

**Green Air Products Inc.**  
**Infrared Carbon Dioxide Generator**  
**Installation and Operation Manual**



**All persons involved with the installation, operation and maintenance of this appliance must read and understand the information in this manual.**

## **WARNING**



Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read and understand the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment. Only trained, qualified gas installation and service personnel may install or service this equipment. Failure to comply could result in personal injury, asphyxiation, death, fire and/or property damage. In locations used for the storage of combustible materials, signs must be posted to specify the maximum permissible stacking height to maintain the required clearances from the heater to the combustibles. Signs must either be posted adjacent to the appliance in a conspicuous location.



### **Not for residential use!**

This heater is not approved in any residential application. This includes (but is not limited to) the home, living quarters, attached garages, etc. Installation in residential indoor spaces may result in property damage, asphyxiation, serious injury or death.

### **For Your Safety**

#### **If you smell gas:**

- Do not try to light any appliance. • Immediately call your gas supplier from a neighbor's phone.
- Do not touch any electrical switch. • Follow the gas supplier's instructions.
- Do not use any phone in your building. • If you cannot reach your gas supplier, call the fire department.

**Keep these instructions for future reference.**

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## 1.0 Safety

### WARNING




Improper installation, adjustment, alteration, service or maintenance can cause property damage, serious injury or death. Read and understand the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment. Only trained, qualified gas installation and service personnel may install or service this equipment.

#### Safety Symbols

 **WARNING**

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

 **CAUTION**

**Caution** indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

**NOTICE**

**Notice** indicates a potentially hazardous situation which, if not avoided, could result in property damage.

#### Applications

This is not an explosion proof appliance. Consult your local fire marshall, insurance carrier and other authorities for approval of the proposed installation.

#### Commercial / Industrial (Indoor Use Only)

Infrared CO<sub>2</sub> generators are designed and certified for use in industrial and commercial buildings designed and specific to plant growth environments. For maximum safety, the building must be evaluated for potential hazards before installing the heater system. A critical safety factor to consider before installation is the clearance to combustibles.

#### Not For Residential Use.

Installation of an infrared CO<sub>2</sub> generator in residential indoor spaces, may result in property damage, asphyxiation, fire, serious injury or death.

#### Residential

This appliance is **NOT** approved for use in any residential application. This includes, but not limited to, attached garages, living quarters, solariums, etc. Consult the local fire marshal and/or insurance provider if unsure of your application.

### WARNING



#### Not For Residential Use.

Installation of an infrared heater system in residential indoor spaces, RV's, mobile homes, etc. may result in property damage, asphyxiation, fire, serious injury or death.

# WARNING



Placement of explosive objects, flammable objects, liquids and vapors close to the heater may result in explosion, fire, property damage, serious injury or death. Do not store, or use, explosive objects, liquids and vapor in the vicinity of the heater.

Failure to comply with the published clearances to combustibles could result in personal injury, death and/or property damage.

## CAUTION



Signs shall be posted specifying the maximum permissible stacking height in order to maintain clearances to combustibles.

### Hazards Include:

For maximum safety the building must be evaluated for hazards before installing the heater system.

Examples include, but are not limited to:

- Gas and electrical lines
- Combustible and explosive materials
- Chemical storage areas
- Areas of high chemical fume concentrations
- Provisions for accessibility to the heater
- Adequate clearances around air openings
- Combustion and ventilating air supply
- Vehicle parking areas
- Vehicles with lifts or cranes
- Storage areas with stacked materials
- Lights
- Sprinkler heads
- Overhead doors and tracks
- Dirty, contaminated environment

A critical safety factor to consider before installation is the clearances to combustibles. Clearance to combustibles is defined as the minimum distance you must have between the infrared surface, or reflector, and the combustible item. Considerations must also be made for moving objects around the infrared heater. The following is a partial list of items to maintain clearances from:

### Combustible Items Include:

- Wood
- Paper
- Fabric
- Chemicals
- Wall or roof insulation

### Moving Objects Include:

- Overhead doors
- Vehicles on lifts
- Cranes
- Hoists
- Car wash equipment

The stated clearance to combustibles represents a surface temperature of 90°F (32°C) above room temperature. Building materials with a low heat tolerance (such as plastic, vinyl siding, canvas, tri-ply, etc.) may be subject to degradation at lower temperatures. It is the installer's responsibility to assure that adjacent materials are protected from degradation.

When installing the infrared generator, the minimum clearances to combustibles must be maintained. These distances are : 18 inches in all directions

If you are unsure of the potential hazards, consult your local fire marshall, fire insurance carrier or other qualified authorities on the installation of gasfired infrared heaters for approval of the proposed installation.

## WARNING



An approved connector, suitable for the environment of equipment usage, is required. Visible or excessive swaying, flexing and vibration of the gas connections must be avoided to prevent failure. Neither the gas pipe nor the connector shall be placed in the 'flue discharge area'. In no case shall the gas supply support the weight of the heater.

To ensure your safety, and comply with the terms of the warranty, all units must be installed in accordance with these instructions.

### Standards, Certifications and Government Regulations

Installation of this infrared heater must comply with all applicable local, state and national specifications, regulations and building codes. Contact the local building inspector and/or fire marshall for guidance.

In the absence of local codes, the installation must conform to the latest edition of:

**United States:** National Fuel Gas Code, ANSI Z223.1 (NFPA 54).

**Canada:** CAN/CGA B149.1 and .2, Canadian Electrical Code C22.1

Copies of these standards can be viewed or purchased at [www.nfpa.org](http://www.nfpa.org) or [www.scc.ca](http://www.scc.ca).

