

# Tutorial: Measuring Voltage with Voltmeters

Using voltmeters to measure voltage is a fundamental, everyday skill used by electrical engineers in lab.

## Step 1: Plug in Cables

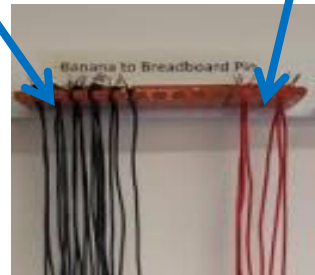
Get cables and plug them into the voltmeter sockets.

### Sub-steps

1. Gather your equipment:
  - a. Get a **red cable** and a **black cable** at the front of the room under the “Banana to Breadboard Pin” sign. See the photo on the right for reference:
2. Plug in the cables:
  - a. Plug in the **red cable** in the “HI” socket. See photo below for reference.
  - b. Plug in the **black cable** in the “LO” socket. See photo below for reference.

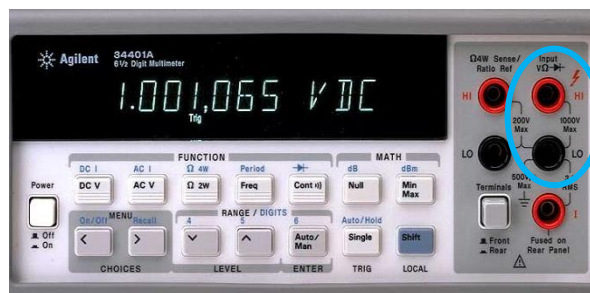
*Black Cables*

*Red Cables*



*Red Cable Socket*

*Black Cable Socket*



## Step 2: Set Multimeter to Measure DC Voltage

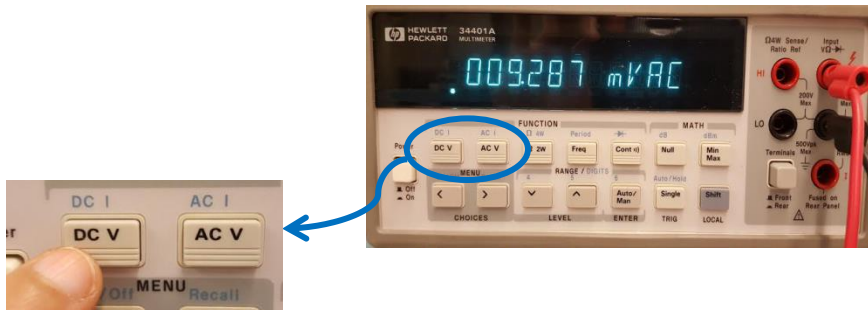
Turn on the multimeter and set it to measure DC Voltage.

### Sub-steps

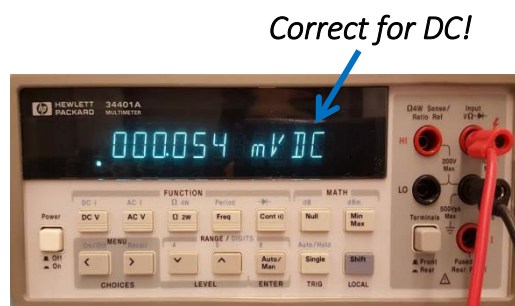
1. Turn on the Multimeter
  - a. Press the “Power” button in the lower left corner. See photo below for reference:



2. Select the Voltage Units
  - a. Press the “DC V” button. In this class, we will almost always only use DC voltage. If you do want to measure AC voltage in future classes, you will press the “AC V” button next to it. See the photo below for reference:



3. Double-check the voltage units are “V DC”.
  - a. Looking at the voltage units to the right of the display, double-check it says “V DC” or “mV DC”. See the photo below for reference:

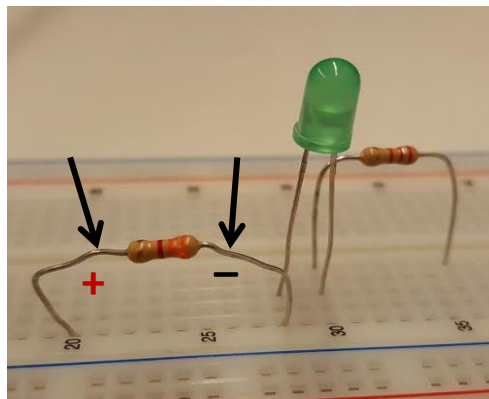


### Step 3: Determine the Voltage to Measure

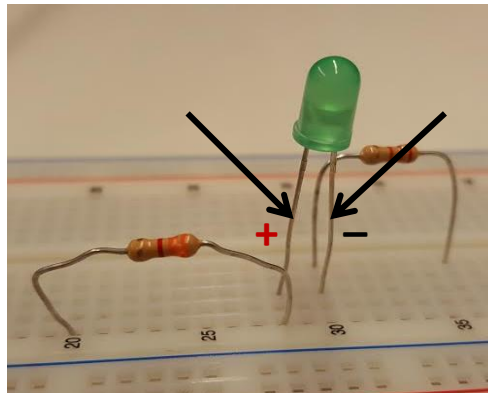
To know where to put the red and black cables, you need to first determine the voltage you want to measure and the two points in the circuit that represent those points.

