

SECTION 1

BASIC ELECTRICITY

INTRODUCTION

Knowing the various types of electrical systems used in modern household appliances will assist you with evaluating the appliance complaints caused by electrical system failures. This is an important key to the fundamental diagnostic process. As you work through this section, you will find that each topic is set up to provide you with:

- A definition of the system or component.
- An explanation of its operation.
- An example of how its function may be applied to an appliance overall operation.

The beginning of this section explains some of the basic electrical fundamentals. Exercises will be used to help in the learning process.

To prepare you for the basis of the content and exercises in this section, we will review some of these electrical fundamentals.

ELECTRICAL TERMS

The following is a list of electrical terms and definitions used throughout this section:

- Voltage:** Usually referred to as “Electromotive Force” (EMF). This force causes electrons to move from negative to positive.
- Current (Amperage):** A unit of measurement referring to the intensity, or amount of electrical force through a circuit.
- Direct Current (DC):** Current that flows only in one direction. DC current is used in the following applications:
- a) Mostly in low-voltage conditions.
 - b) Circuits that are conducted over relatively short distances.
 - c) Appliances with electronic controls.
- Alternating Current (AC):** Current that flows in both directions. AC current is used in the following applications:
- a) Low- and high-voltage conditions.
 - b) Circuits that are conducted over long distances.
 - c) Used to operate the main components in an appliance.
- Resistance:** The restriction to the flow of electricity in a circuit. Resistance is measured in ohms (Ω).
- Infinite Resistance** is so much resistance that current cannot flow through the circuit (“open” circuit).
- Zero Resistance** is no resistance and current can flow through the circuit (“closed” circuit).

Wattage:	The unit of measurement for power, or the work being done by electricity.
Load:	Component that converts electricity to heat, light, or motion. All loads restrict the flow of electricity while performing their work.
Conductor:	Material through which electricity can flow. It will usually be a copper wire, and sometimes the chassis, or metal frame, on which the components are mounted.
Short:	A circuit that offers no resistance to the current flowing through it. A direct short will cause a fuse to blow, or possibly start an electrical fire.
Shorted Switch:	A switch that offers no resistance to the flow of current through it. The switch may have a shorted contact.
Open Switch:	A switch that will not allow current to flow through it. The switch may have an open contact.
Shunt:	A bypass around a load that still offers resistance in the circuit for the flow of current.
Circuit:	A complete path through which electricity can travel.

OHM'S LAW

There is a fundamental relationship between voltage, amperage, and resistance in a closed functional circuit. This relationship is known as "Ohm's Law." Ohm's law states that:

- a) Current is directly proportional to the applied voltage.
- b) Current is inversely proportional to the circuit resistance.

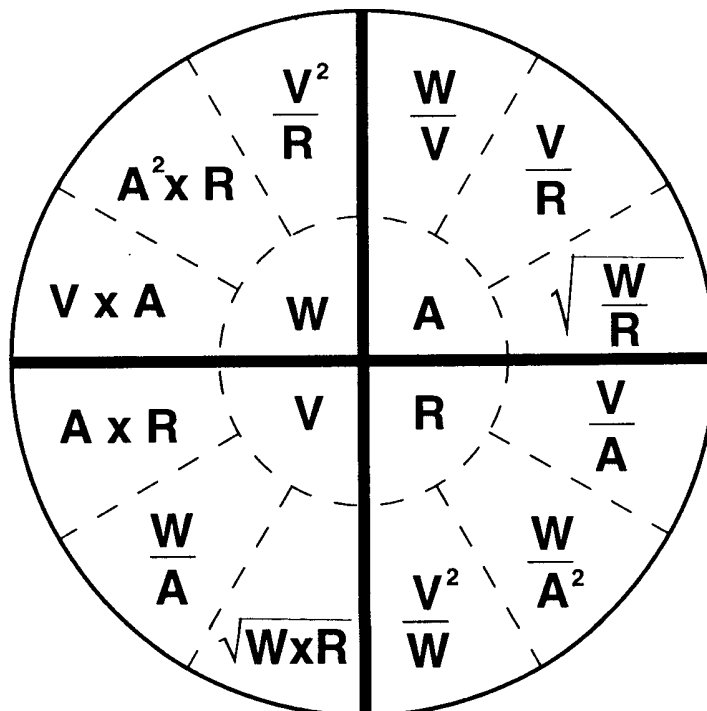
What this really means is:

- a) When the circuit voltage increases, the current increases.
- b) When the circuit voltage decreases, the current decreases.
- c) When the circuit resistance increases, the current decreases.
- d) When the circuit resistance decreases, the current increases.

This relationship can be expressed in the mathematical formulas shown in the illustration below. If two of the three values are known for a circuit, the third value can be found by using one of these formulas.

Wattage also has a direct relationship with the voltage, amperage, and resistance in the circuit. The formula wheel shows all the mathematical relationships these values have with each other.

V = Voltage
 R = Resistance
 A = Amperage
 W = Wattage



$V = A \times R$
 $R = V \div A$
 $A = V \div R$
 $W = V \times A$

PRACTICE EXERCISE 3

OHM'S LAW

1. If an electric range has four burners rated at 900-, 1500-, 1500-, and 2600-watts, a broil element rated at 2600-watts, and a bake element rated at 2400-watts, what is the amperage draw if the voltage is 240 volts?

Ohm's Law Formula: _____

Answer: _____ amps

2. Voltage applied to a circuit is 120 volts and the current flow is 20 amps. What is the resistance of the circuit?

Ohm's Law Formula: _____

Answer: _____