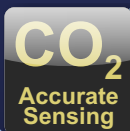


Evolution

Carbon Dioxide Controller



Introduction

Thank you for purchasing the **Ecotechnics Evolution Carbon Dioxide Controller**. In order to take full advantage of your new controller, please read this manual carefully and use the product as directed.



Carbon dioxide (CO₂) is a colourless, odourless gas that occurs naturally in our environment. It is normally present in the atmosphere at an average concentration of approximately 0.00036% or 360 PPM.

Many growers fail to recognise the importance of Carbon Dioxide in their growroom. Most plants grow faster and larger with enhanced CO₂ levels because of more efficient photosynthesis and a reduction in water loss. There are also many other benefits for plants, among them greater resistance to temperature extremes and other forms of stress, better growth at low light intensities, improved root/top ratios & less injury from air pollutants.

Photosynthesis is the term used to describe the process by which plants combine CO₂ molecules with water molecules to form complex sugars. There is a resultant spare oxygen atom which is released back into the air. The sugars are then further processed by the plant to form natural polymers for growth. The ambient level of CO₂ in air is 300-400 PPM, which fast growing plants in your growroom or glasshouse can use all the available CO₂ in less than an hour, slowing photosynthesis and bringing growth to a virtual halt.

Your new Evolution controller utilizes the latest microprocessor and infrared technology to monitor & control the levels of carbon dioxide in your growing area. The controller can operate with or without the optional Evolution Solid State NDIR CO₂ sensor and can also be used with either bottled CO₂ gas or with a propane or natural gas burning CO₂ generator. In addition to this the Evolution controller can be interfaced to most external thermo / hygrometers for improved environmental control.

It can be seen that the rate at which plants are able to grow is relative to the availability of photosynthesized complex sugars. Raising the ambient CO₂ level in your growroom causes more sugars to be produced allowing the plant to grow bigger and faster. The optimum level of CO₂ for plant growth is dependant upon many different factors such as light levels, temperature, humidity and nutrient availability. Plants grown with enhanced CO₂ can grow up to 40% faster thus shortening crop times and increasing yields. This is of course assuming there are no other limiting factors such as lack of available light etc.

It should be noted that there is generally no advantage to increasing CO₂ levels beyond 3000 PPM for most greenhouse plant species. It should also be noted that there is generally no advantage to raising CO₂ levels during dark hours.

Controller & Accessories



The Evolution CO₂ Controller

Your new Evolution controller utilizes the latest microprocessor and infrared technology to monitor & control the levels of carbon dioxide in your growing area. The controller can operate with or without the optional Evolution Solid State NDIR CO₂ sensor and can also be used with either bottled CO₂ gas or with a propane or natural gas burning CO₂ generator.

In addition to this the Evolution controller can be interfaced to most external thermo / hygostats for improved environmental control.



The Evolution NDIR CO₂ Sensor

The new solid state evolution CO₂ sensor from Ecotechnics represents the latest state of the art sensor technology utilizing advanced solid state Indium Antimonide LED's and detectors with precision engineered, gold plated optics to provide high accuracy fast response real time CO₂ sensing from 0-10,000ppm

This Sensor can be purchased separately from the Evolution controller.

Ask your retailer for further details of this product.



The Ecotechnics Carbon Dioxide Regulator

This is the perfect bottled gas regulator for use with the Evolution CO₂ Controller. We have this regulator produced for us in the UK from top quality components it has a fixed flow rate of 17 Litres per min. and is our standard horticultural regulator.

Ask your retailer for further details of this product.



The Evolution digital fan speed Controller

This is the perfect thermostat system to use with the Evolution CO₂ Controller. It can control your extraction system and interface to the stat input of the CO₂ controller, it can also switch up to 3Kw of heater load for those cold winter nights.

