

Installation and Start-Up Manual

GEN42WN & GEN45WL

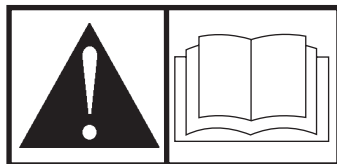
45000 Watt Residential Generator System

Questions?

Help is just a moment away!

Call: **Home Generator Helpline**

(877) 369-9400 M-F 8-5 CT



Thank you for purchasing this quality-built Rheem / Ruud residential generator. We are pleased that you've placed your confidence in the Rheem or Ruud brand. When operated and maintained according to the instructions in this manual, your residential generator will provide many years of dependable service.

This manual contains safety information to make you aware of the hazards and risks associated with residential generator systems and how to avoid them. This generator system is designed and intended only for use as an optional home standby system that provides an alternate source of electric power and to serve loads such as heating, refrigeration systems, and communication systems that, when stopped during any power outage, could cause discomfort or inconvenience. This product is not intended for any other purpose and does not qualify for emergency standby as defined by NFPA 70 (NEC). **Save these instructions for future reference.**

This generator system requires professional installation before use. Refer to the separate installation manual for instructions on safe installation procedures. Your installer should follow the instructions completely

Where to Find Us

You never have to look far to find support and service for your generator. Consult your Yellow Pages. There are many Rheem and Ruud authorized service dealers who provide quality service. You can also contact Customer Service by phone at **(877) 369-9400**.

For Future Reference

Please fill out the information below and keep with your receipt to assist in unit identification for future purchase issues.

Date of Purchase

Generator

Model Number

Model Revision

Serial Number

Engine

Model Number

Serial Number

Rheem Sales Company
Randleman, NC 27317
(877) 369-9400

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Table of Contents

Important Safety Instructions	4
Installation	7
Home Owner Responsibilities	7
Installing Dealer/Contractor Responsibilities	7
Delivery Inspection	7
Generator Location	8
Fuel Consumption	12
System Connectors	13
Grounding the Generator	14
System Control Panel	15
Final Installation Considerations	15
Initial Start-up (No Load)	16
Fuel Conversion	17
Schematic Diagram	18
Wiring Diagram	19
Controls	20
Operation	20
Automatic Operation Sequence	20
Setting Exercise Timer	20
Installation Inspection	20

Safety

Installation

Controls

Operation

Save These Instructions

Important Safety Instructions

SAVE THESE INSTRUCTIONS - This manual contains important instructions that should be followed during installation and maintenance of the generator and batteries.

The safety alert symbol (▲) is used with a signal word (DANGER, CAUTION, WARNING), a pictorial and/or a safety message to alert you to hazards. **DANGER** indicates a hazard which, if not avoided, will result in death or serious injury. **WARNING** indicates a hazard which, if not avoided, could result in death or serious injury. **CAUTION** indicates a hazard which, if not avoided, might result in minor or moderate injury. **NOTICE** indicates a situation that could result in equipment damage. Follow safety messages to avoid or reduce the risk of injury or death.

This manual contains installation, startup and adjustment instructions for a residential generator that supplies 120/240 Volt, single phase, 60Hz devices. The residential generator may be operated on LP vapor or natural gas fuel. Separate engine and generator operator's manuals are supplied that contain operating and maintenance instructions for this system.

Every effort has been made to ensure that the information in this manual is both accurate and current. However, the manufacturer reserves the right to change, alter or otherwise improve the system at any time without prior notice.

Hazard Symbols and Meanings



Explosion



Fire



Electrical Shock



Toxic Fumes



Rotating Parts



Hot Surface



Auto Start



Explosive Pressure



Chemical Burn



Rotating Belt/Pulley



Rotating Fan Blade



Exploding Battery



Lift Hazard



Read Manual

▲ WARNING



Running engine gives off carbon monoxide, an odorless, colorless, poison gas. Breathing carbon monoxide can cause headache, fatigue, dizziness, vomiting, confusion, seizures, nausea, fainting or death.

- Operate generator ONLY outdoors.
- Install a battery operated carbon monoxide alarm near the bedrooms.
- Keep exhaust gas from entering a confined area through windows, doors, ventilation intakes, or other openings.

▲ WARNING



Storage batteries give off explosive hydrogen gas during recharging. Slightest spark will ignite hydrogen and cause explosion.



Battery electrolyte fluid contains acid and is extremely caustic.



Contact with battery contents will cause severe chemical burns.

A battery presents a risk of electrical shock and high short circuit current.



- DO NOT dispose of battery in a fire. Recycle battery.
- DO NOT allow any open flame, spark, heat, or lit cigarette during and for several minutes after charging a battery.
- DO NOT open or mutilate the battery.
- Wear protective goggles, rubber apron, rubber boots and rubber gloves.
- Remove watches, rings, or other metal objects.
- Use tools with insulated handles.



▲ 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


Certain components in this product and related accessories contain chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm. Wash hands after handling.


 WARNING	
	<p>Generator produces hazardous voltage. Failure to properly ground generator can result in electrocution. Failure to isolate generator from power utility can result in death or injury to electric utility workers due to backfeed of electrical energy.</p>
<ul style="list-style-type: none"> • When using generator for backup power, notify utility company. • DO NOT touch bare wires or bare receptacles. • DO NOT use generator with electrical cords which are worn, frayed, bare or otherwise damaged. • DO NOT handle generator or electrical cords while standing in water, while barefoot, or while hands or feet are wet. • If you must work around a unit while it is operating, stand on an insulated dry surface to reduce risk of shock hazard. • DO NOT allow unqualified persons or children to operate or service generator. • In case of an accident caused by electrical shock, immediately shut down the source of electrical power and contact the local authorities. Avoid direct contact with the victim. • Despite the safe design of the residential generator, operating this equipment imprudently, neglecting its maintenance or being careless can cause possible injury or death. • Remain alert at all times while working on this equipment. Never work on the equipment when you are physically or mentally fatigued. • Before performing any maintenance on the generator, disconnect the battery cable indicated by a NEGATIVE, NEG or (-) first. When finished, reconnect negative cable last. • After your residential generator is installed, the generator may crank and start without warning any time there is a power failure. To prevent possible injury, always set the generator's system switch to OFF, remove the service disconnect from the disconnect box AND remove the 15 Amp fuse BEFORE working on the equipment. 	

 WARNING	
	<p>Propane and Natural Gas are extremely flammable and explosive. Fire or explosion can cause severe burns or death.</p>
<ul style="list-style-type: none"> • Install the fuel supply system according to applicable fuel-gas codes. • Before placing the residential generator into service, the fuel system lines must be properly purged and leak tested. • After the generator is installed, you should inspect the fuel system periodically. • NO leakage is permitted. • DO NOT operate engine if smell of fuel is present or other explosive conditions exist. • DO NOT smoke around the generator. Wipe up any oil spills immediately. Ensure that no combustible materials are left in the generator compartment. Keep the area near the generator clean and free of debris. 	

 WARNING	
	<p>Hazardous Voltage Contact with power lines can cause electric shock or burn.</p> <p>Lifting Hazard / Heavy Object Can cause muscle strain or back injury.</p>
<ul style="list-style-type: none"> • If lifting or hoisting equipment is used, DO NOT contact any power lines. • DO NOT lift or move generator without assistance. • DO NOT lift unit by roof as damage to generator will occur. 	

⚠ WARNING	
	<p>Contact with muffler area can result in serious burns.</p> <p>Exhaust heat/gases can ignite combustibles or structures causing a fire.</p>
<ul style="list-style-type: none"> • DO NOT touch hot parts and AVOID hot exhaust gases. • Allow equipment to cool before touching. • DO NOT install the generator closer than 5 feet (1.5m) from any combustibles or structures with combustible walls having a fire resistance rating of less than 1 hour. • Keep at least minimum distances shown in General Location Guidelines to insure for proper generator cooling and maintenance clearances. • It is a violation of California Public Resource Code, Section 4442, to use or operate the engine on any forest-covered, brush-covered, or grass-covered land unless the exhaust system is equipped with a spark arrester, as defined in Section 4442, maintained in effective working order. Other states or federal jurisdictions may have similar laws. Contact the original equipment manufacturer, retailer, or dealer to obtain a spark arrester designed for the exhaust system installed on this engine. • Replacement parts must be the same and installed in the same position as the original parts. 	

