

sphero
littleBits

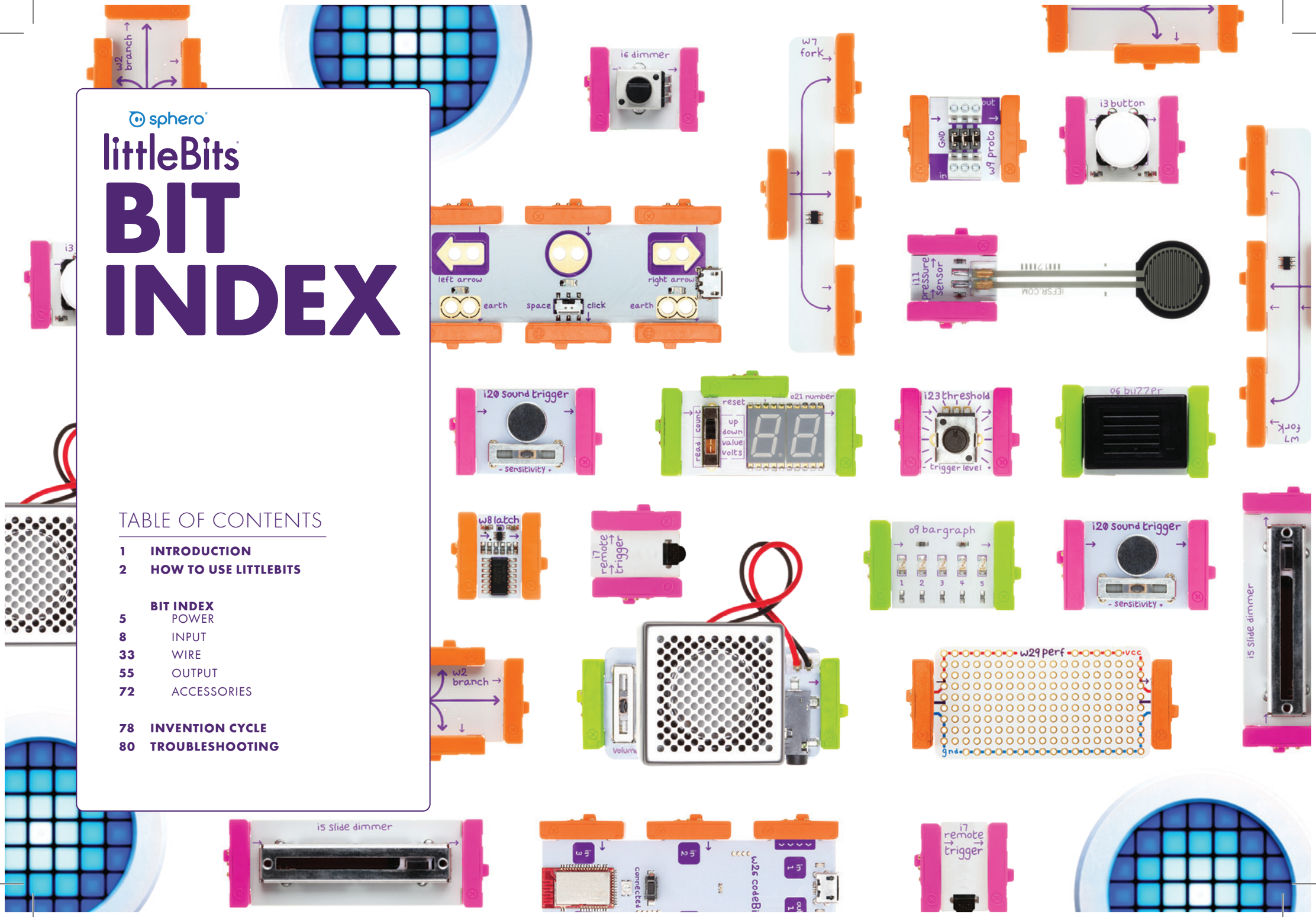
BIT INDEX

TABLE OF CONTENTS

- 1 INTRODUCTION
- 2 HOW TO USE LITTLEBITS

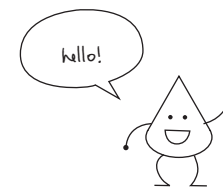
- BIT INDEX**
- 5 POWER
- 8 INPUT
- 33 WIRE
- 55 OUTPUT
- 72 ACCESSORIES

- 78 INVENTION CYCLE
- 80 TROUBLESHOOTING



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

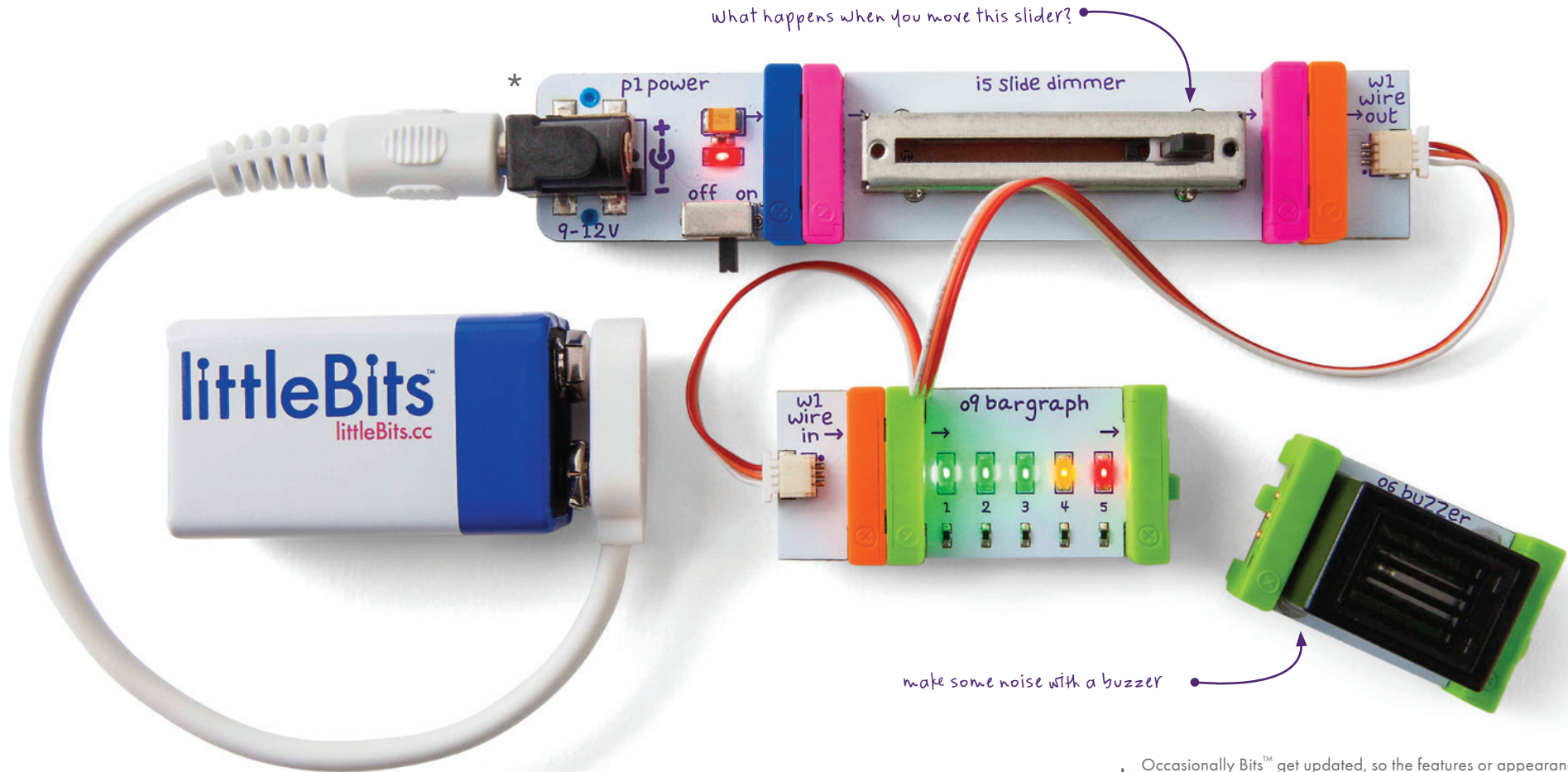
littleBits has 3 distinct Power Bits that are interchangeable and can all be used to power your circuits.



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

HOW TO USE LITTLEBITS

MAKE THIS CIRCUIT FIRST
And play with it!

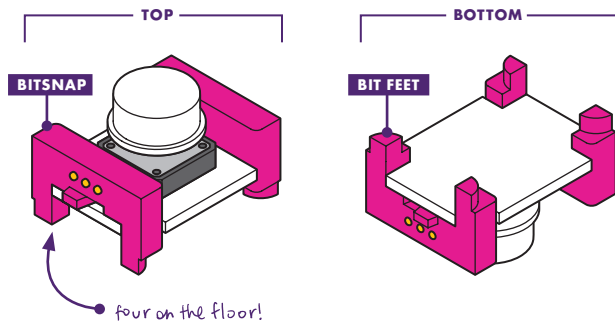


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littleBits has 3 distinct Power Bits that are interchangeable and can all be used to power your circuits.

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.

C WIRE (ORANGE)

Wire Bits connect to other systems and let you build circuits in new directions.

B INPUT (PINK)

Input Bits accept input from you or the environment and send signals that affect the Bits that follow.

D OUTPUT (GREEN)

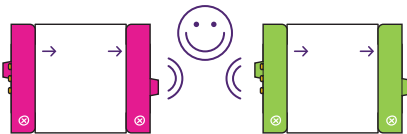
Output Bits do something – light up, buzz, move...

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

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



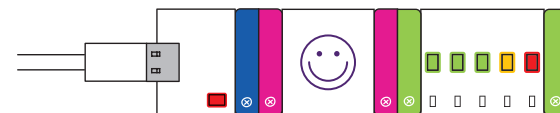
5 ORDER IS IMPORTANT

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** Power Bits
- 06** p4 power
- 07** p3 USB power

INPUT

- 08** i1 slide switch
- 09** i2 toggle switch
- 10** i3 button
- 11** i5 slide dimmer
- 12** i6 dimmer
- 13** i7 remote trigger
- 14** i8 proximity sensor
- 15** i11 pressure sensor
- 16** i12 temperature sensor
- 17** i13 light sensor
- 18** i16 pulse
- 19** i17 timeout
- 20** i18 motion trigger
- 21** i19 roller switch
- 22** i20 sound trigger
- 23** i22 sequencer
- 24** i23 threshold
- 25** i28 accelerometer
- 26** i30 keyboard
- 27** i31 oscillator
- 28** i32 filter
- 29** i34 random
- 30** i35 delay
- 31** i36 micro sequencer
- 32** i37 mix

WIRE

- 33** w1 wire
- 34** w2 branch
- 35** w3 OR
- 36** w4 AND
- 37** w5 MIDI
- 38** w7 fork
- 39** w8 latch
- 40** w9 proto
- 41** w10 inverter
- 42** w14 Makey Makey[®]
- 44** w15 NOR
- 45** w16 NAND
- 46** w17 XOR
- 47** w18 CV
- 48** w19 split
- 49** w21 wireless receiver
- 50** w22 wireless transmitter
- 51** w26 codeBit
- 53** w29 perf
- 54** micro:Bit Adapter

OUTPUT

- 55** o1 LED
- 56** o2 long LED
- 57** o4 vibration motor
- 58** o6 buzzer
- 59** o7 IR LED
- 60** o9 bargraph
- 61** o11 servo
- 62** o13 fan
- 63** o14 bright LED
- 64** o15 UV LED
- 65** o19 RGB LED
- 66** o21 number
- 67** o25 DC motor
- 68** o26 speaker
- 69** o29 round LED matrix

ACCESSORIES

- 72** a2 USB cable
- a5 magnet shoes
- a6 hook & loop shoes
- a7 adhesive shoes
- 73** a8 brick adapter
- a10 motorMate
- 74** a14 USB cable & adapter
- 75** a21 powerSnap
- a23 mechanical arm
- 76** a24 servo mount
- a25 wheel
- 77** a27 rechargeable battery
- a26 mounting board
- a28 mounting board (8" x 7")

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

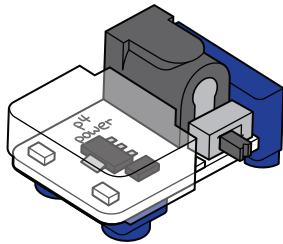
littleBits has 3 distinct Power Bits that are interchangeable and can all be used to power your circuits.

POWER BITS

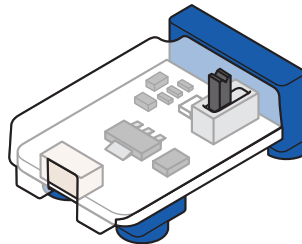
Power Bits, plus a power supply, run power through your circuit.

The following Power Bits are interchangeable and can all be used to power your circuits.

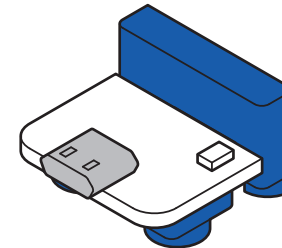
p4 POWER



p7 POWER

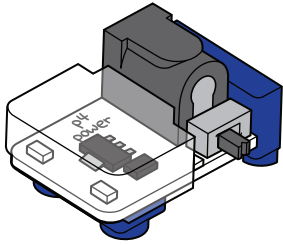


p3 USB POWER



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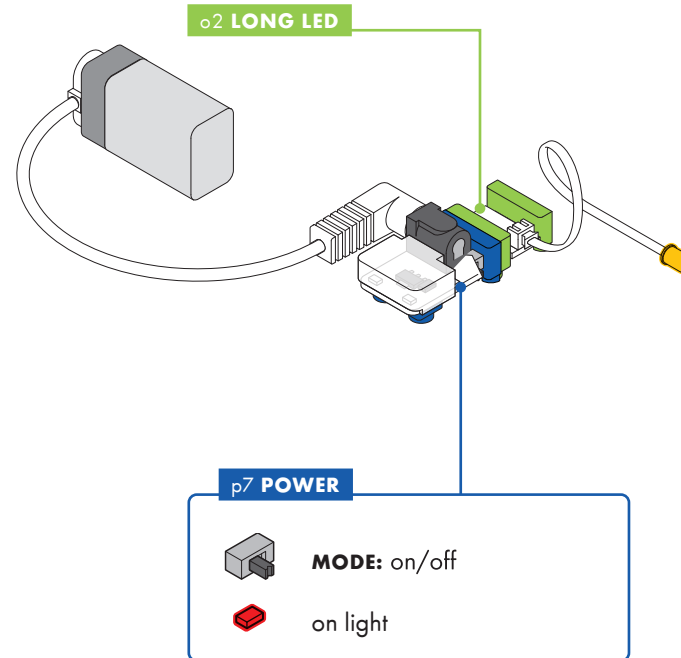
p4 POWER



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.

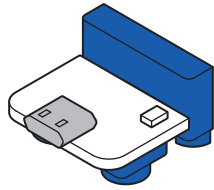
The power Bit also sends a signal through your circuit. Controlling this signal with inputs is how you control your circuit.

REAL WORLD ANALOGIES



PHONE CHARGER

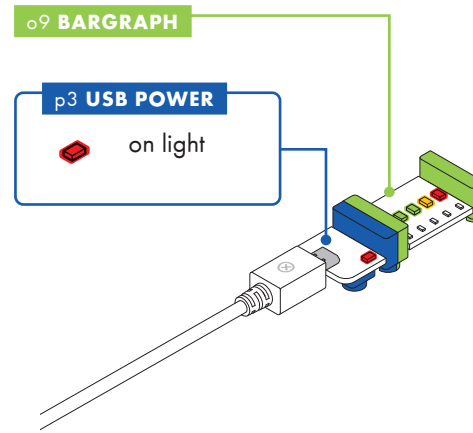
p3 USB POWER



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

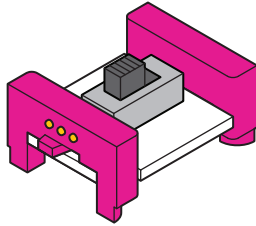


PHONE CHARGER



LAPTOP CHARGER

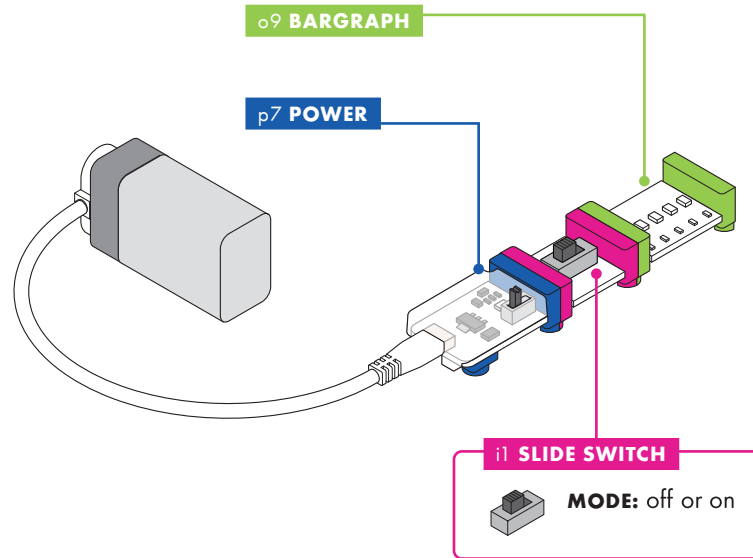
i1 SLIDE SWITCH



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

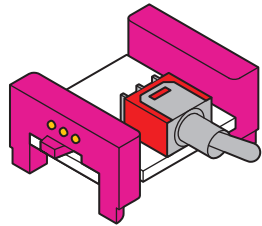
When the slide switch is off, it sends a 0 volt signal and will not pass through any Bits past the switch. When the slide switch is on, it sends a 5 volt signal to the following Bits in the circuit.

REAL WORLD ANALOGIES



VIDEO GAME CONSOLE
POWER SWITCH

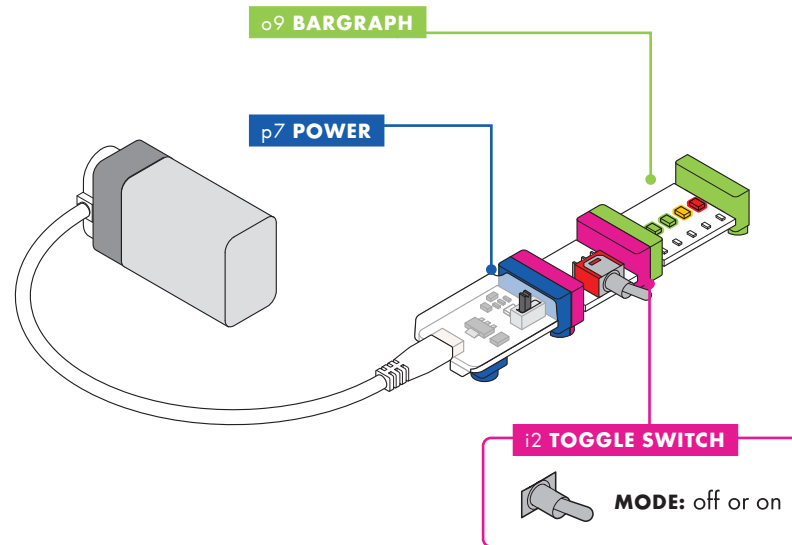
i2 TOGGLE SWITCH



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.

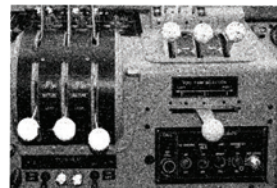
SAMPLE CIRCUIT



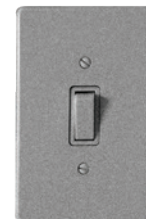
HOW IT WORKS

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

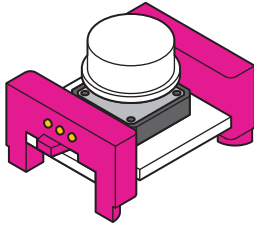


AIRPLANE
CONTROL PANEL



LIGHT SWITCH

i3 BUTTON



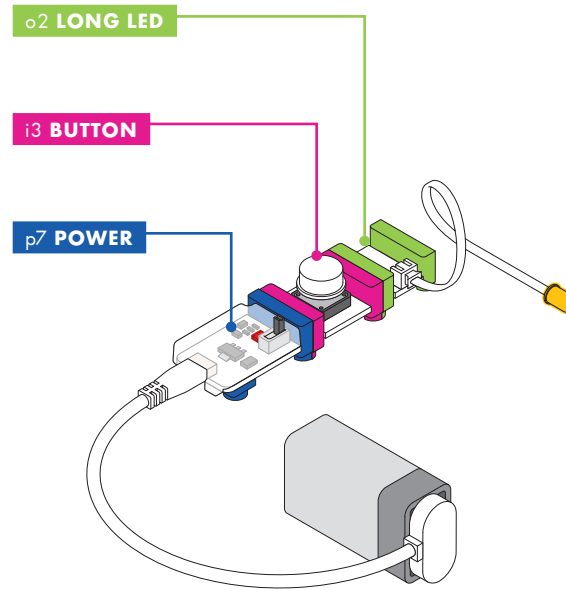
MEET THE BIT

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.

MINI-CHALLENGE

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

SAMPLE CIRCUIT



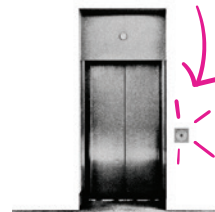
HOW IT WORKS

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.

REAL WORLD ANALOGIES



VIDEO GAME CONTROLLER

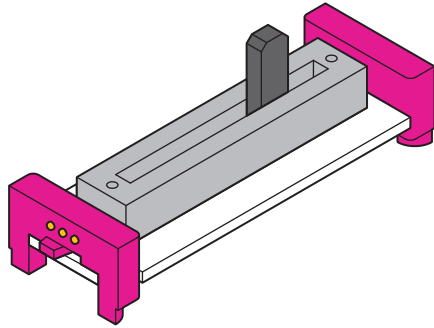


ELEVATOR BUTTON



GAME SHOW BUZZER

i5 SLIDE DIMMER



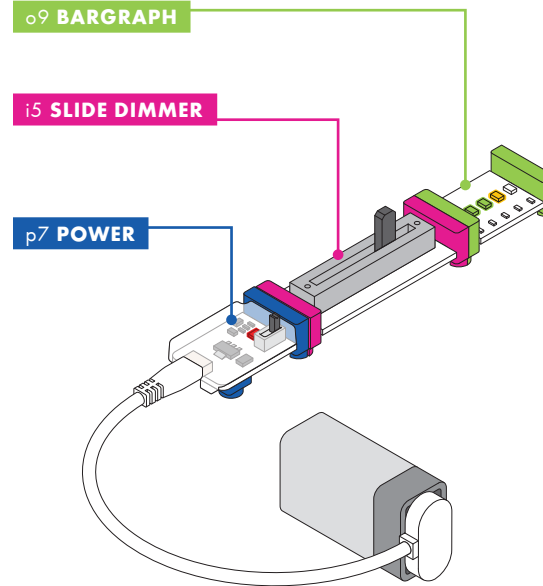
MEET THE BIT

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.

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?

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.

