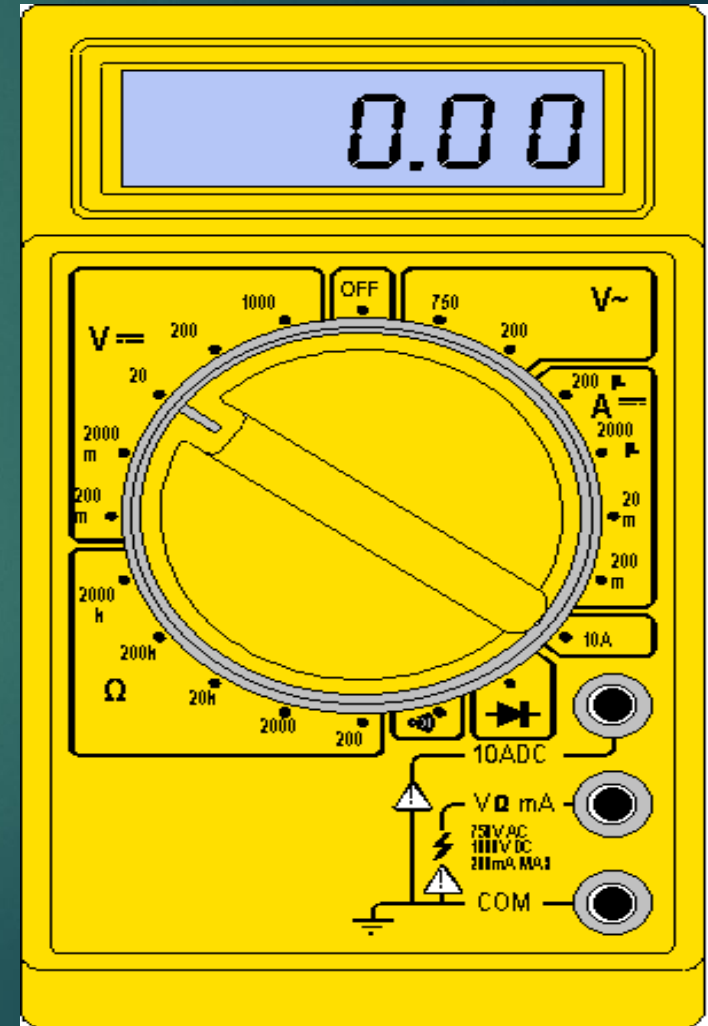


**PROGRAMME: ICP
CENTRE: POINT FORTIN GVC
COURSE: ELECTRICAL INSTALLATION LEVEL # 1
INSTRUCTOR: MASLYN VERNE MENDEZ**

Use electrical/electronic measuring devices

(Walton, 2022)



VIDEO ON HOW TO USE MULTIMETERS

<https://www.youtube.com/watch?v=P2XW49F12n4>

https://www.youtube.com/watch?v=r_migcta_ls

LESSON OBJECTIVE

At the end of this lesson, the trainees will be able to:

- Identify what a multimeter is.
- List the different types of multimeters
- Appreciate the main purpose of a multimeter.
- Learn the different symbols on a multimeter.
- Explain the difference between the analogue and digital multimeters.

LESSON OBJECTIVE CONTINUED

- Identify the functions of a multimeter.
- Identify the advantages of the DMMs.
- Identify the disadvantages of the DMMs.
- Identify the disadvantages of VOMs.
- Identify the advantages of the VOMs

LESSON OBJECTIVE CONTINUED

- Describe how to measure current using an ammeter.
- Describe how to connect an ammeter into a circuit.
- Describe how a voltmeter is used in a circuit.
- Discuss how an ammeter is used in a circuit.
- Describe how an ohmmeter is used for measuring resistance.

What is a Multimeter?

- ▶ A **multimeter** is a device used to measure voltage, resistance and current in electronics & electrical equipment
- ▶ It is also used to test continuity between 2 points to verify if there is any breaks in circuit or line
- ▶ There are two types of multimeter Analog & Digital
 - ▶ Analog has a needle style gauge
 - ▶ Digital has a LCD display (**Referenced during this PPT**)

INTRODUCTION TO METERS



Analog meter

- Uses a graduated scale with a pointer.

Digital meter

- Provides a reading in numbers.
- More accurate than analogue meters.

