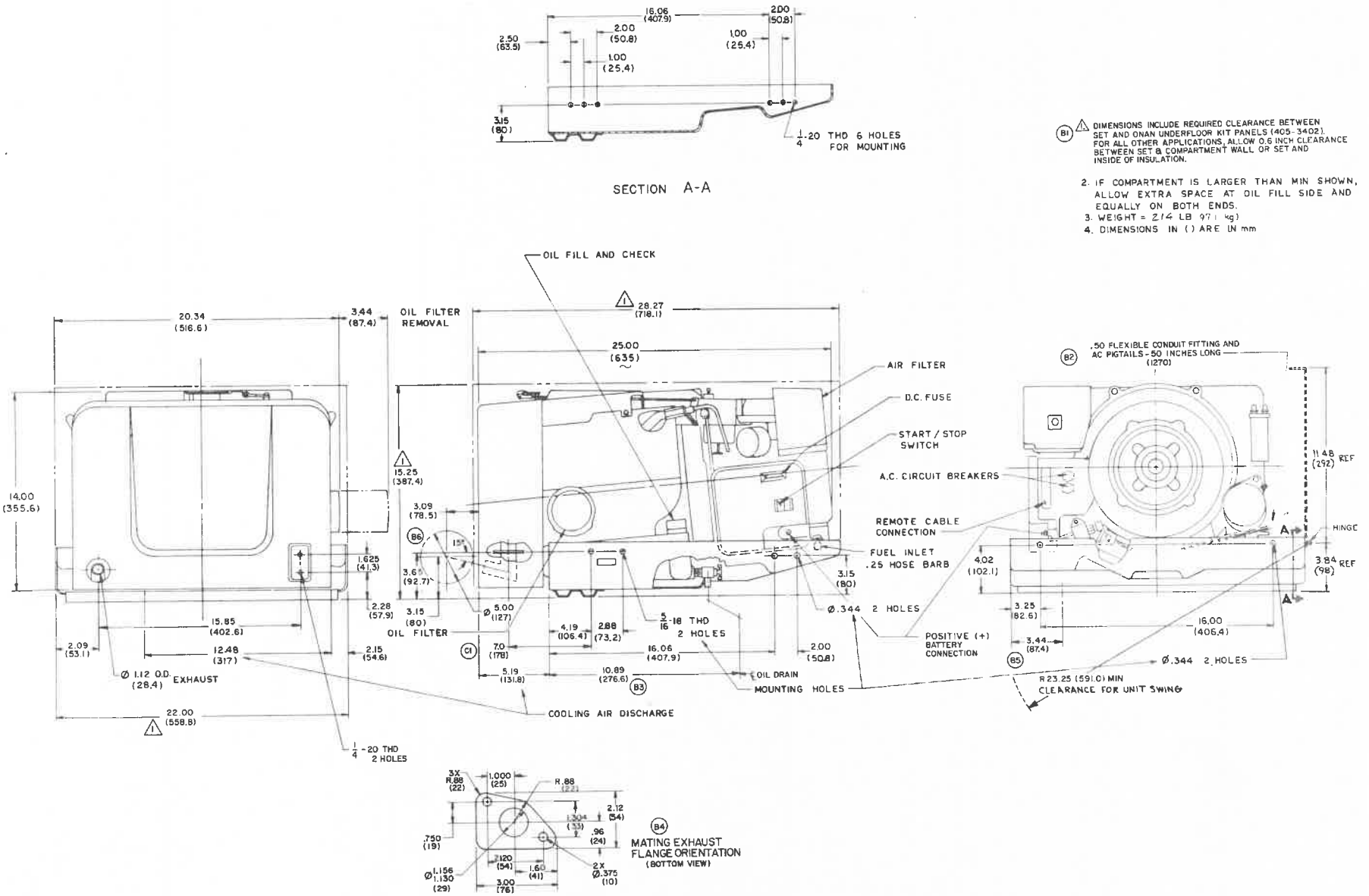

FIGURE 5. UNDER-FLOOR MOUNT (BGE SHOWN)

Ventilation and Acoustics

VENTILATION

The most important factors of ventilation for an RV air-cooled generator set are sufficient incoming air (for combustion and cooling) and adequate exhausting of heated air. All Onan generator sets for recreational vehicles use Vacu-Flo® cooling.

A centrifugal fan in a scroll housing on the engine (Figure 6) draws air from the generator end of the compartment, through the generator (generator also has a cooling fan), and over the cooling surfaces of the engine, then discharges the heated air out through the Vacu-Flo® discharge opening.

Make sure nothing obstructs or restricts discharged airflow and that recirculation of air is minimal. A dust or noise deflector if added must be a minimum of 6 inches (150 mm) below the generator set and open on three sides.

⚠WARNING ***Exhaust gas presents the hazard of severe personal injury or death. Since discharged cooling air can contain some exhaust gas, never use discharged cooling air for heating.***

The free air inlet area is critical for proper generator set operation and cooling. A minimum free air inlet area of 85 in² (548 cm²) with no restrictions is required. Reference: the generator set air discharge rate is 480 ft³/min (13.6 m³/min).

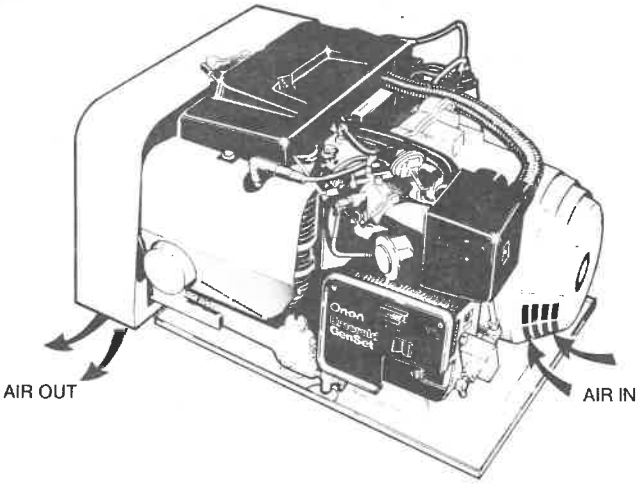

FIGURE 6. VACU-FLO® COOLING SYSTEM

When planning the air inlet to the generator set, allow for airflow restrictions caused by grilles and duct work. Some expanded metal grilles provide only 60 percent free air inlet area per square foot. Even the most efficient grille only provides about 90 percent free inlet area per square foot. The free inlet area of the material can be obtained from the material supplier. Multiply the grille area times the percent of free area of the grill to obtain the free inlet area.

Inlet air ducting should provide a direct free-airflow path to generator set, with minimal bends; and materials used should 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 might result due to vapor locking (gasoline fuel), hot combustion air, etc.

⚠WARNING ***Fuel or fuel leakage presents 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. Compartments must be vapor-tight to the vehicle interior to keep fumes from entering the vehicle.***

To obtain the 85 in² (548 cm²) free air inlet area, Onan recommends bringing in cooling air through the recreational vehicle skirt. This can be accomplished by using the access door, ducting into the generator end from the side wall, or using the horizontal area between the recreational vehicle skirt and the generator set along with the vertical area (if road splash is not a problem —see the *MOUNTING* section). See Figure 7 for reference to these areas. If the skirt of the vehicle does not extend to or below the top of the generator set drip tray, provide an extension.

You can bring air from under the coach for cooling. However, run tests while the recreational vehicle is both parked and while the vehicle is moving at highway speeds to ensure proper cooling with this method. A temperature rise of 8°F (4.4°C) between the outside ambient and air in the top openings of the generator housing is acceptable.

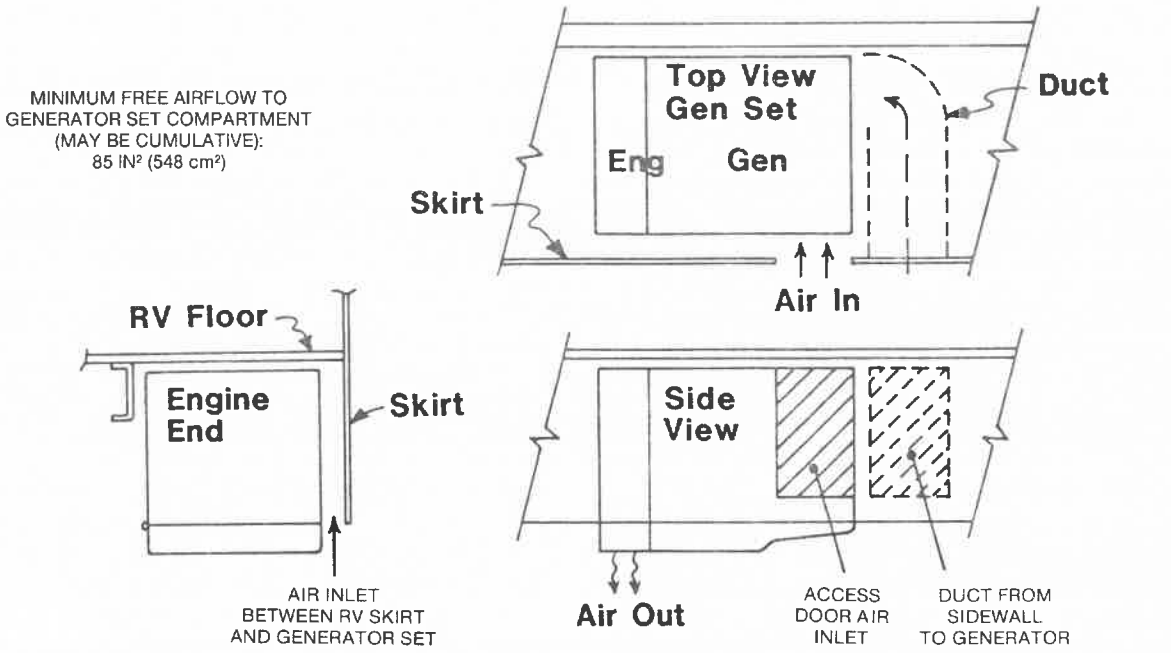

FIGURE 7. AIR INLET ALTERNATIVES FOR UNDER-FLOOR MOUNT GENERATOR SET.

ACOUSTICS

The Onan housing kit for the under-floor mount generator set contains acoustical material to minimize noise. Additional insulation is not necessary. If, however, you are constructing your own compartment or housing, use the following guidelines.

For the conventional compartment mount, if compartment penetrates floor, be sure all joints and corners of the compartment are vapor-tight to the interior. Lining the compartment is less effective if openings, cracks, doors, and joints are not sealed. Also, seal compartment door edge to eliminate noise leaks around the door perimeter.

Cover the sound reflective surfaces, back, top and sides (not compartment base) with fiberglass or other self-extinguishing acoustical material. Acoustical material and adhesive should be rated for use at 200°F (90°C) minimum.

Rather than using one single material, a combination of materials can reduce noise considerably. For instance, a sheet of lead or viscoelastic material and a layer of acoustical materials is more effective than either alone.

To reduce line of sight noise, a sound panel (baffle) should be added behind the air inlet. The panel must be spaced to allow for minimum free air inlet of 85 in² (548 cm²).

Refer to Figure 8 to aid your generator set compartment design and noise reduction plans. Size ducting to ensure that minimum free airflow of 85 in² (548 cm²) is still attained after acoustical material is added.

⚠WARNING ***High temperatures in the compartment can present the hazard of fire which can result in severe personal injury or death. To meet ANSI and CSA temperature rise requirements for recreational vehicles, insulation must not reduce the 0.6 inch (15 mm) clearance specified.***

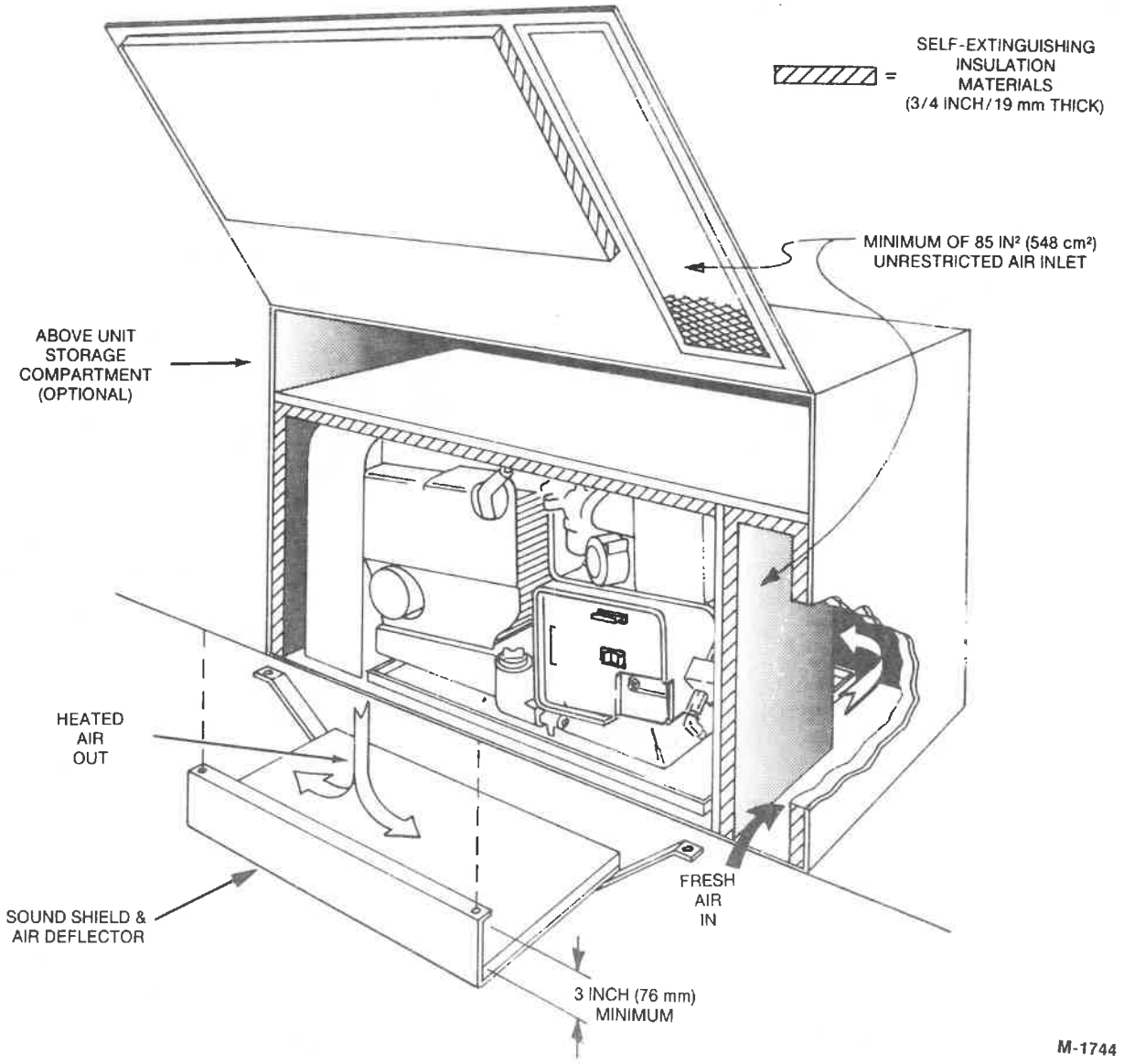

FIGURE 8. NOISE REDUCTION - COMPARTMENT DESIGN RECOMMENDATION

Exhaust System

GENERAL

Plan each individual exhaust system carefully. A proper installation is not only vapor-tight, but usually quieter and safer too. Be sure to check all applicable standards, local codes and regulations.

Refer to the following text and Figure 9 for recommendations to follow when installing the exhaust system. Then refer to the installation instructions supplied with the exhaust system kit for specific mounting procedures. See Figures 10 and 11 for examples of exhaust kit options.

MUFFLER RECOMMENDATIONS

Onan supplied muffler/spark arresters are forest service approved and meet code requirements. (Failure to provide and maintain a spark arrester can be in violation of the law.) Use only Onan approved mufflers.

