



# PLTW Engineering

## 10-12/Using an Ohmmeter

May 12, 2020



10-12/DE

Lesson: 5/12/2020

**Objective/Learning Target: Students will be able to measure electrical circuit properties with an Ohmmeter.**



## What is an ohmmeter?

An ohmmeter can also be called a multimeter because it can measure volts, and amps.

Earlier meters were only capable of measuring one type of electrical value, so a person would have to carry a meter for each unit they needed to measure. Later meters were designed with a rotary switch so they could measure multiple units of value, hence the term multimeter.



## Using a multimeter?

Before going in to detail about multimeters, it is important for you to have a clear idea of how meters are connected into circuits.

To measure current, the circuit must be broken to allow the ammeter to be connected in series.

To measure potential difference (voltage), the circuit is not changed:  
the voltmeter is connected in parallel.



## Using a multimeter?

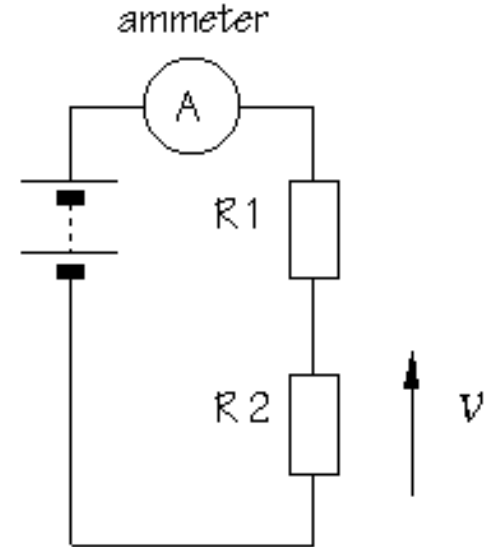
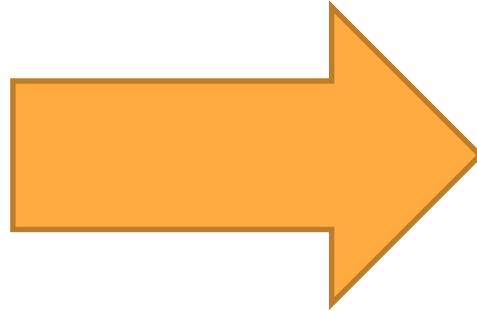
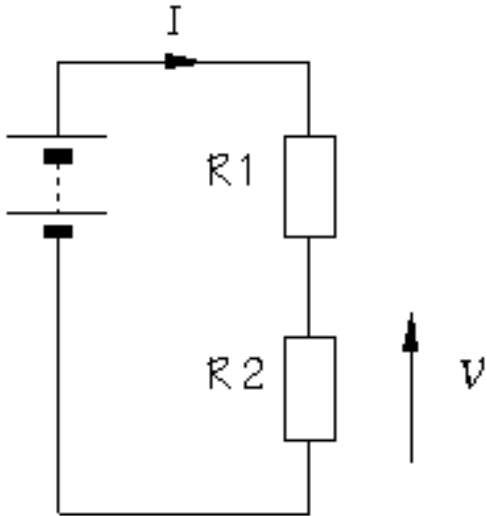
To measure resistance, the component must be removed from the circuit altogether.

Ohmmeters work by passing a current through the component being tested.

The processing of electronic signals is usually thought of in voltage terms. It is an added advantage that a voltage measurement is easier to make. The original circuit does not need to be changed. Often, the meter probes are connected simply by touching them to the points of interest.