TYPES OF METERS

Digital Multimeter

Analogue Multimeter



Digital Multimeter

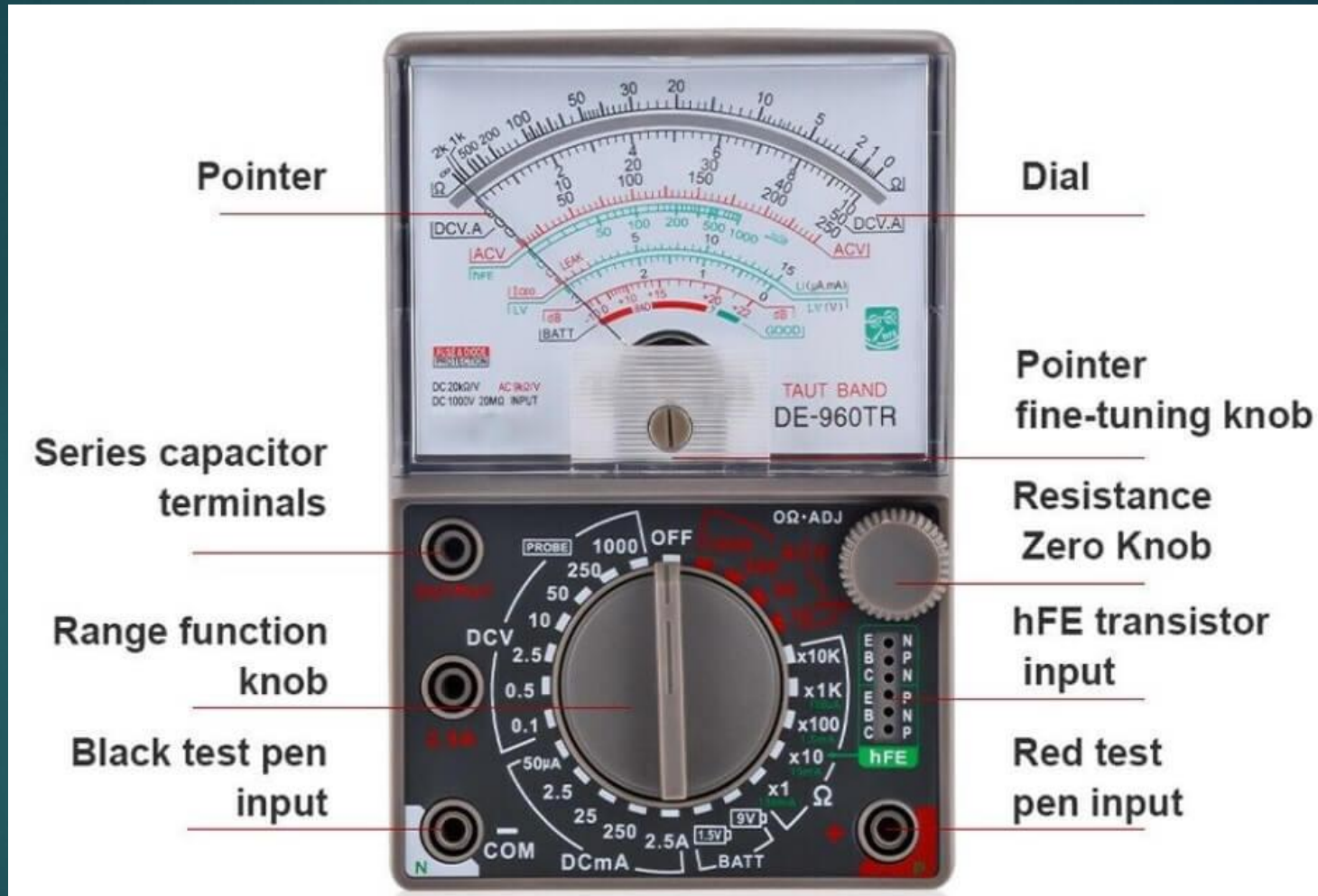
VS



Analog Multimeter

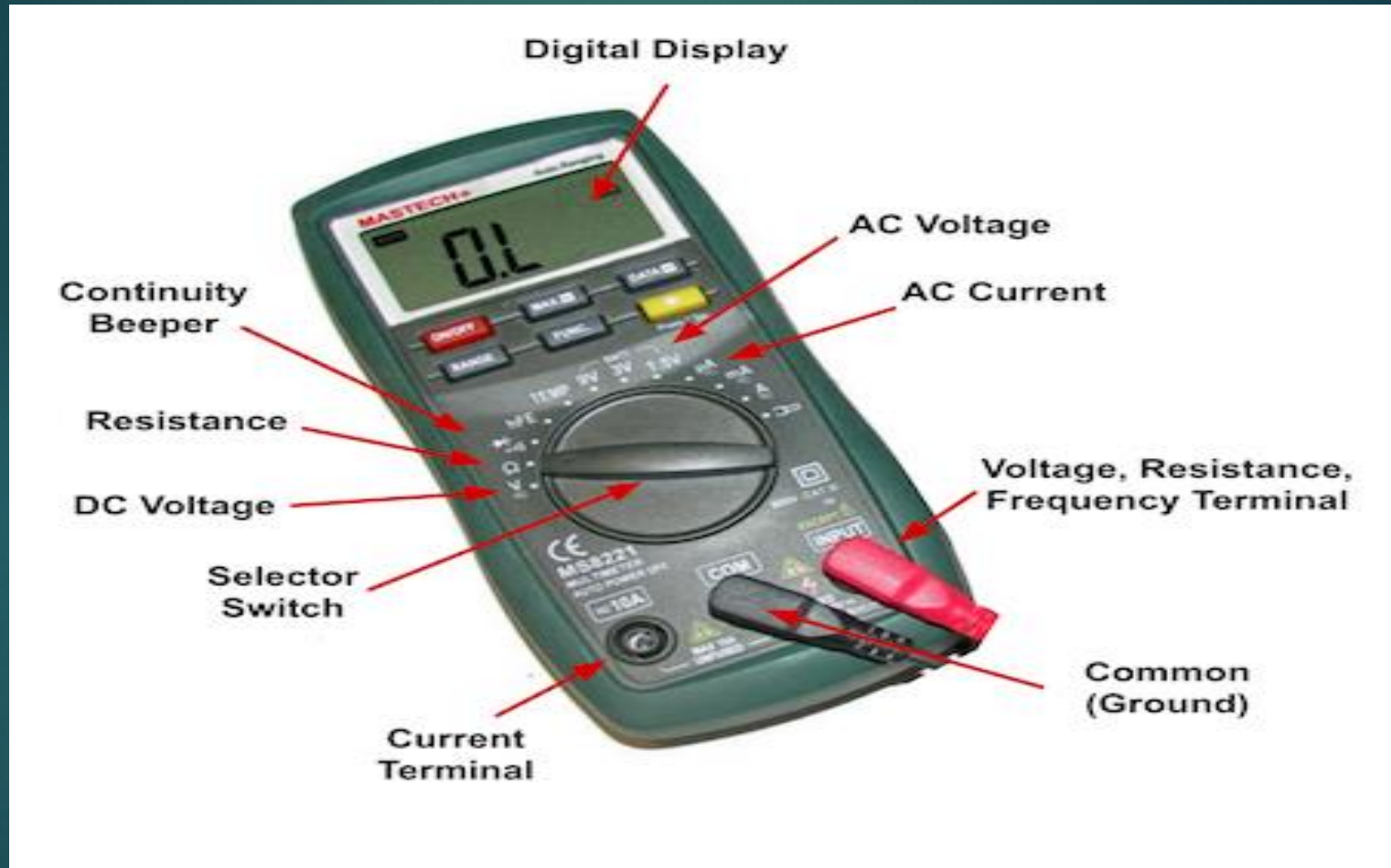
(Sisco, n.d.)

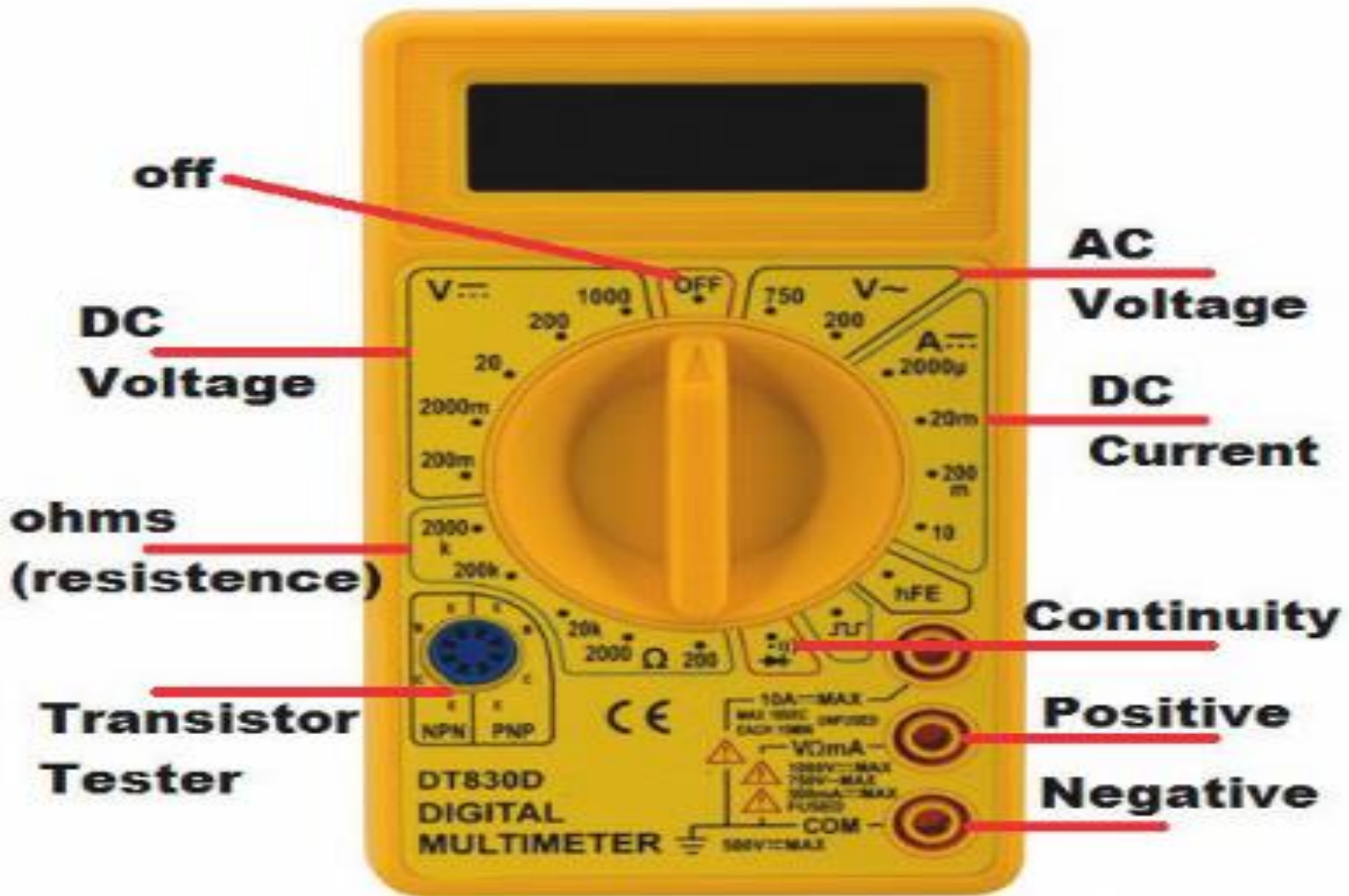
ANALOGUE MULTIMETER



(Ariat-Tech.com, n.d.)

DIGITAL MULTIMETER





CLAMP MULTIMETER



(Amazon, n.d.)

Multimeters

- ▶ **Multimeter**
- ▶ **Combines a voltmeter, ammeter, and ohmmeter into one package**
- ▶ **VOM (volt-ohm-milliammeter)**
- ▶ **An analog multimeter that measures volts, ohms, and milliamperes**
- ▶ **DMM**
- ▶ **A digital multimeter**

ADVANTAGE OF ANALOGUE MULTIMETER

Advantages of an analogue multimeter are:

- Cheaper than digital meters.
- The responsiveness of an analogue multimeter is pretty quick.
- Another good thing about an analogue multimeter is that it does not require any power source/ battery, except when you need to measure resistance.

DISADVANTAGE OF ANALOGUE MULTIMETERS

Disadvantages of an analogue meter are:

- **Lower accuracy:** The main disadvantage of these multimeters is their limited accuracy.
- **Fragile:** In an analogue multimeter, a magnetic field activates the needle. The magnetic field causes the needle to rotate. This delicate mechanism can get damaged if you accidentally drop the multimeter. It can also stop working if you use the multimeter for years.

ADVANTAGE OF A DIGITAL MULTIMETER

Advantages of a digital multimeter are:

- They are more accurate than analogue multimeters.
- They reduce reading and interpolation errors.
- Parallax errors are eliminated. If the pointer of an analogue multimeter is viewed from a different angle, you will see a different value. This is a parallax error. A digital multimeter's numerical display solves this problem

ADVANTAGE OF A DIGITAL MILTIMETER

- Accuracy is increased due to digital readout. You can make mistake in reading the scale in analogue multimeter, but digital multimeters have a LCD display to show accurate reading.
- DMMs can be used in testing continuity, capacitors, diodes and transistors. More advanced digital multimeters can also measure frequency.
- They have very high input impedence.
- Portable size makes it easy to carry anywhere.

