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BASE KIT, DELUXE KIT  How can electronics help spread laughs?

**TICKLE MACHINE**

1. Start with this circuit

   - power
   - wire
   - DC motor
   - motorMate

   **YOU’LL NEED**
   - feathers

   **DIFFICULTY:**
   - TIME: 15 mins

2. Attach feathers to the MotorMate

3. Tickle your friends (and dust your bookshelf)

HUNDREDS OF INSPIRATIONAL PROJECTS AT littleBits.cc/projects
BASE KIT, DELUXE KIT  Want to trick a friend? We’ll show you how!

PRANK HANDSHAKE

1 Start with this circuit

- power
- wire
- button
- wire
- buzzer

TIME: 15 mins
DIFFICULTY: 0

You'll need
- rubber bands

How else can you surprise your friends using modules?

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

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

### BASE KIT
How can you create a light that only turns on at night?

#### TIME: 30 mins  
#### DIFFICULTY: ★★★★★

**YOU’LL NEED**
- Box cutter
- Rubber bands
- Plastic cup
- Bike

### 1. Start with this circuit

**power**  
**light sensor**  
**bargraph**

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

**Stay Safe!** Always use with an adult.

- **Box cutter**
- **Rubber bands**
- **Plastic cup**
- **Bike**

### 2. Rubber band battery cable in a loop

### 3. Cut a hole in the bottom of the cup

and pull the cable loop through the hole.

**Sharp!**

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

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

**Stay Safe!** Use additional lights at night.

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[HUNDREDS OF INSPIRATIONAL PROJECTS AT littleBits.cc/projects](http://littleBits.cc/projects)
FLASHLIGHT

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

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

3. Turn it on and go!
ART BOT

1. Start with this circuit:
   - Power
   - DC motor
   - MotorMate

   - Use the MotorMate and attach it with the MotorMate.
   - Tuck the battery under the DC motor and attach it with the motorMate.
   - Attach the LEGO™ axle and wheel.

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

3. Put on the MotorMate and connect your battery.

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

TIME: 30 mins
DIFFICULTY: 

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!
**BASE KIT** Deck out your bedroom door.

**DOORBELL**

1. Start with this circuit

- **电源**
- **线**
- **按钮**
- **线**
- **调光**
- ** bargraph**
- **蜂鸣器**

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

You'll need:
- **盒**
- **推针**
- **马克笔**
- **剪刀**
- **胶水**
- **纸板**
- **标记笔**

**TIME:** 60 mins

**DIFFICULTY: **********

2. Find a box and cut the bottom off

3. Place modules in box and tape down

4. Make top piece

5. Cut out decorative doorbell shape and glue to top piece

6. Glue one tab on top piece and attach to inside of box

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

8. Ding dong!

- **VIOLET'S ROOM**

Customize it! Add paint, stickers... Go all out!

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

**TIP:** When cutting holes, be careful!

**ALWAYS:** Connect battery to the power module.
base kit: 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.

   **YOU’LL NEED:***
   - hot glue
   - glue
   - scissors
   - pencil eraser
   - craft sticks

   **TIME:** 90 mins
   **DIFFICULTY:** 🌋🔥🔥🔥

2. Make a house out of craft sticks.
3. Put the modules in your house.
4. Put a pencil eraser on the DC motor.
5. Build a fan out of craft sticks and attach to the eraser with your glue.
6. ENJOY your charming desk decor!

Always connect your battery to the power module.

This is a fun alternative to the motorMate.

Stay Safe! Always use with an adult.
base kit: Learn how to make a light-controlled vehicle.

THREE WHEELER

1 Start with this circuit

- power
- wire
- light sensor
- wire
- DC motor

STAY SAFE! Always use with an adult.

YOU’LL NEED: box cutter, wood grill, tape, pen, marker, cardboard, box

TIME: 90 mins
DIFFICULTY: ★★★★★

2 Make 3 wheels

- Trace a cup on cardboard to get perfect circles.
- Use the motorMate.
- What other objects can be a wheel? Try a CD!

3 Make the base out of cardboard

- Cut a slot in the cardboard wide enough to fit the wheel.
- Be careful!

4 Put modules on cardboard base

- Bottom
- Top
- Use tape to hold modules down

5 Add wheel to motorMate

- Use pen to poke hole in wheel... motorMate will go in here...

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

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

cut out, color, and mark the center

THREE WHEELER base kit learn how to make a light-controlled vehicle.

2 Make 3 wheels

- Trace a cup on cardboard to get perfect circles.
- Use the motorMate.
- What other objects can be a wheel? Try a CD!

3 Make the base out of cardboard

- Cut a slot in the cardboard wide enough to fit the wheel.
- Be careful!

4 Put modules on cardboard base

- Bottom
- Top
- Use tape to hold modules down

5 Add wheel to motorMate

- Use pen to poke hole in wheel... motorMate will go in here...

continuously on next page
Three wheeler continued from previous page

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

7. Attach back wheels after you've made the axle cut the points off the ends of the skewers.

8. Draw yourself and cut the figure out. (not too tight, axle should still spin)

9. Ride through the night!
   Try the light sensor in both modes. Which is your favorite?

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PREMIUM KIT

Cooling Campfire
Hypnotizing Wheel
Auto Greeter
Truck Crane
Funny Face
Drawer Alarm
Box Monster
Bristole Bot
Bubble Flute
Playful Pet

littleBits.cc/projects
COOLING CAMPFIRE

1. Start with this circuit

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

Don’t have any? Try tissues or feathers.

3. Cool off by the fire!

You’ll need:
- Scissors
- Tape
- Tissue paper

TIME: 30 mins
DIFFICULTY: ⭐️️️️️
PREMIUM KIT  Create a simple machine to hypnotize your friends!

**HYPNOTIZING WHEEL**

1. **Start with this circuit**
   - 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)**

4. **Hypnotize your friends!**

**WHAT OTHER PATTERNS DO YOU FIND MESMERIZING?**

**YOU’LL NEED**
- marker
- scissors
- tape
- paper

**TIME:** 15 mins
**DIFFICULTY:** ★★★★★

*Speak here* 
*Use screwdriver to adjust sensitivity*

*Turn me on*

See more at [littleBits.cc/projects](http://littleBits.cc/projects)
AUTOMATIC GREETING

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

What else can you animate with the servo?

