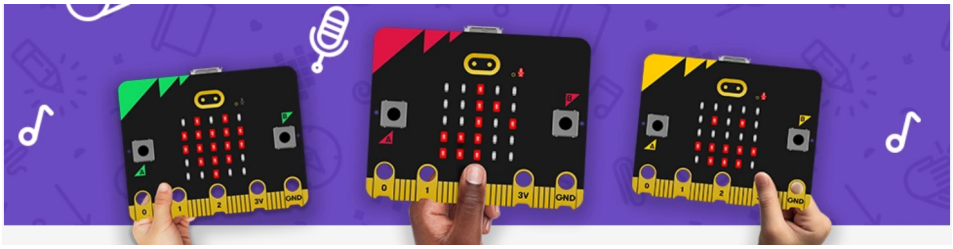
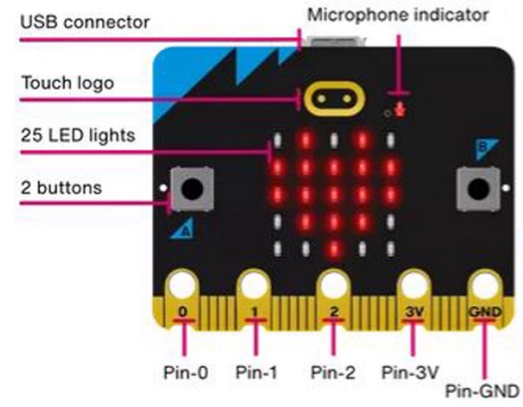
1.1. What Is the micro:bit v2.2?

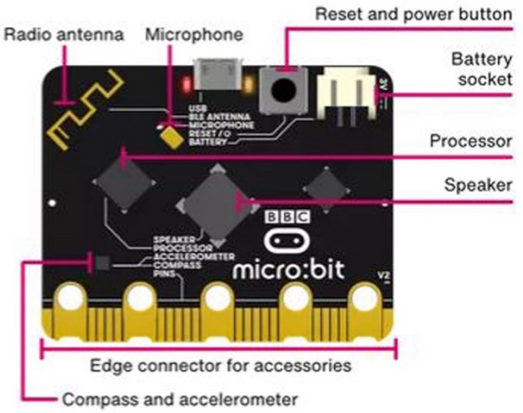
The BBC micro:bit is a pocket-sized computer that introduces you to how software and hardware work together. It has an LED light display, buttons, sensors and many input and output features that, when programmed, let it interact with you and your world.

The new micro:bit with sound adds a built-in microphone and speaker, as well as an extra touch input button and a power button.



1.2. Features – Hardware





Display

An LED, or light-emitting diode is an output device that gives off light. Your BBC micro:bit has a display of 25 LEDs for you to program.

User Buttons

Buttons are a common input device. Your micro:bit has two buttons you can program, and a reset button.

Accelerometer

An accelerometer is a motion sensor that measures movement. The accelerometer in your BBC micro:bit detects when you tilt it left to right, backwards and forwards and up and down.

Temperature sensor

A temperature sensor is an input device that measures temperature. Your BBC micro:bit has a temperature sensor inside the processor which can give you an approximation of the air temperature.

Light sensor

A light sensor is an input device that measures light levels. Your BBC micro:bit uses the LEDs to sense the levels of light and lets you program your micro:bit as a light sensor.

Compass

A digital compass is an input sensor that detects magnetic fields. Your BBC micro:bit has an inbuilt compass that can detect the direction in which it is facing.

Touch logo

The touch logo uses capacitive touch, sensing tiny changes in electrical fields to know when your finger is pressing it - just like your phone or tablet screen.

Speaker

The new micro:bit has built-in speaker, which makes it easy to add sound to your projects. Any micro:bit sound project will work with the speaker, but with the new micro:bit you can also express yourself with some new sounds: make your micro:bit giggle, greet you or let you know when it is sleepy or sad.

You can also mute the speaker and sound will still come out of the pins so you can still enjoy micro:bit music on headphones connected to GND and pin 0. In MakeCode, use the music block 'set on-board speaker off'.

Microphone

The new micro:bit has a built-in microphone. You can use it as a simple input - make your micro:bit turn the lights on when you clap. It can also measure the amount of sound, so you can make a noise level meter or disco lights that beat in time with music.

The microphone is on the back of the new micro:bit, and on the front, you'll find a new microphone LED next to the hole that lets the sound in. It lights up to show you when your micro:bit is measuring sound levels.

Radio

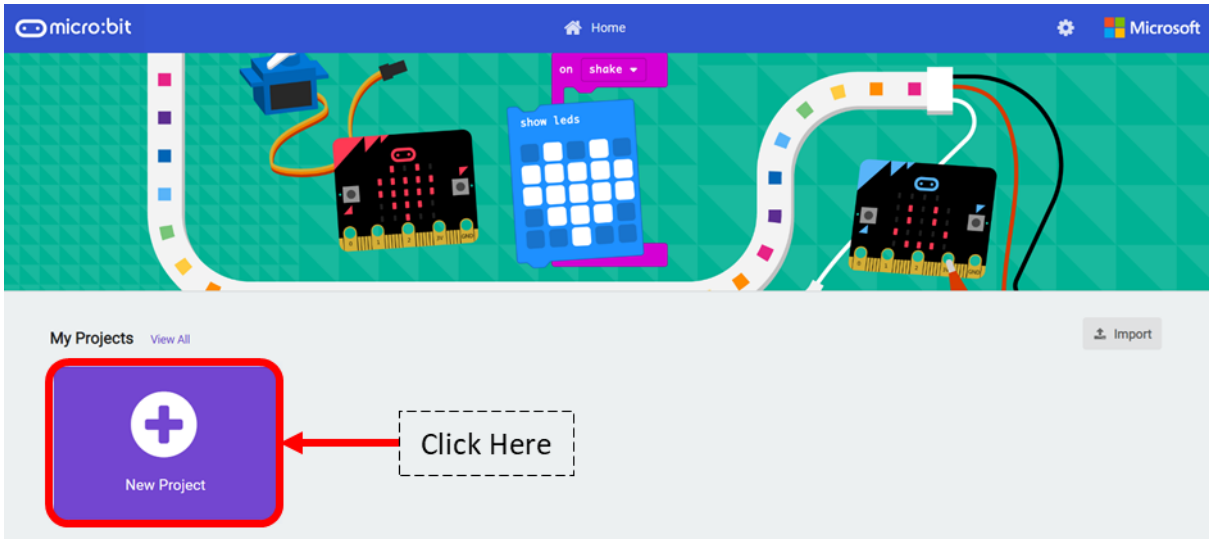
Radio is a way of sending and receiving messages and BBC micro:bits can use radio waves to communicate with each other.

Pins

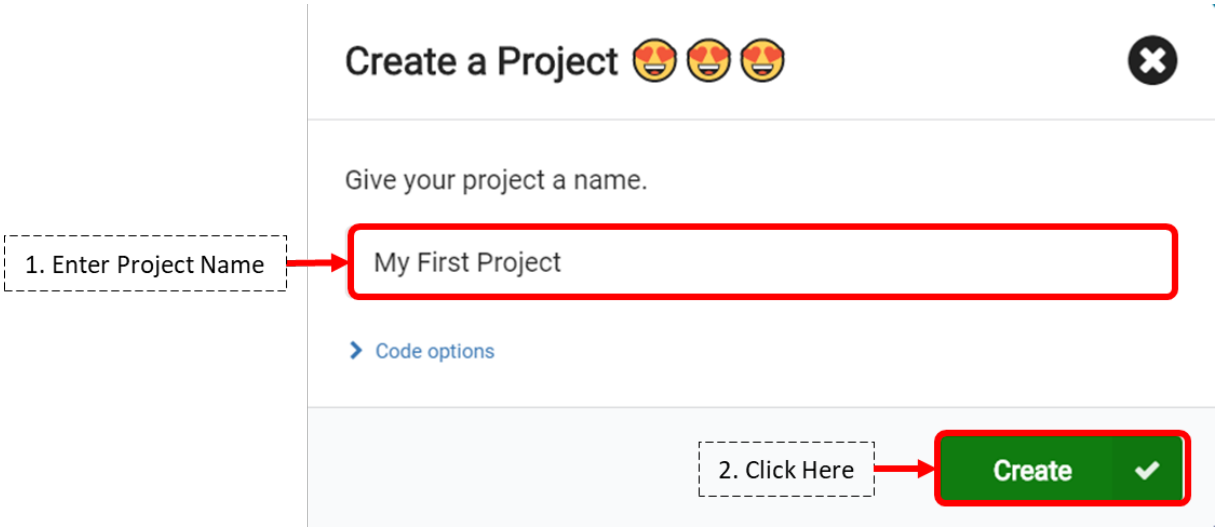
On the bottom edge of your BBC micro:bit there are 25 gold strips, called pins. These pins allow you to really get creative. You can create circuits, connect external things like buzzers and motors and make your own fun projects.

1.3. Using MakeCode Blocks Editor

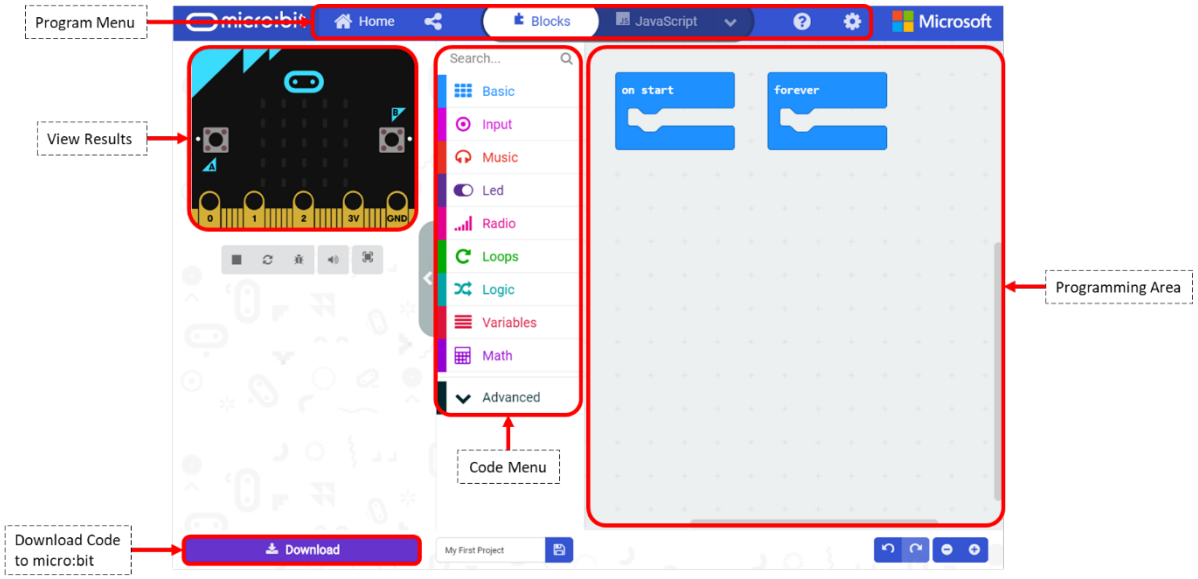
1. Using Google Chrome, key in the following website: *http://makecode.microbit.org/*



