AutoVent 2t

Operating Manual

Computerized Environmental Control System

For fan ventilated houses

- Four time zones to allow detailed environment profiling
- Advanced venting and heating algorithms
- Humidity control using, heating, venting, dehumidifying
- Suits greenhouses with extraction fans (and evaporative pad)
- Can automatically switch to/from air conditioning
- Two shading screens
- Thermal/blackout screen control
- Optional Fogging (up to 4 zones)
- Optional Lighting – 2 banks with 52 week schedule
- Optional CO_2 injection
- Optional Dehumidifier
- Computer connection for Data Logging and Setting

Contents

1. Overview

Features

- Suits most types of fan vented greenhouse with or without a wet wall evaporative cooler
- Four time zones to allow detailed profiling of environment
- If fan cooling unsuccessful shade can be forced closed to assist
- If cooling still unsuccessful the system can be set to automatically switch to an air conditioning unit
- Heating – proportional (hydronic) or ON/OFF
- Advanced algorithm for venting and heating to give good control of temperature and humidity
- Optional Fogging control – pump plus up to 4, pulsed zones
- Stirring fan control - 1 or 2 (optional) banks of stirring fans
- Multiple levels of shade control 2 shades plus thermal screen
- Exhaust fan control (up to 3 ON/OFF fans or variable speed)
- Optional CO_2 injection
- Optional Lighting control with 52 week schedule of day lengths and light integration
- PC interface with remote setting, data logging, event logs etc

Fan and Pad

There are two modes of operation for the fans "normal mode" and "binary mode". Each of the three fan banks has its own set point. These are based on the time zone setpoint plus an offset for each of the fan banks. Bank 1 has zero offset and banks 2 and 3 have a user set offset applied. Typically, bank 2 will have an offset of 1 to 2°C and bank 3 an offset of 2 to 4°C. The actual switching of each fan has a differential of +/- 0.5°C ie the fan switches on 0.5 °C above its setpoint and off 0.5°C below

Normal mode

On entering the fan pad mode the system looks at the measured temperature and switches on the appropriate number of fan banks. These will start up with a 5 second delay between each group to avoid excessive loading on the electricity supply. After a further 3 minutes if the setpoint is still exceeded (by more than the 0.5°C differential) then the pad water will start providing the RH is below its set point. If all fans are on then the pad water will start if the RH is below its maximum level. Once started the pad water will stay on until the RH exceeds the max level or the temperature drops below the bank two setpoint. Once it turns off, it will only come on again if the RH falls below the pad water RH low level (or if all fans are on it will come back on again after 20 mins if the RH is below the RH max level).

Binary mode

In binary mode the fan banks must be arranged in a "binary weighted" sequence so that bank 2 has twice the effect of bank 1 and bank 3 has twice the effect of bank 2. The controller then operates in a similar way to the normal mode except it tries to switch on combinations of the fan banks to achieve exactly the amount of cooling necessary. By choosing combinations, 7 levels of cooling become possible instead of just the 3 available in normal mode.
Just as in normal mode each bank has its own setpoint and as soon as the temperature exceeds that setpoint the highest bank of fans allowed for that setpoint will come on. Then, at 3 minute intervals, lesser fans will come on in binary sequence until the temperature no longer exceeds the setpoint (+0.5° differential). At each 3 minute step, the RH is checked to see if the pad water can be activated instead of the next level of fans.

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 (hydronic heating). 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.

Time Zones

Up to four time zones may be selected together with the possibility of pre-dawn heating to give a very detailed temperature profile. At the boundaries between time zones, temperature ramp-rates may be specified which cause the controller to ensure gradual changes of temperature from zone to zone. The PC software provides a "mimic" diagram which clearly shows both the venting and heating profiles to assist the grower in setting the system for optimum performance.

Humidity Control

Humidity is controlled by varying the heating and venting temperature set points, by switching on stirring fans, by wet wall control, by fogging and, in extreme conditions, by purging. Temperature set points are varied, within user-set limits, in order to increase venting to allow excess humidity to escape or decrease venting in order to try to retain humidity from transpiration. Within a user-set "proportional range" this effect is progressive. Outside the proportional range the effect will be at one of the user-set limits. Again, the Compugrow software assists the grower in optimizing these settings by providing graphical interpretation of settings in real time. The wet wall (if fitted) is used in varying combinations with the fan banks to achieve the desired temperature AND humidity.
It is also possible to use a dehumidifier (output expander required). This is particularly useful when using air conditioning and also when injection CO2.

Purging

Two purging regimes are possible. First is the "timed purge" which can be enabled by the grower to start a fan periodically whenever all fans are stopped. This has the effect of allowing an air change in order to release trapped humidity and also introduce CO_2 from the outside.
The second method is one set by the grower to only be invoked when the humidity is excessive. When active this has the effect of raising the heating temperature and periodically starting a fan to allow the warm moist air to escape. The fresh air entering is warmed by the raised heating temperature (which tends to dry it further) but gradually the transpiring crop will raise the humidity until the next purge is triggered. Both timed purging and humidity purging may operate at the same time.

Fogging (output expander required)

Fogging may be used to assist with cooling or to increase humidity in dry weather. Five outputs are used; one that comes on constantly while puffs of fog are emitted sequentially from the 1 to 4 zones). This function may be used with high or low pressure fogging systems. After a sequence of puffs of fog, there is a user set detent before it can fog again. The puffs of fog from each zone have a duration that varies proportionally to the error that it is trying to correct. Thus if the temperature is just a little over the set point then the puffs will be at the minimum duration whereas if the temperature is a few degrees above the set point they will be near the maximum size. Both the minimum and maximum puff sizes are set by the user as is the minimum detent time between one set of puffs and the next.

Stirring fans

A single stage of stirring is provided. This is normally set to come on whenever the vents are closed, when humidity is excessive or when injecting CO_2. It may be disabled during fogging if desired. (Note that if the optional output expander unit is installed then a second stir fan control becomes available)

Shading

Two shade control outputs and one thermal screen output is provided Shading operates to maintain the light level below a user set maximum. If the maximum light level is exceeded it will start to close the appropriate shade (or both shades) immediately, but once closed requires the light to remain below the set point for at least the time specified by the user. Safe change-over is ensured when swapping from one shade to another as the new shade closes before the exiting one opens.

Optional CO_2 (output expander required)

CO_2 is measured and injected providing 1) there is sufficient light and 2) the venting are below a set limit. The user may specify any desired level of CO_2 from 0 to 2000ppm and the system will try to provide this when the above conditions are satisfied. It may be set to only operate during certain time zones.

PC interface

The optional PC interface allows the settings to be viewed and set from the user-friendly CompuGrow software. It also facilitates the collection of measured data and events from the controller for logging to the hard drive whence it may be displayed graphically for ease of interpretation. The computer interface also allows for alarms to sound at the PC (via the PC sound card) or even be auto-dialled out to a telephone or pager (via the PC MODEM).

VERY IMPORTANT

Manual override switches

When using the front panel switches, it is very important to always allow the vent and shade motors to fully stop before reversing direction. Some motors may take a few seconds to fully stop. If this is not done then it is possible for the motor to continue in the same direction in which case it will not stop when it contracts the limit switches.

It is also important to always open the pad vent BEFORE manually switching on any exhaust fans.

Outside sensors

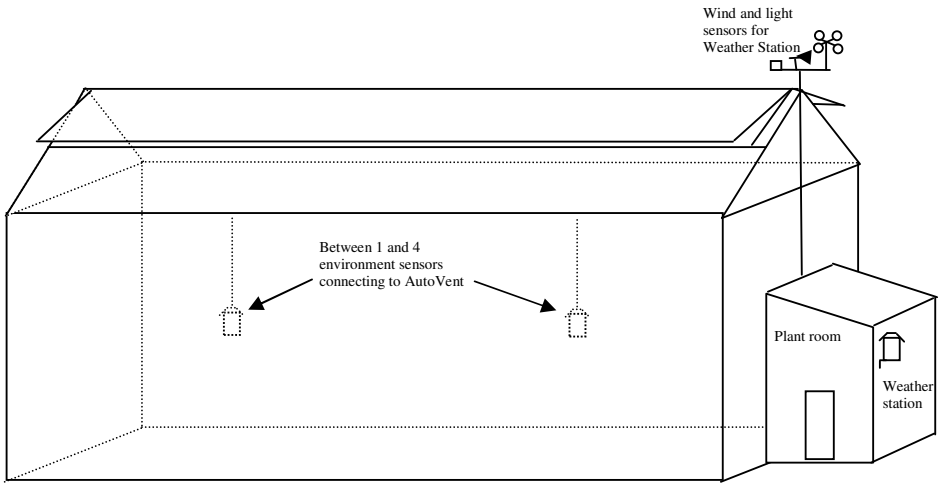
For satisfactory control, the AutoVent2t requires to know the outside temperature, humidity and light levels. This information is provided by a weather station. The full weather station provides additional information to the grower such as wind speed and direction and rainfall.

Weather station (optional)

The Autogrow weather station has sensors to measure wind direction, wind speed, rain sense, rainfall in mm, solar irradiance (PAR), temperature and relative humidity. The humidity sensor is a rugged electronic sensor which is easily replaceable. The rotary wind sensors have been selected for long life and their manufacturer assures us that a bearing life of up to eight years can be expected.

The weather station is housed in a very rugged twin skin (thermally insulated) powder coated aluminium case which is aspirated by a specially dipped (to provide resistance to high humidity) 12V DC computer fan.

2. System layout suggestions



The ideal installation will have a plant room at one end of the greenhouse (the south end in the Southern Hemisphere/ North end in the Northern Hemisphere) to locate the control equipment. This room should be constructed to provide a dry, shaded and well ventilated environment for the controllers. Typically, the Weather Station (or outside enviro sensor) will be mounted on an outside wall of the plant room and the wind gear (if used) will be mounted at the same end, about 1.5m above the apex of the house. Bear in mind that a single Weather Station (or outside enviro sensor) can supply weather data to a number of greenhouses and in this case will normally be mounted on an end house in a row of greenhouses. The end chosen should preferably be the end most exposed to any strong prevailing winds.

