EVAPOSENSOR MISTING CONTROL
INSTALLATION AND OPERATION

The Evaposensor consists of two temperature sensing ‘leaves’ each with a temperature sensitive element formed by wet and dry platinum resistance Pt100 temperature sensors. One leaf remains wet via a wick immersed in a reservoir of distilled water, the other ‘dry’ leaf gets wetted periodically by bursts of mist or fog. Unlike conventional wet and dry hygrometers housed in an aspirated screen for measuring humidity, the Evaposensor is placed in the misting environment just above cutting height where it will be influenced by solar radiation, air temperature, humidity and air movement – i.e. the drivers affecting the rate of transpiration loss from the cuttings.
Evaporative cooling from the wick normally keeps the wet leaf cooler than the dry leaf during the day, except when the dry leaf is wetted by mist or fog The difference in temperature between these artificial leaves is called Wet Leaf Depression or WLD. The higher the WLD the greater the rate of evapotranspiration. Periodic misting or fogging will wet the dry leaf which is subject to evaporative cooling causing the WLD to rapidly drop, rising again as the wet leaf dries.
The Evaposensor accurately controls mist or fog in propagation, as it senses WLD in an analogous way to the transpiration stress experienced by cuttings or a plant and is approximately proportional to the evaporative demand on the real leaves of plants or cuttings. Misting frequency will be automatically adjusted to changes in the weather to accurately reflect changes in evaporative demand.
The Evaposensor is more reliable and accurate than the electronic leaf.
The Evaposensor is also better than controlling mist by light integration as it factors in air temperature, movement and humidity

The difference in temperature between these artificial leaves is approximately proportional to the evaporative demand on the real leaves of plants or cuttings.
The Evaposensor can act as stand alone misting controller, a fog control system (‘wet’ or ‘dry’ fog) or as an evaporative meter that can be integrated with an E&TS irrigation controller to automatically adjust watering requirements.
A digital meter continuously displays the current ‘wet leaf depression’ a measure of evaporative demand and thus of stress on unrooted cuttings.
The wet and dry sensors are connected to a differential amplifier, which cancels any common bridge error signals.

EVAPOSENSOR CONTROL

Any small difference in bridge resistance and connecting cable is cancelled by the adjustment of the ZERO control. This is normally set only when a new sensor has been connected. However it can be checked at regular intervals if so desired.

For mist or fog control the SET POINT can be adjusted from1ºC or less to maintain a very wet regime for soft and stress sensitive cuttings, right through to 10ºC for cuttings that need very dry conditions e.g. succulents.

The Evaposensor has three different types of output:

1) Relay with Change over contacts, voltage free.

2) 24Vac for switching mist valves etc When wet leaf depression (WLD) exceeds set point a 24Vac signal switches on the misting valve for the time set in seconds by the ON SECONDS control (adjustable from 0 – 10 seconds). This output switches off for a period set by the OFF MINUTES control (adjustable from 0 minutes to 30 minutes).This process is repeated until the sensor is 'satisfied', i.e. WLD falls below the set point.

3) 0 – 20 mA non isolated linear current output. This can be connected to existing controllers e.g. E&TS 16 station irrigation controller and other common misting, fogging and irrigation control systems that are capable of integrating the signal and adjusting the watering times accordingly. It can also be used for remote display, data logging etc.

The DEMAND LED is on when WLD is above set point, i.e. when there is a demand for mist. Relay contacts closed

The OUTPUT LED is on when the 24Vac output is on. If the DEMAND LED is on but the OUPUT LED is off it will normally mean that the system is timing the interval between mist bursts (set by the OFF time control).

When the DEMAND led is illuminated a mist burst can be activated manually by pushing MANUAL START, when the OFF interval has timed out.

Endorsed by years of successful use for propagation of difficult subjects in a research environment at East Malling

Successfully field tested with excellent results on six commercial nurseries in HDC funded research (HNS 159).

Reports available from HDC

Based on sound theoretical concept (Harrison Murray), 1991.