REAL WORLD ANALOGIES

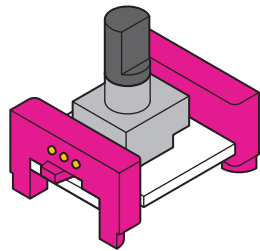


HOUSEHOLD DIMMER SWITCH



CAR PEDAL

i6 DIMMER



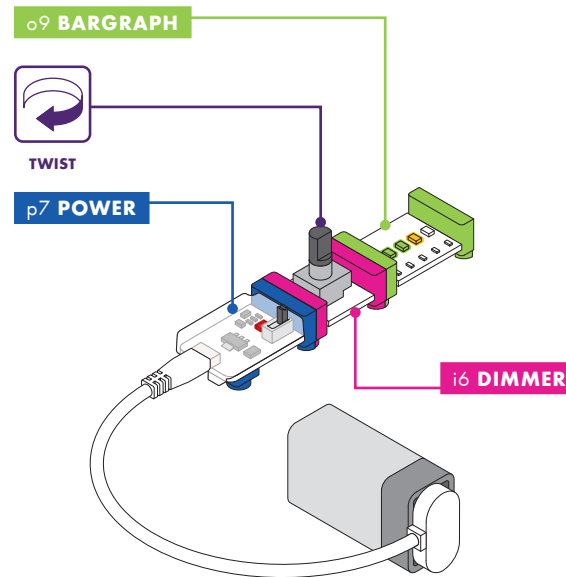
MEET THE BIT

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



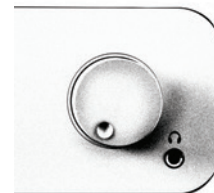
HOW IT WORKS

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

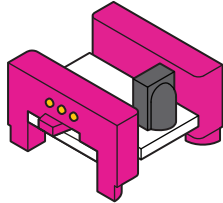


FAUCET



STOVE KNOB

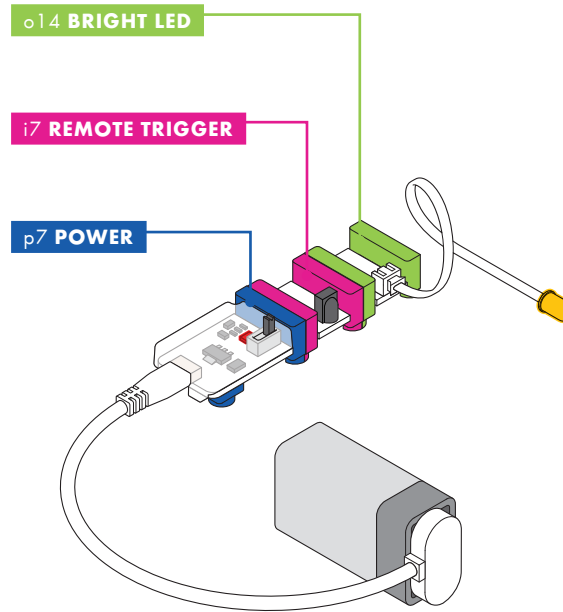
i7 REMOTE TRIGGER



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

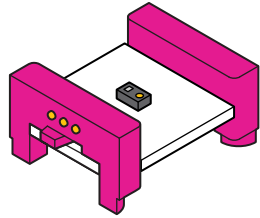
The remote trigger will work with almost any button on a remote that uses infrared light (IR) to send signals (like the one you use for your TV). When it senses IR light, it sends an on or 5 volt signal momentarily to the following Bits in the circuit.

REAL WORLD ANALOGIES



TV REMOTE

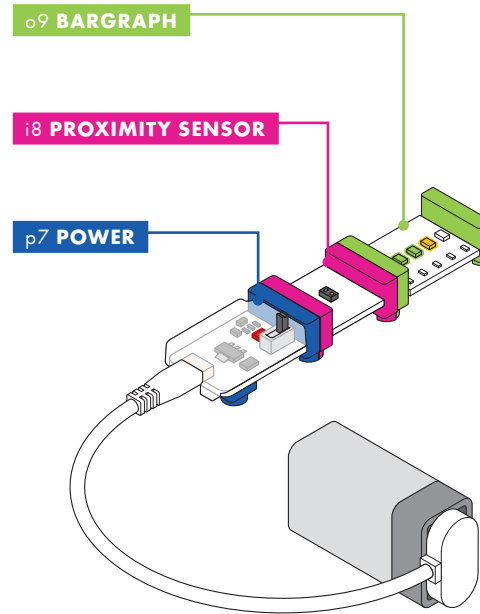
i8 PROXIMITY SENSOR



MEET THE BIT

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

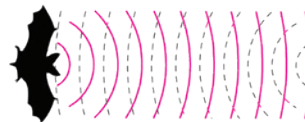
SAMPLE CIRCUIT



HOW IT WORKS

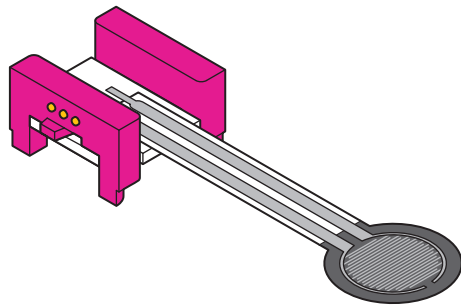
The proximity sensor is like a pair of eyes for your circuit. It detects objects by using an infrared beam to sense what's in front of it. As the object gets closer to the proximity sensor, more signal will pass to the following Bits in the circuit.

REAL WORLD ANALOGIES



BAT VISION

i11 PRESSURE SENSOR



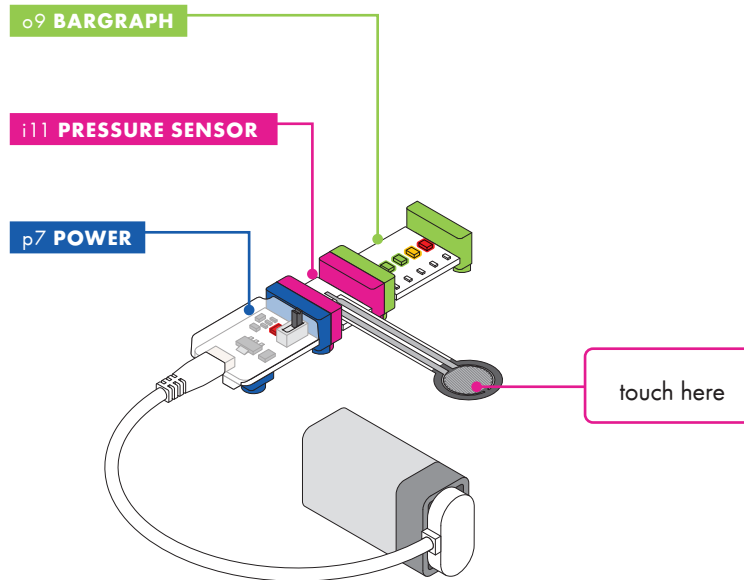
MEET THE BIT

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

MINI-CHALLENGE

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

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.

REAL WORLD ANALOGIES



SCALE

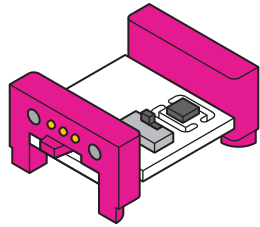


HAMMER CARNIVAL GAME



MICROWAVE TOUCH SCREEN

i12 TEMPERATURE SENSOR



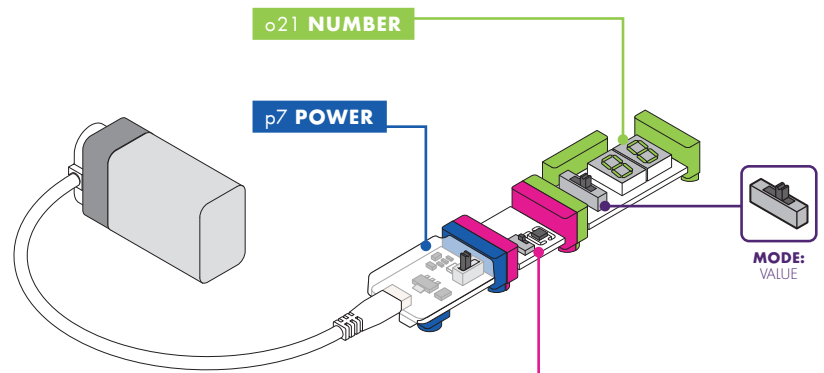
MEET THE BIT

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?

SAMPLE CIRCUIT





o21 NUMBER

p7 POWER

MODE:
VALUE

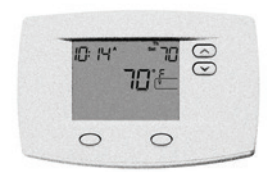
i12 TEMPERATURE SENSOR

-  **MODE:** F° or C°
-  this is the component that measures the temperature

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).

REAL WORLD ANALOGIES



THERMOSTAT



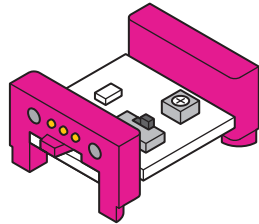
MEDICAL THERMOMETER



AUTOMATIC TEA KETTLE

A temperature sensor tells your automatic kettle when to turn off.

i13 LIGHT SENSOR



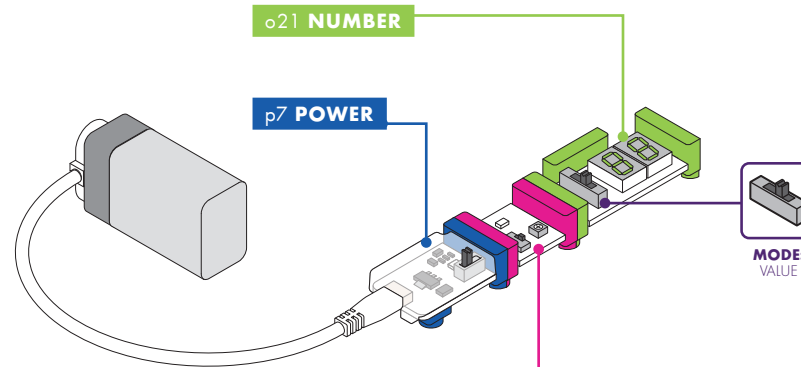
MEET THE BIT

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!




MINI-CHALLENGE

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

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.

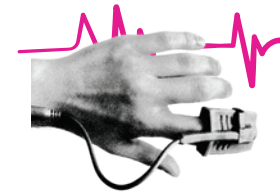
REAL WORLD ANALOGIES



NIGHT LIGHT SENSOR



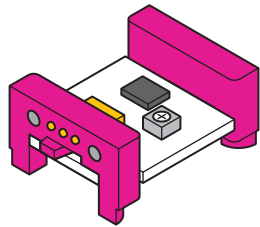
PHOTOGRAPHER'S LIGHT METER



FINGER PULSE METER

A pulse meter shines a bright light into your finger and uses a light sensor to measure blood flow.

i16 PULSE



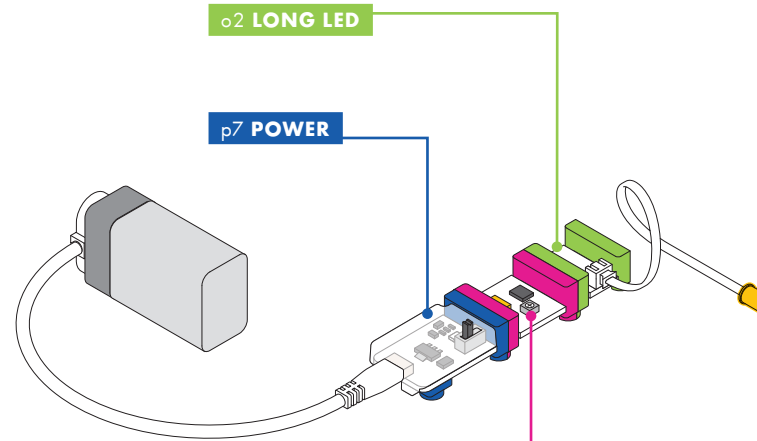
MEET THE BIT

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



i16 PULSE



SPEED: turn counterclockwise to decrease, turn clockwise to increase speed

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

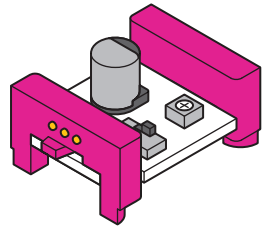


TURN SIGNAL



CLOCK SECONDHAND

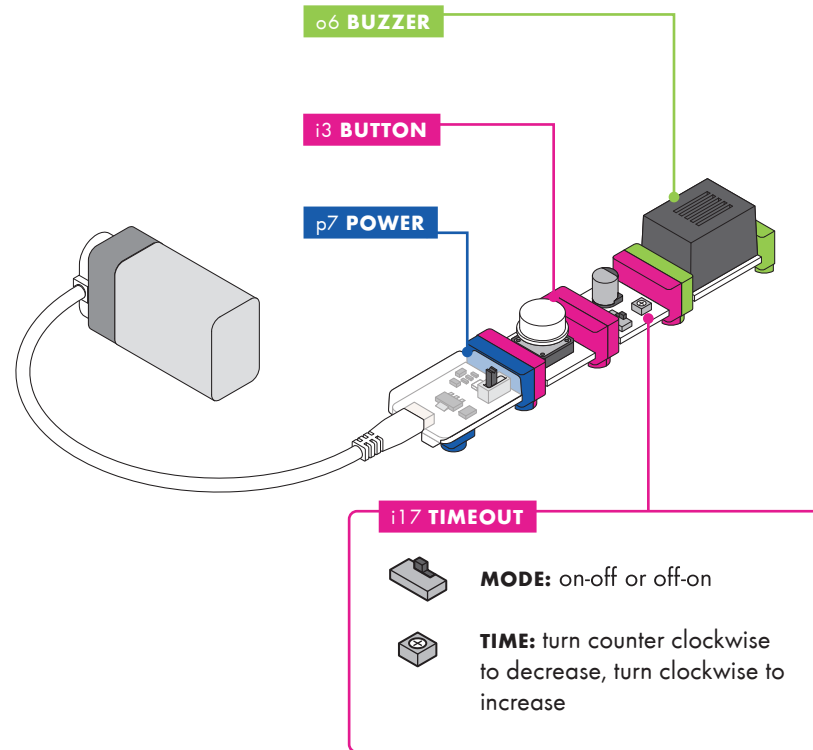
i17 TIMEOUT



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

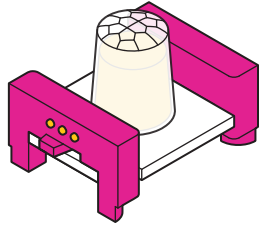


KITCHEN EGG TIMER



BASKETBALL SHOT CLOCK

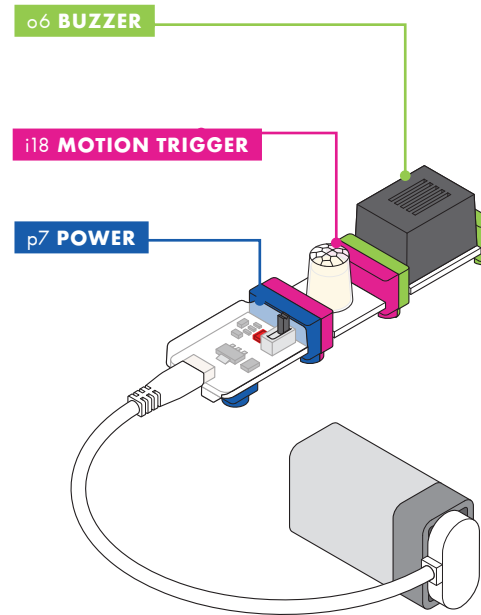
i18 MOTION TRIGGER



MEET THE BIT

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

SAMPLE CIRCUIT



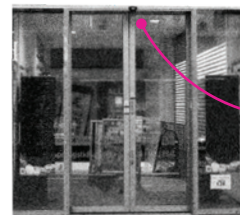
HOW IT WORKS

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



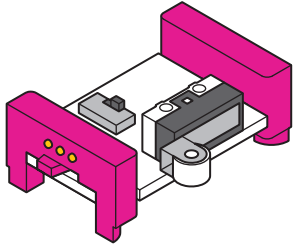
SECURITY SYSTEM



GROCERY STORE DOORS

grocery store doors automatically open using a motion trigger

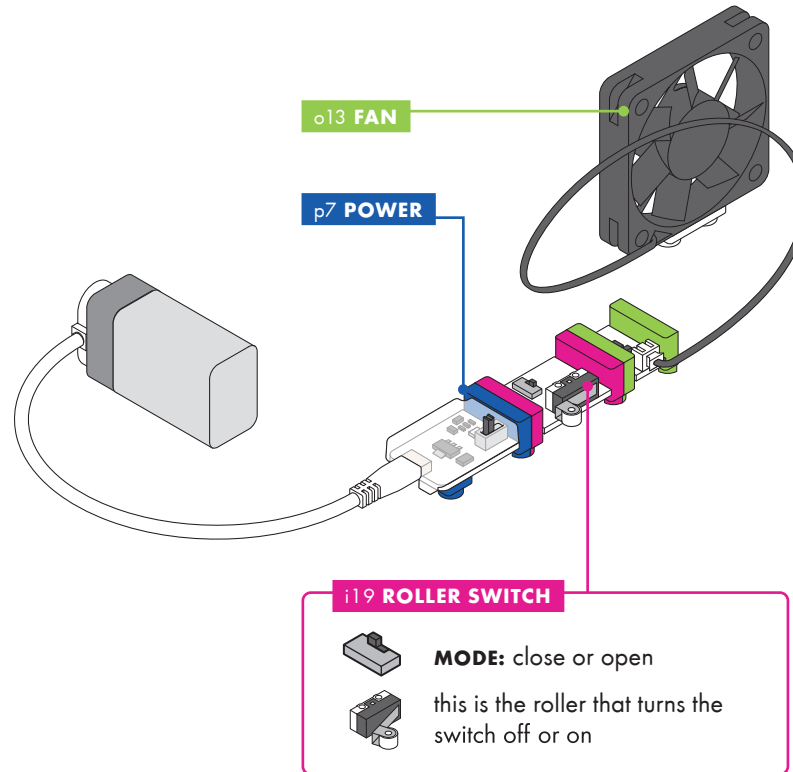
i19 ROLLER SWITCH



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.

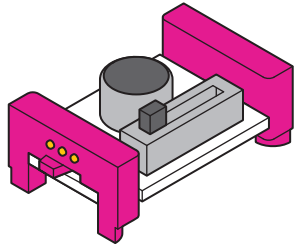
Note: The lever can only be pushed in towards the Bit. Do not pull the lever away from the Bit.

REAL WORLD ANALOGIES



REFRIGERATOR LIGHT

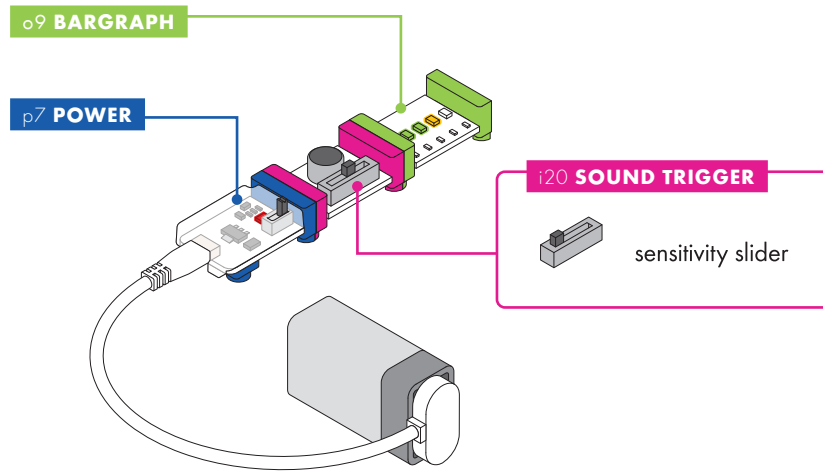
i20 SOUND TRIGGER



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

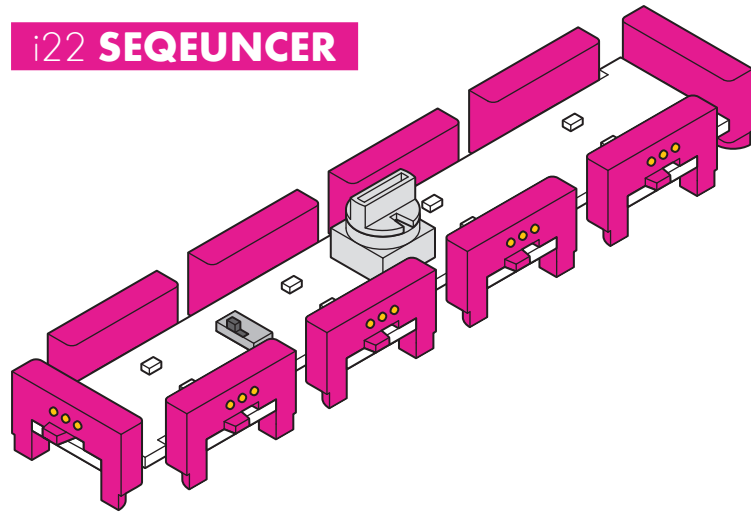


HUMAN EAR



BEAR IN HIBERNATION

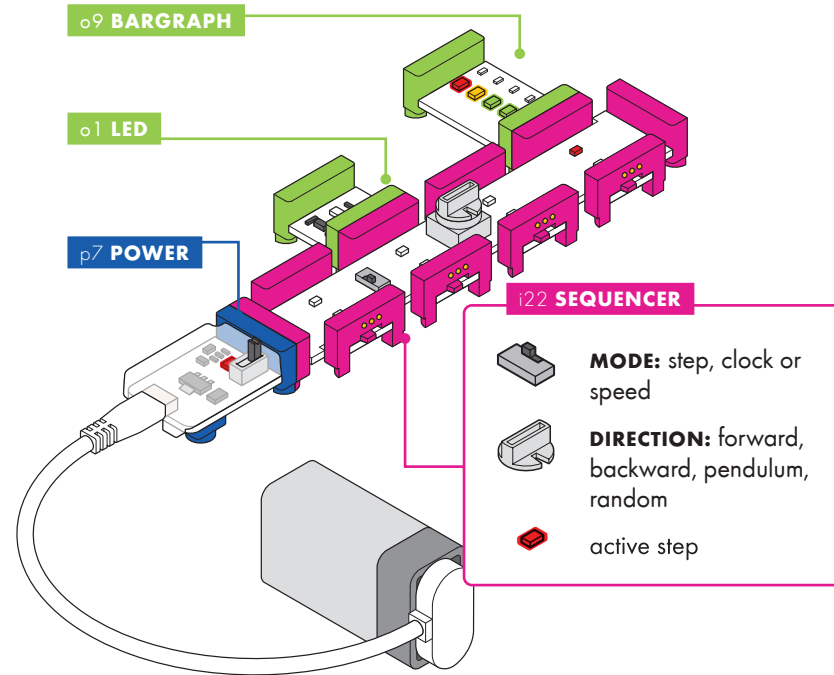
i22 SEQUENCER



MEET THE BIT

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

SAMPLE CIRCUIT



HOW IT WORKS

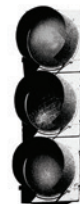
The sequencer can carry out multiple tasks for your circuit, but can only do them one at a time. There are clock **MODES** that control when the Bit transitions from sequence step to sequence step. You can also choose which direction your sequence runs using the **DIRECTION** knob.

