Signal Builder: DIY Traffic Lights

Overview

In this exciting project, we will transform everyday materials into a working traffic light system! Using cardboard, copper tape/Aluminium foil, and LEDs connected to a micro:bit, you will build your own traffic light controller from scratch.

What you will Learn

By the end of this project, you will understand:

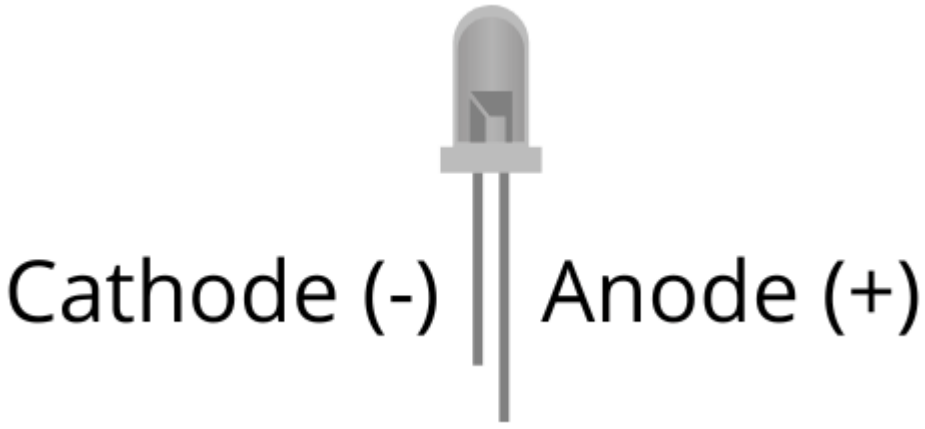
- ☐ How LEDs work and how to connect them safely
- ☐ How to create circuits using copper tape
- ☐ How to program light sequences using a micro:bit
- ☐ The basics of traffic light systems

What you will Need

- 1 x Red LED
- 1 x Yellow LED
- 1 x Green LED
- 1 x Piece of cardboard
- Copper tape / aluminium foil and glue
- 4 x Crocodile / alligator leads
- 1 x micro:bit (version 1 and 2 will work)
- 1 x Micro USB cable
- 1 x Battery pack for the micro:bit (optional)

Let's move on and create our traffic light circuit.

What is an LED



An LED (Light Emitting Diode) is a small light bulb that lights up when electricity flows through it. It's just like the tiny lights you see on your toys, TV, or Christmas decorations!
Every LED has two legs:

- A longer leg (called the positive or + side)
- A shorter leg (called the negative or - side)

Think of these legs like the LED's feet - they need to be connected the right way around for the LED to work. Just remember: Long leg = Positive (+), Short leg = Negative (-). If you connect them the wrong way around, your LED won't light up!

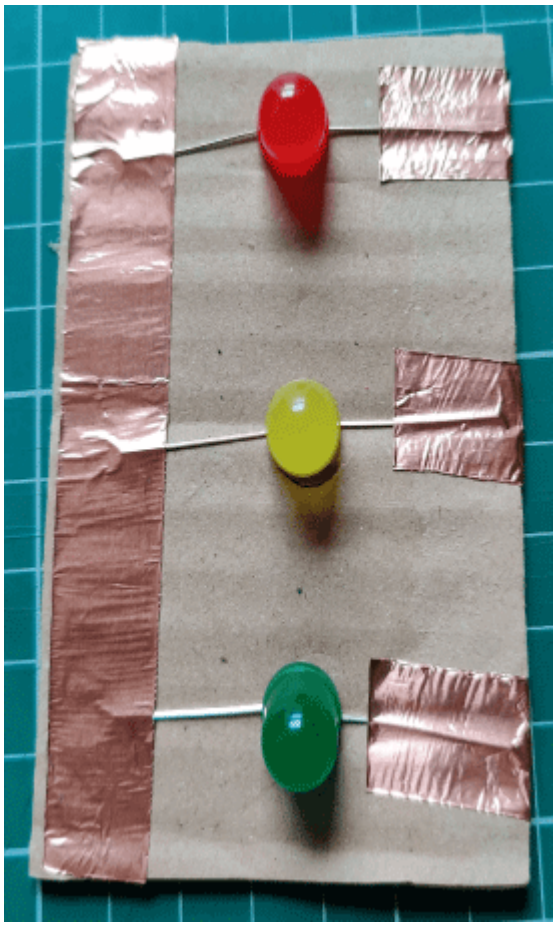
Creating the Circuit

1. Place the bit of cardboard on the desk.
2. Take the red LED and bend the legs out to the sides. Place the LED on the cardboard with the longer leg to the right.

