

GAS PRO CO₂ GAS GENERATOR (NATURAL GAS)



WARNING

- Use only with natural gas at 5" to 7" W.C. pressure.
- Natural gas can cause fire or explosion if handled improperly.
- Installation to be done by qualified personnel only.
- Unit gets hot when operating, DO NOT TOUCH. Keep flammable materials away.
- High CO₂ levels (5000 PPM) are hazardous to people. Plants generally don't need more than 1500 PPM.
- Unit must be controlled by timer or CO₂ controller. Not for continuous operation.

FEATURES

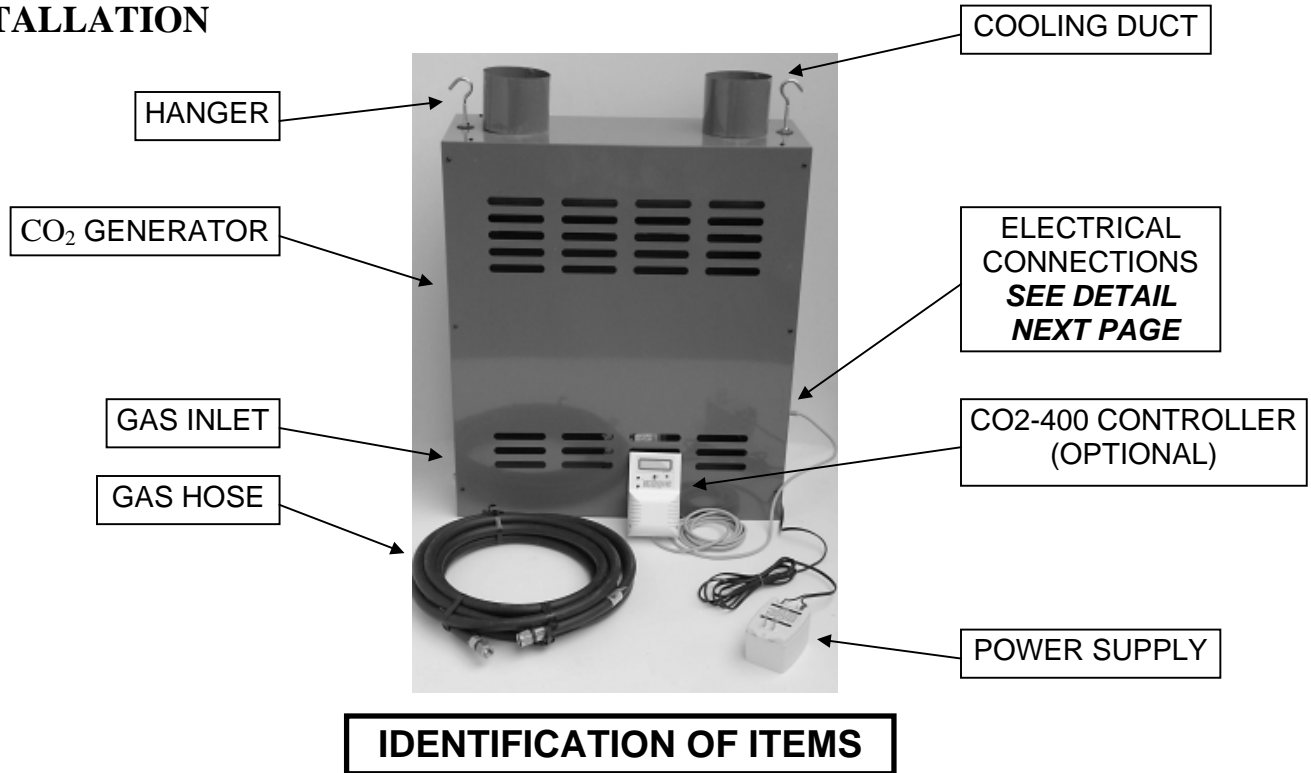
- ◆ Faster, more reliable, more efficient, electronic spark ignition compared to other methods.
 - Better than standing / continuous pilot - they must be manually lit, burn all the time, waste gas.
 - Faster than glow plug - no time needed for glow plug to heat up, spark ignites immediately.
 - More reliable - in a glow plug ignition system, the most likely part to fail is the glow plug.
- ◆ Easier to add optional CO₂-400 controller (shown above).
 - Just plug CO₂-400's 10 ft. cable into connector on side of Gas Pro. Extension cable available.
 - No separate power supply - draws power from Gas Pro.
 - Safer 24 VAC operation - no 120 VAC at controller.
- ◆ Heat exchanger for forced air cooling of Gas Pro.
- ◆ Slots for air in and CO₂ out - safer than big holes or large open area.
- ◆ Two models - GP-06-NG (6 burner) and GP-12-NG (12 burner).