PREMIUM KIT, DELUXE KIT

How can you use a servo to imitate a human wave?

1. Trace hand on paper and cut it out.
2. Tape paper hand to servo.
3. Use screwdriver to adjust pulse if you want to wave faster or slower.

What else can you animate with the servo?

YOU'LL NEED:
- Marker
- Scissors
- Tape
- Construction paper

TIME: 15 mins
DIFFICULTY: 🌟🌟🌟🌟

WAVE TO SOMEONE YOU LOVE!
How can you use a servo to pick things up?

**TRUCK CRANE**

1. Start with this circuit
   - power
   - slide dimmer

   *servo in swing mode*

   ![Diagram of truck crane setup](image)

2. Rubber band the paperclip to the other end

3. Bend the paperclip to make a hook!

4. Use slide dimmer to control the crane arm

**YOU'LL NEED**
- rubber bands
- paper clip
- craft stick

**TIME:** 30 mins
**DIFFICULTY:** 📩 📩 📩 📩

Other materials can pick things up? Try tape or a fork!
**PREMIUM KIT** Make someone smile with this silly project.

# FUNNY FACE

1. **Start with this circuit**

   - Power
   - Pressure sensor
   - Wire
   - Long LED
   - Vibrator motor
   - Branch
   - Long LED

   **TIME:** 30 mins  
   **DIFFICULTY:** 🌟🌟🌟🌟

   **YOU'LL NEED:**
   - Marker
   - Scissors
   - Tape
   - Construction paper
   - Foam balls
   - Paper plate

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

3. **Stick the modules through holes and put the foam balls on the long LEDs.**

   - Long LEDs
   - Pressure sensor
   - VibeSnap

   Don't have foam balls? Try cotton balls!

4. **Tape ear to pressure sensor on the back of the plate.**

5. **This is what the back looks like.**

6. **Press ear**

   - Eyes light up
   - Tongue wags

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See this tutorial with video extras at littleBits.cc/premium
PREMIUM KIT  How can you design a system to prevent someone from going through your things?

DRAWER ALARM

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!

TIME: 30 mins
DIFFICULTY: ★★★★

WHAT HAPPENS WHEN YOU OPEN YOUR DRAWER?

WHAT OTHER MATERIAL WOULD MAKE A LOUD NOISE?

YOU’LL NEED:
- power
- roller switch
- wire
- vibration motor
- tape
- drawer
- jingle bell

DON’T FORGET TO CONNECT YOUR BATTERY AND TURN ME ON!

In open mode, make sure the roller is above the drawer.
**PREMIUM KIT** Talk to the hand!

**BOX MONSTER**

1. **Start with this circuit**

   - Power
   - Wire
   - Roller switch
   - Wire
   - Vibration motor
   - Branch
   - Long LED

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

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. **Pose holes for the long LEDs (edges)**

4. **Tape modules in place inside the box**

5. **Decorate!**

   - Cut out a crazy tongue shape...
   - Slide on your foam balls.
   - Use markers, paint, glitter, colored paper and anything else you can think of to make your monster uniquely yours!

6. **Open and close the box puppet and watch his tongue shake!**

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

---

**TIME:** 60 mins

**DIFFICULTY:** ★★★★★

**YOU’LL NEED**

- Box cutter
- Tape
- Foam balls
- Box construction paper
- Box vibration motor
- Roller switch

**Remember to always connect your battery to the power module!**

Stay Safe! Always use with an adult.
How can you make a robot from a toothbrush?

**BRISTLE BOT**

1. **Start with this circuit**

   - Power
   - Slide dimmer
   - Wire
   - Vibrator motor

   ![Circuit diagram](image)

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

   **YOU’LL NEED**
   - Box cutter
   - Marker
   - Tape
   - Glue
   - Scissors
   - Rubber bands
   - Fuzzy balls
   - Cardboard toothbrush
   - Pipe cleaners

   **TIME:** 60 mins
   **DIFFICULTY:** ⭐⭐⭐⭐⭐

   **Always connect your battery to the power module.**

2. **Have an adult cut the head off a toothbrush.**
3. **Attach the vibration motor to the back side of the bristles.**
4. **Now attach the bristles to the actual vibration module.**
5. **Draw and cut out your Bristle Bot design.**

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.**
   - Use scissors or wire cutters. Be careful!

9. **Control your Bristle Bot Buddy’s Buzzy Dance.**

   - Use a rubber band to connect your battery to your slide dimmer.

   - Make sure the bristles stick out the bottom.

   - Decorate him with pipe cleaners and fuzzy balls.

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

   - Put the slide dimmer and battery inside here.

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

   - Use a rubber band.

   - Use tape.

   - Use scissors or a box cutter.

   - Every Bristle Bot is different.

   - Stay Safe! Always use with an adult.

**Premium Kit**

- How can you make a robot from a toothbrush?
- BRISTLE BOT
- Start with this circuit
- Power
- Slide dimmer
- Wire
- Vibrator motor
- STAY SAFE! Always use with an adult.
- YOU’LL NEED
  - Box cutter
  - Marker
  - Tape
  - Glue
  - Scissors
  - Rubber bands
  - Fuzzy balls
  - Cardboard toothbrush
  - Pipe cleaners
- TIME: 60 mins
- DIFFICULTY: ⭐⭐⭐⭐⭐
- Always connect your battery to the power module.
- Have an adult cut the head off a toothbrush.
- Attach the vibration motor to the back side of the bristles.
- Now attach the bristles to the actual vibration module.
- Draw and cut out your Bristle Bot design.
- Wrap the cardboard base around the bristles and glue or tape in place.
- Glue the body to the base.
- Make a control box.
- Control your Bristle Bot Buddy’s Buzzy Dance.
- Make sure the bristles stick out the bottom.
- Decorate him with pipe cleaners and fuzzy balls.
- Don’t forget to cut the slot for the slide dimmer.
- Put the slide dimmer and battery inside here.
- Don’t forget to cut the slot for the slide dimmer.
- Use a rubber band.
- Use tape.
- Use scissors or a box cutter.
- Every Bristle Bot is different.
- Stay Safe! Always use with an adult.
**PREMIUM KIT** Create bubbles with the sound of your voice.

