

# AutoVent 3

The AutoVent 3 is an advanced greenhouse environment controller with PC interface. With its advanced cooling mechanisms it is able to control and modify the growing environment to suit a wide range of crops.

## Features

Suits most types of roof and/or side vented greenhouse

- Four time zones to allow detailed profiling of environment
- Three stage fan plus pad evaporative cooling
- Automatic switch over from passive venting to fan/pad
- Heating – proportional and/or ON/OFF
- Fogging control for cooling or humidity control - pulsed
- Advanced algorithm for venting and heating to give good control of temperature and humidity including purging sequences
- Two stage stirring fan control
- Two levels of shading with inside/outside selection
- Supplemental lighting control – two levels
- Thermal blanket or blackout photoperiod control
- CO2 injection
- Single weather station for multiple AutoVent3 controllers
- PC interface with remote setting, data logging, event logs etc



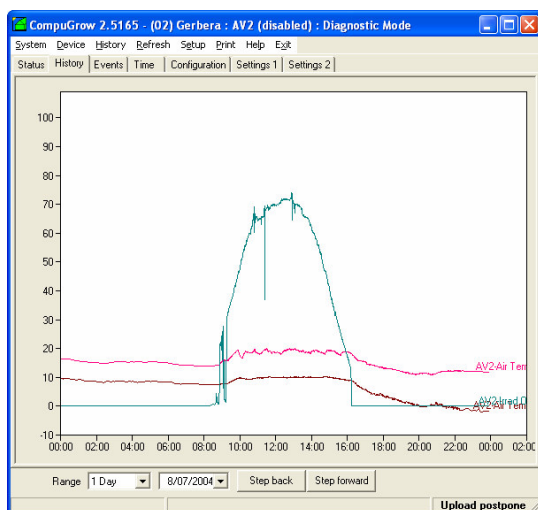
## Venting

The AV3 can operate with any mixture of vents and fan/pad evaporative cooling. If both are available it will start cooling by operating the vents but if this is unsuccessful in reducing the temperature, the vents will close and the fan/pad will start. If only fan/pad is provided then cooling will start with single stage fan exhaust and if this is unsuccessful in controlling the temperature it will add stages and/or pad one at a time.

If the temperature remains above the set-point when all stages and the pad are operating, then shading can be set to try to assist.

The venting algorithm will try to control both temperature AND relative humidity. If

heating is available then this too will be used to try to control humidity in addition to temperature.



Any combination of vents can be controlled including twin independent roof (gull wing), saw tooth, single and/or twin side walls. The roof venting uses an intelligent algorithm to adjust the nudge size taking into account present roof position, size of error, rate of error change, differential temperature (inside – outside) and wind effect.

The change over to fan/pad and back has a differential (settable) to prevent frequent switching back and forth and can only change back to passive venting twice within each time zone

The 3 stage fans come on in sequence and the pad is normally added between the first and second stages unless the humidity is very high (settable) in which case it will activate between the second and third stage unless extremely high when it activates only after the third stage fan has come on.

### **Heating**

Air heating can be by either proportional control or ON/OFF control. Proportional control is normally used in conjunction with a boiler heating water pipes. This provides a very gentle heat and the heating pipes can be positioned either under the grow beds or between the rows of plants. In this way less heat need be supplied as compared with general warm-air heating. Water pipe heating is gentle, economical and avoids sudden drying of the air. The heating is used to control both the temperature and the relative humidity.

### **Fogging (4 zones)**

Fogging may be used instead of fan/pad to assist with cooling. The fogging may also be used to increase humidity in dry weather. Five outputs are used; one that comes on constantly while fogging is called for and the rest that pulse on for short periods to inject puffs of fog.

### **Stirring fans**

Two stages of stirring is provided. The first stage will always be on when the vents are closed and exhaust fans are stopped. The second stage will also come on when the temperature or humidity is high. Both fans may be set to come on when fogging is active.

