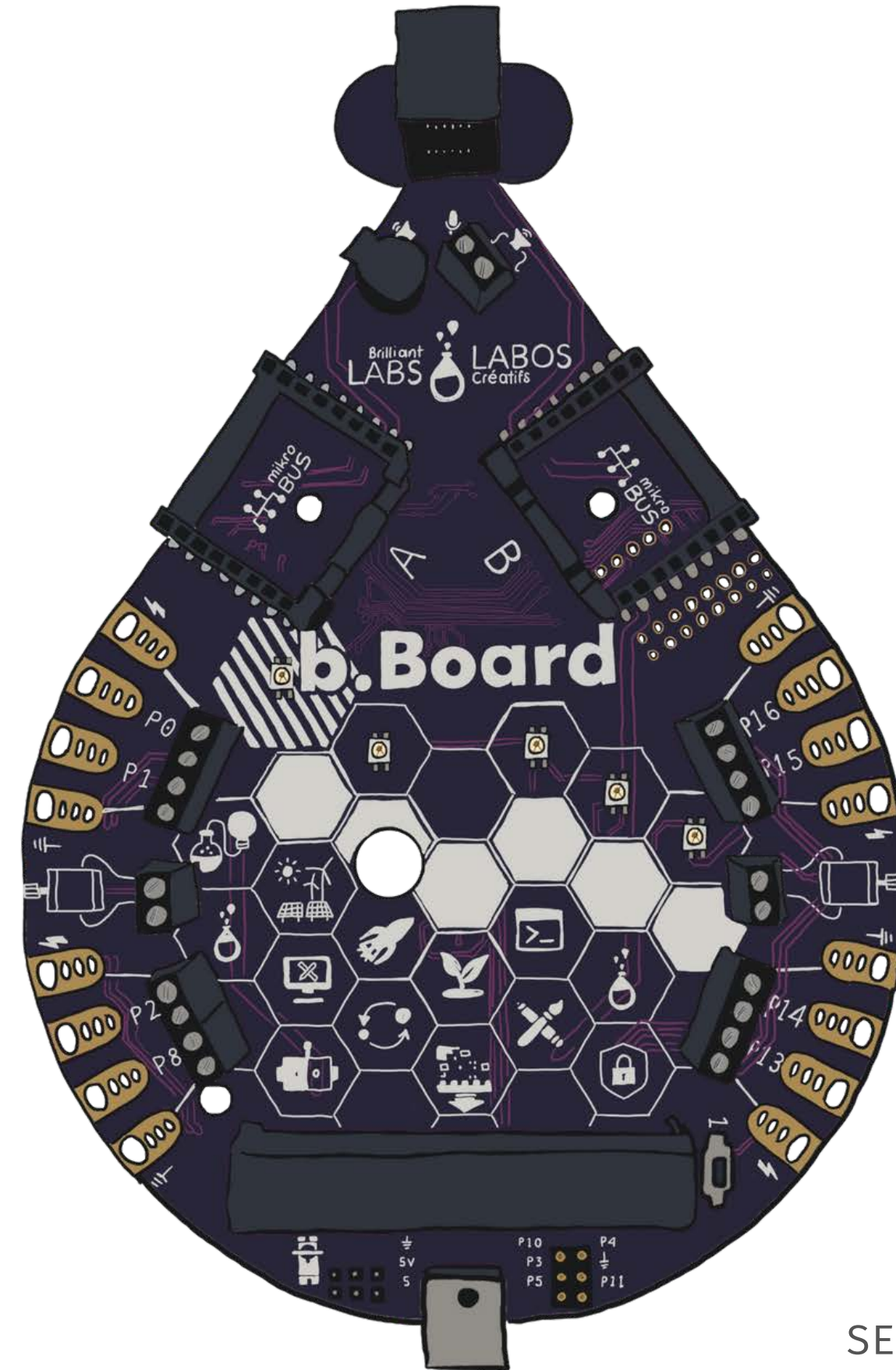


HELLO

b.Board



A GETTING STARTED GUIDE



SEP 2021
Model: bBoard 110

WELCOME

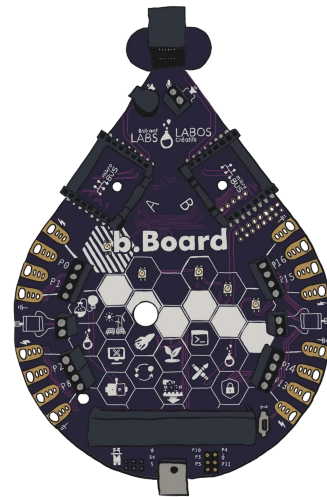
We are thrilled to introduce you to your new b.Board. In this guide, we will take you through the absolute essentials you need to know in order to get started.

Remember, your b.Board will help you explore an infinite number of maker adventures - each different than the one before. Any maker adventure with the b.Board will likely lead you to adding components that are not included in this kit.

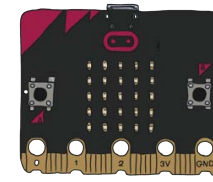
For the most up to date information, please refer to the documentation provided at www.brilliantlabs.ca/bboard.



THINGS YOU MUST HAVE...



b.Board



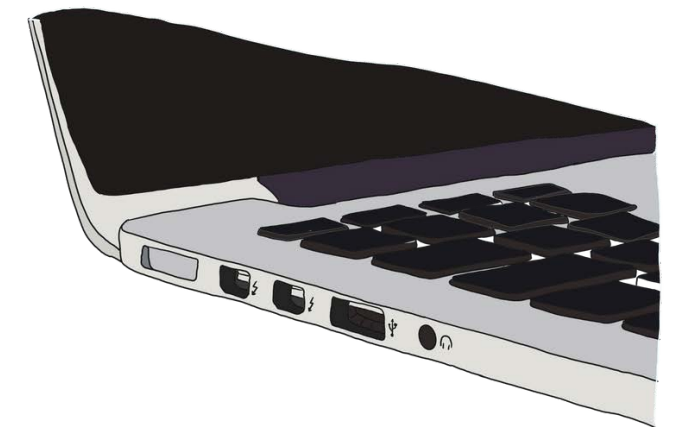
micro:bit
(V1 or V2)



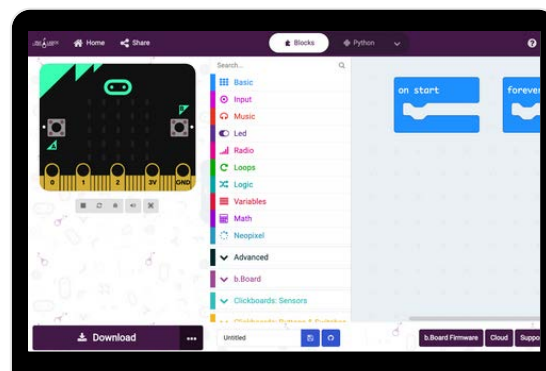
4 X AA
Battery Pack
+ Batteries



USB Micro
Cable

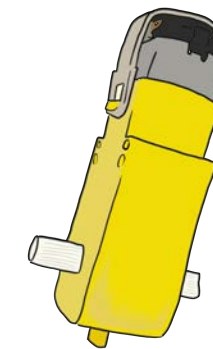


Personal Computer
with USB Port



Internet Access and browser
navigated to
code.brilliantlabs.ca

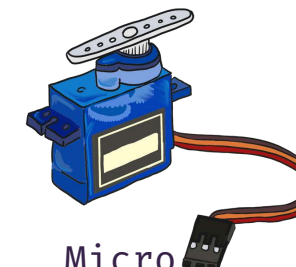
THINGS YOU MIGHT HAVE...



Geared
Motor



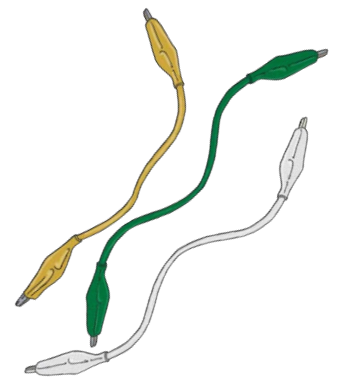
D Axle
Wheels



Micro
Servos



Compatible
clickBoards



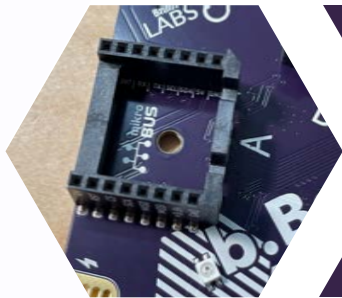
Alligator
Clips

b.Board ANATOMY



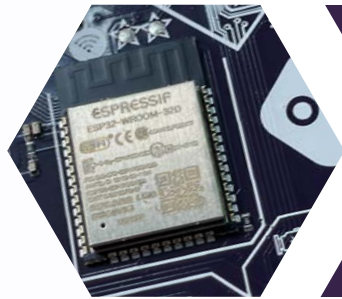
MICROPHONE, SPEAKER + TERMINAL

Hear your code. The b.Board has an impressively loud speaker (A). If this is not loud enough, hook up your own speaker via the terminals (B). Curious about the noise around you? Check out the on-board microphone (C).



CLICK BOARD HEADERS

Expand the functionality of your b.Board with Click Boards from Mikroe. Your b.Board supports a growing number of peripherals including motion sensors, servo drivers and even a Carbon Dioxide monitor (D).



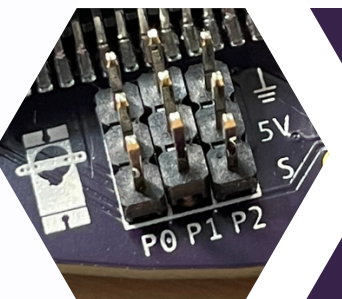
WiFi

With on-board WiFi via a ESP32 chip, the b.Board can become an IoT device using as few as 4 blocks of code. When combined with our Brilliant Labs Cloud, the b.Board can publish and subscribe to all kinds of creative feeds.



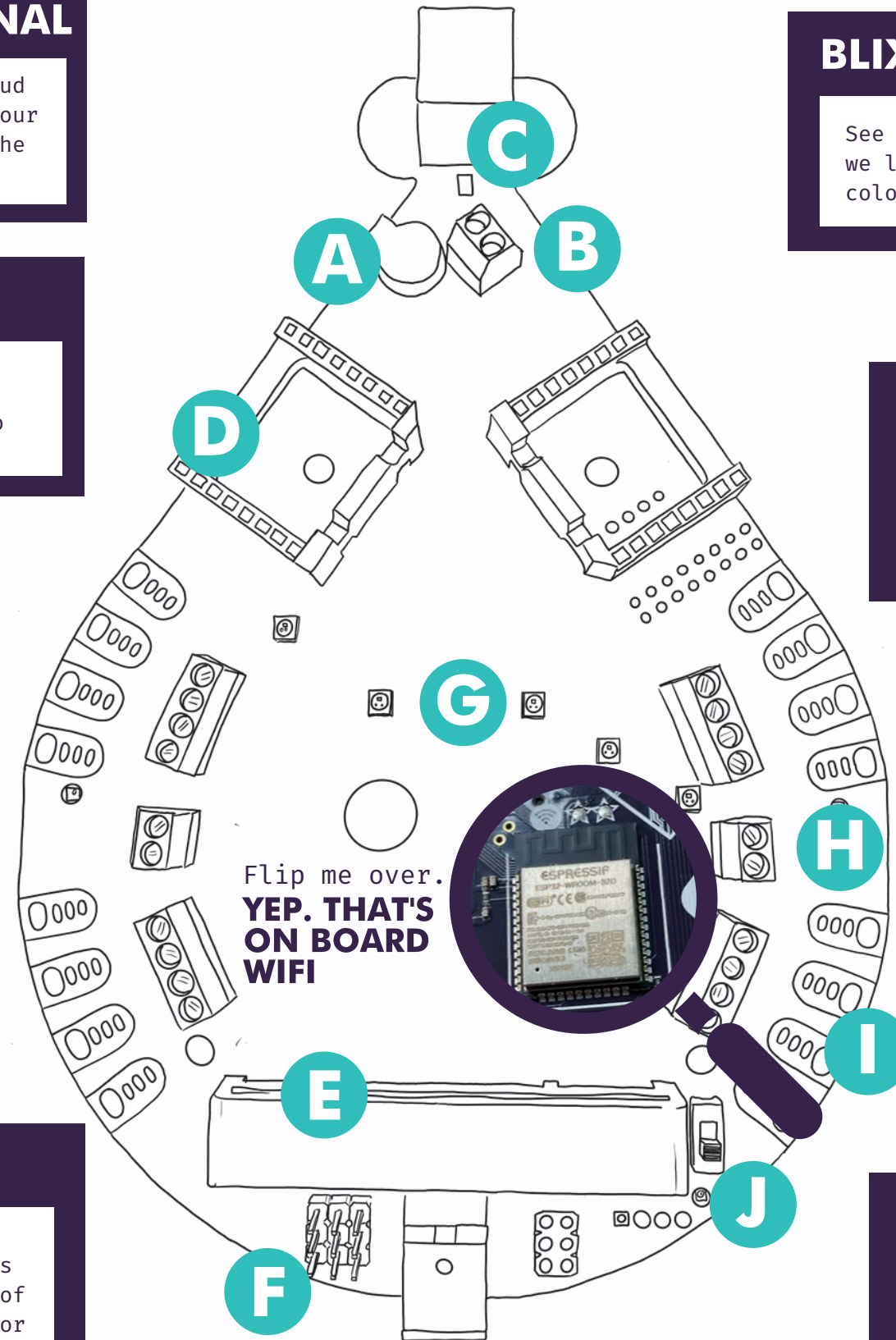
micro:bit HEADER

This is the cozy home for your micro:bit. Make sure your micro:bit is fully seated so that none of the gold pins peek out of the black header (E).



