Installation Manual

Cummins **Onan**

Performance you rely on.™

RV Generator Set

KYD (Spec A–C)

English – Original Instructions

2–2012

981–0636 (Issue 4)

WARNING:

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

WARNING

Do not use this genset on a boat
Such use may violate U. S. Coast Guard regulations and can result in severe personal injury or death from fire, electrocution, or carbon monoxide poisoning

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Safety Precautions

Thoroughly read the OPERATOR'S MANUAL before operating the genset. Safe operation and top performance can be obtained only when equipment is operated and maintained properly.

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

⚠ DANGER ***alerts you to an immediate hazard which will result in severe personal injury or death.***

⚠ WARNING ***alerts you to a hazard or unsafe practice which can result in severe personal injury or death.***

⚠ CAUTION ***alerts you to a hazard or unsafe practice which can result in personal injury or equipment damage.***

When equipped with an integral or add–on Automatic Generator Starting System (AGS) control, exhaust carbon monoxide (CO), electric shock, and moving parts hazards are possible due to unexpected starting. Turn off AGS whenever preforming maintenance or service, when the vehicle is stored between uses, is awaiting service, or is parked in a garage or other confined area.

GENERAL PRECAUTIONS

- Keep ABC fire extinguishers handy.
- Make sure all fasteners are secure and torqued properly.
- To prevent accidental or remote startting while working on the generator set, press the Stop button and diconnect the battery cables at the batteries to prevent starting durning maintenance and service. (Always disconnect negative [–] first and reconnect last to prevent sparks between tools and vehicle frame.)
- Keep the genset and its compartment clean. Excess oil and oily rags can catch fire. Dirt and gear stowed in the compartment can restrict cooling air.
- Before working on the genset, disconnect the negative (–) battery cable at the battery to prevent starting.
- Use caution when making adjustments while the genset is running—hot, moving or electrically live parts can cause severe personal injury or death.
- Used engine oil has been identified by some state and federal agencies as causing cancer or reproductive toxicity. Do not ingest, inhale, or contact used oil or its vapors.
- Benzene and lead in some gasolines have been identified by some state and federal agencies as causing cancer or reproductive toxicity. Do not to ingest, inhale or contact gasoline or its vapors.
- Do not work on the genset when mentally or physically fatigued or after consuming alcohol or drugs.
- Carefully follow all applicable local, state and federal codes.

GENERATOR VOLTAGE IS DEADLY!

- Disable the automatic genset feature (AGS) of an inverter–charger or other automatic starting device before servicing the genset to avoid electric shock from an unexpected start.
- Generator output connections must be made by a qualified electrician in accordance with applicable codes.
- The genset must not be connected to the public utility or any other source of electrical power. Connection could lead to electrocution of utility workers and damage to equipment. An approved switching device must be used to prevent interconnections.
- Use caution when working on live electrical equipment. Remove jewelry, make sure clothing and shoes are dry and stand on a dry wooden platform.

ENGINE EXHAUST IS DEADLY!

- Learn the symptoms of carbon monoxide poisoning in this manual and never occupy the ve-

hicle while the genset is running unless the vehicle is equipped with a working carbon monoxide detector.

- Prior to every startup and after every eight hours of running, all carbon monoxide detectors must be tested and confirmed to be working in accordance with the manufacturer's instructions or owners manual.
- The exhaust system must be installed in accordance with the genset Installation Manual. Engine cooling air must not be used for heating the working or living space or compartment.
- Inspect for exhaust leaks at every startup and after every eight hours of running.
- Make sure there is ample fresh air when operating the genset in a confined area.

FUEL IS FLAMMABLE AND EXPLOSIVE

- Do not smoke or turn electrical switches ON or OFF where fuel fumes are present or in areas sharing ventilation with fuel tanks or equipment. Keep flame, sparks, pilot lights, arc-producing equipment and switches and all other sources of ignition well away.
- Fuel lines must be secured, free of leaks and separated or shielded from electrical wiring.
- Leaks can lead to explosive accumulations of gas. Natural gas rises when released and can accumulate under hoods and inside housings and buildings. LPG sinks when released and can accumulate inside housings and basements and other below-grade spaces. Prevent leaks and the accumulation of gas.

BATTERY GAS IS EXPLOSIVE

- Wear safety glasses and do not smoke while servicing batteries.
- When disconnecting or reconnecting battery cables, always disconnect the negative (–) battery cable first and reconnect it last to reduce arcing.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Disable the automatic genset starting feature (AGS) of an inverter–charger or other automatic starting device before servicing the genset to avoid unexpected starting.
- Do not wear loose clothing or jewelry near moving parts such as PTO shafts, fans, belts and pulleys.
- Keep hands away from moving parts.
- Keep guards in place over fans, belts, pulleys, etc.

Introduction

ABOUT THIS MANUAL

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

This manual addresses the following aspects of the installation:

- Location, Mounting and Enclosure
- Exhaust Connections
- Fuel Connections
- Electrical Connections
- Startup

See the Operator's Manual for operation and maintenance and the Service Manual for service.

Note: Manuals are updated from time-to-time to reflect changes in the equipment and its specifications. For this reason, only the copy of the installation manual supplied with the genset should be used as a guide for the installation.

INSTALLATION CODES AND STANDARDS FOR SAFETY

The builder of the RV or work vehicle bears sole responsibility for the selection of the appropriate genset, for its proper installation and for obtaining approvals from the authorities (if any) having jurisdiction over the installation. These sets meet the basic requirements of the Standard for Safety for Engine Generator Sets for Recreational Vehicles, ANSI/ RVIA EGS-1.

In the United States the installation must comply with the following standards:

- ANSI A119.2 / NFPA No. 1192—Recreational Vehicles
- NFPA No. 70, Article 551—Recreational Vehicles and RV Parks
- NFPA No. 58—Liquefied Petroleum Gas Code

In Canada the installation must comply with:

- CSA Electrical Bulletin 946—Requirements for Internal Combustion Engine-Driven Electric Generators for Use in Recreational Vehicles

Federal, State and local codes, such as the California Administrative Code—Title 25 (RV installation), might also be applicable. Installation codes and recommendations can change from time-to-time and are different in different countries, states and municipalities. Obtain the standards in Table 1 for reference.

Code of Federal Regulations, Title 49: Chapter III and Chapter V	Superintendent of Documents P. O. Box 371954 Pittsburgh, PA 15250-7954
NFPA Nos. 58, 70, 1192	National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210
ANSI A119.2 ANSI/RVIA-EGS-1	Recreational Vehicle Industry Association 14650 Lee Road Chantily, VA 22021
California Administrative Code—Title 25, Chapter 3	State of California Documents Section P.O. Box 1015 North Highlands, CA 95660
CAN/CSA-Z240 Recreational Vehicles Bulletin 946	Canadian Standards Association Housing and Construction Materials Section 178 Rexdale Blvd. Rexdale, Ontario, Canada M9W 1R3

TABLE 1. REFERENCE CODES AND STANDARDS

⚠CAUTION ***Unauthorized modifications or replacement of fuel, exhaust, air intake or speed control system components that affect engine emissions are prohibited by law in the State of California.***

⚠WARNING ***Improper installation can result in severe personal injury, death and equipment damage. The installer must be qualified to perform the installation of electrical and mechanical equipment.***

TYPICAL GENSET

Figure 1 illustrates a typical genset. See OUTLINE DRAWING (Page 27) for installation details: mounting bolt hole locations, connection points (fuel, battery, remote control, AC output and exhaust), sizes and types of fittings, inlet and outlet air openings, weight and overall dimensions, etc. See your Onan dealer for large-scale copies of the drawings and for full-size floor template 539-4814 for floor opening cutouts.

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

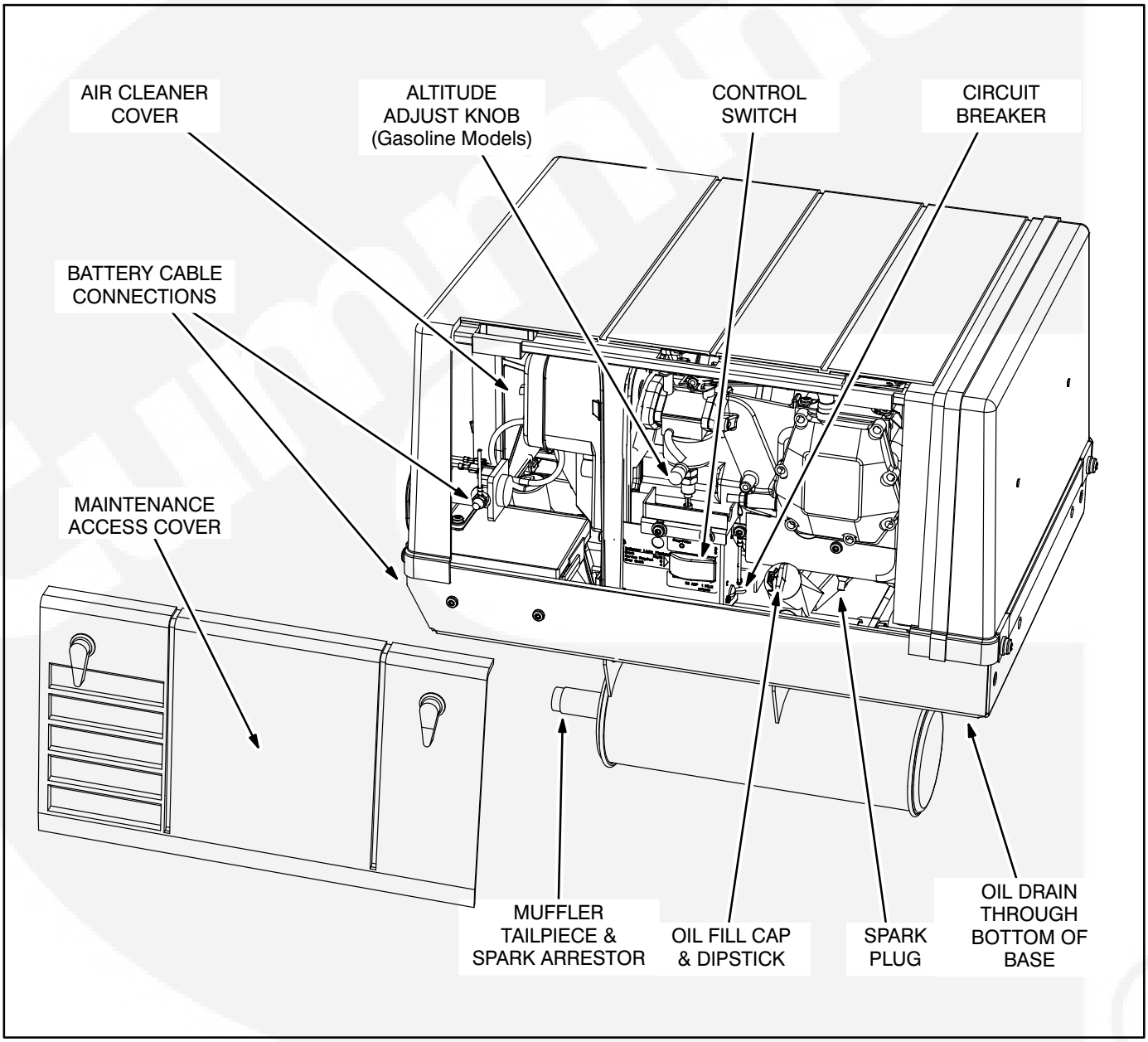

FIGURE 1. TYPICAL GENSET

Mechanical Installation

⚠ CAUTION ***Avoid tipping the front (service side) down while handling the genset. Otherwise, engine oil could drain into and soak the air filter and cause hard starting and poor operation until the filter is replaced.***