2. Click on [New Project] and give the project a name. Click on the [Create] button.

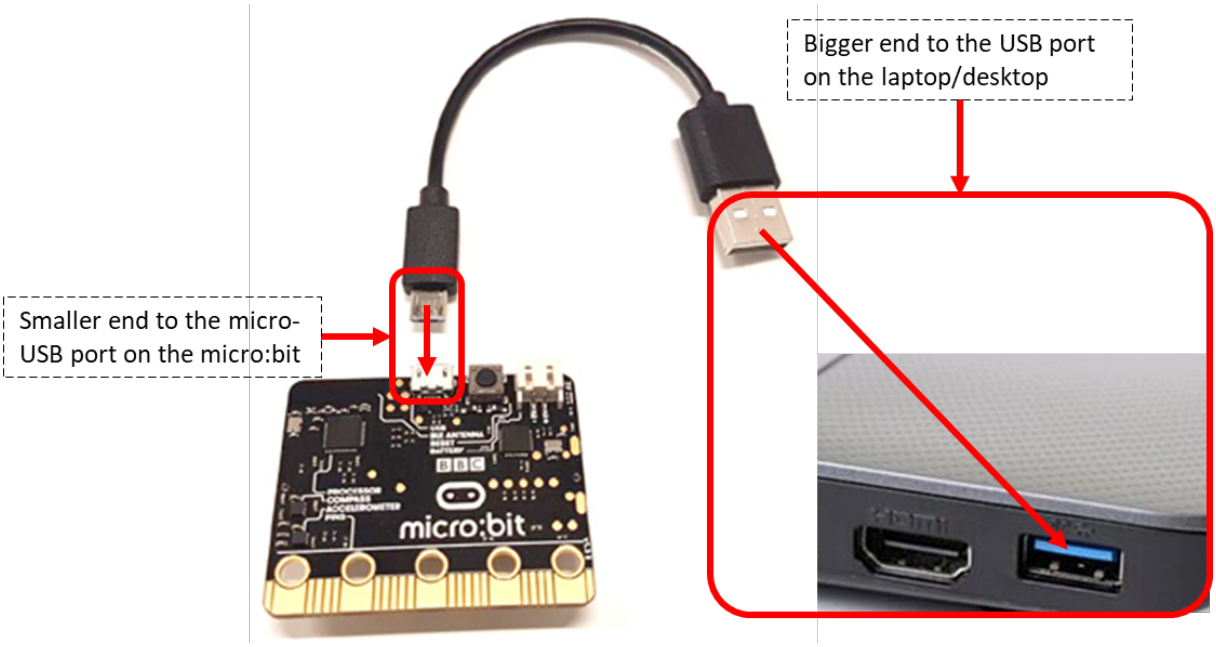


3. The different areas of the coding interface.

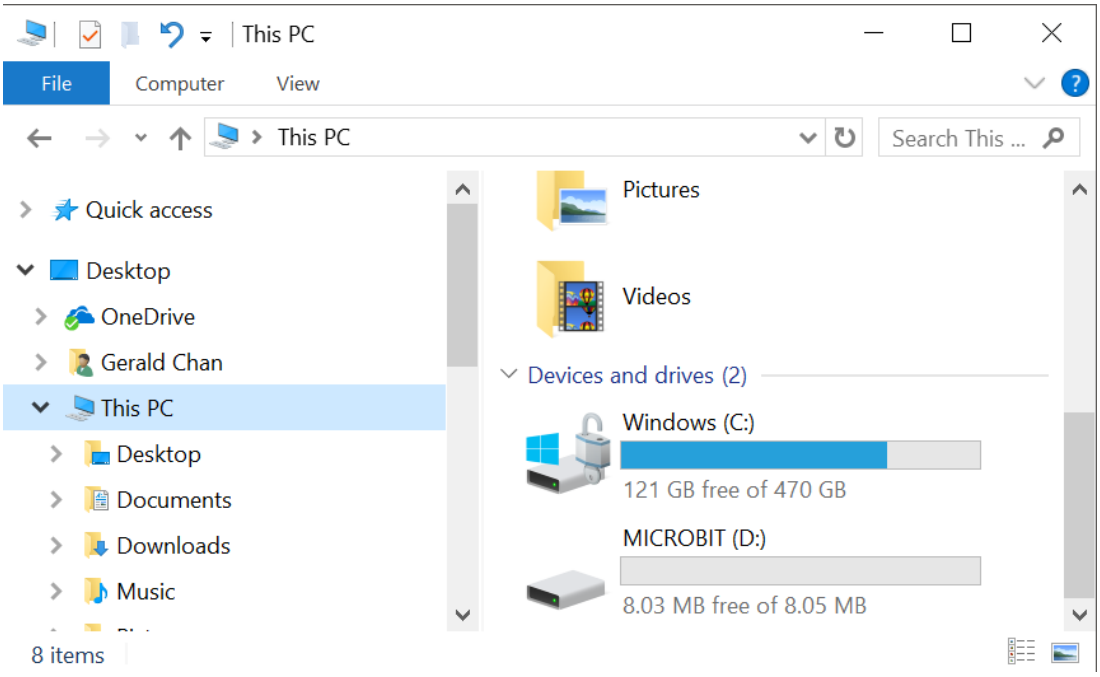


1.2.4 Getting A Program on the micro:bit

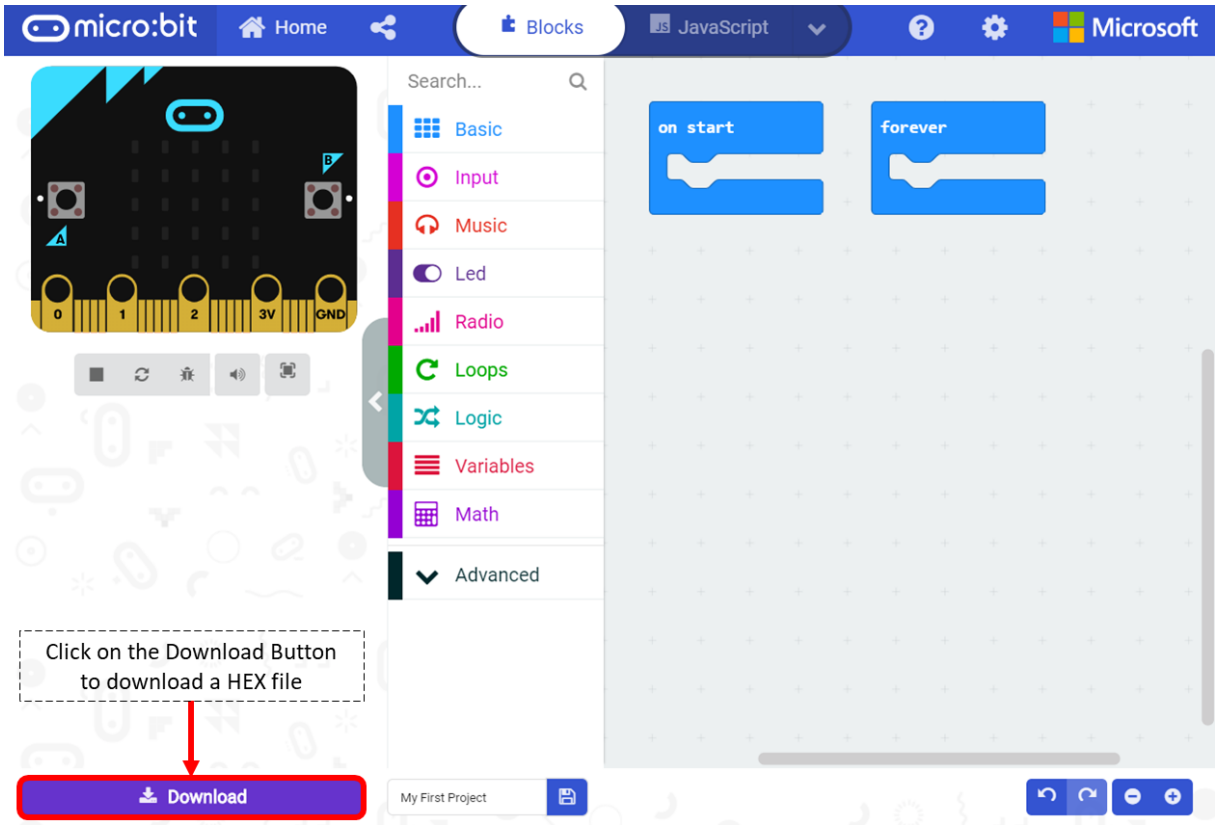
1. Connect the smaller end of the USB cable to the micro-USB port on the micro:bit and the other end to a USB port on your computer.



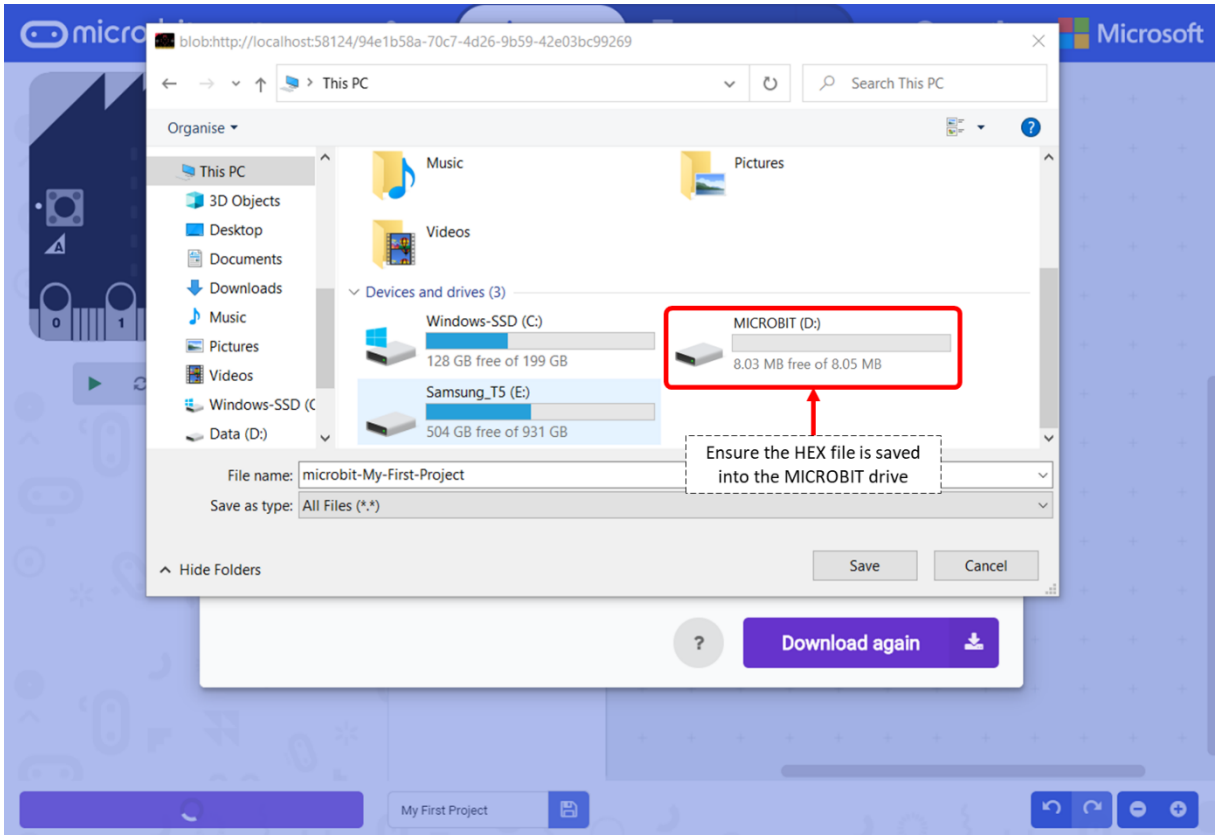
2. Your computer should recognize your micro:bit as a new drive and will appear as MICROBIT drive under Devices and drives.



3. Download the program



4. Transfer the program to the micro:bit



5. Once transferred, the code will run automatically on your micro:bit. To restart your program, press the reset button on the back of your micro:bit.

6. By copying the HEX file onto the MICROBIT drive, you have programmed it into the flash memory on the micro:bit, which means even after you unplug the micro:bit, your script will still run if the micro:bit is powered by battery.