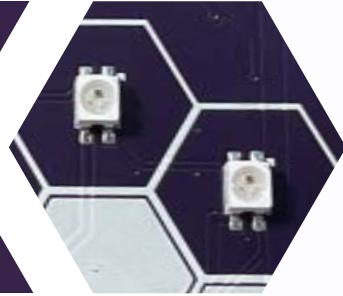
SERVO HOOK-UP TERMINAL

Need your project to turn at a specific angle? Servos will be your friend. Attach up to 3 servos to this terminal block (F). The signals of each of the servo pins are shared with P0, P1 and P2 Gator Grabbers.



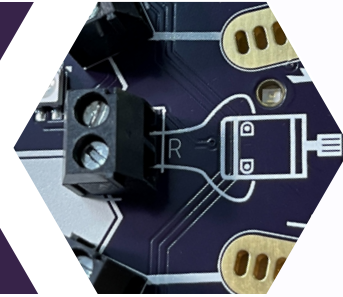
BLIXELS

See your code. The b.Board has 5 addressable RGB LEDs - we like to call them BliXels. These LEDs can become any colour you choose, in any pattern you decide (G).



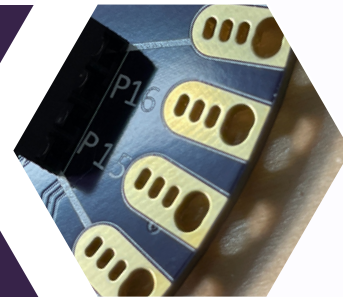
MOTOR DRIVERS

See your code move. The b.Board has 2 motor drivers (H) that will drive most motors that require 3-6 V.



GATOR GRABBERS

Grab some alligator clips and hook them up to these helpful Gator Grabbers (I). Want a more permanent solution? Use wires directly in the black terminal blocks or solder directly to the copper pads. There are 4 groups of Gator Grabbers on the b.Board with access to power and ground on either side of data pins.



POWER SWITCH

0 = OFF; 1 = ON. Always make sure that your power switch (J) is on before you test your code.



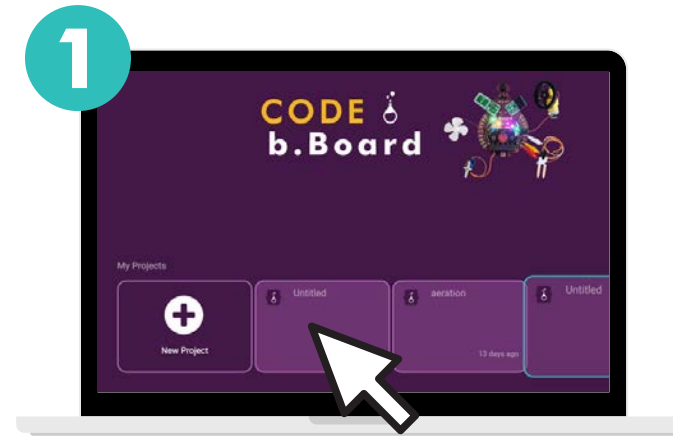
b.Board UPDATE REQUIRED

We know you are excited to get started with your b.Board, but it may need to be updated first. There have probably been some brilliant changes to the firmware since we had these b.Boards manufactured and we want your experience to be successful. So please, grab the following supplies and get ready to feel like a hardware engineer.

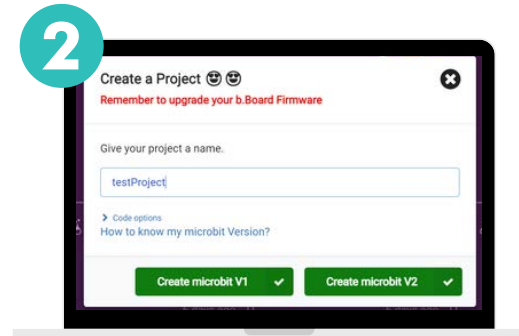
UPDATING FIRMWARE

We will be using the Micro:bit to help update the b.Board Firmware. This process requires the following:

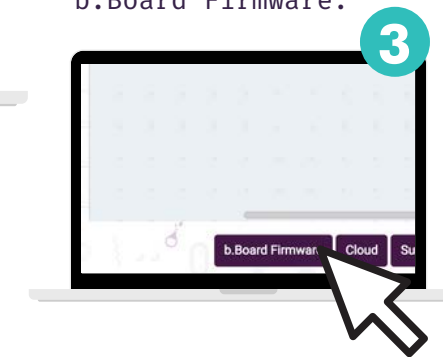
- b.Board
- micro:bit (V1 or V2)
- b.Board Battery Pack
- USB Micro Cable
- Internet enabled computer with available USB port.



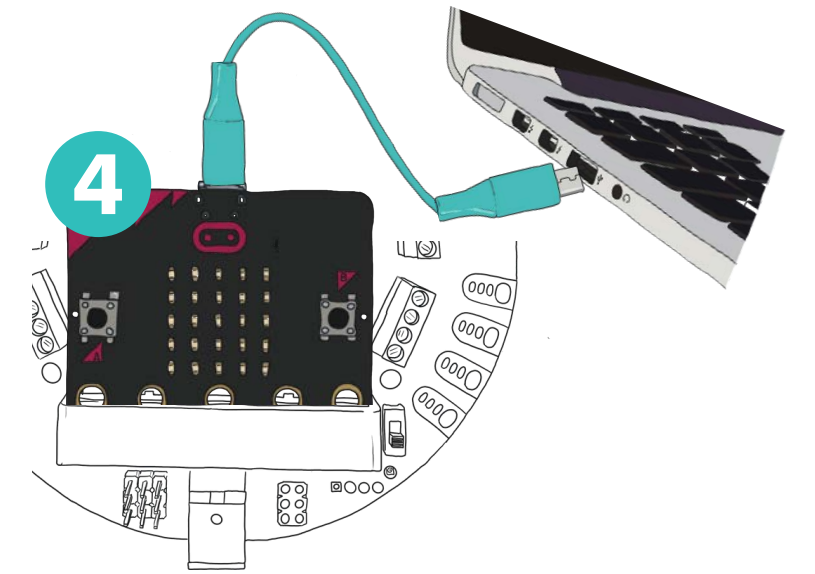
Navigate to `code.brilliantlabs.ca` and click on "New Project." Feel free to name your project when prompted.



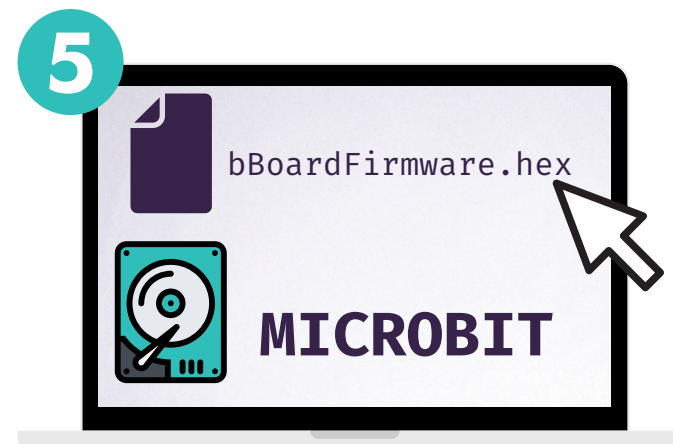
Select the version of Micro:bit you are using (v1 or v2)



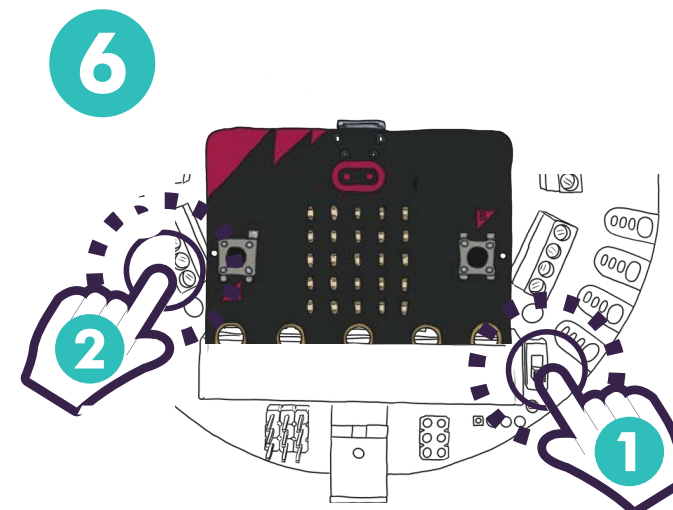
When the project opens you will find the Firmware button at the bottom right corner, click on b.Board Firmware.



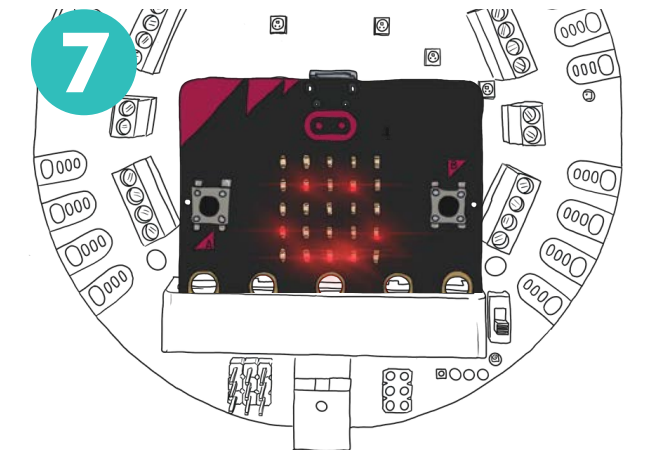
Connect your micro:bit to the computer.



On your computer, click the button to download latest firmware version. Once .hex file is downloaded, drag and drop that as you would code onto your micro:bit.



- 1 Turn the power to your b.board off then back on again.
- 2 Press Button A on the micro:bit



Your firmware is up to date when you see a smiley face on your micro:bit.



PSST...

It's good practice to also update the firmware on your Micro:bit. More information can be found here: <https://microbit.org/get-started/user-guide/firmware/>

<HELLO WORLD/>

Now that the b.Board firmware is up to date, let's begin exploring some code that will bring the functions of the b.Board to life. We have prepared some test code that highlights most features of the b.Board.

Please use this test code to inspire infinitely more creative purposes. The following pages will take you through some more block code functions. Remember, this test code is available in blocks, javascript and python.

Test code available here:
code.brilliantlabs.ca/testcode

Remember, your b.Board can also be coded using a bluetooth enabled tablet.

