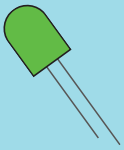
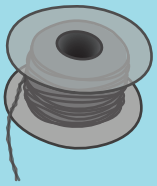
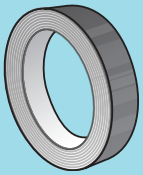
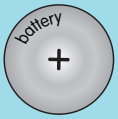
BROWN DOG Gadgets

Getting Started with Wearables









Making Electronics Wearable

From smart watches to heated jackets to light-up jewelry, wearable electronics can make it feel like the future is here! And by adding simple circuits to your projects, you can bring your own wearable electronics to life too. A design can really shine when you incorporate lights, and by creating a switch, you can conserve power when you're not wearing the project. The possibilities are endless, and learning the basics couldn't be easier.

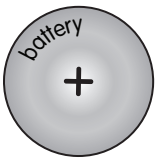
In this *Getting Started with Wearables eBook,* we'll tell you what materials to use, explain how simple circuits work, and provide templates and examples that you can build right away. Then, we'll recommend projects that will help you practice your skills. You can also follow along with the *Getting Started with Wearables* video available at:

https://youtu.be/SED0wriXNZE

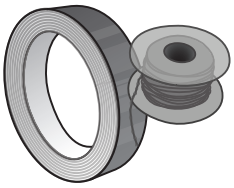
If you need circuit parts, materials, or supplies, pick up a kit from BrownDogGadgets.com

What makes a circuit a circuit?

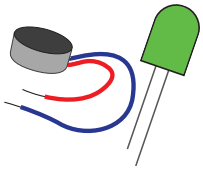
Every circuit has 3 or 4 main components:



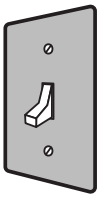
Power:
Every circuit needs a power source. For wearables, a coin-cell battery is perfect because it's small and flat. We use CR2032 batteries in a Crazy Circuits battery holder, or by making a battery holder from scratch.



Wire:
Most circuits use metal wires to connect components. For wearables, we use either Maker Tape, a conductive tape that's made of woven metal fabric with conductive adhesive on the bottom, or Conductive Thread, a thread that's made of metal fibers.



Outputs:
The output of a circuit is what it "does." The circuits in this eBook light up with LEDs (light emitting diodes). Other circuits could vibrate, make sound, or even change color.



Inputs:
Inputs are ways to interact with a circuit like buttons and switches. Yes, you can have a circuit with no input, but think about it: a string of lights is way better with a switch! Inputs add interactivity and control.

Kits from Brown Dog Gadgets

You don't need to buy our kits to make these projects, but they do have everything you need for your convenience.

The Wearable Circuits Kit

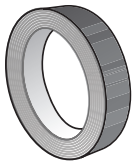
The Sewing Circuits Kit

Tricks of the Trade:

Maker Tape

Here are a few universal techniques to help you build wearable circuits with Maker Tape:

Maker Tape comes in 2 sizes: 1/4 inch and 1/8 inch.

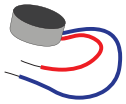


We use 1/4 inch tape for wearables because components like LEDs are easier to attach with wider tape.

1/8 inch tape is great for working in a brick-based environment.

Positive and Negative

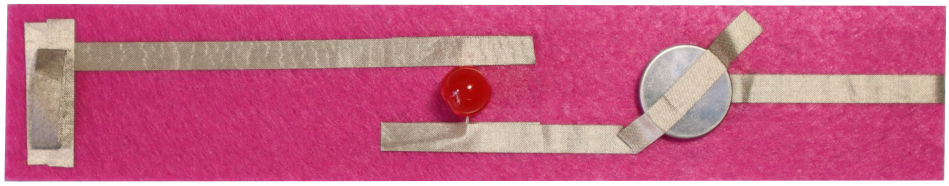
LEDs have one positive leg and one negative leg. The long leg is positive, and the short leg is negative.



