Deluxe Kit

1. Connect battery and cable to blue module.
2. Turn it on.
3. Pink modules affect modules after them.
4. Green modules do something.

let's go!
**WARNING**

- This product contains small magnets. Swallowed magnets can stick together across intestines causing serious infections and death. Seek immediate medical attention if magnets are swallowed or inhaled.
- Most littleBits are small parts. DO NOT allow children under 3 years old to play with or near this product.
- NEVER connect any littleBits or circuits to any AC electrical outlet.
- Do not touch or hold any moving parts of littleBits while they are operating.
- Keep conductive materials (such as aluminum foil, staples, paper clips, etc.) away from the circuit and the connector terminals.
- Always turn off circuits when not in use or when left unattended.
- Never use littleBits in or near any liquid.
- Never use in any extreme environments such as extreme hot or cold, high humidity, dust or sand.
- littleBits are subject to damage by static electricity. Handle with care.

**VERY IMPORTANT NOTE**

- Several projects in this kit involve the use of a box cutter, grill skewers and/or a hot glue gun.

**INSTRUCTIONS**

We recommend using littleBits brand 9-volt batteries, but standard alkaline or standard rechargeable batteries may also be used. Properly discard and replace exhausted battery. Do not connect the two battery terminals with any conducting material.

**CARE AND CLEANING**

Clean Bits modules ONLY by wiping with a dry cloth. If necessary, isopropyl alcohol on a cloth may be used sparingly, and then wipe with a dry cloth. DO NOT use any other cleaning products on Bits modules.

**SEND US YOUR LOVE**

Contact support@littlbitcs.cc with any questions or comments.

www.littlbitcs.cc

littlbitcs Electronics Inc.
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NY, NY 10003
(917)444-6737

You are a proud owner of the Deluxe Kit v1 from the Exploration Series. Over 5 million combinations?! Are you serious? Yep, www.littlbitcs.cc/mathmagic

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littlbitcs Electronics, Inc.

Made in Dongguan City, China

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MAKE SOMETHING THAT DOES SOMETHING™
littleBits™ is an expanding library of modular electronics that snap together with magnets.

1. **CIRCUITS IN SECONDS™**

2. **COLOR CODED**
   littleBits™ are grouped into 4 different categories, which are color coded:
   - **POWER** needed in every circuit and the start of all your creations.
   - **INPUT** these Bits modules accept input from you and the environment and send signals to the modules that follow.
   - **OUTPUT** these Bits modules DO something—light, buzz, move...
   - **WIRES** these Bits modules expand your reach and change direction—great for helping to incorporate littleBits into your projects.

3. **ORDER IS IMPORTANT**
   - Power Modules always come first and Input Modules only affect the Output Modules that come after them.

4. **MAGNET MAGIC**
   littleBits™ snap together with magnets. The magnets are always right, you can’t put modules together the wrong way.

5. **littleBits™ + anything**
   littleBits are just the beginning. Combine them with craft materials, building sets, and other toys to electrify your life. We’ll show you how!
This power module lets you use a 9-volt battery to supply electricity to your littleBits. Snap in the battery + cable (both included) and flip the switch to turn it on.

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It’s a classic: big, round, and springy for comfortable pressing! Push to turn on and release to turn it off – just like a button on a keyboard or elevator.

---

Move the slider from one end to the other. It functions just like a light dimmer you might find at home or a volume fader in a recording studio. Experiment with how it affects output modules that follow.

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This is the Deluxe Kit, Version 1
Learn more and shop for individual Bits Modules at littleBits.cc/Bits
This module is like a settable timer. Try it after a button and follow it with a light. Press and release the button to start the countdown. In “on-off” mode, the light will go on and the timer will start counting down to turn-off time. In “off-on” mode, the light will go out when you release the button and will turn back on after the timer reaches the allotted time. The time ranges from approximately 1 second to 5 minutes.

This module senses the noise level in your room, and sends an ON signal when it gets over a certain level. You can make that threshold louder or softer using the included screwdriver.

The pulse is like an electronic heartbeat. It sends out a stream of short ON signals and you can make the speed of the pulses faster or slower using the included screwdriver. It’s great for making lights blink!

This module is like a settable timer. Try it after a button and follow it with a light. Press and release the button to start the countdown. In “on-off” mode, the light will go on and the timer will start counting down to turn-off time. In “off-on” mode, the light will go out when you release the button and will turn back on after the timer reaches the allotted time. The time ranges from approximately 1 second to 5 minutes.
do something you've never done before. 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.

The wire allows you to physically separate your Bits modules. Try it whenever you need to break up your chain of littleBits, like when you need to put a light at the top of a model building.

The fork gives you more options for connecting your littleBits: it lets you connect the output of a single module to as many as three others. Use it when you want to trigger light, sound, and motion at the same time.

Use the latch to turn any momentary input, like a button, into an ON/OFF switch. 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.

Let's get logical! Hold circuit ON or OFF. Great for projects!
The RGB LED is a special light whose color you can adjust. Use the included screwdriver to adjust each of the color channels to get almost any color. RGB light is what produces every color from your computer monitor.

The light wire's entire length glows a soft blue. It's made of special stuff called "electroluminescent wire," which is great to form into glowing shapes. Like safe neon, it's best to use in the dark.

A controllable motor that can swing back and forth. It has two modes: in "Turn" mode, the input from other littleBits determines the position of the arm – try using your slide dimmer to set the angle you want. In "Swing" mode, the servo will move back and forth on its own – the input controls how fast it goes.
<table>
<thead>
<tr>
<th>BUZZER</th>
<th>DC MOTOR</th>
<th>MOTORMATE™</th>
<th>SCREWDRIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>The buzzer is like the sound in an alarm clock: it makes a noise that you just can’t ignore. It buzzes whenever it gets an ON signal. Try using it to make your own doorbell or alarm!</td>
<td>The DC (or “Direct Current”) motor rotates a shaft when you send it an ON signal. The left/right switch controls the direction of rotation. Try attaching various things to make windmills, cars, helicopters and more.</td>
<td>motorMate works with the DC motor. This makes it easy to attach wheels, paper, cardboard, and lots of other materials to the DC motor. Simply slide it on the “D” shape of the shaft. A LEGO™ axle also fits in the end.</td>
<td>This little purple screwdriver is used to modify any module that has a micro adjuster.</td>
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SERVO ACCESSORIES

Your servo motor comes with a couple great arms to help you in your projects. Use a Phillips screwdriver* to change the arms.

*not included

I work great with the slide dimmer.

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*not included
TRY THESE CIRCUITS

Get started with these, but don’t let us hold you back – every module fits with every other module – feel free to experiment.
INTRO TO SERVO
Control your servo's position.

ROBOT ARM
Learn how to change the speed & angle of your servo.

NEON SIGN
Make a bright statement.

NOISE MAKER
Have fun making your own rhythm.

TIMER
Learn how to make an alarm clock.

INTRO TO DC MOTOR
Get to know the motor.
**CLAP IT** Clap your lights on and off.

*power* sound trigger latch RGB LED

- Adjust sensitivity
- Turn me on

**DO THE OPPOSITE** Discover the magic of the inverter.

*power* button inverter RGB LED

- Adjust color with the screwdriver

**TIMED MOTION** Set how long your DC motor spins for.

*power* sound trigger timeout DC motor

- Adjust time with the screwdriver

- Off/on mode

**CLOCK** Learn how to make the DC motor tick.

*power* pulse DC motor

- Turn me on

- Adjust speed with the screwdriver

**TO THE RESCUE** Create sirens, light and motion!

*power* fork slide dimmer buzzer RGB LED
don’t forget to connect your battery to the power module
PROJECTS

1 Tickle Machine
2 Prank Handshake
3 Auto Greeter
4 Truck Crane
5 Art Bot
6 Dancing Signs
7 Glowing Handlebars
8 Birthday Candle
9 Stomping Shoes
10 Surprise Party
11 Flickering Lantern
12 Cat Nap
13 Unihorn Helmet
14 Honking Tricycle
15 Robot

TRY THESE AND INVENT YOUR OWN PROJECTS

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PROJECT 1: How can electronics help spread laughs?

TICKLE MACHINE

Start with this circuit:

- Power wire
- DC motor
- A wire to extend and bend
- Always connect battery and cable to motor module
- Attach feathers to the motor

Time: 15 mins
Difficulty: 🌟🌟🌟🌟

Enhanced instructions plus tons more projects online, littleBits.cc/deluxe
PROJECT 2: Want to trick a friend? We’ll show you how!

PRANK HANDSHAKE

1. Start with this circuit
   - power
   - wire
   - button
   - wire
   - buzzer

2. Put the circuit on your hand and arm using rubber bands
   - Wide circuits under long sleeves

3. Go ahead, shake a hand, SURPRISE YOUR FRIENDS!

YOU’LL NEED
- stretch it
- assume nothing
- How else can you surprise your friends using littleBits?

