



# XGC-1e Xtreme Greenhouse Controller

The XGC-1e Xtreme greenhouse controller from C.A.P. controls all of the main devices that are used in today's modern hydroponic garden. The built-in Fuzzy Logic™ controls your CO<sub>2</sub> level with unmatched accuracy.

## WORD TO THE WISE...

*Before attempting to operate the XGC, you should at least take the time to look at the Example Connection diagram on page 2 and read the "Start-up Procedure on page 3 of this manual. To get the most out of the XGC-1e, familiarize yourself with this manual. It contains many useful hints, examples and a troubleshooting guide.*

## IMPORTANT STUFF TO REMEMBER

The XGC is designed to operate from a 120vac, 15-amp power source. It can safely control up to 15-amps of equipment including up to 1000 watts of HID lights. If required, additional lights and larger equipment can be connected to the XGC-1e by using our HPR, MLCs or UPM "Universal Power Modules".

In addition to lights, the XGC also maintains the temperature and humidity by controlling your exhaust fan(s). CO<sub>2</sub> levels can be controlled with the built-in timers, which are coordinated with your exhaust fans and function only when the lights are ON.

## PROTECTION & SAFETY

The XGC is overload protected a main 15-amp fuse. Do not exceed the maximum rating of the XGC-1e.

**IMPORTANT:** Replace blown fuses with fuses of the same rating ONLY!

**Note:** A surge suppressor / power strip is always recommended when operating electrical equipment such as the XGC.

## WARRANTY

The XGC is protected by our 3-year limited warranty. All components are warranted by R & M Supply against defects in workmanship and materials under normal use for 3-years from the date of purchase. The XGC is 100% maintenance-free and does not require service.