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

EXHAUST INSTALLATION GUIDELINES

The exhaust system must be 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 or bumper of the vehicle. If the generator set tailpipe is on the same side of the coach as the compartment, try to terminate the tailpipe aft of the generator set air intake to reduce the possibility of exhaust recirculation, by directing the exhaust down and to the rear.

To reduce the possibility of damaging the tailpipe and emitting exhaust gases under the vehicle, be sure no part of the exhaust system intrudes into the departure angle or approach angle unless it is adequately protected by a skid bar or other protection device. See shaded areas in Figure 9 for typical mounting locations.

⚠WARNING ***Inhalation of exhaust gases can result in severe personal injury or death. Do not mount any portion of the exhaust system into the departure angle or approach angle unless it is adequately protected. Use sufficient number of hangers to prevent dislocation of the system.***

⚠WARNING ***Exhaust gas presents the hazard of severe personal injury or death. Use only Onan specified exhaust equipment with generator set and support the system per kit instructions.***

⚠WARNING ***Exhaust gas presents the hazard of severe personal injury or death. Do not terminate exhaust gas under vehicle. Do not terminate exhaust gas under vehicle. Do not terminate exhaust system directly under any vent, window, or opening which can be opened and which is not permanently sealed from the vehicle living space. Keep all openings closed when the generator set is running.***

⚠CAUTION ***Excessive exhaust back pressure can cause engine damage. If 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 since water vapor from one engine can damage the other.***

TAILPIPE RECOMMENDATIONS

An exhaust tailpipe is NOT supplied because of variation in length requirements between motor home manufacturers. After muffler is installed and prior to installing exhaust tailpipe, refer to the following recommendations for additional tips and safety considerations.

Use 1-3/8 inch I.D. 18 gauge rigid steel tubing for tailpipe. Use stainless steel tubing for extended tailpipe life.

⚠WARNING ***Exhaust gas presents the hazard of severe personal injury or death. Do not use flexible exhaust tailpipe since it can leak or break due to road shock or vibration. Do not terminate 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 clamps marked 1-3/8 and double rubber, U-shaped shock mounted hangers for supporting the exhaust system. If tailpipe extends beyond 1-1/2 feet (0.46 m) from muffler, attach one or more automotive tailpipe hangers for additional support. The exhaust system must be supported at or near the perimeter of the vehicle to prevent the pipe from being damaged and pushed up under the skirt.

⚠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 usefulness of exhaust system components. Mount muffler and tailpipe hanger brackets directly above the component support, not at an angle. Do not twist the rubber sections of any hangers.***

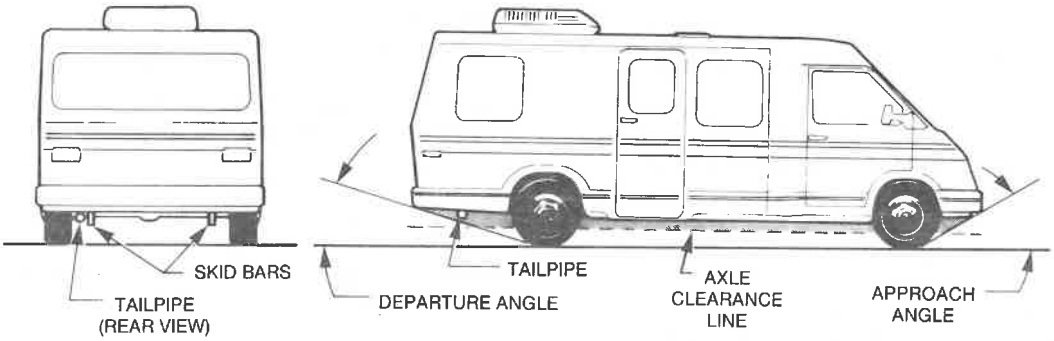

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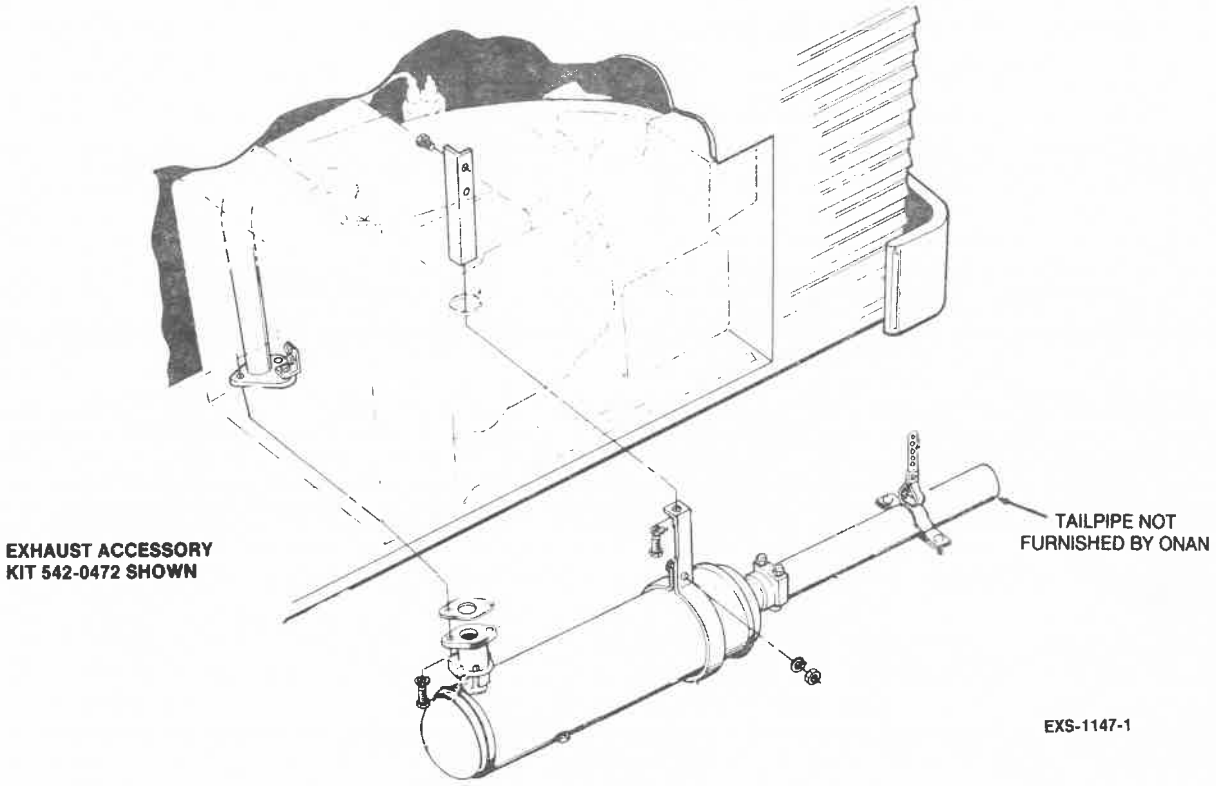
FIGURE 9. TAILPIPE INSTALLATION



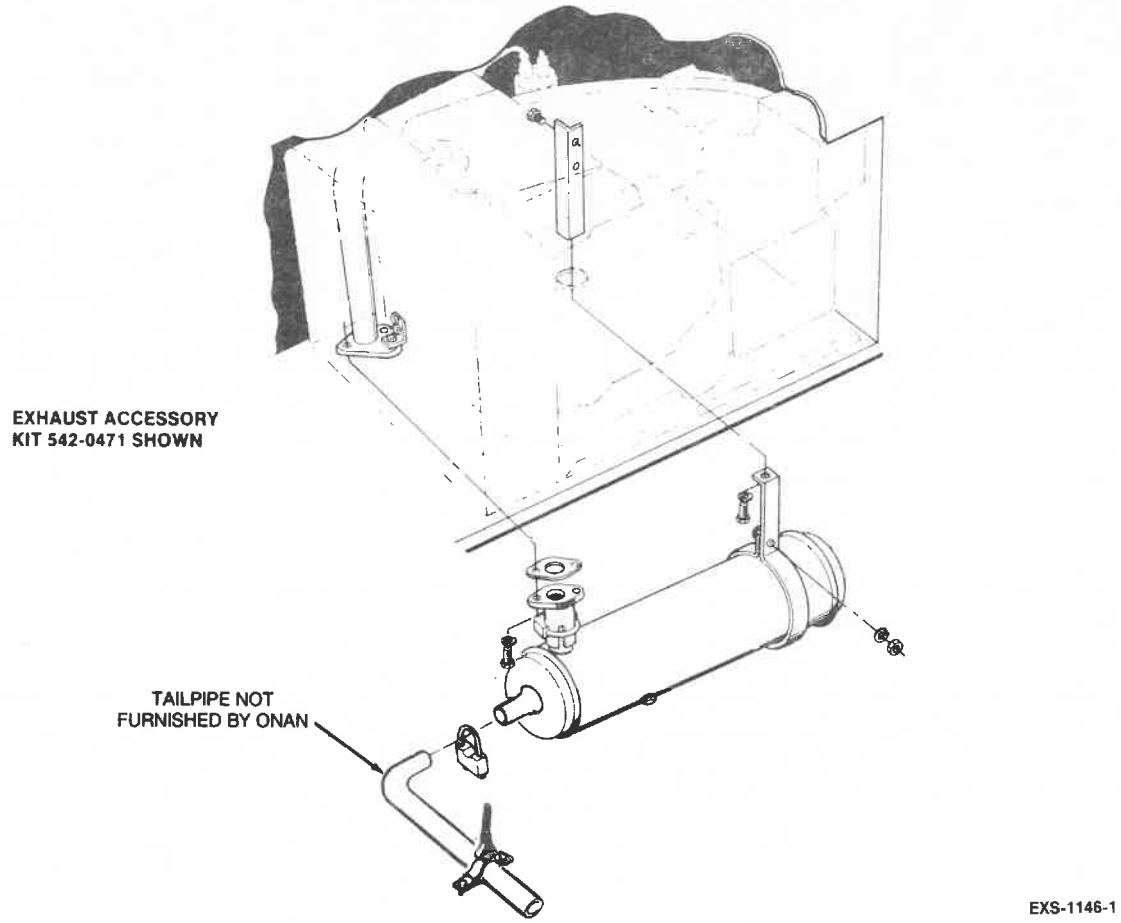
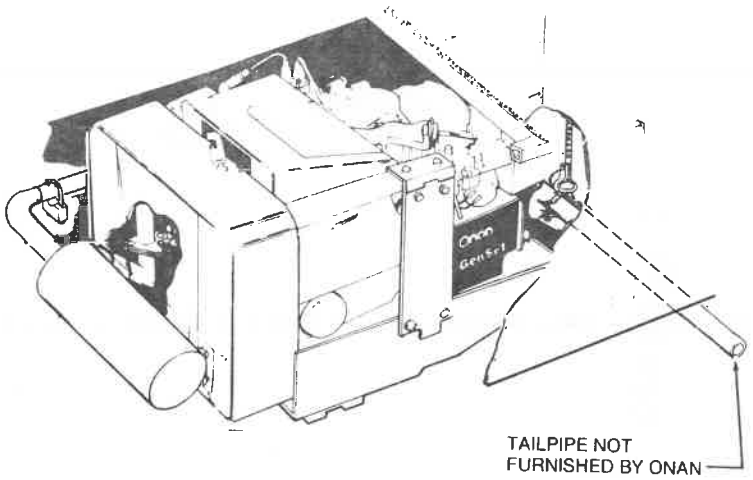
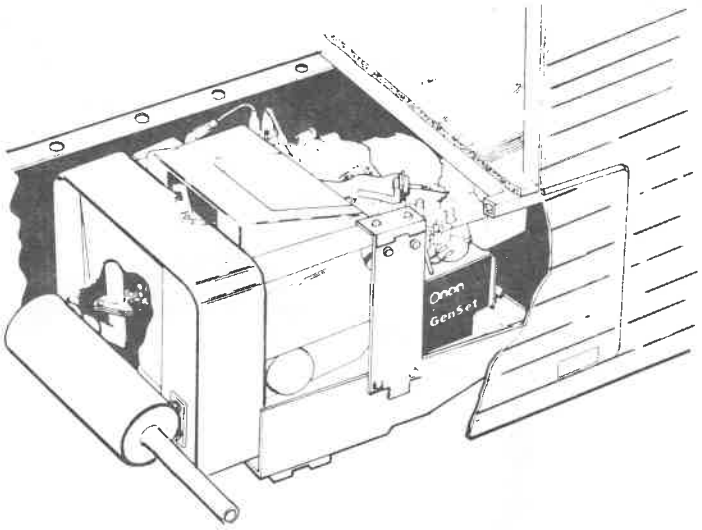


FIGURE 10. EXHAUST SYSTEM KIT EXAMPLES FOR CONVENTIONAL COMPARTMENT MOUNT GENERATOR SET

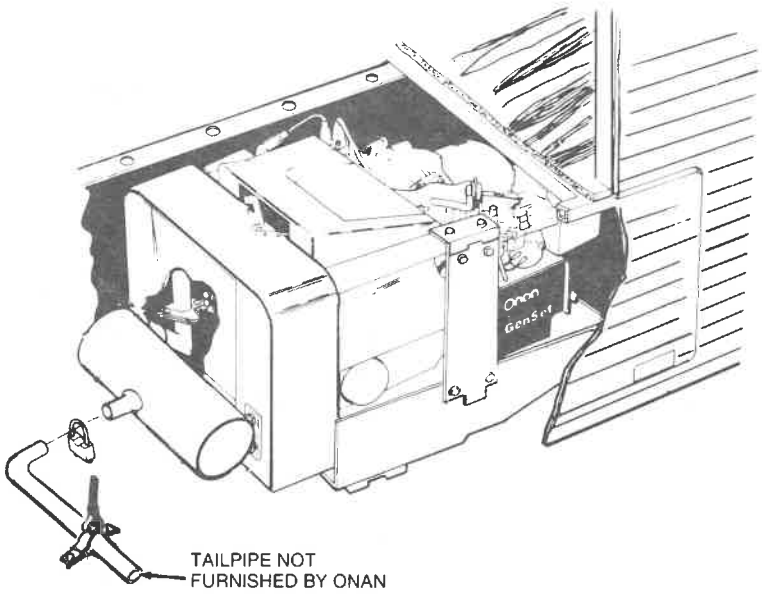
EXHAUST ACCESSORY
KIT 542-0482 SHOWN



EXHAUST ACCESSORY
KIT 542-0469 SHOWN



EXHAUST ACCESSORY
KIT 542-0470 SHOWN



EXS-1172

FIGURE 11. EXHAUST SYSTEM KIT EXAMPLES FOR UNDER-FLOOR MOUNT

Fuel System

GENERAL

This installation manual covers gasoline and LPG (liquid-propane gas) fuel systems. The Onan BGE and NHE models are gasoline-fueled, and the Onan BGEL and NHEL models are liquid LPG fueled. Separate procedures are given for each.

⚠WARNING ***Fuel presents the hazard of fire or explosion which can result in severe personal injury or death. Do not allow any spark, pilot light, lit cigarette, or other ignition sources in the installation area. Keep a type ABC fire extinguisher nearby. The ventilation system of the installation area 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 the vehicle interior.***

GASOLINE FUEL SYSTEM

Fuel System Provisions

Generator set installations may be designed to share the vehicle fuel supply tank with the vehicle engine. All connections to the vehicle fuel tank must be done in accordance with chassis (vehicle) manufacturer's detailed installation instructions. See Fuel Line Installation.

The generator set includes a fuel shut-off valve as a safety feature and is an integral part of the fuel pump. Should the vehicle fuel tank become pressurized, the positive fuel shut-off prevents flooding of the generator set when the set is not operating.

For the possibility of contaminated fuel, Onan recommends an in-line fuel filter.

To aid future set maintenance or servicing, Onan also recommends installing an in-line manual shutoff valve.