TIME: 15 mins
DIFFICULTY: 3

Rubber bands
PROJECT 3: How can you use a servo to imitate a human wave?

AUTO GREETER

1. Start with this circuit:
   - power
   - pulse
   - servo in swing mode

2. Trace hand on paper and cut it out.

3. Tape paper hand to servo.

4. Use a screwdriver to adjust pulse if you want to wave faster or slower.

5. Wave to someone you love!

YOU’LL NEED:
- marker
- scissors
- tape
- construction paper

TIME: 15 mins
DIFFICULTY: 🍎🍎🍎🍎🍎
PROJECT 4: How can you use a servo to pick things up?

TRUCK CRANE

1. Start with this circuit:
   - Power
   - Slide dimmer
   - Servo

2. Rubber band the paperclip to the other end.

3. Rubber band the stick to the servo.

4. Use slide dimmer to control the crane arm.

TIME: 30 mins
DIFFICULTY: 1

What other materials can pick things up? Try tape or a fork!
ART BOT

PROJECT 5: How can you build a device to draw for you?

1 Start with this circuit

2 Rubber band together battery cable and insert your charcoal or marker

3 Tuck battery under DC motor and attach with rubber band

YOU’LL NEED
- marker
- charcoal
- rubber bands
- LEGO™ axle
- wheel

Don’t have an axle or wheel? Make one!

WHAT OTHER TOOLS CAN YOU DRAW WITH?

TIME: 30 mins
DIFFICULTY: ⭐️⭐️⭐️⭐️
PROJECT 6: How can you use the inverter to activate two different and opposite motions?

DANCING SIGNS

1. Start with this circuit:
   - power
   - pulse
   - DC motor
   - inverter
   - adjust speed
   - servo

2. Make 2 signs out of paper:
   - SPIN IT
   - SHAKE IT

3. Attach the signs to the Bits modules:
   - Insert into motorMate
   - Tape onto servo

4. Watch what they do!

YOU'LL NEED:
- power
- pulse
- DC motor
- inverter
- servo
- adjust speed
- motorMate
- tape
- construction paper
- marker
- scissors
- scissors

TIME: 30 mins
DIFFICULTY: ⚡️⚡️⚡️
PROJECT 7: How can you brighten up your bike for night rides?

**GLOWING HANDLEBARS**

1. **Start with this circuit**
   - power
   - light wire

   *Don’t forget to connect your battery to the power module.*

2. **Rubber band battery cable around the battery**

3. **Tie the battery and circuit to your front handlebar post with string**

   *Where else can you wrap the light wire?*

4. **Wrap the light wire around your handlebars and RIDE ON!**

**YOU’LL NEED**
- rubber bands
- string
- bike

**TIME:** 30 mins
**DIFFICULTY:** ★★★★☆
PROJECT 8: Create an electronic alternative to the classic birthday candle.

**BIRTHDAY CANDLE**

1. Start with this circuit

   - power
   - wire
   - sound
   - trigger
   - latch
   - inverter
   - RGB
   - LED

2. Use rubber bands to connect a popsicle stick to the back of the littlebits

3. Cut out tissue paper in the shape of a flame

4. Tape the flame to the front of the RGB LED

   - How old are you?
   - Create a custom candle shape.

**TIME: 30 mins**

**DIFFICULTY:** •••••

**YOU'LL NEED**

- rubber bands
- tape
- scissors
- popsicle stick
- tissue paper

**INVERTER**

Stick the popsicle stick in a cake...

Blow on the flame to turn it on and off!
PROJECT 9: Going to a dance party? Create a fun accessory!

STOMPING SHOES

1. Start with this circuit:
   - **power**
   - **sound trigger**
   - **latch**
   - **light wire**
   - **tape**
   - **shoes**

2. Rubber band the circuit to your lower leg.

3. START DANCING!

TIME: 60 mins
DIFFICULTY: 📀 📀 📀 📀

**YOU’LL NEED:**
- rubber bands
- tape
- shoes

**WHAT OTHER CLOTHING CAN YOU ATTACH THE LIGHT WIRE TO?**

- Then weave the light wire through the holes, use tape when needed.
PROJECT 10: Throwing a surprise party? Use the timeout!

**SURPRISE PARTY**

1. Start with this circuit:
   - power
   - button
   - timeout

2. Decorate and cut out a sign:
   - buzzed wire
   - light wire

3. Bend light wire into the shape of the message:
   - marker
   - scissors
   - tape

4. Surprise your friend!

**YOU'LL NEED**
- fork
- wire
- DC motor
- wire
- light wire
- buzzer

**TIME:** 60 mins

**DIFFICULTY:** 4/5

**CREATE A CUSTOM MESSAGE.** Try writing a friend’s name with the light wire.
And now a brief intermission from the projects.

VISIT US AT LITTLEBITS.CC/TIPS FOR SOME AMAZING TIPS & TRICKS

10 coolest ways to use the light wire... Find out why the pulse is the life of the party... 5 ways to attach materials to the servo motor... 10 techniques for creating the goofiest eyeballs... 6 things you didn’t know about the button... Find out why the wire is the second most important littleBit... You are a musician! Learn the mystical art of playing the buzzer... bitFeet™ + cardboard — 5 different attachment techniques... Don’t throw that away! It could transform your next project... What household item enhances any lighting project? We'll show you... 7 fun ways to set off the sound trigger... Play with your food by attaching it to the DC motor... How many wires would it take to circle the globe? Find out...
**FLICKERING LANTERN**

**PROJECT 11: How can you use littleBits to imitate a flame?**

1. **Start with this circuit**

   - **Power**: wire
   - **Pulse**: RGB LED
   - **Adjust speed of flicker**
   - **Adjust color**

**NEED TO KNOW**

- Always connect your battery to the power module.
- STAY SAFE! Always use with an adult.

**TIME:** 60 mins  
**DIFFICULTY:** ☺️☺️☺️

**MATERIALS:**

- box cutter  
- glue  
- cardboard  
- plastic cup  
- marker  
- pipe cleaners

**DIRECTIONS:**

2. **Make the top of the lantern**

   - Trace big side of cup on cardboard 3-4 times
   - Then cut them out

3. **Glue circles on top of cup**

4. **Make bottom of lantern**

   - Trace cup again
   - Draw bigger circle around and cut it out! Don’t cut the inner circle.
   - Make 3-4 of these big circles!

**ALWAYS USE WITH AN ADULT.**

---

**STAY SAFE!**

- Use caution with sharp objects.
- Cut the inner circle with care.
Put littleBits in lantern
Put top of lantern on cardboard base
Cut hole to reach the power switch
Glue or tape cup to base
Tape littleBits in place
Create your own handle
Decorate!

First, glue together big circles
littleBits sit on top of circles
Do you want a blue strobe or red blinking light? Use the screwdriver to experiment.

Make an “X” out of pipe cleaner. You could also try using ribbon or string or paper strips!
PROJECT 12: How can you use littleBits to create an alarm without sound?

CAT NAP

1. Start with this circuit

   - power
   - wire
   - button
   - timeout
   - wire
   - servo

   STAY SAFE! Always use with an adult.

2. Find box

   - Cut a hole in the back of the box
   - Leave room there!

3. Place these littleBits on the front of the box

   - Cut hole for the servo then tape in place

PRO TIP: You can disconnect the alarm here

TIME: 60 mins
DIFFICULTY: ★★★★★

HINTS NEED
- box cutter
- scissors
- tape
- rubber bands
- pin
- box
- feathers
- popsicle sticks
- string
- push pin
4. Place the other littleBits inside the back of the box

5. Rubber band the servo to the popsicle stick

6. Put “Alarm Feathers” on the servo

7. Set a time and take a nap!

What other material can wake you up?
PROJECT 13: Invent a magical accessory for nighttime bike riding.

UNIHORN HELMET

1. Start with this circuit:
   - power
   - wire
   - pulse
   - light wire
   - adjust speed

2. Measure and cut a piece of cardboard to fit along the top of your helmet.
   - place two holes here
   - be careful!

3. Make the inner horn structure:
   - cut cardboard triangles that will interlock
   - slide them together

4. Roll the inner horn structure in colored paper

STAY SAFE! Always use with an adult.

MATERIALS NEEDED:
- box cutter
- tape
- bike helmet
- cardboard
- colored paper
- tissue paper
- pipe cleaners

TIME: 2.5 hrs
DIFFICULTY: ◣❆❆❆
Feed light wire up through the base of the horn and out through the top.

Tape the base of the horn to the cardboard and tape the rest of the Bits modules as well.

Tie the back of the cardboard down with a pipe cleaner.

Use the excess light wire to secure the cardboard to the helmet at the front.

Make your own creature. How many horns does it have?

Add hair! Fold and cut tissue paper. Give it a fluff and tape it to the top of the cardboard.

Tie down the cardboard base with the light wire.

RIDE OFF INTO THE SUNSET!
PROJECT 14: Build an intelligent vehicle with multiple functions.