## INSTALLATION / START-UP

**There are a few requirements for a successful installation and start-up.**

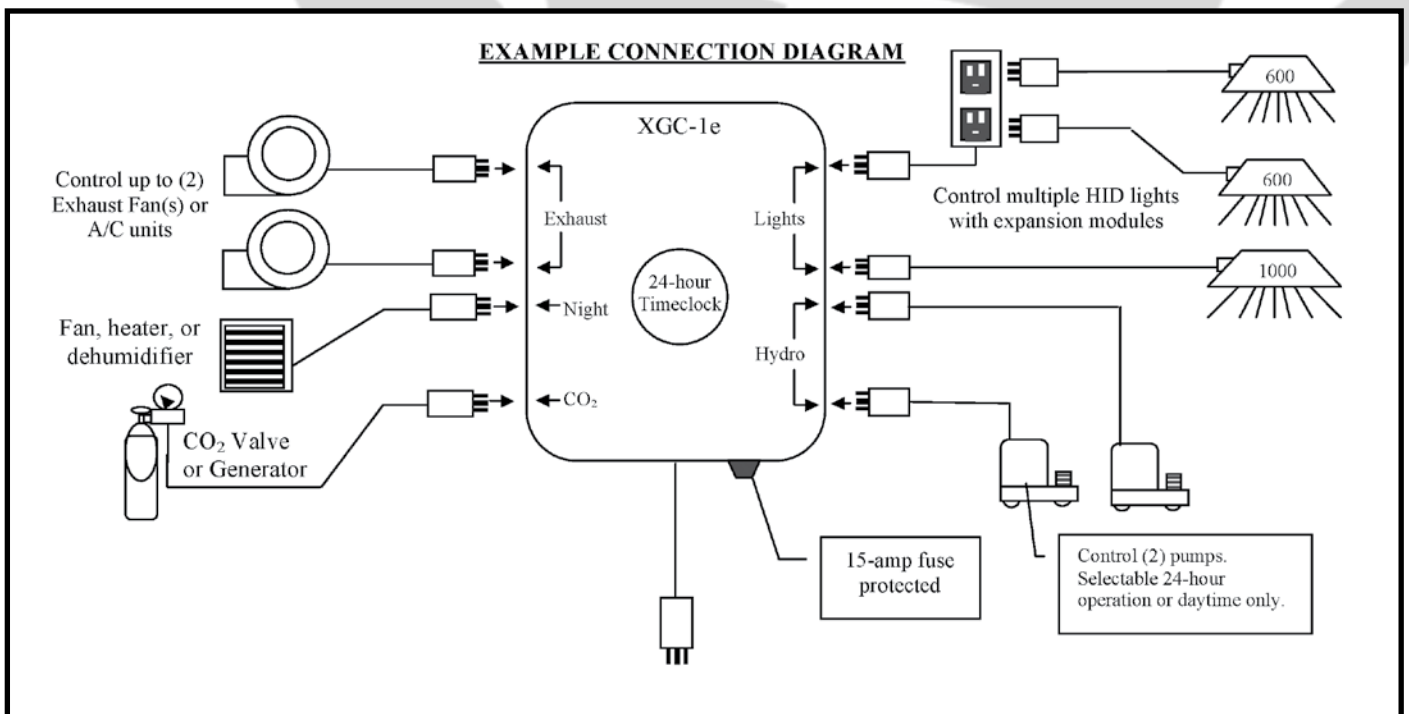
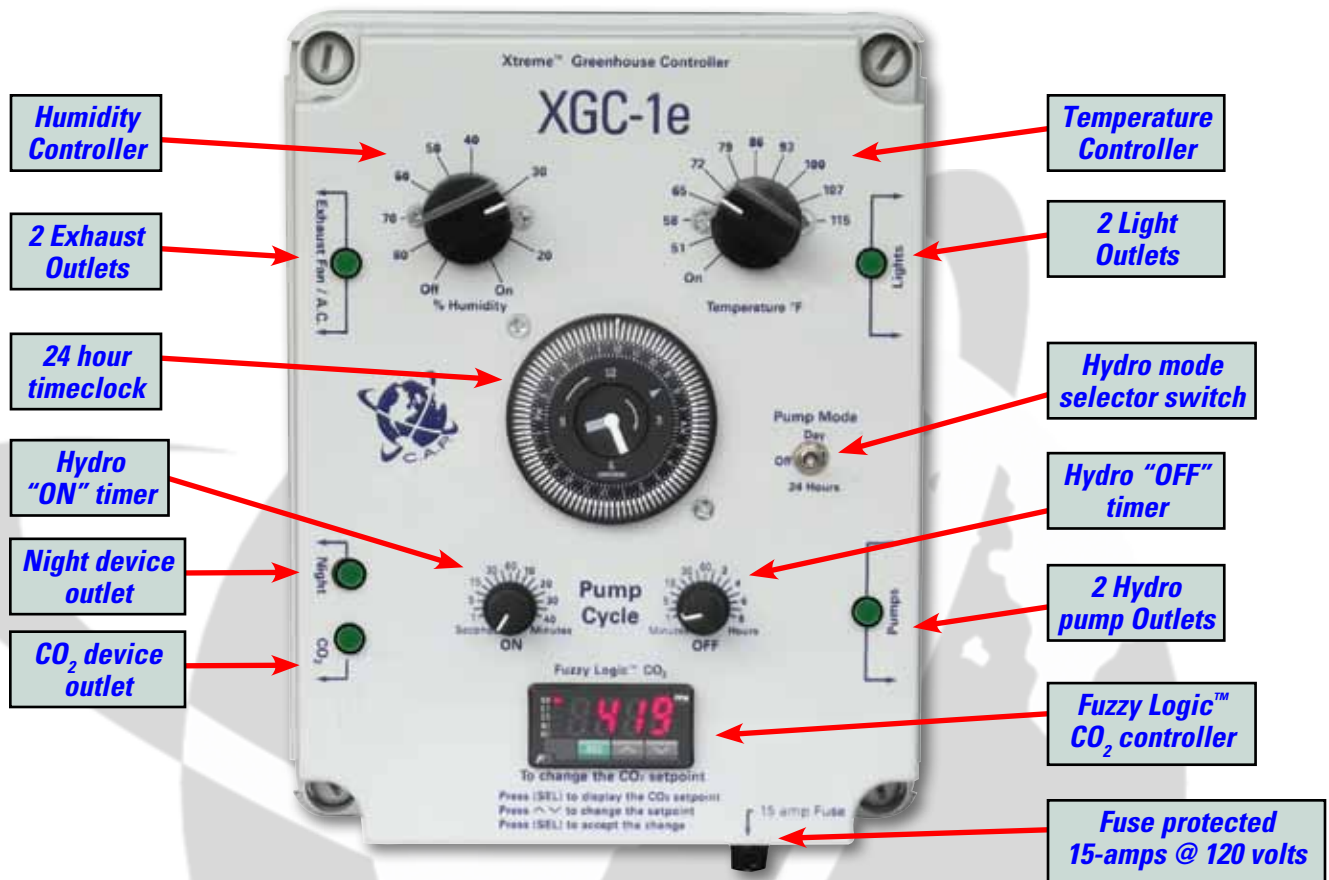
- 1) The XGC must be mounted in a vertical position. Mounting feet are included to allow you to secure the unit to a wall.
- 2) The XGC requires "free air movement" to maintain temperature and humidity accuracy. The top and bottom of the enclosure has ventilation slots to provide airflow through the unit however, we greatly recommended using an oscillating fan in the growing area to provide fresh air for the internal humidity sensor and provide adequate ventilation for the internal electrical components.
- 3) A dedicated 120 VAC, 15-amp power supply is recommended. A ground wire (3-wire outlet) must be used. Do not use 2-wire adapters or cords to operate the XGC.
- 4) The XGC must be protected from water. Do not mount the unit where it can be exposed directly to water.
- 5) Read the rest of the manual!!! It has been designed to take you through step-by-step to make start-up a breeze.



# "FRONT PANEL"

## OVERVIEW

"The XGC-1e is a self-contained greenhouse control system designed for people who want simply the best all-in-one controller available".



# **START-UP PROCEDURE**

## **OVERVIEW**

"There is no substitute for reading and understanding the operating manual however... You can use the instructions on this page for a trouble-free start-up".

