Ohm's Law

In the field of electricity, the prevailing formula for defining the relationship between the three primary electrical elements is called Ohm's Law. This formula is widely used as it can be used for any and every electrical application. The basic law of the formula states that in order to know the measured values of all three elements, you must know two of the elements values.[1]

Elements of Electromotive Force

The three primary electrical elements are voltage (electromotive force), amperage (current or intensity) and resistance (Ohm's or Ω). The common algebraic symbols for these elements when applying the formula are V (voltage), I (intensity), R (resistance). However, E for electromotive force can be substituted for V except when referring to a specific measurement of voltage (12V), in which case V is still used.

Voltage

Electromotive force or volts can be expressed as the electrical potential difference between two points in space. Electric potential is potential energy per unit charge equal to the work that would have to be done against or by an electrical field to move the charge from one point to another. Typical measuring instruments include the voltmeter, potentiometer, and oscilloscope.

Intensity

Also known as amperage (from the singular ampere) or current, intensity is defined as the amount of work that is being accomplished within two points of an electromagnetic field. The two types of electric current are AC (alternating current) and DC (direct current). AC is an electric charge that periodically can reverse directions depending on the polarity of the charge. DC is an electric charge that always flows in one direction, usually positive (+) to negative (-). Electric current is measured with an ammeter.

Resistance

Electrical resistance is the amount of difficulty for an electrical charge to pass through a conductor measured in the unit Ohms or expressed as the mathematical symbol Ω. Since current travel is largely dependent on the size and length of a conductor, resistance is anything that interferes with the proper conducting properties, for example. corrosion, broken strands of wiring, loose connections. Resistance can be measured by an ohmmeter or a multi-meter.

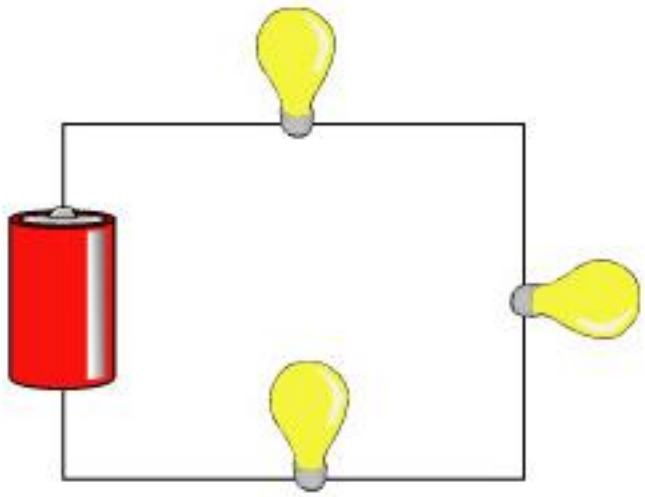
Calculations for Ohm's Law

In order to properly equate Ohm's Law, you must know two out of the three measured values of your equation. It is proper to write out the equation in a triangle format which is known as the Ohm's Law Triangle. In the triangle, E (voltage) is always on top, I (amperes) is always on the bottom left and R (resistance)always on the bottom right. Similar to algebraic equations, the E numeral being above the I

[1] For those studying electrical fundamentals as an important tool for basic troubleshooting. The audience has at least a basic understanding of algebra (high school) and will be using this information for their studies or careers.

and the R symbolizes that it acts as the numerator and the lower symbols as the denominators. Likewise, the bottom symbols being next to each other means that they are multiplicative of each other.

To give an example of an Ohm's Law calculation, consider this simple series circuit in which one single path leads from power source or (+) to ground or (-).



For a simple series circuit, give each light bulb (resistor) a value of 1Ω, and the red battery a value of 12 volts. One necessary law to know about series circuits is that the resistance total. Therefore, the total equates to the sum of the resistors in the circuit. In this case, that total is 3Ω. The voltage potential remains a fixed value of the difference between the most positive and most negative points of the circuit.

Using the above stated formula, the equation can be stated as $\frac{12V}{3R} = 4A$

Likewise if the value for V was unknown but the values of A=4 and R=3 were known, the equation could be stated as $4A\ x\ 3R = 12V$.

References

http://www.physicsclassroom.com/class/circuits/Lesson-3/Ohm-s-Law

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