HONKING TRICYCLE

1. Start with this circuit:
   - power
   - sound trigger
   - RGB LED
   - latch
   - wire
   - DC motor
   - wire
   - inverter
   - pulse
   - buzzer

2. Cut foamcore base using cutter and ruler. Cut slot down center that is wide enough for a piece of foamcore to slide in. This is the back, leave space here. 4 inches

3. Make axle holder with foamcore and glue to the back of the base.

STAY SAFE! Always use with an adult.

TIME: 2 hrs
DIFFICULTY: 4

MUST HAVE:
- box cutter
- hot glue
- wood grill shavers
- tape
- marker
- hole puncher
- plastic cup
- foamcore
- colored paper
- popsicle sticks

Plus the motorMate.

THAT'S ONE SERIOUS CIRCUIT YOU GOT THERE!
4. Make back wheels
   - Trace a cup

5. Make the back axle
   - Trace a cup
   - Cut out 2 circles
   - Poke skewer through circle and put a dab of glue...
   - Carefully cut the point off...
   - Then thread through axle holder and then add the other wheel

6. Make and mount the front wheel
   - Cut out a larger wheel and stick the popsicle stick through the center
   - Glue here

7. Cut off end of popsicle stick, then attach wheel to motorMate
   - Cut the popsicle stick
   - Tape down
   - Brace under here
   - Dispose of lake
   - Place littleBits on top of base
   - Make back wheels

8. Decorate and RIDE ON!
   - Make a loud noise to ride on. Make another loud noise to stop and honk
PROJECT 15: Give life to a cardboard box.

ROBOT

1. Start with this circuit
   - Power
   - Sound trigger
   - Wire
   - Pulse
   - Timeout
   - Wire
   - Slide dimmer
   - Wire
   - DC motor

2. Cut a flap in the back of a box.

3. Use a small cup to trace 3 circles on cardboard. Mark the center and cut them out. Shiny, be careful!

These are your robot’s wheels! Try other sizes!

TIME: 2 hrs
DIFFICULTY: ⭐⭐⭐⭐

STAY SAFE! Always use with an adult.

See this tutorial with video extras at littleBits.cc/deluxe

Required:
- Box cutter
- Ruler
- Plastic cup
- Hot glue
- Wood grill skewers
- Tape
- Box cardboard
- Paper
- Popsicle sticks
- MotorMate

What do you have at home? Try other sizes!

We used a tissue box. What do you have at home?
1. Cut slots for cardboard wheels in base of the box.

2. Place motor with motor-Mate and wheel in the center slot of the box base.

3. A little longer than 1.5 inches.

4. Place a cardboard shelf inside box.

5. Poke holes in center of smaller wheels. Stick the skewer through wheels and cut to size. Be careful!

6. We recommend this size, but you can try others!

7. Stick a popsicle stick through the center of the 2.5 inch cardboard wheel.

8. You can bend a piece of cardboard to make the shelf!

9. A little longer than 2.5 inches.

10. Hot glue here to hold in place.

11. Hot glue here.

12. Cut the popsicle stick down and fit into motor-Mate.

13. Tape littleBits down well here.
MAKE NOISE TO GET HIM ROLLING!

12 Use a smaller box to make the robot head

11 Use a smaller box to make the robot head

9 Connect Bits modules and tape down inside on shelf

8 Slide dimmer adjusts speed of motor wheel

7 Cut hole for servo and stick through box, tape in place

6 Set pulse to on-off mode

5 Set time to whatever you like

4 Feed buzzer and RGB LED through top of large box, then stick inside small box and tape down

3 What will your robot’s eyes look like?

2 Make 2 arms and tape to servo and other side of the box

1 Tape or glue head to the top of the box

Keep making noise to get him to wave to you!
MAKE SOMETHING THAT DOES SOMETHING™
Upload your project and you may be handsomely rewarded. We regularly feature awesome community projects and send out exclusive gifts.

Visit us online where we’ve got tons more projects and tips and tricks for every Bits module. Check out other littleBits in the expanding library.

Online we’ll show you how to make this great SWIMMING SHARK www.littleBits.cc/shark and TONS MORE PROJECTS at www.littleBits.cc/deluxe

Want More? You got it! Plus littleBit Bundles & Boost It Packs... available here www.littleBits.cc/products

Base Kit
pressure sensor
motion trigger
bargraph
fan

Premium Kit
move it
This power module lets you use a 9-volt battery to supply electricity to your littleBits. Snap in the battery + cable (both included) and flip the switch to turn it on.

Move the slider from one end to the other. It functions just like a light dimmer you might find at home or a volume fader in a recording studio. Experiment with how it affects output Bits modules that follow.

The pulse is like an electronic heartbeat. It sends out a stream of short ON signals. You can make the speed of the pulses faster or slower using the included screwdriver. It’s great for making LEDs blink!
The roller switch is handy – it has a little lever with a wheel and activates when something presses it – just like inside your fridge. You can also flip the mode switch to make it turn off when the lever is pushed in.

This module senses the noise level in your room, and sends an ON signal when it gets over a certain level. You can make that threshold louder or softer using the included screwdriver.

This is a touch-activated module; give its pad a little squeeze to activate it. Pressure sensors allow your game controller to know how hard you’re pressing. The more pressure you apply, the more current it sends out. Put it in front of your vibration motor and control how much it shakes!

The roller switch is handy – it has a little lever with a wheel and activates when something presses it – just like inside your fridge. You can also flip the mode switch to make it turn off when the lever is pushed in.
The vibration motor is very similar to the device that makes your cellphone shake when you get a text. You can make anything vibrate and buzz. The vibeSnap helps you connect to paper, tin foil, a pipecleaner...

The long LED (or “Light-Emitting Diode”) is another lighting option. We call it the “long” LED because the light is tethered to the board by a cable. This lets you put the light in some interesting places.

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Yep, just what you’d think: a small electric fan tethered to a littleBits module. Use your little fan to create fluttering movement in your creations or just to keep yourself cool.
Your servo motor comes with a couple great arms to help you in your projects. Use a Phillips screwdriver* to change the arms.

VIBESNAP™ a17
You’ll find this little guy attached to your vibration motor. The vibeSnap helps you attach stuff – like paper or tin foil – to your vibration motor. Remember to keep it light!

SCREWDRIVER a4
This little purple screwdriver is used to modify any littleBit that has a micro adjuster.

BATTERY AND CABLE a1
This Kit contains a 9-volt alkaline battery and a cable to connect it to the power module. Connect it and then flip the switch to power all of your creations!

*not included
TRY THESE CIRCUITS

Get started with these, but don’t let us hold you back – every module fits with every other module – feel free to experiment.

PERSONAL FAN Chill out and feel the breeze.

- power
- slide dimmer

Try the slide dimmer to turn the fan on and off. Connect your cable and 9V battery to get the maximum performance.
**EYEBALLS**

Branch out with two long LEDs

**BACK MASSAGER**

Keep calm and vibe on.

**MAKE SOME NOISE**

Transform sound into light.

**INTRO TO SERVO**

Control your servo's position.

**INTRUDER ALERT**

Create your own security system.

**ROBOT ARM**

Learn how to change the speed & angle of your servo.

**IN TRO TO SERVO**

Control your servo's position.

**INTRO TO SERVO**

Control your servo's position.

**INTRO TO SERVO**

Control your servo's position.

**INTRO TO SERVO**

Control your servo's position.
PROJECTS

1 Cooling Campfire
2 Hypnotizing Wheel
3 Auto Greeter
4 Truck Crane
5 Funny Face
6 Drawer Alarm
7 Box Monster
8 Bristle Bot
9 Bubble Flute
10 Playful Pet

TRY THESE AND INVENT YOUR OWN

COOLING CAMPFIRE

PROJECT 1: Cool down and camp out.

TIME: 30 mins
DIFFICULTY: ★★★★★

YOU'LL NEED
- tissue paper
- scissors
- tape

Cut colored tissue paper to look like flames.

Don’t have any? Try tissues or feathers!

1. Start with this circuit:
   - power
   - pressure sensor
   - fan
   - always connect battery and cable to power module
   - turn me on

2. Feel which end air is coming out from, and attach tissue paper to that side using tape!

COOL OFF BY THE FIRE!

Plus tons more projects online
littleBits.cc/premium
PROJECT 2: Create a simple machine to hypnotize your friends!

HYPNOTIZING WHEEL

1. Start with this circuit diagram:
   - Power
   - Sound trigger
   - Fan

2. Draw a hypno circle on paper and then cut it out.

3. Attach paper wheel to fan with tape (on the fan piece that spins).

TIME: 15 mins
DIFFICULTY: ●●●●

YOU’LL NEED:
- Marker
- Scissors
- Tape
- Paper

HYPNOTIZE YOUR FRIENDS!

What other patterns do you find mesmerizing?

You are getting very sleepy...
PROJECT 3: How can you use a servo to imitate a human wave?