DISADVANTAGE OF A DIGITAL MULTIMETER

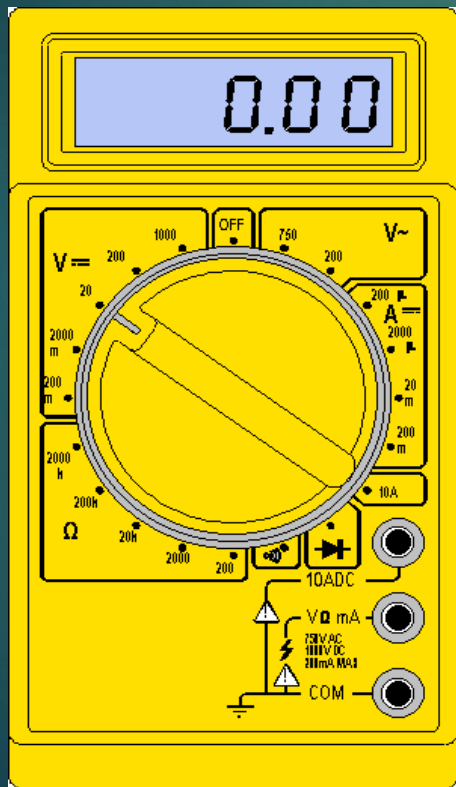
Disadvantages of a digital multimeter are:

- The LCD display depends on a battery or external power source. When the battery is low, the display will be dim, making it difficult to read.
- In case of fluctuations or transients, it can record an error.
- They are expensive due to high manufacturing cost.
- There is a voltage limitation. If it is increased beyond the limit, the meter will be damaged.
- Warming of the meter during its use can change its properties leading to errors in measured value.

There are 2 styles of Multimeters

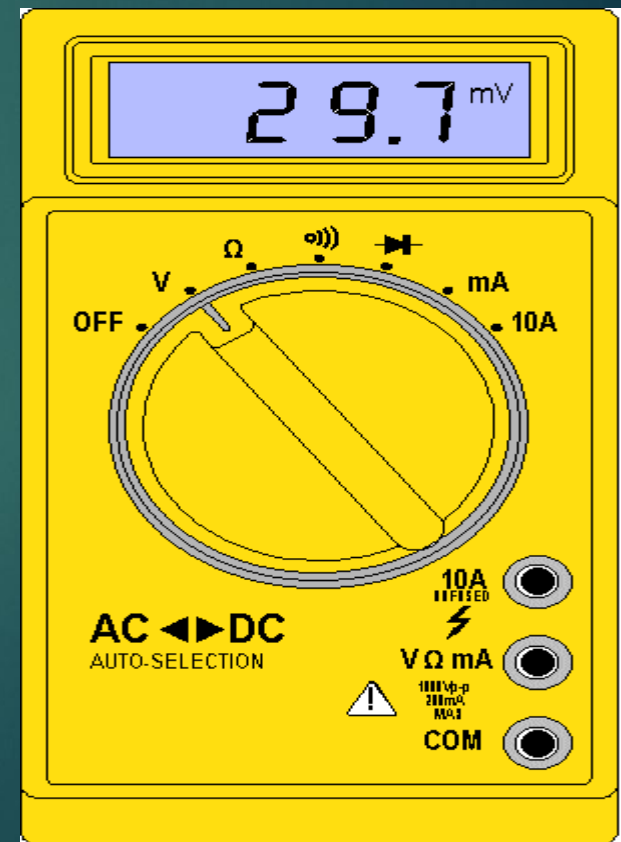
Switched

Manually switch between ranges to get most accurate reading.



Auto Range

Switches between ranges automatically for best reading.



Both of these styles work the same

(Walton, 2022)

Meter leads

- **Red** meter lead

Is connected to Voltage/Resistance or amperage port

Is considered the positive connection

- **Probes**

Are the handles used to hold tip on the tested connection

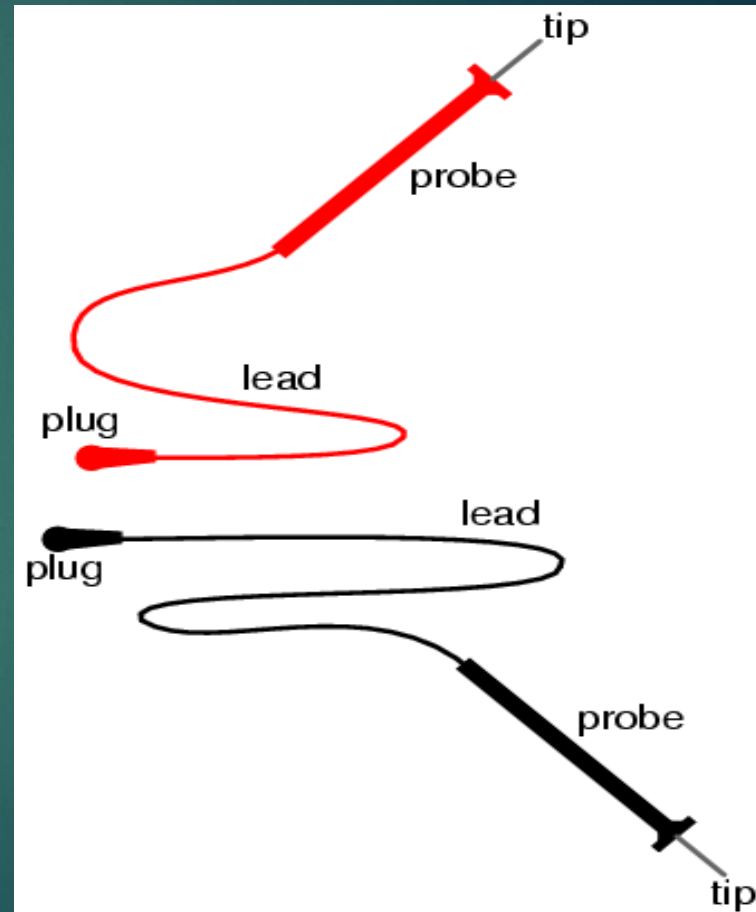
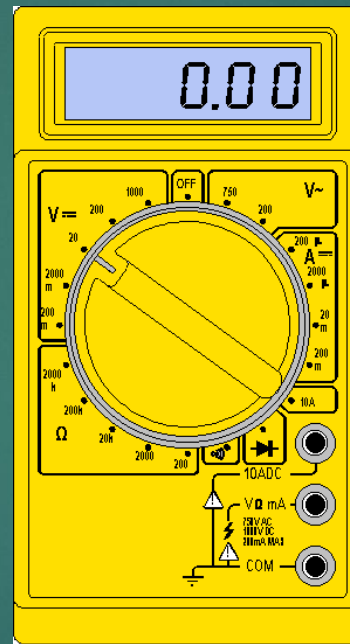
- **Tips**

Are at the end of the probe and provides a connection point

- **Black** meter lead

Is always connected to the common port

Is considered the negative connection



(Walton, 2022)

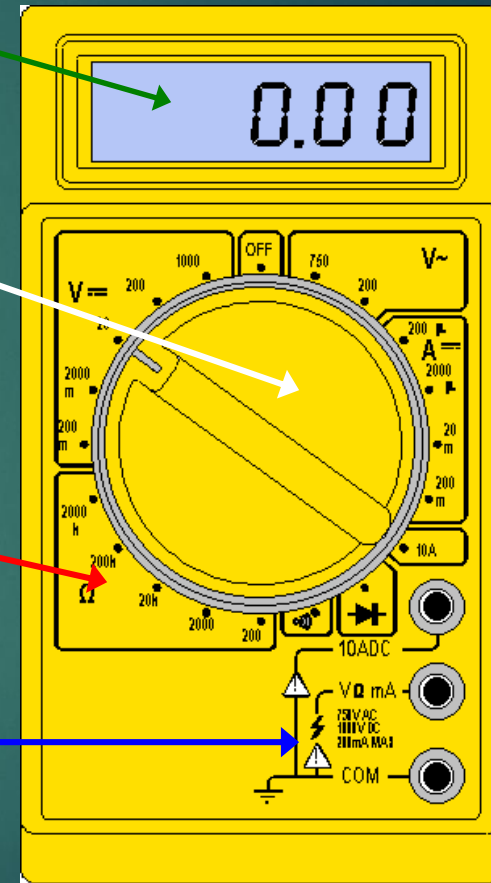
Display & Dial Settings

- **Digital Display**
Shows measured value.

- **Meter Dial**
Turn dial to change functions.
Turn dial to OFF position after use.




- **Panel Indicator**
Shows each function and
setting range to turn dial to.

- **Probe Connections**
Specific for each function.



