littleBits™

BIT INDEX

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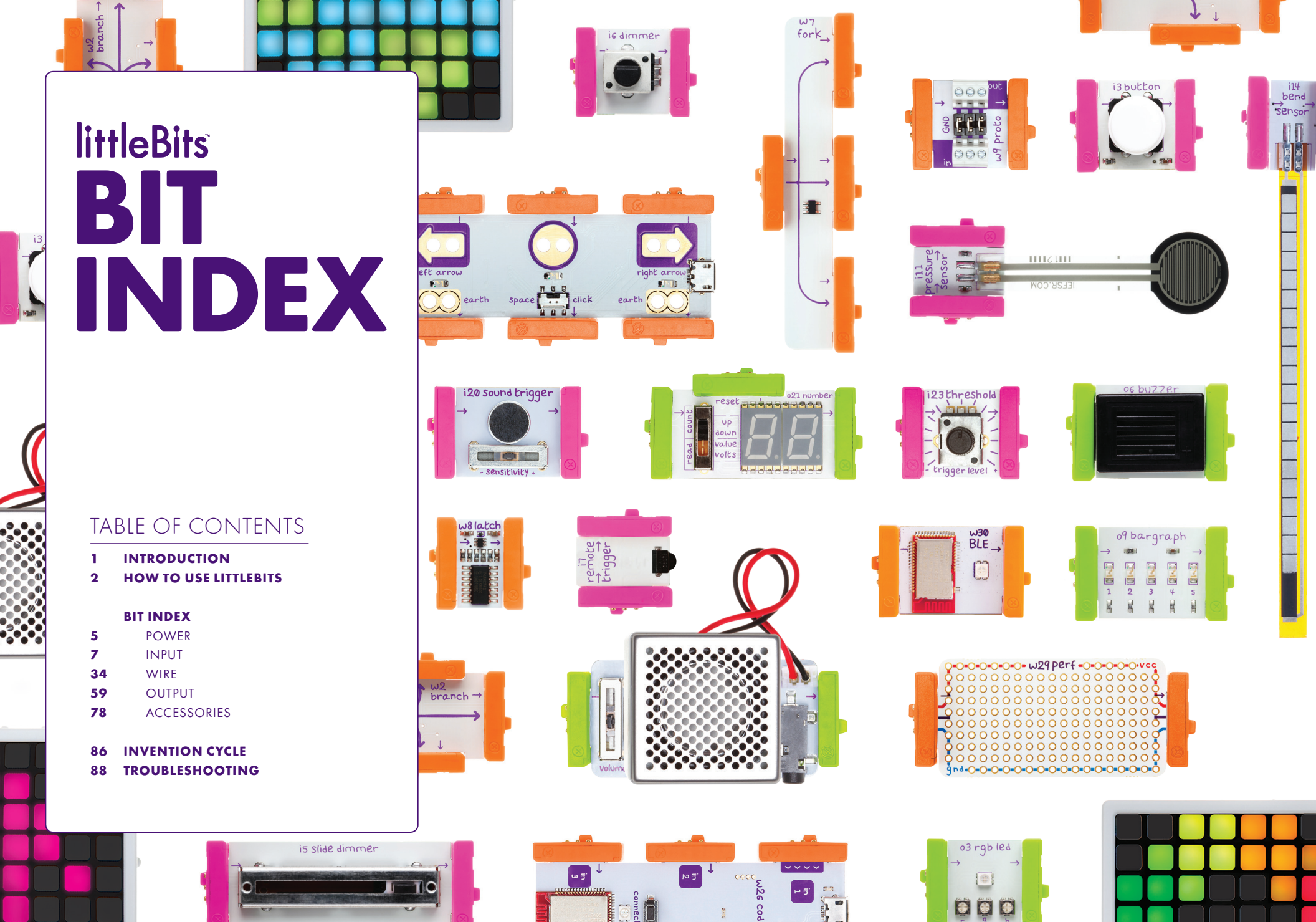
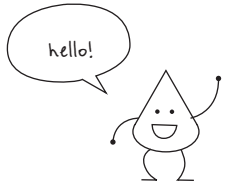


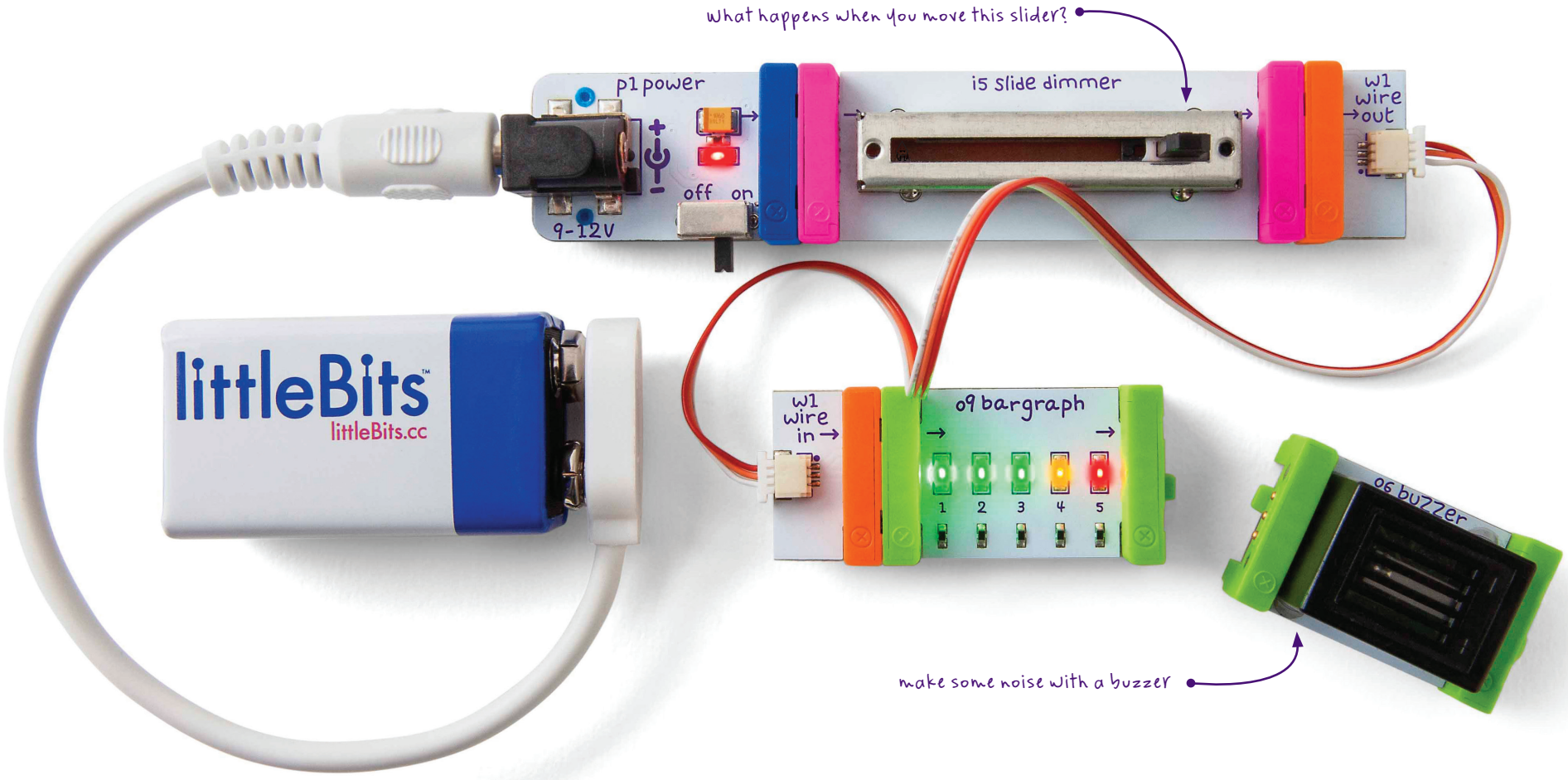
* Occasionally Bits™ and accessories get updated, so the features or appearance of your Bits may differ from those used in this guide.



Hi. This is the littleBits Bit Index, the place where you can find everything you want to know about all the Bits in your Pro Library collection.

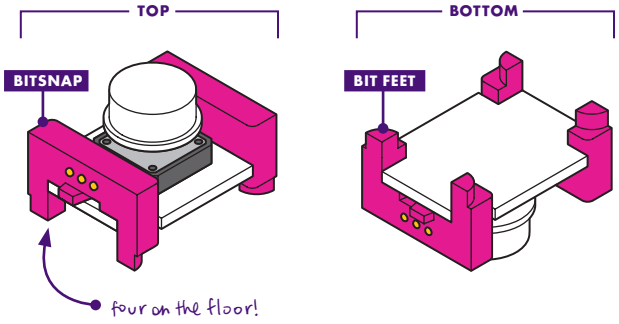
HOW TO USE LITTLEBITS

1 **MAKE THIS CIRCUIT FIRST**
And play with it!



2 ANATOMY OF A BIT™

Learn how you can tell top from bottom.



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

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

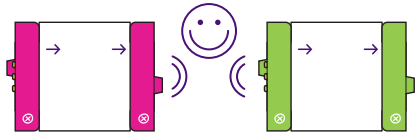
D OUTPUT (GREEN)
Output Bits do something – light up, buzz, move...

Learn more about your Bits **ON PAGE 04**

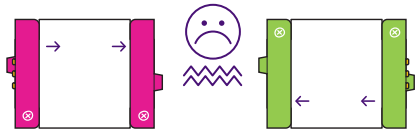
4 MAGNET MAGIC!

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



5 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

littleBits™ BIT™ INDEX

POWER

05 p1 power
06 p3 USB power

INPUT

07 i1 slide switch
08 i2 toggle switch
09 i3 button
10 i5 slide dimmer
11 i6 dimmer
12 i7 remote trigger
13 i8 proximity sensor
14 i11 pressure sensor
15 i12 temperature sensor
16 i13 light sensor
17 i16 pulse
18 i17 timeout
19 i18 motion trigger
20 i19 roller switch
21 i20 sound trigger
22 i21 microphone
23 i22 sequencer
24 i23 threshold
25 i25 MP3 player
26 i30 keyboard
27 i31 oscillator
28 i32 filter
29 i33 envelope
30 i34 random
31 i35 delay
32 i36 micro sequencer
33 i37 mix

WIRE

34 w1 wire
35 w2 branch
36 w3 OR
37 w4 AND
38 w5 MIDI
39 w7 fork
40 w8 latch
41 w9 proto
42 w10 inverter
43 w14 Makey Makey®
45 w15 NOR
46 w16 NAND
47 w17 XOR
48 w18 CV
49 w19 split
50 w20 cloudBit™
51 w21 wireless receiver
52 w22 wireless transmitter
53 w26 codeBit
55 w27 USB I/O
56 w29 perf
57 w30 littleBits Bluetooth™ Low Energy Bit

OUTPUT

59 o1 LED
60 o2 long LED
61 o3 RGB LED
62 o4 vibration motor
63 o6 buzzer
64 o7 IR LED
65 o9 bargraph
66 o11 servo
67 o13 fan
68 o14 bright LED
69 o15 UV LED
70 o16 light wire
71 o21 number
72 o25 DC motor
73 o26 speaker
74 o28 LED matrix

ACCESSORIES

78 a2 USB cable
a5 magnet shoes
a6 hook & loop shoes
a7 adhesive shoes
79 a8 brick adapter
a10 motorMate
80 a14 USB cable & adapter
a19 servo hub
81 a21 powerSnap
a23 mechanical arm
82 a24 servo mount
a25 wheel
83 a27 rechargeable battery
a26 mounting board
a28 mounting board (8" x 7")
84 a29 codeBit dongle

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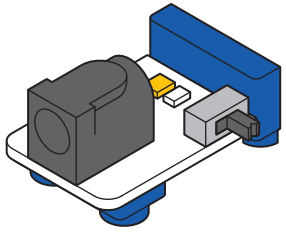
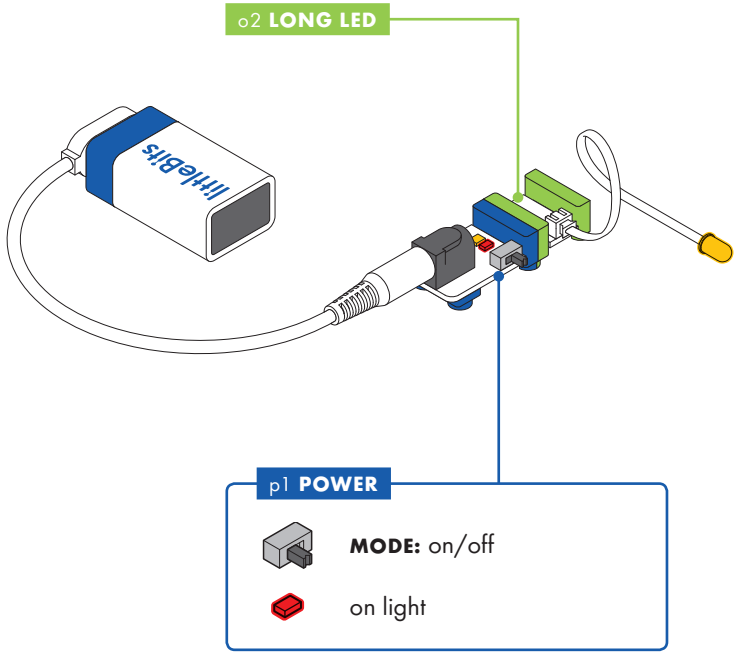
p1 POWER



MEET THE BIT

Every circuit starts with power. It provides the electricity that makes your Bits spin, buzz, blink, and shine.

SAMPLE CIRCUIT



HOW IT WORKS

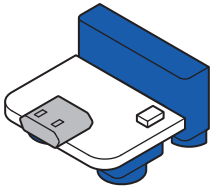
The power Bit converts the 9 volts of electricity in the battery to the 5 volts that littleBits circuits run on.

The power Bit also sends a signal through your circuit. Controlling this signal with inputs is how you control your circuit.

REAL WORLD ANALOGIES

PHONE CHARGER

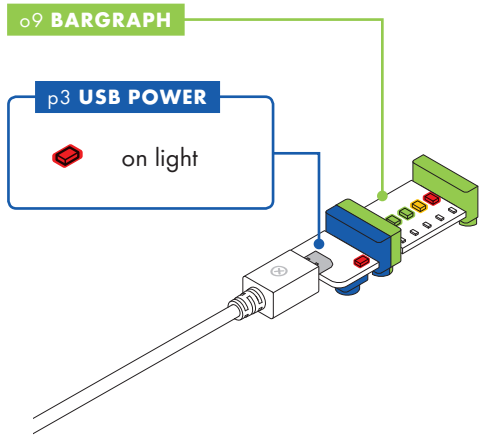
p3 USB POWER



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, the AC power adapter, or the rechargeable battery.

SAMPLE CIRCUIT



HOW IT WORKS

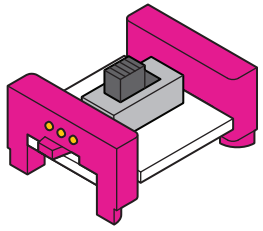
The USB power Bit sends a 5 volt signal through your circuit, which allows you to power up your Bits.

REAL WORLD ANALOGIES

PHONE CHARGER

LAPTOP CHARGER

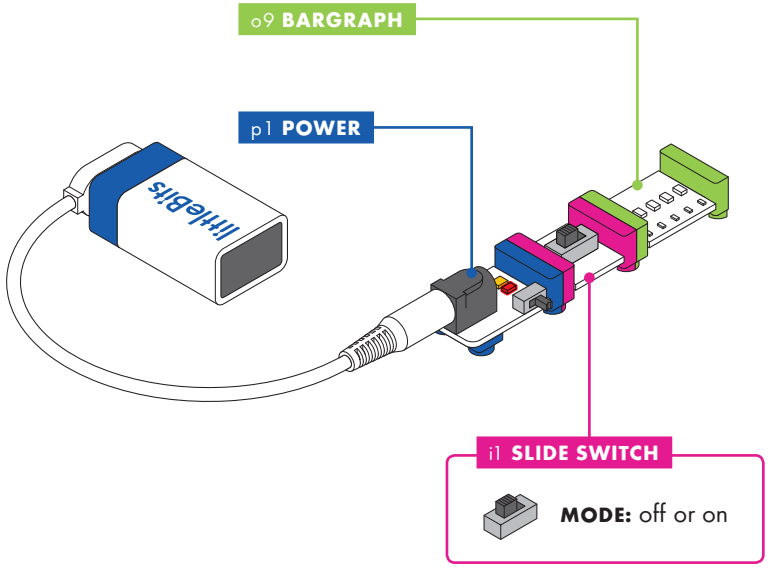
i1 SLIDE SWITCH



MEET THE BIT

The slide switch is a small and convenient way to turn your creations on and off. It uses a sturdy plastic lever to switch back and forth. Try it with any of your favorite Bits, like the DC motor or bright LED!

SAMPLE CIRCUIT



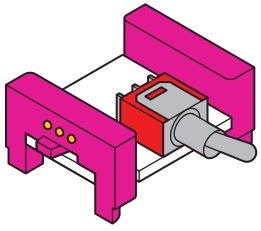
HOW IT WORKS

When the slide switch is off, it sends a 0 volt signal and will not pass through any Bits past the switch. When the slide switch is on, it sends a 5 volt signal to the following Bits in the circuit.

REAL WORLD ANALOGIES

VIDEO GAME CONSOLE
POWER SWITCH

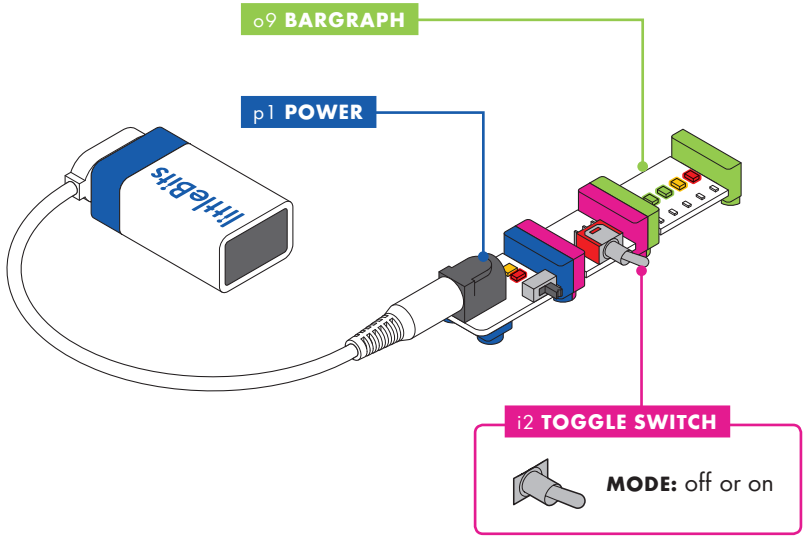
i2 TOGGLE SWITCH



MEET THE BIT

The toggle switch is a sturdy on/off switch that you can use to activate your creations with a nice, solid click. The toggle switch gives a great look and feel to any invention! Snap it in before an LED to make a lamp.

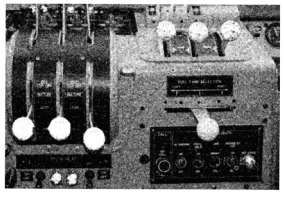
SAMPLE CIRCUIT



HOW IT WORKS

When the toggle switch is off, it sends a 0 volt signal which will not pass through any Bits past the switch. When the toggle switch is on, it sends a 5 volt signal to the following Bits in the circuit.

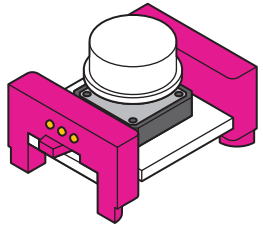
REAL WORLD ANALOGIES



AIRPLANE CONTROL PANEL

LIGHT SWITCH

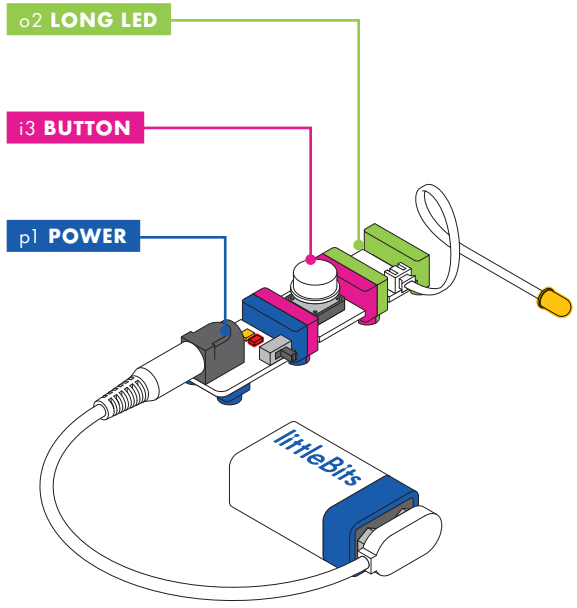
i3 BUTTON



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.

SAMPLE CIRCUIT



HOW IT WORKS

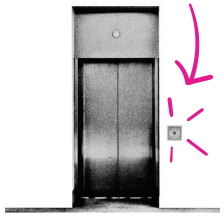
The button is like a door. When you press it, the door opens, sending an on or 5 volt signal to the following Bits in the circuit. The button is a momentary switch, you must continue to press it for the signal to flow. When you release the button, the door closes, sending an off or 0 volt signal to the following Bits in the circuit.

MINI-CHALLENGE

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

REAL WORLD ANALOGIES

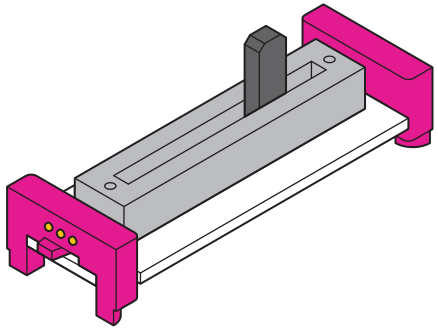
VIDEO GAME CONTROLLER



ELEVATOR BUTTON

GAME SHOW BUZZER

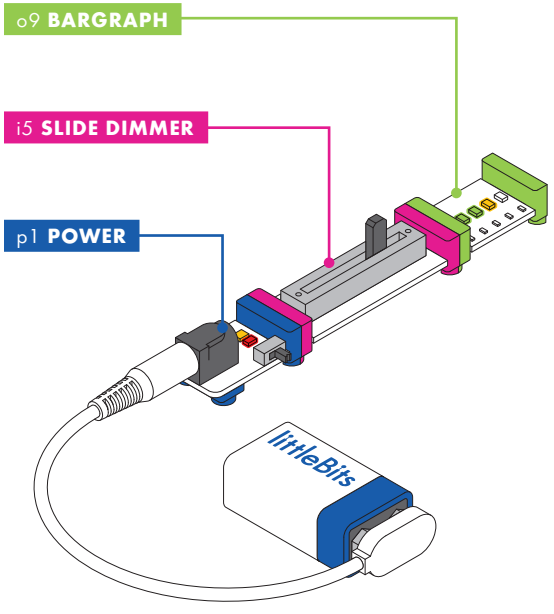
i5 SLIDE DIMMER



MEET THE BIT

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

SAMPLE CIRCUIT



HOW IT WORKS

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 an on or 5 volt signal. The slider can be positioned to send any signal between 0 and 5 volts.

MINI-CHALLENGE

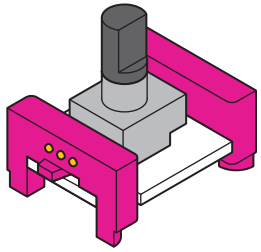
Can you invent something with the slide dimmer that waves a flag back and forth? How could you change the speed it waves?

REAL WORLD ANALOGIES

HOUSEHOLD DIMMER SWITCH

CAR PEDAL

i6 DIMMER



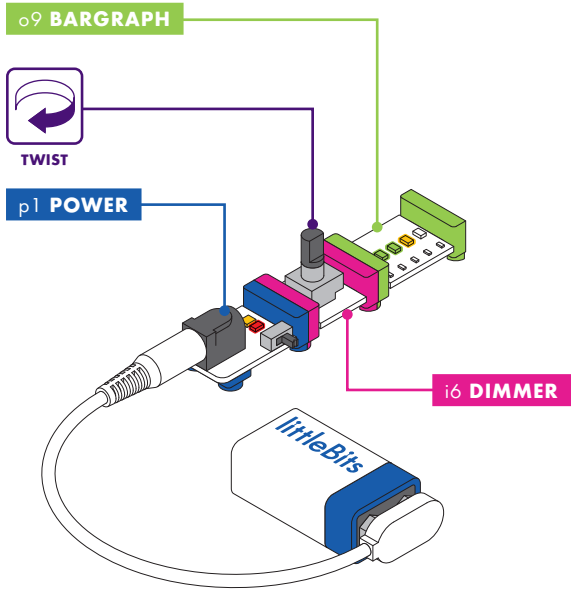
MEET THE BIT

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?

SAMPLE CIRCUIT

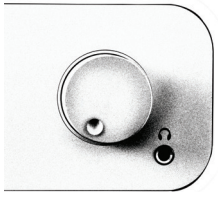


HOW IT WORKS

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. When the dimmer is all the way to the left, it's sending an off or 0 volt signal. When the dimmer is all the way to the right, it's sending an on or 5 volt signal. The dimmer can be positioned to send any signal between 0 and 5 volts.

REAL WORLD ANALOGIES

HOUSEHOLD DIMMER SWITCH

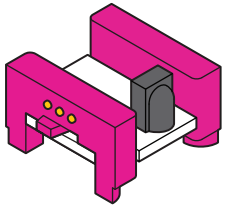


STEREO VOLUME CONTROL

FAUCET

STOVE KNOB

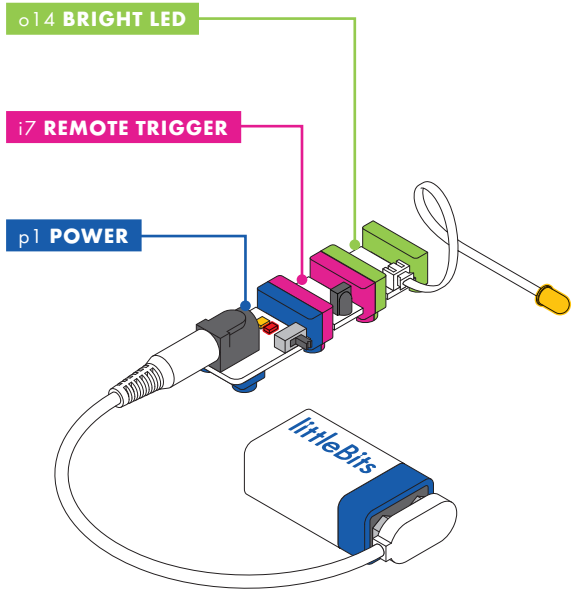
i7 REMOTE TRIGGER



MEET THE BIT

The remote trigger lets you use a common remote control with your Bit. Make the sample circuit to the right and point a remote control at the remote trigger's sensor. Then, press any button on your remote control to activate the Bit.

SAMPLE CIRCUIT



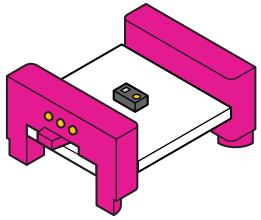
HOW IT WORKS

The remote trigger will work with almost any button on a remote that uses infrared light (IR) to send signals (like the one you use for your TV). When it senses IR light, it sends an on or 5 volt signal momentarily to the following Bits in the circuit.

REAL WORLD ANALOGIES

TV REMOTE

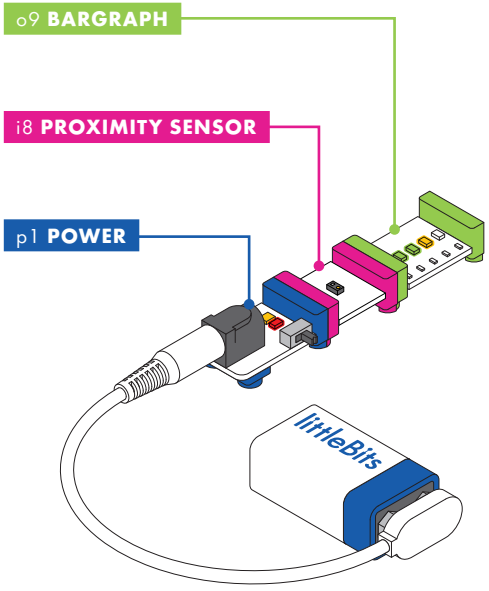
i8 PROXIMITY SENSOR



MEET THE BIT

This Bit beams an infrared light that allows it to sense objects in front of it.

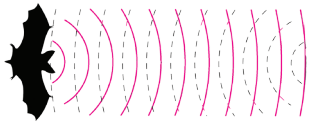
SAMPLE CIRCUIT



HOW IT WORKS

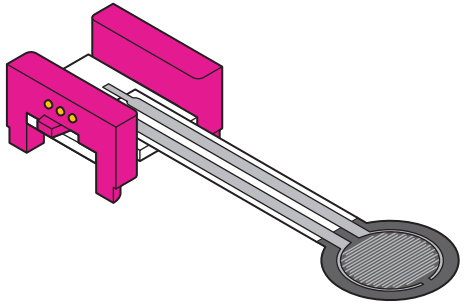
The proximity sensor is like a pair of eyes for your circuit. It detects objects by using an infrared beam to sense what's in front of it. As the object gets closer to the proximity sensor, more signal will pass to the following Bits in the circuit.

REAL WORLD ANALOGIES



BAT VISION

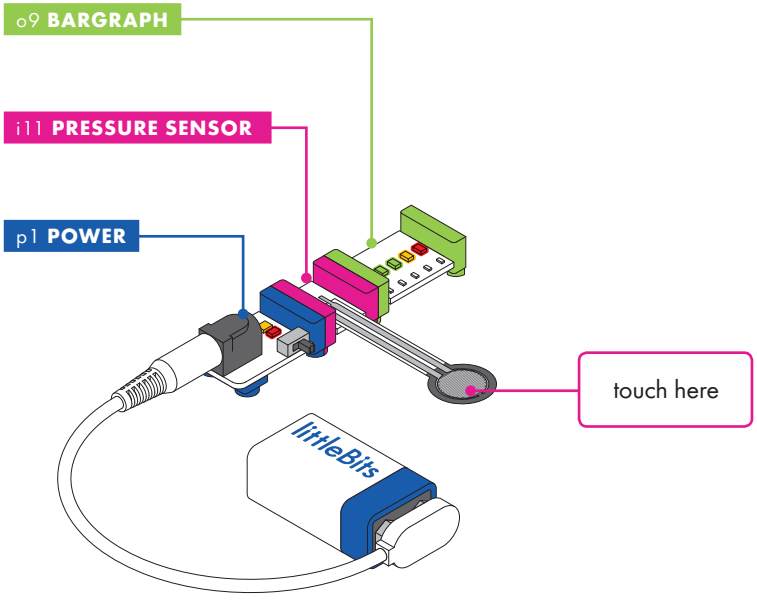
i11 PRESSURE SENSOR



MEET THE BIT

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

SAMPLE CIRCUIT



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 to the following Bits in the circuit.

Note: Do not fold or crease the pressure sensor.