Troubleshooting Note:

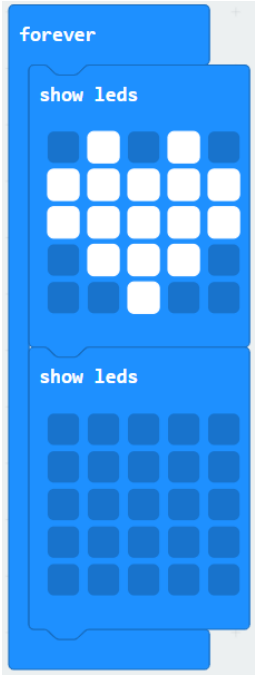
1. *You cannot drag and drop more than one hex file at once onto your micro:bit. If you try to drag and drop a second hex file onto your micro:bit before the first file has finished downloading, then the second file may fail in different ways.*

2. *When the first hex file has been written to the micro:bit, the drive will disengage. If you drag and drop a second hex file at this point it may not find the drive and the second write will fail.*

1.4. Blinking, Simple Animation, Scrolling Text & Display Number

Blinking Heart LED

1. Click on the Basic menu and drag the [SHOW LEDS] block to the programming area under the [FOREVER] block.
2. Choose the following LEDS to display a blinking heart animation

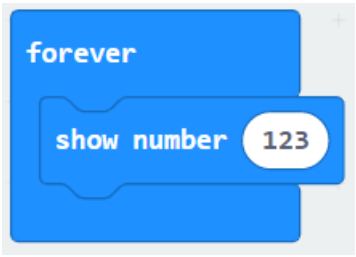


Scrolling Text LED

1. Click on the Basic menu and drag the [SHOW STRING] block to the programming area under the [FOREVER] block.
2. Choose the following LEDS to display a scrolling line of text “Hello”

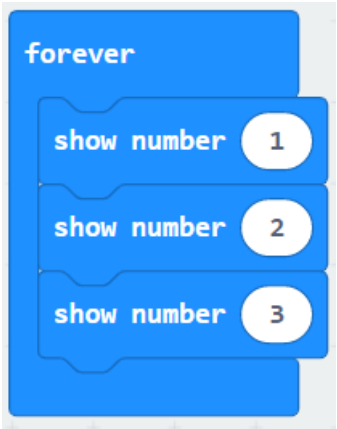
Display Number LED (1)

1. Click on the Basic menu and drag the [SHOW NUMBER] block to the programming area under the [FOREVER] block.
2. Choose the following LEDS to display a scrolling number “123”



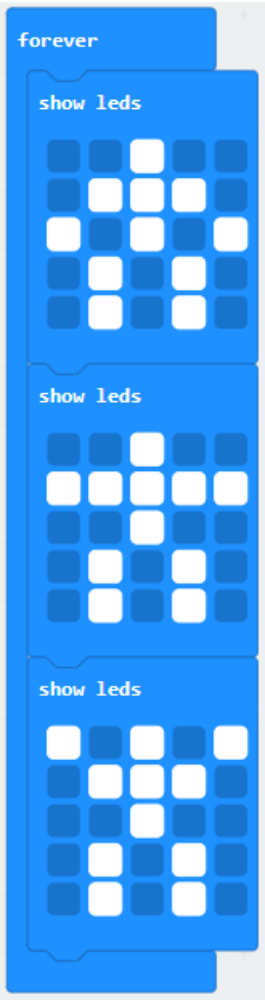
Display Number LED (2)

1. Click on the Basic menu and drag the [SHOW NUMBER] block to the programming area under the [FOREVER] block.
2. Choose the following LEDS to display individual numbers “1” followed by “2” followed by “3”



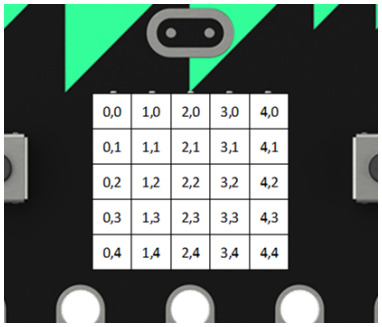
Display Simple Animation LED

1. Click on the Basic menu and drag the [SHOW LEDS] block to the programming area under the [FOREVER] block.
2. Choose the following LEDS to display a dancing man animation



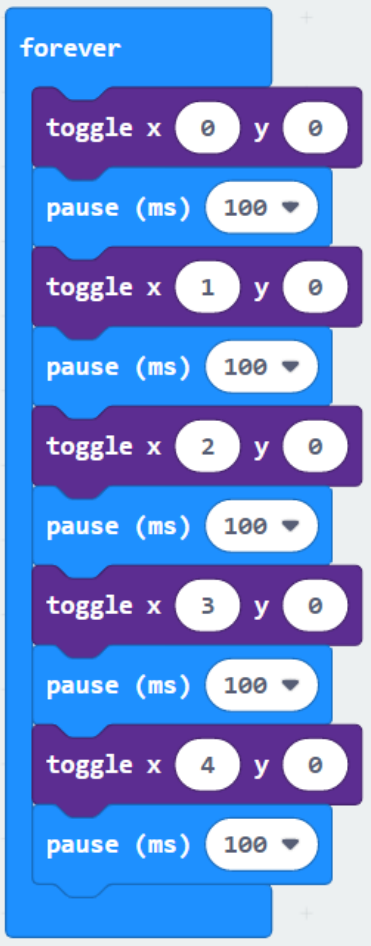
1.4.1. Activity 1: Program a LED animation that shows chasing LED lights looping forever

Each LED is assigned an X and Y value (X,Y) corresponding to its position on the matrix.



1. Click on the LED menu and drag the [TOGGLE] block to the programming area under the [FOREVER] block.

2. Click on the BASIC menu and drag the [PAUSE (MS)] block to the programming area under the [TOGGLE] block
3. Repeat Steps 1 & 2, 4 more times.



1.4.2. What is a Buzzer?

It is an output device that generates a buzzing noise. Typical uses of buzzers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke. It works when an electrical field is applied which causes the length of the piezoelectric material surface to change and converts electrical energy into mechanical energy that creates sound waves the human ear can detect.

1.4.3. Active & Passive Buzzer

A passive buzzer is an electromagnetic squeaker used to generate sound signals of different frequencies while an active buzzer is a module that produces a sound of about 2 kHz.

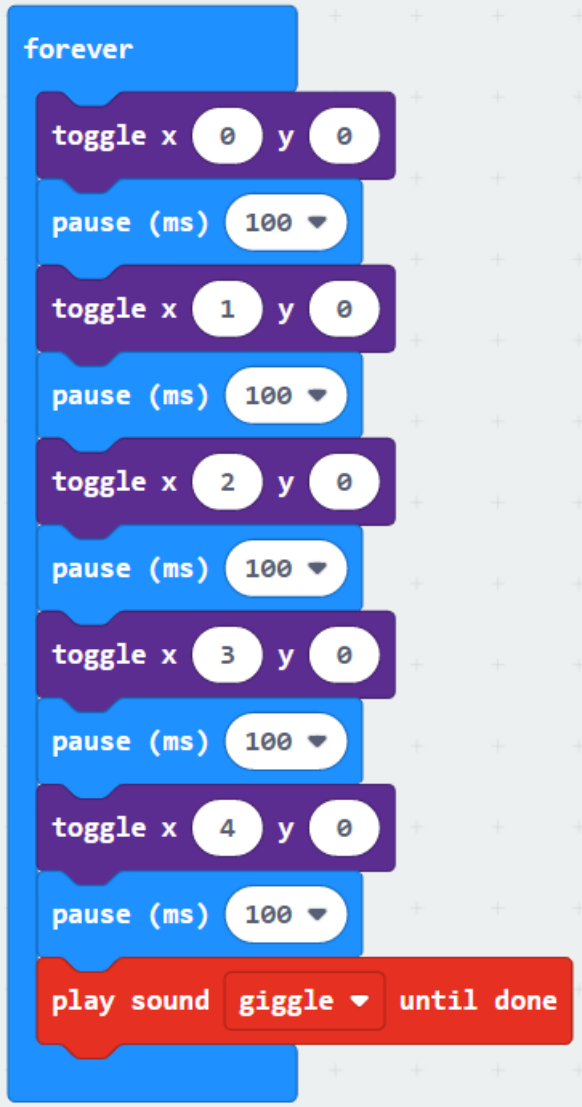
The main difference between the active buzzer and the passive buzzer is that the active buzzer generates sound independently. To do this, the user simply turn it on or off; in other words, by applying a voltage to the contacts or by de-energizing. On the other hand, a passive buzzer requires a signal source, which will set the sound signal parameters.

Active buzzer

Passive buzzer

1.4.4. Activity 2: Improve LED animation

1. Click on the LED menu and drag the [TOGGLE] block to the programming area under the [FOREVER] block.
2. Click on the BASIC menu and drag the [PAUSE (MS)] block to the programming area under the [TOGGLE] block
3. Repeat Steps 1 & 2, 4 more times.
4. Click on the MUSIC menu and drag the [PLAY SOUND UNTIL DONE] block to the programming area under the last [PAUSE (MS)] block.



1.4.5. Button State and Event

What is a push button?

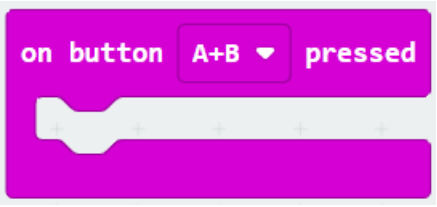
It is an input sensor that is pushed to operate an electrical device. Typical uses include calculators, doorbells and emergency stop buttons.

Button State

The buttons on the micro:bit has 2 states; [PRESSED] & [NOT PRESSED]. It can be applied on button A, button B and button A+B.

Button Event

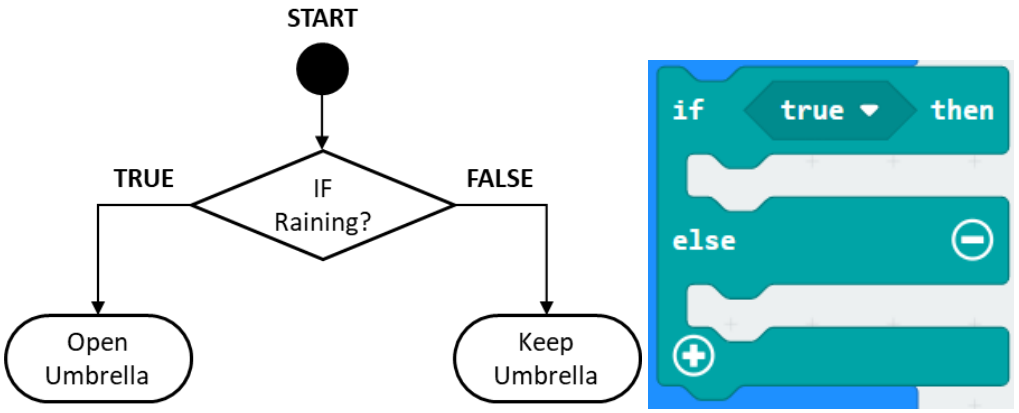
The buttons on the micro:bit supports 3 events; [ON BUTTON A PRESSED], [ON BUTTON B PRESSED] & [ON BUTTON A+B PRESSED]



1.4.6. Selection/Conditional Statements

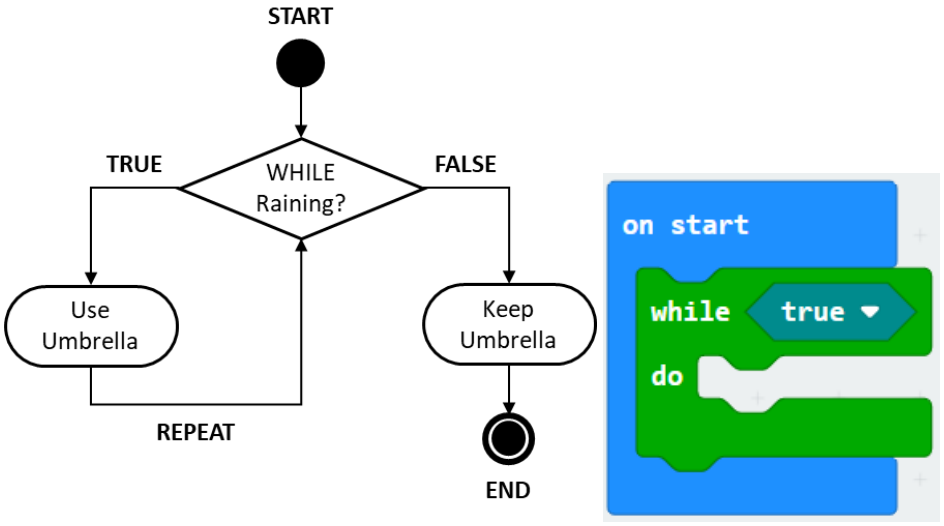
If . . . else Statements

If...else statement is a set of programming instructions that is performed at a defined point of the program once. It allows the programmer to execute different sets of instructions when different defined conditions are met. For example, IF the input condition is “Raining?”, the program will execute [Open Umbrella] when the result is TRUE and execute [Keep Umbrella] when the result is FALSE.