## **How To START-UP THE XGC**

- 1) Locate a suitable source for power. A 3-wire, grounded, 15-amp dedicated circuit is recommended.
- 2) Secure the enclosure to a wall using the enclosed mounting "feet". The XGC requires a vertical orientation for proper internal ventilation. If proper ventilation is not provided, the thermostat may not be able to properly control the temperature & humidity of the growing area.
- 3) Plug the XGC into the power source. Do not connect your lights until you have set the "ON and "OFF" times on the 24-hour timeclock.
- 4) You may want to change the CO<sub>2</sub> set point on the "Fuzzy Logic"™ controller. Normally 1250 to 1500 PPM is recommended for most applications. Once you set the PPM level, the built-in CO<sub>2</sub> sensor and "Fuzzy Logic"™ module work together to actually dial-in the perfect parameters for YOUR area automatically. Refer to Changing the setpoint (SV).
- 5) Now set the thermostat and de-humistat to the approximate settings you would like to use. A small, inexpensive combination thermometer and hygrometer works just fine to "dial in" the exact settings. Just compare the reading on the thermometer to what the XGC is set at and adjust as required.
- 6) You can now select the Hydro mode you would like to use. Choose between operating the Hydro outlet during the "Daytime" only or, 24-hours a day. Move the Hydro mode switch to the appropriate position. Moving the switch to the center "OFF" position momentarily will reset the timer.
- 7) There are 2 timers on the XGC, which are used to control your hydroponics pumps. To fully understand the timers that control the XGC, refer to the Timers section of this manual. Set the Hydro "ON" and "OFF" timers to your desired settings before continuing. (Refer to Timers)
- 8) The 24-hour timeclock can now be set. Push in the trip levers on the front face of the timer dial for the time you want your lights to be "ON". Rotate the dial to the current time to set the timer.
- 9) Now you can plug the equipment you will be using into the appropriate receptacles. Remember that the XGC can handle a combined load up to 15-amps. A single 1000-watt HID ballast needs over 9-amps alone. Select and size your pumps and fans appropriately or use our UPM-1 or MLCs to increase power capacity.

**\*Note: We highly suggest NOT plugging in your HID ballast just yet.**

- 10) When the "day" cycle begins, the "Lights" indicator will light up to confirm power is going to the (2) light receptacles. If you have selected the "Daytime" setting on the Hydro mode, the "Hydro Pumps" indicator will also light up to indicate your pump is powered for the amount of time you selected
- 11) You can manually override the timeclock to switch from "night" to "day" or back to Night by rotating the outer dial of the timeclock slowly clockwise. At night, the Lights and CO<sub>2</sub> are disabled while the thermostat and humistat continue to control the temperature and humidity.

**\* NOTE: The Hydro outlet will also be disabled if the "Daytime" mode is selected on the Hydro mode switch.**

- 12) When all settings have been confirmed, the HID lights or UPMs can be plugged into the "Lights" receptacles. If more than 1000 watts are to be controlled, use our Universal Power Modules or the MLCs.

**\* IMPORTANT: Do not plug in more than 1000 watts worth of lighting into the XGC receptacles.**

- 13) Monitor the equipment connected to the XGC to ensure proper operation. Small adjustments are likely to be made until you find the right combination of controls. Once you are happy with the settings sit back and enjoy the show!

**For more details concerning any of the XGC functions, refer to the appropriate section of this manual.**

# **“CONTROLS”**

## **OVERVIEW**

“The XGC-1e controls your lights, hydroponic pumps, exhaust fan or A/C, de-humidifier, heater and CO<sub>2</sub> level with “Part-Per-Million” accuracy... automatically! No more guesswork!

## **24 HOUR TIMECLOCK**

The timeclock selected to run the XGC performs all of the day to night transitions required for crops requiring controlled photoperiods. It can directly control up to 1000 watts of HID lights.

To set the current time on the timeclock, turn the dial clockwise until the current time on the outer dial lines up with the arrow on the inner dial. To set the timeclock on and off times, carefully push in each of the orange trip levers at the times you want the lights to be on.

**\*NOTE: If power is interrupted, the timeclock will have to be reset.**

## **TEMPERATURE CONTROLLER**

The XGC utilizes a remote-bulb thermostat with a 30” lead to control ventilation and cooling functions. This allows you to place the temperature sensor up to 30” away from the XGC. The thermostat can be set to control temperature from 50 – 115°F.

The thermostat is coordinated with the CO<sub>2</sub> control system and the exhaust receptacles to maintain a constant temperature. When the temperature rises above the set point selected on the thermostat, the CO<sub>2</sub> system is disabled and the Exhaust receptacles are enabled. When the temperature level drops below the set point, the CO<sub>2</sub> system is re-activated.

**IMPORTANT: To achieve the greatest accuracy, provide the XGC with plenty of “fresh air”. The enclosure is designed to allow air to pass over the humidity sensor.**

## **HUMIDITY CONTROLLER**

The XGC utilizes a de-humistat to control ventilation and humidity levels. The de-humistat can control humidity levels from 20% - 80%.