⚠ WARNING	
	<p>Starter and other rotating parts can entangle hands, hair, clothing, or accessories.</p>
<ul style="list-style-type: none"> • NEVER operate generator without protective housing or covers. • DO NOT wear loose clothing, jewelry or anything that may be caught in the starter or other rotating parts. • Tie up long hair and remove jewelry. 	

⚠ CAUTION	
	<p>Installing the 15A fuse could cause the engine to start.</p>
<ul style="list-style-type: none"> • Observe that the 15 Amp fuse has been removed from the control panel for shipping. • DO NOT install this fuse until all plumbing and wiring has been completed and inspected. 	

⚠ CAUTION	
<p>Excessively high operating speeds increase risk of injury and damage to generator.</p> <p>Excessively low speeds impose a heavy load.</p>	
<ul style="list-style-type: none"> • DO NOT tamper with governed speed. Generator supplies correct rated frequency and voltage when running at governed speed. • DO NOT modify generator in any way. 	

NOTICE	
<p>Exceeding generators wattage/ampere capacity can damage generator and/or electrical devices connected to it.</p>	
<ul style="list-style-type: none"> • See <i>Essential Circuits</i> in operator's manual. • Start generator and let engine stabilize before connecting electrical loads. 	

NOTICE	
<p>Improper treatment of generator can damage it and shorten its life.</p>	
<ul style="list-style-type: none"> • Use generator only for intended uses. • If you have questions about intended use, contact an authorized dealer. • Operate generator only on level surfaces. • Adequate, unobstructed flow of cooling and ventilating air is critical for correct generator operation. • The Oil Fill, Oil Drain and the Control Panel doors must be installed whenever the unit is running. • DO NOT expose generator to excessive moisture, dust, dirt, or corrosive vapors. • Despite the safe design of the residential generator, operating this equipment imprudently, neglecting its maintenance or being careless can cause possible injury or death. • Remain alert at all times while working on this equipment. Never work on the equipment when you are physically or mentally fatigued. • DO NOT start engine with air cleaner or air cleaner cover removed. • DO NOT insert any objects through cooling slots. • DO NOT use the generator or any of its parts as a step. Stepping on the unit can cause stress and break parts. This may result in dangerous operating conditions from leaking exhaust gases, fuel leakage, oil leakage, etc. • If connected devices overheat, turn them off and disconnect them from generator. • Shut off generator if: <ul style="list-style-type: none"> -electrical output is lost; -equipment sparks, smokes, or emits flames; -unit vibrates excessively. 	

Installation

Equipment Description

This product is intended for use as an optional residential generator system which provides an alternate source of electric power and to serve loads such as heating, refrigeration systems, and communication systems that, when stopped during any power outage, could cause discomfort or inconvenience. This product does not qualify for emergency standby as defined by NFPA 70 (NEC).

Home Owner Responsibilities

- Read and follow the instructions given in the Operator's Manual, especially the section regarding selecting essential circuits.
- Follow a regular schedule in maintaining, caring for and using your residential generator, as specified in the Operator's Manual.

Installing Dealer/Contractor Responsibilities

- Read and observe the safety rules.
- Install only an UL approved transfer switch that is compatible with the generator.
- Read and follow the instructions given in this Installation and Start-up Manual.

IMPORTANT: The system is equipped with a water heater that is activated when ambient temperature is less than 80°F AND utility power is present at the transfer switch.

If you need more information in this matter, please call **(877) 369-9400** between 8:00 AM and 5:00 PM CT.

Unpacking Precautions

The unit is shipped ready for installation on a prepared reinforced cement slab or engineered base. Avoid damage from dropping, bumping, collision, etc. Store and unpack carton with the proper side up, as noted on the shipping carton.

Delivery Inspection

After removing the carton, carefully inspect the generator for any damage that may have occurred during shipment.

IMPORTANT: If loss or damage is noted at time of delivery, have the person(s) making delivery note all damage on the freight bill and affix his signature under the consignor's memo of loss or damage. If loss or damage is noted after delivery, separate the damaged materials and contact the carrier for claim procedures. Missing or damaged parts are not warranted.

Shipment Contents

The generator system is supplied with:

- Residential generator
- Fully-serviced coolant system
- Fully-serviced oil/lubricating system
- 650 CCA starting battery
- Flexible fuel hook-up hose
- Installation and start-up manual
- Operator's manual
- Engine operator's manual
- Installation checklist
- Two access door keys
- One spare 15A fuse
- 10 Pole control panel connector
- Remote LED indicator kit (red LED/plate/screws)

Not Supplied:


- Mounting pad
- Connecting wire and conduit
- Fuel supply valves/plumbing

Required Specialty Tools/Equipment

- Two 60" lengths of 2" Schedule 40 pipe (NOT conduit)
- Crane, lifting straps, chains or cables
- Hole punches for 7 ga steel
- Torque screwdriver, 5 to 50 inch-pound range
- Voltage/frequency meter
- Ignition timing light (if converting fuel type)
- Air Fuel Ratio Meter (O2 Sensor and Analyzer, if converting fuel type)
- Dummy load (if converting fuel type)


Generator Location

Before installing generator, consult with the homeowner and convey the following guidelines, which may affect the desired location.

⚠ WARNING	
	Exhaust heat / gasses can ignite combustibles or structures causing a fire.
<ul style="list-style-type: none"> DO NOT install the generator closer than 5 feet (1.5m) from any combustibles or structures with combustible walls having a fire resistance rating of less than 1 hour. 	

Generator Placement

Install generator outdoors in an area which will not accumulate deadly exhaust gas. DO NOT install generator where exhaust gas could accumulate and enter inside or be drawn into a potentially occupied building. Ensure exhaust gas is kept away from windows, doors, ventilation intakes or other openings that can allow exhaust gas to collect in a confined area. Prevailing winds and air currents should be taken into consideration when positioning generator.

⚠ WARNING	
	Running engine gives off carbon monoxide, an odorless, colorless, poison gas. Breathing carbon monoxide can cause headache, fatigue, dizziness, vomiting, confusion, seizures, nausea, fainting, or death.
<ul style="list-style-type: none"> Operate generator ONLY outdoors. Install a battery operated carbon monoxide alarm near the bedrooms. Keep exhaust gas from entering a confined area through windows, doors, ventilation intakes, or other openings. 	

General Location Guidelines

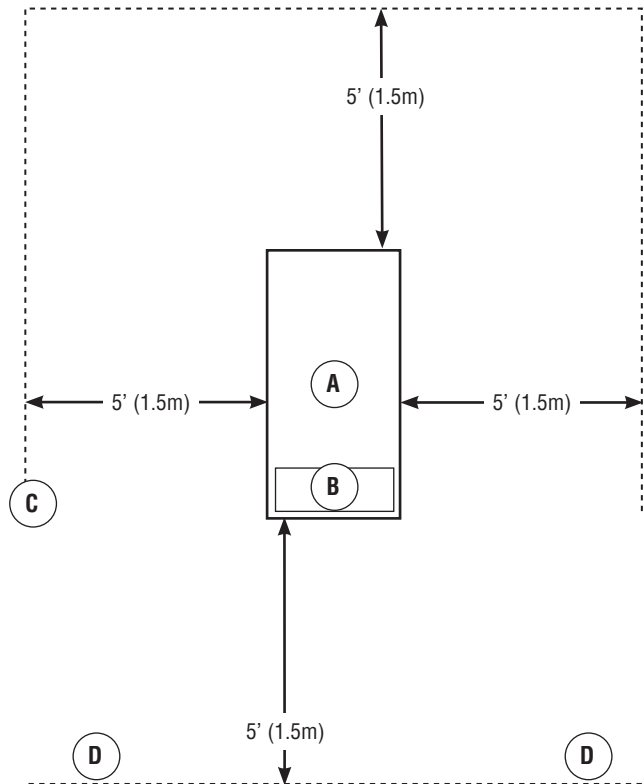
- Install the unit outdoors ONLY.
- Place the unit on a prepared concrete slab that is flat, level, and has provisions for water drainage.
- Install the unit in a location where sump pump discharge, rain gutter down spouts, roof run-off, landscape irrigation, or water sprinklers will not flood the unit or spray the enclosure and enter any air inlet or outlet openings.
- Install the unit where it will not affect or obstruct any services (including covered, concealed and underground), such as telephone, electric, fuel, irrigation, air conditioning, and so forth.
- Install the unit where air inlet and outlet openings will not become obstructed by leaves, grass, snow, etc. If prevailing winds will cause blowing or drifting, you may need to construct a windbreak to protect the unit.

