



# GEN-1e CO<sub>2</sub> Generator

*Custom Automated Products offers economical and safe carbon dioxide generators. They produce CO<sub>2</sub> by burning either propane or natural gas. We have designed our CO<sub>2</sub> generator to allow you to increase the CO<sub>2</sub> production by simply installing additional burners.*

## OVERVIEW

*The GEN-1e can produce between 3-13 cubic feet of CO<sub>2</sub> per hour. It is recommended for areas under 3200 cubic feet.*

*The GEN-1e features an Electronic Ignition Module so that there is no standing pilot light.*

*Our standard "tip-over" switch will shut down the fuel to the main burner in the event the unit falls or tips over.*

*The GEN-1e comes standard with 2 burners. It can be expanded up to 4 burners. Each burner produces approximately 3 cubic feet of CO<sub>2</sub> per hour.*

*Manufactured in the USA using only AGA and UL listed components.*

## INSTALLATION

- 1) Determine the desired location for the generator. It must be positioned at least 18" away from walls or other flammable materials. A distance of at least 18" must be maintained between the top of the unit and the ceiling or roof. Open flames are present inside the unit. Do not use the unit around flammable materials.
- 2) The unit must be hung from suitable supports. Use the hooks and chains that are included with the GEN-1e to secure the unit. The unit must be level in order to operate correctly and safely.
- 3) The hose that is supplied with the generator is fitted with a standard 3/8" female flare connection. Connect the gas hose to the back of the CO<sub>2</sub> generator. To connect the hose, use two wrenches in order to properly tighten the connection without twisting any internal connections.



***\*WARNING: Connecting propane to a generator meant to burn natural gas will result in dangerously large flames. Alternately if natural gas is connected to a generator meant to burn propane will result in inconsistent flames with too little fuel available to burn properly. Make sure the fuel supply matches your generator type!***

## PROPANE GENERATORS ONLY

***\*NOTE: The GEN-1e propane model comes with a standard tank mounted regulator, which must be used unless the LP pressure is already regulated to 11" WC pressure at an outdoor propane tank.***

- 4) Connect the other end of the hose to the LP regulator supplied with the unit. To connect the hose, use two wrenches in order to properly tighten the connection.
- 5) Open the gas valve on the propane tank. Check for leaks on all connections using a spray bottle with soapy water. Look for bubbles, which would indicate a leak.

## NATURAL GAS GENERATORS ONLY

***\*NOTE: It is critical to install the regulator supplied "in-line" between your gas supply and the generator. The regulator supplied with the GEN-1e is preset to maintain a constant pressure of 4.5" WC, which is around 1/4 PSI. It is important to verify the main gas pressure before installing the unit. Most gas utility companies install low-pressure gas regulators on the main gas line that are set up to 1/2 PSI, (4.5 - 7" WC). Some commercial buildings have a high-pressure gas main (usually 2 PSI). If this is this case, you will need to have the pressure reduced to 1/2 PSI or lower before installing the low-pressure regulator supplied with the unit.***

- 4) Make certain that you have a gas shut-off valve on your gas supply. Install the shut-off valve in an accessible location. Install the in-line regulator to the gas supply, (1/2" NPT female thread). Connect the hose to the in-line regulator. To connect the hose, use two wrenches in order to properly tighten the connection.
- 5) Open the gas valve on the gas line. Check for leaks on all connections using a spray bottle with soapy water. Look for bubbles, which would indicate a leak.

## CO<sub>2</sub> CONTROLLERS

**\*NOTE:** The recommended CO<sub>2</sub> level for optimum growth is between 1000 to 1500 PPM. Above that is usually considered wasteful. Above 5000 PPM is considered dangerous to animals and humans. Side effects of excessive CO<sub>2</sub> include headaches and drowsiness. Use a PPM controller to ensure you are maintaining the proper PPM level.

- 1) Connect the CO<sub>2</sub> generator's power supply to the controller that you are using. Normally, the generator is used only during daylight hours. At the very least, a timer or photo-controller should be used to turn the generator on only during the day to eliminate waste.
- 2) If you are using a P.P.M. (Parts Per Million) controller, set the CO<sub>2</sub> level to the desired PPM and plug in the power supply of the CO<sub>2</sub> Generator into the controller.