Recommended Fuel

Use clean, fresh, unleaded or regular grade gasoline. Using unleaded gasoline results in extended periods between service, longer spark plug life, and reduced carbon clean-out maintenance. If regular gasoline is used, lead deposits must be removed from the cylinder heads as required to alleviate engine power loss. Unleaded gasoline may be safely used after lead deposits have been removed.

⚠CAUTION ***Do not alternate between leaded (regular) and unleaded gasoline. Lead deposits can cause engine damage if not removed before using unleaded gasoline.***

Fuel Consumption

It should be noted that under varying electrical loads, fuel consumption of engines for recreational vehicle generator sets varies accordingly.

GASOLINE FUEL CONSUMPTION

Model	No Load	Half Load	Full Load
60 Hz-BGE	0.4 gal/hr (1.5 l/hr)	0.6 gal/hr (2.3 l/hr)	0.8 gal/hr (3.0 l/hr)
50 Hz-BGE	0.35 gal/hr (1.3 l/hr)	0.53 gal/hr (2.0 l/hr)	0.73 gal/hr (2.8 l/hr)
60 Hz-NHE	0.4 gal/hr (1.5 l/hr)	0.7 gal/hr (2.5 l/hr)	1.3 gal/hr (4.9 l/hr)
50 Hz-NHE	0.35 gal/hr (1.3 l/hr)	0.57 gal/hr (2.2 l/hr)	0.8 gal/hr (3.0 l/hr)

Fuel Line Installation

Recreational vehicle fuel systems are designed to operate in a critical pressure range. It is very important during the installation of the generator set that the vehicle fuel supply design NOT be altered. The fuel fill tube, fill limiter vent, vapor canister, vapor lines and gas fill cap should never be changed, removed or replaced without PRIOR approval from the vehicle manufacturer. Check the filler cap to ensure that the pressure vacuum relief valve is functioning properly. Replace if required.

If 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 tank so the vehicle can still be run, after generator runs out of fuel.

Do NOT tee off the vehicle fuel line. Doing so may cause poor operation of the generator or the vehicle. Consult with vehicle manufacturer for further specifics regarding a shared fuel supply. Unauthorized fuel system modifications could result in dangerous operating conditions.

⚠CAUTION ***Connecting the generator set fuel line with a tee to the main fuel line will 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. Use a separate fuel line for the generator set.***

⚠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.***

Install an approved, flexible non-metallic (non-conductive) and non-organic fuel line between the vehicle fuel system and the generator set to absorb vibration. Onan recommends using a 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 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. This reduces chance of vaporlock. Install lines so that they are accessible and protected from damage. Use metal straps without sharp edges to secure them.

Flexible line must be long enough to allow for set movement in order to prevent binding, stretching or breaking.

PROPANE (LPG) FUEL SYSTEM

Fuel System Provisions

Onan liquid LPG generator sets contain a filter cartridge and magnet in the fuel solenoid valve to protect the solenoid valve and regulator valves from dirt and contaminants. The solenoid valve and filter is shown in Figure 12. Figure 13 shows the flow diagram for the liquid LPG fuel system components used on the generator set.

Generator set operation using liquid LPG is very sensitive to altitude, temperature, and BTU content of the gas. Variation in any one of these factors directly affects the performance of the generator set. Because of this, minor adjustments might be required after the installation, refer to Generator Set Service Manual if adjustments are required.

Recommended Fuel

Use clean, fresh commercial propane or HD-5 grade liquid propane gas in a mixture of at least 90 percent propane. Propane fuels other than HD-5 grade can contain more than 2.5 percent butane and can result in poor fuel vaporization and poor engine starting in low ambient temperatures (below 32°F or 0°C).

Fuel Consumption

It should be noted that under varying electrical loads, fuel consumption of engines for recreational vehicle generator set varies accordingly. Average fuel consumption at various loads is shown in the table following.

LPG FUEL CONSUMPTION

Model	No Load	Half Load	Full Load
60 Hz-BGEL	0.5 gal/hr (1.9 l/hr)	0.8 gal/hr (3.0 l/hr)	1.3 gal/hr 4.0 l/hr)
50 Hz-BGEL	0.4 gal/hr (1.5 l/hr)	0.65 gal/hr (2.5 l/hr)	0.98 gal/hr (3.7 l/hr)
60 Hz-NHEL	0.65 gal/hr (2.5 l/hr)	1.05 gal/hr (4.0 l/hr)	1.7 gal/hr (6.4 l/hr)
50 Hz-NHEL	0.5 gal/hr (1.5 l/hr)	0.78 gal/hr (3.0 l/hr)	1.18 gal/hr (4.5 l/hr)

Propane Fuel Lines and Supply Tank

The installer must review all codes that apply to the particular installation. Paragraph 3-5.1 (Gas Piping Systems) of NFPA Pamphlet 501C deals specifically with propane fuel lines but does not necessarily cover all applicable codes and regulations. You can obtain this pamphlet from the address listed in the beginning of this manual.

When installing the fuel lines, keep the following in mind:

1. Install all propane fuel lines so they are accessible, yet protected from damage.

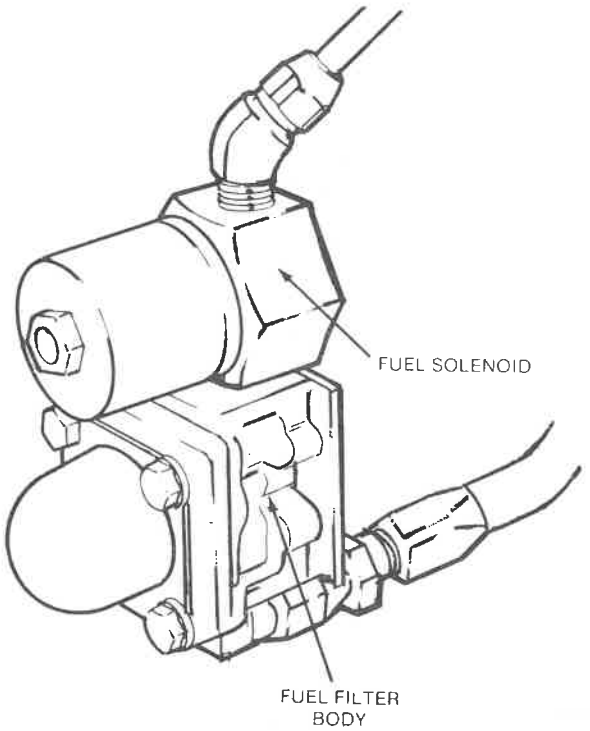


FIGURE 12. FUEL SOLENOID VALVE AND FILTER

2. Use metal straps without sharp edges to secure fuel lines.
3. Keep fuel lines away from hot engine or exhaust areas.
4. Do NOT run fuel lines in conjunction with electrical wiring.

Most propane (LPG) liquid withdrawal generator set installations are designed to share the vehicle propane fuel supply tank(s). The vehicle propane fuel supply tank MUST have a dip tube to ensure liquid withdrawal.

An excess flow valve MUST be mounted internal to the propane fuel supply tank(s) per NFPA 501C, Paragraph 3-4.4. This excess flow valve and propane fuel lines MUST be sized so the excess flow valve will close with a completely severed (broken) propane fuel line. For operation at the lowest ambient temperature, a valve rated at 2.6 gallons per hour (9.9 l/hr) flow rate and 6.5 pounds per square inch (45 kPa) differential pressure is recommended. Consult the Natural LP Gas Association for the limitations of excess flow valves.

Install an approved flexible non-metallic (non-conductive) and non-organic fuel line between the vehicle fuel system and the generator set to absorb vibration. Onan recommends using a seamless steel tubing and flared connection for long runs between the fuel tank and the flexible connector to the generator set.

A manual shut-off valve MUST be mounted on the propane fuel supply tank. This supply tank valve MUST be fully open when operating the generator set to ensure the excess flow valve will close with a severed (broken) propane fuel line.

A hydrostatic pressure relief valve MUST be installed between the propane fuel supply tank manual shut-off valve and the propane fuel solenoid valve and filter assembly.

This relief valve protects the propane fuel line from pressure buildup if both the supply tank manual shut-off valve and the fuel solenoid valve are closed at the same time.

Testing Fuel System for Leaks

The completed propane fuel system installation MUST be checked and tested for leaks before the generator set is operated. The fuel solenoid MUST be energized from a separate 12 volt DC source before testing the fuel system for leaks. The test MUST conform to procedures listed in NFPA-58, Paragraph 318, or NCTI (US Testing) recommended test procedure as follows:

After assembly and prior to initial operation, all fuel system connections, hose, valves, regulators, and fittings must be tested and proven free of any leaks using a soap and water or equivalent solution while the system is under a gas or air pressure of not less than 90 pounds per square inch (620 kPa).

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

⚠WARNING ***Liquid LPG fuel presents the hazard of explosion or fire which can result in severe personal injury or death. Do not allow any spark, flame, pilot light, lit cigarette, or other ignition sources in the installation area.***

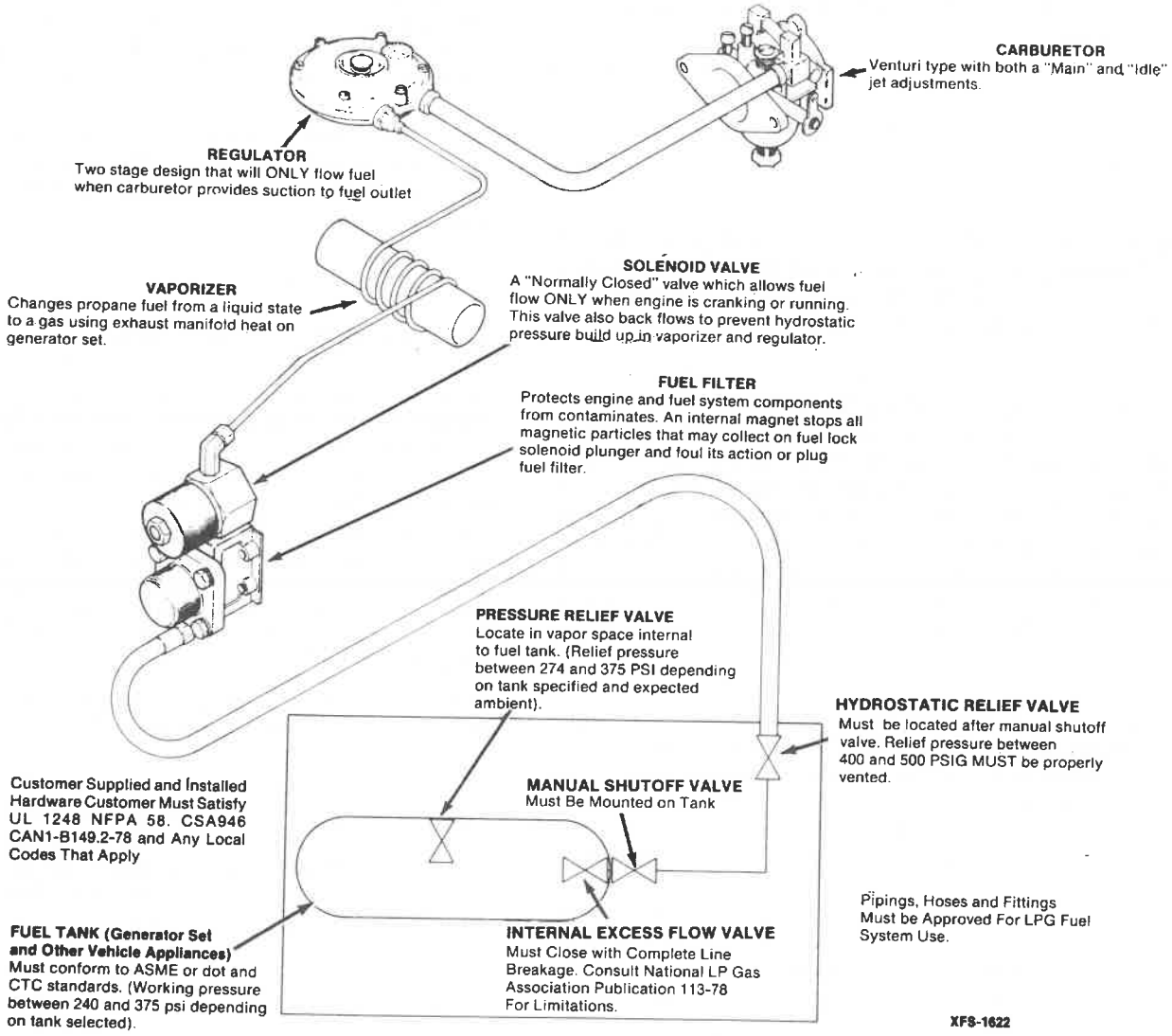


FIGURE 13. FLOW DIAGRAM OF LIQUID LPG FUEL SYSTEM

Electrical Connections

All wiring must meet applicable local electrical codes. Accordingly, have a qualified electrician 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 conductors of the generator set must have an ampere rating not less than 115 percent of the nameplate current rating of the generator. The Onan-supplied AC feeder conductor insulation is rated at 125°C. Wires connected to the Onan feeder conductors must meet this insulation rating, or must be of a larger wire 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 procedure must comply with codes.

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

- **Rubber (with a 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.**

Conduit

Install generator load conductors supplied with the generator set in a flexible metallic conduit. Cut conduit to desired length, leaving extra wire as required for the junction box (connecting wires must be appropriately sized and insulated for the specified current rating). Prepare ends of conduit to prevent sharp edges from cutting wire insulation.

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 within the junction box or panelboard. Flexible metal conduit is not vapor-tight along its length due to its unique 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.***

Run conduit in such a way as not to interfere with the movement of the set. This is especially pertinent to the under-floor installation in which the set must be free to move.

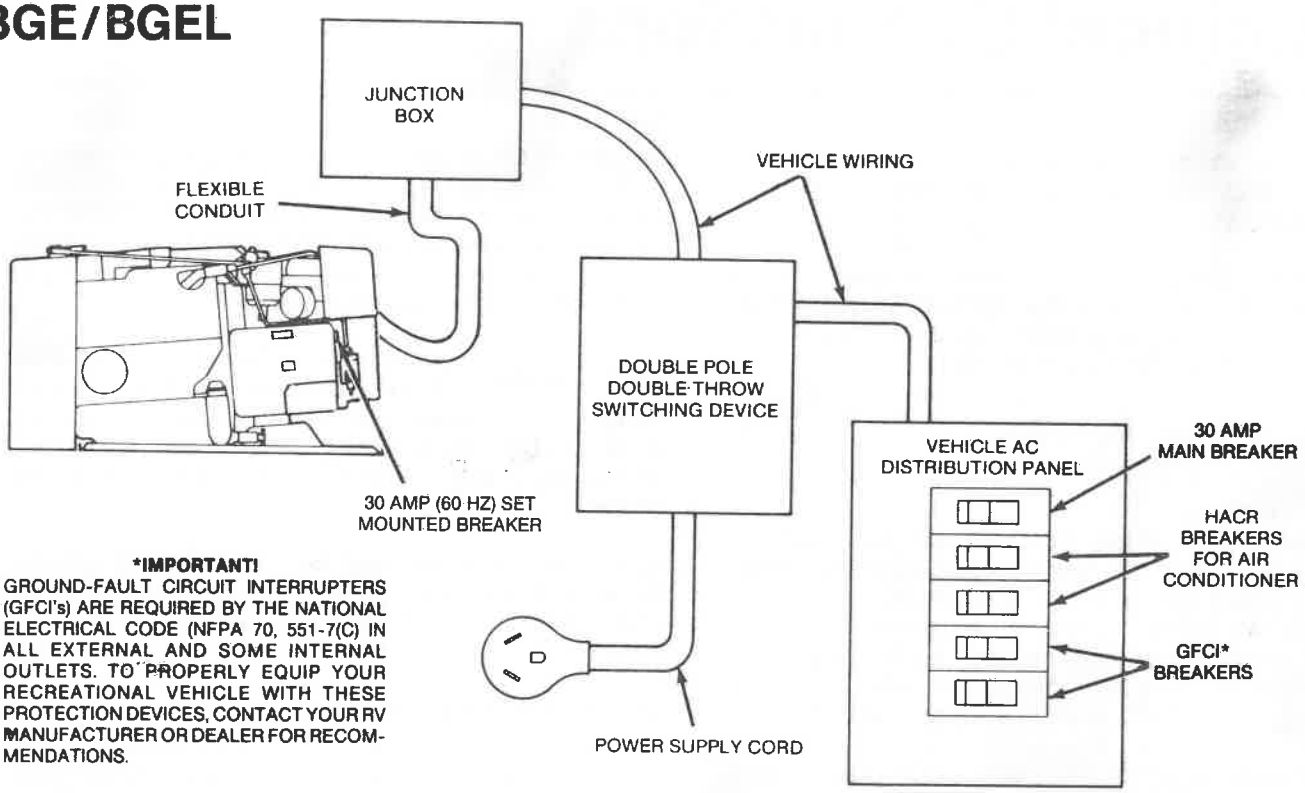
Wiring Disconnect Method

The feeder conductors from the set compartment must terminate in a properly sized double-pole, double-throw positive off switching device before the vehicle distribution panel, or connect to a generator set receptacle box. This assures the outside power source cannot be connected simultaneously with the generator set. Figures 14 and 15 illustrate possible wiring connections. Figures 16, 17, 18, and 19 show generator set wiring diagrams and schematics.

