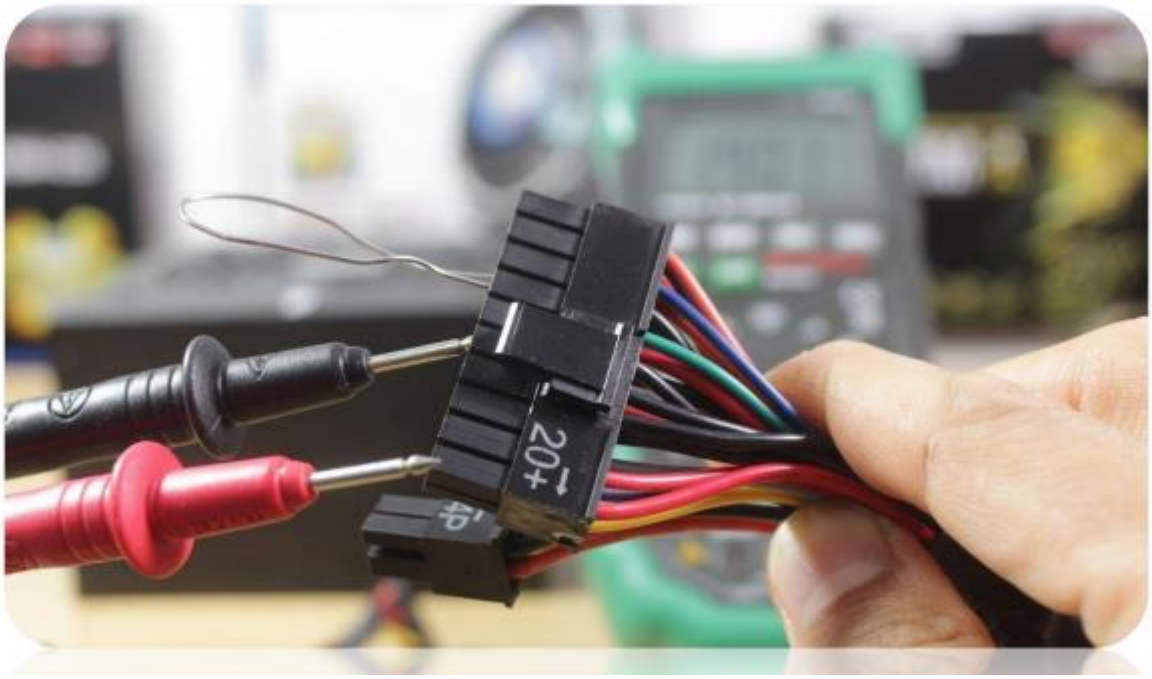
TESTING ELECTRONIC COMPONENTS



LEARNING OUTCOME 1

Determine the Criteria for Testing Electronics Components

OBJECTIVES

At the end of the lesson the learner shall be able to:

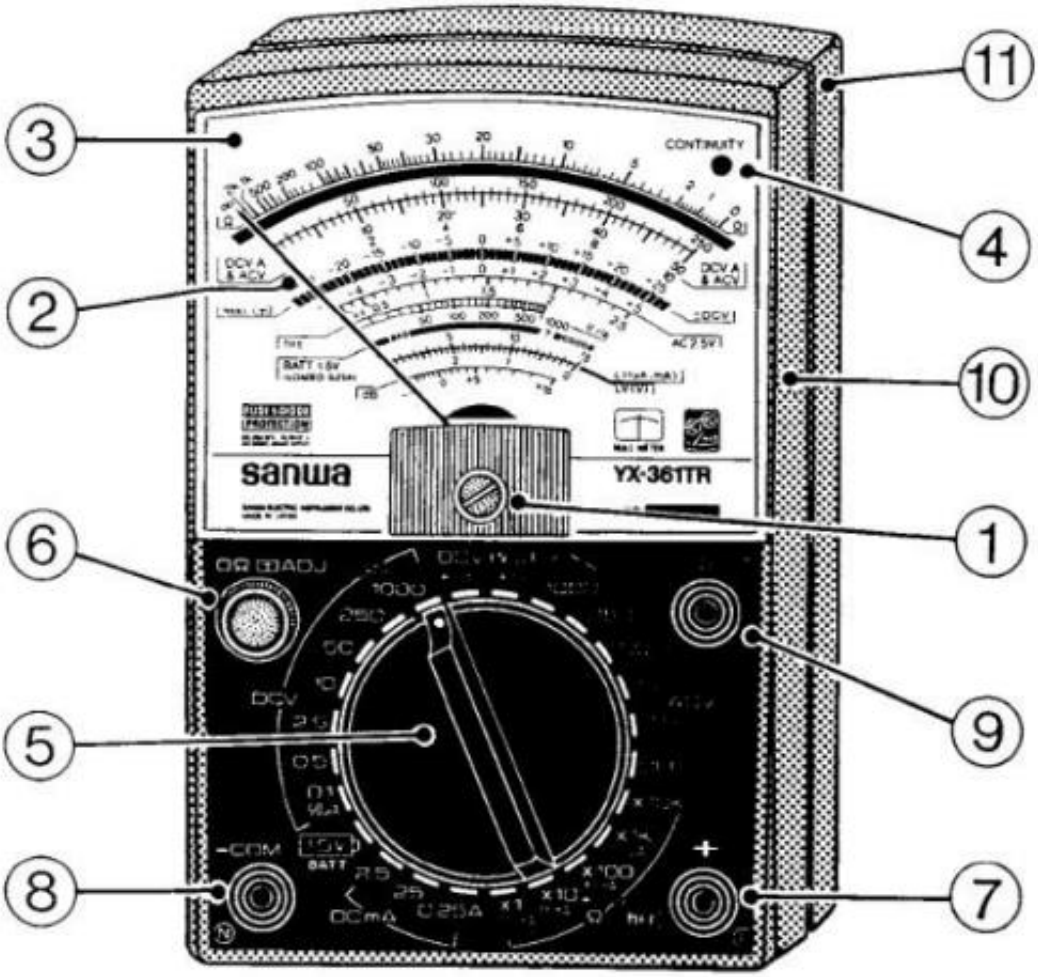
- Identify the multimeter;
- Use the multimeter; and
- Appreciate the importance of multimeter when troubleshooting the computer.

