

Electrical Measurements Primer

Using a Multimeter

- Multimeters:** common devices used to perform a variety of electrical measurements by selection of the function with one or two switches
 - While both analog and digital multimeters are available, digital multimeters are less expensive and more accurate. The range of expected values is selected, and the actual reading is determined by the “range scale” with the digit read from the face. For example, a reading of 2.35 on a 400 mA scale would be 2.35 mA. Take the prefix for the unit (milli, kilo...) and digits from the reading.
 - It is important that the probes are placed in the correct ports for the quantity being measured.
- ac vs. dc:** Choose the setting to correspond to the type of circuit.
 - ac values are rms values, and some older meters are accurate only for 60 Hertz signals.
- Potential Difference – Units are Volts:**
 - Voltage measurements can be made with the component in or out of the circuit. For example, batteries can be tested outside of the circuit.
 - When used to measure potential difference in a working circuit, place probes across the circuit element (probes on both sides). The potential difference is measured with the circuit turned on and operating.
 - Volt meters have very high resistance, so they will not alter the circuit they are analyzing.
- Current: Units are Amperes or Amps:**
 - The amp meter is placed in the circuit (i.e., in series with the circuit element that you want the current through).
 - Ammeters have very low resistance, so they alter the circuit as little as possible. The digital meters do not have the same “resistance” on all scales, and thus, this can be a problem for circuits with very small resistance values.
 - The language is “the current through that circuit element is _____.”
- Resistance: Units are Ohms:** Resistance is measured with the resistor **out of the circuit**.
 - Select resistance, place probes across the resistor, look at meter scale, and read the value. If you take too high a value, it may take a long time to register.