- Install the generator as close as possible to the transfer switch and fuel supply to reduce the length of wiring, conduit, and piping.

IMPORTANT: Laws or local codes may regulate the distance to the fuel supply.

The minimum clearances from aerial view of generator (**A**) to combustible (**C, D**) materials is shown below.

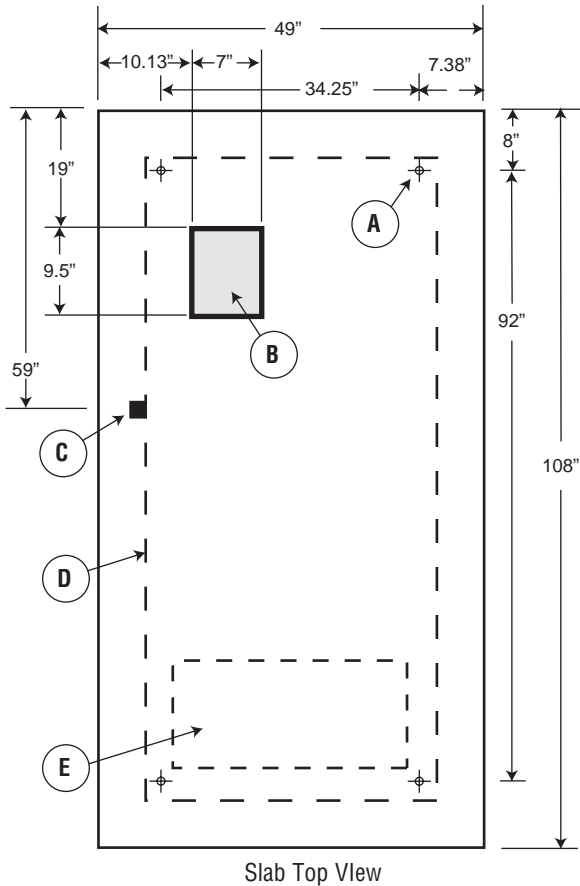
- These distances are provided to give generator location guidance relative ONLY to combustibles, generator cooling, and maintenance.
- The minimum distances in the figure are as shown. All four sides of the generator cannot be enclosed or restricted, even if the minimum distances are maintained. DO NOT connect (**C**) to (**D**)
- A roof cannot be used.
- Exhaust (**B**) is directed out the top of the generator and must not be allowed to accumulate.



- A Home Standby Generator*
- B Engine Exhaust (exits vertically from enclosure)*
- C Combustible Material or Structure with a Fire Resistance Rating of less than 1 hour.*
- D Any structure or material. DO NOT connect (C) to (D).*

Concrete Slab

At the appropriate location, construct a concrete slab:



- 28 day compression strength of 3000 psi (200 MPa)
- Minimum 5 inches thick
- Minimum 6 inches wider than enclosure on all sides (shown as dashed line (D))
- Strengthen slab with No. 6 reinforcing bars (on 12" centers) or 8 ga. steel wire fabric (6" centers).

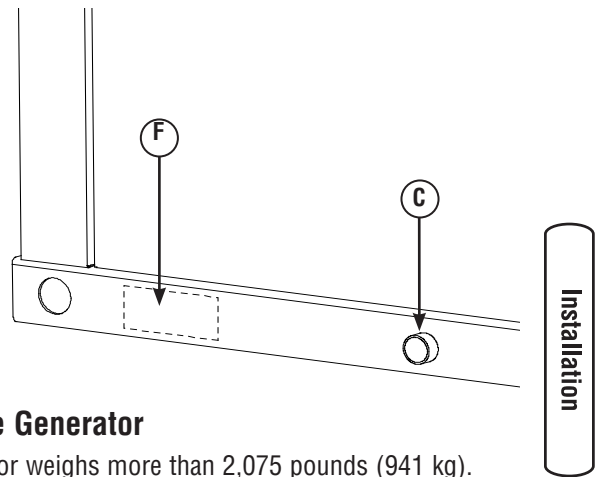
NOTE: Avoid placing reinforcement in entrance stub-up area.

Attach unit to slab at four corner locations (A) with minimum 5/16" diameter (8mm) masonry anchor bolts long enough to secure the unit.

The fuel inlet location (C) and the exhaust opening (E) are shown for reference.

Electrical and Fuel Inlet Locations

A through-slab power cable stub-up is preferred (see figure above). If stub-up's are not used, (F) indicates the recommended location for punching holes for attaching power conduit. The 1 inch N.P.T. fuel inlet connector (C) is shown for reference.

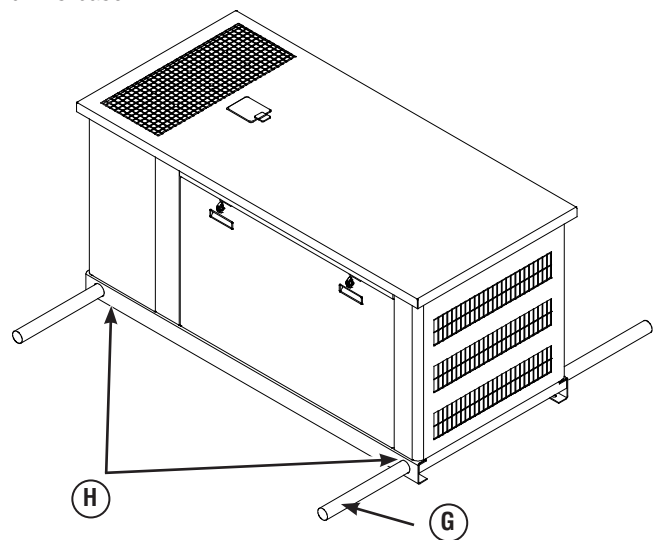


Lifting the Generator

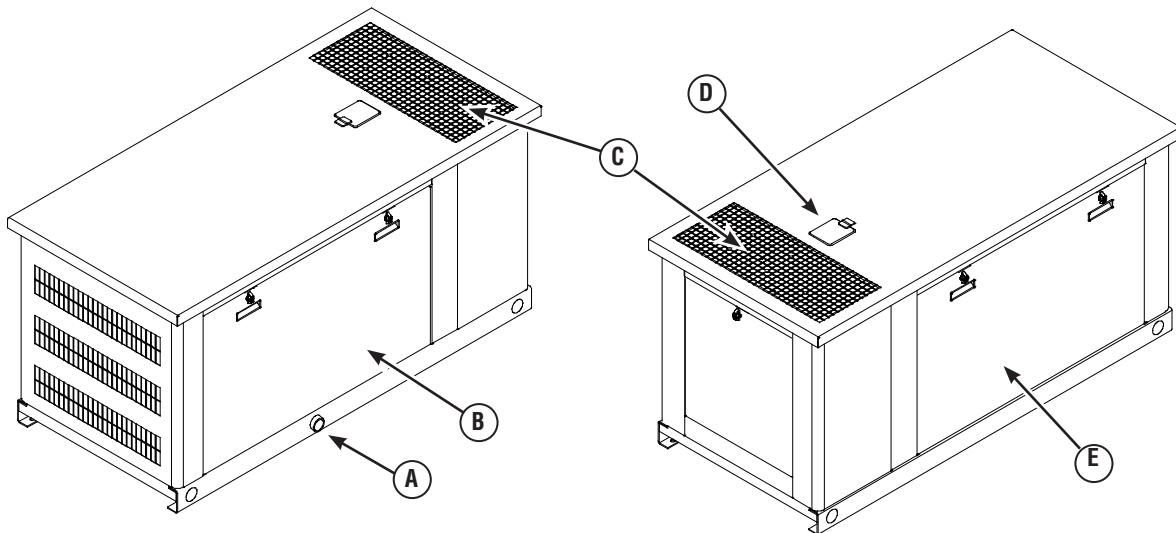
The generator weighs more than 2,075 pounds (941 kg). Proper tools, equipment and qualified personnel should be used in all phases of handling and moving the generator.