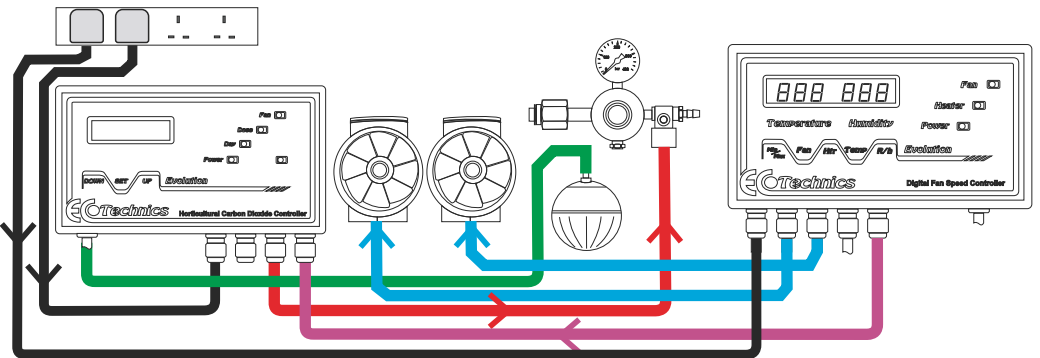
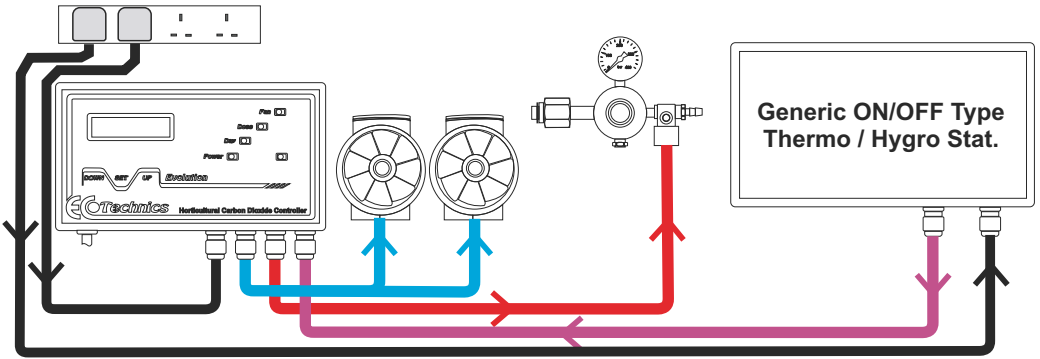
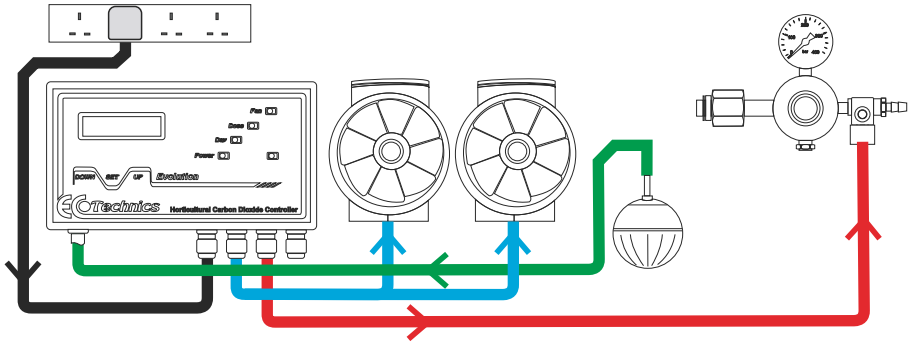
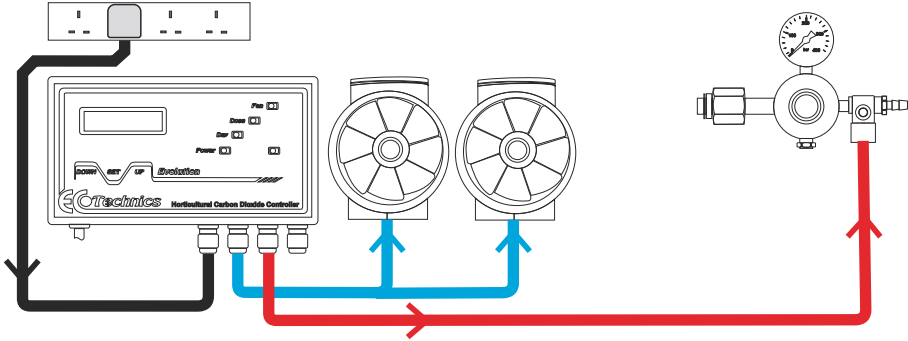
Ask your retailer for further details of this product.