The rain sensor should be mounted at a 30 deg angle to allow large drops of rain to run off. The internal heater will then dry off any remaining droplets. Always mount with the cable entry at the bottom to avoid water entry.

The solar sensor should be mounted exactly horizontally in a position where it will not be shaded by nearby structures, poles or trees. A spirit level may be used for best accuracy.

Inside the house, the inside Enviro Sensor (temperature/RH) aspirated boxes are suspended on chains so that their height can be adjusted to ensure that they sample the air from just above the crop canopy. Up to four Enviro Sensors may be used and their readings can be averaged in order to derive the most representative values possible. Each Enviro Sensor has a unique address (set by jumpers on its circuit board) and may have a solar sensor and/or a CO_2 sensor connected to it. It is a good idea to have more than one solar sensor so that when shadows fall on them from roof beams etc the average is not unduly affected. Internal light sensors should be positioned horizontally below any shade cloth and with maximum exposure to the northern sky (southern sky in the Northern Hemisphere). Full control is provided to allow which sensors are included in the "average value" which is used to control the environment.

In large houses, it may be desirable to divide the house into a number of environmental zones. In this case each zone will be connected to its own AutoVent controller which in turn will have its own Enviro Sensor boxes. By using separate controllers in this way any failure will be limited to a single zone.

3. Settings

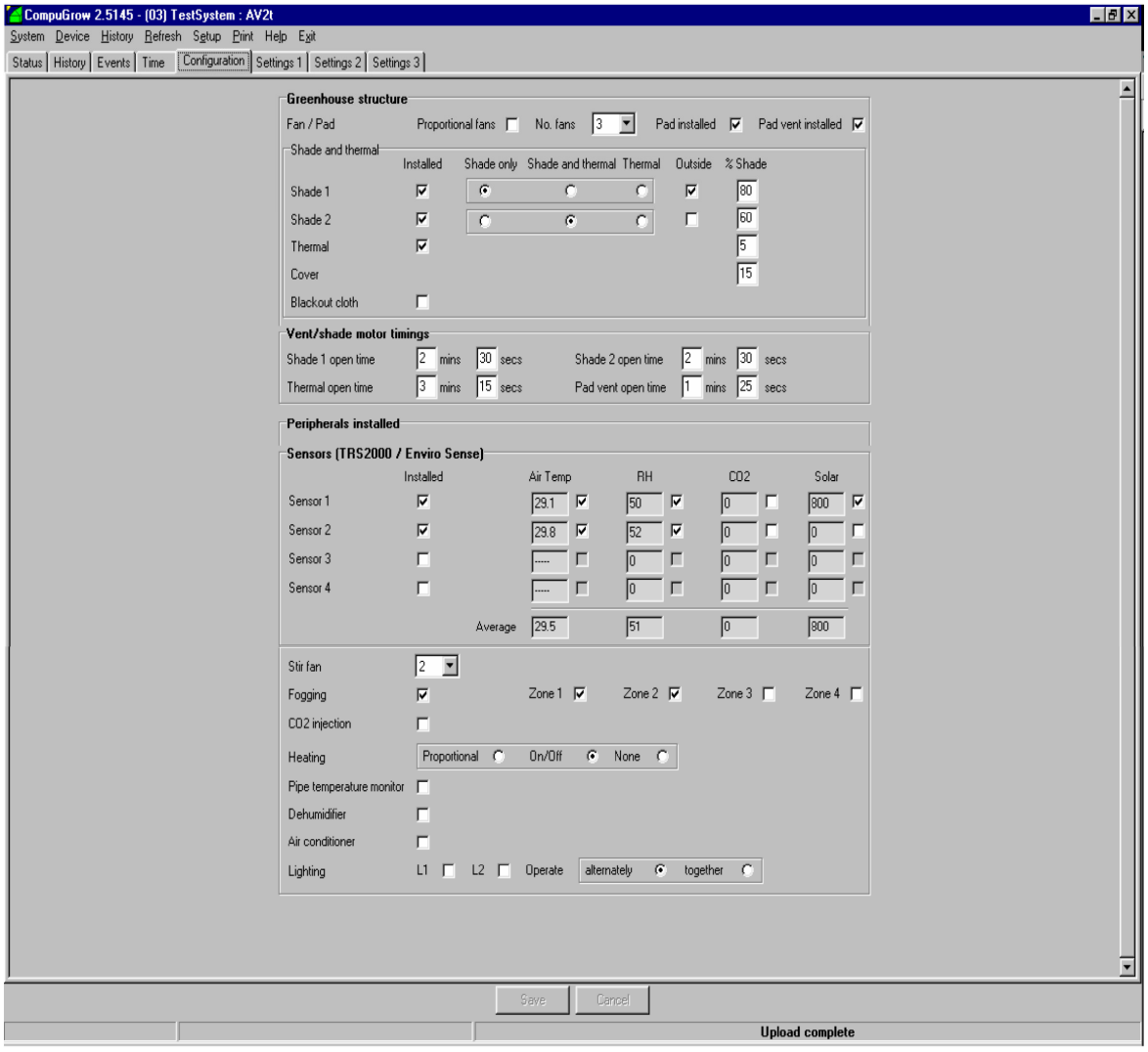
Introduction

It is far easier to set the controller from the PC than from its front panel as it avoids the tedium of entering, exiting and navigating the many menu screens. For this reason we will concentrate on entering settings at the PC. Once familiar with the PC settings, it is relatively easy to find the equivalent settings within the controller menu system.

General guidance for setting the controller

Refer to the CompuGrow software manual for instructions to establish communications between the PC and the AutoVent controller and once this has been established proceed as follows:-
We will work through the settings in the order that is most likely to be followed in practice.

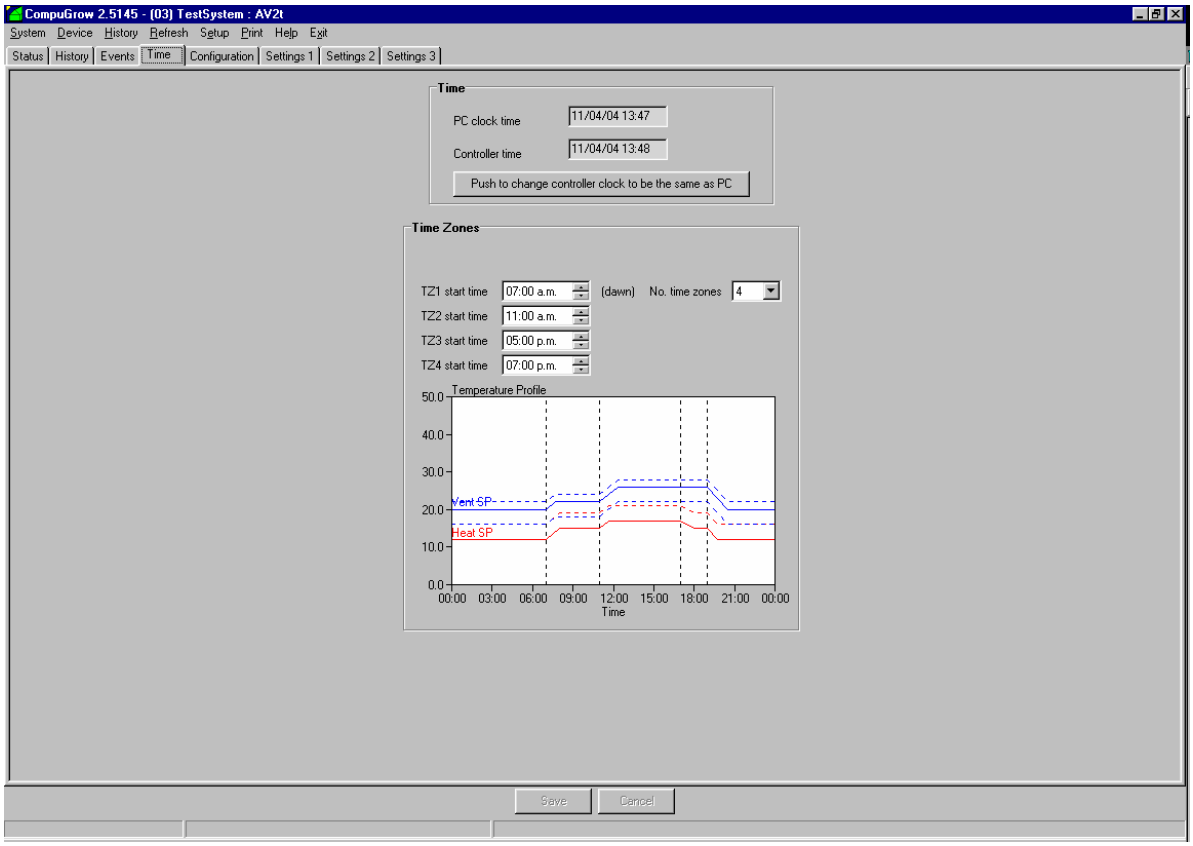
Configuration tab



The configuration tab is used to specify details about the installed equipment. Here you select the type of equipment installed. For example, the number and type of fans, shading screens, thermal screens and their individual shading qualities. You also enter things like the total run time (from fully open to fully closed) for the shades and pad vent.
The peripherals connected must also be selected. Note that you may install up to four inside enviro sensors. These can be positioned at key points inside the greenhouse. When doing this you must set the address of each sensor by changing its jumper positions as described in section 5. Then in the configuration tab, enable each of the enviro sensors and then tick each parameter that you want to be

used for calculating the average values. NOTE that it is the average values that are used for control purposes.
Also select the type of heating, lighting, CO2 injection, if you have an air conditioning unit or dehumidifier etc that you have installed.