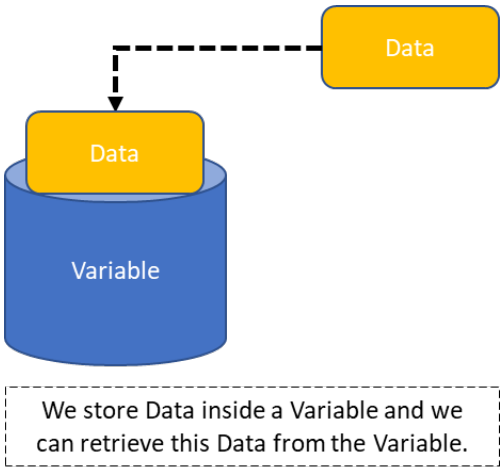
Conditional Loops

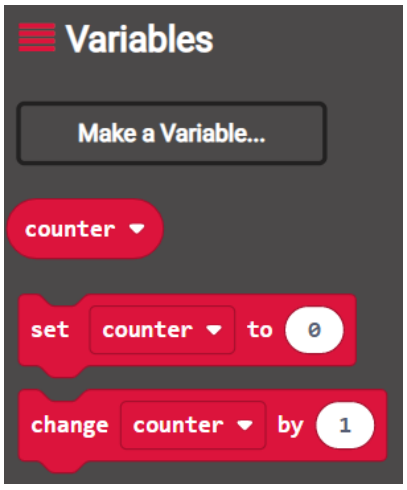
A conditional loop is a set of programming instructions that is performed at a defined point of the program repeatedly the counter number is reached. For example, WHILE the input condition is “Raining?”, the program will execute [Use Umbrella] when the result is TRUE and keep repeating the same input condition. Only when the input condition result is FALSE then will the program execute [Keep Umbrella].



1.4.7. Variables

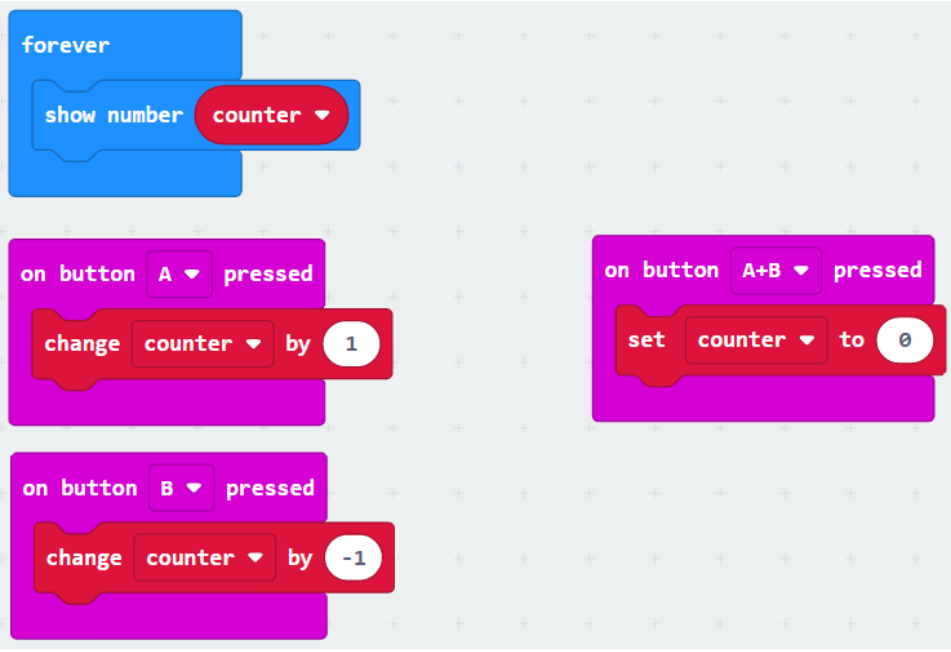
A variable is a virtual storage location for data in a computer program. This data can be retrieved subsequently by the computer program for use.





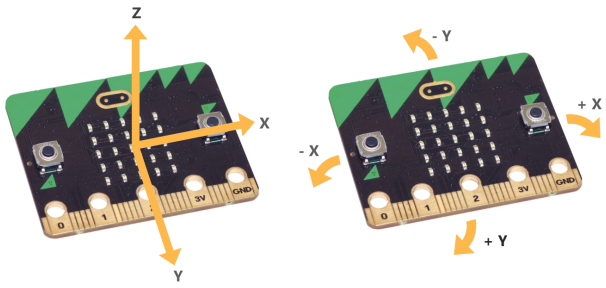
1.4.8. Activity 3: Counter (Keeping Score)

1. Click on the BASIC menu and drag the [SHOW NUMBER] block to the programming area under the [FOREVER] block.
2. Click on the VARIABLE menu and click on the [MAKE A VARIABLE] button. Give it a name [COUNTER]
3. Click on the VARIABLE menu and drag the variable [COUNTER] block to the programming area inside the [SHOW NUMBER] block
4. Click on the INPUT menu and drag the [ON BUTTON A PRESSED] block to the programming area
5. Click on the INPUT menu and drag the [ON BUTTON B PRESSED] block to the programming area
6. Click on the INPUT menu and drag the [ON BUTTON A+B PRESSED] block to the programming area
7. Click on the VARIABLE menu and drag the [CHANGE BY 1] block to the programming area inside the [ON BUTTON A PRESSED] block
8. Click on the VARIABLE menu and drag the [CHANGE BY -1] block to the programming area inside the [ON BUTTON B PRESSED] block
9. Click on the VARIABLE menu and drag the [SET TO 0] block to the programming area inside the [ON BUTTON A+B PRESSED] block



1.5.1 What Is an Accelerometer?

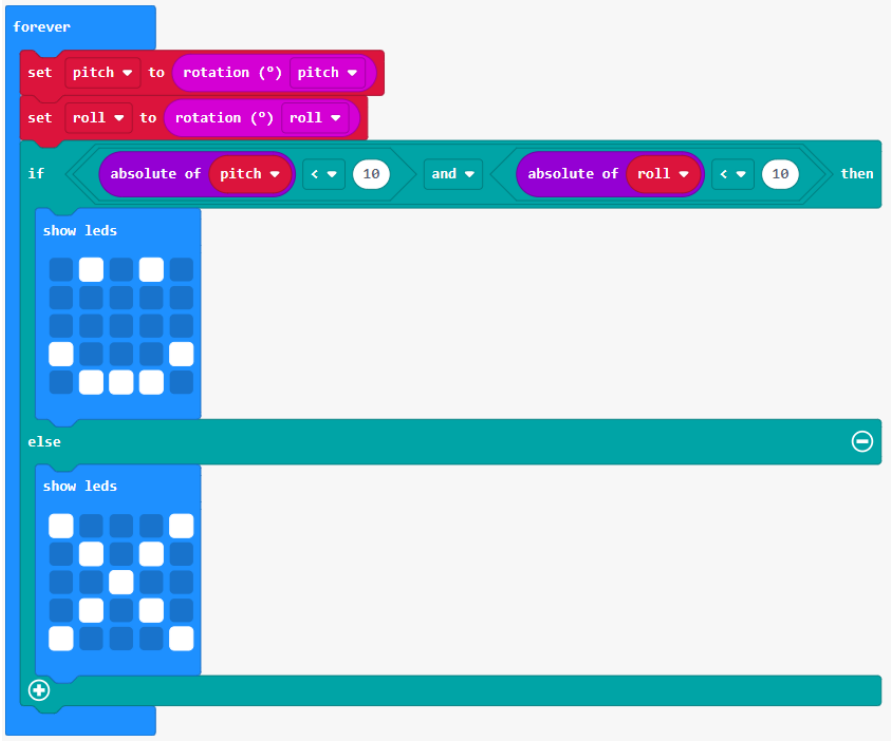
An accelerometer is a device used to measure force and acceleration. It is useful for sensing vibrations and orientation. The accelerometer reports values that describe the changes in acceleration along the 3 axes of the coordinate system (X, Y & Z axis).



1.5.2 Tilting - Measuring Pitch & Roll

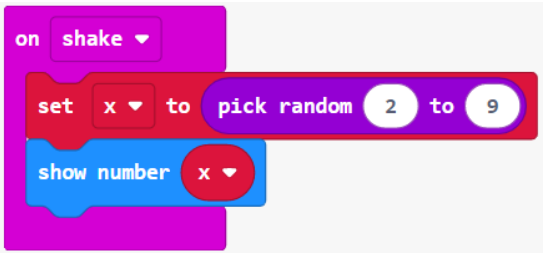
The accelerometer can measure the pitch and roll of the micro:bit, rotation along the x-axis or y-axis, in degrees

This program will show a smiley when the micro:bit is level.



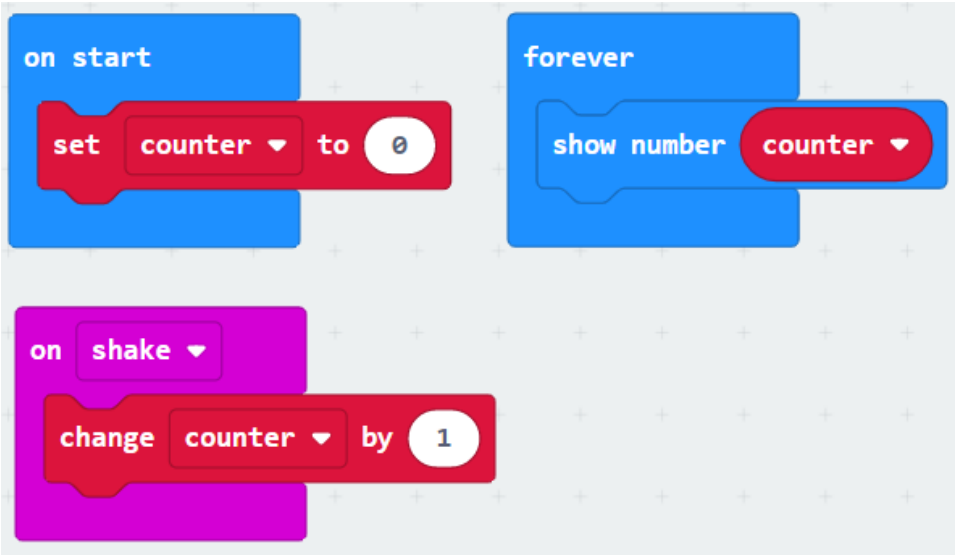
1.5.3 Shaking

The gesture event can also detect the way you hold or move the micro:bit. One of the ways is shaking. This program will show a number from 2 to 9 when you shake the micro:bit.