## LIGHTING THE GENERATOR

- 1) Connect the power supply to the power connection on the side of the generator and plug it into the wall or your CO<sub>2</sub> controller.
- 2) Ensure the power switch on the side of the unit is OFF. Turn ON the gas supply to the unit.
- 3) Turn on the power switch. The generator will turn on the valve and attempt to light the generator. It will make 5 attempts to light the main burner, 20 seconds apart. If the generator does not light by the 5th attempt, a RED light will appear on the Electric Ignition Module indicating that it was unable to light in 5 attempts. It will not try again until the power is cycled. Turn off the power switch and turn it back on. It should light within the next 5 attempts after all of the air in the gas line is gone. Depending on the length of the gas hose, you might need to turn it on and off up to 3 or 4 times. If your generator still will not light, please refer to the troubleshooting tips at the end of this instruction manual.

**\*NOTE:** If lighting the unit for the first time, it may take a couple of on/off cyclings to purge the air from the gas hose.

- 4) Once the main burner lights, it should light reliably until the tank (propane only) is changed out.
- 5) The amber indicator light on the side of the generator is on as long as the main burner is running.

## ELECTRONIC IGNITION MODULE

- 6) The Electronic Ignition Module is the grey plastic box in the bottom of the generator. The status light is on the front of the Electronic Ignition Module. If the status light is BLUE, the generator is on and running normally. A RED light indicates that it attempted to light the generator 5 times without success. A GREEN light indicates a Module Failure. If this light is displayed, turn off the generator for 5 minutes and then attempt to relight.

**\*WARNING:** The outer enclosure gets hot while operating, especially at the top of the unit. Do not touch the generator until it is cool.

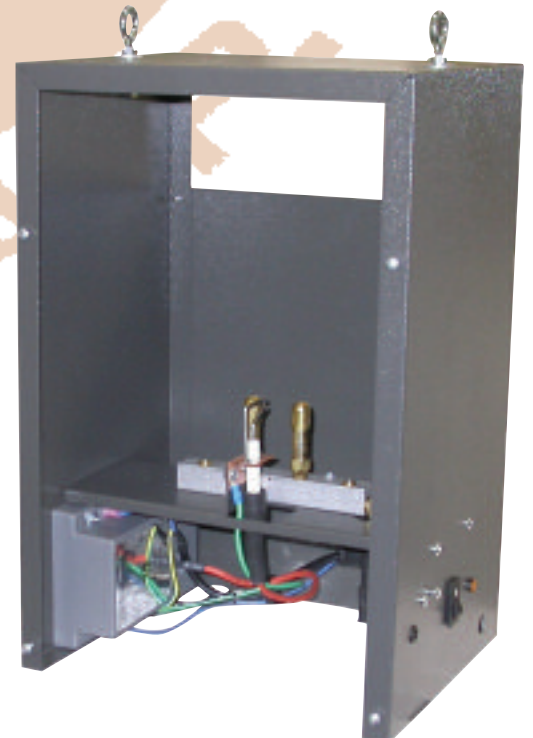
## MAINTAINING YOUR GENERATOR

The GEN-1e has been designed for years of trouble-free service. The brass burners have been chosen over steel because of their superior performance over long periods of operation. The powder-coated enclosure can be cleaned with normal cleaners and will not "fade" over time. However, if for any reason the generator is not performing correctly, shut off the gas supply and turn the unit OFF. Simple problems can be remedied by consulting the troubleshooting guide within these instructions.

## FRONT BURNER ACCESS PANEL

The unit must operate with all of the panels in place. However, the front panel can be removed when lighting or installing additional burners. Four screws are used to secure the panel in place. Simply loosen the screws and lift the panel off the "keyholes" in order to expose the burner assembly. Be sure to replace the cover prior to operating the GEN-1e.

**\*WARNING:** There are no user serviceable parts inside this generator. Do not attempt to service the GEN-1e gas components.