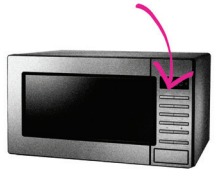
MINI-CHALLENGE

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

REAL WORLD ANALOGIES

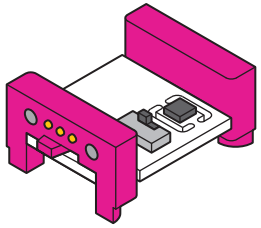
SCALE

HAMMER CARNIVAL GAME

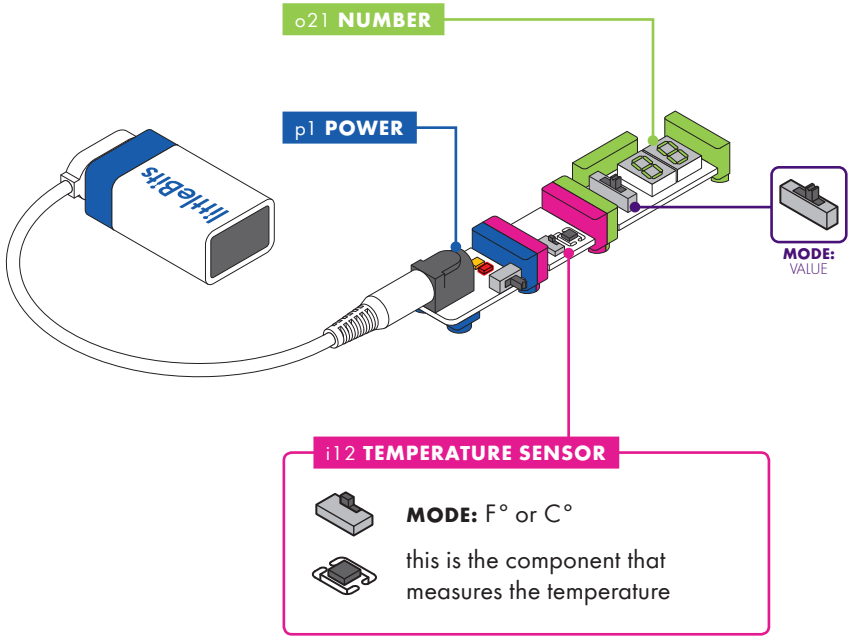


MICROWAVE TOUCH SCREEN

i12 TEMPERATURE SENSOR



SAMPLE CIRCUIT



HOW IT WORKS

The temperature sensor takes a measurement from the environment and translates it into a signal. The higher the temperature it senses, the more signal it sends out to the following Bits in the circuit (making lights brighter and motors turn faster).

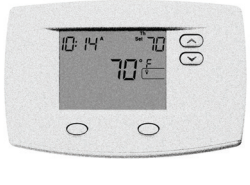
MEET THE BIT

With the temperature sensor you can use the temperature in the surrounding air to control your circuit. It's especially useful for gathering data when paired with the number Bit set to **VALUE** mode.

MINI-CHALLENGE

Can you invent a temperature-controlled gadget to beat the summer heat?

REAL WORLD ANALOGIES

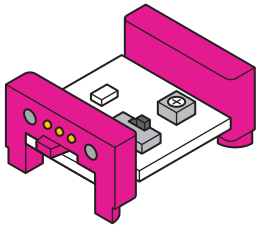


THERMOSTAT

MEDICAL THERMOMETER

AUTOMATIC TEA KETTLE

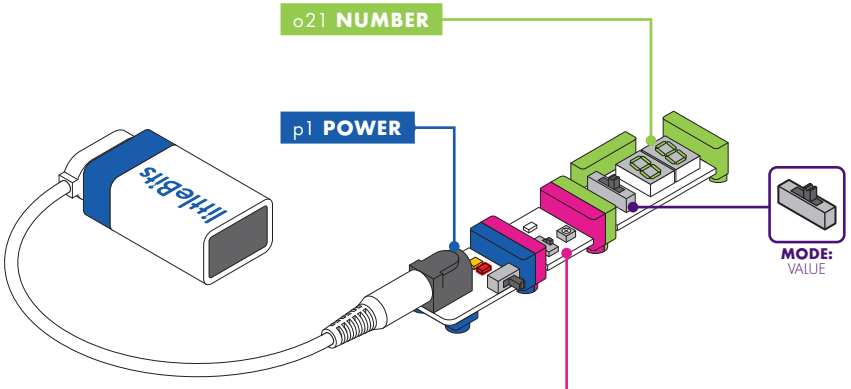
i13 LIGHT SENSOR



MEET THE BIT

Use this Bit to control your circuits with light! The amount of light shining on the sensor will change how your circuit behaves. It's a great way to activate your circuit without hands and is perfect for alarms!

SAMPLE CIRCUIT



i13 LIGHT SENSOR

- **MODE:** light or dark
- **SENSITIVITY:** turn counter-clockwise to decrease, turn clockwise to increase
- this is the component that measures light

HOW IT WORKS

The light sensor detects how much light is shining on it. It has two modes: in **LIGHT** mode, as the light shining on the sensor gets brighter, more signal passes through to the following Bits in the circuit (making lights brighter or motors turn faster), in **DARK** mode, the signal increases as it gets darker.

Use the purple screwdriver to turn the dial and adjust how much light it takes to change the signal. Clockwise increases sensitivity, counter-clockwise decreases it.

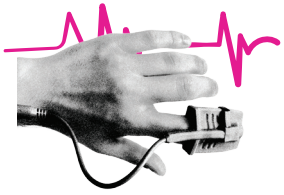
MINI-CHALLENGE

Can you invent something that moves when the lights go out?

REAL WORLD ANALOGIES

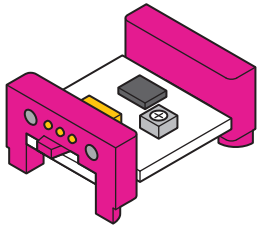
NIGHT LIGHT SENSOR

PHOTOGRAPHER'S LIGHT METER



FINGER PULSE METER

i16 PULSE



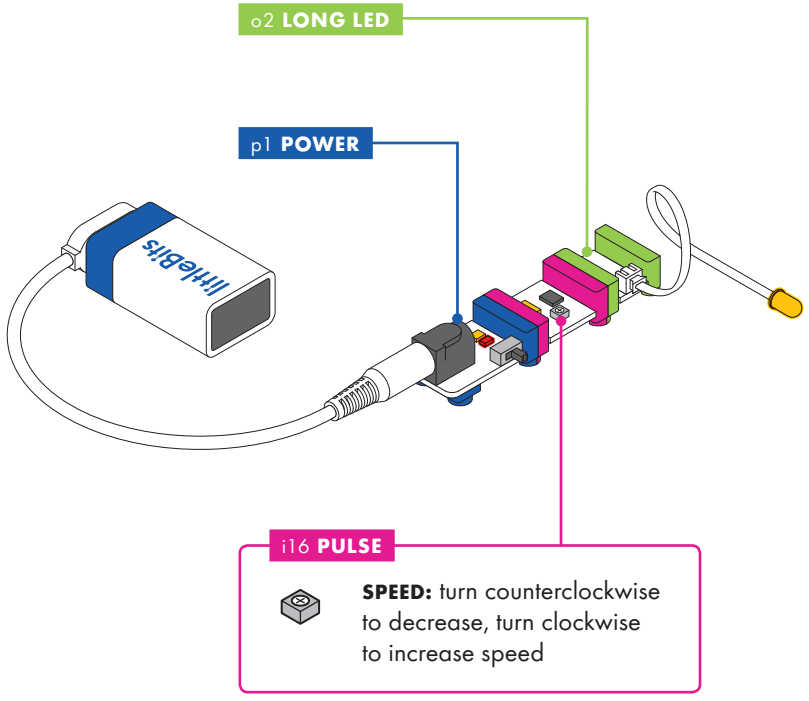
MEET THE BIT

The pulse is like a heartbeat that makes the Bits after it turn on and off in a steady rhythm.

MINI-CHALLENGE

Can you invent a warning signal with the pulse? How can you make the signal pulse faster or slower?

SAMPLE CIRCUIT



HOW IT WORKS

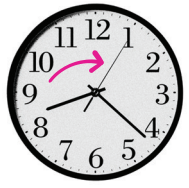
The pulse is a switch that opens and closes over and over again. When it's open, it sends an on or 5 volt signal through to the next Bit. When the switch closes, it sends an off or 0 volt signal through to the next Bit.

Use the purple screwdriver to adjust the dial. You can change the speed of the rhythm by turning the small dial on the Bit with your purple screwdriver. Clockwise increases speed, counterclockwise decreases it.

REAL WORLD ANALOGIES

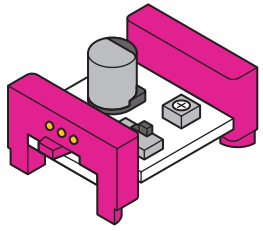
FIREFLY

TURN SIGNAL



CLOCK SECONDHAND

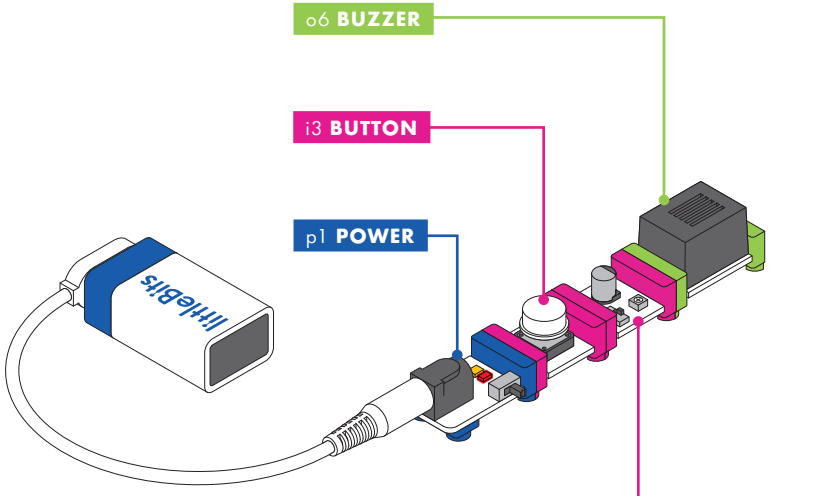
i17 TIMEOUT



MEET THE BIT

The timeout is a settable timer. Try it after a button and follow it with a noisemaker. Press and release the button to start the countdown.

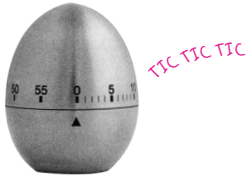
SAMPLE CIRCUIT



HOW IT WORKS

The timeout works like an alarm clock or a stopwatch. It works best when paired with a button. In **ON-OFF** mode, signal passes to the following Bits when the timer starts, and signal stops after time runs down to zero. In **OFF-ON** mode, signal is held for the amount of time of the buzzer, and then passes to the following Bits after the timer reaches zero. Adjust the **TIME** dial with the included purple screwdriver to choose how long the signal passes - the time ranges from approximately one second to five minutes.

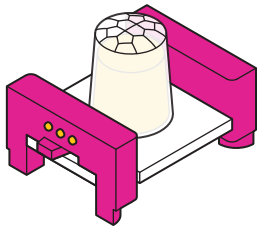
REAL WORLD ANALOGIES



KITCHEN EGG TIMER

BASKETBALL SHOT CLOCK

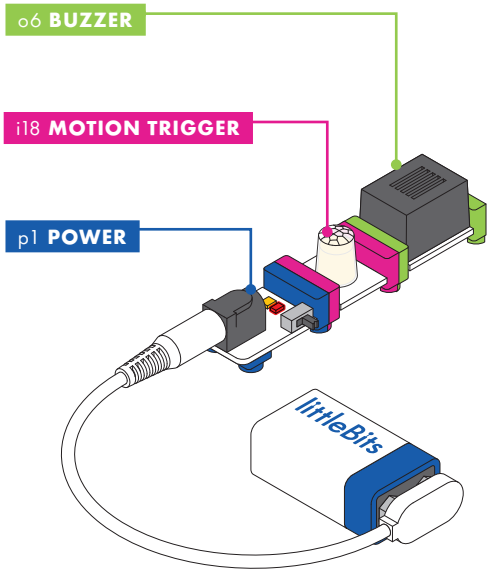
i18 MOTION TRIGGER



MEET THE BIT

The motion trigger senses the slightest movement 360 degrees around it.

SAMPLE CIRCUIT

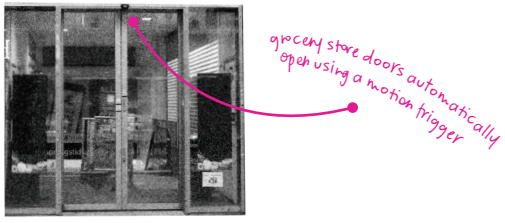


HOW IT WORKS

The motion sensor is similar to the sensor on an automatic door. When someone is moving nearby, it will pass the signal to the following Bits in the circuit. It is very sensitive. The motion trigger can sense an area of around 10 feet by 10 feet.

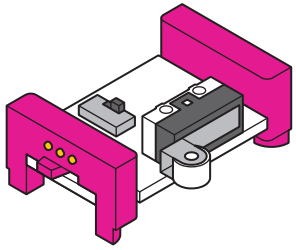
REAL WORLD ANALOGIES

SECURITY SYSTEM



GROCERY STORE DOORS

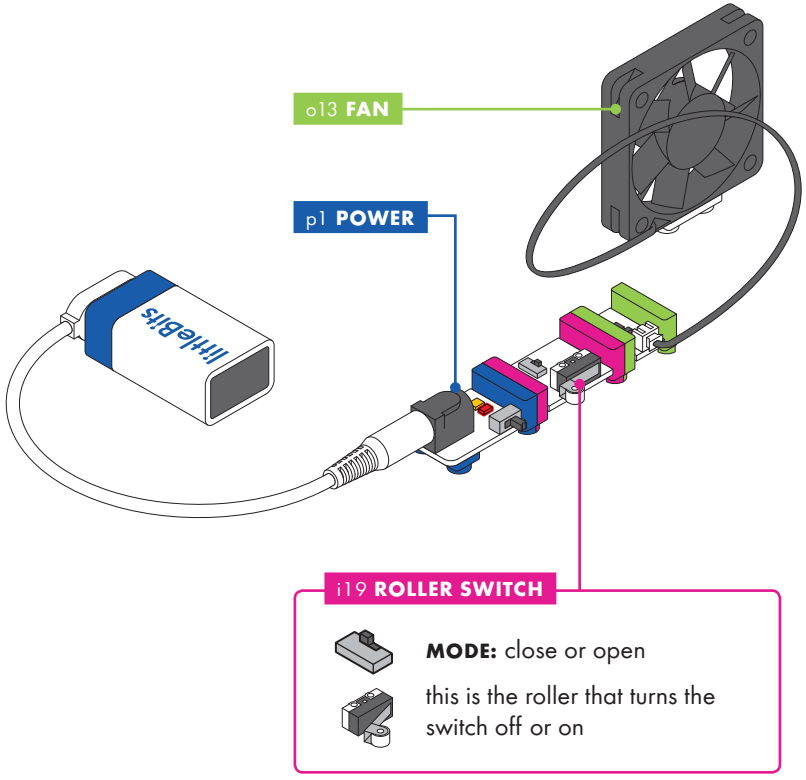
i19 ROLLER SWITCH



MEET THE BIT

The roller switch has a little lever with a wheel and activates when something presses it. You can change the mode of the roller switch to make it turn off when the lever is pushed in towards the Bit. In **OPEN** mode, it is similar to a refrigerator light. When you open a refrigerator the light is on and when you close the refrigerator the roller switch is activated and the light turns off.

SAMPLE CIRCUIT



HOW IT WORKS

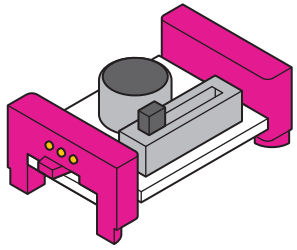
When the roller switch's mode switch is set to **CLOSE**, the signal will not pass through until the lever is pushed in. When the mode switch is set to **OPEN**, the signal will pass until the lever is pushed in.

Note: The lever can only be pushed in towards the Bit. Do not pull the lever away from the Bit.

REAL WORLD ANALOGIES

REFRIGERATOR LIGHT

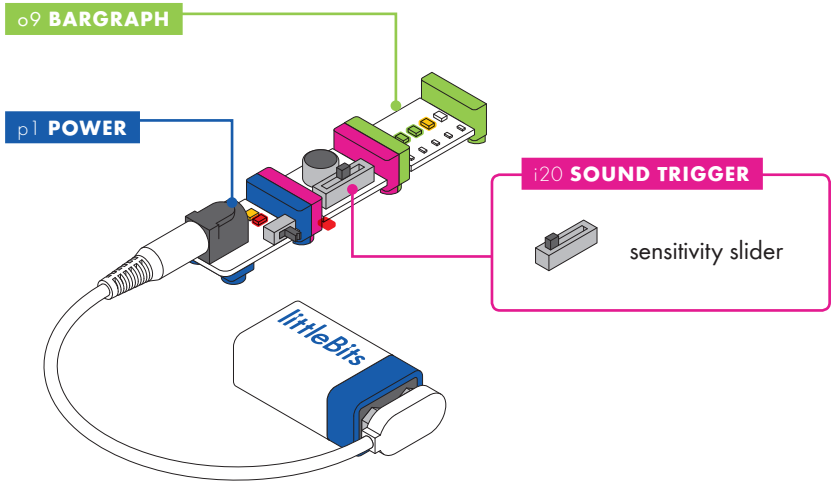
i20 SOUND TRIGGER



MEET THE BIT

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

SAMPLE CIRCUIT



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 an on or 5 volt signal to the following Bits in the circuit. Use the adjustment slider to set the sensitivity (how much noise is needed to trigger your Bit).

MINI-CHALLENGE

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

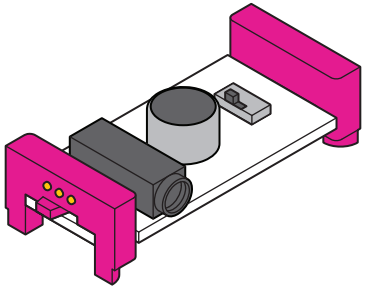
REAL WORLD ANALOGIES

CLAP ON LIGHT

HUMAN EAR

BEAR IN HIBERNATION

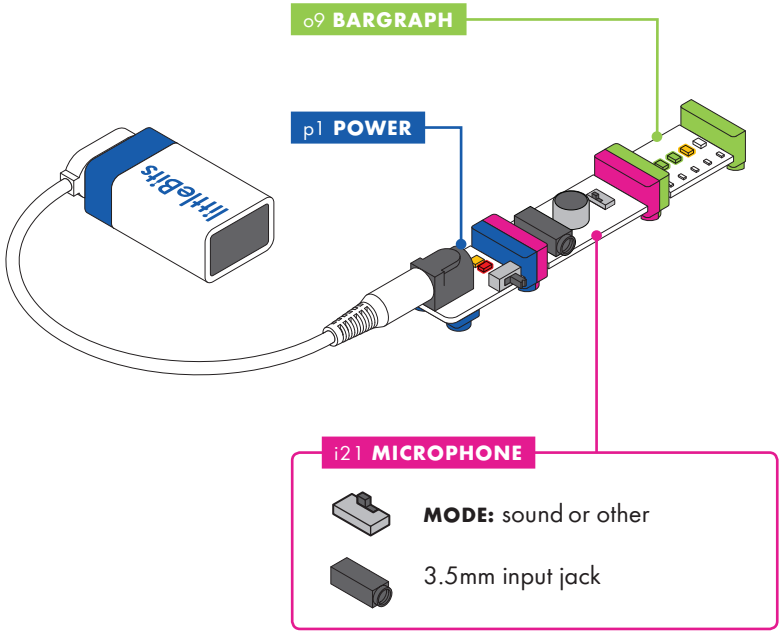
i21 MICROPHONE



MEET THE BIT

The microphone allows you to use your voice to control your circuits. You can use it to turn sounds into light or motion, or use it with the speaker like a small megaphone!

SAMPLE CIRCUIT



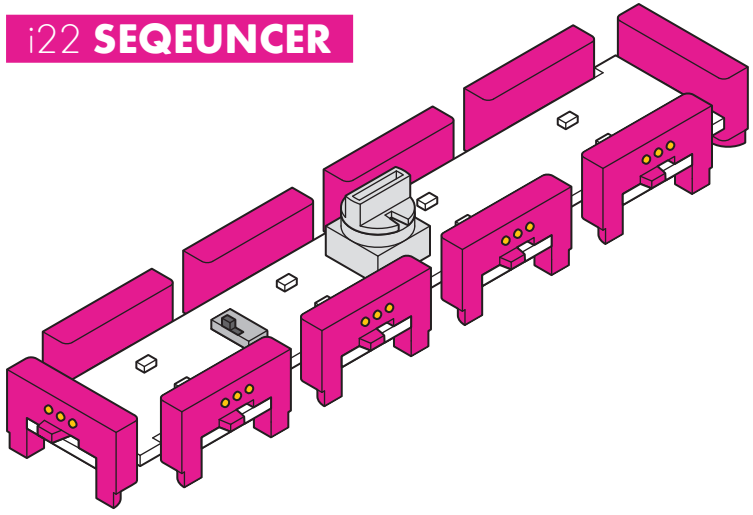
HOW IT WORKS

The microphone translates sound into the electronic language of littleBits. Make sure the switch is set to **SOUND** when you're using it with the speaker, and **OTHER** for all your other Bits, like LEDs and motors. The microphone also has a 3.5mm input jack so you can plug in your computer or mp3 player.

REAL WORLD ANALOGIES

KARAOKE MICROPHONE

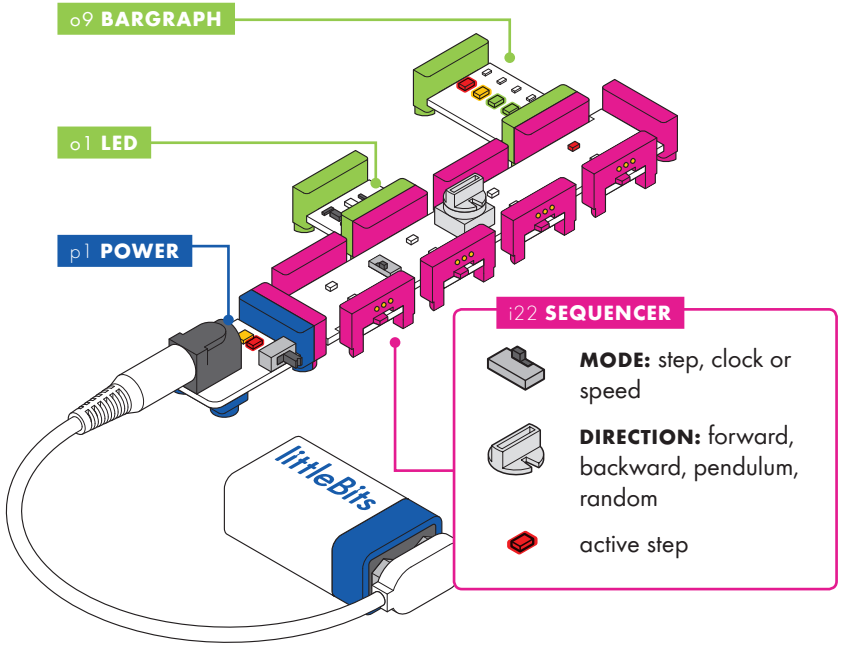
i22 SEQEUNCER



MEET THE BIT

The sequencer allows you to connect up to 8 outputs and control them in sequential patterns.

SAMPLE CIRCUIT



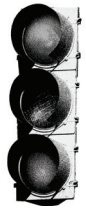
HOW IT WORKS

The sequencer can carry out multiple tasks for your circuit, but can only do them one at a time. There are clock **MODES** that control when the Bit transitions from sequence step to sequence step. You can also choose which direction your sequence runs using the **DIRECTION** knob.

For a full description of all the modes and directions, visit: littleBits.com/products/sequencer

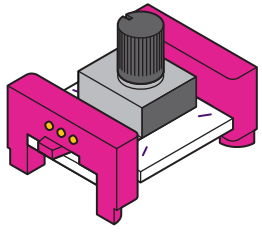
REAL WORLD ANALOGIES

MERRY-GO-ROUND



TRAFFIC LIGHTS

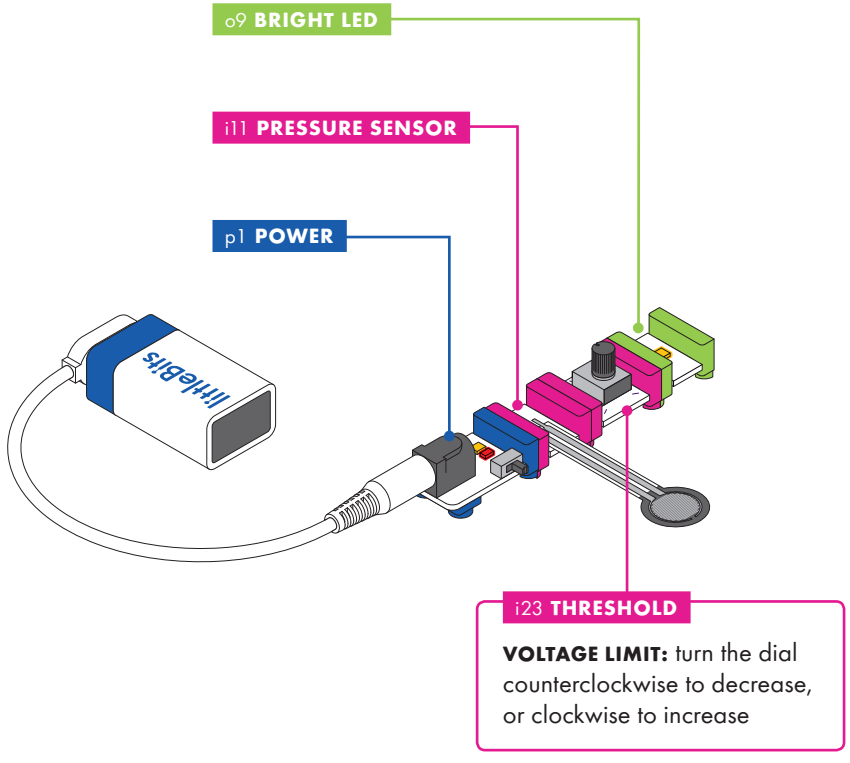
i23 THRESHOLD



MEET THE BIT

The threshold Bit helps you automate your circuit. It checks for signal, and decides whether that signal can move on to the other Bits and activate the circuit. Think of it like the height requirement on a roller coaster: If you're over a certain height, you can pass through the gate, and the ride starts. Try it with a temperature sensor and a fan to automate a breeze when it's hot out!

SAMPLE CIRCUIT



HOW IT WORKS

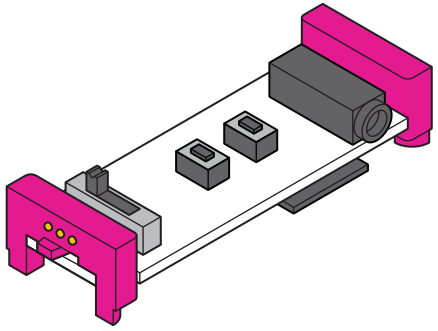
The threshold receives signal from the Bits before it, and doesn't let the signal pass until it reaches the amount of voltage you set using its knob. Set a higher limit by turning the knob clockwise. The bit does not let any signal pass through unless the signal is more than the limit you set. Don't see any signal passing through? Give it more signal or lower the limit you set by turning the knob counterclockwise.

REAL WORLD ANALOGIES

TOLL BOOTH

ROLLER COASTER HEIGHT CHECK

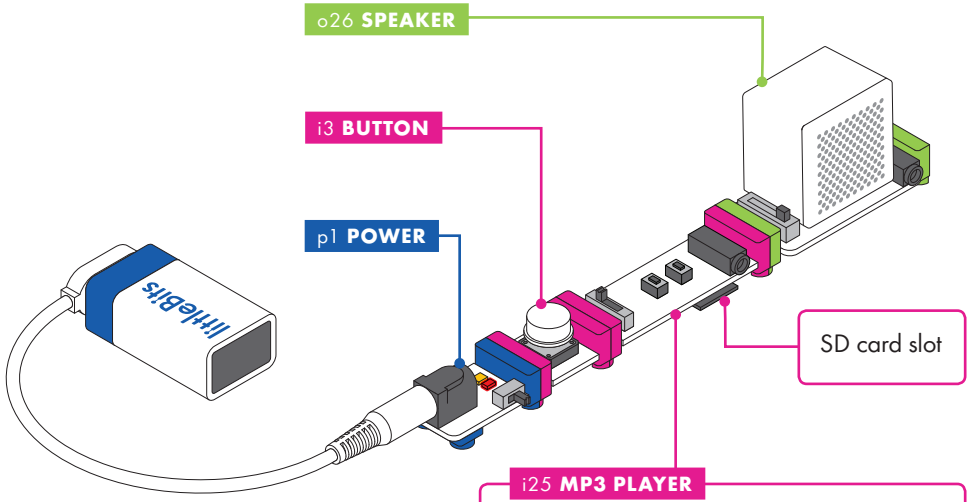
i25 **MP3 PLAYER**



MEET THE BIT

The MP3 player allows you to play your own MP3 playlist with littleBits! All you have to do is upload your MP3 files to the provided SD card.

SAMPLE CIRCUIT



HOW IT WORKS

The MP3 player reads MP3 files off of the SD card that is underneath the Bit. To choose the order that files are played in, simply rename the MP3 file so that it has a number in front of the file name. The MP3 player will then play your MP3 tracks in numerical order.

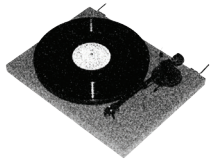
Use the **BACK** and **FORWARD** buttons to switch between tracks on the MP3 player.

You can either send the audio signal out through the headphones or through the output bitSnap. When headphones are connected to the Bit, audio will not be carried through the output bitSnap.

For a full description of the **MODE** switch, visit: littleBits.com/products/mp3-player

REAL WORLD ANALOGIES

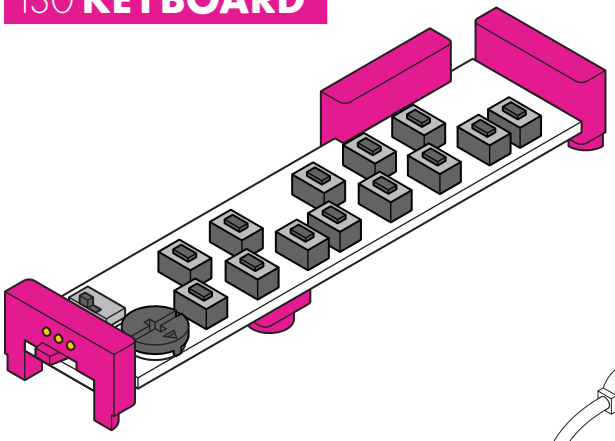
JUKEBOX



TURNTABLE

CELL PHONE RING TONE

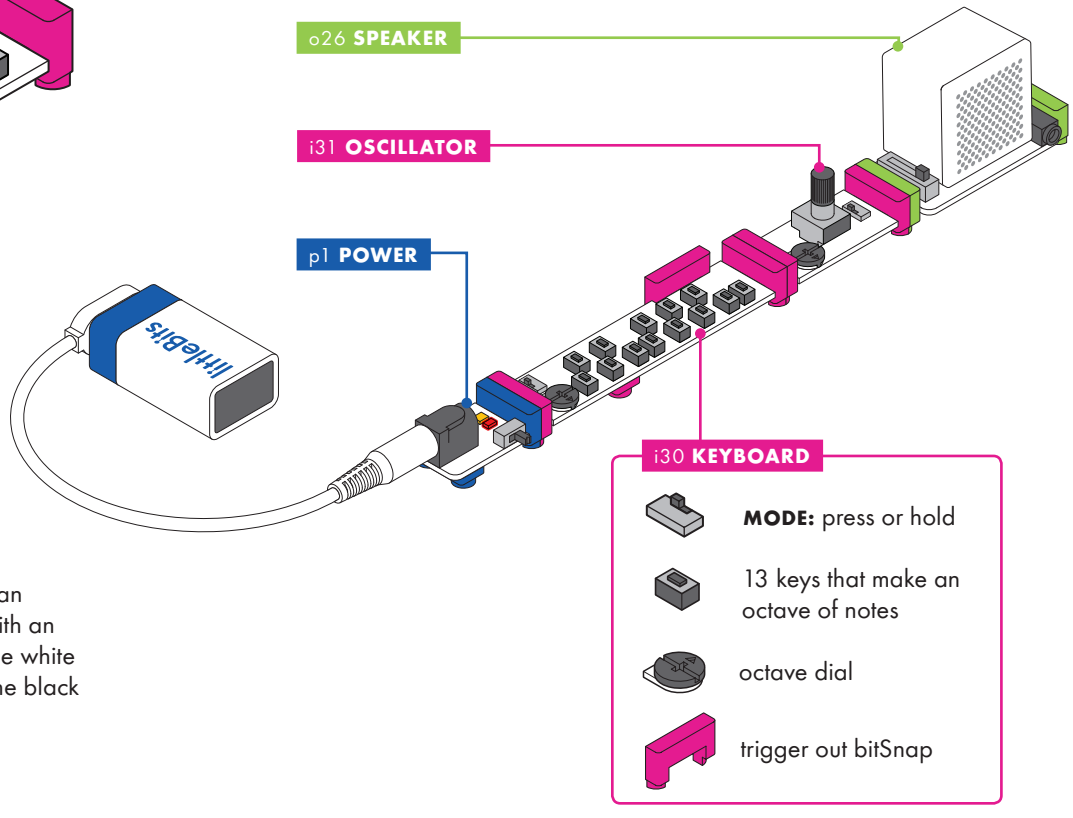
i30 KEYBOARD



MEET THE BIT

The keyboard Bit features 13 buttons that make up an octave of notes like a piano. This Bit can be used with an oscillator Bit to play melodies. Similar to a piano, the white keys on the keyboard are on the bottom row, and the black keys are spaced on top.