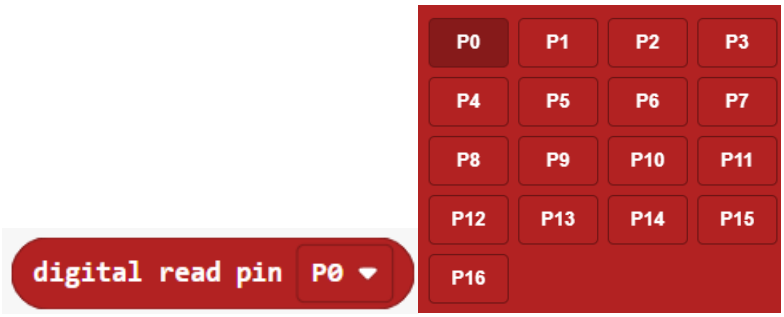
1.5.4 Activity 4: Step Tracker

1. Click on the VARIABLE menu and drag the [SET TO 0] block to the programming area under the [ON START] block.
2. Click on the BASIC menu and drag the [SHOW NUMBER] block to the programming area under the [FOREVER] block.
3. Click on the VARIABLE menu and drag the variable [COUNTER] block to the programming area inside the [SHOW NUMBER] block
4. Click on the INPUT menu and drag the [ON SHAKE] block to the programming area
5. Click on the VARIABLE menu and drag the [CHANGE BY 1] block to the programming area inside the [ON SHAKE] block

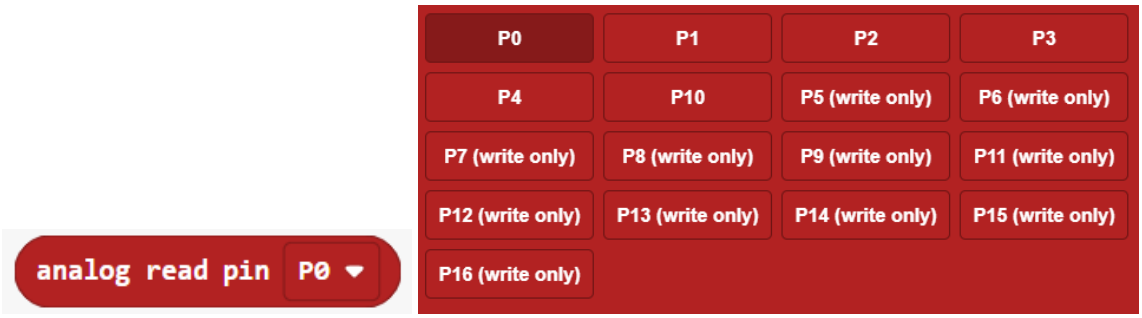


2.1.1 Programming - External Sensors (Digital/Analog Read)

To be able to read in values from a connected external sensor, we need to use the Digital Read or Analog Read blocks. Digital Read will read a digital (0 or 1) signal from any of the pins P0 to P16 on the micro:bit board.

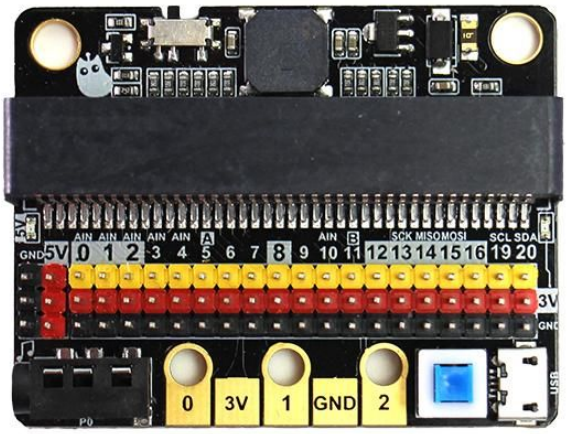


Analog Read will read an analog signal (0 through 1023) from any of the pins P0 to P4 and P10 on the micro:bit board.



2.1.2 Connecting External Sensors to the Breakout Board

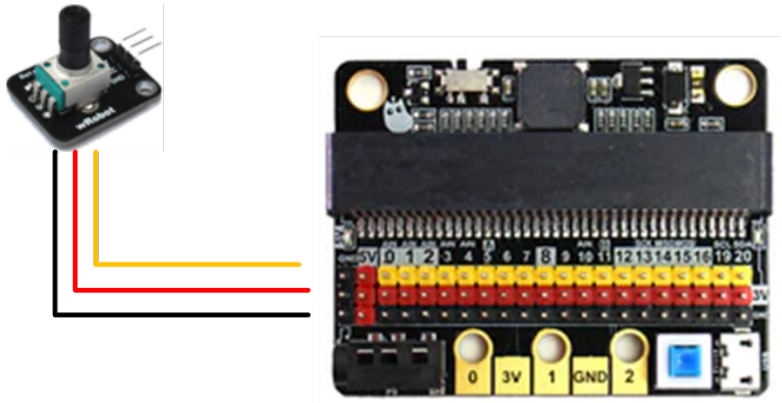
The breakout board allows you to utilize all the pins on the micro:bit and opens up some previously inaccessible communication ports, like I2C and SPI.



To connect external sensor modules to the breakout board, we match the pins on the external modules to the pins on the breakout board.

The 3 coloured pins are:

1. Yellow is the signal pin that transfers data between the micro:bit and the external sensor
2. Red is the voltage pin that is used to deliver electricity to the external sensor
3. Black is the ground pin that is used to complete the circuit between the micro:bit and the external sensor

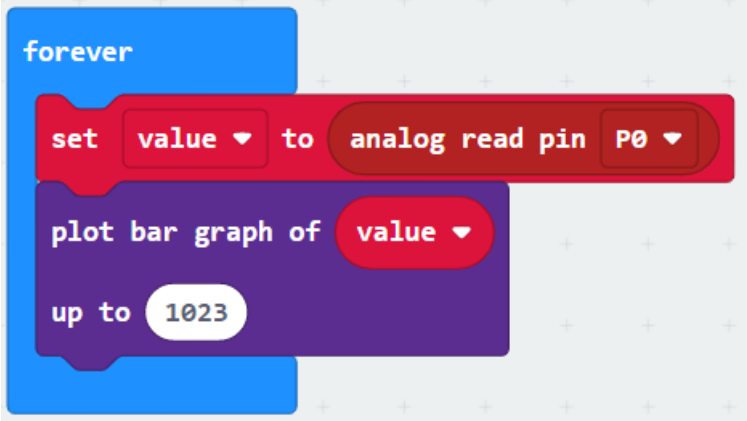


2.1.3 Analog Rotation Sensor and How it Works

The Analog Rotation Sensor is an analog potentiometer mounted onto a handy module. It is based on multi-turn precision potentiometer. It can measure the amount of rotation on the potentiometer.

1. Click on the VARIABLE menu and click on the [MAKE A VARIABLE] button. Give it a name [VALUE]
2. Click on the VARIABLE menu and drag the [SET TO] block to the programming area under the [FOREVER] block
3. Click on the ADVANCED > PINS menu and drag the [ANALOG READ PIN] block to the programming area inside the [SET TO] block
4. Click on the LED menu and drag the [PLOT BAR GRAPH] block to the programming area under the [SET TO] block
5. Set the [UP TO] value of the [PLOT BAR GRAPH] block to 1023

6. Click on the VARIABLE menu and drag the variable [VALUE] block to the programming area inside the [PLOT BAR GRAPH] block
7. Click on the INPUT menu and drag the [ON SHAKE] block to the programming area
8. Click on the VARIABLE menu and drag the [CHANGE BY 1] block to the programming area inside the [ON SHAKE] block



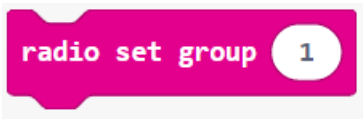
2.1.4 Activity 5: Tuning Music

1. Click on the VARIABLE menu and click on the [MAKE A VARIABLE] button. Give it a name [VALUE]
2. Click on the VARIABLE menu and drag the [SET TO] block to the programming area under the [FOREVER] block
3. Click on the ADVANCED > PINS menu and drag the [ANALOG READ PIN] block to the programming area inside the [SET TO] block
4. Change the analog read pin to P1
5. Click on the LOGIC menu and drag the [IF ELSE] block to the programming area under the [SET TO] block
6. Click on the [+] button at the bottom of the [IF ELSE] block to get 3 more [ELSE IF] extensions
7. Click on the [-] button at the bottom to remove the [ELSE] block
8. Click on the LOGIC menu and drag the [=] comparison block to the programming area inside all the comparison area of the [IF ELSE] block

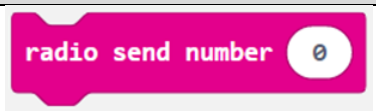
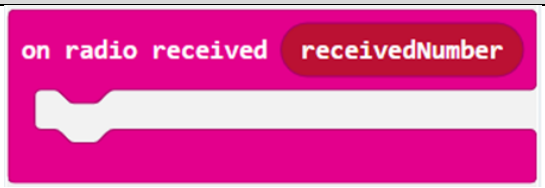
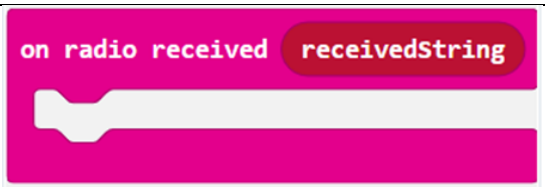
9. Click on the VARIALBE menu and drag the [VALUE] variable to the programming area inside all the [=] comparison blocks.
10. Set the right comparison values of the [=] comparison blocks to 256, 512, 768 and 1023 respectively
11. Click on the MUSIC menu and drag the[REST] & [PLAY TONE] blocks to the programming area inside the [IF ELSE] block
12. Set the [TONE] of the [PLAY TONE] blocks to “Middle C”, “Middle D”, “Middle E” and “Middle F” respectively

2.2.1 Programming - Radio Control

The Radio function allows the micro:bit to send and receive data between micro:bits using radio packets. Radio group will need to be set up before the micro:bits can start to send and receive data. A group is like a channel (a micro:bit can only send or receive in one group at a time). A group ID is like the channel number. The group ID can be between 0 to 255.



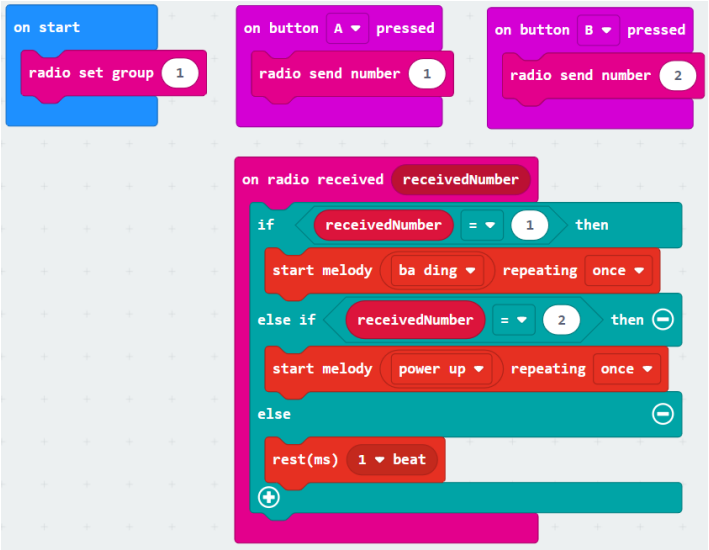
To send and receive data, the following pair of blocks will have to be used together.

Radio data sent through this block	Can only be received using this block
	
	
	

2.2.2 Activity 6: Radio Doorbell

1. Click on the RADIO menu and drag the [RADIO SET GROUP] block to the programming area under the [ON START] block
2. Set the [GROUP] value to 1
3. Click on the INPUT menu and drag the [ON BUTTON A PRESSED] block to the programming area

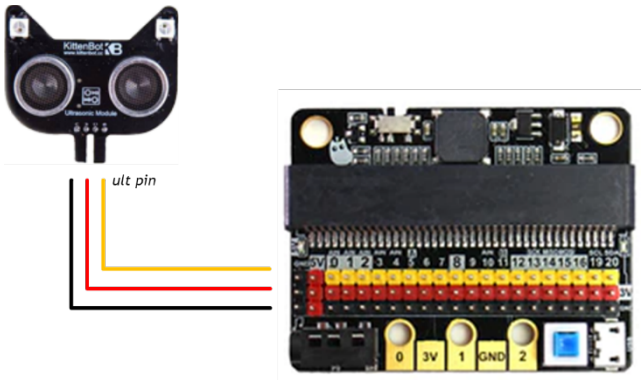
4. Click on the RADIO menu and drag the [RADIO SEND NUMBER] block to the programming area under the [ON BUTTON A PRESSED] block
5. Set the [NUMBER] value of the [RADIO SEND NUMBER] block to 1
6. Click on the INPUT menu and drag the [ON BUTTON B PRESSED] block to the programming area
7. Click on the RADIO menu and drag the [RADIO SEND NUMBER] block to the programming area under the [ON BUTTON B PRESSED] block
8. Set the [NUMBER] value of the [RADIO SEND NUMBER] block to 2
9. Click on the RADIO menu and drag the [ON RADIO RECEIVED NUMBER] block to the programming area
10. Click on the LOGIC menu and drag the [IF ELSE] block to the programming area under the [ON RADIO RECEIVED NUMBER] block
11. Click on the [+] button at the bottom of the [IF ELSE] block to get 1 more [ELSE IF] extension
12. Click on the LOGIC menu and drag the [=] comparison block to the programming area inside all the comparison area of the [IF ELSE] block
13. Click on the [RECEIVEDNUMBER] variable on the [ON RADIO RECEIVED NUMBER] block to the programming area inside all the [=] comparison blocks.
14. Set the right comparison values of the [=] comparison blocks to 1 and 2 respectively
15. Click on the MUSIC menu and drag the[REST] & [START MELODY] blocks to the programming area inside the [IF ELSE] block
16. Set the [MELODY] of the [START MELODY] blocks to “ba ding” and “power up” respectively



