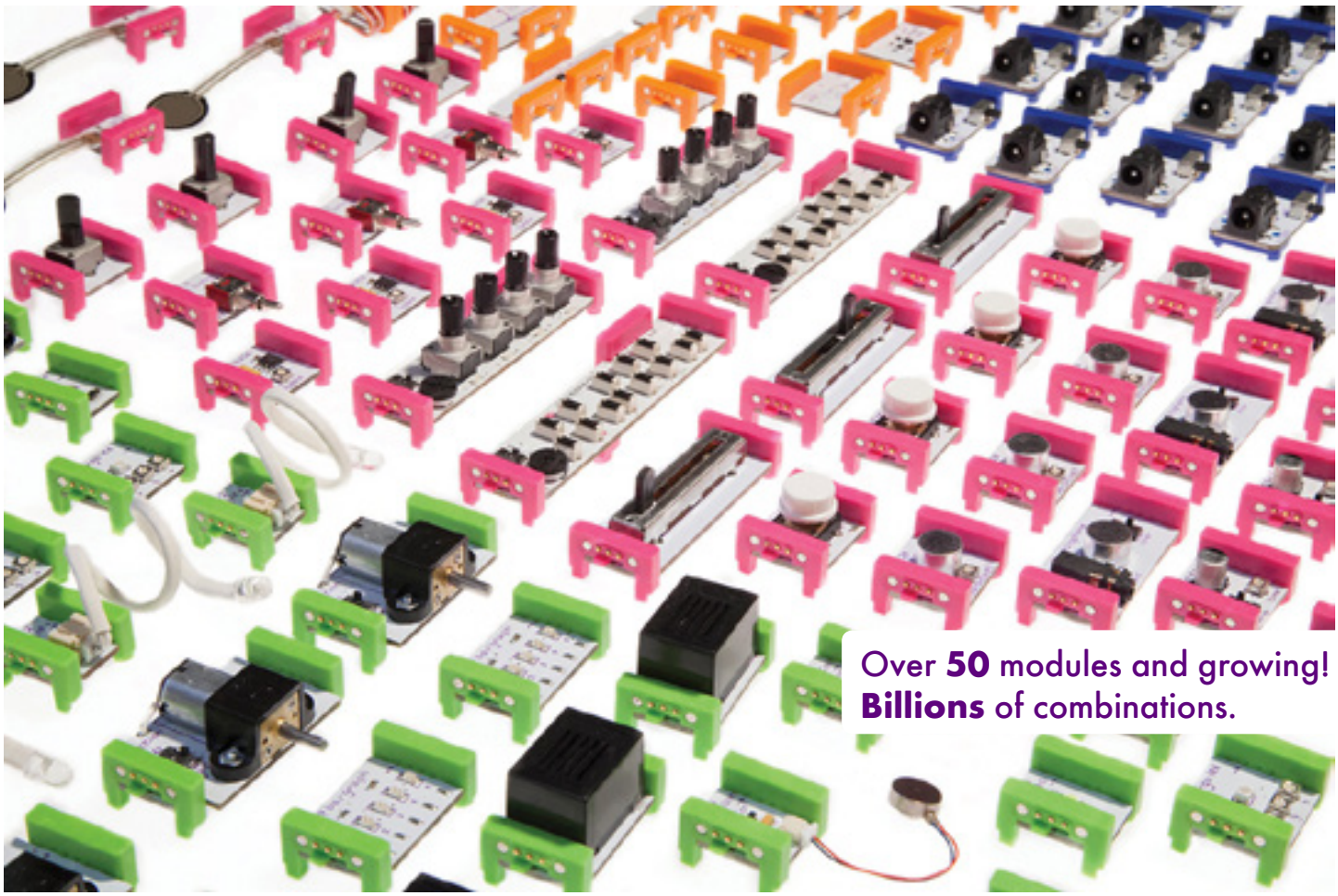
littleBits™

2014 WORKSHOP GUIDE



littleBits is the **easiest** and **most versatile** way to learn and prototype with electronics.