Chart 1.2 • Standards and Code Installation Guidelines • Building Aspect

Building Aspect	Codes and Guidelines
<b>Electrical</b>	<p>The heater must be electrically grounded in accordance with the following codes:</p> <p><b>United States:</b> Refer to National Electrical Code®, ANSI/NFPA 70 (latest edition). Wiring must conform to the latest edition of National Electrical Code®, local ordinances, and any special diagrams furnished.</p> <p><b>Canada:</b> Refer to Canadian Electrical Code CSA C22.1 Part 1 (latest edition).</p>
<b>Venting</b>	<p>Venting must comply with the requirements within this manual and the following codes:</p> <p><b>United States:</b> Refer to NFPA54/ANSI Z223.1 (latest edition), the National Fuel Gas Code.</p> <p><b>Canada:</b> Refer to CAN/CGA B149.1 Installation Codes for Gas Burning Appliances.</p>

## Generator Mounting

# WARNING



Improper suspension of the infrared generator may result in collapse and being crushed. Always suspend from a permanent part of the building structure that can support the total force and weight of the heater.



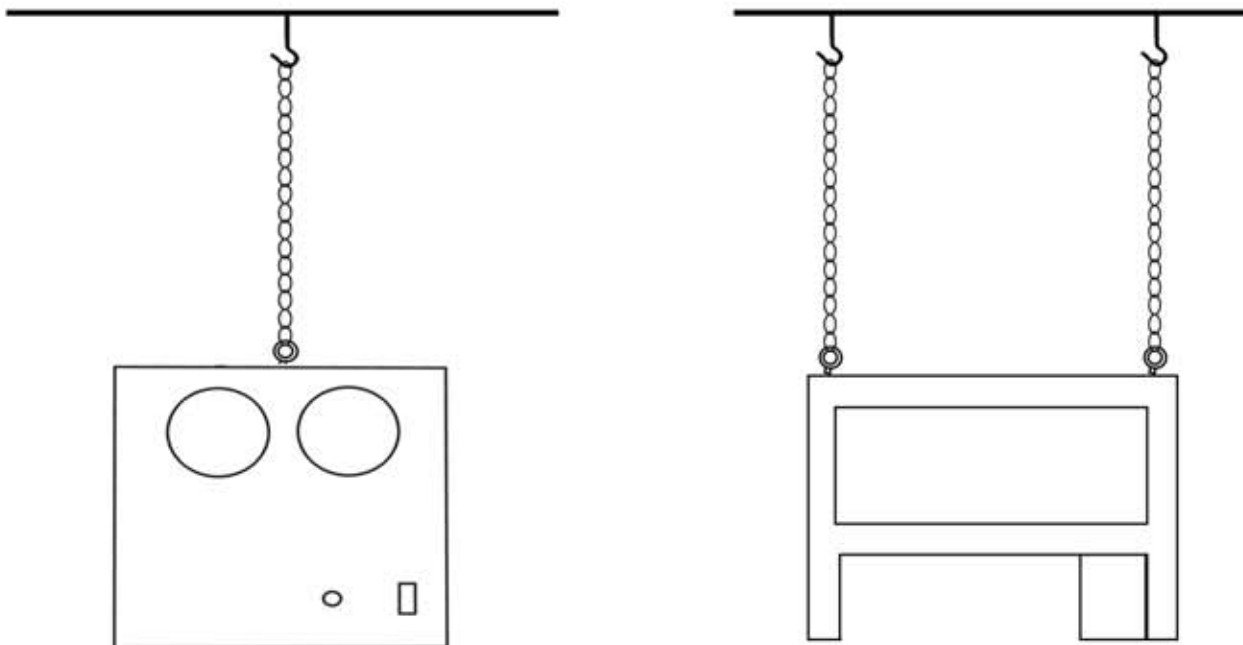
Failure to maintain minimum clearance to combustibles may result in fire and/or explosion, property damage, serious injury or death. Always maintain minimum clearances and post signs or provided tags where needed. Signs should state the hazards for the particular application and be legible to the building occupants. Consult the factory or a factory representative for additional information on signage compliance.



An approved connector, suitable for the environment of equipment usage, is required. Visible or excessive swaying, flexing and vibration of the gas connections must be avoided to prevent failure. Neither the gas pipe nor the connector shall be placed in the 'flue discharge area'. In no case shall the gas supply support the weight of the heater.

The generator should be suspended with chains provided. Consult all applicable codes before installation.

Figure 2.3 • Heater Mounting and Orientation



## Ventilation

# WARNING

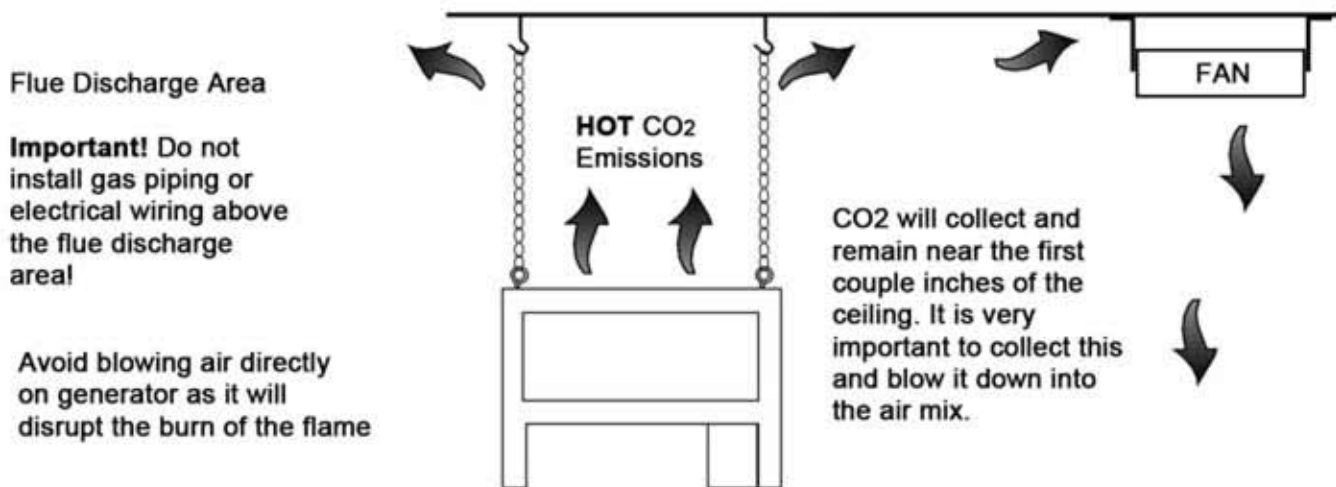


Insufficient ventilation may result in health problems, carbon monoxide poisoning or death. Vent enclosed spaces and buildings according to national, state, provincial and local codes. Improper venting may result in asphyxiation, fire, explosion, injury or death.