(Walton, 2022)

Common DMM Symbols

~	AC Voltage		Ground
---	DC Voltage		Capacitor
Hz	Hertz	μF	MicroFarad
+	Positive	μ	Micro
-	Negative	m	Milli
Ω	Ohms	M	Mega
	Diode	K	Kilo
•)))	Audible Continuity	OL	Overload

These symbols are often found on multimeter and schematics.

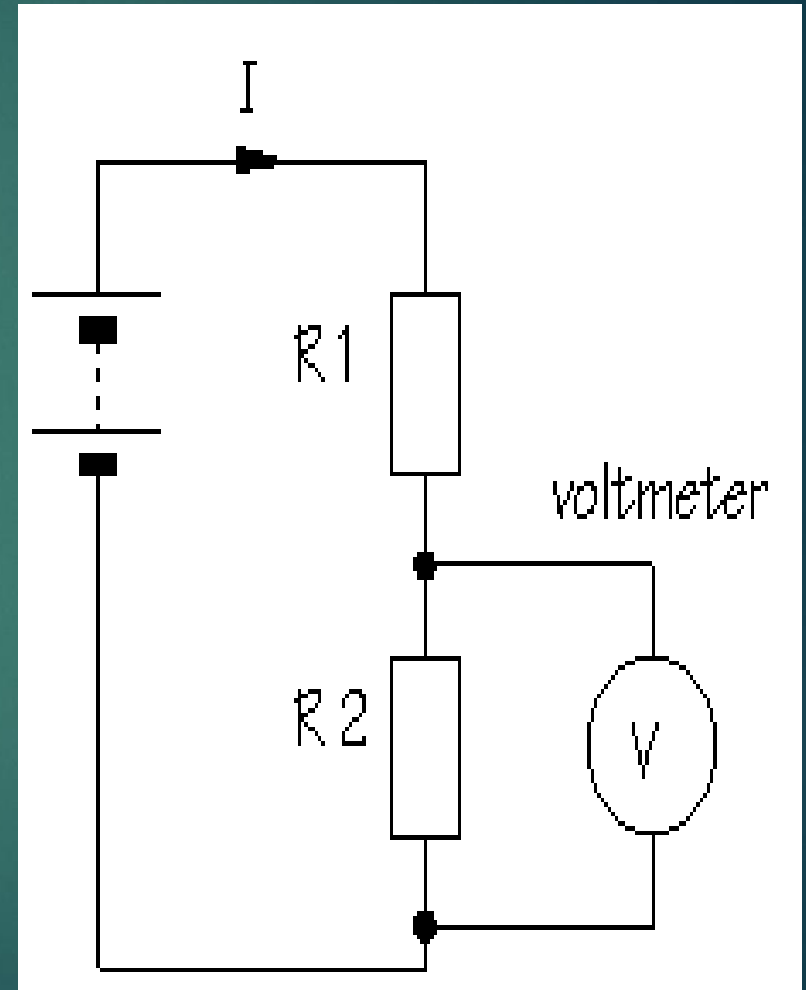
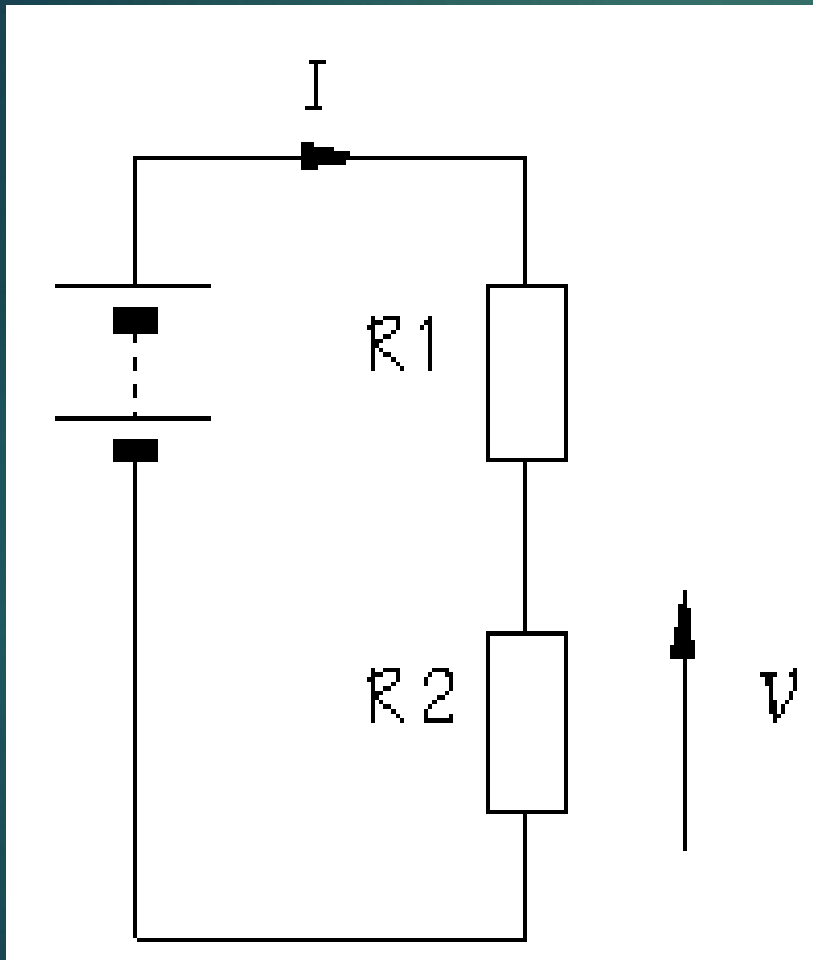
They are designed to symbolize components and reference values.

(Slideshare, n.d.)

Measuring Voltage

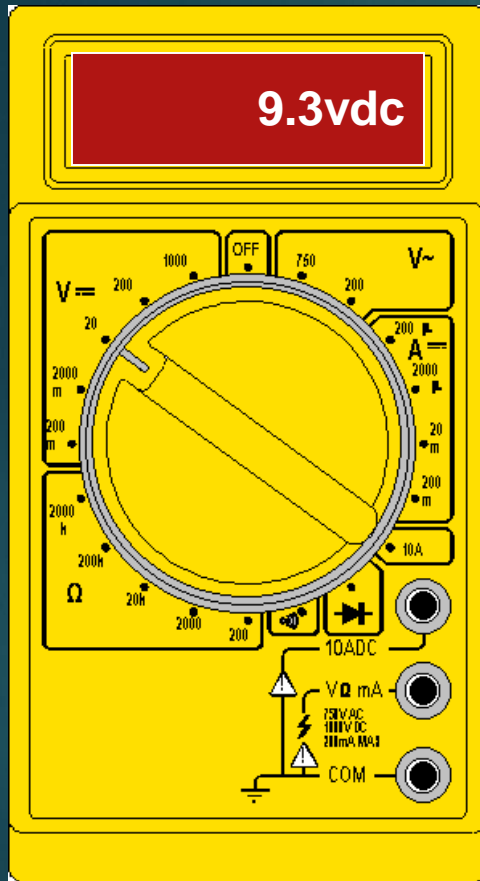
- ▶ Voltage (V) is the unit of electrical pressure; one volt is the potential difference needed to cause one amp of current to pass through one ohm of resistance
- ▶ Voltage is broke up into 2 sections AC & DC
 - ▶ **Alternating Current (AC)** is house voltage (110vac)
 - ▶ **Direct Current (DC)** is battery voltage (12vdc)
- ▶ On switched meters use one value higher than your expected value
- ▶ Be very careful to not touch any other electronic components within the equipment and do not touch the tips to each other while connected to anything else
- ▶ To measure voltage connect the leads in parallel between the two points where the measurement is to be made. The multimeter provides a parallel pathway so it needs to be of a high resistance to allow as little current flow through it as possible

