

With the help of a parent, teacher, or other adult partner, you can make a secret circuit board. After your partner hides a wire under the board, you can make a circuit detector to figure out where the wire is hidden. Let's try it!

Materials:

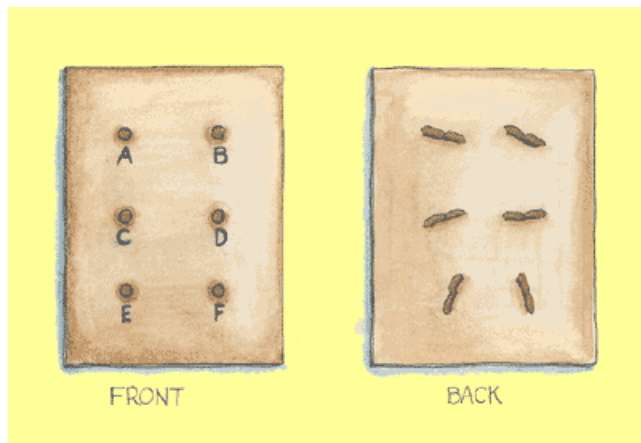
Piece of cardboard (about 15 cm x 20 cm)
6 brass paper fasteners
Flashlight battery (1.5 volts D cell)
Flashlight bulb
Insulated wire
Tape
Strong magnet

Parent or Teacher Preparation:

Cut 3 pieces of wire about 15 centimeters (cm) long. Carefully strip off about 1 cm of insulation from both ends of each wire. If the exposed wire is frayed, twist it together.

Procedures:

1. Cut a piece of cardboard into a rectangle of about 15 cm x 20 cm. Use a pen or pencil to carefully poke 6 holes in the cardboard in the pattern shown.



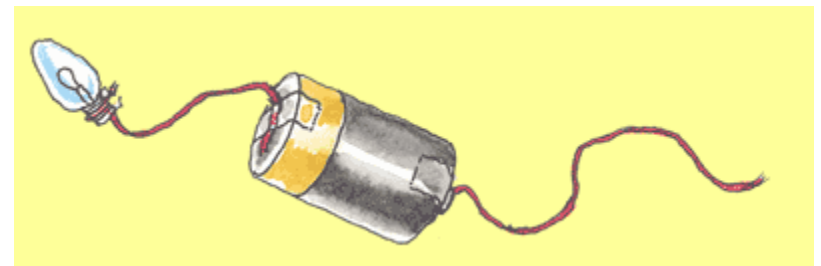
2. Use letters to mark the holes in your secret circuit board A-F as shown. Place a brass fastener through each of the 6 holes. Open the fasteners on the other side so they stay firmly in place.



3. Close your eyes as your partner connects a piece of wire between any two brass fasteners underneath the cardboard.

Your job is to use your secret circuit detector to figure out where the hidden wire is.

4. Take your circuit detector by wrapping one end of the wire around the base of the bulb and taping it securely so that the wire makes good contact with the bulb base.



5. Tape the other end of the wire securely to the positive end of the battery.
6. Tape one end of the other wire securely to the negative end of the battery. This is your secret circuit detector.



7. Touch the bottom of the bulb to one brass fastener and the end of the wire to another. If the hidden wire is connecting those two fasteners, the circuit will be complete, the bulb will light, and you will have found the hidden wire.

Here are all the possible connections for one hidden wire:

AB, AC, AD, AE, AF
BC, BD, BE, BF
CD, CE, CF
DE, DF
EF

[Think about this ...](#)

Have your partner hide two wires under the circuit board and see if you can find them!

Where's the Chemistry?

The circuit detector is actually most of a circuit but not all. There needs to be a way for electricity to flow from the end of the wire to the bottom of the bulb to complete the circuit. When you touch the wire and the bulb to two fasteners that are connected by the hidden wire, you have given the electricity a path to flow and complete the circuit.

A device similar to your circuit detector is actually used to try to figure out where the connections in a circuit are good or where a connection may be broken.



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The American Chemical Society develops materials for elementary school age children to spark their interest in science and teach developmentally appropriate chemistry concepts. The *Activities for Children* collection includes hands-on activities, articles, puzzles, and games on topics related to children's everyday experiences.

The collection can be used to supplement the science curriculum, celebrate National Chemistry Week, develop Chemists Celebrate Earth Day events, invite children to give science a try at a large event, or to explore just for fun at home.

Find more activities, articles, puzzles and games at www.acs.org/kids.

Safety Tips

This activity is intended for elementary school children under the direct supervision of an adult. The American Chemical Society cannot be responsible for any accidents or injuries that may result from conducting the activities without proper supervision, from not specifically following directions, or from ignoring the cautions contained in the text.

Always:

- Work with an adult.
- Read and follow all directions for the activity.
- Read all warning labels on all materials being used.
- Wear eye protection.
- Follow safety warnings or precautions, such as wearing gloves or tying back long hair.
- Use all materials carefully, following the directions given.
- Be sure to clean up and dispose of materials properly when you are finished with an activity.
- Wash your hands well after every activity.

Never eat or drink while conducting an experiment, and be careful to keep all of the materials used away from your mouth, nose, and eyes!

Never experiment on your own!

For more detailed information on safety go to www.acs.org/education and click on "Safety Guidelines".