The location, mounting and enclosure of a genset must be such that mounting is secure; engine exhaust, cooling air and fuel vapors are properly vented and prevented from entering the vehicle; rain and road debris are prevented from entering the genset; and ready access is afforded for operating the genset and performing periodic maintenance.

LOCATION

Review *Exhaust Connections, Fuel Connections* and *Electrical Connections* before deciding where to locate the genset. Figure 2 shows typical genset locations.

MOUNTING

The genset support structure must be able to resist the dynamic loads of the genset: cyclical forces of ±3 g vertical and ± 1 g horizontal. *A plywood or particle board floor must be reinforced with steel to resist the dynamic loads.* See *Specifications* (Page 23) for the weight of the specific model being installed.

Mounting On Floor: The genset base pan has four 5/16-18 UNC threaded holes in the bottom for floor mounting. Use grade 5 screws to mount the genset. To avoid interference with internal parts, the screws must not protrude more 1/2 inch (12.7 mm) from the sheet metal of the base pan.

Mounting Below Floor: Kit 541–0952 is available from Onan for mounting the genset below the floor. Carefully follow the instructions in the kit.

⚠ WARNING ***A weak supporting structure can lead to severe personal injury or death if the genset falls from the vehicle. Design the structure carefully, follow applicable mounting kit instructions and torque mounting bolts properly.***

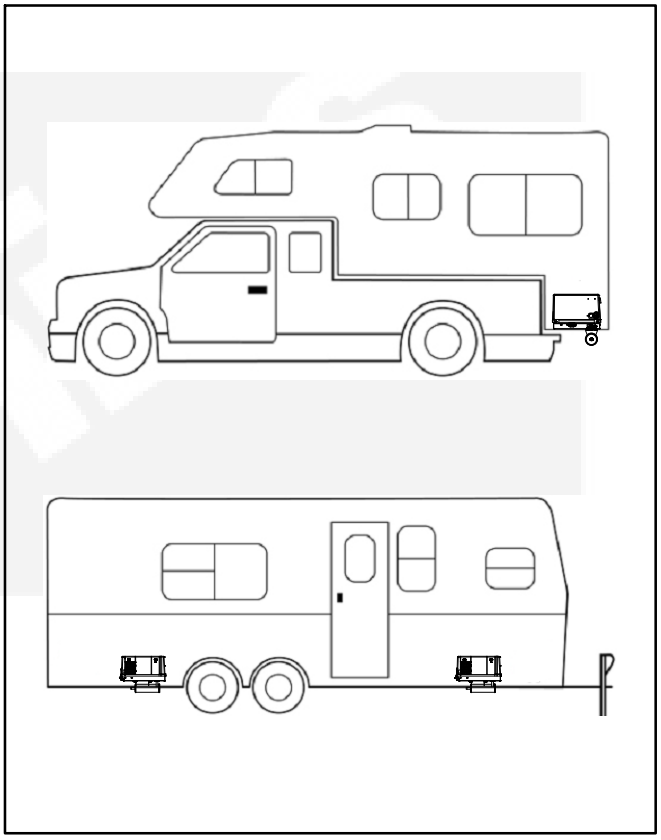

FIGURE 2. TYPICAL GENSET LOCATIONS

ENCLOSURE

General

The genset must not share a compartment or ventilation with sources of flammable vapors, such as batteries and fuel tanks. A genset can ignite flammable vapors.

The genset must be shielded from rain and from debris and water thrown up by the vehicle tires.

Do not duct genset cooling air into the vehicle: the cooling air may include deadly exhaust gases.

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

Fire and Vapor Barriers

Floor-Mounted Installations: When the genset is mounted on the floor of the vehicle, construct a vapor-tight, fire-resistive compartment equivalent to 26 gauge galvanized steel to isolate the genset from the vehicle interior. Seal all openings through the barrier, such as for bolts and wiring.

Note: If the floor is of wood or other combustible material, it must be lined with 26 gauge galvanized steel or equivalent material where the distance is less than 3 inch (76 mm) from the muffler, mounting bracket or tail pipe.

Below-Floor Installations: When the genset is mounted below the floor of the vehicle and outside the interior envelope of the vehicle, install a vapor-tight, fire-resistive barrier above the genset equivalent to 26 gauge galvanized steel. Seal all openings through the barrier, such as for bolts and wiring.

Compartment Dimensions

See *Specifications* (Page 23) and the outline drawing (Page 23) to determine the minimum inside dimensions of a genset compartment. If the compartment has thermal or acoustic insulation, increase the minimum compartment dimensions by the thicknesses of the insulation. The minimum clearance required between the genset and the compartment or its insulation is 1/4 inch (6.4 mm) on the sides and back, 1/2 inch (12.8 mm) on top and 1-1/4 inch (31.8 mm) in front. The space on the left side must be sufficient for making fuel and electrical connections.

Acoustic Insulation

Acoustic and thermal insulation and adhesive should be Classified as “Self-Extinguishing” for use at not less than 200°F (90°C). Do not line the bottom of the compartment with insulation, which absorbs spilled fuel and oil.

Access for Operation and Maintenance

Provide ready access for starting and stopping the genset and performing all periodic maintenance procedures.

The compartment floor must not block off the oil drain plug or air outlets. See your Onan dealer for a full-size floor cutout template (539-4814).

Compartment Drain

The floor of the genset compartment must have holes which allow water and fuel to drain. Refer to floor template 539-4814 for recommend drain hole locations.

VENTILATION

Air for combustion, cooling and ventilation enters through the column of rectangular openings on the left front of the genset and exits through the two openings in the base pan (Figure 3). To prevent overheating, the installation must minimize the re-circulation of warm air back into the genset.

It is recommended that the genset compartment door have an air opening in line with the genset air openings and that the opening have a seal around it that takes up the space between the door and genset, forming an air duct. The opening must have the equivalent of 40 square inches (258 cm^2) or more of "free air" and should be baffled or louvered to keep out rain. Check with the manufacturer of the louver, grille or expanded metal to determine how to size the air opening to obtain the required area on a "free air" basis.

If the compartment door air inlet is not in line with the genset air inlets, block any gap between the genset base pan and the front of the compartment to prevent the hot air discharge below the genset from being recirculated into the air inlets.

The compartment floor must not block off the two ventilating air outlet openings in the base pan. Also, the space below the outlets must be unobstructed and open on at least three sides to let the warm air disperse. See your Onan dealer for large-scale copies of the drawings and for full-size floor template 539-4814 for floor opening cutouts.

