

INSTALLATION MANUAL

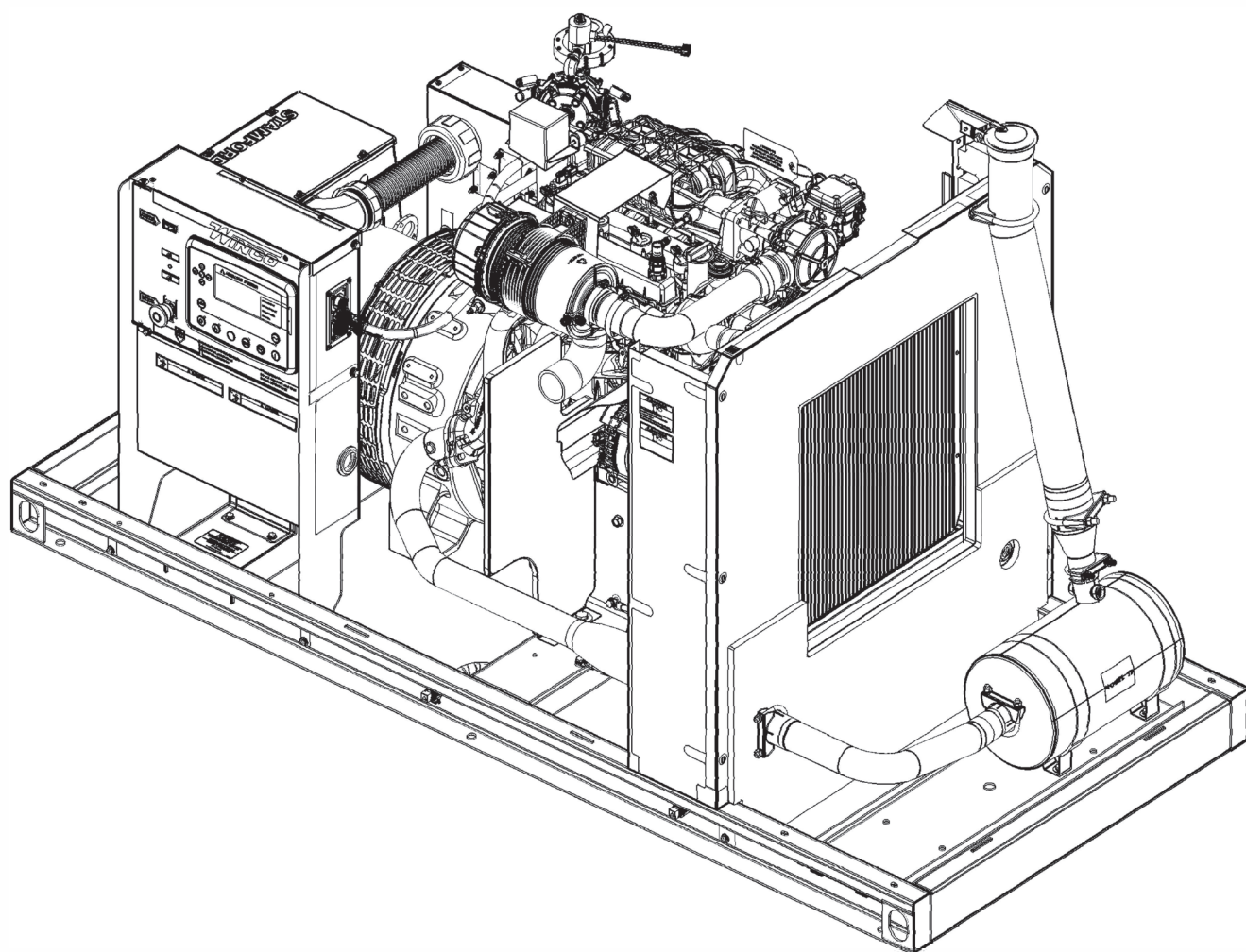


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SAFETY INFORMATION

This engine generator set has been designed and manufactured to allow safe, reliable performance. Poor maintenance, improper or careless use can result in potentially deadly hazards; from electrical shock, exhaust gas asphyxiation, or fire. Please read all safety instructions carefully before installation or use. Keep these instructions handy for future reference. Take special note and follow all warnings on the unit labels and in the manuals.