The de-humistat is coordinated with the CO<sub>2</sub> control system and the exhaust receptacles to maintain a constant humidity. When the humidity rises above the set point selected on the de-humistat, the CO<sub>2</sub> system is disabled and the Exhaust receptacles are enabled. When the humidity level drops below the set point, the CO<sub>2</sub> system is re-activated.

## **HYDRO MODE SELECT SWITCH**

The Hydro mode select switch is used to select whether the hydro outlet will cycle 24-hours or only during the day. The mode selector switch also doubles as a Hydro bypass switch. Each time the switch position is changed to the center “OFF” position, the hydro timers will reset and initiate a new cycle. This comes in handy during set-up of the hydro pumps and timer settings.

**NOTE: \*Leaving the mode select switch in the center position disables the hydro function.**

## **NIGHT ONLY DEVICE**

An additional outlet is provided which is powered only at “night” when the lights are turned OFF. This works great for heaters, fans, dehumidifiers or any other device that needs to run only at night.

## **WHAT IS “FUZZY LOGIC”™ CO<sub>2</sub> CONTROL?**

What set’s the XGC-1e apart from the competition? Fuzzy logic... What is “fuzzy logic”? Fuzzy Logic can be compared to a good driver. As a good driver approaches a red light, he or she applies the brakes to gradually slow down BEFORE getting to the intersection. Fuzzy Logic uses the same idea to bring the CO<sub>2</sub> level up to the desired setting without going over the set point. With Fuzzy Logic, relatively safe compressed CO<sub>2</sub> can replace LP / gas CO<sub>2</sub> generators economically.

The XGC combines an extremely accurate infrared CO<sub>2</sub> sensor with a state-of-the-art Fuzzy Logic module to give you the most precise method of controlling supplemental CO<sub>2</sub>. **SIMPLY SET IT... AND FORGET IT!**

# TIMERS

## OVERVIEW

The XGC-1e uses 2 timers to control the hydroponic pump functions. It also has a 24-hour time-clock which controls your daytime and nighttime functions.

## ADJUSTABLE RECYCLING TIMERS

The two Adjustable Recycling Timers (ART) provide an adjustable "ON" / "OFF" cycle for various devices. The 2-adjustable recycling timers onboard the XGC are set using the dials on the front face of the enclosure. The timer name and range of each timer is printed around the timer dials. Because the dials of the XGC are small to conserve space, the settings may have to be adjusted to an actual time setting. If necessary, use a watch or stopwatch to confirm the settings are correct. Once the timers are set, they are repeatable to +/- .5%.

The timers are designed to finish the cycle they are presently timing which means adjustments made to the timers during a cycle will not affect the present cycle.

**RESETTING HYDRO TIMERS:** *The Hydro timers can be reset by switching the Hydro mode select switch to the center "OFF" position momentarily. Switching back to your desired mode starts the timing cycle.*

## HYDROPONIC PUMP TIMERS

The Hydroponic outlet can be configured to cycle one of two ways... 24-hours a day or, during the "daytime" only. Simply moving the Hydro Mode selector switch to either the "24-Hour" or the "Daytime" position enables the desired mode. When used in the Daytime" mode, the Hydro outlet will only cycle while the lights are on. The "24-hour" mode works great for NFT or aeroponic systems that require moisture during the day and night. The mode selector switch also doubles as a Hydro bypass switch. Each time the switch position is changed, the hydro timers will reset and initiate a new cycle. This comes in handy during set-up of the hydro pumps and timer settings.

There are two timers that control the hydroponics receptacle, Hydro "ON" and Hydro "OFF". The XGC-1's Hydro "ON" time can be set from 30 seconds to 20 minutes; the Hydro "OFF" time can be set from 12 to 480 minutes. Set the timers by moving the dial to the appropriate position.

## 24 HOUR, TIMECLOCK

The timeclock selected to run the XGC performs all of the day to night transitions required for crops requiring controlled photoperiods. It can directly control up to 1000 watts of HID lights.

To set the current time on the timeclock, turn the dial clockwise until the current time on the outer dial lines up with the arrow on the inner dial. To set the timeclock on and off times, carefully push in each of the orange trip levers at the times you want the lights to be on.

**\*NOTE:** *If power is interrupted, the timeclock may have to be reset.*

# **FUZZY LOGIC™ CO<sub>2</sub> CONTROL**

## **OVERVIEW**

Most people who have used the XGC-1e, rate it the best combination controller available today. The fact that the built-in "Fuzzy Logic"™ CO<sub>2</sub> control system has redefined what true Part-Per-Million CO<sub>2</sub> control is really about, may have something to do with it...

## **"SUPPLEMENTAL CO<sub>2</sub>"**

Let's talk about ... Carbon Dioxide. CO<sub>2</sub> is present in relatively low quantities, (300-600 PPM) in your normal, generic, everyday air. But plant growth can be increased and accelerated if the level of CO<sub>2</sub> is increased to, let's say... 1000 -1500 PPM. For this reason, the XGC can control CO<sub>2</sub> distribution for those people who prefer to use supplemental CO<sub>2</sub>.

