

Eii MK1.1 EvapoIrrigation Interface INSTALLATION AND OPERATION

The Evapoirrigation interface (or Eii for short), developed from the results of extensive Defra and HDRC research and nursery trials, is the latest addition to the E&TS range and further exploits their award winning EvapoSensor (ETS4 pt 100). It automatically adjusts irrigation frequency according to weather conditions, so that water applied matches crop requirements, saving water and improving plant quality. Particularly appropriate for small to medium sized enterprises, it is uncomplicated, grower-friendly and takes the guesswork out of deciding when to irrigate. The key feature of the Eii is its ability to integrate evaporation rate over time. It triggers irrigation when accumulated evaporation reaches a user adjustable target value. Simplicity is the key; fitting an Eii to an irrigation timer transforms it into an intelligent controller. It is compatible with any existing controllers that can accept a remote start signal.

The Eii is connected to the signal output of the EvapoSensor which 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 is exposed to the same conditions as the crop. The EvapoSensor is placed in the growing environment just above plant 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 crop.

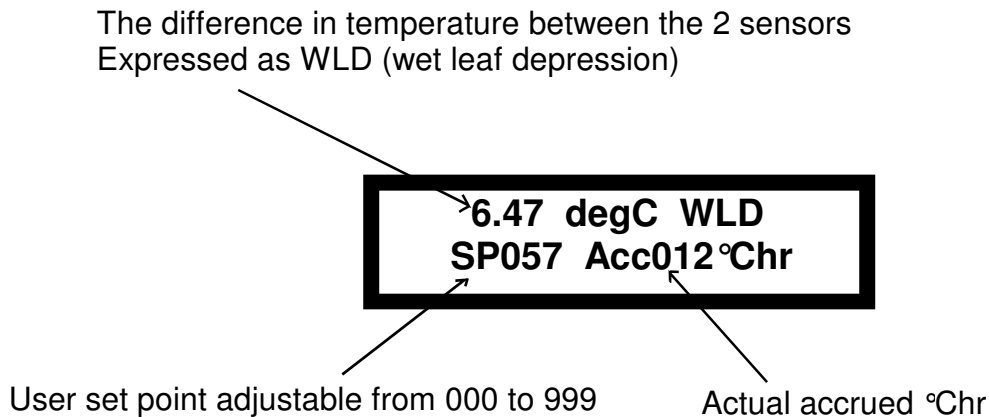
Evaporative cooling from the wick keeps the wet leaf cooler than the dry leaf during the day. The difference in temperature between these artificial leaves is called Wet Leaf Depression or WLD. The higher the WLD the greater the rate of evapotranspiration.

The EvapoIrrigator accurately controls irrigation frequency, as it senses WLD in an analogous way to the transpiration stress experienced by a plant and is approximately proportional to the evaporative demand on the real leaves of plants. Irrigation frequency will be automatically adjusted to changes in the weather to accurately reflect changes in evaporative demand.

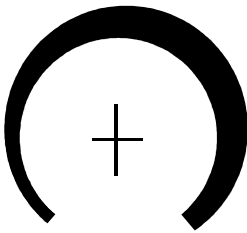
The EvapoSensor is better at controlling irrigation by light integration as it factors in air temperature, movement and humidity

The difference in temperature between the artificial leaves is approximately proportional to the evaporative demand on the real leaves of plants or cuttings. The key feature of the EvapoIrrigator is its ability to accurately integrate the signal from the EvapoSensor. The signal to initiate an irrigation cycle is generated when accumulated evaporation reaches a user adjustable target value. The signal is a volt free change over relay contact which can be used to trigger the ETS range of irrigation controllers and those controllers that have a remote start facility.

Integration rate is proportional to the WLD, for instance if the WLD displayed is 20°C the Acc °C hours will accumulate at the rate of 1°C per 3 minutes. If the WLD decreases to 10°C the Acc °C hours will accumulate at the rate of 1°C per 6 minutes. If the WLD decreases to 1°C the Acc °C hours will accumulate at the rate of 1°C per 60 minutes, if WLD is 0.1°C, the Acc °C hours will accumulate at the rate of 1°C per 10 hours. The EvapoIrrigator integrates the complete WLD value and is accurate to 0.1°C