INTRODUCTION

CO₂ (carbon dioxide) is needed by plants for proper growth. In an indoor environment it is quickly depleted which slows or even stops growth. CO₂ can be added by either a cylinder of CO₂ or by burning cheaper and easier to get natural gas. Natural gas is 95% methane (CH₄). It is delivered to many buildings by pipeline from the local gas utility company. See the Installation section below. Under ideal combustion, natural gas produces only CO₂ and water vapor. A furnace burns gas, uses the heat, and discards the combustion gases. A CO₂ generator generally does the opposite - it uses the combustion gases (CO₂) and discards or redirects the heat. A furnace is optimized for maximum heat, a CO₂ generator for cleanest CO₂. CO₂ generators are best suited for larger grow rooms with temperature and humidity under good control.

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INSTALLATION



Location of CO₂ Generator

The generator is mounted in the growing area such that the CO₂ can be distributed to the plants. Do not block the ventilation slots on the front or back. The generator can be set on a non-flammable material (not carpet or wood floor). If necessary, it can be set on a stable brick platform. It can also be hung by the two hangers. Use a metal chain or other metal support. Do not use a flammable material such as rope or plastic covered chain. Many hardware or home improvement stores will sell bulk chain cut to your desired length. Use chain rated for at least 50 LBs. Keep flammable materials away. Do not set things on the generator. It gets HOT. Locate it in a central location to allow even distribution of CO₂ to the growing area. Be sure to have circulation fans but don't blow directly into the generator such that the flames are disrupted.

Natural Gas Distribution (not shown)

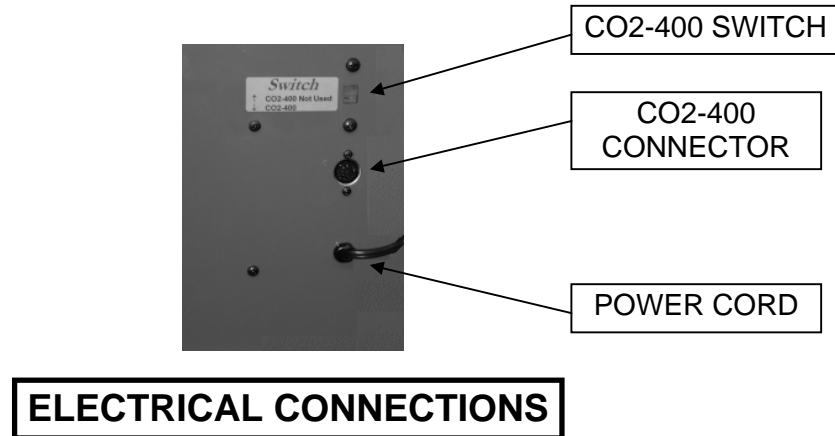
The utility typically delivers gas to a building at 5 to 15 psig. At the service entrance there is a meter and regulator which reduces the pressure for distribution within the building. The Gas Pro requires an inlet pressure of 5" to 7" W.C. (7" Water Column is approximately 1/4 psig). If gas is distributed in the building at that pressure, then no further reduction is required. If the gas pressure is higher, such as 2 psig, then a "pounds-to-inches regulator" (not supplied) is required to reduce it to 5" to 7" W.C. A shut off valve should be installed with easy access in case of emergency. The gas supply fitting for the hose is 3/8" male flare.