Table of Contents

About littleBits 2

Advantages to littleBits 3

See What People Have Made 3

Workshops 4

Workshop Leaders 5

Which Workshop Should I Run? 5

Workshop Formats 6

How to Run a Design Challenge Workshop 8

More Info 9

Helpful Hints for Getting Started 10

How Do I Know What Modules to Buy? 10

Demo Overview 11

Sample Circuits 12

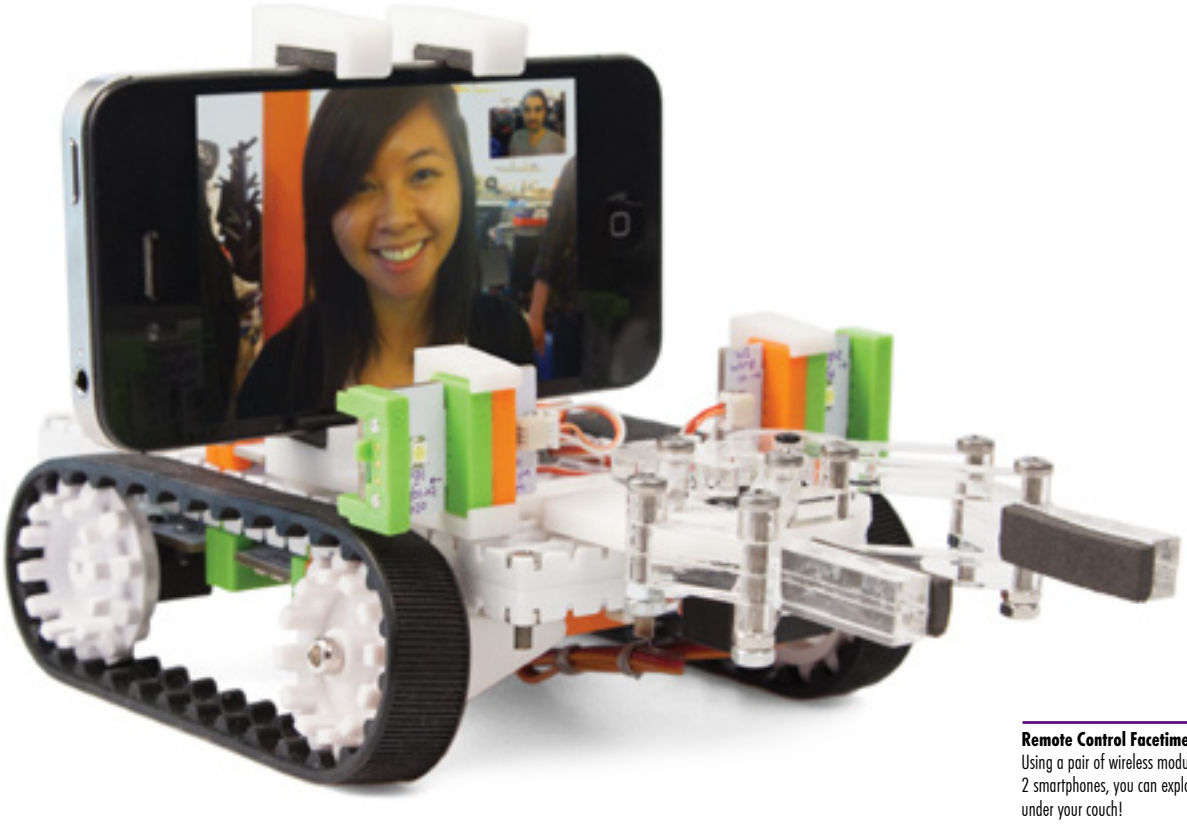
Craft Material List 12

Project Tips & Tricks 13

Troubleshooting & Safety 15

Browse & Share Projects 16

Contact Us 17



Remote Control Facetime® Car
Using a pair of wireless modules, two DC motors, a servo, and 2 smartphones, you can explore the unknown - like Mars or under your couch!

About littleBits

littleBits makes a growing library of electronic modules that snap together with magnets for prototyping, learning, and fun.

Each module has a specific function (motors, lights, sound, sensors, buttons, thresholds, pulse, wireless control, etc.), and all modules snap to make larger circuits. Building circuits is simple and intuitive, allowing anyone to create powerful, sophisticated electronics in a matter of seconds.

No soldering, no wiring, no programming – it's the easiest, most powerful way to prototype, learn about, and have fun with electronics.

You can join this growing community and host a workshop using littleBits' modules. Within minutes of introducing littleBits' modules to someone, curiosity is ignited and an organic process of active inquiry and problem solving begins.

littleBits' workshops serve as a catalyst for discovery about electronics, circuits and the gadgets that surround us in our everyday lives.

littleBits' kits and modules are an electronics prototyping tool that can be incorporated into your makerspace or classroom. The flexibility and adaptability of our modules make it easy for beginners of all ages to build and create simple circuits instantly. Advanced and experienced makers can effortlessly combine modules with laser cutters, 3D printers, mills and sewing stations to create more complex and sophisticated results.

Join littleBits in creating the new generation of problem-solvers and tinkerers. Design and run your own littleBits' workshops, combine the modules with your favorite materials, and help us share the magic with the world.

For inspiration go to, littleBits.cc/projects.

Advantages to littleBits

littleBits is a powerful platform and prototyping tool that makes building with electronics easy! Our open source library of electronic modules allows novices and experts alike to make complex circuits – no soldering, wiring, or programming required. However, with the new Arduino At Heart module, you now also have the ability to incorporate programming into your littleBits circuits.

FOR LEARNING:

- ✓ gender neutral
- ✓ age agnostic
- ✓ cross-disciplinary
- ✓ reusable
- ✓ engaging experience

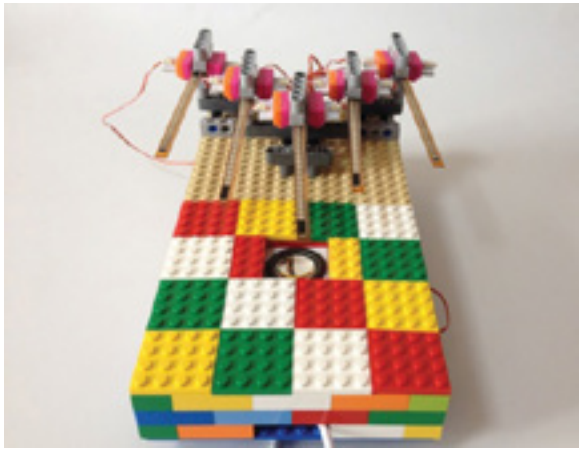
FOR PROTOTYPING:

- ✓ cost-efficient
- ✓ easier and much faster than breadboarding
- ✓ able to produce complex interactions
- ✓ programmable
- ✓ infinitely scalable

See What People Have Made

Robotic Arm – Shakey
Designed by: Tmax
This small robotic arm uses littleBits' servo modules to pick up and transport objects.

Crayon Lathe
Designed by: Tmax
A mini lathe that allows you to carve crayons.



Kalimba
Designed by: htkgk
Combine LEGO® with littleBits' bend sensors and oscillators to create this musical instrument.

WORKSHOPS

Workshop Leaders

More at littleBits.cc/category/workshops

LOVE LITTLEBITS AND HAVE AN INTEREST IN THE MAKER MOVEMENT
You are excited about emerging technologies and electronics, DIY culture and want to share it with the world.

HAVE BACKGROUND IN MAKING, DESIGNING, AND ENGINEERING
You have experience building things and working with your hands. You have the ability to come up with creative solutions both conceptually and physically.