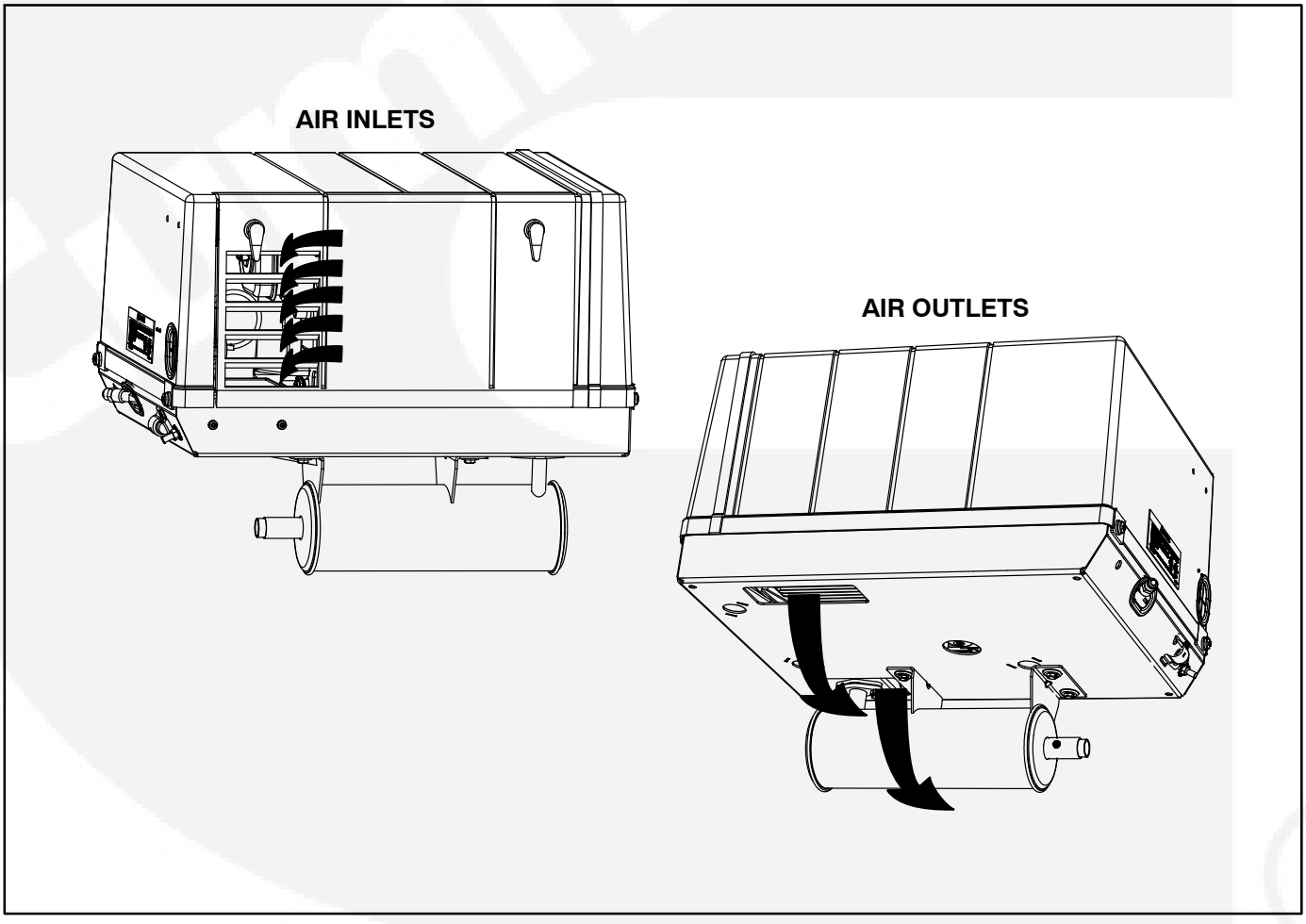

FIGURE 3. AIR FLOW THROUGH GENSET

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Exhaust Connections

MUFFLER

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

The genset exhaust system must be gas-tight and prevent entry of exhaust gases into the vehicle.

Figure 4 illustrates installation of the muffler kit available from Onan. Carefully follow the instructions in the kit. The muffler has a USDA (Forest Service) spark arrestor, meets RVIA EGS-1 requirements for construction and complies with emissions certification of the genset.

Note: A muffler must have a USDA (Forest Service) spark arrestor and meet RVIA EGS-1 requirements for construction (aluminized steel or equivalent and welded or crimped joints). A genset without a properly installed and maintained spark arresting exhaust system can cause a brush fire or forest fire and is illegal on federal lands.

Liability for damage, injury and warranty expense due to modification of the exhaust system or to use of unapproved parts is the responsibility of the person performing the modification or installing the unapproved parts.

⚠CAUTION ***Unauthorized modifications or replacement of fuel, exhaust, air intake or speed control system components that affect engine emissions are prohibited by law in the State of California.***

Do not mount the muffler closer than 3 inches (76 mm) to combustible material (wood, felt, cotton, organic fibers, etc.) unless it is insulated or shielded. The temperature rise (above ambient) on adjacent combustible material must not exceed 117°F (65°C).

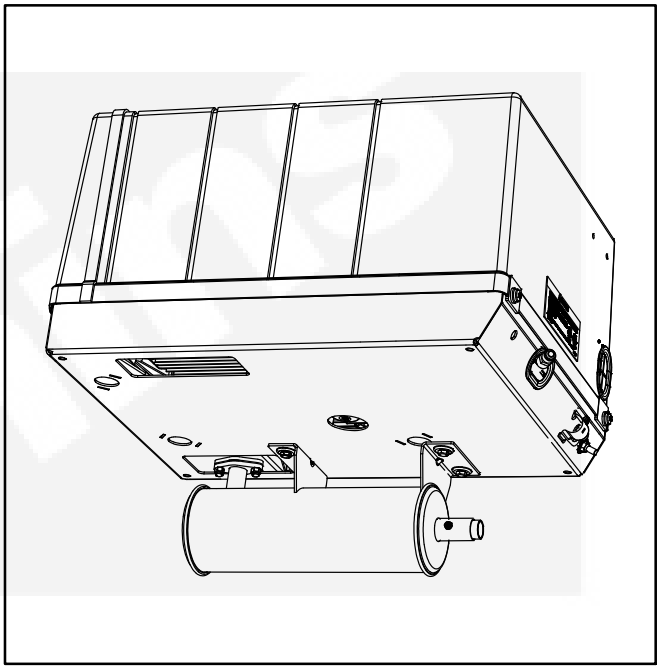

FIGURE 4. MUFFLER KIT 541–0916

TAIL PIPE

1. For the tail pipe, use 18-gauge, 1-1/8 inch I. D. aluminized steel tubing or material of equivalent heat and corrosion resistance. Do not use flexible tubing, which is neither gas tight nor durable.

2. Use U-bolt muffler clamps (available from Onan) for tail pipe connections. Overlapping pipe should be slotted (Figure 5).

3. Support the tail pipe near its end and at intervals of 3 feet (0.9 m) or less. Use automotive-type tail pipe hangers (available from Onan). Tail pipe hangers must hang straight down. Otherwise, the hanger will pull the tail pipe to side, front or back causing noise and/or damage to the muffler and tail pipe.

4. Do not route the tail pipe near fuel lines and fuel tanks or closer than 3 inches (76 mm) to combustible material (wood, felt, cotton, organic fibers, etc.) unless it is insulated or shielded. The temperature rise (above ambient) on adjacent combustible material must not exceed 117°F (65°C).

5. To prevent damage to the tail pipe and muffler while the vehicle is moving, keep it out of the approach and departure angles and above the axle clearance line (Figure 6).

6. Do not terminate the tailpipe underneath the vehicle. Extend it a minimum of 1 inch (25 mm) beyond the perimeter of the vehicle (Figure 7). *Support the end of the tail pipe such that it cannot be pushed in and up under the skirt of the vehicle*.

7. Do not terminate the tail pipe such that it is closer than 6 inches (153 mm) to any opening, such as a door, window, vent or unsealed compartment, into the vehicle interior (Figure 8)

8. Make sure a tail pipe deflector will not cause excessive back pressure (*Specifications, Page 23*).

⚠ CAUTION ***Excessive back pressure may void emissions certifications and cause engine damage.***

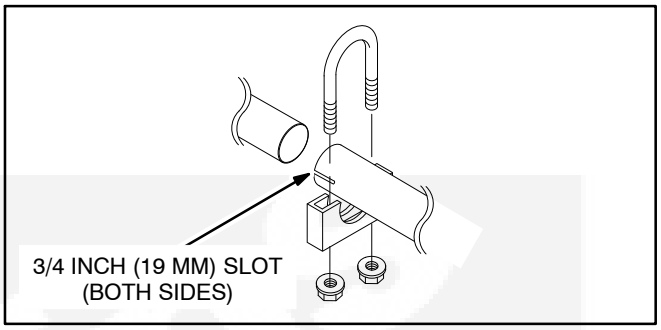

FIGURE 5. EXHAUST TAIL PIPE CONNECTIONS

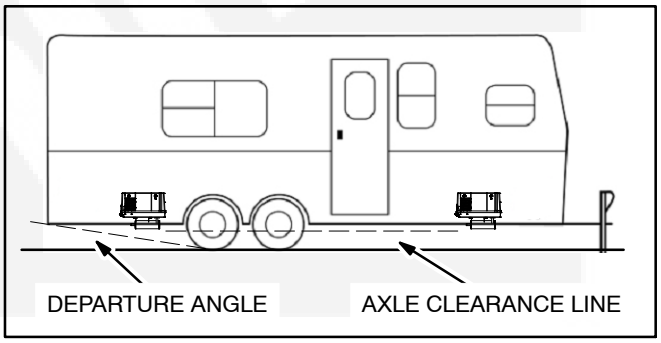

FIGURE 6. DEPARTURE ANGLE & AXLE CLEARANCE LINE

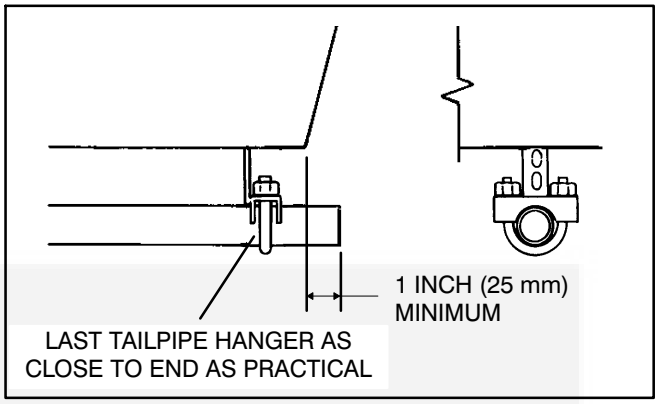

FIGURE 7. TERMINATING THE TAILPIPE

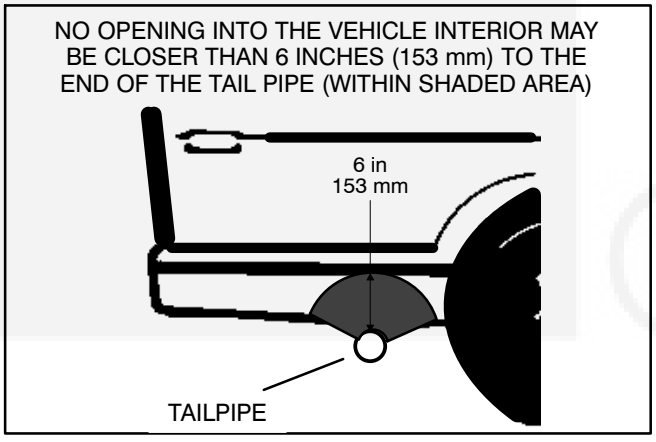

FIGURE 8. MINIMUM DISTANCES TO OPENINGS

Fuel Connections

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

⚠WARNING ***Gasoline and LPG are flammable and explosive and can cause severe personal injury or death. Do not smoke or allow any flame, spark, pilot light, arc-producing equipment, switches or other ignition sources around fuel or fuel components, or in areas sharing ventilation. Keep an ABC fire extinguisher handy.***

GASOLINE

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

⚠WARNING ***Excessive fuel pressure can flood the genset causing a fire. Genset fuel supply line pressure must not exceed 1-1/2 psi under any condition.***

SAE J1508 Type D screw & nut hose clamps (Figure 9) are recommended for all fuel hose connections.