#### Sub-steps

1. Determine what voltage you want to measure
  - a. This could be the voltage across a resistor or LED
  - b. This could also just be the voltage between two points in your circuit
2. Determine the 2 points that correspond to your voltage.
  - a. “Across a resistor” – the two points are the two leads of the resistor:



- b. “Across an LED” – the two points are the two leads of the LED:



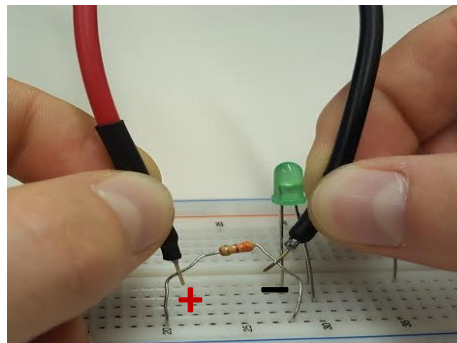
**Note:** Unless specified in the lab, you can choose which of the two points will be the positive (+) and negative (-) points. Just make sure you take note of your choice when recording your voltage measurement. Indeed, the voltage value will depend on which way you choose!

## Step 4: Place Cables and Read Voltmeter

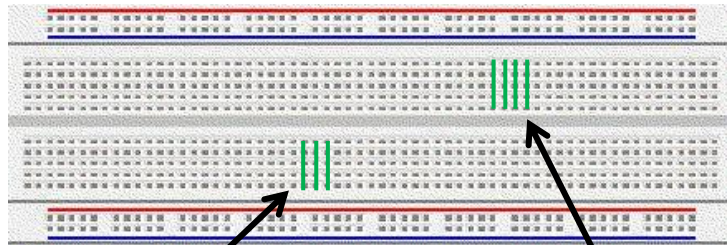
Once you choose the two points of your circuit, place the cables at the two points in your circuit, and read the measured voltage on the multimeter screen.

### Sub-steps

1. Place the cables at the two points you found in the previous step:
  - a. Place the **red cable** at the positive (+) point you chose. See the photo below for reference.
  - b. Place the **black cable** at the negative (-) point you chose. See the photo below for reference.

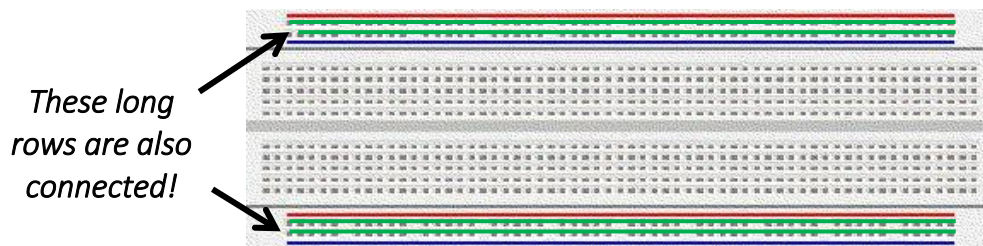


Note: This student could have put the cables into the breadboard, as well. If you choose to do this, make sure the cable is a breadboard socket in the same row as the corresponding resistor pin. See image below for reference:



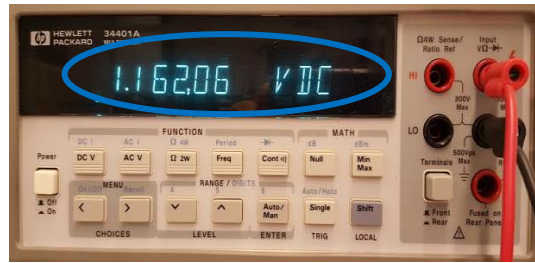
*Each row of 5 sockets  
is connected!*

*Each row here is also  
connected!*



*These long  
rows are also  
connected!*

2. Read the voltage measurement from the multimeter screen. See the photo below for reference.



Note: **Ignore** the tick mark circled in the photo below. This is not a decimal point.



**Ignore the Tick Mark!**

## Review

### Steps

1. Plug in cables
2. Set multimeter to measure DC voltage
3. Determine the voltage you want to measure
4. Place the voltmeter cables and read the voltage measurement