Propane CO₂ Generator

There are many different propane burners available on the market and the evolution controller can work with most of them. Burner sizes of 0.01Kwh to 9.99Kwh are supported and the switching output is 230Vac.

Controller Configuration Options



Controller Configuration Options

Basic Open loop configuration with No CO₂ Analyser

This is the simplest way to connect your controller; it only requires a power connection, a connection to the CO₂ release system and a connection to your extraction system. In this mode the controllers internal cycle timer will periodically turn the extraction system on and off for the programmed amounts of time. Primary dosing will occur when the extraction system is turned off & secondary or top up dosing will occur as programmed. For further information on setup parameters please refer to the settings section of this user guide.

Basic Closed loop configuration with CO₂ Analyser

This is the second way to connect your controller; it requires a power connection, a connection to the CO₂ release system, a connection to the Evolution NDIR CO₂ Analyser and a connection to your extraction system. In this mode the controllers internal cycle timer will periodically turn the extraction system on and off for the programmed amounts of time. Primary dosing will occur when the extraction system is turned off & secondary or top up dosing will occur after the peak level minus the CO₂ deadband setting is achieved. For further information on setup parameters please refer to the settings section of this user guide.

Configuration with an external basic ON / OFF Type Thermo / Hygro-Stat

The Evolution CO₂ Controller is equipped with an interface input so that it can work in conjunction with an external Thermostat or Thermo/Hygro-Stat. The AC Power output of the Thermostat that normally would connect to the extractor fan should be connected to the STAT INPUT of the CO₂ Controller. In this mode the controllers internal cycle timer will periodically turn the extraction system on and off for the programmed amounts of time unless your external Thermo/Hygro-Stat initiates an extraction first. Please note, this input is an on & off type input and is not suitable for use with fan controllers that vary fan speed, except the Evolution Digital Fan Speed Controller that has a dedicated interface output. For further information on setup parameters please refer to the settings section of this user guide.

Configuration with an Evolution Digital Fan Speed Controller.

The Evolution CO₂ controller is equipped with an interface input so that it can work in conjunction with an external Thermostat or Thermo Hygrostat. When used with the Evolution Digital Fan Speed Controller the STAT OUTPUT from the fan controller should be connected to the STAT INPUT of the CO₂ controller & the intake / exhaust fans should be connected to the FAN 1 & FAN 2 outputs of the fan controller. In this mode the fan controller will control the speed of the fans and will only allow the CO₂ controller to dose when the fans are running at the minimum or Idle speed. Please note this can be set to zero if desired. For further information on setup parameters please refer to the settings section of this user guide.

Controller Settings



Use the **SET** Button to scroll through the menu items & the **UP / DOWN** buttons to alter the setting

SELECT LANGUAGE
ENGLISH >

Language selection screen for English, French, German and Spanish.

ROOM VOLUME
37 m3

Set the volume of your growing area in cubic meters. This can be calculated by multiplying the height of your growing area by the width and then by the length the controller needs to know the room volume in order to calculate the dosing times for your required CO₂ level.

CO2 LEVEL
1600 PPM

Set the level of CO₂ that you require in your growing area in PPM. Please note that the maximum level of CO₂ that a plant can process will be dependant on temperature, humidity and available light levels. It should also be noted that the length of time that a CO₂ cylinder will last for is dependant on the target level of CO₂ that you set.

GAS Source
Cylinder

Gas source - CO₂ cylinder or propane burner.

GAS FLOW RATE
17 LPM

This controller can calculate the required dose times for bottled CO₂ or for a propane CO₂ generator. For bottled CO₂ gas you must set the flow rate of your gas regulator in litres per minute and for a propane gas burner you should set the burner capacity in Kw/Hrs in order for the controller to calculate the correct dosing times.

Burner size
0.18 kWh

This controller can calculate the required dose times for bottled CO₂ or for a propane CO₂ generator. For bottled CO₂ gas you must set the flow rate of your gas regulator in litres per minute and for a propane gas burner you should set the burner capacity in Kw/Hrs in order for the controller to calculate the correct dosing times.

TDOSE %
10 %

This setting is for the top up dose. The controller assumes that after it doses CO₂ into the growing area the level will gradually fall due to a number of reasons ie: CO₂ usage by plants, gas leakage under doorways or through gaps etc. After the extractor fan turns off the controller makes a primary dose in order to achieve the level of CO₂ enrichment required by the user, it will then wait for a period, as specified by the user and make a small top up dose to allow for seepage / usage of gas. This will be a percentage of the primary dose as per this setting. Top up dosing can be disabled by setting this option to 0%.