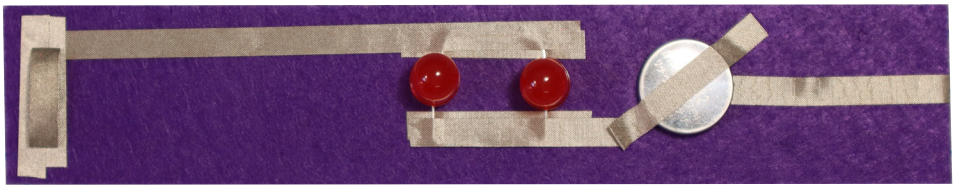
In the case of wires, red is typically positive, and black, dark blue, or white is typically negative.

Easy Maker Tape Projects

Make these light-up bracelets with one or two LEDs using the templates on the following pages.



Maker Tape Flower Bracelet

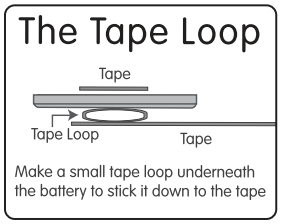


Maker Tape Robot Bracelet

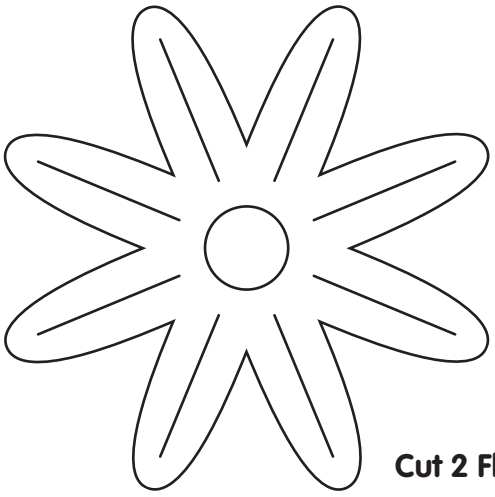
One Light Bracelet

Make a circuit with a single LED.

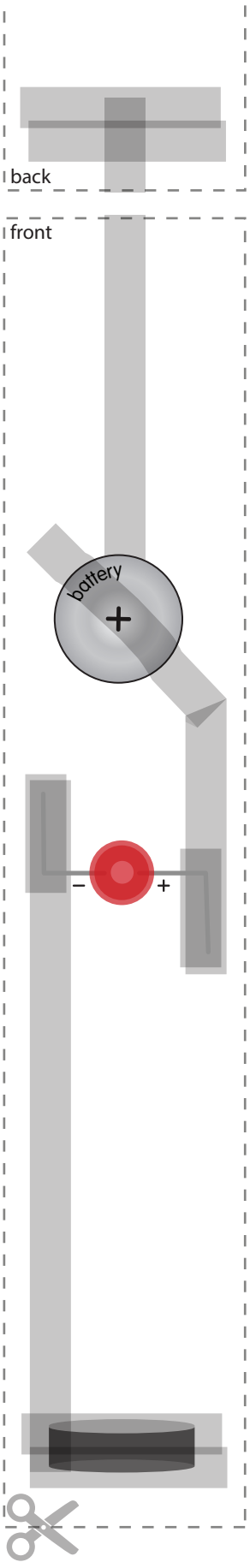
1. Cut out a piece of felt using the rectangle template.
2. Place two horizontal pieces of Maker Tape on the back as shown.
3. Connect another piece of Maker tape and wrap it over the edge to the front, stopping at the location of the battery.
4. Add a loop of Maker Tape on top of the line of tape, then place the battery on top of it with the positive side of the battery facing up.



5. Place Maker Tape over the battery and down along the line, stopping at the location of the LED.
6. Continue to cover the rest of the lines with Maker Tape.
7. Bend the LED legs flat, then at 90 degree angles as shown. Place the LED, aligning the positive (longer) and negative (shorter) legs.
8. Secure the LED in place by laying another piece of Maker Tape over each of the LED's legs.
9. Add a loop of Maker Tape on top of the horizontal pieces at the bottom to create a closure for the bracelet.
10. Create a bracelet design using the flower template below, and glue or tape it over the LED. Or, create your own design.
11. Wrap the bracelet around your wrist, connecting the tape loop to the Maker Tape on the other side. Allowing these pieces to touch will close the switch and the LED should light up!