**BUBBLE FLUTE**

1. **Start with this circuit**
   - Place the components as shown in the diagram.
   - Ensure the battery is connected to the power module.

2. **Cut a hole in the bottom of the cup**
   - Use a sharp tool to make the cut.

3. **Place fan on the hole you just made**
   - Make sure the fan blows air into the cup.

4. **Tape in place**
   - Ensure the seal is tight to prevent air leakage.

5. **Tape to the end of a ruler**
   - Secure the rubber bands in place.

6. **Connect modules to other end of the ruler with rubber bands**
   - Use the rubber bands to hold the modules in place.

7. **Use the screwdriver to adjust the sensitivity of the sound trigger to your liking**
   - Fine-tune the sensitivity for optimal performance.

8. **Dip the rim of the cup in a bowl of bubble solution**
   - Ensure the cup is sealed tightly.

9. **Blow into sound trigger and watch the bubbles come out**
   - Experiment with different sounds to see which ones work best.

**PRO TIP:** Don't have bubble solution? Mix dish soap with water.

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

**TIME:** 60 mins  
**DIFFICULTY:** ⭐️⭐️⭐️⭐️  
**YOU’LL NEED:** duct tape, rubber bands, bubble solution, plastic cup, ruler, sound trigger, fan, box cutter, sharp tool.

Stay Safe! Always use with an adult.
PREMIUM KIT: How can you use modules to create your own interactive friend?

**PLAYFUL PET**

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

   **TIME:** 2.5 hrs  
   **DIFFICULTY:** 
   
   **YOU’LL NEED:**
   - scissors
   - box cutter
   - hot glue
   - tape
   - plastic cup
   - cardboard
   - box
   - construction paper
   - bell
   - foam balls
   - string
   - tape
   - or-
   - x4 x2

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

   **That’s one serious circuit you got there!**

2. **Find a box to be the dog’s body**
   - Cut piece of cardboard to be the dog’s head

3. **Cut piece of cardboard to be the dog’s body**
   - Cut piece of cardboard to be the dog’s head
   - Hot glue the head on the side of the box
   - Place them under the box as feet!
   - What else would make good feet?

4. **Put hot glue on the top of 4 cups**
   - Put hot glue on the top of 4 cups

5. **Insert modules into the dog’s body**
   - Cut hole for pressure sensor
   - Cut hole for the power switch
   - The servo is the tail!

6. **Decorate your dog!**
   - Draw and cut out ears, nose, tail, and spots
   - Long LED and holes for the eyes and the tongue

7. **Add foam balls and bell**
   - Put LEDS into balls
   - Put vibration motor into the well
   - Glue nose

8. **Tie string with bell around neck**
   - The string will keep the bell in place

9. **Add spot of paper over pressure sensor and add tail**
   - This is where you’ll pet your dog!
   - Tape tail on servo

10. **PET AND SEE ITS TAIL WAG!**

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DELUXE KIT

Tickle Machine
Prank Hand
Auto Greeter
Truck Crane
Art Bot
Dancing Signs
Glowing Handlebars
Birthday Candle
Stomping Shoes
Surprise Party
Flickering Lantern
Cat Nap
Unihorn Helmet
Honking Tricycle
Robot

littleBits.cc/projects
DELUXE KIT: How can you use the inverter to activate two different and opposite motions?

DANCING SIGNS

1. Start with this circuit
2. Make 2 signs out of paper
3. Attach the signs to the modules
4. Get creative! Try different shapes or characters.

DELUXE KIT includes:
- power
- pulse
- DC motor
- inverter
- servo
- DC motor inverter
- servo
- tape
- construction paper
- marker
- scissors
- motorMate

TIME: 30 mins
DIFFICULTY: 3

HUNDREDS OF INSPIRATIONAL PROJECTS AT littleBits.cc/projects
DE LUXE KIT: 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.

   - **You'll need:** rubber bands, string, bike.

   - **Time:** 30 mins
   - **Difficulty:** ★★★★★

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

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

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

   - Where else can you wrap the light wire?

   - Stay safe! Use additional lights at night.

HUNDREDS OF INSPIRATIONAL PROJECTS at littleBits.cc/projects
**DELUXE KIT** Create an electronic alternative to the classic birthday candle.

**BIRTHDAY CANDLE**

1. **Start with this circuit**

2. **Use rubber bands to connect a craft stick to the back of the modules**

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

4. **Place the craft stick in a cake...**

   - Blow on the flame to turn it on and off!

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

| **TIME:** 30 mins | **DIFFICULTY:** ⭐️⭐️⭐️⭐️ |

**YOU'LL NEED**
- Rubber bands
- Tape
- Scissors
- Craft stick
- Tissue paper

**How will you celebrate a birthday?**

[HUNDREDS OF INSPIRATIONAL PROJECTS AT littleBits.cc/projects](https://littleBits.cc/projects)
DELCHE KIT: Going to a dance party? Create a fun accessory!

STOMPING SHOES

1. Start with this circuit

- power
- sound
- trigger
- latch
- light wire

2. Rubberband the circuit to your lower leg

- adjust sensitivity
- bend it

3. Rubberband the circuit to your lower leg

- then weave the light wire through the holes, use tape when needed

- what other clothing can you attach the light wire to?

TIME: 60 mins
DIFFICULTY: 🌟🌟🌟🌟

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

START DANCING!
DELUXE KIT: Throwing a surprise party? Use the timeout!

**SURPRISE PARTY**

1. **Start with this circuit**

   - power
   - button
   - timeout

2. **Decorate and cut out a sign**

3. **Bend light wire into the shape of the message**

4. **Surprise your friend!**

   - Decorate and cut out a sign
   - Create a custom message. Try writing a friend’s name with the light wire.