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

REAL WORLD ANALOGIES

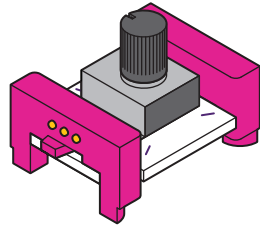


MERRY-GO-ROUND



TRAFFIC LIGHTS

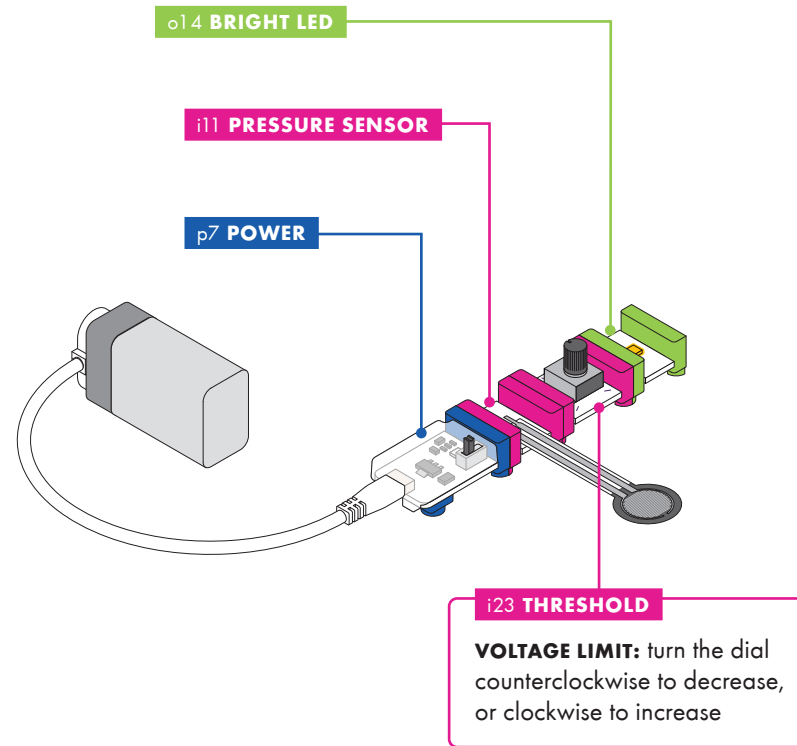
i23 THRESHOLD



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

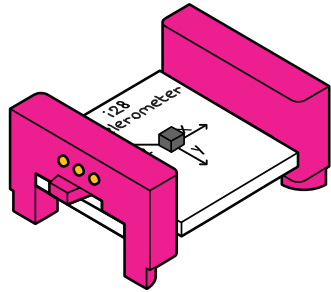


TOLL BOOTH



ROLLER COASTER
HEIGHT CHECK

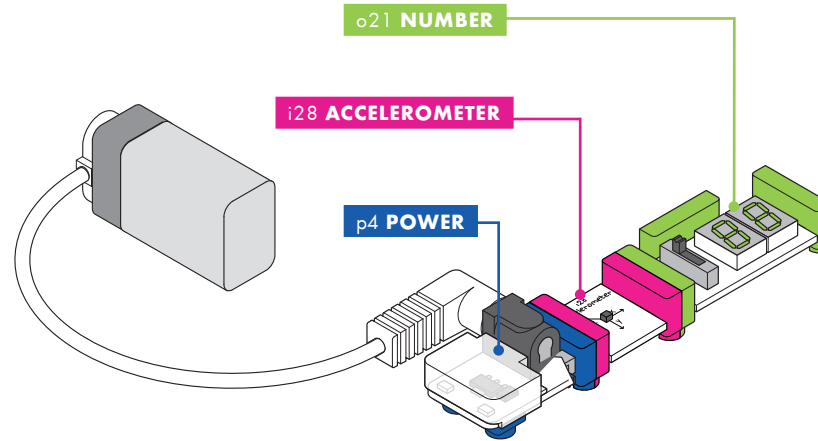
i28 ACCELEROMETER



MEET THE BIT

Use this Bit to control your circuits with movement. The accelerometer senses how quickly you speed it up or slow it down. Snap it to a bargraph on a mounting board. Then give it a wave to visualize your movements.

SAMPLE CIRCUIT



HOW IT WORKS

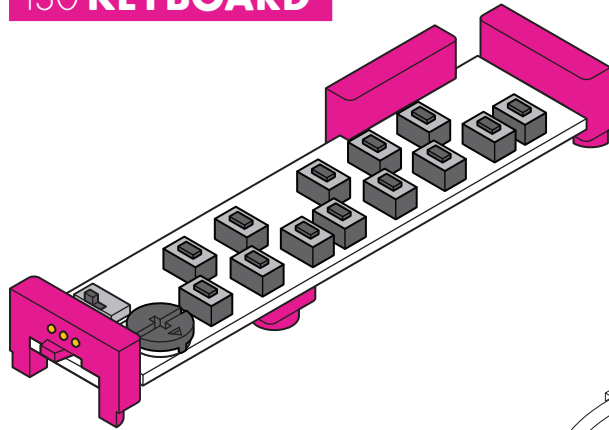
The accelerometer Bit measures acceleration, which is different than measuring speed (how fast something is moving). The accelerometer Bit senses how quickly it is speeding up or slowing down. This helps it detect different types of motion, like shaking.

REAL WORLD ANALOGIES



CAR ACCELEROMETER

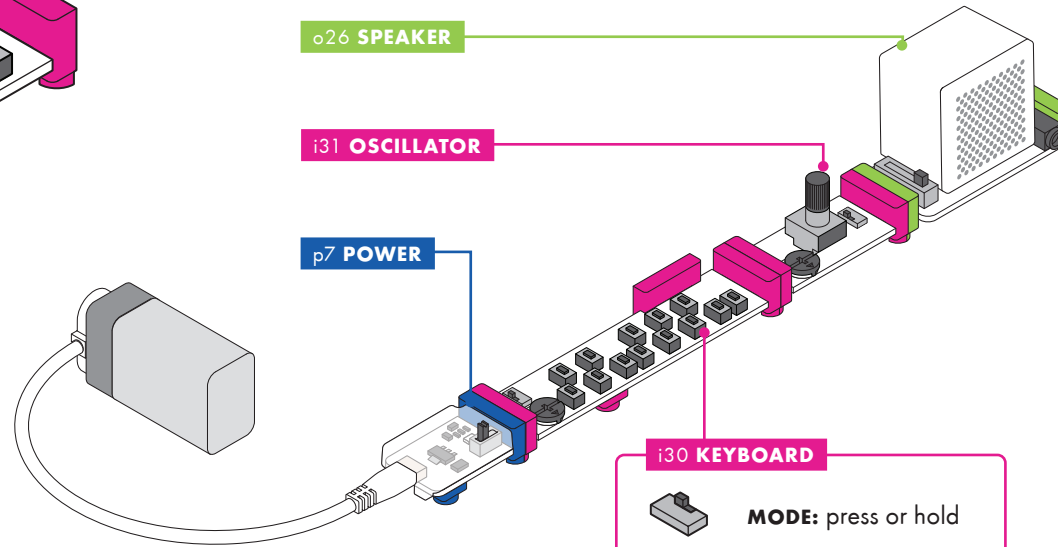
i30 KEYBOARD



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.

i30 KEYBOARD

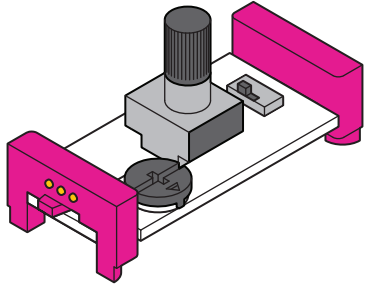
-  **MODE:** press or hold
-  13 keys that make an octave of notes
-  octave dial
-  trigger out bitSnap

REAL WORLD ANALOGIES



GRAND PIANO

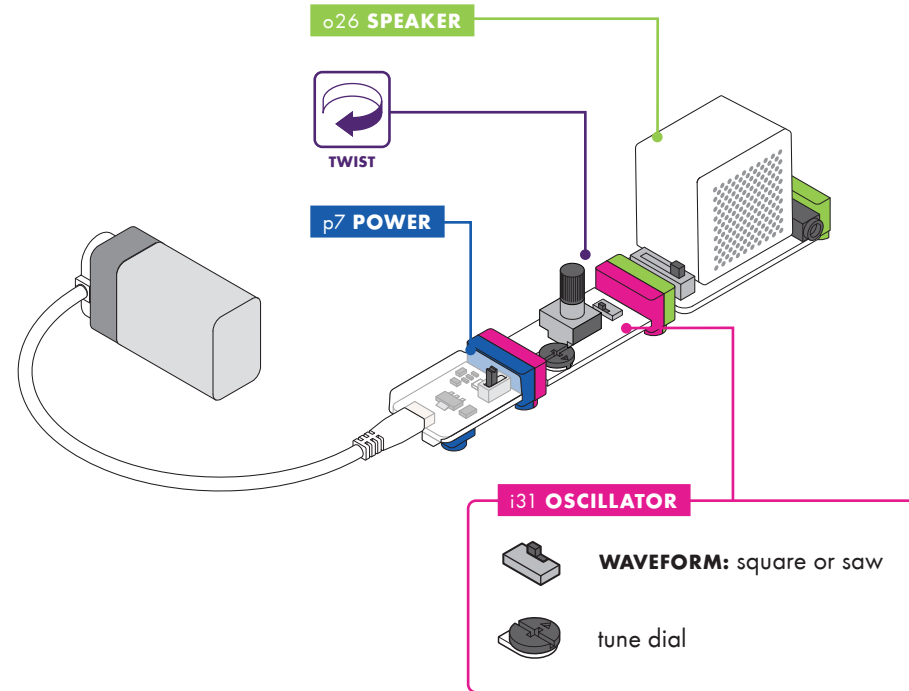
i31 OSCILLATOR



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



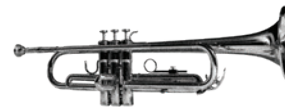
HOW IT WORKS

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

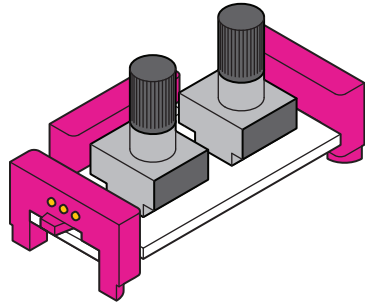


TRUMPET



SAXOPHONE

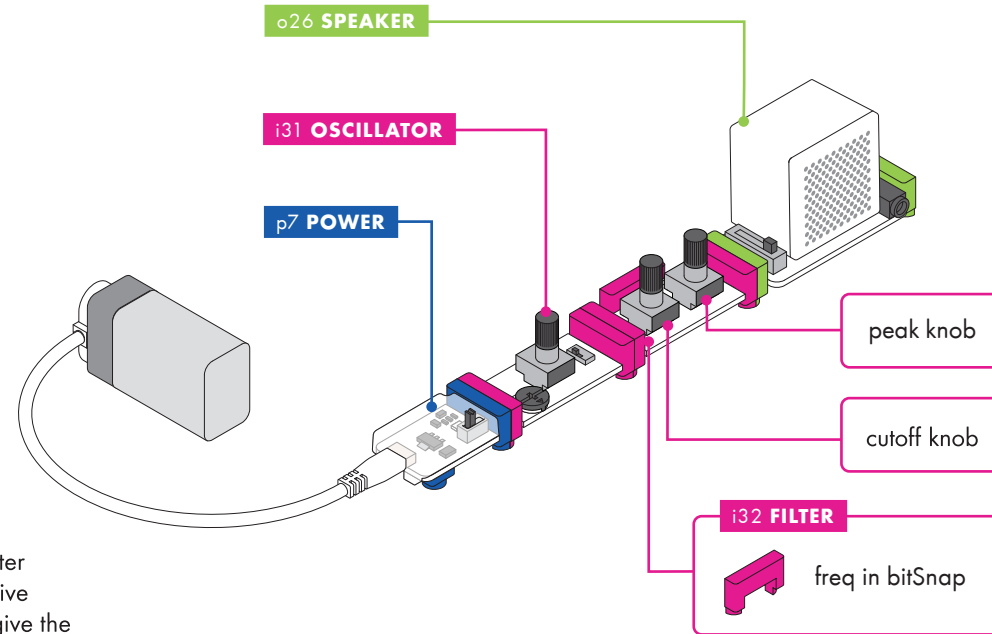
i32 FILTER



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

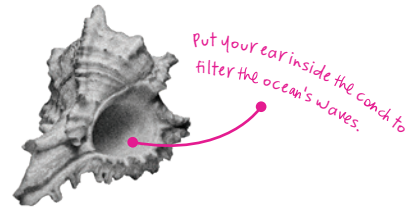


HOW IT WORKS

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!

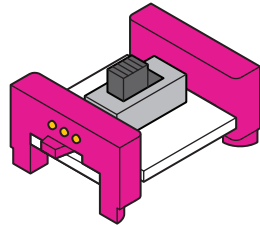
The filter allows you to sculpt the tone of your sounds. If the cutoff knob is fully counterclockwise, it cuts off the tone completely, darkening the oscillator's sound. When the knob is fully clockwise, the filter is open and allows the oscillator's tone to pass through. The peak knob emphasizes the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

REAL WORLD ANALOGIES



CONCH SEASHELL

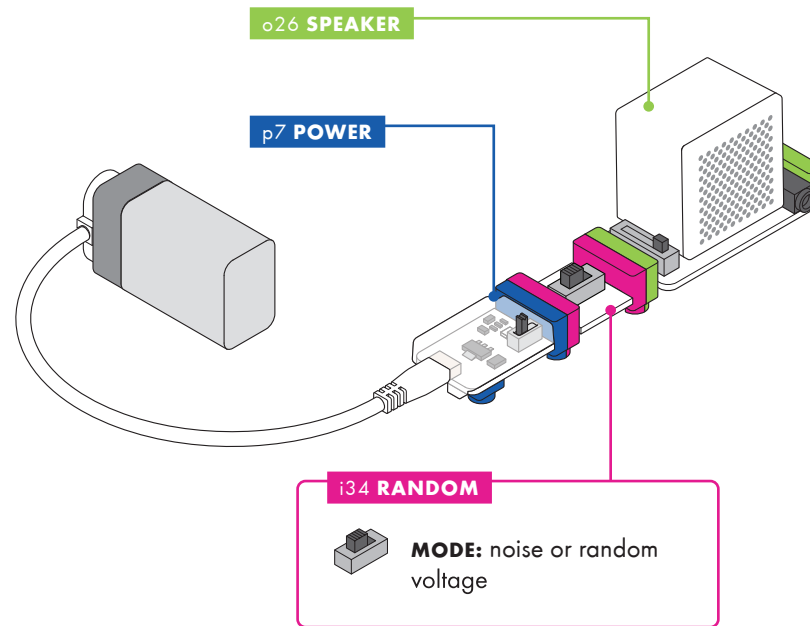
i34 RANDOM



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

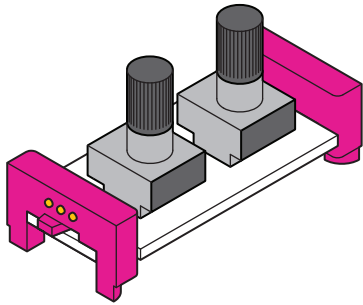


DICE TOSS



WAVES ON THE BEACH

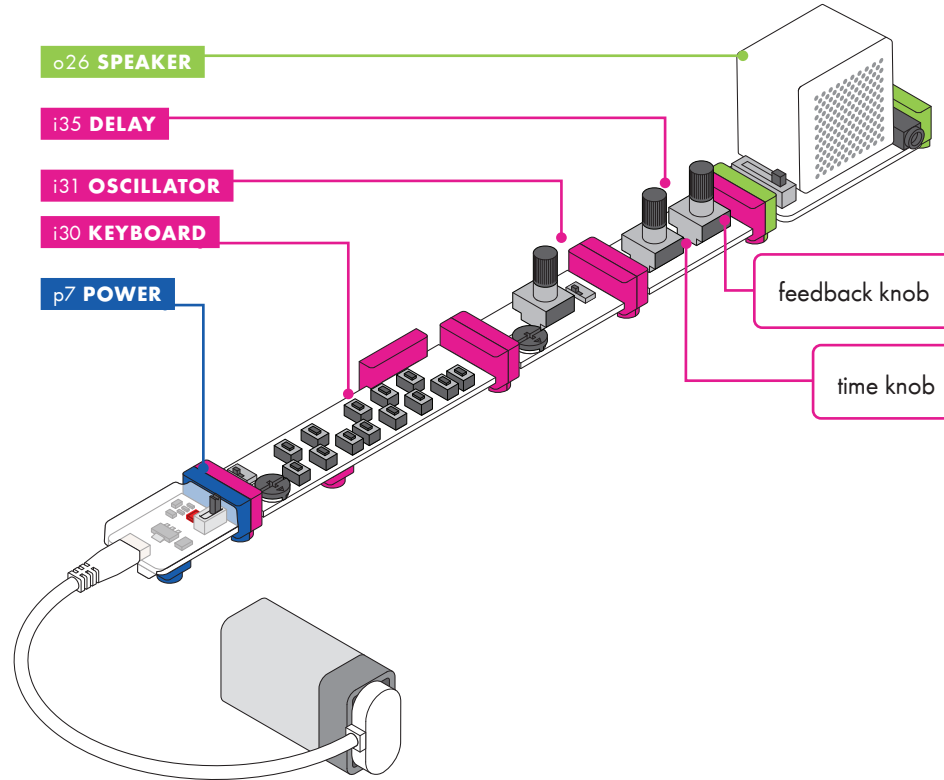
i35 DELAY



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



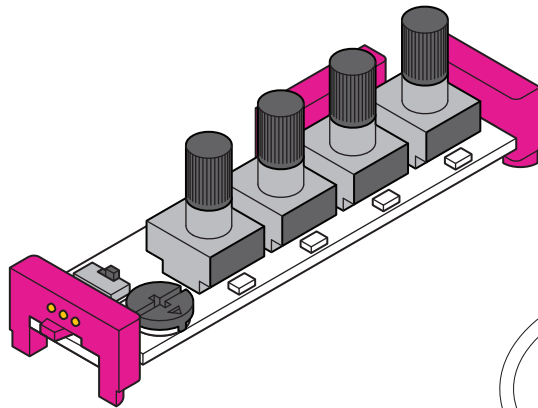
HOW IT WORKS

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 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



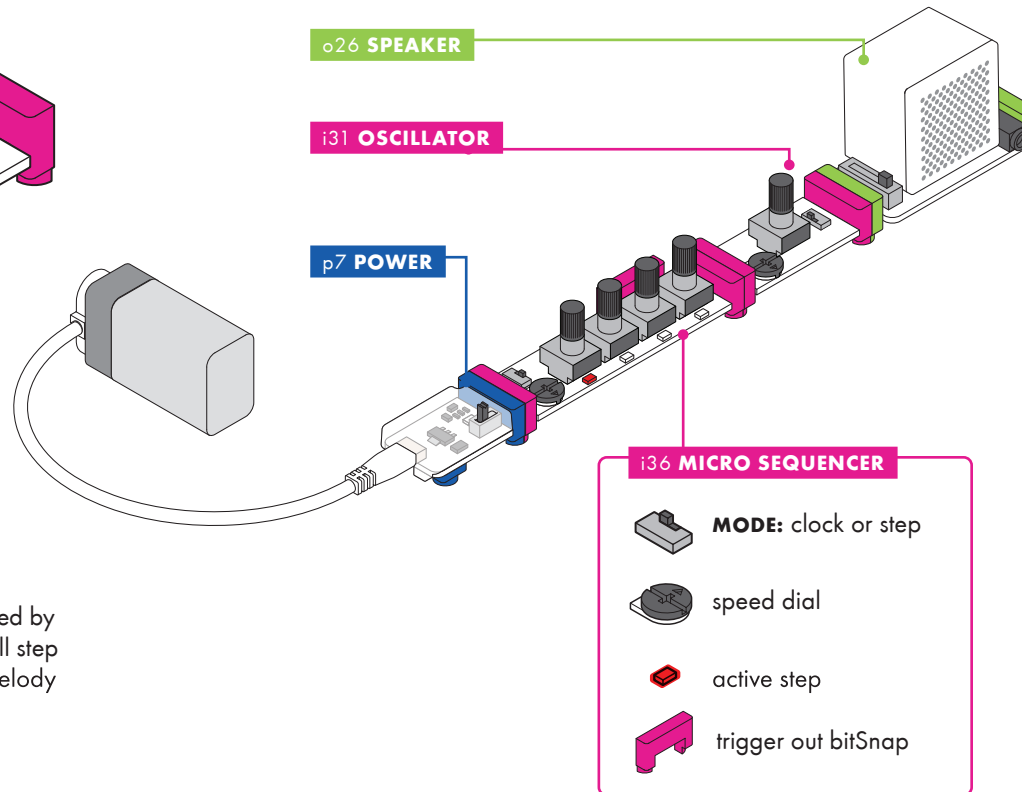
i36 MICRO SEQUENCER



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).

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.

REAL WORLD ANALOGIES

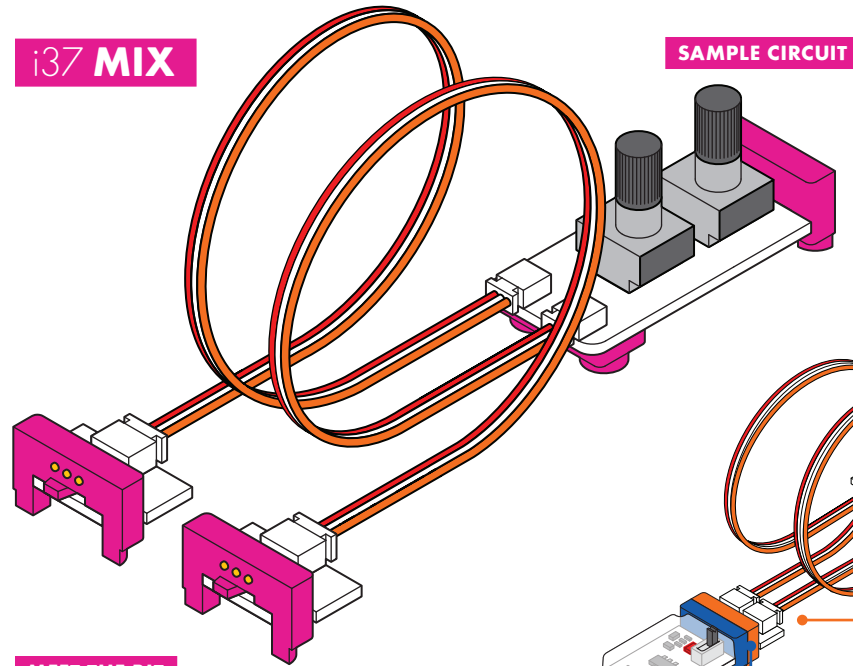


MUSICAL SCORE

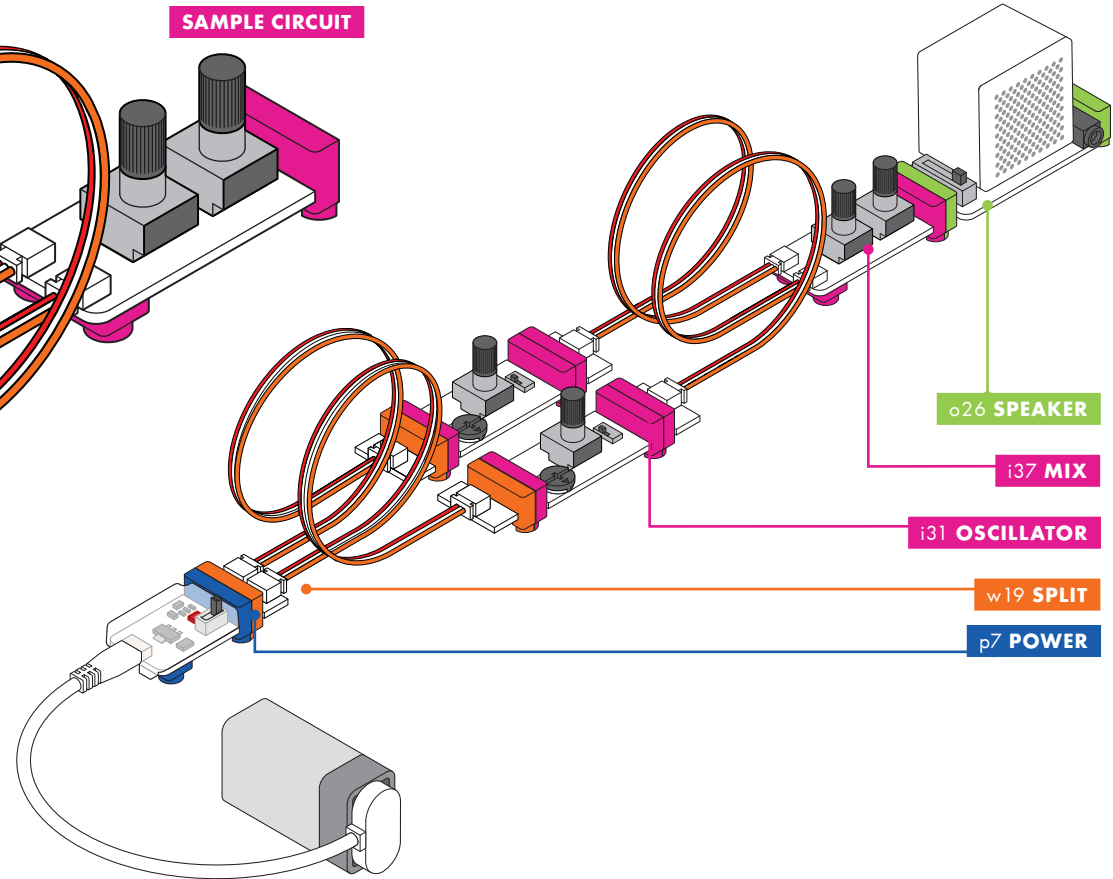


CELL PHONE RING TONE

i37 MIX



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.