Reference:

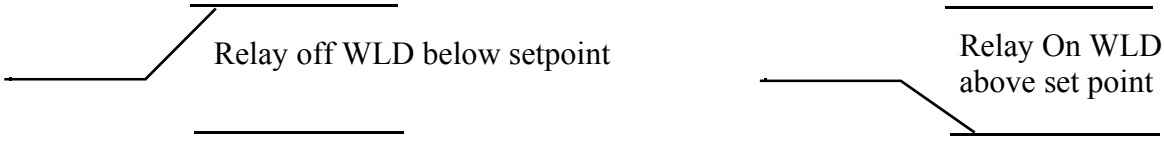
HARRISON – MURRAY, R.S. (1991). An electrical sensor for potential transpiration: principle and prototype.
Journal of Horticultural science, 66, 141 – 149

There are seven control modes:

1). Relay, single pole change over, controlled by sensor.
2). Relay, (and solenoid if connected), switched by cyclic function controlled by sensor.
3). Relay (and solenoid if connected), switched by cyclic function controlled by time.
4). Solenoid if connected, switched by cyclic function controlled by sensor.
5). Solenoid if connected, switched by cyclic function controlled by time.
6). Relay controlled by sensor. Solenoid if connected, switched by cyclic function controlled by sensor.
7) Relay controlled by sensor. Solenoid if connected, switched by cyclic function controlled by time.

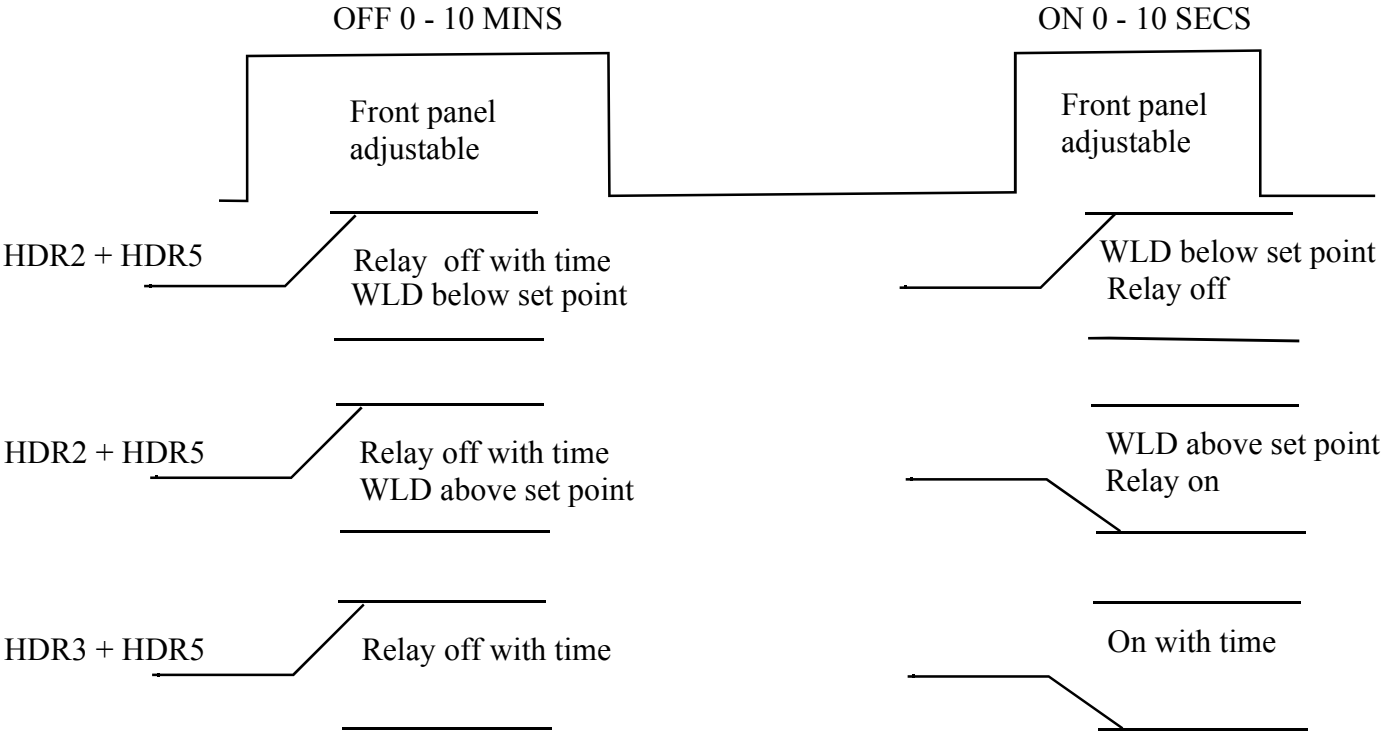
1) Select HDR4, relay on when the measured WLD exceeds the set WLD – off when the measured WLD falls below the set WLD, voltage free change over contacts. Action referred to as sensor control.
2) Select HDR2 + HDR5 relay (and solenoid if connected), operates when the wet leaf depression (WLD) Exceeds set point. Relay contacts will close for the time set in seconds by the ON SECONDS control (adjustable from 0 – 10 seconds). Relay contact opens for a period set by the OFF MINUTES control (adjustable from 0 – 30 minutes). This process is repeated until the sensor is 'satisfied', i.e. WLD falls below set point. This control action is referred to as cyclic with sensor (WLD) override.
3) Select HDR3 + HDR5, relay (and solenoid if connected) operates for the ON time, set on the front panel, followed by the OFF time, set on the front panel. This control action repeats continuously. This control action is referred to as cyclic, controlled by time.
4) Select HDR2 misting solenoid if connected, operates when the wet leaf depression (WLD) exceeds set point. The 24Vac signal switches the misting valve for the time set in seconds by the ON SECONDS control (adjustable from 0 – 10 seconds). The solenoid valve switches off for a period set by the OFF MINUTES control (adjustable from 0 minutes to 30 minutes).This process is repeated until the sensor is 'satisfied', i.e. WLD falls below the set point. This control action is referred to as cyclic with sensor (WLD) control.
5) Select HDR3 misting solenoid if connected, operates for the ON time, set on the front panel, followed by the OFF time, set on the front panel. This control action repeats continuously. This action is referred to as cyclic, controlled by time.
6) HDR2 + HDR4, relay controlled by WLD. Solenoid if connected, switched by cyclic action with sensor (WLD) control.
7) HDR3 + HDR4, relay controlled by WLD. Solenoid if connected, switched by cyclic action, controlled by time.