**YOU’LL NEED**

- fork
- wire
- DC motor
- buzzer
- motorMate
- marker
- scissors
- tape
- construction paper
- light wire

**TIME: 60 mins**

**DIFFICULTY: 1/5**
**FLICKERING LANTERN**

**DELUXE KIT** How can you use modules to imitate a flame?

1. **Start with this circuit**

   - **power**
   - **wire**
   - **pulse**
   - **RGB LED**

   - **STAY SAFE!** Always use with an adult.
   - **YOU’LL NEED:**
     - box cutter
     - glue
     - cardboard
     - plastic cup
     - marker
     - pipe cleaners
   - **TIME:** 60 mins
   - **DIFFICULTY:** ★★★★★

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

   - Trace big side of cup on cardboard 3-4 times
   - Then cut them out
   - Open end
   - Sharp! Be careful!

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

   - Trace big side of cup on cardboard 3-4 times
   - Then cut them out
   - Open end
   - Sharp! Be careful!

4. **Make bottom of lantern**

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

5. **Put modules in lantern**

   - Modules sit on top of circles
   - Do you want a blue strobe or red blinking light? Use the screwdriver to experiment.

6. **Put top of lantern on cardboard base**

   - First, glue together big circles

7. **Cut hole to reach the power switch**

   - Trace big side of cup on cardboard 3-4 times
   - Then cut them out
   - Open end
   - Sharp! Be careful!

8. **Glue or tape cup to base**

   - Tape modules in place

9. **Decorate!**

   - Create your own handle
   - Make an “X” out of pipe cleaners. You could also try using ribbon or string or paper strips!

10. **Go explore outside!**

**How can you use modules to imitate a flame?**

- Always connect your battery to the power module

**How can you use modules to make a glow?**

- Adjust speed of flicker
- Adjust color

**How can you use modules to make a moving light?**

- Box cutter
- Glue
- Cardboard
- Plastic cup
- Marker
- Pipe cleaners

**How can you use modules to make a pet?**

- Pipe cleaners
- Glue
- Cardboard
- Plastic cup
- Marker
- Pipe cleaners

**How can you use modules to make a story?**

- Pipe cleaners
- Glue
- Cardboard
- Plastic cup
- Marker
- Pipe cleaners

**How can you use modules to make a music box?**

- Pipe cleaners
- Glue
- Cardboard
- Plastic cup
- Marker
- Pipe cleaners

**How can you use modules to make a costume?**

- Pipe cleaners
- Glue
- Cardboard
- Plastic cup
- Marker
- Pipe cleaners

**How can you use modules to make a game?**

- Pipe cleaners
- Glue
- Cardboard
- Plastic cup
- Marker
- Pipe cleaners

**How can you use modules to make a craft?**

- Pipe cleaners
- Glue
- Cardboard
- Plastic cup
- Marker
- Pipe cleaners

**How can you use modules to make a science fair project?**

- Pipe cleaners
- Glue
- Cardboard
- Plastic cup
- Marker
- Pipe cleaners

**How can you use modules to make a toy?**

- Pipe cleaners
- Glue
- Cardboard
- Plastic cup
- Marker
- Pipe cleaners

**How can you use modules to make a holiday decoration?**

- Pipe cleaners
- Glue
- Cardboard
- Plastic cup
- Marker
- Pipe cleaners
DELUXE KIT: How can you use modules 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.

   TIME: 60 mins
   DIFFICULTY: 

   YOU'LL NEED:
   - box cutter
   - scissors
   - tape
   - rubber bands
   - pen
   - box
   - feathers
   - craft sticks
   - string
   - push pin

2. Find box:

   Cut a hole in the back of the box.

   Leave room here:

   PRO TIP: you can disconnect the wire here.

3. Place these modules on the front of the box:

   - Cut hole for the servo to tape in place
   - Poke holes to feed wires through
   - Poke hole for power switch

4. Place the other modules inside the back of the box:

5. Rubber band the servo to the craft stick:

6. Put "Alarm Feathers" on the servo:

   - What other material can wake you up?

7. Hang above bed:

   SET A TIME AND TAKE A NAP!

   or try playing with your cat!
DELUXE KIT  Invent a magical accessory for nighttime bike riding.

**UNIHORN HELMET**

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

2. Measure and cut a piece of cardboard to fit along the top of your helmet.

3. Make the inner horn structure:
   - Cut cardboard triangles that will interlock.
   - Slide them together.
   - Inner Horn Structure
   - Secure with tape.

4. Roll the inner horn structure in colored paper.

5. Feed light wire up through the base of the horn and out through the top.

6. Wrap the light wire down and around the horn, leave some extra at the end.

7. Tape the base of the horn and the rest of the modules to the cardboard.

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

9. Tie down the cardboard base with the light wire.

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

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

**TIME:** 2.5 hrs  
**DIFFICULTY:** ⭐⭐⭐⭐

**YOU'LL NEED:**
- box cutter
- tape
- bike helmet
- cardboard
- colored paper
- tissue paper
- pipe cleaners
- scissors
- adjust speed

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

RIDE OFF INTO THE SUNSET!

HUNDREDS OF INSPIRATIONAL PROJECTS AT littleBits.cc/projects
DELUXE KIT. 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

   

   - You'll need:
   - box cutter
   - hot glue
   - wood grill skewers
   - tape
   - marker
   - ruler
   - hole-puncher
   - plastic cup
   - foamcore
   - colored paper
   - craft sticks

   - Stay Safe! Always use with an adult.

   - Make sure to adjust with a screwdriver to be less sensitive.

   - Time: 2 hrs
   - Difficulty: ★★★★★

2. Cut foamcore base using cutter and ruler.

   - 7 inches
   - This is the back, leave space here

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

   - That's one serious circuit you've got there!

4. Make back wheels:

   - Trace a cup
   - Cut out 2 circles
   - Try different sized circles for your wheels

5. Make the back axle:

   - Poke skewer through circle and put a dab of glue...
   - ...carefully cut the point off...