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!

REAL WORLD ANALOGIES

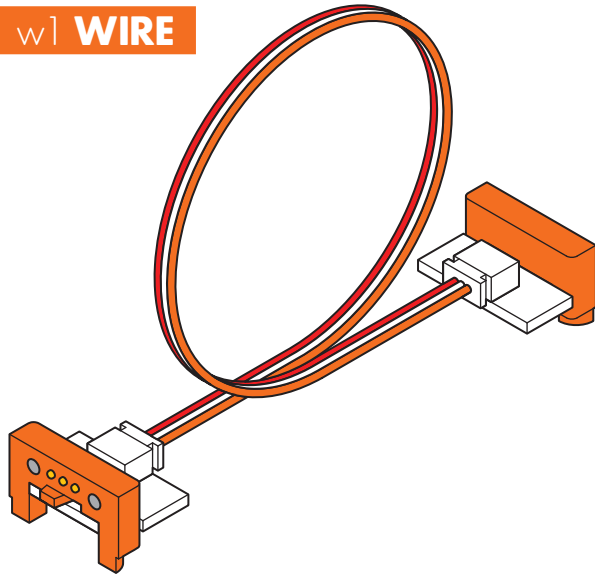


BIVALVE



CHEF MIXING INGREDIENTS

w1 WIRE



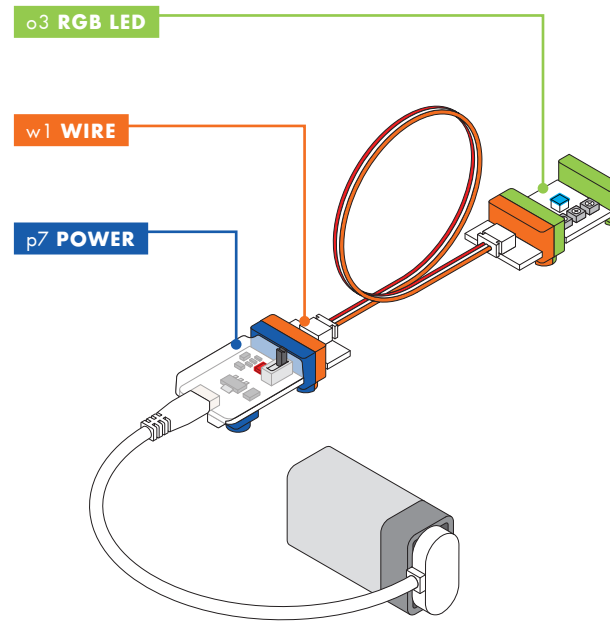
MEET THE BIT

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.

MINI-CHALLENGE

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

SAMPLE CIRCUIT



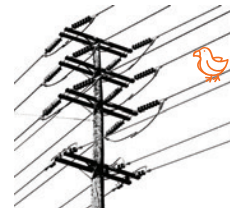
HOW IT WORKS

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.

REAL WORLD ANALOGIES



EXTENSION CORD

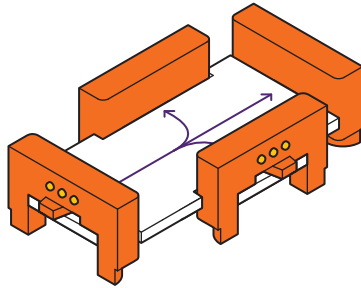


POWER LINES



STRING OF LIGHTS

w2 BRANCH



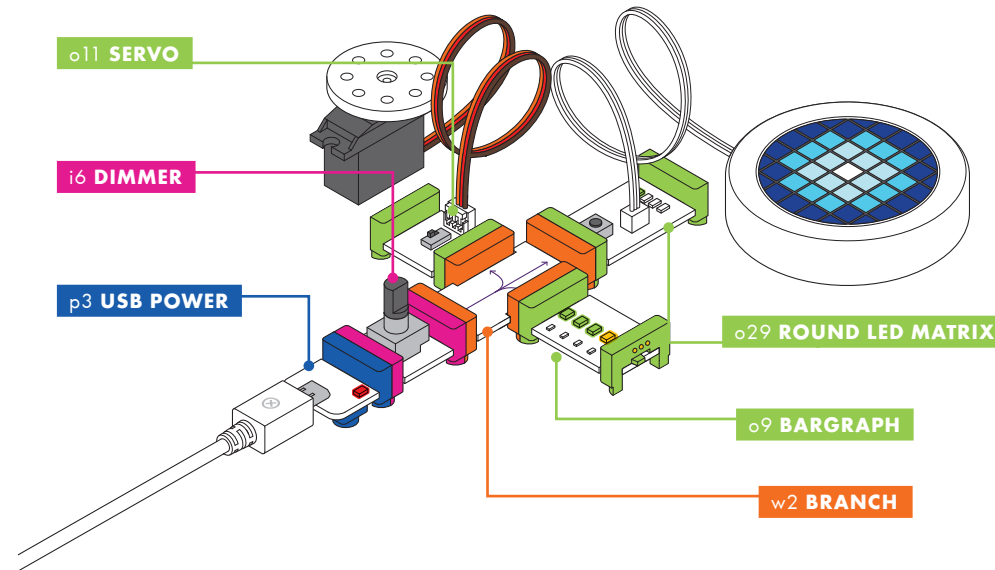
MEET THE BIT

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

MINI-CHALLENGE

Can you invent a creature controlled with one input Bit?

SAMPLE CIRCUIT



HOW IT WORKS

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

REAL WORLD ANALOGIES



POWER STRIP



USB HUB

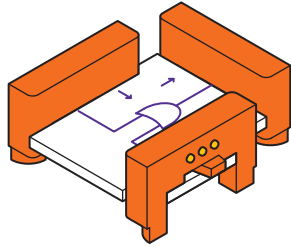


TREE BRANCH



FORK IN A RIVER

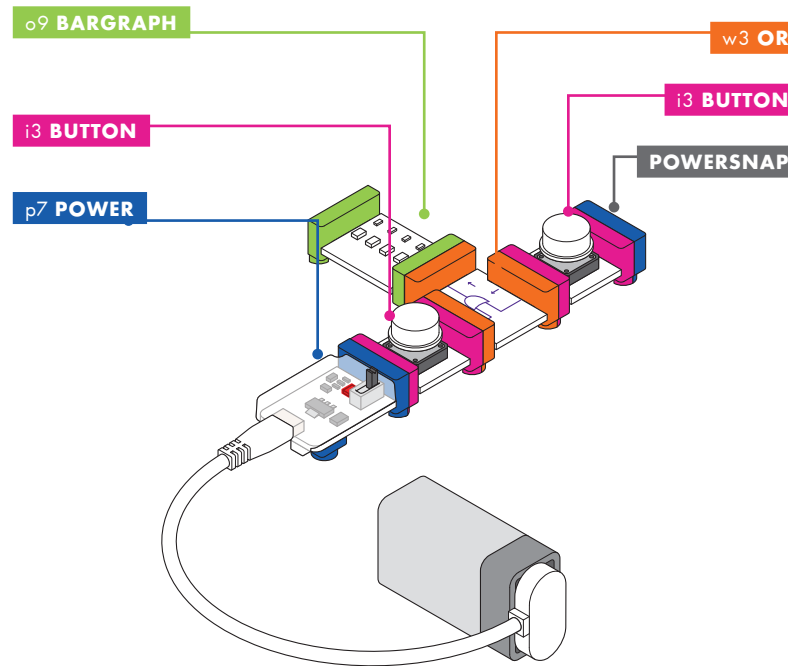
w3 OR



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.

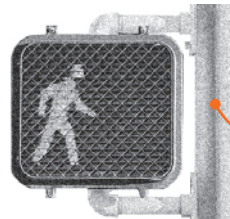
SAMPLE CIRCUIT



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



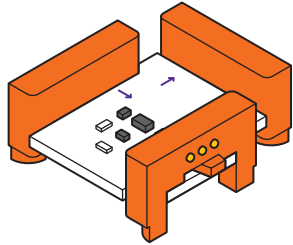
CROSS WALK SIGNAL

if either someone from one side of the road OR someone from the other side of the road presses a button, the crosswalk signal will be triggered.

CHEAT SHEET

INPUT 1	INPUT 2	OUTPUT
OFF	OFF	OFF
ON	OFF	ON
OFF	ON	ON
ON	ON	ON

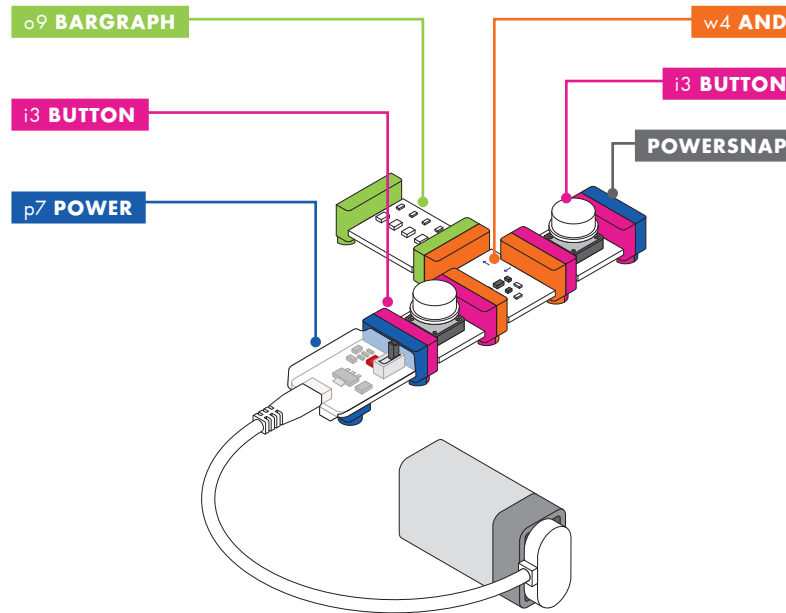
w4 AND



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

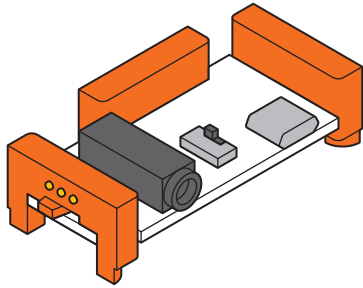


You need to press a letter key AND the shift key in order to type a capital letter.

CHEAT SHEET

INPUT 1	INPUT 2	OUTPUT
OFF	OFF	OFF
ON	OFF	OFF
OFF	ON	OFF
ON	ON	ON

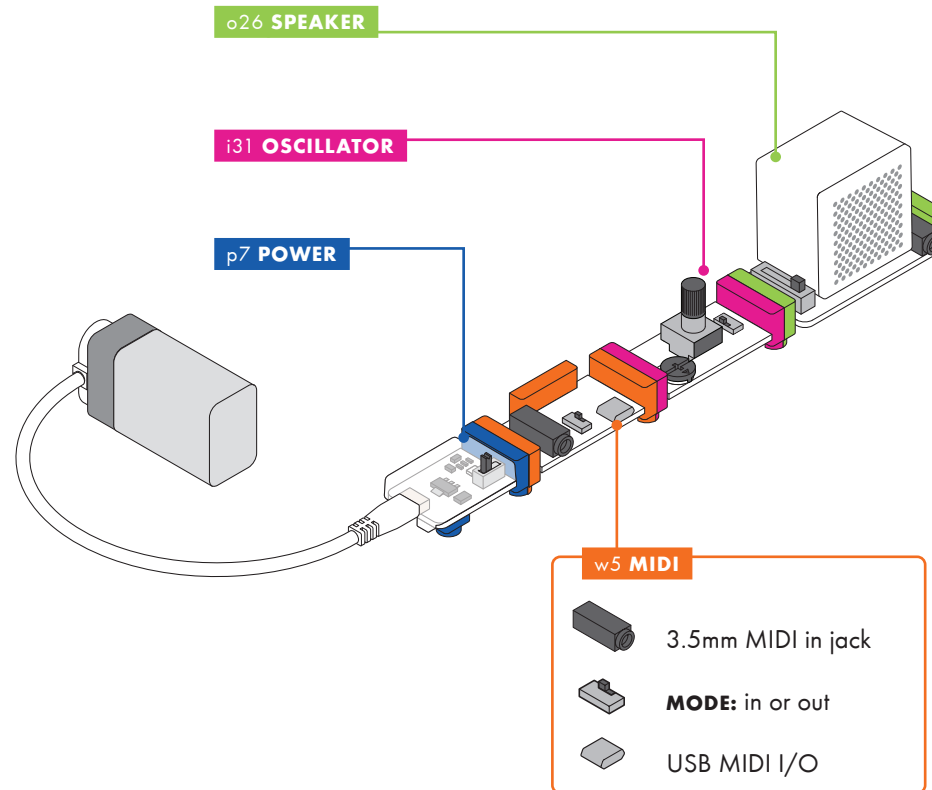
w5 MIDI



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.

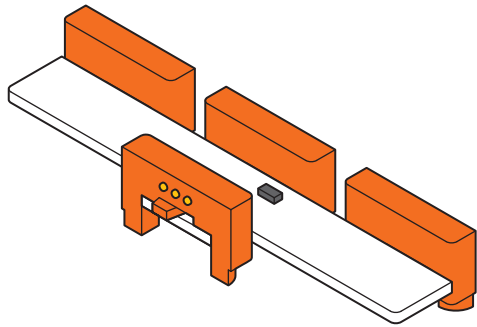
The note range of the Bit is from C2 to C6. MIDI note C2 generates an output CV of 0.2V. Thereafter, the output CV increases by 1V/oct up to C6. Similar to the keyboard and micro sequencer Bits, this Bit has 2 outputs: a main bitSnap output that sends control voltages to other Bits and a **TRIGGER OUT**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

REAL WORLD ANALOGIES



BAND CONDUCTOR

w7 FORK



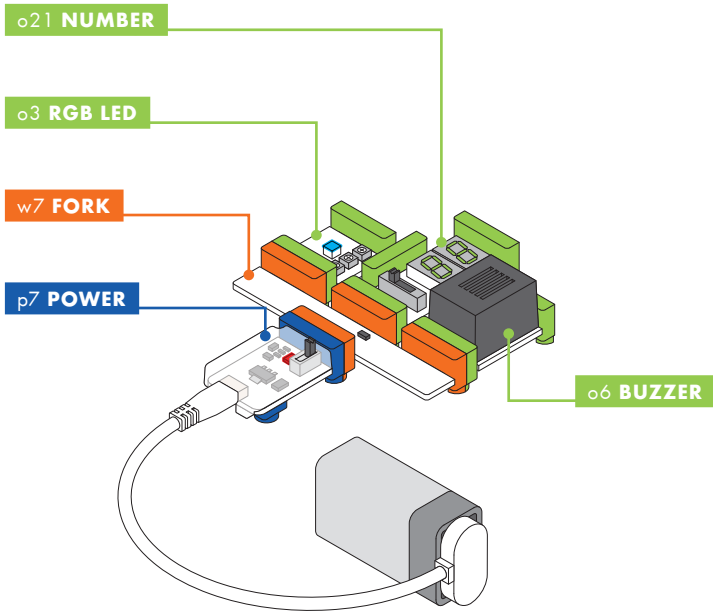
MEET THE BIT

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.

MINI-CHALLENGE

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

SAMPLE CIRCUIT



HOW IT WORKS

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

REAL WORLD ANALOGIES

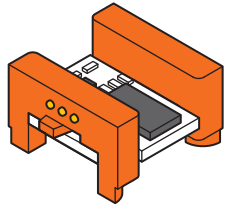


POWER STRIP



FORK IN THE ROAD

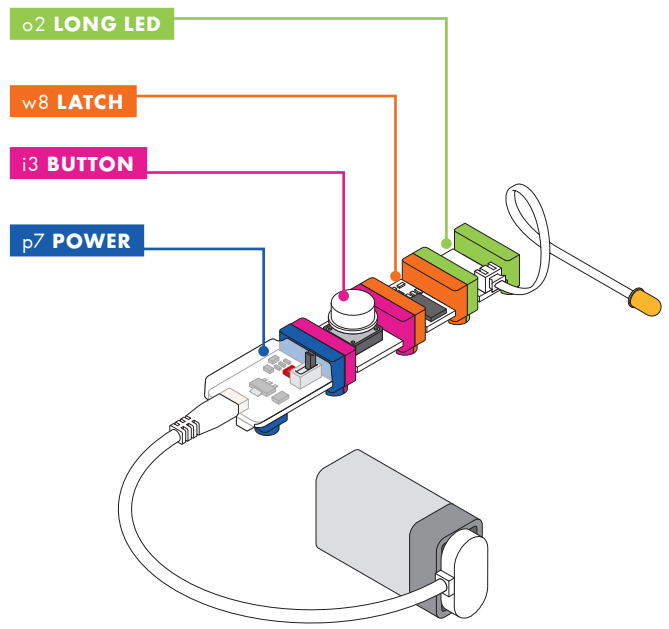
w8 LATCH



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

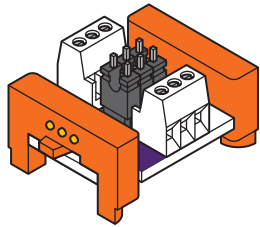


DOORSTOP



CLICKING A PEN

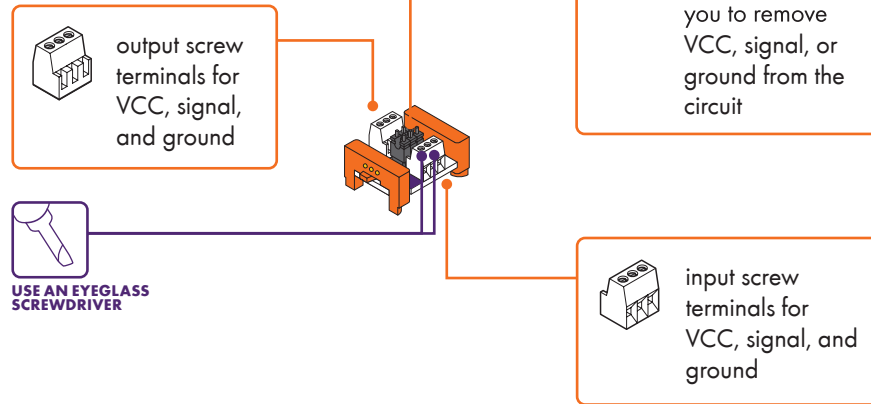
w9 PROTO



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



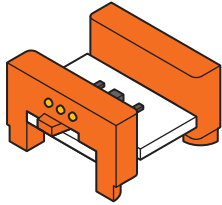
CAR JUMPER CABLES



FIRE HYDRANT

Firefighters can tap into the hydrant's water supply to fight fires.

w10 INVERTER



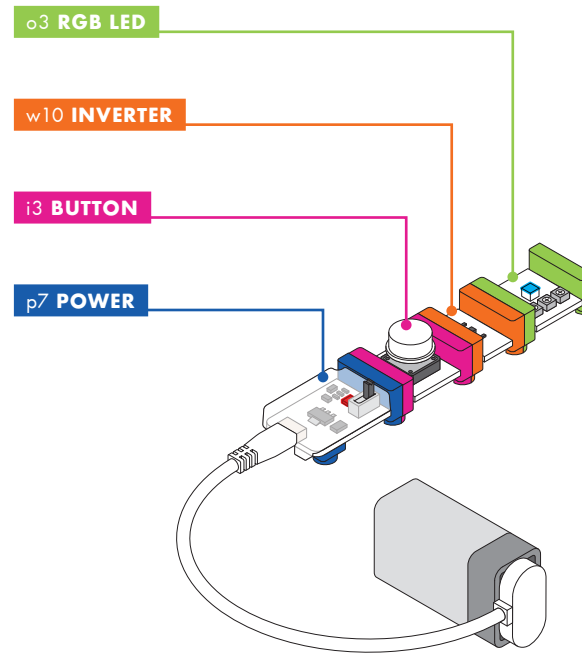
MEET THE BIT

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.

MINI-CHALLENGE

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

SAMPLE CIRCUIT



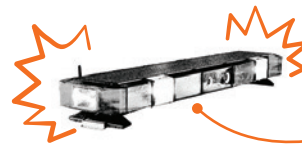
HOW IT WORKS

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.

REAL WORLD ANALOGIES



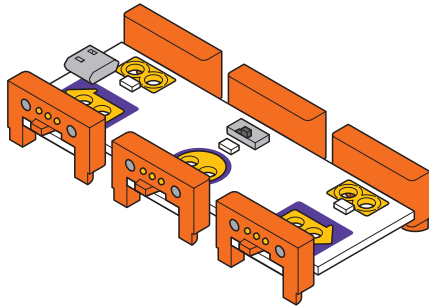
OPPOSITE DAY



ALTERNATING POLICE LIGHTS

Try this: power, pulse, light, inverter, light.

w14 MAKEY MAKEY® BIT



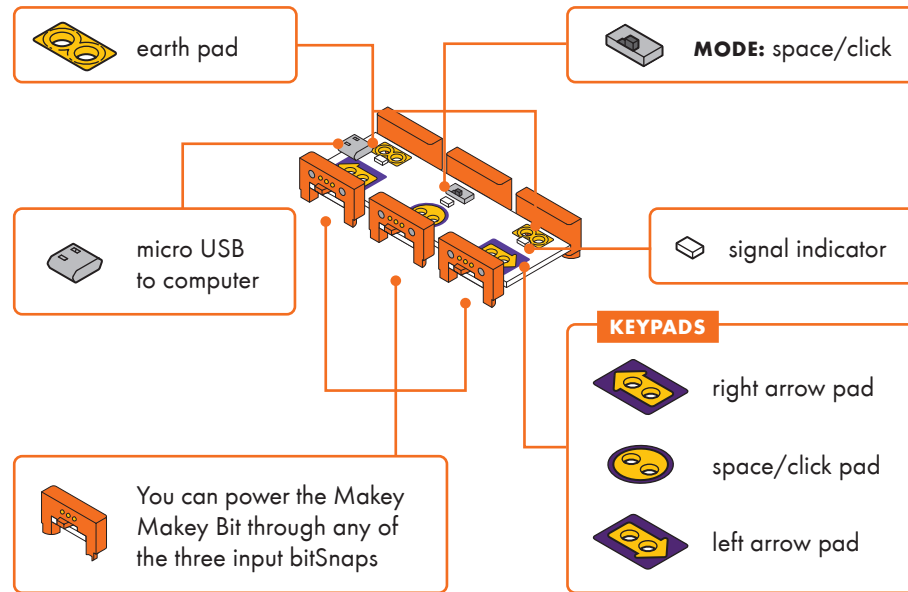
MEET THE BIT

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?