KNOW THE MODULES
You've spent time getting to know the functionality of each module and how they all interact with one another. You are able to explain in basic terms the features of each module.

HAVE EXPERIENCE LEADING AND ORGANIZING WORKSHOPS
You are highly organized and comfortable presenting information to groups. You are a hands-on person who is able to help keep people on track and lead a design process.

ARE YOU A SUPER LEADER?
Super Leaders are energetic, encouraging, and are able to help participants work towards meaningful solutions. If you plan to lead a Design Challenge Workshop, we suggest that you be very comfortable with the design process (ideation/brainstorming, problem solving/narrowing ideas, iteration/prototyping, building/making, and presenting).

Which Workshop Should I Run?

Please consider age/experience, time, venue/event type, product variety

❶ MAKER/INTRO WORKSHOPS
These are ideal for beginners and makers with less experience. For this type of workshop, pick 1 or 2 projects for the participants to make. Maker/Intro workshops are typically under 2 hours and can be hosted in most locations. You will need to supply enough modules for each participant (or team) to create a predetermined project as well as the materials and tools needed to build it. You may also want to include extra modules to provide options for improvisation.

❷ DESIGN CHALLENGE WORKSHOPS
These are great for experienced makers. If you have 2+ hours and a location conducive to making (ie: makerspace, fab lab, design studio), you may want to go this route. You will need to provide enough modules to engage your higher level makers. Choose a variety of modules and be sure to include a lot of wires. You will also want to provide an array of materials and tools to help your participants get the most out of the workshop. Choose a theme and go through a design process. (See page 8 for more information.)

MAKER EXPERIENCE LEVEL

AGE RANGE	Beginner	Intermediate	Advanced
8-10 [Elementary School]	MAKER	MAKER	MAKER
11-13 [Middle School]	MAKER	MAKER	MAKER/ DESIGN CHALLENGE
14-∞ [High School & beyond]	MAKER	MAKER/ DESIGN CHALLENGE	DESIGN CHALLENGE

EXAMPLE WORKSHOPS

BASIC INTRO TO LITTLEBITS AND MAKING
Time: ~2 hours
Participants: Elementary School Aged Children
Sample Projects: Simple Line Follower, Pizza Box Phonograph, Crayon Lathe
Supplies: Set number of modules and building materials for specific projects plus some extra modules for improvisation

INTRODUCTION TO LITTLEBITS AND MORE COMPLEX CIRCUIT BUILDING, INTERACTION AND MAKING
Time: ~2 hours
Participants: Tweens
Sample Projects: DIY Etch A Sketch, Grappler, Creepy Crawly Cockroach
Supplies: Set number of modules and building materials for specific projects plus some extra modules for improvisation

MORE COMPLEX CIRCUIT BUILDING AND INTERACTIONS; HIGHER LEVEL PROBLEM-SOLVING AND MAKING SKILLS
Time: ~4 hours
Participants: University Students, Design Programs, Creative Adults
Sample Projects: Animatronic Hand, Wireless Bathroom Vacancy Sign, CNC Bot, Remote Control Facetime® Car
Supplies: Large array of modules and materials, access to Fab Lab/Makerspace/more complex tools

Workshop Formats

In this workshop guide, we will cover two types of littleBits' workshops: **Maker/Intro Workshops** and **Design Challenge Workshops**. The workshop formats we present are based on our most successful past workshops. We feel these formats are the best ways for sharing the magic of littleBits with the world, but there are many ways to run a littleBits' workshop, so please feel free to adjust them to fit your specific situation.

❶ MAKER/INTRO WORKSHOP

Learn, understand, and make something with predetermined projects
Time: ~2 hours
Participants: First-timers (all ages), younger audiences
Content: Changes depending on demographics
Location: Conferences, varying events

Maker/Intro Workshops are theme-based and focus on creating specific projects. Basic instructions are provided to participants as well as a set list for materials and modules. Participants are able to walk away with a basic understanding of modules, a sense of accomplishment, and the completion of a project. With this sort of workshop, there is room for improvisation in making a project.

Components:
- Demonstration of the modules
- Sample circuits
- Prompt: theme + predetermined projects/templates
- Transparent goal
- Ability to improvise

What do participants get out of it?
- Basic understanding of modules
- The act of making/constructing
- Finished Project – success
- Positive experience

Resources:
- **WIRED Workshop (Space Kit Projects: Grappler & Satellite Dish):**
  This workshop was based around the idea of "solving problems like a NASA engineer" where participants were tasked with the mission to save some rogue astronauts (pulling inspiration from the movie *Gravity*) and our 24 "space engineers" had the choice to build a satellite dish or a robotic arm, called a grappler, to aid in the astronauts' safe retrieval.
  littleBits.cc/wired-uk-2013-the-future-is-now

- **Hack My House Workshop:**
  During this workshop held at San Francisco Maker Faire, participants used pre-designed templates, craft materials, and modules to create different buildings. The purpose of this workshop was to integrate electronics with common objects.
  littleBits.cc/browse-lessons/hack-my-house-workshop

- **Techno Jungle Workshop:**
  Participants construct different creatures – like tail-wagging animals and blinking robots – out of craft materials and modules. There are 8 templates available, but participants are encouraged to create their own designs.
  littleBits.cc/browse-lessons/let-s-make-a-techno-jungle-together

