

## Robotics Badges: *Showcasing Robots 1*

# Mini Robot Building Instructions

**Overview:** Assemble a robot to use for the mini-competition in Step Three of the Showcasing Robots badge.

### Materials



- 1 small vibrating motor, 3 volts or less (sometimes listed as “pager motors” or “phone motors;” comes as a disc or as a cylinder with a weight on a rotating shaft)
- 1 3-volt coin battery (such as BR1225 or CR2032)
- Lightweight materials for the body, such as recycled plastic or cardboard containers, caps to jars or bottles, clothespins, etc
- Materials to use as legs, such as bent paper clips, round beads, or sections of toothpicks or bamboo skewers
- Decorations such as pipe cleaners and googly eyes
- Adhesive and connectors, such as: foam tape (comes in squares or in rolls with backing paper attached), electrical tape, hot glue, adhesive dots, zip ties, twist ties, rubber bands
- **Optional:** Toothbrush head (cut off with pliers or heavy scissors) to make a “programmable” body by bending the bristles
- **Optional:** wire cutters, wire strippers, sandpaper

### Safety Notes:

- The battery used in this project is too small to give you a shock. However, if the positive and negative sides are connected accidentally, the battery may get hot or cause a fire. This is called a short circuit. If batteries feel warm, turn the power off.
- Do not connect the positive and negative sides of the battery. The positive and negative sides will touch either side of the load while in the circuit.
- Be careful when cutting wires and using other tools. Never cut wires connected to a battery, electrical outlet or plug.
- If you are cracking open the outside casing of a device, wear safety goggles to keep broken bits from flying into your eyes.

(continued)

### Steps

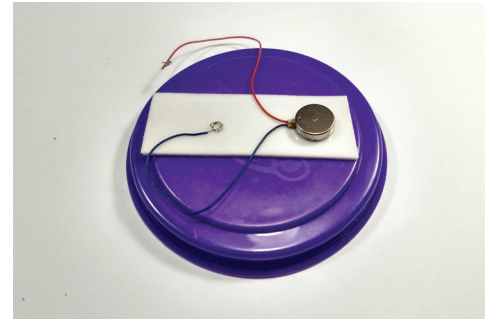
1. Choose a container, lid, or other item to use for the robot's body.
2. Take a motor and a battery and test them to make sure they work by sliding the battery between the motor wires. (It doesn't matter which way.) Make sure the metal end of each wire is touching one side, **and only one side**, of the battery. The motor should shake or buzz when it is on.

**Troubleshooting tip:** If you need to expose more of the metal wire, carefully use wire strippers or sandpaper to remove some of the insulation.

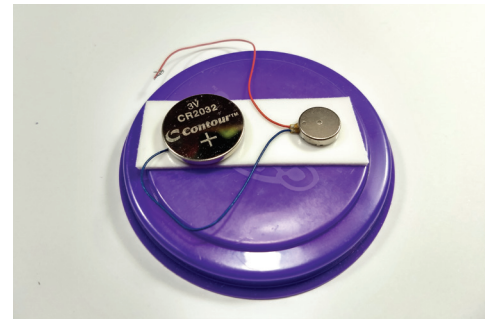
3. To attach the motor to the robot's body, take a strip of foam tape that is long enough to hold the battery and the motor. Attach the tape to the robot's body.
4. Peel the backing paper off the tape. Press the motor and one of its wires onto the foam tape. Gently bend the other wire so it is sticking up slightly. (*figure a.*)
5. Take the battery. Press it onto the foam tape, right over the motor wire. Make sure it is touching the metal end of the wire. Gently touch the other end of the wire to the top of the battery to make sure everything is working. (*figure b.*)
6. Of needed, use a small flap of tape, or a connector like a rubber band or zip tie, to hold the top motor wire onto the top of the battery when you want it on. (*figure c.*) Be sure to leave some way to turn the motor off, such as slipping a piece of paper under the wire. (*figure d.*)
7. If desired, add feet or decorations to the robot.

### Want More Challenge? Try this!

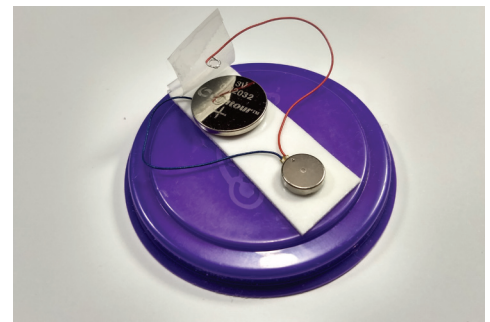
Take apart cheap (\$1) electric toothbrushes and remove the vibrating motor inside to use in your robots. Depending on the model you find, you may need screwdrivers and pliers. Wear safety goggles to protect against small broken pieces of the casing that may fly into your eyes.



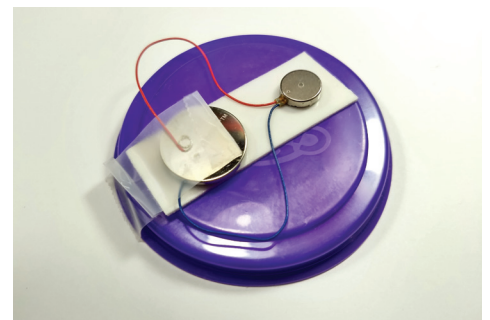
*figure a.*



*figure b.*



*figure c.*



*figure d.*