

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 (CO_2) 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 recognize the importance of Carbon Dioxide in their growroom. most plants grow faster and larger with enhanced CO_2 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 CO_2 molecules with water molecules to form complex sugars, there is a resultant spare oxygen atom which is released back into the air, the sugars being further processed by the plant to form natural polymers for growth. The ambient level of CO_2 in air is 300-400 PPM, fast growing plants in your growroom or glasshouse can use all the available CO_2 in less than an hour slowing photosynthesis and therefore 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 CO_2 sensor, this controller can also be used with either bottled CO_2 gas or with a propane or natural gas burning CO_2 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 CO_2 level in your growroom causes more sugars to be produced allowing the plant to grow bigger and faster. The optimum level of CO_2 for plant growth is dependant upon many different factors such as Light levels , Temperature , Humidity and Nutrient availability. Plants grown with enhanced CO_2 can grow up to 40% faster thus shortening crop times and increasing yields. This is of course assuming no other limiting factors such as lack of available light etc.

It should be noted that there is generally no advantage to increasing CO_2 levels beyond 3000 PPM for most greenhouse plant species. It should also be noted that there is generally no advantage to raising CO_2 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 CO₂ sensor, this controller can also be used with either bottled CO₂ gas or with a gas burning CO₂ generator, in addition to this the Evolution controller can be interfaced to most external thermo / hygrometers 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

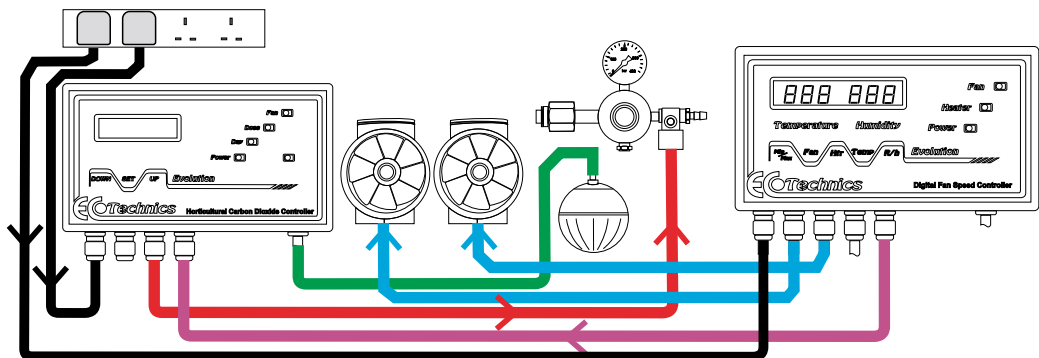
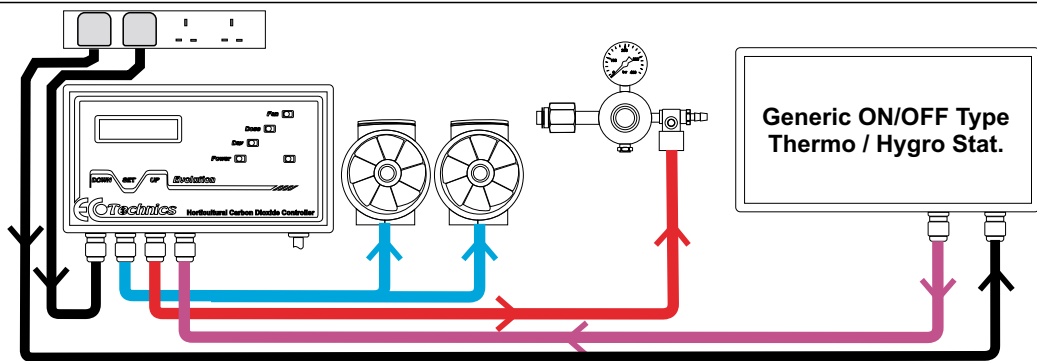
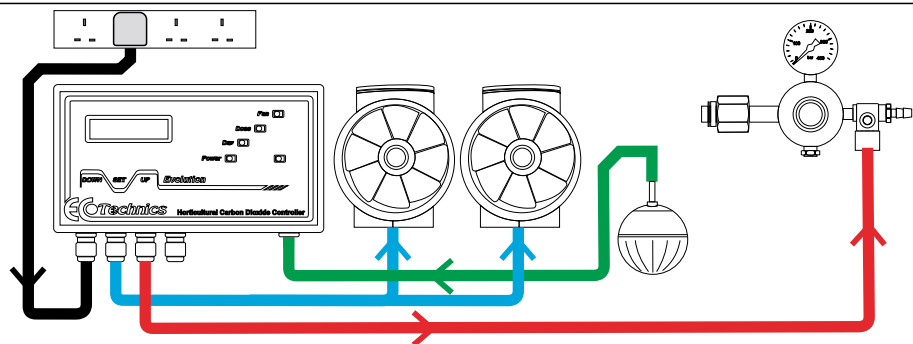
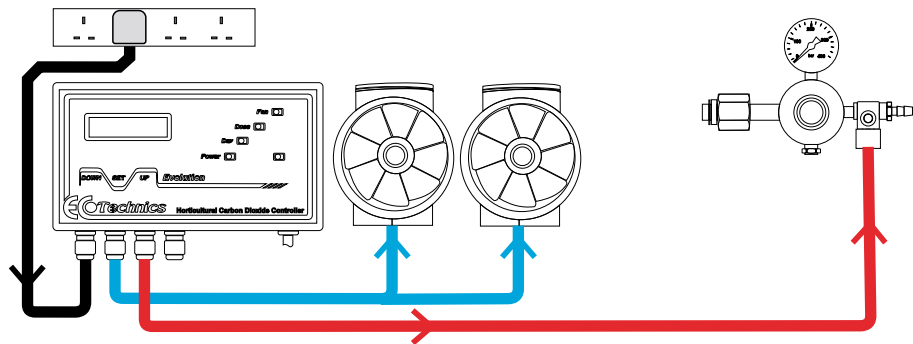
Ask your retailer for further details of this product.