It is required that the levels where heaters are mounted be properly ventilated to supply combustion air to the heaters and to sufficiently dilute the products of combustion. It is also required that the flue discharge area is kept clear of gas piping and electrical wiring (see Figure 2.4).

This infrared generator must be vented in accordance with national, state, provincial and local codes and the guidelines in this manual. In the United States refer to the latest edition of ANSI Z223.1 (NFPA 54) and in Canada refer to the latest edition of the CAN/CGA B149.1 & B149.2 Standard.

Figure 2.4 • Hot Flue Discharge



Provisions must also be made to provide sufficient fresh air intake area and exhaust air outlet area. For proper ventilation, a positive air displacement of 4 CFM/1,000 BTU/h of gas consumed must be provided. Where insufficient air movement exists, induced air displacement is required. A balanced system is essential to avoid negative building pressure which causes excessive infiltration, unfavorable drafts and affects combustion efficiency.

Air displacement may be accomplished by either natural or mechanical means. Mechanical exhausters are preferred and typically mounted at high points on the roof where stagnant air accumulates inside the building. For a flat roof, considerations of prevailing winds, high and low pressure areas, and distribution of air movement must be taken into consideration when locating exhausters.

Best air distribution is accomplished by using a number of small exhausters versus one large exhauster. Provide a minimum of one square inch of inlet area per 1,000 BTU/h for combustion air supply. Inlet opening in the building should be well distributed (see Figure 2.1) high in the sidewalls and should direct incoming air upward to dilute products of combustion while preventing drafts at lower levels. Inlets are typically 1 to 3 sq. ft.

Local codes may require that mechanical exhaust systems be interlocked with heaters to enable both to function simultaneously or allow control of exhausters with a thermostat.

## Gas Supply

# WARNING



Improperly connected gas lines may result in fire, explosion, poisonous fumes, toxic gases, asphyxiation or death. Connect gas lines in accordance to national, state, provincial and local codes

The gas supply to the infrared heater must be connected and tested in accordance with national, state, provincial and local codes along with the guidelines in the Detroit Radiant DR Series manual. In the United States refer to the latest edition of the ANSI Z223.1 (NFPA 54) Standard and in Canada refer to the latest edition of the CAN/CGA B149.2 Standard.

**Important!** Before connecting the gas supply to the infrared heater(s):

- Check that the gas piping and service has the capacity to handle the load of all heaters being installed, as well as any other gas appliances being connected to the supply line.
- Check that the main gas supply line is of proper diameter to supply the required fuel pressures.
- If utilizing used pipe, verify that its condition is clean and comparable to a new pipe. Test all gas supply lines in accordance with local codes.
- Test and confirm that inlet pressures are correct. Refer to the rating plate for required minimum and maximum pressures (see Chart 2.3). The gas supply pipe must be of sufficient size to provide the required capacity and inlet pressure to the heater (if necessary, consult the local gas company).

### Manifold Pressure

Type of Gas	Required Manifold Pressure	Minimum Inlet Pressure	Maximum Inlet Pressure
Natural	6.0 Inches W.C.	7.0 Inches W.C.	14.0 Inches W.C.
Propane	10.0 Inches W.C.	11.0 Inches W.C.	14.0 Inches W.C.

**Note:** Check manifold pressure at the tap located either at the outlet of the gas valve or on the gas manifold pipe. Readings will be above atmospheric pressure during operation

**Pressure Equivalents:** 1 inch W.C. equals .058 oz/sq. in. equals 2.49 Mbar.



To connect the gas

## WARNING



Failure to install, operate or service this appliance in the approved manner may result in property damage, injury or death.

## WARNING



An approved connector, suitable for the environment of equipment usage, is required. Visible or excessive swaying, flexing and vibration of the gas connections must be avoided to prevent failure. Neither the gas pipe nor the connector shall be placed in the 'flue discharge area'. In no case shall the gas supply support the weight of the appliance.

This appliance must be installed and serviced by trained gas installation and service personnel only.

The installation of this generator must conform with local building codes or, in the absence of such codes, the National Fuel Code (NFPA 54).

The gas outlet must be in the same room as the appliance and accessible. It may not be concealed within or run through any wall, floor or partition.

1 The generator is equipped to receive a 10 ft. length of 3/8 I.D. flexible gas supply line (provided). The unit comes with a propane regulator for LP use. There is also a natural gas adapter for 1/2" NPT Schedule 40 metallic pipe. All piping must be installed in accordance with the requirements outlined in the National Fuel Gas Code ANSI/Z223.1 (latest edition) or CSA B149.2. Support all gas supply with pipe hangers, metal strapping, or other suitable material. Do not rely on the heater to support the gas pipe.

2 Install a ground joint union with a brass seat and a manual shut off valve adjacent to the unit for emergency shut off and easy servicing of controls. A 1/8" NPT plugged tap is accessible for the test gauge connection by removing the component cover.

3 A sediment trap must be installed in the supply line in the lowest spot prior to connecting to the unit. The trap length shall be at least three inches long. Ideally, the trap would be installed as close as possible to the shut off.

