DIY Unpowered Measured Irrigation Controller Kit

User Manual

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1. Introduction to the DIY Unpowered Measured Irrigation Controller

Measured irrigation is an irrigation scheduling method that satisfies the following two conditions:

1. *Variations in the water usage throughout the year are controlled by the prevailing net evaporation rate (evaporation minus rainfall).*
2. *The volume of water discharged by each emitter during an irrigation event is controlled directly without the need to control the flow rate or the duration of the irrigation event.*

It is assumed that the irrigation system (either pressurised or gravity feed) for your garden or small plot of land has already been established.

The DIY Unpowered Measured Irrigation Controller can be used for gravity feed or pressurised irrigation, for drip or sprinkler irrigation, for pressure compensating drippers (PC) or non pressure compensating drippers (NPC).

The water usage for the DIY Unpowered Measured Irrigation Controller is directly proportional to the net evaporation rate experience by you plants. This is a unique feature of measured irrigation.

The DIY Unpowered Measured Irrigation Controller KIY can be purchased online from the Measured Irrigation website: https://www.measuredirrigation.com/product-page/diy-unpowered-measured-irrigation-kit

I recommend that you watch the Measured Irrigation video:
DIY Unpowered Measured Irrigation Controller Kit:
https://www.youtube.com/watch?v=iN_DZOaqyfM

2. Instructions for assembling the DIY Unpowered Measured Irrigation Controller Kit

The Kit includes everything that you need except for an evaporator. The components in the kit are as follows:

- Valve assembly with inlet pipe
- Cylindrical float
- 6 float rings
- Outlet pipe (15mm BSP)
- 2 round plastic nuts (15mm BSP)
- Inlet adaptor 15mm x 20mm
- Adjustable control dripper assembly
- Flexible overflow tube

Components in the DIY UMIC Kit

Step 1. Choose a suitable evaporator. The evaporator is a plastic container with vertical sides with an opening of at least 20cm x 20cm and a height of at least 15cm (a hobby box is ideal).

A hobby box makes an ideal evaporator

Step 2. Drill two 20mm holes opposite each other in opposite sides of the evaporator. The centres of the holes should be no more than 5cm higher than the bottom of the evaporator.

Drill 2 holes in opposite sides of the evaporator

Step 3. Insert the inlet pipe (connected to the valve assembly) through one of the holes in the evaporator and attach one of the round plastic nuts.

Insert the inlet pipe through one of the holes

Attach a round plastic nut

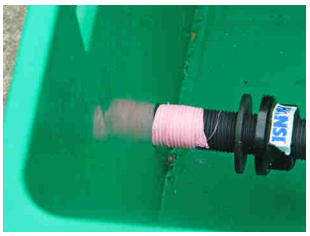
Step 4. Insert the outlet pipe through the other hole in the evaporator so that the washer is inside the evaporator. Attach the other round plastic nut.

Step 5. Connect the outlet pipe to the valve assembly (use teflon tape).

Insert the outlet pipe through the other hole

Connect the inlet pipe to the valve assembly

Step 6. Wrap teflon tape around the inlet pipe and the outlet pipe as close as possible to the sides of the evaporator. To prevent water leaking from the evaporator, tighten the internal backing nuts against the external round plastic nuts.



Wrap teflon tape around the inlet and outlet pipe

Tighten the internal backing nuts against the external round plastic nuts

Step 7. Attach the inlet adaptor to the inlet pipe (use teflon tape). Note that the inlet side of the valve extends farther than the outlet side.

Attach the inlet adaptor to the inlet pipe

Step 8. Attach the adjustable control dripper assembly to the outlet pipe (use teflon tape).

Attach the adjustable control dripper assembly to the outlet pipe

Step 9. Connect the water supply to the inlet side of the evaporator.

Step 10, Connect the irrigation system to the outlet side of the evaporator.

Connect the water supply to the inlet side of the evaporator

Connect the irrigation system to the outlet side of the evaporator

Step 11. Adjust the float shaft (clear plastic tube) so that it is vertical. Be very careful to avoid putting any stress on the fragile plastic float shaft.

Step 12. Slide the cylindrical float shaft over the float shaft.

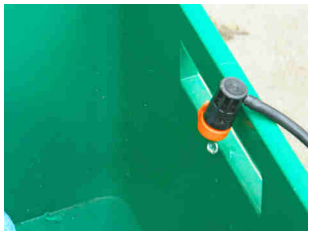
Step 13. Connect the flexible overflow tube to the top of the float shaft.

Slide the cylindrical float over the float shaft

Connect the overflow tube to the top of the float shaft

Step 14. Turn on the water supply and the irrigation should start. Check that there are no leaks into the evaporator.

Step 15. Adjust the control dripper so that water drips into the evaporator.