⚠ WARNING	
	Hazardous Voltage Contact with power lines can cause electric shock or burn.
	Lifting Hazard / Heavy Object Can cause muscle strain or back injury.
<ul style="list-style-type: none"> • DO NOT contact any power lines when using required lifting/hoisting equipment. • DO NOT lift or move generator without assistance. • Use lifting pipes or straps. The unit may shift during movement, which can cause injury. • DO NOT lift unit by roof as damage to generator will occur. 	

Two 60" lengths of 2" Schedule 40 pipe (G), supplied by the installer, are required to lift the generator onto cement pad. Insert pipes through the lifting holes (H) located near the unit's base.




Use a spreader bar to ensure that the chains, straps or cables DO NOT touch the generator's roof.



Access Doors

The residential generator is equipped with an enclosure that has several access doors, as shown above. The doors are named for a significant component located behind them, as follows:

- A. Fuel Inlet port (shown for reference)
- B. Control Panel door (may be two doors)
- C. Exhaust opening (shown for reference)
- D. Coolant Fill door
- E. Battery door

⚠ WARNING	
	Contact with muffler area can result in serious burns.
<ul style="list-style-type: none"> DO NOT touch hot parts and AVOID hot exhaust gases. Allow equipment to cool before touching. 	

The Coolant Fill, Battery and Control Panel doors must be installed whenever the unit is running.

Each residential generator is equipped with two identical keys. These keys fit the locks that secure the access doors.

To Open an Access Door:



1. Insert key into lock of access door handle you wish to open and turn key one quarter turn counterclockwise. Remove key. Handle will remain unlocked until you re-lock it.
2. Grasp door's handle and turn one quarter turn counterclockwise to open.
3. Coolant Fill door is unlocked in the same manner. It can be used for adding coolant or oil.

To Close an Access Door:

1. Close door and turn handle one quarter turn clockwise.
2. Insert key into lock in handle and turn key one quarter turn clockwise. Remove key.

The Gaseous Fuel System

The information below is provided to assist gaseous fuel system technicians in planning installations. In no way should this information be interpreted to conflict with applicable fuel gas codes. Consult with your local fuel supplier or Fire Marshall if questions or problems arise.

⚠ WARNING	
	Propane and Natural Gas are extremely flammable and explosive.
	Fire or explosion can cause severe burns or death.
<ul style="list-style-type: none"> LP gas is heavier than air and will settle in low areas. Natural gas is lighter than air and will collect in high areas. The slightest spark can ignite these fuels and cause an explosion. DO NOT light a cigarette or smoke. 	


TO THE INSTALLER: Consult with the generator owner(s) and convey any technical considerations that might affect their installation plans before applying these general guidelines.

The following general rules apply to gaseous fuel system piping:




- The piping should be of a material that conforms to federal and local codes, rigidly mounted and protected against vibration.
- Piping should be protected from physical damage where it passes through flower beds, shrub beds, and other cultivated areas where damage could occur.

- Install the flexible, gaseous hose (supplied) between the residential generator Fuel Inlet port and rigid piping to prevent thermal expansion or contraction from causing excessive stress on the piping material.

NOTE: Where local conditions include earthquake, tornado, unstable ground, or flood hazards, special consideration shall be given to increase strength and flexibility of piping supports and connections.

 CAUTION	
The supplied flexible gaseous pipe is not to be installed underground or in contact with the ground.	
<ul style="list-style-type: none"> • The entire flexible gaseous pipe must be visible for periodic inspection and must not be concealed within nor contact nor run through any wall, floor, or partition. 	

- Piping must be of the correct size to maintain the required supply pressures and volume flow under varying generator load conditions with all gas appliances connected to the fuel system turned on and operating.
- Use a pipe sealant or joint compound approved for use with NG/LPG on all threaded fittings to reduce the possibility of leakage.
- Installed piping must be properly purged and leak tested, in accordance with applicable codes and standards.

 WARNING	
	Propane and Natural Gas are extremely flammable and explosive.
	Fire or explosion can cause severe burns or death.
<ul style="list-style-type: none"> • Before placing the residential generator into service, the fuel system lines must be properly purged and leak tested. • No leakage is permitted. 	

Consider the following factors when planning to install the fuel supply system:

- A minimum of one accessible, approved manual shutoff valve shall be installed in the fuel supply line within 6 ft (1.8 m) of the residential generator. A union or flanged connection shall be provided downstream from this valve to permit removal of controls.
- Both LP vapor and natural gas fuel supply pressure at the generator’s fuel inlet port should be between 7 to 11 inches of water (in. W.C.) at full load with all gas appliances turned on and operating.

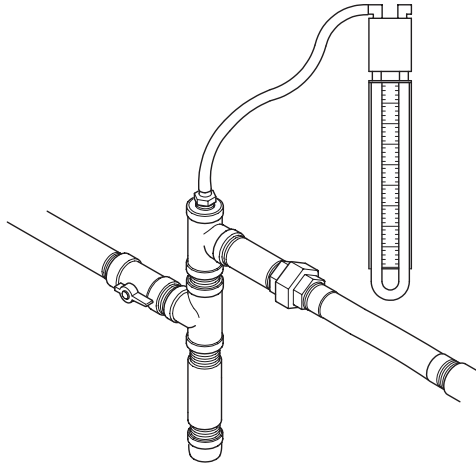
The residential generator unit has been factory load tested to run on either natural gas or LP vapor fuel. The unit can be converted from natural gas to LP vapor or vice versa using two people and special tools. See *Fuel Conversion*, later in this manual.

It is recommended that the fuel connection incorporate the following components:

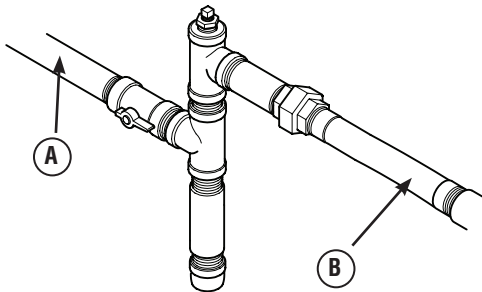
- A minimum 10 ft. (3 m) section of gas pipe between the primary fuel regulator and the generator fuel inlet connection (acts as accumulator for high block loads).
- A manual fuel shut-off valve located in the interior of the building.
- A manual fuel shut-off valve located outside the building, just before the generator unit.
- Where the formation of hydrates or ice is known to occur, piping should be protected against freezing. The termination of hard piping should include a sediment trap where condensate is not likely to freeze.
- A manometer port should be provided.

The manometer port permits temporary installation of a manometer to ensure that the engine receives the correct fuel pressure to operate efficiently throughout its operating range.

Installation



When the initial test runs are completed, the manometer is removed and the port is plugged. A typical final fuel connection assembly is shown here, where (A) is the fuel supply and (B) goes to the residential generator.



Fuel Pipe Sizing

There are numerous on-line or otherwise-published references for fuel pipe sizing. For example, NFPA 54 - National Fuel Gas Code, 2006 (Item #: 320-6031-06) is a common resource. The installer should consider the specific gravity of gas and compensate for a nominal amount of restriction from bends, fittings, etc. If an unusual number of fittings, bends, or other restrictions are used, refer to federal and local codes for guidance.