BIT BREAKDOWN



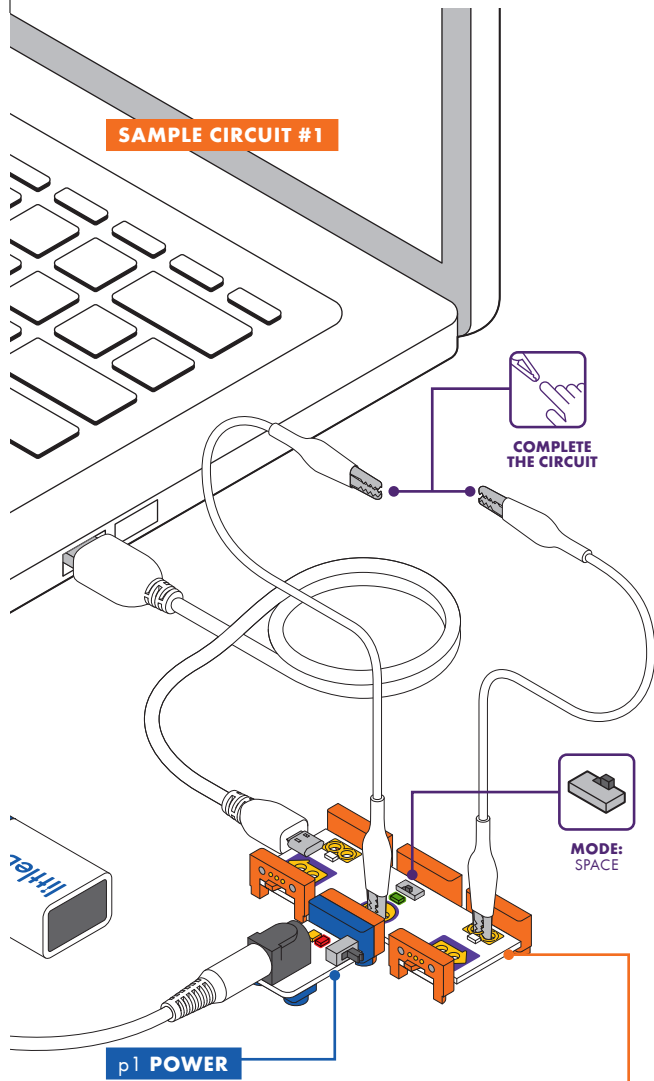
REAL WORLD ANALOGIES



COMPUTER KEYBOARD



OPERATION GAME®

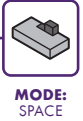


SAMPLE CIRCUIT #1

HOW IT WORKS

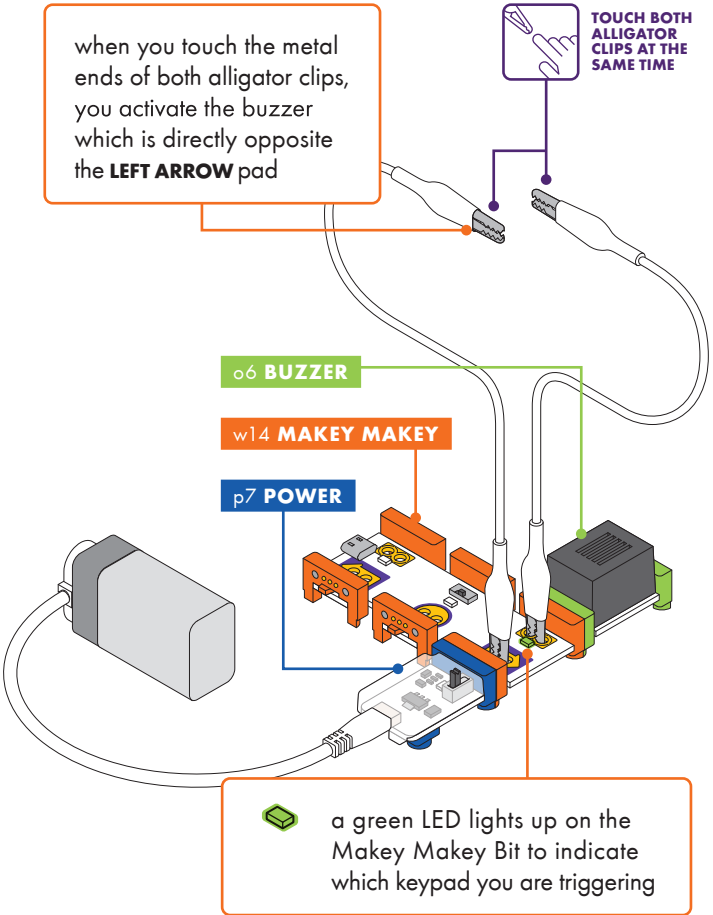
When you connect the Makey Makey Bit to your computer with the micro USB cable it can act like a keyboard or mouse, controlling **LEFT ARROW**, **RIGHT ARROW**, and **SPACE/CLICK**. For example, when you touch the **SPACE/CLICK** pad and an **EARTH** pad, it is the same as pressing the space bar or left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



w14 MAKEY MAKEY

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



SAMPLE CIRCUIT #2

HOW IT WORKS

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



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!

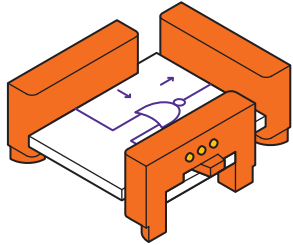
o6 BUZZER

w14 MAKEY MAKEY

p7 POWER

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

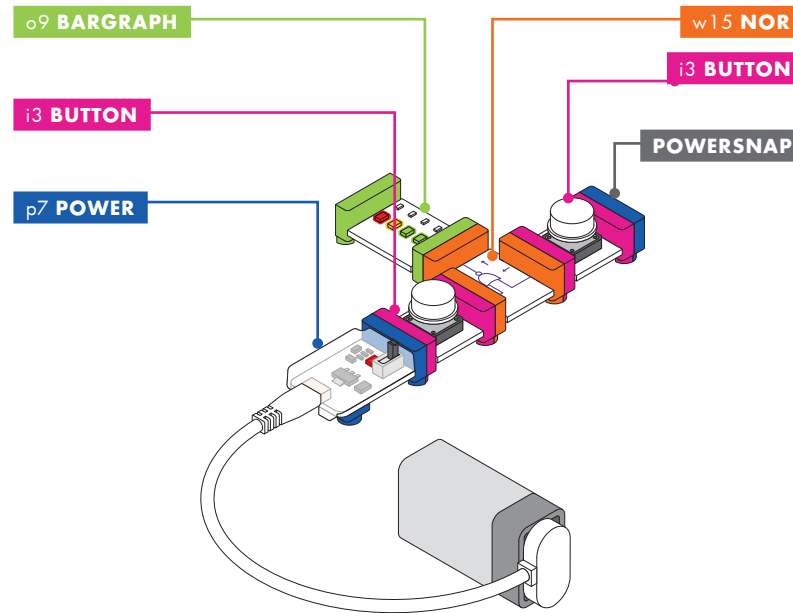
w15 NOR



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



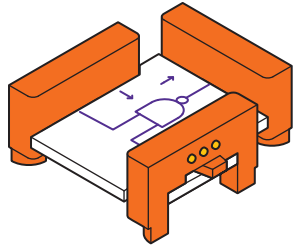
SLEEP MODE ON A COMPUTER

Your computer stays asleep as long as neither the mouse NOR the keyboard are touched.

CHEAT SHEET

INPUT 1	INPUT 2	OUTPUT
OFF	OFF	ON
ON	OFF	OFF
OFF	ON	OFF
ON	ON	OFF

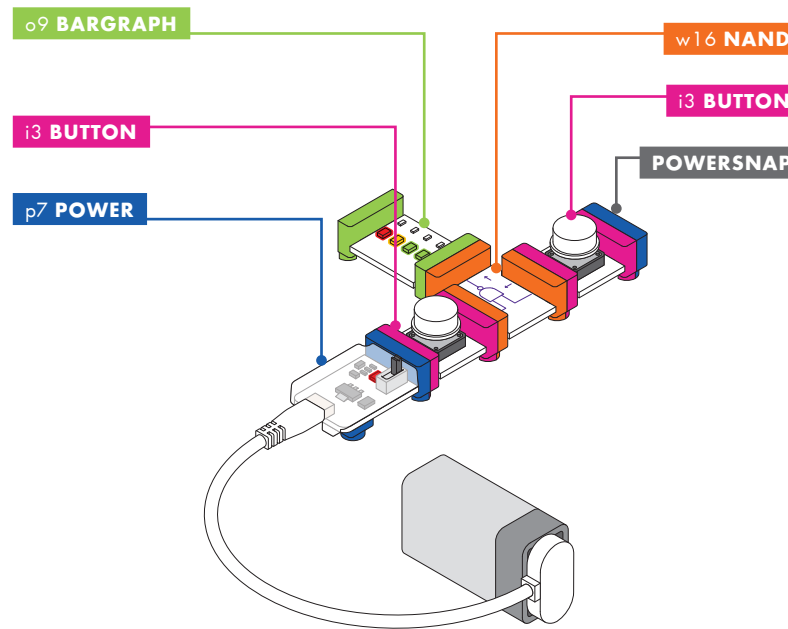
w16 NAND



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

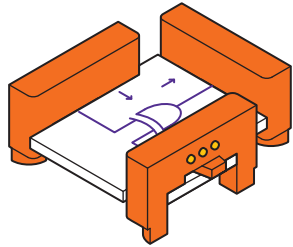


Car headlights stay on unless both the driver's door and passenger's door are closed.

CHEAT SHEET

INPUT 1	INPUT 2	OUTPUT
OFF	OFF	ON
ON	OFF	ON
OFF	ON	ON
ON	ON	OFF

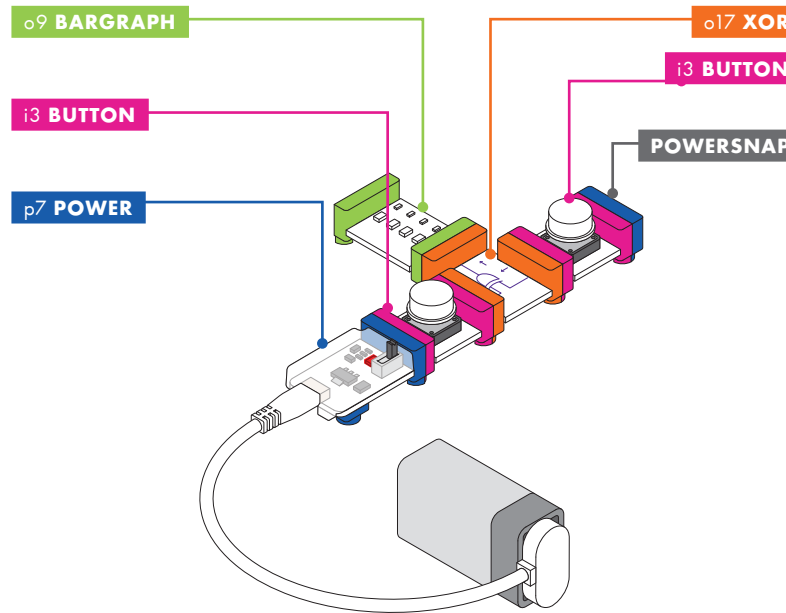
w17 XOR



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.

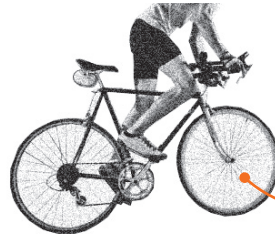
SAMPLE CIRCUIT



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



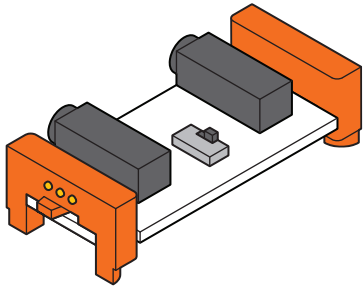
PEDALING ON A BICYCLE

You can only move forward if you are pushing with one foot OR the other. If you push with both feet at the same time, you won't move.

CHEAT SHEET

INPUT 1	INPUT 2	OUTPUT
OFF	OFF	OFF
ON	OFF	ON
OFF	ON	ON
ON	ON	OFF

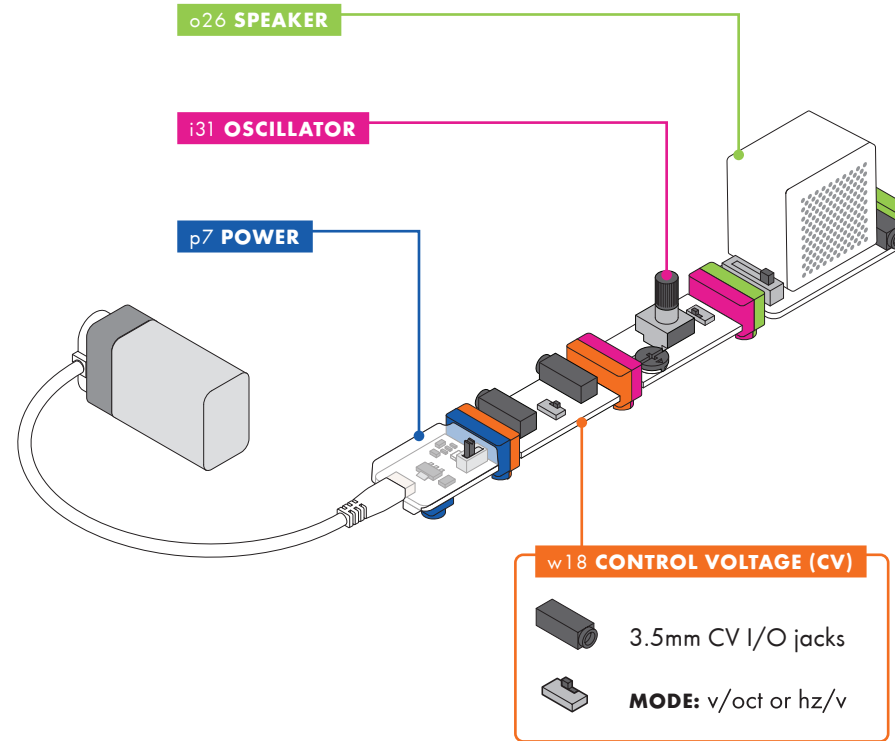
w18 CONTROL VOLTAGE (CV)



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



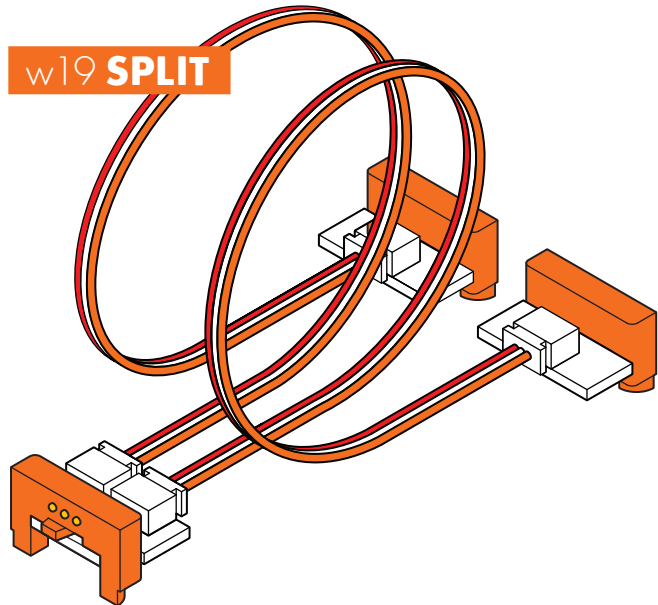
HOW IT WORKS

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

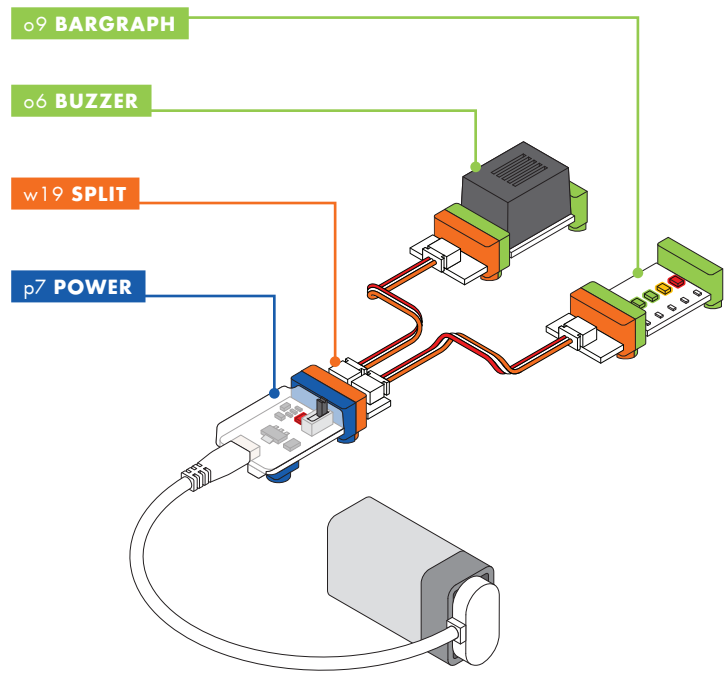
MEET THE BIT

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.

MINI-CHALLENGE

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

SAMPLE CIRCUIT



HOW IT WORKS

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

REAL WORLD ANALOGIES

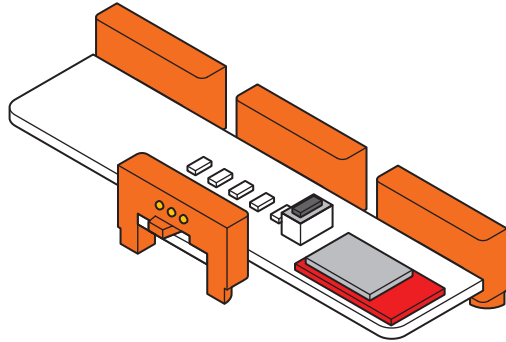


POWER STRIP



HEADPHONES

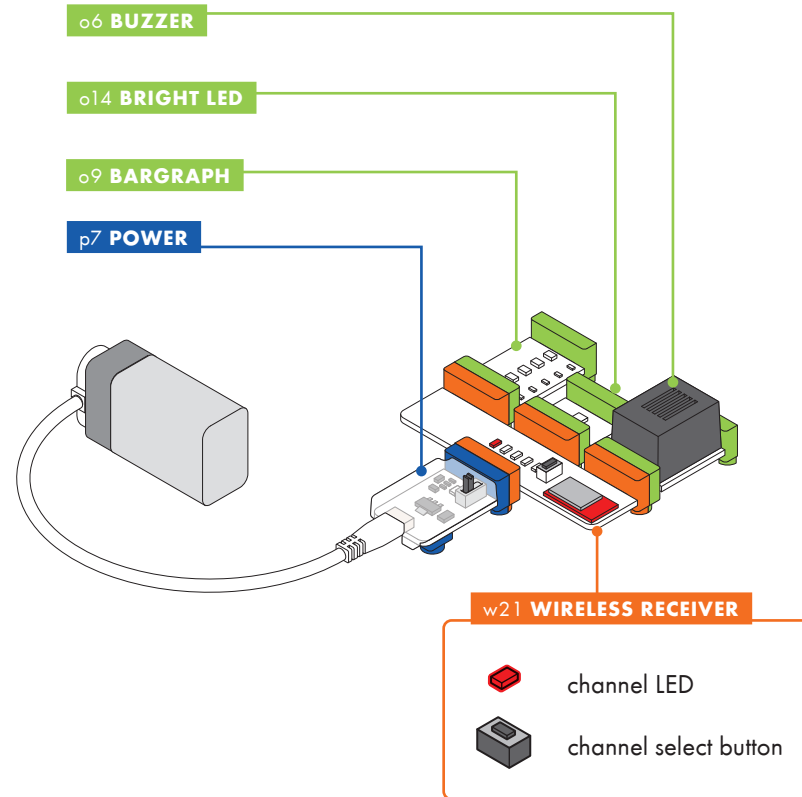
w21 WIRELESS RECEIVER



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

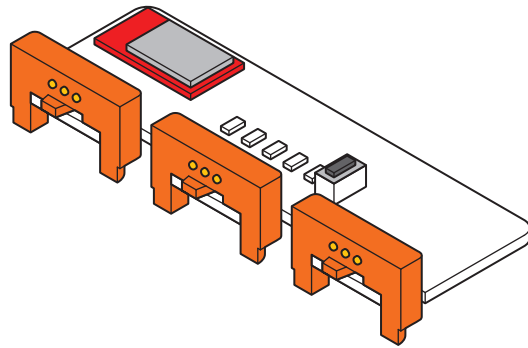
The wireless Bits are able to communicate on 5 transmission channels, like a walkie-talkie. They just need to be set to the same channel (labeled a, b, c, d, and e) in order to talk to each other. A single transmitter can send its signal to multiple receivers on the same transmission channel. However, 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 receiver must correspond with the input on the transmitter end.

REAL WORLD ANALOGIES



RADIO ANTENNA

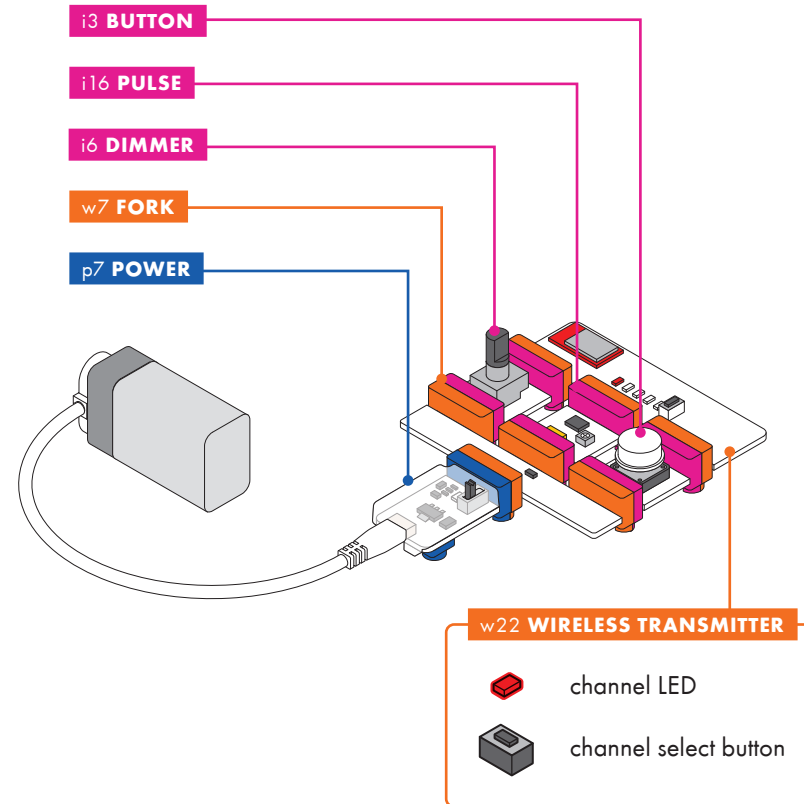
w22 WIRELESS TRANSMITTER



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 receiver end.