For separate fuel pickup tube installations:

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

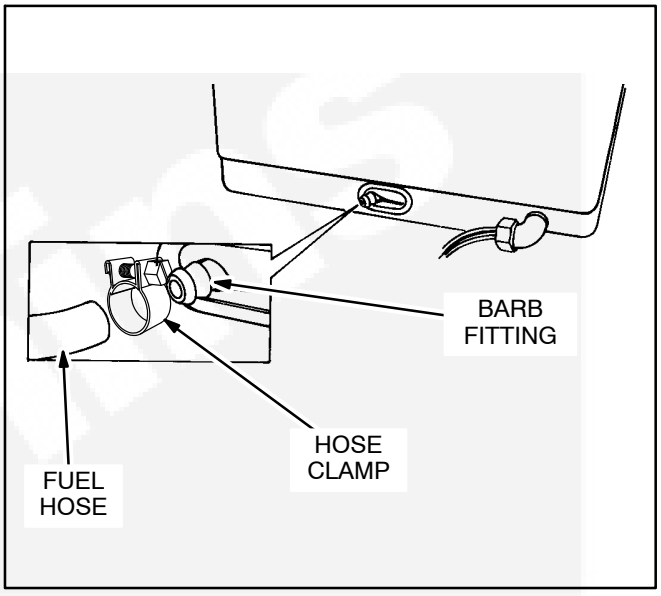

FIGURE 9. GASOLINE FUEL CONNECTION

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

For long runs use copper or hot dip coated seamless steel tubing (ASTM A-254) with double-flared fittings. See Figure 9 for the connection at the genset. Use 1/4 inch I. D. fuel hose (SAE 30-R7 or better) and stainless steel hose clamps.

Run the fuel line at or above the top of the fuel tank to reduce the risk of siphoning fuel out of the tank if the line should break. The maximum fuel pump lift is 36 inches (914 mm).

Route gasoline fuel lines away from electrical wiring and hot engine exhaust components. (Heat can cause fuel vapor lock.) Fuel lines should be accessible for inspection and replacement, protected from damage and secured to prevent kinking, contact with sharp edges and chafing due to vibration.

⚠WARNING ***Sparks can ignite gasoline, leading to severe personal injury or death. Do not run electrical wiring and fuel lines together. Separate them with conduit or tubing if run through the same opening. Do not tie them together.***

LPG

Follow the Standard for the Storage and Handling of Liquified Petroleum Gases (NFPA No. 58) when installing the LPG fuel system. Figure 10 illustrates a typical LPG fuel system.

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

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

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

Route LPG fuel lines away from electrical wiring and hot engine exhaust components. Fuel lines should be accessible for inspection and replacement, protected from damage and secured to prevent kinking, contact with sharp edges and chafing due to vibration.

⚠WARNING ***Sparks can ignite LPG, leading to severe personal injury or death. Do not run electrical wiring and fuel lines together. Separate them with conduit or tubing if run through the same opening. Do not tie them together.***

Route the LPG vent hose (Figure 10) so that it vents outside the genset compartment.

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

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

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

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

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

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

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

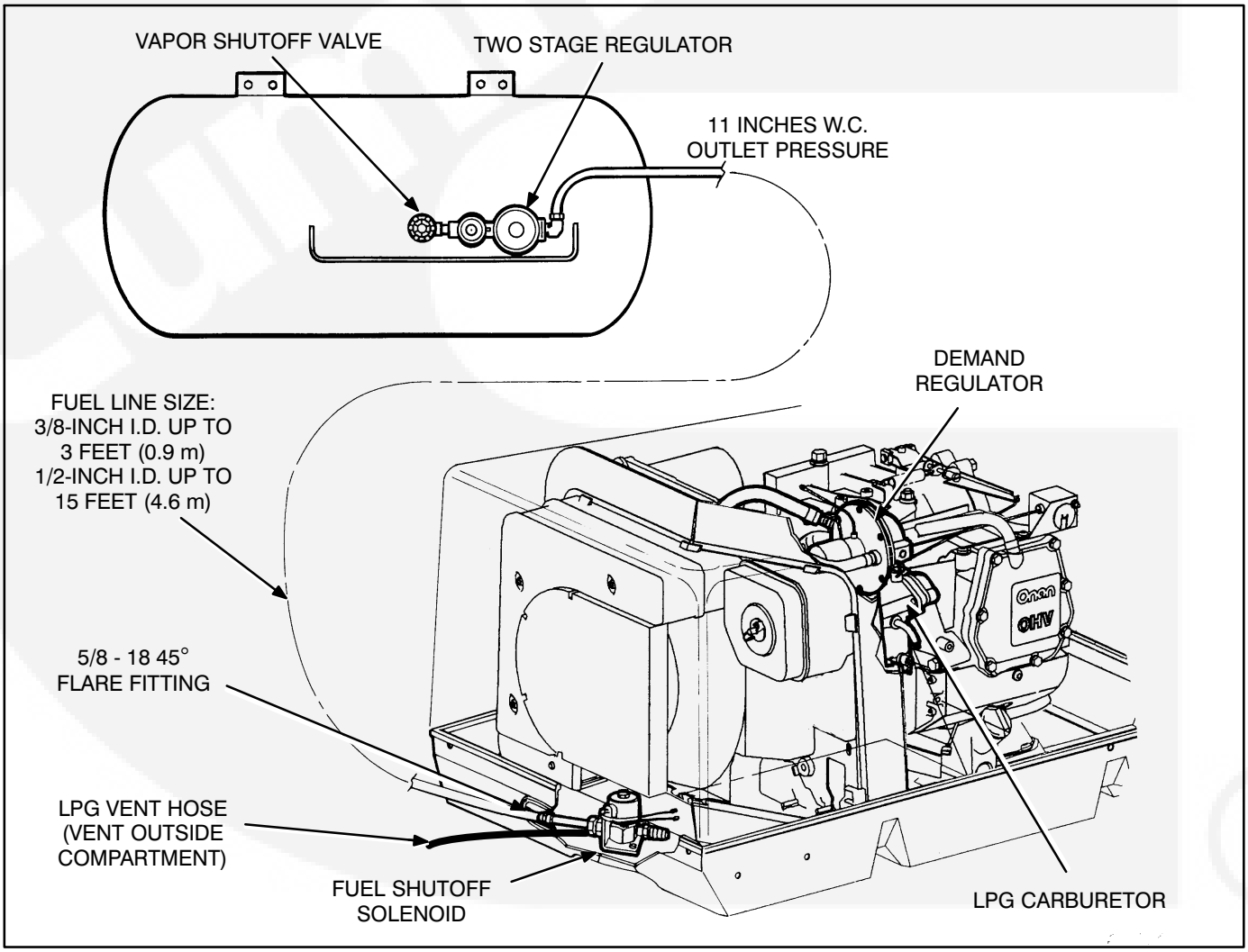

FIGURE 10. TYPICAL LPG VAPOR WITHDRAWAL FUEL SYSTEM

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Electrical Connections

Do not connect the battery cables to the battery until *Installation Review and Startup* (Page 25) has been completed to prevent accidental starting of the genset during installation.

⚠WARNING ***Accidental starting of the genset can cause severe personal injury or death. Do not connect the starting battery until Installation Review and Startup has been completed.***

GENERATOR CONNECTIONS

The genset is equipped with 104 inch (2.6 m) long AC power output leads which exit through a 1/2 inch trade size conduit connector (Figure 11). See Figure 12 for typical connections.

Wiring Methods

Follow the National Electrical Code, especially noting the following:

1. Have a qualified electrician supervise and inspect the installation of all AC wiring.
2. Install vibration-proof switches and controls that won't open and close circuits when the vehicle is in motion.
3. Provide ground fault circuit interrupters (GFCIs)for all convenience power receptacles.
4. Route AC wiring, remote control wiring and fuel lines separately.
5. Seal all conduit openings into the vehicle interior to keep out exhaust gas. Apply silicone rubber or an equivalent type of sealant inside and outside each conduit connector. (Flexible conduit is not vapor-tight and will allow exhaust gas to enter along the wires if not sealed.)

   ⚠WARNING ***EXHAUST GAS IS DEADLY! Seal all wiring openings into the vehicle interior to keep out exhaust gas.***
6. Bond the genset and all connected AC and DC equipment and controls to a common grounding point in accordance with applicable codes.

   ⚠WARNING ***Faulty grounding can lead to fire and electrocution, resulting in severe personal injury or death. Grounding must be in accordance with applicable codes.***

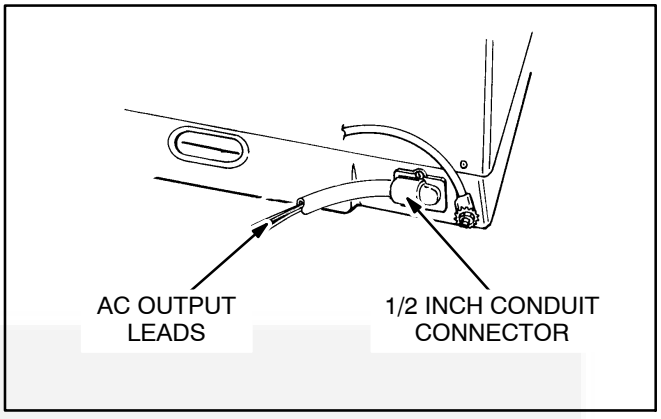

FIGURE 11. AC OUTPUT LEADS AND CONDUIT

Connecting the Vehicle to Utility Power

When the vehicle has provision for connecting utility power it must have an approved device to keep the genset and utility from being interconnected. See Figure 12 for typical connections.