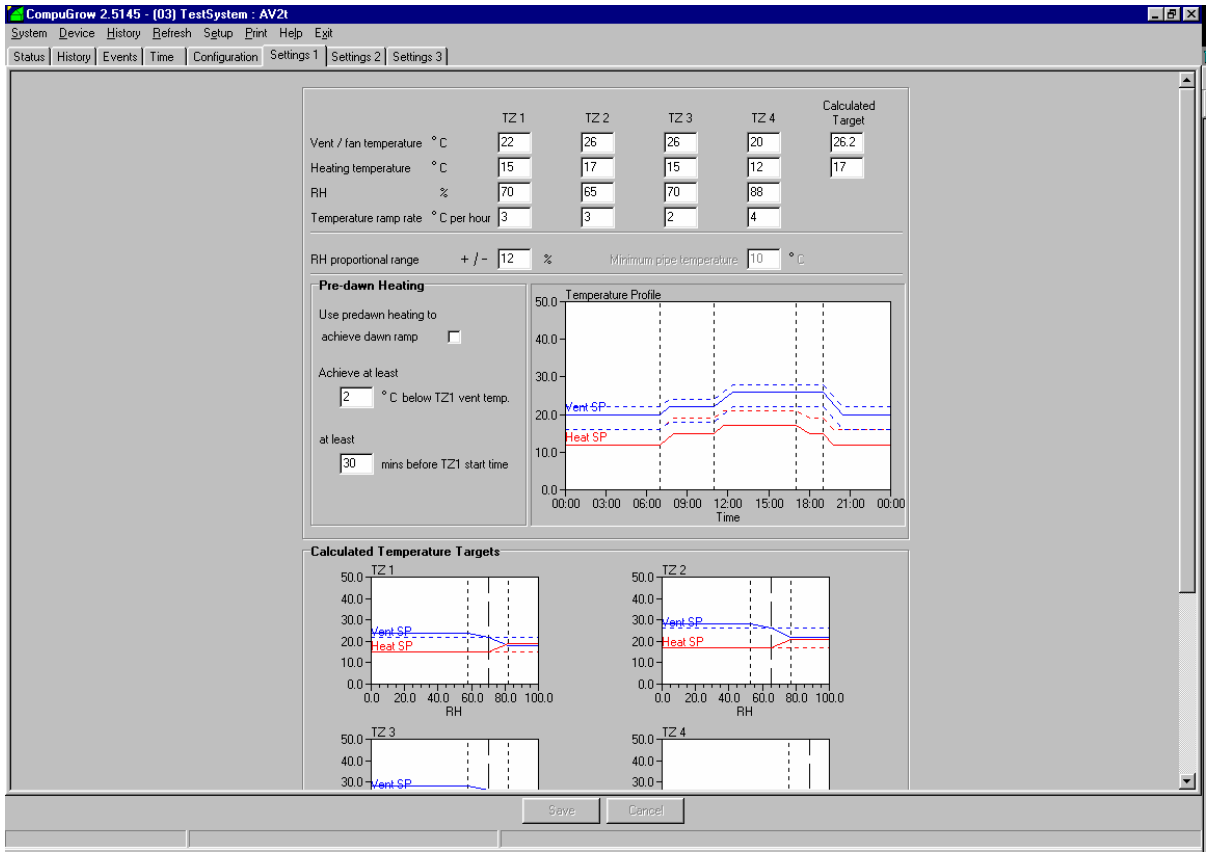
Time tab



The time tab is used to set the controller clock (by making it the same as the PC clock). Of course, it is a good idea to correct the PC clock and calendar before setting this. You also need to specify the start time for each time zone. Note that time zone **one** must start at dawn if pre-dawn heating is to be used.

Settings 1 tab
The three settings tabs allow you to enter all of the settings for temperature and humidity to construct the required profile for your crop. Settings 1 starts with the target temperatures and humidities for each time zone. It also has entries for maximum ramp rates between time zones. To assist you in visualizing the complete profile a graphical representation is displayed showing every change that you make. Note that at the end of the row of vent temperature set points and heater temperature setpoints is shown the calculated temperature set point. This is the actual set point that the controller is working to at this instant. It is derived from the set point for the current time zone, the relative humidity rules (at the bottom of settings 1 tab) and the maximum ramp rate. You may overwrite these calculated set points if you want them to change quickly and avoid having to wait for them to slowly change due to the ramp rate setting. NOTE: It is the calculated set point that the controller tries to achieve.
The rules for modifying the target temperatures to take into account high or low humidities are also entered at the bottom of settings 1 tab, and again, a graph for each time zone can be viewed in order that you can see the effect of the rules on the temperature set points. Note that these rules modify the

target temperature setpoints to create the “calculated target” setpoints shown at the end of the row of setpoints for each time zone. These rules allow you to set limits on the amount of deviation you will permit in the target venting and heating temperatures in order to try to control humidity.



Settings 2 tab

The second settings tab holds a range of less frequently changed settings.

Purging is used to force an air change during cold weather when the ventilation fans will be stopped. This is done for two purposes, first to reduce humidity and second to bring in CO2 from outside. Purging for humidity reduction is achieved by rules that specify the RH value at which purging should commence. Purging to achieve an air change and CO2 replenishment is best done by “timed purging”. In both cases, the fans to be used and duration of purging is specified by the user. These setting will tend to change with seasons with longer, more frequent purges allowed during very humid, cool (but not freezing) conditions and shorter, less frequent purges during freezing weather.

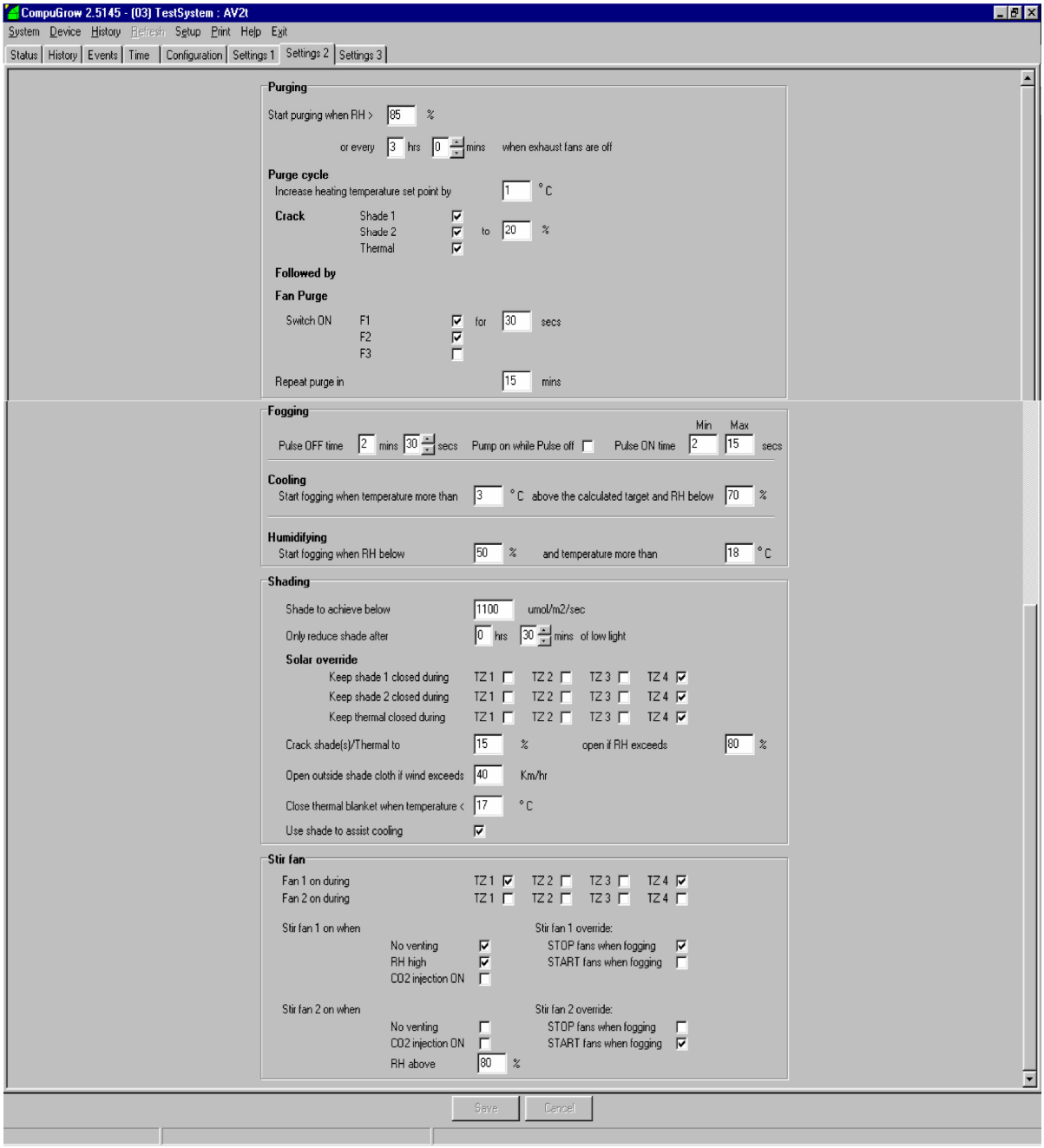
When purging for high humidity, the heating set-point may also be elevated to help dry the cool fresh air entering the greenhouse.

Alternatively, a dehumidifier may be used. This has its own humidity set point above which it is switched on. When fogging is operating the dehumidifier is automatically shut-out and can not come on.

Fogging is used for both cooling and humidifying purposes. If fan/pad evaporative cooling is installed then fogging is more likely to just be used for humidification as the fan pad will cool and humidify the air when hot. Note that when using fogging for cooling a shut-out humidity may be entered above which fogging ceases. Similarly, when fogging for humidification, a shut out temperature is used to prevent fogging when too cold.

The shading rules are reasonable self explanatory. Shades are applied in an intelligent way to try to achieve an inside light below the target set point. Shades always move in such a way as to protect the

crop. For example, when swapping from shade 1closed to shade 2 closed, first shade 2 will close and then shade one will open so the crop is never exposed to severe radiation levels.