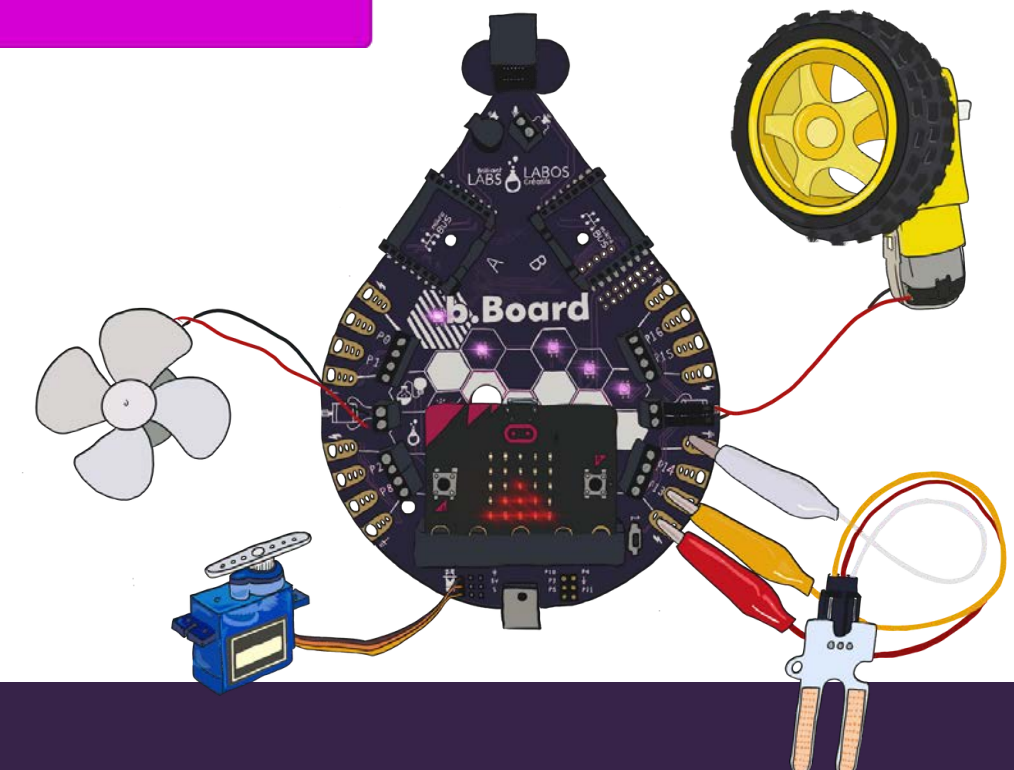
```
on start
  show string "Hello World!"
```

```
forever
  set all BLiXels to [red]
  pause (ms) 500
  set all BLiXels to [blue]
  pause (ms) 500
```

```
on loud sound
  show string "Shhh!"
```

```
on button B pressed
  start melody [dadadum] repeating [once]
```

```
on button A pressed
  set both motors speed to [75] % for [1000] (ms)
```



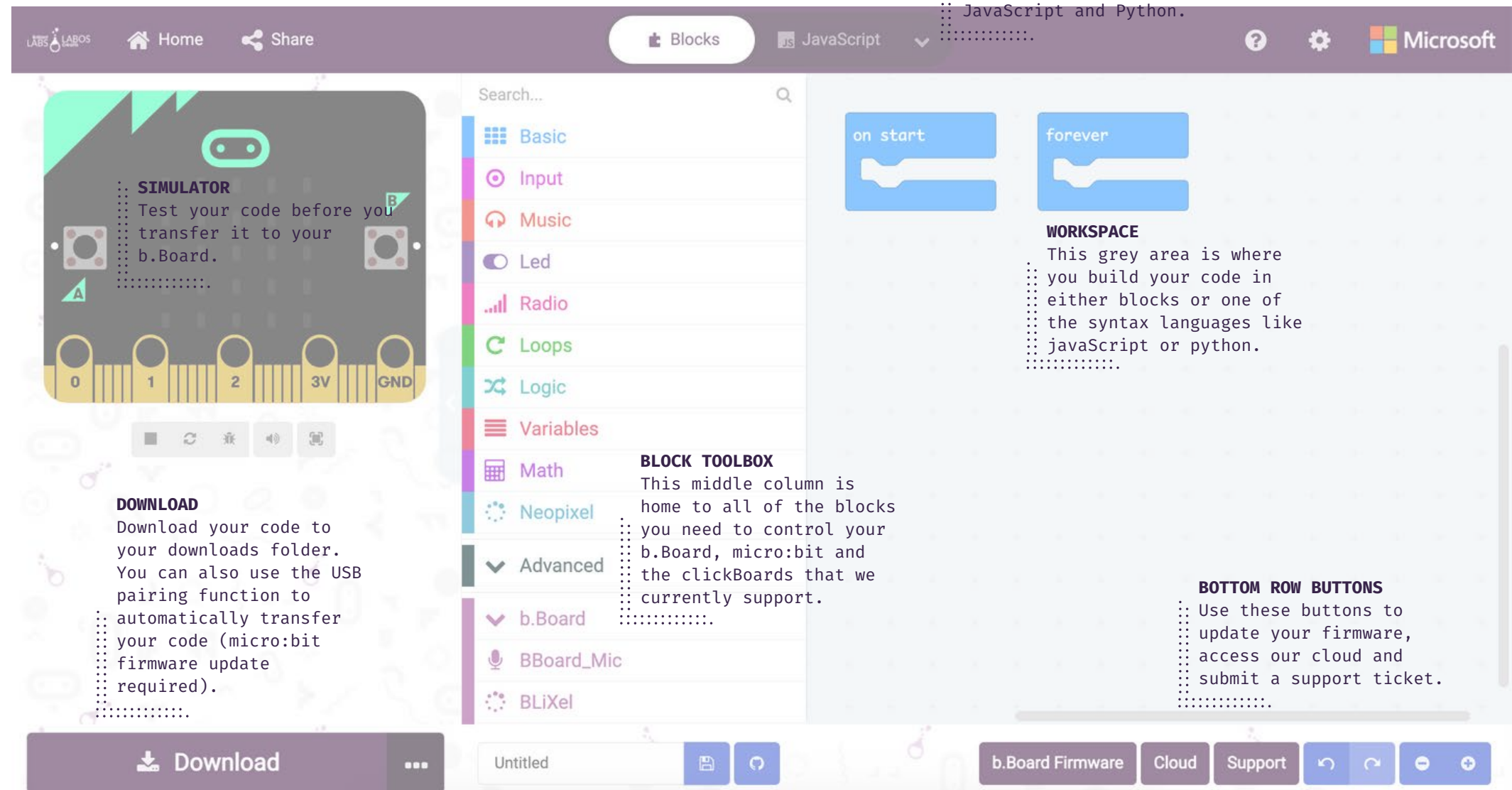
CODE YOUR PROJECT

Coding your first project with the b.Board begins with what an Independent Development Environment (IDE). This cloud-based software is a like a home that was specifically built for your micro:bit, b.Board and clickBoards to all work together as a family.

This home for b.Board coding can be found at code.brilliantlabs.ca.

The next few pages of this Getting Started Guide will take you through a sampling of code for each of the on-board, b.Board components.

Use this page to get acquainted with where to find the blocks of code that help the b.Board function.



CODE LANGUAGE
Use these buttons to switch between Blocks, JavaScript and Python.



Once your browser loads to code.brilliantlabs.ca, click on New Project to begin. Remember to give your project a unique name so that it is easier to find later.



PSST...

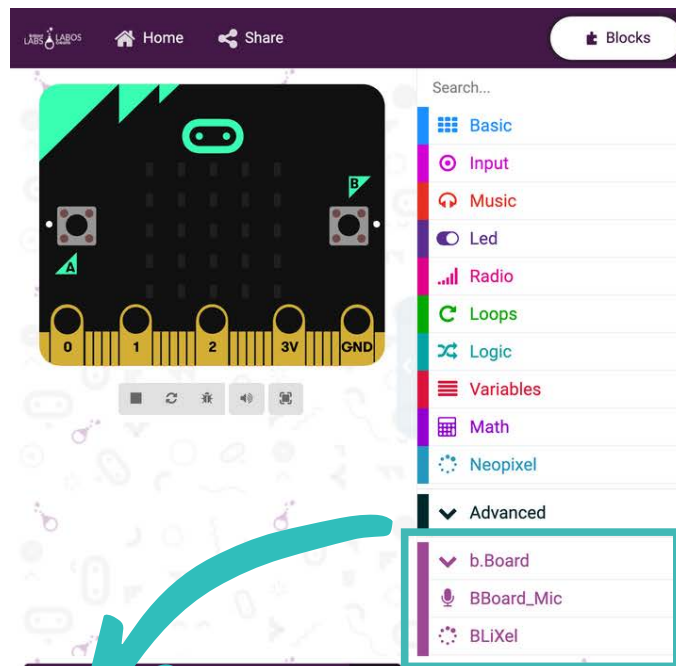
The b.Board IDE may prompt you that it uses memory on your computer. This is normal as the homepage of code.brilliantlabs.ca is designed to remember your past projects for easy retrieval. This should not be treated as a permanent storage solution as clearing cache memory will clear these projects.

b.Board BLOCK TOOLBOX

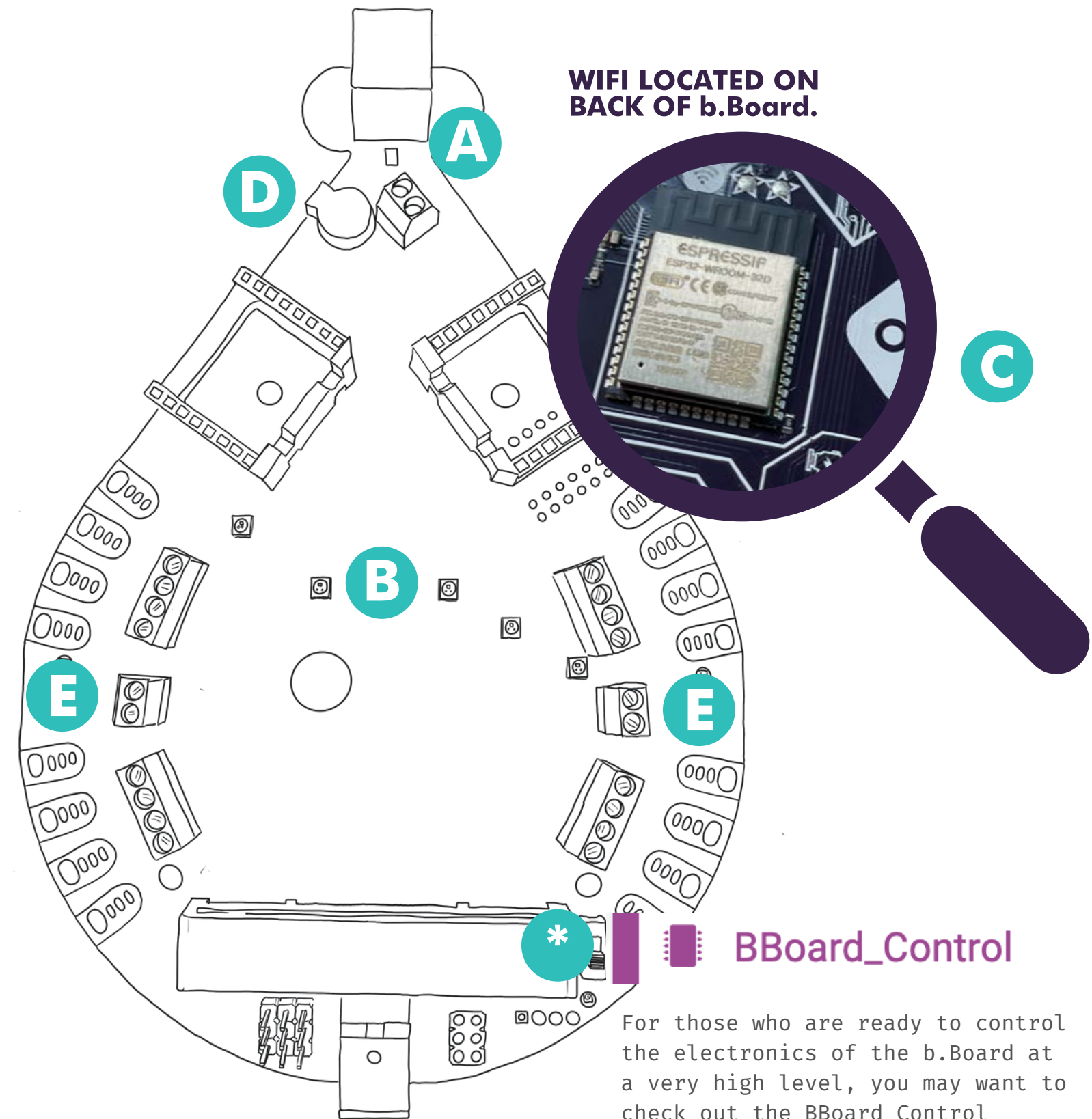
At the bottom of the toolbox, you will find all of the block categories that have been designed specifically for your b.Board. There are too many blocks in these categories to explain in detail and we are adding more each week.

Click on each category to explore all of the blocks. There are some categories that have a 'more' option should you require a few more advanced features.