SUGGESTED PROJECTS

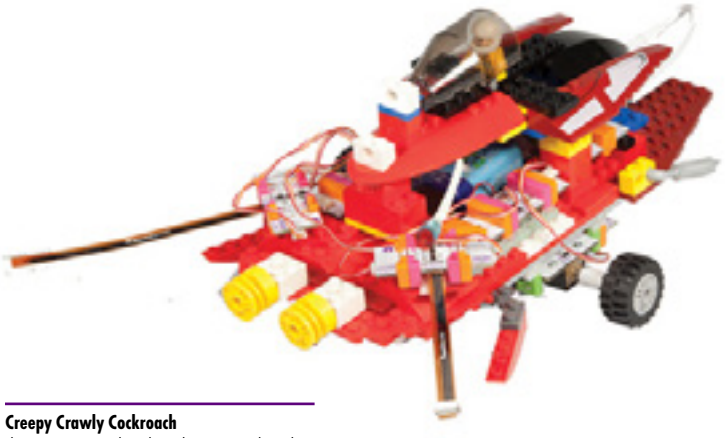
- **Logic Lesson**
  littleBits.cc/browse-lessons/introduction-to-logic

- **Satellite and Exploring Parabolas**
  littleBits.cc/projects/satellite-dish
  littleBits.cc/browse-lessons/space-lesson-satellite-dish

- **SeedSpinner: Simulating microG with littleBits and FastPlants**
  littleBits.cc/browse-lessons/seedspinner-simulating-microg-with-littlebits-and-fastplant

- **Investigating the Law of Reflection**
  littleBits.cc/browse-lessons/investigating-the-law-of-reflection

- **Creepy Crawly Cockroach**
  littleBits.cc/projects/creepy-crawly-cockroach



Creepy Crawly Cockroach
This super smart cockroach easily navigates through any environment using bend sensors and light triggers.

❷ DESIGN CHALLENGE WORKSHOP

The process of working through prompt to creation – original end product
Time: +2 hours
Participants: Middle School & up
Content: Changes depending on demographics
Location: Conferences, varying events

Design Challenge Workshops are great for experienced makers. If you have 2+ hours and a location conducive to making (ie: maker-space, fab lab, design studio), you may want to go this route. You will need to provide enough modules to engage your higher-level makers (choose a variety and be sure to include a lot of wires). You will also want to provide an array of materials and tools to help your participants get the most out of the workshop. Choose a theme and work through a design process from problem to solution with modules. Then, share these projects with the littleBits' community

Characteristics:
- Demonstration of the modules
- Sample circuits
- Prompt: Theme + Design Challenge
- Open-ended goal
- Design process – brainstorming/problem solving/critical thinking
- Prototyping and iterations
- Team based
- Post and share projects on the littleBits' community page

What do participants get out of it?
- Basic understanding of modules
- The act of making/constructing
- Finished project (ideally, but not required)
- Positive experience
- Sharing of ideas

Resources:
- **SXSW Reinvent the Play Date Workshop:**
  This workshop encourages adult participants to feel like kids again by creating a "play date" game from their childhood using modules.
  littleBits.cc/browse-lessons/sxsw-challenge-re-invent-the-play-date

- **Generative Art Machines:**
  Use modules to invent machines that can create drawings and paintings independently.
  littleBits.cc/browse-lessons/drawing-bots-generative-art-machines

- **Technology Will Save Us:**
  Imagine and make new devices that help everyday life to be-come more meaningful, useful or fun.
  lb-community.s3.amazonaws.com/uploads/supporting_file/asset/313/Posters_and_worksheetsTWSU.pdf

- **Caine's Arcade Cardboard Games Workshop:**
  A workshop to empower children in the community to make intricate, interactive games out of cardboard.
  littleBits.cc/browse-lessons/cardboard-games-workshop

SUGGESTED THEMES

- **Smart navigation/robots that react to their surrounding environments**

  Example Projects:
  littleBits.cc/projects/creepy-crawly-cockroach
  littleBits.cc/projects/robot-butler
  littleBits.cc/projects/simple-line-follower

- **Make something that draws something (generative art machines)**
  littleBits.cc/browse-lessons/drawing-bots-generative-art-machines

- **Makeathon: Bring your City to life**
  How can you make an icon of your city interactive? Bring its skyline to life? Portray what you love about your neighborhood? Or make a 3D postcard of your favorite part of the city?
  littleBits.cc/makeathon

  Example Projects:
  littleBits.cc/projects/hollywood--2
  littleBits.cc/projects/perfect-shanghai-sandwich
  littleBits.cc/projects/parking-garage-entrance
  littleBits.cc/projects/brooklyn-nets

How to Run a Design Challenge Workshop

❶ DEMONSTRATE (15 min)
The workshop leader gives a brief demonstration of how modules work. Each "block" or component is introduced and snapped together. The basic components of a circuit are introduced: power (blue) + input (pink) + output (green).

❷ EXPLORE (15 min – though this timing can be extended)
Next, we recommend that participants have about 10 minutes to independently explore the functionality of the modules with a hands-on experience. When the workshop leader decides the time to explore is complete, we recommend that participants cover the modules with a sheet of paper in order to optimally focus on the design challenge.

❸ DESIGN CHALLENGE APPROACHES
Start by introducing the theme of your workshop and posing a question or design prompt to get participants thinking. You can show examples of projects that represent possible solutions to the challenge.

Check out these Design Challenge Workshop examples:
littleBits.cc/browse-lessons/sxsw-challenge-re-invent-the-play-date
littleBits.cc/browse-lessons/drawing-bots-generative-art-machines
littleBits.cc/browse-lessons/why-did-the-lights-go-out-how-hurricane-sandy-left-nyc-powerless

❹ BRAINSTORM, PLAN & SKETCH
Have participants sketch and write out ideas on a sheet of paper. Ask them to think about how their ideas fit into the parameters of the design challenge and how they plan to incorporate the modules. Brainstorming is often very successful when you group participants together. This way they can bounce ideas off of one another. Assist participants as needed – answer questions and provide guidance.

❺ TIME FOR THE MODULES!
Prototype and build the circuits. Participants begin to build and combine the modules with additional materials.

❻ ITERATE
Participants explore the functionality of their creation. They work out any kinks and make improvements. If this is an open-ended design challenge, they can observe and record their creation through writing and drawing.

