

The relay_board plugin for [OSPi](#) allows you to use one or more relay boards to control sprinkler valves. Some features:

- Control up to 12 stations
- Inexpensive relay boards reduce the cost of building your sprinkler controller

The easiest way to install the relay_board plugin is to use the plugin manager in OSPi (version 2.2.28 or newer). Connect to OSPi with your web browser then select the **Plugin** menu and select **Manage Plugins**, then select the **Browse More Plugins** button. Find relay_board in the list and check the box on the right and select the **Install** button. Go back to **Manage Plugins**, find relay_board in the list and check the box to the right to enable it then select the **Update Enabled** button.

To install the plugin manually, download it from the [OSPİ Plugin Repository](#) and copy `therelay_board.py` file into the `OSPİ/plugins` directory, then copy the `relay_board.html` file to the `OSPİ/templates` directory.

Use your web browser to connect to OSPi running on your Raspberry Pi. After logging in, select the **Plugins** menu then select **Relay Board**.

Relay channels: From the drop-down list select the total number of relay channels you have connected. Often this is just one relay board but you can use as many boards as you want up to 12 total channels.

Active: Select **Low** if your relays are activated (switched on) by taking the input low (0 Volts). Select **High** if the Raspberry Pi should change it's output (input of the relay board) from low to high (3.3 Volts).

IMPORTANT: If **Active** is changed, **Relay channels** will be set to 1 to prevent all the relays being switched on, and possibly damaging the power supply (see the wiring section below for

Relay Boards

Mechanical Relay Boards

Requirements:

Power In - Most boards have a power input (usually labeled VCC) used to run the amplification / protection circuits and energize the relay coils. The relatively weak outputs of the Raspberry Pi can't provide enough power to activate the relay. Make sure the relay board has power (VCC) and ground (GND) inputs.

Load Rating - The switch output of the relay must be capable of handling the electrical current, or load, of the sprinkler valve. A typical sprinkler valve will activate with 0.2 Amps of 24 Volt AC power, so the relay must be able to handle this load. To be safe I recommend relays that can switch at least 0.5 Amps. Most relay boards use 10 Amp relays.

Protection - Most boards also have optoisolated inputs to protect the fairly sensitive outputs of the Raspberry Pi from being blown out by power spikes and voltages higher than 3.3 Volts. While not required, optoisolator inputs are strongly encouraged - they usually don't add much to the cost of the board. Also the coils of the relays should have diodes across them to protect from voltage spikes generated by a coil when it de-energizes - almost all boards have protection diodes.

Indicators (LEDs) - Although not required, it's nice to have LED indicators on the board so you can see when a relay is activated.

Examples:

Keyes funduino relay board - This 4 channel relay board meets all the requirements above. It is active high, meaning a relay is switched on when the Raspberry Pi output changes from 0 Volts to 3.3 Volts. I particularly like how the indicator LEDs are powered by external power (Vcc) and not the Raspberry Pi output signal like some boards. If the Keyes board is not available, [this board](#) is electrically the same and works the same (I bought one and tested it). There is also an [8 channel version](#). [Schematic](#)

SainSmart relay board - This 4 channel relay board meets most of the requirements above. It is active low, meaning a relay is switched on when the Raspberry Pi output changes from 3.3 Volts to 0 Volts. The indicator LEDs are powered by the Raspberry Pi output signal, which isn't ideal but it works. There have been reports of the LEDs on these boards (SainSmart) degrading over time to the point where they prevent the relay from activating - the fix is to either replace the LED or solder a wire jumper over it. There is also an [8 channel version](#). [Schematic](#)

Solid State Relay (SSR) Boards

Boards with SSRs can be used but they are more expensive. SSRs use only electronic components (like transistors) to switch the load so they have no mechanical switch which may wear out. SSRs are a good choice when switching frequently, like many times a day or hour. Mechanical relays will handle years of typical sprinkler switching, but if you'd like higher reliability, go with SSR boards. I haven't tried any SSR boards so have no examples.

Wiring

There are two wiring steps: Connecting the relay board(s) to the Raspberry Pi, and connecting the relay board(s) to the sprinkler valves and power.

Raspberry Pi wiring

The diagram below shows an example of two relay boards (first an 8 channel board, then a 4 channel board) connected to a Raspberry Pi to control up to 12 sprinkler valves.



TIP: Connect only the first relay and make sure everything works properly, then connect the rest of the relays.

1 - 11

2 - 12

3 - 13

4 - 15

5 - 16

6 - 18

7 - 22

8 - 7

9 - 3

10 - 5

11 - 24

12 - 26

Step 3 Connect VCC (power in) of the relay board(s) to the 5 Volt output (pins 2 and 3) of the Raspberry Pi.

The plugin provides some protection by reducing the number of relay channels when **Active** is changed (see **Plugin Settings** above). Before connecting any relay boards, set the plugin to 1 Relay channel to be sure at most only 1 relay will turn on while you get things setup. Be sure the plugin is enabled, if it is not enabled the OSPi program will default to OpenSprinkler board mode which will cause 3 relays to be activated if a relay board is connected.

OSPi defaults to sequential mode which means only one station (relay) is on at a time. If sequential mode is disabled (in OSPi: Options, Station Handling), you must be very careful not to exceed the maximum permitted current. If you need to have more than one relay on at a time, you could use a USB power supply capable of higher current output, or use a separate 5

Sprinkler Valve wiring

The diagram illustrates the wiring for a 4 Relay Module. A 24V AC power source is connected to the module. The module has four relays, numbered 1 to 4. Each relay is connected to a corresponding valve: Valve 4, Valve 3, Valve 2, and Valve 1. The wiring is color-coded: green for the common line, blue for relay 4, red for relay 3, yellow for relay 2, and orange for relay 1.

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Step 3 Connect each sprinkler valve to the normally open terminal of each relay (blue, yellow, violet and orange wires in diagram above). When the Raspberry Pi activates a relay, the normally open terminal is connected to the common terminal to turn the sprinkler valve on. The normally open terminal is usually on the left, but it's a good idea to verify with a multi-meter. The other terminal is normally closed and is connected to the common terminal until the relay is activated, then it becomes open.

TIP: Connect only the first relay and make sure everything works properly, then connect the rest of the relays.