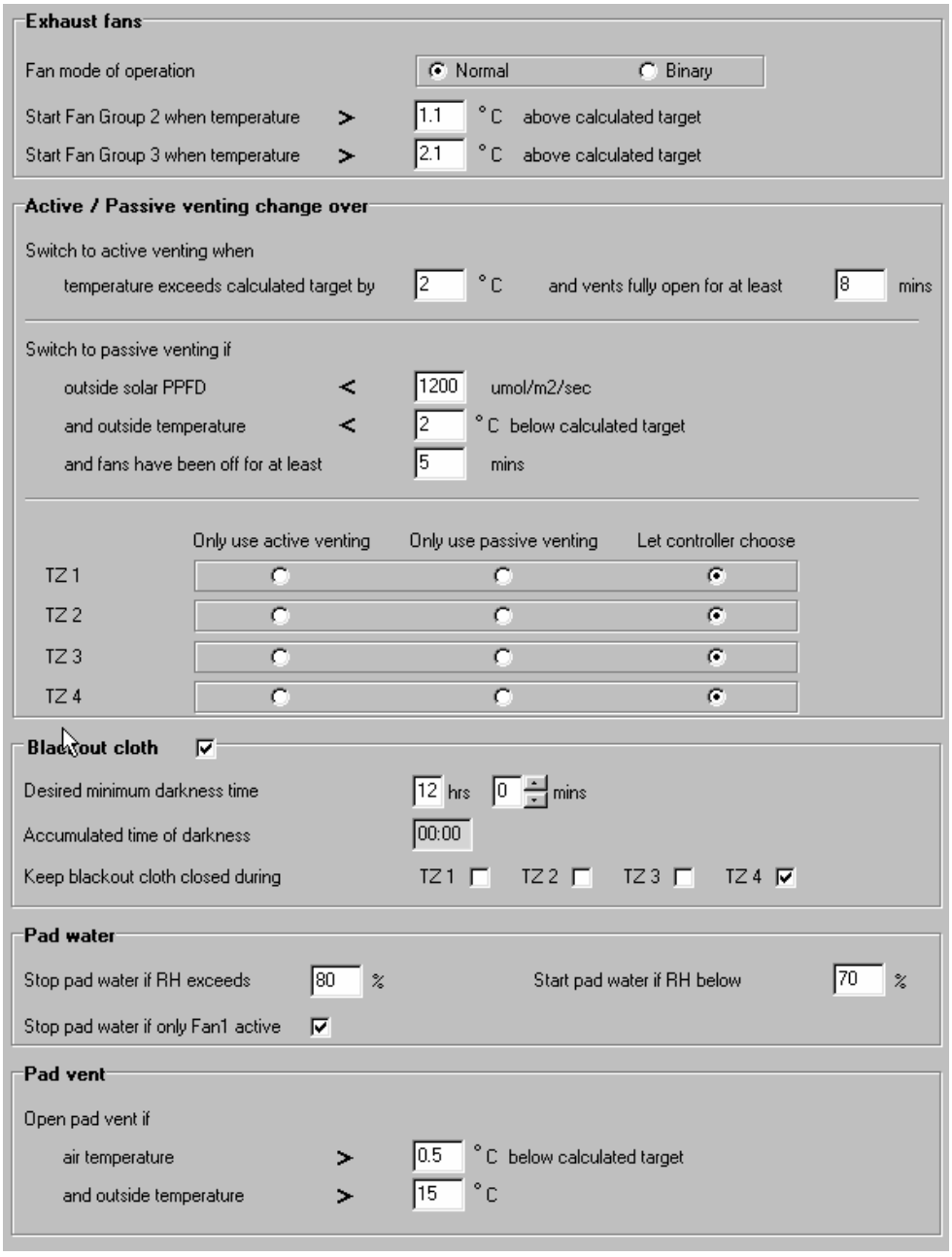


Once a shade closes due to high light levels it will not reopen immediately but will stay closed for the time set before reopening.
Shades/thermal screen may be set to “crack” open if humidity becomes excessive.
For outside shades a wind override may be set to withdraw (ie open) the shade to prevent damage.
The thermal blanket or screen may be set to close on low temperature as an option to forcing it closed during a time zone.
The setting to use shade to assist cooling will cause the outside shade (if fitted) followed by any inside shades to close if the temperature rises above the calculated set-point when all fans and pad are running.
Stir fans can be arranged in two banks which can independently be forced ON for any time zone in addition to the conditions that can be specified to activate them. Normally, the stir fans are left

running when fogging but if condensation on the fan blades unbalances them they can be set to stop during fogging.

Purging may be set so that if the RH exceeds the set point then the heating set point will be raised and periodically the extraction fans will start for a short time. The idea is to expel the humid air and then warm and dry the fresh air which replaces it.

Settings 3



Fan and Pad

If the vents are fully open and the temperature continues to rise then the system will switch over to fan/ pad control. This will also occur if the temperature rises when the vents are disabled or restricted from opening fully due to wind or rain. The exact point at which this happens can be set by the user. Once switched to fan/pad, the system can switch back to passive venting only twice during any time

zone. This is to avoid the possibility of the system constantly cycling between passive and active venting.
There are two modes of operation for the fans "normal mode" and "binary mode". Each of the three fan banks has its own set point. These are based on the time zone setpoint plus an offset for each of the fan banks. Bank 1 has zero offset and banks 2 and 3 have a user set offset applied. Typically, bank 2 will have an offset of 1 to 2°C and bank 3 an offset of 2 to 4°C
Normal mode
On entering the fan pad mode the system looks at the measured temperature and switches on the appropriate number of fan banks. These will start up with a 5 second delay between each group to avoid excessive loading on the electricity supply. After a further 3 minutes if the setpoint is still exceeded (by more than the 0.5°C differential) then the pad water will start providing the RH is below its set point. If all fans are on then the pad water will start if the RH is below its maximum level. Once started the pad water will stay on until the RH exceeds the max level or the temperature drops below the bank two setpoint. Once it turns off, it will only come on again if the RH falls below the pad water RH low level (or if all fans are on it will come back on again after 20 mins if the RH is below the RH max level).

Binary mode

In binary mode the fan banks must be arranged in a "binary weighted" sequence so that bank 2 has twice the effect of bank 1 and bank 3 has twice the effect of bank 2. The controller then operates in a similar way to the normal mode except it tries to switch on combinations of the fan banks to achieve exactly the amount of cooling necessary. By choosing combinations, 7 levels of cooling become possible instead of just the 3 available in normal mode.
Just as in normal mode each bank has its own setpoint and as soon as the temperature exceeds that setpoint the highest bank of fans allowed for that setpoint will come on. Then, at 3 minute intervals, lesser fans will come on in binary sequence until the temperature no longer exceeds the setpoint (+0.5° differential). At each 3 minute step, the RH is checked to see if the pad water can be activated instead of the next level of fans.

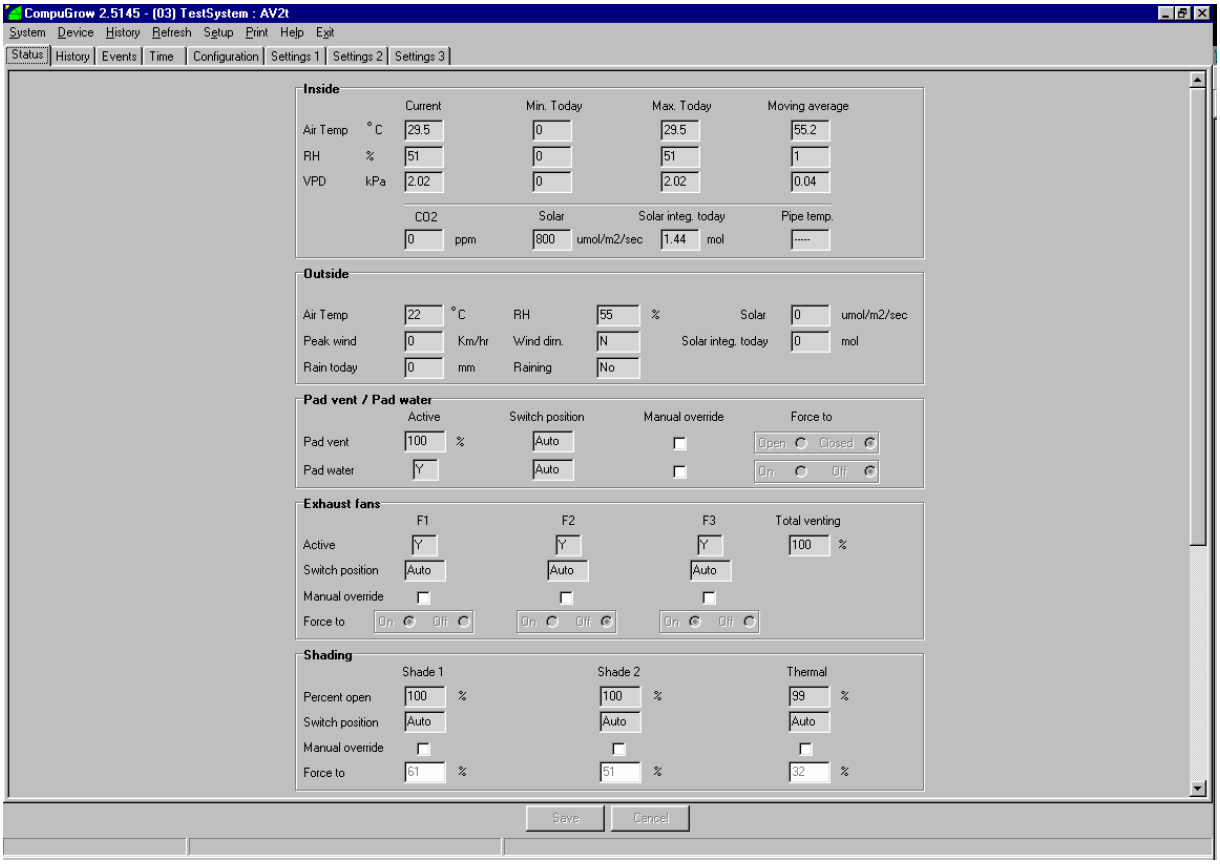
Blackout control

This output can be used either as a dedicated thermal blanket or for blackout cloth control. When used for blackout it can be set to operate during specified time zones and to keep closed for a specified time per day. Usually the time zones chosen are TZ3 (evening) and TZ1 (morning). When set this way it is important that the end time of TZ3 is late enough to ensure almost total darkness when the cover is removed. Similarly, TZ1 must start well before the sun comes up. When all blackout cloth is closed it is possible for humidity to build up. Purging may be enabled to crack the blackout and at the same time crack the roof vents to allow the humidity to escape. Note however that for some plants the dark period must be continuous in which case this method cannot be used. If this is the case then the exhaust fans can be specified to be used to switch on for short periods to purge the humidity. The blackout will open during TZ1 when the required dark period has been reached.