Please note this setting is only available if the controller does not have the Evolution Analyser connected

TDOSE TIME
01:00 Minutes

This setting specifies the amount of time after the primary dose that the small percentage Top up dose occurs. Top up dosing can be disabled by setting this option to zero. **Please note this setting is only available if the controller does not have the Evolution Analyser connected**

Controller Settings

CO2 DEADBAND
50 PPM

The controller will make a CO₂ dose to the target level but will not re-dose until the level has fallen buy at least the set deadband amount. By reducing this setting you get better control and by increasing it you get better gas economy. **Please note this setting is only available if the controller does have the Evolution Analyser connected**

FAN CYCLE TIME
15 Minutes

This setting is for the internal fan cycle timer. It controls the amount of time between extraction cycles when using the internal fan cycle timer. If an external Thermostat / Hygrostat is connected, then in the event of an externally induced extraction cycle, the internal cycle timer will be reset.

FAN DURATION
3 Minutes

This setting is for the duration of the extraction cycle ie: if the FAN CYCLE time is set to 30 Min & the FAN DURATION is set to 5 min. Then the fan will turn on for 5 min's then off for 30 min's repeatedly unless an externally induced extraction cycle is detected. **Please note, fan duration should be set to ZERO in a sealed room with air conditioning.**

FAN RUNDOWN TIME
10 seconds

This setting allows the controller to wait for the programmed time period from the fan output being turned off so that the fans stop spinning before the CO₂ is injected.

Please note that the time required will vary from one fan to another and can be set to suit your particular fan.

Stat ignore time
0 Minutes

This setting is for the Stat input & allows the controller to ignore the stat input for the set period of time. This is useful if your thermostat has a very sensitive deadband and effectively will allow the fan to come on for the first time the stat asks for it but will not allow another extraction to be triggered by the stat until the ignore time has passed.

DAY SETPOINT
50 %

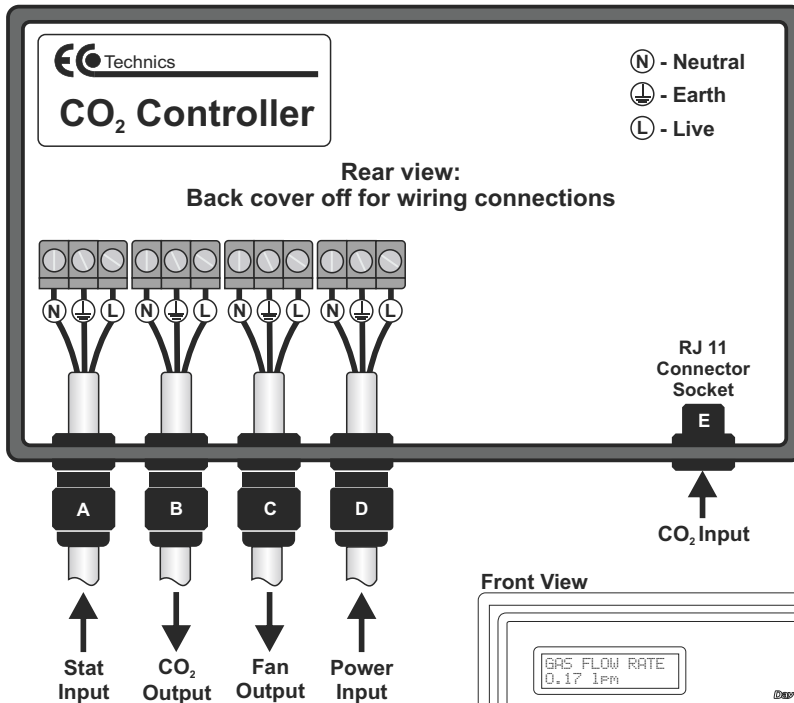
This setting is for the level of light at which the controller decides to disable the CO₂ output. The light sensor is located in the front panel of the controller. Make this setting lower to increase sensitivity.

