

ELECTRICAL BASICS

BASIC ELECTRICITY:

Electricity is the flow of electrons through a medium. Media through which electrons flow easily are called, "conductors;" Those through which the flow is difficult are called, "insulators." The metal core of an electrical wire is a conductor. The rubber or plastic that surrounds it, keeping the metal from touching other wires (or you), is an insulator.

The degree to which a conductor allows or does not allow the flow of electrons is its "resistance". It is measured in ohms (named after [Georg Simon Ohm](#)).

The pressure which causes electrons to flow through a conductor is called "electromotive force," or voltage, and is measured in volts (for [Alessandro Volta](#), who invented what some regard as the first electric battery).

The speed with which the electrons flow is called "current," and is measured in amperes or "amps" (for [André-Marie Ampère](#), the father of electrodynamics).

The amount of electrical "work" that gets done is called "power," and is measured in watts (named after [James Watt](#), whose invention of the first practical steam engine brought on the Industrial Revolution).

OHM'S LAW:

A description of the relationship between voltage, current, and resistance, where:

- **E** stands for voltage (or "electromotive force")
- **I** stands for current (from the French word, "intensité"), and
- **R** stands for resistance.

Ohm's Law is expressed thusly:

$$E = IR$$

So, if we know that our voltage is 120V and our current is 20A, we can calculate the resistance:

$$120 = 20 \times R$$

$$120/20 = 6$$

Therefore, our resistance is 6 ohms. Since the mathematical symbol for "ohm" is the Greek letter Omega, we write this answer as:

THE POWER EQUATION:

Describes the relationship between wattage, current, and voltage, where:

- **E** stands for voltage (or "electromotive force")
- **I** stands for current, and
- **P** stands for wattage (or "power")

Because of these symbols, the Power Equation is often referred to as the "PIE" formula:

$$P=IE$$

If, as in the above example, our voltage is 120V and our current is 20A, we can use the Power Equation to calculate the wattage:

$$P = 20 \times 120$$

$$20 \times 120 = 2400$$

...So our power is 2400W.

If, however, our voltage is 240V and our current is 10A, the equation looks like this:

$$P = 10 \times 240$$

$$10 \times 240 = 2400$$

...So our power is still 2400W.

The Power Equation is also known as the "West Virginia" formula, because it can also be expressed with these symbols:

$$W=VA$$