

How to Make a Simple Circuit with a Switch

For this project you'll build a simple circuit with a switch that allows you to control the flow of electricity. The individual parts can then be used later for other experiments.

Materials you will need:

- Power Pack (see instructions for creating a Power Pack on page 3)
- Spring-tension wood or plastic clothespin
- Number 22 insulated copper bell wire
- Small block of wood
- Nail, thumbtacks, and paper clip
- 3-volt flashlight bulb

How to Build the Circuit:

1. Wind one wire from the Power Pack around a thumbtack. Hook a paperclip around the tack and press it into the wood block. Cut a new wire, strip both ends, and wrap each end around two more thumbtacks. Press one thumbtack into the wood so that when the paperclip rotates it will make contact and close the switch. Press the other thumbtack into the location where the light bulb will be held. Wrap the other wire from the Power Pack around the light bulb.

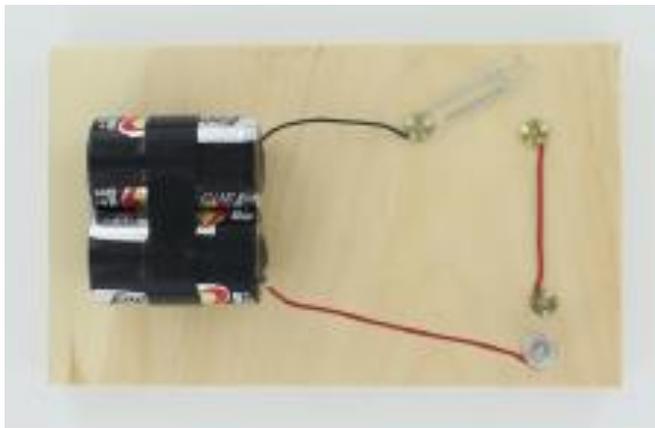


Figure 1

2. Position the clothespin so that it will hold the bulb directly above the thumbtack and then nail it into the wood block. Insert the bulb into the clothespin so that it is making contact with the thumbtack. When the circuit switch is open (Figure 2) current does not flow to the bulb.

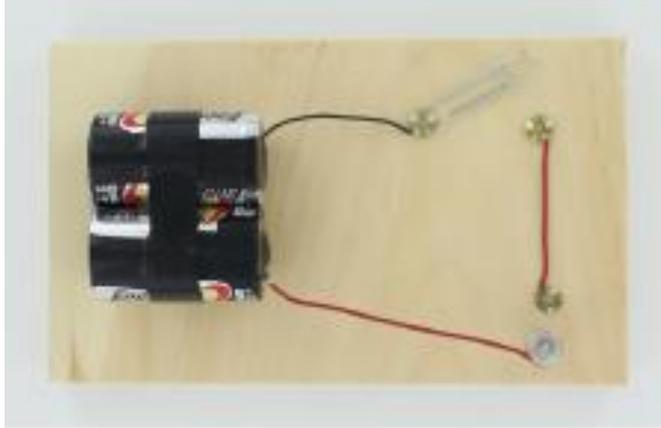


Figure 2

3. When you rotate the paperclip and make contact with the second thumbtack you close and complete the circuit, current flows through the circuit and lights up the bulb (Figure 3). The switch, bulb holder, and portable power pack are a complete circuit and arrangement of conductors; they allow the passage of electric current through the wire. Metal objects make the best conductors. Copper, brass, steel, or a strip of tin can have many free electrons capable of being moved along by an electromotive force such as voltage from the battery. In insulators, such as the wire covering, electrons do not move easily, so you can work with electricity safely.

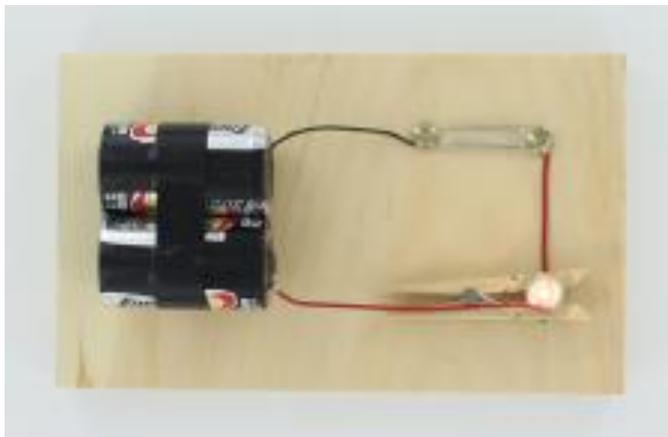


Figure 3

How to Build a Power Pack

Materials You Will Need:

- 2 D batteries, out of the package
- Electrical tape
- Insulated number 22 copper wire
- Two metal paper clips

This experiment uses safe, low-voltage battery power. Household electrical current contains high voltage that could cause serious injury. **DO NOT** use household electrical current for this experiment. Conduct experiments under adult supervision.

- Carefully follow wiring instructions. Improper wiring can result in battery leakage and/or rupture.
- **DO NOT** take a battery apart. Contact with internal battery material can cause injury.
- **DO NOT** dispose in fire, recharge, put in backwards, or mix with used or other battery types. This may cause batteries to explode, leak and cause personal injury.

Steps to Building a Power Pack:

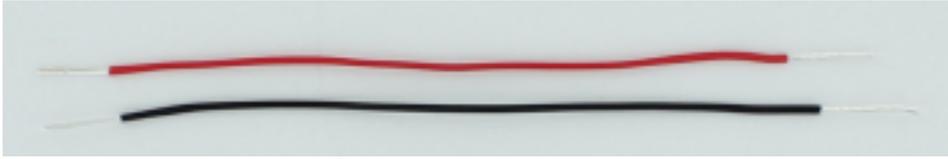
1. Place the two batteries side by side with the positive terminal right side up on one battery and the negative terminal right side up on the other. Use electrical tape around the middle of the batteries to secure them together.



2. Standing the batteries upright, place a paper clip between the positive and negative contacts. Use two four-inch pieces of electrical tape to secure the paper clip in place on both batteries.



3. Cut two pieces of wire about 6 inches long. Strip approximately one-half inch of insulation from each end of the wires.



4. Turn the battery pack over, exposing the two unused battery contacts. Place the stripped portion of one of the wires on a battery contact and secure it in place with a four-inch piece of electrical tape. Repeat this procedure with the other battery and wire.



5. The pack is now ready to provide power to your experiments. It is important that the bare wires do not touch each other and cause a short circuit. We recommend that you temporarily cover the end of these bare wires with electrical tape to avoid accidental shorting of the batteries.



6. An alternative option would be to purchase a 2 cell D size battery holder as shown.