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 Analyzer

This is the simplest way to connect your controller; it requires only 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 Analyzer

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 Analyzer 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 ThermoHygrostat. When used with the evolution digital fan 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 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 FLOW RATE
0.17 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 na 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 na propane gas burner you should set the burner capacity in Kw/Hrs in order for the controller to calculate the correct dosing times

FAN RUNDOWN TIME
10 seconds

This setting allows the controller to wait for the programmed time period from the fan output being turned off to let 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.

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 like 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 zero%.

Please note this setting is only available if the controller does Not have the Evolution Analyzer connected

Controller Settings

TD0SE 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 Analyzer connected**

FAN CYCLE TIME
15 Minutes

This setting is for the internal fan cycle timer and 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.**

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 this 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 Analyzer connected**

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 dead band 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 %

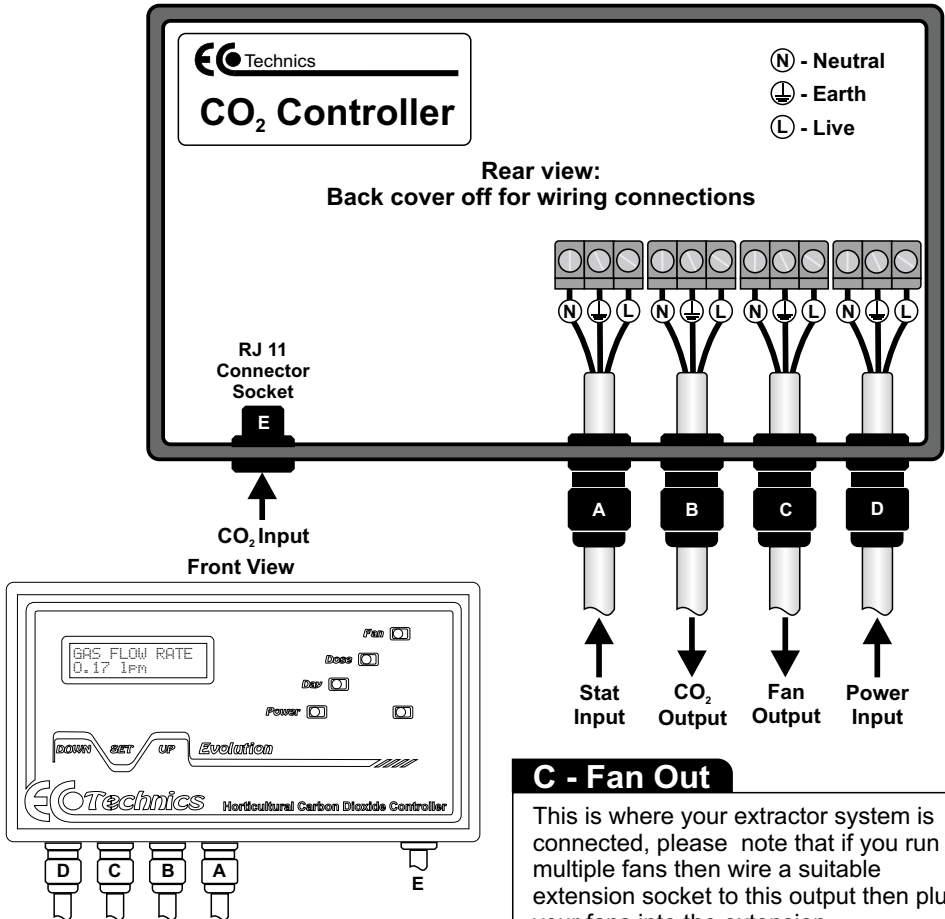
This setting is for the level of light at which the controller decides to disable the CO₂ output, the light sensor is located in the front panel of the controller. Make this setting lower to increase sensitivity.