RESTORE DEFAULTS
No Yes

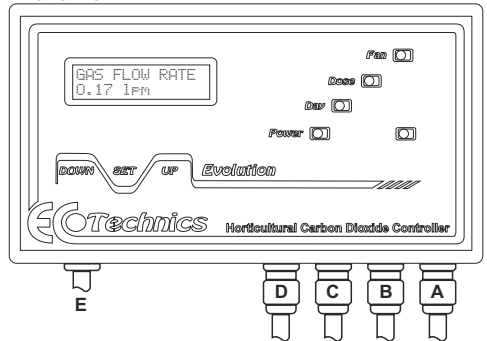
This setting will restore all controller settings to default parameters. The list of default settings can be found in the specification sheet.

Note selecting yes will result in permanent loss of all user defined settings.

Controller Power Connections



Front View



A - Stat Input

This input is an interface to external fan controllers and thermostats & can be used to implement a full environmental control system when combined with a suitable temperature / humidity controller such as the Evolution digital fan speed controller.

B - CO₂ Out

This is where you connect your CO₂ regulator or solenoid controlled gas burner. Please note this is a 220/240v AC output. Please check solenoid coil voltage before connecting.

C - Fan Out

This is where your extractor system is connected. Please note that if you run multiple fans then wire a suitable extension socket to this output then plug your fans into the extension.




D - Power Input

This is the main power connection for the controller.

E - CO₂ Input

This RJ 11 Socket is to plug the Evolution NDIR Carbon Dioxide Sensor. Please note this controller can only be used with the Evolution NDIR Carbon dioxide Sensor.

Wire connection diagram for angled plug on Regulator

-  **Brown: Live**
-  **Blue: Neutral**
-  **Green/Yellow: Earth**



Advanced Settings

Information Menu

Depress and hold the **up** button when in normal operating mode to display.....

Peak CO₂, Average CO₂, Dose Error %, CO₂ Required, Gas Generation Rate, Dose Time & Time to Next Fan cycle.

Internal Counter Zero

Pressing the **down** button in normal operating mode will **reset the internal counter to zero**, this function can be used to skip a fan cycle, fan rundown or CO₂ dose.

Dose Calibration

- 1.Power turned off
- 2.Depress and hold the **Up** Button,
- 3.Turn the power on, with the **UP** button held down to enter the Dose Calibration mode.
- 4 Adjust the Cal factor by using the **Up & Down** buttons, once an adjustment has been made
- 5.Leave the unit alone and it will automatically store the new setting.
- 6.Alternatively you can store by simply pressing the **Set** button, this will store the offset and enter into normal operating mode.

Note:

All green houses, grow rooms etc have a leakage rate which is dependant on many factors such as gaps under doors gaps in glass panels etc. This setting can be used to calibrate the dose factor to overdose a bit in order to compensate for losses. This can also be done by just increasing the room size setting or decreasing the flow rate setting.

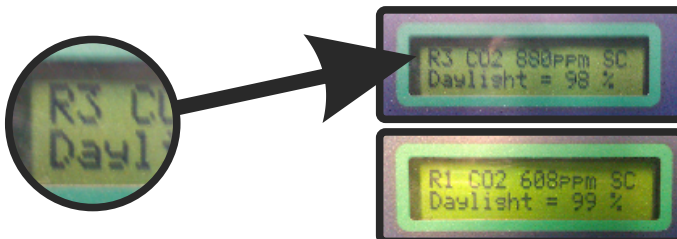
How to Detect which Evolution CO₂ Sensor you are using

- 1.**Power off**
- 2.Depress and hold down the **Set** Button
- 3.Switch **power on** you will enter **Test & Sensor Calibration mode**
- 4.Now release the **SET** key
- 5.Depressing the **Down & Up** buttons Simultaneously will enter the "CO₂ Calibration mode" the screen will **blank** and when the buttons released you will be in "cal mode"

On this display screen in the top Left of the display is the revision number of the Sensor you are using.

- R1 = Mk1 Sensor
- R2 = Mk2 Sensor
- R3 = Mk3 Sensor

In the examples below you can see R3 [Mk 3 sensor] has been detected and in the second photograph you can see that the R1 [Mk 1 sensor] has been detected.