SAMPLE CIRCUIT



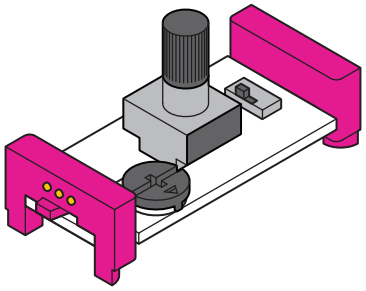
HOW IT WORKS

The keyboard has two modes: **PRESS**, which only produces output when you press a button, and **HOLD**, which will sustain the last note you played. You can use the **OCTAVE DIAL** to change the playable range. The top bitSnap is a **TRIGGER OUT**, which sends an on or 5 volt signal whenever a key is pressed. Try using on the **TRIGGER IN** of the envelope or other Bits.

REAL WORLD ANALOGIES

GRAND PIANO

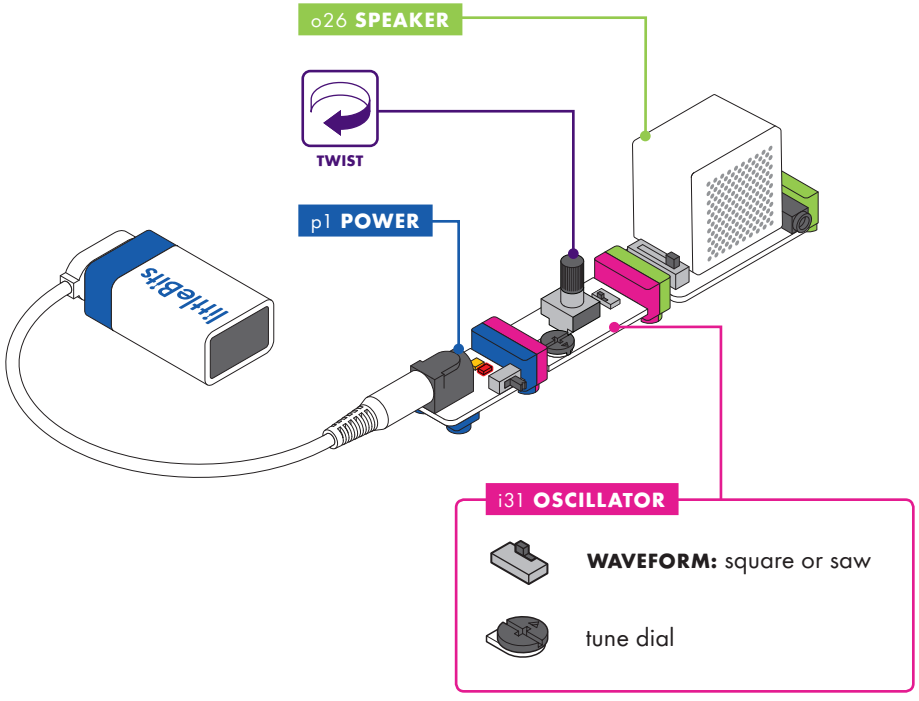
i31 OSCILLATOR



MEET THE BIT

The oscillator is a sound source that is capable of creating audio tones that will be used in almost every sound experiment you create with your Bits.

SAMPLE CIRCUIT



HOW IT WORKS

The oscillator allows you to generate sounds when connected to the speaker Bit. The **WAVEFORM** switch changes the output. The invisible sound wave will either look like a square or a saw. The square has a hollow sound, similar to a flute. The saw has a strong, buzzy sound, similar to brass instruments. It also features a **PITCH** knob in the center and a **TUNE** pitch dial. The oscillator's frequency range is 0.3 Hz to 4000 Hz.

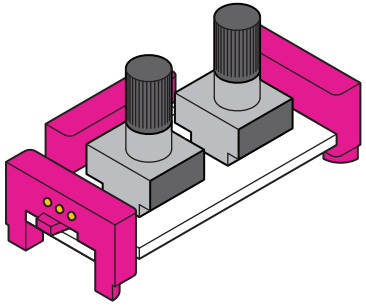
REAL WORLD ANALOGIES

FLUTE

TRUMPET

SAXOPHONE

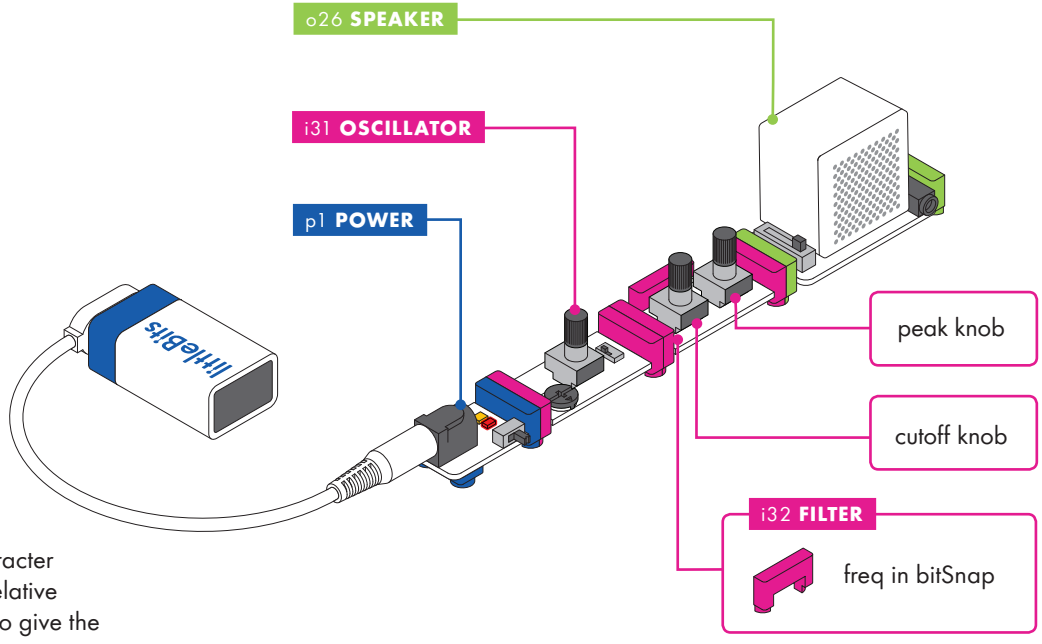
i32 **FILTER**



MEET THE BIT

The filter has the biggest effect on the sound's character or "timbre." It affects the timbre by changing the relative volume of certain frequencies in the sound. Use it to give the impression that a sound is "brighter" (more high frequencies) or "darker" (more low frequencies).

SAMPLE CIRCUIT

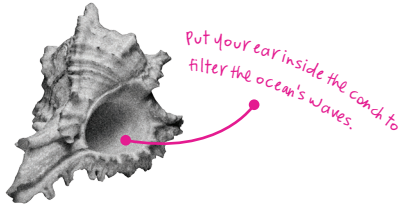


HOW IT WORKS

The **CUTOFF** knob sets the frequency to be emphasized, while the **PEAK** knob controls the intensity of the filter. If the peak is turned up all the way, the filter turns into an oscillator!

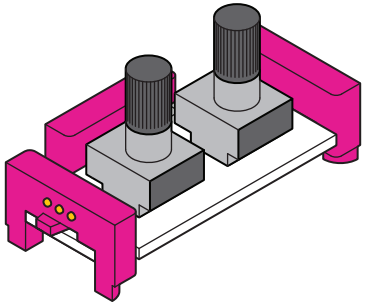
The filter allows you to sculpt the tone of your sounds. If the cutoff knob is fully counterclockwise, it cuts off the tone completely, darkening the oscillator's sound. When the knob is fully clockwise, the filter is open and allows the oscillator's tone to pass through. The peak knob emphasizes the intensity of the filter, capable of creating deep bass or high-pitched frequencies.

REAL WORLD ANALOGIES



CONCH SEASHELL

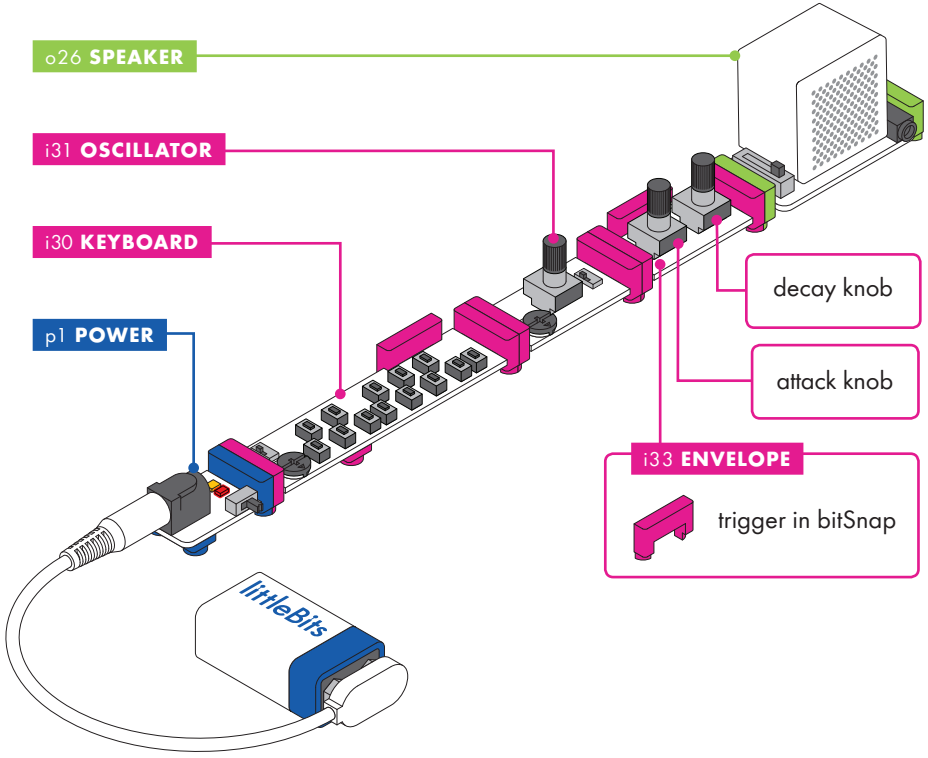
i33 ENVELOPE



MEET THE BIT

The envelope modifies the loudness contour of a sound. It takes a sound input and shapes it into something you'd hear from an acoustic musical instrument, like a piano or saxophone.

SAMPLE CIRCUIT



HOW IT WORKS

This envelope has two controls: **ATTACK**, which is how long it takes to ramp up to maximum volume, and **DECAY**, which is how long it takes to fade to silence again. You can use its third bitSnap to trigger the envelope from different sources, like the keyboard.

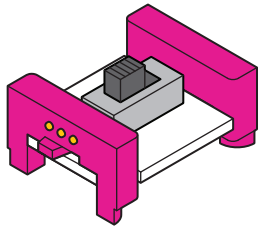
Musical instruments have a unique characteristic associated with their loudness when played. The envelope allows you to shape the sound's loudness over time to give it a similar characteristic to acoustic instruments. To emulate a bowed instrument, use a longer attack and decay time. To emulate a string pluck, use no attack and a short decay time. To emulate a percussive stirke, use no attack and vary your decay time to short or medium times.

REAL WORLD ANALOGIES

MALLETS

VIOLIN BOW

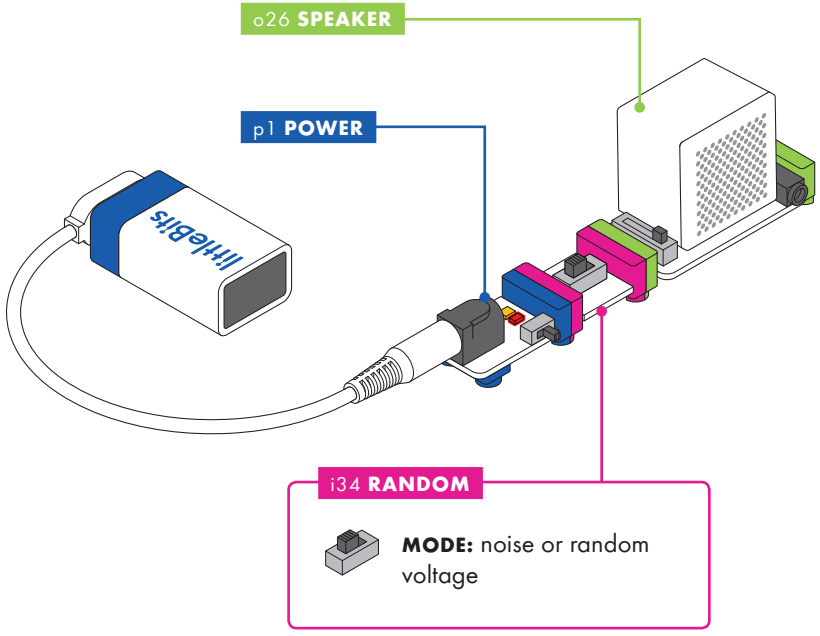
i34 **RANDOM**



MEET THE BIT

The random Bit is the perfect way to shake things up when your sound gets too repetitive. It creates unpredictable voltages and trigger signals to create complex sound sequences. It can either produce white noise, or it can control oscillators to make them play random pitches.

SAMPLE CIRCUIT



HOW IT WORKS

The random Bit has two modes: **NOISE** and **RANDOM VOLTAGE**. In noise mode, it outputs white noise, like a radio not tuned to any station. In random voltage mode, it outputs random voltage signals that can control oscillators. The random Bit needs a clock input like the pulse or micro sequencer. Adjust the speed to change the random rate.

REAL WORLD ANALOGIES

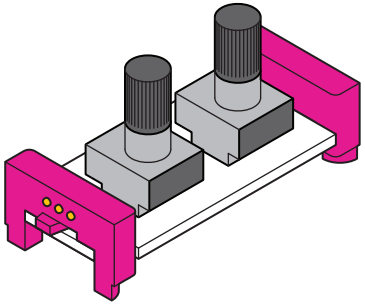
RADIO TUNER

UNSHUFFLED DECK OF CARDS

DICE TOSS

WAVES ON THE BEACH

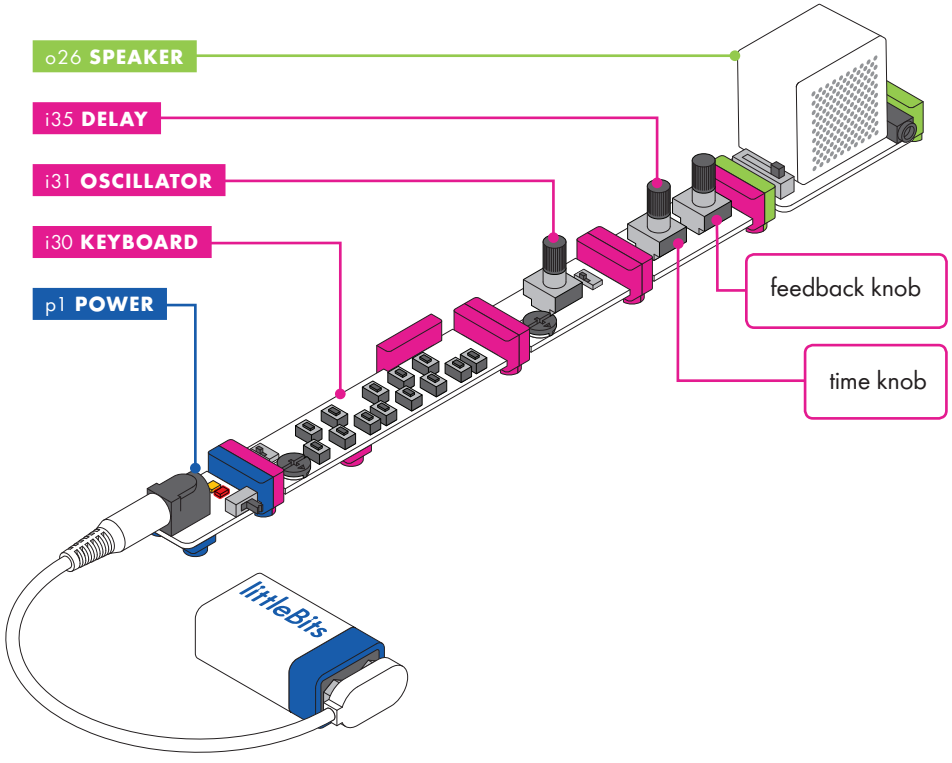
i35 **DELAY**



MEET THE BIT

The delay Bit takes incoming audio and repeats it, like an echo. Delays can be long and spacey, like shouting into the Grand Canyon, or loud and crazy.

SAMPLE CIRCUIT



HOW IT WORKS

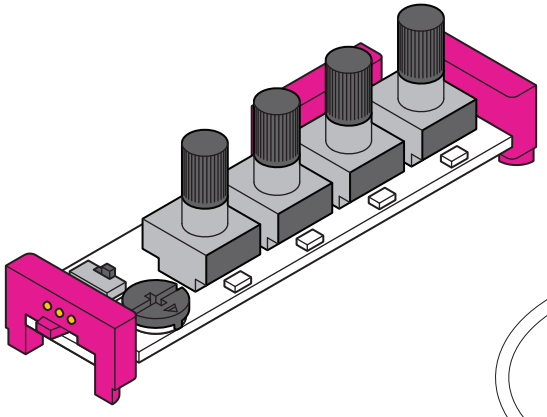
The delay Bit has two knobs: **TIME**, which sets the delay length between a sound and its repetition, and **FEEDBACK**, which controls how many times the sound repeats. This Bit will play forever if you turn the knob all the way up. You can also shift the pitch of a sound by turning the control while a sound is repeating.

REAL WORLD ANALOGIES

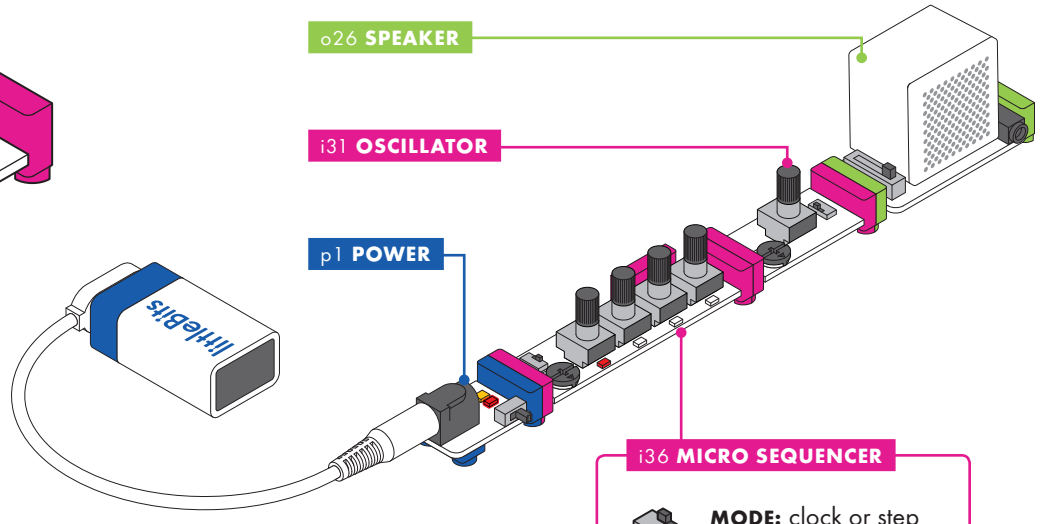
CAVE

GRAND CANYON

i36 **MICRO SEQUENCER**



SAMPLE CIRCUIT



HOW IT WORKS

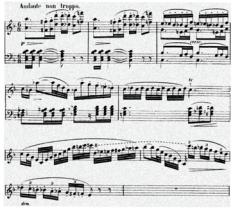
The micro sequencer sends out voltages based on the position of each of the four **STEP** knobs. Turn a knob fully counterclockwise to make the step silent.

Use the Bit in **SPEED** mode to set the speed using the dial, or flip the switch to **STEP** mode to use an input Bit like a pulse or button for control. It also has a **TRIGGER OUT**, which you can send to any of your other Bits. This can be used to trigger other Bits like the envelope.

MEET THE BIT

The micro sequencer creates short melodies controlled by the pitch knobs. Connect it to an oscillator and it will step through the "sequence" consecutively to make a melody (the LEDs tell you which step is active).

REAL WORLD ANALOGIES



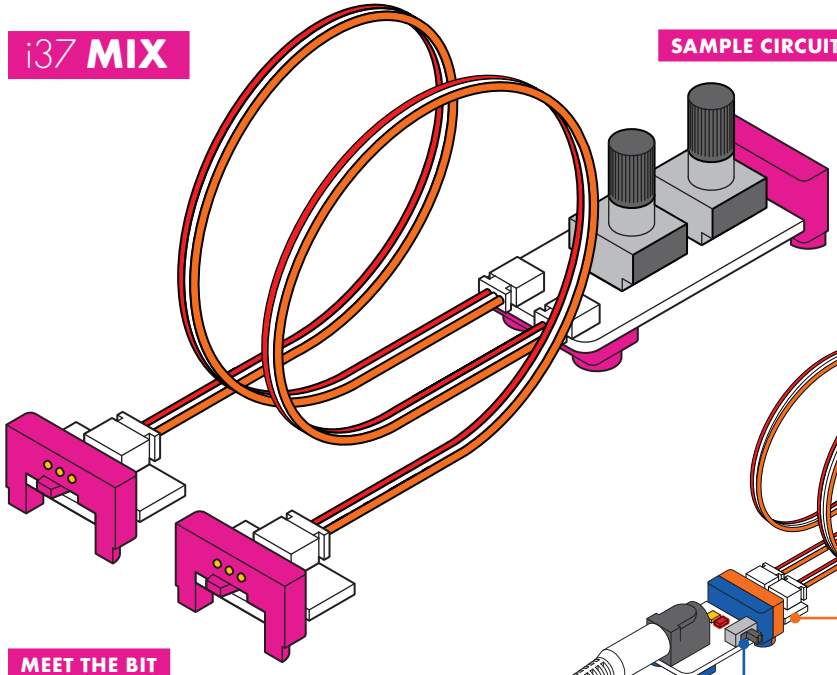
MUSICAL SCORE

CELL PHONE RING TONE

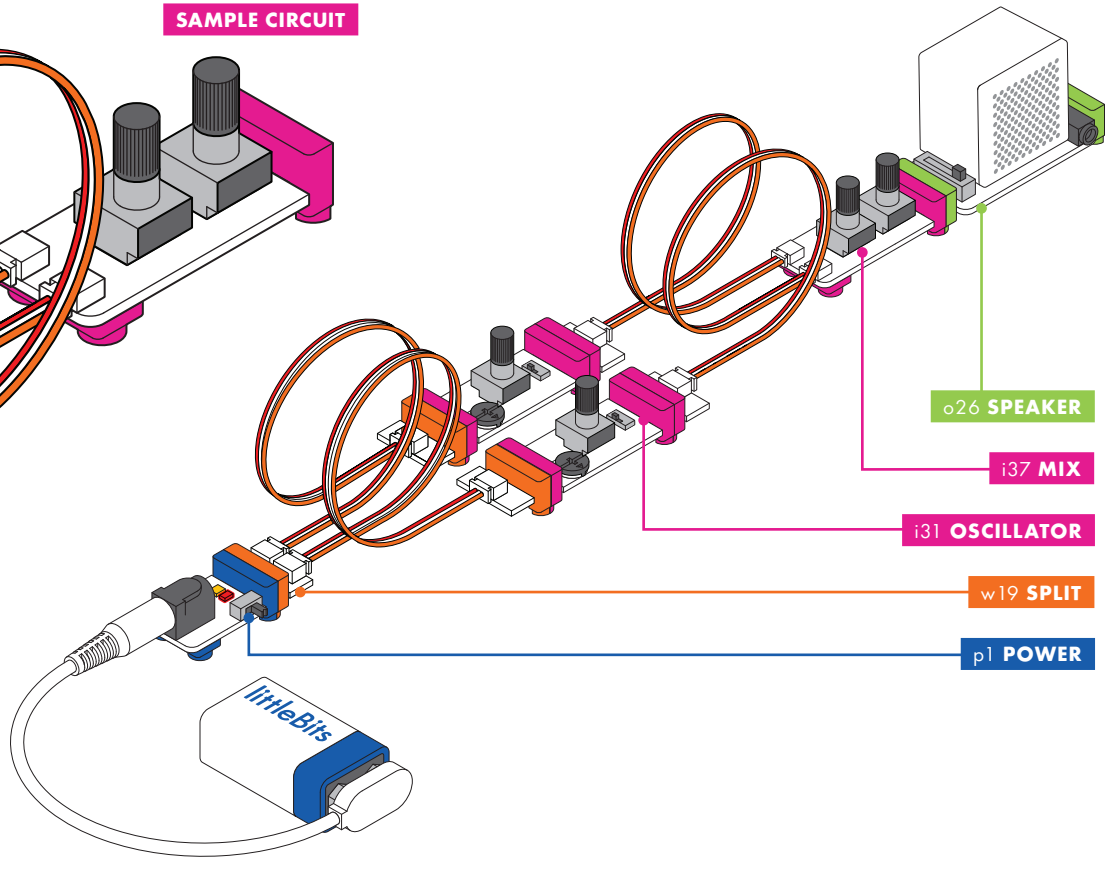
i37 **MIX**

MEET THE BIT

The mix Bit allows you to combine two inputs and send them to a single output. It also has a level control for each of its inputs – that's where the mixing comes in. Use it to play two oscillators on a single speaker!



SAMPLE CIRCUIT



HOW IT WORKS

The mix Bit accepts signal from two separate inputs, and allows you to mix them together and control how much of each input's signal passes through to the next Bit.

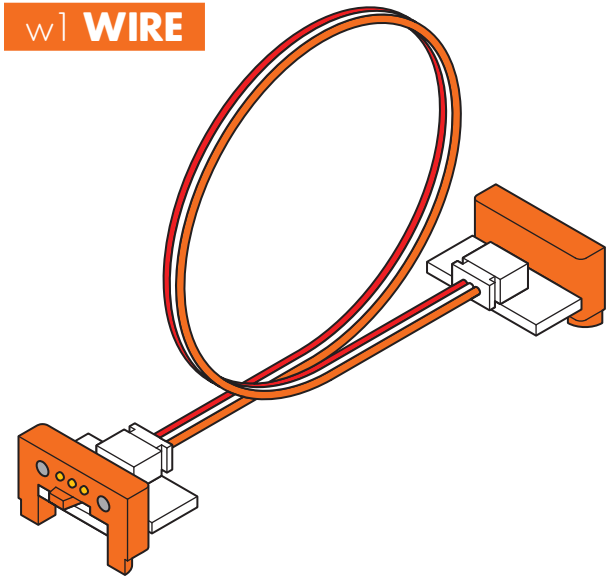
Use the two dials on the Bit to emphasize certain sounds - the sound from one input might be very soft, while the sound from another is stronger.

REAL WORLD ANALOGIES

BIVALVE

CHEF MIXING INGREDIENTS

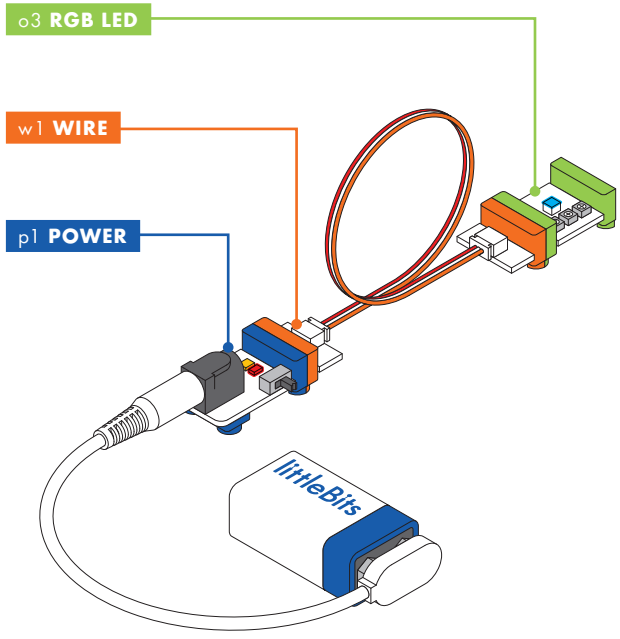
w1 WIRE



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.

SAMPLE CIRCUIT



HOW IT WORKS

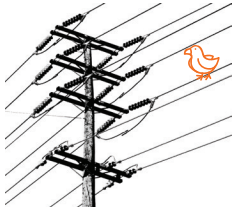
The wire doesn't change the signal in any way – it just carries the signal over from one Bit to another. Each wire Bit is 6 inches (15 cm) long.

MINI-CHALLENGE

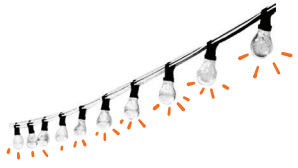
Can you invent a circuit that you wrap around your arm?

REAL WORLD ANALOGIES

EXTENSION CORD

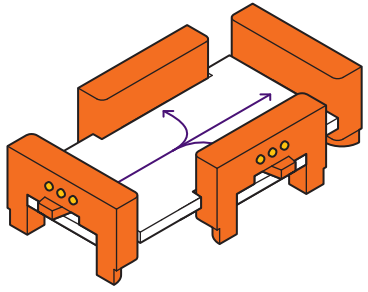


POWER LINES



STRING OF LIGHTS

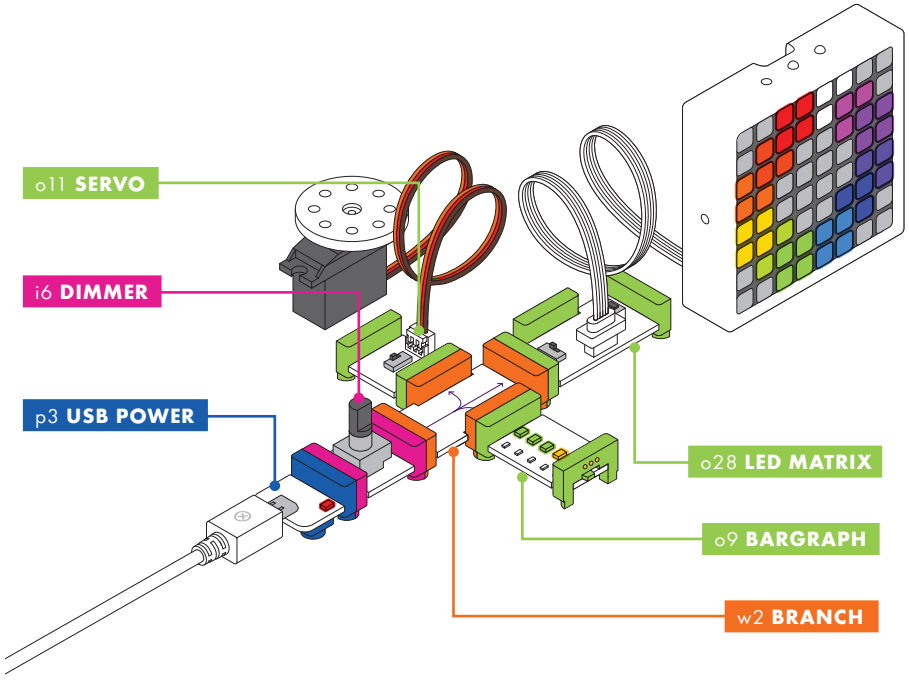
w2 BRANCH



MEET THE BIT

The branch lets you send the same signal to up to 3 other outputs, in 3 different directions.