Below the b.Board toolbox, you will find all of our currently supported clickBoards. There is a huge library of clickBoards available from mikroe. If you are interested in learning more on how to design your own blocks of code to make a new clickBoard function, please submit a support ticket.



▼	b.Board	
🎤	BBoard_Mic	A
🌐	BLiXel	B
📶	BBoard_WiFi	C
🎵	BBoard_Sound	D
🔌	BBoard_Control	*
⚙️	BBoard_Motor	E



WIFI LOCATED ON BACK OF b.Board.

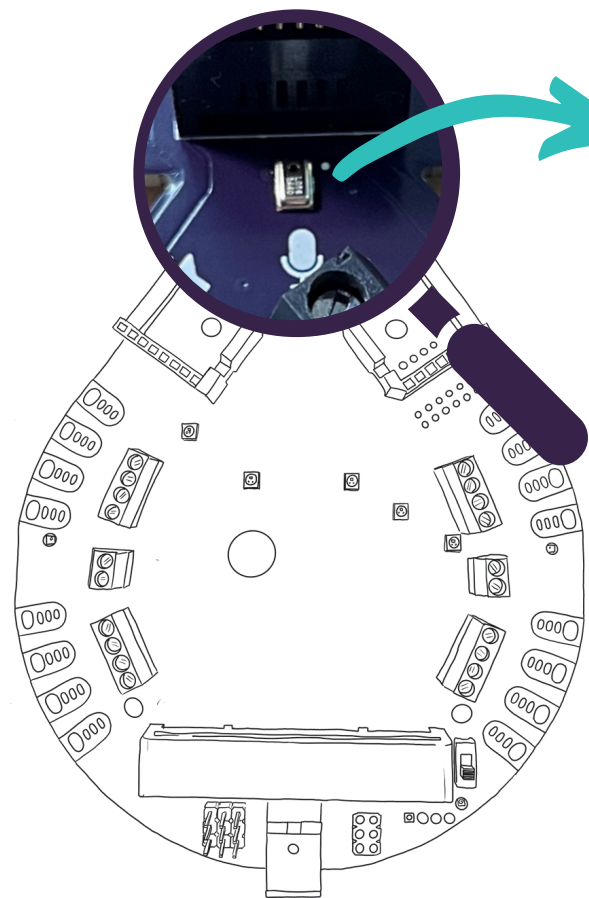
BBoard_Control

For those who are ready to control the electronics of the b.Board at a very high level, you may want to check out the BBoard_Control category.



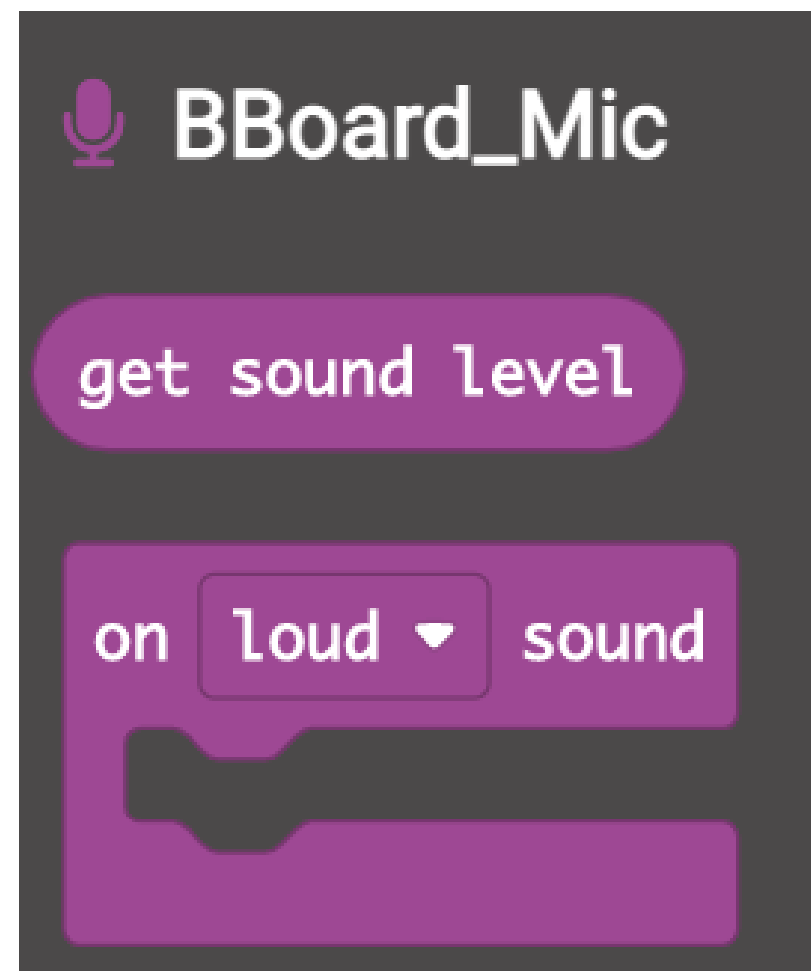
MICROPHONE A

The microphone is better described as a sound level meter. Perhaps you are interested knowing more about how loud your classroom is at different times of the day. What are you going to do with this information? Light up some LEDs? Drive some motors? Turn some servos?

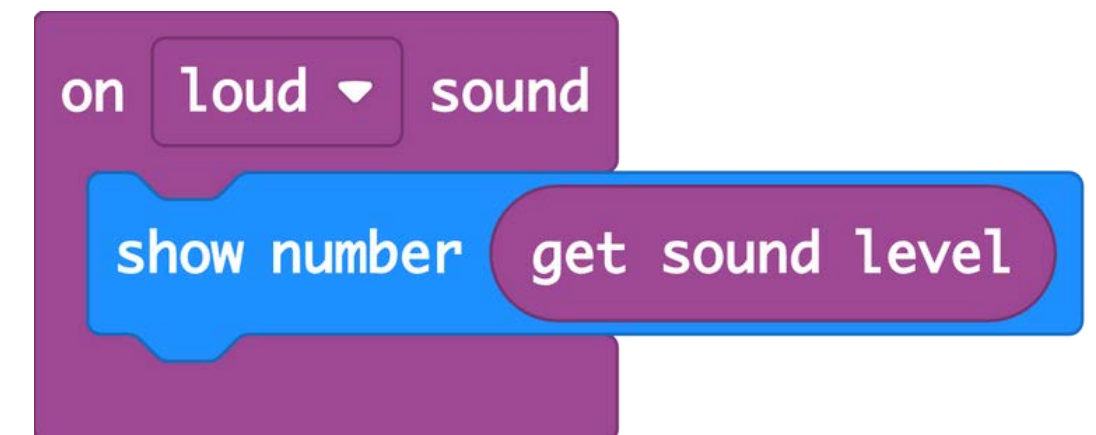


**YEP.
THAT'S THE
MICROPHONE**

RELATED TOOLBOXES



EXAMPLE CODE

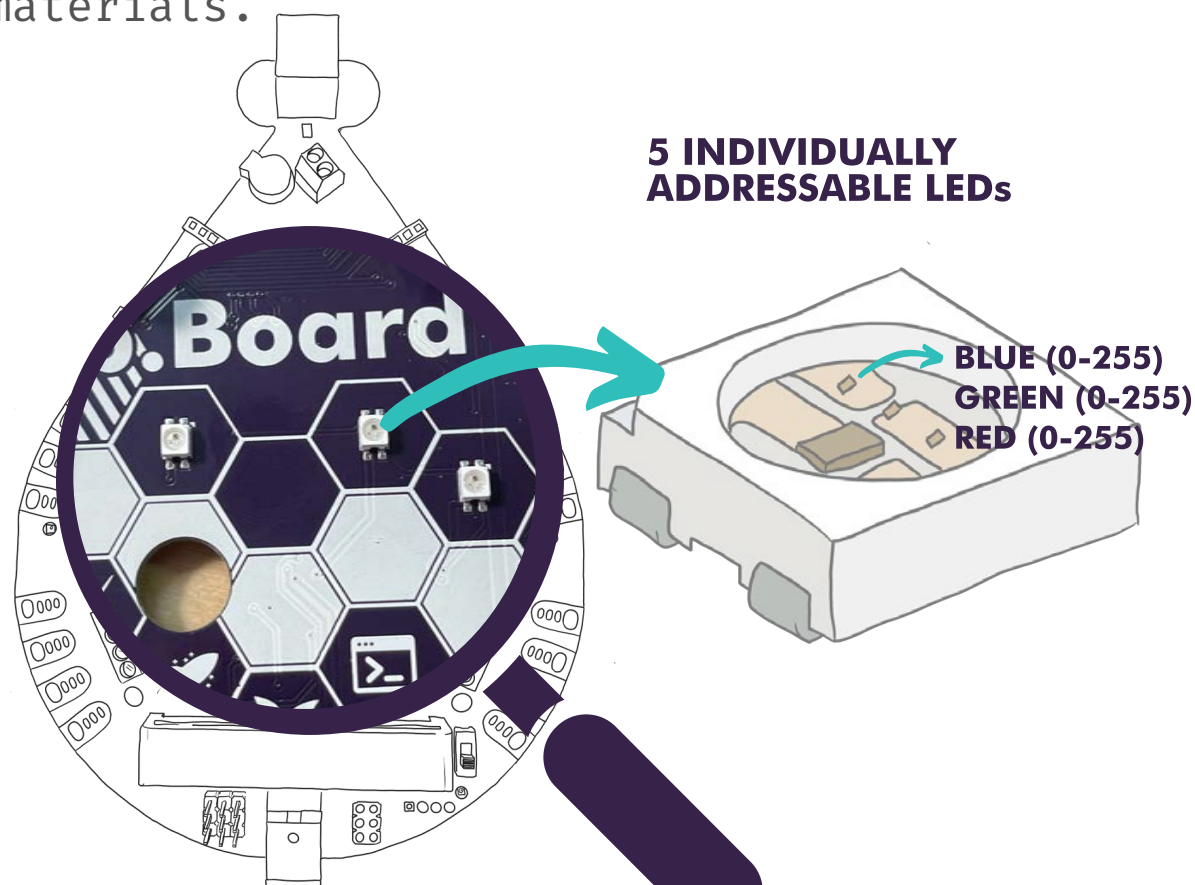


THINGS TO CONSIDER...

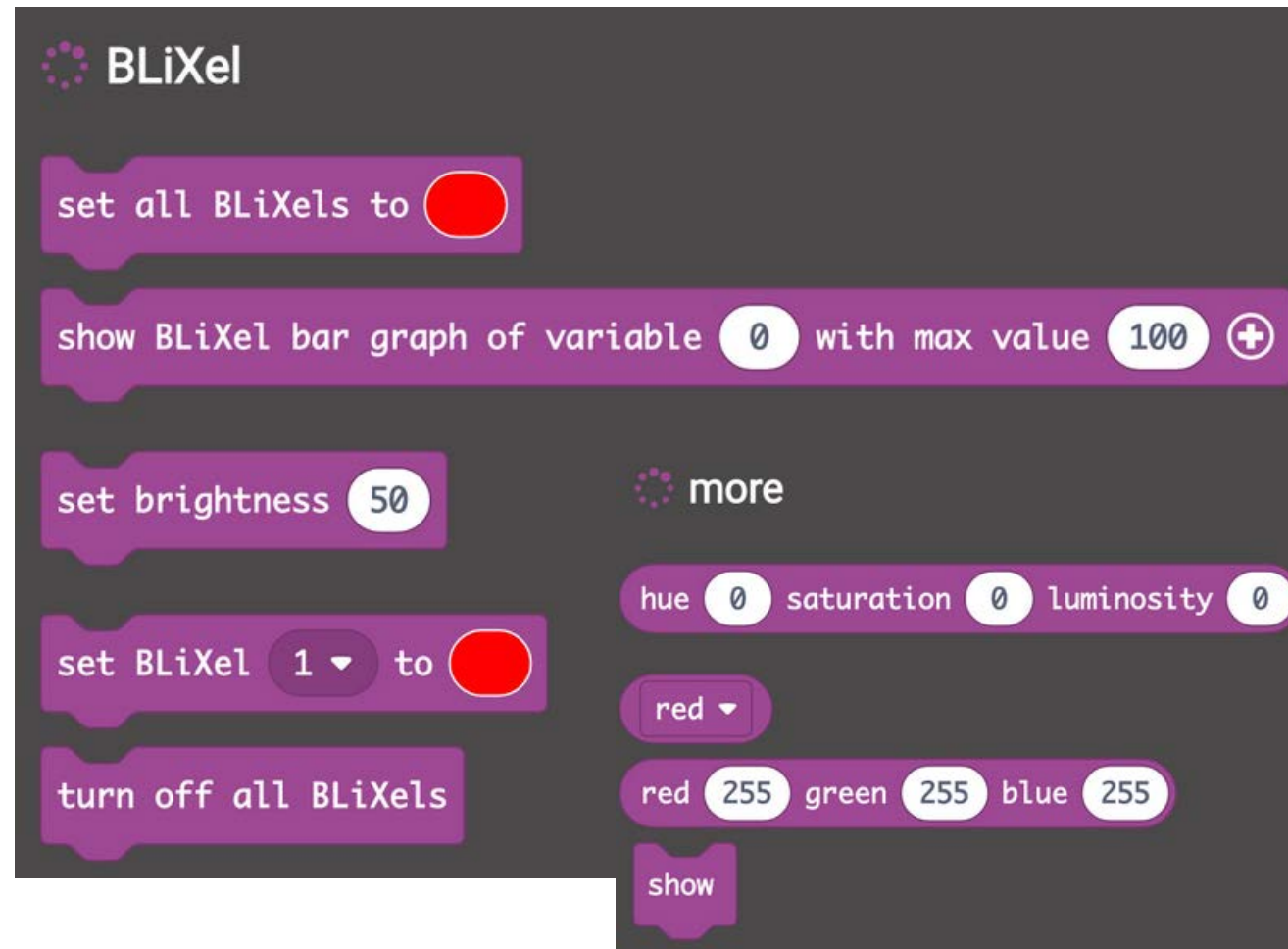
- It is good practice to understand the values your microphone is sensing. Consider using the "get sound level" block with show number to create a real time readout to your micro:bit.
- Currently this microphone is not able to record sound.