All electrical/mechanical equipment should be operated at regular intervals to ensure reliable performance lubrication and to dry electrical winding. WINCO recommends running generator sets once a week at no load for 15 minutes (an optional automatic exercising clock is available for remote start units), and once a month under full connected load for a similar interval.

CALIFORNIA PROPOSITION 65



WARNING: This product contains crude oil, gasoline, diesel fuel and other petroleum products, Antifreeze to which can expose you to chemicals including toluene and benzene, Ethylene glycol (ingested) which are known to the State of California to cause cancer, birth defects or other reproductive harm and developmental issues. For more information go to www.P65Warning.ca.gov.

ANSI SAFETY DEFINITIONS

DANGER:

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

WARNING:

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION:

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

1. ELECTRICAL SHOCK -

The output voltage present in this equipment can cause fatal electric shock. This equipment must be operated by a responsible person.

- A. Do not allow anyone to operate the generator without proper instruction.
- B. Guard against electric shock.
- C. Avoid contact with live terminals or receptacles.
- D. Use extreme care if operating this unit in rain or snow.
- E. Use only three-pronged grounded receptacles and extension cords.
- F. Be sure the unit is properly grounded to an external ground rod driven into the earth.

2. FIRE HAZARD -

Gasoline and other fuels present a hazard of possible explosion and/or fire.

- A. Do not refuel when the engine is running or hot.
- B. Keep fuel containers out of reach of children.
- C. Do not smoke or use open flame near the generator set or fuel tank.
- D. Keep a fire extinguisher nearby and know its proper use. Fire extinguishers rated ABC by NFPA are appropriate.
- E. Store fuel only in an approved container, and only in a well ventilated area.
- F. Follow local codes for closeness to combustible material.

3. DEADLY EXHAUST GAS -

Exhaust fumes from any internal combustion engine contain carbon monoxide, an invisible, odorless and deadly gas that must be mixed with fresh air. Do not operate this equipment in a way that it is possible for dangerous levels of carbon monoxide to accumulate.

4. NOISE HAZARD -

Excessive noise is not only tiring, but continual exposure can lead to loss of hearing.

- A. Use hearing protection when working around this equipment for long periods of time.
- B. Keep your neighbors in mind when using this equipment.

5. CLEANLINESS -

Keep the generator and surrounding area clean.

- A. Remove all grease, ice, snow or materials that create slippery conditions around the unit.
- B. Remove any rags or other materials that could create a potential fire hazard.
- C. Carefully clean up any gas or oil spills before starting the unit.

6. SERVICING EQUIPMENT -

All service, including the installation or replacement of service parts, should be performed only by a qualified technician.

- A. Use only factory approved repair parts.
- B. Do not work on this equipment when fatigued.
- C. Never remove the protective guards, covers, or receptacle panels while the engine is running.
- D. Use extreme caution when working on electrical components. High output voltage from this equipment can cause serious injury or death.
- E. Always avoid hot mufflers, exhaust manifolds, and engine parts. They can cause severe burns instantly.
- F. The use of the engine-generator set must comply with all national, state, and local codes.

INSTALLATION

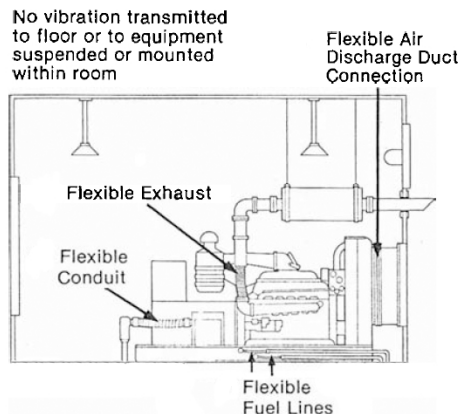
This manual contains general installation guidelines. For a proper installation refer to the generator specification sheet, outline drawings, operator's manuals and the applicable codes for specific details on your installation.

APPLICABLE CODES

NFPA 30 - Handling and Use of Flammable Liquids
NFPA 37 - Installation and Use of Internal Combustion Engines
NFPA 54 - Installation of Gas Piping and Gas Appliances in Buildings
NFPA 58 - Storage and Handling of Liquefied Petroleum Gases
NFPA 70 - National Electrical Code
Fire Protection Code
National Building Code

All installations must comply with these codes and any instructions provided in this manual are general guidelines and are not intended to be a comprehensive summary of the applicable codes.

SHELTER CONSTRUCTION



All structures should comply with the national building code and any local ordinances.