ZERO



6.47 degC WLD
SP057 Acc012°C

SET



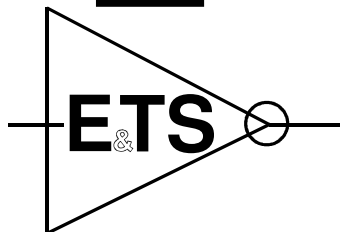
☐ POWER

☐ OUTPUT RELAY

☐ SET POINT ADJUST



MANUAL START (& RE ZERO ACCUMULATOR)



— **EVAPO IRRIGATION INTERFACE** —

Front panel controls

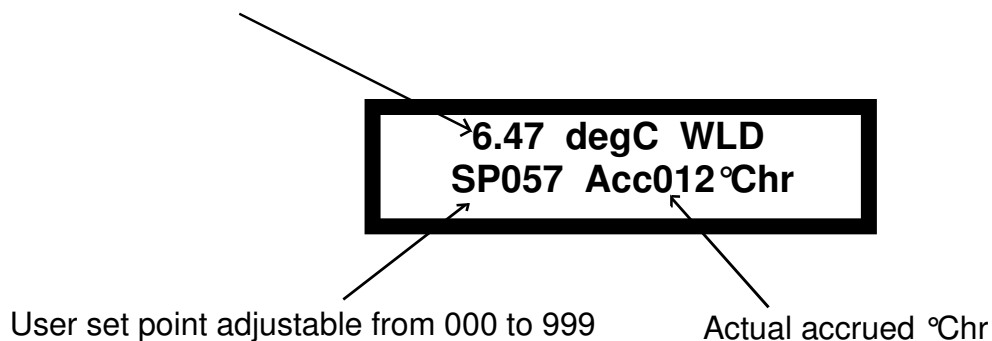
Zero

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.

Accumulated evaporation displayed value	0°C to 999°C
User adjustable displayed target	0°C to 999°C
Integration range	0.1°C to 20°C
Integration times	0.1°C 10 hours 20°C 3 minutes
WLD displayed	00.00 to 19.99 degC

The POWER LED is on when the controller is supplied with mains, 240Vac.

The difference in temperature between the 2 sensors
Expressed as WLD (wet leaf depression)



The SET POINT ADJUST LED is on when the SET tactile push button is pressed. Actuation of either ▲ ▼ chevron tactile push button adjusts the °C hours set point displayed up or down from 000 to 999.

If the SET push button is pressed and no data inputted for a period of 10 seconds, the set point facility is disabled and the program returns with the existing °C hours set point value unchanged.

If the °C hours set are less than the actual °C hours accumulated, the output relay is actuated and the Acc °C hours display is cleared

The OUTPUT RELAY LED is on when the accumulated °C hours of evaporation reaches the user adjustable set point, or if the MANUAL START tactile push button is pressed. The relay operates for 5 seconds and the normally open pair of contacts close to initiate the standalone irrigation controller. The Acc °C hours display is cleared

The EvapIrrigator has two types of output:

- 1) Relay with Change over contacts, voltage free. Operational time 5 secs
- 2) Output current proportional to WLD; 0mA, 0°C – 20mA, 10°C

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.

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

CONNECTIONS:

SUPPLY

Connect a mains 240V ac supply to terminal block TB2

Brown to LIVE

Neutral to BLUE

Green/yellow to Earth.

SENSOR

- 1) Connect the EvapoSensor, wet lead to Wet and 0 on TB1, dry lead to Dry and 0 on TB1
- 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.

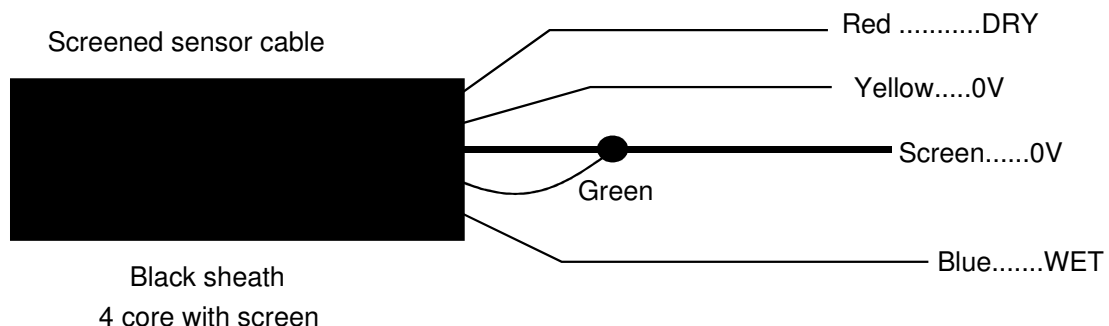
The gain and range have been factory set and must not be adjusted,

do not adjust VR1, VR2 and VR4.