Fuel Consumption

Estimated fuel supply requirements at half and full load for natural gas and LP vapor fuels are shown below.

	Natural Gas		LP Vapor	
	1/2 Load	Full Load	1/2 Load	Full Load
45kW	483 C	777 C	178 C	297 C
	483,000 B	777,000 B	445,000 B	742,000 B

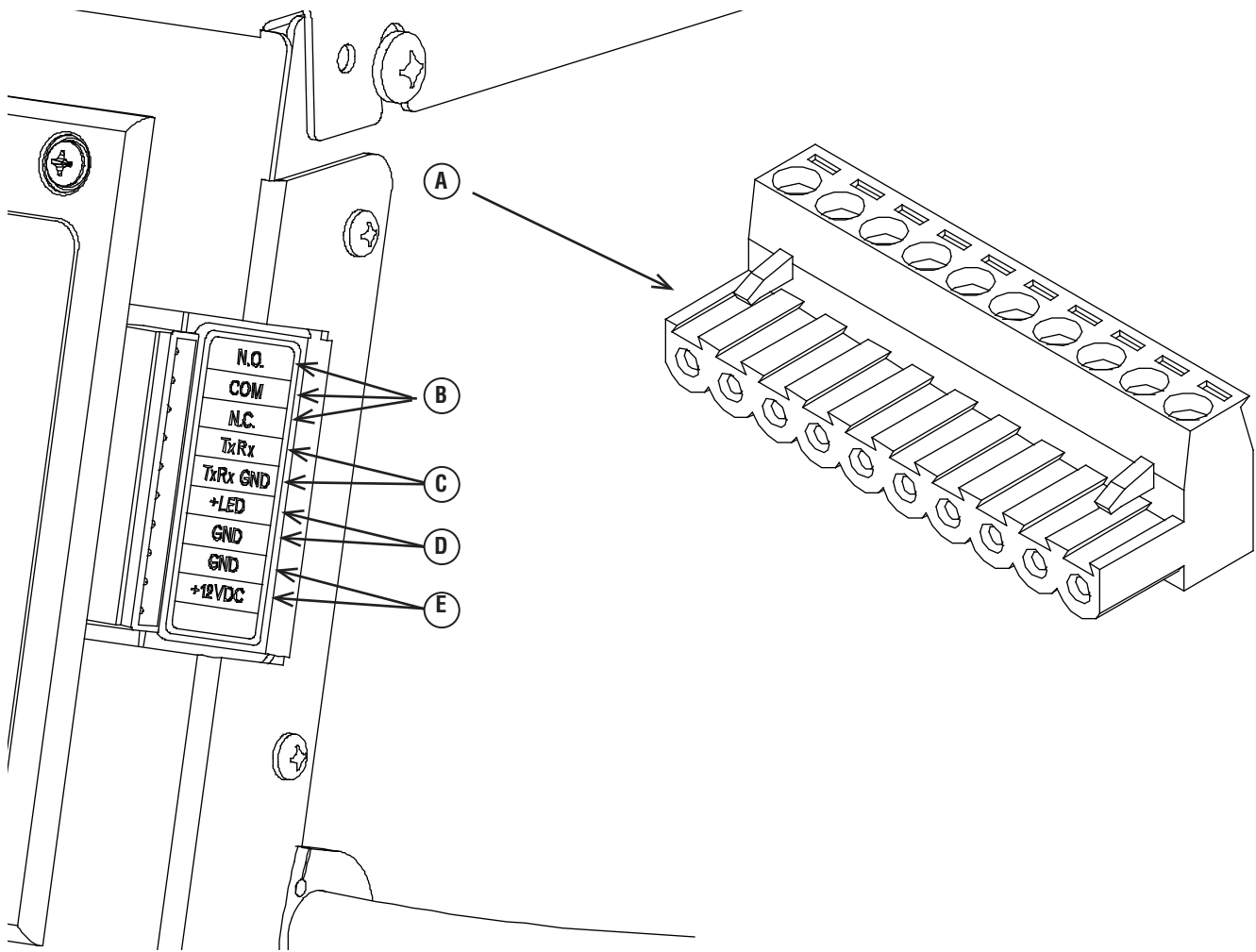
C = Cubic feet per hour
B = BTU's per hour

Physical Properties	LP Vapor	Natural Gas
Normal Atmospheric State	Gas	Gas
Boiling Point (in °F):		
Initial	-44	-259
End	-44	-259
Heating Value:		
BTU per gallon (Net LHV*)	83,340	63,310
BTU per gallon (gross**)	91,547	
Cubic feet (gas)	2,500	1,000
Density***	36.39	57.75
Weight†	4.24	2.65
Octane Number:		
Research	110+	110+
Motor	97	

* LHV (Low Heat Value) is the more realistic rating.
** Gross heat value does not consider heat lost in the form of water during combustion.
*** Density is given in "Cubic Feet of Gas per Gallon of Liquid".
† Weight is given in "Pounds per Gallon of Liquid".

System Connectors

Low Voltage connections to signal fault contacts, transfer switch communication, remote LED and auxiliary 12VDC power are made via a removable ten-pole connector plug. Compare this illustration with your generator to familiarize yourself with the location of these connections:



A - 10 Pole Connector Plug — Used to connect signal wires to the control panel.

B - Fault Contacts — Use NO, COM and NC for operating a siren, light, optional GenAlert, etc. to alert you in case of a fault. Contacts reverse state (NO goes to NC and vice versa) upon a fault condition.

C - Transfer Switch Communication — Connect to transfer switch control board for communication interface using 18AWG copper twisted pair wire.

D - Remote LED Output — Used to connect to the remote LED supplied with the generator. The remote LED will turn on and off in a series of blinks if certain faults are detected in the generator.

E - +12 Volt DC, .5 Amp Output — Internal auxiliary power supply.

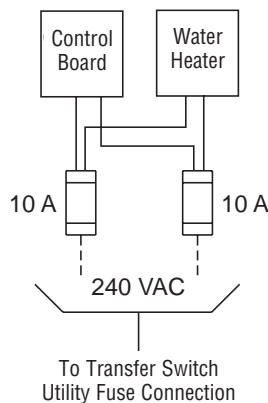
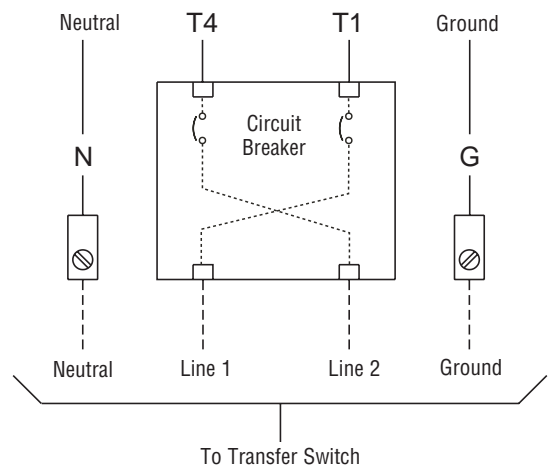
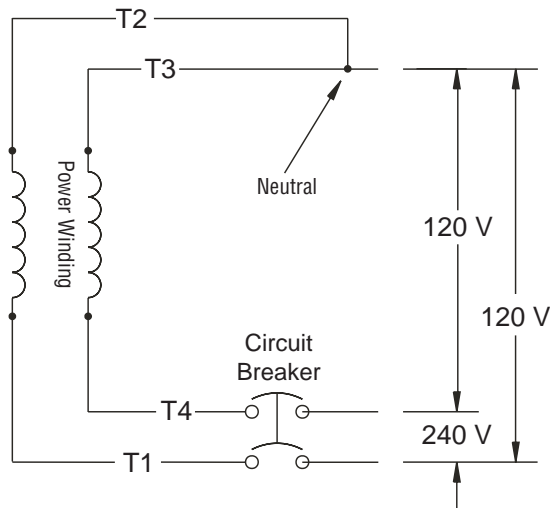
IMPORTANT:

- When connecting to the ten-pole connector plug, use 12-18AWG copper wire with insulation rated for 105° C.
- Fasten only one wire to each connector screw.
- Torque connector plug screws to 7 in-lb (7.9 Newton meter).