HDR4

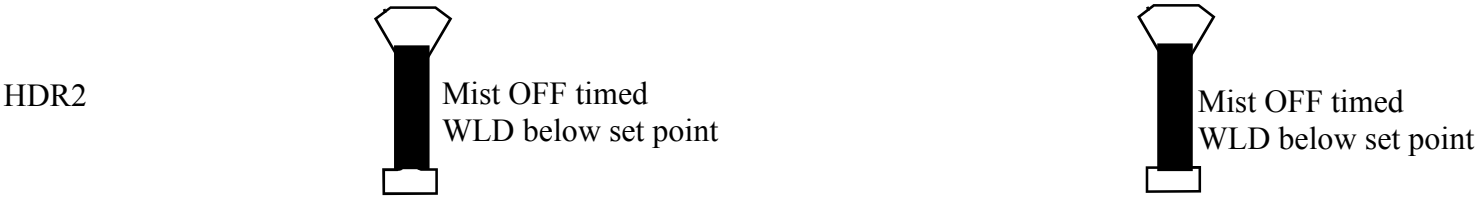


HDR2 + HDR5 Relay and solenoid if connected, switched by cyclic function, controlled by sensor.

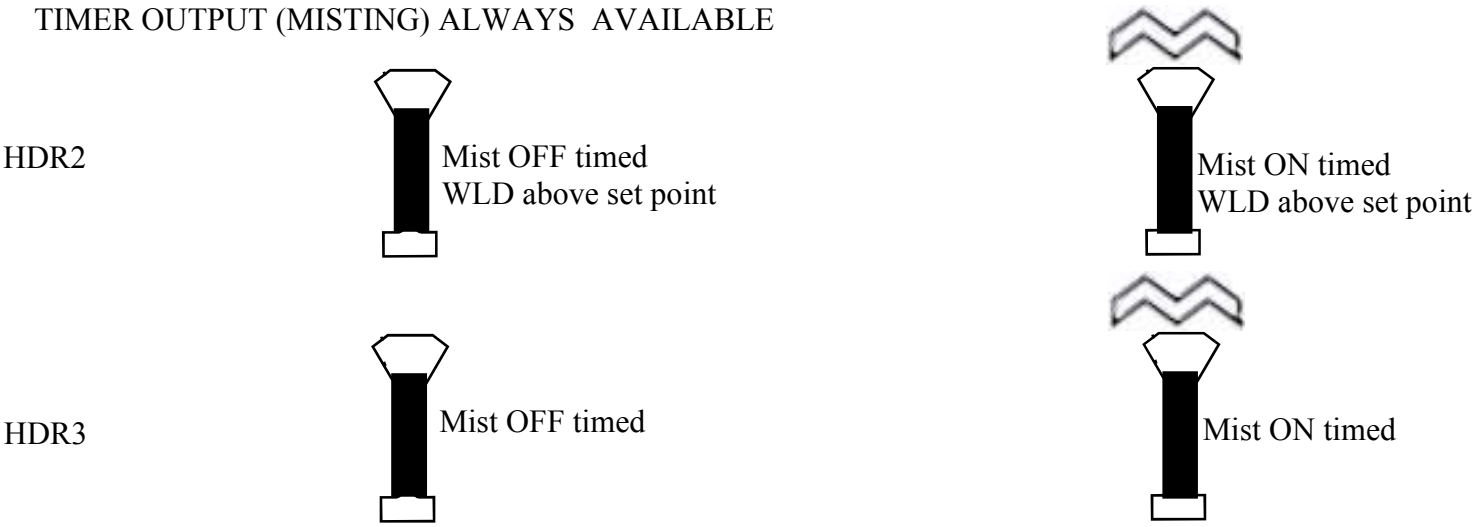
HDR3 + HDR5 Relay and solenoid if connected switched by cyclic function, controlled by time.



