# CODE KIT

## BIT INDEX

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Occasionally Bits™ and accessories get updated, so the features or appearance of your Bits may differ from those used in this guide.
Hi. This is the Bit Index, the place where you can find everything you want to know about the Bits in your kit.

Teacher resources live here: littleBits.com/code-kit-resources

Download the Code Kit app here: littleBits.com/code-kit-app
HOW TO USE LITTLEBITS

MAKE THIS CIRCUIT FIRST
And play with it!

What happens when you move this slider?

Make sure it’s in signal mode!
ANATOMY OF A BIT™
Learn how you can tell top from bottom.

TOP

BOTTOM

COLOR-CODED BY FUNCTION
Bits™ are grouped into four different categories, which are color-coded.

A POWER (BLUE)
Power Bits, plus a power supply, run power through your circuit.

B WIRE (ORANGE)
Wire Bits connect to other systems and let you build circuits in new directions.

C INPUT (PINK)
Input Bits accept input from you or the environment and send signals that affect the Bits that follow.

D OUTPUT (GREEN)
Output Bits do something – light up, buzz, move...

Learn more about your Bits ON PAGE 04

MAGNET MAGIC!
Bits snap together with magnets. The magnets are always right – you can’t snap them together the wrong way.

ARROWS SHOULD POINT IN THE SAME DIRECTION

IF THE BITS WON’T SNAP TOGETHER, TRY SPINNING ONE AROUND AND MAKE SURE THE ARROWS POINT IN THE SAME DIRECTION

ORDER IS IMPORTANT
POWER BITS always come first and INPUT BITS only affect the OUTPUT BITS that come after them.

WITH NO OUTPUT BIT AFTER IT, THE INPUT BIT HAS NOWHERE TO SEND ITS SIGNAL

THE INPUT BIT AFFECTS THE OUTPUT BITS THAT FOLLOW
**MEET THE BIT**

The USB power may be the smallest in the series, but it's big enough to send electricity to all your creations. This Bit lets you power your circuit through a micro USB cable. It can be connected to a computer or the rechargeable battery.

**HOW IT WORKS**

The USB power Bit sends a 5 volt signal through your circuit, which allows you to power up your Bits.

**REAL WORLD ANALOGIES**

- PHONE CHARGER
- LAPTOP CHARGER
**MEET THE BIT**

The button Bit is a classic: big, round, and springy for comfortable pressing! Push it to turn something on and release it to turn it off.

**REAL WORLD ANALOGIES**

- VIDEO GAME CONTROLLER
- ELEVATOR BUTTON
- GAME SHOW BUZZER

**MINI-CHALLENGE**

Can you invent a chair that makes noise when you sit down?

**HOW IT WORKS**

The button is like a door. When you press it, the door opens, letting the signal pass through the Bit and on to the next Bits in the circuit. The button is a momentary switch, you must continue to press it for the signal to flow. When you release the button, the door closes, stopping the signal from passing on to other Bits.
When the slider is all the way to the left, it’s sending an off or 0 volt signal. When the slider is all the way to the right, it’s sending a 5 volt signal. The slider can be positioned to send any signal between 0 and 5 volts.
MEET THE BIT

Twist this dimmer back and forth to control your circuit. As you twist the dimmer clockwise, more signal goes to the Bits that follow, brightening lights, speeding up motors, or raising the volume on buzzers.

MINI-CHALLENGE

Can you invent a light that changes color?

REAL WORLD ANALOGIES

HOUSEHOLD DIMMER SWITCH
STEREO VOLUME CONTROL
FAUCET
STOVE KNOB

HOW IT WORKS

The dimmer is like the knob on a water faucet. The more you turn the knob, the more the water flows from the faucet. The dimmer is similar - the more you twist it clockwise, the more signal it lets through.
**PRESSURE SENSOR**

The pad of the sensor detects how much pressure is being applied. The harder you press down on it, the more signal it lets pass through to the following Bits.

Note: Do not fold or crease the pressure sensor.

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**MEET THE BIT**

The pressure sensor is a touch-activated Bit that responds to how much pressure you put on it.

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**MINI-CHALLENGE**

Can you invent a light-up sign with the pressure sensor?