6. Make and mount the front wheel:

   - Cut out a larger wheel and stick the craft stick through the center.
   - Place modules on top of base

7. Cut off end of craft stick, then attach wheel to motorMate.

   - Decorate and RIDE ON!

8. Place modules on top of base

   - Buzzers under here
   - Battery underneath

   - Make a loud noise to ride on. Make another loud noise to stop and honk.

9. Adjust with screwdriver to be less sensitive.

   - Sharp! Be careful!
DELUXE KIT Give life to a cardboard box.

ROBOT

1. Start with this circuit

   power sound trigger

   wire pulse

   on-off mode

   use screwdriver to set how long your robot rolls

   set robot's speed

   wire

   slide dimmer

   buzzer RGB LED

   plus the motorMate

   cut a flap in the back of a box.

   use a small cup to trace 3 circles on cardboard. Mark the center and cut them out.

   sharp!

   be careful!

   These are your robot's wheels!

   Try other sizes!

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

DIRECTIONS

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

   we used a tissue box, what do you have at home?

3. Use a small cup to trace 3 circles on cardboard. Mark the center and cut them out.

   sharp!

   be careful!

   These are your robot's wheels!

   Try other sizes!

TIME: 2 hrs
DIFFICULTY: ⭐⭐⭐⭐⭐

YOU'LL NEED

box cutter hot glue wood grill skewers tape ruler plastic cup box cardboard paper craft sticks

STAY SAFE! Always use with an adult.

4. Cut slots for cardboard wheels in base of the box

   A little longer than 1.5 inches

   1.5 in

   2.5 in

   WE recommend this size, but you can try others!

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

   sharp!

   be careful!

6. Stick a craft stick through the center of the 2.5 inch cardboard wheel

   2.5 in cardboard wheel

   Hot glue here to hold in place

   Cut the craft stick down and fit into motorMate

   Hot glue here

   the axle here

7. Place motor with motorMate and wheel in the center slot of the box base

   Place a cardboard shelf inside box.

   You can bend a piece of cardboard to make the shell!

8. Place a cardboard shelf inside box.

   You can bend a piece of cardboard to make the shell!

continued on next page
THREE WHEELER
continued from previous page

9. Connect modules and tape down inside on shelf

10. Use a smaller box to make the robot head
    - Cut hole for servo and stick through box, tape in place
    - Slide dimmer, adjusts speed of robot wheel
    - Set pulse to on-off mode
    - Cut out small holes for the eyes
    - What will your robot's eyes look like?
    - Feed buzzer and LED through top of large box, then stick inside small box and tape down

11. Make 2 arms and tape to servo and other side of the box
    - Tape or glue head to the top of the box

12. Make noise to get him rolling!
    - Keep making noise to get him to wave to you!
Wave Generator
Energy Meter
Make a Spectrum
Measuring the Atmosphere
Data Communication
Satellite Dish
Star Chart
Satellite Orbit
Grappler
Mars Rover
**SPACE KIT** An introduction to speakers and mechanical waves.

**WAVE GENERATOR**

1. Start with this circuit.

2. Play song on mp3 player and gently touch speaker cone.
   - can you feel the vibrations?
   - try a fast song and slow song... what happens
   - be sure to keep your modules dry!

3. Attach spoon to speaker with tape.
   - be careful and use removable tape

4. Pour milk into spoon, then play some songs.
   - try different songs until you see some waves.

5. Turn up your volume and check out the cool wave patterns!

**YOU’LL NEED**
- pen
- spoon
- tape
- milk
- mp3 player
- audio cable
- power wire

**TIME:** 15 mins

**DIFFICULTY:** ★★★★★

Describe how different music causes different reactions in the liquid.

---

**WHY’D IT DO THAT?**

Refer back to What is Energy on p.10

---

Having trouble?
Try different songs until you see some waves.

---

**HUNDREDS OF INSPIRATIONAL PROJECTS AT** littleBits.cc/projects


**ENERGY METER**

**1.** Start with this circuit.

- **power**
- **light sensor**
- **number**

**Turn on**

- **on light mode**
- **on value mode**

**Adjust sensitivity**

- With **screwdriver**

**2.** Walk around and find different sources of energy. Record your findings in table.

*For example: Hold your circuit to the sun, a light bulb, or in the dark.*

**If you are having trouble seeing the numbers change, adjust sensitivity with screwdriver.**

**3.** Move the sensor closer or farther from the energy source. Record your observations in table.

**4.** Can you see any energy coming from a TV remote control? What happens if you point it at the energy meter and press a button? (Most remotes have IR LEDs)

**Describe what happens when you move the sensor closer to or farther from the energy source.**

**What happens if you point a household remote at the light sensor?**

**What sources of energy can you find?**

1. .................................................................
2. .................................................................
3. .................................................................
4. .................................................................

**WHY’D IT DO THAT?**

Refer back to Electromagnetic Energy on p.11

**TIME:** 15 mins  
**DIFFICULTY:**  

**YOU’LL NEED**

- **pen**

**Digital cameras create images by measuring light energy. This is similar to how NASA satellite images are created by measuring energy reflecting off the Earth’s surface.**

NASA images by Reto Stöckli, based on data from NASA and NOAA
As white light bends, each color in the spectrum bends at a slightly different angle because their wavelengths are different sizes. Shorter wavelengths will bend more and longer wavelengths will bend less.

Why does a CD behave like a prism? They both act as “diffraction grating.” The grooves on a CD diffract light into several beams like you saw in this experiment!

Refer back to Electromagnetic Energy on p.11

A SPECTRUM is a range of electromagnetic waves in order of their wavelength. You can always remember the order by thinking of “ROY G BIV.” From longest to shortest – Red, Orange, Yellow, Green, Blue, Indigo, Violet.
HUNDREDS OF INSPIRATIONAL PROJECTS AT littleBits.cc/projects

MEASURING THE ATMOSPHERE

1. Make these two circuits.

<table>
<thead>
<tr>
<th>power</th>
<th>wire</th>
<th>light sensor</th>
<th>wire</th>
<th>number</th>
</tr>
</thead>
</table>

2. Place glass of water over the space between two books. Cover glass of water with plastic wrap. Make sure books are the same height.