TIMER OUTPUT (MISTING) ALWAYS AVAILABLE



TIMER OUTPUT (MISTING) ALWAYS AVAILABLE



PERMISSIBLE JUMPER LINKS:

HDR4	**RELAY CONTROLLED BY SENSOR.**
HDR2 + HDR5	**RELAY (AND SOLENOID IF CONNECTED), SWITCHED BY CYCLIC FUNCTION CONTROLLED BY SENSOR.**
HDR3 + HDR5	**RELAY (AND SOLENOID IF CONNECTED), SWITCHED BY CYCLIC FUNCTION CONTROLLED BY TIME.**
HDR2	**SOLENOID, IF CONNECTED, SWITCHED BY CYCLIC FUNCTION CONTROLLED BY SENSOR.**
HDR3	**SOLENOID, IF CONNECTED, SWITCHED BY CYCLIC FUNCTION CONTROLLED BY TIME.**
HDR2 + HDR4	**RELAY CONTROLLED BY SENSOR. SOLENOID IF CONNECTED, SWITCHED BY CYCLIC FUNCTION CONTROLLED BY SENSOR.**
HDR3 + HDR4	**RELAY CONTROLLED BY SENSOR. SOLENOID IF CONNECTED, SWITCHED BY CYCLIC FUNCTION CONTROLLED BY TIME.**

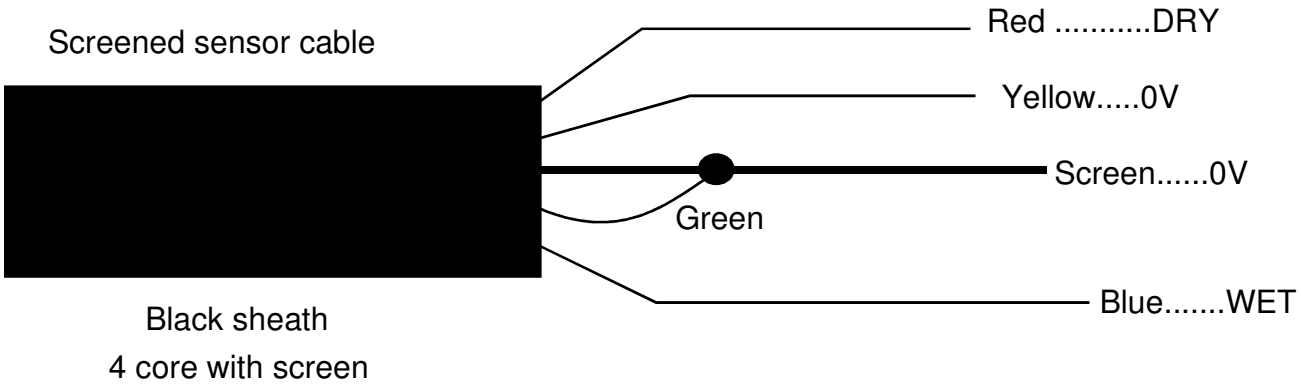
DEFAULT (FACTORY SETTING) **HDR2 + HDR4**

DISALLOWED, NO HARM JUST CONFUSION:

