Voltage and Current

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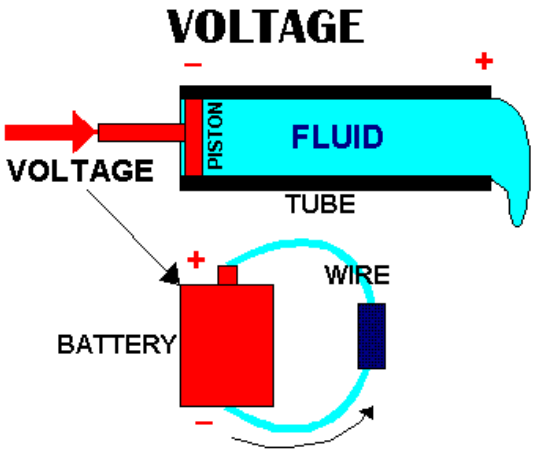
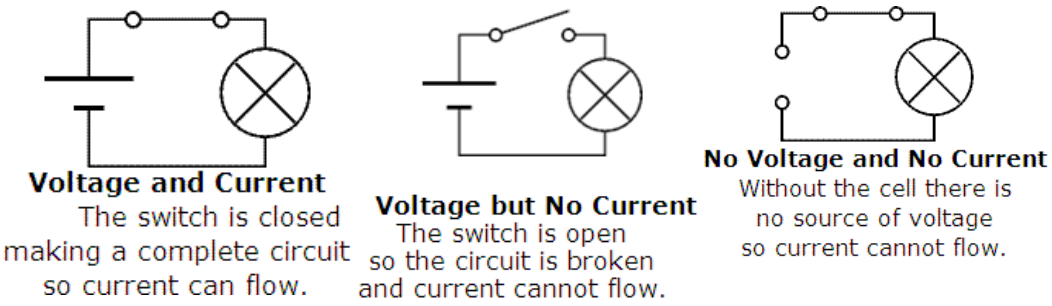
Introduction to Voltages and Currents



Voltage is the Cause, and Current is the Effect

What is Voltage?

Voltage attempts to make a current flow, and current will flow if the circuit is complete. Voltage is sometimes described as the 'push' or 'force' of the electricity, it isn't really a force but this may help you to imagine what is happening. It is possible to have voltage without current, but current cannot flow without voltage.



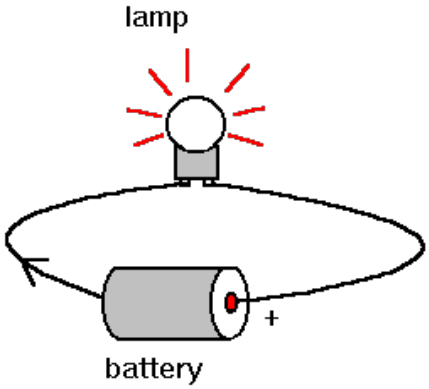
Voltage is a specific measure of potential energy that is always relative to the space between two points. When we speak of a certain amount of voltage being present in a circuit, we are referring to the measurement of how much potential energy exists to move electrons from one particular point in that circuit to another particular point. Without reference to two particular points, the term "voltage" has no meaning. The amount of current in a circuit depends on the amount of voltage available to motivate the electrons, and also the amount of resistance in the circuit to oppose electron flow.

What is Current?

An electric current is usually thought of as a flow of electrons. When two ends of a battery are connected to each other by means of a metal wire, electrons flow out of one end (electrode or pole) of the battery, through the wire, and into the opposite end of the battery. The ampere (amp) is used to measure the amount of current flow, and is defined in terms of the number of electrons that pass any given point in some unit of time. Since electric charge is measured in coulombs, an exact definition of the ampere is the number of coulombs that pass a given point each second.

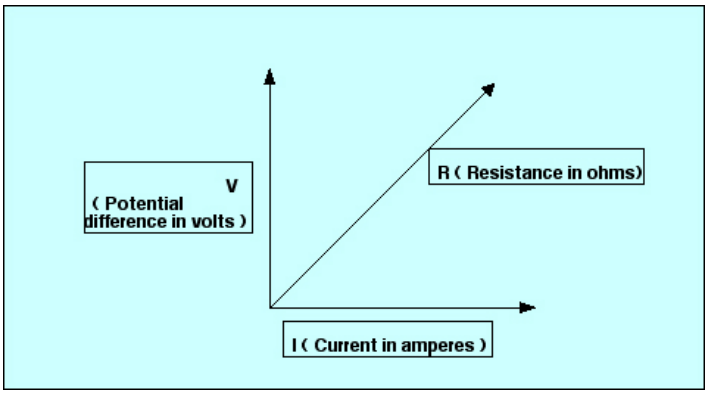
Let's say you have a tank of pressurized water connected to a hose that you're using to water the garden. If you increase the pressure in the tank, more water will come out of the hose, right? The same is true of an electrical system: increasing the voltage will result in greater current flow.

Relation Between Voltage and Current



By definition, an electric current **I** is the amount of charge q flowing per second, hence **I = q/t** . Current is measured in Colombs per second (also called Amperes, see below). However, the charge on the electron is only a tiny fraction of a Coulomb -- hence a current of 1 Coulomb per second would correspond to an awful lot of electrons running around.

German scientist Georg Ohm was the first to discover that there is a linear relationship between charge and current in many materials, since charge will only flow if there is a voltage difference between the terminals of a circuit.



Ohm's law states that the current **I** passing through a material connected to an energy source **V** is given by the equation **I = V/R**. Here, **R** is the constant of proportionality and is called electrical resistance and you can see why from the equation: a material with a very large value of **R** will pass almost no current (it will serve as an electrical insulator), while another material with very small **R** will yield a large current for the same voltage (it will be a very good electrical conductor).

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- http://www.physics.about.com/od/glossary/g/electron.htm
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