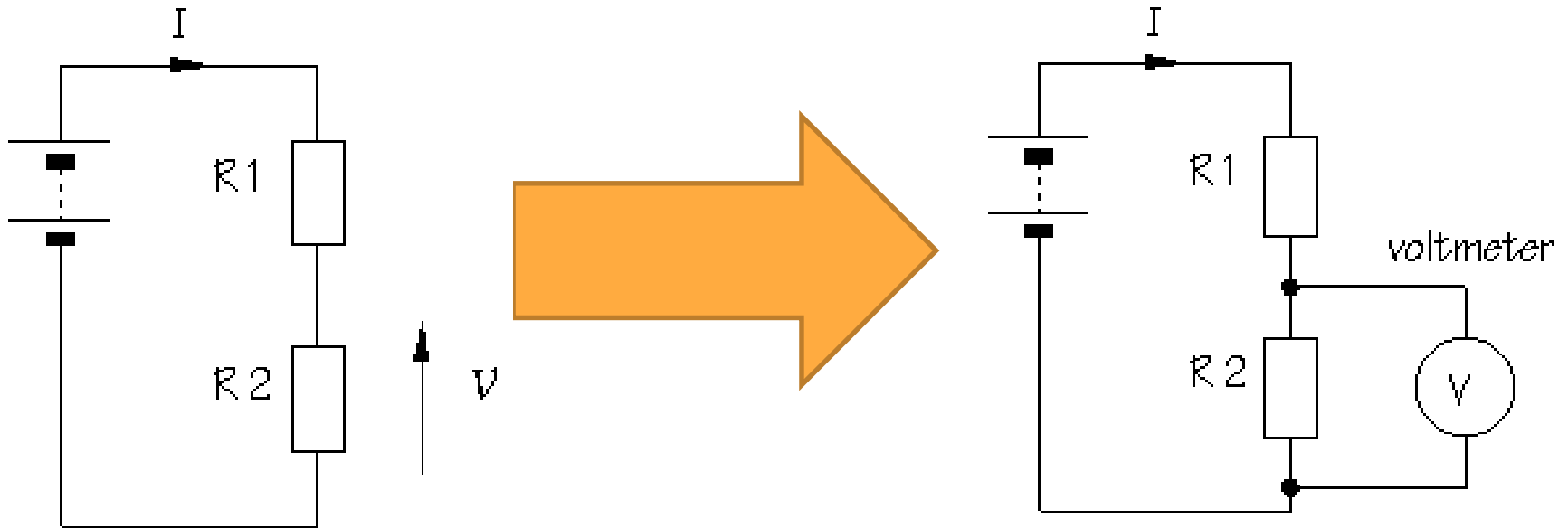
## Measuring Amps

Remember, the circuit must be broken and the multimeter in-line with the current.



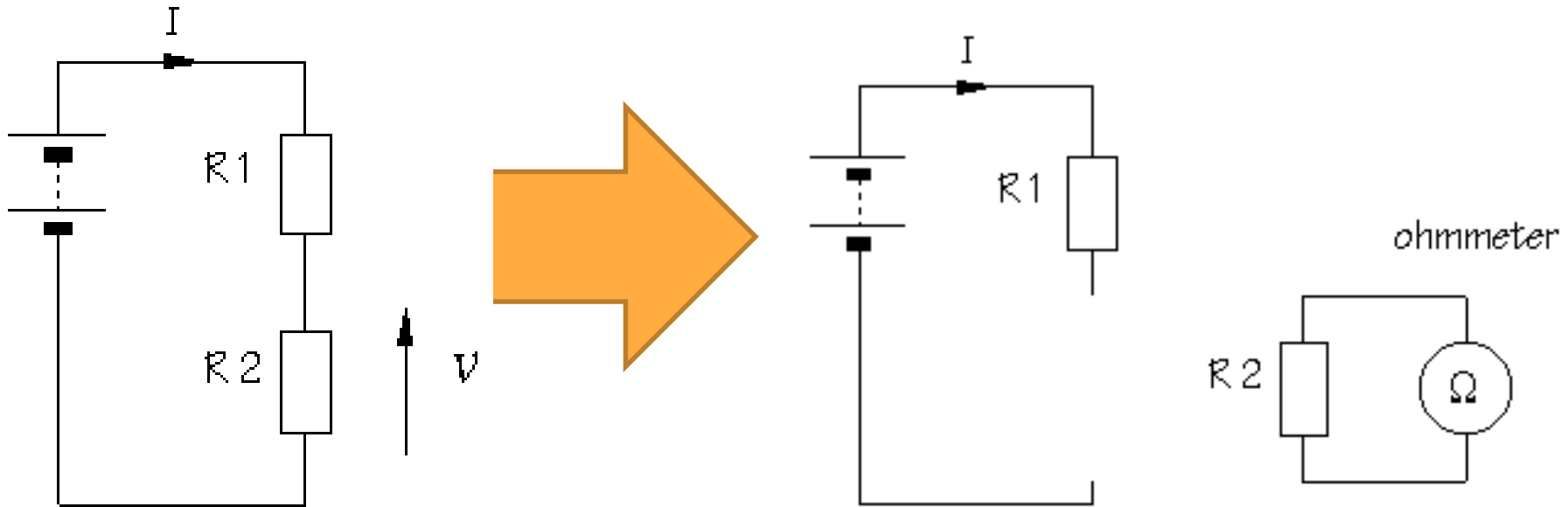
# Measuring Voltage

The voltmeter is connected in parallel.



# Measuring Ohms / resistance

Ohmmeters test components outside the circuit.







## Measurement considerations

Ohmmeters contain internal sources of voltage to supply power in taking resistance measurements.

If that power source diminishes the accuracy of the reading with also diminish.