2.3.1 What is an Ultrasonic Sensor and how it works

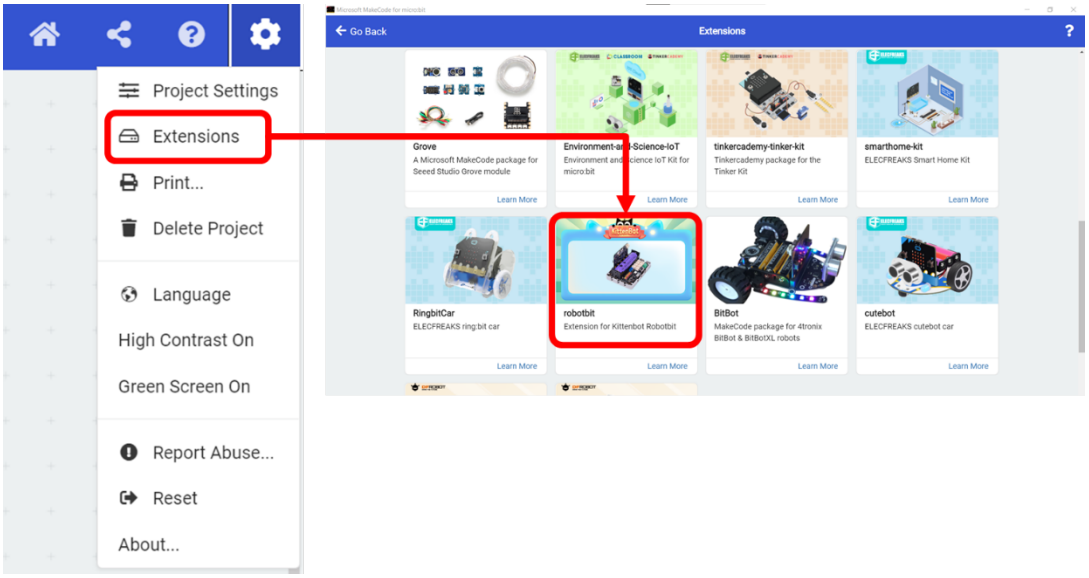
An ultrasonic sensor is an output device that uses sound to accurately measure distance. It is often used to detect objects.

Connection to the breakout board



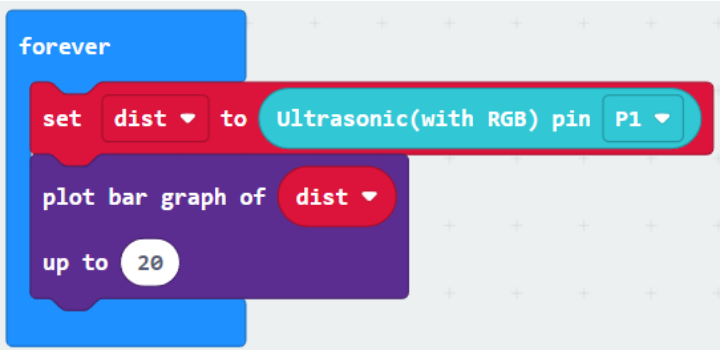
Adding the ultrasonic sensor extension

1. Click on the gear icon on the top right corner of the program menu.
2. Click on the [EXTENSIONS] link
3. The default list of extensions will be displayed
4. Click on the [ROBOTBIT] extension
5. MakeCode will download the [ROBOTBIT] extension
6. When done, the [ROBOTBIT] extension will be found on the code menu



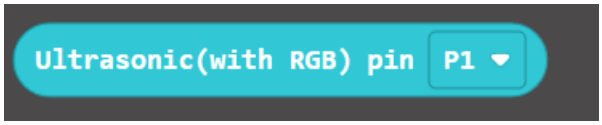
Sample code

Use the [PLOT BAR GRAPH] block to visualize the distance reported by your sensor.



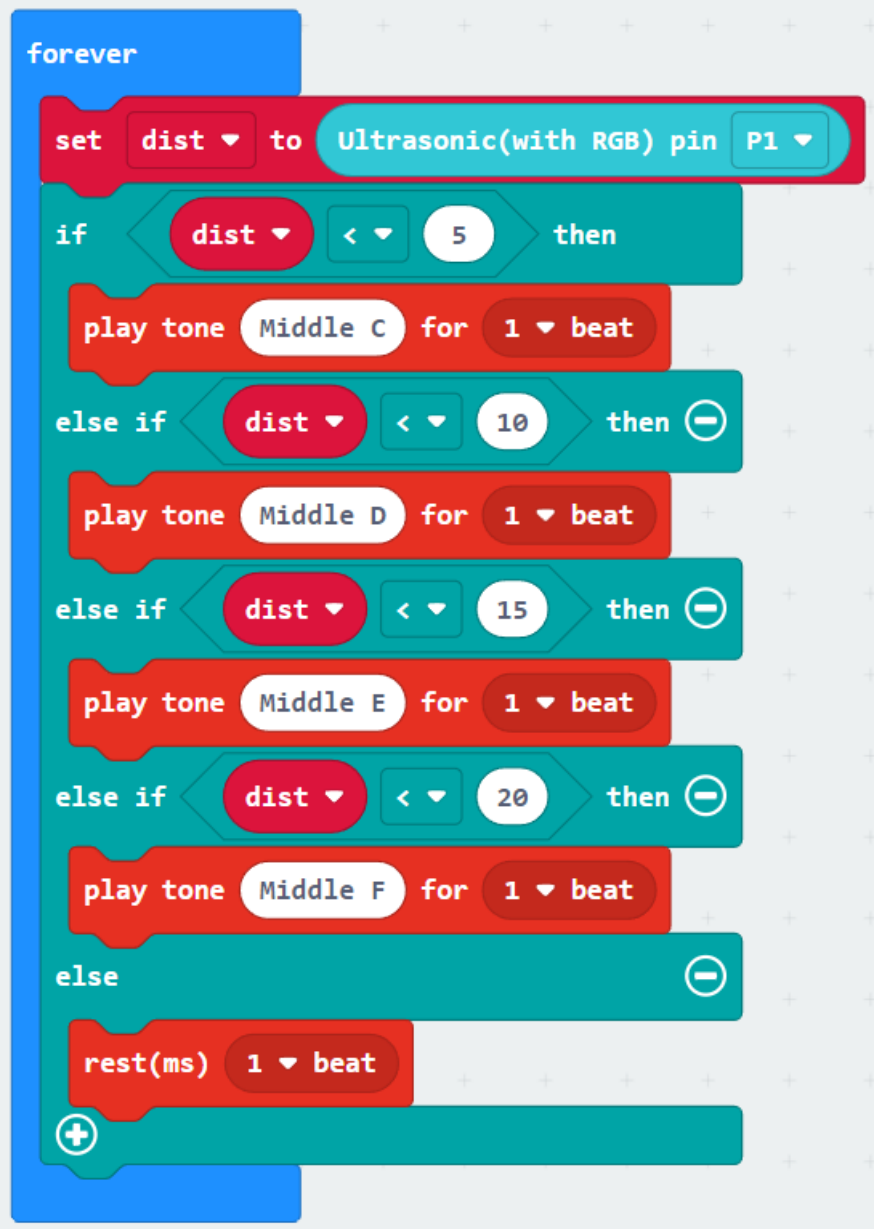
2.3.2 Understanding the values of the Ultrasonic Sensor

The values returned by the ultrasonic sensor is the distance to an obstacle detected by the ultrasonic sensor. The unit of measurement is in “cm”



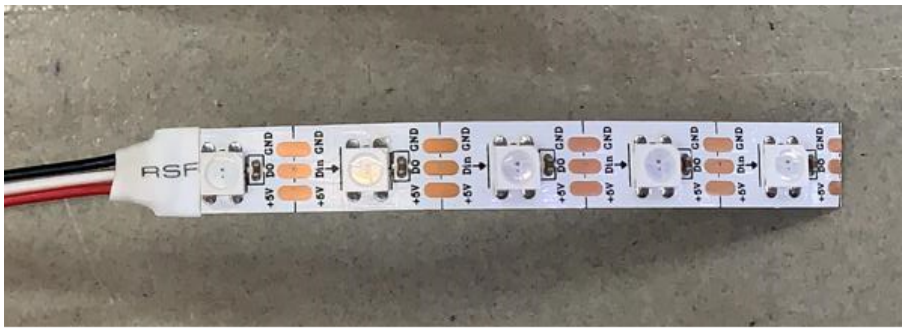
2.3.3 Activity 7: Invisible Guitar

1. Click on the VARIABLE menu and click on the [MAKE A VARIABLE] button. Give it a name [DIST]
2. Click on the VARIABLE menu and drag the [SET TO] block to the programming area under the [FOREVER] block
3. Click on the ROBOTBIT menu and drag the [ULTRASONIC] block to the programming area inside the [SET TO] block
4. Click on the LOGIC menu and drag the [IF ELSE] block to the programming area under the [SET TO] block
5. Click on the [+] button at the bottom of the [IF ELSE] block to get 3 more [ELSE IF] extension
6. Click on the LOGIC menu and drag the [<] comparison block to the programming area inside all the comparison area of the [IF ELSE] block
7. Click on the VARIABLE menu and drag the [DIST] variable to the programming area inside all the [<] comparison blocks.
8. Set the right comparison values of the [<] comparison blocks to 5, 10, 15 and 20 respectively
9. Click on the MUSIC menu and drag the[REST] & [PLAY TONE] blocks to the programming area inside the [IF ELSE] block
10. Set the [TONE] of the [PLAY TONE] blocks to “Middle C”, “Middle D”, “Middle E” and “Middle F” respectively

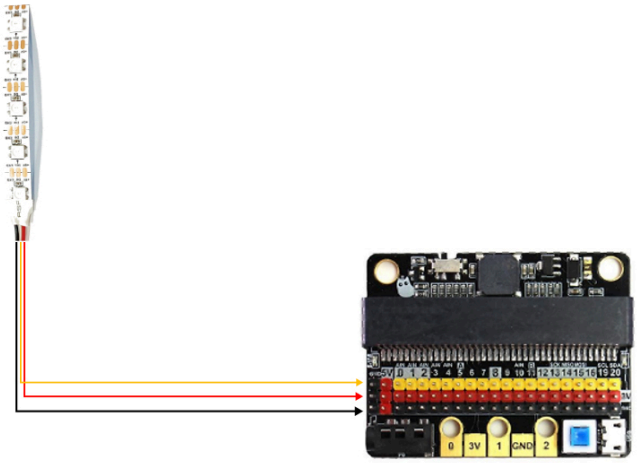

forever
set dist to Ultrasonic(with RGB) pin P1
if dist < 5 then
play tone Middle C for 1 beat
else if dist < 10 then
play tone Middle D for 1 beat
else if dist < 15 then
play tone Middle E for 1 beat
else if dist < 20 then
play tone Middle F for 1 beat
else
rest(ms) 1 beat

3.1.1 What are NeoPixel LEDs and how they work

NeoPixel LEDs are individually addressable LEDs all housed on a string that can be controlled from a single pin on the micro:bit. This means that one pin can control all of the LEDs colours and which LEDs are on at any given time.

