

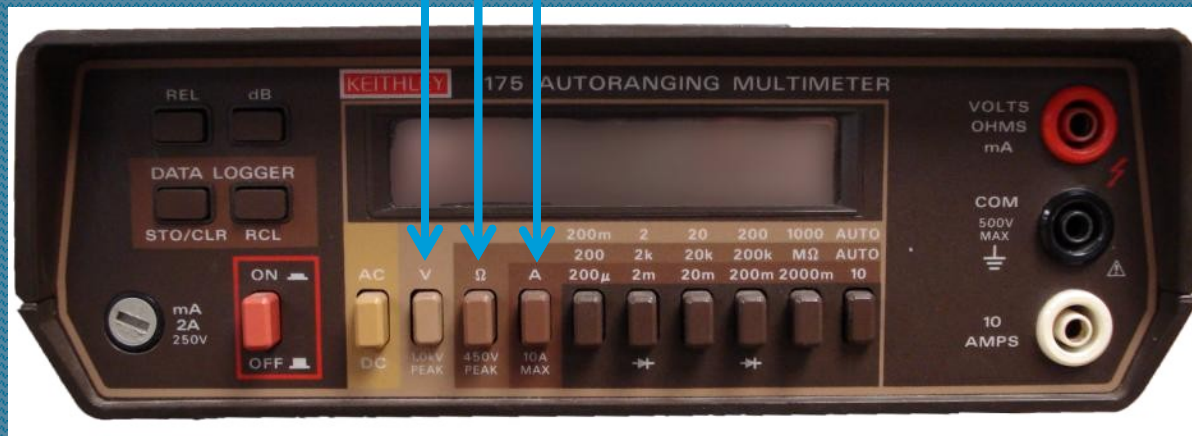
Multimeter

Measuring the Voltage Across the Resistor...Using the Multimeter



What is a Multimeter?

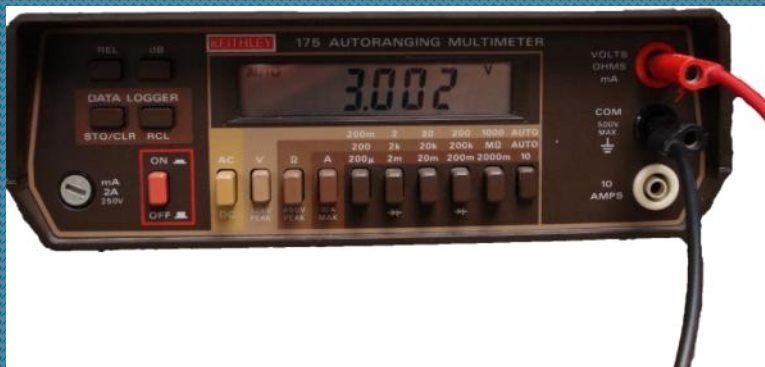
- A tool capable of measuring a variety of different quantities.
- Possible Measurements
 - Current (Amperes)
 - Resistance (Ohms)
 - Voltage (Volts)



How is the Multimeter different than the Oscilloscope?

Multimeter

- Numerical Output Displayed
- Represents a complete signal with a single value.
- Measures voltage, current and resistance.



Oscilloscope

- Graphical Output Displayed
- Shows how a signal changes over time
- Many only display voltage



Explanation of Controls

Setting up the multimeter for various measurements.

Taking measurements with the Multimeter

First, we connect our wires.

- One wire is always connected to the black terminal. This is called the common terminal.
- The red terminal is used when measuring voltage, resistance and small currents.
- The white terminal is used when measuring large currents.