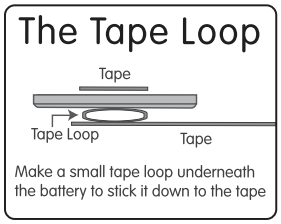
Cut 2 Flower Shapes



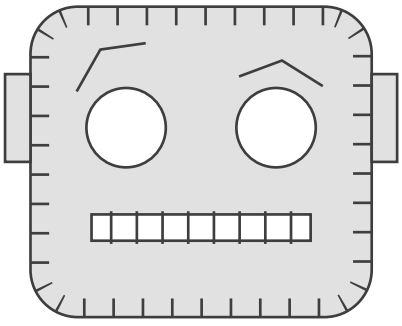
Two Light Bracelet

Make a circuit with two LEDs.

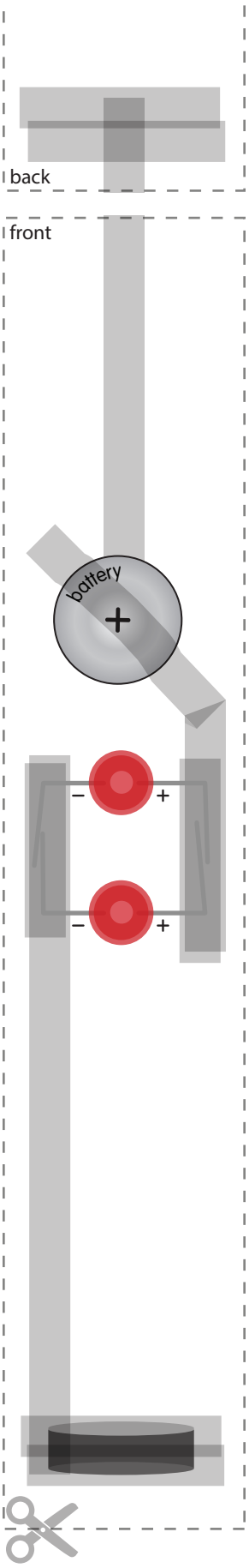
1. Cut out a piece of felt using the rectangle template.
2. Place two horizontal pieces of Maker Tape on the back as shown.
3. Connect another piece of Maker tape and wrap it over the edge to the front, stopping at the location of the battery.
4. Add a loop of Maker Tape on top of the line of tape, then place the battery on top of it with the positive side of the battery facing up.



5. Place Maker Tape over the battery and down along the line, stopping at the location of the LEDs.
6. Continue to cover the rest of the lines with Maker Tape.
7. Bend the LEDs legs flat, then at 90 degree angles as shown. Place the LEDs, aligning the positive (longer) and negative (shorter) legs.
8. Secure the LEDs in place by laying another piece of Maker Tape over each of the LED's legs.
9. Add a loop of Maker Tape on top of the horizontal pieces at the bottom to create a closure for the bracelet.
10. Create a bracelet design using the robot template below, and glue or tape it over the LED. Or, create your own design.
11. Wrap the bracelet around your wrist, connecting the tape loop to the Maker Tape on the other side. Allowing these pieces to touch will close the switch and the LED should light up!



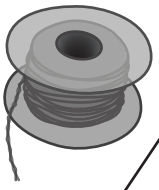
Challenge: Can you make a circuit with more than 2 LEDs? How?



Tricks of the Trade:
Conductive Thread

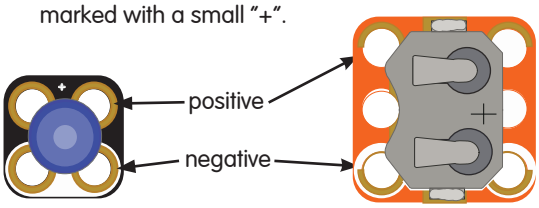
Here are a few universal techniques to sew circuits with conductive thread and Crazy Circuits:

Conductive thread can be used just like regular thread, but since it's made of metal fibers, it will act as the wire in our circuit too!



