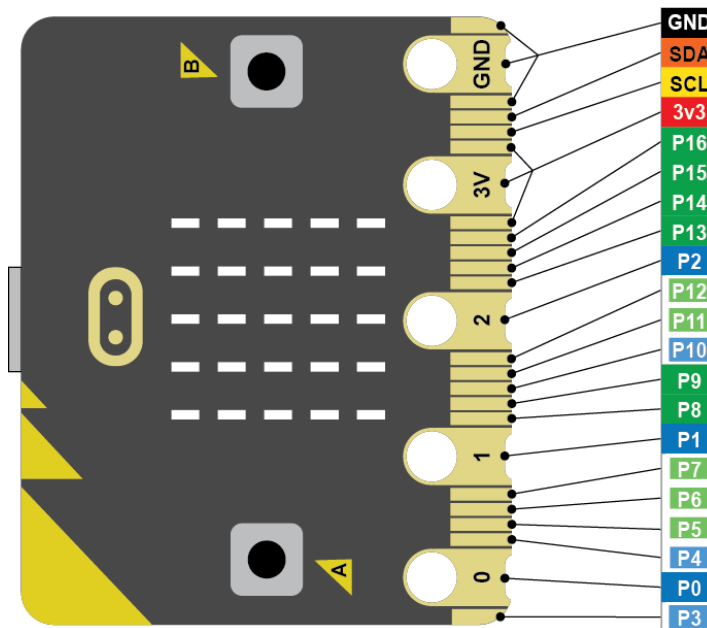


# Microbit Pins

The real power of the micro: bit is in the “pins” that are the gold contacts on the edge of the board. These 25 pins allow you to connect a variety of components to the micro: bit. In the worksheets the pins will be colour-coded as follows:



The different pins have different purposes:

	Digital Pins	Analogue Pins	I2C Pins	Power Pins
Preferred	P8 P13 P15 P9 P14 P16	P0 P1 P2	SDA SCL	GND 3v3
Optional Must switch off LED Matrix to use them	P6 P7	P3 P4 P10		
Optional Shared with buttons A and B	P5 P11			
Optional Reserved for accessibility	P12			

Note that P13, P14 and P15 can additionally be used for SPI Connections

Digital pins can be used for digital inputs and outputs, which are either on or off. For example a button is pressed or a light is switched on.

Analogue pins can be used for analogue inputs and outputs, which can vary from full on to full off. For example a volume control or a dimmable light. Note that all the analogue pins can also be used as digital pins.

The power pins provide 3.3 volts of electrical current, which can be used to power the micro: bit and some other devices.

The I2C pins are used for some specific devices that need to be controlled in a particular way.

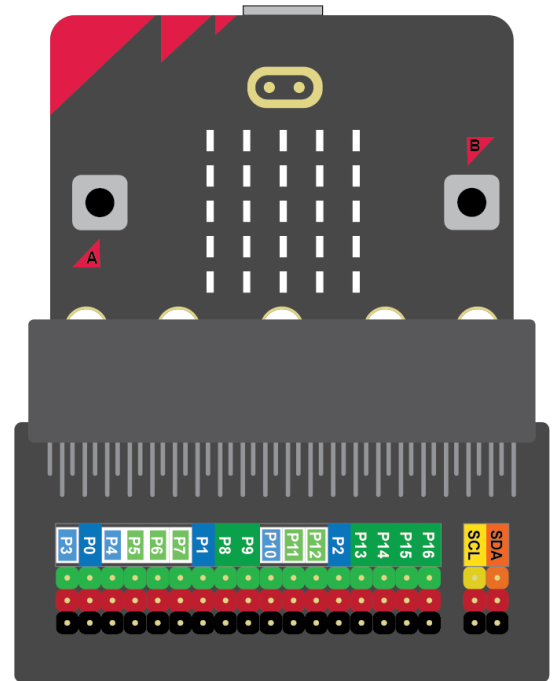
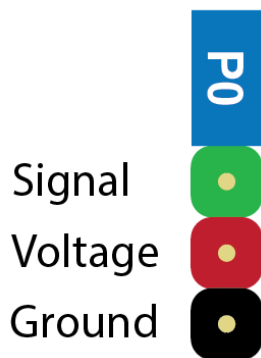
The SPI pins are also used for specific devices, but as SPI is not used that often, so we will mostly use these pins as general-purpose digital pins.