❼ DEMO & SHARE YOUR WORK
Have your participants turn and share with a partner, and/or share with whole group. Encourage a discussion on the functionality of what was built and the challenges faced during the iteration portion of the workshop.

As the workshop leader, you can pose these types of questions:
- What was your design challenge?
- How many times did you iterate?
- What did you design?
- What does it do?
- What modules were used to make it work?
- What was the most challenging part of your design process?
- Where is the science, technology, engineering, art and math (STEAM) component in the product you created?
- What module would you add to change or enhance your creation?

❽ DOCUMENTING & ARCHIVING
Be sure to take photos and consider taking a video of the process during the workshop. We encourage you to share the work by submitting to the littleBits' projects page – it's a great way to promote your program and to let your participants' efforts shine. You can also curate your own "Wall of Fame" for your space and feature photos of your favorite projects.

❾ SUSTAINABLE MAKING
littleBits' modules are designed to be sustainable. Just as students grow accustomed to building with wooden blocks and LEGO® and then deconstruct their work; your set of modules is also intended to be reused again and again.

❿ SORT & STORE THE MODULES
Have students de-construct their projects. Prepare for the next workshop by sorting and classifying the modules for storage.

For more information go to, littleBits.cc/category/workshops.

More Info

Helpful Hints For Getting Started

THE POWER MODULE, BATTERY & CABLE
You need a power module, a 9V battery, and a littleBits' battery cable for each person or team. All three components are necessary to start a circuit.

THE COLOR CODE
Modules are grouped into 4 different categories, which are color coded:
POWER is needed in every circuit and is 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...
WIRES modules expand your reach and change direction–great for helping to incorporate modules into your projects.

ORDER IS IMPORTANT
Power modules always come first and input modules only affect the output modules that come after them.

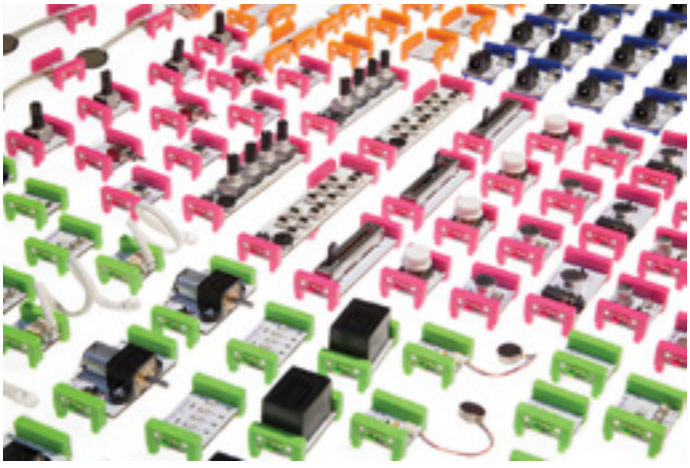
HANDLE WITH CARE
Modules are electronic components, and while they are designed to be robust, they are not invincible. To minimize breakage, please take care of the modules.

USE WIRE MODULES
Use the orange wire modules (branch, fork, wire) to help place modules exactly where you want especially if you are embedding inside a structure.

How Do I Know What Modules to Buy?

WHEN PURCHASING MODULES YOU CAN EITHER
- Buy kits: Base, Premium, Deluxe, Synth and Space Kits
- Buy a Workshop Set or Pro Library (ideal for design challenges)
- Buy individual modules. To see all modules available, visit our online store at littleBits.cc/bits

  For more information about each individual module, check out our shop page. littleBits.cc/products



littleBits is the easiest and most versatile way to learn and prototype with electronics.

IMPORTANT THINGS TO KNOW
The Exploration Series and Synth Kits come with 1 power module and the Space Kit comes with 2 power modules. If you want each student to make his or her own individual project, each student will need a power module. If students are working in groups we recommend 2–3 students share 1 kit.

How many modules does each student need?
The simplest circuit to make a project involves: 1 battery & cable, 1 blue power module, 1 pink input module, 1 green output module, and 1 orange wire module.

At the very minimum each student should have these 4 modules so that they can make something. The more inputs, outputs and wires, the more complex their project can be!

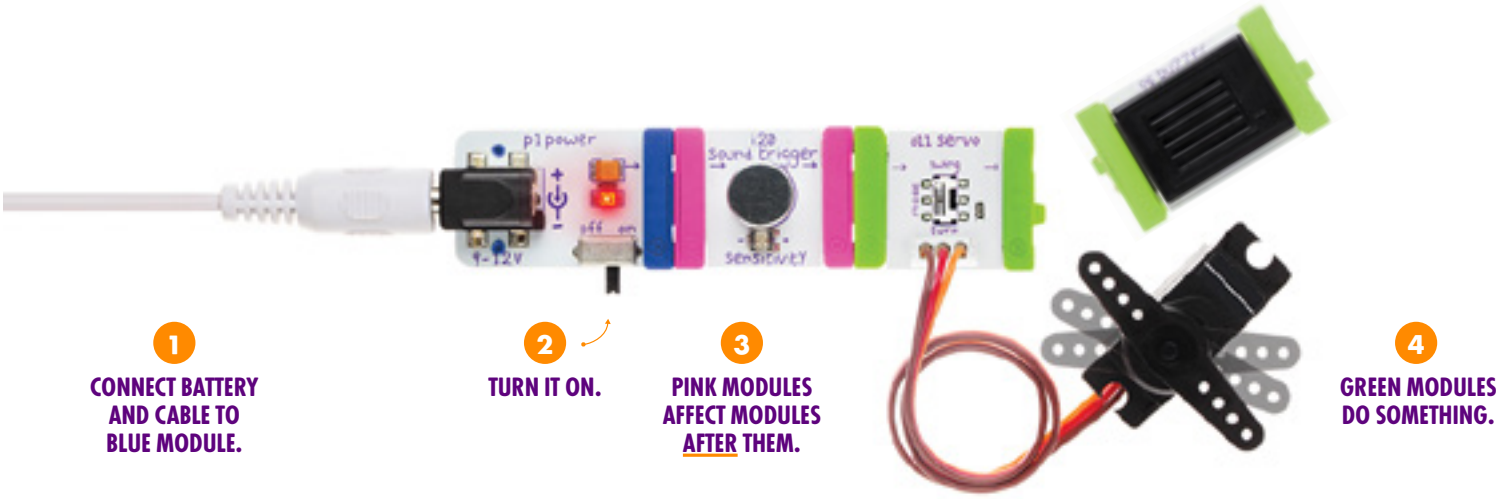
Projects need lots of wires!
For project-based workshops, it is very important that you buy many wire modules. On average, small projects require 1–3 wire modules. Wire modules are important because they allow students to break out of the circuit line and place modules in different directions.