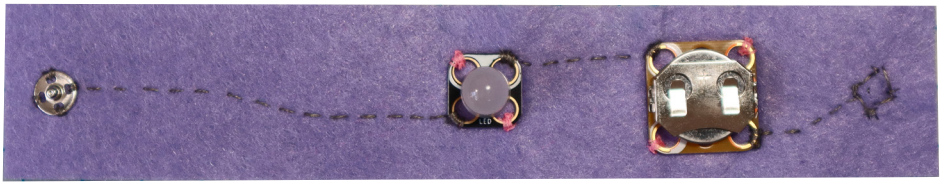
Use the needle threader that came in your kit to thread the needle easily. Finish each stitch with a finishing knot, and trim any excess so that the loose thread won't short your circuit!

Positive and Negative:
Crazy Circuits components have the negative holes marked in white, and the positive holes marked with a small "+".

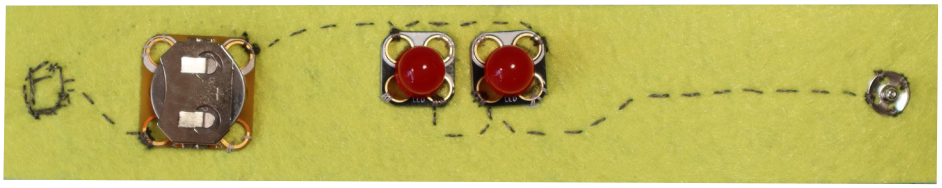


Conductive Thread Projects

Make these light-up bracelets with one or two LEDs using the templates on the following pages.



Conductive Thread Flower Bracelet

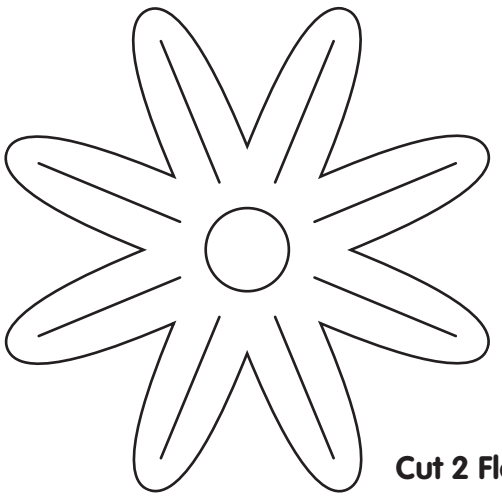


Conductive Thread Robot Bracelet

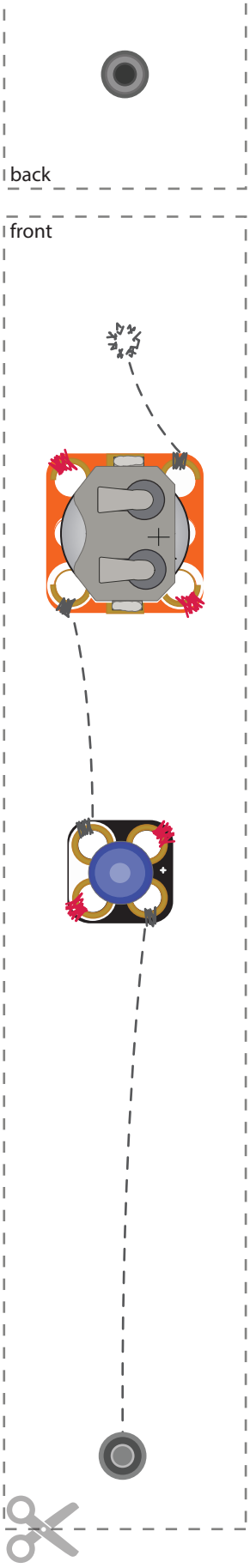
One Light Bracelet

Make a circuit with a single LED.