3. Take a bit of copper tape or glue and some aluminium foil over the long leg of the red LED.

4. Complete steps 2 and 3 for the yellow and green LEDs.

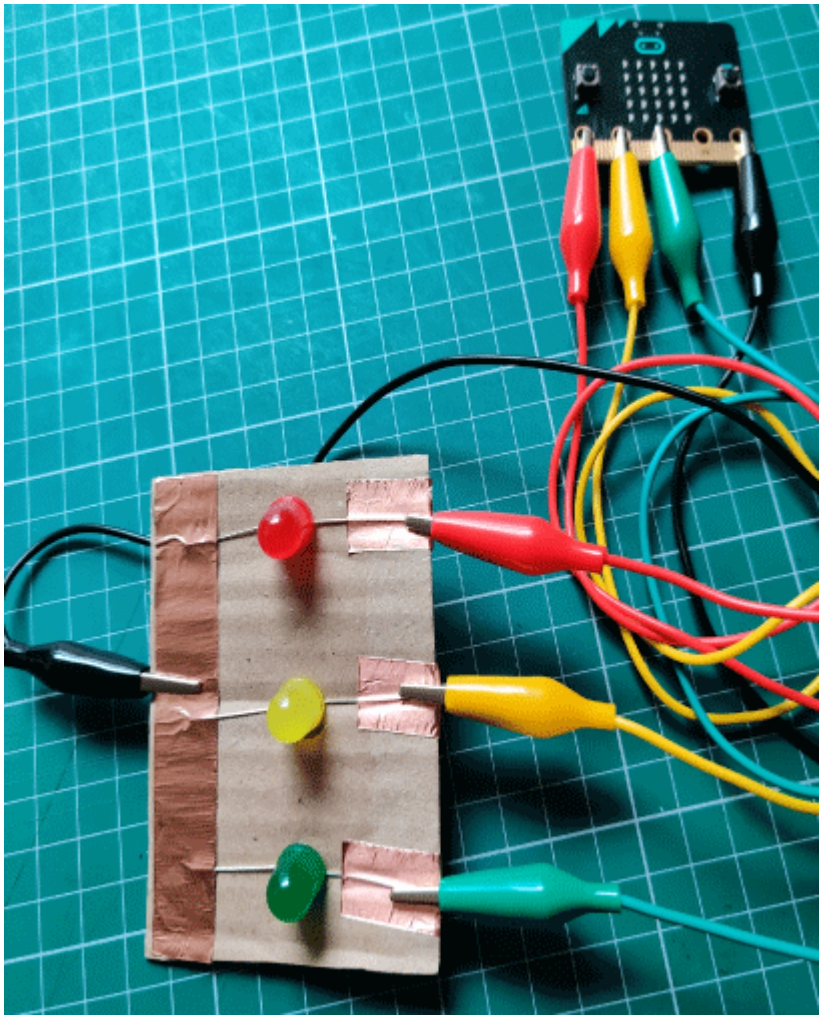
5. Take a longer bit of copper tape or foil and tape/glue all three of the short legs of the LEDs together.



Connecting the micro:bit

1. Take one of the crocodile/alligator leads and clip one end to the long piece of copper tape/aluminium foil covering the short legs of the LEDs and clip the other end to the GND pin of the micro:bit.
2. Take another crocodile/alligator lead and clip one end to the copper tape/aluminium foil of the longer leg of the red LED and attach the other end to pin 0 on the micro:bit.
3. Take another crocodile/alligator lead and clip one end to the copper tape/aluminium foil of the longer leg of the yellow LED and attach the other end to pin 1 on the micro:bit.
4. Take the last crocodile/alligator lead and clip one end to the copper tape/aluminium foil of the longer leg of the green LED and attach the other end to pin 2 on the micro:bit.