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.

ES4 Evaporation sensor

Fitted with two Pt100 temperature sensors



POSITIONING OF THE EVAPOSENSOR

It is important to position the EvapoSensor in the best position to attain the best results.

Ideally the sensor should be positioned at the height of the cuttings, this may mean placing the sensor unit on an inverted flower pot or other suitable object so that the wet and dry sensor are at the same height as the leaf level

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

The sensor must not be covered or shaded. Avoid shading from any structure such as risers, pipes, stanchions etc.

Position to the North side of the glass house/poly tunnel to ensure that the sensor is not shaded

For all input/output connections, refer to Diagram 1

OUTPUTS

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

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 0° to 20°C
Displayed reading -16°C to 20°C
Integration resolution 0.1°C
Bridge temperature drift 15ppm 5°C to 50°C zero
Bridge zeroing $\pm 0.1^\circ\text{C}$
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.

0V connected to mains earth.
Optical isolator switches the relay.
Input voltage 240V ac European harmonized.
Relay output: voltage-free contacts, change-over.
Splash proof box size 175mm x 150mm x 80mm.
Meets all CE requirements.

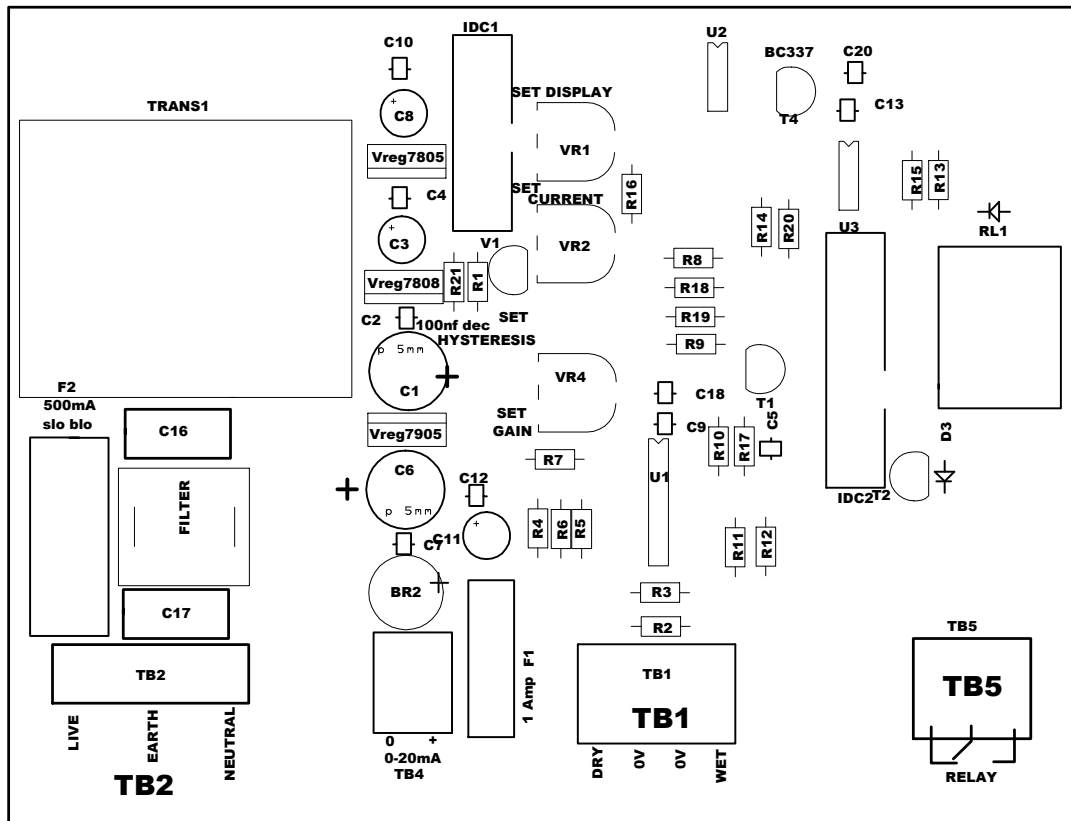


Diagram 1

Declaration of Conformity

Name of manufacturer
Full postal address

E&TS Ltd
40 Acreville Rd
Bebington
Wirral
Cheshire CH63 2HY
UK

Country of origin

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.