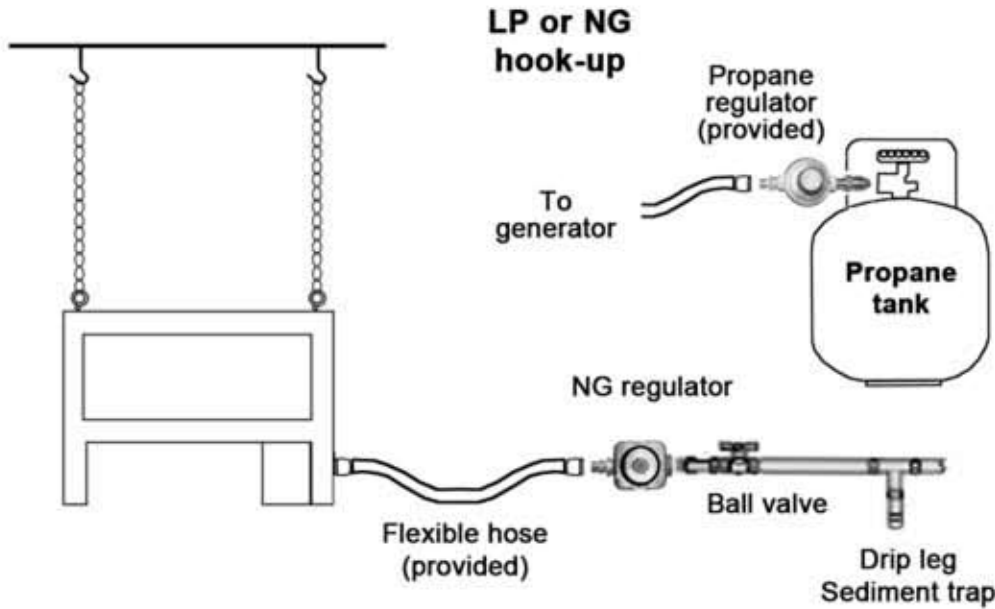
4 When connecting piping to the unit, the use of a thread joint compound is required. The thread compound (pipe dope) shall be resistant to the action of propane gas or any other chemical constituents of the gas to be conducted through the piping. Use of Teflon® tape is not permitted.

## WARNING



Always use two (2) opposing wrenches to tighten mating pipe connections to prevent excessive torque on the gas valve and manifold pipe. Excessive torque can damage the valve and/or misalign the orifice, resulting in fire, explosion, serious injury or death.

## Gas connection - leak testing



**NOTE:** Use a NG regulator when supply pressure exceeds 14" W.C. Do not exceed 14" W.C. to the appliance

## WARNING



Use a soap solution or equivalent for leak testing. Never test for leak with an open flame. Failure to comply could result in personal injury, property damage or death.

Always leak test final gas assembly for gas leaks according to the procedures outlined in NFPA 54 and all local codes and/or Standards.

### For leak testing on pressures below ½" PSI

Before leak testing, close the field installed manual shut off valve shown on figure above on the supply line to isolate the gas valve from the pressure.

**NOTE:** All factory installed gas connections have passed an approved leak test.

### For leak testing on pressures above ½" PSI

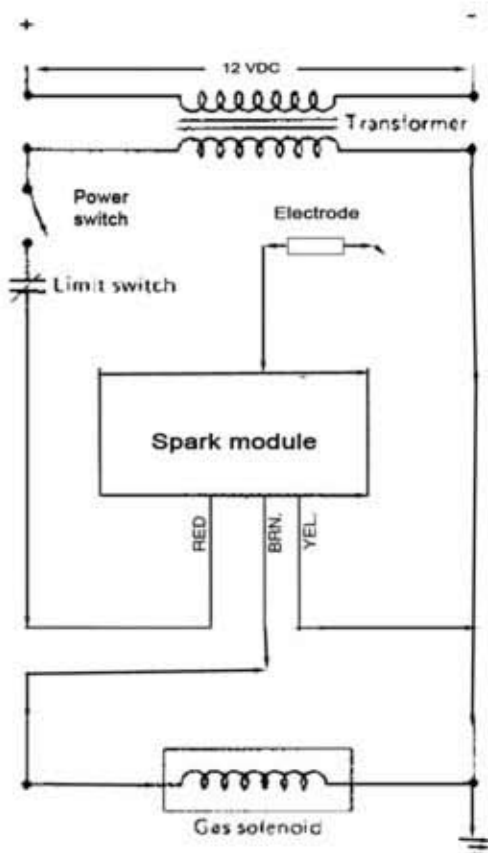
When leak testing with pressures above ½" PSI (14 inches W.C.), the unit must be isolated from the supply pipe. Close the field installed manual shut off valve, disconnect the supply line to the unit, and temporarily cap the supply line for testing purposes.

## WARNING



Gas pressures to the appliance controls must never exceed 14 inches W.C. (1/2" PSI). Supply pressures greater than 14" W.C. can damage the controls, resulting in personal injury, property damage, or death.

## Wiring diagram and specifications



Propane use per hour cu/ft	Propane Tank Size				Generator Output		
	1	5	10	25	MAX BTU/HR	CU/FT CO2/HR	
MODEL	Hours of Operating Time						
IR-28	8	4.5	22.5	45	112.5	20000	28
IR-42	12	3	15	30	75	30000	42

This chart is used to determine how long a tank of propane will last. First you look in the left column to pick a model, then follow it across to the propane tank size you have. The number that corresponds with the two selections will be the number of hours that you can operate the CO2 generator. This chart also shows the LP use in cu/ft per hour for each model and the BTU's and cu/ft per hour of CO2 produced. Example: a IR-28 will operate for 45 hours on a 10 gal propane tank. If each run cycle is 5 minutes it will run 540 cycles. If you run 20 cycles a day a 10 gal tank will last 27 days.