There are some inherent dangers associated with using CO<sub>2</sub>. Here are some of the rules to remember when using CO<sub>2</sub>:

- A) Cylinders (bottles) of compressed CO<sub>2</sub> should never be stored inside the growing area or anywhere else where the temperature may rise above 100° F.
- B) The growing area should not be occupied while CO<sub>2</sub> is in operation.
- C) Do not enter the growing area until the CO<sub>2</sub> has been exhausted.
- D) CO<sub>2</sub> is heavier than air and will accumulate towards the ground.
- E) In high enough concentrations CO<sub>2</sub> can kill!!! The OSHA maximum "Personal Exposure Level" is 5000 PPM.

**\*Note: The XGC CO<sub>2</sub> control system can be used for both compressed CO<sub>2</sub> cylinders, and generators. The CO<sub>2</sub> receptacle is 120vac. Compressed CO<sub>2</sub> cylinders require an approved regulator / flow gage and a valve.**

If optimum CO<sub>2</sub> "mileage" is desired, a self-contained air conditioner or other "Closed loop" cooling method is highly recommended. A closed loop system will regulate temperatures within the zone allowing you to extend the CO<sub>2</sub> maximum cycle time thus reducing CO<sub>2</sub> use dramatically.

Another method of reducing heat build up includes utilizing "Ventilated light hoods". Just be sure to make the ventilation system of the hood as airtight as possible so that your precious CO<sub>2</sub> is not being drawn out of the area by the ventilated hood exhaust fan.

If sufficient CO<sub>2</sub> is provided and the proper level of nutrients and light is available, a 35% increase in growth rate is possible. However if you suspect the higher temperatures are adversely affecting the plants, a shorter CO<sub>2</sub> cycle may produce better results. Remember that a shorter CO<sub>2</sub> cycle duration translates to increased CO<sub>2</sub> usage.

## **FUZZY LOGIC™ CO<sub>2</sub> CONTROL**

Fuzzy Logic is a form of Artificial Intelligence (AI). It is as though a trained operator is there to monitor the level and release more CO<sub>2</sub> only when required. It can also "learn" how to maintain the set point when it is first started by pressing a couple of buttons. It then calculates how to best maintain the CO<sub>2</sub> level for any size space... automatically!

## **AUTO-TUNING CO<sub>2</sub>**

Every growing area has variables such as area size, fan types, ambient temperature, unique airflow characteristics, CO<sub>2</sub> delivery system and flow-rate. Ordinary "part-per-million" controllers do not take most of these variables into consideration thus they are not very good at keeping the CO<sub>2</sub> at a constant level. A standard set of "parameters" which define how the Fuzzy Logic's AI (Artificial Intelligence) is pre-programmed into the XGC-1e. For MOST applications, the standard set will work fine. In fact, most people report the XGC-1e maintains their desired setpoint +/- 15-25 PPM.

If after a few days of operating the XGC-1e you are not satisfied with the performance, you can try to allow the unit to "re-teach" itself the base parameters FOR YOUR SPECIFIC AREA. And that is exactly what the "Auto-Tuning" function does. When the "Auto-Tuning" function is used, the XGC-1e automatically measures your systems performance and calculates the best method to control CO<sub>2</sub> within the area. It then uses this information in conjunction with a simple form of Artificial Intelligence called Fuzzy-logic to give you truly exceptional efficiency. Auto-tuning is only required when using compressed CO<sub>2</sub> and Fuzzy-logic control mode.

There are ONLY four reasons to perform "Auto-Tuning" and most people will not see any improvement over the factory setpoints.

- 1) Unsatisfactory performance after operating the unit for a few days.
- 2) Changing the set point (SV) more than 500 PPM.
- 3) Major (and some minor) changes in the CO<sub>2</sub> delivery system, area configuration, fan changes, ECT.
- 4) Abnormal or inconsistent results from previous Auto-Tunings.

**\*Note: NEVER perform an Auto-tune when using a CO<sub>2</sub> generator.**

# ***Fuzzy Logic™ Co2 CONTROL (CONTINUED)***

## **How To PERFORM “AUTO-TUNING”**

The Auto-Tuning function takes from 1 ½ to 2 ½ hours to complete. **DON'T WORRY.** It is completely automatic once the test is started. However, before performing an Auto-Tuning, you **MUST** prepare the area for the procedure. This may take at the most 15 minutes.