AUTO GREETER

1. Start with this circuit:
   - Power
   - Pulse
   - Servo (in swing mode)

2. Trace hand on paper and cut it out.

3. Tape paper hand to servo.

4. Use a screwdriver to adjust pulse if you want to wave faster or slower.

5. Wave to someone you love!

What else can you animate with the servo?

You'll need:
- Tape
- Construction paper
- Marker
- Scissors

TIME: 15 mins
DIFFICULTY: ┅���
PROJECT 4: How can you use a servo to pick things up?

TRUCK CRANE

1. Start with this circuit
   - power
   - slide dimmer
   - servo

   In swing mode

2. Rubber band the paperclip to the other end
   - Bend the paperclip to make a hook!
   - Use slide dimmer to control the crane arm

3. Rubber band the pencil stick to the servo
   - Try tape or a fork!

YOU’LL NEED
- Rubber bands
- Paperclip
- Popsicle stick

TIME: 30 mins
DIFFICULTY: 3

EMBRACE ANY ERRORS
PROJECT 5: Make someone smile with this silly project.

FUNNY FACE

1. Start with this circuit

   power  pressure sensor  wire
   long LED  vibration motor
   branch
   long LED

2. Draw a face on the plate and cut out holes for eyes and mouth

3. Draw ears and tongue on paper and then cut them out

   Stick littleBits through holes and put the foam balls on the long LEDs
    long LEDs
    pressure sensor
    power

Don't have foam balls? Try cotton balls!

YOU'LL NEED

power  construction paper  foam balls  paper plate
marker  scissors  tape

TIME: 30 mins
DIFFICULTY: ♦♦♦♦
4. Tape ear to pressure sensor on the back of the plate.

5. This is what the back looks like.

Use vibeSnap to attach the tongue tape.

Tape littleBits down.

Press ear.

Eyes light up.

Tongue wags.

See this tutorial with video extras at littleBits.cc/premium.
What other material would make a loud noise?

YOU’LL NEED

drawervibration

power

roller switch

wire

vibration motor

1 Start with this circuit

2 Insert the vibration motor into the jingle bell

3 Tape the circuit to the inside of your drawer

4 Protect your things!

PROTECT YOUR THINGS!

WHAT HAPPENS WHEN YOU OPEN YOUR DRAWER?

TIME: 30 mins
DIFFICULTY: 11111

DRAWER ALARM

PROJECT 6: How can you design a system to prevent someone from going through your things?
And now a brief intermission from the projects.

VISIT US AT LITTLEBITS.CC/TIPS FOR SOME AMAZING TIPS & TRICKS

15 ways to make stuff move with the vibration motor... Find out why the pulse is the life of the party... 5 ways to attach materials to the servo motor... 10 techniques for creating the goofiest eyeballs... Find out why the wire is the second most important littleBit... Learn how to levitate with the fan... bitfeet™ + cardboard = 5 different attachment techniques... Don't throw that away! It could transform your next project... What household item enhances any lighting project? We'll show you... 7 fun ways to set off the sound trigger... 5 ways to make noise with the vibration motor... How many wires would it take to circle the globe? Find out!...

... plus lots more tips for how to use your littleBits!
**BOX MONSTER**

**PROJECT 7: Talk to the hand!**

1. **Start with this circuit**
   - Power
   - Wire
   - Roller switch
   - Wire
   - Vibrant motor

2. **Find a box and cut it in half**
   - Cut three sides but **NOT** the fourth.
   - Bend in half to make a puppet shape.

3. **Poke holes for the long LEDs (edges)**
   - Make holes for the vibration motor and roller switch.

---

**TIME:** 60 mins

**DIFFICULTY:**  ●  ●  ●  ●

---

**STAY SAFE!** Always use with an adult.

**NEED TO KNOW**
- Box cutter
- Tape
- Foam balls
- Box
- Construction paper

---

**ALWAYS connect your battery to the power module.**
Tape littleBits in place inside the box.

Decorate:
- cut out a crazy tongue shape...
- ...and attach it to the inside of the box.

Use markers, paint, glitter, colored paper and anything else you can think of to make your monster uniquely yours.

Got some cool colors or decorating techniques? We want to see your Box Monster! Upload it here littleBits.cc/upload

Slide on your styrofoam balls.

Open and close the box puppet and watch his tongue shake!

Can you think of anything else that would make good glowy eyes? Try ping pong balls.
BRISTLE BOT

PROJECT 8: How can you make a robot from a toothbrush?

STAY SAFE! Always use with an adult.

1. Start with this circuit:
   - power
   - slide dimmer
   - wire
   - vibration motor

2. Have an adult cut the head off a toothbrush.
   - Use scissors or wire cutters; be careful!

3. Attach the vibration motor to the back side of the bristles.
   - Use tape

4. Now, attach the bristles to the actual vibration module.
   - Use a rubber band

5. Draw and cut out your Bristle Bot design.
   - Use scissors or a box cutter

TIME: 60 mins
DIFFICULTY: 4/5

YOU'LL NEED:
- box cutter
- marker
- tape
- glue
- scissors
- rubber bands
- fuzzy balls
- cardboard
- toothbrush
- pipe cleaners

Always connect your battery to the power module.

STAY SAFE! Always use with an adult.
6. Wrap the cardboard base around the bristles and glue or tape in place

7. Glue the body to the base

8. Make a control box

9. Control your Bristle Bot buddy's BUZZY DANCE

Make your robot happy, sad, crazy, silly or whatever you want!

Decorate him with pipe cleaners and fuzzy bails...

Put the slide dimmer and battery inside here

Cut out this shape to fold into a rectangular tube

Don’t forget to cut the slot for the slide dimmer

Make sure the bristles stick out the bottom

Use a rubber band to connect your battery to your slide dimmer
PROJECT 9: Create bubbles with the sound of your voice.

BUBBLE FLUTE

1. Start with this circuit:
   - Power
   - Sound trigger
   - Fan

   **STAY SAFE!** Always use with an adult.

2. Cut a hole in the bottom of the cup.

3. Place fan on the hole you just made.

4. Tape in place.

**YOU’LL NEED:**
- Box cutter
- Duct tape
- Rubber bands
- Bubble solution
- Plastic cup
- Ruler

**TIME:** 60 mins

**DIFFICULTY:** 4/5

Make sure no air escapes through the seal.
5. Tape to the end of a ruler
6. Connect Bits modules to other end of the ruler with rubber bands
7. Use the screwdriver to adjust the sensitivity of the sound trigger to your liking
8. Dip the rim of the cup in a bowl with bubble solution
9. Blow into sound trigger and watch the bubbles come out

PRO TIP: don’t have bubble solution? mix dishsoap with water

What other sounds make the bubbles blow? Try clapping, singing or stomping.
PLAYFUL PET

PROJECT 10: How can you use littleBits to create your own interactive friend?

1. Start with this circuit
   - power
   - pressure sensor
   - wire
   - vibration motor
   - long LED
   - branch
   - wire
   - pulse
   - servo
   - long LED

2. Find a box to be the dog's body
3. Cut piece of cardboard to be the dog's head
4. Put hot glue on the top of 4 cups

STAY SAFE! Always use with an adult.

What else would make good feet?

TIME: 2.5 hrs
DIFFICULTY: ☀️☀️☀️☀️
5 Insert littleBits into the dog’s body

6 Decorate your dog!

7 Add styrofoam balls and bell

8 Tie string with bell around neck

9 Add spot of paper over pressure sensor and add tail

10 PET AND SEE TAIL WAG!

- Insert littleBits into the dog’s body
- Back of the head: Poke holes for the eyes and the tongue
- Front of the head: Put vibration motor into the well
- Decorate your dog: Draw and cut out ears, nose, tail, and spots
- Add styrofoam balls and bell
- Tie string with bell around neck
- Add spot of paper over pressure sensor and add tail
- PET AND SEE TAIL WAG!

5 6 8 9 7

- Cut hole for pressure sensor
- Cut hole for the power switch
- The screw is the tail!
LITTLEBITS.CC/UPLOAD
Upload your project and you may be handsomely rewarded. We regularly feature awesome community projects and send out exclusive gifts.

Visit us online where we've got tons more projects and tips and tricks for every Bits module. Check out other littleBits in the expanding library.

Online we'll show you how to make this great PIGGY BANK
www.littleBits.cc/piggy
and
TONS MORE PROJECTS at
www.littleBits.cc/premium

Want More? You got it!
EXPLORATION SERIES

INDIVIDUAL BITS™ MODULES

Base Kit
light sensor motion trigger DC motor RGB LED

Deluxe Kit
squeeze it
light it

Want More? You got it!
plus littleBits Bundles & Boost It Packs... available here www.littleBits.cc/products
This power module lets you use a 9-volt battery to supply electricity to your littleBits. Snap in the battery + cable (both included) and flip the switch to turn it on.

**POWER p1**

This power module lets you use a 9-volt battery to supply electricity to your littleBits. Snap in the battery + cable (both included) and flip the switch to turn it on.

