

User Manual – MI upgrade kit with level sensor

This document is for smallholders who have previously purchased the DIY solar drip irrigation kit from Measured Irrigation and wish to replace the float switch in the evaporator by a level sensor with 3 probes. The MI upgrade kit with level sensor can be purchased online from the Measured Irrigation website:
www.measuredirrigation.com.au



Level sensor resting on the evaporator

Dr Bernie Omodei
Measured Irrigation
5/50 Harvey Street East, Woodville Park SA 5011
Phone +61 8 8244 0071
Mobile 0403 935277
Email bomodei@measuredirrigation.com.au
Website www.measuredirrigation.com.au

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Contents of the kit

As well as this User Manual, the kit consists of the following components:



level sensor with 3 probes



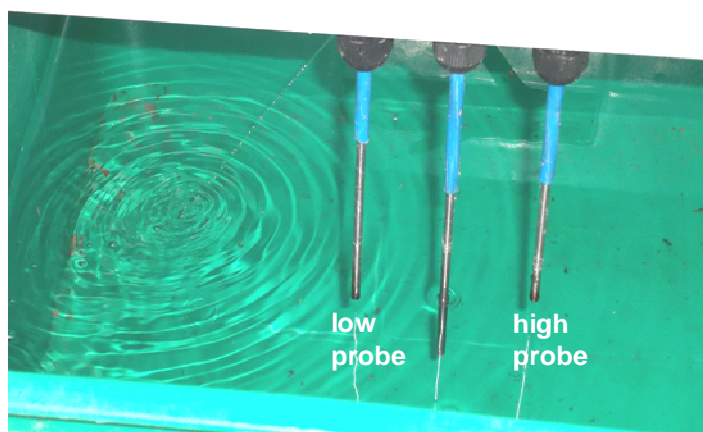
10 metres of 3-strand electrical irrigation cable



MI upgrade kit adaptor

If you wish to automate more than one zone, you will need to buy a kit for each zone.

The level sensor has three probes as shown. During the irrigation event the water level rises as water slowly drips into the evaporator from the control dripper. When the water level reaches the high probe on the right a solenoid valve closes and the irrigation stops. The water level then falls due to evaporation until the water level is below the low probe on the left at which point the solenoid valve opens and the irrigation recommences. The middle probe is a reference probe. This cycle continues indefinitely.



level sensor with 3 probes

The volume of water required to raise the water level from the low probe level to the high probe level is called the **control volume**. It is also the volume of water that must evaporate between irrigation events. The control volume is determined by the surface area of evaporation and the gap between the high probe and the low probe. The length of the low probe and high probe are adjustable.

If the control dripper is the same as all the other drippers in the zone, then the control volume is the same as the volume of water emitted by a dripper during the irrigation event.

As well as being completely automatic, the irrigation frequency responds to the prevailing weather conditions. During very hot weather the evaporation rate will be much greater and so the irrigation frequency increases. On cool overcast days, the evaporation rate will be quite small and so the irrigation frequency decreases. The irrigation frequency can be changed by adjusting the gap between the low probe and the high probe.

Step by step instructions for installing MI upgrade kit with level sensor

Step 1. You may need to replace the evaporator if the level sensor does not rest on the evaporator with the probes clear of the bottom of the evaporator.

Step 2 The level sensor adaptor has 7 colour-coded wires which need to be connected as follows:

Connect the **red** wire to the grey wire from the irrigation controller.

Connect the **black** wire to the white wire from the irrigation controller.

Connect the **blue** wire to the purple wire from the irrigation controller (or to one of the red wire from the four-zone adaptor to upgrade a zone connected to the four-zone adaptor).

Connect the **green** wire to the pink wire from the irrigation controller (or to the corresponding black wire from the four-zone adaptor to upgrade a zone connected to the four-zone adaptor).

Connect the **white** wire to the white wire from the level sensor (reference probe).

Connect the **yellow** wire to the yellow wire from the level sensor (high probe).

Connect the **brown** wire to the black wire from the level sensor (low probe).

Step 3 Fill the evaporator with water until the water level is just below the low probe

Step 4. Start irrigating

Turn the switch the side if the irrigation controller to the ON position (switch up) and the irrigation will start. The irrigation stops automatically when the water level reaches the high probe. During the day the water level in the evaporator falls due to evaporation. The switch is a three position switch with UP ON (24 hour operation), CENTRE OFF, DOWN ON (night only operation).

With the switch in the up position (24 hour operation), the irrigation will start automatically as soon as the water level in the evaporator has fallen below the low probe.

With the switch in the down position (night only operation), the irrigation is restricted to dark hours only. If you do not wish to irrigate during the heat of the day, turn the switch to the NIGHT ONLY position (switch down) so that the irrigation starts automatically at sunset (provided that the water level is below the low probe).

To stop the irrigation at any time, turn the switch to the OFF position.



The switch on the irrigation controller has 3 positions

How to adjust the water usage

The amount of water that your plants need will depend on many factors in addition to the weather. For example, as the plants grow and become bigger they will need more water. Plants growing in sandy soil will need more water than plants growing in heavy soil.

