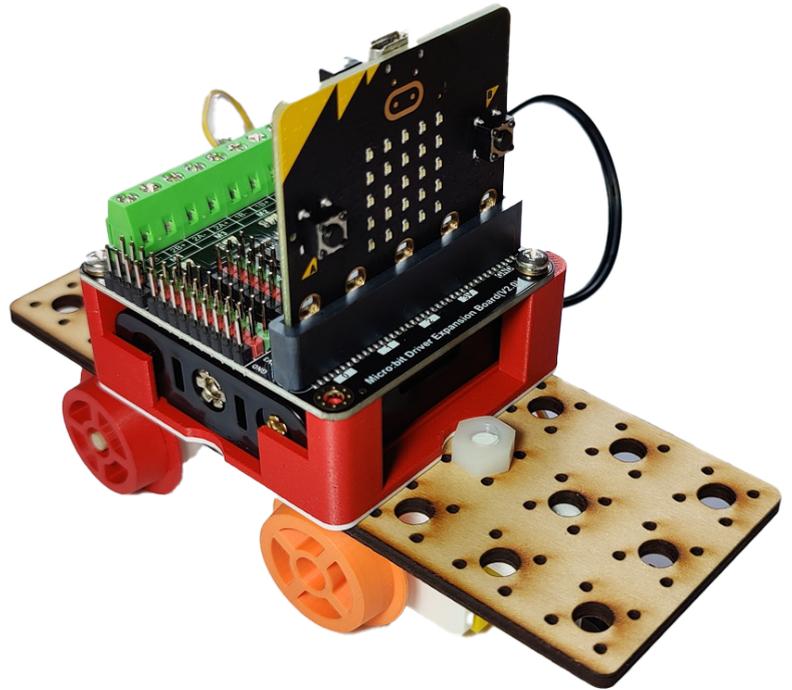


Build a Train

Project 2.01

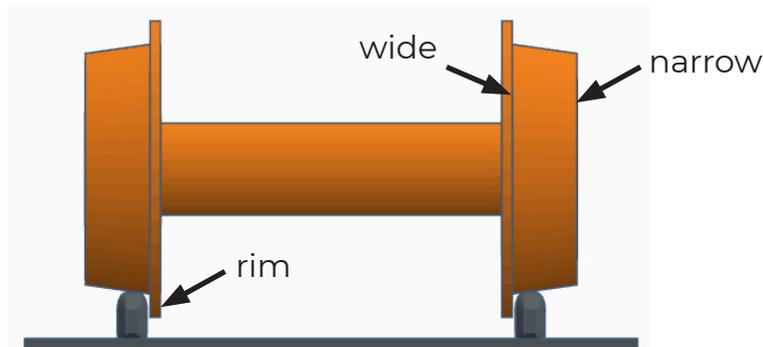
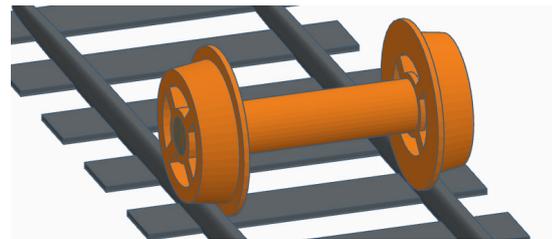
In this workshop you will make a small train. You can run the train on the floor, but it's much more fun to run the train on tracks.



How it Works

The train will have 4 wheels. Two wheels will be driven by a motor. The other wheels will spin freely.

Notice the shape of the wheels. They are designed to keep the train on the track! The rim prevents the train slipping off the track. Notice also that the wheel is slightly narrower on one side than the other. This helps to keep the train running smoothly on the track when the train goes around bends.



The Motor Controller is used to drive the motors. It turns on the current when you want the motor to spin and turns it off when you want the motor to stop. You can also change the speed and direction of the motors.

A Microbit will be coded to make whatever movements you want.

