

Ammeters & Voltmeters

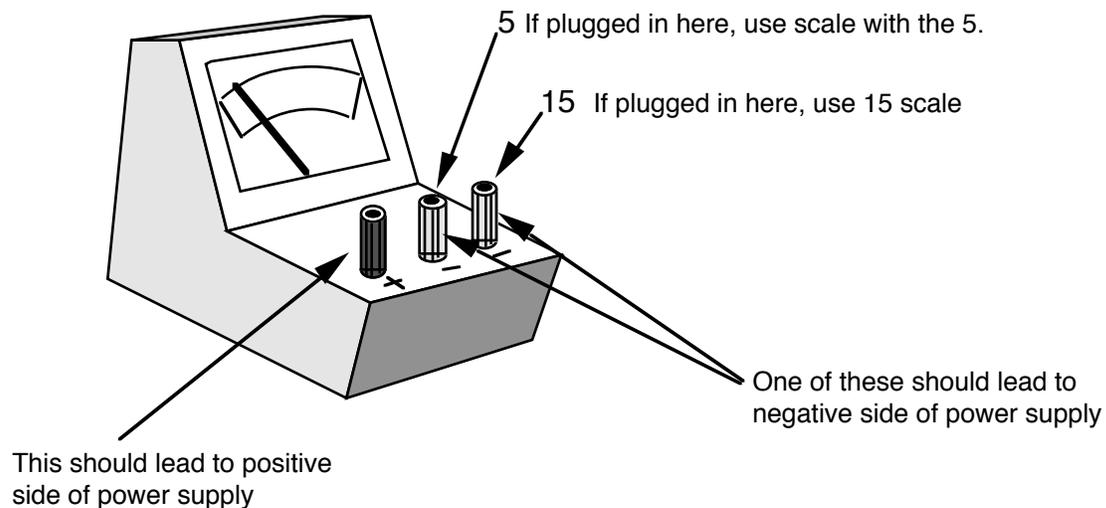
Though ammeters and voltmeters look very similar on the outside, they work very differently because they measure fundamentally different quantities. If you keep in mind what they measure, you will have no problems using them in the lab. If you don't, it is easy to get frustrated because of improperly connected meters.

General Information:

Ammeters and voltmeters are almost identical. They look the same and inside, the only difference is how a couple wires are connected. There are some general rules that apply to both meters.

Ammeters and Voltmeters are all electrically polarized, meaning they have a positive side and a negative side. It is very important that you hook these meters up correctly. By tracing wires from the negative terminal on the power supply to the meter, you should come in contact with a negative terminal on the meter. Likewise, positive should go to positive. If you have accidentally hooked the meter up backwards, the needle on the meter will pin itself to the very left of the meter. To fix this, simply switch the wires from one terminal to the other.

All our ammeters and voltmeters have more than one scale on them. They can read very small values or very large values. You will notice that there is more than one negative terminal on the meters. There are numbers on the terminals, and there are identical numbers on the scale behind the needle. The number you are plugged into is the scale you should use to read the meter. NOTE: Be careful of the units on the meter. Remember the metric system: a little "m" stands for "milli-."



Be Careful:

Most of the ammeters have three scale choices with the numbers: 5, 50, and 500. These are not all amps!

The scale that goes from 0 to 5 is measured in *amps*.

The scale that goes from 0 to 500 is measured in *milliamps*, so you have to divide by 1000. This scale actually reads values from 0 to 0.5 amps!

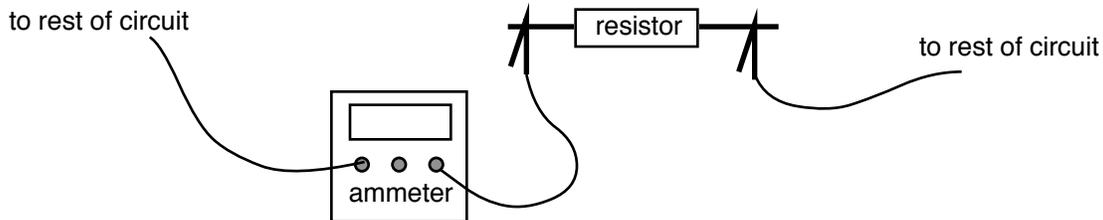
The scale that goes from 0 to 50 is also measured in *milliamps*, so you have to divide by 1000. This scale actually reads values from 0 to 0.05 amps!

Ammeters & Voltmeters

*Ammeters are connected in series.
Voltmeters are connected in parallel.*

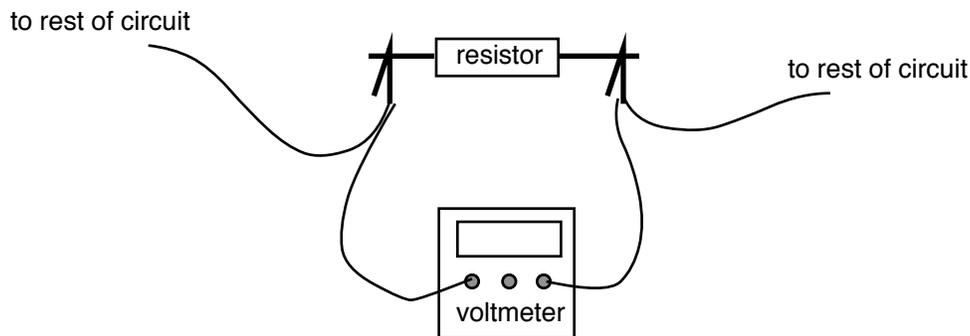
Ammeters: Measure current passing through one spot.

Electric current is defined as the number of electrons that pass by a given point every second. (It is a measure of the rate of flow of electrons.) If you wish to measure the current passing through a resistor, you need to count how many electrons are going into or leaving the resistor. To do this, disconnect one of the wires touching the resistor and hook it into the ammeter. Then connect the other end of the ammeter to the resistor. Because it is important for ammeters not to block the flow of electrons, they have very low resistance



Voltmeters: Measure potential difference from one place to another.

The voltage drop from one place to another is a measure of how much potential energy electrons will lose going from one place to the next. If there is no potential drop, electrons will not move. To measure voltage, hook one end of the voltmeter to one side of the resistor, and the other end of the voltmeter to the other end of the resistor. Because it is important for voltmeters not to draw off electrons from going through the resistor, they have very high resistance.



Trouble shooting tips

If you accidentally connect an ammeter in parallel, it will act like a short circuit.

If you accidentally connect a voltmeter in series, it will act like a break in the circuit.

If you accidentally connect a meter backwards, the needle will be pinned to the very left.

(This is bad because you can bend the needle.)

If everything is hooked up correctly, but you are not getting any reading, try a smaller scale on the meter.