BASIC ELECTRONIC CIRCUITS

Circuit
A circuit is a path for electrons to flow around. The path goes from the negative terminal of a power source, through various components and onward to the positive terminal.

Think of it as a circle. The paths may split off here and there but they always form a line from the negative to positive.

NOTE: Negatively charged electrons in a conductor are attracted to the positive side of the power source.
Conductor
A conductor is a material (usually a metal such as copper) that allows electric current to pass easily. The current is made up of electrons. This is opposed to an insulator which prevents the flow of electricity through it.
Voltage
Voltage is the electrical force, or "pressure", that causes current to flow in a circuit.

Voltage would be the force that is pushing the water (electrons) forward.

It is measured in VOLTS (V).
Current

Current is the movement of electrical charge - the flow of electrons through the electronic circuit.

In our analogy, current would be the flow of water moving through the tube (wire).

Current is measured in AMPERES (AMPS, A or I).

Current Direction is from positive to negative voltages
Resistance

Resistance is anything that causes an opposition to the flow of electricity in a circuit. It is used to control the amount of voltage and/or amperage in a circuit. Everything in the circuit causes a resistance (even wire).

It is measured in OHMS (Ω).
Electric Circuits

Voltage (Volts)

Load/Resistor (Ohms)

Current (Amps)

Circuit Drawing
Ohm’s Law

is used in electronics to calculate the relationship between current, voltage, and resistance. It was named after the German physicist Georg Simon Ohm. Born 1787. Died 1854.

Unless you know this basic fundamental building block of electronics, you will never have a strong foundation to hold up the electronics towers you will be constructing in the future. Learn Ohm’s Law. Learn it inside and out!
Ohm's Law is a formulation of the relationship of voltage, current, and resistance, expressed as:

\[ V = I \times R \]

or

\[ I = \frac{V}{R} \]

or

\[ R = \frac{V}{I} \]

Where:
- \( V \) is the Voltage measured in volts
- \( I \) is the Current measured in amperes
- \( R \) is the resistance measured in Ohms

Therefore:

\[ Volts = Amps \times Ohms \]
In this simple circuit there is
• a current of 12 amps (12A)
• a resistive load of 1 Ohm (1Ω).

• Using the formula to determine the required Voltage:
  • \( V = I \times R \)
  
  \( = 12 \text{ (Amps)} \times 1 \text{ (Ohm)} \)

\( V = 12 \text{ Volts (12V)} \)
If we knew the battery was supplying 12 volts, and there was a resistive load of 1 Ohm, the current would be:

\[ V = IR \]

\[ IR = V \]

\[ I = \frac{V}{R} \]

\[ I = \frac{12 \text{ (Volts)}}{1 \text{ (Ohm)}} : \]

\[ I = 12 \text{ Amps (12A)} \]
If we knew the battery was supplying 12V and the current being generated was 12A, then the Resistance would be:

\[ R = \frac{V}{I} \]

\[ R = \frac{12 \text{ Volts}}{12 \text{ Amps}} \]

\[ R = 1 \text{ Ohm} \] (1 \( \Omega \))
Simple Circuit

If we break a circuit down to its elementary blocks we get:
1) A Power Source -- eg: battery
2) A Path -- eg: a wire
3) A Load -- eg: a lamp
4) A Control -- eg: switch (Optional)
5) An indicator -- eg: Meter (Optional)
Series Circuit

A series circuit is one with all the loads in a row. Like links in a chain.

There is only ONE path for the electricity to flow.

If this circuit was a string of light bulbs, and one blew out, the remaining bulbs would turn off.
Parallel Circuit

A parallel circuit is one that has two or more paths for the electricity to flow – similar to a fork in a river.

In other words, the loads are parallel to each other.

If the loads in this circuit were light bulbs and one blew out there is still current flowing to the others.
OK, Time for mad scientist demo
**BASIC ELECTRONIC CIRCUITS**

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**VOLTAGE, CURRENT & RESISTANCE**

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Electric Circuits
Voltage (Volts)
Load/Resistor (Ohms)
Current (Amps)

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\[ V = I \times R \]

\[ I = \frac{V}{R}, \quad R = \frac{V}{I} \]

Where:
- \( V \) is the Voltage measured in volts
- \( I \) is the Current measured in amperes
- \( R \) is the resistance measured in Ohms

Therefore:

Volts = Amps times Ohms

In this simple circuit there is:
- a current of 12 amps (12A)
- a resistive load of 1 Ohm (1Ω).

Using the formula to determine the required Voltage:

\[ V = I \times R = 12 \text{ (Amps) } \times 1 \text{ (Ohm)} \]

\[ V = 12 \text{ Volts (12V)} \]
If we knew the battery was supplying 12 volts, and there was a resistive load of 1 Ohm, the current would be:

\[ I = \frac{V}{R} = \frac{12 \text{ Volts}}{1 \text{ Ohm}} = 12 \text{ Amps (12A)} \]

\[ V = I R \]
\[ I R = V \]
\[ I = \frac{V}{R} \]

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