WINCO open skid generators are pieces of electrical equipment and as such should be protected from the elements. Exposure to water, snow or excessive dust can cause dangerous conditions. Any enclosure should be designed to provide a dry and clean environment for the generator set and all electrical and fuel connections. Take precaution to ensure that the generator set is protected from direct contact with rain as well as the work area designed in a way to prevent water from pooling or otherwise running in the service areas.

Generator sets produce significant amounts of heat. The structure should be constructed of non-combustible materials like concrete block, steel, or other fire resistant materials complying with local code. Adequate space between the structure and any component of the generator is necessary. The radiator side of the generator should be mounted near an outside wall to make successful ventilation easier. Be sure to account for ceiling height and exhaust installation when planning a structure. Protect the

structure from the heat generated by the system and allow room for service personnel to gain access to the generator for routine maintenance and other necessary repairs. A general rule is to allow at least three feet between the generator and any part of the structure or utilities. Keep the area next to the generator clear and do not allow anything to be left or stored in this area.

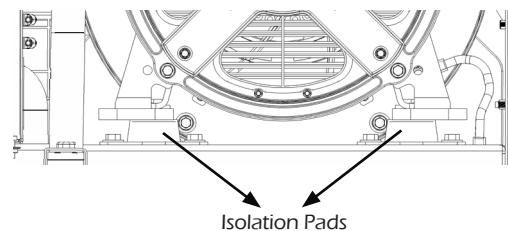
The structure should be designed to restrict access to the generator set and other utilities from unauthorized people. Access to the shelter or any maintenance work should only be performed by people that are qualified and properly trained on the safe operation and service of the generator, fuel system and all other electrical components. Generator sets can start automatically and must be properly disabled before any service work begins. See the operator's manual for additional instructions.

FLOOR LOADING

The floor of the shelter should be designed for the proper mounting of the generator set. Each generator is required to be mounted with anchor bolts to a concrete slab per the instructions in the operator's manual. The generator should not be set on dirt, rock or any other unstable surface. The dirt under the slab must be able to support the combined weight of the slab and the generator set. Some areas and soil types may require special foundations or larger/thicker pads to provide a stable foundation. Failure to provide a stable foundation may result in the generator moving during operation or settling over time and cause damage to the fuel and electrical system that could result in injury or death.

VIBRATION

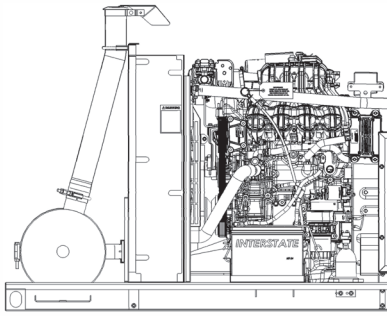
The generator sets produce electricity with rotating equipment that causes vibration to be transmitted to any surface it comes into contact with. WINCO generators are equipped with vibration isolation mounts between the engine and generator ends and the base. This allows the base to safely be mounted to the concrete pad directly without any additional vibration dampening.



During installation you will be required to make connections to the generator set. Any connection to a part of the system that is allowed to vibrate with the engine and generator will require isolation as part of your installation. The easiest way to identify components that require isolation is to observe whether they are connected to the generator base or if they are mounted to the engine or generator. Any item mounted to the base is safe to make a rigid connection. All other items require isolation. See details in the fuel, electrical and exhaust sections.

To make installation easier some Winco models come with the exhaust system factory installed. This saves you the time and effort of having to hang the muffler and isolate it. It also

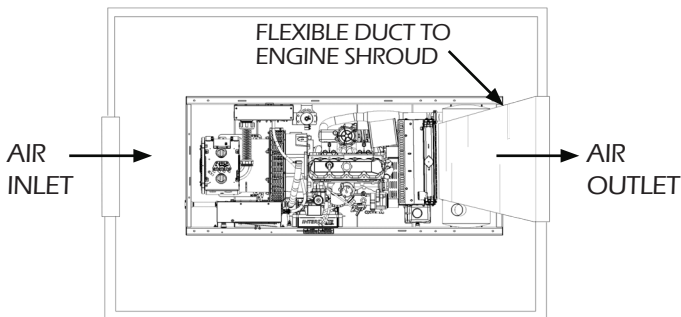
makes the ducting very easy to install. These models can be identified in their outline drawings looking for the radiator divider and exhaust system installation. We will discuss how to quickly install these models in the various sections.