3. Orient your circuits above and below the glass. Measure the amount of energy passing through the bottom of the glass. Record your data.

4. Measure the amount of energy coming through the side of the glass. Record your data in table.

5. What do you think will happen to the number if you add a drop of milk to the water? Record your hypothesis. Now conduct an experiment to find out if you were right. Scientists use what they know to make a guess about what may happen. This is called a “hypothesis.”

6. Add 1 drop of milk and stir. The milk represents particles in the atmosphere.

7. Continue adding milk and record your observations. Repeat steps 3 and 4 and record your data.

Hypothesis:

Data Table

<table>
<thead>
<tr>
<th>Water</th>
<th>Bottom</th>
<th>Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 drop milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 drops milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 drops milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 drops milk</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Was your hypothesis correct?

Measuring from bottom: With water, the reading will be high because light is traveling downward. With milk, the reading will be lower because light is scattered.

Measuring from side: With water, the reading will be low because light is traveling downward. With milk, the reading will be higher because the light is scattered.

Why not try some other liquids as well? Orange juice? Soda?

This project is similar to how satellite instruments measure the atmosphere. Since aerosols and gases scatter light differently, NASA instruments can determine the composition of the atmosphere by measuring how light is scattered.
SPACE KIT: Learn how to wirelessly transmit music using a digital signal.

DATA COMMUNICATION

1. Make these two circuits.

   - power
   - mic
   - IR LED (green)
   - bright LED
   - light sensor
   - speaker
   - audio cable

   TIME: 30 mins
   DIFFICULTY: 2

   YOU’LL NEED
   - mp3 player
   - module
   - cable

   NASA uses electromagnetic waves to communicate with satellites orbiting Earth.

2. Plug audio cable into microphone module and an mp3 player and play your favorite song.

3. Place both circuits on a flat surface, like below.

4. Now swap out the IR LED for the bright LED and see what happens.

   - hold about 3" above light sensor
   - make sure the IR LED is at a 90 degree angle to the light sensor and adjust sensor to minimum sensitivity

5. Put different materials between the light source and sensor. What happens?

   - try blocking the light sensor with your hand or a piece of paper!

   How does it work?
   Your digitized music is converted into a series of light wave pulses. The pulses are decoded by the light sensor and converted into sound waves by the speaker.

HUNDREDS OF INSPIRATIONAL PROJECTS AT littleBits.cc/projects
SPACE KIT Learn the science behind satellites and make your own parabolic reflector.

SATELLITE DISH

1. Make these two circuits.
   - power wire light sensor wire number
   - bright LED light mode try both modes
   - box cutter scissors paper bowl plastic cup craft stick foam ball foil
   - hot glue box
   - tape
   - rubber band
   - stay safe! Always use with an adult.

TIME: 60 mins
DIFFICULTY: 

2. Find a paper or plastic bowl and cover it with foil.
3. To optimize the amount of light that is reflected into your sensor, you’ll need to calculate where the focus point is.
4. Use craft stick to make a sensor arm.
5. Once you have found the ideal focus point, glue craft stick to bowl.

6. Rubberband light sensor to tip of arm. It should face into bowl.
7. Create a mounting stick.
   - glue craft stick to back of bowl
8. Cut slit in bottom of cup.
9. Stick satellite dish into cup through the slit.
10. Use tape and place number module on front of cup.
11. Shine bright LED into your dish... what happens to the number reading?

STAY SAFE! Always use with an adult.

To learn how to calculate the focus distance, go here:
littleBits.cc/satellitedish

TRY DIFFERENT SHAPES LIKE A MIXING BOWL OR POT LID AND SEE IF YOU CAN IMPROVE YOUR DESIGN!

SHOW US WHAT SATELLITE DISH YOU MADE!
littleBits.cc/upload

HUNDREDS OF INSPIRATIONAL PROJECTS AT littleBits.cc/projects
THE DEEP SPACE NETWORK (DSN) is a worldwide network of antennas developed by NASA to communicate with robotic spacecraft exploring our solar system and beyond. Sensors on board this spacecraft gather and transmit data about distant planets, moons, asteroids, comets, stars, and galaxies.

Receiving data from this spacecraft is very challenging because of the extreme distances between the spacecraft and Earth. Signals must travel millions or even billions of kilometers between Earth and a spacecraft in deep space. The spacecraft’s communications equipment – designed to be small and lightweight – transmits at very low power, typically about the same as a refrigerator light bulb. Receiving antennas on Earth must have large collectors (antenna dishes) with precisely shaped surfaces and they must accurately point towards the spacecraft.

The DSN has three ground stations located approximately 120 degrees apart on Earth (120 + 120 + 120 = 360). This is to ensure that as the Earth rotates, at least one station is able to capture and transmit signals to any deep space mission without any gaps in coverage.

SATELLITE DISH
continued from previous page

Unique curved surfaces, such as parabolas, have a point called the **FOCUS**, where all of the energy entering the shape is ‘reflected’ from the parabolic curve and intersects at the focus. In your satellite dish model, the light sensor is your focus that receives energy from the bright LED and measures it in the number module.

**Deep Space Network Station in Goldstone, California**

**Goldstone View**

**Madrid View**

**Canberra View**

CONTRIBUTED BY NASA
SPACE KIT. Learn about astronomy and project the night sky in your room.

**STAR CHART**

1. Start with this circuit.

```
<table>
<thead>
<tr>
<th>power</th>
<th>wire</th>
<th>light sensor</th>
<th>wire</th>
<th>bright LED</th>
</tr>
</thead>
</table>
```

**TIME:** 60 min  
**DIFFICULTY:**  

**YOU’LL NEED**
- box cutter  
- scissors  
- pen  
- tape  
- cardboard  
- plastic cup  
- colored paper

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

2. Cut the bottom off of a plastic cup.

3. Trace wide end of the cup on a piece of cardboard and cut it out.

4. Tape bright LED on top of cardboard circle.

5. Roll a piece of paper into a cone and place cup inside.

6. Tape light sensor on the outside of the cone.

7. Print out a star chart. You can download one at littleBits.cc/starchart

8. Create a handle out of cardboard. Cut a rectangular strip and tape ends together then tape it to your cone.

9. Turn off the lights, the darker it gets the brighter the stars will be!

For expanded activity, go to littleBits.cc/starchart
NASA instruments measure energy in the night sky across the electromagnetic spectrum. By looking at the sky in wavelengths beyond the visible spectrum, scientists can see a more complete picture. This helps them study questions like ‘how was the universe formed’ and ‘how is it changing.’