INFORMATION SHEET 1.1

What is an Analog Multimeter?

Sometimes called the VOM (voltmeter, multimeter, ohmmeter, milliammeter). It is the best instrument that can measure voltage, resistance and current. It is generally made of two types: the analog and the digital.

Multimeter Parts



1.) **Indicator Zero Connector / Zero Pointer Adjuster** - it is to set the zero position of the pointer.
2.) **Indicator Pointer -** The needle-shape rod that moves over the scale of a meter. It is mechanically connected to the moving coil. It indicates the measured values on the multimeter.
3.) **Indicator Scale -** is a series of marking used for reading the value of quantity.
4.) **Continuity Indicating –** it indicates if there is a presence of a complete path for current flow.
5.) **Range Selector Switch knob -** makes it possible to select different function and range of the meter.
6.) **Zero-ohms adjusting Knob -** used to zero-in the pointer before measuring resistance.
7.) **Measuring Terminal + -** for the red probe.
8.) **Measuring Terminal - COM** – for the black probe.
9.) **Series Terminal Capacitor OUTPUT**
10.) **Panel LED (CONTINUITY)**
11.) **Rear Case –** used to cover the multimeter.

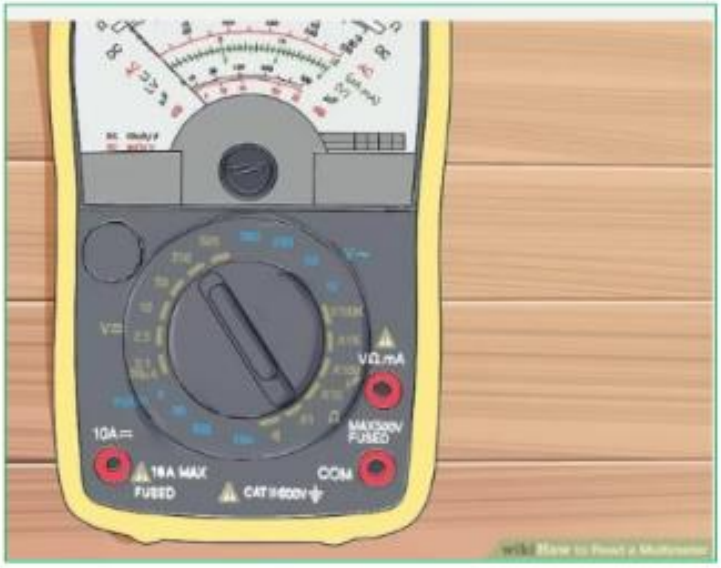
How to Read a Multimeter

Part 1
Reading the Dial Settings

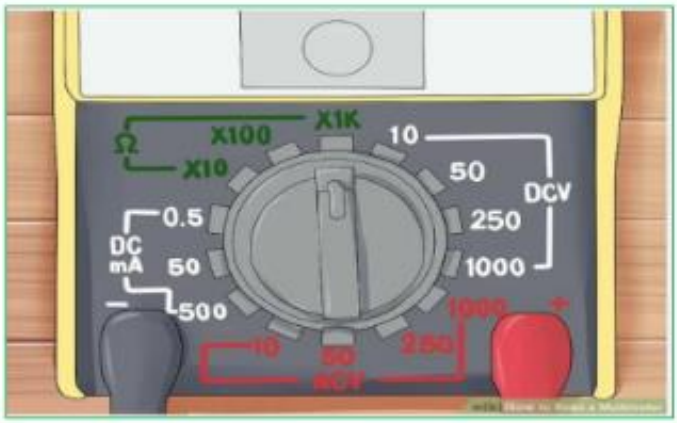
1. **Test AC or DC voltage.** In general, V indicates voltage, a squiggly line indicates alternating current (found in household circuits), and a straight or dashed line indicates direct current (found in most batteries). The line can appear next to or over the letter.
    - The power coming from most household circuits is AC. However, some devices may convert the power to DC through a transistor, so check the voltage label before you test an object.
    - The setting for testing voltage in an AC circuit is typically marked V~, ACV, or VAC.
    - To test voltage on a DC circuit, set the multimeter to V–, V⎓, DCV, or VDC.

2. **Set the multimeter to measure current.** Because current is measured in amperes, it is abbreviated A. Choose direct current or alternating current, whichever the circuit you are testing is made for. Analog multimeters typically do not have the ability to test current.
   - A~, ACA, and AAC are for alternating current.
   - A–, A---, DCA, and ADC are for direct current.

3. **Find the resistance setting.** This is marked by the Greek letter omega: **Ω**. This is the symbol used to denote ohms, the unit used to measure resistance. On older multimeters, this is sometimes labeled **R** for resistance instead.



4. **Use DC+ and DC-.** If your multimeter has this setting, keep it on DC+ when testing a direct current. If you aren't getting a reading and suspect you've got the positive and negative terminals attached to the wrong ends, switch to DC- to correct this without having to adjust the wires.



5. **Understand other symbols.** If you're not sure why there are multiple settings for voltage, current, or resistance, read the troubleshooting section for information on ranges. Besides these basic settings, most multimeters have a couple additional settings. If more than one of these marks is next to the same setting, it may do both simultaneously, or you may need to refer to the manual.

- **)))** or a similar series of parallel arcs indicates the "continuity test." At this setting, the multimeter will beep if the two probes are electrically connected.[4]
