

## Weather-Watcher Sensor

### Overview

The Weather-Watcher (WW) sensor is a hardware device that connects to the Cloudmaster controller and enables it to detect light level and temperature. Loop cycle programming can then be used to set up watering/misting schedules, which will automatically adjust to weather conditions. Typical applications are mist propagation benches, hydroponics and water conservation in general irrigation. This document assumes a knowledge of the scheduling capabilities of the Cloudmaster controller. The complete Cloudmaster Operators Manual can be downloaded from [www.jec.com.au](http://www.jec.com.au).

### Units of Measure and Accuracy

The sensor is not intended as a laboratory instrument. Light level is displayed in watts per sq metre ( $W/m^2$ ) but it has not been calibrated against a standard, has no cosin correction and is not filtered for the PAR (photosynthetically active radiation, 400nm to 700nm) band. Temperature is displayed in degrees celsius, is accurate to about 1 degree celcius and has a time response in the order of tens of minutes.

### Mounting and Electrical Connection

Mount the sensor vertically, in a position where it is subject to the same ambient temperature and light levels as the plants. As the sensor needs to measure ambient air temperature, it should only ever receive diffused light, never direct sunlight, which would heat the sensor well above ambient. The ideal location in a misting application would be inside the glasshouse or igloo, mounted at head height, out of the mist and pointing in towards the centre of the growing area. The unit 'looks' away from its wall mount bracket. In an outdoor setting, a painted glass or translucent plastic cover to shield the sensor from direct sunlight should suffice.

Connect the white wire to the Cloudmaster terminal 'Slave+', the blue wire to 'Slave-', the red wire to 12V (or 'Spare' on earlier machines) and the black wire to the terminal immediately left of 12V ('Spare'). The cable can be lengthened to a maximum of 100m, as long as good quality shielded twisted pair cable is used. All connections should be sealed from moisture and the wires not shorted or crossed at any time. Do not use spare conductors in solenoid valve cable looms; the sensor will not work and damage to the controller or sensor may result. Note also, for long cable runs, extra lightning protection should be installed (ref. Jeffery Electronics info sheet).

### Cloudmaster Configuration

Use Operation 42 (OP42) to logically connect the sensor to the Cloudmaster controller. You should now be able to see the glow of the red LED blinking at the end of the sensor. Multiple sensors can be connected if required.

The automatic weather adjustment of loop cycle intervals feature must be enabled before it will operate. This is done with OP70 and selecting 'Enable' for **Weather-Watcher**. The **WW advance mode** determines whether you want to specify temperature and light energy amount globally for all WW loop cycles or specifically for each one. This is explained in more detail below.

For the mist propagation application, which requires very short misting durations, you may also want to enable **Seconds duration**. Similarly, irrigation scheduling requiring very long watering duration or

interval times (>250 minutes) would need '**Hours duration**' enabled as well. Leave other settings as required or at their default values.

OP65 is used to enter the parameters by which the watering schedule is adjusted according to the weather (detailed explanation below). For misting, enter starting values of 55 for Temp% and 30,000 S. The 'M' is changed to an 'S' with the '0/CHG' key. For irrigation, refer below to determine values.

### View Current Sensor Readings

OP21 is used to display the current readings from the sensor. If more than one sensor is attached, use the arrow keys to step between them. An example is given below:

WW#	Temp	Light
1	26.5	126.4W

### Enter a New Loop Cycle

The Cloudmaster controller can be programmed with both weather controlled misting and irrigation and standard time clock irrigation schedules. You can set up any number of loop cycles to run concurrently or at different times of the day.

To enter a new WW controlled loop cycle, run OP09 'Enter a new loop cycle' and select 'enable' when prompted for 'Sensor control'. A mist propagation cycle would use very short misting durations of typically 5 to 10 seconds. An irrigation schedule would typically have longer watering times and a much longer interval.

### Choosing Temp% and LightW/ Values

OP65 is used to enter global parameters which determine how the loop cycle interval for all loop cycles entered are adjusted by the weather. If '**WW Advanced Mode**' is enabled in OP70 then these parameters can be entered individually for each loop cycle. This would be required if, for example, you wanted the sensor to be adjusting both propagation mist cycles and irrigation cycles which have very different interval timing.

The 'Temp%' value determines how much affect the temperature has. A value of 0 means the temperature has no affect at all. A value of 55 approximates the temperature response of the Jeffery Electronics 'Weather-Watcher' range of misting controllers. Assuming constant light level, a temperature above 25°C will shorten the interval between cycles and a temperature below 25°C will lengthen the interval. With a 'Temp%' setting of 55 the interval will be adjusted down to 66% of its normal (25°C) value at a temperature of 40°C and up to 133% at 10°C. A larger setting will result in a greater variation in interval.