⚠WARNING ***Interconnecting the genset and the public utility (or any other power source) can lead to the electrocution of personnel working on the utility lines, damage to equipment and fire. An approved switching device must be used to prevent interconnections.***

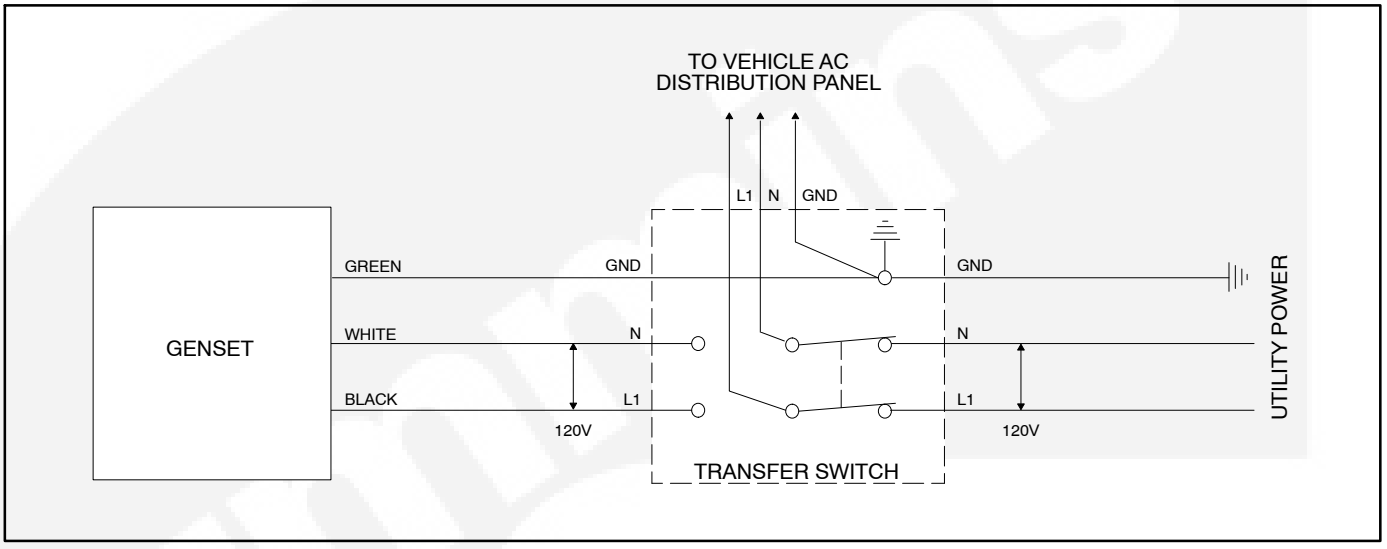

FIGURE 12. TYPICAL CONNECTIONS WITH TRANSFER SWITCH AND UTILITY

REMOTE CONTROL CONNECTIONS

Onan offers three varieties of remote control panel:

- Remote start/stop switch with status indicator light only (Figure 13).
- Remote start/stop switch with status indicator light and hour meter (Figure14).
- Remote start/stop switch with status indicator light and DC voltmeter (Figure15).

The genset has an 8-pin connector for remote control connections (Figure 16). Remote control wiring harnesses in several lengths are available separately. To make connections to a remote control panel:

1. Push the remote control wire harness connector through the entrance hole in the side of the genset housing and snap it together with the genset connector. If the wiring harness is made up by others, insulated 18 AWG copper conductors should be used for distances up to 30 feet (9 meters) and heavier gauge conductors for distances that are greater. Use flexible sheathing to protect remote control wiring. Figure 17 is a schematic of typical remote control connections. It identifies the function of each connector pin number. The remote panel end of each lead should be marked to identify the connector pin number.
2. Route control leads separately from AC power leads to reduce the possibility of erratic operation due to false induced signals.
3. Seal the opening where the leads enter the vehicle interior with silicone rubber or an equivalent type of sealant to keep out exhaust gas.

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

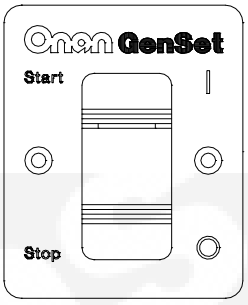

FIGURE 13. REMOTE CONTROL

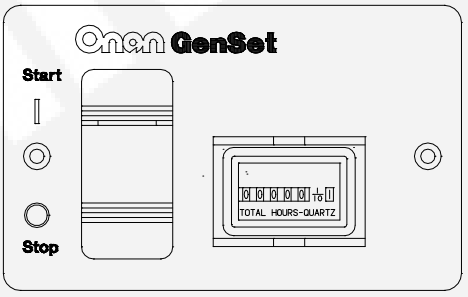

FIGURE 14. REMOTE CONTROL / HOUR METER

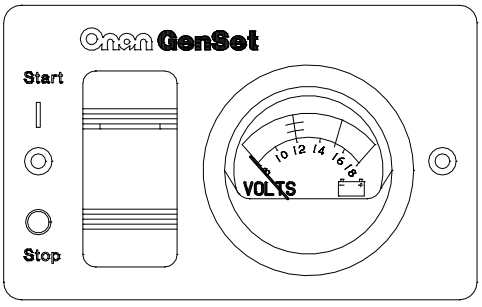

FIGURE 15. REMOTE CONTROL / DC VOLTMETER

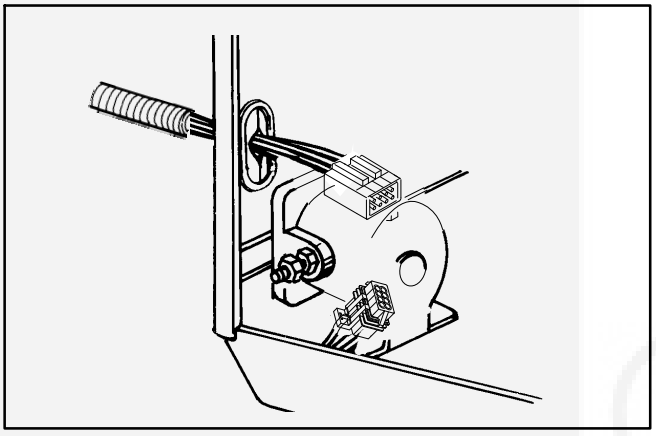

FIGURE 16. REMOTE CONTROL CONNECTOR

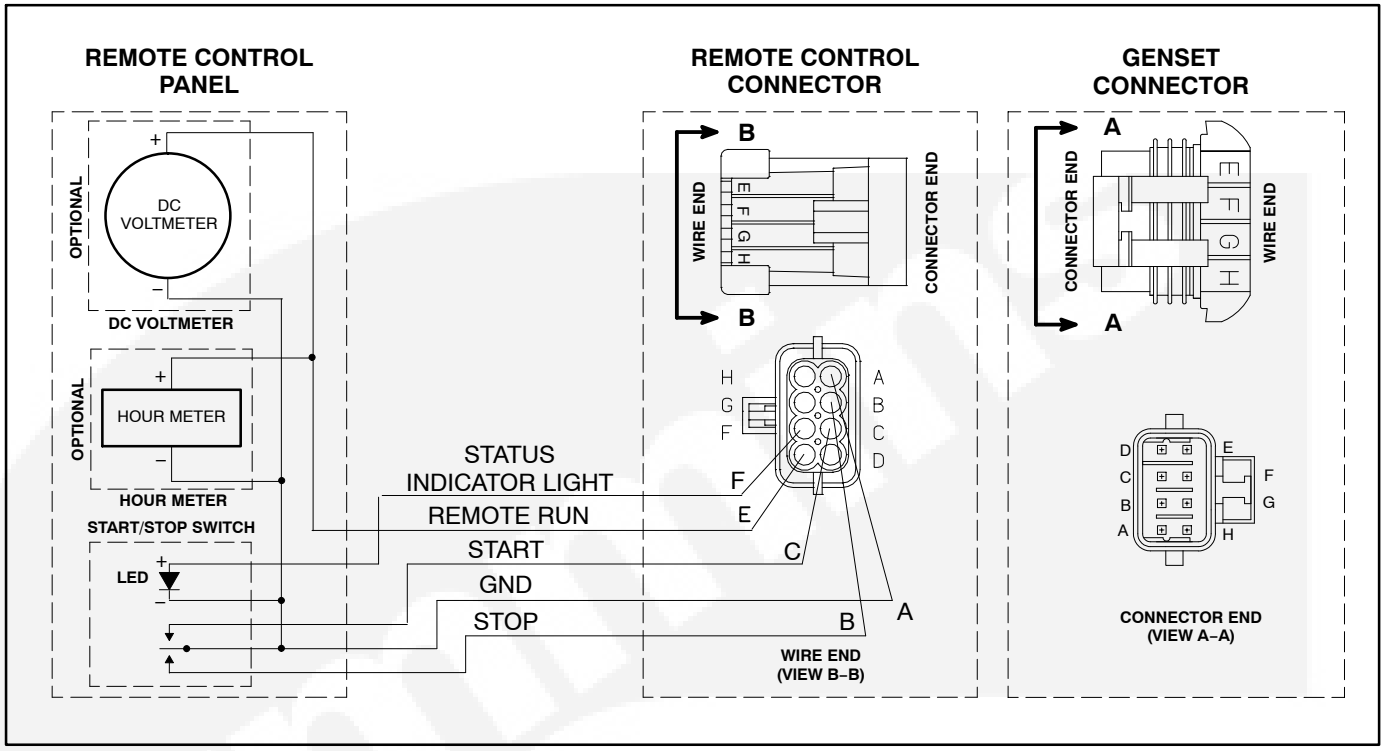

FIGURE 17. SCHEMATIC OF TYPICAL REMOTE CONTROL CONNECTIONS

BATTERY CONNECTIONS

Do not connect the battery cables to the battery until *Installation Review and Startup* (Page 25) to prevent accidental starting of the genset during installation.

WARNING ***Accidental starting of the genset can cause severe personal injury or death. Do not connect the starting battery until Installation Review and Startup (Page 25).***

The genset has a 12 VDC, negative-ground engine control and cranking system. See *Specifications* for the requirements for cranking batteries.

Battery Compartment

Batteries must be mounted in a separate compartment from that of the genset and away from spark-producing equipment. A compartment must have openings of at least 1.7 square inches (11 square centimeters) at the top and bottom for ventilation of battery gasses. It should be mounted such that spills and leaks will not drip acid on fuel lines, wiring and other equipment that could be damaged.

WARNING ***Arcing can ignite the explosive hydrogen gas given off by the battery, causing severe personal injury. The battery compartment must be ventilated and must isolate the battery from spark-producing equipment.***

Battery Cables

Size battery cables according to Table 2. The current path between the genset and the negative (–) battery terminal must also be able to carry full cranking current without causing excessive voltage drop. It is highly recommended that a full-length cable be used to connect the genset to the negative (–) battery terminal (Figure 18). Note also that codes may require bonding conductors from the genset and the battery to the vehicle frame.