Lighting

Two outputs for supplemental lighting are provided. This allows lights to be arranged in two banks which may be switched on alternately to ensure a lesser draw on the power supply as compared with a single large bank or alternatively to provide one bank for photoperiod manipulation and the other for supplemental lighting. The lighting algorithm may be used to either provide minimum day length, a minimum light level during some time zones or to top-up the accumulated sun-light for the day. In the last application it can be set to operate only during hours when electric power is available at a lower rate. A 52 week schedule of required light levels and day lengths may be entered to cause an automatic update of settings every Saturday night.

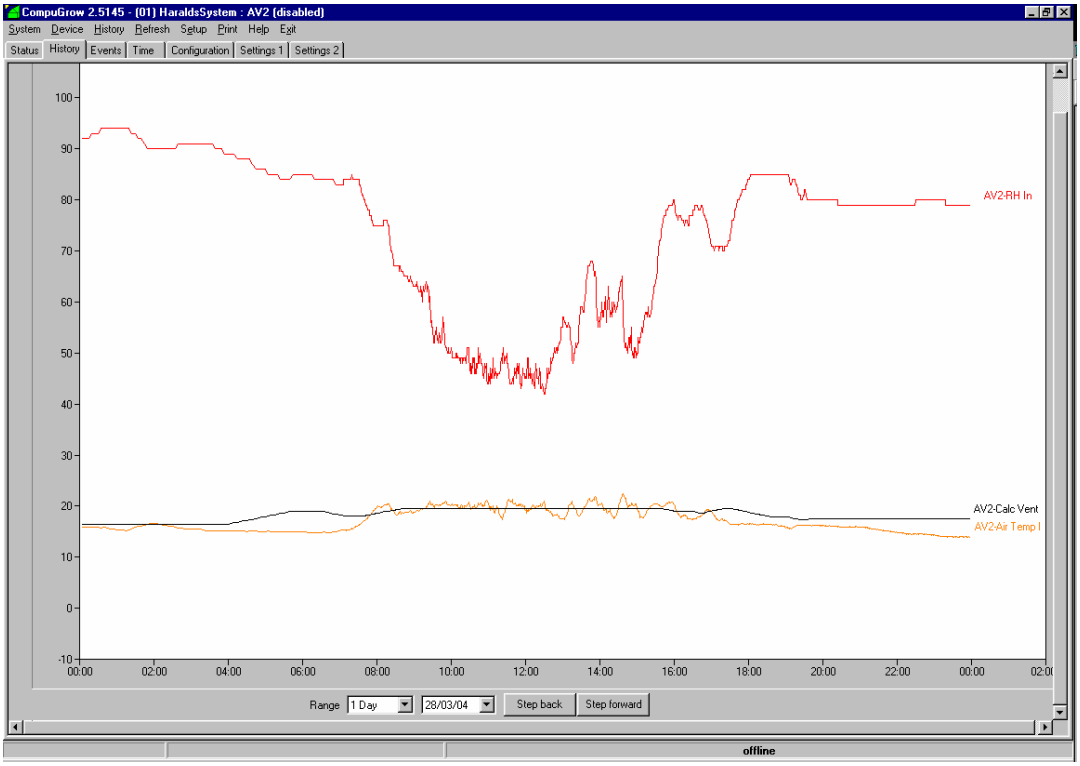
Status tab



The status tab shows the current readings and status of the environment both inside and outside the greenhouse. It also shows the current fan status and allows you to force them on or off. It also allows you to see if other functions are currently active and it will allow you to disable or force some functions to become active. In the case of most output functions you can also see the position of the manual override switch on the controller itself. Of course of this has been left on manual, it is impossible to change an output from the PC and you have to go to the controller to physically move the switch.

Remember that when forcing fans on at the PC, the controller will automatically open the pad vent before the fan comes on. However, when using the manual switches on the controller, it is the users responsibility to always open the pad vent BEFORE switching on any fans.

History tab



The history tab allows you to view graphs of all of the main measured variables. Note that the vertical scale is marked from 0 to 100%. For some variables this requires some interpretation as follows:-
Temperature – read directly in deg C or deg F
RH - read directly as a percentage
Solar irradiance - 100% corresponds to 2000umol/m2/sec
CO_2 – 100% corresponds to 2000ppm
Wind speed – read directly up to 100KPH
Wind direction 0 = North, 5 = NNE, 10 = NE, etc etc up to 75=NNW
Rainfall – read directly in mm of rain
Venting percentage – read directly as % open
From the history tab, you can select History View on the main menu bar and can then switch on/off all variables and change the graph colours to obtain the view you require

Events tab

The events tab provides you with a detailed log of events and is very useful for trouble shooting. For instance, if you find the shade closed on a dull day you can look back in the log file to see exactly what time they closed and the reason for the closure eg too hot.

Saving and restoring settings

The controller settings can be saved/restored to the PC hard disk from menu item “setup/detailed device” accessed from the main menu bar. This is particularly useful when a controller is changed as the settings can be transferred to the new controller very simply.

The menu system on the controller

All of the above settings can also be viewed/changed from the menu system on the controller.

Installation

Introduction – general comments

All electronic equipment will last longer if it is installed in a dry, cool shady location. Normally, a plant shed adjoining the greenhouse is used to house the control equipment in which case it should be well ventilated and any water/chemical activity should be positioned away from the controllers to avoid splashes and fumes causing corrosion. Wherever the controllers are installed it is critical that they are shaded from direct sunlight as this can easily cause them to overheat.
Remember that equipment exposed to direct sunlight can reach very high temperatures (over 70 deg C) even when the air temperature is relatively cool. If the equipment case temperature exceeds 60 deg C the warranty will be void.
The power supply to the control equipment should be protected from voltage surges by means of surge arrestors fitted at both the main and sub distribution boards. Local electrical engineers will advise on the size required which depends on the locality and the frequency of electrical storms in the area. In situations with frequent power disturbances a power filter or UPS may also be required to ensure continuous control of the system.
Use STRANDED CAT 5 (PATCH CABLE) for all data cabling and connections to remote sensors. The stranded CAT 5 cable is much less prone to breakage as compared with the more common solid style CAT5 cable. For the connection between the wind sensors and the weather station we recommend Marine Grade security cable. Autogrow Systems normally carry a small stock of this cable.

Installing the AutoVent controller
Fix the AutoVent controller to a wall in a shaded, dry, cool position and run the cables through the holes in the bottom. Note that the cable entry is via a split removable panel which allows the plugs and the IEC mains lead to be removed. Use cable ties to provide strain relief and run the field cables up the left hand side of the box and loop them at the top so that they easily bend when the face plate is opened/closed. Number the plugs from top to bottom in case they are ever removed. Section 5 has all of the connection information and wiring diagrams for this. Fit the IEC mains plug to the internal socket and check that the voltage label on the controller matches the supply voltage.

Installing the Inside Enviro Sensor(s)
The Enviro Sensor(s) should be positioned just above the crop canopy in a representative position in the greenhouse. This means avoiding positions immediately in front of doorways or other positions that may experience draughts etc. By suspending it on a chain, it is easy to raise the sensor box as the crop grows. If more than one Enviro Sensor is installed then position these to get wide coverage of the greenhouse. These are then wired on a common cable which loops from one box to the next in "daisy-chain" fashion. Note that the terminator should be removed from all enviro sensors except for the one at the end of the cable. Also note that the communications address for each Enviro Sensor must be set by installing jumpers as listed below.

Address	Jumpers fitted
1	None
2	B
3	C
4	B and C

RH Calibration
If the enviro sensor has a label attached marked " CALIB +/- xx% then you will need to ensure that the calibration is set to +/- xx% on the controller. For example, if the label states Calib -7% then go into the calibration screen on the controller <enviro\calib> and then adjust the calibrated reading until it is 7% less than the raw reading. If more than one enviro sensor is used then adjust the calibration to achieve the average of the calibration factors for each enviro sensor.

