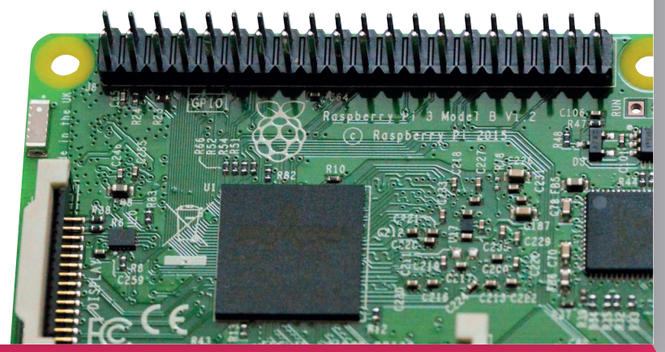
Feature

GETTING TO KNOW GPIO



Discover the joy of electronics by hooking up components, wires, and hardware to the pins on a Raspberry Pi board

One of the most powerful and fun features of the Raspberry Pi is the row of pins at the top. Known as 'GPIO' (general-purpose input/output), these pins enable you to hook up the Raspberry Pi to additional hardware and electronics.

On a larger board, such as the Raspberry Pi 3, the pins are soldered in place. With the Pi Zero W included in your kit, you'll need to solder the GPIO pins to the board.

There are lots of hardware attachments for the Raspberry Pi that connect directly to the GPIO pins. Many are known as HATs (Hardware Attached on Top). These connect directly to the GPIO and sit on top of the Raspberry Pi. More importantly, HATs are designed to work as soon as you connect them to the Raspberry Pi, so hardware branded as a HAT is easier to set up.

> "You can connect the GPIO pins to all kinds of electronic circuitry and control it"

The real joy of GPIO isn't using pre-made hardware, but building your own electronics projects. You can connect the GPIO pins to all kinds of electronic circuitry and control it using the Raspberry Pi. With the right cables, you can hook the GPIO pins up to switches, buttons, sensors, buzzers, and all manner of electronic gizmos and widgets. These are used to learn all about electronics hardware and circuit building.

While it's possible to wire parts directly to the GPIO pins, most tinkerers place electronic components in a breadboard and connect this to the Raspberry Pi. Unlike the type used for cutting bread, an electronic breadboard is a plastic slab with lots of holes in it.

Wiring a breadboard (or circuit) directly to the GPIO pins is generally safe, as long as you avoid circuits with external power sources. Most tinkerers invest in a breakout cable to go with the breadboard (see 'Breadboards and breakouts').

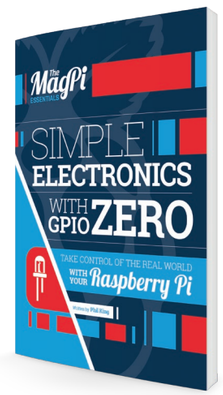
With your circuit set up, you then control the GPIO pins in a programming environment like Python or Scratch. GPIO pins are set to input or output mode. GPIO outputs are easy because the pin is switched on or off (known as HIGH or LOW in computing terms).

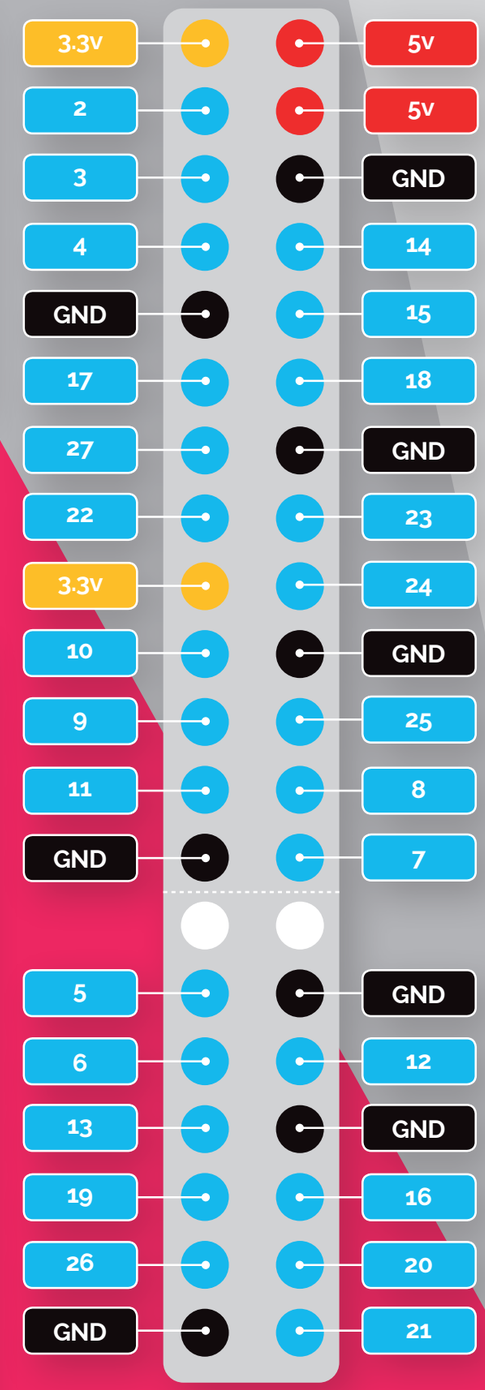
GPIO input is a bit more tricky. In this case, the GPIO pin is set to HIGH or LOW and responds to a change from a circuit. A button (or other electronic component) can change the circuit from LOW to HIGH, or HIGH to LOW, with the Raspberry Pi coded to respond accordingly. This is often referred to as 'pull up' or 'pull down'. Don't worry: if this all sounds complicated, you can get started by using GPIO Zero to make programming much easier.

Never underestimate the pure fun you can get from a little computer, a bunch of pins, and a handful of electronic components. Discovering how to use GPIO is a great way to spend your time.

GPIO ZERO ESSENTIALS

Learning to use the GPIO pins is the route to having real fun with a Raspberry Pi. It's a big subject, with lots of tricks and tinkering to discover. Our *GPIO Zero Essentials* book teaches you the basics (and beyond) of using the GPIO port with the GPIO Zero Python library. See **magpi.cc/GPIOZero-book** for more information.





There are 40 GPIO pins, each with a specific function. Use this image as a handy guide whenever you're programming electronics

BREADBOARDS AND BREAKOUTS



Electronic components are plugged into the holes on the breadboard, and components in adjacent holes are linked. In this way, you can build up a test circuit without having to actually solder components together.

If you follow the instructions, connecting directly to the GPIO pins on a Raspberry Pi is safe, but randomly plugging in wires and power sources to the Raspberry Pi may cause bad things to happen, especially plugging in devices that use a lot of power (like motors).

Because of this, many electronics enthusiasts use a device known as a 'breakout cable' between the Raspberry Pi and breadboard. The breakout cable plugs into the GPIO pins, and into the breadboard.

There are also devices like the Explorer HAT that combine a breakout with a breadboard and enable you to create prototype circuits.