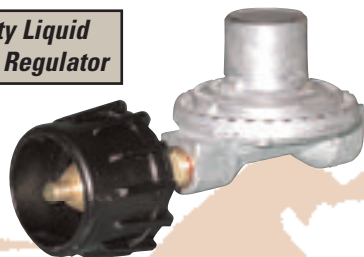


## SAFETY FEATURES

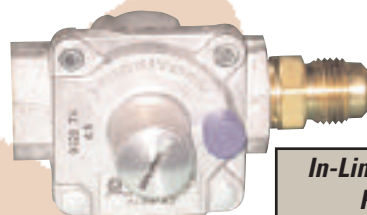
*Your GEN-1e has been designed with safety in mind. There are several items worth mentioning.*

- 1) **Electronic Spark Ignition:** We use a proprietary Electronic Ignition Module to light the main burner. Though standing pilot lights have been used safely for years, many appliances are moving over to electronic spark ignition to eliminate the standing pilot lights and the risks involved with a constant standing flame and possible gas leakage if the pilot light were to go out.
- 2) **Tip-over shut-off switch:** Gas and electric heater manufacturers are required to use a simple safety device in their units that shut off the unit in the event it tips over or falls. We have incorporated the same safety into the GEN-2e. If the unit is tilted more than 35 degrees in any direction, the main valve is turned off preventing fuel flow to the main burner.
- 3) **AGA approved devices:** All of the gas components we use are appropriate for use with both LP and Natural gas. We use only the finest brass fittings and heavy-duty hoses. The GEN-2e comes with a low-pressure, in-line natural gas regulator or the new Type I style "no-tool-required" LP regulator to make tank replacement easy. The Type I LP tank connector incorporates a "flow-limiting" device that reduces flow to 10 SCFH in the event of a leak. The Type I also contains a heat sensing spring-loaded module, which stops gas flow if the temperature exceeds 240 degrees F.

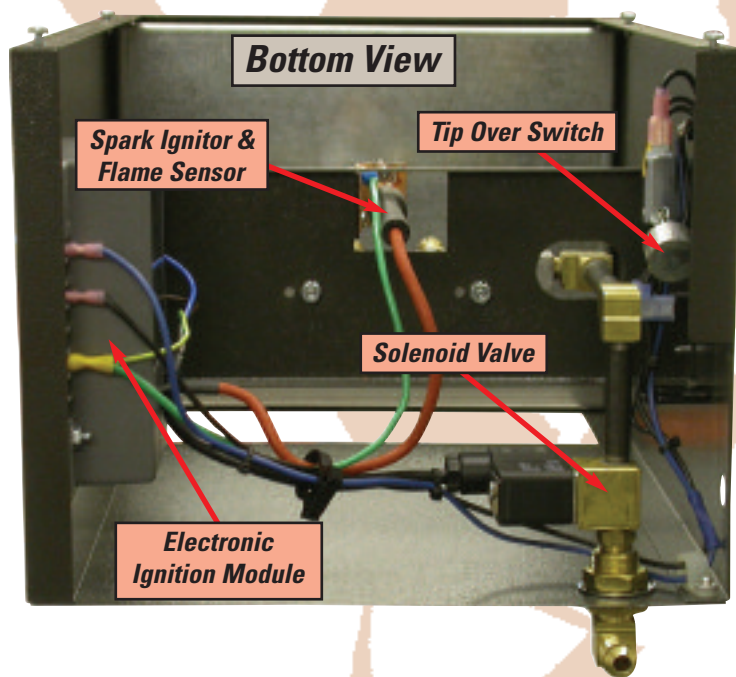
**Type I Safety Liquid Propane Gas Regulator**



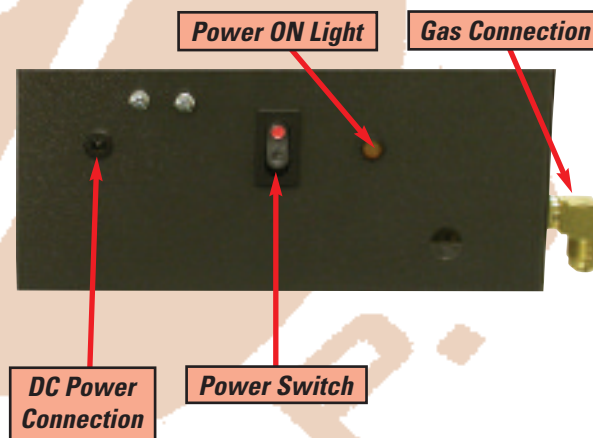
**In-Line Natural Gas Regulator**



**Bottom View**



**Side View**



## OTHER FEATURES

*We have tried to make your CO<sub>2</sub> generator as easy to use and attractive as possible. Some of the less noticed details of the GEN-1e include the following.*

