



# For Raspberry Pi® - Getting started

Have complete control of your electronic environment and all your devices. Relay+ gives you the control over as many circuits as you need. It couldn't be easier to take advantage of the Raspberry Pi® with Relay+ to control your projects over the Internet.

## Product highlights

### Typical applications:

- Robotics
- Motor control
- Home automation

### Features:

- 4 onboard relays
- 4 indicator LEDs
- One command install of easy to program software libraries
- Easy connection with screw terminals
- PiFace EXTRA expansion port compatible with:
  - PiFace™ Relay EXTRA - for more relay
  - PiFace™ Motor EXTRA - for H-bridge motor control
- Provides protection to your Raspberry Pi® from damage
- Raspberry Pi® HAT footprint
- Onboard EEPROM ready for HAT ID
- 3 address jumpers to allow stacking of up to 8 boards
- Jumper to select standalone, or connection to Raspberry Pi®'s power supply
- Easy to add switches/inputs with GPIOs

### Technical specifications:

- 4 changeover relays, 20V 1A switching max
- PiFace EXTRA expansion port with 4 outputs and 4 GPIOs
- Additional 4 GPIOs with switchable pullups
- Operating Temp -40° to 70°

PiFace™ Relay+ is a highly expandable interface board for Raspberry Pi® with easy to connect screw terminals. A range of pick and mix EXTRA boards allow you to further expand the capabilities. If you need more connectivity, up to eight PiFace™ Relay+ boards can be stacked on a single Raspberry Pi®. As PiFace™ Relay+ is HAT compatible, the stack fits perfectly on the Raspberry Pi® A+ and B+ models.

**Before using PiFace™ Relay+ or any PiFace™ EXTRA board always read the instructions and follow precautions carefully.**

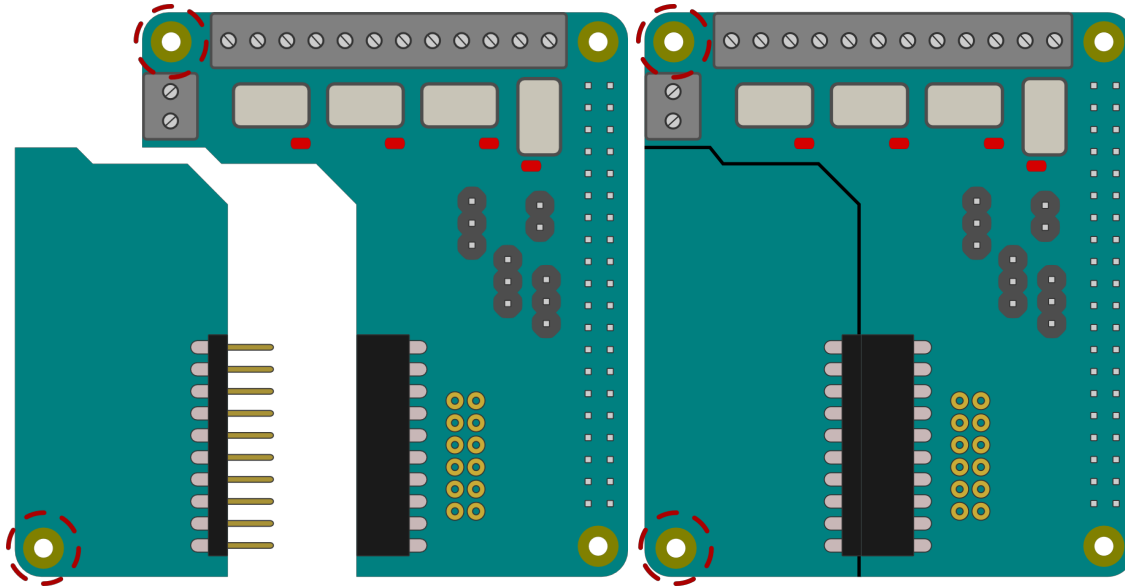
## Fitting instructions

### Warnings

- Ensure that no power is supplied to Raspberry Pi®, PiFace™ Relay+ or PiFace™ EXTRA boards when plugging or unplugging.