Test and Calibration mode Evolution CO₂ Sensor

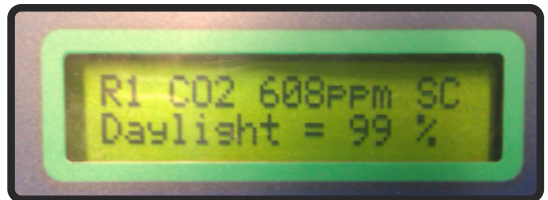
Test and Sensor Calibration Mode for mk1 and mk2 Sensors (R1 and R2)

Please note the Evolution CO₂ Sensor needs at least 15 min's to warm up and stabilize before calibration can be started.

1. **Power off**
2. Depress and hold down the **Set** Button
3. Switch **power on** you will enter **Test & Sensor Calibration mode** now release the **SET** key
4. Depressing the **Down** button will test the CO₂ Output>> the CO₂ LED will illuminate.
5. Depressing the **Set** button will test the Fan Output>>the Fan LED will illuminate.
6. Depressing the **Down & Up** buttons Simultaneously will enter the "CO₂ Calibration mode" the screen will **blank** and when the buttons released you will be in "cal mode"
7. CO₂ Cal mode: use the **down & up** buttons to calibrate the Mk1 and Mk2 CO₂ sensor
8. Once the correct level is programmed depress the **Set** button to **store** the new calibration setting the display will read press **SET** to exit [storing your setting]

Note: ambient CO₂ levels are usually 450ppm

R1 (Mk 1) sensor detected



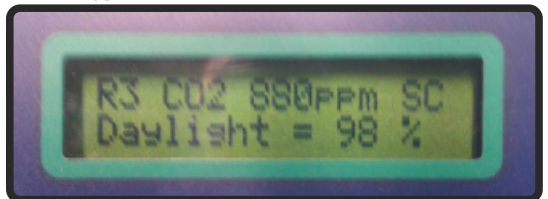
Test and Sensor Calibration Mode for Mk3 Sensor (R3)

Please note the Evolution CO₂ Sensor needs at least 15 min's to warm up and stabilize before calibration can be started.

1. **Power off**
2. Depress and hold down the **Set** Button
3. Switch **power on** you will enter **Test & Sensor Calibration mode** now release the **SET** key
4. Depressing the **Down** button will test the CO₂ Output>> the CO₂ LED will illuminate.
5. Depressing the **Set** button will test the Fan Output>>the Fan LED will illuminate.
6. Depressing the **Down & Up** buttons Simultaneously will enter the "CO₂ Calibration mode" the screen will **blank** and when the buttons released you will be in "cal mode"
7. **Mk 3 CO₂ sensor air calibration**

The sensor must be positioned in outside air until stable then press the **up** button to calibrate. This assumes ambient CO₂ levels to be 450ppm.

Once you have entered Air Cal mode the sensor will count down from 3mins on the display to allow the sensor to settle on the ambient Co2 level which it assumes is 450ppm it then stores this automatically as the new calibration setting.



R3 (Mk 3) sensor detected

Light Level Sensor

The correct operation of the Light level sensor can also be tested in this mode and the level is reported in the display by covering the sensor window the function can be tested.

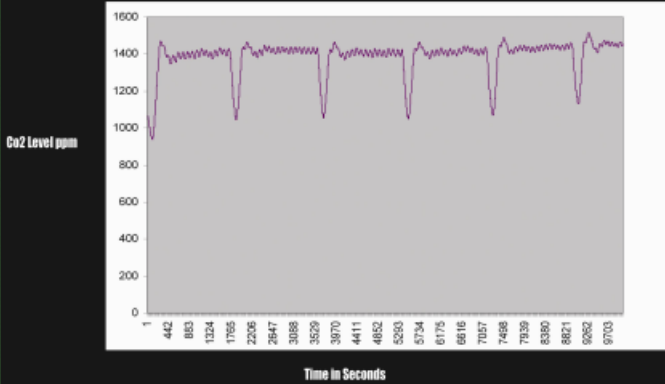
Stat Input Test

The operation of the Stat input can also be tested by connecting your thermostats output to the Stat input and triggering it, the state will be displayed in the top right hand corner of the display on will show as **SC** and off will show as **SO**.