MODEL	CU/FT CO2/HR	Pounds CO2/HR	BTU's per hr.	Fuel cu/ft/hr	Size LxWxH	Shipping Weight
IR-28	28	3	20000	8	18x12x13	20 lbs
IR-42	42	6	30000	16	18x18x13	25 lbs

AC Power supply - 120/12 VDC 1 amp 2.1 mm plug center positive

## Model IR-42-MF specifications

Dimensions	L 19" X W 17" H 13"
Weight	Net weight 20 lbs
Construction	Aluminum sheet 16 ga.
Environment	Indoor use only - 95% humid non-condensing
Operating temperature	-40°C to +75°C
Fuel	LPG or NG (vapor)
Electrical	12 VDC 1 amp
BTU's	31,000 LP - 27,000 NG
Burners	three (3) infrared ceramic
Mounting	usually ceiling suspended - chain included
Clearance from combustable material	top: 18 in. - back: 18 in. - sides: 18 in.
Electronic ignition	Kidde/Fenwal spark module

## **Introduction**

Carbon Dioxide Enrichment will dramatically increase the growth of green plants. Green plants use carbon dioxide (CO<sub>2</sub>) and water in the presence of light to synthesize organic compounds. The plant then converts these organic compounds into elements that it can use (food). This process is called photosynthesis. If any of these ingredients (CO<sub>2</sub>, water or light) are at levels below what the plant can use for maximum efficiency, it will only be able to perform at that level and no greater. Adding carbon dioxide to a growing environment that is not receiving proper nutrients or is low on light will not produce the desired results. Similarly, plants that are receiving plenty of sunshine and nutrients will only perform as well as the level of CO<sub>2</sub> will allow. The ambient level of CO<sub>2</sub> in the earth's atmosphere is generally between 300 and 400 ppm. Most plants receive far more water and energy in the form of sunshine than they can use. Increasing the CO<sub>2</sub> in the growing area will let the plant use the excess water and energy that is stored in the leaves. The result is a substantial increase in the growth rate of any plant that uses chlorophyll in the process of photosynthesis. Enrichment should commence at sunrise or when photoperiod begins and refrain during darkness hours. The average CO<sub>2</sub> level that is recommended is 1000 to 2000 parts per million (PPM). The object is to maintain a constant level in the atmosphere. You can run a small unit continuously during photoperiods or you can use a larger unit and time it to function periodically. Where exhaust requirements are frequent, the latter method is preferable. After the exhaust function the generator can be cycled to replenish CO<sub>2</sub> quickly to maintain rapid plant photosynthesis. Use the operation time charts to determine the size of generator and the number of minutes of operation required for the level of CO<sub>2</sub> desired. Frequency of recharge depends on the rate of consumption. For the greatest fuel economy and accuracy of recharge it is recommended that a Green Air Products CO<sub>2</sub> Monitor Controller be used with all generator and emitter systems.

## **Principles of Operation**

Carbon dioxide generators operate by burning carbonaceous fuels such as propane or natural gas. The burners used in Green Air Products CO<sub>2</sub> generators are specially designed to maximize the production of CO<sub>2</sub> and minimize heat as a by-product. Green Air Products generators provide CO<sub>2</sub> far more economically than any other means of enrichment. An electronic spark ignition is used to ignite the gas when the generator is turned on. A thermo sensor is used to monitor the burner flame. If the flame is lost, a safety valve will close so that unburned fuel will not be released into the enclosure. CO<sub>2</sub> generator operations may be automatically functioned according to actual ambient values when installed in conjunction with a CO<sub>2</sub> controller. This control device continually samples the level of carbon dioxide in the growing area and functions the generator whenever CO<sub>2</sub> levels do not meet your predetermined values. Generators are easily installed, dependable and efficient. Transformer included. Operates on 110 VAC.

# Highly Recommended Read

## Important info about using CO2 enrichment

CO2 is a little heavier than air but only when it is cold. Hot CO2 emissions go straight to the ceiling instantly and stay there until they cool, and up there they may never cool enough to get mixed in properly with your plant zone atmosphere. You need to sit back and think about your grow room atmosphere and where your CO2 is going. If you just let it go wherever you will not be optimizing your enrichment and will be wasting CO2 and creating unnecessary heat.

The idea is to get the CO2 emission properly diluted and directed into your air mix. I get many calls from people who think the generator is not producing CO2 but actually that is impossible. If it is burning a clean flame it is producing the amount of CO2 we say it is. That is just the law of physics. You burn a given amount of propane or natural gas you get a resulting ratio of CO2 and BTU. It does not matter how you do it or how fast you do it, it will always be the same ratio of CO2 and BTU per fuel. This of course is assuming it is a proper flame and a complete combustion. If the flame is not proper you will see yellow in the flame that indicates either a contaminated fuel or improper air/fuel mix. An incomplete burn will produce CO carbon monoxide which we all know is not good.

Green Air Products generators have always been designed to produce a clean and complete burn providing the best combustion for maximum CO2. Our new infrared burners are especially efficient at providing a pure conversion of fuel. That is because of the extremely compact low profile of the flame on a large ceramic surface.

Infrared waves are electromagnetic radiation which is a spectrum of light much like the light put off by the sun. It does not transfer heat until it hits an object. That is why radiation can travel from the sun 100 million miles to earth and still provide heat. The infrared burner in your generator turns its radiant energy into infrared and provides that this heat can be transferred to the aluminum heat sink and then carried away by exhaust. Less heat is transferred to the air in your atmosphere as a result.

Place or suspend your generator anywhere that is convenient. It is preferable that it is not too close to an exhaust vent. The idea is to direct the hot emissions from the generator out into your enclosure where it will be involved into your air circulation. It is recommended that you place a fan above and offset to one side so it is gathering the emissions and broadcasting it out into the room. It is also suggested that you place fans at a few locations near the ceiling blowing the ceiling air directly down into the plant canopy. This will keep the CO2 from collecting at the ceiling and assure an even distribution of atmosphere throughout the enclosure. A consistent atmosphere is important to the plants for many reasons. All of your atmospheric controls will work together much more efficiently.