Gas Connection

Route the hose between the generator and gas supply. Be sure to protect it from being stepped on, cut or otherwise damaged. Connect the hose to the generator's gas inlet. Tighten with two wrenches - keep the generator fitting from turning and turn the hose fitting. Connect the gas supply to the hose in a similar manner. Suitable pipe can be substituted for the hose if desired. Natural gas is lighter than air and any leaks will cause gas to rise, so be sure to provide good ventilation.

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INSTALLATION (*continued*)



Electrical Connection

The Gas Pro is designed to be controlled by a timer or CO₂ controller. It is not designed for continuous operation. Plug the Gas Pro's power supply into the timer or controller's 120 VAC outlet. If the supply blocks other outlets on the timer or controller, use a power strip or extension cord. Route the supply's cord such that it will not be stepped on or damaged. The cord connects to terminals on the supply that are 24 VAC. They are recessed and this will normally protect them from accidental contact but if this is an issue, protect them with electricians tape. **NEVER USE DUCT TAPE WITH ELECTRIC CIRCUITS** - it has metal in it and will cause a short circuit. The CO2-400 Switch should be UP if a CO2-400 is not used.

CO2-400 Controller

The optional CO2-400 controller plugs directly into the CO2-400 connector on the Gas Pro. It operates on 24 VAC from the Gas Pro - no separate power supply needed. It uses a 10 foot long cable, extension cables are available. If a CO2-400 is connected, the CO2-400 Switch is DOWN, towards the connector. The Gas Pro power supply is plugged into an outlet that is always powered. See CO2-400 instructions for further details.

Cooling Ducts

The Gas Pro allows the connection of forced air cooling to remove heat from the generator and growing area. Two duct fittings are on the top of the generator, separated from the combustion area (and hence CO₂) by a heat exchanger baffle. Use 4" flexible ducting. Use an inline fan to blow cool air into one side and run the other side outdoors to vent the hot air. It does not matter which duct is inlet or outlet. The cooling ducts are useful in a grow room where temperature is generally under control but some of the added heat from the Gas Pro needs to be removed to maintain desired conditions.

Carbon Monoxide (CO) Detector (not shown)

A carbon monoxide detector should be installed in any area where a gas appliance is being used. These are readily available at hardware or home improvement stores. Carbon monoxide is odorless but deadly.

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OPERATION

Principles of Operation

The Gas Pro uses electronic spark ignition. When power is applied (or the optional CO₂-400 controller requests CO₂), gas is supplied to the pilot burner and a high voltage spark is generated which lights the pilot. The Gas Pro senses when the pilot lights, and then turns off the spark and supplies gas to the main burners. The pilot then lights the main burners. The pilot stays lit and is monitored. If the pilot goes out (and also the main burners, as one would re-light the other), the main burner gas is shut off and the pilot tries to light again as described above. The pilot will try to light for about 90 seconds. If it cannot light in this time, it shuts off the gas and spark and retries in about 6 minutes. When power is removed, gas is shut off to both pilot and main burners. When operating, cool air is drawn in through the lower slots on the front and back. Hot gases, including CO₂, rise up and are forced out the upper slots by the heat exchanger baffle. If cool air is forced into the cooling duct, the baffle is cooled and heat is sent out the other duct.

Initial Startup

After the steps in the Installation section above have been done, a leak check should be done. The power supply should be unplugged. Slowly open the natural gas supply valve. Spray the hose connections with soapy water and verify no bubbles (leaks) are seen. If you smell gas (natural gas has a rotten egg or other unpleasant smell added), shut off the gas, and allow it to vent out before continuing. Tighten connections if necessary using two wrenches. Next plug the power supply into 120 VAC to start the generator. You should hear the pilot valve open and the spark start after a few seconds. Because there is still air in the hose, it may take a minute or two to light the first time. If it is still sparking after 60 seconds, unplug the supply for a few seconds and plug back in. This will defeat the 90 second time-out for attempting to light the pilot. Once the pilot lights, you should hear the spark stop, the main valve open, and the main burners will light. Unplug the supply and plug it into the timer or controller and set them for desired operation.