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 settings.

Controller Power Connections



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

B - CO₂ Out

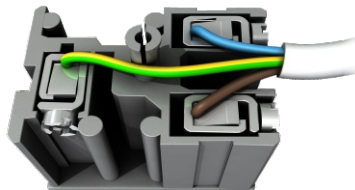
This is where you connect your CO₂ regulator or solenoid controlled gas burner. Please note this is a 220/240 v AC output. Please check solenoid coil voltage before connecting.

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

With the power turned off **Depress and hold the Up Button**, then turn the power on, this will enter the Dose Calibration mode.

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. Cal factor can be adjusted by using the Up & Down buttons, once an adjustment has been made then depressing the Set button will store the offset and enter into normal operating mode.

Test and Sensor Calibration Mode

With the power turned off Depress and hold the Set Button, then turn the power on, this will enter the Test & Sensor Calibration mode.

Depressing the Down button will test the CO₂ Output.

Depressing the Set button will test the Fan Output.

Depressing the Down button & the Up button Simultaneously will enter the CO₂ Calibration mode, when in CO₂ Cal mode use the down & up buttons to calibrate the Mk1 and Mk2 CO₂ sensor when the correct level is programmed depress the Set button to store the new calibration setting.

If you have a Mk 3 CO₂ sensor then it can be given an AIR CALIBRATION COMMAND. 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.

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

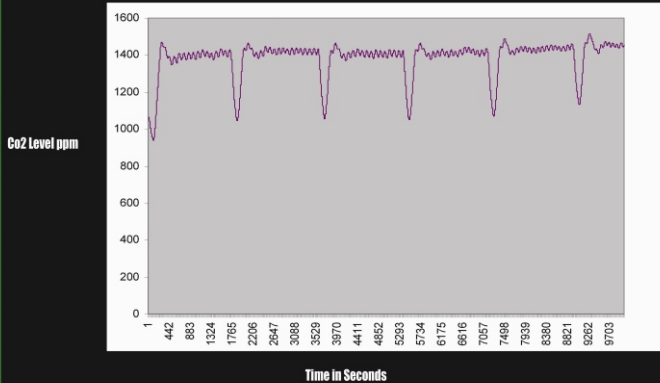
The correct operation of the Light level sensor can also be tested in this mode and the level is reported in the display by covering the sensor window the function can be tested.

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 be displayed as SO.

Typical Performance Graphs

Evolution Co2 Controller

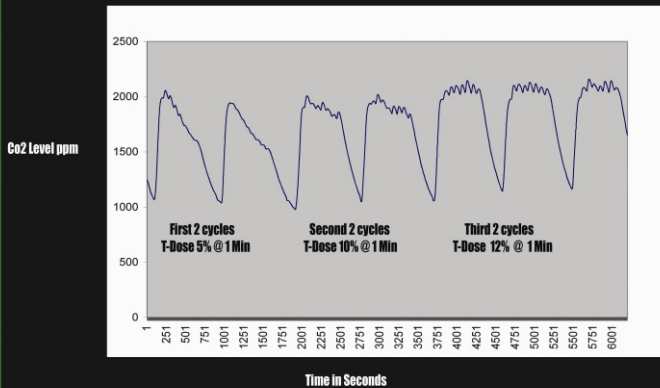
Control graph demonstrating Ecotechnics Multi-Stage Volumetric Discharge dosing with Evolution ND-IR analyser



Ecotechnics *Insist on the BEST*

Evolution Co2 Controller

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



Ecotechnics *Insist on the BEST*

Specifications

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
Start 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.

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

Serial Number

E

C

•

•