The brilliant stars that make up this rectangular star pattern seem to be close-by because they are so bright, but in fact they are very far away. Astronomers measure distances using a unit called the light year, which equals about 5.9 trillion miles (9.5 trillion km), or 63,240 times the distance from Earth to the Sun!

**TRY THESE CALCULATIONS:**
The bright star in Orion called Betelgeuse is located 650 light years from Earth. What is this distance in miles or kilometers?

Betelgeuse is expected to blow up as a supernova sometime in the next million years. Suppose this happened in the year 3000 AD. In what year would someone on Earth see this explosion? Go online to find the answer: littleBits.cc/starchart
SPACE KIT Learn about how satellites take photos of the Earth.

SATELLITE ORBIT

1. Make this circuit.

2. Make a ring. Trace a large plate and then a small plate on a piece of cardboard and cut them out.

3. Cut a slot in a plastic cup.

4. Fill the cup with some weight.

5. Cover cup with circular piece of cardboard and tape it down.

6. Stick skewer through the cardboard curve and the center of the foam ball.

7. Place the cardboard curve in the slot in the cup and tape in place.

8. Make a cardboard shelf for the DC motor.

9. Then glue to center of cardboard curve.

10. Attach pipe cleaner to motorMate and put on the DC motor.

11. Tape the DC motor to the cardboard shelf.

12. Add satellite to end of pipe cleaner.

13. Decorate your model.

TIME: 90 min DIFFICULTY: 🌟🌟🌟

YOU’LL NEED: tape box cutter marker plastic cup cardboard foam ball (large) weight plates box skewers pipe cleaner remote hot glue

STAY SAFE! Always use with an adult.

Try different sizes and measure and tape cardboard thickness.

The Earth is on a 23° tilt.

For expanded activity, go to littleBits.cc/orbit

HUNDREDS OF INSPIRATIONAL PROJECTS at littleBits.cc/projects
Every day, NASA satellites (like AURA pictured to the left) collect global observations of the Earth. The image to the right shows the path of the Aqua satellite. Data is only collected when the satellite is on the sunlit side of the Earth because it measures reflected light from the Sun. With each orbit, the MODIS sensor onboard the satellite can observe a swath of data over 1400 miles (2253 km) wide and can image almost the entire Earth surface everyday.

A satellite at an altitude of 438 miles (705 km) orbits Earth once every 99 minutes. How many orbits does the satellite make in a day? How many times does it cross the equator in one day?
**SPACE KIT** Learn NASA engineering by building this robotic space arm.

**GRAPPLER**

1. Start with this circuit.

   - power
   - remote
   - trigger
   - wire
   - DC motor

2. Cut the bottom off of 2 plastic cups. (Note: Be careful!)

3. Cut three pieces of string the same length. Tape them to the inside of one cup.

4. Place the other cup over the cup with strings. Feed the strings up through the top of both cups. Tape them to the outside of the outer cup.

5. Trace wide end of cup on cardboard and cut out circle.

6. Cut the end off of a craft stick and stick into motorMate.

7. Tape cardboard circle to inner cup and stick the craft stick in the hole.

8. Put the circuit on a ruler and use rubberbands to hold in place.

9. Place motorMate onto D-shaft of the motor.

10. Secure the outer cup to the ruler using wooden skewers and tape. Make sure lip of the outer cup is half an inch higher than the inner cup.

**YOU’LL NEED**

- box cutter
- glue gun
- grill skewers
- drawing tool
- rubber band
- plastic cups
- string
- cardboard
- craft stick
- ruler
- remote
- wooden skewers
- tape
- hot glue gun
- rulers
- motorMate

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

**TIME:** 90 mins  
**DIFFICULTY:**  

*Image Courtesy NASA*

**A GRAPPLER is on the end of the ISS Robot Arm and is used to grab onto objects in space — like astronauts!**

**WOW!!**

Try the Grappler with another part!

**Put the circuit on a ruler and use rubber bands to hold the outside of the outer cup.**

**Image Courtesy NASA**

**Cut a small hole! Be careful!**
**SPACE KIT**  Learn how NASA scientists are able to explore new worlds!

**MARS ROVER**

1. **Make this circuit.**
   - remote trigger
   - power
   - wire
   - DC motor
   - wire
   - light sensor
   - number
   - motorMate
   - adjust sensitivity with screwdriver
   - either mode
   - plus
either mode

2. **Make the big wheel.**
   - Cut the tops off of two plastic cups
   - Slide them together, then facing out
   - Make a cut the size of a craft stick on the center of the circles

3. **Make 2 cardboard circles for the inside of the big wheel.**
   - circles need to be the same diameter as the inside of the big wheel!

4. **Place cardboard circles on both sides of the wheel and glue in place.**
   - Make sure the craft stick is long enough so that it stays in place when the wheel spins

5. **Cut a hole in the base of a box large enough to fit your wheel.**
   - Make sure that the craft stick goes through both slots

6. **Put the craft stick through the slots and add the motorMate to one end of it.**
   - move the craft stick to a will fit in the box
   - motorMate connects to the D-shaft of the DC motor
   - cut the craft stick to a will fit in your box

7. **Make an axle holder for the craft stick on your wheel.**
   - cut a strip of cardboard and make a hole in one side

8. **Attach the wheel.**
   - Make sure that the craft stick goes through and the axle holder
   - Use a straw to poke hole center

9. **Make 6 wheels!**
   -傷心 you are ready to make them, but use what you have to create your own!
   - Cut six cardboard circles to fit inside the wheels.