The 'LightW/' value determines the time interval between cycles (at 25°C). It is used as a countdown timer and can be any number between 1 and 65,000 watthours, wattminutes or wattseconds (H, M or S in the display). It is the amount of light energy that must be detected before a cycle repeats. For example; a value of 500M (500 Watt'M'minutes) would result in the cycle repeating every 500 minutes at a light level of 1 W/m<sup>2</sup>, every 50 minutes at 10 W/m<sup>2</sup>, every 5 minutes at 100 W/m<sup>2</sup> or every 10 minutes at 50 W/m<sup>2</sup>. Note, entering the figure in WSec results in a bigger number which would make it easier to watch the value count down. A value of 30,000 WSec is equivalent to 500 WMin (500 x 60 = 30,000), that is it is the same amount of light energy, so the above example figures would equally apply.

In complete darkness the interval of a WW controlled loop cycle extends to infinity i.e. the cycle stops. If you wish to apply some water during the night this can be achieved by programming the stations to come on using standard timeclock watering.

Although accurately calculating interval from these variables is possible, it is usually not necessary. The best way to determine a value for the 'LightW/' value for mist propagation is to start with 30,000S and let the system run for a while. If too much water is being applied then increase this value. If too little water is applied then decrease it.

### **Determining Start Time of Next Cycle**

When waiting an interval the Cloudmaster will scroll in its display a countdown value. When the value reaches 0 the cycle will repeat. The interval count for a loop cycle that has been set up on a timeclock basis, i.e. it is not weather controlled, will decrement each second, minute or hour depending on whether the interval was specified in seconds, minutes or hours respectively.

The interval count for a sensor controlled loop cycle will decrement at a rate determined by the current weather parameters as displayed by OP21. It will count down faster in hot, bright conditions. Refer to technical explanation below.

### **Modifying Existing Program**

To view or make changes to an existing program use OP01 'Display or modify entries'.

### **Immediate Override Control**

To immediately start a loop cycle (or stated another way, set the current interval to 0) run OP01 and press the 'Enter' key until the 'Light Remain' details are displayed. If you have more than one loop cycle running then be sure to find the correct one. Use the arrow keys to move the cursor to the remaining countdown timer and set it to 0 and finally press 'Enter'. Assuming the present time is within the period that this cycle is permitted to run and the present day is selected, the cycle will run through once and then wait its normal interval as determined by either time or the WW sensor. You can also use this method to lengthen the delay until the next cycle.

### **Displaying Number of Cycles Run**

OP13 is used to display how many times all loop cycle programs have run since midnight. It is most meaningful when only one loop cycle is programmed into the unit.

### Example 1. Propagation Mist

You have stations 1 to 5 controlling individual mist beds. They must be turned on in sequence 2, 3, 1, 5 and 4 for 5, 5, 8, 12 and 5 seconds respectively. You want the interval to be 20 minutes at 25 degrees celcius and a light level reading in the glasshouse of 500 W/m<sup>2</sup>. Warmer/lighter conditions will shorten the interval, cooler/darker conditions will lengthen it. You also want the loop cycle to run every day of the week, from 6:00 AM to 9:00 PM. Use OP09 to initially enter the loop cycle and OP01 to thereafter modify it as follows:

OP09-Enter a new loop cycle	Loop On    Off 06:00 21:00	Days    MTWTFSS X=ON    XXXXXXXX
Sensor control <u>E</u> nable    Disable	WW# Temp LightW/ 1    55%    10000 M	Stn Dur 2    5
Stn Dur 3    5	Stn Dur 1    8	Stn Dur 5    12
Stn Dur 4    5		

### Example 2. Irrigation

We want to irrigate stations 10, 11 and 12 for 45 minutes each at a frequency determined by the prevailing weather conditions. The stations can only be watered between the hours of 1:00 AM and 5:00 AM on weekdays. We have determined that in mild weather conditions, ie 25 degrees average temperature and an average daily light level of 300 W/m<sup>2</sup> we want to water twice a week or an interval of 84 hours. Hotter or lighter conditions will shorten the interval, colder/darker conditions will lengthen it but we want the temperature to have a greater influence on the interval. Again we would use OP09 to initially enter the loop cycle and OP01 to thereafter modify it as follows:

OP09-Enter a new loop cycle	Loop On    Off 01:00 05:00	Days    MTWTFSS X=ON    XXXXX..
Sensor control <u>E</u> nable    Disable	WW# Temp LightW/ 1    75%    25200 H	Stn Dur 10    45
Stn Dur 11    45	Stn Dur 12    45	

These examples assume that 'WW Advanced Mode' has been enabled using OP70. They could both be entered into the Cloudmaster and run concurrently.