Measuring Voltage

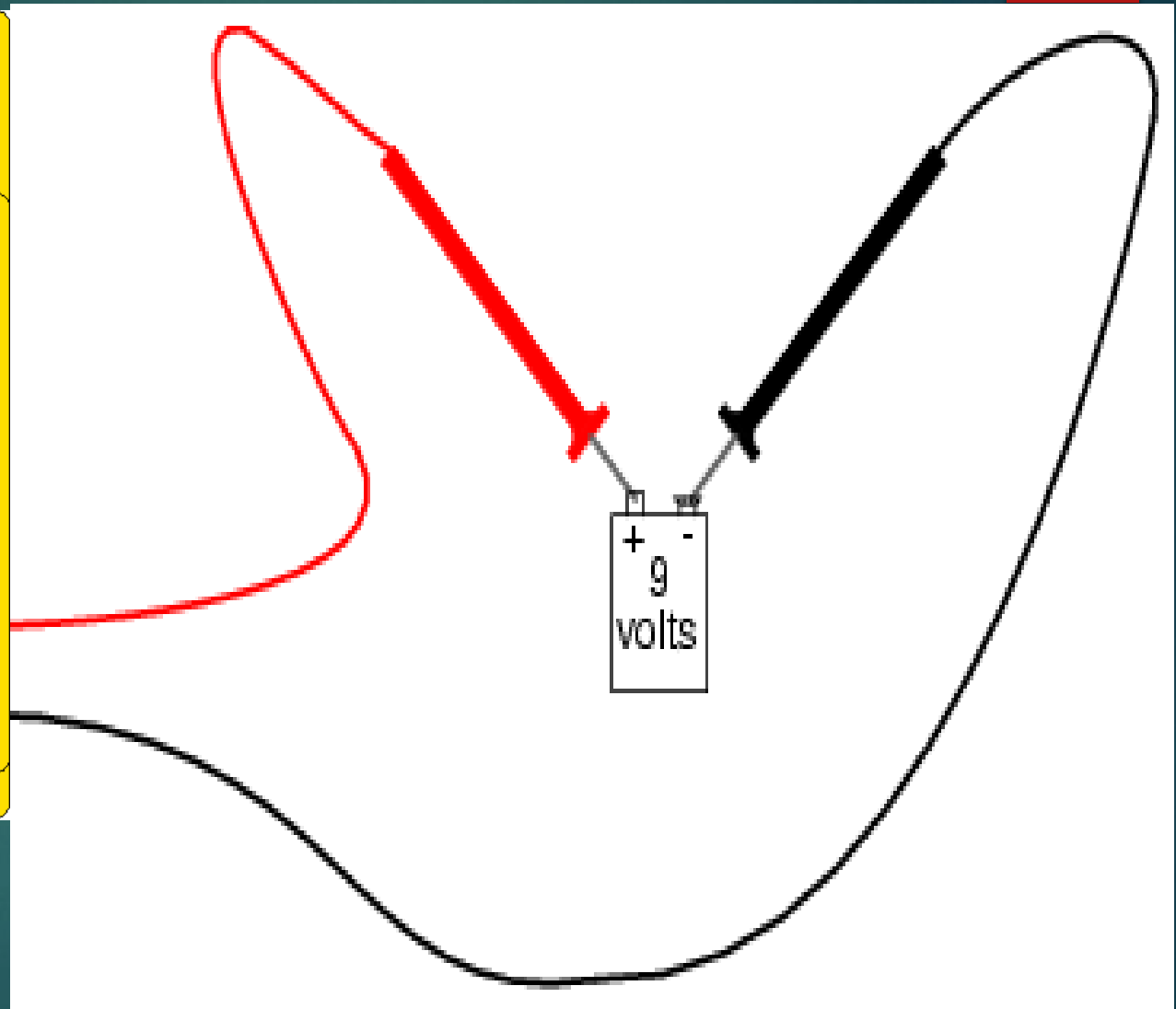


(Walton, 2022)

Measuring Voltage



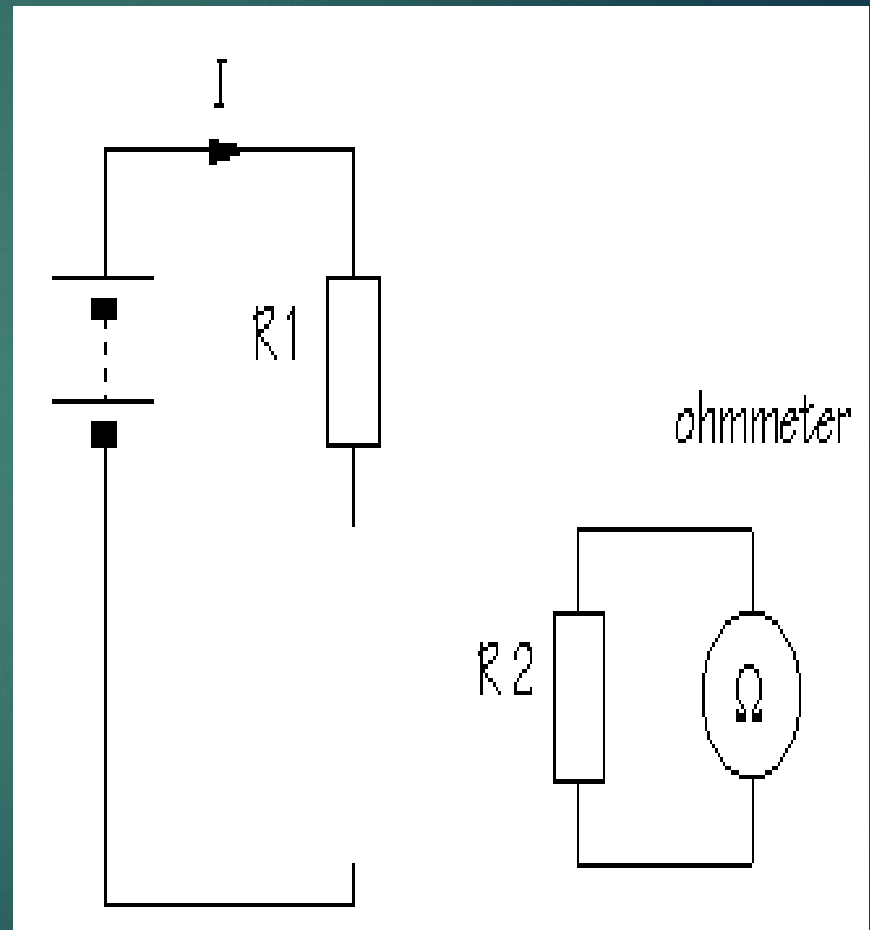
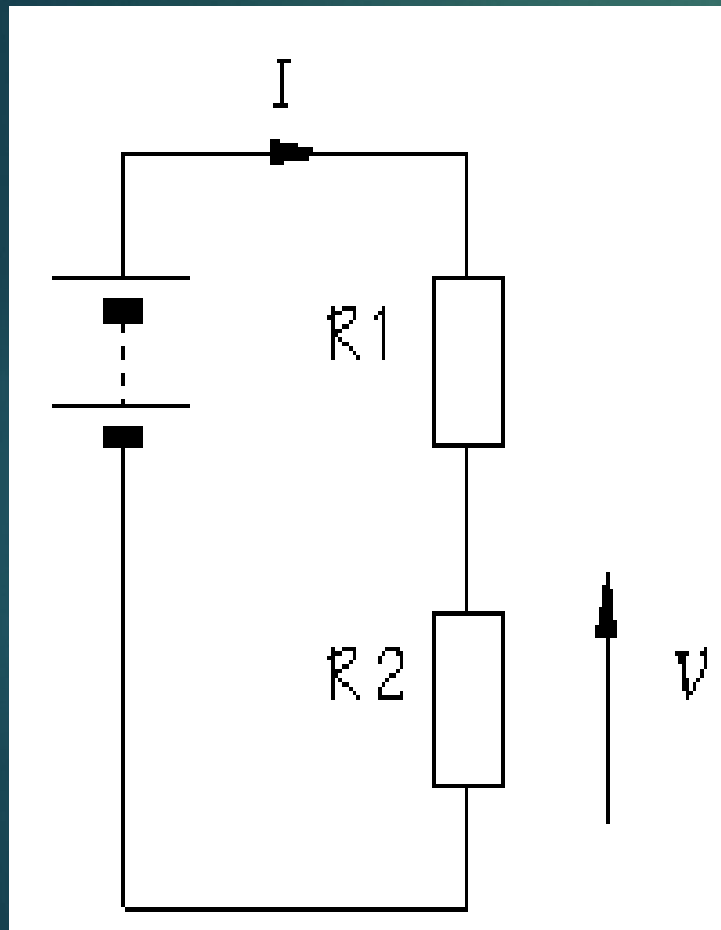
(Walton, 2022)