### Attaching PiFace™ EXTRA boards

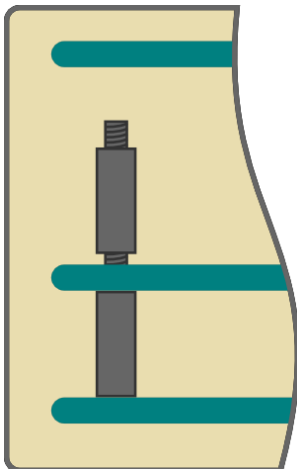
Carefully line up all the pins of the PiFace™ EXTRA board with all the sockets on the PiFace™ Relay+. Once aligned, gently push the EXTRA board in until flush.



\*PiFace™ EXTRA board is shown simplified in this diagram.

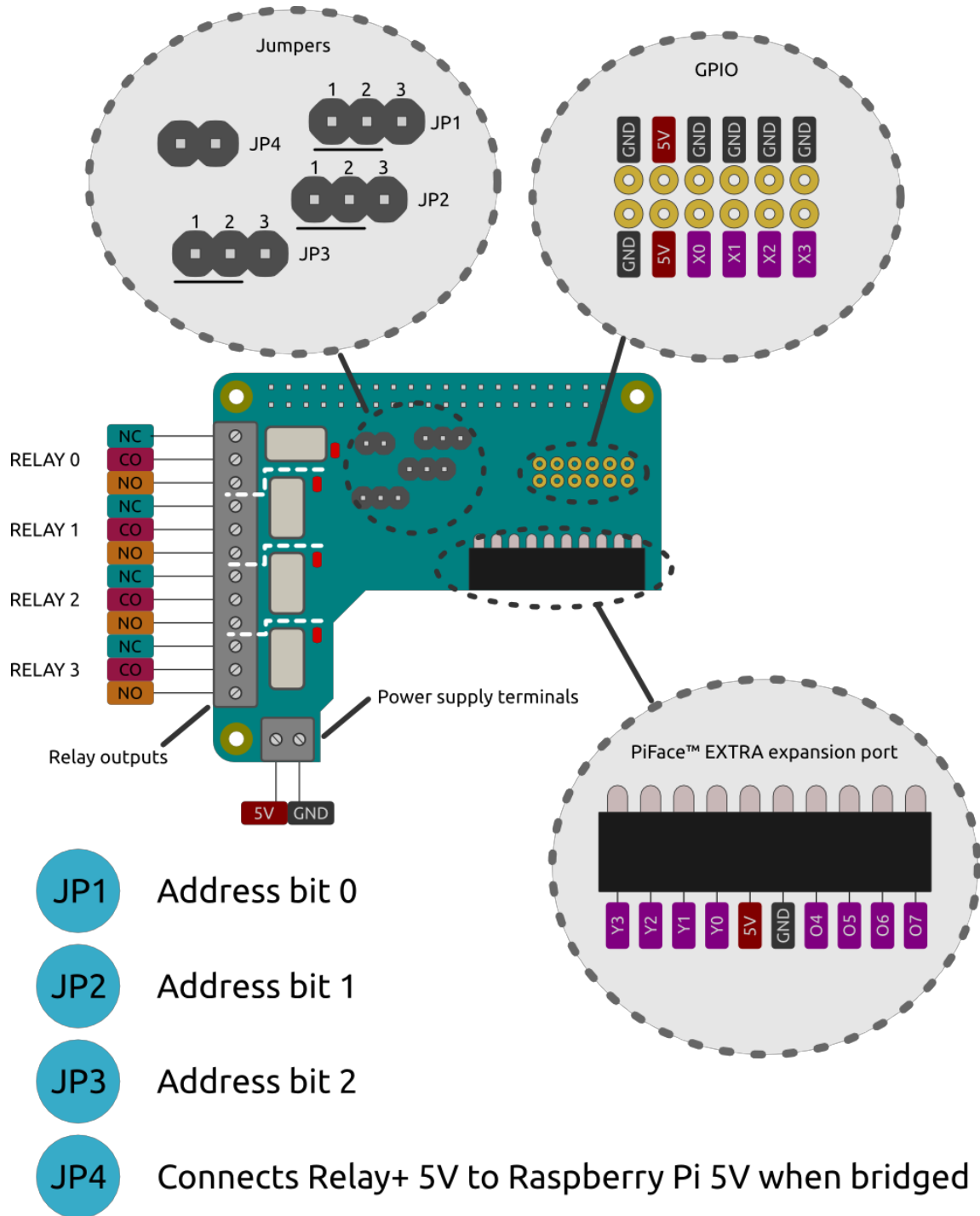
### Mounting PiFace™ Relay+ on the Raspberry Pi®