If a full-length negative (–) cable is not run from the battery (Figure 19), all vehicle frame members in the path of battery cranking currents must have substantial cross sections. The electrical resistance of riveted or bolted frame joints must also be carefully considered, especially if the joints will be exposed to corrosive conditions. A cable must be used to connect the frame to the designated negative (–) terminal on the genset (Figure 19). The cable must be sized according to Table 2. ***The genset mounting bolts are not considered adequate means for bonding the genset to the vehicle frame, either for the purpose of carrying cranking currents or for complying with requirements for genset/system grounding.***

Route battery cables away from fuel lines and hot engine exhaust components. Battery cables should be accessible for inspection and replacement, protected from damage and secured to prevent chafing due to vibration.

⚠WARNING ***Routing battery cables with fuel lines can lead to fire and severe personal injury or death. Keep battery cables away from fuel lines.***

Terminate the battery cables with appropriately sized eyelet connectors and connect them to the genset as shown in Figure 20.

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

TOTAL CABLE LENGTH* FEET (METERS)	CABLE SIZE AWG
0 to 10 (0 to 3)	2**
11 to 15 (3 to 4.5)	0
16 to 20 (4.5 to 6)	000

* – Add the negative battery cable lengths with the positive battery cable lengths for the total.

** – A total length of up to 20 feet (6 meters) may be used in warmer climates or when battery capacity totals at least 1000 CCA (Cold Cranking Amps).

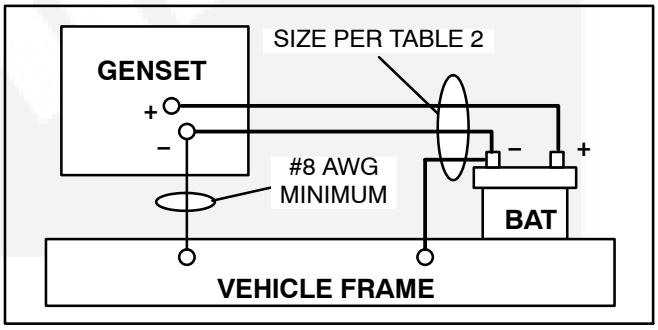

FIGURE 18. FULL-LENGTH CABLE FROM BATTERY NEGATIVE (–) TERMINAL

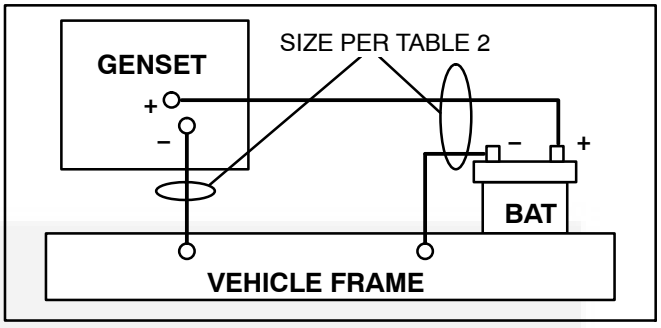

FIGURE 19. VEHICLE FRAME AS PATH FROM BATTERY NEGATIVE (–) TERMINAL

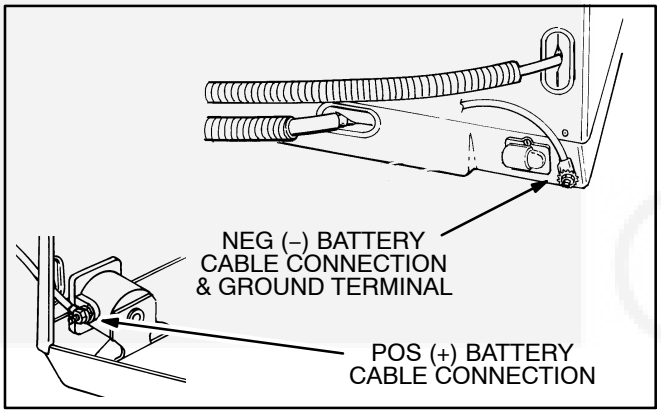

FIGURE 20. BATTERY CABLE CONNECTIONS

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Specifications

	GASOLINE MODELS		LPG MODELS	
	4KYD	**3.6KYD**	**3.6KYD**	**3.3KYD**
GENERATOR: 2-Pole Revolving Field, Self-Excited, 1-Phase, Microprocessor Regulated				
Power	4000 watts	3600 watts	3600 watts	3300 watts
Frequency	60 Hertz	50 Hertz	60 Hertz	50 Hertz
Voltage	120 volts	230 volts	120 volts	230 volts
Current	33.3 amperes	15.7 amperes	30 amperes	14.3 amperes
Speed	3600 rpm	3000 rpm	3600 rpm	3000 rpm
FUEL CONSUMPTION:				
No load Half load Full load	0.29 gph (1.1 l/h) 0.48 gph (1.8 l/h) 0.71 gph (2.7 l/h)	0.21 gph (0.79l/h) 0.37 gph (1.4 l/h) 0.58 gph (2.2 l/h)	1.5 lbs/h (0.7 kg/h) 2.2 lbs/h (1.0 kg/h) 3.3 lbs/h (1.5 kg/h)	1.1 lbs/h (0.5 kg/h) 2.0 lbs/h (0.9 kg/h) 2.9 lbs/h (1.3 kg/h)
ENGINE: 1-Cylinder, 4-Stroke Cycle, Spark-Ignited, OHV, Air Cooled, Mechanically Governed				
Bore	3.11 inch (79 mm)		3.11 inch (79 mm)	
Stroke	2.44 inch (62 mm)		2.44 inch (62 mm)	
Displacement	18.5 $inch^3$ (304 cc)		18.5 $inch^3$ (304 cc)	
Compression Ratio	8.5 : 1		8.5 : 1	
Oil Capacity	1.6 quart (1.5 l)		1.6 quart (1.5 l)	
Intake Valve Lash (Cold)	0.002 inch (0.05 mm)		0.002 inch (0.05 mm)	
Exhaust Valve Lash (Cold)	0.002 inch (0.05 mm)		0.002 inch (0.05 mm)	
Spark Plug Tightening Torque	13 lbs-ft (17 N-m)		13 lbs-ft (17 N-m)	
Ignition Timing (magneto)	25° BTDC, non-adjustable		25° BTDC, non-adjustable	
Magneto Air Gap	0.009-0.015 inch (0.23-0.38 mm)		0.009-0.015 inch (0.23-0.38 mm)	
Spark Plug Gap	0.025 inch (0.64 mm)		0.020 inch (0.51 mm)	
DC SYSTEM:				
Nominal Battery Voltage	12 volts		12 volts	
Min. Battery Rating: Cold Cranking Amps (CCA) @ 0° F (–18° C)	450		450	
Battery Charging Current	–	10 amp (regulated)	–	10 amp (regulated)
INSTALLATION:				
Weight with Muffler	172.6 lb (78.3 Kg)		172.6 lb (78.3 Kg)	
Minimum Compartment Size (H x D x W)[1]	14.55 inch x 20.13 inch x 26.31 inch (369.25 mm x 511.3 mm x 668.3 mm)		14.55 inch x 20.13 inch x 26.31 inch (369.25 mm x 511.3 mm x 668.3 mm)	
Minimum Free Air Inlet Area	40 $inch^2$ (258 cm^2)		40 $inch^2$ (258 cm^2)	
Muffler Outlet Collar O. D.	1.13 inch		1.13 inch	
Max. Exhaust Back Pressure	32 inch WC		32 inch WC	
Fuel Connection	1/4 inch barb fitting for gasoline hose		5/8-18UNC, SAE 45° Flare Fitting	
LPG Vapor Supply Pressure	–		9-13 inch (228-330 mm) Water Column (WC)	

1. See the Installation Manual for additional considerations when sizing the genset compartment.

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Installation Review and Startup

INSTALLATION REVIEW

Before starting the genset inspect the installation and check (√) each of the following questions if it can be answered "YES". If an item cannot be checked, provision must be made to satisfy the requirement.

[ ] Is the control panel on the genset easily accessible for starting and stopping the genset and resetting the circuit breaker?

[ ] Is there easy access for checking and adding engine oil, replacing the spark plug and changing the air filter?

[ ] Is the genset securely bolted in place?

[ ] Are all specified clearances provided?

[ ] Are the air inlet and outlet openings free of obstructions?

[ ] Is there access for draining engine oil?

[ ] Are all tailpipe connections tight and all hangers and support straps secure?

[ ] Does the tailpipe terminate at least 1 inch (25 mm) beyond the perimeter of the vehicle and at least 6 inches (153 mm) away from any opening into the vehicle?

[ ] Is the genset located outside the vehicle interior or separated by approved vapor-tight and fire-resistive materials?

[ ] Are all openings into the vehicle, such as for AC wiring, sealed to keep out engine exhaust? Are AC conduit connectors sealed inside and outside?

[ ] Have all AC connections been inspected and approved?

[ ] Has a properly sized battery for genset starting and control been installed in a ventilated compartment isolated from the genset?

[ ] Have properly sized battery cables been installed and secured at sufficient intervals to prevent chaffing and contact with sharp edges, fuel lines and hot exhaust parts?

[ ] Are all fuel connections tight?

[ ] Has the fuel line been secured at sufficient intervals to prevent chaffing and contact with sharp edges, electrical wiring and hot exhaust parts?

STARTUP

When all the items on the Installation Review check list have been checked, connect the battery cables to the battery, positive (+) cable first.

⚠WARNING ***Batteries give off explosive gases that can cause severe personal injury. Do not smoke near batteries. Keep flames, sparks, pilot lights, electrical arcs and arc-producing equipment and all other ignition sources well away.***

Read the Operator's Manual and perform the maintenance and pre-start checks instructed. The genset is shipped from the factory with the proper level of engine oil, which should nevertheless be checked before the genset is started. Start and operate the genset, following all the instructions and safety precautions in the Operator's Manual.

⚠WARNING ***EXHAUST GAS IS DEADLY! Do not operate the genset when the vehicle is indoors or where exhaust can accumulate.***

Check for fuel and exhaust leaks and unusual noises while the genset is running under full and intermediate loads. Do not place the genset in service until all fuel and exhaust leaks have been fixed and operation is satisfactory.

HOT AIR RECIRCULATION TEST

A representative installation of the genset must be tested to determine that the genset will not overheat due to recirculation of hot air back into the genset.

Test Method

1. Complete a representative installation.
2. Set up a load bank to run the genset at rated full-load.
3. Conduct the test at a location where the ambient air temperature will remain between 60°F and 100°F (16°C and 38°C).