Measuring Resistance and Continuity

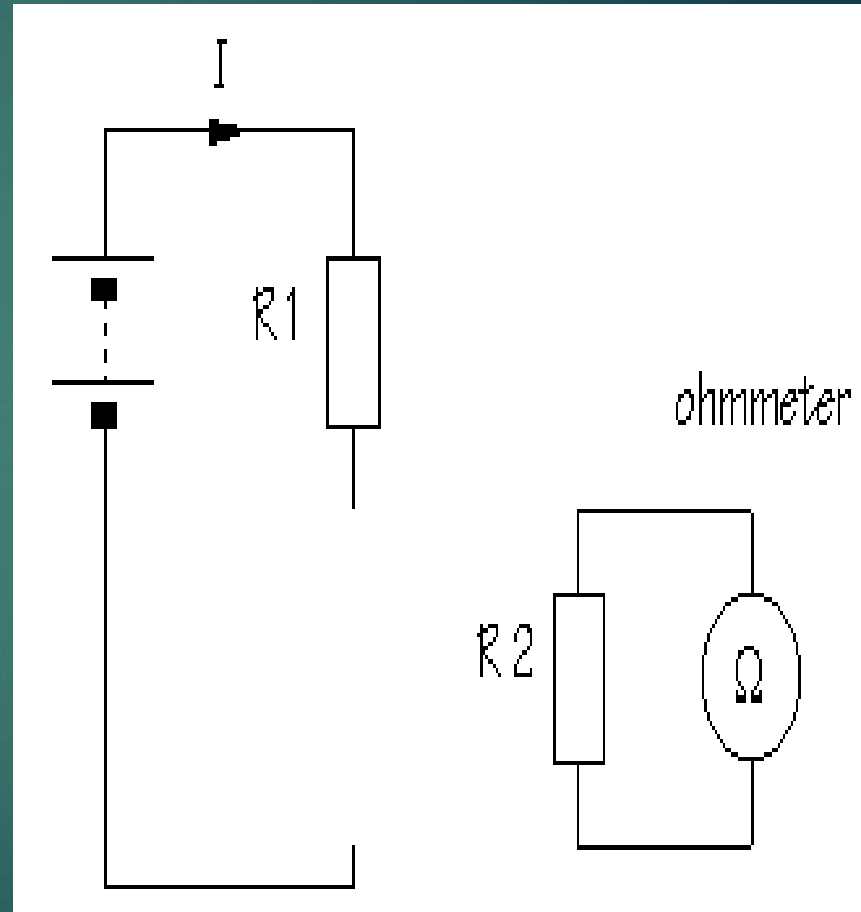
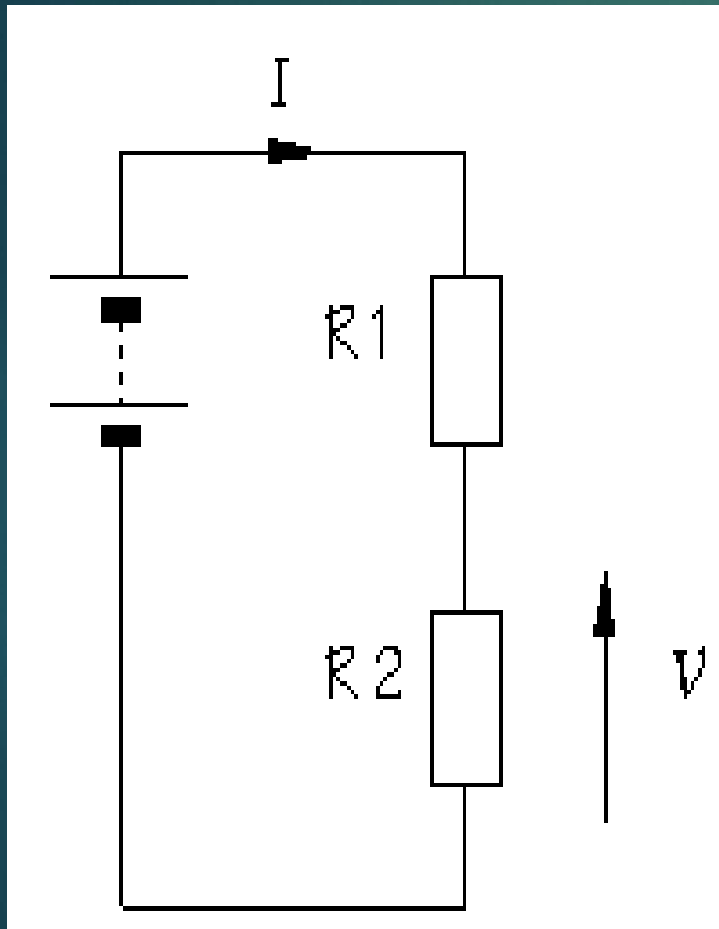
- ▶ Resistance (Ω) is the opposition to current
- ▶ Resistance is measured in Ohm's
- ▶ Disconnect power source before testing
- ▶ Remove component or part from system before testing
- ▶ Measure using lowest value, if OL move to next level
- ▶ Testing for continuity is used to test to verify if a circuit, wire or fuse is complete with no open
- ▶ Audible continuity allows an alarm if circuit is complete
- ▶ If there is no audible alarm resistance of 1ohm to .1ohm should be present (Slideshare, n.d.).

Measuring Resistance



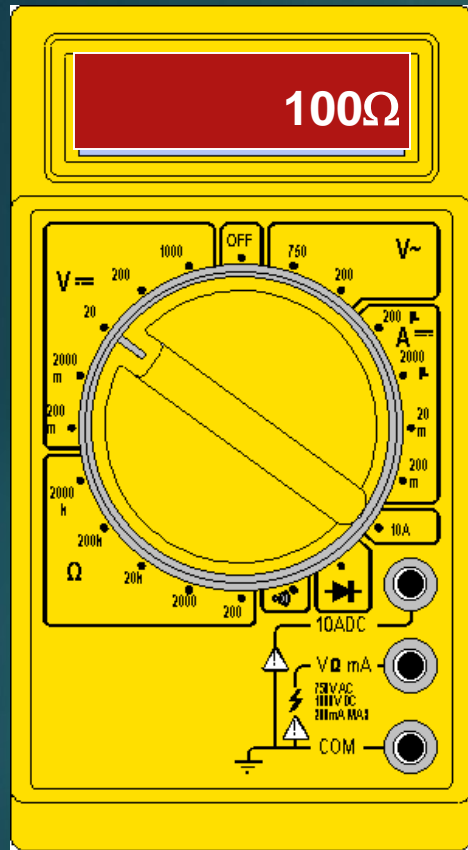
(Walton, 2022)

Measuring or Testing Continuity

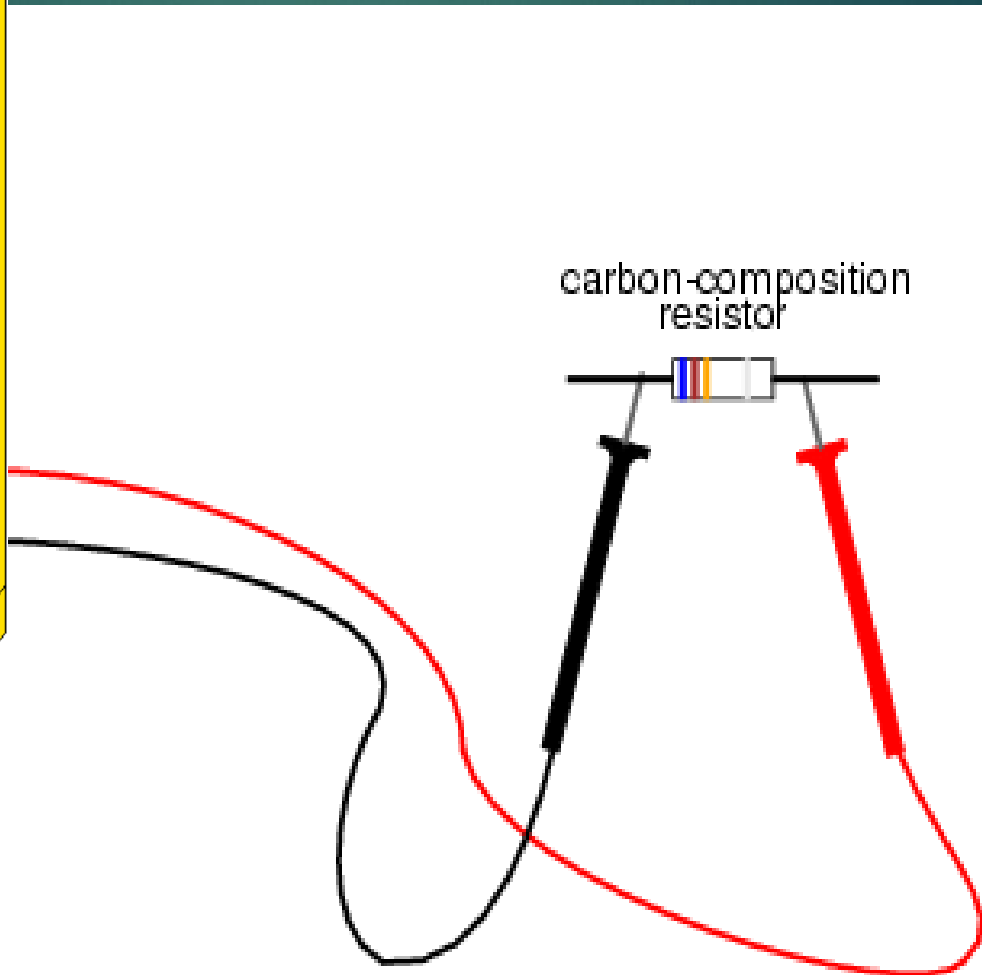


(Walton, 2022)