Kits are great for simple demos
If you are just doing a demo and not a project-based workshop, we recommend buying one of our kits (Base, Premium, Deluxe, Synth and Space Kits). It is also good to have extra power modules and back-up batteries & cables on hand for demo tables.

Then if you'd like, you can supplement the kits by buying some additional individual modules to expand your collection!

Educators are eligible for an educational discount account! Please contact our Education Account Manager, Tara Noftsier, at education@littleBits.cc for more info.

Demo Overview



❶ START WITH A BLUE POWER MODULE

Give each student a blue power module and turn it on. Say something like, "Every circuit needs a blue power module. It provides the electricity for the circuit we are going to build." A red light will indicate that the power is on. If you do not see a red light, you may need to replace your battery or charge your coin battery with a micro USB cable. If you are using the USB power, then each student will need a computer or USB power outlet.

❷ ADD A GREEN OUTPUT MODULE

Next, give each student a green output module. Tell them to snap it after the blue power module. Students will figure out quickly which way the modules snap together. Due to the magnets, the modules can only snap together correctly one way. Once snapped, the green output should turn on.

This is the most basic concept:
POWER + OUTPUT = SOMETHING HAPPENS!

❸ INTRODUCE A PINK INPUT MODULE

Now give each student a pink input module. Say something like, "The pink modules talk to the green modules and tell them what to do. The pink modules go after blue modules and before green modules."

Depending on which pink input module they have, the module will "tell a different story/control what happens" to the green modules. In most cases, the student has to do something to the pink module to make the green module turn on.

❹ DISCOVER

Let the students explore the modules! See how orange wire modules affect the circuit. It's always great to let students discover for themselves what each module does. This way they may get their own ideas on what project they would like to make.

VIDEO: SETTING UP THE DEMO TABLE

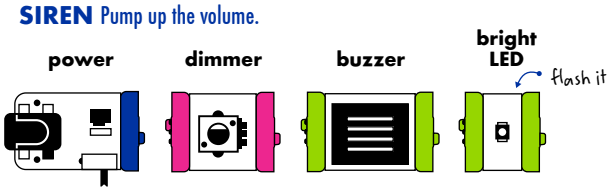
Click image to play video (youtube.com/embed/aXjVO6RBR3c)

VIDEO: GIVING A DEMO

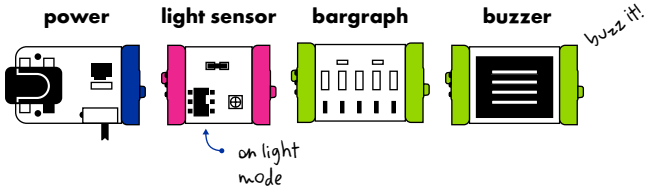
Click image to play video (youtube.com/embed/eMvFqx8-SpI)

Sample Circuits

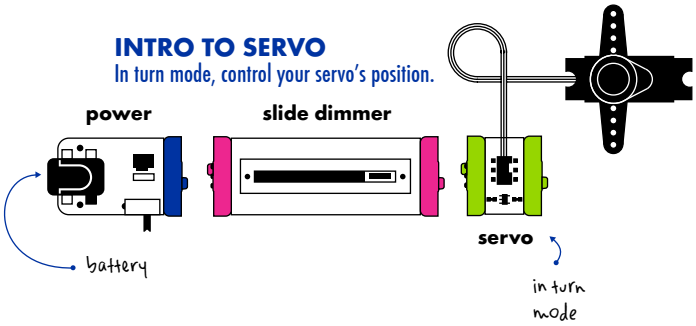
SIREN Pump up the volume.



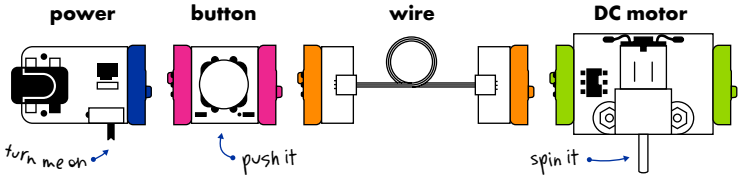
MORNING ALARM Wake up with the sun!



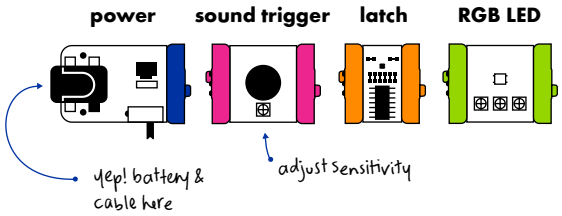
INTRO TO SERVO
In turn mode, control your servo's position.