TO DO: Using another set of banana to mini-grabber cables, connect the banana end to the red & black terminals

Taking measurements with the Multimeter

- Next, we turn it on and select the item to measure.
- Choose from:
 - Current
 - Resistance
 - Voltage

***TO DO:** Since we want to measure the voltage across our 1K ohm resistor, press the Voltage button*



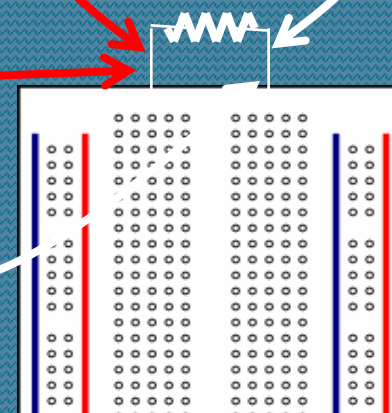
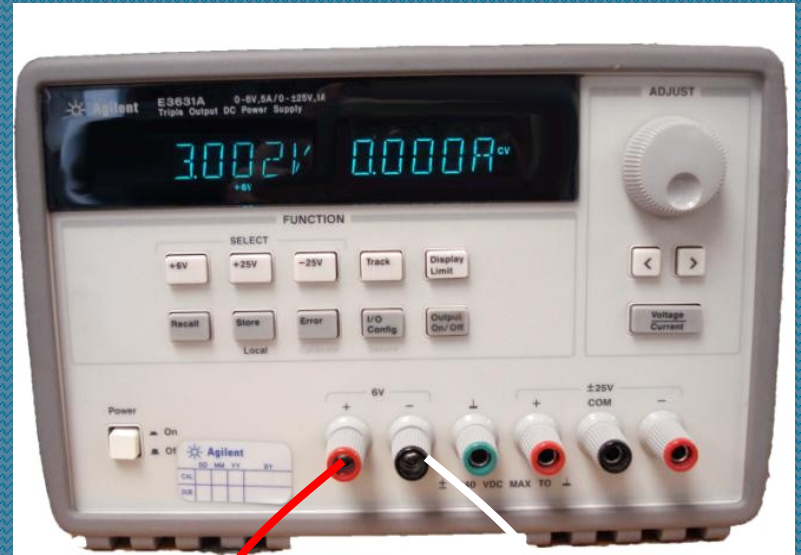
Taking measurements with the Multimeter

- Now, we select our scale.
- Either select a scale appropriate for your measurement or choose AUTO and let the multimeter select the appropriate scale for you.
- Measuring the voltage from across the 1K resistor ($\sim 3V$), you wouldn't want to choose 200mV (much too small) or 200V (much too large). Instead, the 2V selection is more suitable.