SAMPLE CIRCUIT



HOW IT WORKS

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

MINI-CHALLENGE

Can you invent a creature controlled with one input Bit?

REAL WORLD ANALOGIES

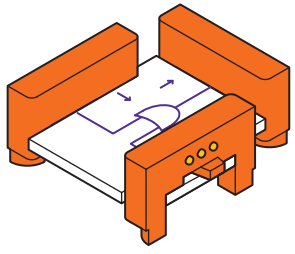
POWER STRIP

USB HUB

TREE BRANCH

FORK IN A RIVER

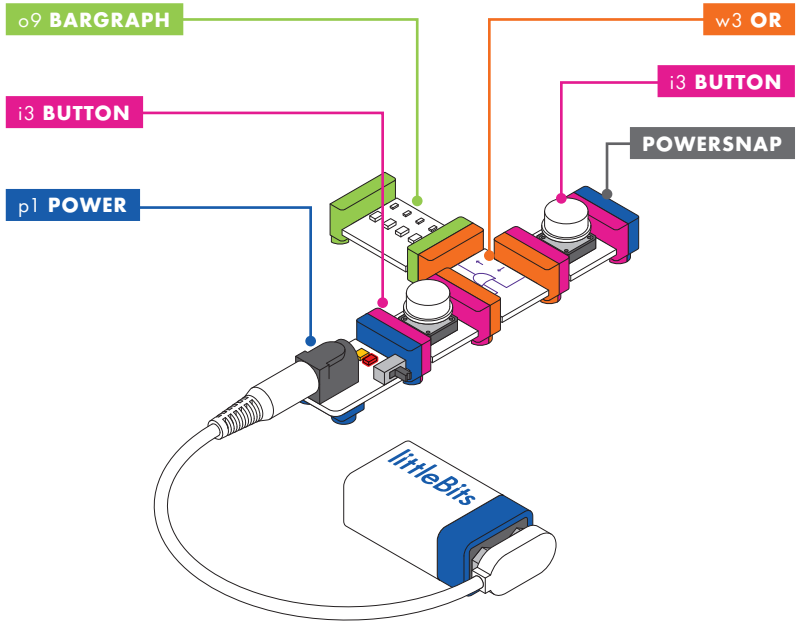
w3 OR



MEET THE BIT

The OR Bit is a logic gate with 2 inputs. In order for the output of the OR to be on, there needs to be at least 1 on input.

SAMPLE CIRCUIT



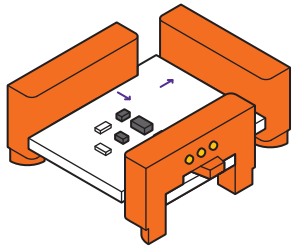
HOW IT WORKS

Anytime the OR receives a signal lower than 2.5 volts at either of its inputs, the OR sends an off or 0 volt signal from its output. If the OR receives a signal greater than 2.5 volts at either input, the OR sends an on or 5 volt signal from its output.

REAL WORLD ANALOGIES

LIVE AUCTION

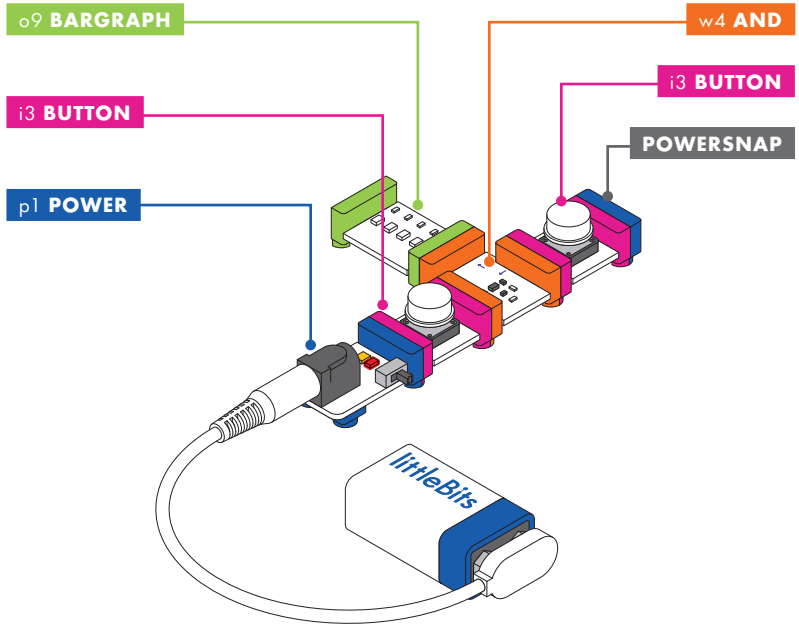
w4 AND



MEET THE BIT

The AND Bit is a logic gate with 2 inputs. It sends an on signal from its output only when input 1 and input 2 are both receiving an on signal.

SAMPLE CIRCUIT

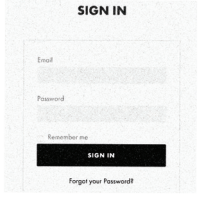


HOW IT WORKS

Anytime the AND receives a signal lower than 2.5 volts at either of its inputs, the AND sends an off or 0 volt signal from its output. If the AND receives a signal greater than 2.5 volts at both of its inputs at the same time, the AND sends an on or 5 volt signal from its output.

REAL WORLD ANALOGIES

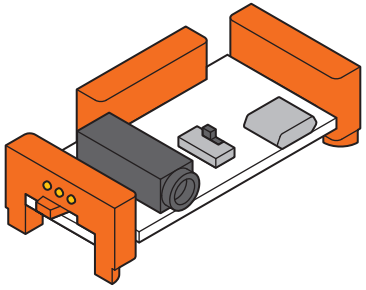
ATM TRANSACTION



LOGGING INTO EMAIL

UNLOCKING A DOOR WITH A DEADBOLT LOCK

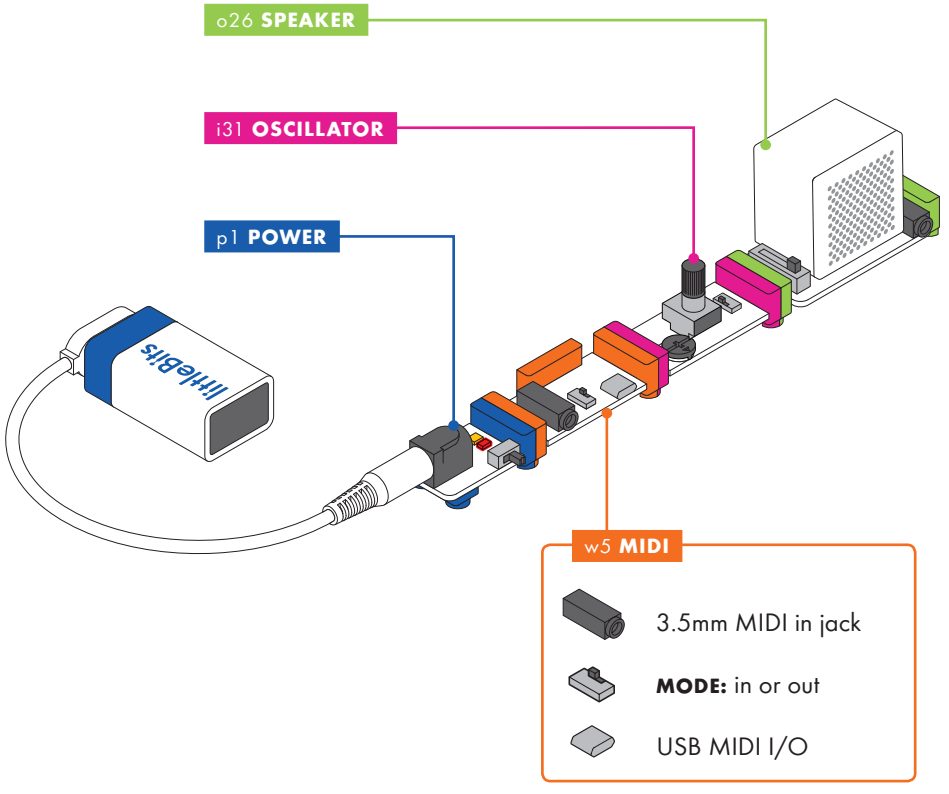
w5 **MIDI**



MEET THE BIT

With the MIDI Bit, you can control your circuits from MIDI-enabled instruments and computer software! Send and receive MIDI messages, create your own MIDI controller with other Bits like the keyboard, and control Bits with software like Ableton Live, Logic, and Pro Tools.

SAMPLE CIRCUIT



HOW IT WORKS

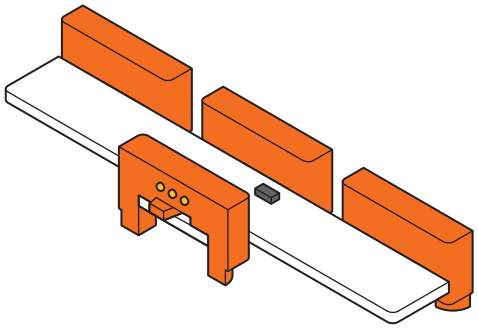
The MIDI Bit functions by acting as a MIDI-to-voltage converter (**MIDI IN** mode) and a voltage-to-MIDI converter (**MIDI OUT** mode). The MIDI Bit will show up in your DAW as a MIDI device.

The note range of the Bit is from C2 to C6. MIDI note C2 generates an output CV of 0.2V. Thereafter, the output CV increases by 1V/oct up to C6. Similar to the keyboard and micro sequencer Bits, this Bit has 2 outputs: a main bitSnap output that sends control voltages to other Bits and a **TRIGGER OUT** that sends a 5 volt signal to Bits when any MIDI note message is sent.

REAL WORLD ANALOGIES

BAND CONDUCTOR

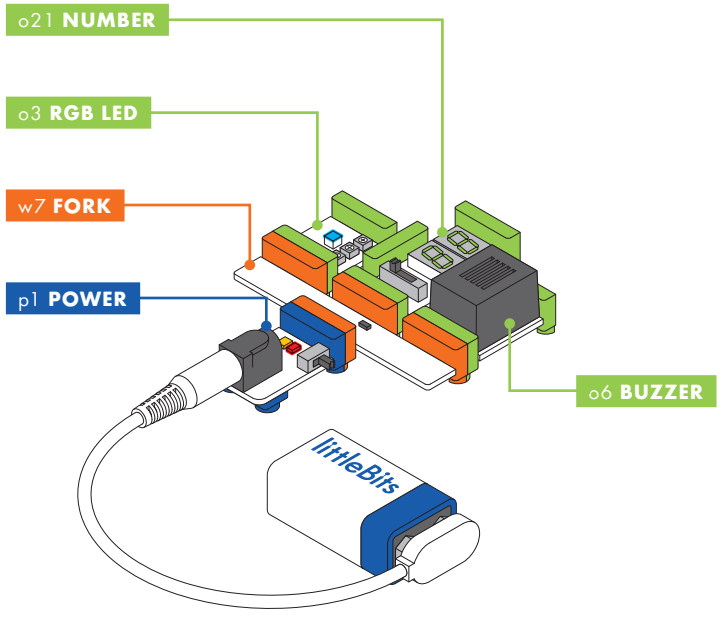
w7 FORK



MEET THE BIT

The fork gives you more options for connecting your Bits; it lets you connect a single Bit to as many as three others. If you place an input before the fork, it will control all three outputs at once, such as light, sound, and motion.

SAMPLE CIRCUIT



HOW IT WORKS

The fork takes the incoming signal and sends it to all three output bitSnaps.

MINI-CHALLENGE

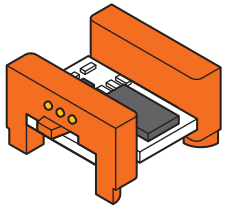
Can you invent a circuit where an input controls three outputs?

REAL WORLD ANALOGIES

POWER STRIP

FORK IN THE ROAD

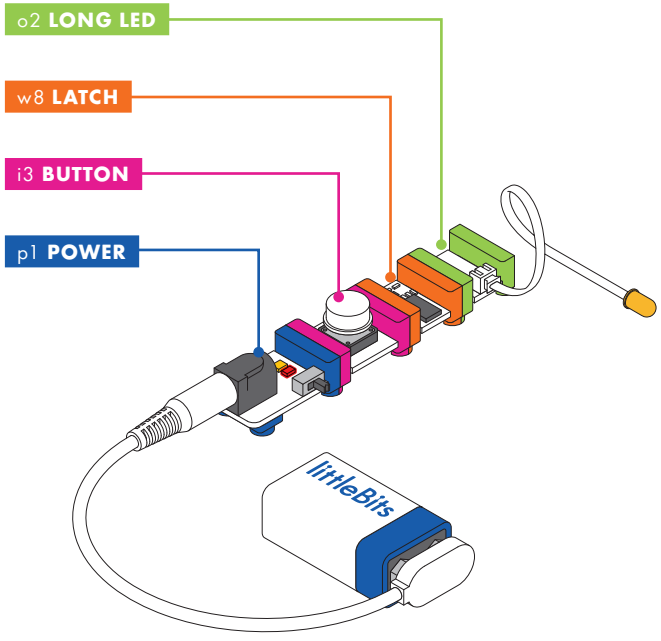
w8 LATCH



MEET THE BIT

Use the latch to turn any momentary input, like a button or a trigger Bit, into an on-off switch, like a toggle!

SAMPLE CIRCUIT



HOW IT WORKS

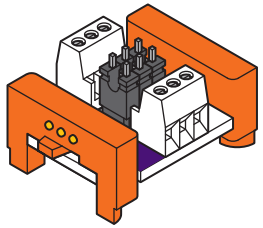
If you place a button in front of the latch, and a light after, pressing the button once will turn it on and keep it ON. Pressing it again will turn it off. Try placing a sound trigger in front of the latch and a light after it, then, just snap your fingers!

REAL WORLD ANALOGIES

DOORSTOP

CLICKING A PEN

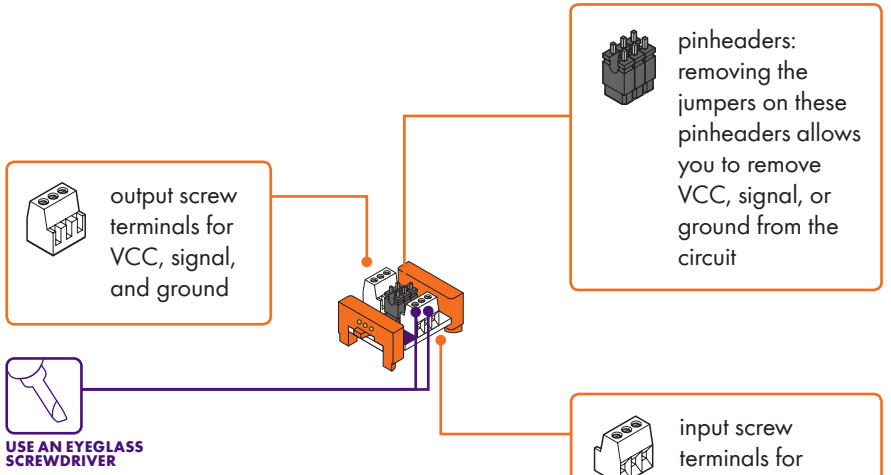
w9 PROTO



MEET THE BIT

If there is a Bit that doesn't exist, you now have the power to make it. This one's for inventors who know their way around a soldering iron!

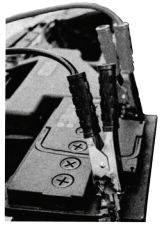
BIT BREAKDOWN



HOW IT WORKS

The proto Bit is what littleBits engineers use to build and prototype new Bits. Hack into existing Bits, or invent a brand-new one by connecting to printed circuit boards or solderless breadboards. With the proto Bit, you have direct access to power, ground and signal lines needed to take measurements and connect to other instruments.

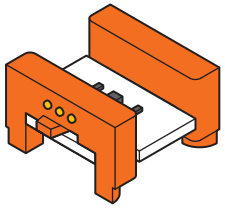
REAL WORLD ANALOGIES



CAR JUMPER CABLES

FIRE HYDRANT

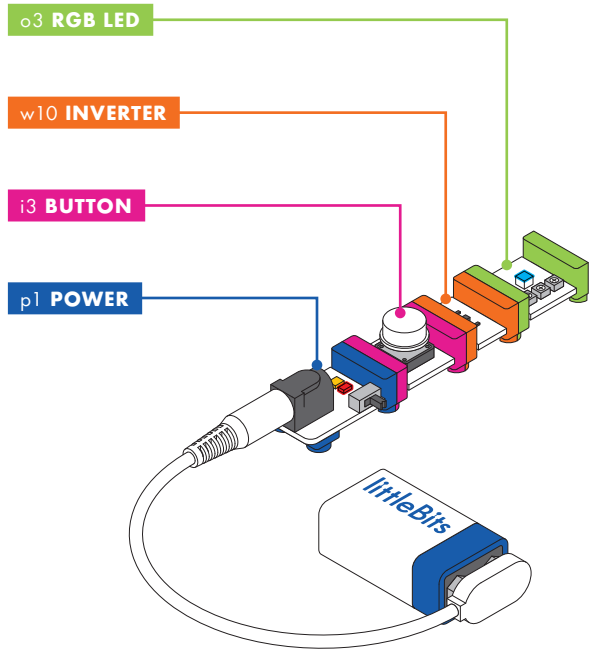
w10 INVERTER



MEET THE BIT

The inverter is a simple logic Bit. It sends out the opposite of whatever it receives: send it an on signal, and the inverter changes it to an off signal, or vice versa. Would you like a button that turns things off instead of on? Try the inverter.

SAMPLE CIRCUIT



HOW IT WORKS

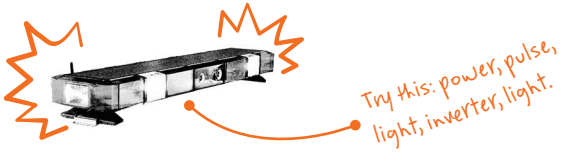
Anytime the inverter receives a signal lower than 2.5 volts, the inverter sends an on or 5 volt signal from its output. If the inverter receives a signal greater than 2.5 volts, the inverter sends an off or 0 volt signal from its output.

MINI-CHALLENGE

Can you invent something with the inverter that alerts you if someone takes a book off the table?

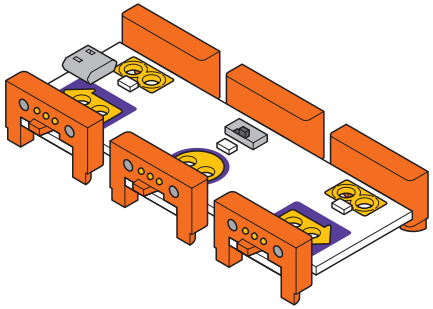
REAL WORLD ANALOGIES

OPPOSITE DAY

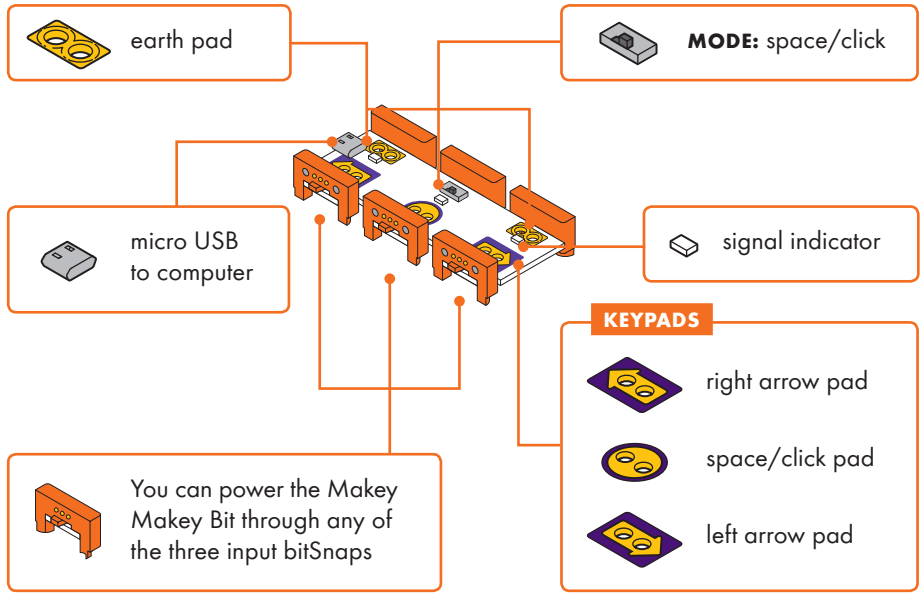


ALTERNATING POLICE LIGHTS

w14 MAKEY MAKEY® BIT



BIT BREAKDOWN



MEET THE BIT

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 the included alligator clips.

MINI-CHALLENGE

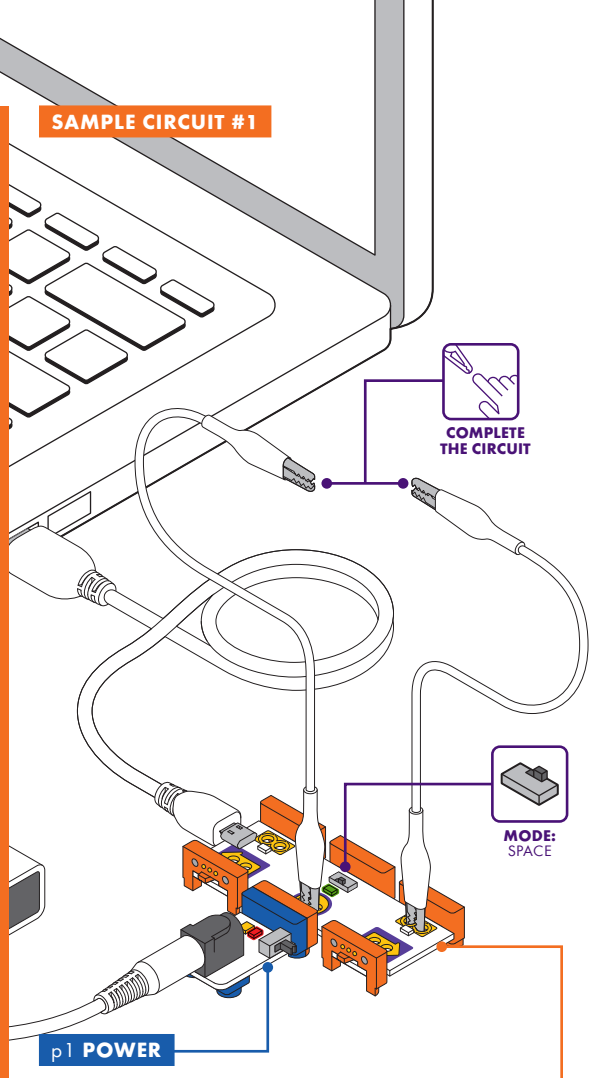
Can you invent a prank with the Makey Makey Bit? What conductive materials can you use to trigger the prank?

REAL WORLD ANALOGIES

COMPUTER KEYBOARD

OPERATION GAME®

SAMPLE CIRCUIT #1



on the **SPACE/CLICK** pad, you can toggle the switch between **SPACE** (space bar) and **CLICK** (left click on your computer mouse) functionalities

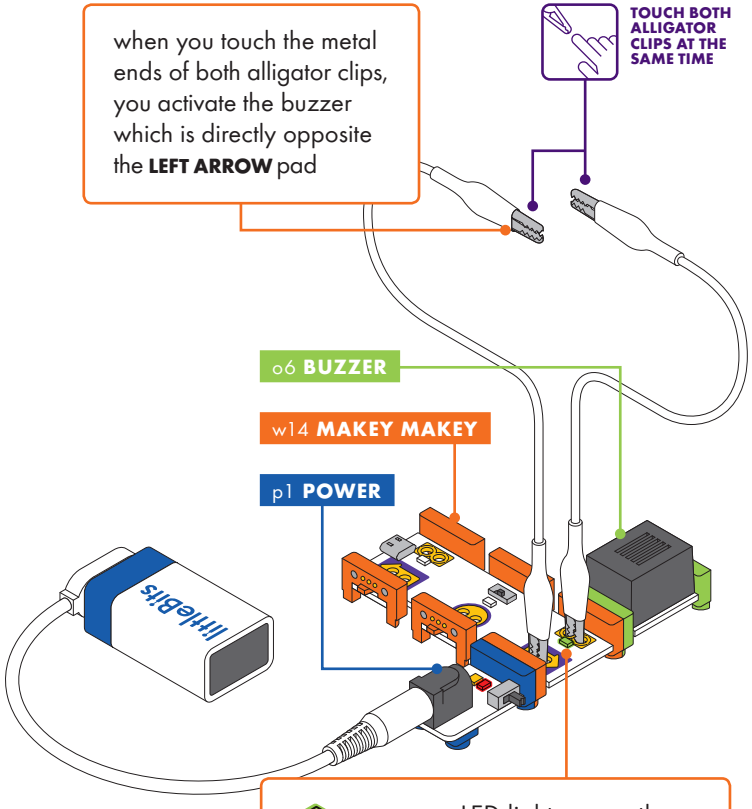
HOW IT WORKS

When you connect the Makey Makey Bit to your computer with the micro USB cable it can act like a keyboard or mouse, controlling **LEFT ARROW**, **RIGHT ARROW**, and **SPACE/CLICK**. For example, when you touch the **SPACE/CLICK** pad and an **EARTH** pad, it is the same as pressing the space bar or left click on your mouse.

NOTE: This Makey Makey Bit interaction requires you to connect a keypad (**LEFT ARROW**, **RIGHT ARROW**, **SPACE/CLICK**) to an **EARTH** pad through a conductive material.

SAMPLE CIRCUIT #2

when you touch the metal ends of both alligator clips, you activate the buzzer which is directly opposite the **LEFT ARROW** pad

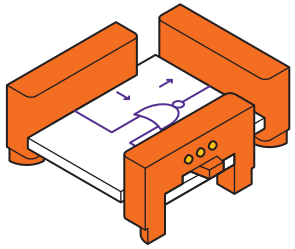


a green LED lights up on the Makey Makey Bit to indicate which keypad you are triggering

HOW IT WORKS

The Makey Makey Bit sends an **ON** signal to the Bits that follow it when a keypad (**LEFT ARROW, SPACE/CLICK,** or **RIGHT ARROW**) is connected to either of the **EARTH** pads through a conductive material. In sample circuit #1, when you touch both alligator clips at the same time, electricity flows from the **LEFT ARROW** keypad to the **EARTH** pad, triggering an **ON** signal to the buzzer. This works because humans are conductive. Yes, even you!

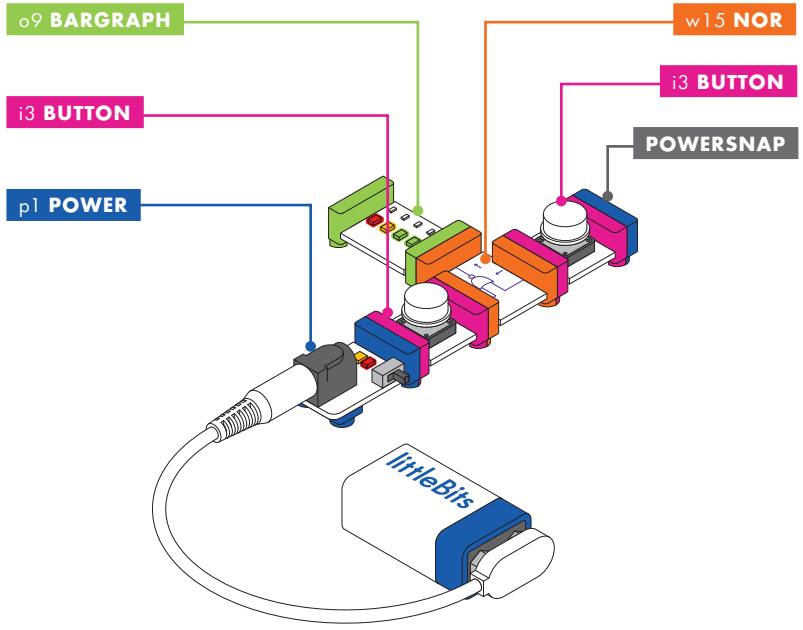
w15 **NOR**



MEET THE BIT

The NOR Bit is a logic gate with 2 inputs. It sends an on signal only when neither input is receiving an on signal. In other words, it's the exact opposite of the OR Bit. The NOR Bit is good for inventions in which you want the output to be on, unless 1 or both of its inputs are triggered.

SAMPLE CIRCUIT



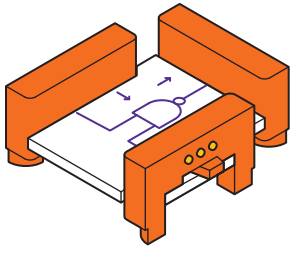
HOW IT WORKS

Anytime the NOR receives a signal lower than 2.5 volts at either of its inputs, the NOR sends an on or 5 volt signal from its output. If the NOR receives a signal greater than 2.5 volts at either of its inputs or at the same time, the NOR sends an off or 0 volt signal from its output.

REAL WORLD ANALOGIES

SLEEP MODE ON A COMPUTER

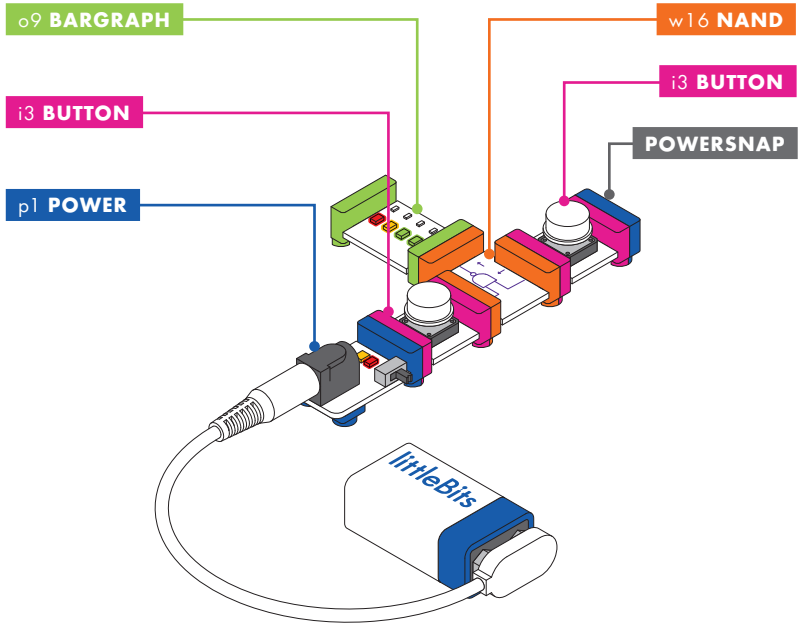
w16 NAND



MEET THE BIT

The NAND Bit is a logic gate with 2 inputs. Think of it as "not and." The NAND Bit will always send an on signal unless both input 1 and input 2 are receiving an on signal. It's the exact opposite of the AND Bit.

SAMPLE CIRCUIT



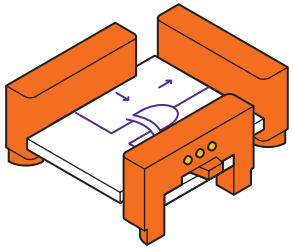
HOW IT WORKS

Anytime the NAND receives a signal lower than 2.5 volts at either of its inputs, the NAND sends an on or 5 volt signal from its output. If the NAND receives a signal greater than 2.5 volts at either of its inputs, the NAND sends an on or 5 volt signal from its output. If the NAND receives a signal greater than 2.5 volts at both of its inputs at the same time, the NAND sends an off or 0 volt signal from its output.