- A right-pointing arrow with a cross through it marks the "diode test," for testing whether one-way electrical circuits are connected.[5]
- **Hz** stands for Hertz, the unit for measuring the frequency of AC circuits.[6]
- **–|(–** symbol indicates the capacitance setting.

6. Read the port labels. Most multimeters have three ports or holes. Sometimes, the ports will be labeled with symbols that match the symbols described above. If these symbols are unclear, refer to this guide:

- The black probe always goes into the port labeled **COM** for common (also called the ground. (The other end of the black lead always connects to the negative terminal.)
- When measuring voltage or resistance, the red probe goes into the port with the smallest current label (often **mA** for milliamps).
- When measuring current, the red probe goes into the port labeled to withstand the amount of expected current. Typically, the port for low-current circuits has a fuse rated to **200mA** while the high-current port is rated to **10A**.

Part 2: Reading an Analog Multimeter Result

1. **Find the right scale on an analog multimeter.** Analog multimeters have a needle behind a glass window, which moves to indicate the result. Typically, there are three arcs printed behind the needle. These are three different scales, each of which is used for a different purpose:[9]
    - The Ω scale is for reading resistance. This is typically the largest scale, at the top. Unlike the other scales, the 0 (zero) value is on the far right instead of the left.
    - The "DC" scale is for reading DC voltage.
    - The "AC" scale is for reading AC voltage.
    - The "dB" scale is the least used option. See the end of this section for a brief explanation.

2. **Make a voltage scale reading based on your range.** Look carefully at the voltage scales, either DC or AC. There should be several rows of numbers beneath the scale. Check which range you have selected on the dial (for example, 10V), and look for a corresponding label next to one of these rows. This is the row you should read the result from.

3. **Estimate the value between numbers.** Voltage scales on an analog multimeter work just like an ordinary ruler. The resistance scale, however, is logarithmic, meaning that the same distance represents a different change in value depending on where you are on the scale. The lines between two numbers still represent even divisions. For example, if there are three lines between "50" and 70," these represent 55, 60, and 65, even if the gaps between them look different sizes.

4. **Multiply the resistance reading on an analog multimeter.** Look at the range setting that the dial of your multimeter is set to. This should give you a number to multiply the reading by. For example, if the multimeter is set to **R x 100** and the needle points to 50 ohms, the actual resistance of the circuit is 100 x 50 = 5,000.

5. **Find out more about the dB scale.** The "dB" (decibel) scale, typically the lowest, smallest one on an analog meter, requires some additional training to use. It is a logarithmic scale measuring the voltage ratio (also called gain or loss).[10] The standard dBv scale in the US defines 0dbv as 0.775 volts measured over 600 ohms of resistance, but there are competing dBu, dBm, and even dBV (with a capital V) scales.