⚠WARNING ***Improper wiring can result in fire and severe personal injury or death. Do not allow contact between electrical wiring and the fuel line.***

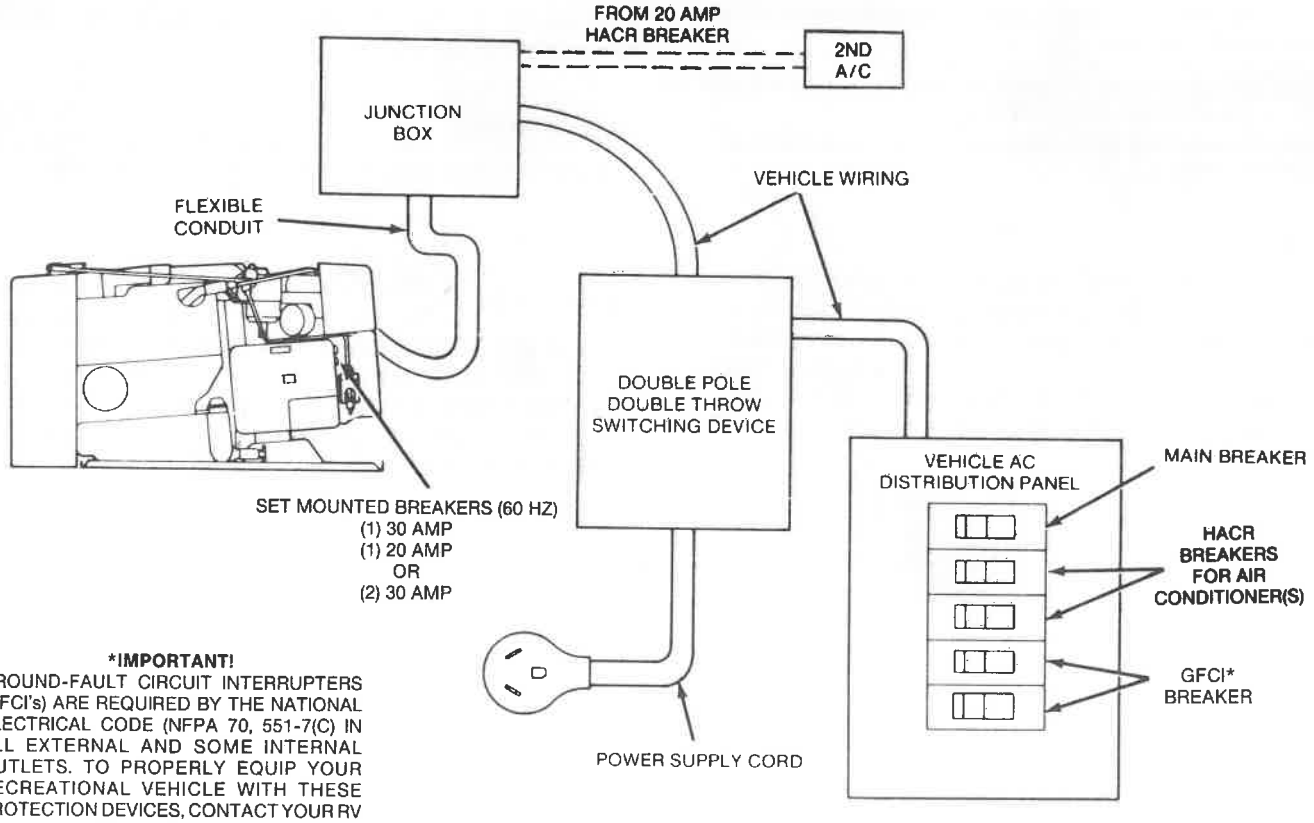
⚠WARNING ***Electrical shock can result in severe personal injury or death. Properly applied and maintained ground fault interrupters can afford additional protection against the hazard of electrical shock. Equip the recreational vehicle with adequate ground fault protection devices to meet the National Electrical Code NFPA 70, 551-7 (C).***

BGE/BGEL



***IMPORTANT!**
GROUND-FAULT CIRCUIT INTERRUPTERS (GFCI's) ARE REQUIRED BY THE NATIONAL ELECTRICAL CODE (NFPA 70, 551-7(C) IN ALL EXTERNAL AND SOME INTERNAL OUTLETS. TO PROPERLY EQUIP YOUR RECREATIONAL VEHICLE WITH THESE PROTECTION DEVICES, CONTACT YOUR RV MANUFACTURER OR DEALER FOR RECOMMENDATIONS.

NHE/NHEL



***IMPORTANT!**
GROUND-FAULT CIRCUIT INTERRUPTERS (GFCI's) ARE REQUIRED BY THE NATIONAL ELECTRICAL CODE (NFPA 70, 551-7(C) IN ALL EXTERNAL AND SOME INTERNAL OUTLETS. TO PROPERLY EQUIP YOUR RECREATIONAL VEHICLE WITH THESE PROTECTION DEVICES, CONTACT YOUR RV MANUFACTURER OR DEALER FOR RECOMMENDATIONS.

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FIGURE 14. SWITCHING DEVICE WIRING FOR UTILITY POWER (60 Hz SHOWN)

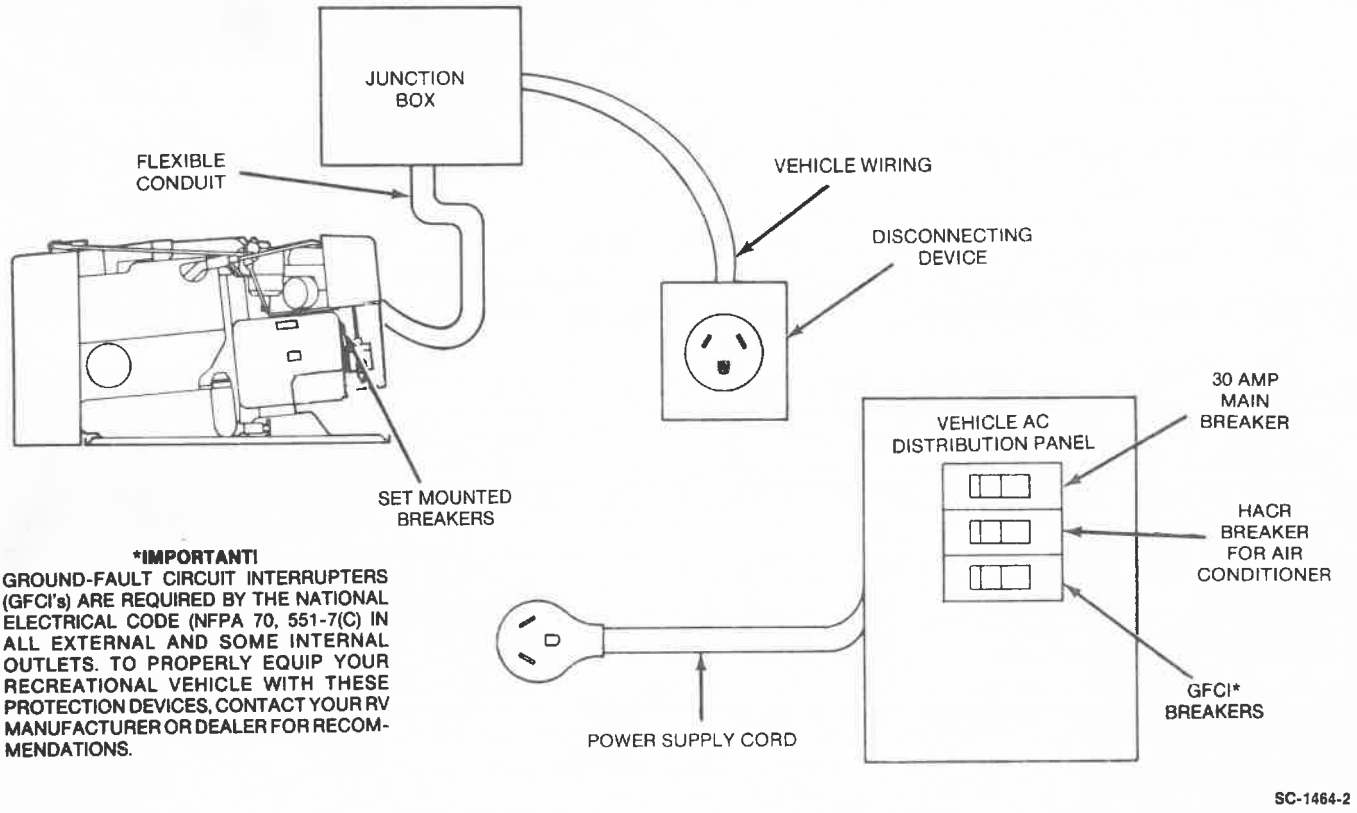
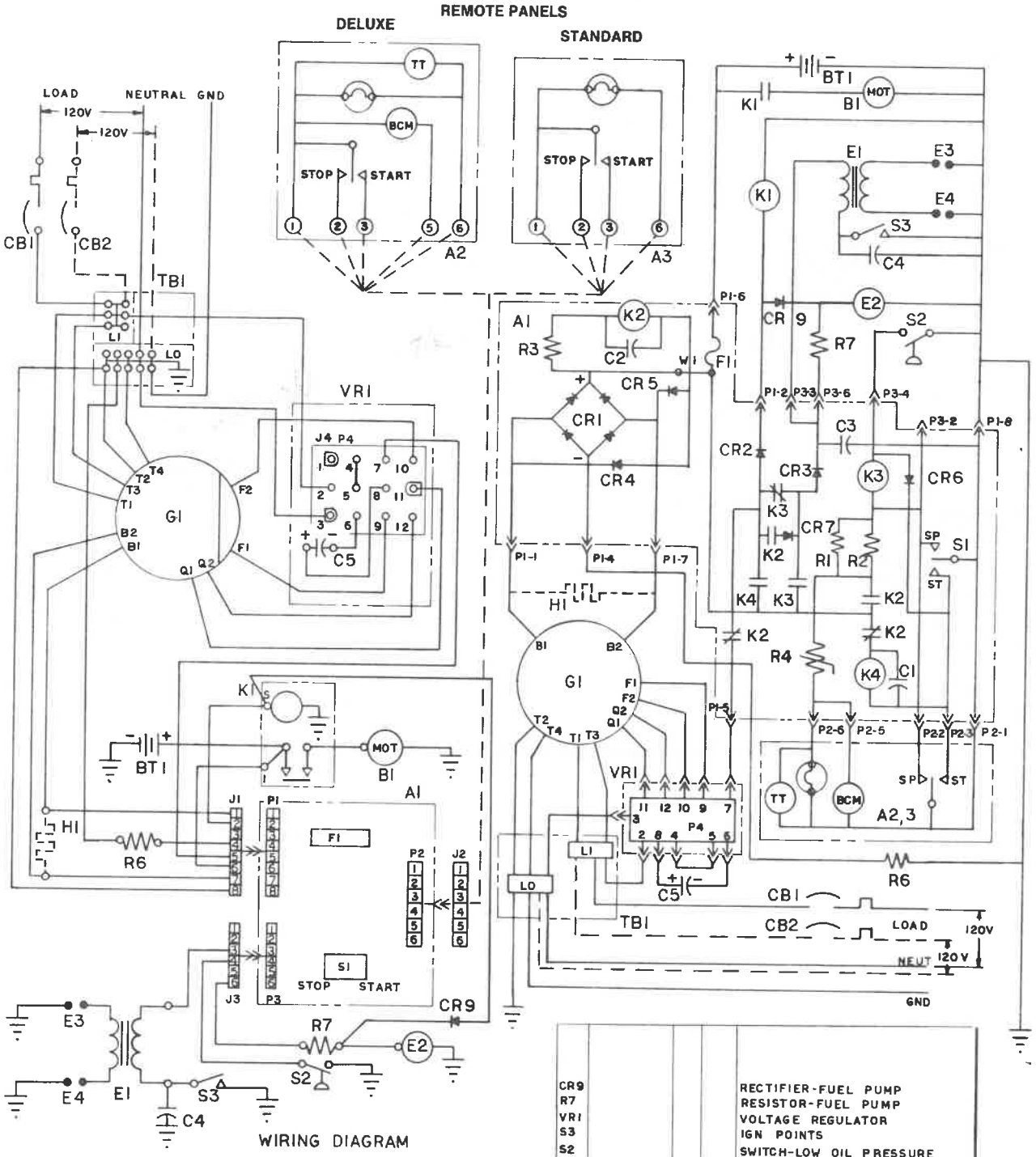