**BUTTON i3**

Big, round, and springy for comfortable pressing! Push to turn on, and release to turn off.
The light sensor measures how much light is shining on it. In “light” mode, the more light shines on the sensor, the higher the signal it sends out. In “dark” mode, it’s just the opposite – the signal increases the darker it gets.

Our dimmer lets you control your creations with a simple knob, just like the volume on your stereo. Turn it clockwise to send more signal to the following Bits modules. Try using it to control the volume of the buzzer or speed of the DC motor.

The wire allows you to physically separate your Bits modules. Try it whenever you need to break up your chain of littleBits, like when you need to put a light at the top of a model building.
The bargraph is one of our favorite Bits modules: it has five LEDs in different colors that light up to show you how much signal the module is receiving.

The buzzer is like the sound in an alarm clock: it makes a noise that you just can’t ignore. It buzzes whenever it gets an ON signal. Try using it to make your own doorbell or alarm!

The DC (or “Direct Current”) motor rotates a shaft when you send it an ON signal. The left/right switch controls the direction of rotation. Try attaching various things to make windmills, cars, helicopters, and more.

A small littleBit with a big light, just like a bike light. Like our other LED modules, 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.
motorMate works with the DC motor. This makes it easy to attach wheels, paper, cardboard, and lots of other materials to the DC motor. Simply slide it on the “D” shape of the shaft. A LEGO™ axle also fits in the end.

**MOTORMATE™ a10**

This little purple screwdriver is used to modify any littleBit that has a micro adjuster.

**SCREWDRAINER a4**

This Kit contains a 9-volt alkaline battery and a cable to connect it to the power module. Connect it and then flip the switch to power all of your creations!

**BATTERY AND CABLE a1**

We recommend using littleBits brand 9-volt batteries, but standard alkaline or standard rechargeable batteries may also be used.

We recommend using littleBits brand 9-volt batteries, but standard alkaline or standard rechargeable batteries may also be used.
TRY THESE CIRCUITS

Get started with these but don’t let us hold you back – every module fits with every other module – feel free to experiment.
LIGHT METER  Measure light around your house.

MORNING ALARM  Wake up with the sun!

SIREN  Pump up the volume.

INTRO TO DC MOTOR  Get to know the motor.

CAR SPEED  Speed it up, slow it down.

SIREN  Pump up the volume.
PROJECT 1: How can electronics help spread laughs?

TICKLE MACHINE

1. Start with this circuit:

- Power
- Wire
- DC motor

2. Always connect battery and cable to power module.

3. Turn me on!

4. Attach wire to extend and bend.

5. Attach feathers to the motorMate.

6. Play the motorMate.

YOU’LL NEED:

- Feathers

TIME: 15 mins
DIFFICULTY: ★★★★★

PROJECTS

1. Tickle Machine
2. Prank Handshake
3. The Night Rider
4. Flashlight
5. Art Bot
6. Doorbell
7. Lil’ Breezy
8. Three Wheeler

Tons more projects online: www.littleBits.cc/base

TRY THESE AND INVENT YOUR OWN
PROJECT 2: Want to trick a friend? We’ll show you how!

PRANK HANDSHAKE

1 Start with this circuit

- power
- wire
- button
- wire
- buzzer

- turn me on?
- stretch it

You’ll need:
- rubber bands

TIME: 15 mins
DIFFICULTY: 🍩꿀 созда

How else can you surprise your friends using littleBits?

2 Put the circuit on your hand and arm using rubber bands

- hide circuits under long sleeves

3 Go ahead, shake a hand, SURPRISE YOUR FRIENDS!
**THE NIGHT RIDER**

**PROJECT 3: How can you create a light that only turns on at night?**

1. **Start with this circuit**
   - Power
   - Light sensor
   - Bargraph

2. **Rubber band battery cable in a loop**
   - Cut a hole in the bottom of the cup
   - Pull the cable loop through the hole

3. **Don’t have a cup? What other materials can glow?**

4. **Hang it on your bike and RIDE ON!**

**TIME: 30 mins**

**DIFFICULTY: ★★★★★**

**STAY SAFE!** Always use with an adult.

**STAY SAFE!** Use additional lights at night.
PROJECT 4: Illuminate your way with household materials.

FLASHLIGHT

1. Start with this circuit
   - power
   - button
   - wire
   - bright LED

2. Put circuit in tube
   - Ensure that LED light faces out

PRO TIP: you can put a clear plastic cup in the end to diffuse the light.

3. Turn it on and go EXPLORING WITH YOUR FLASHLIGHT!

TIME: 30 mins
DIFFICULTY: ★★★★★

YOU’LL NEED
- rubber bands
- tube
- plastic cup

We used a cup to diffuse the LED. What can you try?

We used a cup to diffuse the LED. What can you try?

We used a cup to diffuse the LED. What can you try?
ART BOT

PROJECT 5: How can you build a device to draw for you?

1 Start with this circuit
   - power
   - DC motor
   - use the motorMate

2 Rubber band together battery cable and insert your charcoal or marker
   - Put on the motorMate

3 Tuck battery under DC motor and attach with rubber band
   - Attach LEGO™ axle and wheel

- Don’t forget to connect your battery to the power module
- Any kind of marking device is fine

YOU’LL NEED
- marker
- charcoal
- rubber bands
- LEGO™ axle
- wheel

What other tools can you draw with?
- Don’t have an axle or wheel? Make one!

Put it on paper, turn it on and LET IT DRAW!

TIME: 30 mins
DIFFICULTY: 

Don't have an axle or wheel? Make one!
And now a brief intermission from the projects.

VISIT US AT LITTLEBITS.CC/TIPS FOR SOME AMAZING TIPS & TRICKS

1. Decorate your dimmer... Play with your food by attaching it to the DC motor... You are a musician!
2. Learn the mystical art of playing the buzzer... Find out why the wire is the second most important littleBit... 12 ways to diffuse the bright LED... bitFeet™ + cardboard = 5 different attachment techniques... Don’t throw that away! It could transform your next project... What household item enhances any lighting project? We’ll show you... 6 things you didn’t know about the button... What do a buzzer and a baby have in common? We’ll show you... 3 ways to get over your fear of the dark (hint: use the light sensor)...

Find out how many wires would it take to circle the globe?
PROJECT 6: Deck out your bedroom door.

DOORBELL

Start with this circuit:

- power
- wire
- button
- wire
- dimmer
- bargraph
- buzzer

1. Place modules in box and tape down.
2. Find a box and cut the bottom off.
3. Make top piece.
4. Place modules in box and tape down.
5. Cut out decorative doorbell shape and glue to top piece.

YOU'LL NEED:
- box cutter
- push pin
- marker
- tape
- scissors
- glue
- cardboard box

TIME: 60 mins
DIFFICULTY: 4

PRO TIP: You can disconnect the connector to feed through small holes. Don't forget to reconnect it!

STAY SAFE!

- Always use with an adult.
- Be careful!
- Always adjust the volume.
- Use cardboard box as tool holder.

ALWAYS CONNECT YOUR BATTERY TO THE POWER MODULE.
6 Glue one tab on top piece and attach to inside of box.

7 Place doorbell outside door and rest of bit modules inside room.

8 We’d like to see your take on the doorbell project, upload it here! littleBits.cc/upload

GLUE

ON

RECEIVER,

AND

ATTACH

TO

INSIDE

OF BOX.

ADJUST VOLUME OF

ALARM WITH THE

DIAL (BAR

GRAPH AS

INDICATOR).

INSIDE

OF ROOM,

USE TAPE.

OUTSIDE

OF ROOM,

USE PUSH

PIN

(LIKE THIS).

THEN CLOSE

IT UP, AND...

WE'D LIKE TO SEE YOUR TAKE ON THE DOORBELL PROJECT, UPLOAD IT HERE! LITTLEBITS.CC/UPLOAD

Customize it!

Add paint, stickers . . .

GO ALL OUT!

DING DONG!

VIOLET'S

ROOM
PROJECT 7: Make your own spinning windmill.

LIL’ BREEZY

1. Start with this circuit

```
| power | dimmer | wire | DC motor | wire | bright LED |
```

STAY SAFE! Always use with an adult.

2. Make a house out of popsicle sticks

Use scissors to cut popsicle sticks down to size

3. Put the littleBits in your house

- Make a shelf for the littleBits modules to sit on

TIME: 90 mins
DIFFICULTY: ★★★★☆

STAY SAFE! Always use with an adult.

ALWAYS connect your battery to the power module

ALWAYS connect your battery to the power module.
4. Put a pencil eraser on the DC motor.

5. Build a fan out of popsicle sticks and attach to the eraser with your glue.

ENJOY your charming desk decor!
THREE WHEELER

PROJECT 8: Learn how to make a light-controlled vehicle.

1. Start with this circuit:
   - Power
   - Wire
   - Light sensor
   - Wire
   - DC motor

   Always connect your battery to the power module.
   - STAY SAFE! Always use with an adult.