REAL WORLD ANALOGIES

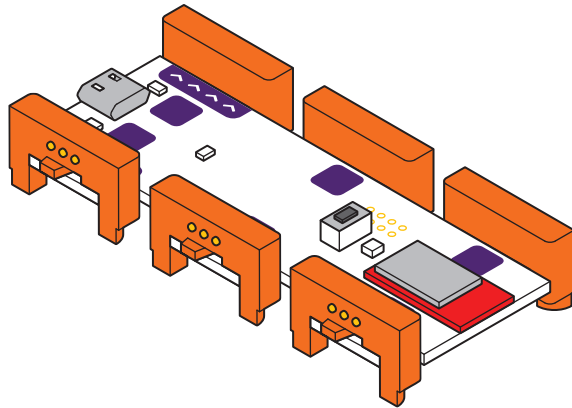


WALKIE-TALKIE



RADIO TOWER

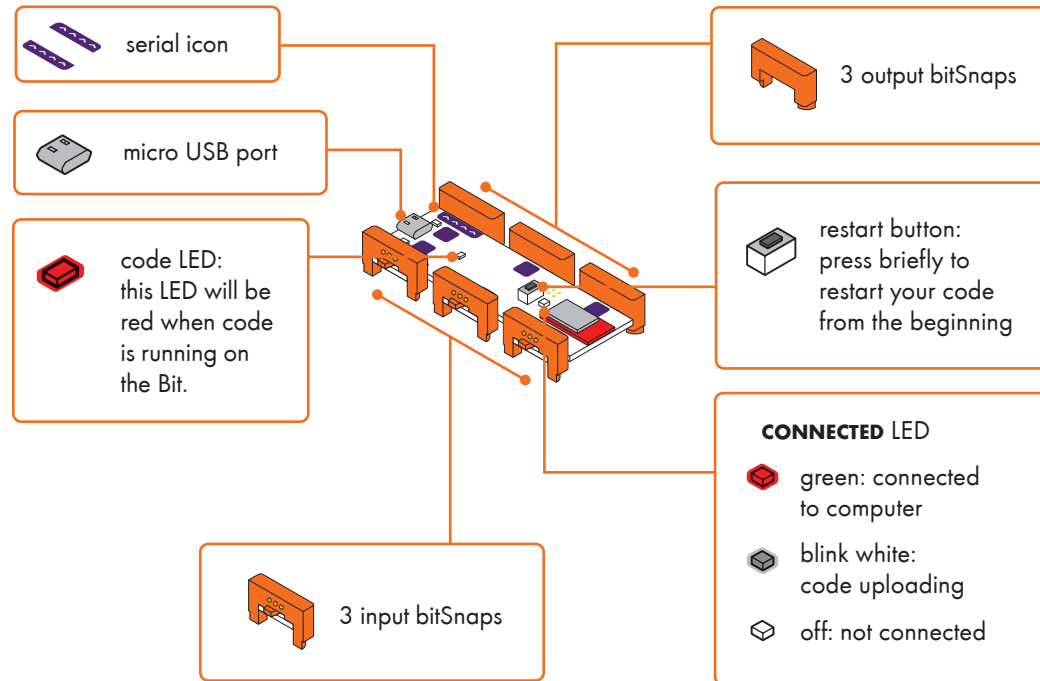
w26 CODEBIT™



MEET THE BIT

The codeBit levels up your littleBits circuits by allowing you to program how your Bits work. Using the Fuse 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

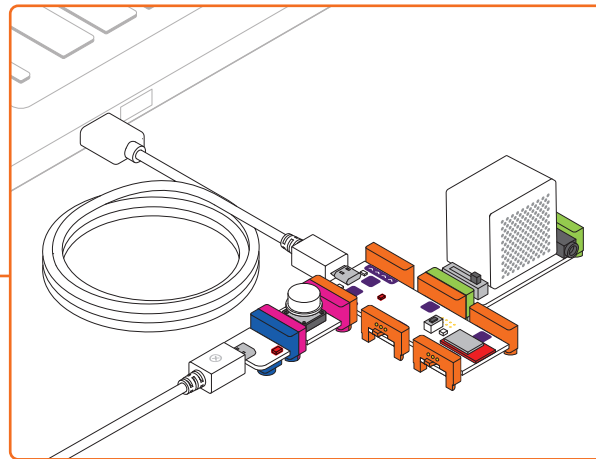
SAMPLE CIRCUIT

o26 SPEAKER

w26 CODEBIT

i3 BUTTON

p3 USB POWER



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 Fuse 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 classroom.littleBits.com

WHAT IS SERIAL?

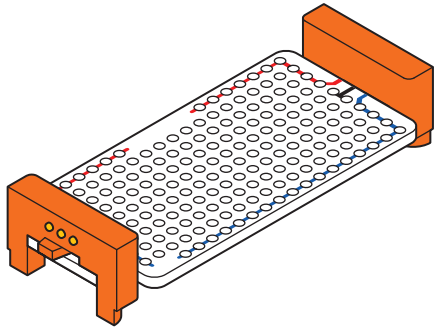


Serial communication is a way to send complex information between computers and other devices. Serial communication is made up of a series of 'on' and 'off' signals.

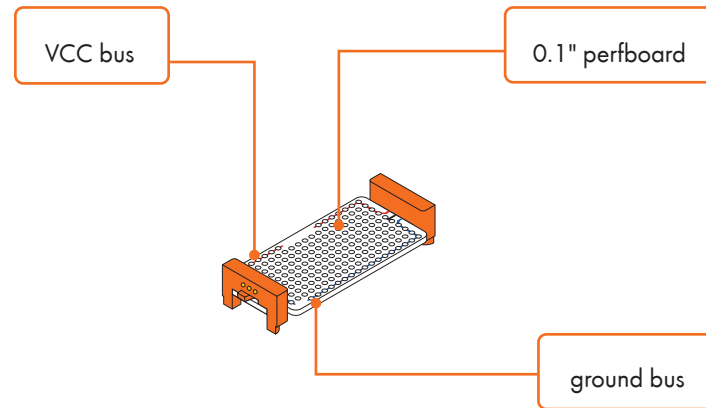
For example, the codeBit can turn your code into serial data and send it to the LED matrix to tell it what to do.

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.

w29 PERF



BIT BREAKDOWN



HOW IT WORKS

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

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.

REAL WORLD ANALOGIES

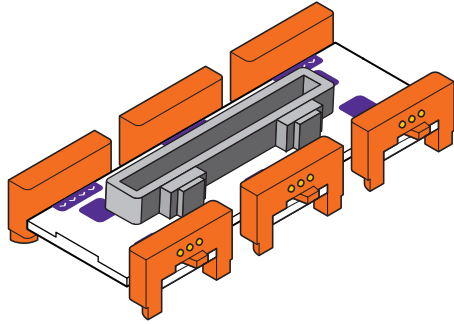


BREADBOARD



WATER PIPES

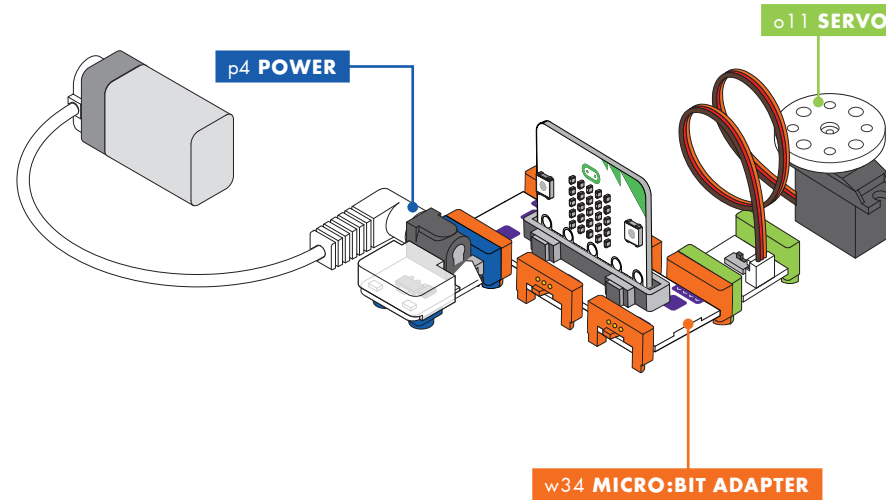
w34 MICRO:BIT ADAPTER



MEET THE BIT

The littleBits micro:bit Adapter connects micro:bit and littleBits enabling new learning experiences and creative inventions in a less-intimidating way. Enhance your learning with micro:bit by adding coding to your littleBits using platforms like the free Microsoft MakeCode or Python editor.

SAMPLE CIRCUIT

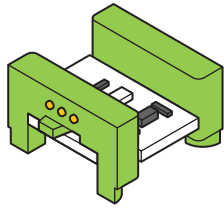


HOW IT WORKS

The littleBits micro:bit adapter Bit works by connecting the signals from the littleBits input and output bitsnaps to pins on the micro:bit edge connectors. No special coding libraries are needed.

* micro:bit is required for use & sold separately

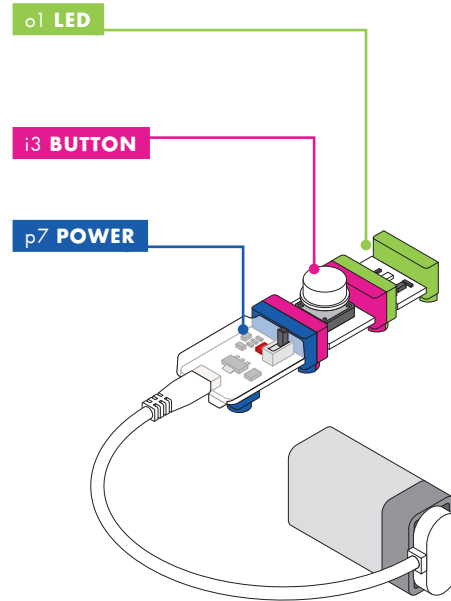
01 LED



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

REAL WORLD ANALOGIES

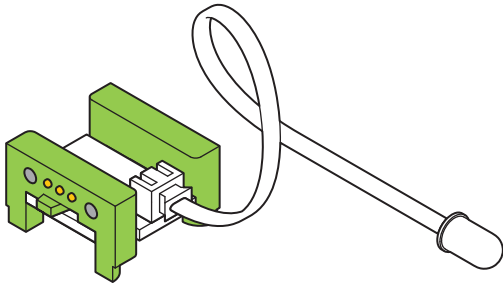


CAMERA FLASH



LED HEADLAMP

o2 LONG LED



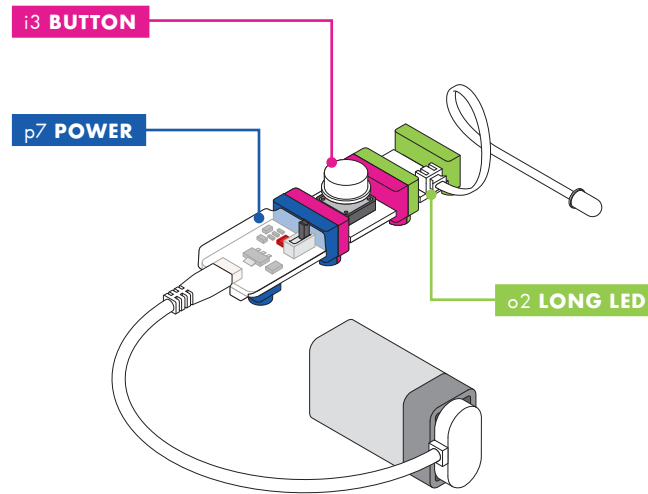
MEET THE BIT

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

REAL WORLD ANALOGIES



FLASHLIGHT

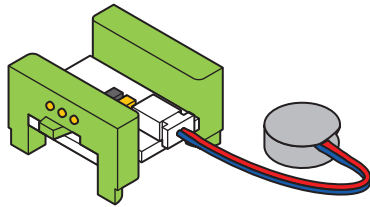


STREET LAMP



ANGLERFISH

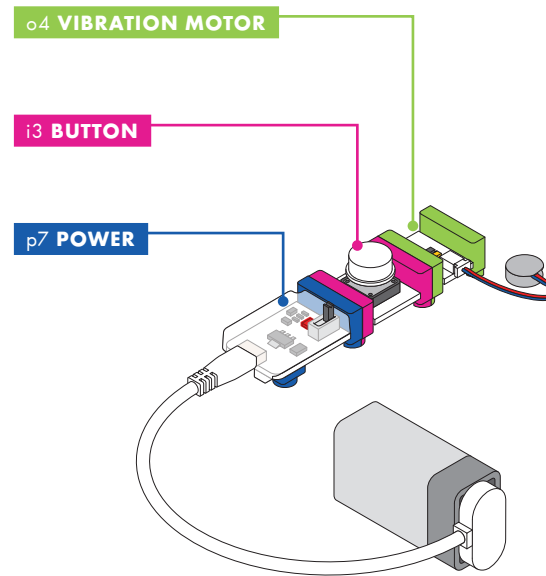
o4 VIBRATION MOTOR



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 vibrateSnap- 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

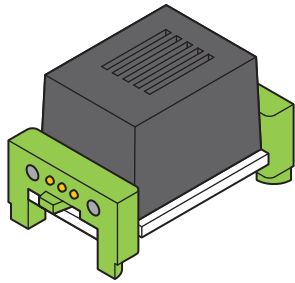


CELL PHONE BUZZER



ELECTRIC TOOTHBRUSH

BUZZER



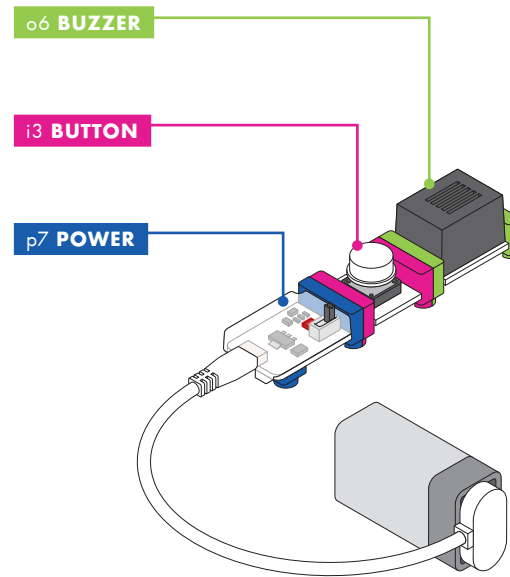
MEET THE BIT

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

MINI-CHALLENGE

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

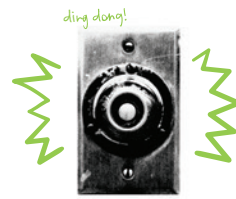
SAMPLE CIRCUIT



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.

REAL WORLD ANALOGIES



DOORBELL

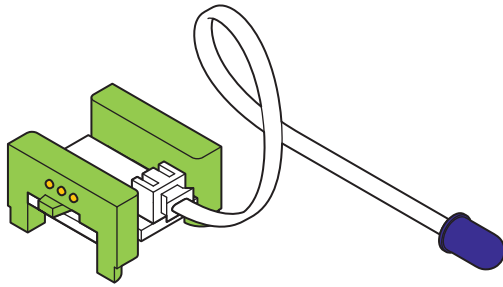


CAR ALARM



WASHING MACHINE

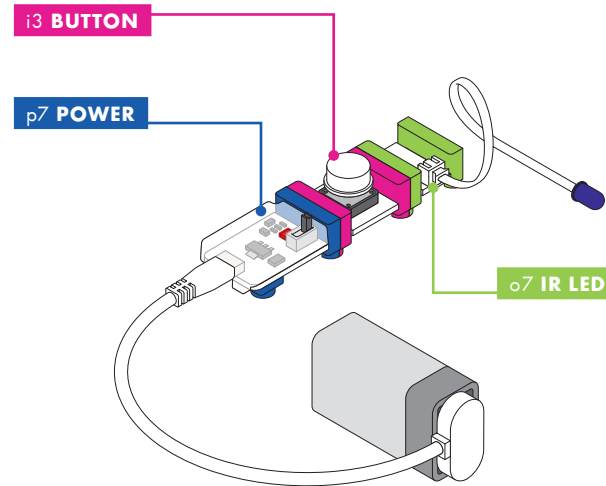
o7 IR LED



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

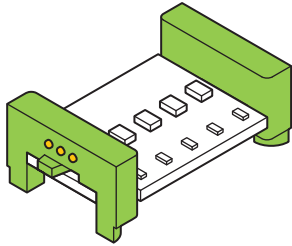


TV REMOTE



BLACK LIGHT

09 BARGRAPH



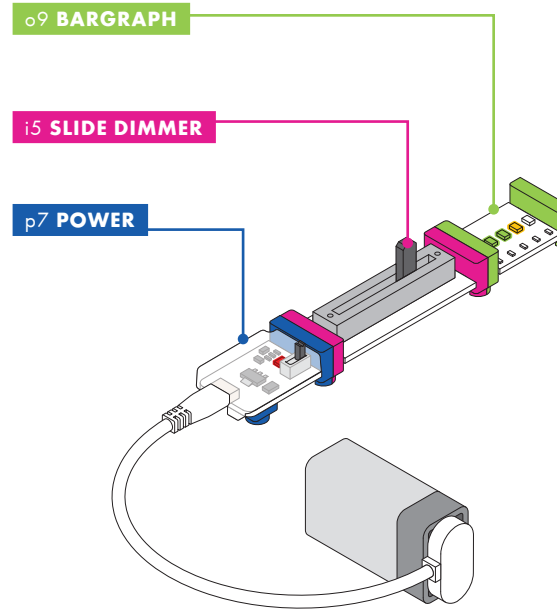
MEET THE BIT

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?

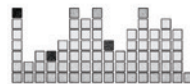
SAMPLE CIRCUIT



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

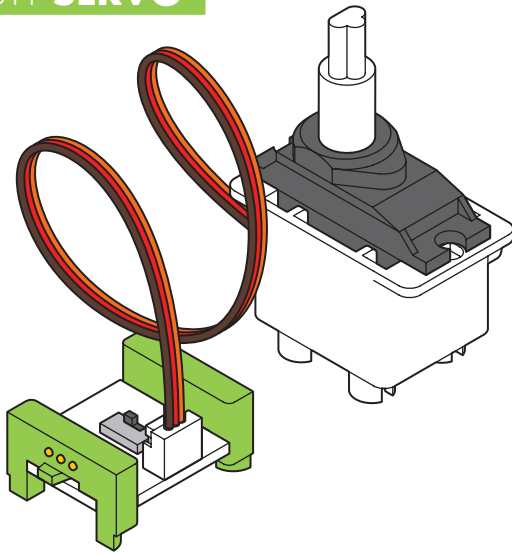


TV VOLUME



PHONE SCREEN BRIGHTNESS

o11 SERVO



MEET THE BIT

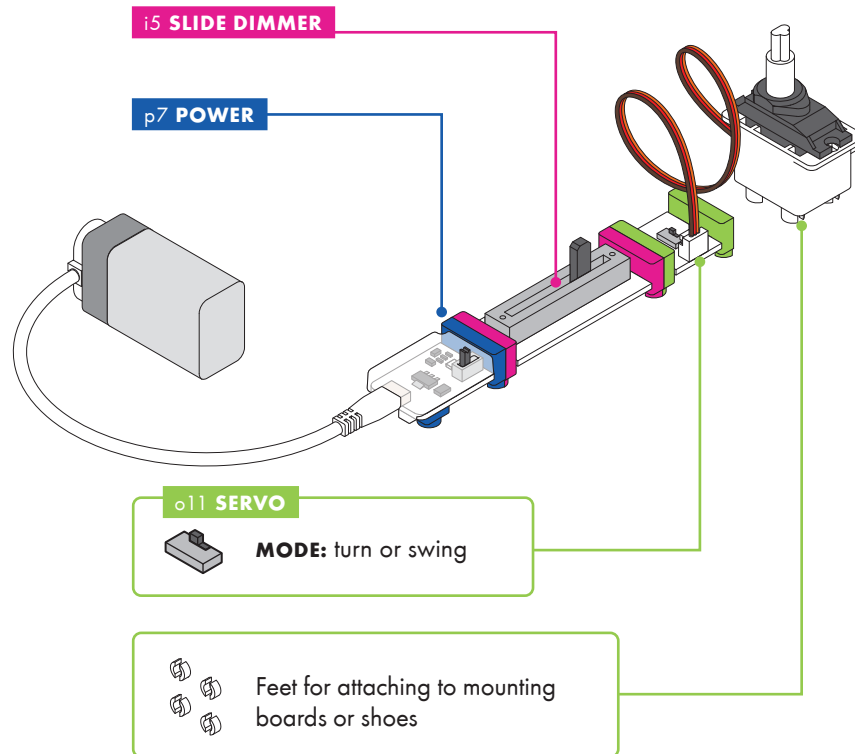
The servo is a motor that can swing back and forth or be turned to a specific position.

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 75 and 76.

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 dimmer to set the angle you want. In **SWING** mode, the servo will move back and forth on its own like a pair of windshield wipers - the input signal controls the speed of the swing.

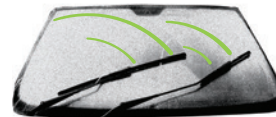
The servo's range of motion is about 180 degrees.

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

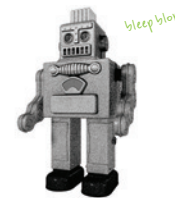
REAL WORLD ANALOGIES



TRUCK CRANE

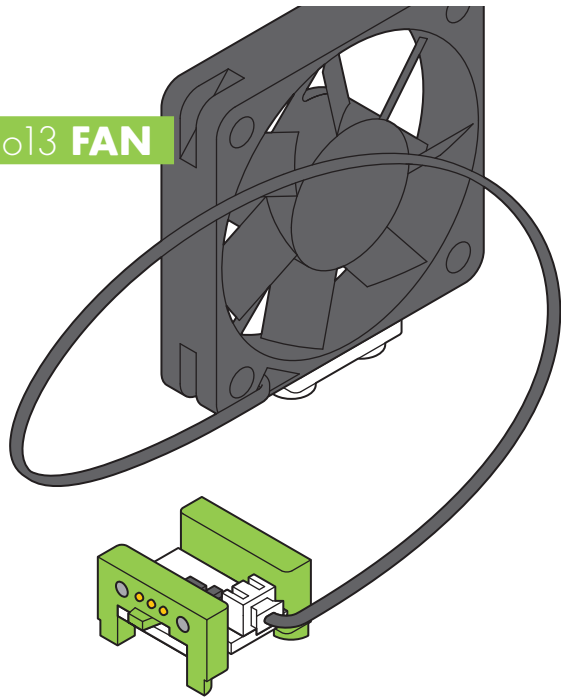


WINDSHIELD WIPERS



ROBOT

o13 FAN



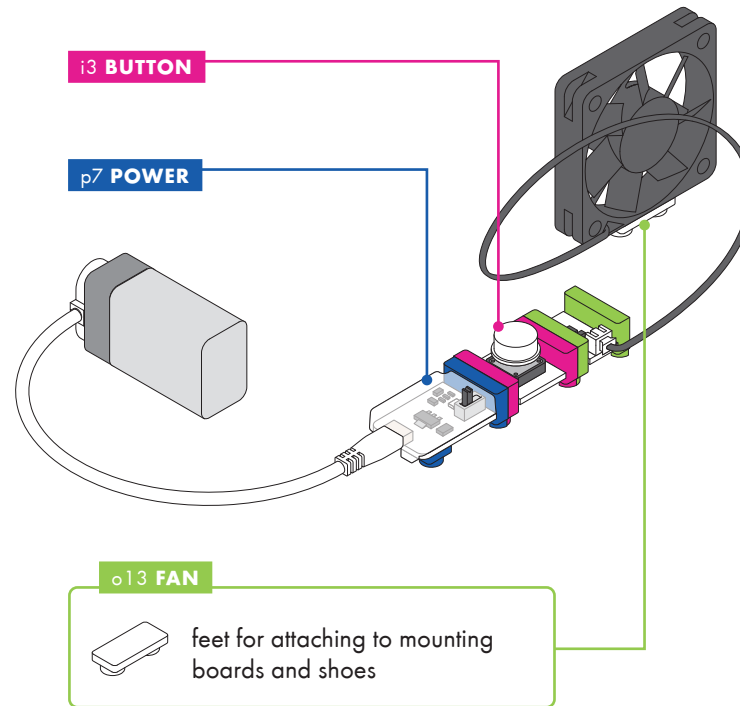
MEET THE BIT

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.