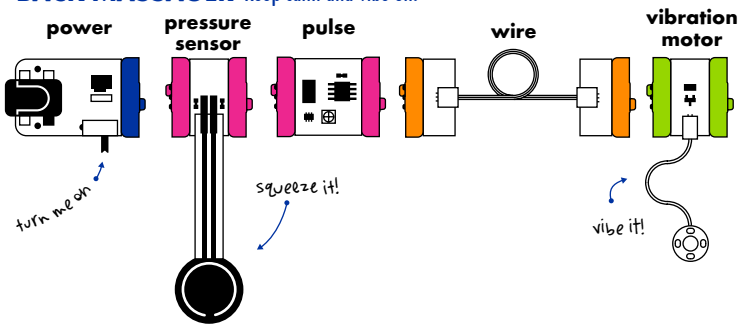
INTRO TO DC MOTOR Get to know the motor.



CLAP IT Clap your lights on and off.



BACK MASSAGER Keep calm and vibe on.



Craft Material List

If you are running a Maker/Intro Workshop, compile materials based on the specific project(s) you plan to make. If you are hosting a Design Challenge Workshop or something less structured, we've compiled a list of our favorite materials. Feel free to add some more of you own too!

Craft Materials We Love:

- craft sticks
- pipe cleaners
- construction paper
- tissue paper
- modeling wood/balsa wood
- tape, double-sided tape
- glue dots
- jingle bells
- plastic straws
- headbands
- foam balls
- cotton balls
- markers
- foam board
- cardstock
- LEGO® bricks, axles & wheels
- paper plates, bowls
- cardboard tubes

Common Tools We Love:

- scissors
- hot glue gun (+ glue sticks)
- x-acto knives
- wire cutters
- wooden rulers

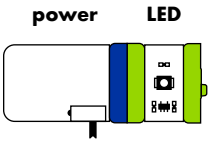
Advanced Tools (for older ages):

- laser cutter (materials: acrylic sheet, plywood)
- 3D printer
- power tools

Project Tips & Tricks

Here are tricks to use when building with littleBits' modules that have really awesome results! Find tips & tricks for each module littleBits.cc/category/tips-tricks

❶ LIGHT IT



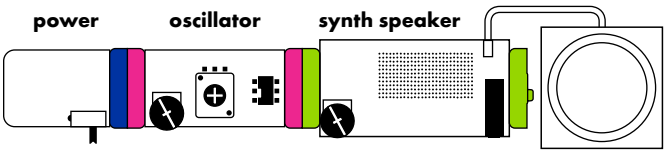
A LED (or "light-emitting diode") is a tiny but powerful type of light! You see it every day in electronic items like traffic signals, video displays, and remote controls. They produce a very bright light and at littleBits, they come in a variety of types, including LED, RGB LED, UV LED, bright LED, and a long LED. LEDs are green output modules. Use them in combination with various materials to create exciting lighting projects.

LED basics:
littleBits.cc/tips-tricks-led-bits

Learn about diffusing light:
littleBits.cc/fridays-tips-and-tricks-ways-to-diffuse-the-bright-led

Check out these household materials that could enhance your lighting projects:
littleBits.cc/fridays-tips-and-tricks-what-household-item-enhances-any-lighting-project-well-show-you

❷ MAKE NOISE

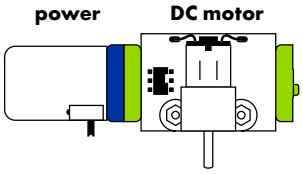


Pitch Sweeps: Learn how an oscillator works
Turn the main knob on the oscillator to change the pitch of the sound. The "pitch" range goes from being so low that it is unpitched (you actually hear clicks) to very high pitches. You can have lots of fun by twisting the pitch knob and "sweeping" through all the frequencies!

You can also select the kind of waveform the oscillator produces, either "saw" or "square." 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.

Projects:
Keytar (littleBits.cc/projects/keytar)
8-step Sequencer (littleBits.cc/projects/8-step-sequencer)
Additive harmonic arpeggiator
(littleBits.cc/projects/additive-harmonic-arpeggiator)

❸ MOVE IT



We have three modules that physically move – the DC motor, servo, and vibration motor. These are great modules to use to get things spinning, swinging, and vibrating.

The DC (or "direct current") motor module rotates a shaft when you send it an on signal. It even has a switch to set the direction of rotation! Try attaching various things to make windmills, cars, helicopters and more. Use the motorMate™ to help you connect materials to the spinning part of the DC Motor.

littleBits.cc/tips-and-tricks-the-dc-motor
littleBits.cc/fridays-tips-and-tricks-motormate
littleBits.cc/fridays-tips-and-tricks-play-with-your-food

The servo module is a fun and intriguing module with limitless uses. Unlike the DC motor that spins continuously, the servo is a controllable motor that can move to exact positions. The servo is what an RC plane uses to pivot the tail. Learn more about its two modes here littleBits.cc/fridays-tips-and-tricks-servo

The vibration motor creates quite a buzz. It's similar to the device that makes your cellphone shake when you get a text. With this module, you can make any project buzz and hum. Attach materials easily to the puck of the vibration motor with the vibeSnap.

littleBits.cc/tips-tricks-vibration-motor
littleBits.cc/fridays-tips-tricks-vibesnap

❹ BUILD IT

Skip tape, use glue dots. We like using materials like poster tack and glue dots to attach the modules to surfaces in our projects. You can find them at an arts and craft store (i.e. Michaels, Blick, or Utrecht). Also, check out Sugru, a putty like substance that cures to a flexible plastic within 24 hours.

As a substitute for tape, glue dots or Sugru, you can use our shoes to secure the modules into your projects. Choose from adhesive, magnet or hook & loop depending on the surface you are using. You can purchase shoes on our website: littleBits.cc/accessories/shoes.

Create quick structures

Balsa wood sticks and plastic straws work well when trying to add structure to crafty projects made out of construction paper. Use modules in combination with other construction sets like LEGO® or K'Nex®.