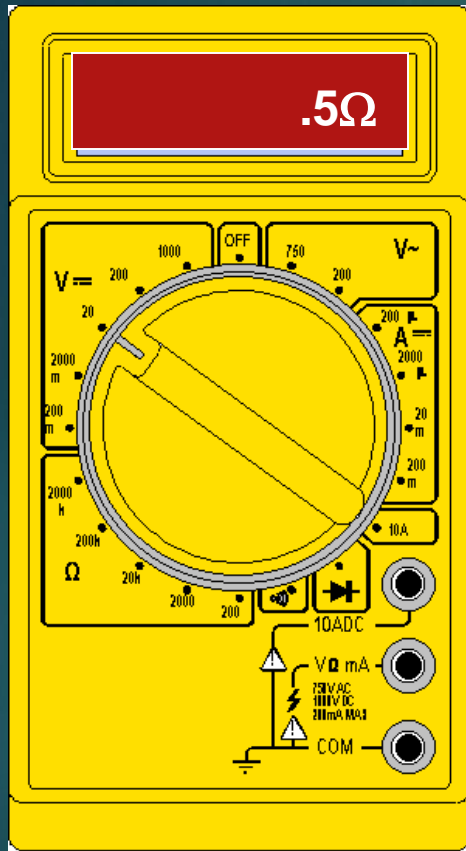
Measuring Resistance



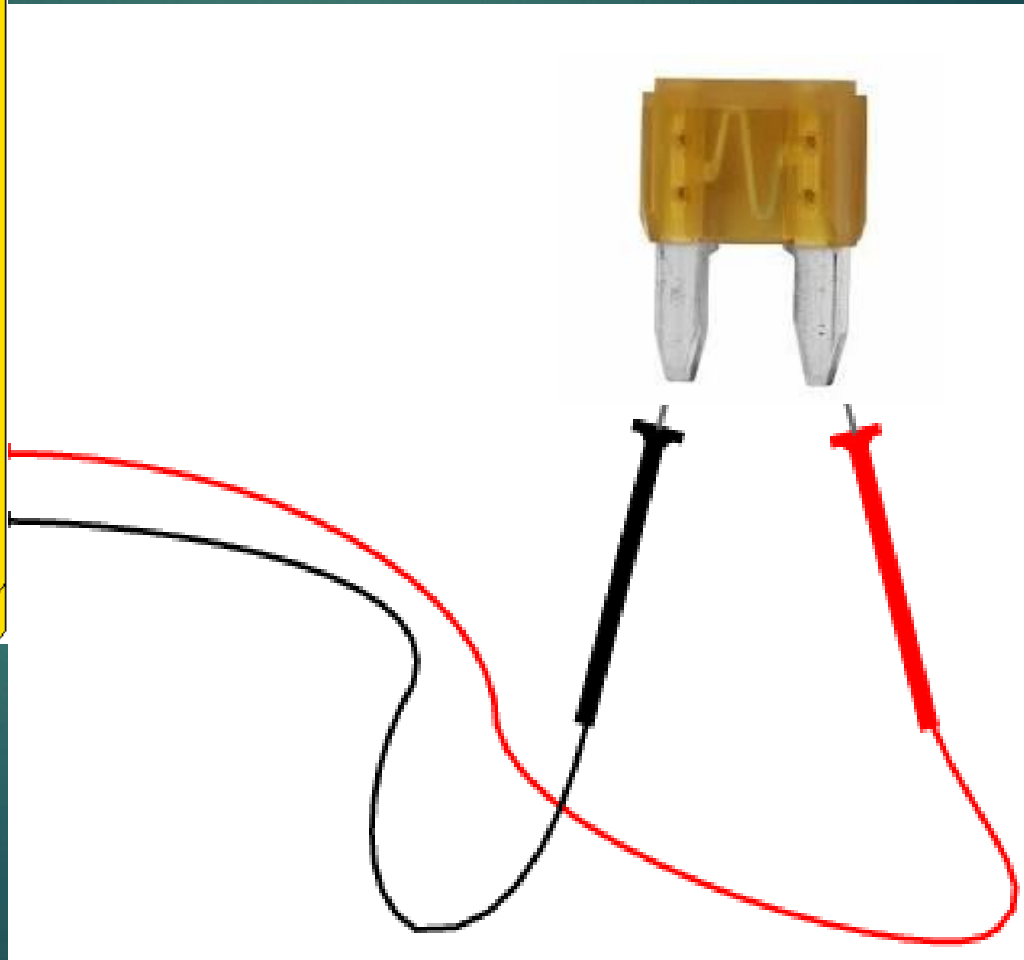
(Walton, 2022)



Measuring Continuity



(Walton, 2022)

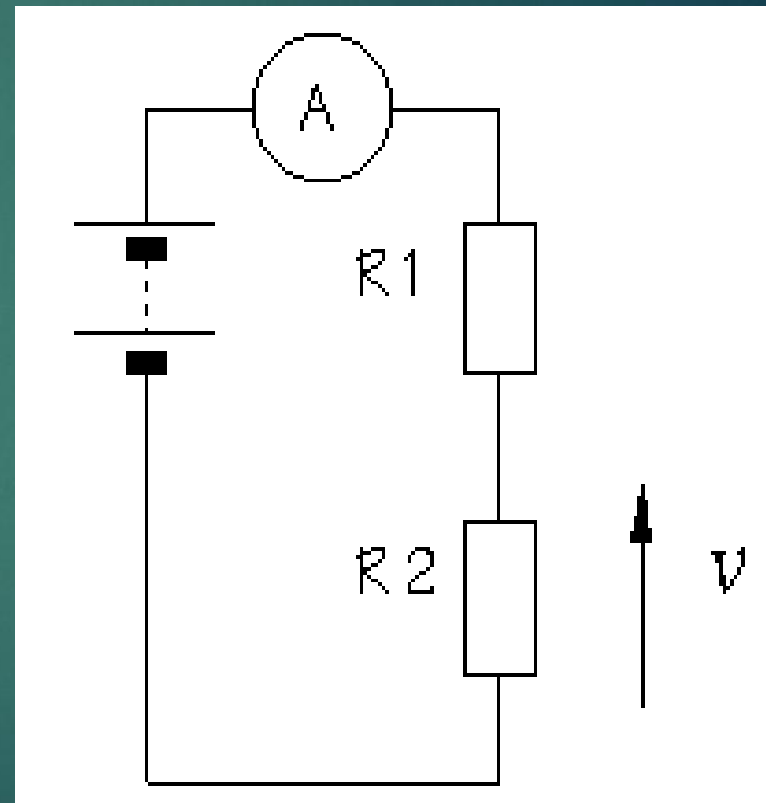
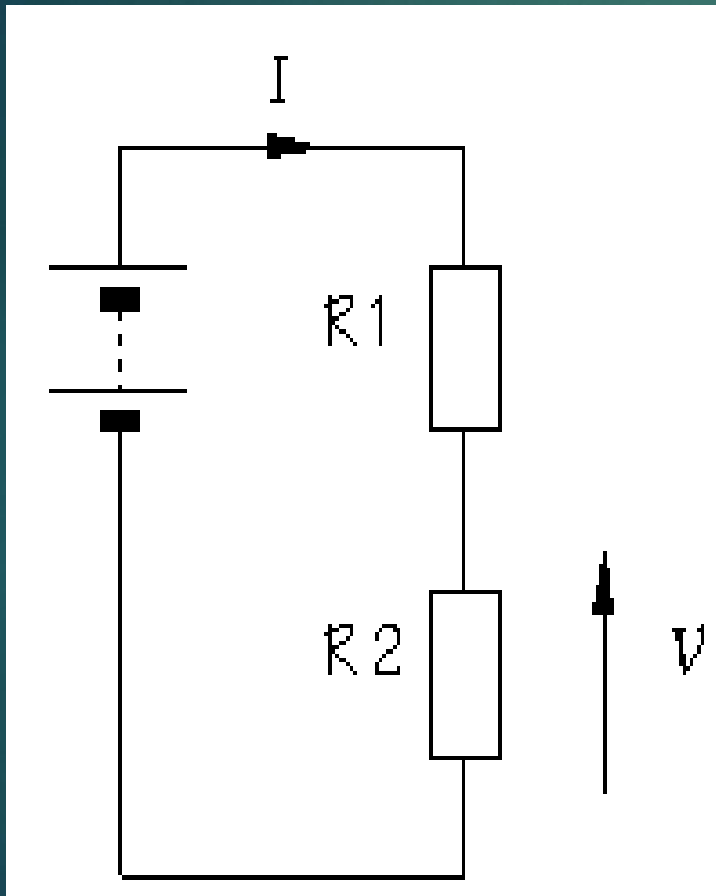


(Eaton, n.d.)