REAL WORLD ANALOGIES

CLOSING CAR DOORS TO TURN OFF LIGHTS

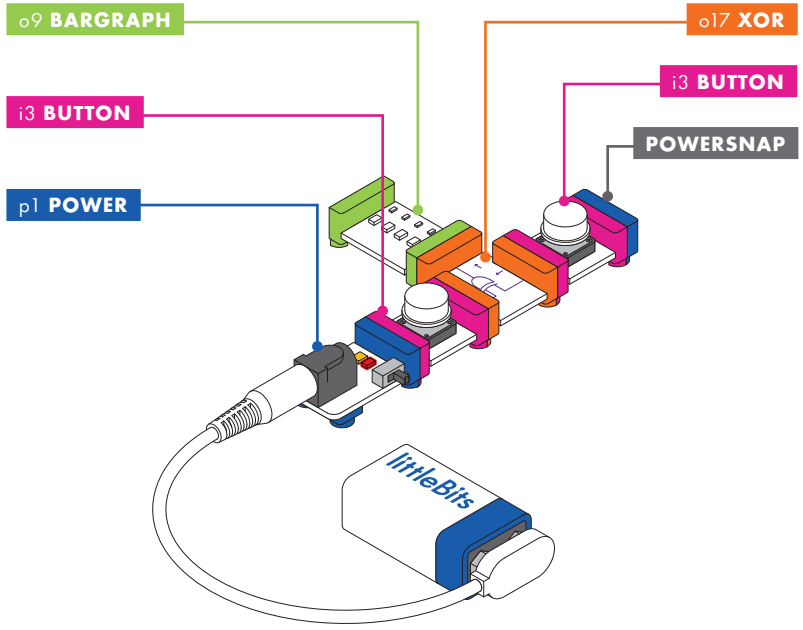
w17 XOR



MEET THE BIT

The XOR Bit is a logic gate with 2 inputs. Think of it as "exclusive or," meaning that it sends an ON signal when it's receiving an ON signal exclusively from 1 input or the other, but not both.

SAMPLE CIRCUIT



HOW IT WORKS

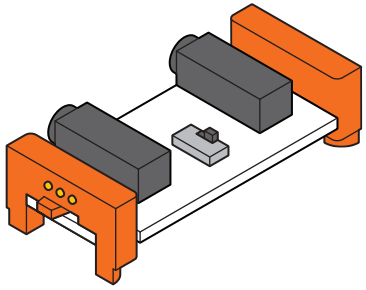
Anytime the XOR receives a signal lower than 2.5 volts at both of its inputs at the same time, the XOR sends an off or 0 volt signal from its output. If the XOR receives a signal greater than 2.5 volts at either of its inputs, the XOR sends an on or 5 volt signal from its output. If the XOR receives a signal greater than 2.5 volts at both of its inputs at the same time, the XOR sends an off or 0 volt signal from its output.

REAL WORLD ANALOGIES

PEDALING ON A BICYCLE

SEESAW

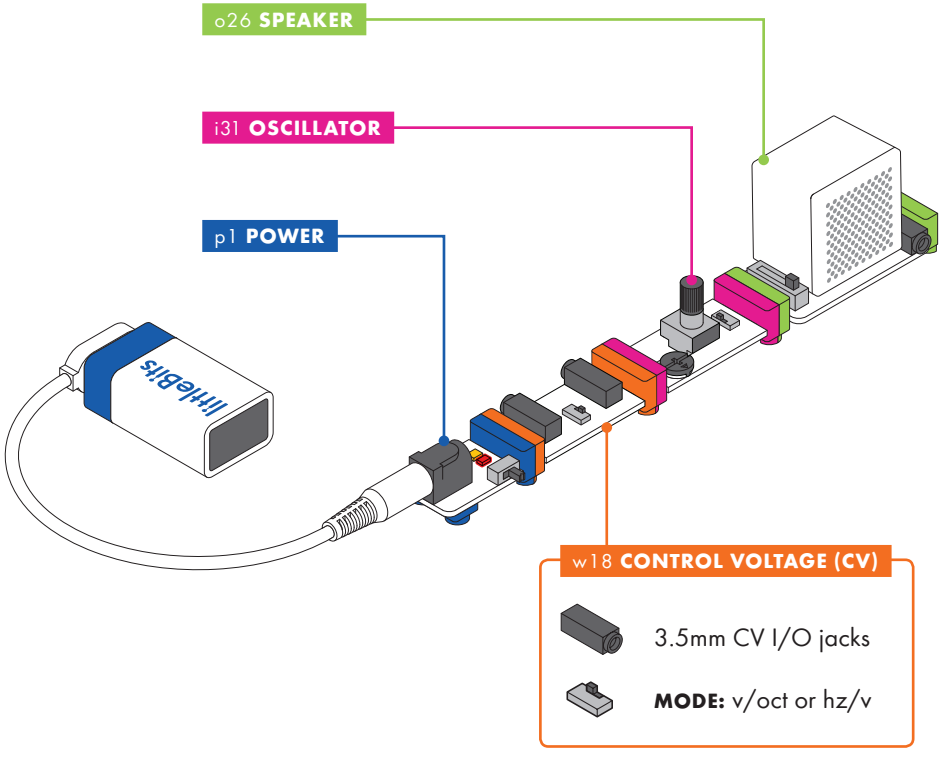
w18 CONTROL VOLTAGE (CV)



MEET THE BIT

The CV Bit lets you integrate synth Bits with other analog synthesizers like modular synths or analog keyboards. Control the pitch of oscillators and cutoff frequency of filters, control analog synthesizers with Bits, or create new control interfaces for your synth.

SAMPLE CIRCUIT



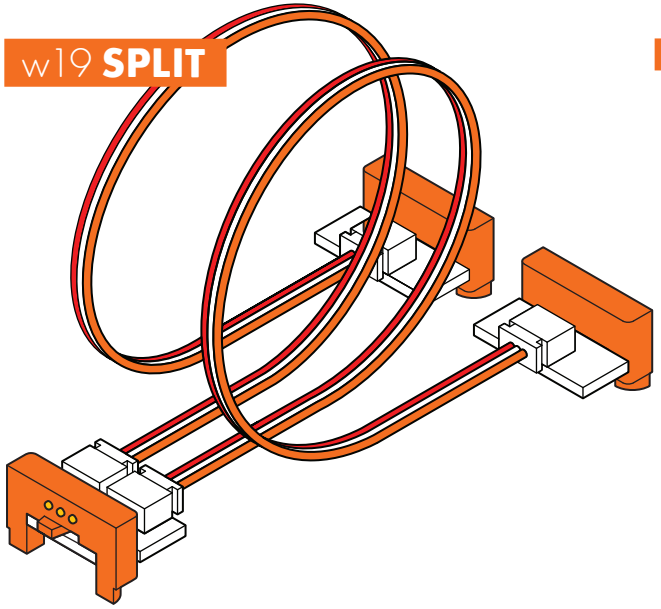
HOW IT WORKS

CV stands for "control voltage" and is a widely used term in the realm of analog synthesizers. A control voltage is a variable voltage signal that is used to control behaviors ranging from the pitch of oscillators to the cutoff setting of filters and more. The CV Bit can be used for both CV and Gate/Trigger type signals used in analog synthesizers. The Bit is suitable for interfacing with modular analog synths, analog keyboards, as well as groove boxes like the Korg Volca series. The "Sync" ports employed in the Volca series of synths can be used to make your Bits play in sync with your Volcas or vice versa. The 3.5mm connection jacks should be used with mono 3.5mm plug phono cables.

REAL WORLD ANALOGIES

BI-LINGUAL TRANSLATION

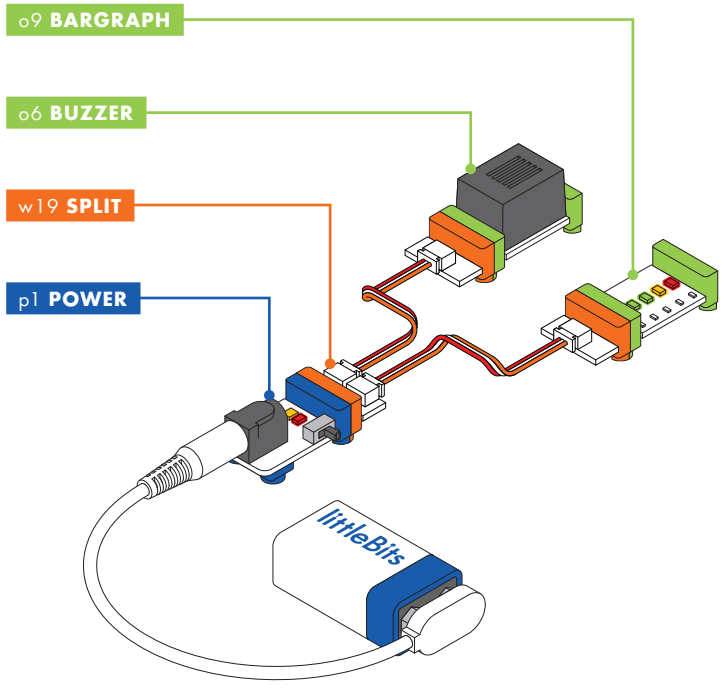
w19 SPLIT



MEET THE BIT

The split lets you connect a single Bit to two others. If you place an input before the split, it will control the two outputs at once, like a single light sensor controlling two motors. The flexible wires on the split also allow you to place your Bits farther apart and position them how you like.

SAMPLE CIRCUIT



HOW IT WORKS

The split divides the incoming signal and sends it to the two output bitSnaps.

MINI-CHALLENGE

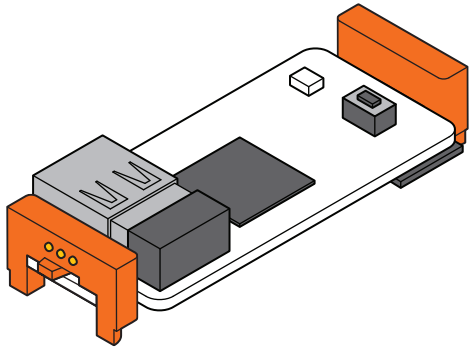
Can you invent a circuit with two parts that move at the same time?

REAL WORLD ANALOGIES

POWER STRIP

HEADPHONES

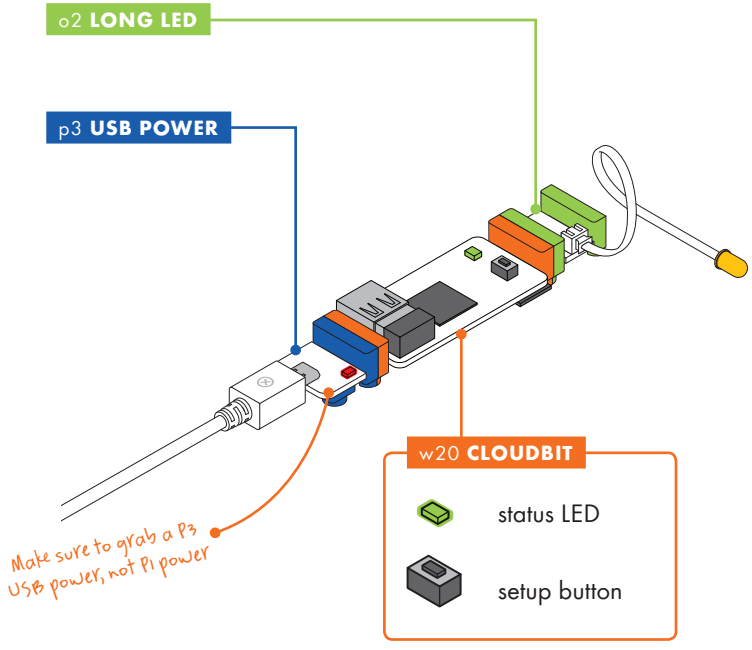
w20 CLOUDBIT™



MEET THE BIT

The cloudBit is the easiest way to create internet-connected devices. You can now snap the internet to anything! Retrofit your thermostat to control it remotely, or set up a sound-triggered alarm system that texts you alerts - the possibilities are endless. No programming, soldering or wiring required.

SAMPLE CIRCUIT



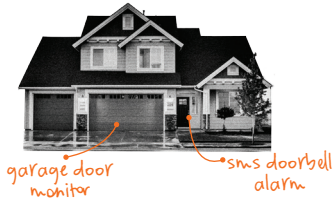
HOW IT WORKS

The cloudBit acts as an input by receiving signal from your littleBits circuit and sending it to the internet. This means you can make a smart doorbell that tweets at you when someone pushes a littleBits button, or a burglar alarm to send you a text message if someone activates the littleBits sound trigger. The cloudBit also acts as an output by sending signal from an event on the internet to your littleBits circuit. This would be like turning a motor to release a treat for your cat if a certain Instagram hashtag is used, or flashing an LED when you get an email from a VIP.

For setup information visit: littleBits.com/products/cloudBit

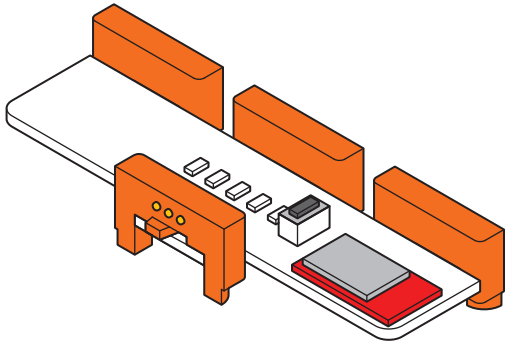
REAL WORLD ANALOGIES

COMPUTER



SMART HOME

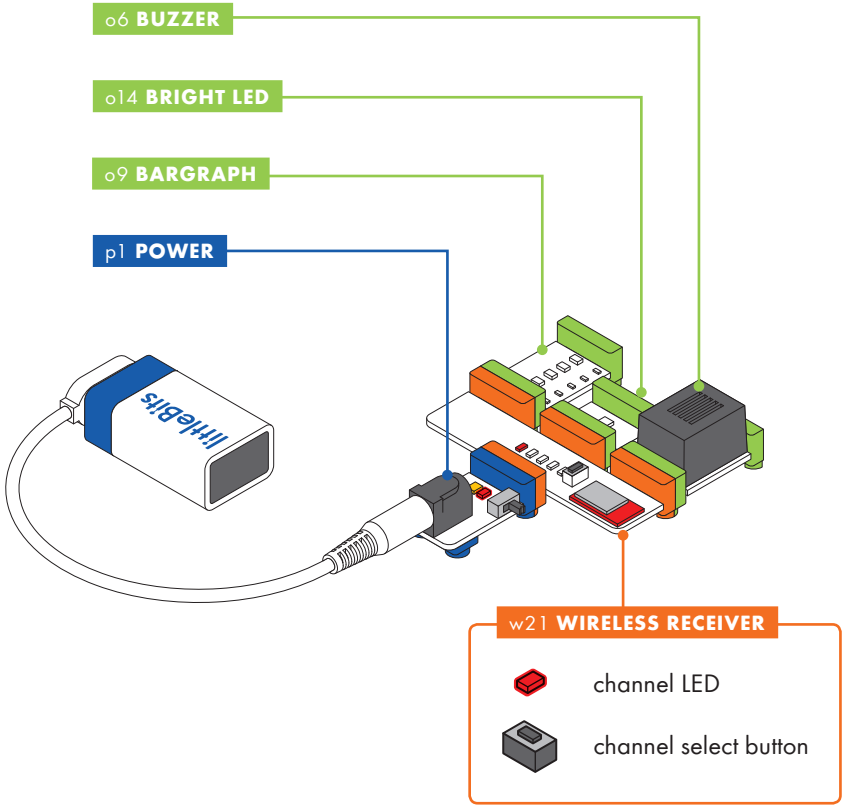
w21 WIRELESS RECEIVER



MEET THE BIT

You can control your Bits wirelessly with the inseparable wireless receiver & wireless transmitter pair. The wireless receiver decodes the information that's sent to it from the wireless transmitter and sends it out of the respective bitSnap to create an action (such as when your RC car moves in the direction you sent it in).

SAMPLE CIRCUIT



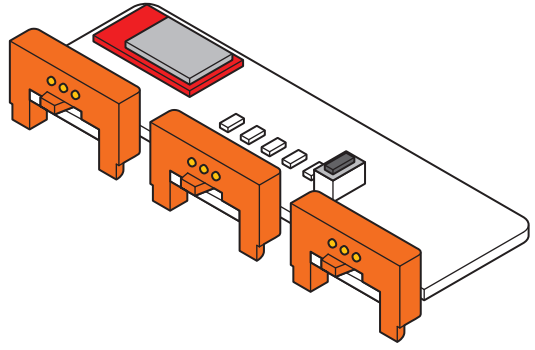
HOW IT WORKS

The wireless Bits are able to communicate on 5 transmission channels, like a walkie-talkie. They just need to be set to the same channel (labeled a, b, c, d, and e) in order to talk to each other. A single transmitter can send its signal to multiple receivers on the same transmission channel. However, multiple transmitters can't send their signal to the same receiver. The 5 transmission channels allow for up to 5 transmitter/receiver pairs to be used in the same vicinity, which can reach a distance of 100 feet indoors! Each output on the receiever must correspond with the input on the transmitter end.

REAL WORLD ANALOGIES

RADIO ANTENNA

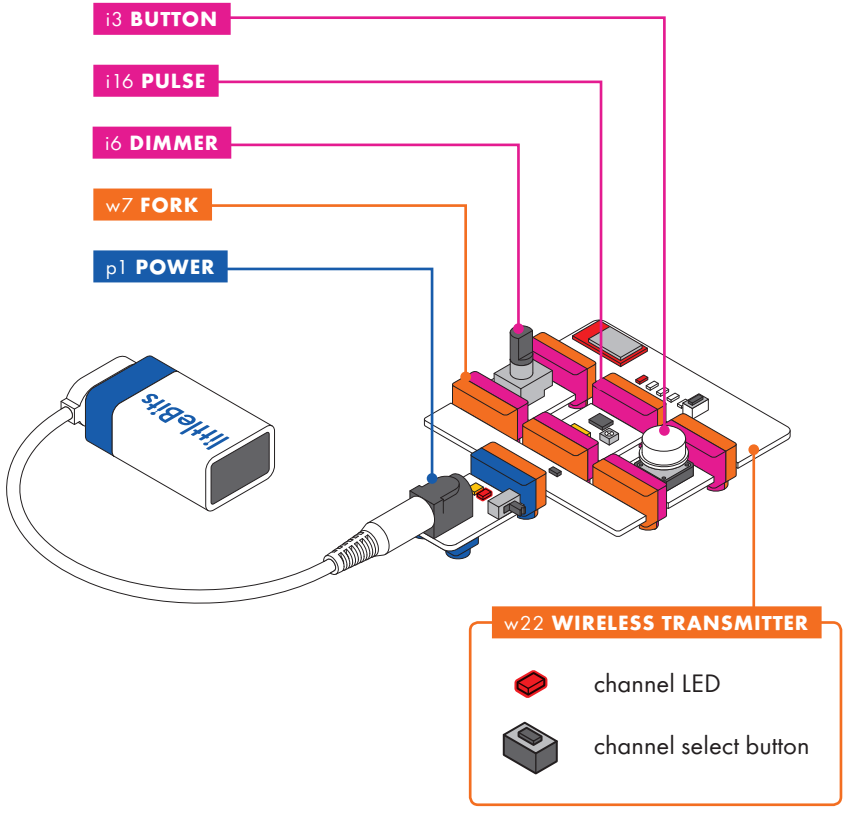
w22 WIRELESS TRANSMITTER



MEET THE BIT

You can control your Bits wirelessly with the inseparable wireless receiver & wireless transmitter pair. The wireless transmitter gathers and encodes information (such as where you want an RC car to move) to send to the receiver.

SAMPLE CIRCUIT



HOW IT WORKS

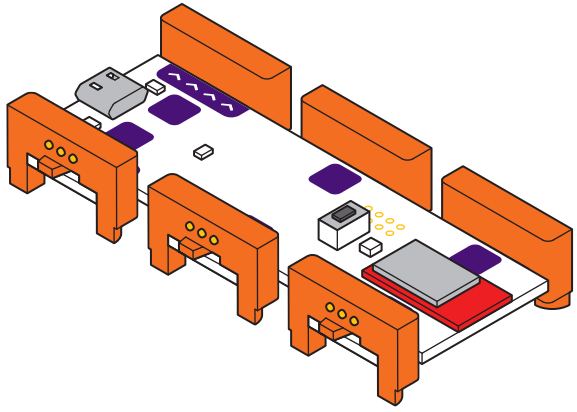
The wireless Bits are able to communicate on 5 transmission channels, like a walkie-talkie. They just need to be set to the same channel (labeled a, b, c, d, and e) in order to talk to each other. A single transmitter can send its signal to multiple receivers on the same transmission channel. However, multiple transmitters can't send their signal to the same receiver. The 5 transmission channels allow for up to 5 transmitter/receiver pairs to be used in the same vicinity, which can reach a distance of 100 feet indoors! Each input on the transmitter must correspond with the output on the reciever end.

REAL WORLD ANALOGIES

WALKIE-TALKIE

RADIO TOWER

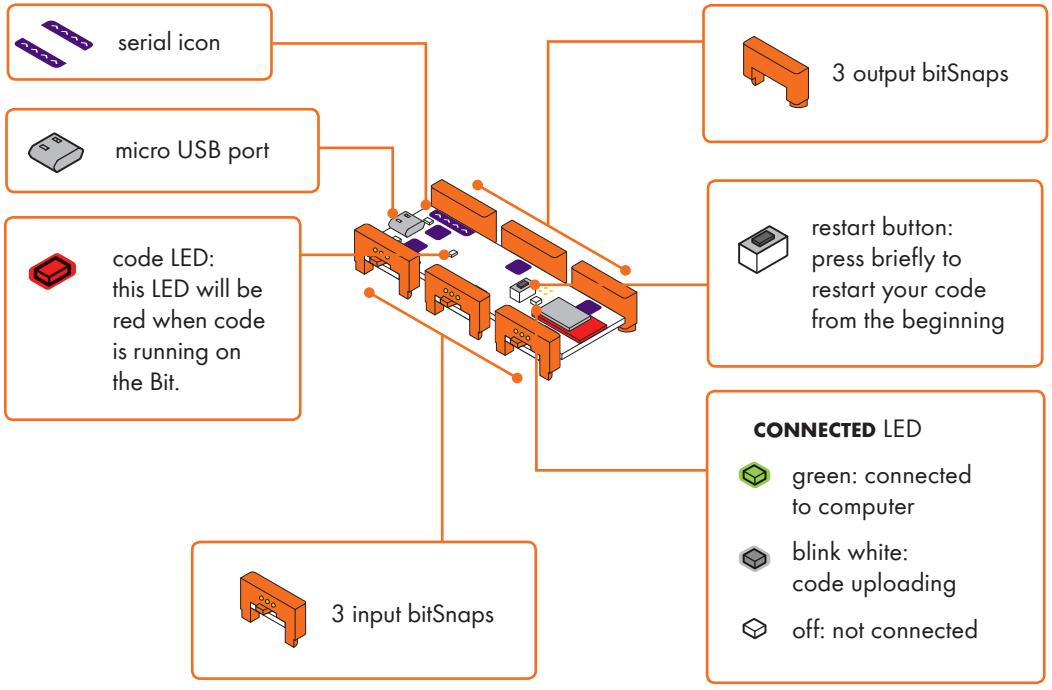
w26 CODEBIT™



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 program this Bit to create unique sounds, movements, and animations.

BIT BREAKDOWN



MINI-CHALLENGE

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

REAL WORLD ANALOGIES

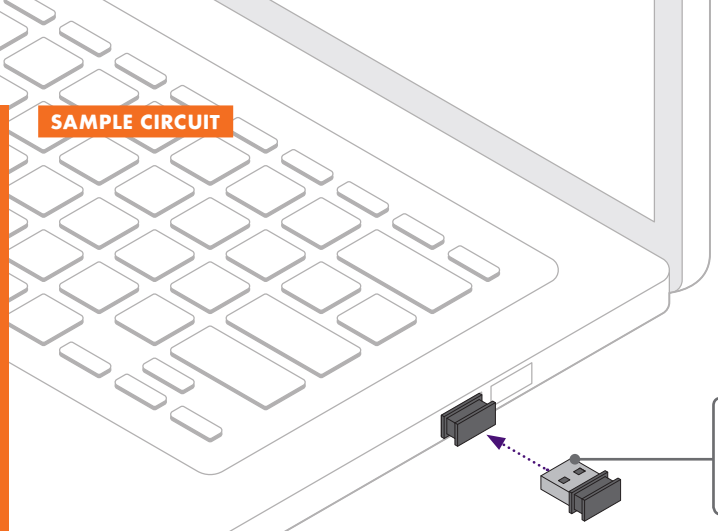
COMPUTER

BRAIN

AIR TRAFFIC CONTROL

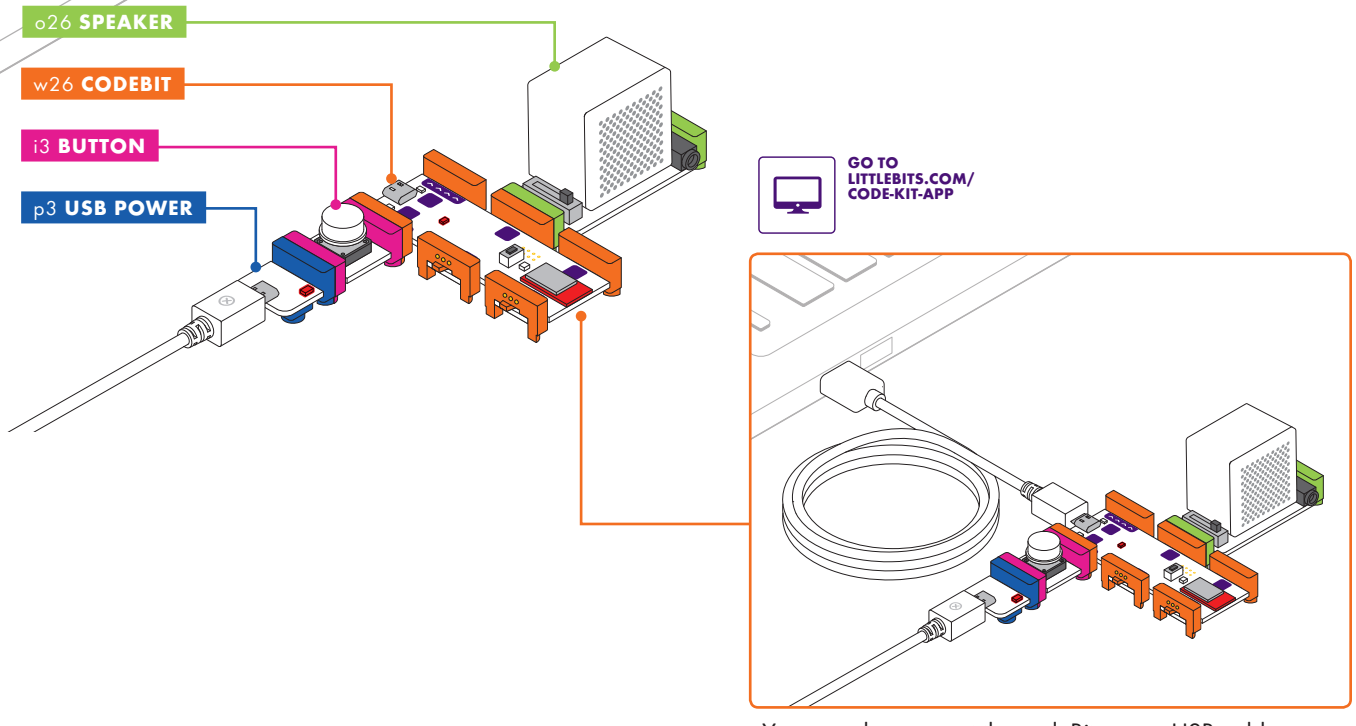
BAND CONDUCTOR

SAMPLE CIRCUIT



CODEBIT DONGLE

more on codeBit dongle on page 84



GO TO LITTLEBITS.COM/CODE-KIT-APP

You can also connect the codeBit over a USB cable instead of using the codeBit dongle.

HOW IT WORKS

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

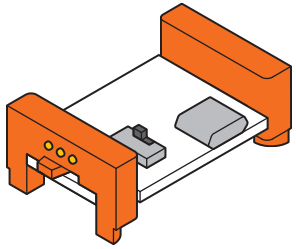
WHAT IS SERIAL?

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.

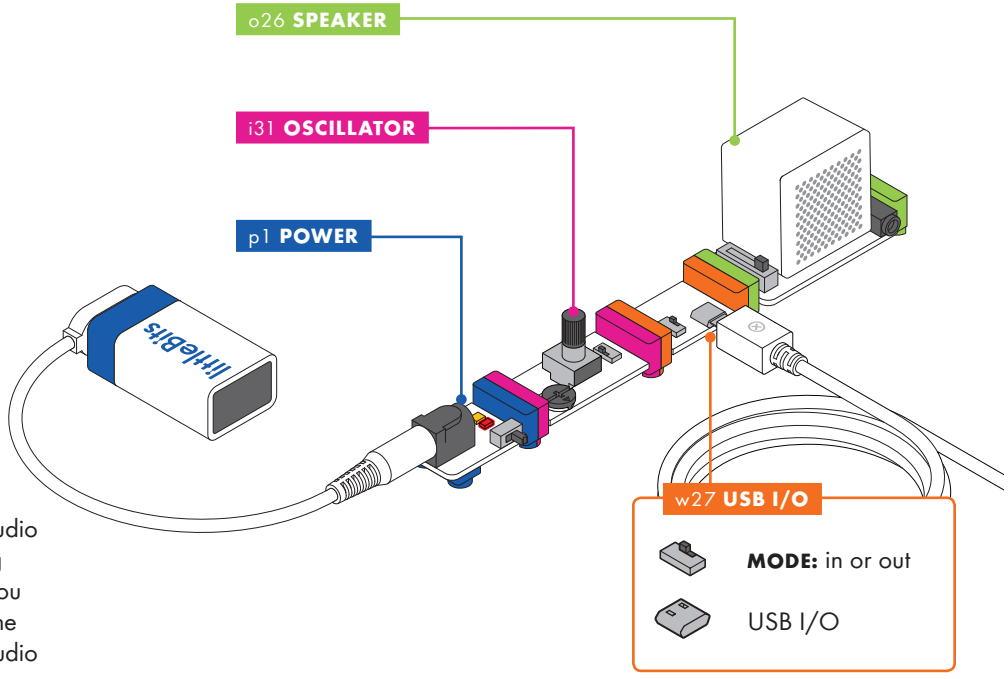
w27 **USB I/O**



MEET THE BIT

The USB I/O Bit allows you to send and receive digital audio and control voltages to and from a computer. When using in conjunction with a Digital Audio Workstation (DAW), you can record your sounds directly into a computer without the need of an external audio interface. You can also send audio from a computer into the littleBits system to manipulate it, for example with the filter and delay Bit.

SAMPLE CIRCUIT



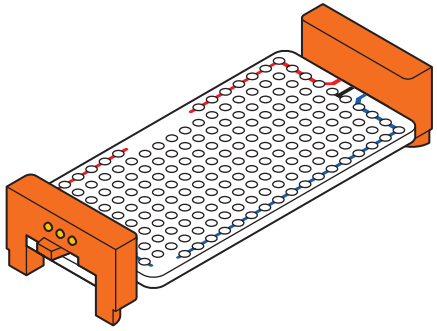
HOW IT WORKS

The USB I/O Bit features 44.1K/12-bit audio conversion for high quality sound. It is also "DC coupled," which means that in addition to sending and receiving signals like music, it can also send and receive control voltages. Sending and receiving control voltages allows you to use software programs like Max, PD, and CV Toolkit with the USB I/O Bit to control other Bits. You can also use Bits to create hardware controls for your software. The USB I/O Bit will appear to your computer as an audio interface and its input and output routing can be selected as with any other audio interface. The Bit can only be selected as either an input or output device at a given time but multiple USB I/O Bits can be used at once.