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**REAL WORLD ANALOGIES**

- **SCALE**
- **TOUCH SCREEN**
- **MICROWAVE TOUCH SCREEN**
- **HAMMER CARNIVAL GAME**

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**SAMPLE CIRCUIT**

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**HOW IT WORKS**

The pad of the sensor detects how much pressure is being applied. The harder you press down on it, the more signal it lets pass through to the following Bits.

Note: Do not fold or crease the pressure sensor.
**MEET THE BIT**

Use this Bit to control your circuits with sound. It’s a great way to make your inventions hands-free!

**MINI-CHALLENGE**

Can you invent something that moves at the snap of your fingers?

**REAL WORLD ANALOGIES**

- CLAP ON LIGHT
- HUMAN EAR
- BEAR IN HIBERNATION

**SAMPLE CIRCUIT**

The sound trigger has a microphone that measures how much noise is around it. When the noise goes above a certain level, the sound trigger will send out a 5 volt signal to the Bits that follow. Use the adjustment slider to set the sensitivity (how much noise is needed to trigger your Bit).

**HOW IT WORKS**

The sound trigger has a microphone that measures how much noise is around it. When the noise goes above a certain level, the sound trigger will send out a 5 volt signal to the Bits that follow. Use the adjustment slider to set the sensitivity (how much noise is needed to trigger your Bit).
MEET THE BIT
The wire Bit has a flexible wire running between its two bitSnaps. This allows you to place your Bits farther apart, turn corners, and make connections that can twist, turn, and spin.

MINI-CHALLENGE
Can you invent a circuit that you wrap around your arm?

REAL WORLD ANALOGIES
- EXTENSION CORD
- POWER LINES
- PIPES
- JUMPSTART CABLE

SAMPLE CIRCUIT

HOW IT WORKS
The wire doesn’t change the signal in any way – it just carries it over from one Bit to another. Each wire Bit is 6 inches (15 cm) long.
### MEET THE BIT
The branch lets you send the same signal to up to 3 other outputs, in 3 different directions.

### MINI-CHALLENGE
Can you invent a creature you control with one input Bit?

### HOW IT WORKS
The branch takes the incoming signal and sends it equally to all 3 output bitSnaps.

### REAL WORLD ANALOGIES
- POWER STRIP
- USB HUB
- TREE BRANCH
- FORK IN A RIVER
MEET THE BIT
The codeBit levels up your littleBits circuits by allowing you to program how your Bits work. Using the littleBits Code Kit app you can command this Bit to create unique sounds, movements, and animations.

MINI-CHALLENGE
Can you code a sound effect that plays at your command?

BIT BREAKDOWN
- serial icon
- micro USB port
- code LED: This LED will be red when code is running on the Bit.
- 3 output bitSnaps
- restart button: press briefly to restart your code from the beginning
- CONNECTED LED
  - Green: connected to computer
  - Blink White: code uploading
  - Off: Not connected
- 3 input bitSnaps

REAL WORLD ANALOGIES
- COMPUTER
- BRAIN
- AIR TRAFFIC CONTROL
- BAND CONDUCTOR
The codeBit is a miniature computer that you can use to control your circuit’s behavior. You can program your codeBit to do different things by writing code in the littleBits Code Kit app. When you’re ready, you can instantly upload the code to your codeBit to see how it works.

Just like all other Bits, the codeBit needs to be connected to a power Bit in order to work. If you turn the power off, the Bit will stop working, but the code will still be on there and will start running when you turn the power back on.

For more information about the codeBit and an intro to all its features, visit littleBits.com/tips-tricks/codeBit

Serial communication is a way to send complex information between computers and other devices. Serial communication is made up of a series of ‘on’ and ‘off’ signals.

For example, the codeBit can turn your code into serial data and send it to the LED matrix to tell it what to do.

Note: Only Bits with the serial communication icon are able to send and read serial data. Some Bits without the serial icon may interfere with serial signals if placed between the codeBit and the LED matrix.
**BARGRAPH**

The bargraph uses five LEDs to turn electricity into light. Each LED on the board needs a certain amount of signal in order to light up. As you increase the signal sent to the bargraph, more LEDs will shine.

**MEET THE BIT**

The bargraph shows you how much signal the Bit is receiving with a display of five light-emitting diodes (LEDs) in different colors. Try it with a dimmer to make your own adjustable lamp.