   Use the motorMate.

   Wire
   - Pool grill
   - Tape
   - Pen
   - Marker
   - Cardboard box

   TIME: 90 mins
   DIFFICULTY: 3

2. Make 3 wheels:
   - Trace a cup on cardboard to get perfect circles.
   - Sharp!
   - Be careful!

3. Make the base out of cardboard:
   - Cut a slot in the cardboard wide enough to fit the wheel.

   STAY SAFE! Always use with an adult.

   Use the motorMate.

   What other objects can be a wheel? Try a CD!

   Ours is 4in x 6in, what size will yours be?

   Ours is 4in x 6in, what size will yours be?

See this tutorial with video extras at littleBits.cc/base.
4 Put littleBits on cardboard base

5 Add wheel to motorMate

- Use tape to hold modules down.
- Use pen to poke hole in wheel... motorMate will go in here...
- Then add wheel to motorMate in cardboard slot.
RIDE THROUGH THE NIGHT!
Try the light sensor in both models. Which is your favorite?

6. Poke skewer through two remaining wheels and glue them in place; these will be the back two wheels.

7. Attach back wheels:
   - Cut a rectangle of paper and fold it in half...
   - ...then place over axle and tape down
   - After you've made the axle cut the points off the ends of the skewers (not too tight, axle should still spin)

8. Draw yourself and cut the figure out

9. RIDE THROUGH THE NIGHT!
MAKE SOMETHING THAT DOES SOMETHING™
Upload your project and you may be handsomely rewarded. We regularly feature awesome community projects and send out exclusive gifts.

Visit us online where we've got tons more projects and tips and tricks for every Bits module. Check out other littleBits in the expanding library.

Online we'll show you how to make this great PUPPET MASTER

www.littleBits.cc/puppet

and

TONS MORE PROJECTS at

www.littleBits.cc/base

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push it
turn it
move it

pressure sensor motion trigger vibration motor light wire

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THE SCREAMING FANS. THE FLOOD OF LIGHTS. THE ONSTAGE RUSH. littleBits and KORG want you to UNLEASH YOUR INNER ROCK STAR.
WARNING
• This product contains small magnets. Swallowed magnets can stick together across intestines causing serious infection and death. Seek immediate medical attention if magnets are swallowed or inhaled.
• Most littleBits modules are small parts. DO NOT allow children under 3 years old to play with or near this product.
• NEVER connect any littleBits modules or circuits to any AC electrical outlet.
• Do not touch or hold any moving parts of littleBits modules while they are operating.
• Keep conductive materials (such as aluminum foil, staples, paper clips, etc.) away from the circuit and the connector terminals.
• Always turn off circuits when not in use or when left unattended.
• Never use littleBits modules in or near any liquid.
• Never use in any extreme environments such as extreme hot or cold, high humidity, dust or sand.
• littleBits modules are subject to damage by static electricity. Handle with care.
• Some littleBits modules may become warm to the touch when used in certain circuit designs. This is normal. Rearrange modules or discontinue use if they become excessively hot.
• Discontinue use of any littleBits modules that malfunction, become damaged or broken.

VERY IMPORTANT NOTE
• Several projects in this kit involve the use of a box cutter and/or a hot glue gun.
• These tools should be used ONLY under direct adult supervision and ONLY by children capable of using them safely.

INSTRUCTIONS
We recommend using littleBits brand 9-volt batteries, but standard alkaline or standard rechargeable batteries may also be used. Properly discard and replace exhausted battery. Do not connect the two battery terminals with any conducting material.

CARE AND CLEANING
Clean Bits modules ONLY by wiping with a dry cloth. If necessary, isopropyl alcohol on a cloth may be used sparingly. DO NOT use any other cleaning products on Bits modules.

SEND US YOUR LOVE
Contact support@littleBits.cc with any questions or comments.

www.littleBits.cc
littleBits Electronics, Inc.
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(917) 464-4577

You are a proud owner of the Synth Kit v1.
Over 500,000 combinations?! Are you serious?
Yep, www.littleBits.cc/mathmagic

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LITTLEBITS®
BASICS

1 CIRCUITS IN SECONDS®
littleBits® makes an expanding library of modular electronics that snap together with magnets.

2 COLOR CODED
Bits® modules are grouped into four different categories, which are color coded:
- POWER is needed in every circuit and the start of all your creations.
- INPUT modules accept input from you and the environment and send signals to the modules that follow.
- OUTPUT modules DO something—light, buzz, move...
- WIRE modules expand your reach and change direction—great for helping to incorporate modules into your projects.

3 ORDER IS IMPORTANT
Power Modules always come first and Input Modules only affect the Output Modules that come after them.

4 MAGNET MAGIC
littleBits® modules snap together with magnets. The magnets are always right, you can’t put modules together the wrong way.

5 littleBits® + anything
The modules are just the beginning. Combine them with craft materials, building sets, and other toys to electrify your life. We’ll show you how!
**WHAT IS SOUND?**

Sound is the vibration of air or another medium (like water). When you speak, sing, or clap, you create sound waves that radiate out into the environment. Every sound has its own “signature” that is called a waveform.

**PITCH**

Pitch is how a person perceives the frequency of a vibration. Every person perceives pitch differently and some have a better sense of pitch than others. Sound can generally be categorized as pitched or un-pitched.

**PITCH VS. FREQUENCY**

Frequency and pitch are similar, but not the same! Frequency can be measured scientifically, while pitch is dependent on individual perception. You can distinguish pitches as being “higher” or “lower.”

**AMPLITUDE**

Amplitude relates to the change in the peaks of waveforms and is perceived as the loudness of a sound. The higher the amplitude of a waveform, the louder it sounds.

**TIMBRE**

Timbre (pronounced tam-ber) is what differentiates sounds of the same pitch. It is what makes a violin and a flute sound different... or your friends’ voices!
Korg’s MS-20 synthesizer, first introduced in 1978, is still a coveted instrument to this day; thanks to its thick, robust sound, its powerful, iconic analog filter, and its versatile patching options. Today, the sounds of the MS-20 have been reborn as the MS-20 Mini.

**HISTORY OF THE SYNTH**

*Theremin - first electronic musical instrument.  
Film score for Forbidden Planet see pg 23*

*Switched On Bach see pg 18*

*Korg MS-20 introduced.  
Sounds were created digitally. Most famous was the Yamaha DX7, which used FM synthesis.*

*Littlebits + Korg launch modular synth kit!*

*50s 60s 70s 80s 90s 00s*

*SWITCHED ON BACH see pg 23*

*Roger Moog and Don Buchla began producing the first commercial musical synthesizers.*

*Rebirth of analog modular synths. Synthesis dominated by computer interfaces.*

**ELEMENTS OF A SYNTH**

- Signal generators
- Modulators
- Controllers (keyboard)
This power module lets you use a 9-volt battery to supply electricity to your other Bits modules. Snap in the battery + cable (both included) and flip the switch to turn it on.
The random module has two modes: “noise” and “random voltage”. In “noise” mode, it outputs white noise, like a television set not tuned to any channel. In “random voltage” mode, it outputs random voltage signals that can control oscillators and make them play random pitches. The “trigger out” of the micro sequencer can be used to set the timing of the random voltages.

The oscillator is the main sound source in the Synth Kit and is capable of creating audio tones that will be used in almost every sound experiment you create. It features a “pitch” knob to adjust its output tone and a “tune” dial for adjusting the tuning (learn about tuning on pg 21) when using with the keyboard. It also features a mode switch that selects between “square” and “saw” waveforms. The “square” waveform has a rich, powerful character, and the “saw” waveform has a more mellow, rounder character.
The micro sequencer sends out voltages based on the position of each of the four “step” 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). Turn a knob fully counterclockwise to make the step silent. Use the module in “speed” mode to set the speed using the dial, or flip the switch to “step” mode to use an input module like a pulse or button for control. It also has a trigger output, which you can send to any of your other modules.

The keyboard lets you play melodies – it features 13 switches that make up an octave of notes. It has two modes: “press” (which only produces output when you press a switch) and “hold” (which will sustain the last note you played). It also features an octave control which changes the playable range. In addition to its main output, which is great for controlling our oscillators, it also has a “trigger out”, which you can send to the “trigger in” of the envelope or other littleBits modules.

The dial allows you to play in 4 octaves.

13 keys

13 x 4 = 52 different notes!

CONTROLLERS

Controllers do exactly what it sounds like they do; they control elements of a synthesizer. Sometimes controllers are familiar like a keyboard and some are lesser known like a sequencer. The Synth Kit has both!

The control can come in the form of control voltages or triggers. A control voltage is usually a changing signal that is often used to control the pitch of an oscillator. A trigger is a short voltage pulse that is commonly used to trigger or “turn on” other parts of circuits. Triggers are also good at generating rhythmic patterns.

