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## **ELECTRICAL MEASUREMENTS AND MULTIMETERS**

### **Introduction To Electrical Meters**

Electrical voltage, current, and resistance can be measured with electrical meters. A voltmeter measures voltage; an ammeter measures amperage (current); and an ohmmeter measures ohms of resistance.

All three of these meters are typically manufactured and combined into one meter called a “multimeter” – also called a digital multimeter (DMM), or a digital volt-ohmmeter (DVOM).

**A voltmeter must be connected across the part of a circuit that is being measured in a “parallel” manner.** It will read the voltage between two points in a live circuit. The voltage measured can be DC voltage or AC voltage.

**An ammeter must be connected “in series” into a circuit in order to measure the current running through the circuit.** In other words, an ammeter will briefly become a part of the circuit wiring in order to measure the current running through the circuit, unless a current clamp is used.

An ammeter should never be connected across a circuit in a “parallel” manner. The voltage would likely damage the ammeter. The current measured can be DC amperes or AC amperes.

**An ohmmeter is connected in parallel to a circuit or load device.** An ohmmeter measures the resistance present in an electrical circuit by injecting a very small amount of voltage into a circuit or load device through one of the probes.

The ohmmeter then uses the other probe to measure the amount of voltage that managed to travel all the way through the circuit. Micro-circuits inside the ohmmeter then calculate the resistance of the circuit based on the return voltage. The resistance that opposes the electrical flow in a circuit is measured in ohms.



*The Fluke 175 True-RMS multimeter. It comes with excellent instructions that help with understanding electrical testing.*

The ohmmeter only puts 0.6 to 0.75 volts through the circuit. No amps are put through the circuit. This is only 6/10'ths to 7.5 tenths of one volt. The circuit or load device that is being tested for resistance must be disconnected from power and must not have any current running through it.

Zero current or voltage should be running through the circuit, or the load device that is being tested for resistance. To be certain that a circuit is dead, it is a good idea to disconnect the battery before using the ohmmeter.

Never apply the test probes to a live circuit for resistance (ohm) testing. It will likely damage the ohmmeter if not completely destroy it.

Multimeters are constructed with either an analog readout or a digital readout. An analog multimeter has a needle pointer that moves along a