WINCO does not recommend that additional vibration isolators be installed between the generator base and the concrete pad. These can increase the total amount of vibration in the generator set causing component failures. Some applications and codes (example: Seismic) may require special vibration isolators. These items should be carefully engineered to ensure that the vibration when the generator set is operating normally is at a safe level and does not exceed component acceptable levels.

Some manufacturing process can create repeated vibrations in the ground. If your facility has these kinds of processes the concrete pad may need to be isolated from the facility to protect the generator system from damage.

VENTILATION

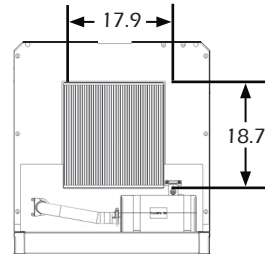


The generator set utilizes an internal combustion engine which generates significant amounts of heat. Running at higher temperatures will increase engine and generator wear and reduce the useful life of the equipment. WINCO liquid-cooled generator sets come equipped with pusher fans. This means that all cooling air is pushed through the radiator from the engine side. In order to ensure proper operation an air inlet and outlet must be supplied in the shelter. All inlets and outlets should be designed to protect the equipment from rodents, moisture and other hazards. WINCO's electronic generator controls can be programed with 12 or 24 VDC outputs (model dependent) to control motorized louvers or other related items. In order to help reduce noise outside the shelter chimneys or other baffling to redirect air flow and noise can be used. Make sure that any 90 degree turns or other routes are expanded to avoid restricting air-flow.

AIR INLET

The cooling air inlet should be at least 150% of the radiator outlet opening. The extra inlet area is essential to minimize restriction and to provide combustion air for the engine. When calculating the inlet area remember that some of the space will be obstructed by screens, louvers or baffles. Make sure your open area accounts for these obstructions.

Example:



$$\text{Area} = W \times H$$

$$17.9" \times 18.7" = 334.73"$$

$$334.73" \times 150\% \text{ (or } 1.5) = 502.095 \text{ in}^2$$

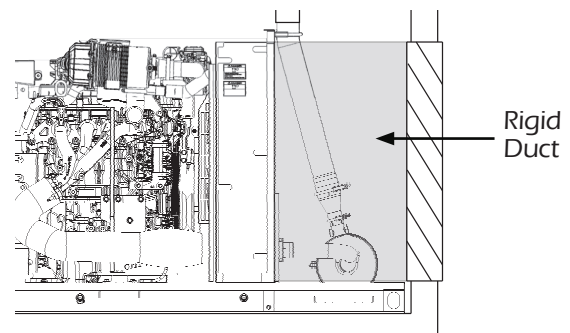
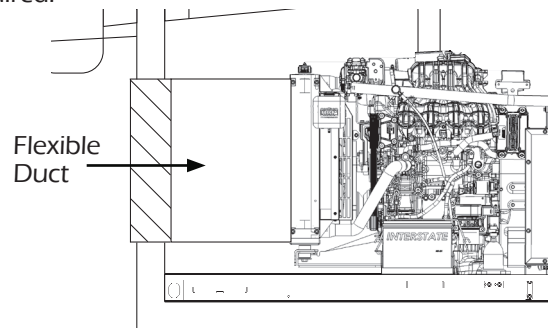
For this example, you will need approximately 503 in² outlet opening.

This inlet should be opposite the hot air exhaust causing the pusher fan to draw the cooling air across the entire machine. The cool air inlet should be protected with louvers or other ducting to prevent water or other contaminants from entering the enclosure. Louvers will also help keep the engine warmer during the winter months.

AIR OUTLET

The radiator output must be over 100% of the total radiator area. Remember to take into account obstructions from louvers and turns when calculating the required outlet area.

The ducting to the outside must be tight to the radiator to prevent air escaping and recirculating in the room. On models where the duct flange is connected directly to the radiator to include a section of flexible ducting to prevent damage to the equipment. On models where the oversized duct flange is bolted to the frame no flexible ducting is required.