**MINI-CHALLENGE**

Can you invent a way to show your mood to a friend?

**REAL WORLD ANALOGIES**

- **MUSIC VISUALIZER**
- **TV VOLUME**
- **PHONE SCREEN BRIGHTNESS**

**SAMPLE CIRCUIT**

**HOW IT WORKS**
The servo is a motor that can swing back and forth or be turned to a specific position.

There is an accessory you can use with the servo called the mechanical arm. You can find out how to use it on page 23.

**MINI-CHALLENGE**
Can you invent something that uses the servo to clean up your desk?

**REAL WORLD ANALOGIES**
- TRUCK CRANE
- WINDSHIELD WIPERS
- ROBOT

**HOW IT WORKS**
The servo has two modes. In **TURN** mode, the input from other Bits determines the position of the cross axle – try using a dimmer to set the angle you want. In **SWING** mode, the servo will move back and forth on its own like a pair of windshield wipers – the input signal controls the speed of the swing.

The servo’s range of motion is about 180 degrees.

The servo motor is contained within a servo bucket. Simply press the plastic feet into a mounting board for extra stability.
MEET THE BIT

Amplify your sonic explorations! The speaker Bit is a tiny speaker that lets you hear the signals coming from an oscillator, an MP3 player, or a codeBit. Pair it with these Bits to add music or sound effects to your inventions.

MINI-CHALLENGE

What is the strangest sound that you can invent?

REAL WORLD ANALOGIES

VOCAL CORDS  LOUDSPEAKER  GUITAR AMP  PHONE SPEAKER

HOW IT WORKS

The speaker turns audio signals into vibrations that make sound. You can control the speaker’s volume with a slider on the left side of the Bit. It also features an output jack on the right side of the Bit that you can connect to headphones, an amplifier, or a computer. When you connect to the output jack, sound will come out of the connected device (like your headphones) instead of through the speaker.

The speaker Bit will only make sound with Bits that create audio signals, such as the oscillator, MP3 player, or codeBit.

The speaker can be removed or repositioned on the board. To reattach, simply press together firmly.
MEET THE BIT

The LED matrix is a colorful display that you can control using code or other Bits. Set it to SERIAL mode to program your own graphics, or switch it to SIGNAL mode to play with the preset programs.

BIT BREAK DOWN

- preset button: lets you choose from 5 presets when in SIGNAL mode, and 4 channels in SERIAL mode (see pages 18 and 19 for examples)
- MODE: signal / serial
- Each square is a pixel made up of an RGB LED
- Second input (see page 18 for an example)
- Feet for mounting board and shoes
You can use different input Bits to control the amount of signal sent to the LED matrix. This will change the display depending on what preset you have selected. All presets require two inputs to fully control them.

For more information about SIGNAL mode, check out the LED matrix Tips & Tricks at littleBits.com/tips-tricks/led-matrix-bit

How it works

Mini-challenge
How many ways can you display a rainbow?

Real-world analogies

SCROLLING SIGN BOARDS  SCOREBOARD  TV SCREEN
WE INVENT THE WORLD
WE WANT TO LIVE IN.

littleBits
WE INVENT THE WORLD
WE WANT TO LIVE IN.
The LED matrix receives serial data, which it translates into images. For more information about SERIAL mode, check out the LED matrix Tips & Tricks at littleBits.com/tips-tricks/led-matrix-bit

**WHAT IS SERIAL?**

Serial communication is a way to send complex information between computers and other devices. Serial communication is made up of a series of ‘on’ and ‘off’ signals.

For example, the codeBit can turn your code into serial data and send it to the LED matrix to tell it what to do.

Note: Only Bits with the serial communication icon are able to send and read serial data. Some Bits without the serial icon may interfere with serial signals if placed between the codeBit and the LED matrix.
When the LED matrix is in serial mode, you can use the codeBit and littleBits Code Kit app to put up to four matrices together to form a bigger image. To help you tile them in the right direction, the case enclosing each LED matrix has dimples and magnets.

To display your image correctly, use the preset/channel button on each LED matrix Bit to control which channel, and part of the image, that the matrix displays.