BLiXELS B

BLiXels are our name for the 5 individually addressable LEDs that are found on the front of your b.Board. These little lights can be changed to flash in any pattern and in any colour. These lights also look great when diffused using different translucent materials.



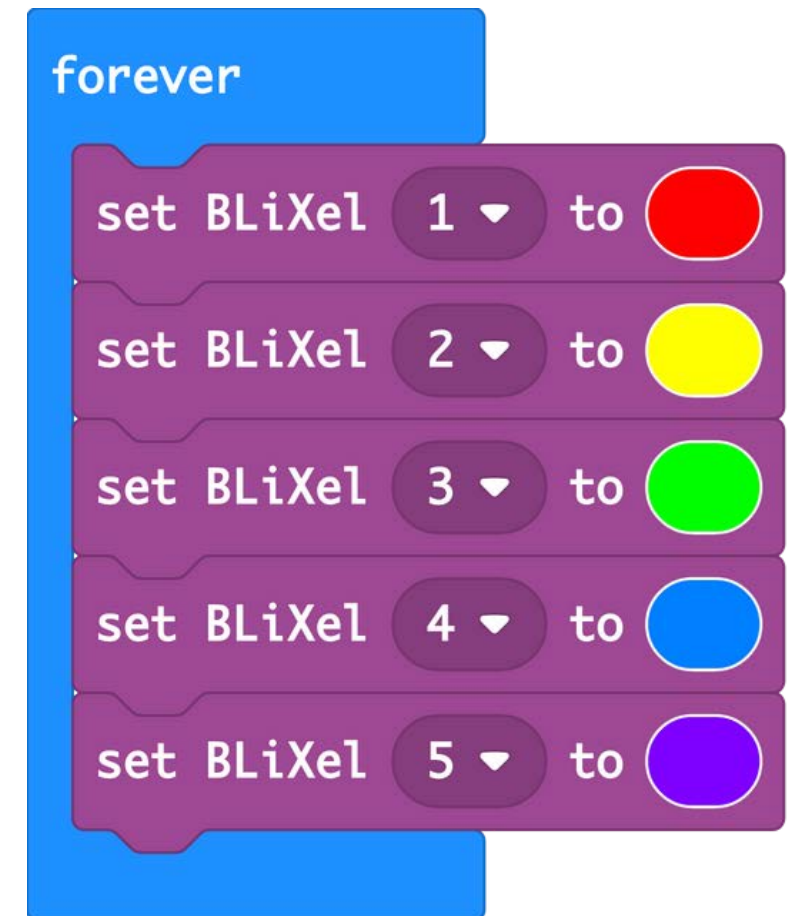
RELATED TOOLBOXES



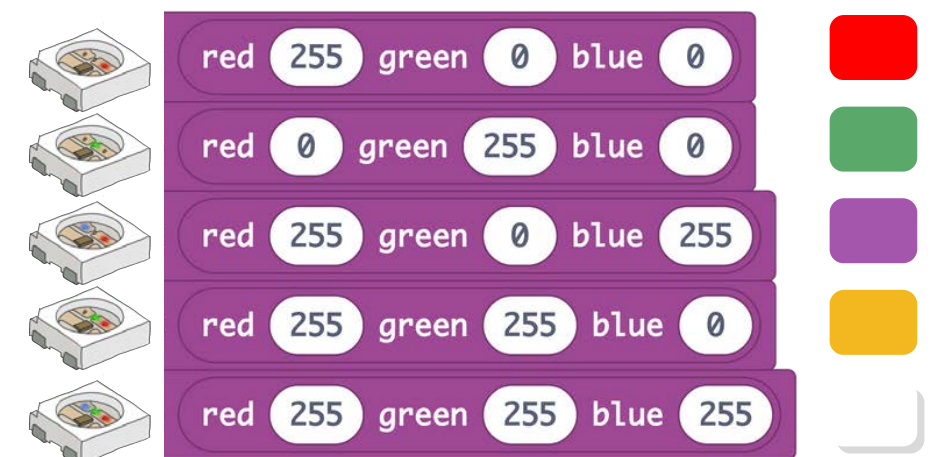
THINGS TO CONSIDER...

- The end colour of a BLiXel is determined by a combination of red, green and blue light emitted from the plastic housing.
- If using the more functions to code a specific colour, the values for red, green and blue are between 0 and 255. For instance one shade of purple would be Red = 0, Green = 255, and Blue = 255.
- What could your 5 BLiXels represent?

EXAMPLE CODE

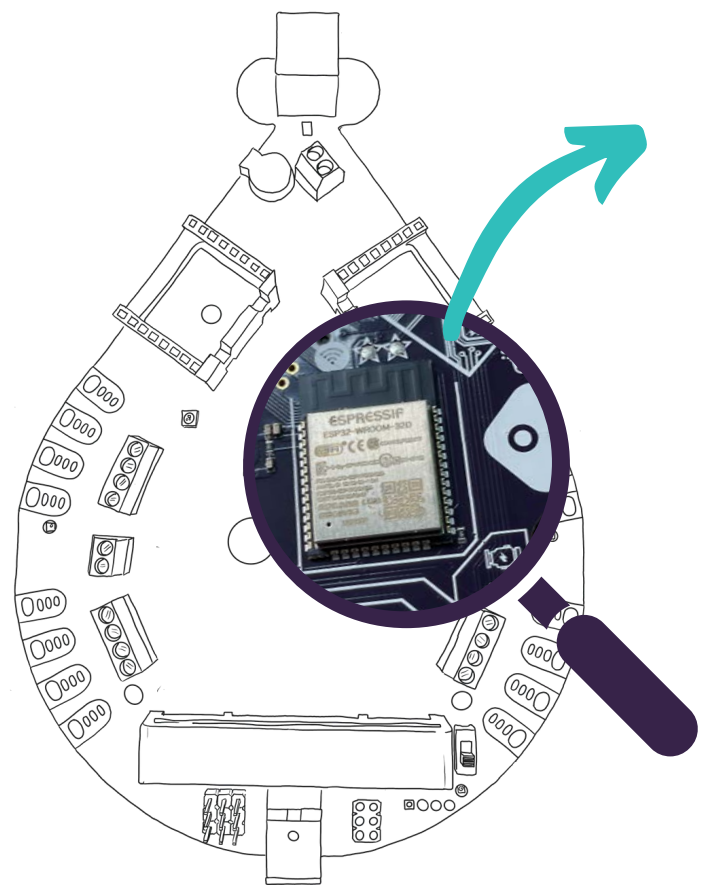


EXAMPLE COLOUR VALUES



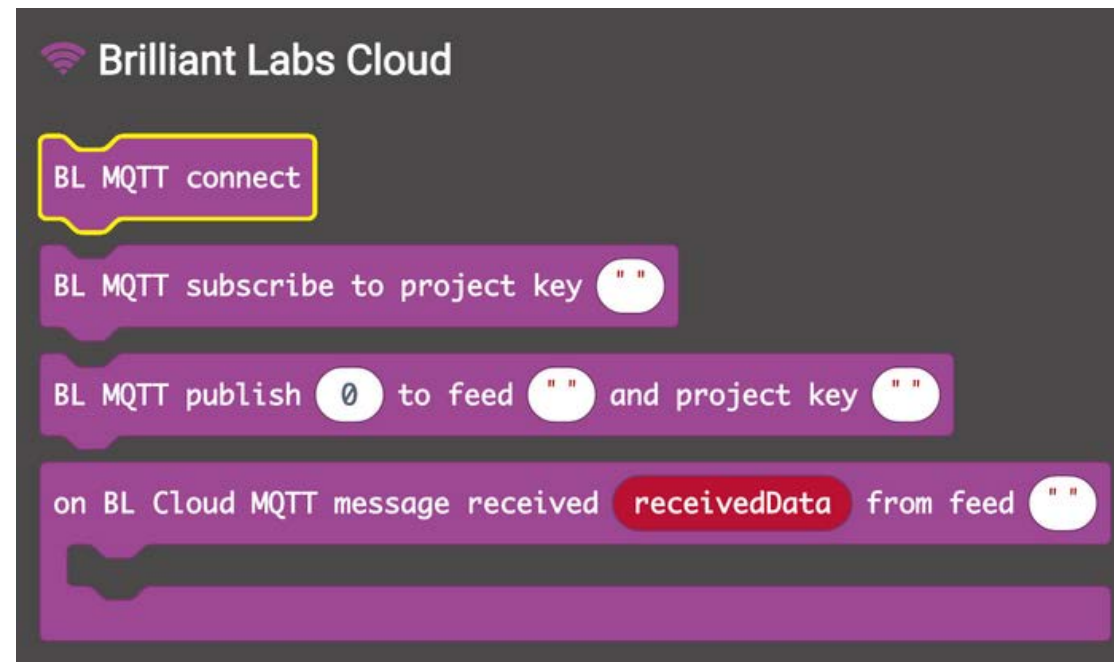
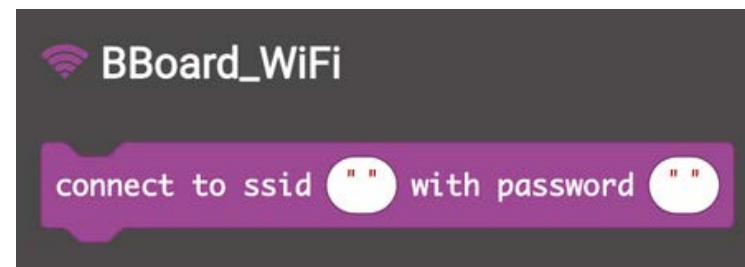
WiFi

With just a few blocks, your b.Board can become a component of your smart classroom or even a way for you to post your project's data to the cloud for others to use in their projects. Please be mindful of everyone's privacy when you use the internet.



CONNECT WITH MAKERS AROUND THE WORLD VIA A 2.4GHz CONNECTION.