⚠WARNING ***EXHAUST GAS IS DEADLY! Do not operate the genset when the vehicle is parked indoors or where exhaust can accumulate.***

4. Measure temperatures with thermocouples not heavier than No. 24 AWG (0.21 mm^2).

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

   B. Measure ambient air temperature with a shielded thermocouple within 4 feet (1.2 meters) of the genset and at approximately the same height. Make sure the thermocouple will not be affected by warm air discharged from the genset or by sunlight. Use 2 inch diameter white PVC piping at least 6 inches long as a thermocouple shield.

5. Close all compartment doors and run the genset at full-load for at least an hour. Record temperatures at 15 minute intervals until they stabilize. Temperature is considered stable when there is no change in three consecutive readings. Table 2 illustrates how the data can be arranged for recording and analysis.

TABLE 2. TEMPERATURE DATA

THERMOCOUPLE LOCATION	TEMPERATURE C° (F°) Time Of Reading				
AMBIENT AIR					
INLET AIR					

Test Requirement

The rise in inlet air temperature over ambient air temperature must not exceed 15°F (8°C). A rise in inlet air temperature indicates hot air recirculation. If the rise exceeds the requirement, steps must be taken to reduce recirculation to an acceptable level. Review VENTILATION (Page 8).

⚠CAUTION ***High ambient operating temperatures could reduce maximum genset power output if the air temperature rise measured in this test is on the high end of the acceptable range. This guide is for air flow testing only and does not completely verifiy Cooling for generators that use both air and liquid cooling systems.***

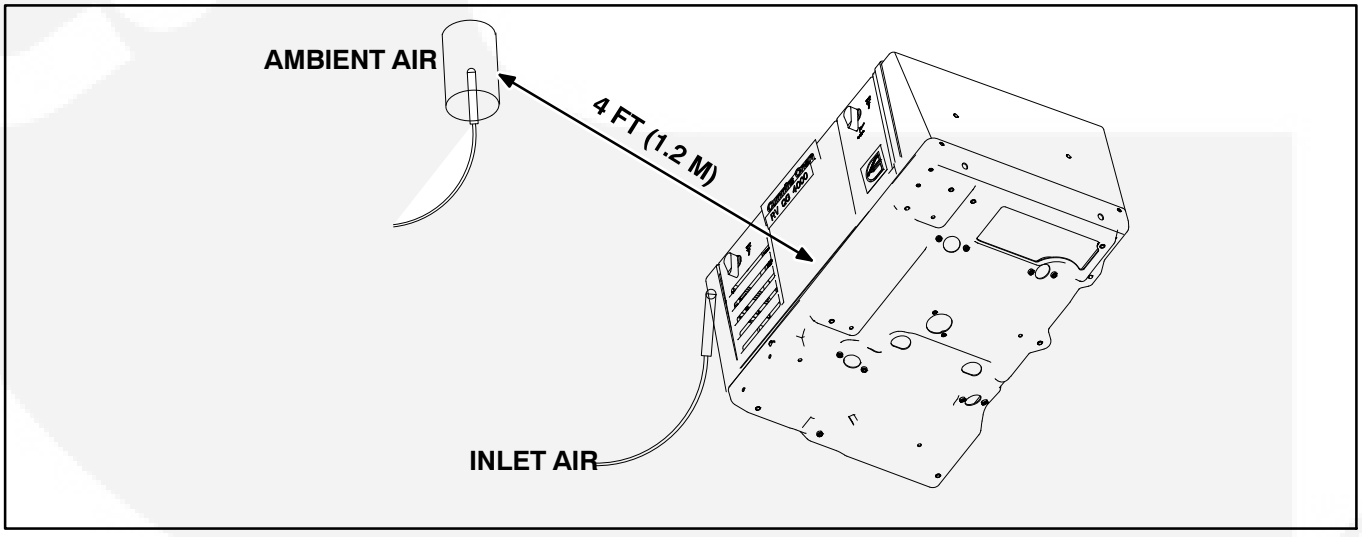
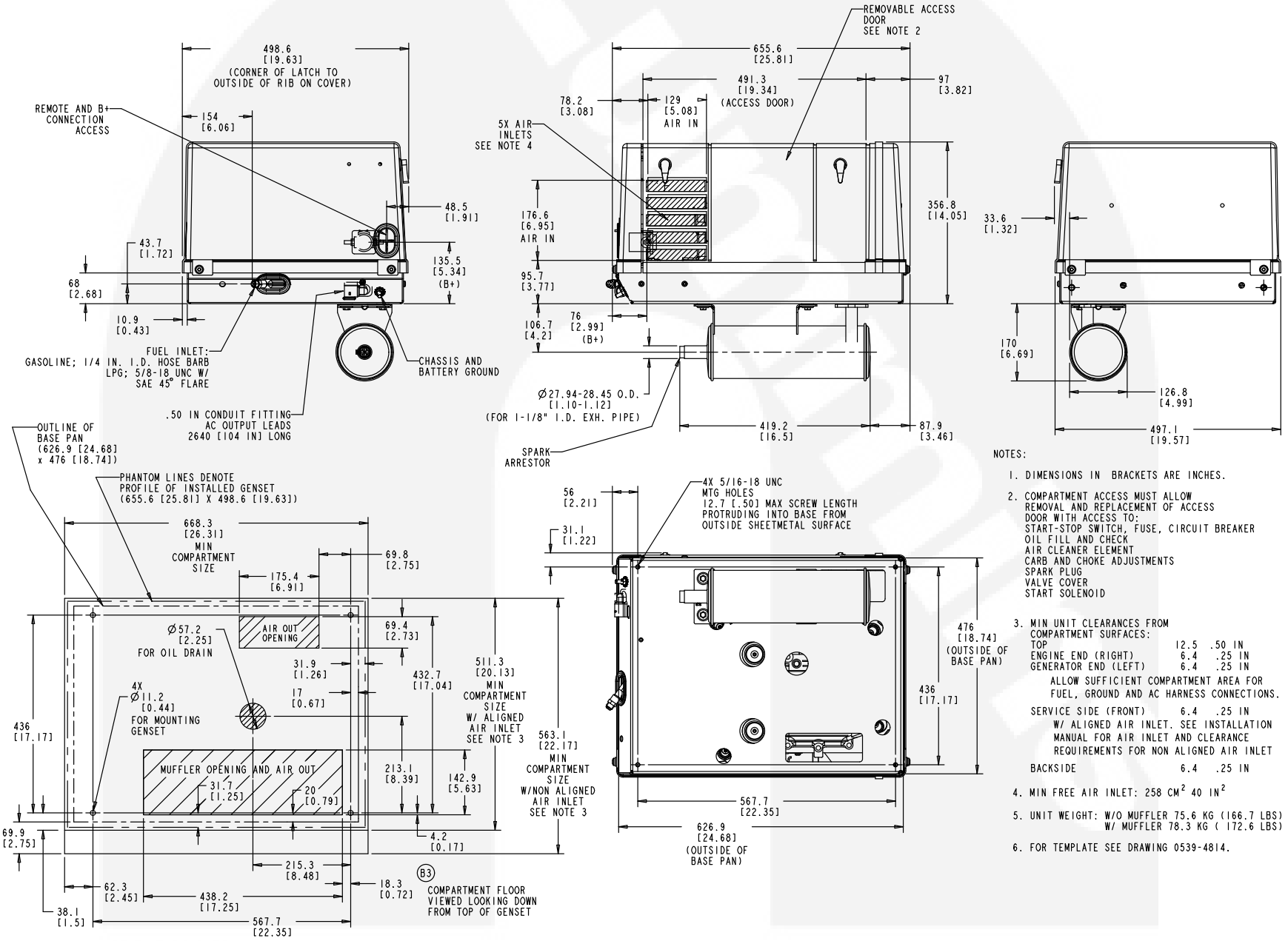


FIGURE 21. THERMOCOUPLE LOCATIONS FOR HOT AIR RECIRCULATION TEST



NOTES:

1. DIMENSIONS IN BRACKETS ARE INCHES.
2. COMPARTMENT ACCESS MUST ALLOW REMOVAL AND REPLACEMENT OF ACCESS DOOR WITH ACCESS TO:
   START-STOP SWITCH, FUSE, CIRCUIT BREAKER
   OIL FILL AND CHECK
   AIR CLEANER ELEMENT
   CARB AND CHOKE ADJUSTMENTS
   SPARK PLUG
   VALVE COVER
   START SOLENOID
3. MIN UNIT CLEARANCES FROM COMPARTMENT SURFACES:

TOP	12.5	.50 IN
ENGINE END (RIGHT)	6.4	.25 IN
GENERATOR END (LEFT)	6.4	.25 IN

   ALLOW SUFFICIENT COMPARTMENT AREA FOR FUEL, GROUND AND AC HARNESS CONNECTIONS.