REAL WORLD ANALOGIES

VOICE RECORDER

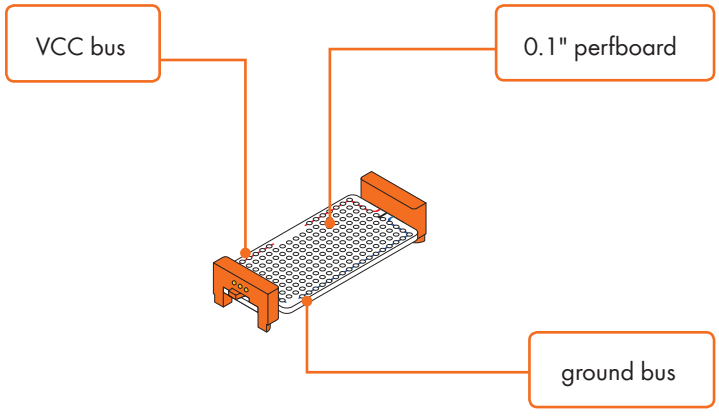
w29 **PERF**



MEET THE BIT

The perf Bit is a quick and easy way to prototype a circuit for a brand-new Bit. It's a standard 0.1" perfboard with a VCC and ground bus connected to our bitSnap connectors.

BIT BREAKDOWN



HOW IT WORKS

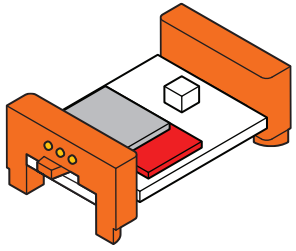
Use the perf Bit to quickly prototype with different sensors and components by soldering directly to the Bit itself.

REAL WORLD ANALOGIES

BREADBOARD

WATER PIPES

w30 LITTLEBITS BLUETOOTH® LOW ENERGY BIT



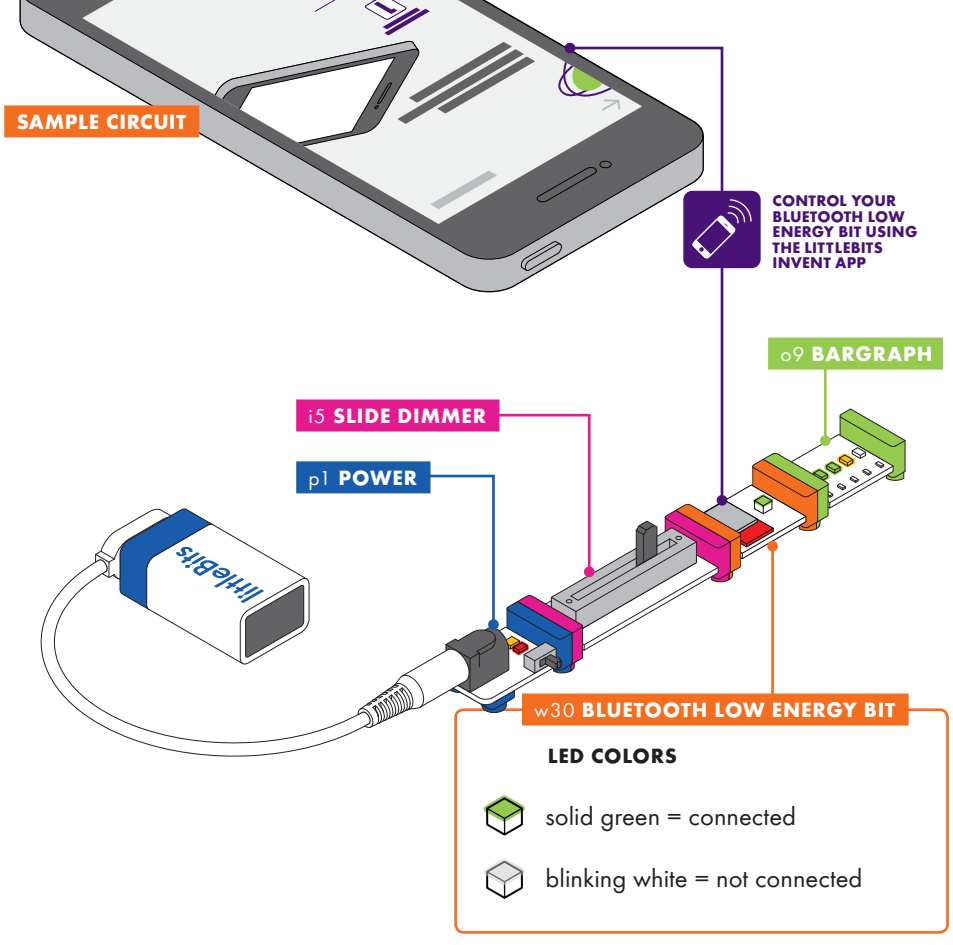
MEET THE BIT

The littleBits Bluetooth Low Energy Bit (marked "BLE" on your Bit) is the easiest way to control your inventions wirelessly, from any smart device (like a phone or tablet). All you need is the littleBits Invent app and this Bit to move motors on wireless vehicles, or trigger buzzers for pranks. You can also use your circuit to control functions on your device, like triggering the camera to take a picture.

MINI-CHALLENGE

Can you invent a prank using the Bluetooth Low Energy Bit in your circuit?

SAMPLE CIRCUIT



HOW IT WORKS

The Bluetooth Low Energy Bit can send and receive a signal from your smart device using Bluetooth Low Energy wireless technology, up to a distance of about 80ft (25m) indoors. To use the Bluetooth Low Energy Bit, you first need to connect it to your smart device (smartphone, tablet) through the littleBits Invent app.

Check your device's compatibility at littleBits.com/app.

REAL WORLD ANALOGIES

WIRELESS MOUSE & KEYBOARD

FITNESS TRACKERS

USING THE BLUETOOTH LOW ENERGY BIT WITH YOUR DEVICE

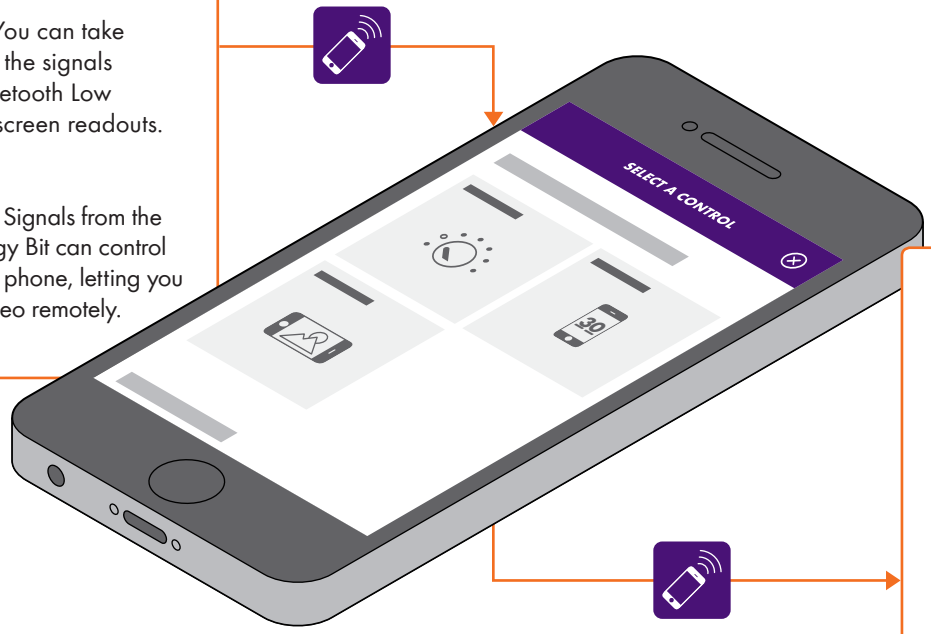
Once connected, you can use the app's controls to send signal information from your device to your circuit and vice versa. You can also create custom control dashboards for your inventions. Controls range from simple buttons and dimmers to accelerometers. You can communicate with up to two Bluetooth Low Energy Bits at the same time.

TO GET STARTED WITH THE BLUETOOTH LOW ENERGY BIT, download the littleBits Invent app and add your Pro Library to your profile.

USING THE BLUETOOTH LOW ENERGY BIT TO CONTROL YOUR DEVICE

DISPLAY SCREEN: You can take remote readings of the signals going into your Bluetooth Low Energy Bit with on-screen readouts.

PHOTOS & VIDEO: Signals from the Bluetooth Low Energy Bit can control the camera on your phone, letting you take photos and video remotely.



USING YOUR DEVICE TO CONTROL YOUR BLUETOOTH LOW ENERGY BIT

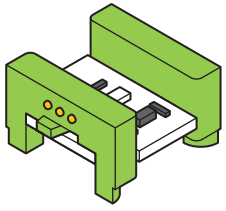
TOUCH SCREEN: Send signals to your Bluetooth Low Energy Bit with on-screen buttons, sliders, and other controls.

MOVEMENT: The accelerometer and gyroscope in your device sense movement. The signals from these sensors can be sent to your Bluetooth Low Energy Bit to control your circuits.

WIRELESS: The antenna sends and receives signals between your device and the Bluetooth Low Energy Bit.

*App may differ from screenshots shown.

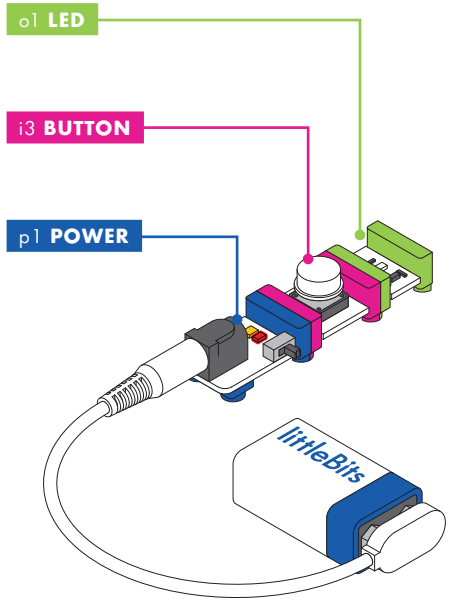
o1 LED



MEET THE BIT

The LED (or "Light-Emitting Diode") Bit is a very small board that shines a nice green light. It's our go-to when you want to light something up.

SAMPLE CIRCUIT



HOW IT WORKS

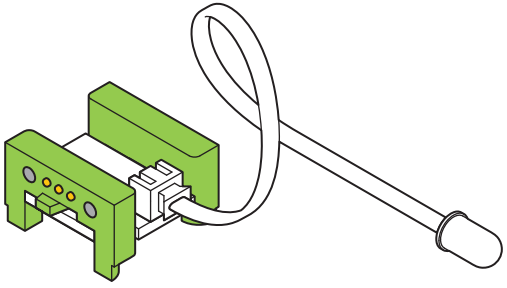
This Bit uses a light-emiting diode (LED) to turn electricity into light. The more signal you send the Bit, the brighter the light shines.

REAL WORLD ANALOGIES

CAMERA FLASH

LED HEADLAMP

o2 LONG LED



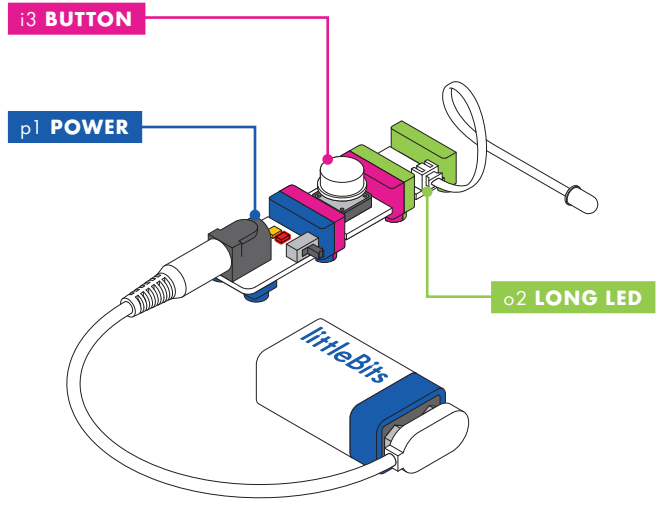
MEET THE BIT

The long LED is a flexible lighting option. We call it the "long" LED because the light is connected to the board by a cable, which lets you put the light in some interesting places.

MINI-CHALLENGE

Can you invent a new wearable accessory using the long LED?

SAMPLE CIRCUIT



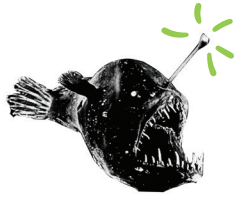
HOW IT WORKS

This Bit uses a light-emmiting diode (LED) to turn electricity into light. The more signal you send the Bit, the brighter the light shines.

REAL WORLD ANALOGIES

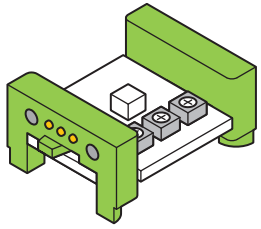
FLASHLIGHT

STREET LAMP



ANGLERFISH

o3 RGB LED



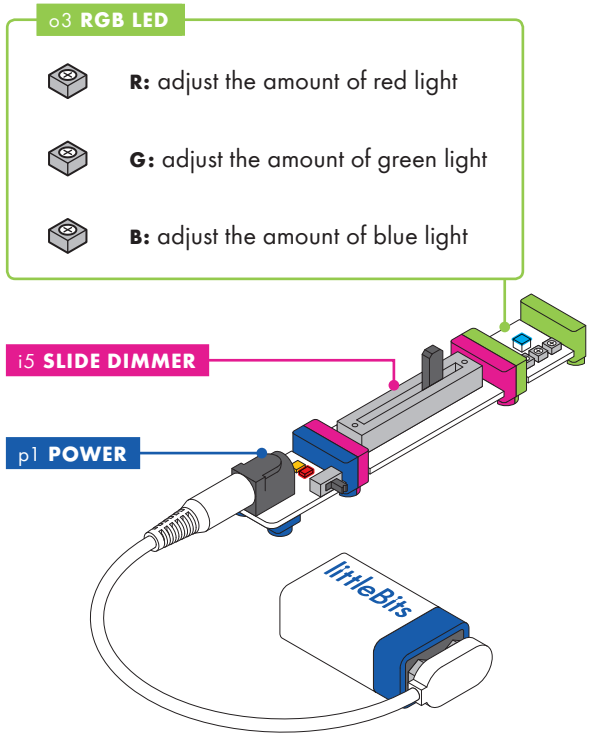
MEET THE BIT

The RGB LED is a light with adjustable color. You can use the purple screwdriver to turn the dials and create your own custom color mix of red, green, and blue.

MINI-CHALLENGE

Can you invent a flashlight that uses your favorite color?

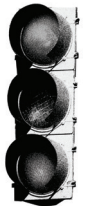
SAMPLE CIRCUIT



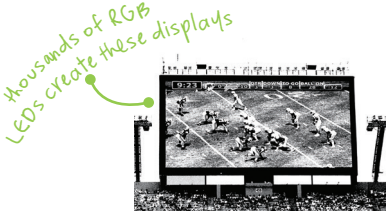
HOW IT WORKS

The RGB LED is actually three very small lights (a red, a blue, and a green light). Turning the dials changes the brightness of each light. The colors from these lights mix together to create every color in the rainbow.

REAL WORLD ANALOGIES



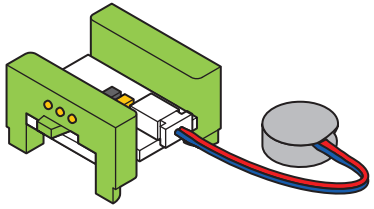
TRAFFIC LIGHT



JUMBOTRON

DECORATIVE LIGHTS

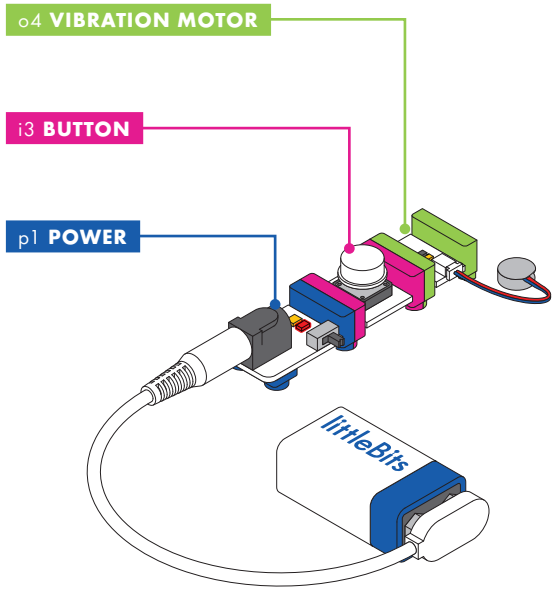
o4 VIBRATION MOTOR



MEET THE BIT

The vibration motor is very similar to the device that makes your cellphone shake when you get a text. With this Bit, you can make anything vibrate and buzz! This Bit also includes the vibeSnap– an accessory that helps you attach stuff - like paper, tin foil, or a pipecleaner - to the motor.

SAMPLE CIRCUIT



HOW IT WORKS

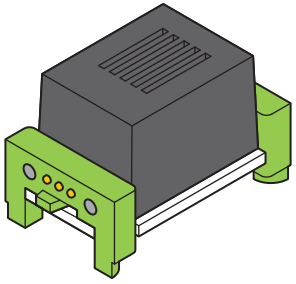
Inside the vibration motor are tiny discs that offset weight and are responsible for the random shaking. As you increase the signal to the vibration motor, it begins to vibrate and buzz.

REAL WORLD ANALOGIES

CELL PHONE BUZZER

ELECTRIC TOOTHBRUSH

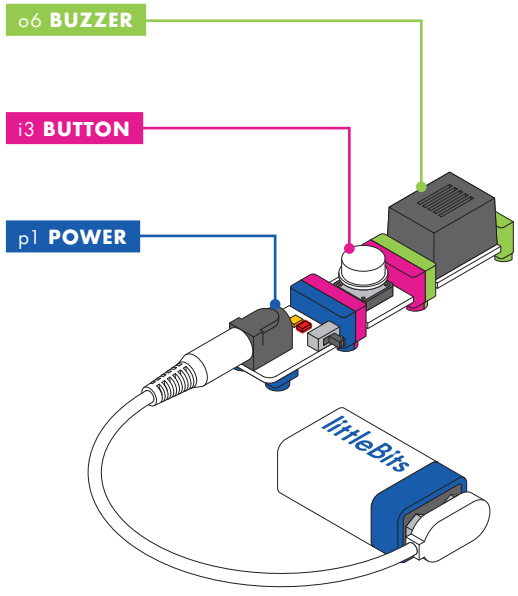
o6 BUZZER



MEET THE BIT

The buzzer makes a sound no one can ignore. It's great at sounding the alarm or annoying those nearby.

SAMPLE CIRCUIT



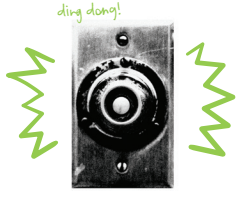
HOW IT WORKS

The buzzer converts the electrical signal it receives into a vibration, which creates a buzzing sound. The higher the signal it receives, the more intense the vibration, and the louder the sound is.

MINI-CHALLENGE

Can you invent a way to communicate with your friends using the buzzer?

REAL WORLD ANALOGIES

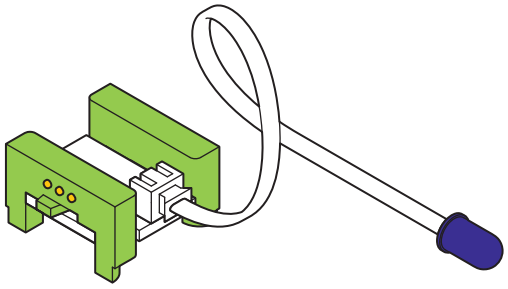


DOORBELL

CAR ALARM

WASHING MACHINE

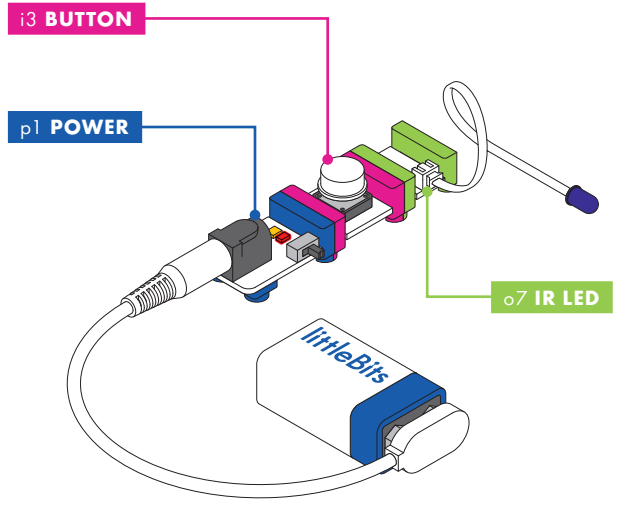
o7 IR LED



MEET THE BIT

The IR LED (or infrared light-emitting diode) Bit sends out light with longer wavelengths than visible light, similar to the light in your remote control. It's invisible to the eye, but many digital cameras can see it. Try using it to activate the light sensor or remote trigger.

SAMPLE CIRCUIT



HOW IT WORKS

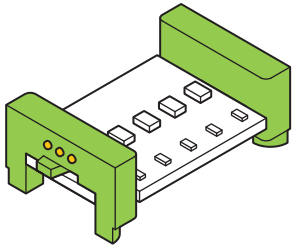
The IR LED emits light waves just beyond the visible spectrum of light. When the signal is increased, the IR LED begins to shine in the infrared spectrum. Bits such as the remote trigger and light sensor are sensitive to this Bit, making them the perfect pair.

REAL WORLD ANALOGIES

TV REMOTE

BLACK LIGHT

o9 BARGRAPH



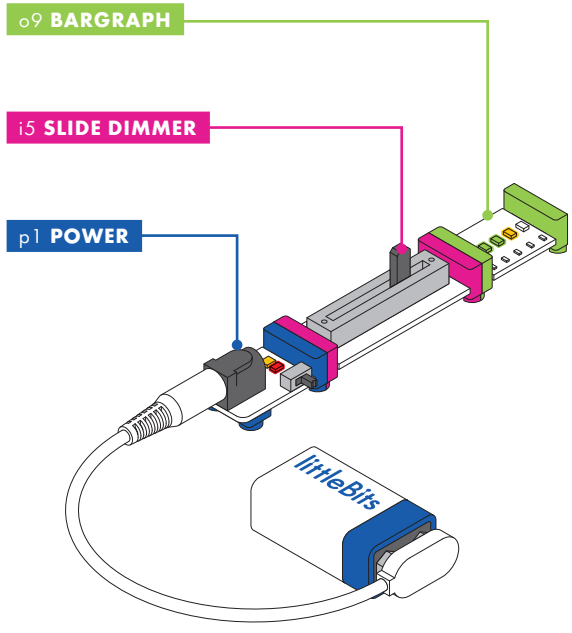
MEET THE BIT

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?

SAMPLE CIRCUIT



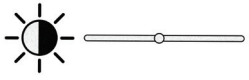
HOW IT WORKS

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.

REAL WORLD ANALOGIES

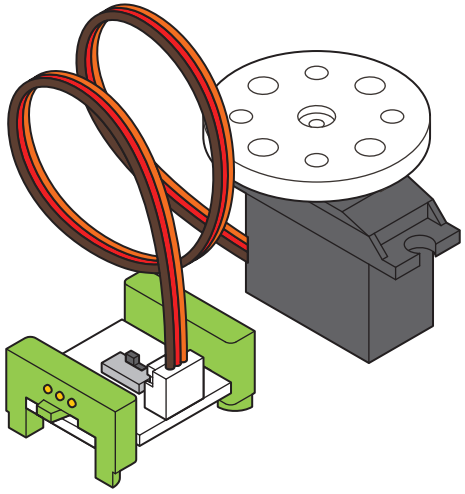
MUSIC VISUALIZER

TV VOLUME



PHONE SCREEN BRIGHTNESS

o11 SERVO



MEET THE BIT

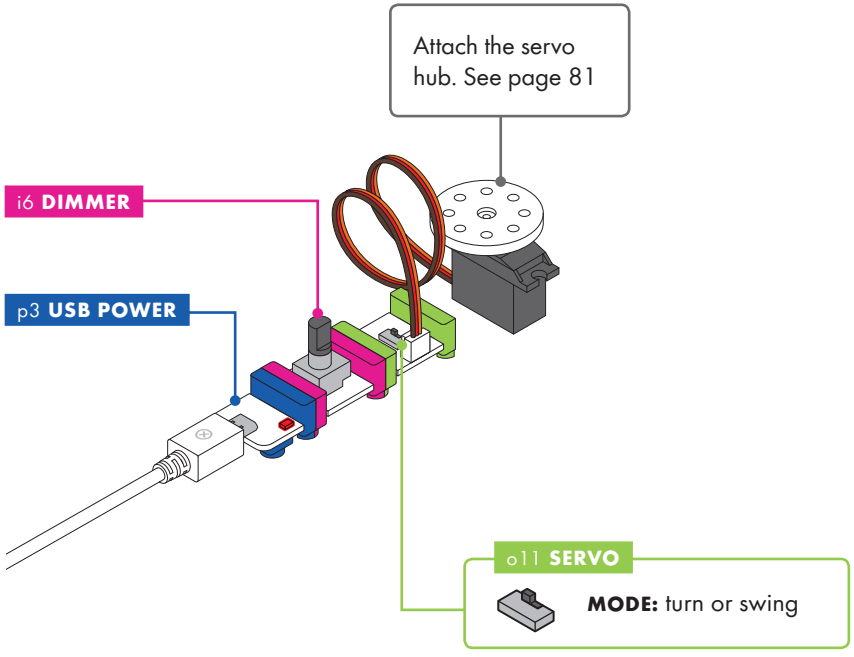
The servo is a motor that can swing back and forth or be turned to a specific position.

There are a few accessories you can use with the servo (like the mechanical arm). You can find out how to use those on pages 81 and 82.

MINI-CHALLENGE

Can you invent something that uses the servo to clean up your desk?

SAMPLE CIRCUIT



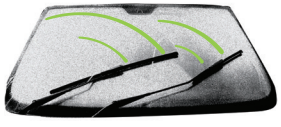
HOW IT WORKS

The servo has two modes. In **TURN** mode, the input from other Bits determines the position of the hub – try using a slide 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.

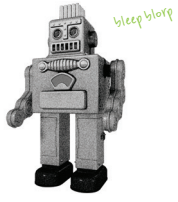
The servo's range of motion is about 110 degrees.

REAL WORLD ANALOGIES

TRUCK CRANE

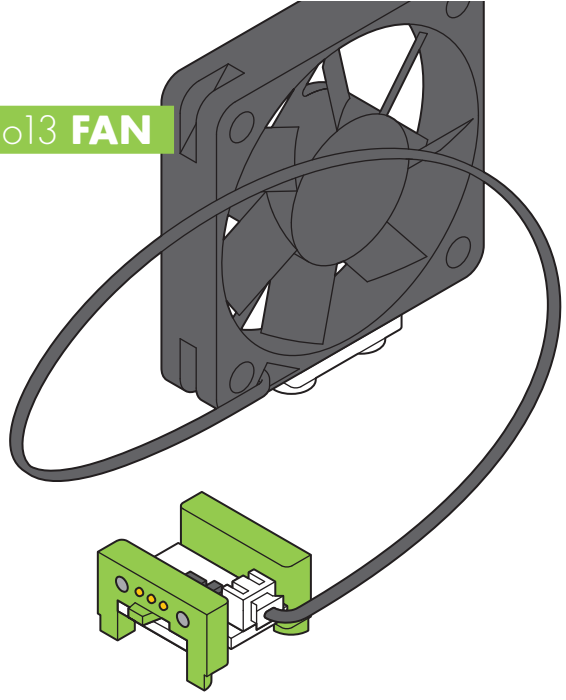


WINDSHIELD WIPERS



ROBOT

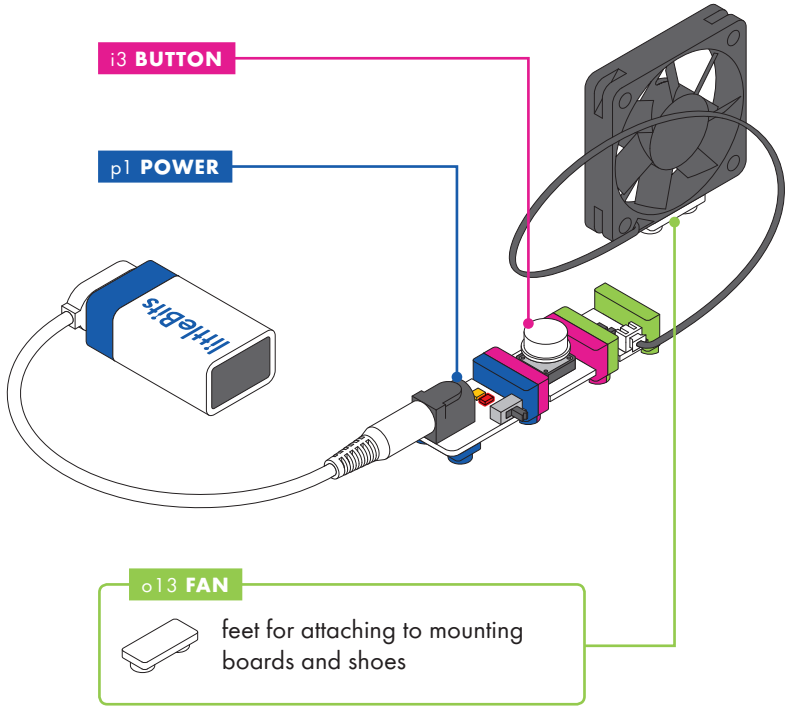
o13 FAN



MEET THE BIT

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.

SAMPLE CIRCUIT



HOW IT WORKS

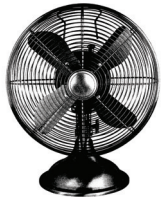
Inside the fan is a tiny motor. When it receives a signal, it spins. The more signal it receives, the faster it spins.

MINI-CHALLENGE

Can you invent something that uses the fan to move an object across the table?

REAL WORLD ANALOGIES

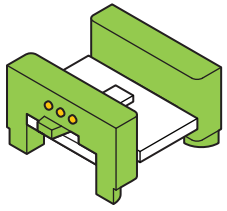
LEAF BLOWER



PERSONAL FAN

AIRPLANE PROPELLER

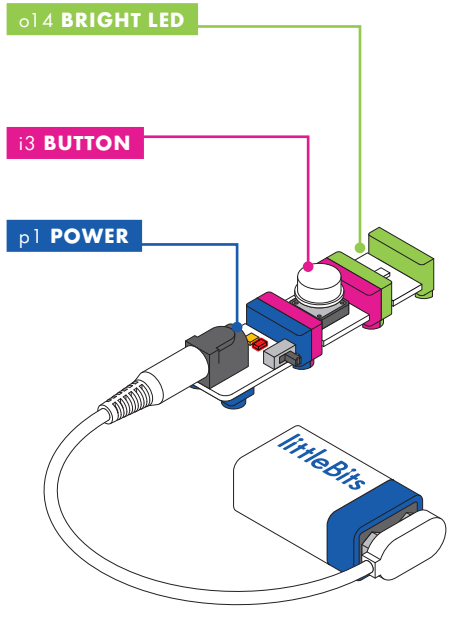
o14 BRIGHT LED



MEET THE BIT

The bright LED (or "Light-Emitting Diode") is a small Bit that puts out a big light. Just like our other LED Bits, it's a great way to shed some light on your creations. Choose the bright LED when you want a LOT of bright white light.

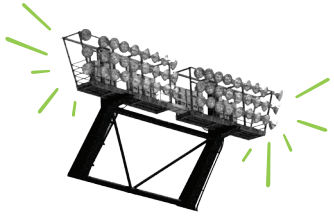
SAMPLE CIRCUIT



HOW IT WORKS

The bright LED features a half watt super bright LED that responds to incoming voltages linearly. The more voltage it receives, the brighter it gets.

