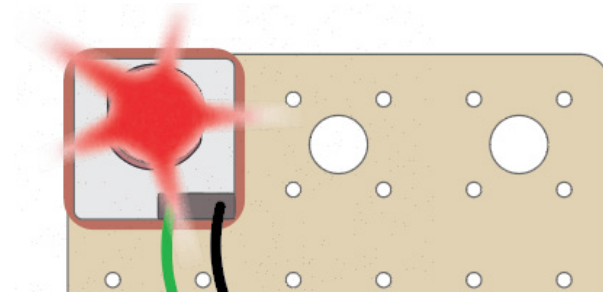# Add Lights to your Train

Project 2.02

In this workshop you will add a light to your train. You can make the light come on for different purposes. For example, you can use it to indicate when the train is moving.

How it Works

The lights we will use are called **LEDs** (Light Emitting Diodes). We will use a **digital output** to turn them on and off. When the output is HIGH, a 3.3 volts current is turned on. This is like switching on a 3.3V battery. The LED will light up. When the output is LOW, the current is turned off.

Each LED will be connected to a **pin** on the Microbit. To turn the LED on we will set the output to HIGH by setting the value of the pin to 1. To turn the LED off we will set the output to LOW by setting the value of the pin to 0.

The LEDs need to be connected to the Microbit using GS cables, which have 2 wires. G is ground, which is the black wire. S is signal, which is the green wire and connects to the pin on the Microbit.
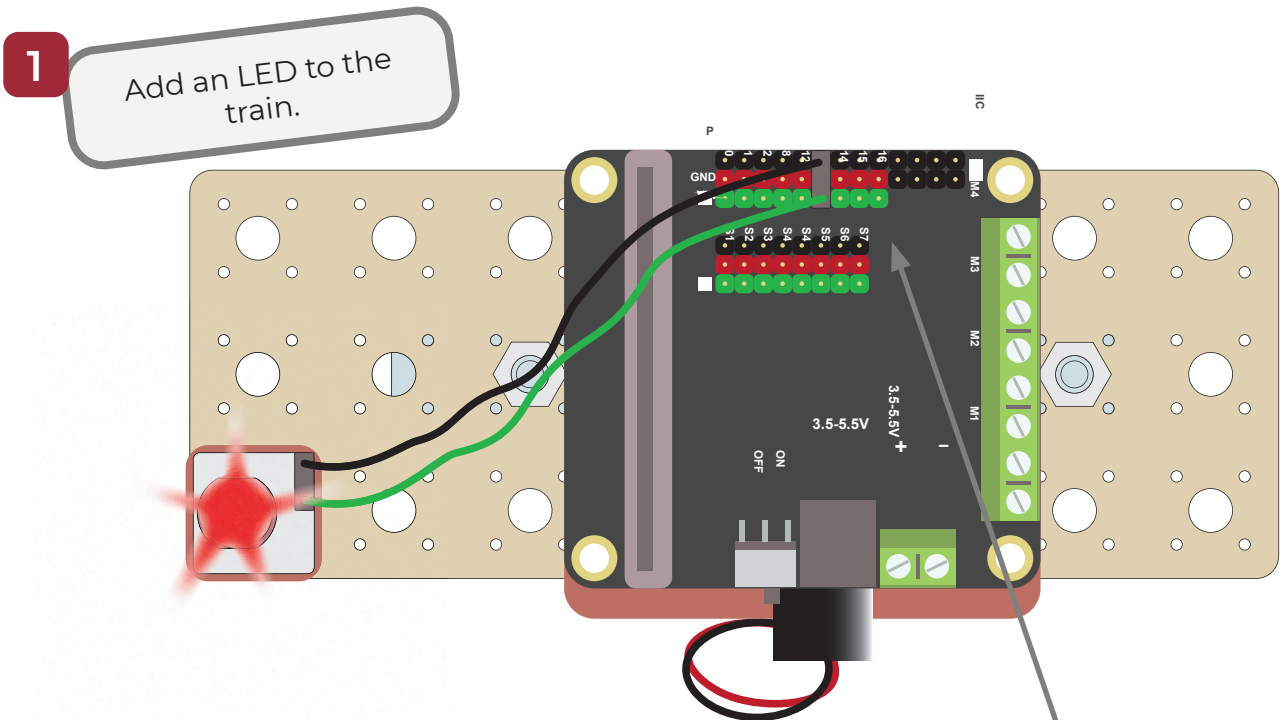
Microbit pin 13 set LOW

Microbit pin 13 set HIGH

What to do

- If you haven't already done so, build and code the train by referring to the previous worksheets

- Then follow this worksheet to add an LED light and get it to flash on and off

- Finally, attempt the coding challenges to design your own light (and perhaps sound) show!

Add the LED

Connect the LED

1 Add an LED to the train.

2 Wire up the LED as follows using **GS cables**

These connections on the microbit are called **pins**

Component	Microbit Connections
LED	P13

Code the LED

Make the LED Flash

Start with any train code you created in the last workshop.

```
forever
    digital write pin P13 ▼ to 1
    pause (ms) 500 ▼
    digital write pin P13 ▼ to 0
    pause (ms) 500 ▼
```

1 Add a new **forever** block with this code

Find the pins blocks in Advanced

✔ Advanced
◎ Pins

The code sets the pin to HIGH (1), waits for 1/2 second and then sets it to LOW (0)

2 Download the code to the Microbit and watch the LED flash!

Download •••

Your Challenge!

Now try out these challenges

- Create your own light show using different sequences and patterns.

- Add sound to make a flashing siren. You can find sounds in the music block:

🎧 Music

- Make the lights come on according to different movements of the train. For example, make the light come on only when the train is moving forwards

- Add a second light and make it do something else, for example turning on when the robot is reversing.

Add Lights to your Train: Solutions

Siren

This code plays alternating high and low sounds, synchronised with the flashing of the lights.

```
forever
    digital write pin P13 ▼ to 1
    digital write pin P14 ▼ to 0
    play tone Middle C for 1 ▼ beat in background ▼
    pause (ms) 500 ▼
    digital write pin P13 ▼ to 0
    digital write pin P14 ▼ to 1
    play tone High C for 1 ▼ beat in background ▼
    pause (ms) 500 ▼
```

Second LED

Connect up the second LED to pin 15 using a GS cable.
This code will flash the additional LED

```
forever
    digital write pin P15 ▼ to 1
    pause (ms) 500 ▼
    digital write pin P15 ▼ to 0
    pause (ms) 500 ▼
```
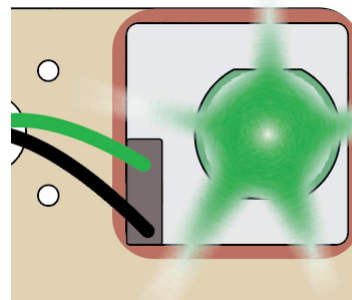
Add Lights to your Train: Solutions

Actions

In this code, one light comes on when the train is going forwards and the other when the train is going backwards.

```
on start
    Motor  M1 ▾  direction  Forward ▾  speed  100
    digital write pin  P13 ▾  to  1
    digital write pin  P15 ▾  to  0
    pause (ms)  2000 ▾
    Motor  M1 ▾  direction  Reverse ▾  speed  100
    digital write pin  P13 ▾  to  0
    digital write pin  P15 ▾  to  1
    pause (ms)  2000 ▾
    Motor Stop All
```