What to do

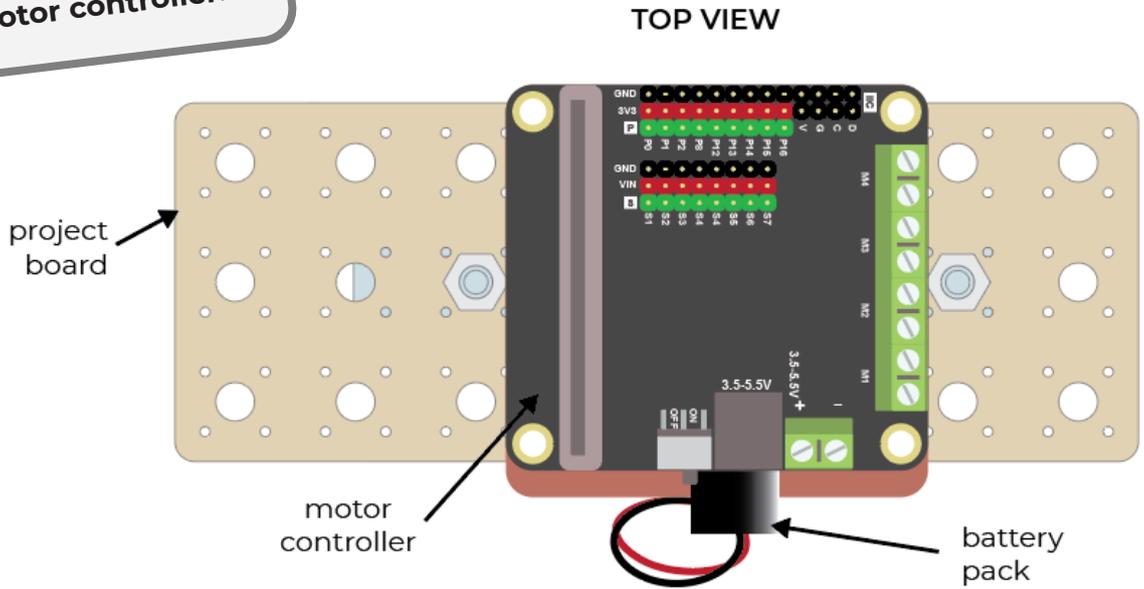
- Follow this worksheet to build and code the basic forwards movement of the robot.
- Attempt the challenges to get other movements
- Run the train on the track

Assemble the Train

Connect all the Components

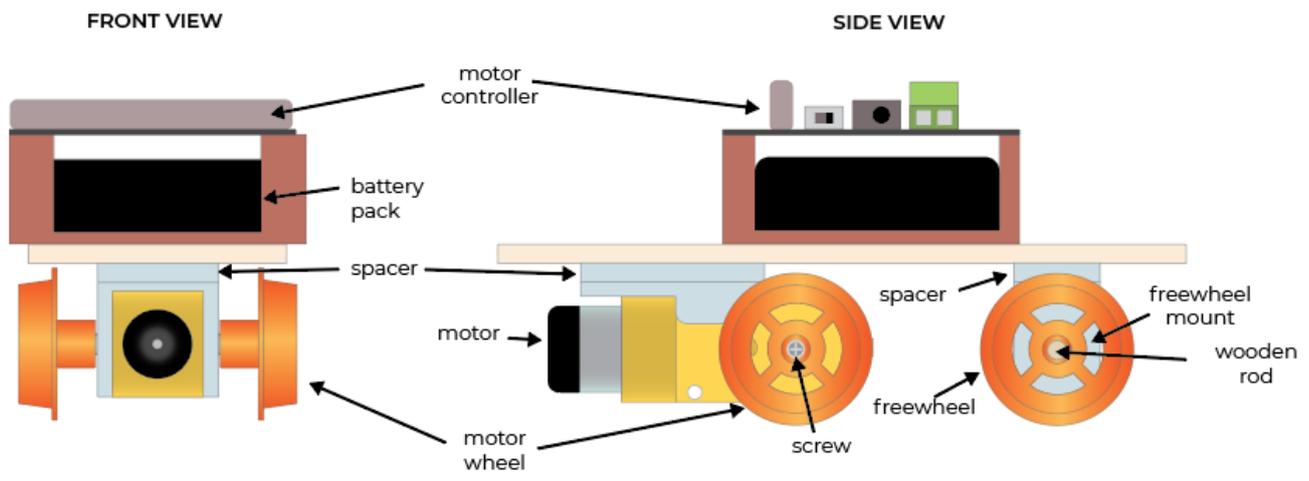
Create a new Makecode project so you can start coding.

1 Start with the **project board** and add the **motor controller**.



2 Insert the **battery** and plug it into the motor controller

3 Add the **motor** and **freewheel mount**, using the **spacers** to make room for the wheels.



4 Add the **motor wheels** to the motor using a small screw to secure it in place.

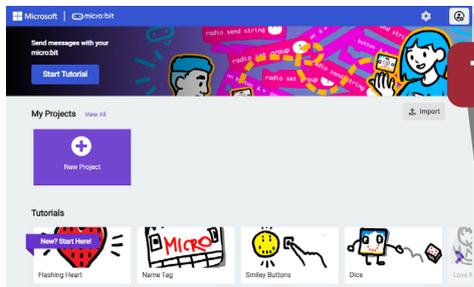
5 Use the **wooden rod** to add the **freewheels**.

Code the Train

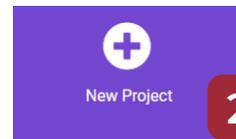
Create a Project

Create a new Makecode project so you can start coding.