Installing the Weather Station

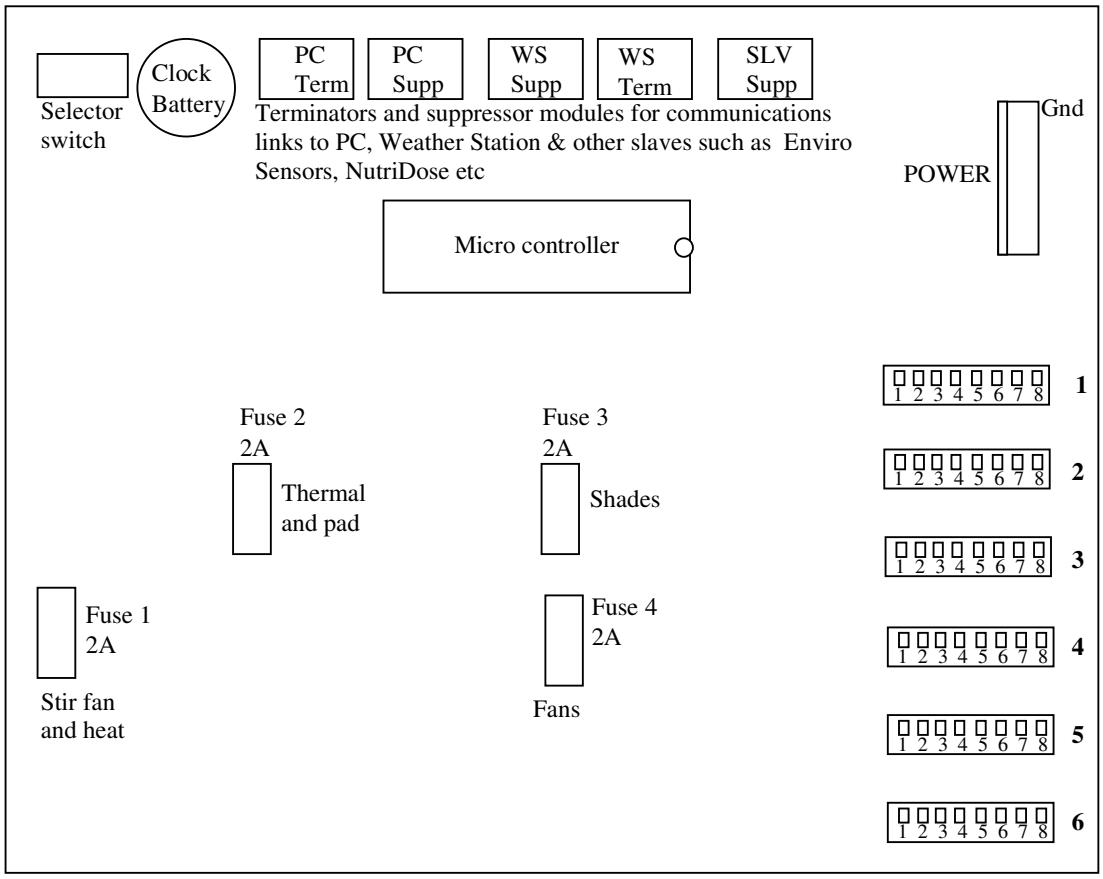
The wind gear should be installed about 1.5m above the apex of the greenhouse. If the Weather Station is to provide data to more than one AutoVent then it should be installed on a greenhouse at the end of the row, preferably in a position that has maximum exposure to any strong prevailing winds. The solar sensor may be installed at ground level or if this is liable to be shaded from the sun then it should be installed on the wind gear cross beam. Ensure it is on the northern end of the beam (southern end in the Northern Hemisphere) so that it is never shaded by the wind sensors. After connecting the cables to the wind sensors (see section 5 for connection diagrams) smear silicone grease over the brass terminals to prevent corrosion and then fit the plastic waterproof boots.
The Weather Station box should be installed in an accessible position where it can be easily serviced. The wind gear connects into the Weather Station and then the Weather Station connects to the first Autovent. Power to the Weather Station is provided from a 12V AC transformer external to the AutoVent controller. The reason for this is to limit the propagation of damage in the event of a high voltage surge due to lightning. Section 5 has full wiring diagrams for the Weather Station and wind gear.
Fit rain sensors on an angle of about 20 to 40 degrees (with cable entry at lowest end) so that rain drops tend to run off the sensor.
Fit solar light sensors horizontally. Do **not** tilt toward the sun. For best accuracy, use a spirit level Adjust the RH calibration in the same way as done for the enviro sensors.

Installing the PC interface

The PC interface box must be positioned close to the PC and is connected to the PC by means of a short standard serial cable. The PC interface box is powered from a small plug pack that supplies it with 12V AC power. The connection between the PC interface box and the first controller must be by means of a stranded CAT5 cable. See the wiring diagram in section 5.

4. Connection Diagrams

AutoVent 2t connections



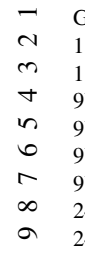
Note that the Terminators should only be fitted if this is the last unit in the daisy chain for that particular CAT 5 cable. For instance, if this is the last device on the cable going to the PC then the PC terminator should be fitted. If it is the last device connected to the weather station then the Weather station terminator should be fitted. Similarly, if it at the end of the CAT 5 cable connecting to slave devices such as the Enviro Sensors or Enviro Minders then again, the Slave terminator should be fitted. In all other cases the terminators must be removed. Note that this rule does not apply to suppressor modules and all of these should be fitted for maximum protection against induced voltage surges such as those caused by nearby lightning.

SELECTOR SWITCH

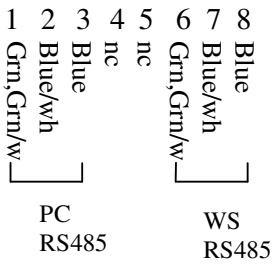
Only switch 3 is currently used.
When in the OFF position the Air Con output stays on continuously whilst in aircon mode. The system relies on the aircon thermostat to control the greenhouse temperature. When switch 3 is moved to the ON position, the aircon output continually switches on/off to control the temperature of the greenhouse, just as a thermostat would.