For more information on tiling, check out the LED matrix Tips & Tricks at littleBits.com/tips-tricks/led-matrix-bit
**POWERSNAP**

**MEET THE ACCESSORY**
The powerSnap supplies power to an open input without extra forks, splits, or power supplies.

**HOW IT WORKS**
Every littleBits circuit needs power, and every Bit receives power through its input bitSnap. When using Bits with multiple inputs, like the codeBit, you can use powerSnaps to bring power to inputs not directly connected to the power Bit. The powerSnaps only work if you have a power Bit connected somewhere else in your circuit.

For more info on how power works in the littleBits system, check out littleBits.com/tips-tricks/powersnap

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**HOOK & LOOP SHOES**

**MEET THE ACCESSORY**
Shoes slip onto your Bits’ feet and hold your circuit together. On the bottom of your shoes you’ll find hook & loops, which connect to the hook & loop strip. This is a great way to attach your circuit wherever you want.

**HOW IT WORKS**
First, snap together your littleBits circuit. Then press the feet of your Bits into the holes of the shoes.

Hook & loop shoes come with an adhesive-backed hook & loop strip. The strip can be cut to any size you desire and affixed to clothing, fabric, or any other surface.

**NOTE:** The strip adhesive is for one-time use only.
The USB cable brings power to your USB power Bit and rechargeable battery. It will also send information between certain Bits and your computer. The cable comes in two lengths, 1’7” (0.5m) and 4’11” (1.5m), to fit your needs.

**HOW IT WORKS**

The cable acts like a bridge between the power source and what you’re trying to turn on or charge. If you connect the USB plug to a power source, and the micro USB to the USB power Bit or rechargeable battery; power will flow from the source to the Bit or battery.

Likewise, the cable will also bridge certain Bits and your computer. If you connect the micro USB directly to Bits (like the codeBit), and the USB plug to your laptop, the cable will send information between the two.

Even though they are different lengths, both cables work the same.

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The rechargeable battery is a portable power source for your inventions, which you can use over and over again.

**HOW IT WORKS**

To power your circuit, connect the USB plug to the charged battery, and the micro USB to the p3 USB power Bit.

To charge the battery, plug the micro USB of a cable into the battery and connect the USB plug to a computer or power adapter. The LED on the battery shows when it is charging.
**MEET THE ACCESSORY**

The codeBit dongle allows you to wirelessly upload code from your computer to your codeBit.

**HOW IT WORKS**

The codeBit dongle goes into the USB port of your computer. Use the codeBit dongle to connect your codeBit to the littleBits Code Kit app. Code that you’ve written in the Code Kit app will be wirelessly uploaded via Bluetooth Low Energy to the codeBit through the codeBit dongle.

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**MEET THE ACCESSORY**

The mechanical arm attaches to both the servo and the DC motor (not included) shaft, and offers lots of leverage for pushing, pulling, and throwing.

**HOW IT WORKS**

To attach the mechanical arm to the servo, line up the T shaft with one of the cross holes in the mechanical arm and press firmly.

The two large holes on the end are perfect for holding pens and markers in place.

*Fits a Sharpie™-sized marker.*

*Fits a pen*
MEET THE ACCESSORY

The mounting board serves as the backbone of your inventions. It provides structure, and allows you to keep your circuit intact and move it around with ease. This mounting board can accommodate large circuits.

HOW IT WORKS

1. First, snap your circuit together.

2. Next, press the circuit into the mounting board. ONLY press on the bitSnaps.

ALWAYS REMOVE BITS BY THE BITSNAP, DO NOT PULL ON CABLES TO REMOVE BITS FROM THE MOUNTING BOARD.
Every circuit starts with power. It provides electricity that makes Bits spin, buzz, blink, & shine.

The slide switch is a small and convenient way to turn your creations on and off.

The toggle switch is perfect for those inventions where you want a sturdy on-off switch.

The remote trigger allows you to send a signal to your circuit with a TV remote.

The temperature sensor takes a measurement from the environment and translates it into a signal.

Use the temperature sensor to invent a SMART FRIDGE.
Get alerted if the refrigerator door has been left open for too long! Now your fridge will communicate with you when this happens so you can save your food.
**i13 LIGHT SENSOR**
Use this Bit to control your circuits with light.