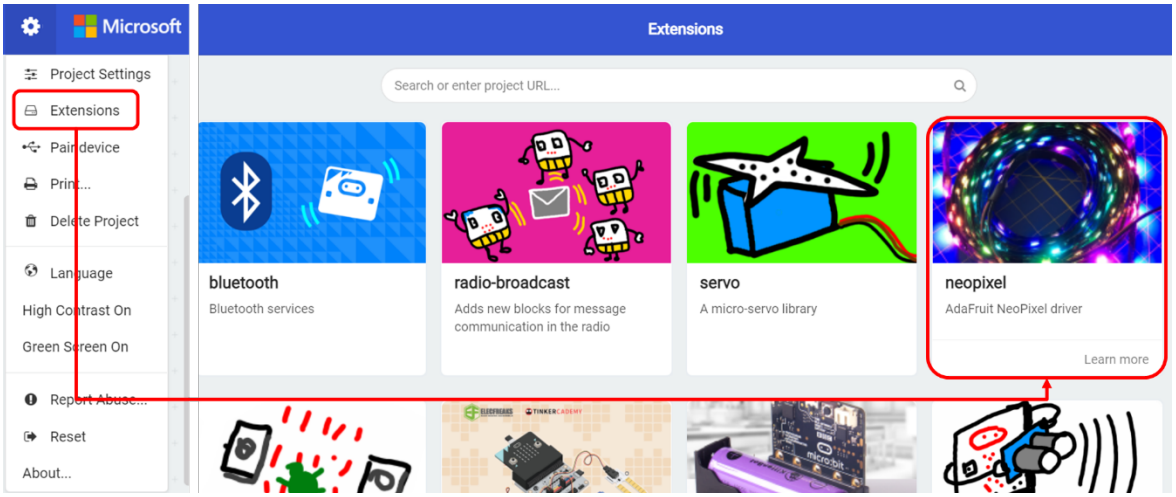


Connection to the breakout board



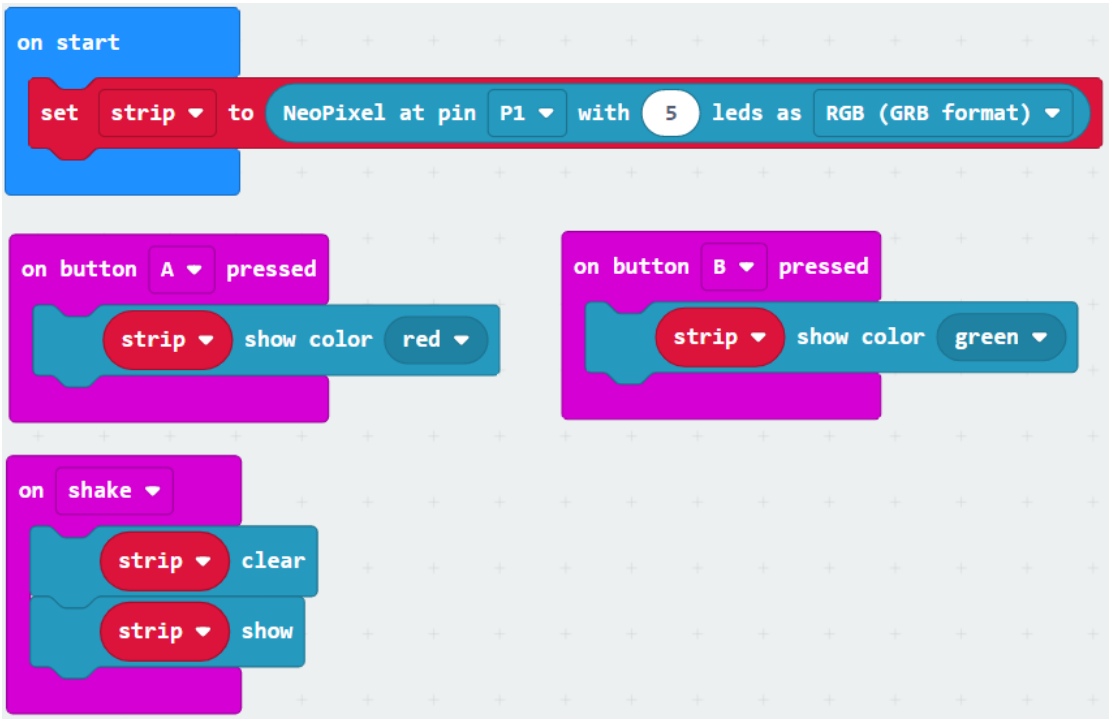
Adding the NeoPixel extension

1. Click on the gear icon on the top right corner of the program menu.
2. Click on the [EXTENSIONS] link
3. The default list of extensions will be displayed
4. Click on the [NEOPIXEL] extension
5. MakeCode will download the [NEOPIXEL] extension
6. When done, the [NEOPIXEL] extension will be found on the code menu



Sample code

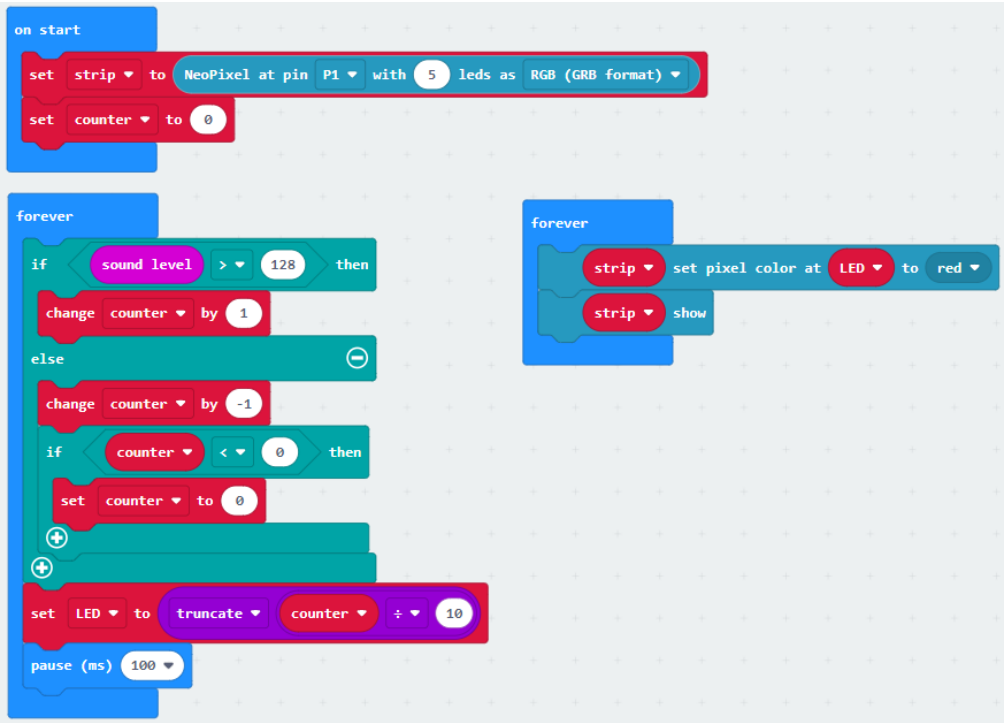
Use the [SHOW COLOR] blocks to control the NeoPixel LEDs.



3.1.2 Activity 8: Clap-O-Meter

1. Click on the VARIABLE menu and click on the [MAKE A VARIABLE] button. Give it a name [COUNTER]
2. Click on the VARIABLE menu and click on the [MAKE A VARIABLE] button. Give it a name [LED]
3. Click on the NEOPIXEL menu and drag the [SET STRIP TO] block to the programming area under the [ON START] block
4. Click on the VARIABLE menu and drag the [SET COUNTER TO] block to the programming area under [ON START] under the [SET STRIP TO] block
5. Set the [SET COUNTER TO] value to 0
6. Click on the LOGIC menu and drag the [IF ELSE] block to the programming area under the [FOREVER] block
7. Click on the LOGIC menu and drag the [>] comparison block to the programming area inside the [IF ELSE] block
8. Click on the INPUT menu and drag the [SOUND LEVEL] variable to the programming area inside the [>] comparison blocks
9. Set the right comparison values of the [>] comparison blocks to 100
10. Click on the VARIABLE menu and drag the [CHANGE COUNTER BY] block to the [IF] area under [IF ELSE] block
11. Set the [CHANGE COUNTER BY] value to 1
12. Click on the VARIABLE menu and drag the [CHANGE COUNTER BY] block to the [ELSE] area under [IF ELSE] block
13. Set the [CHANGE COUNTER BY] value to -1
14. Click on the LOGIC menu and drag the [IF] block to the [ELSE] area under [IF ELSE] block
15. Click on the LOGIC menu and drag the [<] comparison block to the programming area inside the [IF] block
16. Click on the VARIABLE menu and drag the [COUNTER] variable to the programming area inside the [<] comparison blocks
17. Click on the VARIABLE menu and drag the [SET COUNTER TO] block to the [IF] area under the [IF] block

18. Click on the VARIABLE menu and drag the [SET LED TO] block to the programming area under the [IF ELSE] block
19. Click on the MATH menu and drag the [TRUNCATE] block to the programming area inside the [SET LED TO] block
20. Click on the MATH menu and drag the [÷] block to the programming area inside the [TRUNCATE] block
21. Click on the VARIABLE menu and drag the [COUNTER] variable to the programming area inside the [÷] comparison block
22. Set the right comparison values of the [÷] comparison block to 10
23. Click on the BASIC menu and drag the [PAUSE (MS)] block to the programming area under the [SET LED TO] block
24. Set the [MS] value to 100ms
25. Click on the BASIC menu and drag another [FOREVER] block to the programming area
26. Click on the NEOPIXEL menu and drag the [STRIP SET PIXEL COLOR] block to the programming area under the new [FOREVER] block
27. Click on the VARIABLE menu and drag the [LED] variable to the programming area inside the [STRIP SET PIXEL COLOR] block
28. Click on the NEOPIXEL menu and drag the [STRIP SHOW] block to the programming area under the [STRIP SET PIXEL COLOR] block

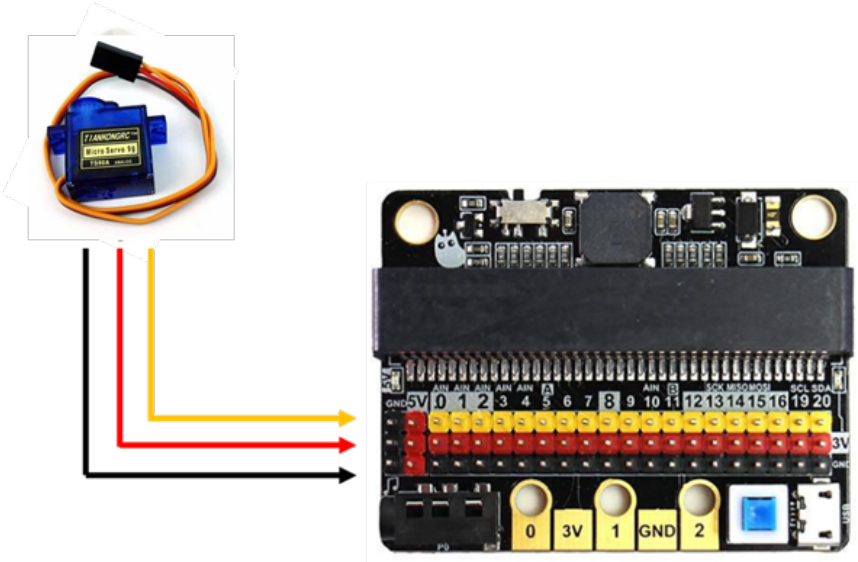


3.2.1 What is a Servo Motor and how it work

A servo motor is an output device with integrated gears and a shaft that can be precisely controlled. Standard servos allow the shaft to be positioned at various angles, usually between 0 and 180 degrees.

Typical uses of servo motors include operating remote-controlled or radio-controlled toy cars, robots and airplanes. Servo motors are also used in industrial applications, robotics, in-line manufacturing, pharmaceutics and food services.