To see how triggers are used, go to page 24 for the Percussion Party project.
The envelope modifies the loudness contour of a sound. It takes a sound input and shapes it into something you’d hear from an acoustic musical instrument, like a piano or saxophone. This envelope has two controls: “attack”, which is how long it takes to ramp up to maximum volume, and “decay”, which is how long it takes to fade to silence again. You can use its third bitSnap™ to trigger the envelope from different sources, like the keyboard.

**MODULATORS**

Modulators are elements of a synthesizer that alter the main audio signal with another signal. In the synth Kit, they are the **oscillator**, **envelope** and **random** modules.

Even though the oscillator is a signal generator, it can also be used as a modulator. You can turn the pitch knob fully counterclockwise to produce frequencies low enough to control other modules.

When the **random** module is in “random voltages” mode, it is also a modulator.

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**FILTER i32**

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.) The “cutoff” knob sets the frequency to be emphasized, and the other controls “peak,” or intensity of the filter. If the “peak” is turned up all the way, the filter turns into an oscillator!
The delay module takes incoming audio and repeats it, like an echo. It 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. Delays can be long and spacey, like shouting into the Grand Canyon, or loud and crazy. This module will play forever if you turn the “feedback” knob all the way up. You can also shift the pitch of a sound by turning the “time” control while a sound is repeating.

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

Modifiers are synthesizer elements that directly affect the sound of the signal generator. They can either reduce or enhance characteristics of sound and manipulate waveforms (filter, delay, and mix modules).
The littleBits split module sends a single input to two wired outputs. It’s great for connecting one output to two inputs, like using a keyboard to control two oscillators. But keep in mind that it can be used just like a wire module if you ignore one of its outputs.

The synth speaker amplifies your sonic explorations! You can control the volume with a dial on the front of the module. It also features an output jack. Use an audio cable to connect to headphones or a computer for recording, or to an amplifier for a show. The speaker can detach from the circuit board, so you can orient it to your liking.

This Kit contains a 9-volt alkaline battery and a cable to connect it to the power module. Connect it and then flip the switch to power all of your creations!
IN 1968, Wendy Carlos a pioneer in electronic music recorded the landmark album “Switched-On Bach”, which consisted of pieces by Johann Sebastian Bach performed on a synthesizer. “Switched-On Bach” was one of the first classical albums to sell half a million copies. The album won 3 Grammy Awards. FORMED IN 1970, Kraftwerk, which means “power station” in German, built the foundation of the electro-pop genre with their revolutionary synth sound. The band and its members are recognized as pioneers in this new technology. Kraftwerk is credited with making machine made sounds commercially appealing and an integral part of pop music. Their studio, “Kling Klang”, was a place where the band not only recorded music, but also invented and built their own complex electronic instruments. FORMED IN 1965, Pink Floyd was a progressive rock band known for experimenting with different technologies to create a unique, uncharted experience with music. Released in 1973, “The Dark Side of the Moon” featured heavy use of analog synthesizers and brought electronic sound further into the main stream. They’ve sold more than 250 million albums worldwide and are one of the world’s most legendary rock bands. THE 1982 ALBUM “Thriller” by Michael Jackson is one of the best-selling albums of all time. Nearly every song on the album features synthesized sounds. IN 2000, the renowned rock band Radiohead won a Grammy for their album “Kid A” which brought synth sounds to the forefront. The album features wide use of analog modular synthesizers and the Ondes Martenot, an early electronic instrument. IN 1982, ALBUM “Thriller” by Michael Jackson is one of the best-selling albums of all time. Nearly every song on the album features synthesized sounds. IN 2000, the renowned rock band Radiohead won a Grammy for their album “Kid A” which brought synth sounds to the forefront. The album features wide use of analog modular synthesizers and the Ondes Martenot, an early electronic instrument. TODAY Björk is praised for her experimental electronic music. She has received 13 Grammy nominations as well as an Oscar nomination for Best Original Song from the film “Dancer in the Dark.” She uses cutting-edge synths like the “Reactable,” a digital tabletop that creates sounds by moving tangible blocks.

LISTEN: Carlos’ compositions can be heard in the films A Clockwork Orange (1972), The Shining (1980) and Tron (1982).

LISTEN: “Trans-Europe Express” from Kraftwerk’s 1977 album of the same name. Replicate the background beats with “Percussion Party” on page 24.

LISTEN: “Do the Reel” from “The Dark Side of the Moon.” It is one of the first excerpts of a sequencer.

LISTEN: “Thriller”, the liquid blast of whooshes that opens the zombie dance was performed on a synthesizer.

LISTEN: “Habitats” from Kid A. Try replicating these sounds in the “Synth Band” project on page 26.

LISTEN: “Army of Me” (1995) by Björk. Try replicating the bass line by lowering the pitch of the oscillator and playing with the micro sequencer or keyboard.

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LISTEN: “Habitats” from Kid A. Try replicating these sounds in the “Synth Band” project on page 26.
"Saw" and "square" are similar waveforms. The saw has a "mellow" character to it and the square sounds more "edgy.

The timbres of these two waveforms are most related to bowed strings and brass in the acoustic instrument families.

The "pitch" range goes from being so low that it is unpitched (you actually hear clicks) to very high pitches. You can have lots of fun by twisting the pitch knob and "sweeping" through all the frequencies!

Try adjusting the tuning knob. What happens?

Try a "d"justifying the tuning knob.

Plug battery in and turn power on.

Turn pitch knob on oscillator to change the frequency.

Select the kind of waveform it produces. The 2 waveforms are Sawtooth (or Saw) and Square.

PITCH SWEEPS Learn how an oscillator works.

Try These Circuits

Get started with these but don’t let us hold you back – every module fits with every other module – feel free to experiment.

Try These

Try These

Touch the silver speaker cone and notice how it moves when you change from higher or lower pitches.

Try These

Try These
WHITE NOISE  Experience the random module.

The random module has two modes and one of them is called “noise”. Un-pitched sound is generally categorized as noise or a collection of many frequencies that are not distinguishable from one another. Unlike a waveform, noise has no repeating pattern.

KEY PLAYER  Learn how to play notes on the keyboard.

A synthesizer is commonly controlled with a keyboard similar to a piano. Each key creates a voltage that represents a note. Since a synthesizer is electronic, it is not limited to the same notes a piano can play!
**SEQUENCER CONTROL**  Make a melody.

- **Make a melody.**
- **Frequency Modulation**
  Discover how two oscillators interact.

A sequencer is a very novel controller and is unique to the world of synthesizers. A sequencer allows you to store note values and play them back in a repeating order. The stored notes are set by tuning each step using the knobs. The pattern will repeat sequentially forever and the speed can be controlled within the sequencer or from an outside pulse.

**FREQUENCY MODULATION**  Discover how two oscillators interact.

- **Frequency Modulation**
  Discover how two oscillators interact.

As previously mentioned, an oscillator can produce a frequency that is too low to be perceived as a pitch. In this case it is known as an LFO or low frequency oscillator. Because the oscillator in your kit can be both low frequency and audio range, you can turn up the frequency of one oscillator and feed it into another oscillator to create “frequency modulation.”
SHAPE YOUR SOUNDS  Experiment with the envelope.

Put in hold mode.  Turn attack up and hit a key.  What happens?

Put in hold mode.  Turn decay down and hit a key.  What happens?

The envelope of a sound has a big effect on the character of the sound. The controls on the envelope Bits module are “attack” and “decay.”

**ATTACK**
Attack is how long it takes the sound to get to its loudest point.

**DECAY**
Decay is how long it takes the sound to fade to silence.

**EXAMPLES OF ENVELOPE AMPLITUDE OVER TIME**
Can you think of other instruments that fit these profiles?

- Violins have slow attacks because each note is drawn out by playing with a bow.
- Hit a drum, the sound appears and disappears right away.
- Sharp attack sharp decay like a drum.
- Gradual attack gradual decay like a piano.

Always connect the battery and turn the power on.
Random voltages can produce interesting effects in a synthesizer. Traditionally, this is created by a circuit called “sample and hold” or “S&H”. In a sample and hold circuit, a voltage is sampled from noise and sent to affect another circuit. There is no telling which voltage will be sampled!

The filter is known as a low-pass filter. This means that frequencies higher than a certain point will be reduced or filtered out. When the peak is increased and the cutoff is adjusted, the timbral effect can sound like a person making vowel like sounds.

You can recreate this with your voice. Try making an “Ah” sound and then slowly shift to an “Ooh” sound. Your mouth creates a filter that changes the timbre of the sound much like the filter.

The filter is based on KORG’s famous MS-20 design.
ECHO AND DELAY Learn how to make infinite repeating sounds with the delay.

The delay affects the sound, but unlike the filter, its primary function is not to add or subtract from the original sound, but to reproduce it. Think of it as an echo in a large room or cave. You make a sound, and that sound gets repeated for some amount of time depending on how big the space is.