**i14 BEND SENSOR**
The bend sensor increases its signal the more you flex the long strip.

**i16 PULSE**
The pulse is a switch that opens and closes over and over again.

**i17 TIMEOUT**
The timeout Bit is a settable timer between 0 and 5 minutes.

**i18 MOTION TRIGGER**
The motion trigger is a sensor that detects the slightest movement around it.

**i19 ROLLER SWITCH**
This Bit has a little lever with a wheel, and activates when something pushes the lever in or out.

**i21 MICROPHONE**
Use this Bit to turn sounds into light or motion, or use it with the speaker Bit like a small megaphone.

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Use the pulse to invent an **ART MACHINE**.
Create a bot made with DC motors and a pulse that dances, wiggles, and draws up a storm. Add your own artistic flair by changing up some of the Bits and materials to create unique masterpieces.
**THRESHOLD**

Think of the threshold as a toll booth for signal passing through your circuit. You’ve got to have a certain amount of signal to get through!

**MP3 PLAYER**

The mp3 player allows you to play your very own mp3 files using littleBits.

**KEYBOARD**

The keyboard features 13 buttons that make an octave of notes so you can play melodies.

**SEQUENCER**

This Bit lets you connect up to eight outputs and control them in sequential patterns.

**OSCILLATOR**

The oscillator creates audio tones that can be manipulated with its pitch nob and tune dial.

**FILTER**

The filter affects a note’s timbre by changing the relative volume of certain frequencies.

**ENVELOPE**

The envelope modifies the loudness contour of a sound.

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**Use the oscillator to invent a SYNTH KEYTAR.**

This electronic instrument uses a winning combination of Synth Bits starting with a micro sequencer, moving through a wire, an oscillator, a delay, and ending with the speaker!
This Bit has two modes: **NOISE** (white noise) and **RANDOM VOLTAGE**.

The delay Bit takes incoming audio and repeats it, like an echo.

The micro sequencer sends out voltages based on the position of each of the four knobs.

The mix Bit allows you to combine two inputs and send them to a single output.

The OR Bit is a logic gate. The output is active if either of its two inputs are active.

The AND Bit is a logic gate. The output is active if both of its two inputs are active.

Send and receive MIDI messages with the MIDI Bit.

Use the random Bit to invent a **SPEECH PUPPET**.

This robot puppet speaks and moves! When the microphone is placed in front of him, the speaker moves his arms, speaks random sounds, and a light goes off in his head.

**INVENTION BY** Pantograph
Use the latch to turn any momentary input into an ON/OFF switch, like a toggle.

Use the proto Bit to build and prototype new Bits.

The inverter sends out the opposite of whatever it receives.

Use the fork to connect a single Bit to as many as three others.

The Makey Makey Bit turns everyday conductive objects (like bananas) into triggers that control your circuit and even your computer. You can connect the Makey Makey Bit to these objects using alligator clips.

NOR is a logic gate. The output is active if either one of its two inputs are inactive.

NAND is a logic gate. The output is active if both of its two inputs are inactive.

Use the Makey Makey Bit to invent a BURGLAR BUZZER.

Invent your own burglar alarm that catches would-be thieves in the act! Protect your prized possessions with this automatic alerter that sounds and stays on when someone tries to take your stuff.
XOR is a logic gate. The output is active if only one of its two inputs are active.

The control voltage lets you integrate your littleBits circuits with other analog synthesizers.

The split lets you connect a single Bit to 2 others.

The cloudBit allows you to connect all of your Bits to the internet and control them on the littleBits Invent App.

The USB I/O Bit allows you to record digital audio directly into your computer.

The perf Bit is an easy way to prototype a new Bit to add to your littleBits collection.

The Bluetooth Low Energy Bit can send and receive a signal from your smart device using Bluetooth Low Energy wireless technology.

Use the Bluetooth Low Energy Bit to invent a REMOTE CONTROL CAR. This bot was made to do your bidding from your smart device! Use this versatile vehicle to prank your pets, set up a snack delivery system for Mom, or turn your room into a race track!
Use the fan to invent a
**BUBBLE BLOWING BOT.**
Invent a bot that creates big, beautiful bubbles using only a few Bits and some items from around the house. Slowly move the slide dimmer to control how quickly the bubble grows. Can you make the ultimate bubble?