Typical Performance Graphs

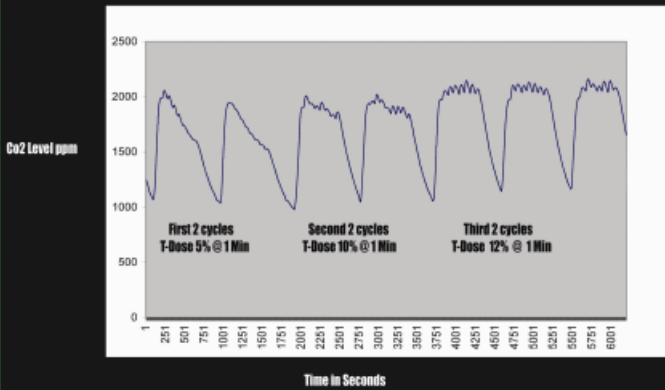
Evolution Co2 Controller

Control graph demonstrating Ecotechnics Multi-Stage Volumetric Discharge dosing with Evolution ND-IR analyser



Evolution Co2 Controller

Control graph demonstrating Ecotechnics Multi-Stage Volumetric Discharge dosing with no analyser



Settings

Controller Setting	Default Setting	Range
Language	English	N/A
Room volume	37 m3	1 - 999
CO ₂ level ppm	1600 ppm	600 - 3000 ppm
CO ₂ source	CO ₂ Cylinder	CO ₂ / Gas
Gas Flow Rate	17 Lpm	1 Lpm - 99 Lpm
Burner size	1.8 kwh	0.01 Kwh - 9.99 Kwh
Fan run down	30 seconds	30 Sec's - 5:00 Min's
T - Dose %	10%	0% - 25%
T - dose Time	1 Min	10 Sec - 30 Min
Deadband ppm	50 ppm	10 - 250 ppm
Fan Cycle time	15 Min	5 Min -60 Min
Fan Duration	3 Min	0 Min - 30 Min
Stat Ignore Time	0 Min	0 Min - 15 Min
Day Set Point	10%	10% - 90%
Reset to Default	Yes/No	Yes / No

Specifications

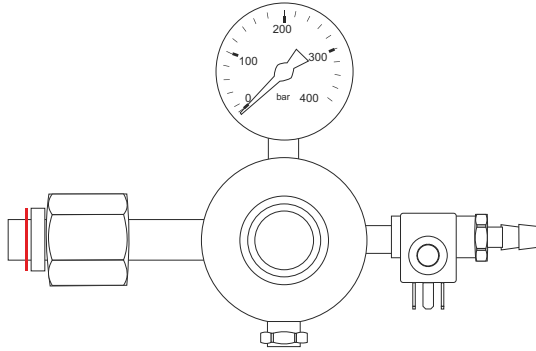
Power Supply	220 - 240 Vac Single Phase
Power Consumption	20 Watts Max
Maximum Total Fan Load	1.5 Kw
Maximum Total CO ₂ output Load	0.5 Kw
Maximum Total combined output Load	1.5 Kw
CO ₂ Measurement Range	0 - 10,000 ppm
CO ₂ Measurement Accuracy	+ / - 50 ppm
CO ₂ Measurement Resolution	1 ppm

Light Sensor



The **Ecotechnics Evolution Carbon Dioxide Controller** has a light sensor as hi-lighted in the graphic on the left. This light sensor can automatically be set to turn **off** the CO₂ controller when it senses night time when light falls and also turn the CO₂ **on** when light rises back to a daytime state.

Gas Regulator Safety Advice



Only experienced and properly trained persons should handle compressed gases, they should be conversant with relative safety instructions including the current British compressed Gases Association code of practice CP7 and the gas safety instructions from the gas supplier.

Markings

The regulator is marked with the following:-

- Maximum inlet pressure (pressure service)
- Rated outlet pressure
- Gas (only use for gas shown)

Fitting to the cylinder

Before fitting the regulator, ensure both the cylinder outlet valve and the regulator inlet are clean and free from contaminants including dirt, oil and water. If fitted, fully release the regulator adjusting knob by winding anticlockwise prior to fitting to the cylinder. Right hand thread is employed for oxygen and permanent gases and left hand thread is used for fuel gases. Use only the correct size spanner and finally tighten by applying 2 blows to the end of the spanner with the heel of the hand.