1. Cut out a piece of felt using the rectangle template.
2. Using regular thread, sew the Crazy Circuits LED and Battery in place as in the diagram (shown in red).
3. Using Conductive Thread, sew half of one snap onto the back side of the bracelet, then bring the thread through to the front side.
4. Continue to sew stitches toward the positive hole in the battery holder and sew multiple stitches around it as shown. Stitch a finishing stitch and trim the thread. Use this technique to start and stop the thread at each hole.
5. With a new piece of Conductive Thread, stitch a new line starting at the negative side of the battery to the negative side of the LED. Cut the thread.
6. With a new piece of Conductive Thread, stitch a new line starting at the positive side of the LED to the location of the snap at the end of the bracelet.
7. Sew the other half of the snap in place, making sure that it is placed so that the bracelet will connect when you turn it into a loop. Allowing these pieces to touch will close the switch and the LED should light up!
8. Create a bracelet design using the flower template below, and glue or tape it over the LED. Or, create your own design.



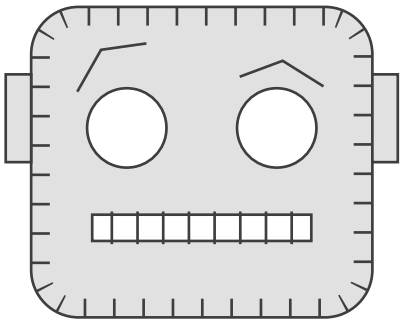
Cut 2 Flower Shapes

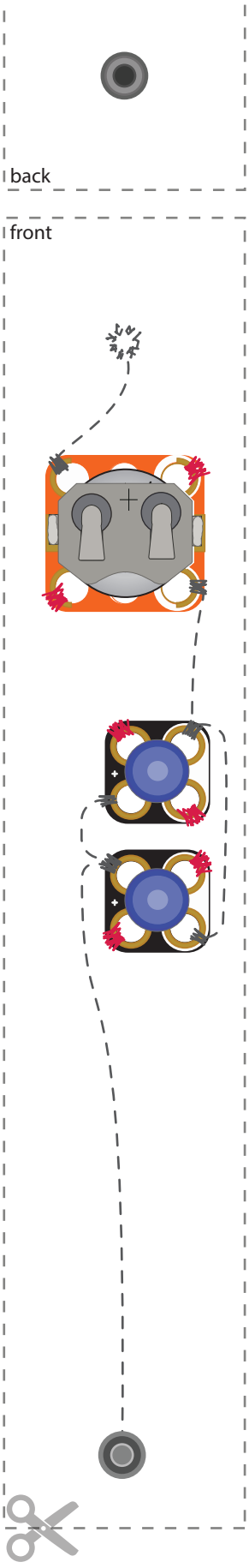


Two Light Bracelet

Make a circuit with two LEDs.

1. Cut out a piece of felt using the rectangle template.
2. Using regular thread, sew the Crazy Circuits LEDs and Battery in place as in the diagram (shown in red).
3. Using Conductive Thread, sew half of one snap onto the back side of the bracelet, then bring the thread through to the front side.
4. Continue to sew stitches toward the positive hole in the battery holder and sew multiple stitches around it as shown. Stitch a finishing stitch and trim the thread. Use this technique to start and stop the thread at each hole.
5. With a new piece of Conductive Thread, stitch a new line starting at the negative side of the battery to the negative side of the first LED and stitch around it. Continue with the same thread to the second LED. Cut the thread.
6. With a new piece of Conductive Thread, stitch a new line starting at the positive side of the first LED to the second LED, then continue to the location of the snap at the end of the bracelet.
7. Sew the other half of the snap in place, making sure that it is placed so that the bracelet will connect when you turn it into a loop. Allowing these pieces to touch will close the switch and the LED should light up!
8. Create a bracelet design using the robot template below, and glue or tape it over the LED. Or, create your own design.