A CO2 monitor is a very important tool in maximizing CO2 benefit. To be effective your plants need a consistent continuous supply of CO2 during their photoperiod. A CO2 monitor will pay for itself in conservation of fuel and heat as well as yield. When choosing the size of generator for your enclosure realize that once your enclosure is charged with CO2 the generator may only come on for a minute or two as required to top off the enrichment level. 1000 ppm is a very adequate level to maintain for optimum growth. Calculate your cu/ft of room size LXWXH. The IR-28 takes 2 minutes per 1000 cu/ft to produce 1000 ppm CO2. The IR-42 takes 1.5 minutes per 1000 cu/ft to produce 1000 ppm CO2. If your generator is running longer or more frequent than is expected you must be losing it somewhere or not have your circulation optimized.

One of the unique features of the Green Air IR generator is the air cooling capability. While this is a popular option I must bring up a few points. If the generator is only running for a couple minutes every so often it is not likely that cooling is necessary. Realistically in a short operating period the heat exchanger will not have enough time to collect and remove much heat. Some larger installations where the generators are operating for longer periods (10 minutes or more) at a more frequent schedule air cooling can be a significant advantage. My recommendation is unless you are certain try it without the cooling and then make a decision.

Go to [www.greenair.com](http://www.greenair.com) for more information about CO2 generators and controls or give us a call at 1-800-669-2113

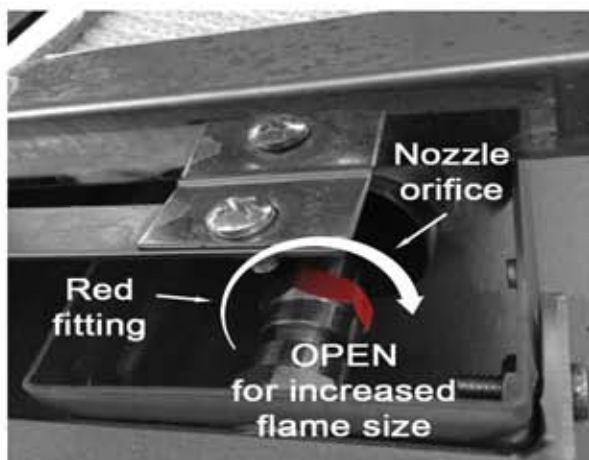
## Installation

Use chain, eyebolts and ceiling hooks found in hardware pack. Hang the generator from a sturdy overhead location at least 18 inches from ceiling, 18 in. from back and 18 in. from sides. The unit must operate in level upright position. "CAUTION" Should unit fall during operation fire may result.

1. For propane applications use a propane tank that has been filled to only 80% of it's capacity. This is very important. An overfilled tank can release fuel from the pressure release valve when placed in a warm room. It is recommended to keep the tank outside the growing enclosure. Failure to observe this common rule could be hazardous and make your generator hard to ignite.
2. Carefully thread the regulator flange nut in the tank valve counterclockwise with your fingers until you feel the flange seat. Tighten firmly with adjustable end wrench. DO NOT USE PLIERS! Fasten hose between regulator and generator gas inlet in same fashion.
3. Turn the propane tank valve half open in the "ON" position.
4. Check for gas leaks. A solution of 25% hand dish soap and 75% water in a spray bottle will work well for detecting gas leaks. Apply solution to all previously connected fittings. Bubbles will occur around loose connections. Always use two wrenches when tightening multiple fittings.

## BURNER ADJUSTMENT

This model of the IR generator has an adjustable nozzle allowing for burner flame adjustment. Should you chose to make adjustments for elevation or any other reason follow the direction below. NOTE: the unit comes LP ready and will usually work fine at any elevation. Adjustment is usually not necessary. Place the generator where you have easy access to the burner nozzles. The flame is easier to see in a dark room. It is almost invisible in bright light. You can make adjustments through the cooling tube holes or from the removable panel inside the component box. Turn the red hex orifice with wrench provided (9/16) very slightly clockwise as if unscrewing it. Turn only the red fitting. Make similar adjustment to each burner. After the initial setting turn ON the generator and inspect the flame. An ideal flame will be a low profile burn that ignites quickly and transfers ignition to the adjacent burners quickly. The flame should be a clean blue and the ceramic will turn red after a minute or two.



## Operating instructions

1. Plug the transformer into a 120 volt outlet, timer, CO2 controller, or other power source. Make certain power is on.
2. Turn gas supply on. Push the red on-off switch to the "ON position. The igniter will begin to spark. It may take a moment to clear the air from the hose. Fuel will pass through the solenoid valve and the burners will ignited.
3. The spark igniter will automatically cycle three attempts to light the burners. If a flame is not present it will cease to spark. Check for fuel, wait 60 seconds for excess fuel to clear from housing and reset on-off switch to cycle igniter electrode again. You will see a rapid visible spark between the igniter electrodes or to the burner tube itself.

## TRUBLE SHOOTING TIPS

supplemental trouble shooting on pages 19-21

### BURNER FAILS TO IGNITE:

Make sure propane tank has fuel and valve is open. For natural gas generators make sure gas supply is "On" and your gas supply shut off valve is open. Make sure propane tank has not been overfilled. If so, take tank outdoors and open valve to release gas for a few seconds and reconnect. Be sure all air has bled from the hose and gas is present. Check that transformer is plugged into a working power source. Make sure power switch is in "ON" position. Check to see that nothing is interfering with igniter probe. It may be necessary to adjust location of the igniter to the burner. The spark probe should be no more than 1/8 inch above the burner ceramic surface. Spark wire shorting to housing. Spark module faulty. Air blowing on burner disrupting fuel.