Generator AC Connection System

A single-phase, three-wire AC connection system is used in the residential generator. The stator assembly consists of a pair of stationary windings with two leads brought out of each winding. The junction of leads T2 and T3 forms the neutral lead, as shown schematically and as wiring diagram below. A complete schematic and wiring diagram can be found later in this manual.

NOTE: Neutral is not bonded to ground at generator.



Grounding the Generator

Ground the residential generator per applicable codes, standards and regulations. There are two generator GND lug locations. The one inside the alternator junction box next to the circuit breaker is the primary lug and should meet most applications. The second generator GND lug is located on the frame below the generator circuit breaker cover, and should ONLY be used for a ground rod located at the generator, if required by local codes. See *Controls* for location.

Utility Circuit Connection

“240V Utility” leads must be routed in conduit. The “240V Utility” leads deliver power to the generator’s circuit board and water heater. This power also charges the battery. When power on these leads is lost, the generator will start.

Using installer-supplied minimum 300V, 14 AWG copper wire, connect each ten-amp fuse terminal in the alternator junction box to the ten-amp fuse terminals in the automatic transfer switch.

When making connections, obey wire type and torque specifications printed on the circuit breaker and neutral/ground connector.

Fault Detection System

The generator may have to run for long periods of time with no operator present. For that reason, the system is equipped with sensors that automatically shut down the generator in the event of potentially damaging conditions, such as low oil pressure, high water temperature, over speed, and other conditions. Refer to *Fault Detection System* in the Operator’s Manual for more detailed information.

The owner will use the remote LED indicator to observe the status of the residential generator system. The remote LED will turn on and off in a series of blinks if certain faults are detected in the generator system. Consult with the owner for a convenient location. Locate the electrical box in an area visible by the home owner such as near a garage door opener or security control panel.

To install the remote LED indicator:

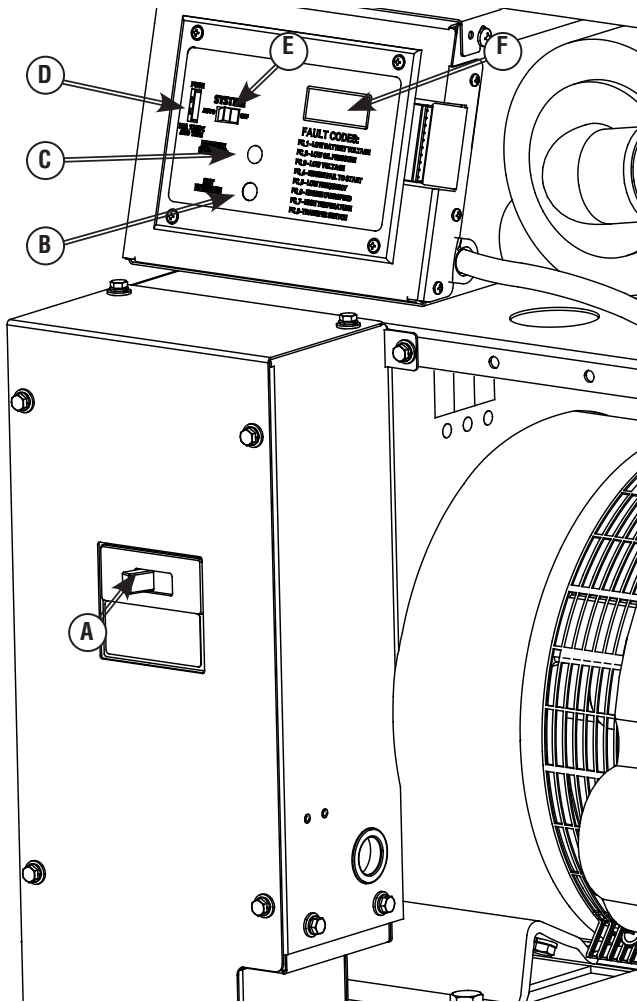
1. Push the LED through the mounting plate from the front until it snaps in place.

IMPORTANT: The LED is polarity sensitive.

2. Using provided 10 pole connector and installer-supplied minimum 18AWG wire, connect the remote LED to the generator control board +LED and GND connection. Use wire nuts to attach wire to LED leads.
3. Attach mounting plate to installer-supplied electrical box.

System Control Panel

The residential generator control panel, located inside the generator housing, is shown below.



Brief descriptions of the controls used during installation are:

- A - Circuit Breaker** — Must be ON to supply power to the transfer switch. Breaker enclosure includes removable bottom panel to assist with conduit connections.
- B - Set Exercise Switch** — Used to set exercise cycle start time.
- C - Manual Over-Ride** — Used to manually start and stop the generator.
- D - 15 Amp Fuse** — Protects DC control circuits.
- E - System Switch** — Switches modes to **OFF** or **AUTO**.
- F - Digital Display** — Displays running time in hours or fault codes.

See *Controls* in the operator's manual for more information

System Switch

This two-position switch is the most important control on the residential generator and is used as follows:

- **"AUTO"** position is the normal operating position. If a utility power outage is sensed, the system will start the generator. When utility power is restored, lets the engine stabilize internal temperatures, shuts off the generator, and waits for the next utility power outage.
- **"OFF"** position turns off running generator, prevents unit from starting and resets any detected faults.

15 Amp Fuse

Protects the residential generator DC control circuits. If the fuse has 'blown' (melted open) or was removed, the engine cannot crank or start. Replace the fuse using only an identical ATO 15A fuse. One spare fuse is supplied with the unit. If fuse was blown or removed, you will need to reset the exercise timer (see *Setting Exercise Timer*).

Final Installation Considerations

Engine Oil

NOTICE

Any attempt to crank or start the engine before it has been properly serviced with the recommended oil will result in equipment failure.

- Refer to *Maintenance* and engine manual for oil fill information.
- Damage to equipment resulting from failure to follow this instruction will void engine and generator warranty.

This engine is shipped from the factory pre-run and filled with non-synthetic oil (API SL 10W-30W). This allows for system operation in a wide range of temperature and climate conditions. Before starting the engine, check oil level and ensure that engine is serviced as described in the engine operator's manual.

Coolant System

This engine is shipped from the factory filled with a 50-50 mix of automotive (Dex-Cool™ orange) anti-freeze and water. This will provide optimum year round protection against freezing, boiling and corrosion. The coolant system incorporates a water heater that operates when ambient temperature is below 80°F AND utility power is present at the transfer switch. Periodically check coolant level as described in the engine manual.

Battery

The residential generator is supplied with a valve-regulated rechargeable 12 Volt battery. The battery cables are connected at the factory. The unit's 15 Amp fuse has been removed from the control panel to prevent the unit from starting in transit.

⚠ WARNING
Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

The battery may not be at full charge when installed. If battery voltage is below 12 Volts, charge the battery. See *Battery* in *Maintenance* of the operator's manual for details.

Fuel Supply System

Ensure that all fuel pipe connections are tight, secure and without leaks.

Ensure that all gas line shutoff valves are OPEN and that adequate fuel pressure is available whenever automatic operation is desired.

Initial Start-up (No Load)

Before operating the residential generator or placing it into service, inspect the entire installation carefully. Then begin testing the system without any electrical loads connected, as follows:

NOTE: Unit has been set-up for NG or LP vapor operation at the factory. Fuel conversion, if needed, must be completed prior to performing these steps.

1. Set generator's main circuit breaker to its **ON** (closed) position.
2. Confirm 15 Amp fuse is installed in system control panel.
3. Set generator's system switch to **AUTO**.
4. Push and hold **MANUAL OVER-RIDE** button on control panel for about six seconds. Engine will start.

NOTE: When the generator is started for the very first time, it will require that air in the gaseous fuel lines be purged. This may take a few minutes.

