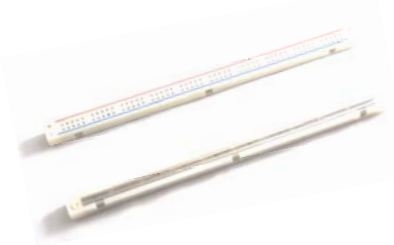
Open and Closed Circuits

TCIPG
TRUSTWORTHY CYBER INFRASTRUCTURE FOR THE POWER GRID

A circuit can be open or closed.
Investigate possible circuit combinations.
Use the prototyping breadboard with the coin battery to explore.



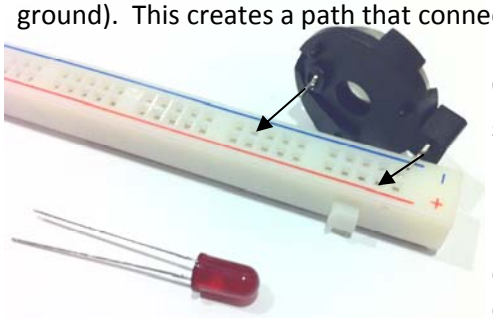
MATERIALS

1 coin battery (CR2032)
1 coin battery holder
1 two-strip 100 pt breadboard
LED's
- Some of each color -
  - red
  - green
  - yellow
  - blue
  - orange

Other power sources -
- Solar panel, other batteries, wind turbine

Using a breadboard is an easy way to experiment with circuits. Breadboards come in many sizes. This one consists of two parallel strips of conducting wire running down the length of each side. Each strip has fifty connected tie points, but the two sides do not touch each other.

Put the coin battery in the battery holder so you can see the side with the writing and + symbol. Connect the battery to the breadboard by connecting the prong near the tab on the battery to the red strip (positive) and the other to the blue strip (negative or ground). This creates a path that connects the two strips.



Connect an LED by pushing the anode (longer leg) into a tie on the red (+) strip and the other leg (the cathode) into the blue (-) strip. The two legs of the LED create a second connection across the two strips.

In order for an LED, or any device in any circuit to function, there must be a complete conducting path for the current to flow. This is similar to a train on a circular track – if the tracks are complete, the train will run. If there is a break in the tracks, the train stops. If there is a break in the conducting path and the current is unable to flow, we say that the circuit is *open*.

Add the battery and one LED to your breadboard in an arrangement that does not allow the LED to light. Using the picture of the back of the breadboard, sketch your circuit arrangement to explain why the LED does not light.

Now adjust the arrangement of the battery and LED on the breadboard so that the LED does light up. Sketch your circuit and show the closed, or complete, conducting path.

Add one more LED, keeping your circuit closed, so that both LEDs light up. Sketch your circuit.