

Terracotta Irrigation Controller for Latching Solenoids

User Manual

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February 2024



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1. Introduction

The Terracotta Irrigation Controller for Latching Solenoids is suitable for automatic sprinkler irrigation or drip irrigation. The white valve at the bottom of the Terracotta Irrigation Controller for Latching Solenoids operates with water supply pressure in the range 10 kPa to 800 kPa. The interval between irrigation events responds automatically to the on-site prevailing weather conditions (namely, evaporation and rainfall).

Terracotta is porous and so the water level in the pot falls as water seeps through the pot. A float inside the pot floats on the water. When the water level reaches the low level, a magnet inside the float activates the valve so that the valve opens. A signal is sent to the control box and the irrigation starts. During the irrigation event a control dripper drips water into the pot and the water level rises. When the water level reaches the high level, the magnet inside the float disengages from the valve so that the valve closes. After a short delay (less than 2 minutes), a signal is sent to the control box and the irrigation stops.



Terracotta Irrigation Controller



Lid removed to show float and water level

A clear acrylic tube connected to the valve is quite fragile, so be very careful not to break it.

The **control volume** is the volume of water that drips into the pot during the irrigation event. It is also the volume of water that seeps through the terracotta pot to evaporate between irrigation events. By adjusting the float, the control may be set to any value between 105 ml and 395 ml.

With identical NPC (non pressure compensating) drippers at approximately the same level and negligible variations in the pressure within the zone due to frictional head loss, the volume of water discharged by each dripper during the irrigation event is approximately the same. For domestic gardens on level ground, the irrigation system can usually be designed so that variations in pressure within the zone due to frictional head loss are negligible.

If the adjustable control dripper is replaced by an irrigation dripper, then the control volume of water is discharged by each dripper during the irrigation event, regardless of the water supply pressure.

Conventional drip irrigation systems control the volume of water discharged by a dripper by using PC (pressure compensating) drippers to control the flow rate and an irrigation controller to control the time. In a domestic garden with mains water supply, many zones are usually required to ensure that the pressure in each zone does not fall below the lower limit for pressure compensation. The irrigation controller is programmed so that each zone is irrigated at a different time.

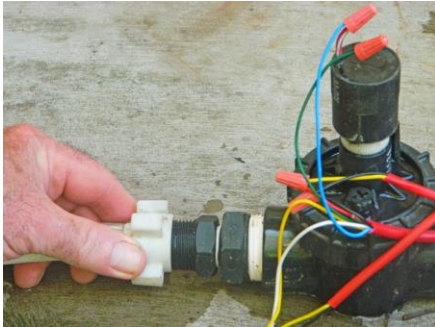
By using the Terracotta Irrigation Controller for Latching Solenoids, many zones with PC drippers may be combined into a single zone with NPC drippers and a single controller, and so the cost of the irrigation system can be reduced dramatically.

2. Installation of the Terracotta Irrigation Controller for Latching Solenoids

Step 1. Position the controller in a suitable location in your garden so that the evaporation at the controller matches the evaporation at your plants.

Step 2. Connect the water supply to the inlet of the latching solenoid valve (not provided) and to the inlet of the Terracotta Irrigation Controller for Latching Solenoids. Connect the irrigation application to the outlet of the latching solenoid valve. You may also connect the irrigation application to the outlets of the Terracotta Irrigation Controller for Latching Solenoids.

The water supply pressure at the inlet of the latching solenoid valve should be the same as the water supply pressure at the inlet of the Terracotta Irrigation Controller for Latching Solenoids.



Connect the water supply to the inlet of the latching solenoid valve



Connect the water supply to the inlet of the controller



Connect the irrigation application to the outlet of the latching solenoid valve

Step 3. Place the terracotta saucer on the terracotta pot and position the adjustable control dripper so that it drips water into the pot during the irrigation event.



Place the terracotta saucer on the terracotta pot and adjust the control dripper

Step 4, The control box has colour-coded wires that need to be connected to the latching solenoid and the float switch.

Connect the **yellow** wire to one of the wires from the Terracotta Irrigation Controller.

Connect the **white** wire to the other wire from the controller.

Connect the **blue** wire to the red wire from the latching solenoid.

Connect the **green** wire to the black wire from the latching solenoid.

If there are 2 latching solenoid valves, connect the latching solenoid valves in parallel.

Note that the 9 volt lithium battery inside the control box may be replaced with an alternative 9 volt or 12 volt external power supply. Connect the **red** wire from the control box to the external power supply positive, and connect the **black** wire to the external power supply negative.

3. How to use the Unpowered Irrigation Controller for Latching Solenoids

The switch on the control box has three positions:

OFF (switch up)

ON Manual (switch middle)

ON Auto (switch down).



Move the switch on the control box to the ON Auto position and turn on the water supply. The irrigation should start immediately. The control dripper drips water into the terracotta pot during the irrigation. The **control volume** is the volume of water that drips into the pot during the irrigation event. It is also the volume of water that seeps through the terracotta pot between irrigation events.

The irrigation stops automatically when the control volume of water has dripped into the pot. The irrigation starts again automatically after the control volume of water has seeped through the pot and evaporated. The cycle continues indefinitely and so you can leave your garden unattended for months on end. A saucer sits on top of the pot so that the water in the pot is protected from algae, mosquitoes and thirsty animals. There are small drain holes in the saucer.