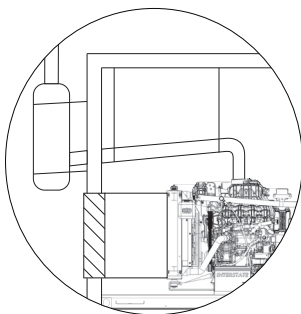


EXHAUST PIPING

It is essential to carefully layout and plan your exhaust system. Improper installation can result in damage to the equipment and create conditions that are hazardous to personnel. Internal combustion engines create carbon monoxide that can result in injury or death. Make sure the exhaust is discharged outside the shelter and insure proper installation prevents leaks inside the shelter. Exhaust temperatures can exceed 1000 degrees F. Use an exhaust thimble when passing exhaust pipes through the shelter's walls or roof. The thimble will prevent heat build-up that can damage the walls and building. Identify windows, building air intakes and other site considerations that could expose personnel to exhaust fumes. Do not place any exhaust components near any combustible material. Pay attention to all service points while installing the exhaust run and remember to consult the applicable codes and standards. Support all exhaust components appropriately to prevent premature wear resulting in cracking and exhaust leaks.

The exhaust system should be designed to be as short as possible. On runs over 25 feet consult the factory. Do not use more than three 90 degree elbows or six 45 degree elbows. The pipe must be at least the same internal diameter of the exhaust manifold on the engine or larger. Reducers in the exhaust increase back pressure which may cause overheating and void the emissions certification on the engine. To improve heat transfer expanding the exhaust to larger diameters after the muffler can help reduce back pressure and reduce heat in the system. A condensation trap should be installed in the exhaust run to allow any water to collect safely and be drained as necessary. Steps must be taken to prevent water from entering the exhaust run. Rain caps, bends and other appropriate techniques can accomplish this task.

Always slope exhaust runs away from the engine so that if any water enters the system it will not collect in the exhaust manifold.



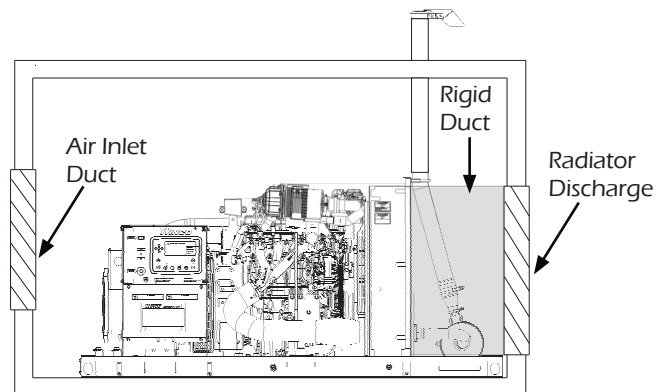
The muffler can be installed either inside or outside the shelter. Installing inside the shelter will increase the overall temperature and may require a larger shelter or additional air flow to prevent equipment overheating. In some cases, the muffler may require appropriate insulation to prevent radiant heat from affecting the equipment inside the shelter.

The location of the exhaust output will change the sound level personnel in the area are exposed to. Generally exhausting upward and higher up will reduce the level of noise personnel in the area are exposed to.

FACTORY INSTALLED MUFFLER

If your model has a factory installed muffler it is designed to be installed within the cooling air discharge duct. This reduces heat inside the structure and significantly reduces the complexity of the installation.

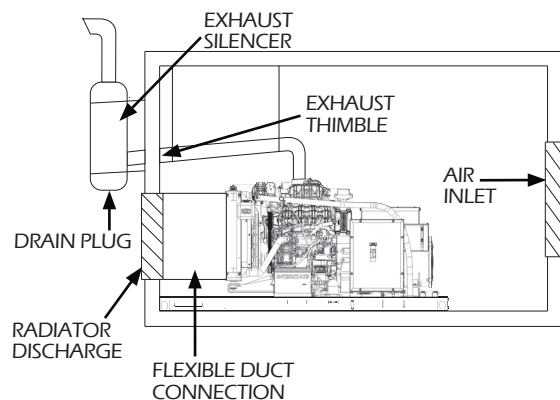
The muffler is isolated from the engine vibration from the factory so you only have to run rigid and do not have to deal with locating the muffler and installing flex piping.