- 1) **Powder-coated steel enclosure:** The attractive steel enclosure has been powder-coated for a long lasting finish that will not fade or shift color with time. The enclosure itself has been engineered to allow the heat produced by the unit to dissipate and also to operate cooler than other competing generators.
- 2) **Visual appearance:** Keeping in mind the importance of the generator's function, we have located all of the key devices on the right side of the unit. A power rocker-switch has a red flag to indicate the unit is turned ON. An amber light glows when the main gas solenoid valve is open. The power supply quick-connect is located in a very accessible location OUTSIDE the enclosure.
- 3) **LP / NG conversions:** Unlike other similar devices, the GEN-1e is very easy to convert from LP to Natural gas operation or vice-versa. A conversion kit is available that includes a new identification label and regulator. Should the need arise to convert the unit, a screwdriver, a couple of wrenches and 5-10 minutes is all that is needed. Also, new burners must also be installed.

## PROPER SIZING

It is important to consider that some manufacturers have inaccuracies within their generator ratings. In order to compare sizes, a very simple conversion can be used to determine a CO<sub>2</sub> generator's ACTUAL capacity to produce CO<sub>2</sub>. That is assuming you know the actual Btu output of the unit. British thermal units (BTUs) are stated as the actual heat output of the unit. Heat output (BTU), is determined simply by knowing the pressure of the gas, the type of gas (LP or natural) and the volume of gas allowed to flow to the burner.

**To convert an LP generator's Btu rating into cubic feet of CO<sub>2</sub> per hour:**

$$\frac{\text{Btu / Hr} \times 1.18}{1000}$$

Example:  $\frac{11,176 \text{ Btu} \times 1.18}{1000}$

$$11,176 \times 1.18 = 13,187$$
$$1000 = \mathbf{13.2 \text{ cuft CO}_2 \text{ /hr}}$$

**To convert a Natural Gas generator's Btu rating into cubic feet of CO<sub>2</sub> per hour:**

$$\frac{\text{Btu / Hr}}{1000}$$

Example:  $\frac{12,540 \text{ Btu}}{1000}$

$$\frac{12,540}{1000} = \mathbf{12.5 \text{ cuft CO}_2 \text{ /hr}}$$

So a CO<sub>2</sub> generator running propane, with a rating of 11,176 Btu will produce 13.2 cubic feet of CO<sub>2</sub> per hour assuming a standard pressure of 11"WP is used. A natural gas fired generator rated at 12,540 will produce up to 12.5 cuft / hr of CO<sub>2</sub> per hour. That's not the only thing to consider.

Before operating your CO<sub>2</sub> generator, make sure you have accounted for the heat it will be producing. The ratings in the specification section of this manual give you the Btu per hour rating. Keep in mind that if the CO<sub>2</sub> generator is only ON for 30 minutes each hour, the Btu / hr rating would be reduced by one half resulting in CO<sub>2</sub> outputs of ½ the capacity rating.

Determining what size unit and how long to allow the unit to run for is almost impossible due to the variables which different areas exhibit. Areas which are well sealed and have coordinated cooling devices can be easily maintained compared to areas which are not sealed or use an exhaust fan at all times.

## ADDING BURNERS

The unique ability to increase the CO<sub>2</sub> production capacity of the GEN-1e by adding burners allows you to expand as necessary. Installing additional brass burners can increase the GEN-1e's CO<sub>2</sub> producing capacity. Use only CAP burners. The brass burners CAP uses are customized specifically for CO<sub>2</sub> production. Each burner installed adds approximately 3 cubic feet of CO<sub>2</sub> per hour.

**\*NOTE: People operating the GEN-1e at altitudes higher than 3000 ft above sea level may need to use slightly smaller burners to reduce fuel flow due to lower levels of oxygen available. If the flames appear yellowish or too large, please contact your dealer or CAP for special burners which are designed to operate at higher altitudes.**

## STORING YOUR GENERATOR

If you are not going to be using your CO<sub>2</sub> generator for an extended period of time, you need to keep it in a dust and insect free area. We suggest that you put the generator and all components into a sealed bag (like a garbage bag), to prevent debris from accumulating inside of the gas train, especially the slotted cap burners.