When using a conventional irrigation controller, you need to set the start time and the run time for each irrigation event. However, with the Terracotta Irrigation Controller for Latching Solenoids, you don't need a timer. The duration of the irrigation event is the time it takes for the control volume of water to drip into the pot, and the interval between irrigation events is the time it takes for the control volume of water to seep through the pot.

It is important to note that the control dripper is adjustable. If you reduce the flow rate of the control dripper, it takes a lot longer for the control volume of water to drip into the pot and so the duration of the irrigation event increases and your plants get more water. On the other hand, if you increase the low rate of the control dripper, the control volume of water drips into the pot more quickly and so the duration of the irrigation event decreases and your plants get less water. Adjust the control dripper so that the irrigation delivers the appropriate amount of water to your plants at their current stage of growth.



The control dripper is adjustable.

The time it takes for the control volume of water to seep through the pot depends on the prevailing on-site weather conditions. When it is hot and dry, the water seeps more quickly and so the interval between irrigation events is shorter. When it is cool and overcast, the water seeps more slowly and so the interval between irrigation events is longer.

If it rains, rainwater collects in the saucer and drains into the pot. This means that the start of the next irrigation event is delayed. In addition to the control volume of water that needs to seep through the pot between irrigation events, any rainwater that has entered the pot between irrigation events also needs to seep through the pot.

To avoid irrigating during the heat of the day, you can turn off the water supply. Alternatively, a tap timer can be used so that water is only available between sunset and sunrise.

The Terracotta Irrigation Controller uses on-site weather data (namely, evaporation and rainfall). Most smart irrigation controllers do not use on-site weather data. Instead they use weather data from the Bureau of Meteorology.

The controller can be used for both gravity feed and pressurised irrigation. It can be used with sprinklers, drippers (PC or NPC), weeper hose and soaker hose.

You can irrigate directly from a rainwater tank by gravity feed without using a pump provided that the water level in the tank is at least 1 metre higher than the valve at the bottom of the controller.

Note that the term **water usage rate** refers to the number of litres per week used by the irrigation.

How to adjust the interval between irrigation events

You can adjust the interval between irrigation events by adjusting the gap between the upper and lower float. The interval between irrigation events is the time it takes for the control volume of water to seep through the porous terracotta pot. To adjust the gap by 4 mm, rotate the upper float by two and a quarter turns.

Adjusting the interval between irrigation events does not change the water usage rate. For example, if you increase the interval between irrigation events by increasing the gap between the upper and lower float, the amount of water used during the irrigation event increases automatically to ensure that the water usage rate remains the same.



To adjust the interval between irrigation events, adjust the gap between the upper and lower float

gap between the upper and lower float	control volume
zero gap	105 ml
4 mm	141 ml
8 mm	177 ml
12 mm	214 ml
16 mm	250 ml
20 mm	286 ml
24 mm	322 ml
28 mm	359 ml
32 mm	395 ml

Table 1. Control volume for various gaps between the upper and lower float.

The gap between the upper and lower float should be chosen so that the next irrigation event starts when there is no further soil moisture available to the plants. Soil moisture sensors or probes may be used to determine the soil moisture profile.

You can start the irrigation at any time by pushing the float down. You can stop the irrigation at any time by lifting the float up.

How to adjust the water usage rate

If your plants are not getting enough water, reduce the flow rate of the control dripper. Reducing the flow rate of the control dripper increases the duration of the irrigation event and so your plants get more water. If your plants are getting too much water, increase the flow rate of the control dripper.

Adjusting the water usage rate does not affect the interval between irrigation events.

You may wish to position an empty measuring container under one of the drippers so that water drips into the container during the irrigation event.

5. Key features

1. Use for any size irrigation application with any size latching solenoid valve
2. The power supply is a small 9 volt lithium battery inside the control box
3. Water supply pressure 10 kPa to 800 kPa
4. Use for sprinkler irrigation or drip irrigation
5. Use for gravity feed or pressurised irrigation
6. Adjust the water usage rate by adjusting the control dripper
7. Adjust the interval between irrigation events by adjusting the float
8. Responds automatically to on-site evaporation and rainfall
9. The irrigation frequency increases significantly during a heat wave
10. The adjustable control volume is between 105 ml and 395 ml
11. Water in the terracotta pot is protected from debris, algae, mosquitoes and thirsty animals
12. Simple, unpowered, and low tech, and therefore fewer things can go wrong
13. Leave your irrigation application unattended for months on end

6. Conclusion

The Terracotta Irrigation Controller for Latching Solenoids uses a radically different approach to irrigation scheduling called Measured Irrigation. See the Measured Irrigation website for more information:

www.measuredirrigation.com.au

Conventional irrigation systems **indirectly** control the volume of water discharged by a dripper by using PC (pressure compensating) drippers to control the flow rate and an irrigation controller to control the time. However, measured irrigation **directly** controls the volume of water discharged by a dripper, rather than controlling the flow rate and the time. It is recommended that NPC (non pressure compensating) drippers be used for measured irrigation.

The Terracotta Irrigation Controller uses on-site weather information rather than information from the Bureau of Meteorology, and so it is ideal for greenhouse applications.