

Circuits Part 2: Switches

Ohm's Law

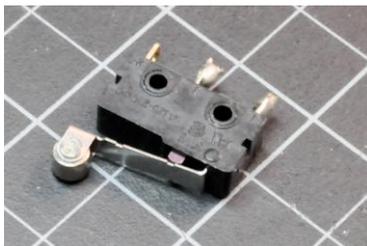
Before we begin our work with switches, let's summarize the observations that we have made on the relationship between voltage, current, and resistance. In the [last exercise](#), you measured the voltage and current in a circuit with a variable resistor, and you found that the voltage (measured in volts) is equal to the resistance in kilohms times the current in milliamps. This relationship between voltage, current, and resistance is formally expressed as Ohm's Law: $V = I \times R$. Please view this [animation of Ohm's law](#) before proceeding.

It is important to understand that Ohm's law applies only to resistive elements, and that it applies to each resistive element. The voltage drop across **each** resistive element is proportional to the current flow through that resistor times the resistance of that resistor.

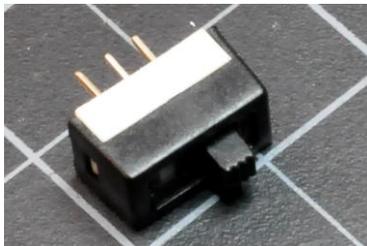
Finally, it is also important to remember that, in a closed circuit, as current moves from a high voltage source to ground, the energy associated with each electron must be expended. This is true regardless of how the loads in the circuit are arranged. The current flow through resistive loads placed in series is described in [this animation](#), while current flow through parallel resistive loads is described [here](#).

Switches

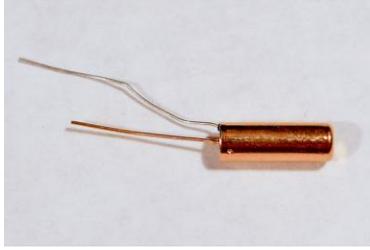
There are many types of switches but just a few basic terms used to describe these switches. Begin by viewing this [animation on switches](#). Below are pictures of some of the switches that are available to you in this lab.



similar to a switch in the train toy



slide switch, similar to those in appliances



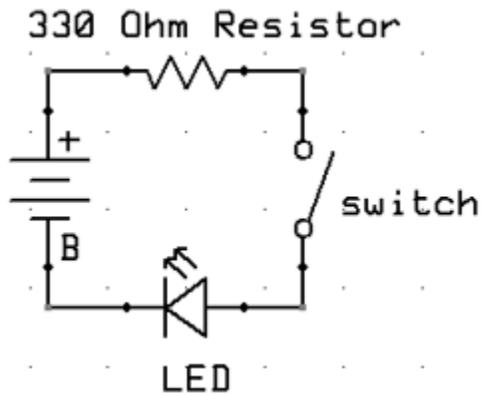
tilt switch



pushbutton switch for use on breadboards

How does each switch work

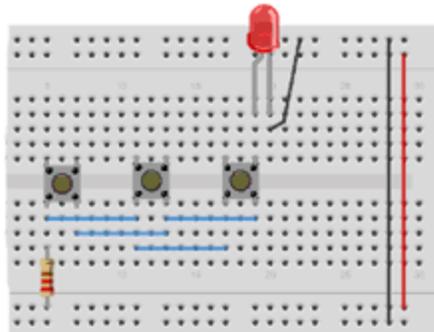
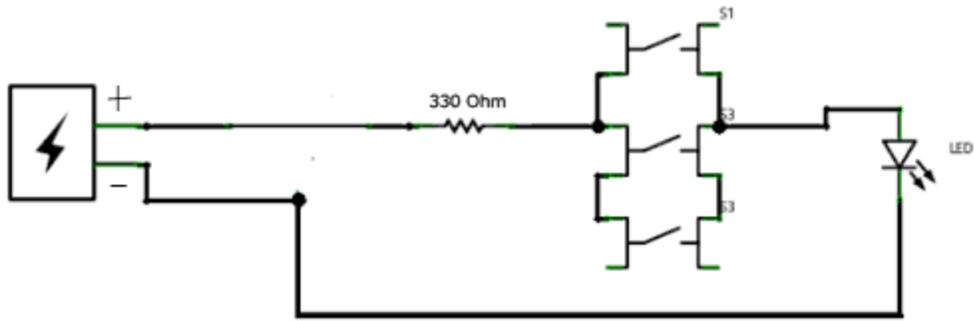
Begin your investigation of these switches by making the simple circuit shown below on your breadboard using each of the switches above. In other words, make the circuit four times, each time with a different switch.



Show me each switches in action before replacing it with the next switch in the list.

Switches in parallel

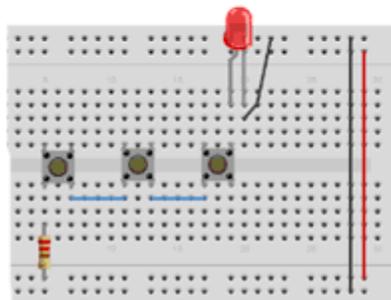
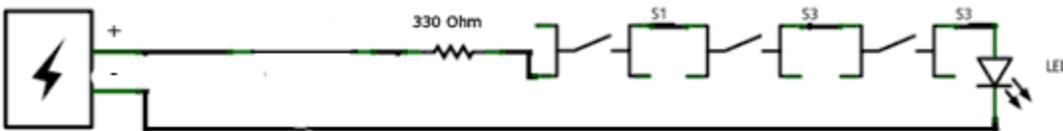
Now that you've mastered the basic use of each switch, try putting three switches in parallel as shown below. The image depicts three pushbutton switches, but feel free to use any switch.



Once you've created the circuit and you understand how it works, show me your circuit before moving to the next section.

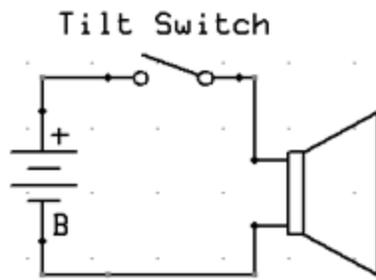
Switches in series

This time, place three switches in series as depicted below. Again, you may use any switch that you like. Be sure to show me your circuit before moving to the last section.



Now for something fun

Begin by removing the speaker from the toy that you used for circuit bending. Use it to build the circuit below.



Tilt the breadboard to activate the tilt switch. Can you explain what you hear? Read a little bit about how your [speaker works](#) because we'll be working with magnetic devices next time.