To stop the PiFace™ Relay+ board from wobbling, use the plastic spacer provided. Fit it in the mounting hole that is circled in the diagram above. When attaching a PiFace™ EXTRA board, use the plastic spacer provided with it in the board's only mounting hole, also circled above.



When fitting the PiFace™ Relay+ on the Raspberry Pi® ensure any spacers are properly lined up, then gently push the Raspberry Pi®'s GPIO pins into the connector. When stacking multiple PiFace™ Relay+s, fit the spacers between the boards before fitting on the Raspberry Pi®.

# Tour of hardware



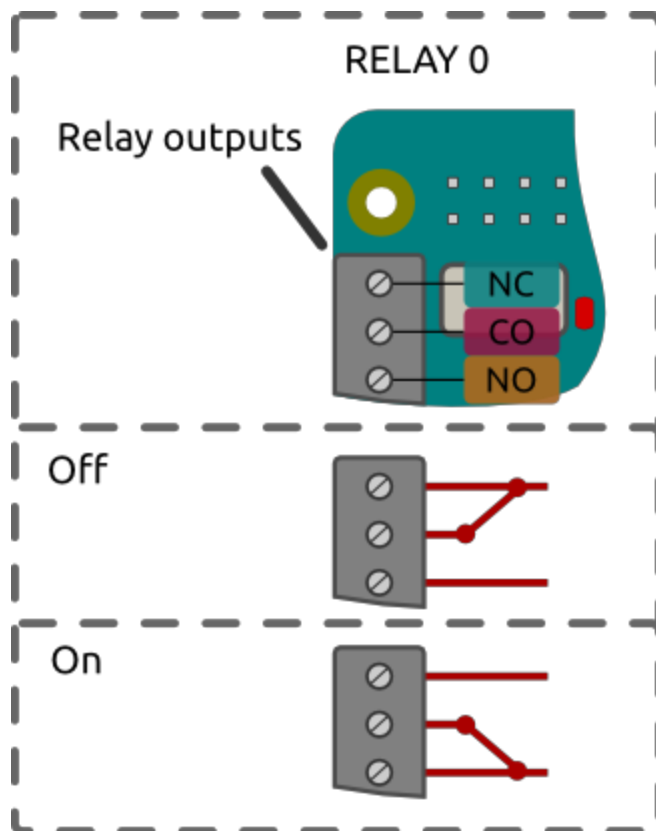
## Hardware features

### 4 relays

On PiFace™ Relay+ there are 4 relays. Each relay is connected to 3 screw terminals. Their function is printed on the underside of the PCB and shown in the diagram below.

- NC - Normally Closed contact
- CO - COmmon contact
- NO - Normally Open contact

NC and CO contacts will be electrically connected until the relay is activated, at which point CO changes over to connect to NO.



Max switching values: 1A 20V.

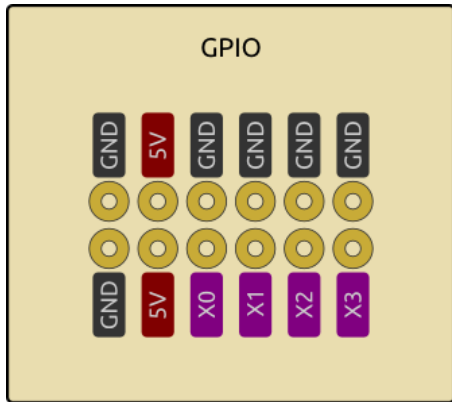
### LED indication

Each relay is paired with a red LED next to it, to provide visual indication of operation.