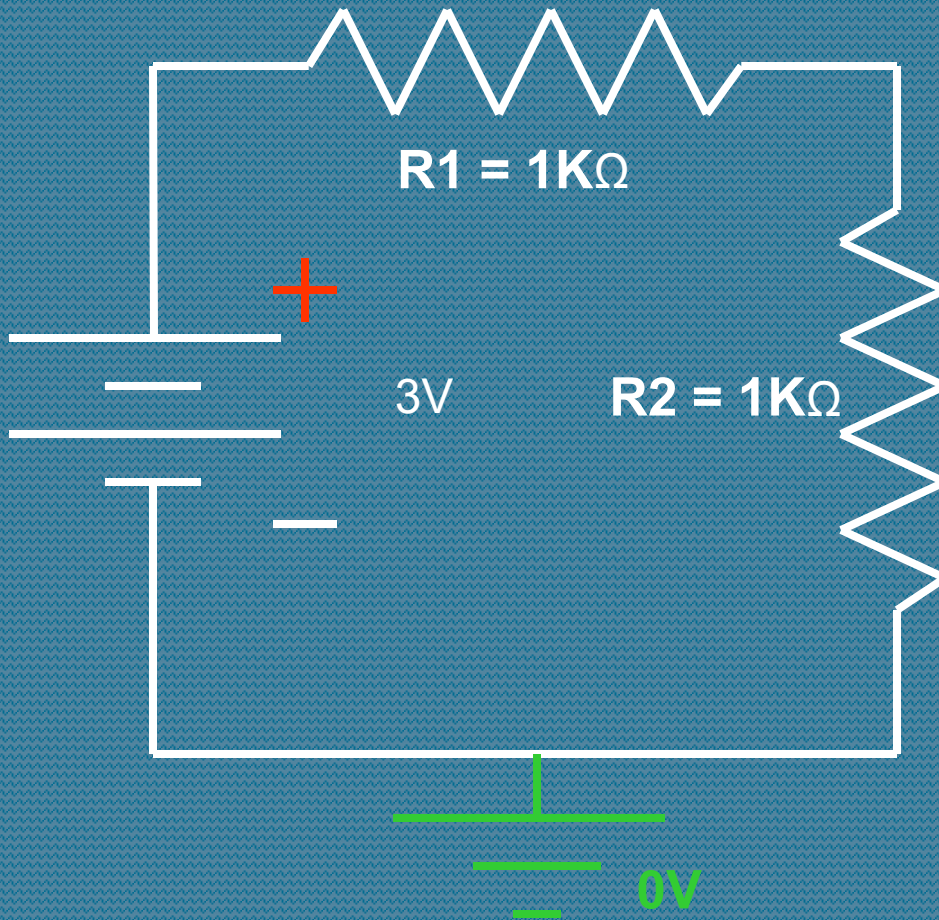


Taking measurements with the Multimeter

- While your circuit is attached to the power supply...
- Attach the minigrabber end around the 1K resistor
- Press the “POWER” button on the multimeter and take a reading!!

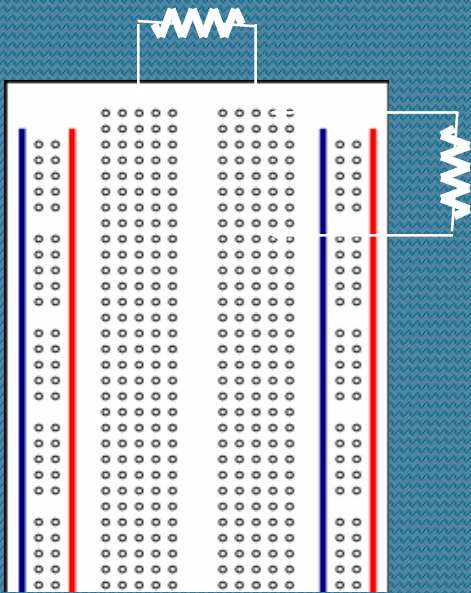


Building & Verifying Series Circuit #2



- Resistors connected by only 1 terminal, back-to-back, are considered to be in 'series'
- Ohm's Law States:
 $V(R1) = 1.5mA \times 1K \Omega = 1.5V$
 $V(R2) = 1.5mA \times 1K \Omega = 1.5V$
- We are now going to build the circuit, and verify the voltage drops...

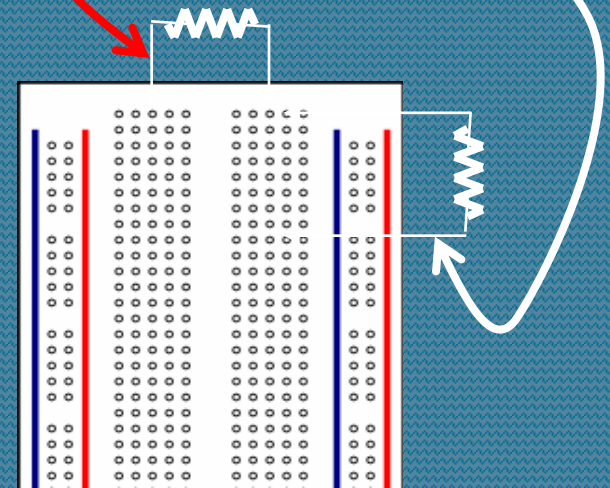
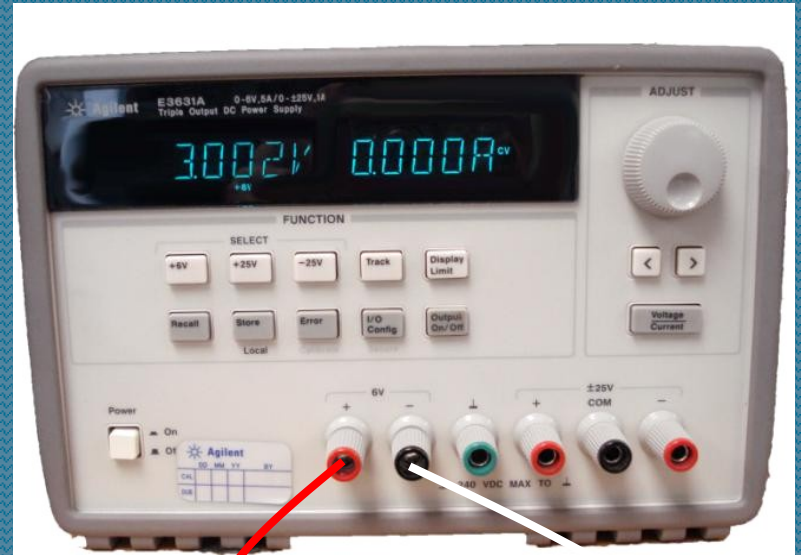
Setting up the breadboard