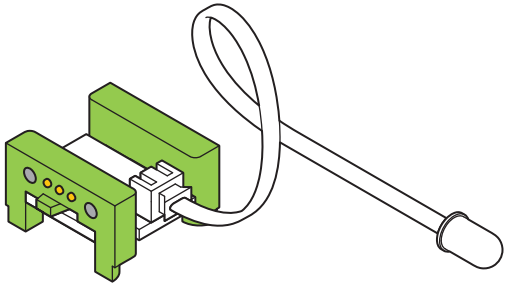
REAL WORLD ANALOGIES



STADIUM LIGHTS

LIGHTHOUSE

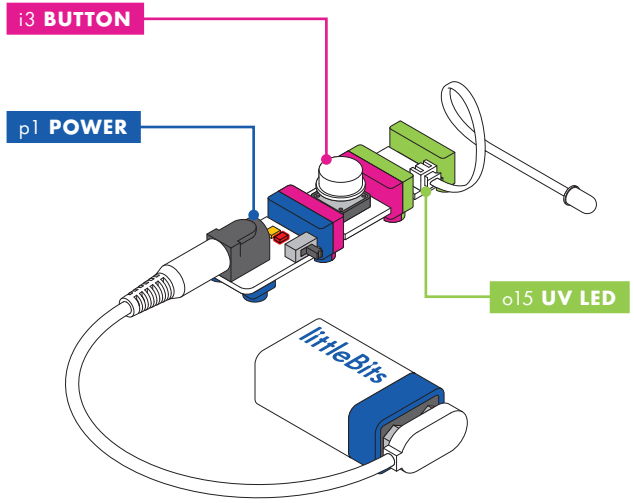
o15 **UV LED**



MEET THE BIT

The UV LED (or "Ultraviolet Light-Emitting Diode") Bit 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.

SAMPLE CIRCUIT

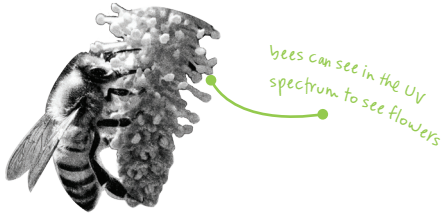


HOW IT WORKS

The UV LED emits an ultraviolet light, at 400nm in the UVA spectrum, which appears purple to our eyes. As the signal is increased, the UV LED begins to light up. The UV LED can make special inks, such as invisible ink, appear visible.

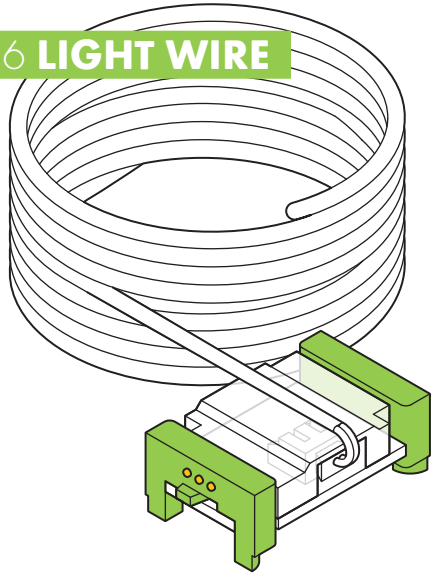
REAL WORLD ANALOGIES

DETECTIVE WORK



BEE VISION

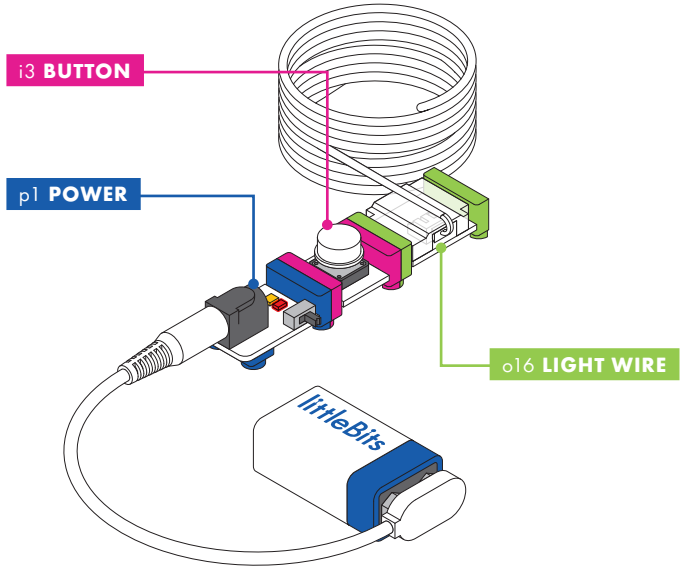
o16 LIGHT WIRE



MEET THE BIT

The light wire Bit is almost 4 feet long and its entire length glows a soft blue. It's made of special stuff called "electroluminescent wire," which is great to form into glowing shapes. It's best to use in the dark. We like to use it for wearable accessories when we go to parties!

SAMPLE CIRCUIT



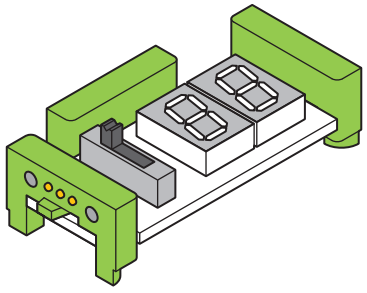
HOW IT WORKS

The light wire Bit uses phosphor as a material to emit light. When the signal is increased, the light wire begins to light up.

REAL WORLD ANALOGIES

GLOW IN THE DARK SAFETY GEAR

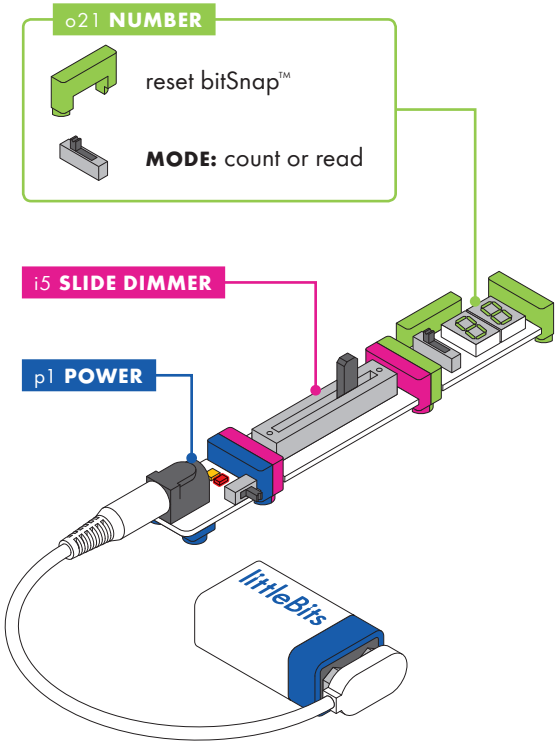
o21 NUMBER



MEET THE BIT

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.

SAMPLE CIRCUIT



HOW IT WORKS

The number Bit displays information about the signal it's receiving.

In **COUNT** mode, the Bit can count up or down when the Bit receives an input signal over 2.5 volts. It can be reset by receiving a signal through the reset bitSnap.

In **READ** mode, the Bit displays information about the signal it's receiving in either volts ranging from 0.0–5.0 or values ranging from 0–99.

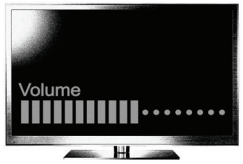
The signal leaving the Bit will always match the number being displayed, even in **COUNT** mode. For example, if you count up to 38, the signal leaving the Bit will be 38% of full power.

MINI-CHALLENGE

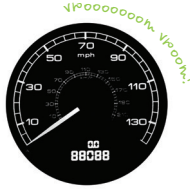
Can you invent a game that uses an automatic score counter?

REAL WORLD ANALOGIES

SCOREBOARD



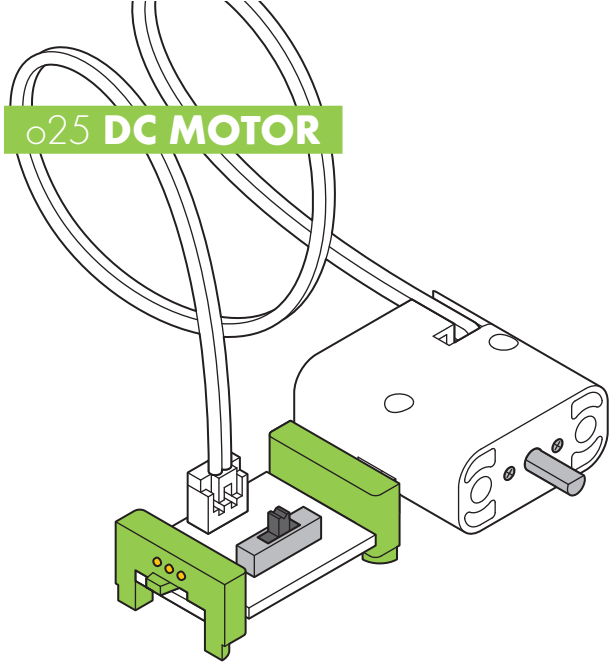
VOLUME INDICATOR ON TV



SPEEDOMETER

PEOPLE COUNTER

o25 DC MOTOR

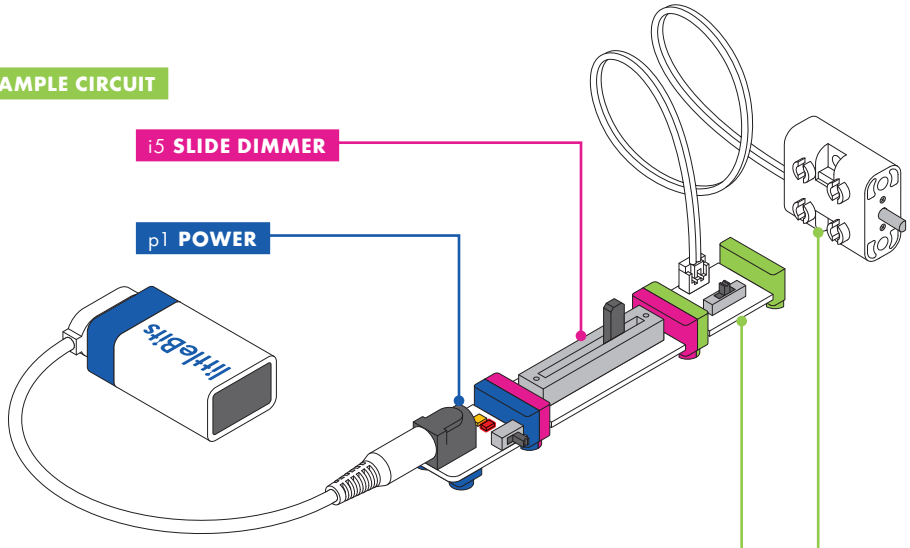


MEET THE BIT

Use the motor to spin, turn, twist, and roll.

There are a few accessories you can use with the DC motor (like wheels). You can find out how to use those on page 82.

SAMPLE CIRCUIT



o25 DC MOTOR

MODE: CW (clockwise), VAR (variable mode), and CCW (counterclockwise)

can be mounted to other materials with included #6 screws

feet for attaching to mounting boards or shoes

HOW IT WORKS

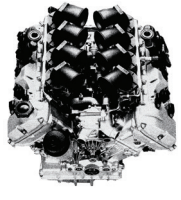
The DC (or "direct current") motor rotates a shaft when it receives a signal. The more signal it receives, the faster the motor will spin.

A switch on the board lets you choose which direction the motor spins. **CW** spins clockwise and **CCW** spins counterclockwise. When the switch is in **VAR** (variable) mode, the amount of signal the motor receives from previous Bits allows you to control the speed and direction (clockwise or counterclockwise) of its motion. In this mode, using an input like a slide dimmer makes steering easy!

MINI-CHALLENGE

Can you invent something using the DC motor that travels across the table?

REAL WORLD ANALOGIES

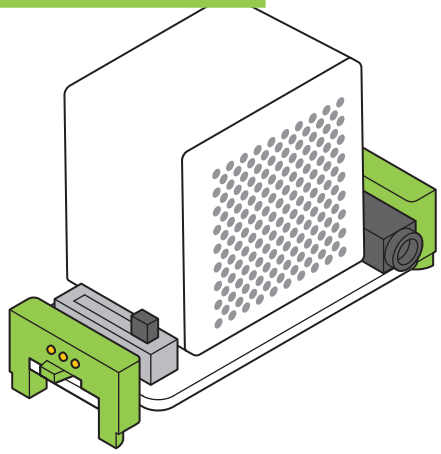


CAR ENGINE

DRILL

FERRIS WHEEL

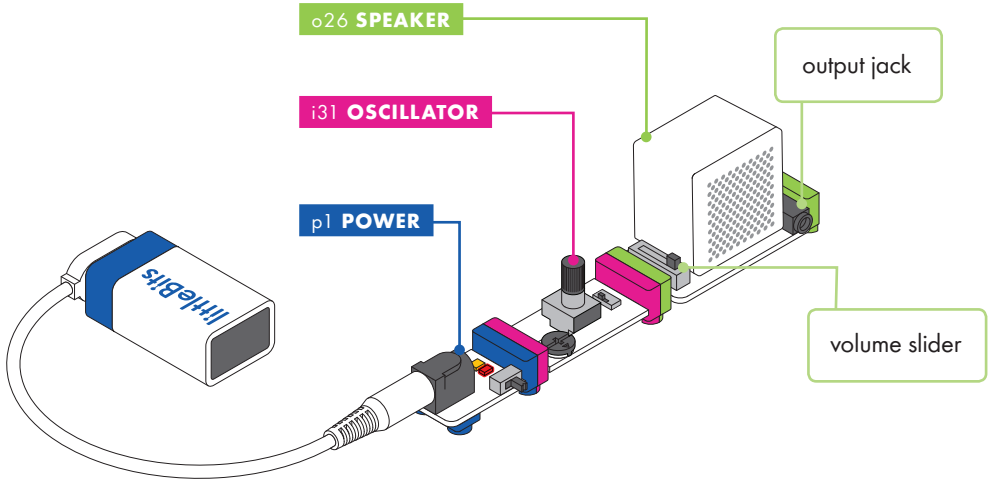
o26 SPEAKER



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.

SAMPLE CIRCUIT



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.

MINI-CHALLENGE

What is the strangest sound that you can invent?

REAL WORLD ANALOGIES

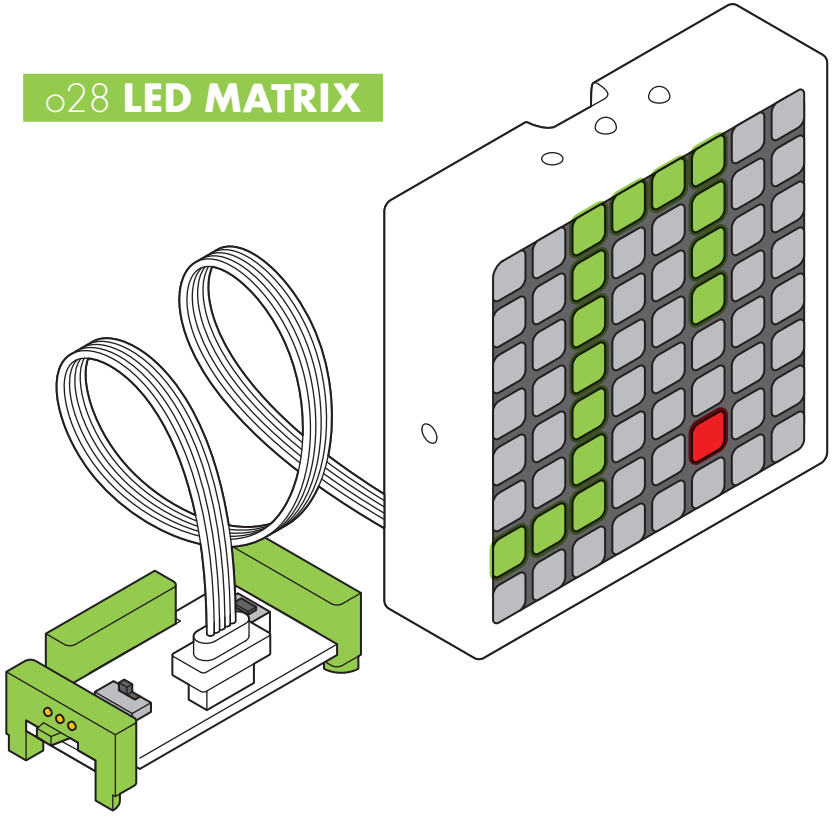
VOCAL CORDS

LOUDSPEAKER

GUITAR AMP

PHONE SPEAKER

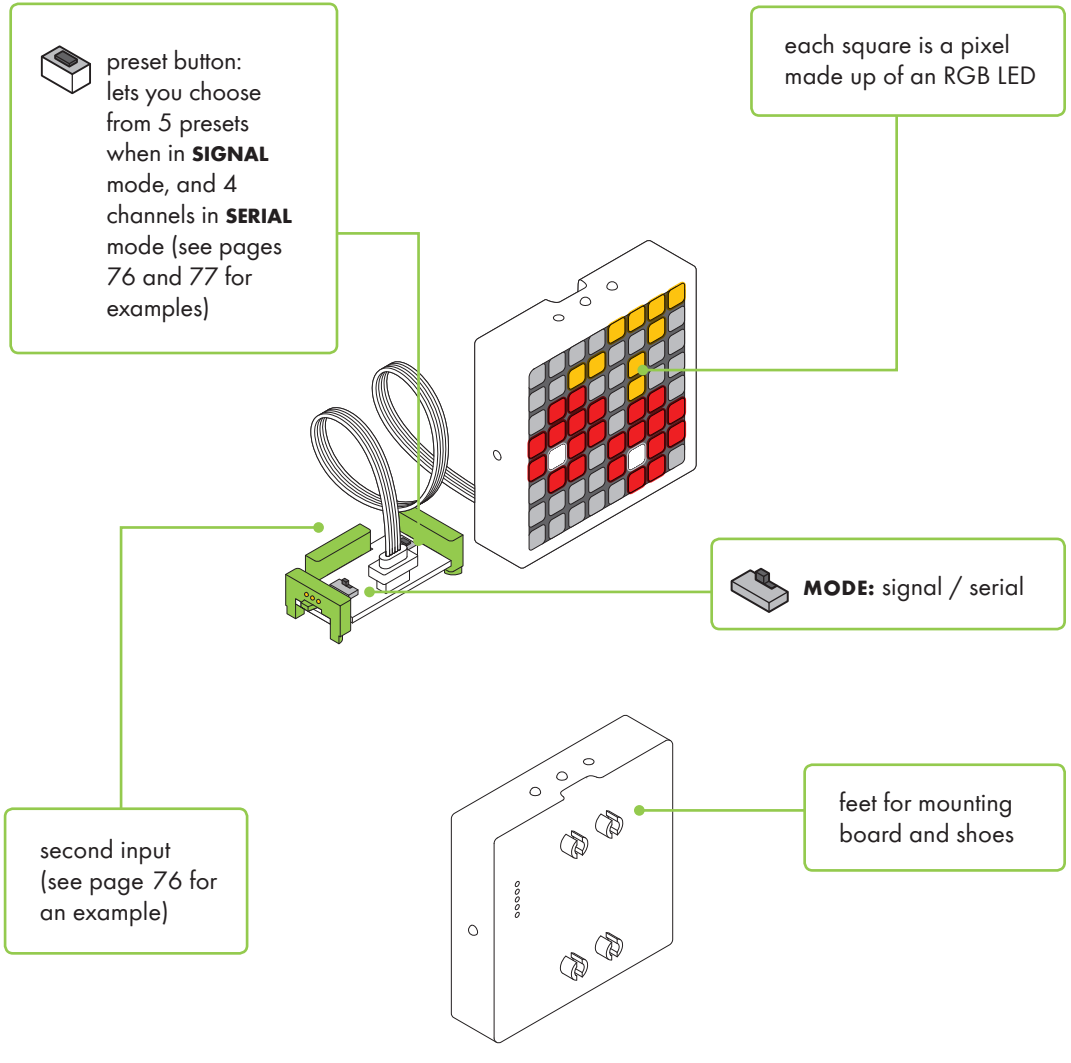
o28 LED MATRIX



MEET THE BIT

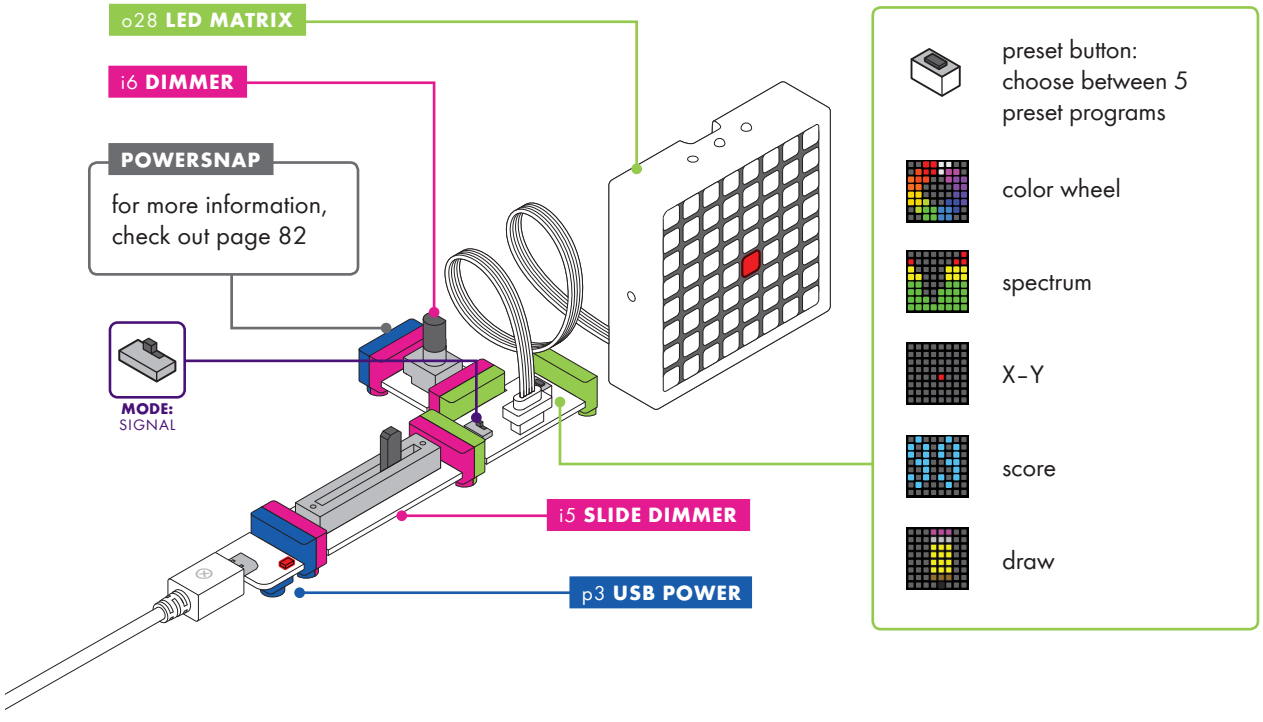
The LED matrix is a colorful display that you can control using code or other Bits. Set it to **SERIAL** mode to program your own graphics, or switch it to **SIGNAL** mode to play with the preset programs.

BIT BREAK DOWN



SAMPLE CIRCUIT #1

SIGNAL MODE



HOW IT WORKS

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

MINI-CHALLENGE

How many ways can you display a rainbow?

REAL WORLD ANALOGIES

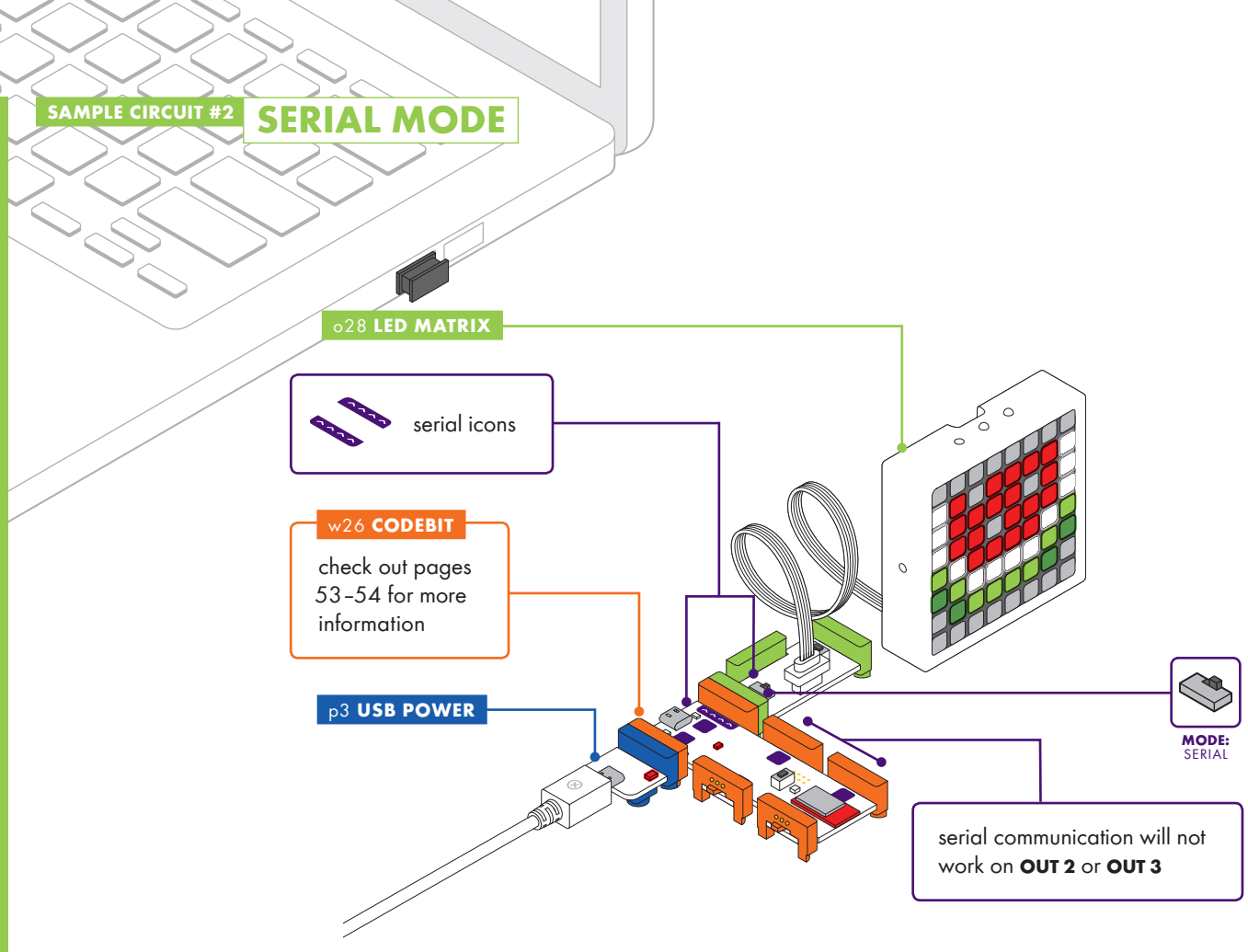
SCROLLING SIGN BOARDS

SCOREBOARD

TV SCREEN

SAMPLE CIRCUIT #2

SERIAL MODE



HOW IT WORKS

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?

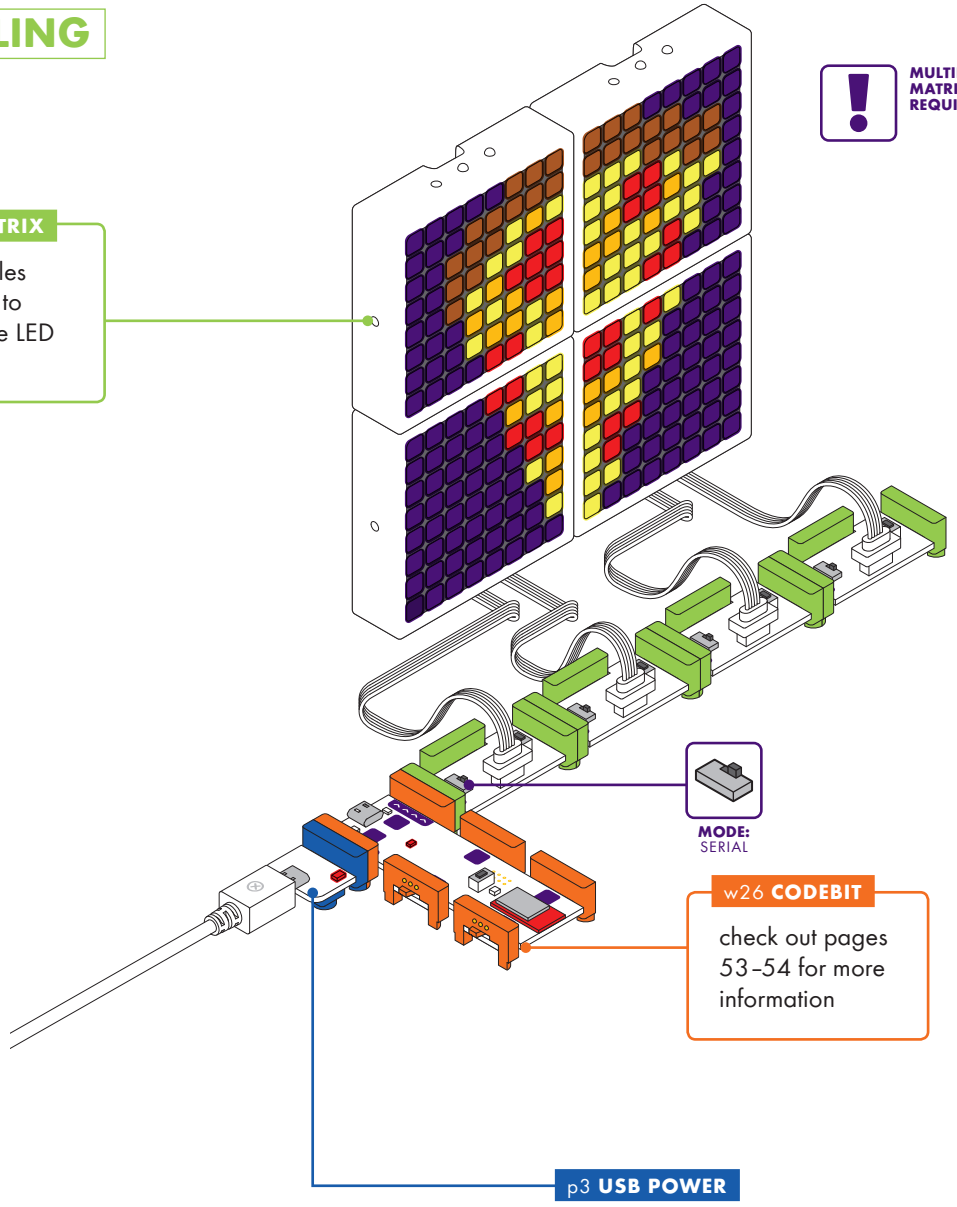
Serial communication is a way to send complex information between computers and other devices. Serial communication is made up of a series of 'on' and 'off' signals.

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.

SAMPLE CIRCUIT #3

TILING



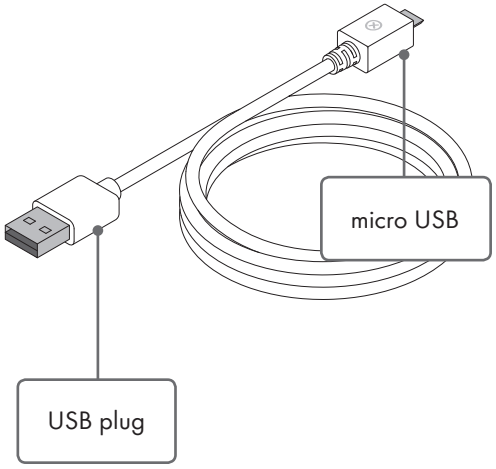
HOW IT WORKS

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

a2 USB CABLE



MEET THE ACCESSORY

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.