❺ ADD LOGIC

With littleBits logic modules, you can program in block form. The logic modules create rules for your circuit to follow, giving you more ability to create interesting and complex interactions. The double AND, double OR, NAND,NOR, and XOR all have specific characteristics that require two inputs to be in a certain state (ON/OFF) before the output can be activated. Let's break it down.

The Basics:

Power it up and branch out!

When using logic modules, you need two input modules. Therefore, you will need to provide power to both of the input modules. This can be done two ways. You can either power the input modules by branching the power with a split, a branch, or a fork or you can use two separate power modules to power each input individually. You can also use branches, forks, and splits after the output of the logic modules to send the signal to multiple places.

Analog and Digital Inputs

Logic modules only work with two states of inputs, *on* and *off*. When an input is either *on* or *off*, like a button, a toggle switch, or a sound trigger, we call it a digital input. Inputs that have variable voltage like pressure sensors, dimmers, and light sensors, are analog inputs. Because logic gates only deal with *on*/*off*, high/low, or true/false, analog signals pass as digital. With analog inputs, an "*on*" signal occurs at about 2.5 volts when passing through a logic gate. Also in logic circuits, you may want to hold the state of a momentary input (like a button). In order to hold this state, you can use a latch.

Experiment with inverters

Inverters can be used in combination with logic gates to change how the logic works. If you place the inverter after the output of a gate, it will change the logic completely. If you place the inverter before one input, it changes the logic going into the gate from that input. You can also use inverters to negate logic blocks and build them out of each other, i.e. AND + inverter = NAND, OR + inverter = NOR.

For info about each logic module, check out the following links:

Logic Lesson
littleBits.cc/browse-lessons/introduction-to-logic

Logic Tips & Tricks
littleBits.cc/fridays-tips-tricks-the-logic-bits

Inverter Tips & Tricks
littleBits.cc/tips-tricks-the-inverter-bit

Latch Tips & Tricks
littleBits.cc/fridays-tips-tricks-latch

❻ WIRELESS CONTROL

Little Modules, Big Reach

The combination of the wireless transmitter and wireless receiver acts as a very long wire module (without the wire!). A signal that passes through the wireless transmitter on one circuit and comes out though the wireless receiver on a second circuit. So, to enable wireless capabilities, you always need two circuits – one to send signals and the other to receive them.

Power Supply

Because power does not transmit wirelessly, you will always need an extra power module (plus battery +cable) before the wireless receiver.

Three Channels

Each connector on the wireless transmitter and receiver modules has number: 1, 2 or 3. These numbers correspond to the three channels than you can send wireless signals through. The channels are independent from one another, so sending a signal through channel 1 on the transmitting circuit will only affect channel 1 on the receiving circuit. Channels 2 and 3 will be unaffected. Basically, the channels on the wireless modules act like three wire modules (without the wire).

Wireless Tips & Tricks
littleBits.cc/wireless-modules-tips-tricks

❼ ARDUINO MODULE

The Arduino At Heart™ module allows you to easily incorporate computer programming into your littleBits circuits. It is built upon the Arduino™ (www.arduino.cc) programming environment. If you're new to programming microcontrollers, littleBits takes care of the electronics so you can focus on coding. All of the resources available for the Arduino™ community (forum.arduino.cc/index.php?action=forum), including community support, can be utilized with this module. There are three inputs and three outputs so you can program advanced hardware interactions or communicate with software. You're only limited by your imagination!

New to Arduino? Check out our Getting Started Guide (discuss.littlebits.cc/t/getting-started/109) and 10 introductory sketches (littleBits.cc/arduino-sketches).

Arduino Module Tips & Tricks
littleBits.cc/tips-tricks-arduino-module

Troubleshooting & Safety

MY CIRCUIT ISN'T WORKING

- Is your power module switched on? The switches are tiny, and sometimes people miss them. When turned on, there should be an LED light on the power module that shines red.
- If you're using a battery, does it need to be charged or replaced?
- Do you need to wipe your connectors? If there's anything on the connectors or the magnets, wipe it off with a soft, clean cloth. An old t-shirt, fresh out of the laundry, is best.
- Do you need to clean your connectors? If any of the three electrical connectors are oxidized (they'll have dark deposits on them) you can use some isopropyl alcohol on your soft, clean cloth. Don't use anything else to clean your modules – some "electrical connector cleaners" have chemicals that can damage the plastic part of the bitSnap™.

THE MOTION TRIGGER IS ALWAYS ON

- The motion trigger is incredibly sensitive and senses up to 10 feet in all directions. Check out these Tips & Tricks to desensitize the cone littleBits.cc/fridays-tips-tricks-the-motion-trigger

SAFETY

Modules are low voltage and low current. If you have any questions about safety, or you have already purchased a product and would like to speak to us, please contact us at info@littleBits.cc.

Minimum age recommendation:
8 years to infinity

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.

For more information, visit support.littleBits.cc.

Browse & Share Projects

More at **littleBits.cc/projects**

SHARE YOUR EXPERIENCE WITH US!

Be sure to take photos and consider taking a video of the process during the workshop. We encourage you to share the work by submitting to the littleBits' projects page – it's a great way to promote your program and to let your participants' efforts shine. You can also curate your own "Wall of Fame" for your space and feature photos of your favorite projects.

MAKER/INTRO WORKSHOPS

We love to see makers in action. Post photos to Facebook, Instagram, Twitter, and send them to us at education@littleBits.cc. If you or your participants design a new project for a Maker/Intro Workshop, please post it on the projects page.

DESIGN CHALLENGE WORKSHOPS

We are so excited to see what you make! Design Challenges tend to produce a number of interesting original works, and we ask that your participants upload projects and share their design process on our projects page.

Contact Us

Not sure what modules to buy? Don't know what project your group should make? No problem!

Feel free to contact:
Tara Noftsier, Education Account Manager
education@littleBits.cc

We love to hear what has worked well and what hasn't. We constantly strive to improve our modules and make sure everyone has a positive experience!