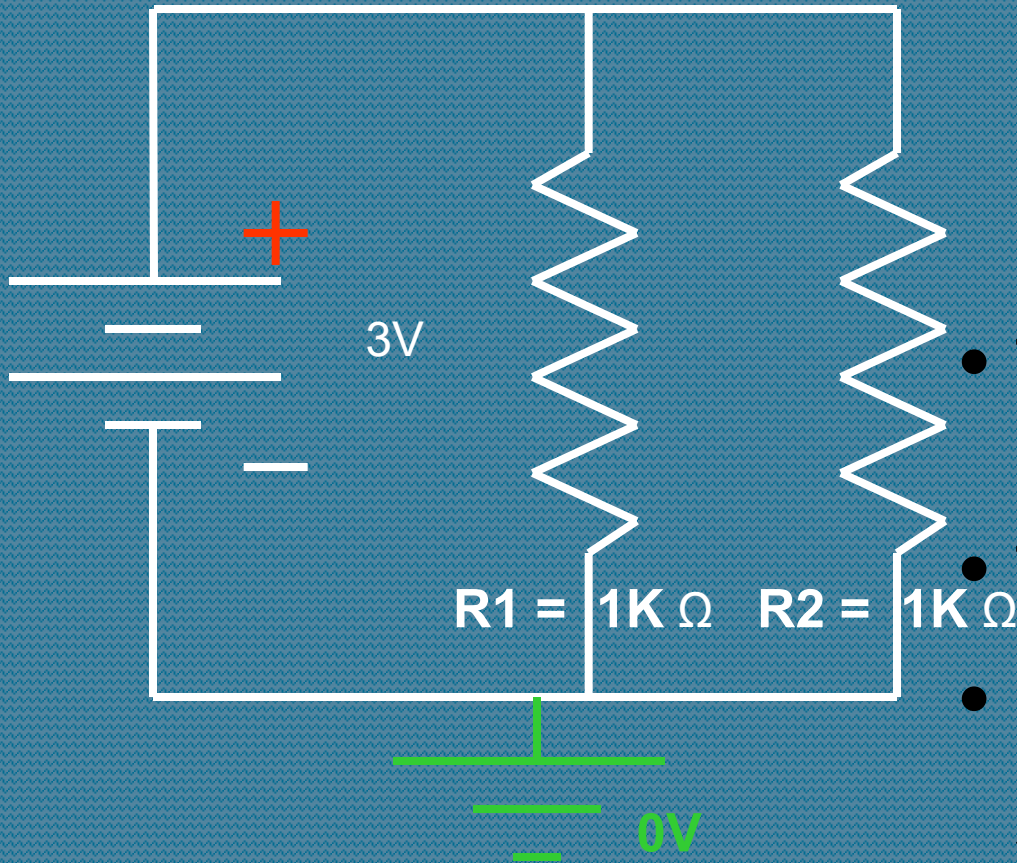
- Turn off the 3V supply and disconnect the cables
- Disconnect the cables to the minigrabbers to the multimeter
- Obtain a 2nd 1K resistor
- Plug one end of the resistor into a hole in the same row as the end of the other resistor
- Plug the other end into a hole in another row

Taking measurements with the Multimeter

- Set the Power Supply to 3V
- Attach the power supply leads as follows
- Measure the voltage across each resistor with the multimeter



Resistors in Parallel



- Resistors connected at 2 terminals, sharing the same node on each side, are considered to be in 'parallel'
- The voltage is the same on both branches of the circuit
- The current will split!
- It is now up to you to build this circuit and verify the voltages