### GPIO I/O port

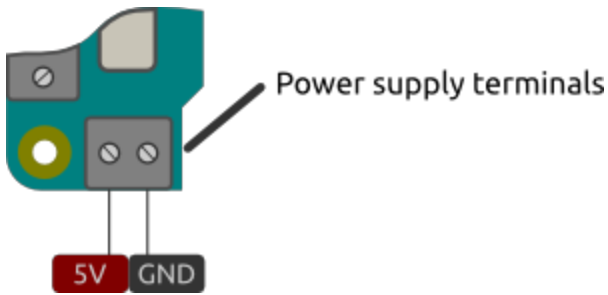
PiFace™ Relay+ has 4 general purpose input output (GPIO) pins. These are made available through 0.1" pin headers in a 2 by 6 configuration. When configured as inputs, a GPIO connected to GND will register in software with a value of 1. The inputs have software switchable pull up resistors to 3V3.

When configured as outputs, 20mA per pin is available.



### 5V supply terminals

PiFace™ Relay+ has a pair of screw terminals for power, which can be used to power the board and the Raspberry Pi®. Alternatively these terminals can be used to supply 5V to your circuit (subject to limits of the power supply), taken from the Raspberry Pi®'s 5V power rail. Check the power jumper section for more information.



### Jumper settings

#### Address jumpers

PiFace™ Relay+ has three address jumpers (JP1-3) to individually identify each board when stacked. With three jumpers you can address up to eight boards.

By default, a single board should have the address 000. This address is set by connecting pins 1 and 2 each of JP1, JP2 and JP3 as indicated by the white line printed next to each jumper. Other addresses are shown in the table below.

Address	Binary Address	JP3 position	JP2	JP1
0	000	1-2	1-2	1-2
1	001	1-2	1-2	2-3
2	010	1-2	2-3	1-2

3	011	1-2	2-3	2-3
4	100	2-3	1-2	1-2
5	101	2-3	1-2	2-3
6	110	2-3	2-3	1-2
7	111	2-3	2-3	2-3

JP1 controls the least significant bit of the address, and JP3 the most significant bit.

### Power jumper

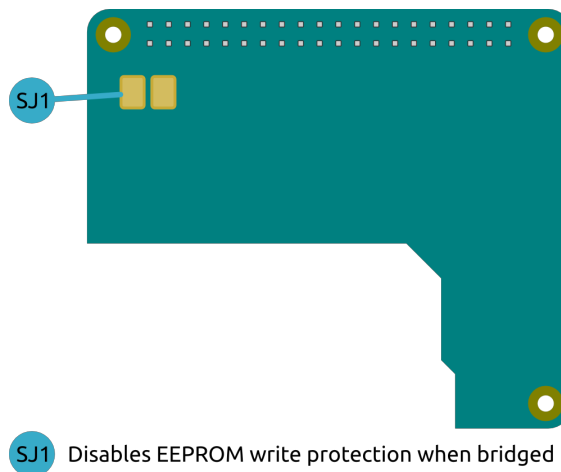
JP4 selects whether the PiFace™ Relay+'s relays and any connected EXTRA board share the same power source as the Raspberry Pi®. This supply can be either provided through the Raspberry Pi®'s MicroUSB connector, or from an external supply provided through the Relay+'s power screw terminals. With the jumper connected, the Raspberry Pi and Relay+ boards will share a single power supply. Disconnected, they will each need to be powered separately.

**Never have separate power supplies for both the Raspberry Pi® and Relay+, when the jumper is connected.**

### EEPROM jumper

The EEPROM on Relay+ allows the device to be detected, and for automatic software configuration in accordance with the Raspberry Pi®'s HAT specification. The Raspberry Pi have currently not finalised this specification yet.