# The Edge Connector Board

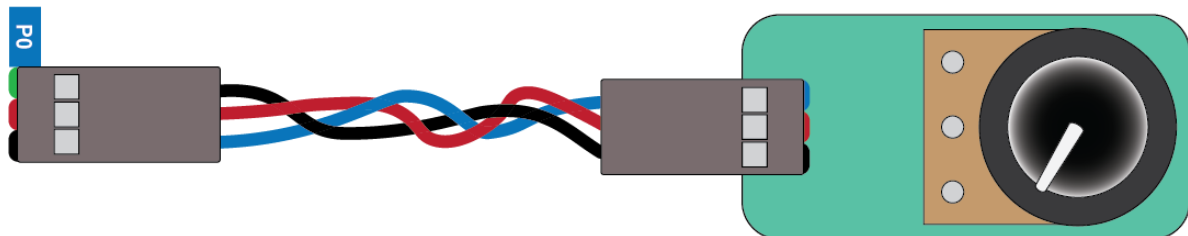
In order to access the Microbit's pins, we need to connect it to an **expansion board**. We will use two types of expansion board. The simplest is the **edge connector board**. This simply makes the 'pins' on the Microbit available as actual pins! This makes it easy to connect wires and hence various components to the Microbit.

Here is a Microbit connected to an edge connector. There are various types of edge connector, but the ones we will use will look something like this —>

Access to each pin is provided through a "GVS" pin block. GVS stands for Ground Voltage Signal, Here is the GVS block for pin 0:



Components can be connected to a GVS block using an appropriate cable. Here a component called a potentiometer is connected to pin 0:

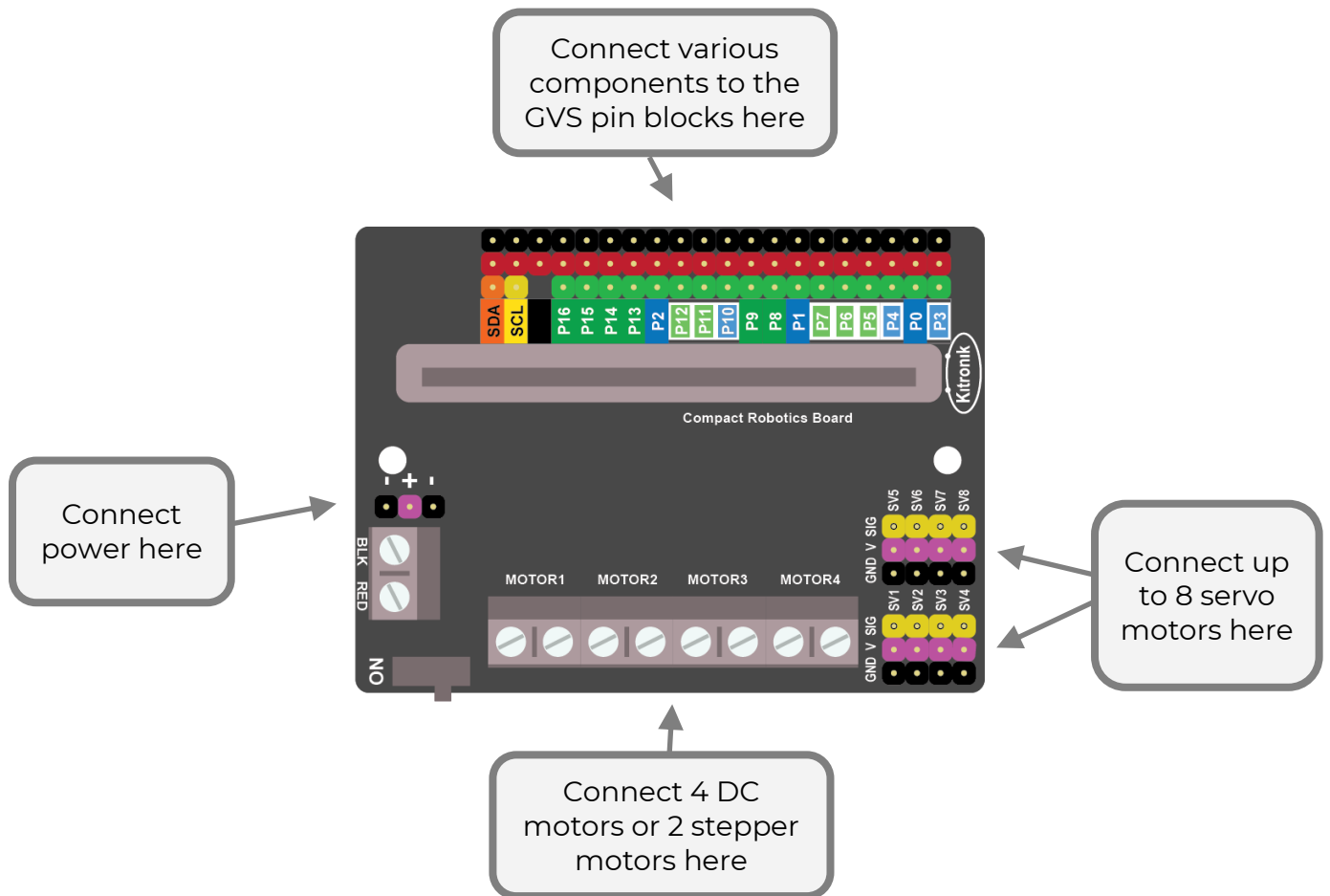


You can build projects by connecting various components to the edge connector and programming the components to interact with each other and the Microbit.

You can find out more about the potentiometer and other components in the **reference worksheets**.

# The Motor Controller Board

The motor controller board is another expansion board that can insert a Microbit into. Like the edge connector, the motor controller board gives access to all the Microbit pins. But additionally, it has special circuitry to control different types of motor. Motors need a lot of power, so you can connect the higher voltages and currents needed to the board.

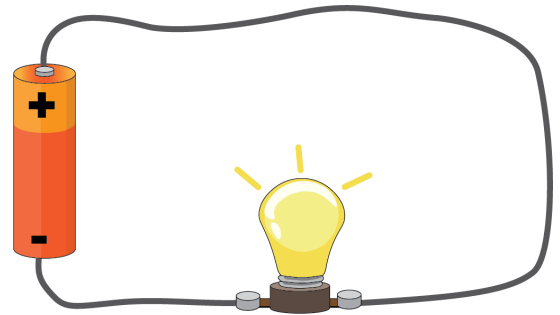


The motor controller board allows you to build robots, machines and lots of different motorised projects!

You can find out more about the different types of motor and other components in the **reference worksheets**.

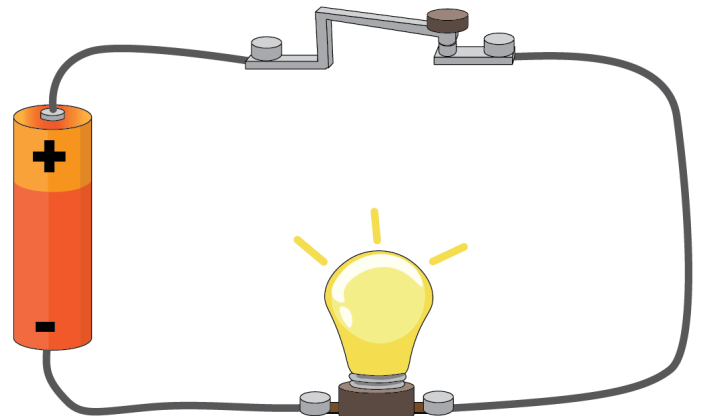
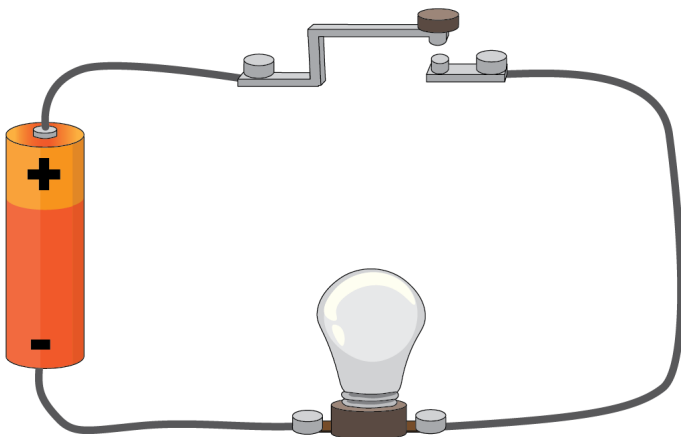
# MicroController: Digital Output

You are probably familiar with the idea that you can use a battery to power electronic devices. For example, connect a battery to a bulb and the bulb lights up!