### BURNER WON'T STAY LIT:

Flame too small. Not enough fuel to burner - adjust orifice. Spark probe tip not in flame. Air in fuel line - bleed air from line. Ignition module faulty - replace. Air blowing on burner.

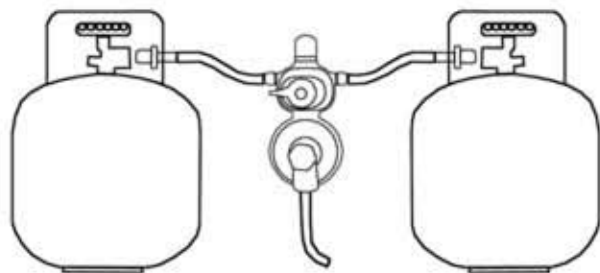
### FLAME BURNS IRREGULAR:

Dirt or residue could constrict burner orifice. Low fuel pressure due to depleted or contaminated fuel supply. Lack of oxygen content in room due to inadequate fresh air intake. Excessive air movement or gust from fan or ventilation. Generator not setting level. The flame should be a strong blue color about 1/2 inch high. Flickers of yellow are normal however constant yellow tips indicate improper burn. Contact Green Air Products service department for solutions.

### NO FUEL

Check power supply, if generator losses power the fuel solenoid automatically closes thus preventing fuel from leaking during power loss. Check gas line to unit and verify gas is getting to unit.

### AUTOMATIC PROPANE CHANGEOVER VALVE - LPCV (optional accessory)



Hose to  
CO2 Generator

This handy valve will keep you from running out of fuel and interrupting CO2 enrichment. When fuel is depleted in main tank the valve switches to the alternate tank and indicator shows red. Disconnect spent tank and refill at your convenience.

## Control diagrams



This example shows the simplest method of CO2 generator control. Set the Cyclestat-4P for short intervals according to the minutes determined in the size and timing chart. We cannot chose for you how often to cycle the generator because that depends on your enclosure and ventilation characteristics. Once every hour is a very general schedule. Cyclestat will limit operation during light hours only.

For an exhaust synchronized CO2 system see the diagram below



This diagram demonstrates an exhaust synchronized system where the CO2 equipment is disabled during exhaust functions and immediately replenished when exhaust is completed. The CT-DH-3 temperature and humidity controller activates the exhaust fan and shuts off the CO2 during the exhaust cycle. Enrichment will only occur when exhaust fan is off and light is present. The CO2 "On" cycles are timed by the Cyclestat repeat cycle timer which cycles the CO2 equipment according to your preset periods. It has a built in photo sensor to limit CO2 enrichment to photoperiods only. An example might be that the timer is set for 5 minutes every hour. The CO2 generator would be operated according to that hour schedule. In the event that there is an exhaust function at any time the CO2 will come on for 5 minutes immediately after the exhaust cycle is completed. It will repeat again one hour after that point. Replenishment of CO2 will always follow an exhaust cycle to maintain a constant and continuous enrichment level.



## The Ultimate CO2 Control system



This system is the ultimate in precise automated CO2 control. The SPC-1 CO2 Set Point Controller continuously determines atmospheric CO2 values. The controller interprets these values and provides flexible set point adjustments to sequence CO2 equipment functions. The SPC-1 has a built in photo sensor to disable CO2 production during darkness. The CT-DH-3 temperature and humidity controller defeats CO2 production during exhaust functions. The CO2 generator (or emitter system) and the monitor are plugged into the CT-DH-3 as shown. The power to the generator will be interrupted whenever the temperature or humidity conditions constitute an exhaust function. CO2 production will resume immediately after exhaust cycle is completed. CO2 levels will be maintained precisely and automatically.

Also see our website for information on the CDMC-6 Carbon Dioxide Monitor Controller for highly specialized enrichment control.

CO2 Generator Size and Timing Chart - 1000 PPM													
CU/FT	200	400	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800
IR-28	.38	.75	1.5	2.3	3	3.8	4.5	5.3	6	6.8	7.6	8.4	9
IR-42	.25	.50	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6

This chart will give you the minutes of operation required for the areas and models shown. Top row of the chart represents cubic feet of area in the enclosure (LxWxH) The left column is the model size. Model numbers represent maximum CO2 output per hour in cubic feet (IR-28 = 28 cuft/hr CO2)

Example: A IR-28 will take 5 minutes to produce a CO2 level of 1000 ppm in a 2000 cu. ft. enclosure. The area should be charged as quickly as possible for maximum advantage. Charging the atmosphere quickly insures that the rapid photosynthesis process will not be interrupted and the plants growth rate reduced. Five to ten minutes is a good charge time. Try not to exceed twenty minutes. Your microclimate will need to be recharged every 1 to 4 hours depending on how much CO2 is lost due to plant usage or drafts (leaks). Large greenhouses logically require longer charge times and multiple units may be necessary. The IR-42 takes 1.25 minutes per 1000 cu.ft. area to charge to 1000 ppm. Therefore a 20,000 cu. ft. area would be 20 X 1.25 which is 25 minutes. For this application that may be an acceptable charge time.

## **Warranty Information**

### **FIVE YEAR LIMITED WARRANTY**

Green Air Products guarantees that this equipment will perform as implied for the purpose it is intended. Green Air Products warrants the original purchaser of this equipment against defects in mechanical parts and workmanship for 5 years and electrical parts for 90 days. At our option we will repair or replace defective equipment. Warranty service is only performed at the factory or authorized service center. Any usage contrary to proper application or alterations of original construction will void warranty obligations. For further warranty information contact your dealer or Green Air Products service department.