## CONTROLLER OPTIONS

CAP offers a full line of CO<sub>2</sub> controllers from simple to sophisticated. Controllers such as the PPM-3 and the AIR-3 intelligently coordinate your exhaust fans with the GEN-1e. The simple and economical PPM-3 is designed specifically for people who want Part-Per-Million accuracy from their generator.



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**The  
Perfect  
Combination!**

## TROUBLESHOOTING

If you are having problems with this unit, refer to these troubleshooting hints.

### *Problem*

### *Suggested Action*

#### ***The Generator will not light***

There could be air in the gas line, especially when changing propane tanks or turning on your generator for the first time. Turn generator off and then turn it back on. Let it attempt to light 5 times and then repeat.

If the generator lights the main burner and then immediately turns back off, the flame sensor may not be directly in the line of the flames. Tighten up the slotted jet caps on both sides of the Spark Ignitor/Flame Sensor so that the flames coming out of the burner are aimed at the Spark Ignitor/Flame Sensor. Bend the mounting bracket slightly to adjust the flame sensor to be in the heat of the flames.

Make sure that tank is full and that the gas is turned on.

Verify the unit matches the type of gas you are supplying and the gas pressure is correct.

#### ***The Generator is being used with a PPM sensor and the generator never seems to turn off***

Your area is leaking out CO<sub>2</sub> faster than the generator can produce it. Try sealing the area better, coordinate the cooling exhaust fans with the generator (an AIR-3 can be used to coordinate ventilation cycles), or possibly add burners to the generator until the level maintains properly.

If you are using a PPM controller, make sure that it is set between 1000 and 1500 ppm. Trying to raise the level above 1500 ppm is wasteful and potentially dangerous.

#### ***The unit is plugged in and turned on but the amber light and burner don't work.***

Verify the power switch is ON and the power supply is getting power. Make sure the unit is level. Check the tilt switch in the right rear corner of the enclosure. It has a small pendulum weight that must be hanging vertically in order for the generator to operate.

#### ***The flames on the main burner seem either too large with yellow flames or too small "flashing" ON and OFF.***

You may have mixed burners. Verify you are using natural gas burners with natural gas and propane burners with propane.

Lazy yellow flames indicate low gas flow due to low propane tank level or low natural gas pressure. Long piping runs with natural gas need to be appropriately sized.

At extremely high altitudes, it may be necessary to use customized burners. Contact the your store or manufacturer for details.

Verify the unit matches the type of gas you are supplying and the gas pressure is correct.

## PRECAUTIONS

***After making the gas connections ALWAYS check for leaks using soapy water and a spray bottle.***

***This unit is NOT for residential use. The exterior of the unit can get very HOT when in operation.***

***Always wait for the generator to properly cool down prior to servicing the unit or removing the front panel.***

***DO NOT allow the CO<sub>2</sub> level to rise above 2500 ppm. Operate only in safe ventilated environments.***

***DO NOT operate the unit if gas or other flammable fumes are noticed.***

***DO NOT operate this unit with the front access panel removed.***

***The Generator SHOULD be connected to a suitable CO<sub>2</sub> controller to regulate the CO<sub>2</sub> level.***

***If operating the unit in an area with limited ventilation, an inexpensive carbon monoxide alarm is recommended.***

***DO NOT use teflon tape on Brass Fittings!***

## WARRANTY

***The GEN-1e is warranted against defects in workmanship and parts for Three Years.***

## SPECIFICATIONS

Power Supply In:	120 volts
Propane Pressure:	11" WC
Total BTU 1 Burner	Propane 2,794 / Natural Gas 3,135
Total BTU 3 Burners	Propane 8,382 / Natural Gas 9,405
Weight	12 lbs

Power Supply Out:	24 volts AC
Natural Gas Pressure:	4.5" WC
Total BTU 2 Burners	Propane 5,588 / Natural Gas 6,270
Total BTU 4 Burners	Propane 11,178 / Natural Gas 12,540
Dimensions	11" x 16½" x 8½"

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