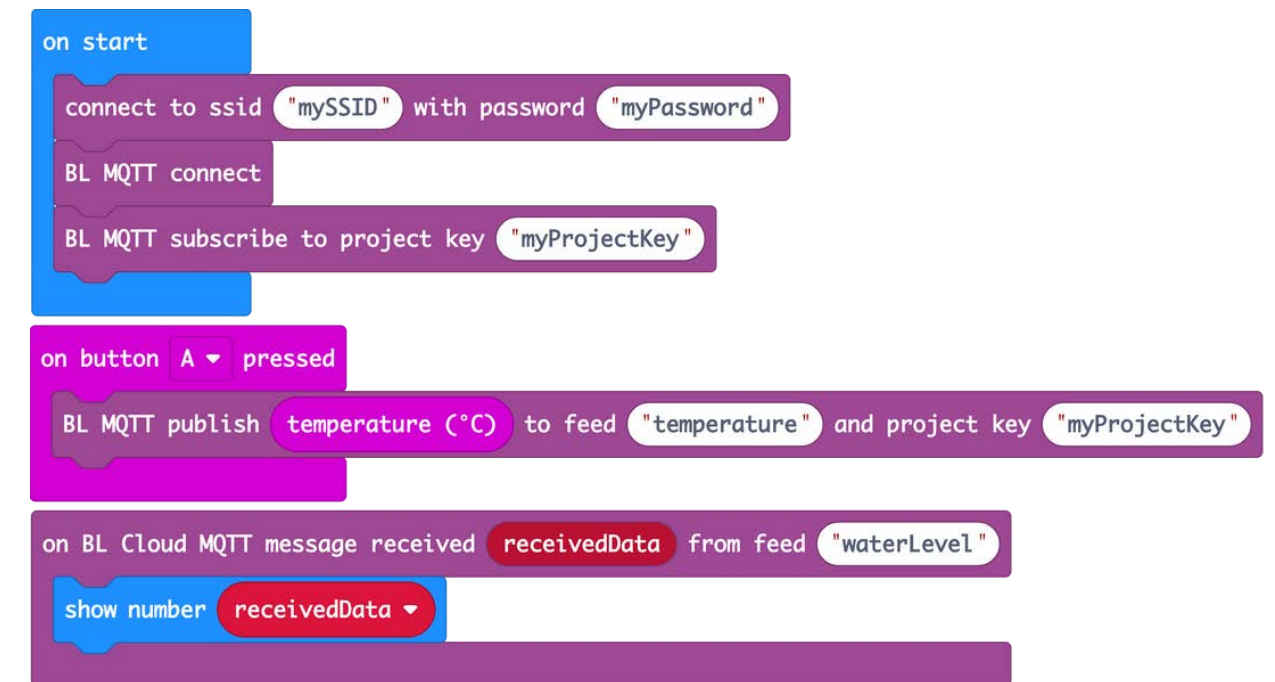
RELATED TOOLBOXES



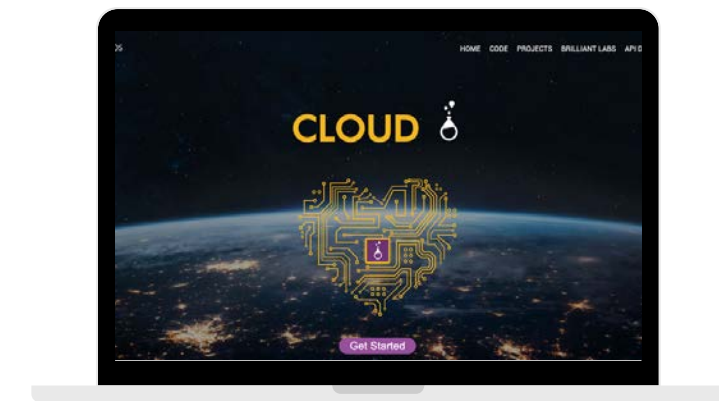
THINGS TO CONSIDER...

- Your SSID and Password should always remain confidential. Never share this information and if you are sharing your code with others be sure to remove your WiFi information before downloading and sharing.

EXAMPLE CODE



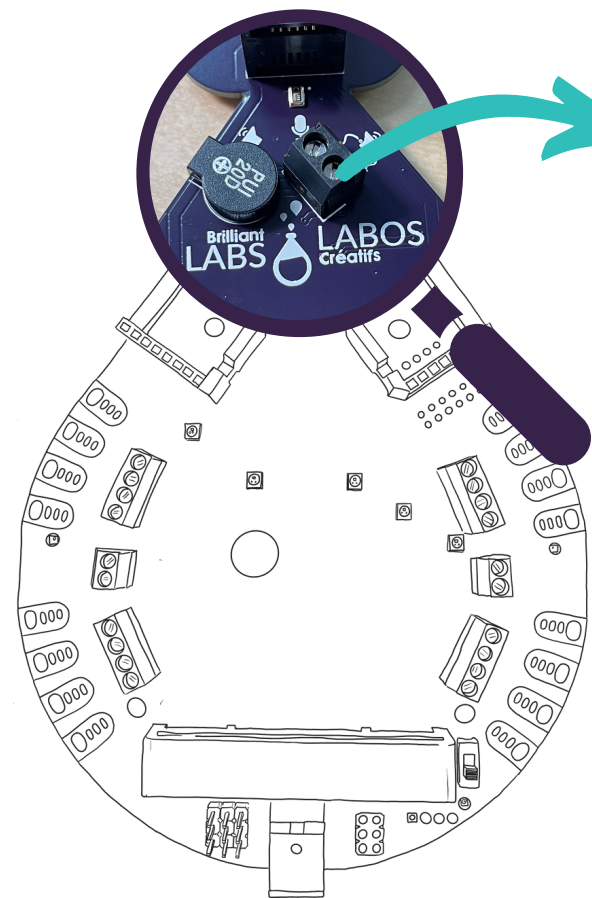
THESE BLOCKS WOULD POST A VALUE TO OUR BRILLIANT LABS CLOUD EVERY TIME BUTTON A IS PRESSED AND RECEIVE DATA FROM YOUR FEED IF THERE IS A NEW DATA ENTRY.



YOUR b.Board IS DESIGNED TO EASILY WORK WITH THE BRILLIANT LABS CLOUD. VISIT [CLOUD.BRILLIANTLABS.CA](https://cloud.brilliantlabs.ca) TO GET STARTED WITH IoT AND DATA COLLECTION.

SPEAKER(S) D

We are super impressed with the power of this little on-board speaker. If you need more volume, you can attach an external speaker. We encourage you to try any speaker that you may have lying around (as long as they are rated for 1.5W and above).



**SPEAKER TO THE LEFT,
SPEAKER TERMINAL TO THE RIGHT.**



USE THE SPEAKER TERMINALS TO TRY OUT AN EVEN MORE POWERFUL SPEAKER.

RELATED TOOLBOXES

Music

Melody

play melody at tempo 120 (bpm)

Tone

play tone Middle C for 1 beat

ring tone (Hz) Middle C

rest(ms) 1 beat

Middle C

BBoard_Sound

play frequencies array of 0 1 - + Hz

set frequencies tempo to (bpm) 60

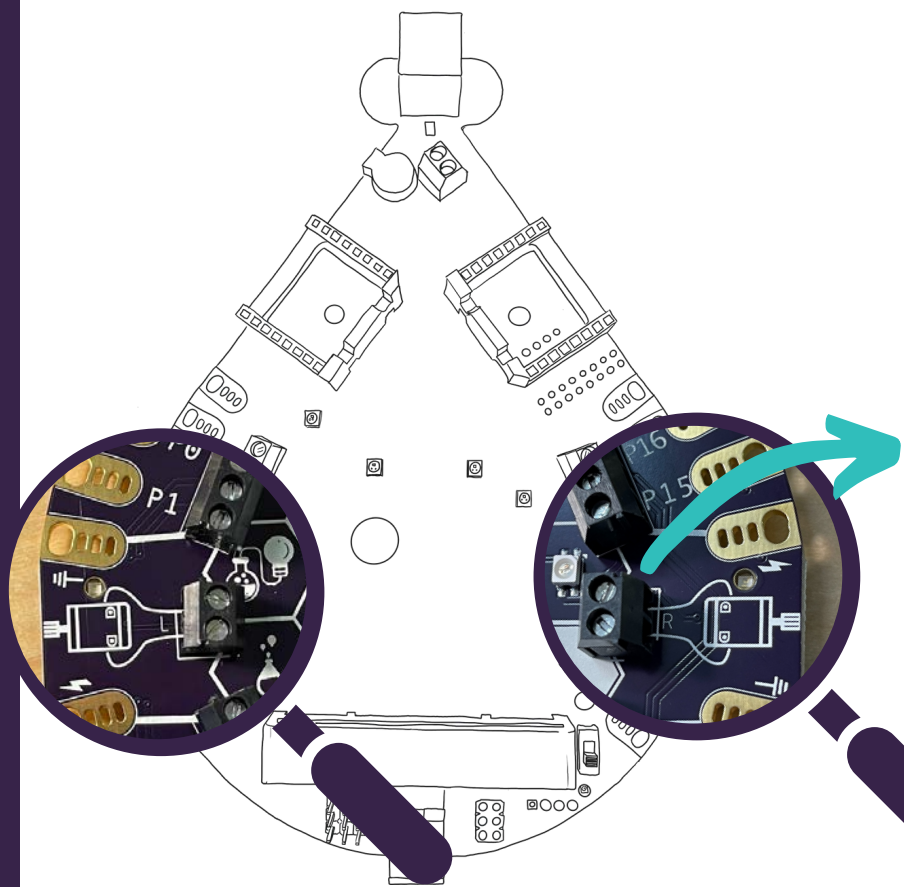
EXAMPLE CODE THINGS TO CONSIDER...

```
on button A pressed
  play tone High F for 1 beat
  play tone High F for 1/2 beat
  play tone High D# for 1/8 beat
  play tone High F for 1/4 beat
  play tone High G for 1/4 beat
  play tone High C for 1 beat
  play tone High F for 1 beat
  play tone High F for 1/2 beat
  play tone High D# for 1/8 beat
  play tone High F for 1/4 beat
  play tone High G for 1/4 beat
  play tone High C for 1 beat
  play tone High A# for 1/4 beat
  play tone High G for 1/2 beat
  play tone High F for 1/2 beat
  play tone High D# for 1/2 beat
  play tone High F for 1 beat
```

- You can control the volume in your code. These speakers may be small but they are mighty.
- Your b.board doesn't play sounds as much as it does tones. Tones are expressed in hertz (Hz) and correspond to keys on a piano keyboard. i.e.: Middle C = 262 Hz.
- For writing longer tunes, you may want to use a syntax based language like JavaScript or the Play Frequencies block.
- If you are using a micro:bit V2, tones are emitted by the b.Board speaker by default.
- There is an itty bitty potentiometer on the back of the b.Board that works as a physical volume knob.

MOTOR DRIVERS E

Want to make your project move? The b.Board's 2 motor drivers can run motors of all sizes. The most popular are those that are 3-6V and sometimes yellow in colour. Other uses include air pumps, water pumps and valves. Remember that there is often no polarity to motors.



TWO MOTOR DRIVERS!

RELATED TOOLBOXES

BBoard_Motor

set left motor speed to % for (ms)

set right motor speed to % for (ms)

set both motors speed to % for (ms)

more

motor driver

set right motor speed to %

set left motor speed to %

EXAMPLE CODE

on button pressed

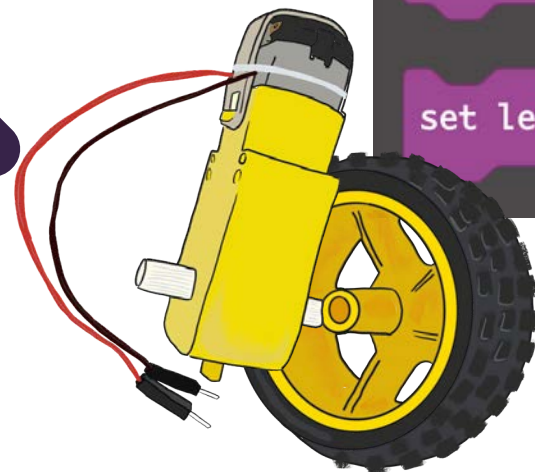
set both motors speed to % for (ms)

pause (ms)

set both motors speed to % for (ms)

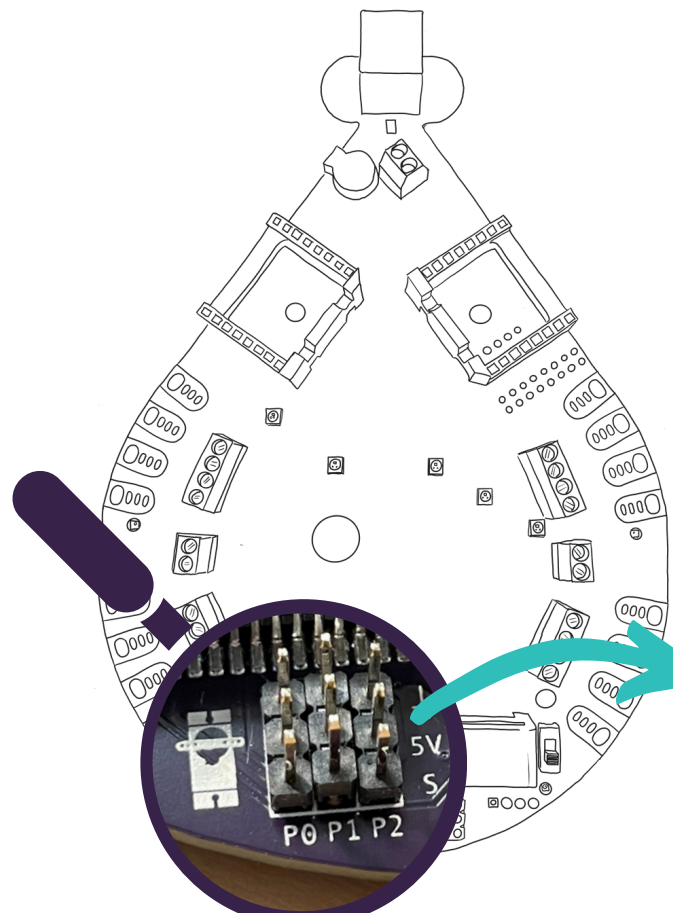
THINGS TO CONSIDER...