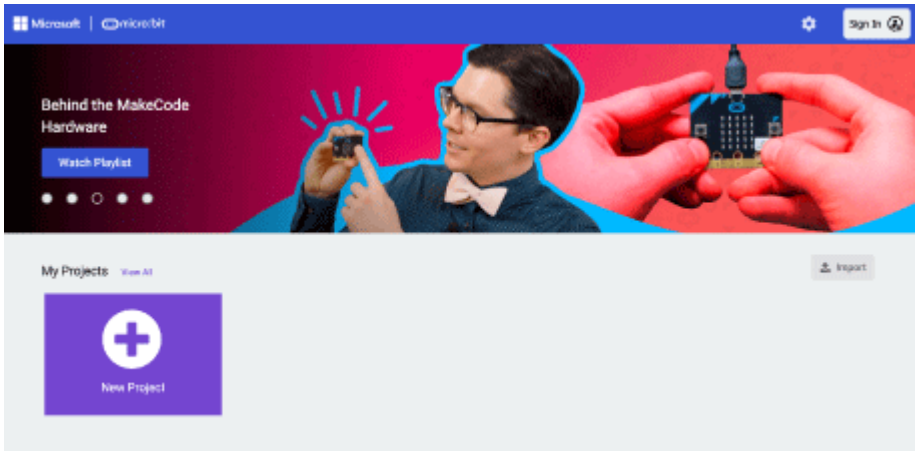
5. Take the micro USB cable and connect the micro:bit to the computer.



Let's move on and set-up our code editor.

Navigating to MakeCode

1. Open your favourite browser (we recommend Google Chrome) or if you are using a mobile phone or tablet open the micro:bit app.
2. Within the address bar of the browser type makecode.microbit.org or on a tablet or phone press create code.



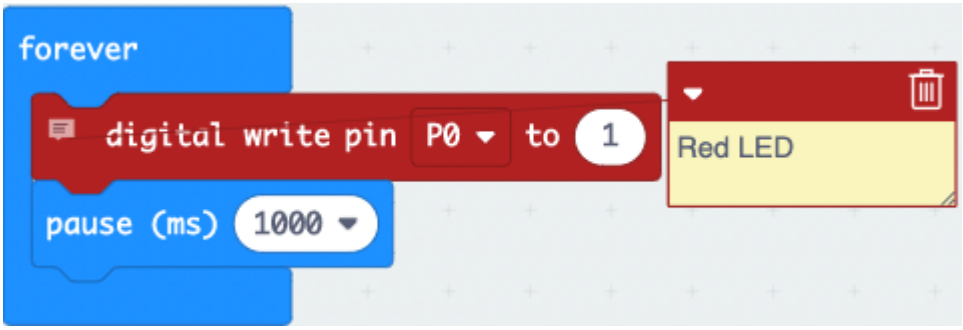
3. Select **New Project** and give it the name Traffic lights.

We are now ready to start coding!

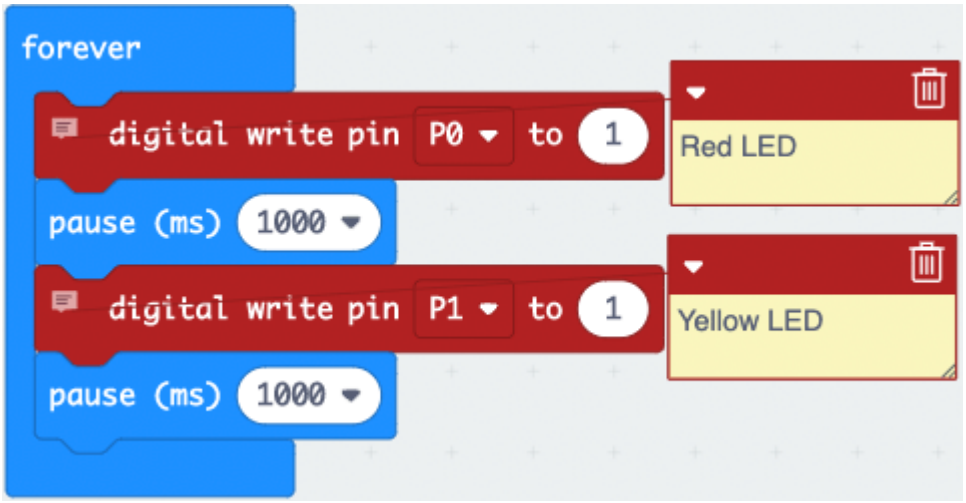
Coding

1. Select and drag the `on start` block to the left and drop it on the **bin**.
2. From the Pins menu within the Advanced menu, select and drag a `digital write pin P0 to 0` block to the code area and attach it within the `forever` block. Change the **0** to **1**.
3. From the Basic menu, select and drag a `pause (ms) 100` block to the code area and attach it under `digital write pin P0 to 1` block. Select **100** and Choose **1 second**.