Adjust the control dripper so that water drips into the evaporator

Step 2. Connect a water supply to the inlet of the Universal Measured Irrigation Controller. The water supply pressure should be between 10 kPa and 800 kPa. An irrigation zone should be connected to the water supply via a solenoid valve.

Step 3. Connect a control dripper to the irrigation zone so that it will drip water into the evaporator during the irrigation event. For gravity feed applications you may need to adjust the height of the evaporator so that the NPC (non pressure compensating) control dripper is at the same level as the irrigation drippers. If your irrigation drippers are PC (pressure compensating), the adjustable control dripper should be replaced by a PC dripper (or drippers). For porous hose irrigation (weeper hose or soaker hose), replace the control dripper by a short length of porous hose.

Control dripper

Connect a 12V DC solenoid valve to your water supply

There are 4 colour-coded wires that need to be connected to the various components as follows:

Connect the **blue** wire to one of the wires from the solenoid valve.

Connect the **green** wire to the other wire from the solenoid wire.

Connect the **red** wire to the positive terminal of a 12V DC power supply

Connect the **black** wire to the negative terminal of the power supply.

Connect the blue and green wires to the solenoid valve

Changes required for an alternative solenoid valve with an alternative power supply:

Disconnect the **blue** wire from the 12V DC solenoid valve.

Disconnect the **green** wire from the 12V DC solenoid valve and connect it to one of the wires from alternative solenoid valve.

Connect the other wire from alternative solenoid valve to one of the wires from the alternative power supply.

Cut the **pink** wire (connected to the **black** wire) and reconnect it to the other wire from the alternative power supply.

Step 5. The switch on the control box had 3 positions: **ON** (switch up), **OFF** (middle position), and **ON night only** (switch down). If you are happy for the irrigation to occur at any time of day, then flick the switch up. If you want the irrigation to occur at night time only, then flick the switch down.

Provided that the switch on the control box is in the ON position and the water level in the evaporator is below the high level, you can start the irrigation manually at any time by pressing the float down. For example, on a very hot dry day you may wish to irrigate in the middle of the day. Simply push the float down and the irrigation starts.

Push the float down to start irrigating

You can delay the next irrigation or stop the irrigation at any time by removing the float. The irrigation cannot start again until the float is replaced.

Remove the float to stop irrigating

Step 6. Make sure that the adjustable float is installed and close the small valve that controls the water supply to Universal Measured Irrigation Controller. Close the small valve connected to the vertical tube with the float switch inside. Slowly open the small valve controlling the water supply until water is dripping from connected to the top of the vertical tube at approximately 6 drips per second. Slowly open the small valve connected to side of the vertical tube until water is dripper from both outlets at the same rate.

Close the small valve on the side of the evaporator

Close the small valve on the vertical tube

Close the small valve connected to the water supply until water drips at about 6 drips per second

Water dripping from the top outlet at about 6 drips per second

Slowly open the small valve connected to side of the vertical tube until water is dripping from both outlets at the same rate

Step 7. Fill the evaporator with water until the water stops flowing from the two outlets.

Fill the evaporator with water until the water stops flowing from the two outlets

Step 8 The float falls as water slowly evaporates from the evaporator. When the float has fallen below the low level, the irrigation starts automatically provided that the switch on the control box is in the ON position. If the switch on the control box is in the ON night only position, the irrigation starts at sunset. The float rises as the control dripper drips water into the evaporator. When the float reaches the high level the irrigation stops automatically. The cycle continues indefinitely.

Step 16. Fill the evaporator with water until the float jumps up and the irrigation stops.

Fill the evaporator with water until the float jumps up

Step 17. The float falls as water slowly evaporates from the evaporator. When the float reaches the low level, the irrigation starts automatically. The float rises as the control dripper drips water into the evaporator. When the float reaches the high level the irrigation stops automatically. The cycle continues indefinitely.

Float at the low level

Float at the high level

Step 18. You may wish to protect the evaporator to prevent animals drinking the water, but make sure that you do not impede the evaporation (chicken wire is ideal). Replace the water and clean the evaporator regularly to remove algae and other contaminants.

Fully assembled kit

The DIY Unpowered Measured Irrigation Controller is completely automatic and does not need any electricity. Furthermore, it is a smart controller because the water usage for each dripper is controlled by the prevailing weather conditions. In fact, the water usage (litres per week for example) is directly proportional to the net evaporation rate (that is, evaporation minus rainfall). You can adjust the water usage by adjusting the control dripper. You can adjust the irrigation frequency by adjusting the float or the surface area of the evaporator.

Many irrigation controllers are programmed and cannot respond to an unexpected heat wave. The DIY Unpowered Measured Irrigation Controller responds appropriately to an unexpected heat wave. If the evaporation rate doubles then so does the water usage.

When it rains water enters the evaporator and delays the start of the next irrigation.

3. How to adjust the irrigation frequency

The DIY Unpowered Measured Irrigation Controller Kit includes 6 float rings that can slide over the cylindrical float to increase the outside diameter of the float (the bottom of the float ring should align with the bottom of the cylindrical float).