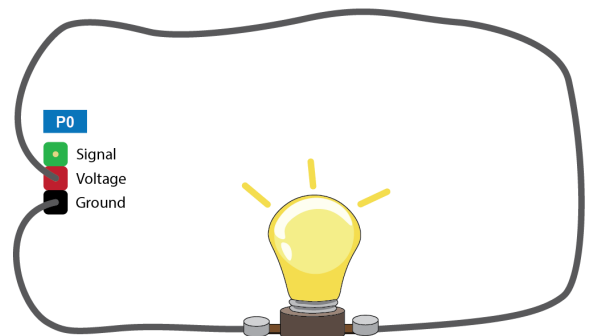


Here we have a simple electronic circuit, connecting power from the battery to the light. As long as the circuit connects the + of the battery to the light and then to the - of the battery, the current will flow and the bulb will light up.

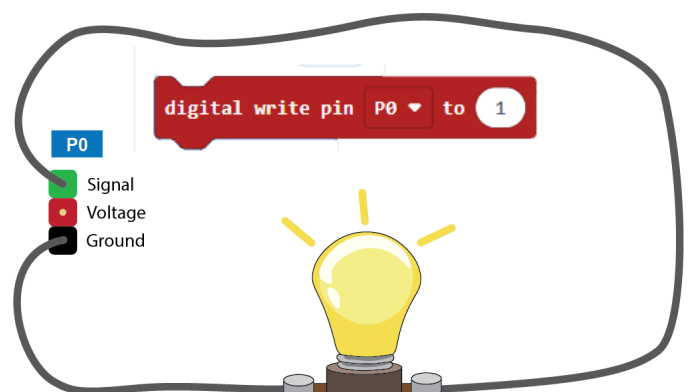
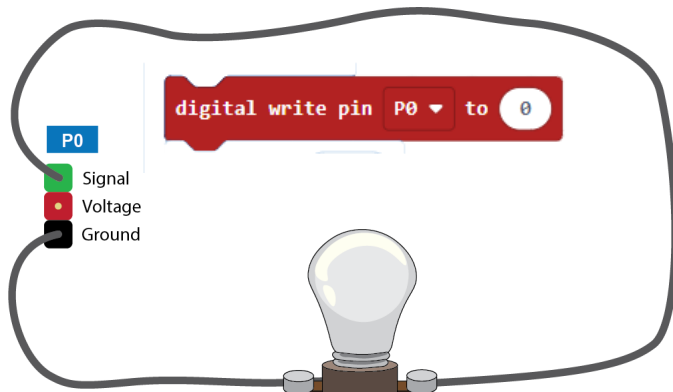
You can also connect a switch into the circuit. The switch breaks the circuit, so the bulb turns off. But pressing the switch completes



When working with microcontrollers such as the Microbit, things work in a similar way. The Microbit can act a bit like a battery. Connecting a bulb to the V and G of the Microbit is the equivalent of the battery + and -, so the bulb lights up.



But if you connect the bulb to the S and G instead, your bulb comes under software control. If you write a 0 to the pin, no voltage is applied to the S wire so the bulb remains off. But if you write a 1 to the pin, a voltage is applied to the S wire and the bulb lights up.