FIGURE 15. USING UTILITY POWER CORD FOR SWITCHING

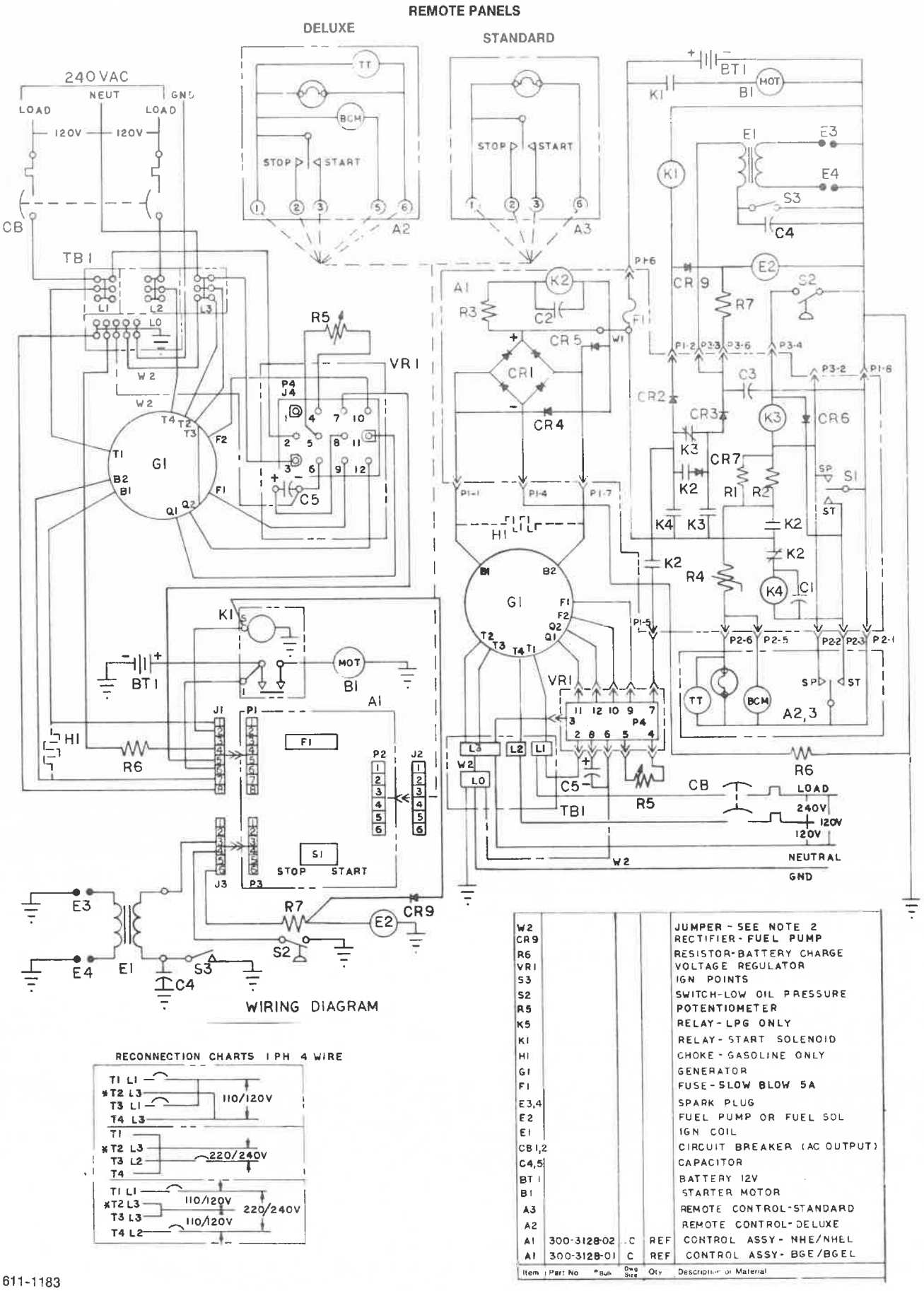


WIRING DIAGRAM

Item	Part No.	*Sub.	Dwg Size	Qty	Description or Material
CR9					RECTIFIER-FUEL PUMP
R7					RESISTOR-FUEL PUMP
VR1					VOLTAGE REGULATOR
S3					IGN POINTS
S2					SWITCH-LOW OIL PRESSURE
R6					RESISTOR-BATTERY CHARGE
K1					RELAY-START SOLENOID
H1					CHOKE
G1					GENERATOR
F1					FUSE
E3,4					SPARK PLUG
E2					FUEL PUMP
E1					IGN COIL
CB1,2					CIRCUIT BREAKER (AC OUTPUT)
C4,5					CAPACITOR
BT1					BATTERY 12V
B1					STARTER MOTOR
A3					REMOTE CONTROL-STANDARD
A2					REMOTE CONTROL-DELUXE
A1	300-3091-02	C		REF	CONTROL ASSY- NHE/NHEL
A1	300-3091-01	C		REF	CONTROL ASSY- BGE/BGEL

611-1180

FIGURE 16. 60 HZ BGE/NHE GENERATOR SET W.D/SCHEMATIC

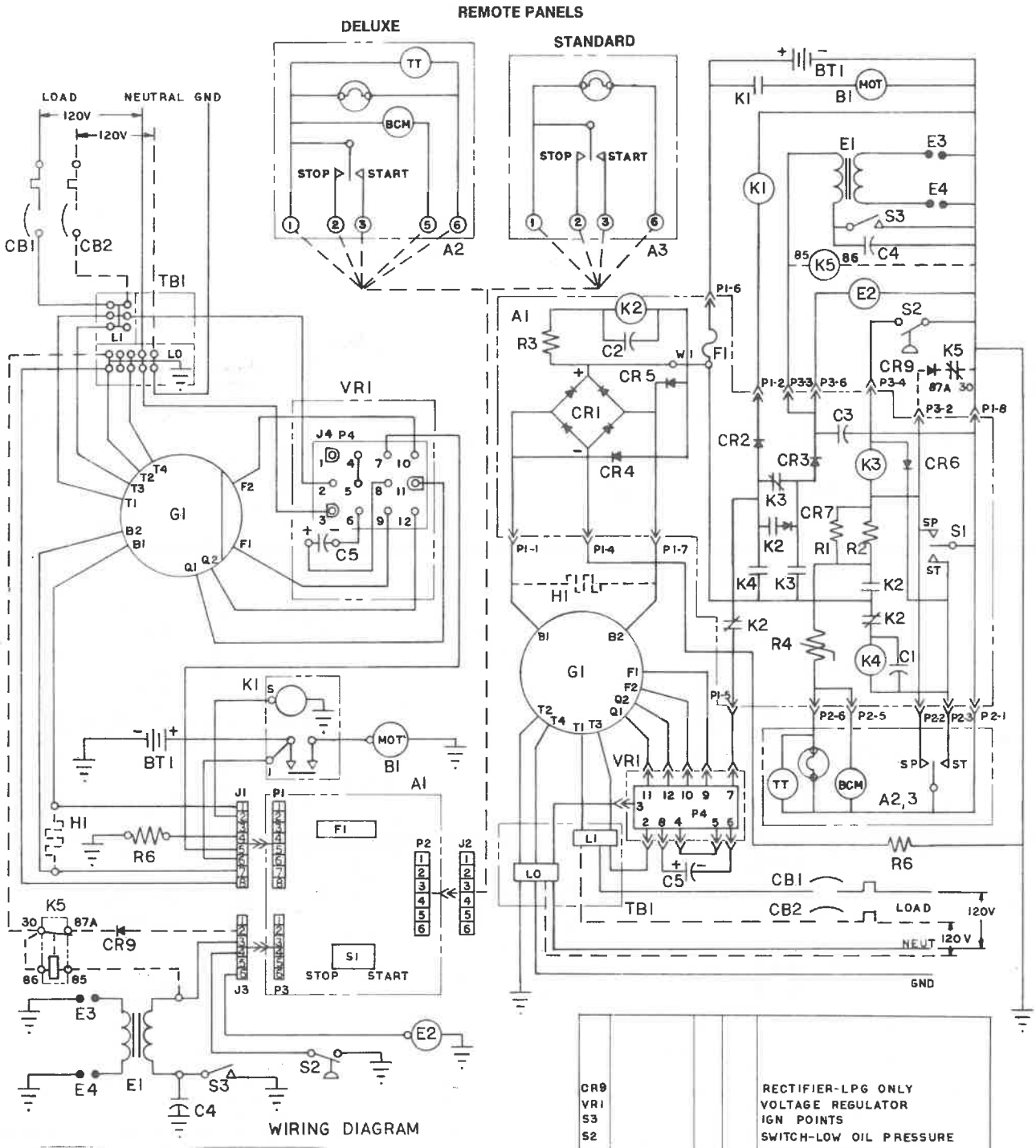


RECONNECTION CHARTS 1 PH 4 WIRE

Item	Part No	*	Dwg Size	Qty	Description or Material
W2					JUMPER - SEE NOTE 2
CR9					RECTIFIER - FUEL PUMP
R6					RESISTOR-BATTERY CHARGE
VR1					VOLTAGE REGULATOR
S3					IGN POINTS
S2					SWITCH-LOW OIL PRESSURE
R5					POTENTIOMETER
K5					RELAY - LPG ONLY
K1					RELAY - START SOLENOID
H1					CHOKE - GASOLINE ONLY
G1					GENERATOR
F1					FUSE - SLOW BLOW 5A
E3,4					SPARK PLUG
E2					FUEL PUMP OR FUEL SOL
E1					IGN COIL
CB1,2					CIRCUIT BREAKER (AC OUTPUT)
C4,5					CAPACITOR
BT1					BATTERY 12V
B1					STARTER MOTOR
A3					REMOTE CONTROL-STANDARD
A2					REMOTE CONTROL-DELUXE
A1	300-3128-02		C	REF	CONTROL ASSY - NHE/NHEL
A1	300-3128-01		C	REF	CONTROL ASSY - BGE/BGEL

611-1183

FIGURE 17. 50 HZ BGE/NHE GENERATOR SET W.D./SCHEMATIC



Item	Part No.	*Bulk	Dwg Size	Qty	Description or Material
CR9					RECTIFIER-LPG ONLY
VR1					VOLTAGE REGULATOR
S3					IGN POINTS
S2					SWITCH-LOW OIL PRESSURE
R6					RESISTOR-BATTERY CHARGE
K5					RELAY-LPG ONLY
K1					RELAY-START SOLENOID
H1					CHOKE-GASOLINE ONLY
G1					GENERATOR
F1					FUSE-SLOW BLOW 5A
E3,4					SPARK PLUG
E2					FUEL PUMP OR FUEL SOL
E1					IGN COIL
CB1,2					CIRCUIT BREAKER (AC OUTPUT)
C4,5					CAPACITOR
BT1					BATTERY 12V
B1					STARTER MOTOR
A3					REMOTE CONTROL-STANDARD
A2					REMOTE CONTROL-DELUXE
A1	300-3091-02		C	REF	CONTROL ASSY-NHE/NHEL
A1	300-3091-01		C	REF	CONTROL ASSY-BGE/BGEL

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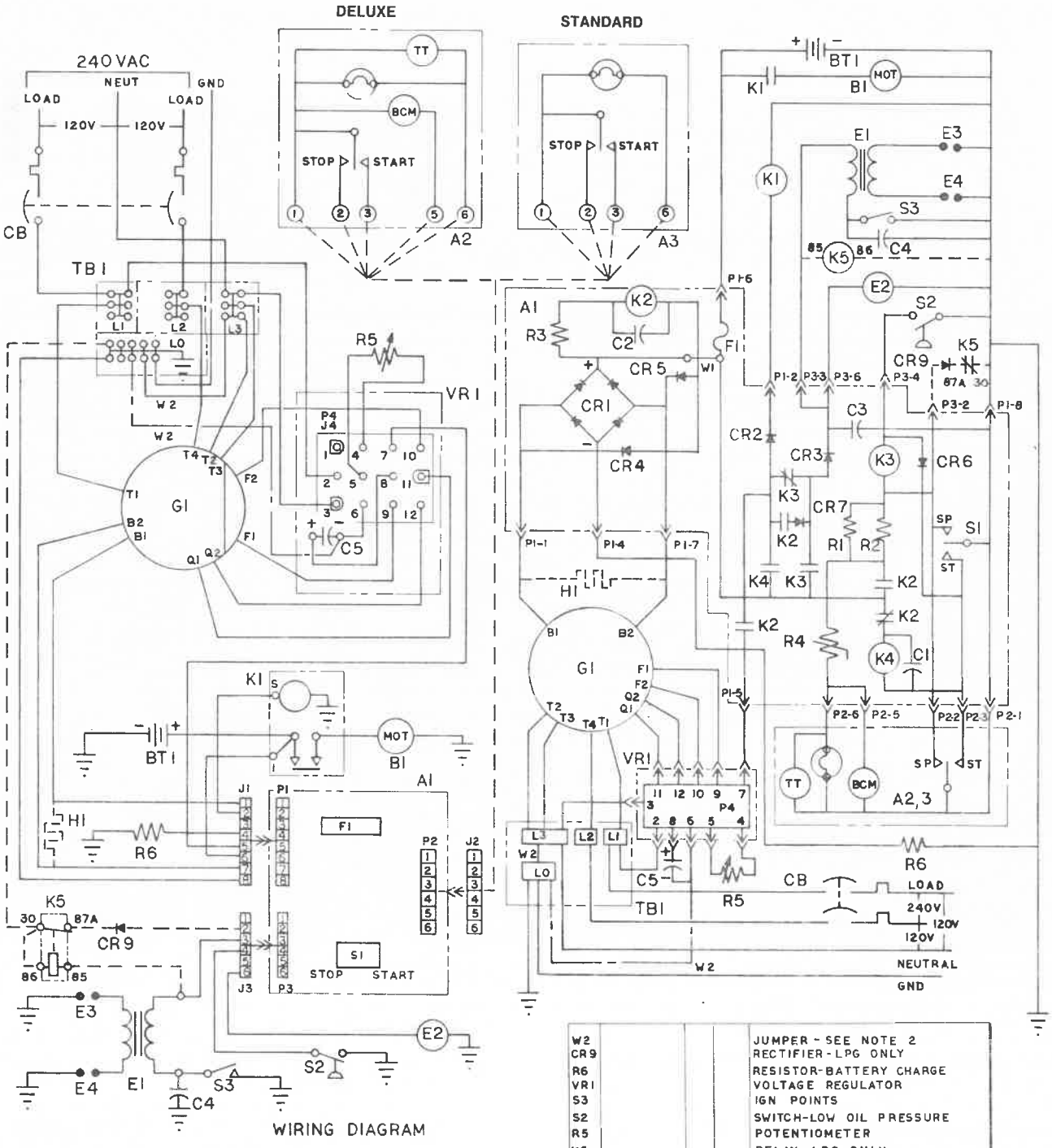
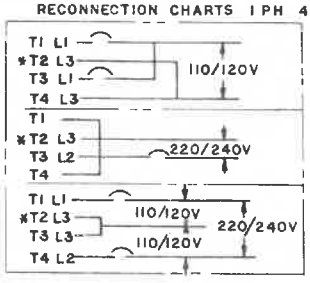
FIGURE 18. 60 HZ BGEL/NHEL GENERATOR SET W.D./SCHEMATIC



RECONNECTION CHARTS 1 PH 4 WIRE



Item	Part No.	*Sub.	Dwg Size	Qty	Description or Material
W2					JUMPER - SEE NOTE 2
CR9					RECTIFIER - LPG ONLY
R6					RESISTOR-BATTERY CHARGE
VR1					VOLTAGE REGULATOR
S3					IGN POINTS
S2					SWITCH-LOW OIL PRESSURE
R5					POTENTIOMETER
K5					RELAY - LPG ONLY
K1					RELAY - START SOLENOID
HI					CHOKE - GASOLINE ONLY
G1					GENERATOR
F1					FUSE - SLOW BLOW 5A
E3,4					SPARK PLUG
E2					FUEL PUMP OR FUEL SOL
E1					IGN COIL
CB1,2					CIRCUIT BREAKER (AC OUTPUT)
C4,5					CAPACITOR
BT1					BATTERY 12V
B1					STARTER MOTOR
A3					REMOTE CONTROL-STANDARD
A2					REMOTE CONTROL-DELUXE
A1	300-3128-02		C	REF	CONTROL ASSY - NHE/NHEL
A1	300-3128-01		C	REF	CONTROL ASSY - BGE/BGEL

611-1179

FIGURE 19. 50 HZ BGEL/NHEL GENERATOR SET W.D./SCHEMATIC

DC WIRING

Remote Control (Option)

The remote control kit options for your generator set are the Standard (300-1030) or the Deluxe (300-1031) models. The basic Standard remote control includes a start-stop switch and indicator lamp. The Deluxe model contains these items plus a running time meter and battery condition meter. See Figure 20.

A remote control plug-in jack is located on the right side of the control housing. Contact your Onan dealer for proper remote connector plug and wiring harness lead assembly.

Because the location of a remote control can vary by application or personal preference, further wiring to connect the generator set remote plug and lead assembly to the remote control is not supplied and must be fabricated at installation. Refer to kit instructions supplied with remote control for further installation information.