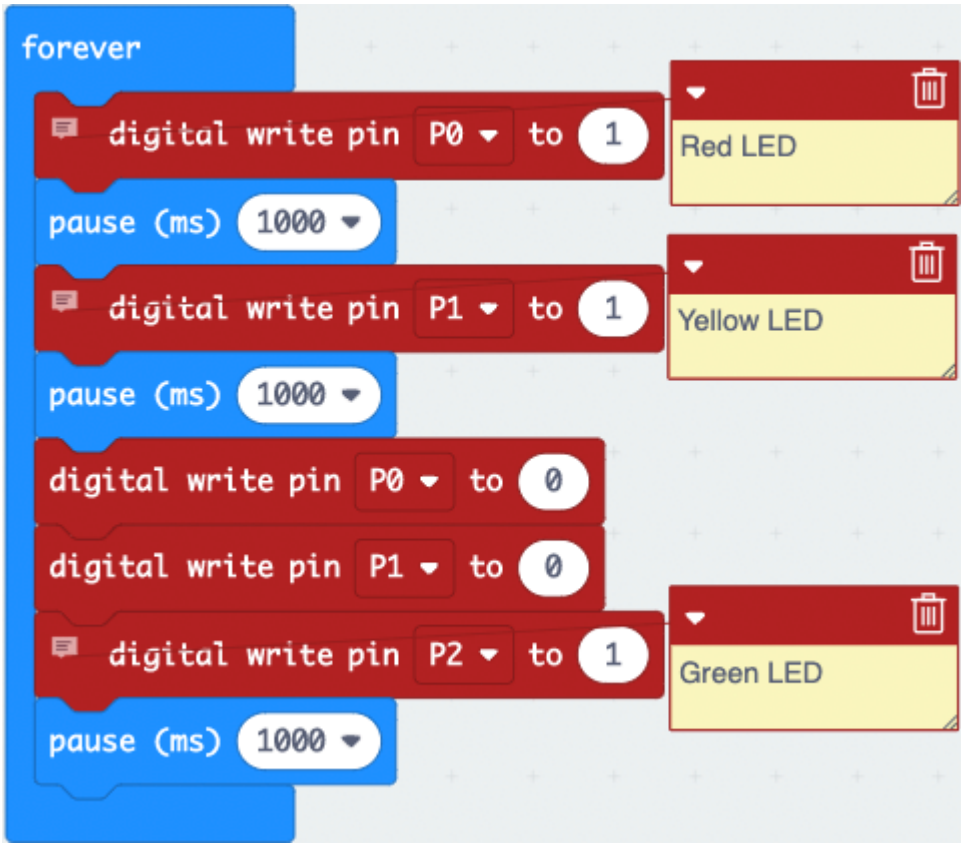
Your code should look like this:



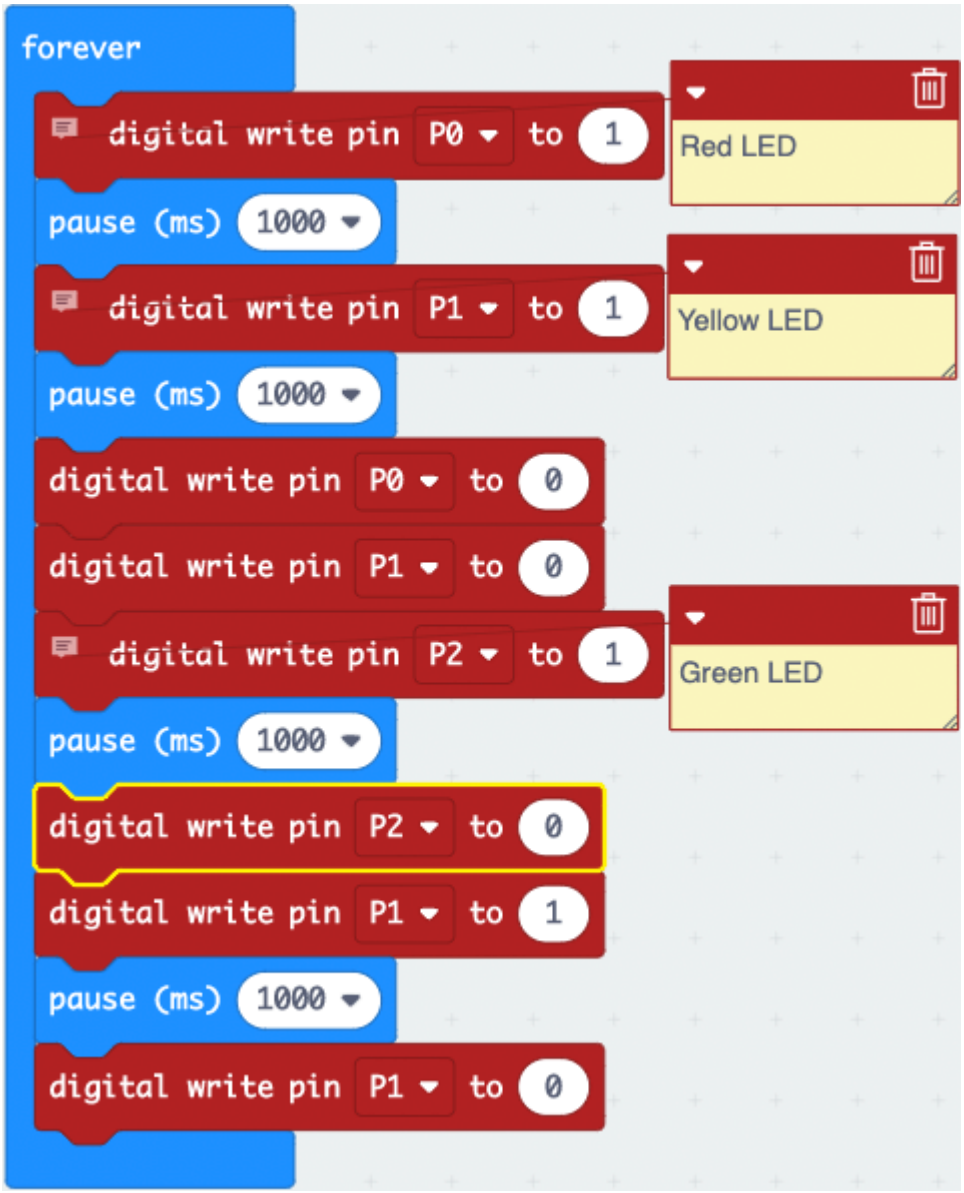
4. Right-click on `digital write pin P0 to 1` block and select **duplicate**. Drag the **duplicated** block and attach it under `pause (ms) 1000` block.
5. Select the little dropdown arrow next to *__P0__ and select **P1**.
6. Right-click on the `pause (ms) 1000` block and select **duplicate**. Attach the **duplicated** block under `digital write pin P1 to 1` block.



7. Right-click on `digital write pin P0 to 1` and select **duplicate** attach the **duplicated** block under `pause (ms) 1000` block.
8. Select the **1** and type **0** within the `digital write pin P0` block.
9. Right-click on `digital write pin P0 to 0` block and select **duplicate** attach the block under the `digital write pin P0 to 0` block. Select **P0** and choose **P1**.
10. Right-click on `digital write pin P1 to 0` block and select **duplicate** and attach it under the original block. Select **P1** and choose **P2**. Change the **0** to **1**.
11. Right-click on `pause (ms) 1000` and select **duplicate** and place the duplicated block under `digital write P2 to 1` block.



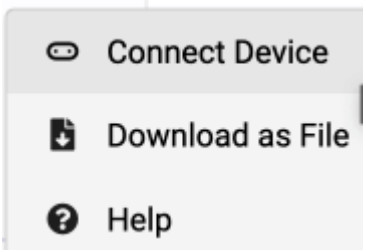
12. Right-click `digital write pin P2 to 1` block and select **duplicate** and attach it below `pause (ms) 1000` block. Change the **1** to **0**.
13. Right-click on `digital write pin P1 to 1` and select **duplicate** attach the **duplicated** block under the `digital write pin P2 to 0` block.
14. Right-click on `pause (ms) 1000` and select **duplicate** and attach it under the `digital write pin P1 to 1` block.
15. Right-click on `digital write pin P1 to 0` block and select **duplicate** connect the **duplicated** block under the `pause (ms) 1000` block.



Downloading the code to the micro:bit

1. Select the **3 dots** next to **Download**.

2. Select **pair device** a pop-up will come on screen to show you how to connect the micro:bit to the computer. Select **pair device** again.



3. Select **BBC micro:bit xxxx** and Select **connect**.

4. Select Download.

Now that we have downloaded our code, let's find out how to play.

How to Play

Web Browser

Within the micro:bit simulator you will see that the pins light up red as the code is switching between them.

Using the micro:bit

Once the code is dowloaded to the micro:bit you should see the LEDs light up in the pattern of traffic lights. If the LEDs aren't lighting up try pushing the copper tape/foil on to the leg to get a better connection.

If you find they are turning on/off in the wrong order check the pin numbering within the code.

P0 = red
P1 = yellow
P2 = green

You can also change the speed that the LEDs turn on and off by changing the timing of the pause blocks.