- 1) During the Auto-Tuning, the area must be operating normally. Circulating fans must remain operating.
- 2) Exhaust and/or cooling fans which bring fresh air into the area must be disabled. If heat or humidity build-up is a problem during the 2-hours required, reduce the lighting or other heat loads temporarily until the test is completed.
- 3) Set the CO<sub>2</sub> flow-gage to the setting most likely to be correct for your area. If no estimate is known, set it near the middle of the range and increase it if the first Auto-Tuning does not provide consistent control.
- 4) Turn the thermostat & humistat responsible for running the exhaust fans all the way to the maximum setting until the Auto-tune is complete.
- 5) Close the CO<sub>2</sub> tank valve. Connect the CO<sub>2</sub> valve or generator to the XGC-1e. There should be no CO<sub>2</sub> flowing out of the tank until the test is started.
- 6) Set the SV (desired CO<sub>2</sub> level) to the desired level. (See Changing Set-Point)
- 7) Press [SEL] for 1 second. (RUN will be displayed)
- 8) Press the [Down] button one time. (AT will be displayed)
- 9) Press the [SEL] button once. (0 is displayed)
- 10) Press the [UP or DOWN] button to bring up 1. (1 is displayed)
- 11) Press the [SEL] button once. The decimal point will begin to flash until the Auto-Tuning procedure is completed. The CO<sub>2</sub> outlet will be energized.
- 12) Quickly open the CO<sub>2</sub> tank valve and verify CO<sub>2</sub> is flowing out of the flow-gage / regulator.
- 13) Get out of the area and do not disturb the area for a minimum of 2 hours. After two hours, enter the area and confirm the decimal point has stopped flashing, which indicates the test is complete.
- 14) Reconnect the Exhaust fans, CO<sub>2</sub> Disable cable and return the area to normal operation while monitoring the level of CO<sub>2</sub>. Do not continue to stand next to the XGC-1e while monitoring. Just keep an eye on the display and record the level every 30 minutes or so. Also try to observe the unit reacting to and recovering from the Exhaust fans operating. The level should drop down to 800 or less and then recover quickly without overshooting the setpoint more than 150 PPM.
- 15) If after operating a day or two you are not getting good consistent control, (+/- 100 PPM from set point) it may be a good idea to perform a second Auto-Tuning.

**\*NOTE: If your CO2 tank runs out for a period of time, the control may take a few hours to re-stabilize, this is normal.**

## **CHANGING THE SETPOINT (SV)**

The XGC-1e has an adjustable set point. The set point is the minimum CO<sub>2</sub> level in Parts-Per-Million you want to maintain. The face of the Fuzzy Logic controller has 5 led indicators on the front. The one marked (SV) is illuminated when viewing and / or changing the set point.

- 1) Press (SEL) momentarily. The SV indicator will light up and the current set point is displayed.  
(The XGC-1e is factory set @ 1500 PPM)
- 2) Use the (UP / DOWN) buttons to change the set point to your desired level. Normally between 1250 –2000 PPM.
- 3) Press the (SEL) button momentarily to accept the change.

## **CHANGING CONTROL MODES**

People operating compressed CO<sub>2</sub> systems will definitely benefit from the XGC-1e's "Fuzzy Logic". But some people who are using LP / Natural gas generators may want to extend the life of their generator by changing the XGC-1e's control mode to ON / OFF. When operating in ON / OFF mode, the rapid pulsing of the control solenoid is eliminated. The XGC-1e will still control the CO<sub>2</sub> generator with extreme accuracy. A preset hysteresis (dead-band) of 50PPM still allows the XGC-1e to control the CO<sub>2</sub> to an average level of +/- 200 PPM. For comparison's sake, the average accuracy of the Fuzzy Logic control mode is around +/-25PPM. Follow the procedures listed below to easily change the control modes on the XGC-1e.

# FUZZY LOGIC™ CO2 CONTROL (CONTINUED)

## CHANGING CONTROL MODES (CONTINUED)

### *Changing to ON / OFF control mode*

- 1) Press and hold the (SEL) pushbutton for three seconds. (P will be displayed)
- 2) Press the (SEL) button momentarily. (The current proportional band setting will be displayed = 5.0)
- 3) Using the (Down) pushbutton, change the display to read (0.0)
- 4) Momentarily press the (SEL) button to accept the change.
- 5) Allow the unit to re-start by not touching any of the buttons for approximately 30 seconds.

### *Changing to "Fuzzy Logic" control mode*

- 1) Press and hold the (SEL) pushbutton for three seconds. (P will be displayed)
- 2) Press the (SEL) button momentarily. (The current proportional band setting will be displayed = 0.0)
- 3) Using the (Down) pushbutton, change the display to read (5.0)
- 4) Momentarily press the (SEL) button to accept the change.
- 5) Allow the unit to re-start by not touching any of the buttons for approximately 30 seconds.

**\* Note: There are several other "hidden" internal parameters that are normally locked-out from the user. These settings are critical in order for the unit to function properly. DO NOT change any of these settings! If you mistakenly access these "weird" numbers reset the unit. To reset the unit, unplug the main power cord for 20 seconds and re-connect.**

## CALIBRATION

The XGC-1e is factory calibrated. The sensor onboard the XGC-1e is capable of remaining in calibration for a minimum of three years. Extreme shock during shipping and other factors may affect the calibration. To check the calibration, follow the procedure below.