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 unique 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.***

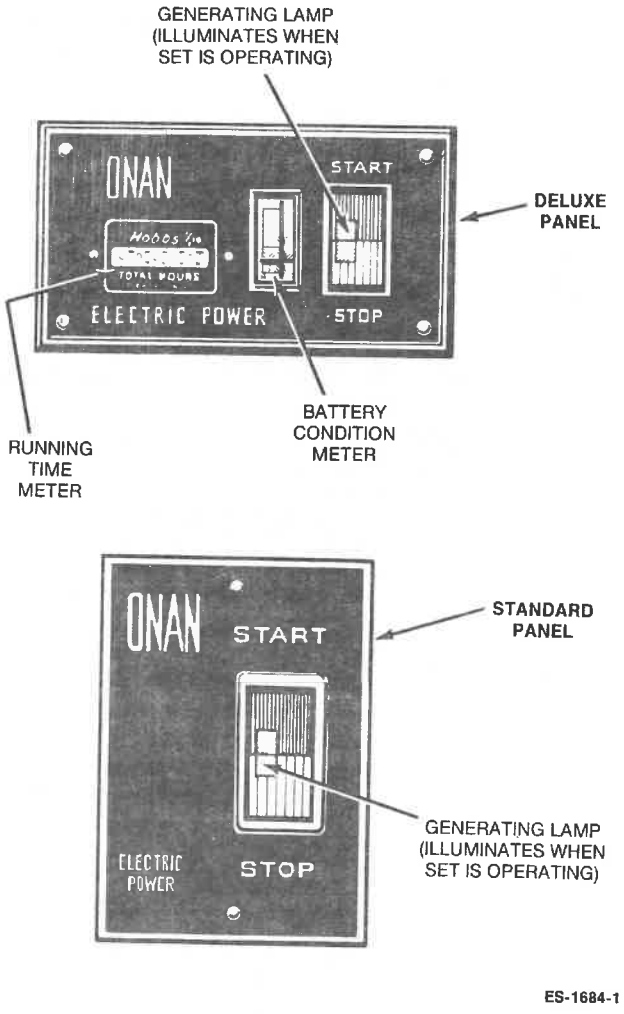


FIGURE 20. REMOTE CONTROL PANELS

Batteries and Connections

The generator set should crank sufficiently under various operating conditions. Before making any battery connections, choose a battery and cables which are appropriate for the anticipated application and devise an adequate battery installation area.

Battery and Cable Selection: Choose a battery that suits the generator set current rating. The starter has a current draw of 60 to 100 amperes. The inrush current is 300 to 400 amperes.

Consider application and weather conditions. For reliable cold weather starting, 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 the following tables to aid in determining cable size and battery rating.

Cables for Reliable Cold Weather Starting to -20°F (-29°C)

*CABLE LENGTH IN FEET (METRES)	CABLE SIZE
0-10 (0-3)	2**
11-15 (3-4.5)	0
16-20 (4.5-6)	000

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

Cold Cranking Amps for Minimum 12-Volt Battery*

ABOVE 32°F (0°C)	BELOW 32°F (0°C)
360 Cold Cranking Amps (Approx. 70 amp/hour)	450 Cold Cranking Amps (Approx. 95 amp/hour)

*** - Larger capacity batteries may be required if battery is also used to power other coach accessories.

Battery Compartment: Use a separate battery from the vehicle starting battery for the operation of the generator set. House the battery in its own compartment, away from the generator set and any spark-producing device. Mount the battery on a rigid support structure and in a location where leaks and accidental spills won't damage the set, battery, or vehicle.

Ensure that battery compartment design provides adequate ventilation to expel battery gases. Compartment drainage should also be a consideration of battery compartment design to allow for proper cleaning. Consult vehicle manufacturer for further specifics regarding battery compartment location and design.

⚠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 or any spark-producing device.***

Battery Connections: Make sure the frame connector (major frame member if possible) is sufficient to minimize resistance. Try to avoid connection at a weld or mechanical joint. For short distances, one negative battery cable can be used between the generator set and battery rather than separate cables to chassis ground.

Route the battery cables between the generator set and its starting battery. Ensure the cables are sufficient length, but do not connect to battery until instructed in Installation Checks and Start-Up section. Provide adequate support of battery cables to avoid abrasion wear due to vibrations when vehicle is in transit.

Positive (+) Battery Cable: Connects to the start solenoid. Assemble the B+ terminal boot cover supplied in the accessory kit onto the generator end of the cable. Connect the B+ cable end to the starter solenoid terminal, tighten securely, and place terminal boot over connection.

⚠WARNING ***Electrical shock can cause severe personal injury or death. Failure to protect B+ terminal can result in personal injury and/or equipment damage if electrical short to control casting would occur. Ensure that terminal connection is secure and boot protector is properly in place.***

Negative (-) Battery Cable: Connects to the mounting plate. Use the same size cable to connect battery negative to ground as used for battery positive. Securely connect the negative cable to an accessible mounting plate fastener position.

Installation Checks and Start-Up

PRE-START CHECKS

Before starting the generator set, perform these steps:

1. Refer to Installation Review, this section.
2. Add oil to the engine. See the Operator's Manual for the recommended oil 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 last.

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

4. Refer to Operator's Manual and specifics of system. Open fuel supply valves to generator set.

INITIAL START-UP INSPECTION

Start Generator Set at Unit Control

1. Place Start/Stop switch to START position. Engine should crank and start. Unit may require more cranking at initial start than subsequent starts to prime fuel system. If generator set fails to start, refer to Troubleshooting in Operator's Manual.
2. After the generator set starts, check for any fuel leaks. If you find any, shut down the generator set immediately, turn off the fuel supply and have leak(s) repaired. Make sure the fuel lines do not rub against anything that can damage them.

⚠WARNING ***Fuel presents the hazard of explosion or fire which can result in severe personal injury or death. If any fuel leaks are found, shut down the generator set immediately and have the leak repaired as soon as possible.***

3. Examine the exhaust system for leaks. If any leaks are found, shut down the generator set immediately and have the leak(s) repaired as soon as possible.

⚠WARNING ***Exhaust gas presents the hazard of severe personal injury or death. Do not operate the generator set if it is excessively noisy. Have it inspected and repaired immediately by an authorized Onan service center.***

4. Refer to Operator's Manual and perform Break-In Procedure.
5. Stop generator set by placing the unit Start/Stop switch to STOP position.

Start Generator Set at Remote Control

1. Place the Remote Start/Stop switch to START position. Engine should crank and start. If generator set fails to crank and start, refer to Troubleshooting in Operator's Manual. Perform checks of all remote control wiring and connections. Correct as required and perform restart.
2. After the generator set starts, check battery condition meter (if equipped) to confirm its proper operation.
3. Refer to Operator's Manual for operating checks.
4. Allow generator set to operate at a normal load condition and continue to monitor fuel supply connections, exhaust system, unit performance, and quality of noise reduction (if so designed). If generator set performance is not correct, refer to Service Manual for adjustment, or contact an Onan distributor for assistance. If fuel supply, exhaust system, or other aspect of installation requires corrective action disconnect starting battery to prevent accidental start-up while performing rework.

⚠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

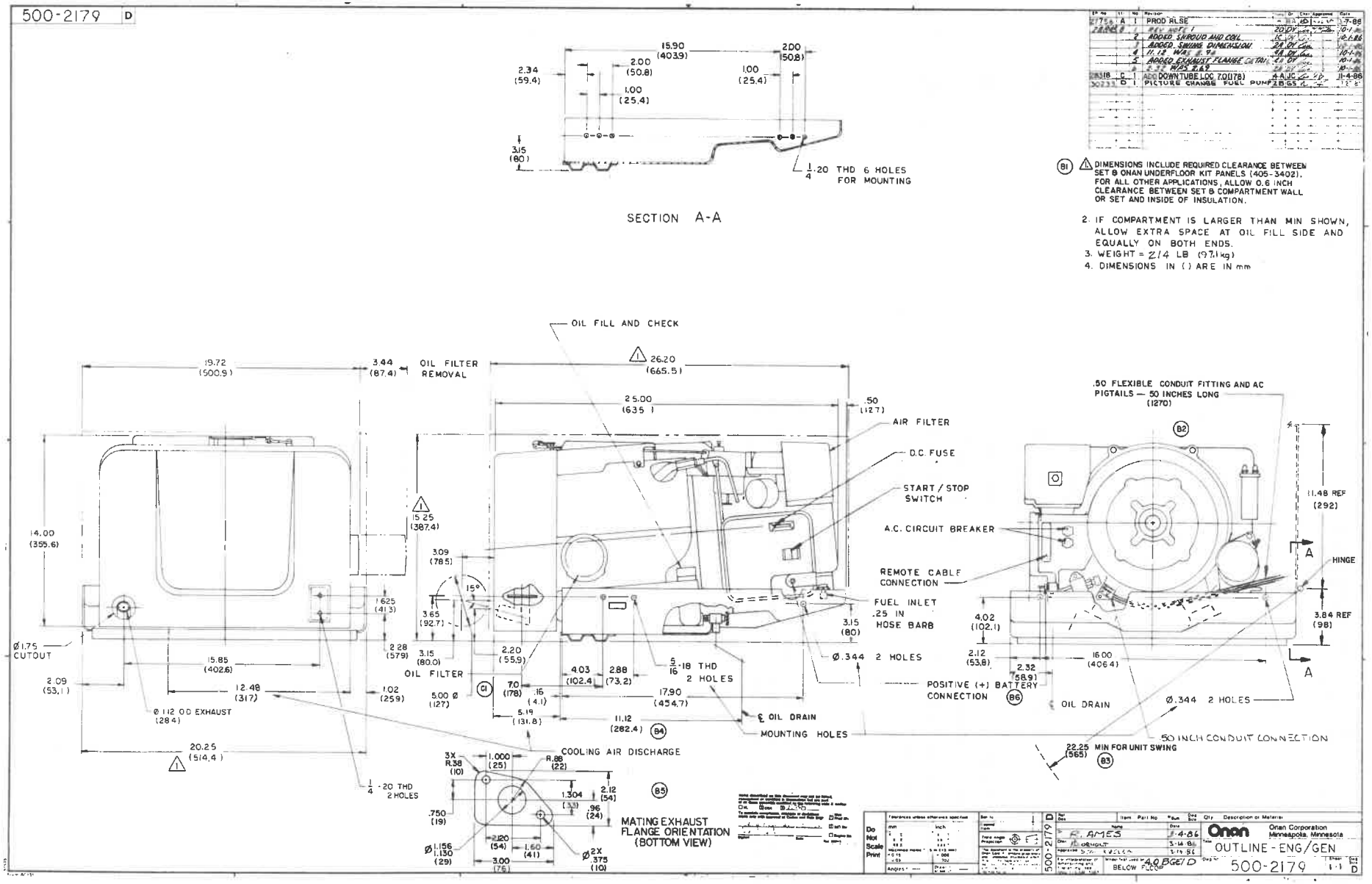
INSTALLATION REVIEW

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

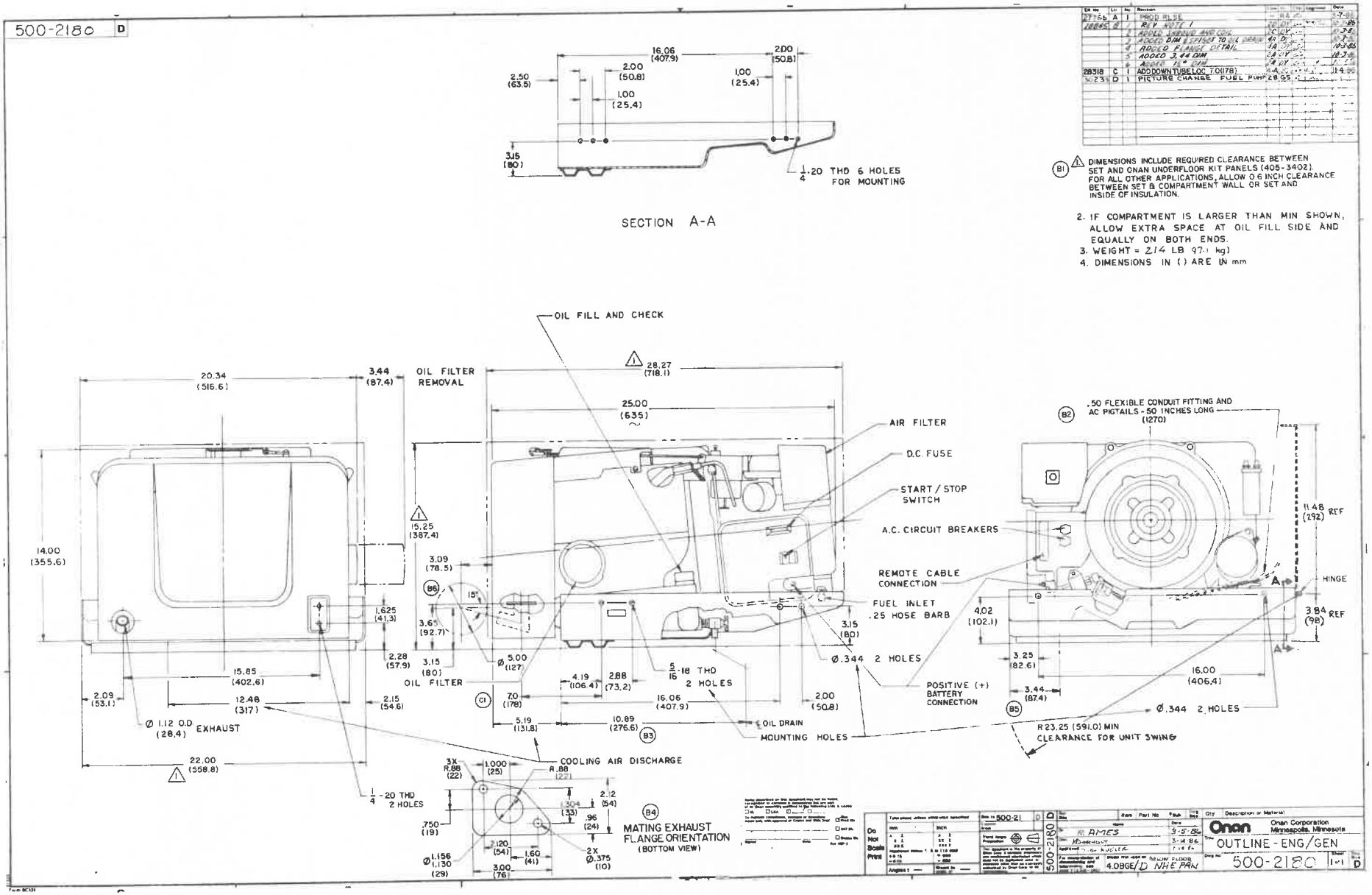
1. Does the exhaust system extend to the perimeter of the vehicle, and not below an openable window or door?
2. Are all required exhaust clamps, hangers and support straps in place per kit instructions?
3. Do the hanger straps located at the perimeter and along the centerline of the generator set have double "U" shaped rubber isolators?
4. Is the compartment metal-lined and sealed around all edges?
5. Is a flexible section of non-conducting fuel line installed between the fuel inlet and the fuel line from tank?
6. Does the installation allow 1/2 inch (13 mm) free movement of generator set on its mounts?
7. Are all fuel connections and hose clamps tight?
8. Is there 85 in^2 (548 cm^2) of free air inlet?
9. Is generator set protected from direct road splash from vehicle wheels?
10. Can the following routine maintenance items be performed (through vehicle access door or removal or cover panel, or swing down/drop out of generator set):
    - Change Oil and Filter
    - Carburetor Adjustments
    - Start/Stop the Unit
    - Change Air Filter
    - Governor Adjustments
    - Operate AC Circuit Breakers
    - Change Spark Plugs
    - Change Ignition Points
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 rubber boot been installed on battery plus (+) lead at the start solenoid connection in the control?
14. On a liquid propane generator set, has system been tested for leaks?
15. If installation uses under-floor hinge kit, is there 2 inches (51 mm) clearance between front of tray and vehicle skirt (or is skirt part of door) to allow set to swing down for service?
16. Are all electrical leads connected and protected, and conduit is adequately supported?

Outline Drawings

The generator set outline drawings in this manual are subject to change and are included for reference only. If necessary contact your Onan distributor for a detail outline drawing.