1. Set the “feedback” knob fully clockwise and play a few notes, the delay will repeat those notes and then repeat the repeats.
2. Adjust the “time” knob to create the effect of raising or lowering the pitch.
3. Twist the knob really fast in both directions to create some really crazy effects!

Artist and producer Brian Eno is well known for pushing the technological boundaries of music. He has famously produced mega albums like “Low” by David Bowie, “Remain in Light” by Talking Heads, and “Joshua Tree” by U2.
Enhanced instructions plus tons more projects online, littleBits.cc/synth
Visit littleBits.cc/recordyourmusic for tips on how to record, edit and share your music.

TRY THESE AND INVENT YOUR OWN

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PROJECT 1: Learn how to make your song’s pitch perfect.

TUNING

1. Start with this circuit.

2. Pick one key and turn the “octave” dial clockwise and counterclockwise. Do you hear the difference? Listen to the range (how “high” and “low” the sound goes).

3. Turn the keyboard “octave” control to the middle of the range.

4. Turn pitch knob on oscillator to change the frequency.

5. Play the notes on the bottom row of the keyboard consecutively from left to right. This is called a major scale in music. You may recognize it as do-re-mi-fa-so-la-ti-do.

6. Play do-re-mi again, does it sound “right” to you? Remember “pitch” is perceived differently for everyone! If the notes didn’t sound quite right, try slowly adjusting the tune dial counterclockwise until it sounds “in tune.”

7. You’ve successfully tuned your oscillator, YOU’RE READY TO PLAY!

TUNING

- Tuning is the relationship between the pitches in a musical instrument. Instruments need to be “tuned” and a synthesizer is no different. By tuning instruments, you can create “melodies” that are recognizable.

- The tuning dial on the oscillator Bits module will alter the relationship between pitches. This will be important when using the keyboard and microsequencer.
PLAY A SONG

PROJECT 2: Serenade a friend!

1. Start with this circuit.
2. Then, tune your oscillator (see previous project).
3. Adjust pitch to match the range of your voice!

The bass sound in Stevie Wonder’s 1973 song “Living for the City” features the use of a keyboard, oscillator, and envelope. Can you replicate that sound?

Go to littleBits.cc/synth to learn how to play more tunes!
The peak knob has a large effect on what the cutoff knob does. It emphasizes certain frequencies and creates a “peak” at these frequencies. If the peak is turned all the way up, the emphasis can be strong enough to increase the loudness of the sound and in some cases create an oscillation.

---

**SPOOKY SOUNDS**

1. Start with this circuit.
2. Put the random module on “noise” mode.
3. Turn the time up (clockwise) on the delay module.
4. Turn the feedback up (clockwise) on the delay module.
5. Set “peak” to middle and play with “cutoff.”
6. SCARE YOUR FRIENDS!

The film score by Louis and Bebe Barron for “Forbidden Planet” (1958) was one of the first to make use of entirely electronic music.
PERCUSSION PARTY

1. Start with this circuit.
2. Put the random module on “noise” mode.
3. Set your rhythm by adjusting knobs on the micro sequencer and adjust tempo with speed dial.
4. Adjust the filter to affect the timbre.
5. Turn the “attack” knob all the way down (counterclockwise). Turn the “decay” knob low but slightly higher than the “attack.”
6. Wall on your synth drum set!

NOISE
Noise is an un-pitched sound. It is often used as a way to create percussion sounds because most drums are un-pitched instruments.

TRY MAKING A...
...horse galloping sound - Turn one of the knobs all the way down on the sequencer to make the sound effect for a horse galloping.
...woodblock sound - Turn the peak knob up (clockwise), turn the cut off down (counter clockwise).
...water drop sound - Keep the peak up. Turn the cut off to a mid-range (higher than the woodblock).
PROJECT 5: Recreate metallic sounds with the envelope.

**METAL MUSIC**

1. Start with this circuit.

2. Set your rhythm by adjusting knobs on the micro sequencer.

3. Turn the pitch of the first oscillator up (clockwise).

4. Turn the pitch of the second oscillator up until you reach a metallic sound — like a bell.

5. On your envelope, turn decay knob and attack knob down (counterclockwise) until you achieve a “pinging” sound.

6. ROCK ON!

**FUN FACT**

People who are musically inclined tend to be better at math! Go figure.
PROJECT 6: Learn how to play a melody with accompaniment.

SYNTH BAND

1. Start with this circuit.
2. Tune both oscillators (refer to page 21 on how to do this). Oscillators can either be set to “consonant” or “dissonant” intervals. In consonance, they are in harmony. In dissonance, they will sound inharmonious.
3. Create a pattern on the micro sequencer that you like. This will become your backing music.
4. Adjust the filter until you reach the sound you like.
5. Set mix level 1 low and mix level 2 higher.
6. Play a few notes on the keyboard. The keyboard is like the “lead singer” and will appear louder than your sequencer because nothing is filtering the sound.
7. Adjust the envelope and delay - these will change your keyboard’s sound.
8. Use an audio cable to connect your speaker to your computer, headphones, or an amplifier!

PRO TIP: You’re ready to perform!
SYNTHESIZER WITH THE WORKS

PROJECT 7: Create one monster synth with all of these modules!

1. Start with this circuit.

2. Tune both oscillators (refer to page 21 on how to do this). Oscillators can either be set to "harmonant" (harmonious) or "dissonant" (inharmonious) intervals.

3. Adjust the envelope.

4. Add just the delay.

5. Add some echoes by adjusting the delay module.

6. Adjust volume of each oscillator on the mix module.

7. Record your music!

Record your music and share it with us! littleBits.cc/upload
And now a brief intermission from the projects.

VISIT US AT LITTLEBITS.CC/TIPS
FOR SOME AMAZING TIPS & TRICKS

And now a brief intermission from the projects.

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FOR SOME AMAZING TIPS & TRICKS
PERFORM LIKE A PRO

PROJECT 8: Transform your box!

TIME: 60 mins
DIFFICULTY: ••••

Visit littleBits.cc/prosetup for instructions on how to set up your modules so you can put on live performances anywhere and on the go!

Buy mounting boards online at littleBits.cc/mountingboards

Build a performance station!

Power up your circuit and START PLAYING!

Cool! Just like the KORG MS-20.
PROJECT 9: Create your own electronic instrument!

KEYTAR

1. Start with this circuit.

TIME: 60 mins
DIFFICULTY: 1

STAY SAFE! Always use with an adult.

In the early '70s Edgar Winter was one of the first people to create a makeshift "keytar" by adding a shoulder strap to an electronic keyboard. Check out the popular song "Frankenstein."
1. Decorate with paint markers, wherever you have!
2. Place the smaller piece on glue stick or double-sided tape, wherever you have!
3. Place the larger piece to the back of the wider end.
4. Show us your design! littleBits.cc/upload
5. Add the circuit.
6. Add a arm_my hand!
7. Add a stop.
8. Lock out!
PROJECT 10: Play your Synth Kit like a DJ.

SYNTH SPIN TABLE

1. Start with this circuit.

- Power
- Speed knob
- Micro sequencer
- Split
- Oscillator
- Mix
- Envelope
- Speaker
- Adjust volume

STAY SAFE! Always use with an adult.

2. Lay cereal box flat.

SYNTH SPIN TABLE

- Oscillator
- Change volumes of each oscillator

SYNTH SPIN TABLE

1. Oscillator
2. Mix
3. Envelope
4. Speaker
5. Power

TIME: 2 hrs
DIFFICULTY: 1

SYNTH SPIN TABLE

- Oscillator
- Change volumes of each oscillator

STAY SAFE! Always use with an adult.

- Hot glue
- Scissors
- Tape
- Pen
- Plastic cup
- Straw
- Cereal box

Disco! The first notable fully synthesized disco hit was “I Feel Love” by Donna Summer in 1977.
1. Put the circuit on the box. Use tape to keep'em in place.
2. Get paper plate cut down to size.
3. Attack one straw on each oscillator knob.
4. Make first turntable.
5. Mark center of plate and poke hole.
7. Make second turntable.
8. Poke a hole in the bottom of a cup and slide it on the straw of the second oscillator.
9. Repeat steps 5-7 and add another plate on top of the cup.

You can tape straw to cup at the base for stabilizing.

2. Decorate!

We used colored straws. What materials do you have at home?

Will you need colored paper, straws, markers, or scissors?

bend flaps.

Your tabletop is ready for the party!
MAKE SOMETHING THAT DOES SOMETHING™
This booklet's over but the fun's not done.

**LITTLEBITS.CC/UPLOAD**

Upload your project and you may be handsomely rewarded. We regularly feature awesome community projects and send out exclusive gifts.

Visit us online where we've got tons more projects and tips and tricks for every Bits module. Check out other modules in the expanding library.

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[www.littleBits.cc/synth](http://www.littleBits.cc/synth)

**EXPLORATION SERIES**

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**INDIVIDUAL MODULES**

- microphone
- pressure sensor
- bargraph
- light wire

**MAKE MORE! Some great additions to your Synth Kit**

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