Supplying the unit with outside air can quickly verify the calibration. The reading outdoors should be around 250-550PPM. If the XGC-1e calibration is incorrect, the unit can be returned to the manufacturer. Please note:

- The XGC-1e CO<sub>2</sub> sensor has built-in temperature compensation that automatically corrects the reading depending on the ambient temperature. However, extreme temperatures of below 20°F or above 120°F may affect the reading.
- Checking calibration in urban areas usually results in higher ambient CO<sub>2</sub> readings due to car exhaust and human activity.

To check calibration:

- 1) Bring the unit outside so that it will receive fresh air. Do not locate the unit in direct sunlight.
- 2) Plug the power supply and power cord into 120vac.
- 3) Move away from the controller to allow the reading to stabilize for approximately 20 minutes.
- 4) Check the CO<sub>2</sub> level.

**\*Important: Do not breathe while checking the calibration the unit. As you exhale, large concentrations of CO<sub>2</sub> are expelled from your lungs. This higher level of CO<sub>2</sub> will affect the calibration of the unit. Try to hold your breath!**

- 5) If the level is between 250 and 550 the unit is performing fine. If it is outside that range, allow the unit to stabilize longer.
- 6) If the calibration is still off, the unit can be returned to the factory for re-certification.



# OPTIONS

## OVERVIEW

The XGC-1e can be upgraded and expanded by using our expansion devices including the UPM-1, and the MLC-4. The Universal Power Modules and Master Lighting Controllers allow you to run multiple pumps, fans and lights by controlling remote relays.

## UNIVERSAL POWER MODULE (UPM-1)

The UPM-1 Universal Power Module is a unique device that can allow the user to run additional HID lights or control multiple fans / air conditioners etc.

The UPM-1's "plug-box" was designed to be plugged into a standard household outlet. The 16-foot long "trigger cable" coming from the UPM-1 is then connected to your control device such as a time clock or thermostat. When the control device turns ON, the relay inside the UPM-1 box applies power to the twin outlets on the front of the UPM-1 turning ON whatever is plugged into it. This allows you to run additional lights etc. from a different circuit with one common control device.

The UPM-1 is rated at 15-amps @ 120 volts.



## HIGH POWER RELAY (HPR-1)

The HPR-1 is a hard-wired, 30-amp capacity, 120/240-volt version of the UPM-1. The HPR-1 is perfect for controlling higher loads such as large air-conditioners or multiple HID ballasts. The user can supply either 120 or 240-volt power to the "input" side of the HPR-1. The air-conditioner or ballasts to be controlled are then wired into the "output" side of the relay. When the trigger cable connected to your control device is activated, the relay applies power to the equipment connected to the HPR-1.

The HPR-1 is rated at 30-amps 120/240 volt.



## MASTER LIGHTING CONTROLLER (MLCS)

The MLC-4X and MLC-4XT Master Lighting Controllers are the best devices for controlling up to (4) HID lights from one time clock or controller. Like the HPR-1, power must be brought into the "input" side of the control relay. The MLC-4 features (4) standard 240v outlets, which your ballasts are plugged into. The MLC-4X is designed for 120 volt ballasts however it can also be used to run ballasts wired for 240-volt operation, which have 120-volt power cords. The MLC-8 Master Lighting Controller is the best device for controlling up to (8) HID lights from one time clock or controller. Power is brought into the MLC-8 by hardwiring up to a 40-amp circuit. The MLC-8 features (8) standard 120/240v outlets, which your ballasts are plugged into.

The MLCs both feature a 120-volt trigger cable to plug into a standard 24-hour timer or controller. The MLC-4X & MLC-4XT are rated 30-amps @120/240 volt. The MLC-8 is rated at 40-amps @ 120/240 volt.



## HID LIGHTING CONTROLLER (HLC-2)

The HLC-2 HID lighting controller was primarily designed to protect your expensive HID lights from HOT-STARTS.

A "Hot-Start" occurs whenever your lights are turned off... and then back on before the lamps are allowed to cool off. Hot-starts caused by power outages reduces your lamp's life and intensity. It can be plugged into either of the "Lights" outlets.

When the HLC-2 is connected to your lights, it will sense a power interruption, and start a 15-minute time-delay to keep the lights from trying to re-fire while the cool down. The HLC-2 can also be used to delay other devices from starting.

The HLC-1 is rated for 15-amps @ 120volts.



# **TROUBLESHOOTING**

If you are having problems with this unit, refer to these troubleshooting hints. Also, refer to the connection diagram to ensure your devices are connected properly.