- A good place to start is to understand how fast your motors spin in relationship to the percentage. How does their motion change for values in the negative?
- When using two or more motors to move a robot, how will the motors work together to turn the robot? How does the speed of each motor influence the turning radius of your robot?
- Do you have a stop function in your code for when your motors don't respond the way you had hoped?
- The Yellow TT motors often have a double axel that passes through the motor. If this is the case, you can hook up two wheels to either side of the motor. Maybe even 4 wheels to 2 motors for extra traction.



SERVOS

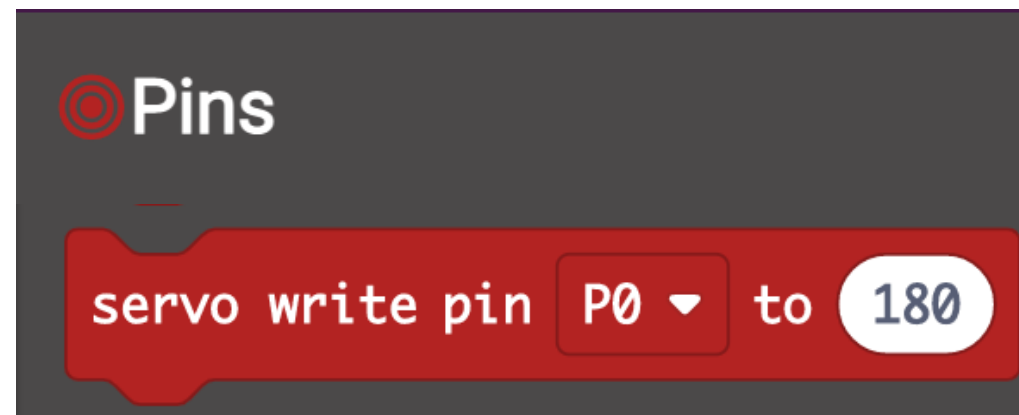
Servos are motors that turn to very specific angles. Some are continuous that turn around and around when power is applied. Most servos you will attach to your b.Board turn from 0-180°. When coding, allow enough time for your servo to reach its destination.



SUPPORT FOR 3 SERVOS ON-BOARD.

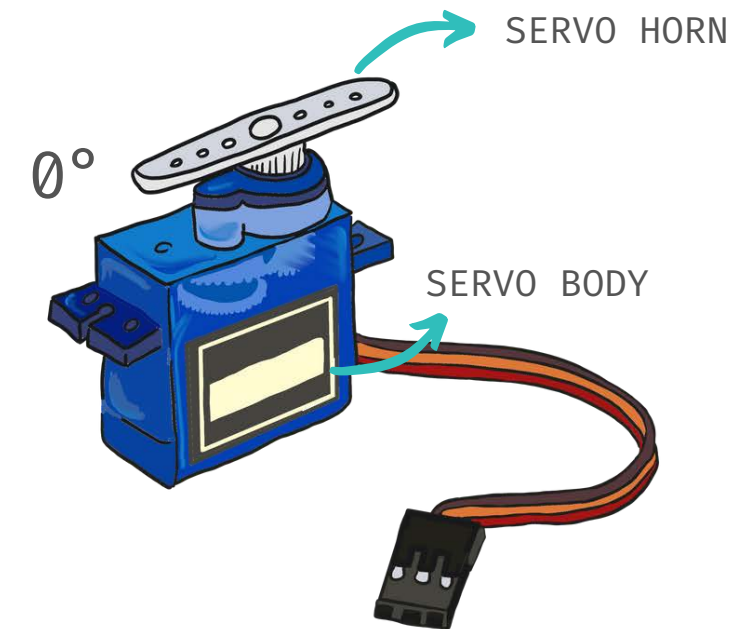
NEED MORE? GRAB A SERVO CLICKBOARD.

RELATED TOOLBOXES



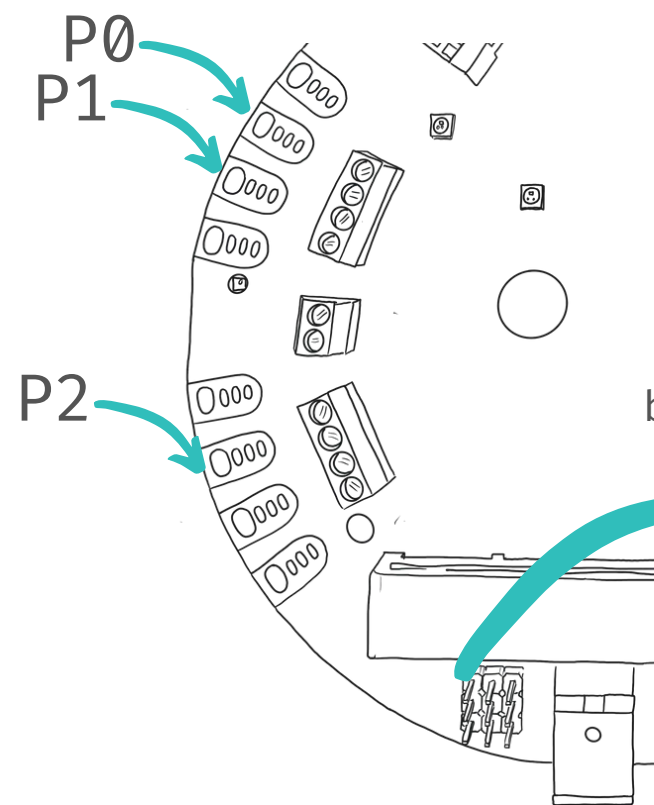
EXAMPLE CODE

```
forever
  servo write pin P1 to 0
  pause (ms) 1000
  servo write pin P1 to 45
  pause (ms) 1000
  servo write pin P1 to 0
  pause (ms) 1000
```

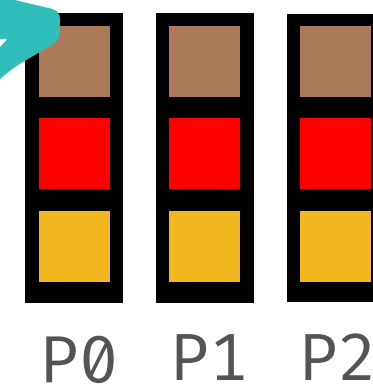


THINGS TO CONSIDER...

- Servos are controlled via pins P0, P1, and P2. You cannot have peripherals connected to the same pins in the Gator Grabber groups on the left of the b.Board. If you require more pins for your project, there are 5 available to the right of the power jack.
- Your b.Board may be capable of driving larger servos. Check the required voltage.

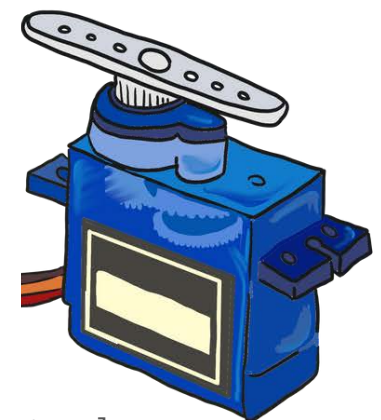


b.Board SERVO TERMINAL



⊥ = GROUND
5V = POWER
S = SIGNAL

COMMON SERVO WIRES

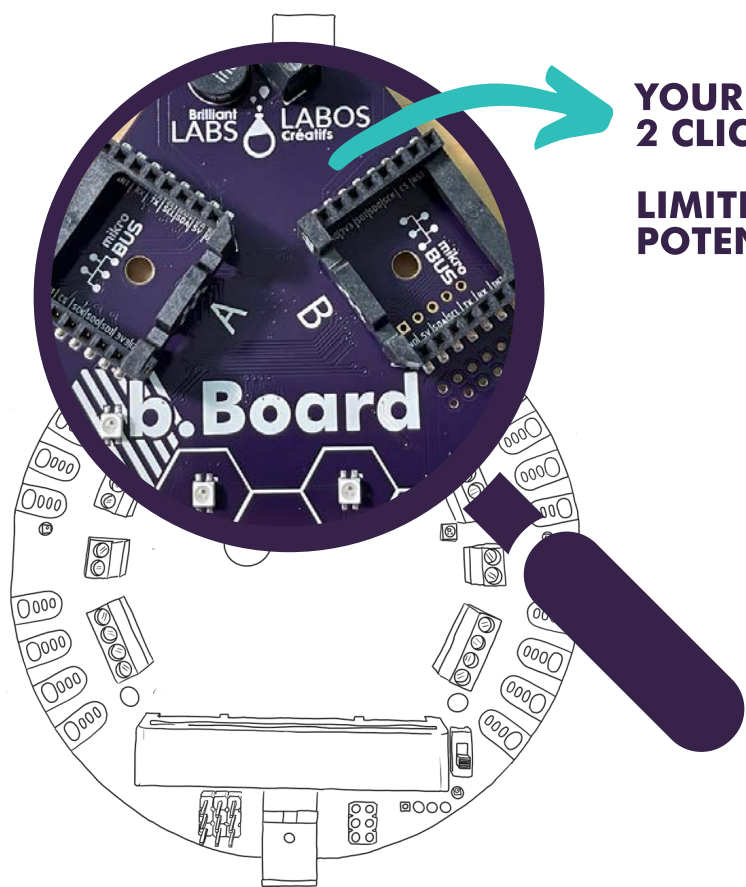


WIRE COLOUR It is possible that your servo wires are different colours. We have noticed some consistence where brown = ground, red = power and yellow = signal.



ClickBoards™

ClickBoards significantly expand the functionality of your b.Board. Designed by Mikroe, there are over 500 different input and output devices. Many of which are used by leading industries around the world. Made accessible by block code and your creativity.

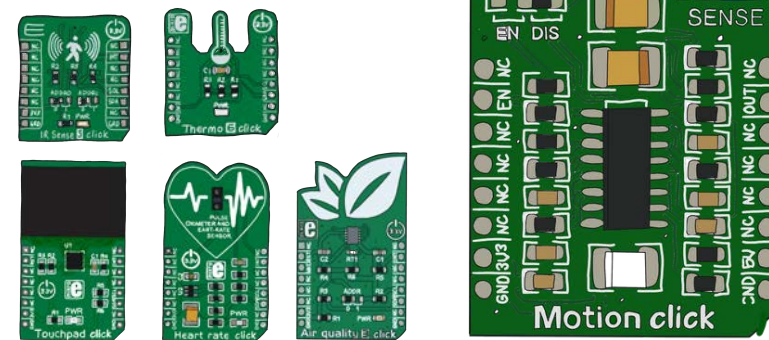


**YOUR CREATIVITY +
2 CLICKBOARDS =
LIMITLESS MAKER
POTENTIAL.**

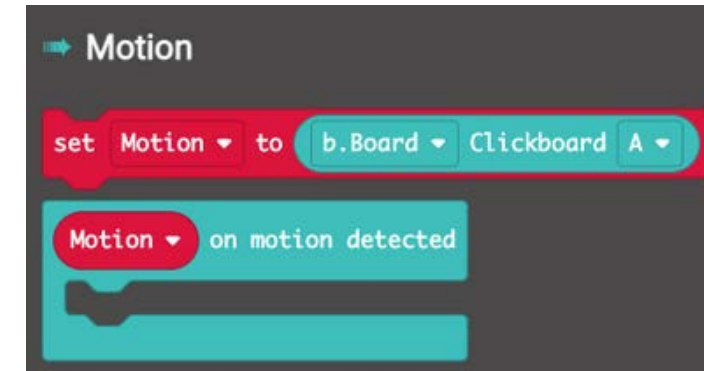
TOOLBOX STRUCTURE

- Clickboards: Sensors
 - UV_3
 - Water_Detect
 - Thermo_6
 - Proximity_2
 - Line_Follower
 - IR_Sense_3
 - IrThermo_3
 - Motion
 - more
- Clickboards: Buttons & Switches
- Clickboards: Wireless
- Clickboards: Motors
- Clickboards: Display & LED

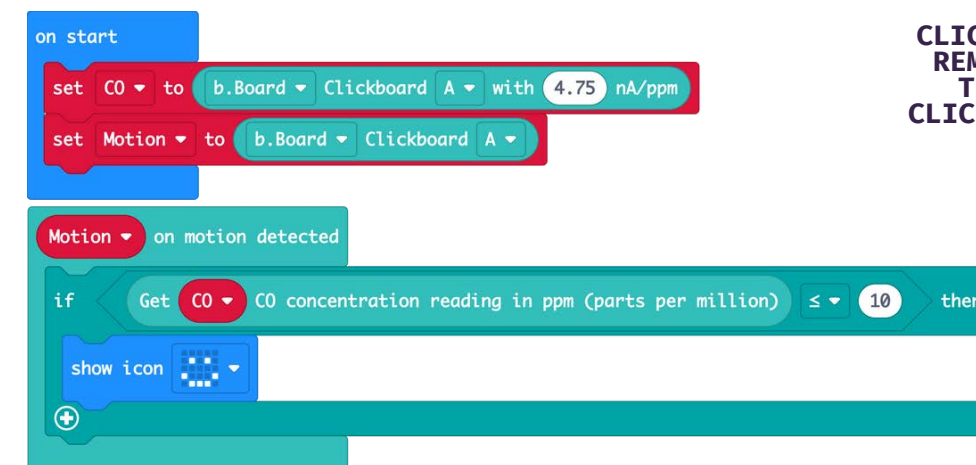
The **Motion Click** is one of our favourite starting points as it adds a sense of vision to your b.Board powered invention.