HDR2 + HDR3	**DEFAULTS TO CYCLING MODE**
HDR4 + HDR5	**DEFAULTS TO MIST CONTROL MODE**

ES4 Evaporation sensor

Fitted with two Pt100 temperature sensors



MAINTENANCE

Fill the reservoir with distilled water . Under no circumstances use tap water, otherwise the wick could rapidly clog up with lime deposit. Check on the level weekly and fill with a tubed plastic bottle.
The wick should be occasionally cleaned of excessive algae using an old toothbrush or similar.
New replacement wicks are available from E&TS Ltd.
Chipped paint on leaf sensors can be touched up with matt black board paint available from good D.I.Y. Stores.

POSITIONING OF THE EVAPOSENSOR
It is important to position the Evaposensor in the optimum position to get the best Results.

Ideally the sensor should be placed just above the height of the cuttings, this may involve placing the sensor unit on an inverted flower pot or other suitable object o that the wet and dry sensors are not shaded or sheltered from mist.

The sensor needs to be placed in a representative area so that it experiences the same mist conditions as the cuttings.

The sensor must not be covered or shaded. Position to the South side of any structures such as risers, pipes or stanchions to reduce the likelihood of sensor shading.

CONNECTIONS:

INPUTS
Please refer to diagram 1
SUPPLY
Connect a mains 240V ac supply to terminal block TB2
Brown to LIVE
Neutral to BLUE
Green/yellow to Earth.

SENSOR
Connect the evaposensor to terminal block TB1
Dry sensor to the block labeled ‘dry’.
Wet sensor to the block labeled ‘wet’
Returns and cable screen to the block labeled 0V

1) Connect the evaposensor, wet leaf to Wet and 0v on TB1, dry leaf to Dry and 0v on TB1. Connect both screens to 0v
2) Power up
3) Remove sensor top and fill reservoir with distilled water.
4) Remove wick from Wet sensor, invert top and immerse both sensors into the reservoir. Leave for 10 minutes
5) Stir water (not with finger as the heat could affect the zero point). Carefully adjust the zero control until 0.00 is displayed on DPM. It is ‘fiddly’ but you can do it ±0.001 or ±0.002 is acceptable but 0.00 is preferable
6) Leave for a further 10 minutes and repeat condition 4.
7) Replace wick and fit sensor top.
   This procedure need only be carried out when new or at the beginning of the growing season.
8) If you gently warm the Dry sensor the reading displayed will be positive, if the reading displays a (-) negative reading, swap the sensor connections over and re do zero calibration.

You can shorten the sensor lead BUT ON NO ACCOUNT LENGTHEN IT, by doing so you will void the warranty and introduce errors that will cause faulty operation.

OUTPUTS
Misting valve connected to terminal block TB3
0 – 20mA connected to terminal block TB4, direction sensitive
Change over voltage free contact connected to TB5

CONTROL SELECTION, Refer to page 4.