Problem	Suggested Action
<ul style="list-style-type: none"> <li>I have no lights and no function at all.</li> </ul>	<p>Check the fuse and main power. Replace the fuse if required with the correct rated fuse. Check the equipment connected to the XGC for problems and/or short circuits.</p>
<ul style="list-style-type: none"> <li>The fuse continues to blow.</li> </ul>	<p>If the fuse blows repeatedly, verify the devices connected to the unit are working properly and that they are not too large for the XGC-1e to safely control.</p> <p>You may need to consider using expansion modules, (UPM / HPR / MLC) to decrease the amperage (load) on the XGC fuse.</p>
<ul style="list-style-type: none"> <li>The fans are running so often, the CO<sub>2</sub> is hardly ever ON.</li> </ul>	<p>You may have too much heat building up in your area or too small of an exhaust fan. Reduce the heat sources or increase your fan size.</p> <p>You may also consider using a "closed-loop" air conditioner to keep the temperature and humidity below the set points so that CO<sub>2</sub> is allowed to run for longer amounts of time.</p>
<ul style="list-style-type: none"> <li>My CO<sub>2</sub> consumption seems to be quite high.</li> </ul>	<p>Make sure your area is sealed. You may want to install a motorized damper to seal your exhaust fans when they are "OFF".</p>
<ul style="list-style-type: none"> <li>The Hydro pumps are not cycling properly.</li> </ul>	<p>The Hydro pump outlets can be operated 24-hours a day or only when the "Lights" are "ON". The "Hydro" selector switch also has a center "OFF" position, which can be used to "reset" the timing function. Make sure the switch is not turned "OFF".</p>
<ul style="list-style-type: none"> <li>The CO<sub>2</sub> outlet is pulsing ON and OFF too often.</li> </ul>	<p>If you are running a CO<sub>2</sub> generator, you may want to change to ON / OFF control. If running compressed CO<sub>2</sub> you may want to try running an Auto tune.</p>
<ul style="list-style-type: none"> <li>After my compressed bottle or LP tank was replaced, the level fluctuates.</li> </ul>	<p>If your CO<sub>2</sub> tank runs out for a period of time, the controller may take anywhere from a few hours to a couple of days to re-stabilize, this is normal. When the tank ran out, the PPM-2a tried to compensate by changing its internal settings.</p>
<ul style="list-style-type: none"> <li>My CO<sub>2</sub> outlet never comes on.</li> </ul>	<p>Make sure the CO<sub>2</sub> disable function is not ON.</p> <p>If the actual CO<sub>2</sub> level is above the set point (SV) the outlet will not turn on. Allow the level to drop or raise the (SV).</p>

## **MAKING CONNECTIONS**

All of the main functions controlled by the XGC are accessed using (8) standard 120 VAC, 15-amp receptacles mounted on the sides of the enclosure. This allows you to simply "plug in" any standard device without hardwiring or hassles. Printed labels on the front face of the enclosure identify the receptacles.

We highly recommend using only 3-wire devices with a ground. Suitably double-insulated devices are acceptable. Keep in mind that the combined amperage draw on all of the devices connected to the XGC-1e must be less than 15-amps @ 120 VAC.

# **MAINTENANCE / SPECIFICATIONS**

## **PRECAUTIONS**

- 1) Please take care in the handling of this precision device. If the unit is dropped or subjected to extreme shock, the calibration may be thrown off. Calibration problems due to abuse, or droppage may affect the warranty.
- 2) DO NOT expose the XGC-1e to water. It utilizes a ventilated enclosure to properly "sample" the CO<sub>2</sub>.

## **SPECIFICATIONS:**

System operating voltage	120vac +/- 20% @ 50-60 Hertz
Maximum Switching amperage	15-amps @ 120vac
Overload protection	15-amp normal blow fuse
Operating temperature	30-120° F
Maximum humidity	95% RH (Non-condensing)
Temperature control range	50-115° F with a 7° F differential, +/- 3.6°
Humidity control range	20 - 80% RH with a 5% differential
Adjustable timer repeatability	+/- .5% under fixed conditions
Timer setting accuracy	+/- 10%
Hydro "ON" timer	30 seconds to 20 minutes
Hydro "OFF" timer	12 minutes to 480 minutes
24-hour timeclock accuracy	+/- 3% monthly
CO <sub>2</sub> Operating principle	Fuzzy Logic™, w / Single-beam Non-Dispersive Infrared (NDIR)
CO <sub>2</sub> Measurement range	0 – 5000 PPM CO <sub>2</sub>
CO <sub>2</sub> Warm-up time	Minimum 10 minutes (full accuracy)
CO <sub>2</sub> Maximum drift per year	+/- 15 PPM
CO <sub>2</sub> Accuracy @ 77°F	+/- 5% of reading
CO <sub>2</sub> Repeatability	< 1% of Fixed Scale
CO <sub>2</sub> Calibration interval	Three years
CO <sub>2</sub> sensor Operating life expectancy	15 years typical
Dimensions	10" X 8" X 7"
Weight	Less than 6 lbs.
Relay operations	Minimum 100,000 electrical / 10,000,000 mechanical

## **MAINTENANCE:**

- 1) Consult the troubleshooting chart for a listing of the most common problems.
- 2) DO NOT open the enclosure!!! There are no components that require maintenance.
- 3) Do not use this equipment for purposes other than what it is designed for. It will provide many years of trouble-free service when used properly.
- 4) In the event you cannot solve the problem, first consult the dealer who sold the unit then contact the factory for instructions on how to return it to the factory for repair.

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