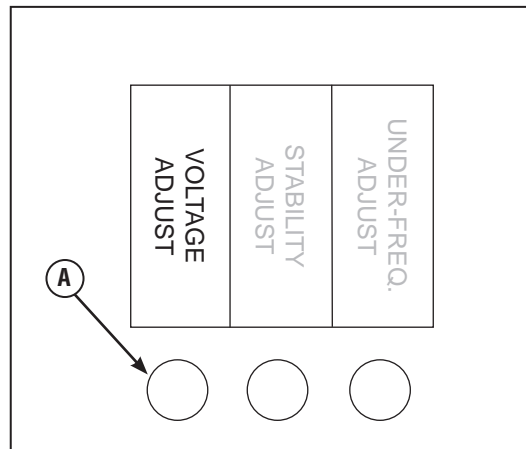
5. Listen for unusual noises, vibration or other indications of abnormal operation. Check for oil or coolant leaks while engine runs.
6. Let engine warm up for about five minutes to allow internal temperatures to stabilize.
7. Connect an accurate AC voltmeter and a frequency meter to check generator output at load side of circuit breaker. No-load voltage should be 239 - 244 Volts, frequency should be 59.8 - 60.2 Hz.

NOTE: If AC voltage is outside these ranges, perform the generator adjustment, Steps 10 and 11 below.

8. Check generator output between one of the generator connection lugs and the neutral lug, then between the other generator connection lug and the neutral lug. In both cases, voltage reading should be 117 - 123 Volts.

IMPORTANT: DO NOT proceed until you are certain that generator AC voltage is correct and within the stated limits. Generator frequency is fixed and not adjustable.

9. If voltage and frequency values are correct, proceed to step 12.
10. Connect voltmeter as described in step 7 above.
11. While observing voltmeter, adjust alternator voltage control (**A**) for 240 volts. DO NOT adjust either of the other alternator controls.

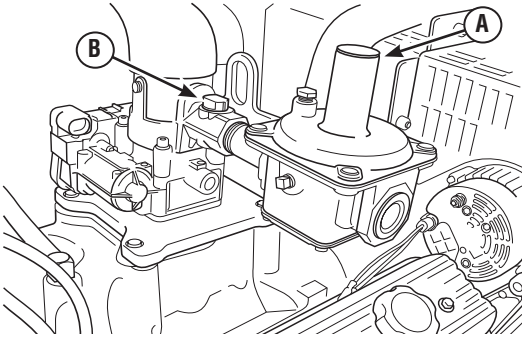


12. Push and hold **MANUAL OVER-RIDE** button on control panel until engine stops.
13. Install alternator circuit breaker enclosure cover.

Fuel Conversion

The unit is shipped from the factory calibrated for NG or LP vapor operation. To convert the engine from NG to LP vapor or from LP vapor to NG operation, follow these steps:

1. Set generator main circuit breaker to **OFF**.
2. Set control panel system switch to **OFF**.
3. Remove 15 Amp fuse from system control panel.
4. Remove Zero Pressure Regulator (ZPR) tower cap (A). The Main Adjust control is shown as (B).



5. Calibrate O₂ sensor per Analyzer manufacturer specification. Install O₂ sensor into exhaust pipe.
NOTE: Technician supplies O₂ sensor and analyzer.
6. Attach timing light to #1 spark plug on engine (see engine manual for diagram).
7. Re-install 15 Amp fuse in system control panel.
8. Set generator main circuit breaker to **ON**.
9. Set control panel System switch to **AUTO**.
10. Push and hold MANUAL OVER-RIDE button on control panel for six seconds. When engine starts, allow it to warm up for ten minutes under no load.
NOTE: If utility power is not connected, the generator will start automatically.
11. Using technician-supplied timing light, locate timing marks on crankshaft vibration dampener.
12. If timing is not within specification, loosen distributor hold-down clamp. While observing timing indicator, adjust distributor as listed below:
LP = 24 degrees before top dead center
NG = 34 degrees before top dead center
13. Tighten distributor hold-down clamp.

14. While observing O₂ Analyzer readout, adjust zero pressure regulator (A) and main adjustment (B) screws to obtain stoichiometric value shown in table. Select table value that corresponds to your O₂ Analyzer display. The shaded line in table indicates optimum target value.

Voltage	Phi	Lamda
2.40	1.000	1.000
2.45	1.012	0.988
2.50	1.024	0.977
2.55	1.036	0.966
2.60	1.048	0.955
2.65	1.060	0.944

Installation

15. Using technician-supplied load, add half load to generator. Check and adjust (A) and (B) to achieve target value.
16. Using technician-supplied load, add full load to generator. Check and adjust (A) and (B) to achieve target value.
17. Remove load and check if sensor value remained in target area. If needed, adjust (A) and (B) to achieve target value.
18. Add half, then full load to generator. Recheck and verify sensor value remains in target area.

IMPORTANT: It may take several attempts to achieve the target setting. Continue to test and adjust with engine stabilized at no, half and full loads until target value is achieved at all generator loads.

19. Remove load from generator. Allow generator to run for ten minutes to stabilize internal temperatures. Turn control panel system switch to **OFF**.

WARNING



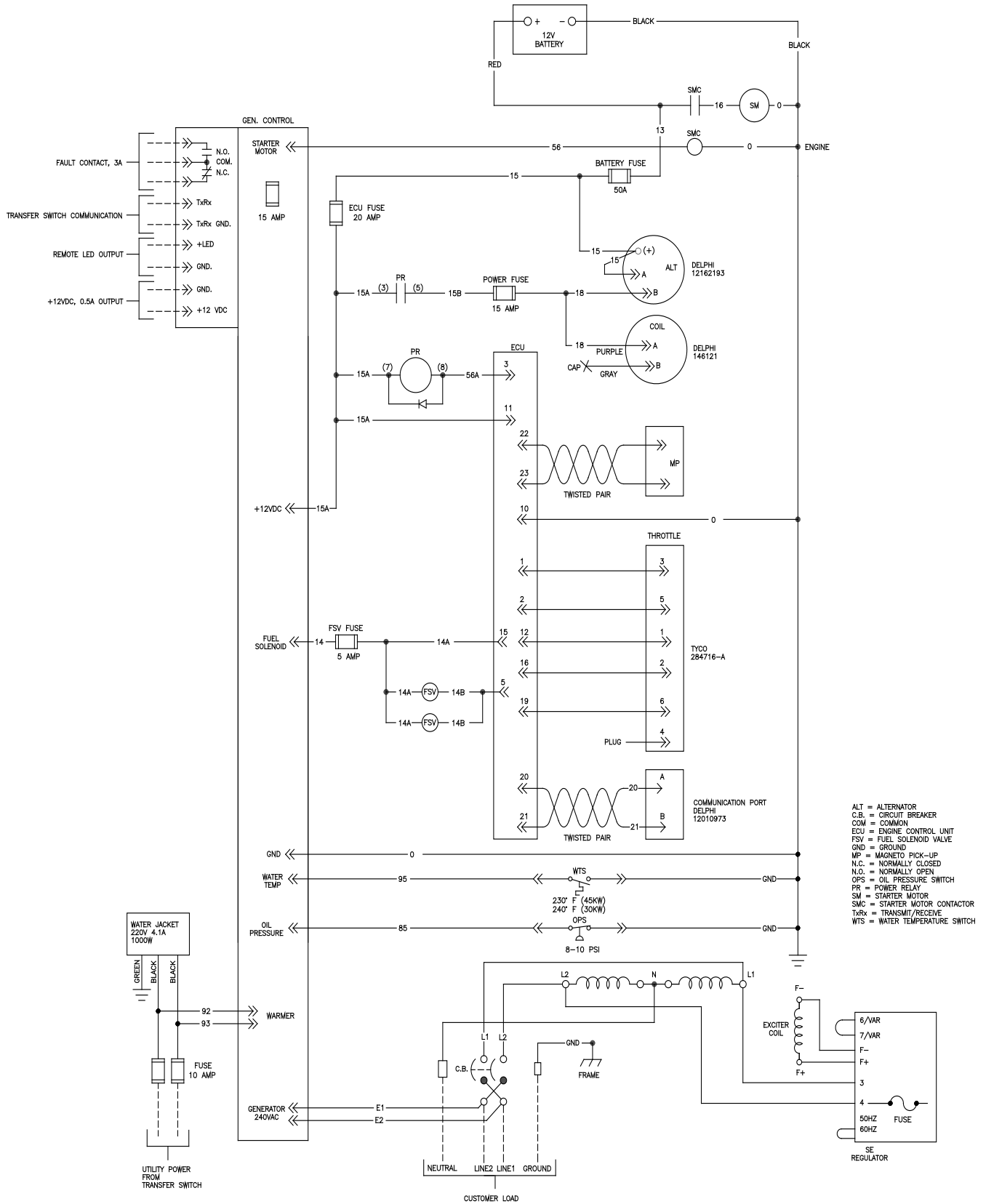
Contact with muffler and engine parts can result in serious burns.