### **Purging**

In the event of very high humidity, the controller can be programmed to go into a purging mode. In this mode it increases the heating temperature by a few degrees (user set) to try to dry the air. Eventually the humidity will creep up again due to plant transpiration and the controller will nudge open the vents (or if no vents or in fan mode will switch on an exhaust fan) for a few seconds (user set) to exhaust the warm humid air. Then the vents will close (or fans turn off) and the heater will again warm and dry the fresh air. This purging cycle will continue until the humidity is brought under control.

### **Shading**

Two stages of shading and one thermal blanket or blackout screen control are provided. The shades may be designated as inside or outside. If outside then they are withdrawn in the event of strong wind or rain.



Normally the shades operate as follows:-

At a set time each morning or if the light exceeds a user set level screen 1 will close. If the light exceeds a second user set level then shade two will close and when closed shade 1 will open. If the light exceeds a third user set level then both shades will close.

Screens will close after the light level exceeds the set point for 1 minute but will only reopen when the light is below the setpoint for a user settable time.

The thermal blanket can be set to close at a set time each evening. If roof vented then this is on provision that the temperature and humidity are within limits. The thermal screen opens when the temperature exceeds the day-time venting temperature. If either temperature or humidity become excessive and if the house is roof vented then the thermal screen will crack to a user settable open position. This will happen before venting or purging is initiated. Alternatively, the thermal screen output may be used for blackout cloth applications for photoperiod manipulation.

### **CO<sub>2</sub> Injection**

CO<sub>2</sub> is measured and injected to achieve a user set point providing 1) there is sufficient light AND 2) the venting is below a user-set limit. The user may specify any desired level of CO<sub>2</sub> from 0 to 2000ppm and the system will try to provide this when the above conditions are satisfied.

### **Lighting**

Two banks of supplemental lighting are available and can be used to extend the hours of daylight for photoperiod manipulation or else to top-up the available sun light to achieve a set integrated value for the day.

### **Historical data logging**

Data is logged to the hard disk in one-month files that are easily identified. The Compugrow software allows easy navigation to view any period over the last year or more. Logged data can be viewed graphically or exported to an Excel spread sheet.

### **Events**

The Compugrow software also allows easy viewing of time and date stamped events. This includes things such as vent movements, fans going on/off, in fact most outputs are reported and in some cases a reason is given for the action eg 10:53 Vent 1 closed reason wind

### **Alarms**

The compugrow software also provides alarms at the PC (via the sound card) and can even be set to phone you in the event of a problem



## **Functions and specification**

4 time zones plus pre-dawn heating  
Full manual overrides on all outputs  
Smart vent control for two roof vents and or up to two side vents  
Suits gull-wing, venlo, saw tooth or single roof styles with up to 3 banks of fans and pad  
Automatic change over between passive venting and fan/pad cooling  
Variable vent nudge size based on temperatures (in and out), RH, Wind  
Flexible wind and rain vent constraints  
Heating – hydronic or ON/OFF  
Fogging – variable pulse, one zone built-in, 4 zones with optional expander  
Stir fan control  
Advanced RH control using increased heating, venting and purge cycling  
CO2 injection control built in  
Shade cloth/ thermal screen control (shared with one side output)  
Advanced lighting control with 52 week schedule available with expansion unit  
Alarms on temperature, humidity, light level, CO2  
Can use up to 4 aspirated enviro sensors – averages readings – flexible control

Uses a weather station that can be shared with other greenhouse environment and irrigation controllers. Weather station measures wind speed, wind direction, rainfall in mm, rain sensor, solar sensor, temperature and relative humidity.

## **Outputs**

All inputs and outputs are optically isolated for maximum immunity in electrically noisy environments All outputs are 24V AC  
Powerful 4A power supply  
Mains input filtered, fused and surge protected  
All field wiring is connected by plug-in connectors making replacement extremely quick and simple.  
Connection to PC, aspirated sensors and weather station by industrial RS485 bus  
Temperature sensors accurate to 0.2 DegC  
Swiss made RH sensors accurate to +/- 2% RH up to 95 and then increasing to 5% at 100%  
Light sensor PAR approximation (0 to 2000umol)