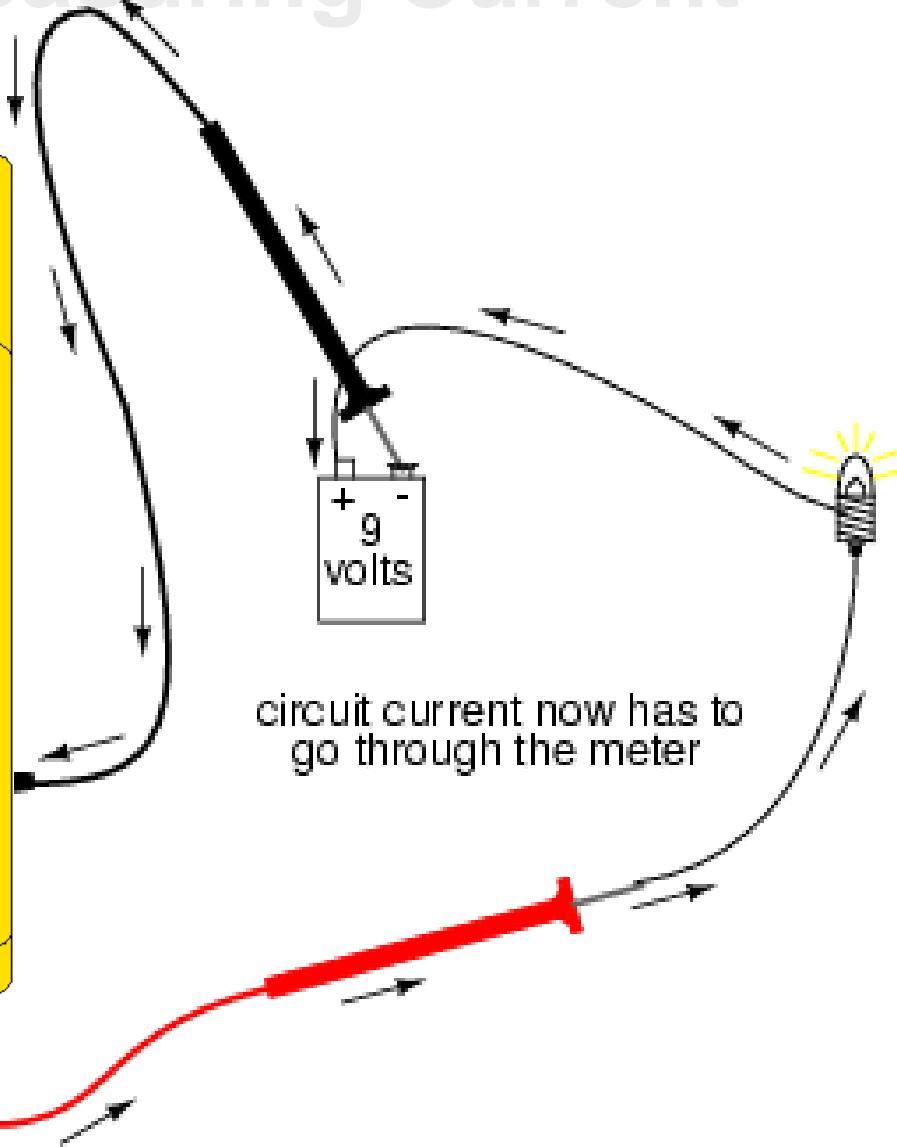
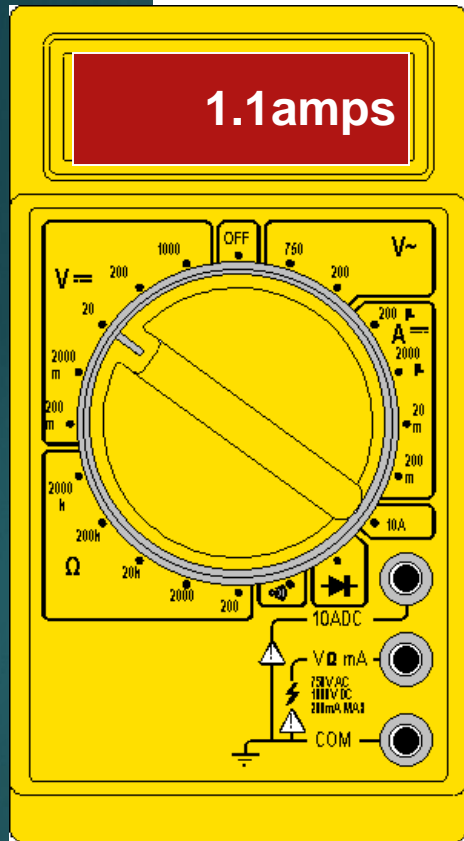
Measuring Current

- ▶ **Current (amps) is the flow of electrical charge through a component or conductor**
- ▶ **Current is measured in amps or amperes**
- ▶ **Disconnect power source before testing**
- ▶ **Disconnect completed circuit at end of circuit**
- ▶ **Place multimeter in series with circuit**
- ▶ **Reconnect power source and turn ON**
- ▶ **Select highest current setting and work your way down**
(Slideshare, n.d.).

Measuring Current



Measuring Current



circuit current now has to go through the meter

Summary Review

- ▶ A meter capable of checking for voltage, current, and resistance is called a *multimeter*,
- ▶ When measuring Voltage the multimeter must be connected to two points in a circuit in order to obtain a good reading. Be careful not to touch the bare probe tips together while measuring voltage, as this will create a short-circuit!
- ▶ Never read Resistance or test for Continuity with a multimeter on a circuit that is energized.
- ▶ When measuring Current the multimeter must be connected in a circuit so the electrons have to flow *through* the meter
- ▶ Multimeters have practically no resistance between their leads. This is intended to allow electrons to flow through the meter with the least possible difficulty. If this were not the case, the meter would add extra resistance in the circuit, thereby affecting the current

Summary Review Continued

- ▶ An ohmmeter measures resistance by applying a known voltage.
- ▶ Analog meters use a graduated scale with a pointer.
- ▶ Digital meters provide a direct readout.
- ▶ A multimeter combines a voltmeter, ammeter, and ohmmeter into one package.
- ▶ A VOM is an analogue multimeter.
- ▶ A DMM is a digital multimeter.

Discussion Time!



REFERENCES

- Amazon. (n.d.). *MT87 blue digital multimeter Amper clamp meter current clamp pincers AC/DC current voltage Tester : Buy online at best price in KSA - Souq is now Amazon.sa: DIY & tools.* Amazon.sa: Shop Online in Saudi - Low Prices on Electronics, Fashion, Mobiles, Grocery & more. Retrieved April 13, 2026, from <https://www.amazon.sa/-/en/Digital-Multimeter-Current-Pincers-Voltage/dp/B09N75SGKS>
- Ariat-Tech.com. (n.d.). *Finding the best multimeter for your projects: Analog VS digital multimeter.* Global Distributor of Electronic Components | ARIAT TECHNOLOGY LIMITED. Retrieved April 13, 2026, from <https://www.ariat-tech.com/blog/finding-the-best-multimeter-for-your-projects-analog-vs-digital-multimeter.html?srsItd=AfmBOordheHiBd-Ne3wsiU28PzJ7MWCFuA5GFXd6LunpoTVmv6jZG-k0>
- Eaton. (n.d.). *Attention required! Attention Required! | Cloudflare.* Retrieved April 13, 2026, from https://www.be-electronics.com/product_p/atm5.htm

REFERENCES

- Sisco. (n.d.). *Digital multimeter vs analog multimeter: Which is best?* Test and Measurement Equipment | sisco.com. Retrieved April 13, 2026, from https://www.sisco.com/digital-multimeter-vs-analog-multimeter?srsltid=AfmBOooLG1ZRqpVSGCqOQCXL_m27ZXrfOVTEYwmseE5mjLKkZKViIOtg
- Slideshare. (n.d.). *Client challenge*. Client Challenge. Retrieved April 13, 2026, from <https://www.slideshare.net/slideshow/how-to-use-a-digital-multimeter-27531431/27531431>
- Study.com. (n.d.). *Study.com*. study.com. Retrieved April 13, 2026, from <https://study.com/academy/lesson/what-is-a-digital-multimeter-dmm-definition-uses.html>
- Walton, C. (2022, April 9). *How to use a 7 function multimeter*. Coolcircuit.com. <https://www.coolcircuit.com/how-to-use-a-7-function-multimeter/>

ASSIGNMENT

1. List three types of multimeters.
2. State what is a multimeter and its use in electrical works.
3. List four parts of a multimeter.
4. Draw a diagram to show current measurement in a circuit.
5. Draw a diagram to show voltage measurement in a circuit.

ASSIGNMENT CONTINUED

6. State which test lead is the positive one.
7. Draw the symbols to show ground, continuity and DC current.
8. State what unit is use to measure current, voltage and resistance.
9. State which terminal is the common terminal on the multimeter.
10. List three [3] advantage and disadvantage of analogue and digital multimeters.