Autovent 2t Connectors

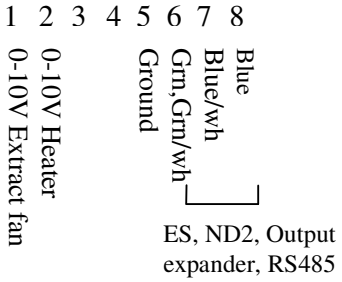
POWER CONNECTOR



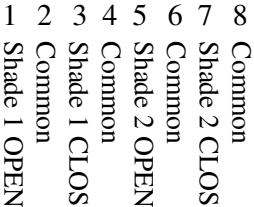
Connector 1



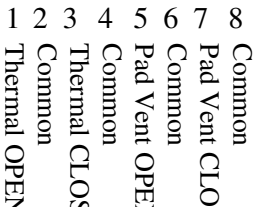
Connector 2



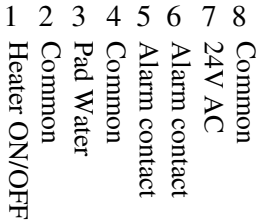
Connector 3



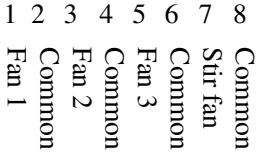
Connector 4



Connector 5

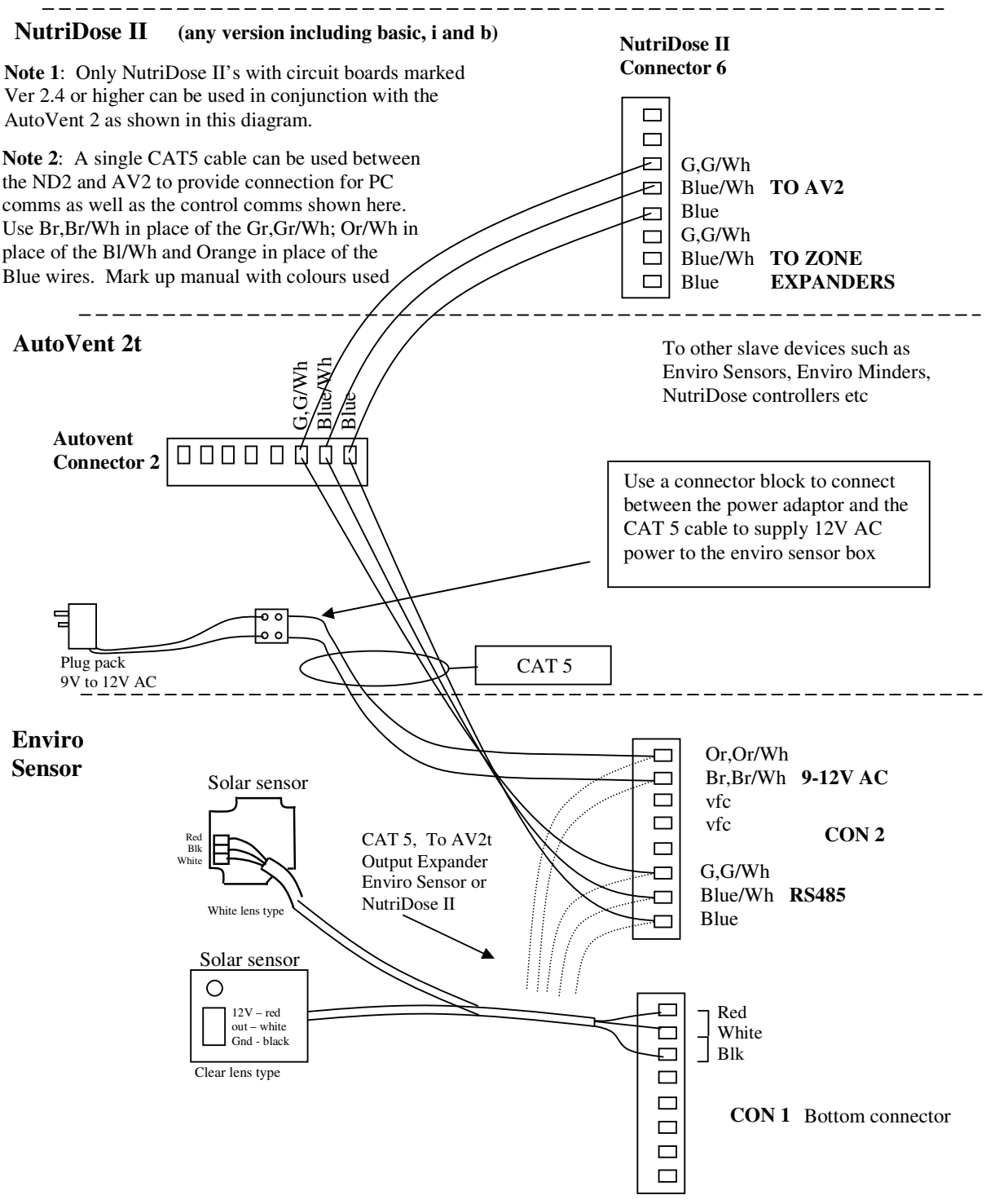


Connector 6

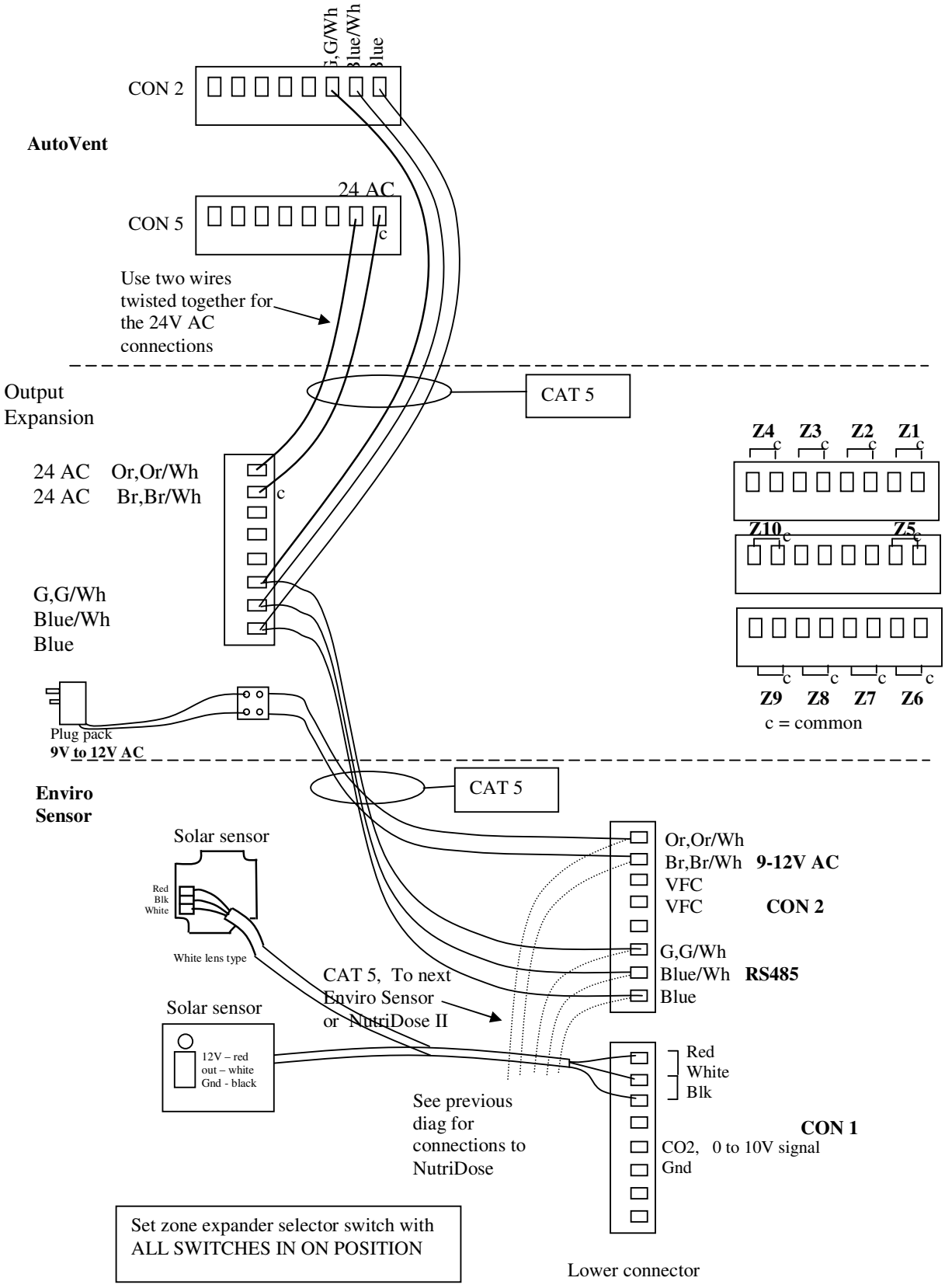


Enviro Sensor connections

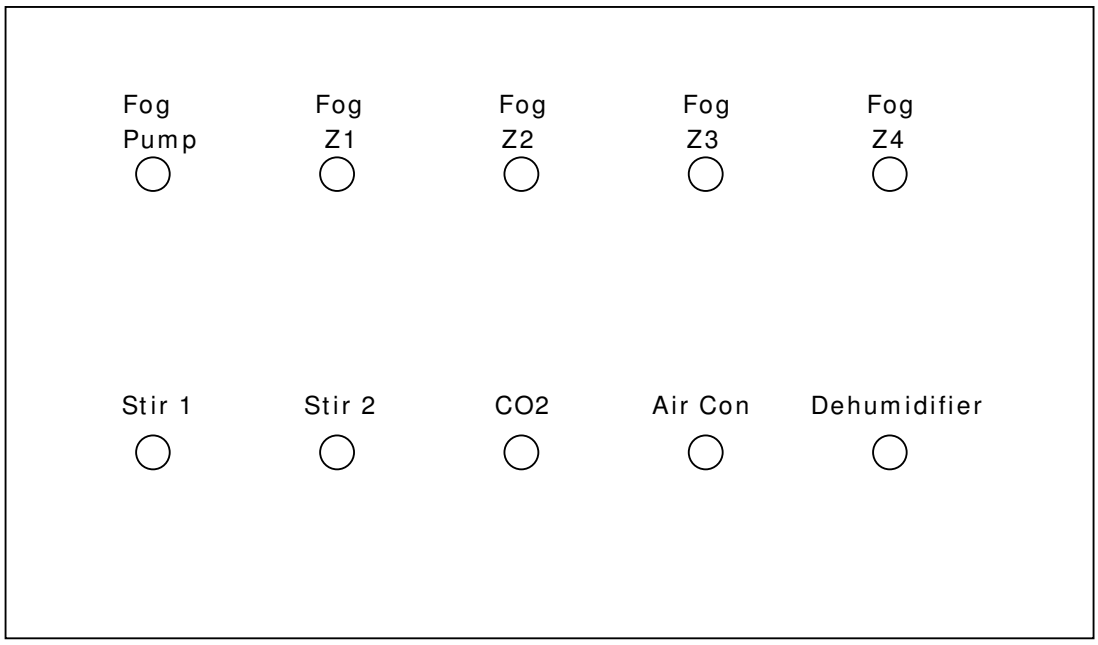
The Enviro Sensors along with any NutriDoses connect in daisy-chain fashion onto the peripheral RS485 bus from connector 2 on the AutoVent. Remember, only the devices at either end of this cable should have terminators fitted. All intermediate terminators should be removed. All devices should have their suppressor diodes modules left in place. These suppressors are to protect the circuit from induced voltage surges. If a severe surge is experienced it is possible for the diodes to fail and prevent communications on the bus. In this event they may be removed and new ones ordered from Autogrow Systems.



Connections from AutoVent2t to Output expander and Enviro Sensor(s)



Zone expander layout



Connections for zone expander (see diagram on previous page)

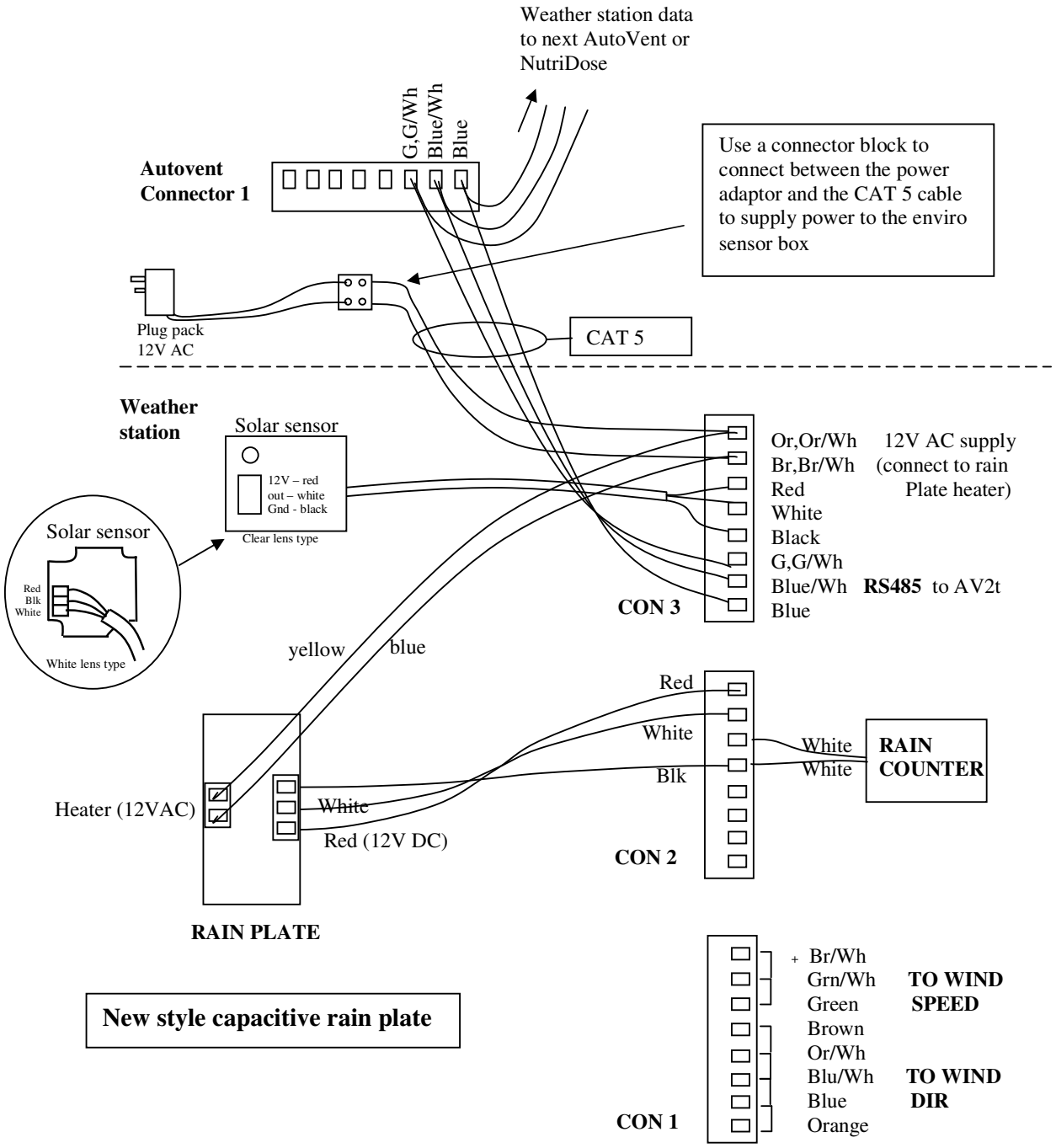
Z1 Fog Pump
Z2 Fog Z1
Z3 Fog Z2
Z4 Fog Z3
Z5 Fog Z4
Z6 Stir fan 1
Z7 Stir fan 2
Z8 CO2 injector
Z9 Air Con
Z10 Dehumidifier