Regular Operation

Normally, the timer or controller will turn on the Gas Pro and the pilot and main burners will light in a few seconds. CO₂ will be generated, replenish the growing area, and the Gas Pro is then shut off until the CO₂ is used up. The Gas Pro is then turned on and repeats the cycle. The Gas Pro is not designed for continuous operation.

Typical CO₂ Dispensing Cycle

The following test was done with a propane GP-12-LP in a 3200 cubic foot room using a CO₂ monitor/controller. The natural gas models put out less CO₂ and should provide similar results in smaller rooms. Equivalentents would be GP-06-NG in a 1330 cubic foot room and GP-12-NG in a 2660 cubic foot room. With the room starting at ambient CO₂, the Gas Pro operated for 11 minutes to bring the CO₂ above the 1400 PPM set point. It then shut off. After 17 minutes, the CO₂ level dropped enough and the Gas Pro was turned back on and ran for 4 minutes. Thereafter the Gas Pro came on about 3 times an hour, running approximately 4 minutes each time. CO₂ in the room rose and fell between 1200 and 1800 PPM, averaging about 1470 PPM. There are a number of variables in CO₂ generation and control, including room air circulation, fresh air ventilation cycles, room air leaks, plant CO₂ absorption rate, etc. Many published numbers have inaccuracies or are based on theoretical not practical studies. Comparison of published data should be done with caution.

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PROBLEM SOLVING

PROBLEM	SUGGESTIONS
There is a strange smell, like rotten eggs.	DANGER! There is a gas leak. Shut off the gas, vent the area and keep out until it dissipates. See OPERATION - Initial Startup section for checking for leaks at startup. Gas leaks are dangerous and must be corrected to prevent fire or explosion.
The power supply has 120 VAC but nothing happens.	Verify that the CO2-400 switch above the power cord is in the UP position. It should only be DOWN when using a CO2-400 controller.
Power is applied, the spark starts, and then stops and the generator doesn't come on.	Verify that the hose is properly connected, all relevant valves open, and gas is supplied to the generator. If the gas supply has been interrupted, changes made in the gas supply lines including hose, or this is initial start up, see OPERATION - Initial Startup section.
The generator flames are weak or extremely strong.	Verify that the pressure at the inlet to the Gas Pro is in the 5" to 7" W.C. range. If too low, the flames will be weak and erratic. If too high, the Gas Pro may not be able to properly regulate the gas and may even be damaged, causing a dangerous situation.
There is discoloration at the top slots.	This is normal due to the flow of hot gases in this area.
A CO2-400 is being used but its display is blank, even though the Gas Pro power supply has 120 VAC.	Verify that the CO2-400 switch above the power cord is in the DOWN position. It should only be UP when NOT using a CO2-400 controller.

SPECIFICATIONS

- Power supply (input) 120VAC, 60Hz, 0.5 Amp
- Power cord (from power supply) 10' length, 18 AWG, 2 conductor
- Internal operation 24 VAC
- Heat (nominal) GP-06-NG: 16,590 BTU / hr.
GP-12-NG: 33,180 BTU / hr.
- CO₂ (nominal) GP-06-NG: 16.5 cu. ft. / hr.
GP-12-NG: 33 cu. ft. / hr
- Gas type Natural gas
- Pressure at Gas Pro inlet 5" to 7" W.C.
- Burner pressure 3.5" W.C.
- Gas hose 20' length, 3/8" ID, 3/8" female flare fittings
- Dimensions 27" high (including ducts) x 21" wide x 8" deep
- Weight 40 LBs.