To take account of all these additional factors, I recommend that you use a length of steel pipe to check the moisture level in the soil. I suggest that the diameter of the pipe be between 30 and 40 mm. An angle grinder can be used to cut some slots in the steel pipe so that you can inspect the soil inside the pipe. I suggest that the width of the slots be about 13 mm. You can also use the angle grinder to sharpen the edge of the end of the soil moisture probe.

A suitable soil moisture probe may be purchased from the Measured Irrigation website

www.measuredirrigation.com.au



An angle grinder can be used to make some slots in a length of steel pipe



After the irrigation event, hammer the steel pipe into the soil near a dripper so that the slots face the dripper.



Remove the steel pipe from the soil and use the slots to inspect the moisture level in the soil and the position of the wetting front.

By checking the moisture level in the soil through the slots in the steel pipe, you can decide whether the plants have been irrigated with too much or too little water.

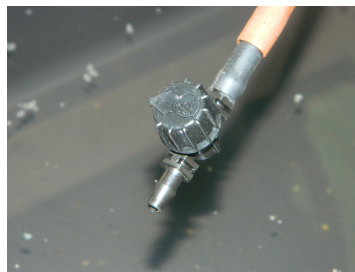
After the irrigation event, hammer the steel pipe into the soil near a dripper so that the slots face the dripper.

Remove the steel pipe from the soil and use the slots to inspect the moisture level in the soil and the position of the wetting front. You may wish to use the slots to remove some soil from the pipe and to squeeze the soil sample between your fingers.

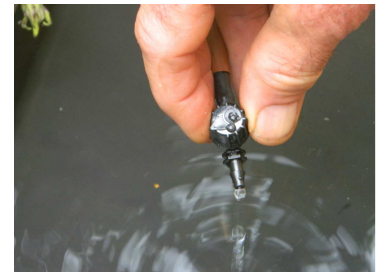
You may wish to place a measuring container under one of the drippers so that you can measure the volume of water emitted by the dripper during an irrigation event.

An easy way to adjust your water usage is to use an adjustable dripper for your control dripper. Increase the flow rate to reduce your water usage, and reduce the flow rate to increase your water usage. To help you make an appropriate adjustment, it is recommended that the irrigation be running while the adjustment is being made.

A suitable adjustable control dripper may be purchased from the Measured Irrigation website
www.measuredirrigation.com.au



Adjustable dripper used as control dripper



Increase the flow rate of the adjustable control dripper to reduce water usage

As your crop grows and the water requirement of the crop changes, you may wish to repeat the process of adjusting the water usage.

Fully-automatic scheduling with level sensor

Fully-automatic scheduling with level sensor is equivalent to modified sunset scheduling for manual systems.

- Step 1. Set the switch on the irrigation controller to the OFF position. Allow the soil to dry out over several days until the soil is dry between the surface and the bottom of the root zone (use the soil moisture probe).
- Step 2. Empty the evaporator. Place a measuring container under one of the drippers to collect water during the irrigation event. Set the switch on the irrigation controller to ON position (switch up) and the irrigation start. During the course of the irrigation, regularly check the depth of the moisture below various drippers (use the soil moisture probe). As soon as the moisture is close to the bottom of the root zone, turn off the irrigation by setting the switch to the OFF position. Record the volume of water in the measuring container. This will be called the **dripper control volume** and it is the volume of water required to moisten the soil below a dripper as far as the bottom of the root zone when the soil is dry. Note that the dripper control volume will be the same as the control volume if and only if the control dripper is the same as the dripper.
- Step 3. Fill the evaporator with water until the water just touches the high probe.
- Step 4. With the switch on the irrigation controller in the OFF position, allow the soil to dry out over several days until the soil is dry between the surface and the bottom of the root zone (use the soil moisture probe). Adjust the low probe so that it is just above the water level. The gap between the high the low probe is the evaporation required to dry out the soil from the surface to the bottom of the root zone.
- Step 5. Empty the measuring container. Set the switch on the irrigation controller to the ON position and adjust the control dripper so that the flow rate is approximately the same as the flow rate of the drippers in the zone.
- Step 6. At the end of the irrigation event, check the volume of water in the measuring container. If the volume is less than the dripper control volume then the moisture below the dripper is unlikely to have reached the bottom of the root zone. So reduce the flow rate of the adjustable control dripper (to increase the duration of the irrigation event) in preparation for the next irrigation. If the volume is more than the control volume then the moisture below the dripper is likely to have extended beyond the bottom of the root zone. So increase the flow rate of the adjustable control dripper (to decrease the duration of the irrigation event).
- Step 7. Repeat Steps 6 until the volume of water in the measuring container is approximately the same as the dripper control volume recorded in Step 2.

After a few adjustments to the control dripper, the water usage should stabilise at an appropriate level for the plants at their current stage of growth.

As your crop grows and the water requirement of the crop changes, you may wish to repeat the process of adjusting the water usage.