An analog ohmmeter scale is “backwards” from that of a voltmeter or ammeter, the movement needle reading zero resistance at full-scale and infinite resistance at rest.



## Measurement considerations

Analog ohmmeters are not precision instruments.

Ohmmeters should *never* be connected to an energized circuit (that is, a circuit with its own source of voltage). Any voltage applied to the test leads of an ohmmeter will invalidate its reading.



## Ohmmeter safety

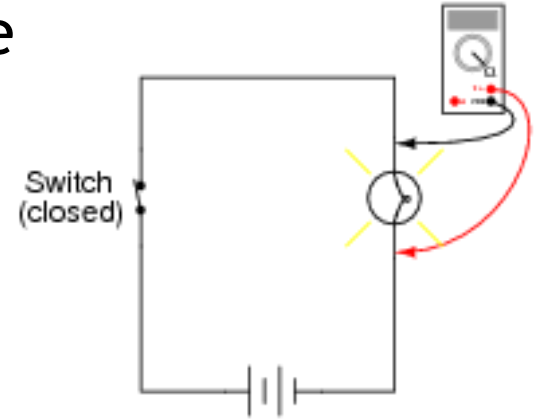
Do not attempt to measure resistance with an ohmmeter on a “live” circuit!

The reason for this is simple: the ohmmeter’s accurate indication depends on the only source of voltage being its internal battery.

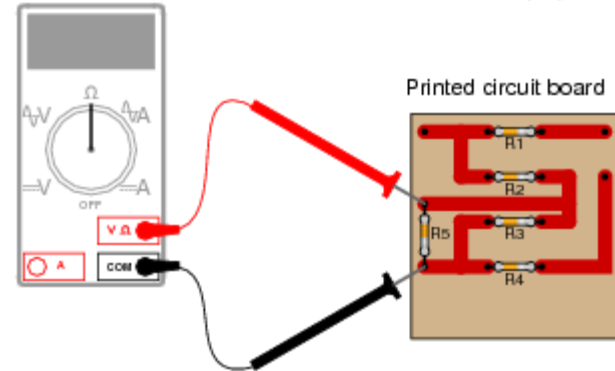
The presence of any voltage across the component to be measured will interfere with the ohmmeter’s operation. If the voltage is large enough, it may even damage the ohmmeter.

## Quiz yourself

What would be wrong about measuring the resistance of a light bulb while it is being powered by a battery?



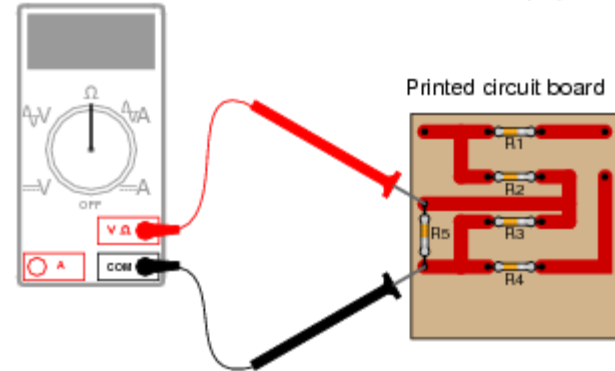
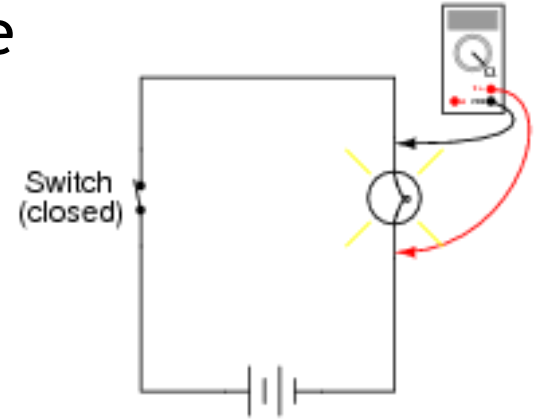
Could a technician measure Resistance of R5 using the setup shown here?



## Quiz yourself

What would be wrong about measuring the resistance of a light bulb while it is being powered by a battery?

Could a technician measure Resistance of R5 using the setup shown here?





## Quiz yourself

A technician picks up a resistor with the following color bands:

Color code: **Brown, Black, Silver, Gold**

Having forgotten the resistor color code, and being too lazy to research the color code in a book, the technician decides to simply measure its resistance with an ohmmeter.

The value this technician obtains is  $0.6 \Omega$ .

What is wrong with the technician's measurement?



## Helpful links

[All about circuits how to use an ohmmeter](#)

[Schematics for ohmmeters](#)

[How to use a mutlimeter video](#)