The solder jumper SJ1 (located on the underside of the board) controls the write protection for the EEPROM chip. By default this jumper is not bridged and the chip is write protected. To reprogram the EEPROM bridge this jumper to disable the write protection.



## Installing software under Linux

This guide assumes you are installing on Raspbian on a Raspberry Pi connected to the Internet to allow you to download packages with apt-get.

Make sure you are using the latest version of Raspbian by opening a terminal and typing:

```
sudo apt-get update && sudo apt-get upgrade
```

To install the PiFace Relay+ libraries for Python 2 and 3, in a terminal, type the following command:

```
sudo apt-get install python3-pifacerelayplus
```

## Testing

You can test the PiFace Relay+ software by running one of the example programs in the examples directory:

```
python3 /usr/share/doc/python3-pifacerelayplus/examples/blink.py
```

This test will toggle one of the relays on and off (you should hear it click and see the corresponding LED flash).

## Writing an example Python program

This example will walk you through how to write a Python program for PiFace™ Relay+ to turn a relay on and off. To write your program, open a Terminal window on your Raspberry Pi® and type `nano relayonoff.py` to create the program file.

Import the Relay+ module and the time module (which you will use for delays) with the following lines:

```
import pifacerelayplus
import time
```

Now initialise your Relay+.

```
pfr = pifacerelayplus.PiFaceRelayPlus(pifacerelayplus.RELAY)
```

In this line the `pifacerelayplus.RELAY` refers to any PiFace™ EXTRA board you have attached. Refer to that EXTRA board's documentation for what you should put here.

Then toggle (switches between off and on) the first relay, pause to see the result and then toggle it again with the following code:

```
pfr.relays[0].toggle()  
time.sleep(2)  
pfr.relays[0].toggle()
```

Save your program by pressing Ctrl-X then Y. Now run your program in the Terminal window to see LED0 flash and hear Relay0 click by typing the following:

```
python3 relayonoff.py
```

## Warnings

- PiFace™ Relay+ and PiFace™ EXTRA boards are not intended for use in critical systems.
- Do not expose to water, moisture or extremes of temperature (below -40°C or above 70°C).
- Take care whilst handling to avoid mechanical and electrical damage to the device and connectors.
- Take suitable precautions to minimise risk of causing damage by electrostatic discharge.
- Connection to unapproved devices may affect compliance or result in damage to unit and invalidate any warranty.
- Connections to PiFace™ Relay+, including connecting external circuits and PiFace™ EXTRA boards, should only be made with the power supply disconnected.
- Ensure that PiFace™ Relay+ and PiFace™ EXTRA boards are powered by a suitably rated power supply that complies with the relevant regulations and standards applicable to the country of intended use.

## Compliance information

- This PiFace™ board complies with the relevant provision of the RoHS Directive for the European Union. In common with all Electronic and Electrical Equipment this PiFace™ board should not be disposed of in household waste. Alternative arrangements may apply in other jurisdictions.
- PiFace™ Relay+ board is CE marked. It is a class B product. The EMC emission test was performed with a PiFace™ Relay+ connected to a Raspberry Pi® Model B+. Due to the nature of the board, as a prototyping and rapid development board, fast transient immunity tests and conducted radio-frequency immunity tests have not been executed. ESD handling precautions should be observed. The board may be considered a component if integrated into another product. Any person designing or developing a product that uses one or more PiFace™ Relay+ boards is responsible for ensuring that



it is compliant and any modification to a PiFace™ board or inter-connection of other elements and devices with a board does not change compliance.

- This Class B digital apparatus complies with CAN ICES-3 (B). Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.
- This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**For more information or ideas and projects visit:**

<http://www.piface.org.uk>

PiFace™ is designed in the UK by OpenLX SP Ltd. Registered Office 145-157 St John Street, London, EC1V 4PW.

PiFace™ is distributed by Premier Farnell UK, 150 Armley Road, Leeds LS12 2QQ, UK

Manufactured in the UK.

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