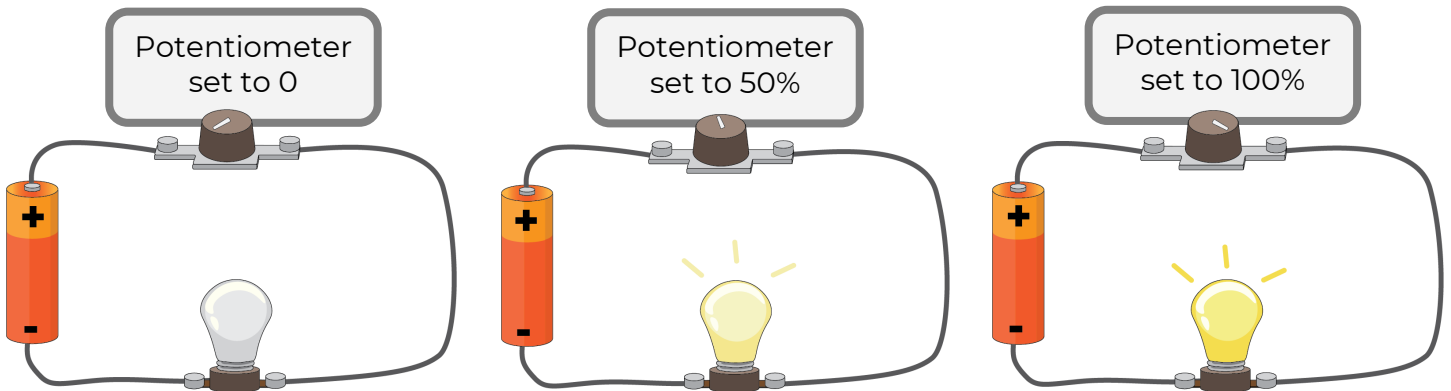


In this case we have a **digital output**. Digital means the output is either fully on or fully off.

# Microcontroller: Analogue Output

On the previous page you saw how a light can be turned on or off using a digital output. But what if you don't want the light fully on or off, but somewhere in the middle.

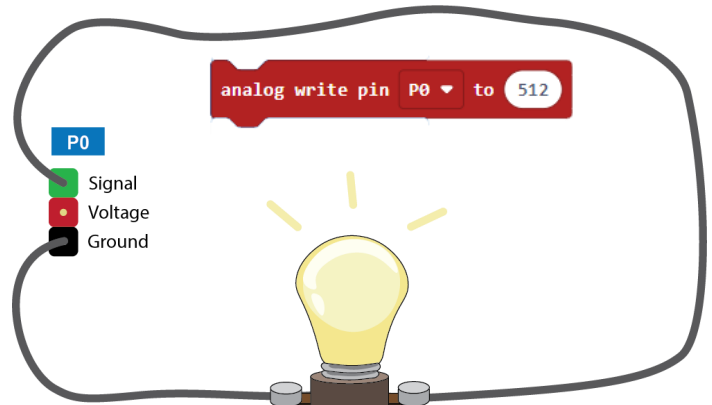
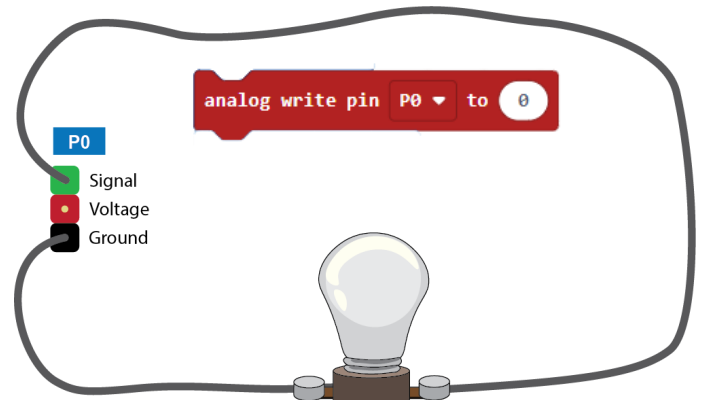
In a basic electronic circuit you can achieve this using a potentiometer, which adjusts the voltage flowing in the circuit. You will be familiar with potentiometers as dimmer switches or volume controls.



With the bulb connected to the S and G of the Microbit we can write an analogue value to the pin to give the effect of changing the voltage. You can write any value from 0 to 1023. A value of 0 means the pin is fully off. A value of 1023 means it is fully on. Values in between 0 and 1023 will give varying intensity.

In this case we have an **analogue output**. Analogue means the output is either fully on or fully off or anything in between.

Note that the Microbit cannot create a true voltage change. It can only simulate it by rapidly switching the current on and off. This is called Pulse Width Modulation (PWM).



# Microcontroller: Digital Input

# Microcontroller: Analogue Input

# Microcontroller: Other Connections

I2C

SPI

Cables