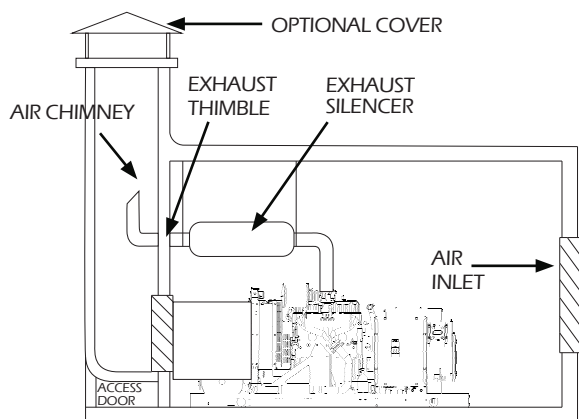


SHIPPED LOOSE EXHAUST

The hot air discharge is accomplished by installing a duct connected to the engine radiator to and opening of equal or greater size in the shelter. Since the duct connects to a radiator that is allowed to vibrate with the engine it must have a flexible section between the shelter and radiator. Failure to install the flexible section will result in the duct and/or radiator to crack from stress. The flexible conduit should be capable of expanding at least two inches.

The exhaust system will be mounted to rotating equipment (engine) which causes vibration and to the shelter which is fixed. An appropriate exhaust flex is required between the engine manifold and exhaust components connected to the shelter. Do not use the flex as an elbow, or to hang exhaust components from.





FUEL SYSTEM

A proper fuel supply system is critical to achieving acceptable performance from an engine or generator. Always follow the appropriate standards and codes when installing the fuel system. The closer the fuel supply is to the generator installation the easier and cheaper the fuel installation will be.

DIESEL FUEL

WINCO generators can operate on a variety of diesel tanks. When specifying your fuel tank the following considerations should be addressed.

- Can I easily refill the tank?
- How much fuel do I need?
- In an emergency how long do I want to run my load without refilling?
- How much fuel will my regular exercises consume?
- How long do I want to be able to exercise the generator before I refill?

Add the exercise refill cycle to your run time and that is how many gallons of fuel you should have on hand.

The most common option is to use a UL142 sub base tank mounted directly below the generator. These tanks are specifically designed for operation with our generators and include fuel level monitoring integrated into the controller. If your application requires a different tank design, there are numerous options available to you from reputable manufacturers. The fuel pump on the engines WINCO uses are generally able to pull fuel up about 36". If your tank is underground or the generator is elevated, you may need an auxiliary fuel pump for your system to work. Diesel tanks that are above the generator set may generate excessive head pressure. Consult the factory to see if your model is compatible with above ground systems.

GASEOUS FUELS

These systems run on LP or natural gas. In order to achieve the full output of the generator it is essential that both the specified pressure and volume is required. The flow and input pressure are available in the operator's manual, specification sheet and the generator fuel inlet decal.

Special care should be taken when installing systems that run on LP. The ambient air temperature will dramatically change the amount of fuel an LP tank can naturally vaporize. A tank sized for operation during the summer months may fail to provide adequate fuel for operation during the winter months. As the generator set gets larger it may become impractical to size an LP tank large enough for the coldest days in your area. A LP liquid-withdrawal system can be equipped on most models. These systems draw liquid rather than vapor fuel from the LP tank. Once the fuel reaches the engine it is vaporized by using the engine coolant to produce vapor fuel on demand. This upgrade is recommended for any LP system that needs to operate in cold environments. The WINCO operator's manual will include model specific information for the proper installation of the fuel system.

The fuel inlet will be located on the base of the generator which is vibration isolated from the engine and generator. The fuel inlet can generally be connected to the generator with rigid piping.

ELECTRICAL CONNECTIONS

The location of the shelter can greatly reduce the cost of the electrical connections by decreasing the length of the run dramatically. Size all wiring in accordance with the proper tables in NFPA 70.

WINCO manufacturers models that mount the Main-Line Circuit Breaker to both rotating and stationary components. It is essential that you identify which type of installation you are working with. Using rigid conduit to a MLCB connected to a rotating components will cause premature vibration caused failures. You can generally identify models with an isolated MLCB because there will be a run of flexible conduit between the generator end and the MLCB. All MLCB assemblies that are mounted to rotating components require flexible conduit between them and any fixed structure or component.

If you are using any control wires for Ethernet, RS485 or other communication connections ensure that you have means to keep them separated from your AC circuits to prevent interference.

TESTING

Before finishing the commissioning of a system run the system under load and observe the coolant temperatures from the controller. The temperature should rise steadily and then stabilize if there is sufficient cooling air. A warning alarm is set in the controller when the system is approaching the maximum allowable operating temperature. Remember that if you are not testing at the maximum ambient air temperature the measured temperatures on hotter days will increase.

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 An American Company



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