BGE-BELOW FLOOR



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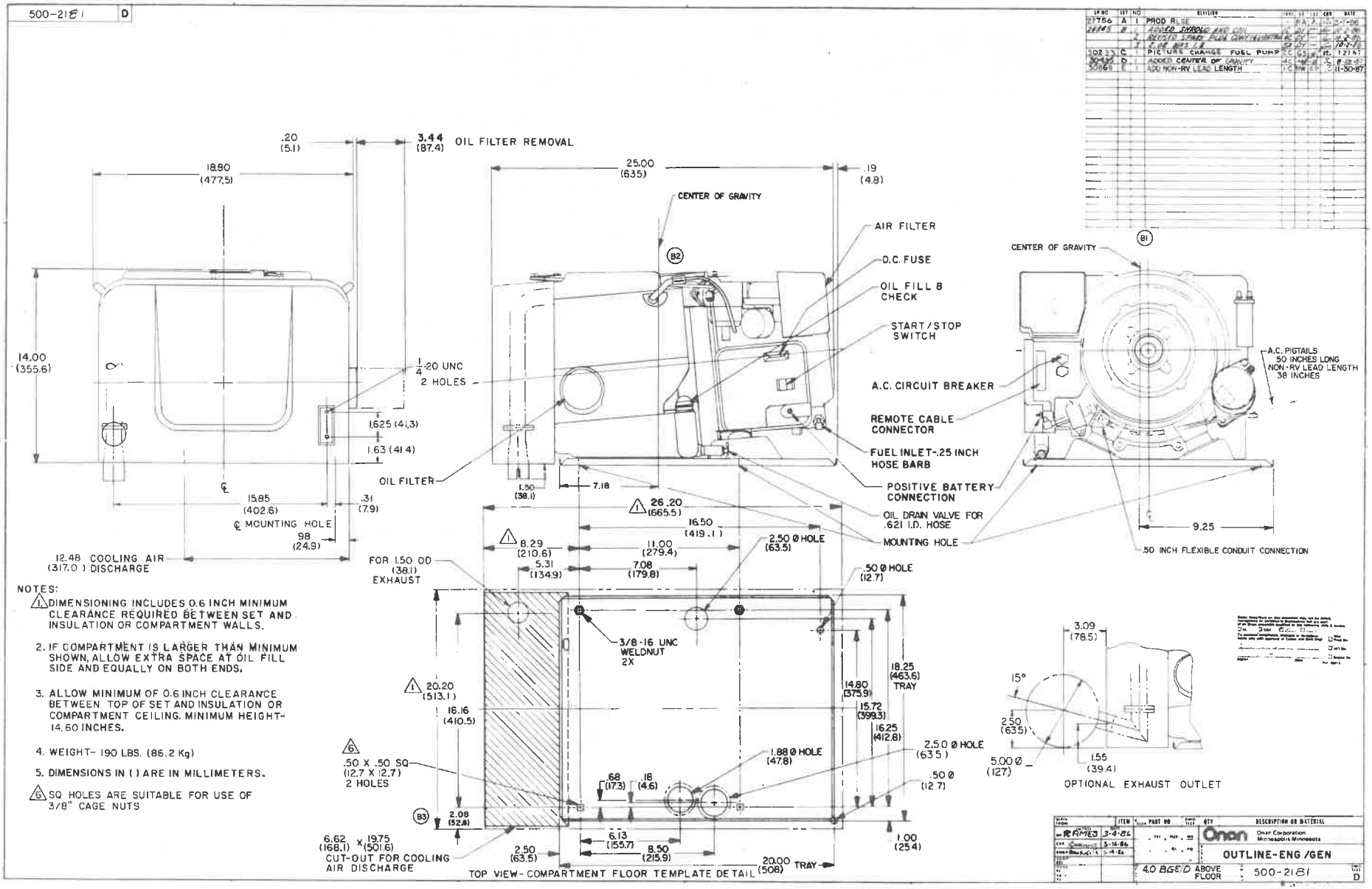
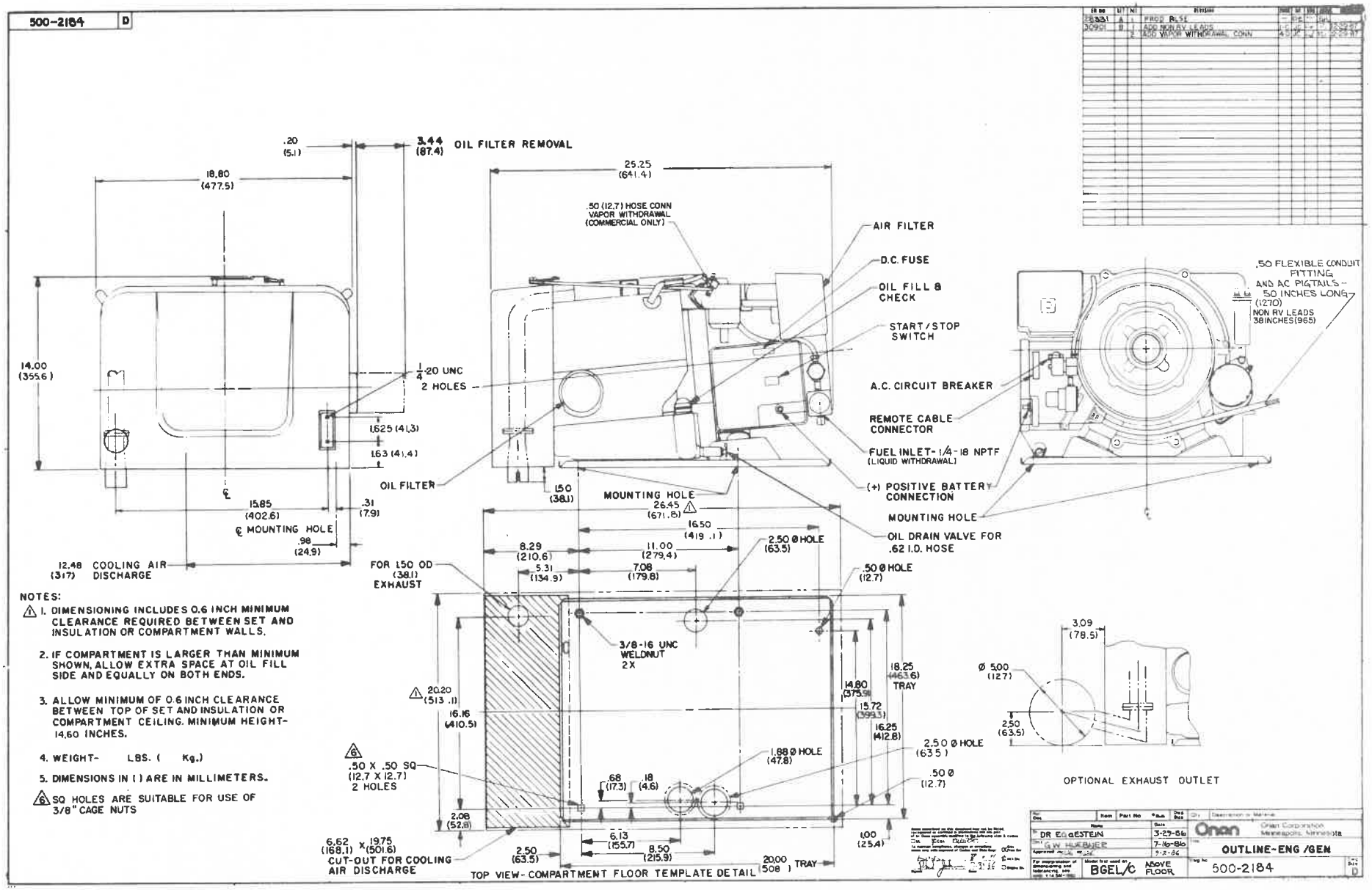


BGE-ABOVE FLOOR/COMPARTMENT



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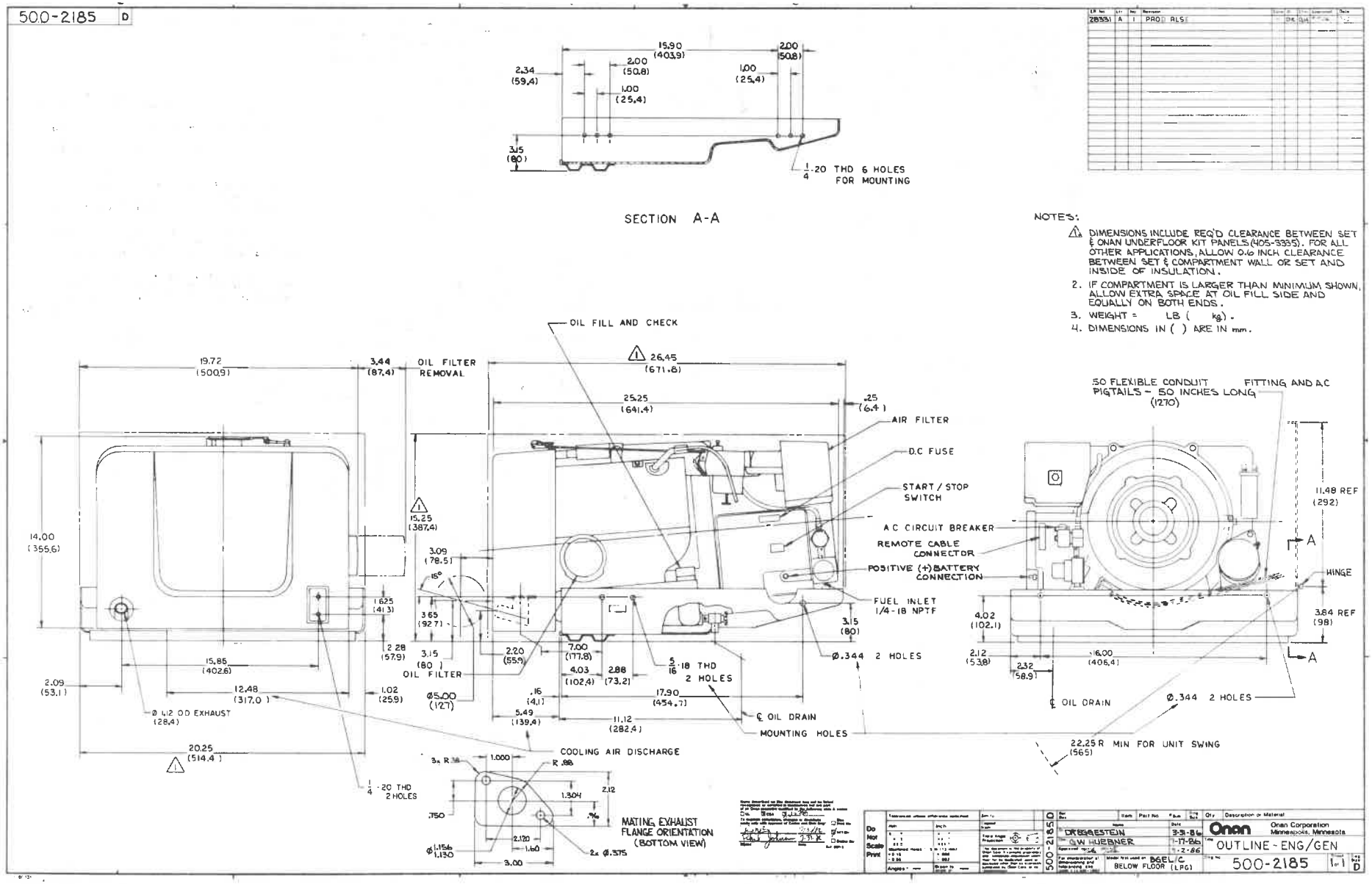

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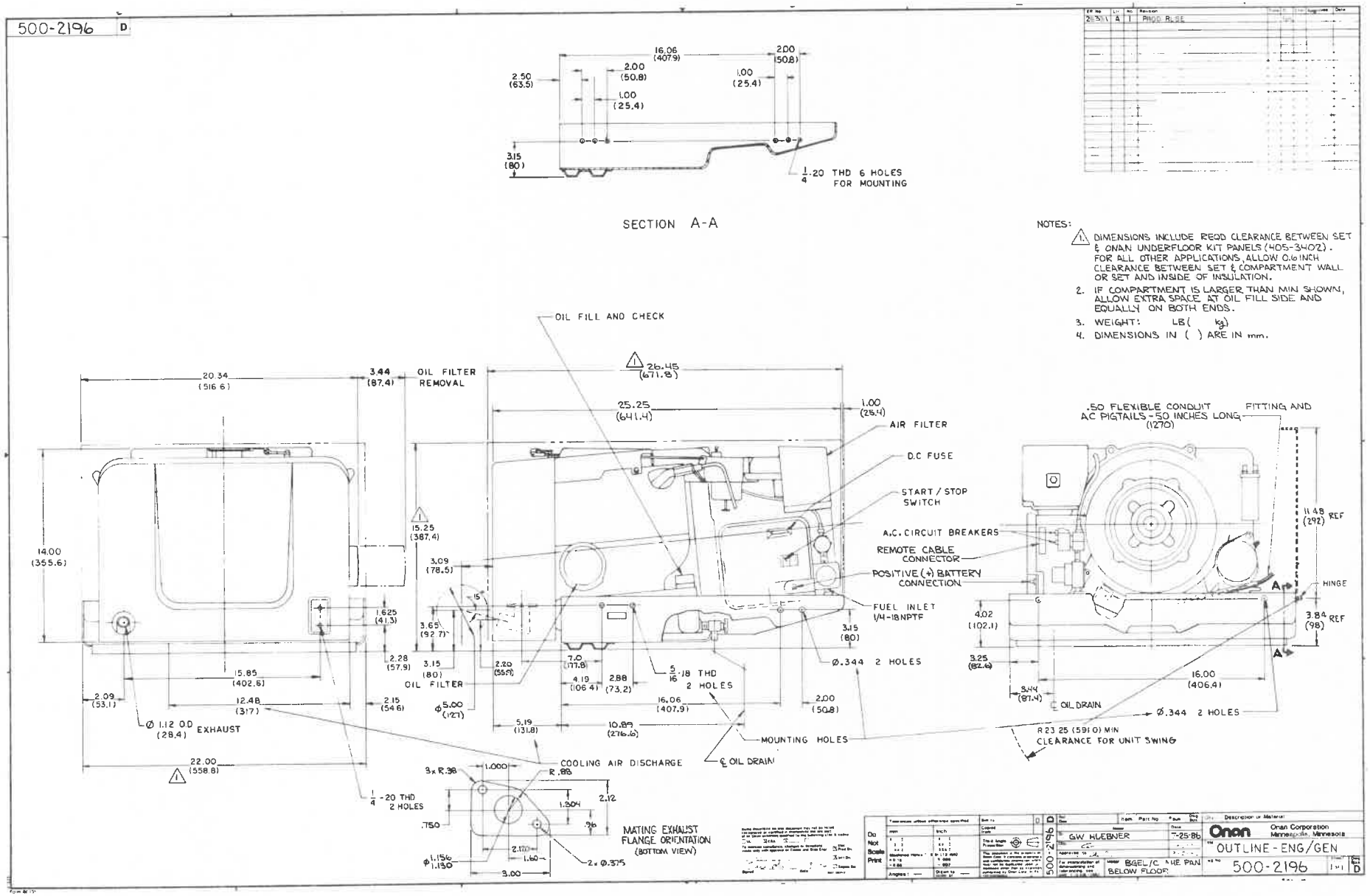