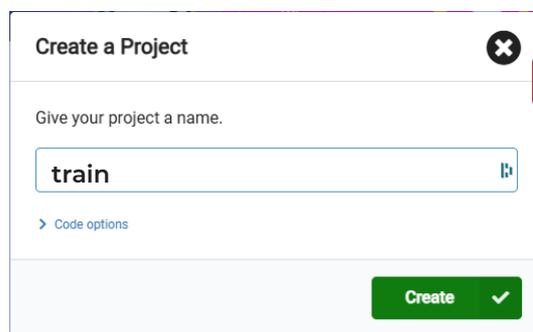
<https://makecode.microbit.org/>



1 Go to the Makecode website.



2 Click on New Project.



Create a Project

Give your project a name.

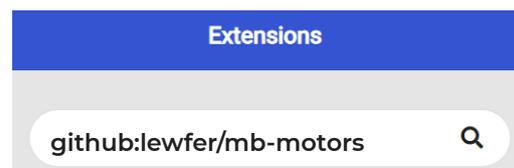
[Code options](#)

Create ✓

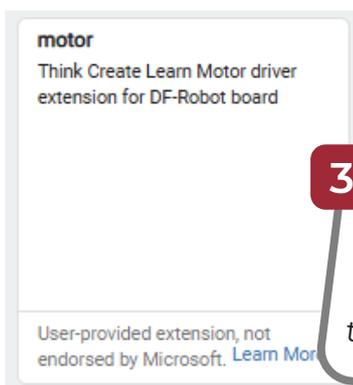
3 Give the project a name (whatever name you like).

Add the Motor Driver Extension

The motor driver extension adds code blocks that allow you to control motors.



2 Type in the extension.



3 Select the motor extension that appears.

github:lewfer/mb-motors

4 If all goes well you will see this new code block.



Add Code to Move the Motors

1 Find these blocks

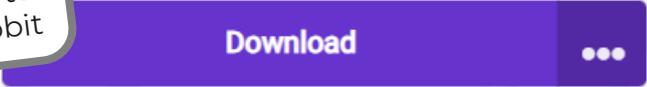


2 Add this code. This move the train forwards at 50% speed for 2 seconds and then stops.

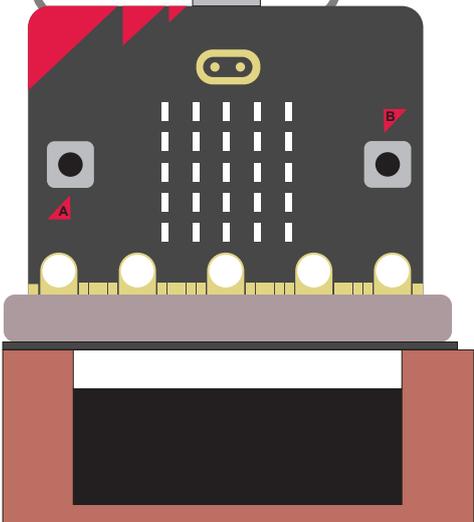
```
on start
  Motor M1 direction Forward speed 50
  pause (ms) 2000
  Motor Stop All
```

The pause tells the train how long to carry on doing the previous thing. In this case this says how long the robot will keep moving forwards. The number is the time in milliseconds, There are 1000 milliseconds in 1 second.

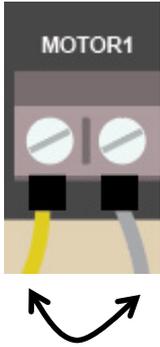
3 Download the code to the Microbit



4 Insert the Microbit into the Motor Controller Board



5 Check that the robot runs correctly. If one or both of the wheels is turning the wrong way, swap the wires on the motor around.



Your Challenge!

- Get your train to perform different movements:
- How can you make the train move backwards?
 - How can you change the speed of the train?
 - Place the train on the track and try to get it to stop when it reaches the end.

Build a Train: Solutions

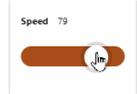
Moving Backwards

Use the "Reverse" direction to move backwards

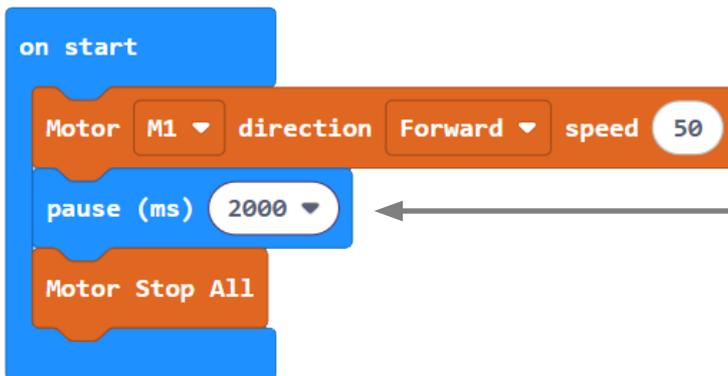


Changing Speed

Click on the speed to adjust it



Running to the end of the Track



Adjust the pause to change the length of time the train runs. Experiment until the train stops right at the end of the track.