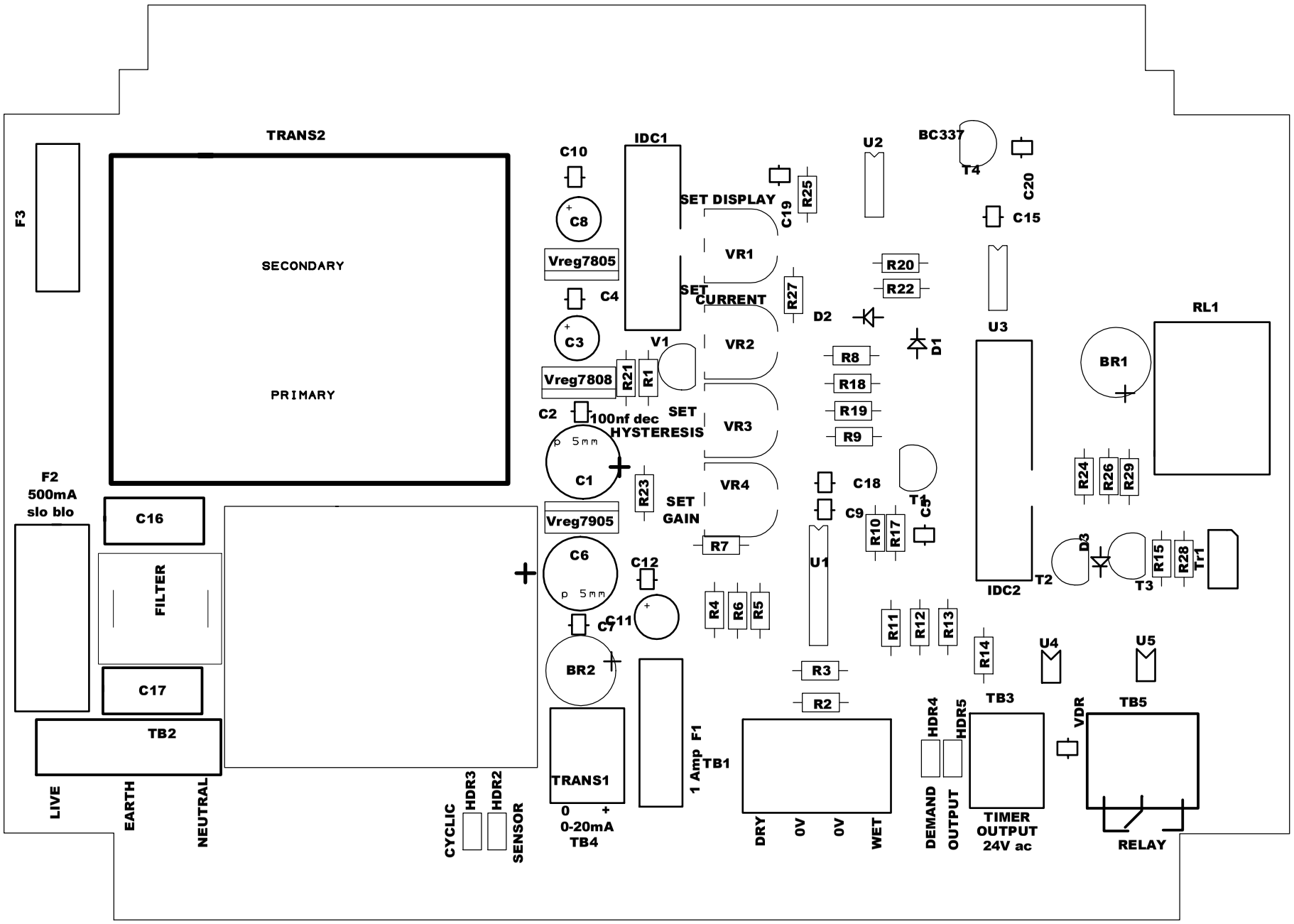
SAFETY
F1 1 amp quick blow 20mm control fuse
F2 500mA slow blow 20mm mains fuse
F3 1 amp quick blow 20mm 24v ac output fuse

SPECIFICATIONS
Control range 0º to 10ºC
Displayed reading -16ºC to 20ºC
Switching differential 0.15ºC
Bridge temperature drift 15ppm 5ºC to 50ºC zero
Bridge zeroing ± 0.1ºC
Maximum bridge error resistance 2 ohm.
High specification bridge differential amplifier with high CMMR.
0 to 20mA non isolated linear current output proportional to the wet leaf depression. Capable of driving long distance into a maximum 350 ohm load. (250 ohm to convert to a 0 – 5V signal, plus max 100 ohm line resistance).

The gain and range have been factory set and must not be adjusted, **do not adjust** VR1, VR2 and VR4.
The hysteresis level has been set at ±0.5 WLD and has a range from 0.1 to 1 WLD. For minimum setting turn VR3 a.c.w.

0V connected to mains earth.
Optical isolators switch the relay and triac outputs.
Input voltage 240V ac European harmonized.
Relay output: voltage-free contacts, change-over.
24V ac 800mA via triac or manual switch operation.
Splash proof box size 175mm x 150mm x 80mm.
Meets all CE requirements.

EVAPOSENSOR ARTWORK 02 09 2010



Declaration of Conformity

Name of manufacturer	E&TS Ltd
Full postal address	40 Acreville Rd Bebington Wirral Cheshire CH63 2HY
Country of origin	UK
Description of product	Evaporative Controller

Conforms to the requirement of the EMC directive 89/336/EEC, of low voltage directive 73/23/EEC and harmonised European and national standards.

Applied standards:	EN50081-1	EMC generic emission
	EN50082-2	EMC generic immunity

We declare that as the authorised representatives, the above information in relation to the manufacture of this product is in conformity with the stated standards and other related documents following the provision of EEC directives.