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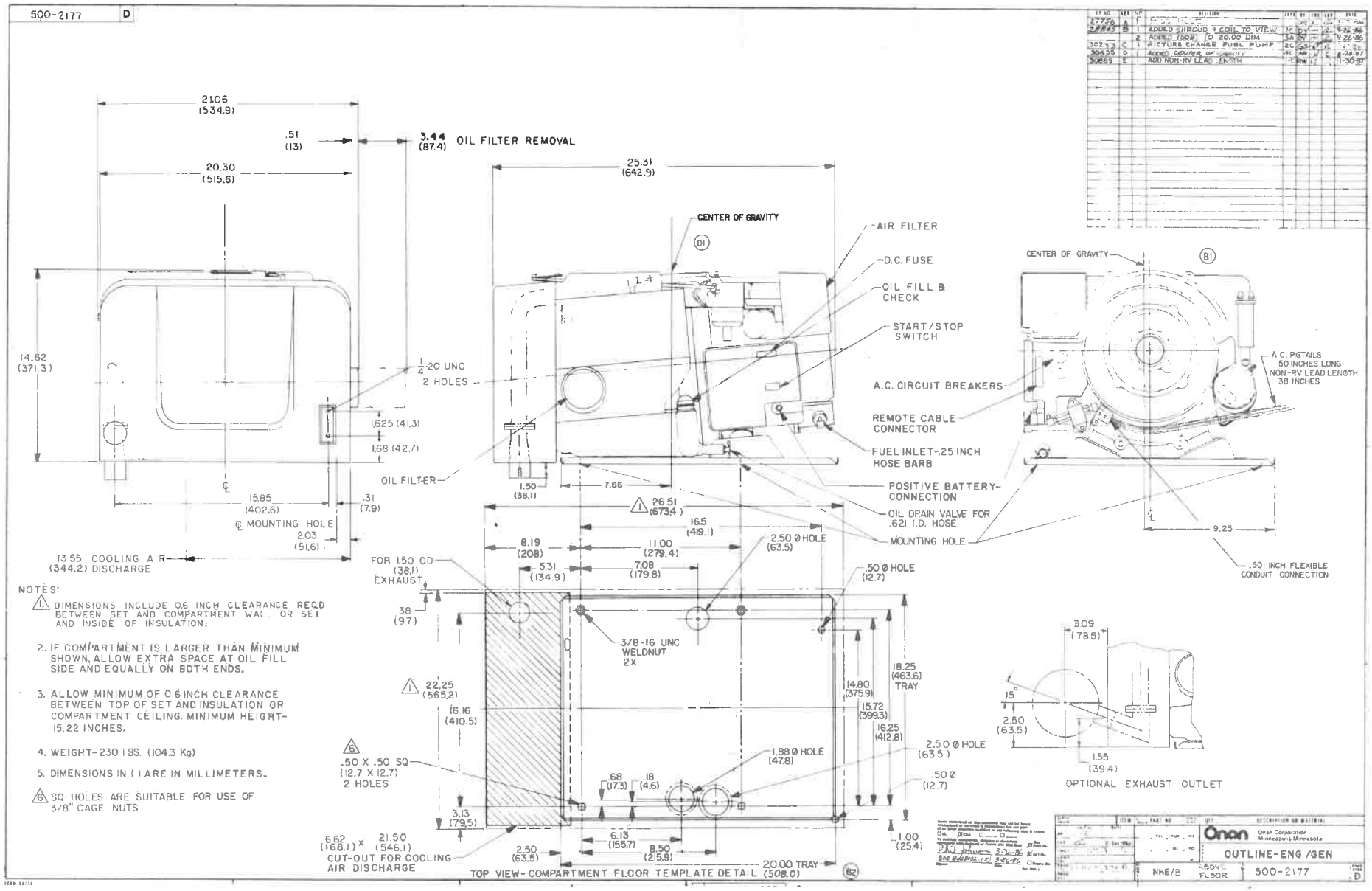
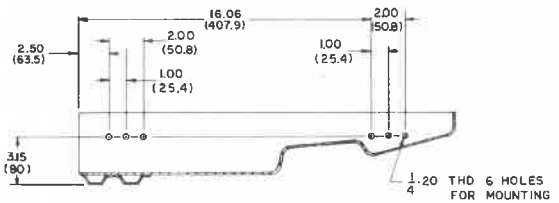


NHE-ABOVE FLOOR/COMPARTMENT

500-2178 D

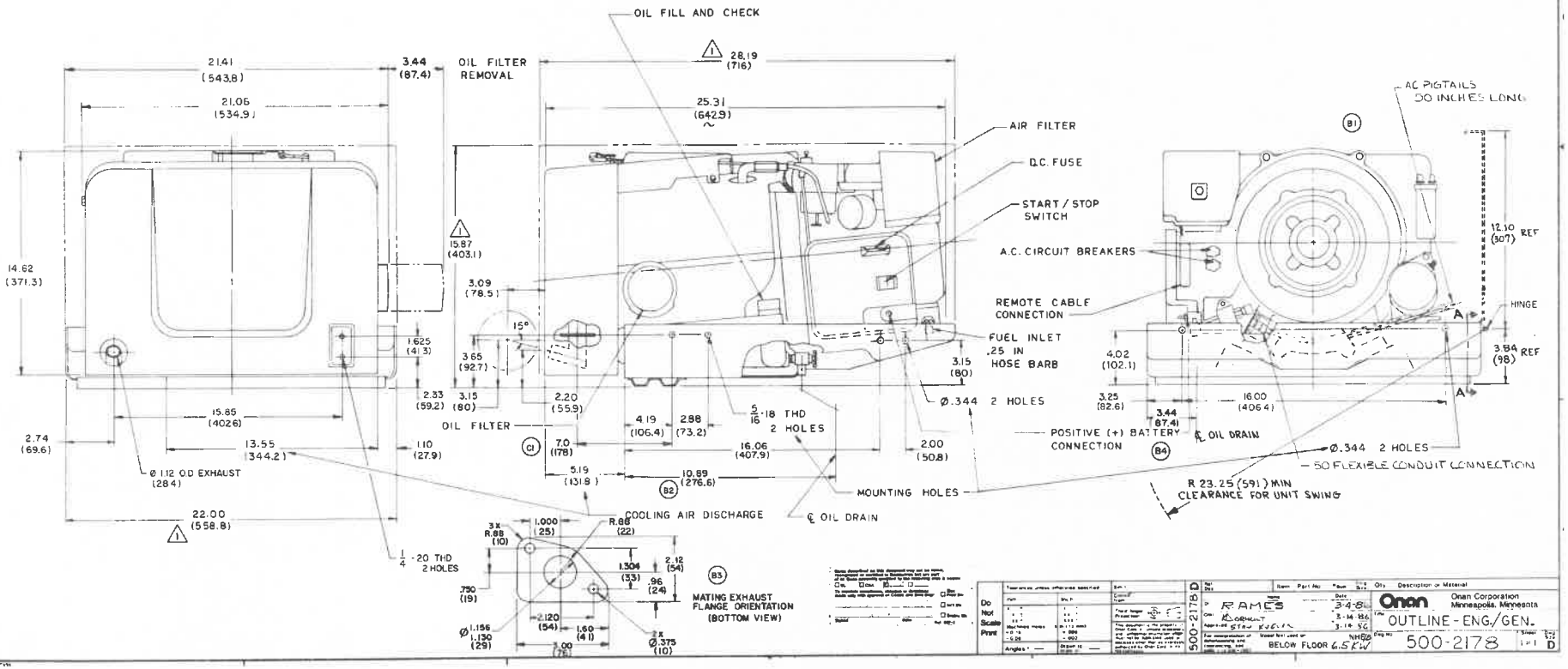


SECTION A-A

ER No.	Ltr	No	Revision	Drawn	Approved	Date
27755	A	1	PROD RLSE	MA	RS	7-85
28045	B	1	ADDED SHROUD & CVRC	JC	DV	01-86
		2	10.89 WAS 8.71	AB	DV	10-86
		3	ADDED EXHAUST FLANGE DETAIL	AB	DV	10-86
		4	3.44 WAS 3.81	PP	DV	01-87
28318	C	1	ADD DOWN TUBE LOC. 7.00/177.8	AB	JC	4-87
30255	D	1	PICTURE CHANGE - FUEL PUMP	PB	JC	4-88

⚠ DIMENSIONS INCLUDE REQD CLEARANCE BETWEEN SET & ONAN UNDERFLOOR KIT PANELS (405-3402) FOR ALL OTHER APPLICATIONS, ALLOW 0.6 INCH CLEARANCE BETWEEN SET & COMPARTMENT WALL OR SET AND INSIDE OF INSULATION

2. IF COMPARTMENT IS LARGER THAN MIN SHOWN, ALLOW EXTRA SPACE AT OIL FILL SIDE AND EQUALLY ON BOTH ENDS.
3. WEIGHT = 242 LB (119.8kg)
4. DIMENSIONS IN ( ) ARE IN mm



Item	Part No.	Rev.	Qty.	Description or Material
1	500-2178	D		

Do Not Scale Print

Drawn: RAMES 3-4-86
Checked: K. ORMHOLT 3-14-86
Approved: STEVE KVEEN 3-18-86

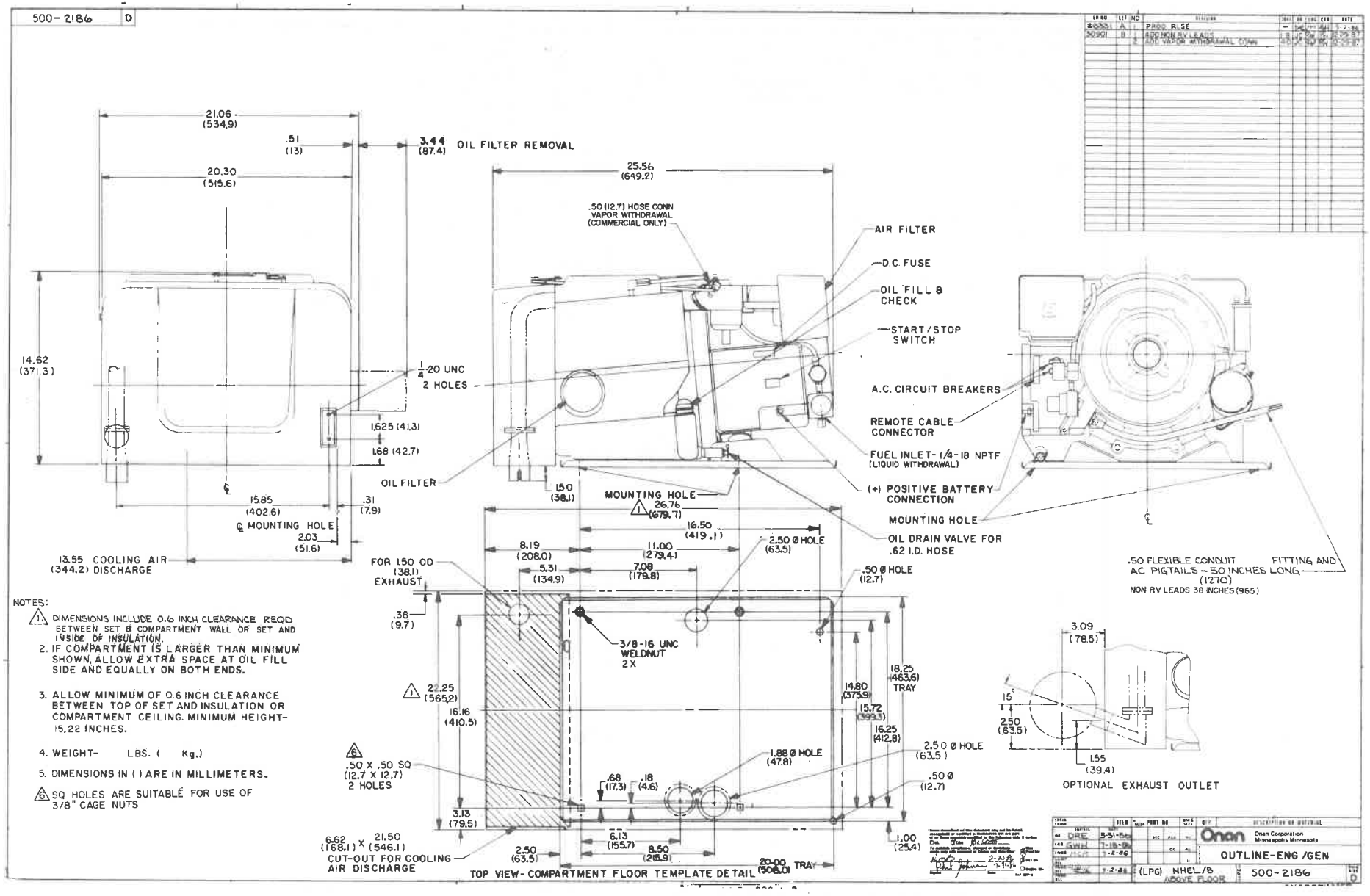
Onan Corporation
Minneapolis, Minnesota

OUTLINE - ENG./GEN.

For combination of NH6B BELOW FLOOR 6.5KW

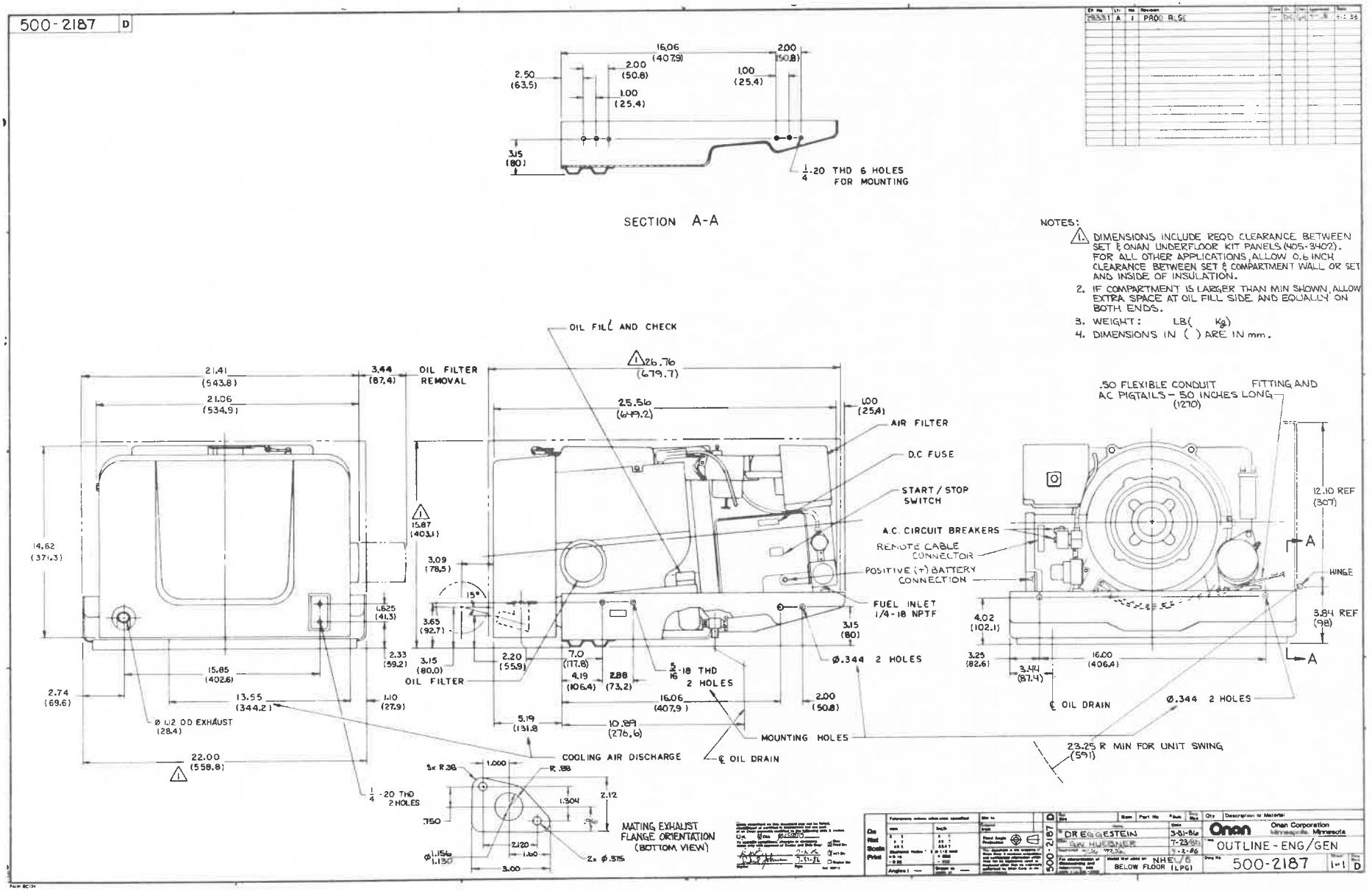
500-2178 D

NHE-BELOW FLOOR



NHEL-ABOVE FLOOR/COMPARTMENT

500-2187 D



NHEL-BELOW FLOOR

Onan

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