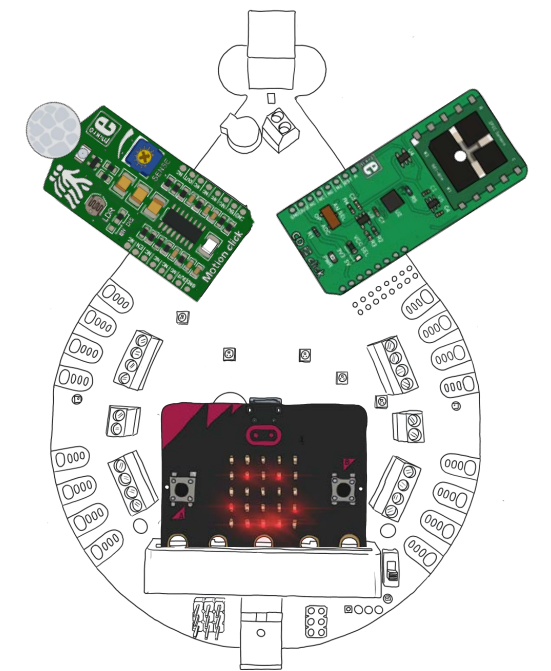
WE SUPPORT MORE THAN 20 CLICKBOARDS ON CODE.BRILLIANTLABS.CA
Our collection of supported clickBoards continues to grow. You can also write blocks for a clickBoard not yet supported. For more information email info@brilliantlabs.ca



EXAMPLE CODE



CARBON MONOXIDE MONITOR: With these two clickBoards, you can create a simple indicator of acceptable CO levels. When using sensitive data that could contribute to a healthy lifestyle, it is important to consult current and reliable sources.



YOU MUST ALWAYS INITIALIZE A CLICKBOARD ON START. REMEMBER TO SELECT THE APPROPRIATE CLICKBOARD POSITION.



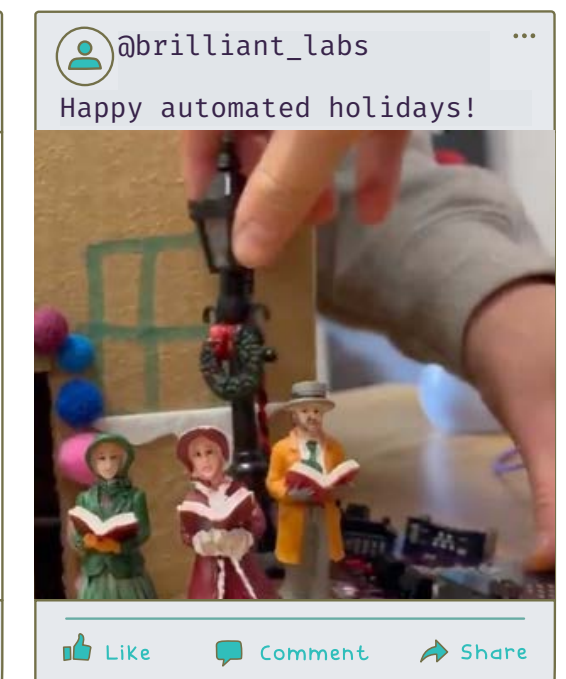
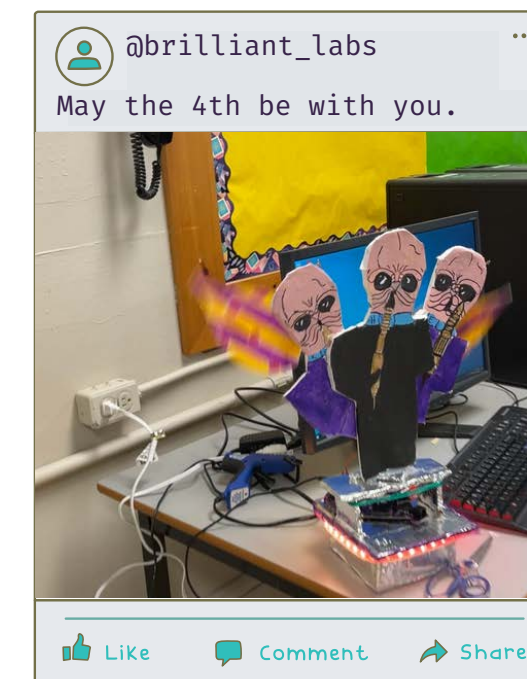
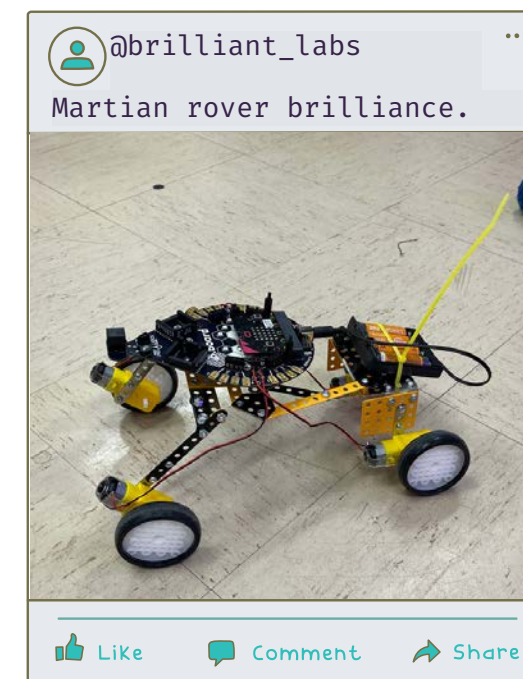
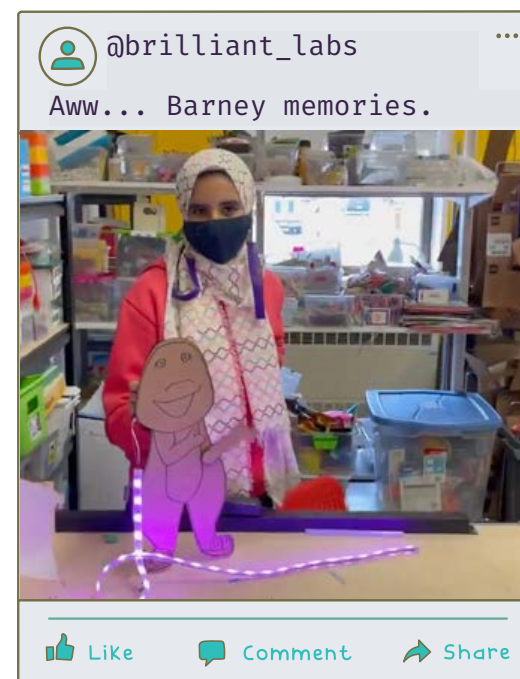
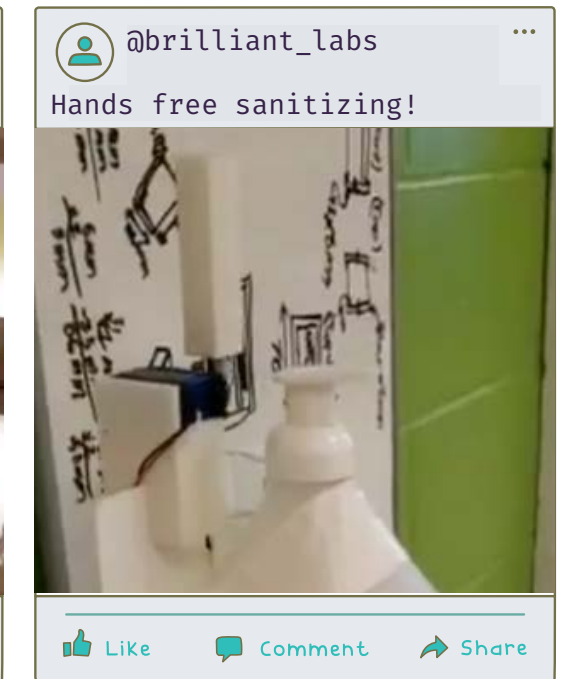
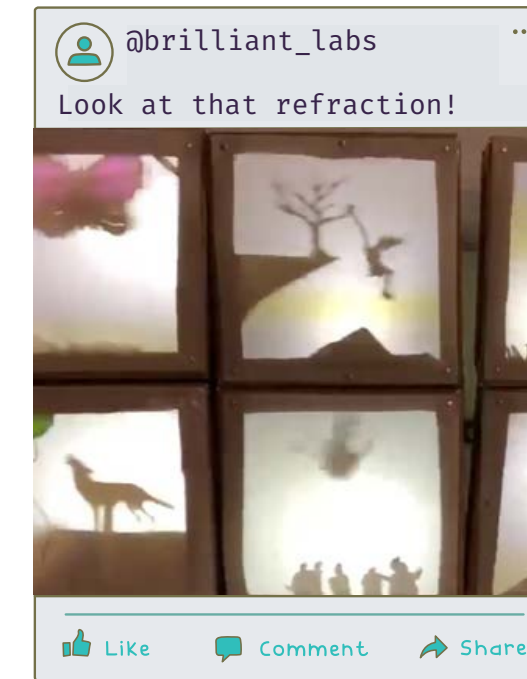
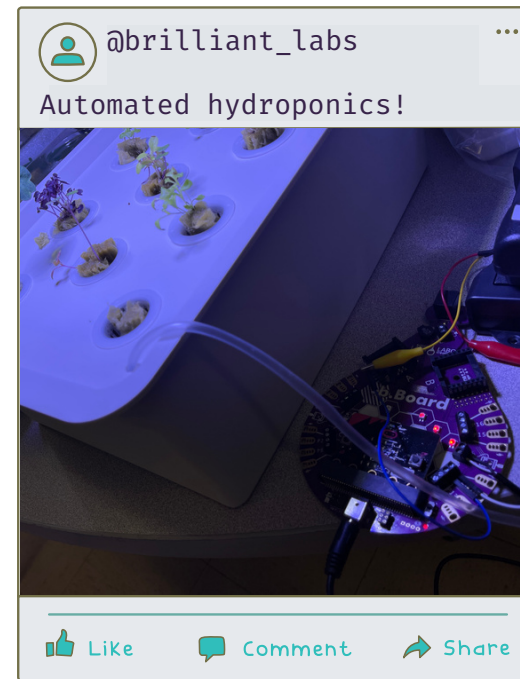
NEXT STEPS...

Even though the b.Board will become the brains of your project, prepared to receive all sorts of data and control all kinds of peripherals - the b.Board will often fade away to the background.

Your projects will become an exciting assemblage of materials: from cardboard to clickBoards, we are always amazed by the creative applications students find for their b.Boards.

Take a look at some of these projects to get inspired for your next b.Board project.

As always, make something brilliant!



FIND MORE PROJECT IDEAS HERE projects.brilliantlabs.ca

INFINITE MAKING WITH THE

b.Board

PLEASE SHARE YOUR CREATIONS:



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