10. **Cut six cardboard circles to fit inside the wheels.**

11. **Place cardboard circle in paper tube and glue in place.**

**January 2004 Mars Exploration Rover "Opportunity" lands.**

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

**YOU'LL NEED**
- hot glue
- barang cutter
- box
cutters
- scissors
- plastic cups
- cardboard
- craft sticks
- paper tube
- cardboard boxes
- ruler
- drinking straw
- remote

**TIME: 2 hrs**

**DIFFICULTY:**

**HUNDREDS OF INSPIRATIONAL PROJECTS AT** littleBits.cc/projects
NASA engineers send instructions to the rovers via radio communications. Depending on where the planets are in their orbits, a radio signal traveling at the speed of light will arrive on Mars between just over 3 minutes or as long as 20 minutes. Due to these time delays, it is impossible to communicate with and control the rover in real time. To send instructions to rovers on Mars, NASA scientists must have a line-of-sight between Earth and Mars. Occasionally, Earth and Mars are on opposite sides of the sun, called conjunction. During this time, the sun can disrupt or block radio communication between the two planets.

In May 2013, the Mars Exploration Rover “Opportunity” exceeded 22.22 miles (35.76 km) since its landing in January 2004. This breaks the record for the greatest distance driven by a NASA vehicle on a world other than Earth since the Lunar Roving Vehicle was driven 22.21 miles (35.74 km) on the moon, in December 1972.
littleBits
SYNTH KIT

Tuning
Play a Song
Spooky Sounds
Percussion Party
Metal Music
Synth Band
Synthesizer with the Works

littleBits.cc/projects
SYNTH KIT. 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. 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.”

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

7. Always connect the battery and turn the power on.

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 module will alter the relationship between pitches. This will be important when using the keyboard and micro sequencer.

You’ve successfully tuned your oscillator, you’re ready to play!
SYNTH KIT: Serenade a friend!

**PLAY A SONG**

1. Start with this circuit.  
2. Then, tune your oscillator (see previous project).  
3. Adjust "pitch" to match the range of your voice!  
4. Use this color-coded keyboard and the notes to the right to help you play a song!

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!

Do you recognize it?
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.
SYNTH KIT: Dance to the beat of your own drums.

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. Wail on your synth drumset!

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 “cutoff” down (counterclockwise).
...water drop sound - Keep the “peak” up. Turn the “cutoff” to a mid-range (higher than the woodblock).

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.

HUNDREDS OF INSPIRATIONAL PROJECTS AT littleBits.cc/projects
SYNTH KIT. 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 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!

People who are musically inclined tend to be better at math! Go figure.
SYNTH KIT: 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. You’re ready to perform!

Use an audio cable to connect your speaker to your computer, headphones, or an amplifier!

HUNDREDS OF INSPIRATIONAL PROJECTS AT littleBits.cc/projects
SYNTH KIT. Create one monster synth with all of these modules!

SYNTHEZIZER WITH THE WORKS

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” (harmonious) or “dissonant” (inharmonious) intervals.

3. Adjust the envelope.

4. Adjust the filter.

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

6. Add some echoes by adjusting the delay module.

7. RECORD YOUR MUSIC!

Record your music and share it with us! littleBits.cc/upload

HUNDREDS OF INSPIRATIONAL PROJECTS AT littleBits.cc/projects
SYNTH KIT. Transform your box!

PERFORM LIKE A PRO

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

TIME: 60 mins
DIFFICULTY: ⭐⭐⭐⭐

Buy mounting boards online at [littleBits.cc/mountingboards](http://littleBits.cc/mountingboards)

Build a performance station!

Power up your circuit and START PLAYING!

COOL! Just like the KORG Ms-20.

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

POWER UP YOUR CIRCUIT AND START PLAYING!
SYNTH KIT. Create your own electronic instrument!

KEYTAR

1 Start with this circuit.

TIME: 60 mins
DIFFICULTY: ●●●●●

YOU'LL NEED
- box cutter
- hot glue
- simpler
- marker
- tape
- string
- foam ball
- small box
- cardboard
- craft stick
- paint brush
- paint
- cardboard foam ball
- small box
- tape or glue
-decide
- draw a guitar-like shape and cut it out of cardboard.

STAY SAFE! Always use with an adult.

Draw a guitar-like shape and cut it out of cardboard.

Add a circuit.

Add a whammy bar!

Add a strap.

Show us your design! littleBits.cc/upload

place foam ball on top of second oscillator

we used elastic. You could also try ribbon, string, cloth... customize!

trace battery in second

be careful!

use simpler

we used elastic. You could also try ribbon, string, cloth... customize!

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.”

3 Tape or glue smaller box to the back of the wider end.

4 Decorate! Use paint, markers, whatever you have!

5 Adjust “pitch”

6 Adjust “pitch”

7 Add the circuit.

8 Add a strap.

9 Add a strap.

10 Rock out!

HUNDREDS OF INSPIRATIONAL PROJECTS AT littleBits.cc/projects
SYNTH SPIN TABLE

SYNTH KIT. Play your Synth Kit like a DJ.

1. Start with this circuit.
   - Oscillator
   - Power
   - Micro sequencer
   - Split
   - Mix
   - Envelope
   - Synth speaker

2. Lay cereal box flat.
3. Put the circuit on the box. Use tape to keep ’em in place.
4. Attack one straw on each oscillator knob.
5. Get paper plate cut down to size.
6. Mark center of plate and poke hole.
7. Slide plate onto straw.
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’LL NEED
- Plastic or paper cup
- Pen
- Scissors
- Tape
- Hot glue
- straw
- Oscillator
- Oscillator

SYNTH HISTORY

Disco! The first notable fully synthesized disco hit was “I Feel Love” by Donna Summer in 1977.

TIME: 2 hrs
DIFFICULTY: 1

STAY SAFE! Always use with an adult.

Remember to change volumes of each oscillator for a mix.

Disco! The first notable fully synthesized disco hit was “I Feel Love” by Donna Summer in 1977.
Glue straws to plates.

Decorate!

Perform!
Your spin table is ready for the stage!

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