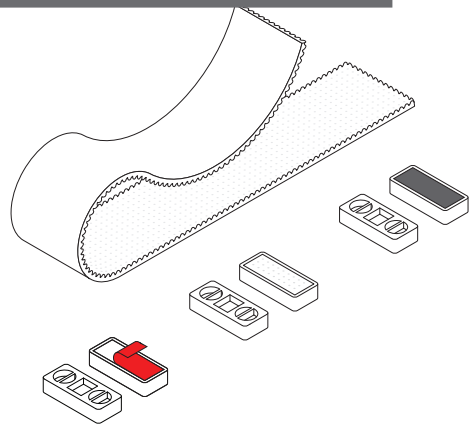
HOW IT WORKS

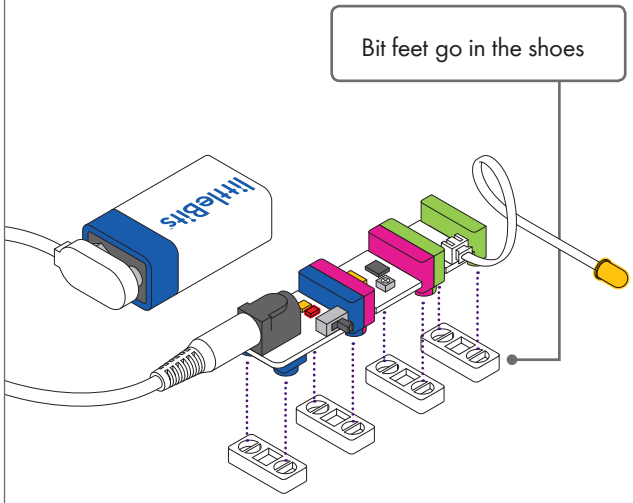
The cable acts like a bridge between the power source and what you're trying to turn on or charge. If you connect the USB plug to a power source, and the micro USB to the USB power Bit or rechargeable battery; power will flow from the source to the Bit or battery.

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.

a5 MAGNET SHOES
a6 HOOK & LOOP SHOES
a7 ADHESIVE SHOES





MEET THE ACCESSORY

Shoes slip onto your Bits' feet and hold your circuit together. On the bottom of your shoes you'll find magnets, hook & loops, or red adhesive backing you can peel off, which are great for securing your circuits to different surfaces.

HOW IT WORKS

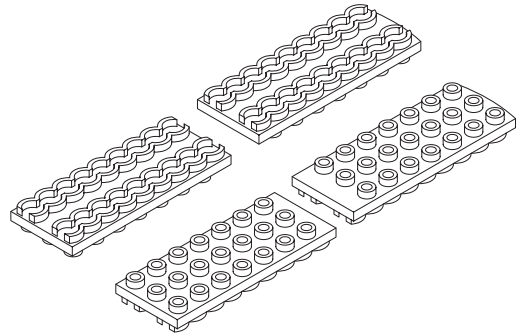
First, snap together your littleBits circuit. Then press the feet of your Bits into the holes of the shoes and place it on your chosen surface.

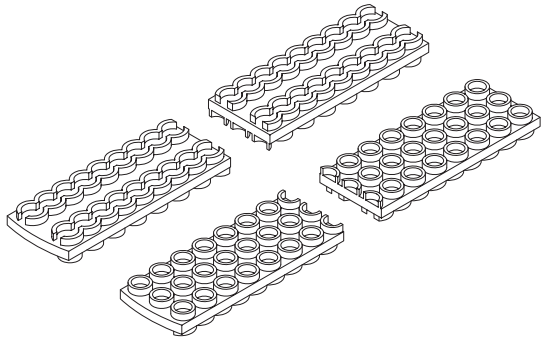
Magnet shoes allow you to adhere your circuit to any magnetic surface. Try your refrigerator or your locker!

Hook & loop shoes come with an adhesive-backed hook & loop strip. The strip can be affixed to any flexible surface.

Adhesive shoes can be secured onto any surface. Just peel the adhesive backing off, and stick it on.

a8 **BRICK ADAPTER**





MEET THE ACCESSORY

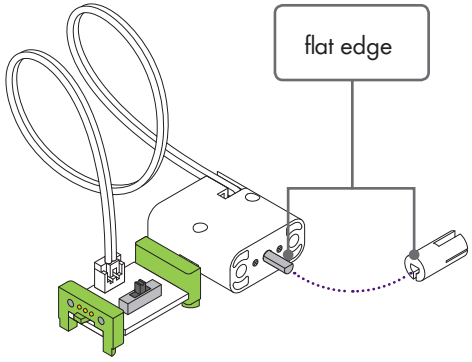
The brick adapter enables you to easily snap your Bits to LEGO® bricks. Each pack comes with brick adapter studs and sockets.

HOW IT WORKS

With brick adapter studs, your Bits will defy gravity! Simply snap an adapter underneath your bricks and press the feet of your Bits into place.

With brick adapter sockets, you can mount your Bits on top of LEGO® bricks. Simply snap the adapter on your bricks, and press the feet of your Bits into place.

a10 **MOTORMATE**



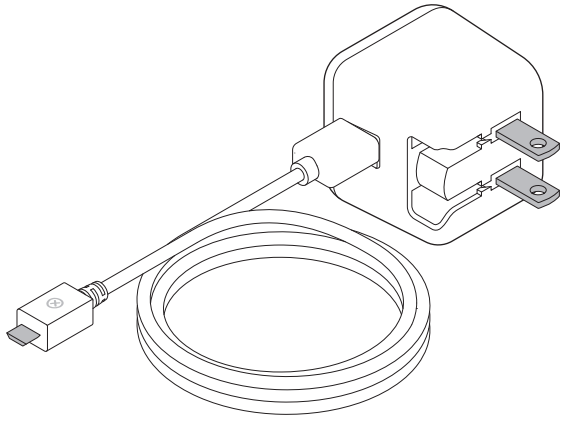
MEET THE ACCESSORY

The motorMate makes it easy to attach paper, cardboard, LEGO® axles, and lots of other materials to the DC motor.

HOW IT WORKS

To mount, slide the motorMate onto the shaft of the DC motor by aligning the flat edges. The motorMate has two different sized slots: one fits most standard craft sticks and the other fits thicker papers like cardstock. LEGO axles fit right into the center.

a14 **AC POWER ADAPTER**



MEET THE ACCESSORY

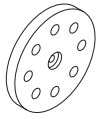
This power adapter and USB cable combo is the perfect way to provide long-term power to your littleBits creations.

HOW IT WORKS

This power adapter converts your 100–240V AC wall power into the 5 volt power that littleBits circuits and the rechargeable battery run on. Simply connect a USB cable from the power adapter to your littleBits USB power Bit, or rechargeable battery.

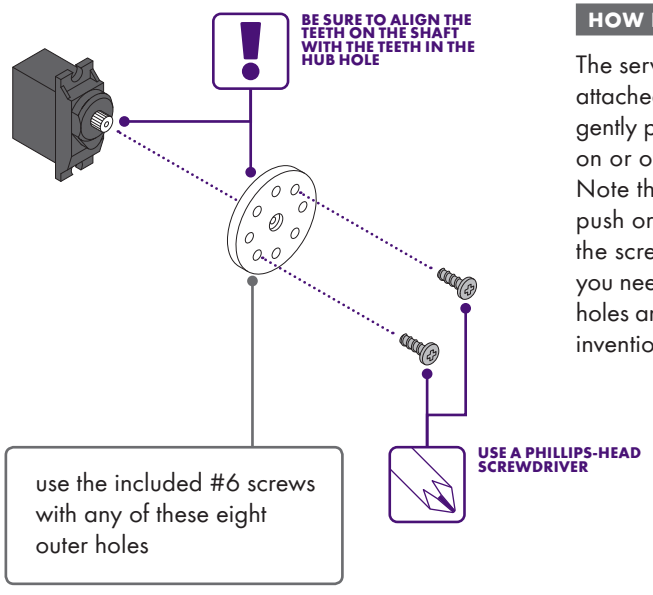
NOTE: 100–240V AC 50/60Hz; Output: 5.0V DC 2000mA. Included adapter is for US electrical outlets only.

a19 **SERVO HUB**



MEET THE ACCESSORY

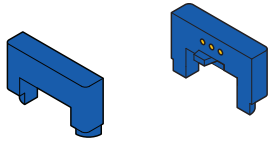
The servo hub lets you easily attach materials to your servo motor and add more complex movements to your littleBits inventions.



HOW IT WORKS

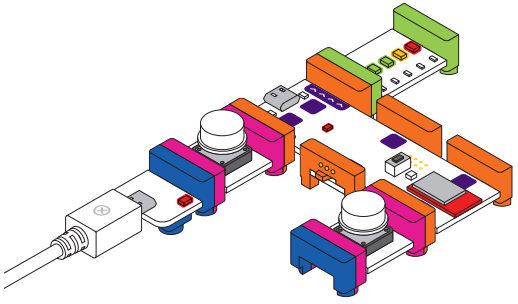
The servo hub can be attached and removed by gently pushing or pulling it on or off the servo motor. Note that you can only push or pull before inserting the screws. This is helpful if you need to reorient how the holes are positioned for an invention.

a21 POWERSNAP



MEET THE ACCESSORY

The powerSnap supplies power to an open input without extra forks, splits, or power supplies.

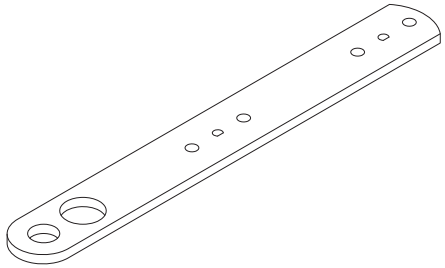


HOW IT WORKS

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.

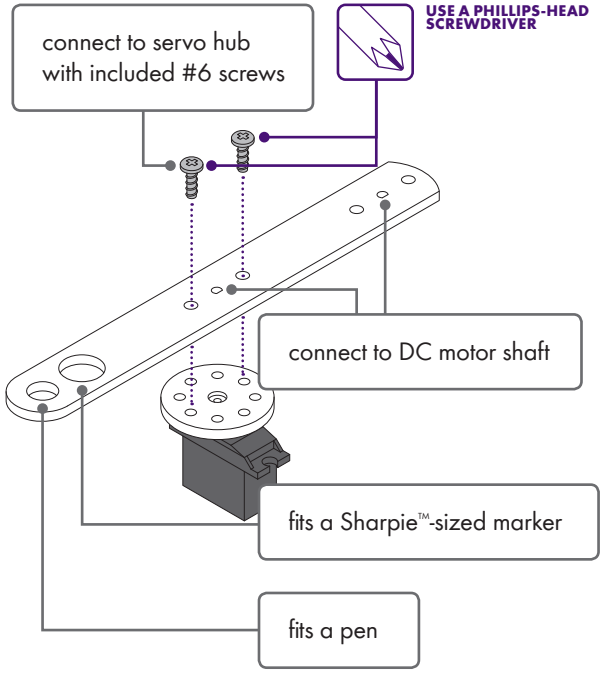
For more info on how power works in the littleBits system, check out littleBits.com/tips-tricks/powersnap

a23 MECHANICAL ARM



MEET THE ACCESSORY

The mechanical arm attaches to both the servo hub and the DC motor shaft, and offers lots of leverage for pushing, pulling, and throwing.



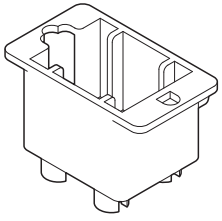
HOW IT WORKS

To attach the mechanical arm to the servo hub, use two of the #6 screws (included) and a Phillips-head screwdriver (not the purple screwdriver). Be sure to screw through the holes on the servo hub.

To attach the mechanical arm to the DC motor, line up the flat edge of the DC motor shaft with the flat edge of either of the flat-edged holes on the mechanical arm.

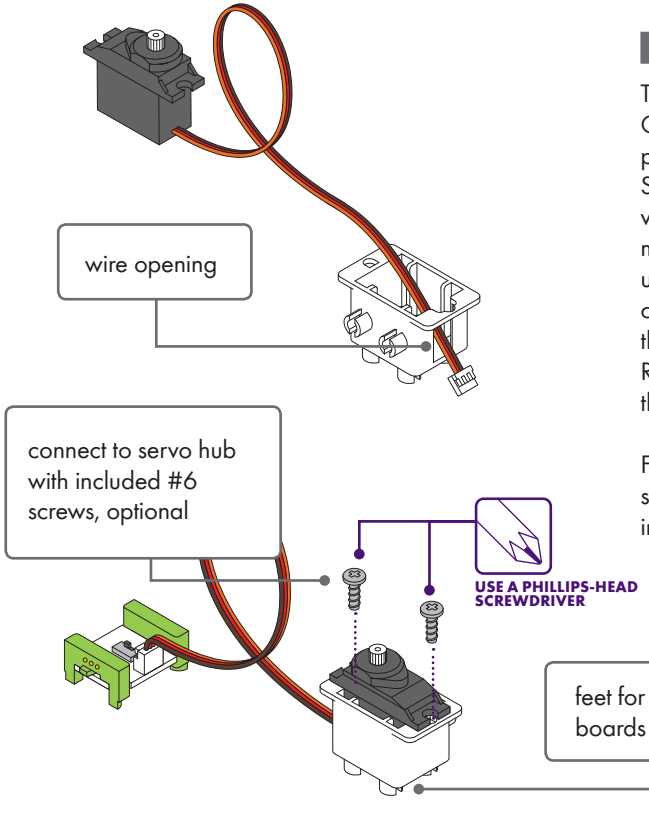
The two large holes on the end are perfect for holding pens and markers in place.

a24 **SERVO MOUNT**



MEET THE ACCESSORY

The servo mount lets you attach your servo to a mounting board or a pair of littleBits shoes. With feet on two sides of the mount, you can orient the servo in all directions. It's a great way to keep the servo steady so the arm can go wild.

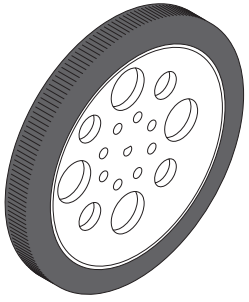


HOW IT WORKS

To use the servo mount: Carefully separate the white plug from the circuit board. Slip the plug through the vertical slot in the servo mount. Pull the wire through until the servo sits on top of the servo mount. Press the servo into the mount. Reconnect the white plug to the board.

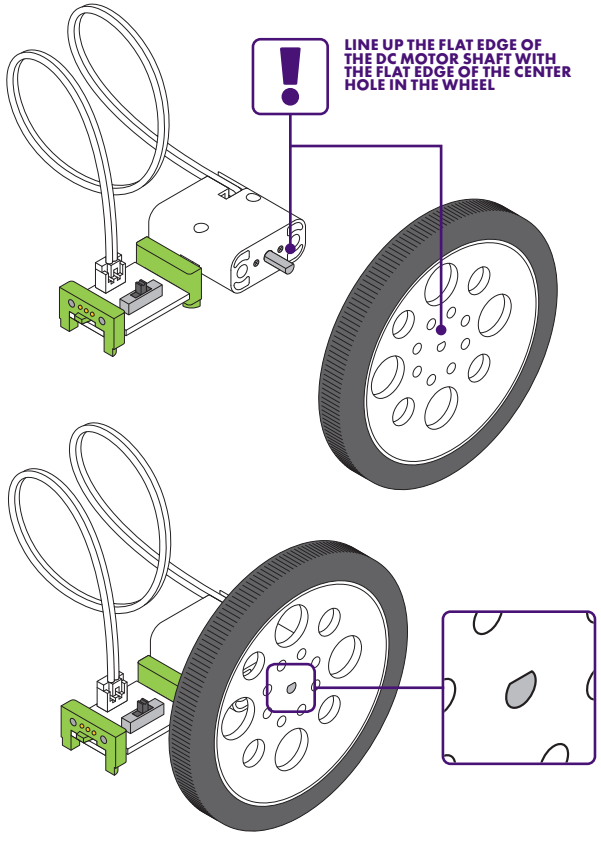
For extra security, screw the servo to the mount using the included #6 screws.

a25 **WHEEL**



MEET THE ACCESSORY

When used with a DC motor, this wheel is perfect for making bots, cars, and all sorts of spinning inventions.

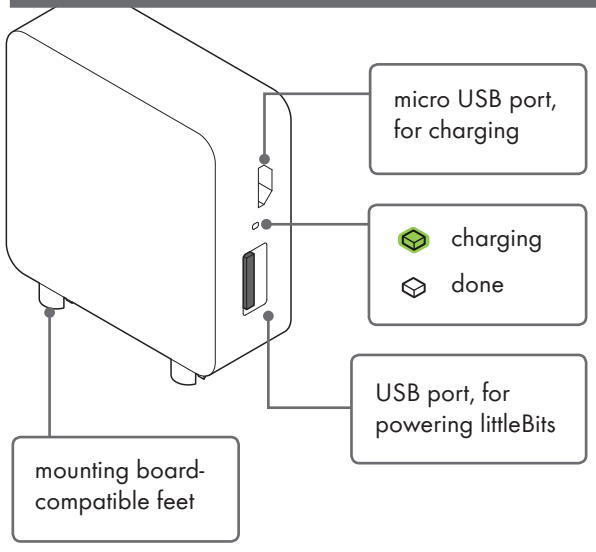


HOW IT WORKS

The metal shaft of the DC motor and the hole in the wheel are both flat edged. To attach the wheel to the DC motor shaft, align the flat edge of the hole in the wheel with the flat edge of the motor shaft. Press firmly to slide it on.

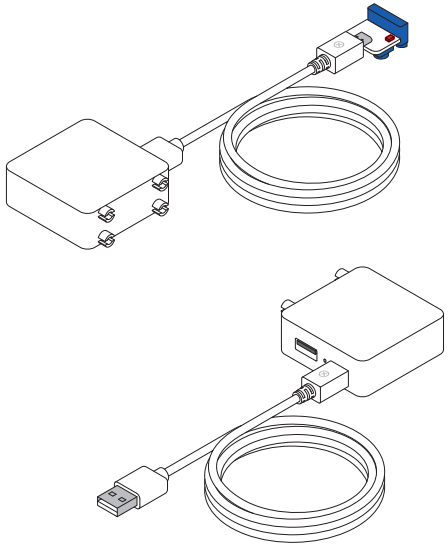
The wheel also connects to the servo hub using the included #6 screws.

a27 RECHARGEABLE BATTERY



MEET THE ACCESSORY

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

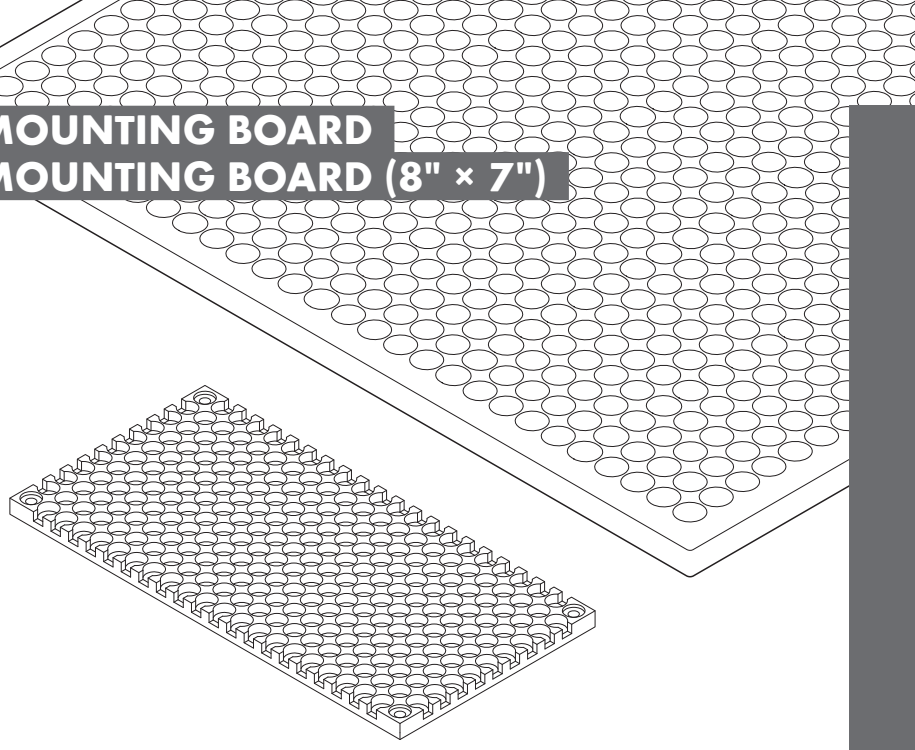


HOW IT WORKS

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; see page 80 for more about the power adapter. The LED on the battery will shine green while charging, and be off when done.

a26 MOUNTING BOARD
a28 MOUNTING BOARD (8" × 7")



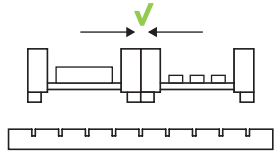
MEET THE ACCESSORY

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.

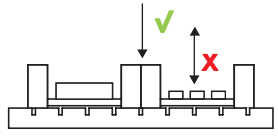
ALWAYS REMOVE BITS BY THE BITSNAP, DO NOT PULL ON CABLES TO REMOVE BITS FROM THE MOUNTING BOARD

HOW IT WORKS

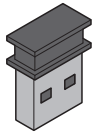
1. First, snap your circuit together.



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

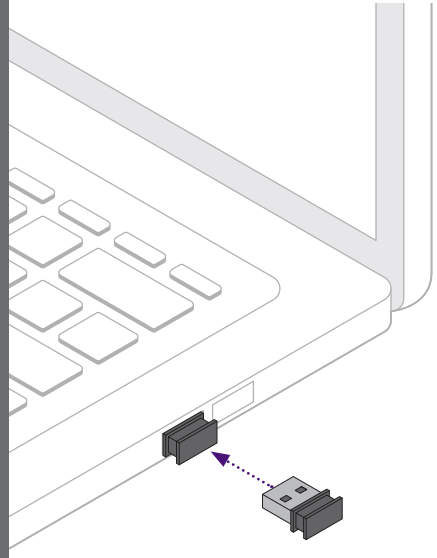


a29 **CODEBIT DONGLE**



MEET THE ACCESSORY

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



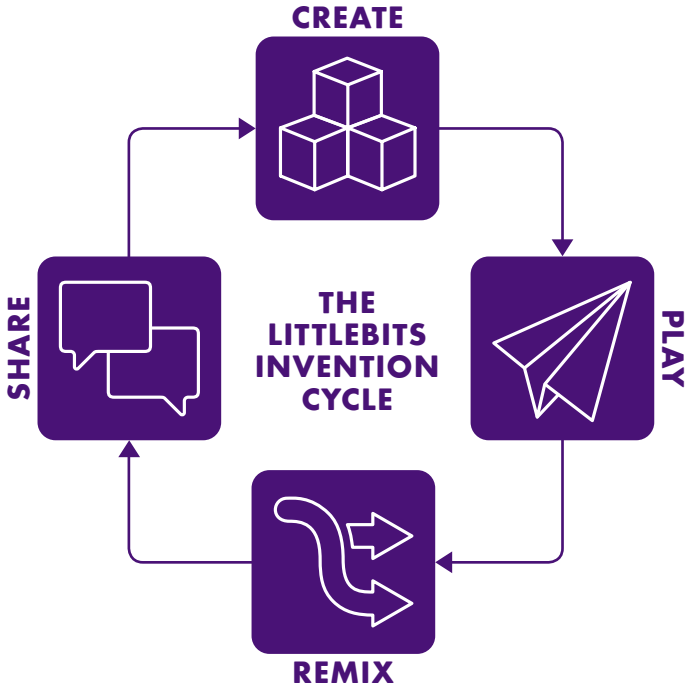
HOW IT WORKS

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.

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

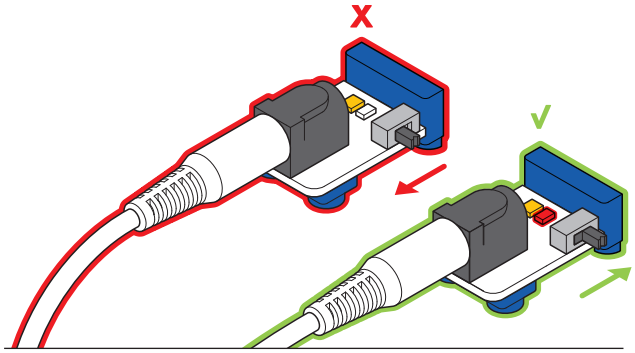
IMPROVE YOUR INVENTION. Keep experimenting! Add new Bits, swap parts with other inventions, or take all the pieces apart and put them together in a different way.

SHARE

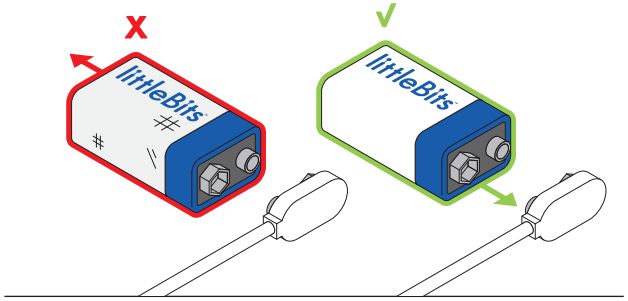
INSPIRE OTHERS. Show the world what you've created on the littleBits Invent app or at littleBits.com. Get inspired by exploring what others have shared. Create, play with, and remix other inventions. This is how awesome new inventions are born.

TROUBLESHOOTING

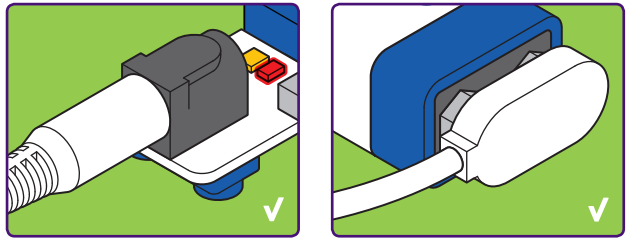
IN-DEPTH TROUBLESHOOTING AVAILABLE AT LITTLEBITS.COM/FAQ OR ON THE LITTLEBITS INVENT APP.



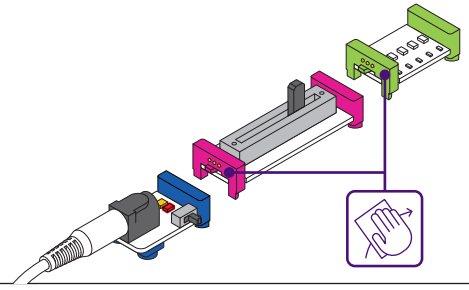
1 **MAKE SURE YOUR POWER BIT™ IS ON.** You should see a red LED illuminated on the board.



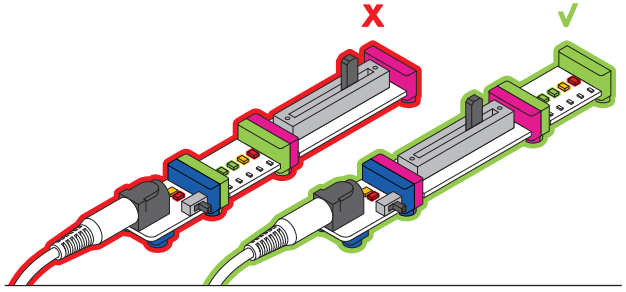
2 **TRY SWAPPING IN A NEW 9 VOLT BATTERY.** Low batteries can cause a circuit to act erratically. Bits™ have different power demands. For example: a DC motor may appear to not be working while a light still shines brightly.



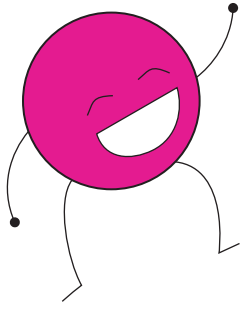
3 **ENSURE THE POWER CABLE IS SECURELY FASTENED TO BOTH THE POWER BIT AND THE BATTERY.**



4 **CHECK YOUR CONNECTIONS**. Are all the Bits securely snapped to each other? You can also try gently wiping down the ends of the bitSnaps with a soft cloth (like your sleeve). Sometimes dust gets in the way of a strong connection. Try unsnapping, cleaning the bitSnaps, and snapping it all back together again.



5 **MAKE SURE YOUR BITS ARE ARRANGED IN THE PROPER ORDER.** Remember that you always need a power Bit & power supply at the beginning of each circuit, and an output Bit at the end. If the last Bit in your chain is an input, then it won't do anything to affect your circuit.



STILL HAVING TROUBLE? Visit littleBits.com/faq or contact our customer service team at support@littleBits.com.

Important safety information, keep this sheet for reference. Do not discard.

⚠ WARNING

This product contains small magnets. Swallowed magnets can stick together across intestines causing serious infections and death. Seek immediate medical attention if magnets are swallowed or inhaled.

Most Bits are small parts. DO NOT allow children under 3 years old to play with or near this product.

NEVER connect any Bits or circuits to any AC electrical outlet.

Do not touch or hold any moving parts of modules while they are operating.

Keep conductive materials (such as aluminum foil, staples, paper clips, etc.) away from the circuit and the connector terminals.

Always turn off circuits when not in use or when left unattended.

Never use Bits in or near any liquid.

Never use in any extreme environments such as extreme hot or cold, high humidity, dust or sand.

Bits are subject to damage by static electricity. Handle with care.

Some Bits may become warm to the touch when used in certain circuit designs. This is normal. Rearrange modules or discontinue using if they become excessively hot.

Discontinue use of any Bits that malfunction, become damaged or broken.

INSTRUCTIONS
Periodically inspect the Bits and modules for hazards and remove or replace any broken or damaged Bits.

BATTERIES
Rechargeable battery pack info and instructions:
Only use the battery as indicated in the instructions.

Do not connect Bits to the rechargeable battery while charging.

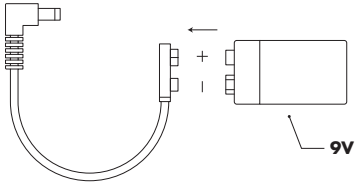
Do not attempt to remove the rechargeable battery from the enclosure provided.

Rechargeable batteries are only to be charged under adult supervision.

9V battery information and instructions:

Use standard alkaline or standard rechargeable batteries. Properly discard and replace exhausted batteries.

Do not connect the two battery terminals to any conducting material.



Non-rechargeable batteries are not to be recharged.

USB ADAPTOR / TRANSFORMER

Product contains USB / AC power adapter:
INPUT: 100-240V~50/60Hz 0.5A
OUTPUT: 5.0V ⎓ 2.0A

Inspect the AC Power Adapter for any damage to the enclosure, plug, or cord; the Adapter must not be used until the damage is repaired.

Only connect USB Power Bit to equipment bearing this symbol:

CARE AND CLEANING
Clean Bits ONLY by wiping with a dry cloth. If necessary and with adult supervision, isopropyl alcohol on a cloth may be used sparingly, and then wipe with a dry cloth.

DO NOT use any other cleaning products on modules.

FC RADIO AND TELEVISION INTERFERENCE
Contains transmitter modules:
WIRELESS TRANSMITTER, WIRELESS RECEIVER, CODEBIT, BLE BIT
FCC ID: SH6MDBT40
IC: 8017A-MDBT40
Contains bluetooth transmitter CODEBIT DONGLE
FCC ID: QOQBLED112
IC: 5123A-BGTBLED112
Contains Wifi transmitter CLOUDBIT DONGLE
FCC ID: V36WL-700N-RXS
IC: TBD

This device complies with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. Operation is subject to the following two conditions:
1) This device may not cause harmful interference, and
2) this device must accept any interference received, including interference that may cause undesired operation.
These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and the receiver.
• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer or an experienced radio/TV technician for help.

Changes and modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment under Federal Communications Commissions rules.

GOT A QUESTION?
Visit littleBits.com/faq for troubleshooting and additional support.

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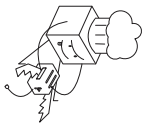
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