Zone expander dip switches must be set so that all switches are in the ON position

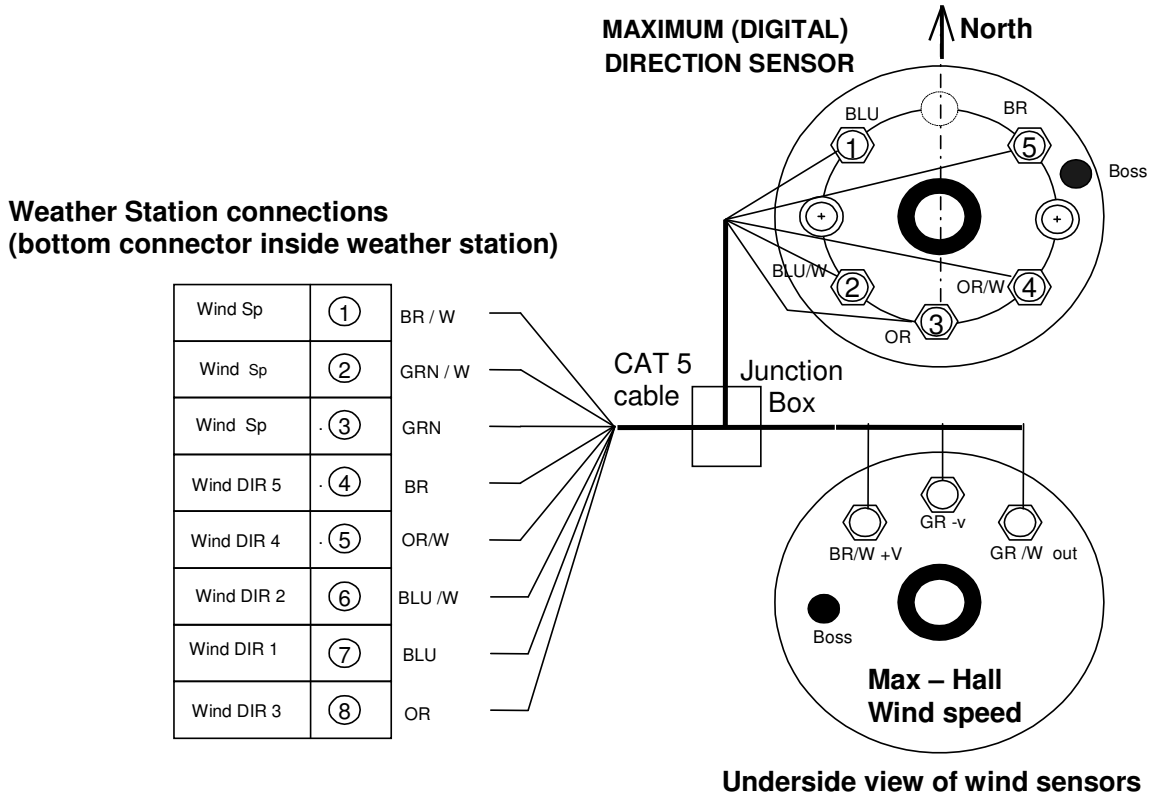
Weather Station connections

The Weather Station broadcasts a report of the weather every three seconds to as many AutoVent and NutriDose controllers that you have connected (maximum 128). The connecting bus (CAT 5 stranded cable) loops from one controller to the next. Only the two devices at the extreme ends of the cable should have their terminating modules installed. All intermediate devices must have their terminators removed. Note that the order of connection is not important and the diagram below shows only one possible ordering.

AutoVent



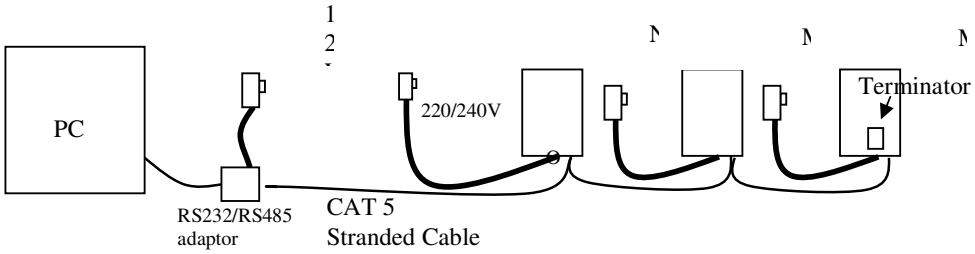
Connection of Wind Sensors



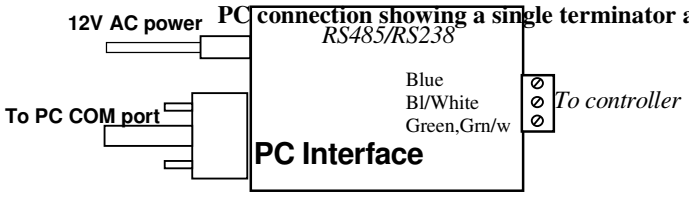
After fitting the wind sensors and correctly orientating the wind direction sensor to North, drill 3.5mm holes in the mounting bracket for the split pins to secure the sensors. Next rub either silicon grease or petroleum jelly (Vaseline) over the brass connections and wires and then fit the rubber boots to protect the connections from the weather.

Connections to PC

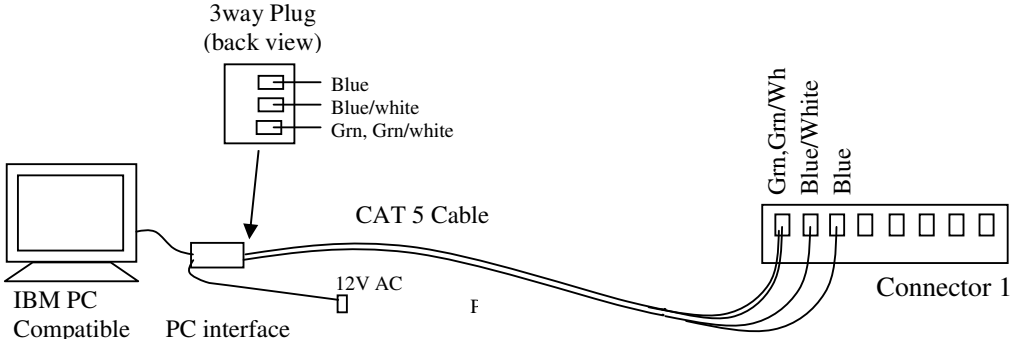
Use light coloured (so as not to attract heat) CAT5 stranded computer network cable between the PC interface and the AutoVent and/or monitors. This cable is "looped in" to each controller/monitor in a "daisy chain" fashion. The last monitor (and only the last monitor) in the chain must have a "terminator" fitted. Remember, when adding a further controller/monitor to remove the terminators from any monitor or controller between the PC interface and the last monitor in the chain. See connection diagram below.



PC connection showing a single terminator at the end of the cable



PC interface connections



Connection of PC interface to the AV2 controller

5. Maintenance

Very little maintenance is required and will vary depending on the environmental conditions.
Periodically clean the air intake to the Weather Station and the environment sensor boxes. Check that the fans are running smoothly. Replace fans (12V DC ball bearing computer type)
Note that the fans supplied by Autogrow are specially coated in water repelling varnish to make them more moisture resistant.
Clean the rain plate on the weather station with a soft damp cloth. Be careful not to scratch the surface which is coated with two thin layers of UV stabilize epoxy paint. If this surface is ever scratched it should be immediately touched up with a thin coat of high grade exterior paint – preferably epoxy.
Check the humidity reading and if incorrect replace the electronic sensor. This sensor will need to be replaced every year or two.
Keep all controllers clean and dry and free from vermin and pests.

6. Trouble shooting

Fans

Test the fans individually on manual (REMEMBER TO OPEN THE PAD VENT FIRST). If they work on manual but not on auto, then check temperature settings, humidity rules and ensure that the system is set for air conditioning only if air conditioning is installed and switched on.

Heating

Proportional heating
If the heating does not come on when the greenhouse is cold, check the following:-
a) the heating set point and the measured temperature
b) the position of the modulating valve – if the valve is open then check why the boiler is not on.
c) try switching to manual, switching the heater on and turning the knob clockwise to open the modulating valve. Observe the valve to ensure it is working properly

ON/OFF heating
Switch to manual and observe if it operates. If it operates on manual then check settings and temperature reading to try to find out why it is not operating

CO_2

If the CO_2 is not injecting, check to ensure that the light level exceeds the setpoint, the vents are closed (below the maximum open position) and that CO_2 injection is enabled for this time zone. Check also the CO_2 reading and CO_2 set point.

Shading

If the shading is not operating, observe that it operates correctly on manual. If it does not operate and the light doesn't come on then check the fuse for this circuit (see main connection diagram). If the light does come on but the screen doesn't move then check if the overload in the relay box is tripped.

7. Warranty

The warranty on the controller, wind sensors, rain sensor, solar sensors and temperature sensor is limited to 2 years – return to factory. Before returning the unit for service you must call Autogrow Systems Ltd for a return authorization .
RH sensors and fans carry only a 6 month warranty from their respective manufacturers.
This warranty specifically excludes any parts that have been broken or damaged by water, chemical attack or excessive temperature. In particular, the controller and PC interface must be stored and used in a dry, shaded and well ventilated situation. At no time must the case temperature be allowed to exceed 60 deg C (140 deg F).

This warranty specifically excludes liability for consequential damages or for charges for labour or other expense in making repairs or adjustments, or loss of time or inconvenience.