MINI-CHALLENGE

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

SAMPLE CIRCUIT



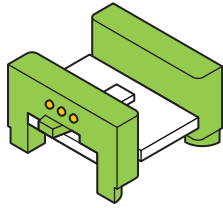
HOW IT WORKS

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

REAL WORLD ANALOGIES



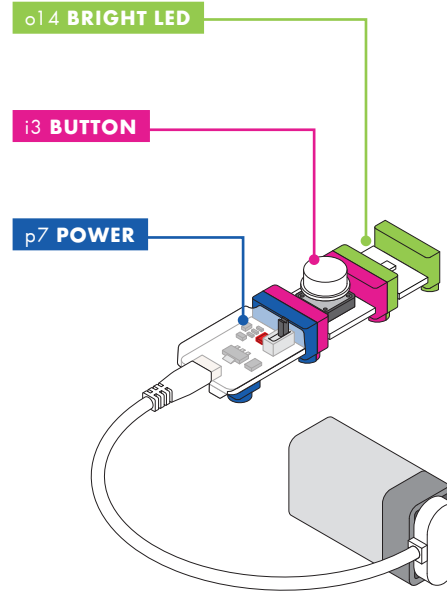
o14 BRIGHT LED



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.

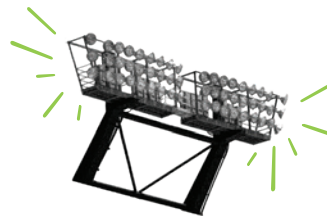
SAMPLE CIRCUIT



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

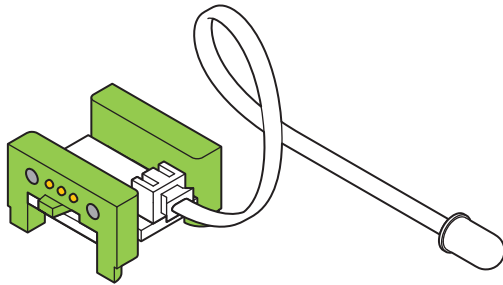


STADIUM LIGHTS



LIGHTHOUSE

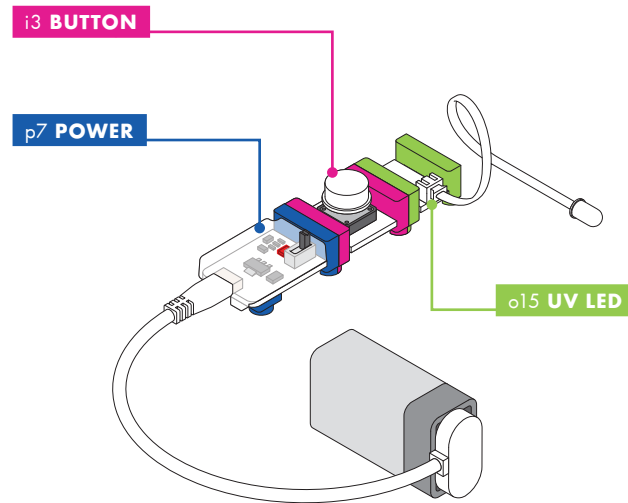
o15 UV LED



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



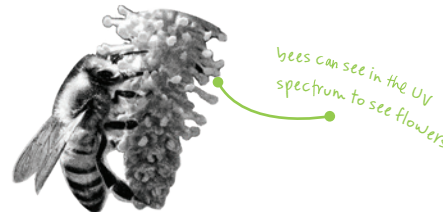
HOW IT WORKS

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

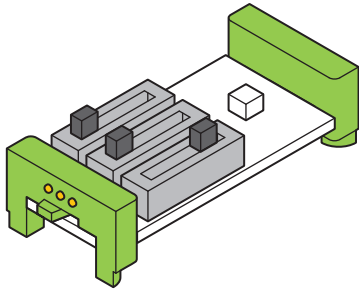


DETECTIVE WORK



BEE VISION

o19 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.

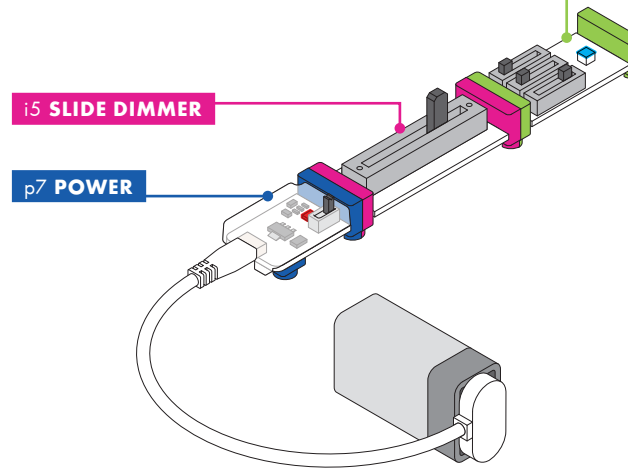
MINI-CHALLENGE

Can you invent a flashlight that uses your favorite color?

SAMPLE CIRCUIT

o3 RGB LED

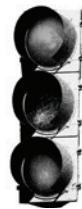
-  **R:** adjust the amount of red light
-  **G:** adjust the amount of green light
-  **B:** adjust the amount of blue light



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

Thousands of RGB LEDs create these displays

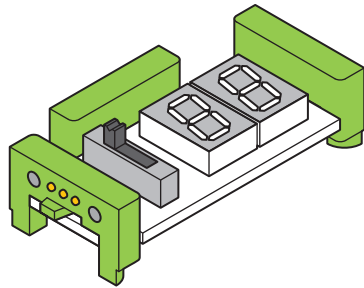


JUMBOTRON



DECORATIVE LIGHTS

o21 NUMBER



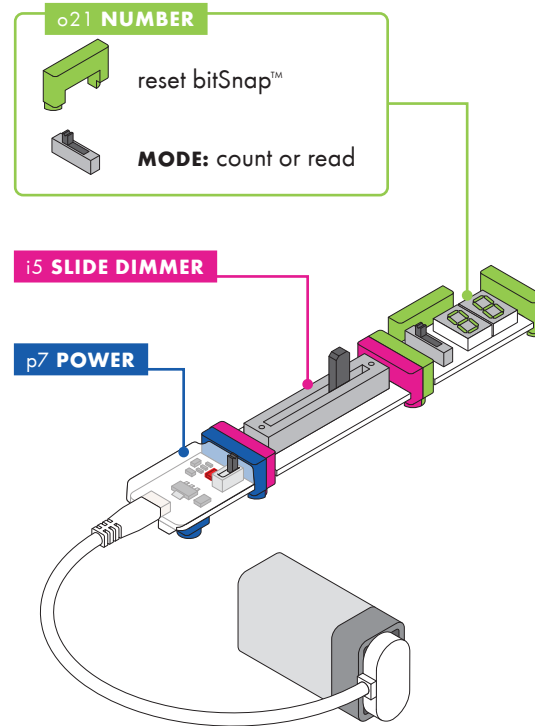
MEET THE BIT

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.

MINI-CHALLENGE

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

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.

REAL WORLD ANALOGIES



SCOREBOARD



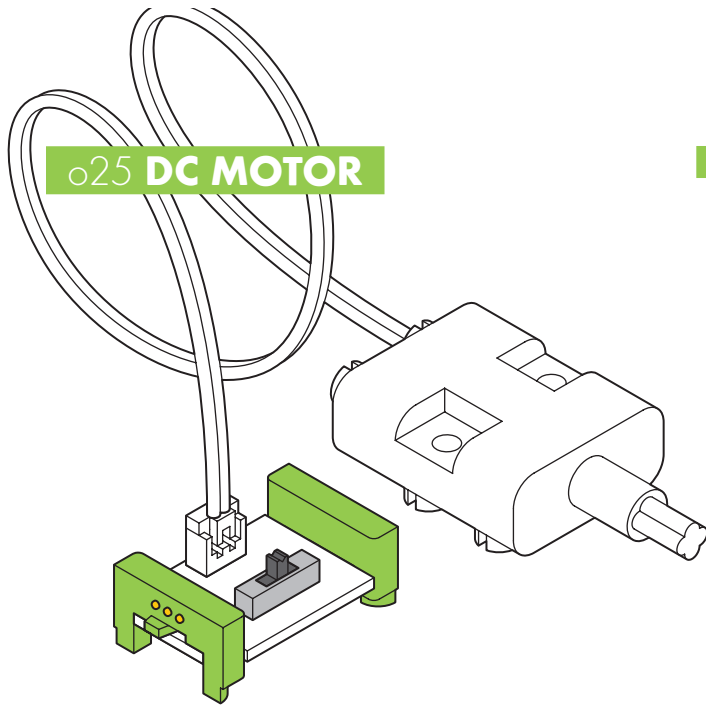
VOLUME INDICATOR ON TV



SPEEDOMETER



PEOPLE COUNTER



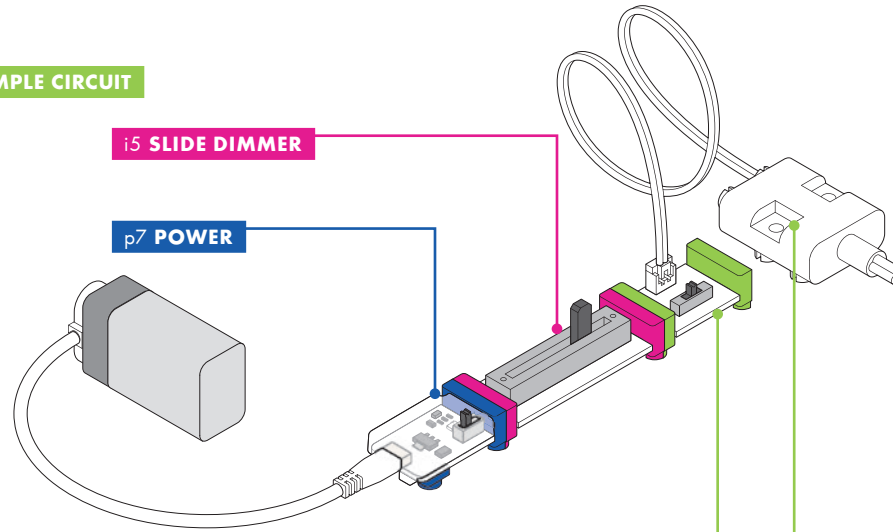
25 DC MOTOR

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 76.

SAMPLE CIRCUIT



25 DC MOTOR



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



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

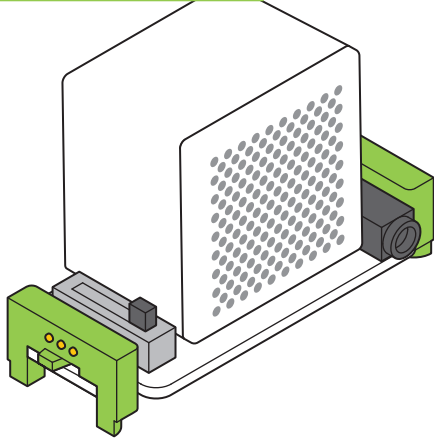


DRILL



FERRIS WHEEL

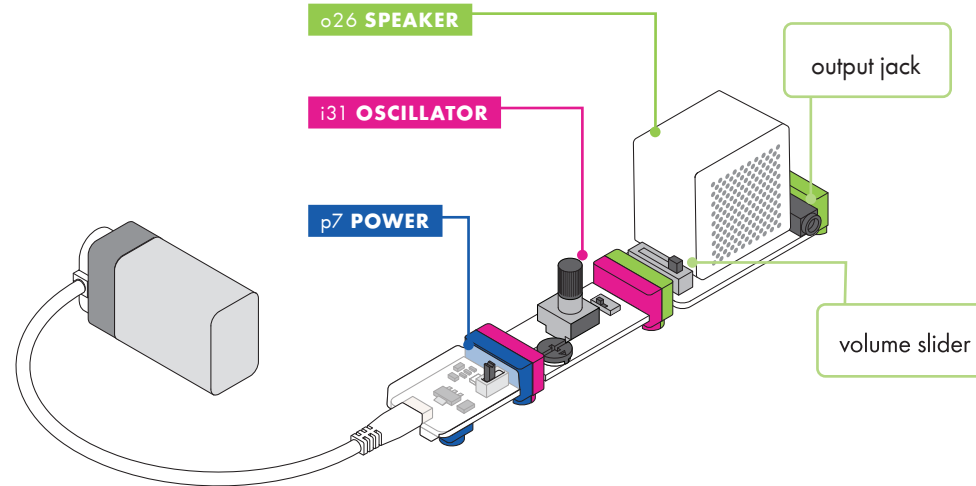
o26 SPEAKER



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

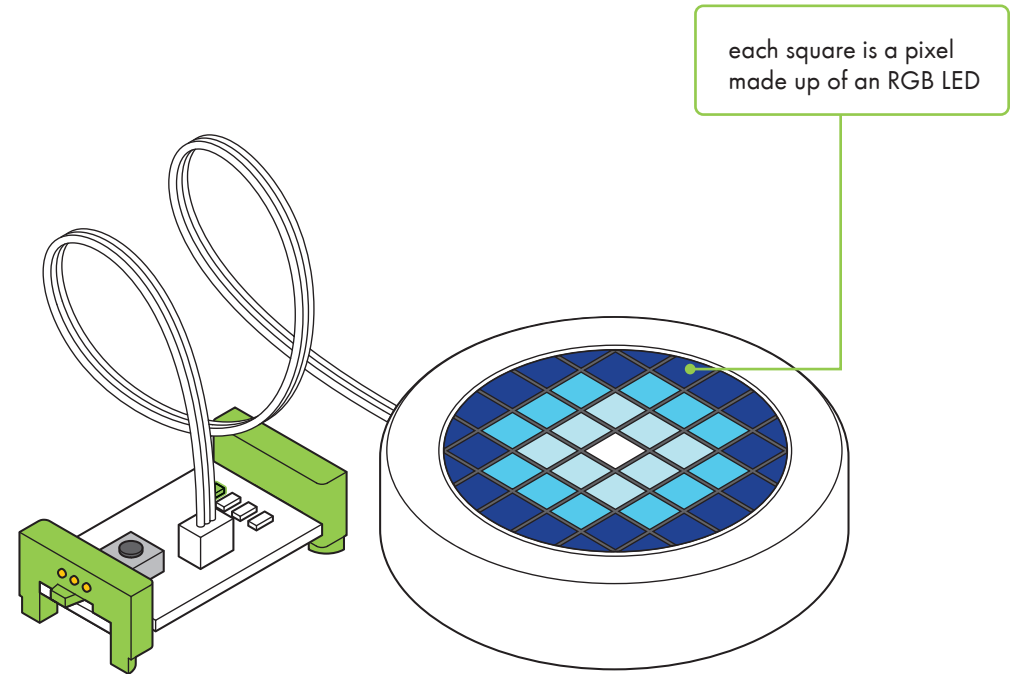
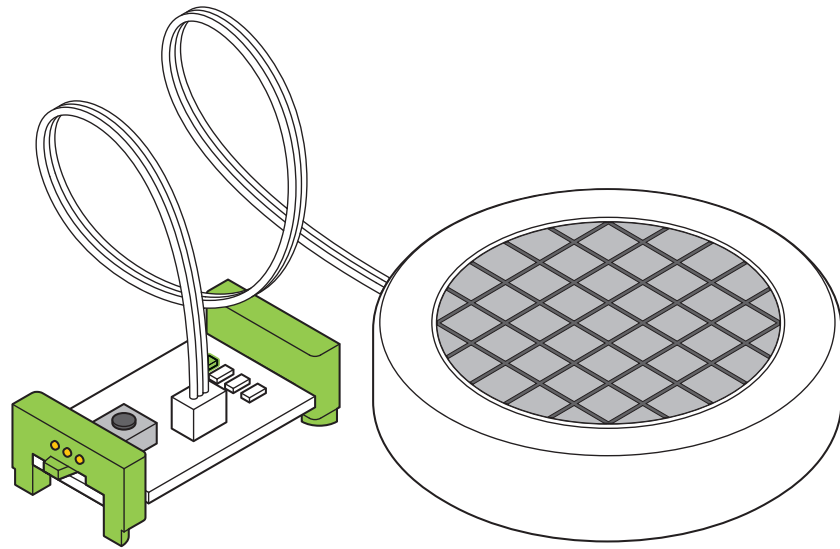


GUITAR AMP



PHONE SPEAKER

029 ROUND LED MATRIX

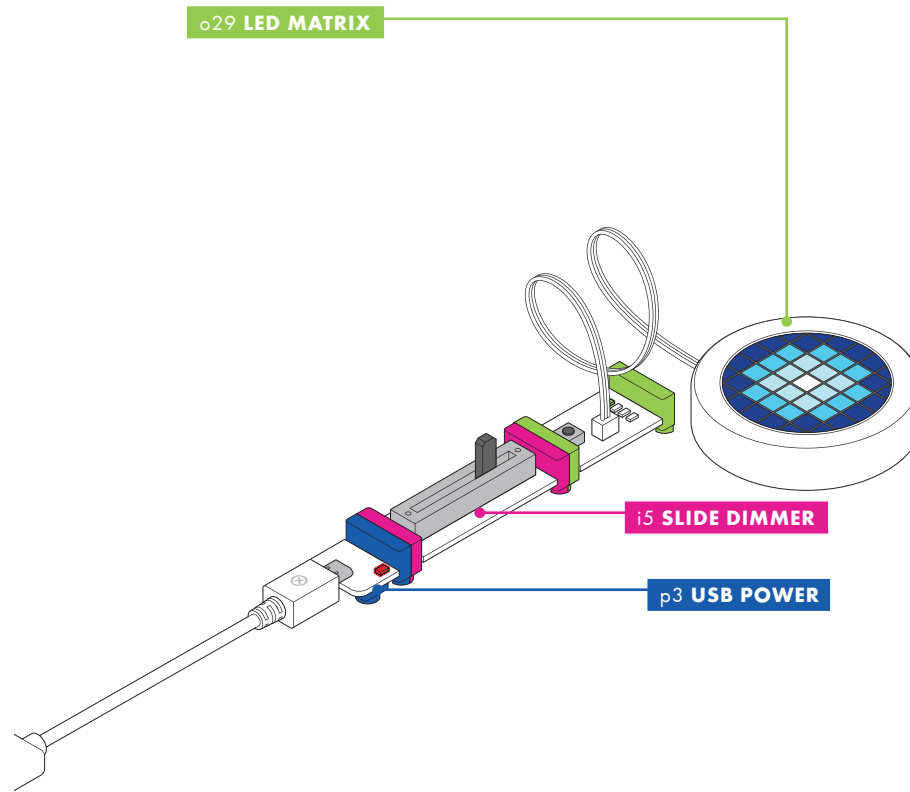


MEET THE BIT

The LED matrix is a colorful display that you can control using code or other Bits.

SAMPLE CIRCUIT #1

ANIMATION MODE



HOW IT WORKS

The o29 round LED matrix Bit has 4 modes selectable by the 'MODE' button: ANIMATION, FILL, BRIGHTNESS, and COLOR. The 4 numbered LEDs on the circuit board turn on to signify what the current mode is.

MINI-CHALLENGE

How many ways can you display a rainbow?

REAL WORLD ANALOGIES



SCROLLING SIGN BOARDS

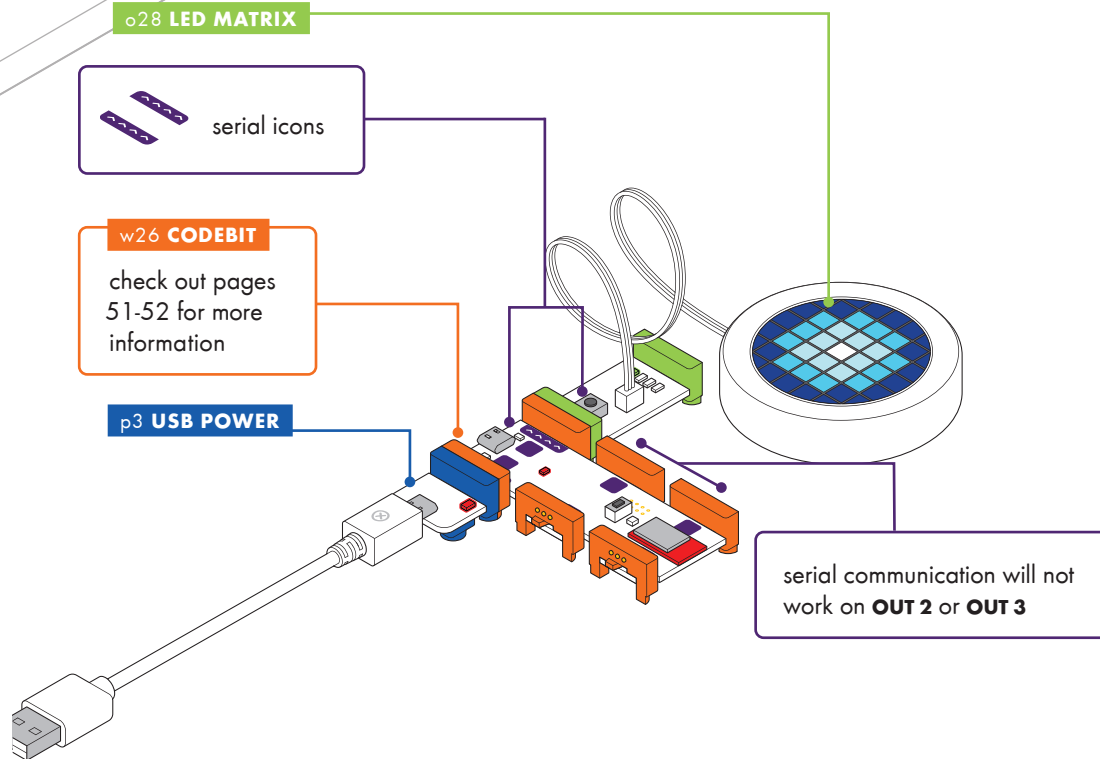


SCOREBOARD



TV SCREEN

SAMPLE CIRCUIT #2



HOW IT WORKS

You can access more features by adding a SERIAL connection - the codeBit - to the input of the round LED matrix Bit. If there are valid serial messages, such as programs written in the Fuse App, the Bit will switch to Serial mode and can display custom images.

WHAT IS SERIAL?

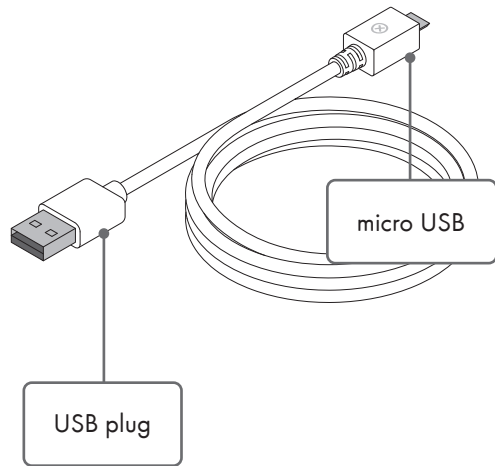


Serial communication is a way to send complex information between computers and other devices. Serial communication is made up of a series of 'on' and 'off' signals.