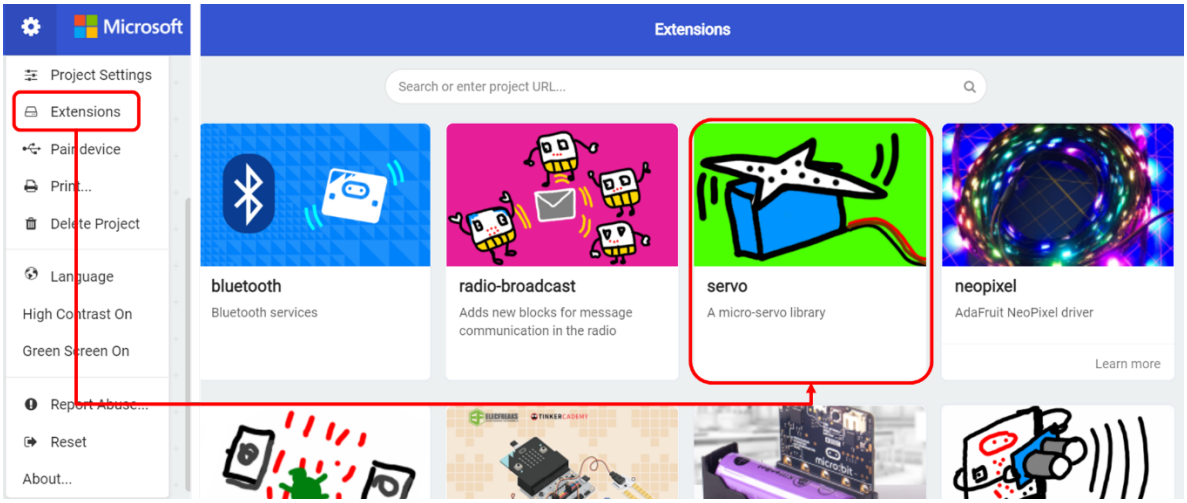
Connection to the breakout board



Adding the Servo extension

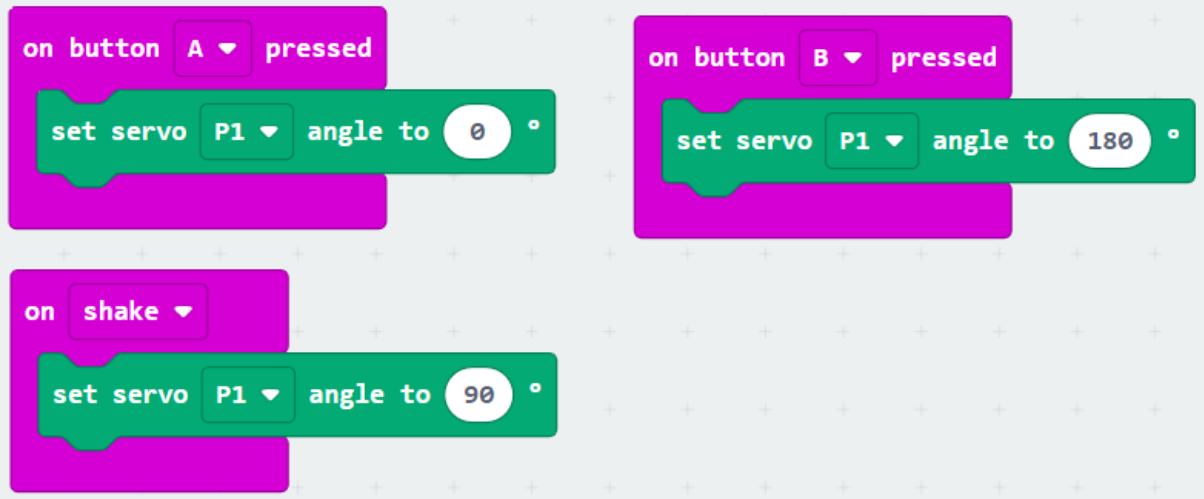
1. Click on the gear icon on the top right corner of the program menu.
2. Click on the [EXTENSIONS] link

3. The default list of extensions will be displayed
4. Click on the [SERVO] extension
5. MakeCode will download the [SERVO] extension
6. When done, the [SERVO] extension will be found on the code menu



Sample code

Use the [SET SERVO] blocks to control the Servo Motors.

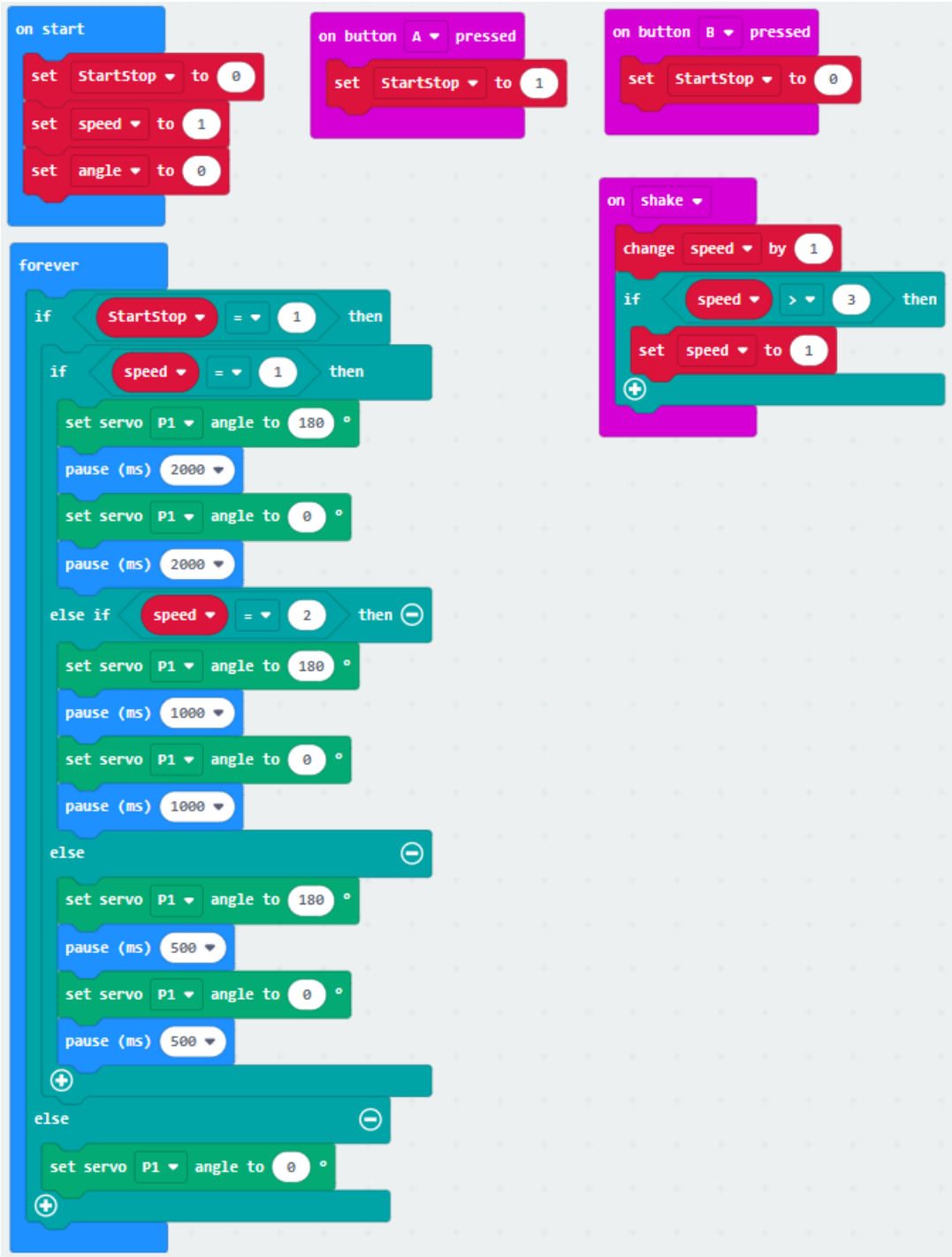


3.2.2 Activity 9: Windscreen Wiper

1. Click on the VARIABLE menu and click on the [MAKE A VARIABLE] button. Give it a name [STARTSTOP]
2. Click on the VARIABLE menu and click on the [MAKE A VARIABLE] button. Give it a name [SPEED]

3. Click on the VARIABLE menu and click on the [MAKE A VARIABLE] button. Give it a name [ANGLE]
4. Click on the INPUT menu and drag the [ON BUTTON A PRESSED] block to the programming area
5. Click on the VARIABLE menu and click on the [SET STARTSTOP TO] block to the programming area under [ON BUTTON A PRESSED] block
6. Set the [SET STARTSTOP TO] value to 1
7. Click on the INPUT menu and drag the [ON BUTTON B PRESSED] block to the programming area
8. Click on the VARIABLE menu and click on the [SET STARTSTOP TO] block to the programming area under [ON BUTTON B PRESSED] block
9. Set the [SET STARTSTOP TO] value to 0
10. Click on the INPUT menu and drag the [ON SHAKE] block to the programming area
11. Click on the VARIABLE menu and click on the [CHANGE SPEED BY] block to the programming area under [ON SHAKE] block
12. Set the [CHANGE SPEED BY] value to 1
13. Click on the LOGIC menu and drag the [IF] block to the programming area under [ON SHAKE] block
14. Click on the LOGIC menu and drag the [>] comparison block to the programming area inside the [IF] block
15. Click on the VARIABLE menu and drag the [SPEED] variable to the programming area inside the [>] comparison blocks
16. Set the right comparison values of the [>] comparison blocks to 3
17. Click on the VARIABLE menu and click on the [SET SPEED TO] block to the programming area under the [IF] block
18. Set the [SET SPEED TO] value to 1
19. Click on the LOGIC menu and drag the [IF ELSE] block to the programming area under the [FOREVER] block
20. Click on the LOGIC menu and drag the [=] comparison block to the programming area inside the [IF ELSE] block
21. Click on the VARIABLE menu and drag the [STARTSTOP] variable to the programming area inside the [=] comparison blocks

22. Set the right comparison values of the [=] comparison blocks to 1
23. Click on the LOGIC menu and drag the [IF ELSE] block to the programming area under the [IF] area under the [IF ELSE] block
24. Click on the [+] button at the bottom of the [IF ELSE] block to get 1 more [ELSE IF] extension
25. Click on the LOGIC menu and drag the [=] comparison block to the programming area inside all the comparison area of the [IF ELSE] block
26. Click on the VARIALBE menu and drag the [SPEED] variable to the programming area inside all the [=] comparison blocks.
27. Set the right comparison values of the [=] comparison blocks to 1 and 2 respectively
28. Click on the SERVO menu and drag 2 [SET SERVO] blocks to the programming area inside [IF] area of the [IF ELSE] block
29. Set the [ANGLE] of the [SET SERVO] blocks to 180 and 0 respectively
30. Click on the BASIC menu and drag 2 [PAUSE (MS)] block to the programming area under each [SET SERVO] block
31. Set the [MS] value to 2000ms
32. Click on the SERVO menu and drag 2 [SET SERVO] blocks to the programming area inside [ELSE IF] area of the [IF ELSE] block
33. Set the [ANGLE] of the [SET SERVO] blocks to 180 and 0 respectively
34. Click on the BASIC menu and drag 2 [PAUSE (MS)] block to the programming area under each [SET SERVO] block
35. Set the [MS] value to 1000ms
36. Click on the SERVO menu and drag 2 [SET SERVO] blocks to the programming area inside [ELSE] area of the [IF ELSE] block
37. Set the [ANGLE] of the [SET SERVO] blocks to 180 and 0 respectively
38. Click on the BASIC menu and drag 2 [PAUSE (MS)] block to the programming area under each [SET SERVO] block
39. Set the [MS] value to 500ms
40. Click on the SERVO menu and drag the [SET SERVO] block to the programming area inside [ELSE] area of the [IF ELSE] block
41. Set the [ANGLE] of the [SET SERVO] block to 0


on start
set StartStop to 0
set speed to 1
set angle to 0
on button A pressed
set StartStop to 1
on button B pressed
set StartStop to 0
on shake
change speed by 1
if speed > 3 then
set speed to 1
forever
if StartStop = 1 then
if speed = 1 then
set servo P1 angle to 180 °
pause (ms) 2000
set servo P1 angle to 0 °
pause (ms) 2000
else if speed = 2 then
set servo P1 angle to 180 °
pause (ms) 1000
set servo P1 angle to 0 °
pause (ms) 1000
else
set servo P1 angle to 180 °
pause (ms) 500
set servo P1 angle to 0 °
pause (ms) 500
else
set servo P1 angle to 0 °