Cylindrical float and six float rings

A control screw inside the float shaft allows fine adjustment of the irrigation frequency. Remove the overflow tube and use a phillips head screw driver to gently turn the control screw clockwise until it stops turning. To adjust the irrigation frequency, turn the control screw anticlockwise the desired number of 360º turns. Note that the overflow can be reduced by removing the screw and wrapping a small amount of teflon tape around the screw.

To adjust the irrigation frequency turn the control screw anticlockwise the desired number of turns

The following table shows the irrigation frequency for various float rings and anticlockwise turns of the control screw. The irrigation frequency is determined by the net evaporation from the evaporator between irrigation events.

Table 1. Irrigation frequency for the DIY Unpowered Measured Irrigation Controller

Diameter of float	Number of float rings	Number of anticlockwise turns of control screw	Net evaporation between irrigation events
15 cm	1	0	2.4 mm
15 cm	1	2	3.3 mm
15 cm	1	4	4.8 mm
15 cm	1	6	6.9 mm
15 cm	1	8	9.1 mm
11 cm	1	0	7.3 mm
11 cm	1	2	8.7 mm
11 cm	1	4	9.9 mm
11 cm	1	6	11.2 mm
11 cm	1	8	12.2 mm
9 cm	2	0	14.7 mm
9 cm	2	2	15.2 mm
9 cm	2	4	15.8 mm
9 cm	2	6	16.9 mm
9 cm	2	8	18.1 mm
8 cm	2	0	19.2 mm
8 cm	2	2	20.2 mm
8 cm	2	4	21.1 mm
8 cm	2	6	21.7 mm
8 cm	1	0	22.6 mm
8 cm	1	4	24.0 mm
8 cm	1	8	25.3 mm
7 cm	0	0	28.0 mm
7 cm	0	4	29.9 mm

Decide the appropriate net evaporation between irrigation events for your plants and then use the table to select the float ring and the number of anticlockwise turns of the control screw.

Provided the water level in the evaporator is below the high level, you can start the irrigation manually at any time by pressing the float down. For example, you may wish to irrigate at sunset by pressing the float down at sunset.

You can delay the next irrigation by removing the float. The irrigation cannot start again until the float is replaced.

When you adjust the irrigation frequency the water usage (litres per week for example) does not change. Both the irrigation frequency and the water usage are directly proportional to the net evaporation rate.

8 cm diameter float with two float rings

8 cm diameter float with one float ring

4. How to adjust the water usage for sprinklers and non pressure compensating drippers

If your plants are not getting enough water, turn the control dripper clockwise to reduce the flow rate of the control dripper.

If your plants are getting too much water, turn the control dripper anticlockwise to increase the flow rate of the control dripper.

Turn the control dripper clockwise to reduce the flow rate

Turn the control dripper anticlockwise to increase the flow rate

5. How to adjust the water usage for pressure compensating drippers

To adjust the water usage for pressure compensating drippers, you need to replace the adjustable control dripper with a pressure compensating dripper.

The water usage is directly proportional to the surface area of evaporation. You can increase the surface area of evaporation by choosing a supplementary evaporator with vertical sides. The total surface area of evaporation is the surface area of the supplementary evaporator plus the surface area of the original evaporator minus the surface area of the float. One way to connect the evaporators is to drill a hole in the side of each evaporator and to insert a rubber grommet into each hole. Insert a barbed connector or elbow into each grommet, and then use a length of flexible tube to connect the evaporators. The water level will be same in both evaporators.

You can decrease the surface area of evaporation by placing full bottles of water in the evaporator.

Connecting two evaporators

6. Key features of the DIY Unpowered Measured Irrigation Controller

1. Completely automatic
2. No electricity is needed (no batteries, no solar panels, no solenoids, and no electronics)
3. Smart irrigation controller – the irrigation is controlled by the prevailing weather conditions rather than a program
4. Use for gravity feed or pressurised irrigation (water supply pressure at least 10 kPa)
5. Use for sprinkler or drip irrigation
6. Use for pressure compensating drippers or non pressure compensating drippers
7. You can adjust the water usage by adjusting the control dripper
8. You can adjust the irrigation frequency by adjusting the float and the control screw
9. Adjusting the water usage does not change the irrigation frequency
10. Adjusting the irrigation frequency does not change the water usage
11. The water usage is directly proportional to the net evaporation rate
    (this is a unique feature of measured irrigation)
12. Responds appropriately to an unexpected heat wave
13. When it rains, water enters the evaporator and delays the start of the next irrigation
14. The water usage is independent of the water supply pressure
    (this is a unique feature of measured irrigation)
15. Uses much less water without affecting the yield
16. Simple and low tech and so easy to assemble and fewer things to go wrong
17. Provided you have a continuous water supply, you can leave your irrigation application unattended for weeks on end