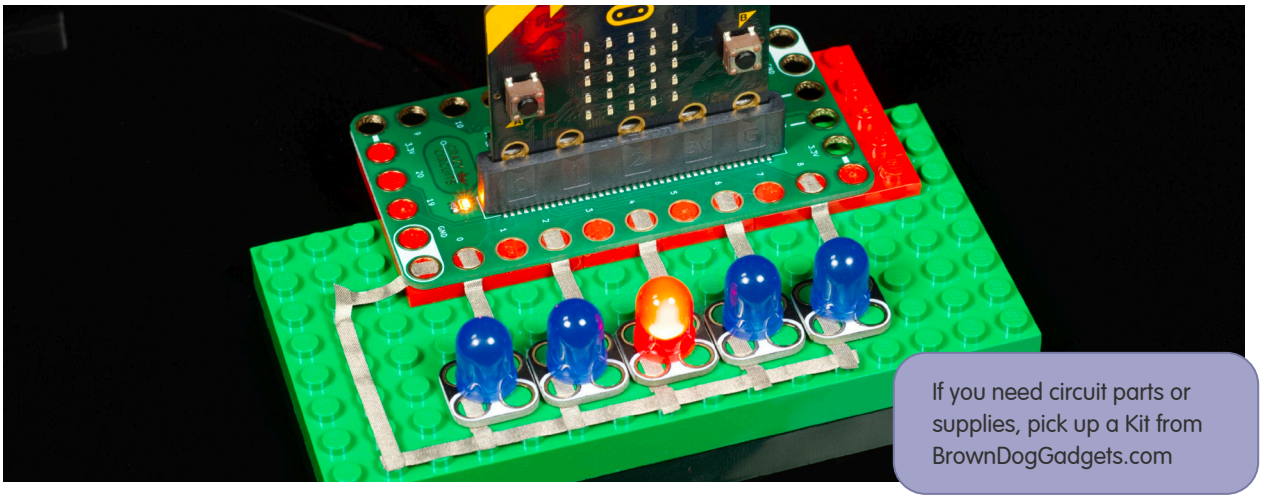




More Projects & Inspiration

Other Materials
You can use Maker Tape on all types of materials and for all types of projects.

With the same basic circuit techniques in this eBook, you can design circuits on top of bricks, paper, or other craft materials. Add lights, movement, and interacitivity to any project that you can dream up - the possibilities are endless. Keep going!



If you need circuit parts or supplies, pick up a Kit from BrownDogGadgets.com

Light-Up Cards (Maker Tape, LEDs, Batteries, and Paper)

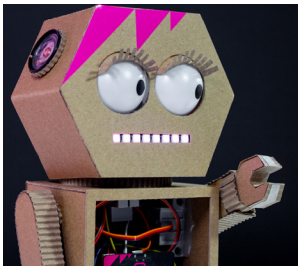
Light-Up Heart

Laser Cat

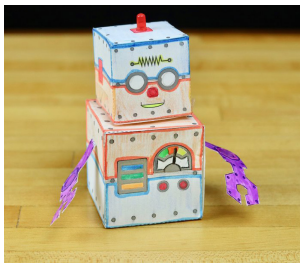
Birthday Candles

Light-Up Tree

Robots & More (Maker Tape, LEDs, Motors, Batteries, Paper, Felt, LEGO, Crazy Circuits)



"High-Fivey the Bot



Motor Robot Buddy

Motor Robot Vacuum

LED Shoes

These are just some of the projects to try next! Check out all of our free project templates and guides available to download at www.BrownDogGadgets.com

BROWN DOG Gadgets

Learn, Create, and Inspire–Even on a Budget

Creating a project from scratch can be difficult for the casual builder. Finding the right directions, the right parts, and the right tools—all at the right price—can be a major hurdle.

At Brown Dog Gadgets, we've created kits and projects for creators of all ages and budgets. Follow our step-by-step project directions and learn more with our classroom resources or find individual parts to dream up your own creations. No matter how or what you create, our products can help you learn the basics of electronics, circuitry, and solar energy.

Find additional eBooks, crafting guides, videos, directions, and educational resources at BrownDogGadgets.com. Contact us for educational discounts and free professional development classes.

help@browndoggadgets.com • 262-788-9223

BrownDogGadgets.com