**o1 LED**
The LED (light-emitting diode) Bit is a small Bit that shines a green light.

**o2 LONG LED**
This flexible Bit uses an LED (light-emitting diode) to turn electricity into light.

**o4 VIBRATION MOTOR**
With the vibration motor Bit, you can make anything vibrate and buzz.

**o6 BUZZER**
The buzzer converts the electrical signal it receives into a vibration, which creates a buzzing sound.

**o7 IR LED**
The IR (infrared) LED Bit sends out light with longer wavelengths than visible light.

**o13 FAN**
Use the fan to create a gentle breeze, perfect for cooling things off. You can also try taping small things (like stickers or pieces of paper) to the center of the fan for some spinning visuals.
**BRIGHT LED**
The bright LED (Light-Emitting Diode) is a small Bit that shines out a big light.

**UV LED**
The UV (ultraviolet) LED sends out a special kind of light. It looks purple to the eye, but it has some special abilities, like making white fabrics and certain inks glow in the dark.

**NUMBER**
The number displays information that it receives from the Bits before it. It's a great way to measure the input from sensors or count things, like the score in a game.

**DC MOTOR**
The DC (direct current) motor rotates a shaft when it receives a signal. The more signal it receives, the faster the motor will spin.

**RGB LED**
The RGB LED is a light with adjustable color. You can create a custom color mix of red, green, and blue.

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Use the DC motor to invent a **SPIN MATE**. Make a spinning sign for your lemonade stand or a creature that dances dizzily on your desk! Create this versatile invention and let your imagination run wild.
THE LITTLEBITS™ INVENTION CYCLE

The littleBits Invention Cycle is a roadmap for your invention journey. Each phase is full of activities and questions that help you explore your ideas and develop your invention.

DO I HAVE TO GO THROUGH THE LITTLEBITS INVENTION CYCLE EXACTLY IN ORDER?
Nope! If you want, you can remix while you play or share while you create. Each phase of the invention cycle represents a different way of thinking and making. They work well in order, but a good design process is always a bit messy.
CREATE

PUT SOMETHING TOGETHER. You can build it from the instructions or make something from your imagination. Don’t worry if it doesn’t work or if it isn’t perfect. The important thing is to create your first model so you have something to experiment with.

PLAY!

USE IT! Playing with what you’ve created is fun, but also an important part of inventing. Playing is like a test run. It’s a chance to see how well your invention works and look for ways you can make it better.

REMIX

IMPROVE YOUR INVENTION. Keep experimenting! Add new Bits, swap parts with other inventions, or take all the pieces apart and put them together in a different way.

SHARE

INSPIRE OTHERS. Show the world what you’ve created online at littleBits learningLab. Get inspired by exploring what others have shared. Create, play with, and remix other inventions. This is how awesome new inventions are born.
TROUBLESHOOTING

1. MAKE SURE YOUR POWER BIT™ IS PLUGGED IN. If you’re having trouble with your circuit, it’s important to make sure your circuit is getting full power. The red LED should be illuminated on the power Bit when plugged in.

2. MAKE SURE YOUR BITS™ ARE ARRANGED IN THE PROPER ORDER AND ARE IN THE RIGHT MODE. Remember that you always need a power Bit at the start of your circuit and output Bit at the end. Some Bits also have different modes, and switching between them can help your circuit work correctly.

3. CHECK YOUR CONNECTIONS. Try gently wiping the ends of the bitSnaps in your circuit with a soft, clean cloth. Sometimes dust and dirt can get in the way of a strong connection.

4. ENSURE THE USB CABLE IS SECURELY FASTENED TO BOTH THE POWER BIT AND THE BATTERY.

5. TRY CHARGING YOUR RECHARGEABLE BATTERY. Low batteries can cause a circuit to act erratically. Bits have different power demands. For example: a motor may appear to not be working while a light still shines brightly.

STILL HAVING TROUBLE? Contact our Customer Success team at support@littleBits.com or check out our FAQ page at littleBits.com/faq.
**ACCESSORIES**
- hook & loop shoes (×12)
- hook & loop strip (×2)
- mechanical arm
- mounting board (8” × 7”)
- rechargeable battery
- USB cables (×2)