SERVICE SIDE (FRONT)	6.4	.25 IN

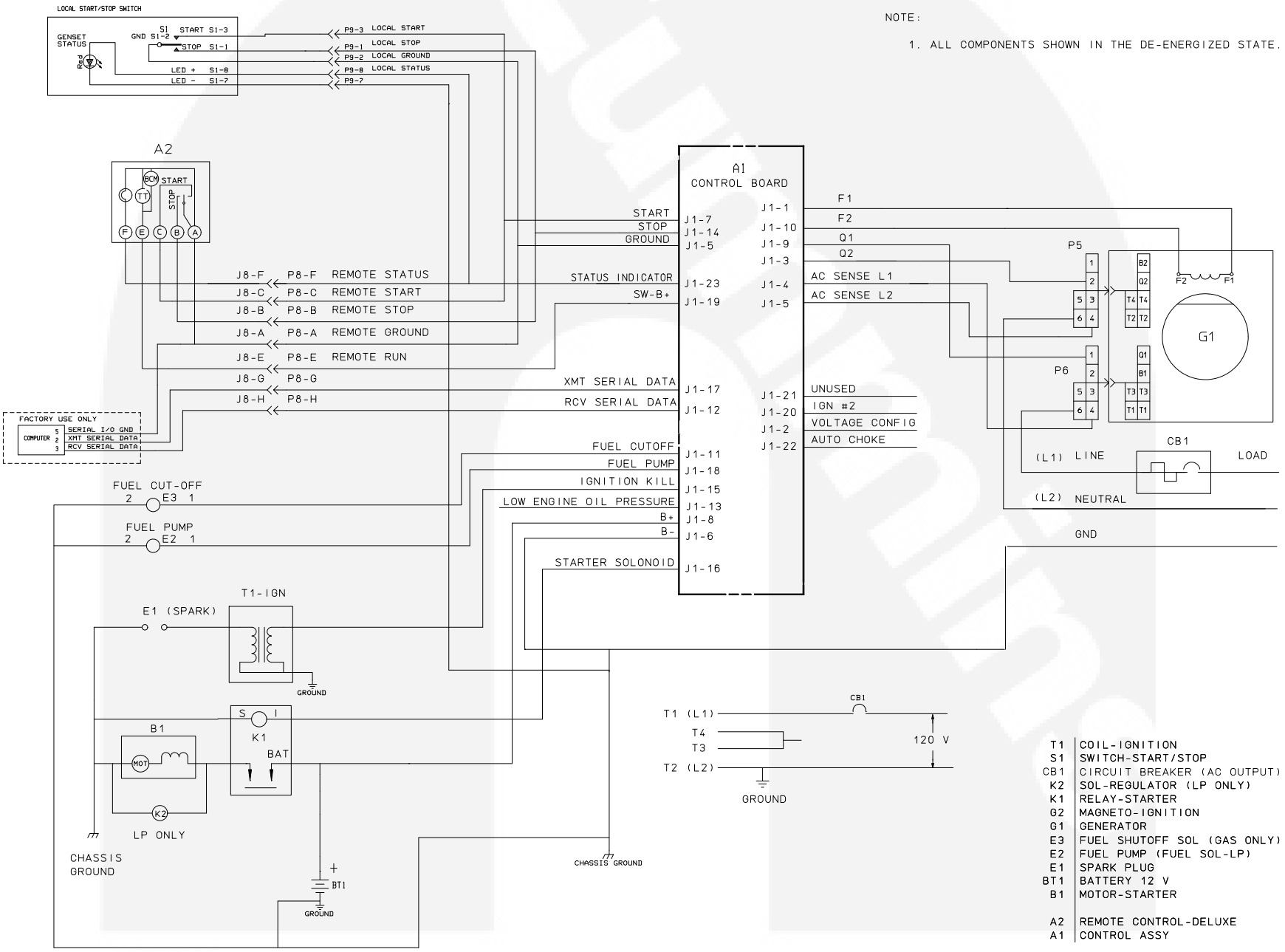
   W/ ALIGNED AIR INLET. SEE INSTALLATION MANUAL FOR AIR INLET AND CLEARANCE REQUIREMENTS FOR NON ALIGNED AIR INLET

BACKSIDE	6.4	.25 IN

4. MIN FREE AIR INLET: 258 CM^2 40 IN^2
5. UNIT WEIGHT: W/O MUFFLER 75.6 KG (166.7 LBS)
   W/ MUFFLER 78.3 KG (172.6 LBS)
6. FOR TEMPLATE SEE DRAWING 0539-4814.

OUTLINE DRAWING

500-3717



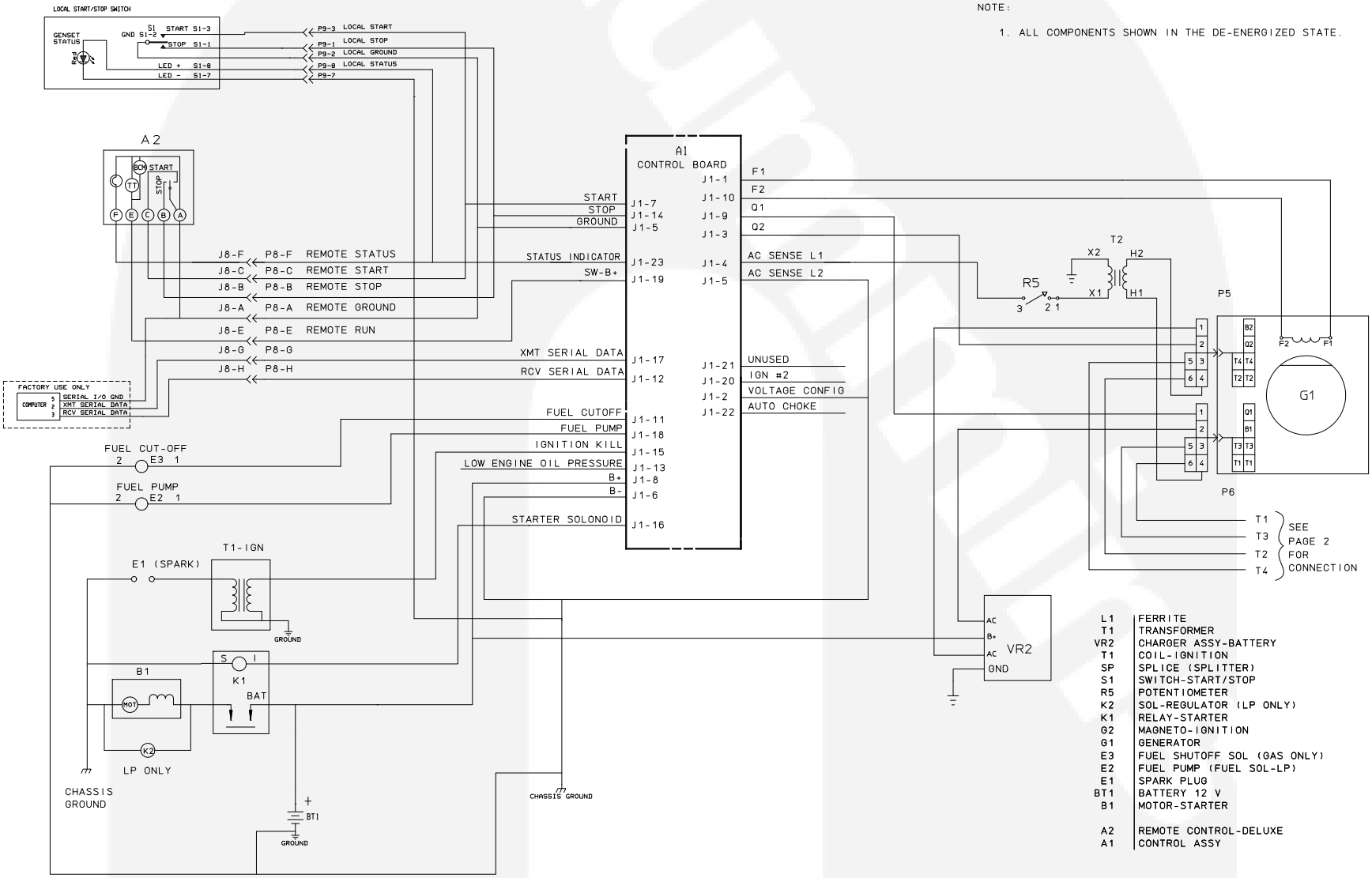
NOTE:

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

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

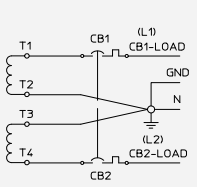
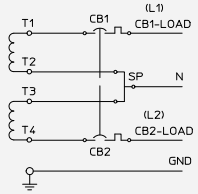
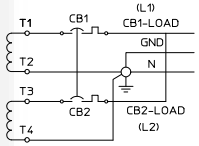
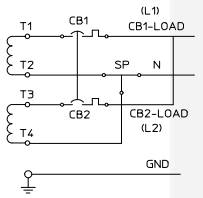
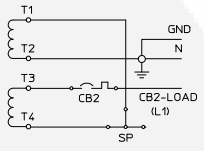
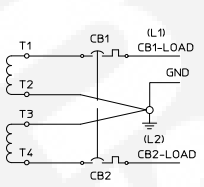
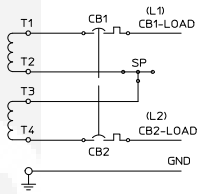
WIRING DIAGRAM—60 HZ

0611-1267



WIRING DIAGRAM—50 HZ

0611-1268-1

FROM:	TO:						
	3 WIRE 100/200, 110/220 OR 120/240V		2 WIRE 100, 110 OR 120V		2 WIRE 200, 220 OR 240V		
	NEUTRAL GROUNDED	NEUTRAL ISOLATED	NEUTRAL GROUNDED	NEUTRAL ISOLATED	LINE TO GND=200 OR 220V NEUTRAL GROUNDED	LINE TO GND=100 OR 110V NEUTRAL GROUNDED	NEUTRAL ISOLATED
T1-LINE T2-LINE T3-LINE T4-LINE	CB1-LINE GROUND GROUND CB2-LINE	CB1-LINE SPLITTER SPLITTER CB2-LINE	CB1-LINE GROUND CB2-LINE GROUND	CB1-LINE SPLITTER CB2-LINE SPLITTER	SPLITTER GROUND CB1-LINE SPLITTER	CB1-LINE GROUND GROUND CB2-LINE	CB1-LINE SPLITTER SPLITTER CB2-LINE
CB1-LOAD (L1) NEUTRAL(N) CB2-LOAD (L2) GROUND (GND)	CB1-LOAD GROUND CB2-LOAD GROUND	CB1-LOAD SPLITTER CB2-LOAD GROUND	CB1-LOAD GROUND CB2-LOAD GROUND	CB1-LOAD SPLITTER CB2-LOAD GROUND	CB1-LOAD GROUND OPEN GROUND	CB1-LOAD OPEN CB2-LOAD GROUND	CB1-LOAD OPEN CB2-LOAD GROUND
SPECIAL INSTRUCTIONS	SPLITTER NOT USED		CONNECT L1-L2 AT JUNCTION BOX SPLITTER NOT USED	CONNECT L1-L2 AT JUNCTION BOX		SPLITTER NOT USED	
100 120V 200 240V	L1-N, L2-N L1-L2	L1-N, L2-N L1-L2	(L1,L2)-N N/A	(L1,L2)-N N/A	N/A L1-N	N/A L1-L2	N/A L1-L2
RECONNECTION DIAGRAMS					 **KYD**		

OUTPUT CONNECTIONS—50 HZ

Cummins **Onan**

Cummins Power Generation
1400 73rd Ave. NE
Minneapolis, MN 55432 USA

Phone 1 763 574 5000
Toll-free 1 800 888 6626
Fax 1 763 574 5298
Email www.cumminsonan.com/contact
www.cumminsonan.com