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.

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.

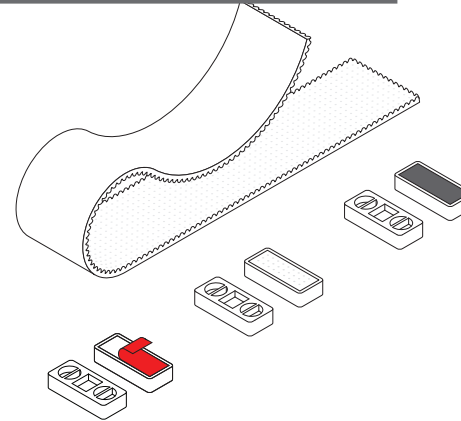
HOW IT WORKS

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.

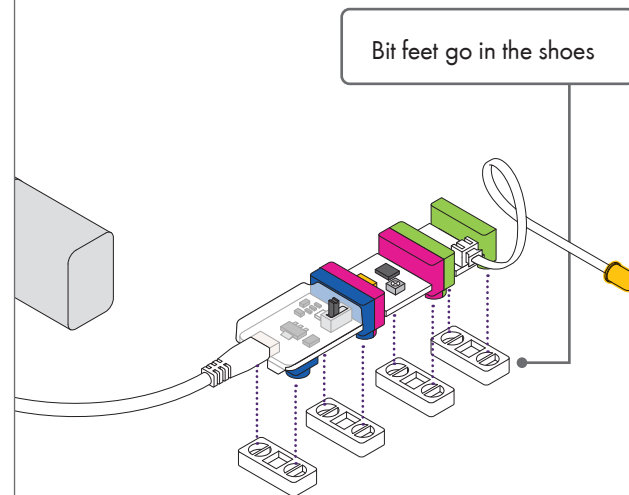
HOW IT WORKS

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.

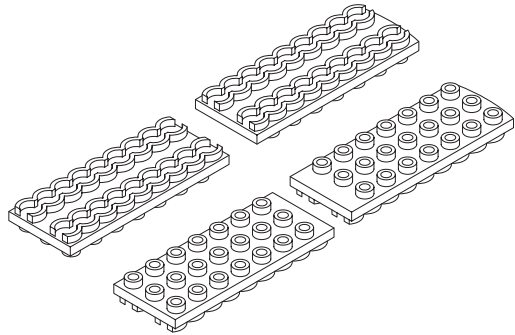
Magnet shoes allow you to adhere your circuit to any magnetic surface. Try your refrigerator or your locker!

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

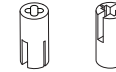
The brick adapter enables you to easily snap your Bits to LEGO® bricks. Each pack comes with brick adapter studs and sockets.

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

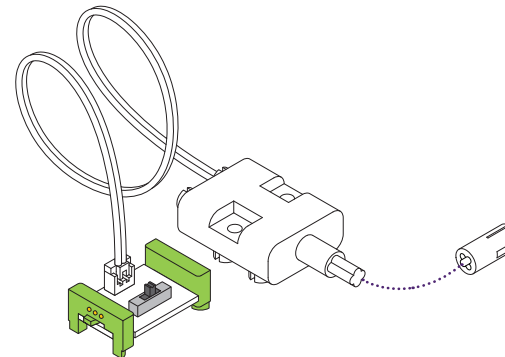


MEET THE ACCESSORY

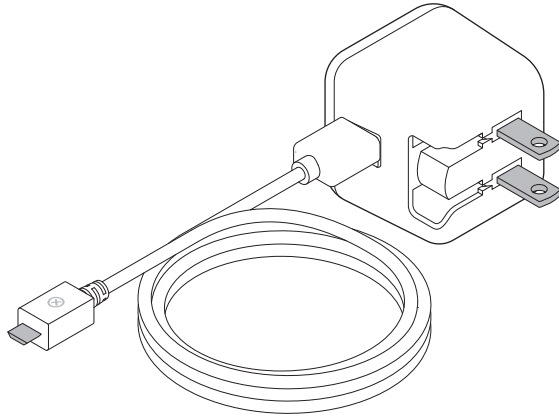
The motorMate makes it easy to attach paper, cardboard, LEGO® axles, and lots of other materials to the DC motor.

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

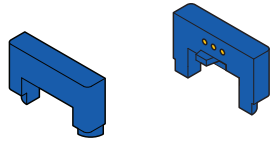
This power adapter and USB cable combo is the perfect way to provide long-term power to your littleBits creations.

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.

a21 POWERSNAP



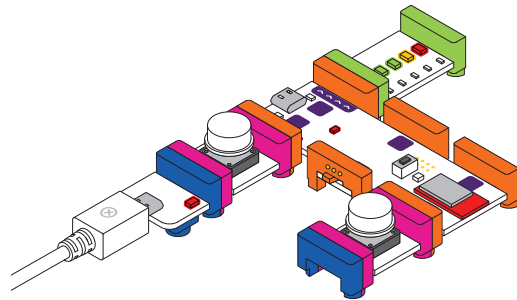
MEET THE ACCESSORY

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

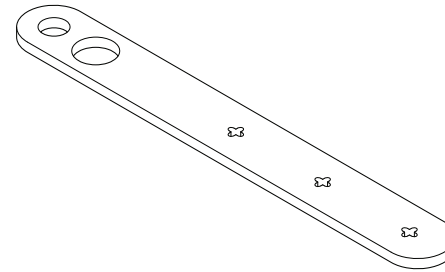
HOW IT WORKS

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

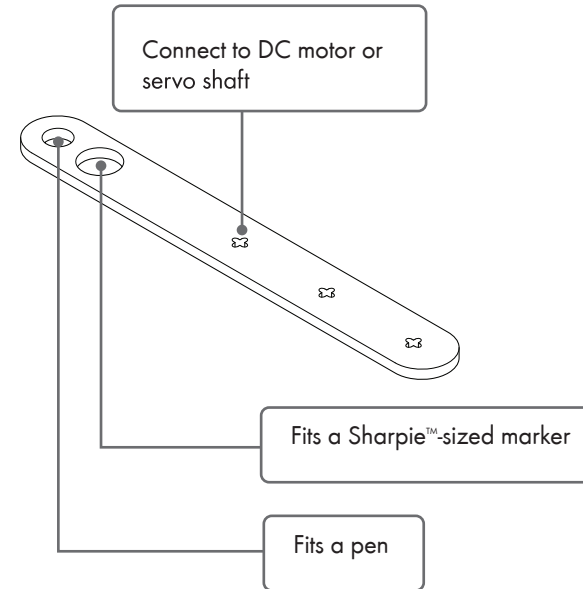
The mechanical arm attaches to both the servo hub and the DC motor shaft, and offers lots of leverage for pushing, pulling, and throwing.

HOW IT WORKS

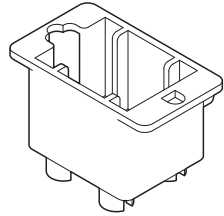
To attach the mechanical arm to the DC motor, line up the DC motor cross shaft with one of the cross holes in the mechanical arm.

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

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



a24 SERVO MOUNT

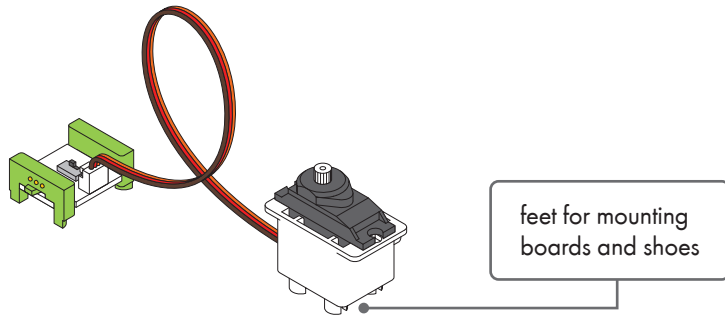
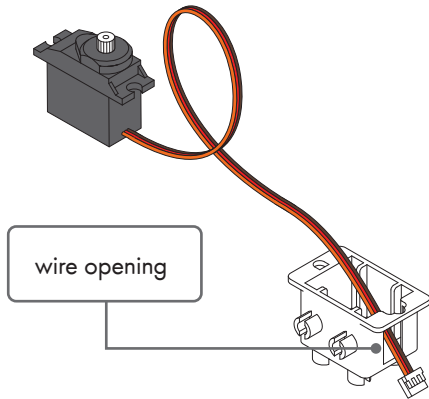


MEET THE ACCESSORY

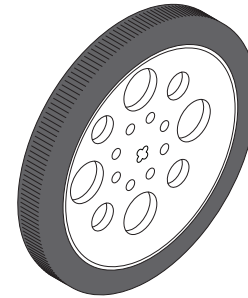
The servo mount lets you attach your servo to a mounting board or a pair of littleBits shoes. With feet on two sides of the mount, you can orient the servo in all directions. It's a great way to keep the servo steady so the arm can go wild.

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.



a25 WHEEL

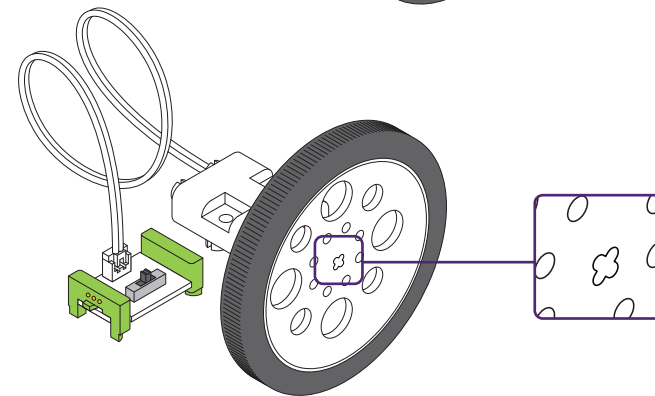
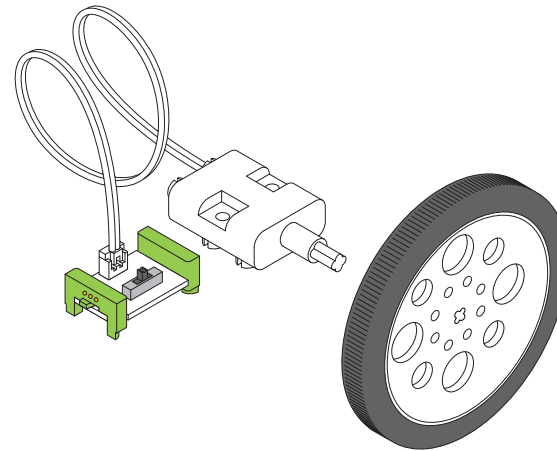


MEET THE ACCESSORY

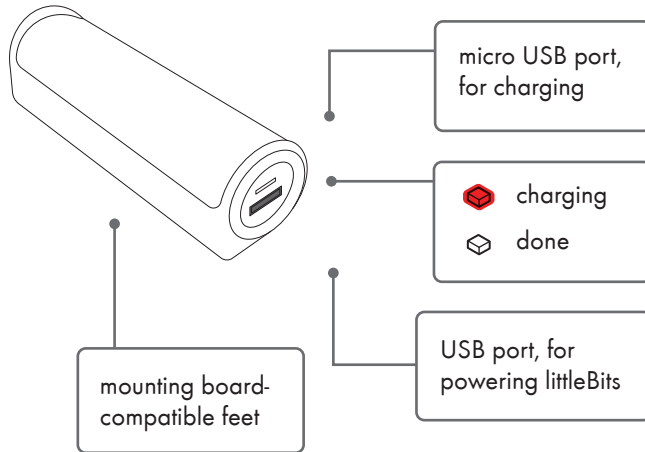
When used with a DC motor, this wheel is perfect for making bots, cars, and all sorts of spinning inventions.

HOW IT WORKS

To attach the wheel to the DC motor shaft, align the cross hole in the wheel with the cross of the motor shaft. Press firmly together.



a27 RECHARGEABLE BATTERY



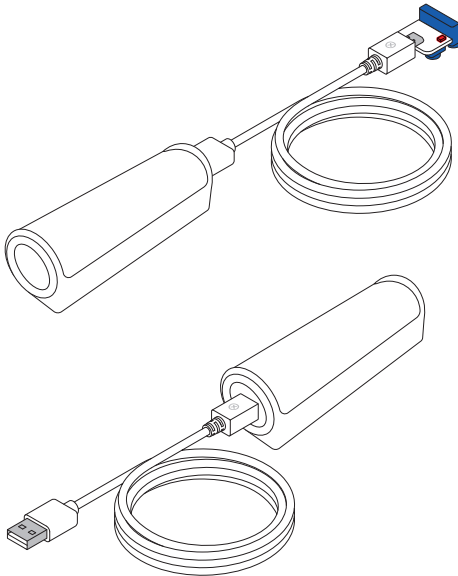
MEET THE ACCESSORY

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

HOW IT WORKS

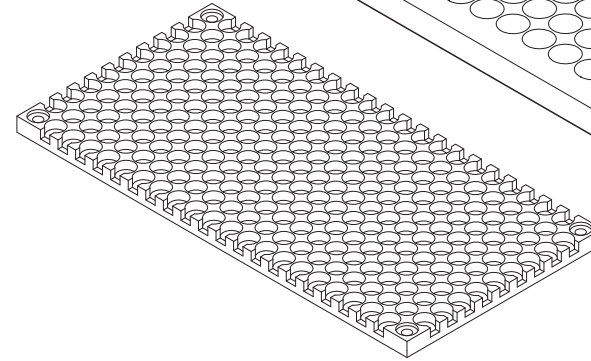
To power your circuit, connect the USB plug to the charged battery, and the micro USB to the p3 USB power Bit.

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 red while charging, and be off when done.



a26 MOUNTING BOARD

a28 MOUNTING BOARD (8" x 7")

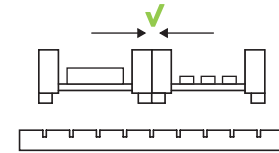


MEET THE ACCESSORY

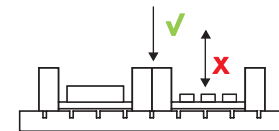
The mounting board serves as the backbone of your inventions. It provides structure, and allows you to keep your circuit intact and move it around with ease. This mounting board can accommodate large circuits.

HOW IT WORKS

- 1 First, snap your circuit together.



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



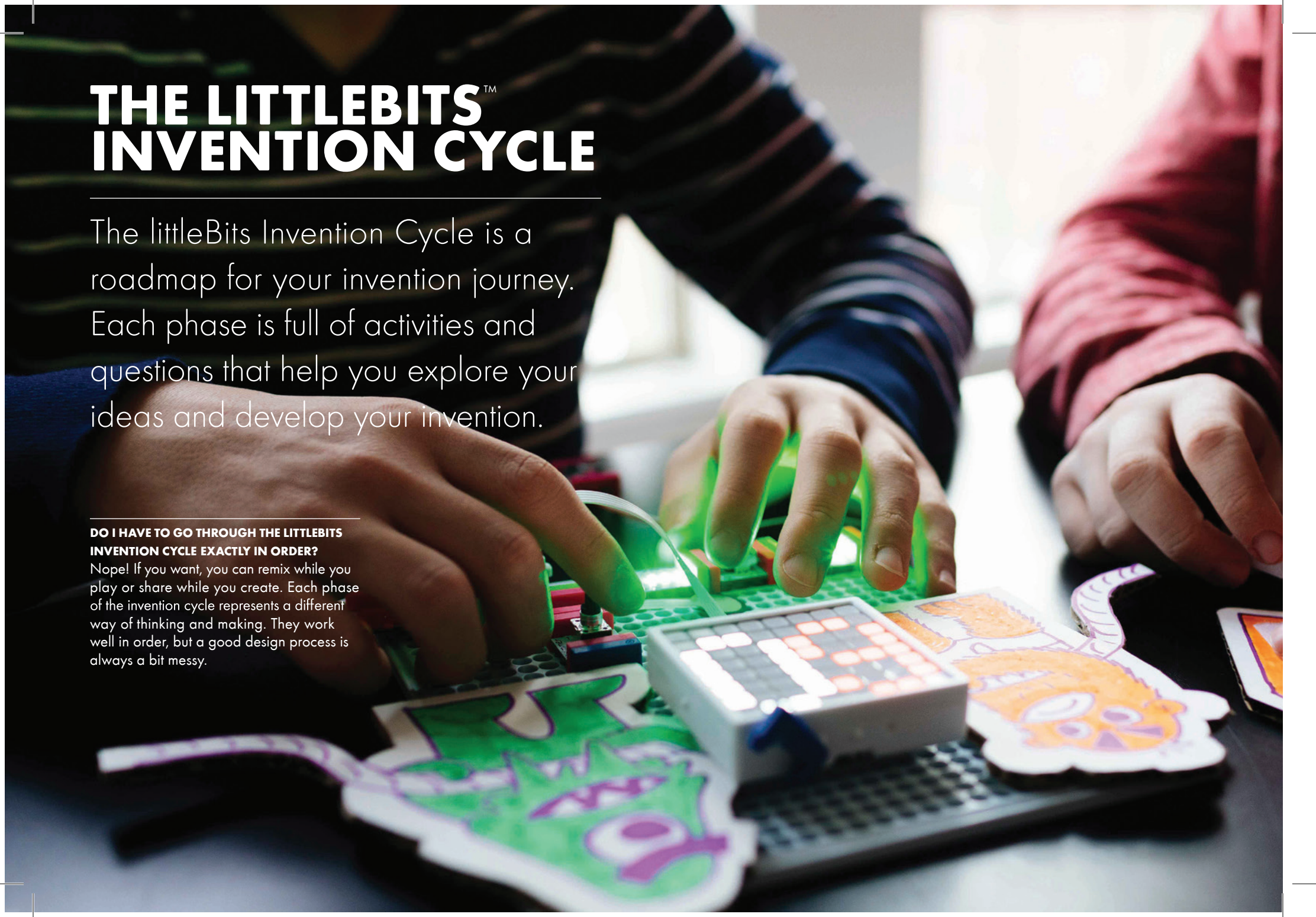
ALWAYS REMOVE BITS BY THE BITSNAP, DO NOT PULL ON CABLES TO REMOVE BITS FROM THE MOUNTING BOARD

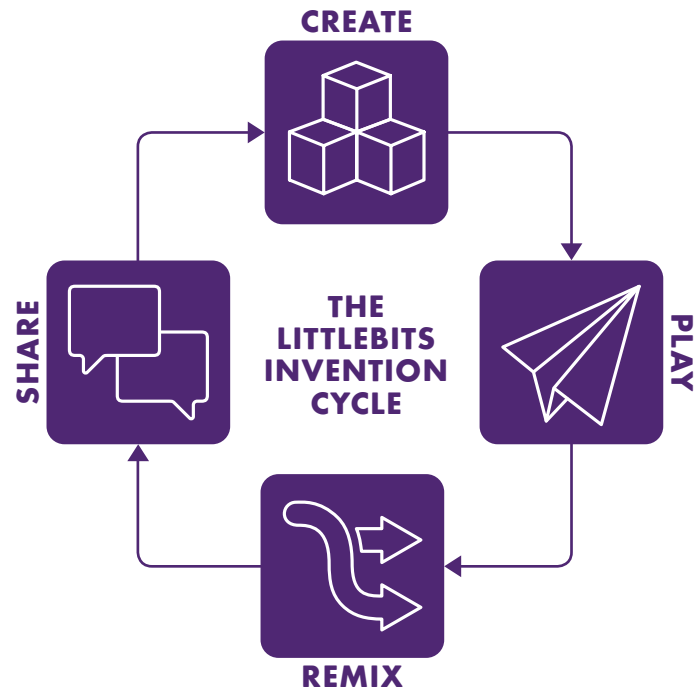
THE LITTLEBITS™ INVENTION CYCLE

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.

REMI]X

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.

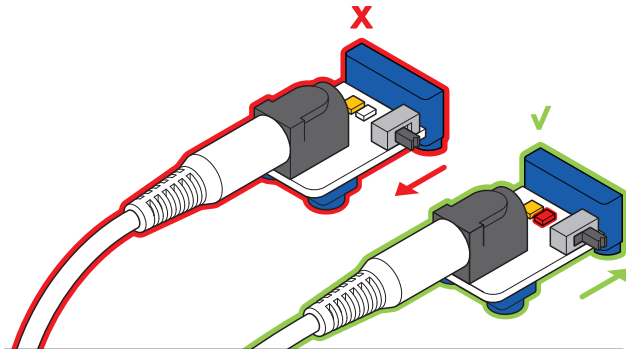
PLAY!

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.

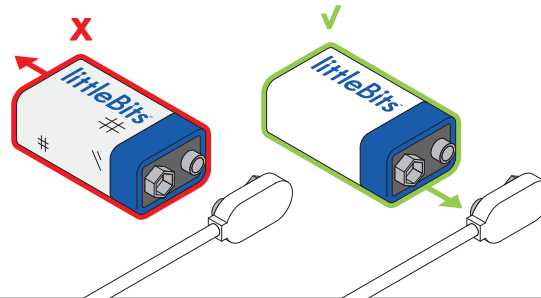
SHARE

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.

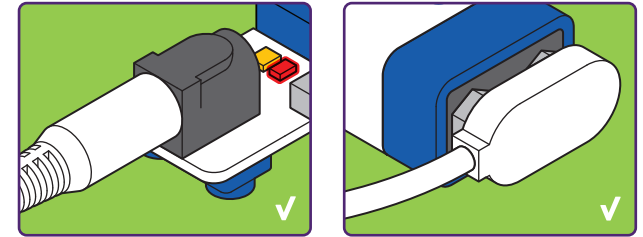
TROUBLESHOOTING



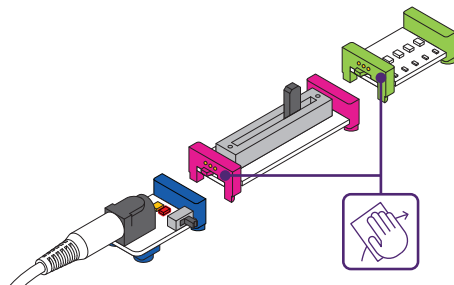
1 MAKE SURE YOUR POWER BIT™ IS ON. You should see a red LED illuminated on the board.



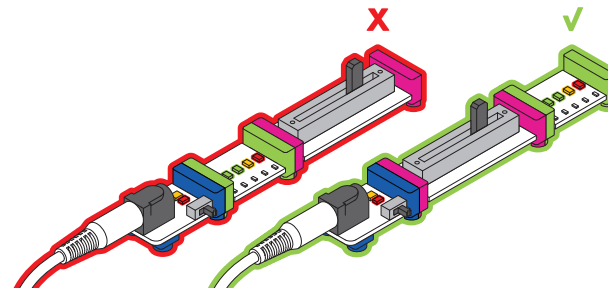
2 TRY SWAPPING IN A NEW 9 VOLT BATTERY. Low batteries can cause a circuit to act erratically. Bits™ have different power demands. For example: a DC motor may appear to not be working while a light still shines brightly.



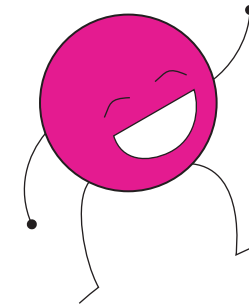
3 ENSURE THE POWER CABLE IS SECURELY FASTENED TO BOTH THE POWER BIT AND THE BATTERY.



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 <https://support.sphero.com/> or drop us a line at support.sphero.com.