- DO NOT touch hot parts and AVOID hot exhaust gases.
- Allow equipment to cool before touching.

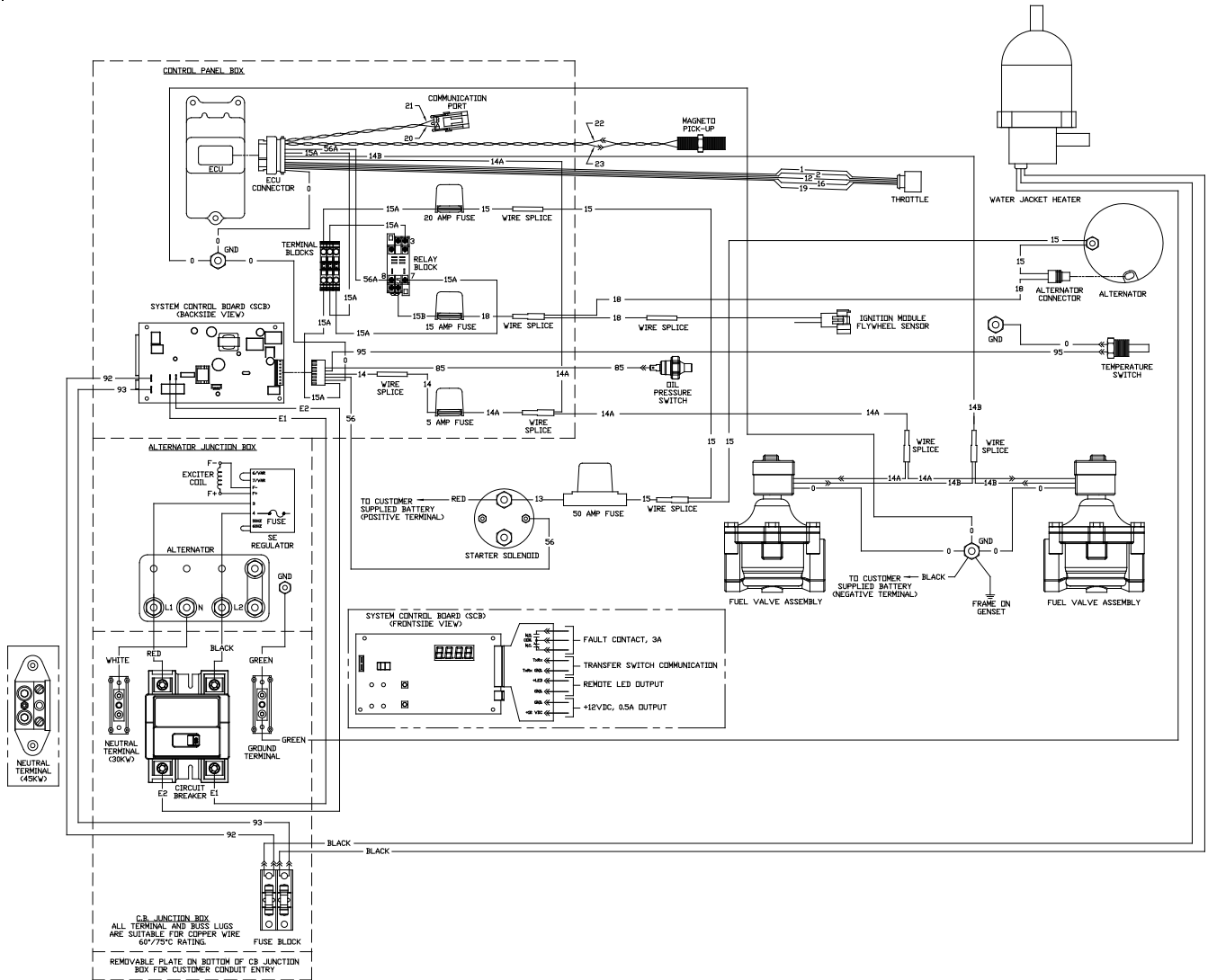
20. Remove 15 Amp fuse from system control panel.
21. Install the ZPR tower cap, remove O₂ sensor, and timing light.
22. Re-install 15 Amp fuse in system control panel.
23. Set exercise timer.
24. Complete emissions statement and send with installation checklist.

Schematic Diagram

Installation



Wiring Diagram



Installation

Controls

See the Operator's Manual for complete description of the residential generator controls.

Operation

Automatic Operation Sequence

The generator's control panel houses a logic control circuit board. This control board constantly monitors utility power source voltage. Should that voltage drop below a preset level, control board action will signal the engine to crank and start.

When utility source voltage is restored above a preset voltage level, the engine is signaled to shut down.

The actual system operation is not adjustable and is sequenced by sensors and timers on the control board, as follows:

Utility Voltage Dropout Sensor

- This sensor monitors utility source voltage.
- If utility source voltage drops below about 70 percent of the nominal supply voltage, the sensor energizes a 10 second timer. The timer is used to 'sense' brown-outs.
- Once the timer has expired, the engine will crank and start.

Utility Voltage Pickup Sensor

This sensor monitors utility power supply voltage. When that voltage is restored above 80 percent of the nominal source voltage, a time delay starts timing and the engine will go to engine cool-down.

Engine Cool-down Timer

- When the load is transferred back to the utility power source, the engine cool-down timer starts timing.
- The timer will run for about one minute, then the generator will stop.
- Minimum engine run time is 5 minutes.

Setting Exercise Timer

The residential generator is equipped with an exercise timer that will start and exercise the system once every seven days. During this exercise period, the unit runs for approximately 20 minutes and then shuts down. Electrical load transfer DOES NOT occur during the exercise cycle (unless an utility power outage occurs).

A button on the control panel is labeled "Set Exercise" (see *System Control Panel*). The specific day and the specific time of day this button is pressed is programmed into the control board memory. This date and time is then used to automatically initiate the system exercise cycle. The "SET EXERCISE" legend on the control panel will flash until the set exercise cycle is set.

To perform the Set Exercise procedure:

1. Choose the day and time you want your residential generator to exercise.
2. On that day and time, press and hold down the "Set Exercise" button for three seconds.

NOTE: "SET EXERCISE" will flash until the button is pressed for three seconds, then "SET EXERCISE" will illuminate for 5 seconds, and finally turn off.

3. The unit will then start and run it's 20 minute exercise cycle.

For example, if you press the "Set Exercise" button on Sunday morning at 10:00 AM, the unit will run an immediate exercise cycle and an exercise cycle every following Sunday at 10:00 AM (+/- 1/2 hour).

NOTE: "Set Exercise" will only work if the unit is in the Automatic mode and this exact procedure is followed. The exerciser will need to be re-set if the 15 Amp fuse is removed or changed, or if the 12 Volt DC battery is disconnected.

If you want to change the day and time the unit exercises, simply perform the "Set Exercise" procedure at the exact weekday and time you want it to take place.

Installation Inspection

Before placing the generator system into service, inspect the entire installation carefully.

Complete the "Installation Checklist" as you make the inspection. Ensure all items have been filled-in and all signatures have been obtained. Return the completed form to your records department.

This completes the installation and start-up instructions. The Operator's Manual provides full details on Operation, Maintenance and Troubleshooting for this generator system.