Operating

After fitting of the downstream equipment, open the cylinder valve slowly, this is a critical operation and must be done slowly to be safe. If fitted, adjust the regulator knob to the required outlet pressure and purge hoses, make the final adjustment when gasses are flowing. It is vital to ensure that any audible vibration or freezing of the regulator is avoided during operation. Check for leaks at all joints with a leak detection spray. On completion of use, close the cylinder valve and exhaust gas from lines.

If fitted, fully release regulator pressure adjusting knob.

Safety points

Carefully inspect the regulator for oil, grease and damaged or dirty parts. Oxygen vigorously supports combustion, never use the regulator if oil, grease or damaged parts are detected.

Never:

Never use a regulator showing any signs of damage

Never allow cylinders to become heated

Never use pressure gauges that are damaged, not smooth in operation or not zeroing

Never remove or change any component parts of a regulator.

Always:

Always check the whole system for damage and leaks at frequent intervals

Always work to BCGA codes of practice (to purchase copies, telephone 01491 825533)

Always fit a flashback arrestor to the outlet of an oxygen or fuel gas cylinder.

---- ALWAYS OBSERVE THE FOLLOWING ----

- When connecting / disconnecting all cables, grasp the connector itself—never pull on the cable. This way you will avoid causing shorts, or damage to the cable's internal elements.
- Do not excessively twist or bend the power cord, or place heavy objects on it. Doing so can damage the cord, producing severed elements and short circuits. Damaged cords are fire and shock hazards!
- In households with small children, an adult should provide supervision which is essential for the safe operation of any electrical appliances in the home. All cords and cables should be placed so they are out of the reach of children.
- Try to prevent cords and cables from becoming entangled.
- Before moving the unit, disconnect the power cable from the mains supply and any cords coming from external devices.
- Never handle an AC adaptor or electrical plugs with wet hands when plugging into, or unplugging from, an outlet or this unit.
- Before cleaning the unit, turn off the power and unplug the AC adaptor from the outlet.
- Do not force the unit's power-supply cord to share an outlet with an unreasonable number of other devices.
- Be especially careful when using extension cords—the total power used by all devices you have connected to the extension cord's outlet must never exceed the power rating (watts/amperes) for the extension cord. Excessive loads can cause the insulation on the cord to heat up and eventually melt through.
- Protect the unit from strong impact.(Do not drop it!)
- Before using the unit in a foreign country, consult with your retailer or an authorized distributor.
- Whenever you suspect the possibility of lightning in your area, disconnect the unit from the power outlet.
- Do not attempt to repair the unit, or replace parts within it. Refer all servicing to your retailer or an authorized distributor.
- When moved from one location to another where the temperature and/or humidity is very different, water droplets (condensation) may form inside the unit. Damage or malfunction may result if you attempt to use the unit in this condition. Therefore, before using the unit, you must allow it to stand for several hours, until the condensation has completely evaporated.

SAFETY CONSIDERATIONS

- Always make sure the unit is unplugged before attempting to connect the fan and/or heater to the unit.
- Always check that all cables are correctly and securely connected and that the cover is securely screwed on before plugging the unit in and turning the power on.
- Always Remember that Electricity and Water is an Extremely Dangerous Combination. Electricity can be fatal especially in the presence of water.
- It is strongly recommended that any electrical equipment used in the growing environment is mounted above ground level, on a shelf or if possible wall mounted so that in the event of water spillage or flooding the two remain separate.

This appliance must be installed by an approved electrician and must be connected via an approved RCD safety breaker.

POWER CONSUMPTION 15 WATTS MAX
SUPPLY VOLTAGE 230-240V AC
TOTAL LOAD NOT TO EXCEED 1.5kw

ECOTECHNICS PRODUCT GUARANTEE

Thank you for choosing an Ecotechnics product for use in your growroom. As leading manufacturers of horticultural equipment and accessories we are committed to providing a range of innovative products to enhance your garden. Our commitment to quality is second to none, however if you do experience any problem all our products are covered with a full 1 year parts & labor guarantee and should be returned to the retailer along with the original purchase receipt .

Ecotechnics UK Ltd is not liable for labor costs involved in the installation or removal of the product, lost profits, incidental or consequential loss, injury to property or persons or any other consequential loss however caused.

Shop / Dealer

Purchase Date

D	D	M	M	Y	Y
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Serial Number

E

C

•

•