That having been said we are determined to keep our equipment operational for as long as someone wants to use it regardless if you are the original purchaser or you bought it at a flea market. We manufacture these products entirely in our facility in Oregon (there is no Oregon in China to my knowledge) and everything we make can be fixed and is usually reasonable to do so. We do not try to make money from repairs or parts we just want it to continue to work and work safely and properly. We have products 30 plus years old still on the job. If your product fails call us for a RMA # and address and we will get you up and running again and you can hang it on that rusty old nail for another 20 years.

## IR SERIES CARBON DIOXIDE CO2 GENERATOR ADDITIONAL TROUBLE SHOOTING

If you still can't resolve issue or have further questions on installation or room setup please do not contact store call us directly 1.800.669.2113 or e-mail [support@greenair.com](mailto:support@greenair.com)

- First and foremost determine what fuel type you plan on using liquid propane (LP) or natural gas (NG)
- For LP gas with portable tanks use green regulator and 10 ft black hose provided
- For LP gas piped into facility from large tank that already has step down regulator (make sure you have at least 10 W.C) use brass NG adapter threaded into shut off ball valve and into at least ½ black pipe (do not use green propane regulator in this instance)
- DO NOT USE PIPE THREAD OR JOINT COMPOUND ON BRASS ON BRASS CONNECTIONS
- For NG applications (AND HIGH ALTITUDE LP) please refer to included instructions.
- USE ONLY COMPONENTS THAT YOU GOT WITH NEW GENERATOR, GAS LINES FROM PREVIOUS MODELS MAY NOT WORK.

### No power

- Bad power cord
- Wrong power cord (power cord should be labeled with the following specs, MODEL: AD-1250, INPUT: 120 VAC 60HZ 12W OUTPUT: 12 VDC 2000Ma)
- Check power source (120v)
- Try another outlet / circuit
- If using a co2 monitor or timer unplug from either of these and find a constant 120v power source to make sure it is not a defective monitor or timer
- Co2 generator is equipped with over temperature switch, if unit is hot please allow to cool and see if power resumes

### No spark / or intermittent spark

- Bad power cord
- Wrong power cord (power cord should be labeled with the following specs, MODEL: AD-1250, INPUT: 120 VAC 60HZ 12W OUTPUT: 12 VDC 2000Ma)
- Check power source (120v)
- Try another outlet / circuit
- If using a co2 monitor or timer unplug from either of these and find a constant 120v power source to make sure it is not a defective monitor or timer
- Some co2 monitors have settings for co2 generator and emitter systems check with manufacturer to make sure this is set properly

- Spark probe wire is grounding out (this is located in component box) inspect wire to make sure there are no bare wires showing) be sure to unplug unit although its low voltage spark probe can give you a strong shock.
- Bad ignition module (this could be due to water condensation and/or heat damage)

Co2 generator sparks and lights but immediately shuts off after spark probe stops sparking

- Bad power cord
- Wrong power cord (power cord should be labeled with the following specs, MODEL: AD-1250, INPUT: 120 VAC 60HZ 12W OUTPUT: 12 VDC 2000Ma)
- Broken spark probe wire (this may not be visible) unit may spark but the flame sensor will not work.

Co2 generator lights for 3-10 seconds than just turns off

- Bad power cord
- Wrong power cord (power cord should be labeled with the following specs, MODEL: AD-1250, INPUT: 120 VAC 60HZ 12W OUTPUT: 12 VDC 2000Ma)
- Orifices not adjusted properly (starved for fuel)
- Wrong gas hose size (hose must be 3/8 ID)
- Gas hose length to long 10ft max at 3/8 ID... If you need a longer hose please call to discuss options.

Flame is weak or has finicky flame

- Orifices set for LP when unit is hooked up to NG
- LP unit located above 2500 ft elevation must be adjusted refer to adjusting orifice nozzle page
- Wrong gas hose size (hose must be 3/8 ID)
- Gas hose length is to long 10ft max at 3/8 ID... If you need a longer hose please call to discuss.
- Low fuel pressure (test line pressure either at end of gas hose before attached to generator or locate 1/8 inch manometer port inside component box) contact customer service for further instruction.

### Burner pads won't turn red

- pads may not be identical but both should turn some form of orange or red
- TALL FLAME (turn orifices down a little at a time, be patient)
- SMALL OR TIMID FLAME (turn orifices up a little at a time, be patient)
- Orifices set for LP when unit is hooked up to NG
- LP unit located above 2500 ft elevation must be adjusted refer to adjusting orifice nozzle page
- Wrong gas hose size (hose must be 3/8 ID)
- Gas hose length is too long 10ft max at 3/8 ID... If you need a longer hose please call to discuss.
- Low fuel pressure (test line pressure either at end of gas hose before attached to generator or locate 1/8 inch manometer port inside component box) contact customer service for further instruction

### Sparks but won't light

- Bad power cord
- Wrong power cord (power cord should be labeled with the following specs, MODEL: AD-1250, INPUT: 120 VAC 60HZ 12W OUTPUT: 12 VDC 2000Ma)
- Orifices not adjusted properly (starved for fuel)
- Wrong gas hose size (hose must be 3/8 ID)
- Gas hose length is too long 10ft max at 3/8 ID... if you need a longer hose please call to discuss
- Bad ignition module (most commonly you will hear faint sparking and the solenoid will not open, solenoid make a clunking sound when it opens)
- Bad solenoid (if units operated properly but you do not hear solenoid open or make a clunking noise) this is rare, check wire connections to solenoid in component box

### Sparks is faint and won't light

- Bad power cord
- Wrong power cord (power cord should be labeled with the following specs, MODEL: AD-1250, INPUT: 120 VAC 60HZ 12W OUTPUT: 12 VDC 2000Ma)
- Bad ignition module (most commonly you will hear faint sparking and the solenoid will not open, solenoid make a clunking sound when it opens)
- Bad solenoid (if units operated properly but you do not hear solenoid open or make a clunking noise) this is rare, check wire connections to solenoid in component box.