7-5 POWER

Power is defined as the rate of doing work (rate of energy availability), with units of watts (W). The symbol for power is "P."

In electrical terms, dc power is determined by multiplying the voltage (volts) times the current (amperes). For ac power, consideration must be given to the relationship between the voltage sine wave and the current sine wave. This will be discussed further in a future section of this text, so for this section assume that ac power is the same as dc power.

P (watts) = E (volts) × I (amps)

7-6 FORMULAS

There is a relationship between the pressure (volts), resistance (ohms), volume or current (amps) and power (watts) of a system. A change in any of these values will result in a change in other values. The relationship between these values can be expressed in the following formulas:

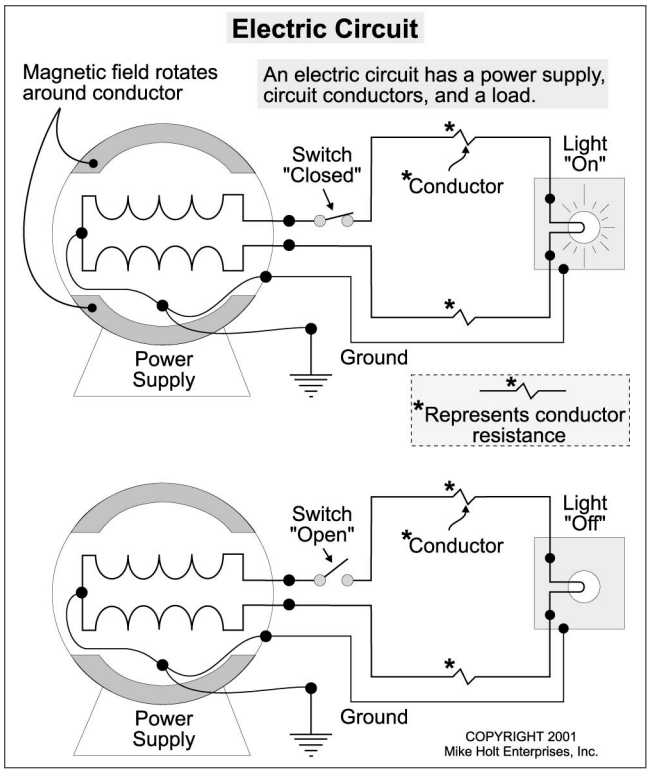

Figure 7-2

OHM'S LAW

• E = I × R Voltage = Current × Resistance

This equation can be rewritten to solve for the other variables:

• $I = \frac{E}{R}$ Current = $\frac{\text{Voltage}}{\text{Resistance}}$ = $\frac{\text{Voltage}}{\text{Current}}$

• $R = \frac{E}{I}$ Resistance

POWER EQUATION

• P = E × I Power = Voltage × Current

This equation can also be rewritten to solve for the other variables:

• $P = \frac{E^2}{R}$ Power = $\frac{\text{Voltage}^2}{\text{Resistance}}$

• $P = I^2 \times R$ Power = Current^2 × Resistance

The above power equations can be solved for any of the quantities in the equation. For example, $P = E^2 / R$ can be solved for "R," so that if the circuit power is known and the voltage is known, the circuit resistance can be solved for, by using $R = E^2 / P$. The same equation can also be solved for "E," so that if the circuit power is known and the resistance is known, the circuit voltage can be solved for, by using E = R × P. If the math seems difficult, it will be explained in the next chapter.

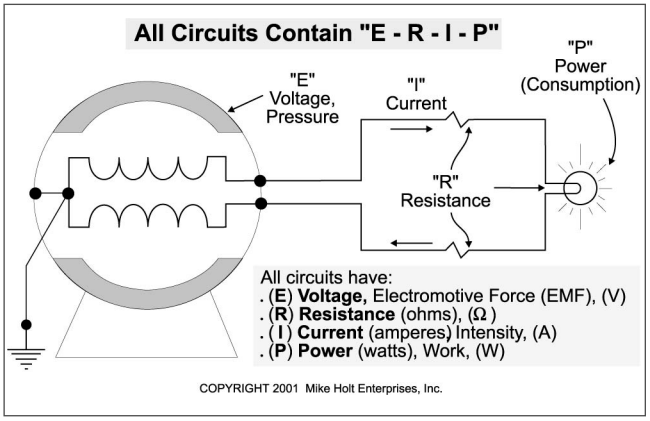

Figure 7-3