Topic 2 - Electricity Within a Circuit

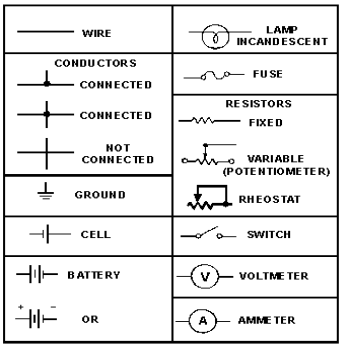
Circuit Elements and Diagrams

A circuit is a pathway that allows the flow of electricity. Most electrical circuits use wires (as conductors), although others may use gases, other fluids or materials.

All circuit diagrams have four basic parts:

- *source* - provides energy and a supply of electrons for the circuit … Battery
- *conductor* - provides a path for the current …Wires
- *switching mechanism* - controls the current flow, turning it off and on, or directing it to different parts of the circuit …Switch
- *load* - converts electrical energy into another form of energy … Bulb

Basic circuit symbols



A drawing made with these symbols is called a *schematic* or schematic diagram.
The rules to follow when making schematic diagrams:

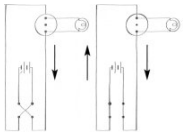
- Use a pencil and ruler on graph or unlined paper
- Place the components in a rectangular or square arrangement
- Conducting lines should be straight with 'right-angled' corners
- Do not cross conductors
- Be neat and make the sizes of the symbols consistent and easy to see

Example - Bulldozer

The toy bulldozer has 2 loads, a motor and a bulb. 2 1.5V cells act as the energy source. A switching mechanism connects to 4 wires. A circuit diagram representing this toy is as follows.

Forward

Backward



Measuring Current

The steady flow of charged particles is called electrical *current*. The flow continues until the energy source is used up, or disconnected. The rate at which an electrical current flows is measured in *amperes* (A). This flow varies from a fraction of an ampere to many thousands of amperes, depending on the device. An instrument used to measure very weak electric current is called a *galvanometer*. Larger currents are measured with an *ammeter*.

Measuring Voltage

Electrical energy is the energy carried by charged particles. *Voltage* is a measure of how much electrical energy each charged particle carries. The higher the energy of each charged particle, the greater the potential energy. Also called '*potential difference*', the energy delivered by a flow of charged particles is equal to the voltage times the number of particles. Voltage units are *volts* (V), and for safety purposes, the voltage of most everyday devices we commonly use is relatively low, while industries and transmission lines are relatively high. A simple way to measure voltage is with a *voltmeter*. [red to positive (+) and black to negative (-)] Some voltmeters can measure a wide range of voltages. These *multi-meters* should be used with caution, so that the sensitive needle is not damaged (by testing a low range with high voltage).

Rivers of Electricity

Electric circuits are often compared to water systems. Electric charge is like the water, as it flows (input) it makes changes in the energy that results (output). *Microcircuits* (Integrated Circuits) - *transistors* are used with three layers of specially treated silicon, with the middle layer (receiving a small voltage, allowing it to control the voltage in the outer layers, allowing them to *act as switches*. ***Microcircuits are made up of transistors*** and resistors and are built on an extremely small scale. Integrated circuits put all of the components in one chip, reducing the size of the circuit.