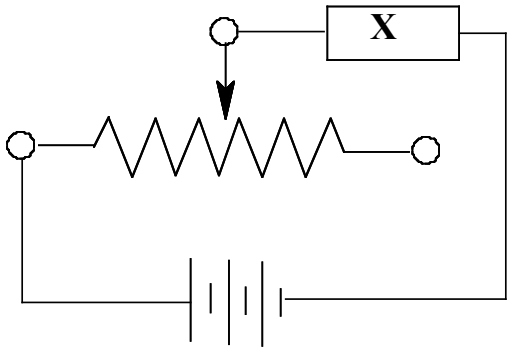
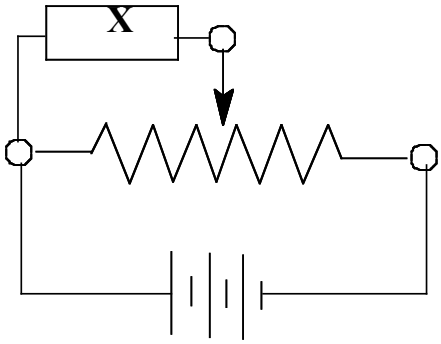
Rheostat and Potentiometer Basics

The term "rheostat" is usually given to a large variable resister used in series with a device and the term "potentiometer" is used for a variable resistor with a fixed potential difference placed across it and the slide wire is moved to obtain any value of potential difference between zero and the full value.

Rheostat

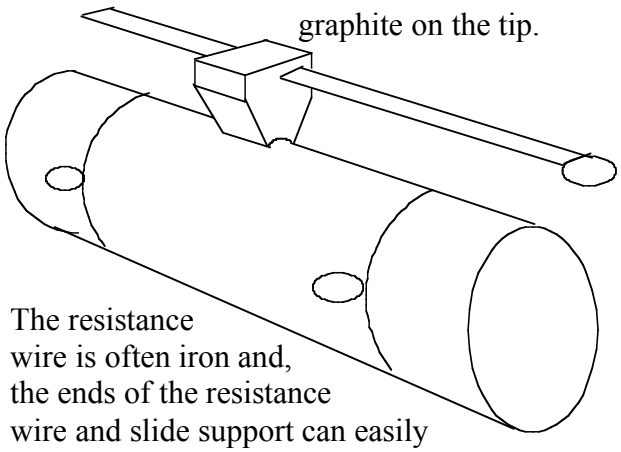


Potentiometer



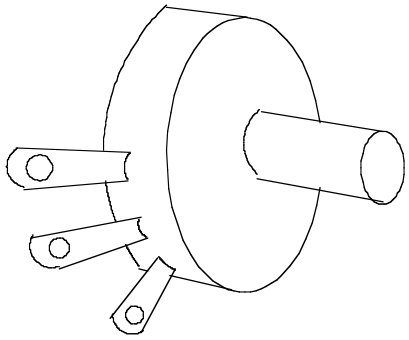
Physics labs often have large rheostats of assorted values of resistance and maximum current rating. These can be wired in either of the above configurations and are helpful in illustrating the role of resistors in series and parallel circuits. Illustrated below is the essential construction of two popular variable resistor configurations.

The slide is often of soft graphite on the tip.



The resistance wire is often iron and, the ends of the resistance wire and slide support can easily be attached to an external circuit.

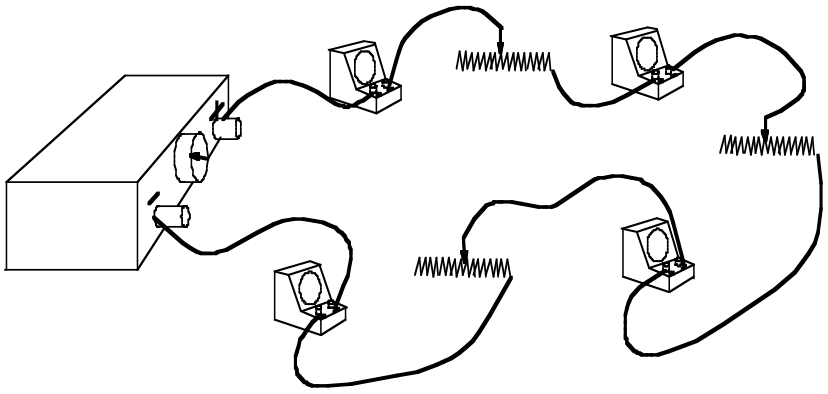
The shaft is attached to a sliding contact connected to the center tab.



The two outside tabs are attached to either end of the resistance wire.

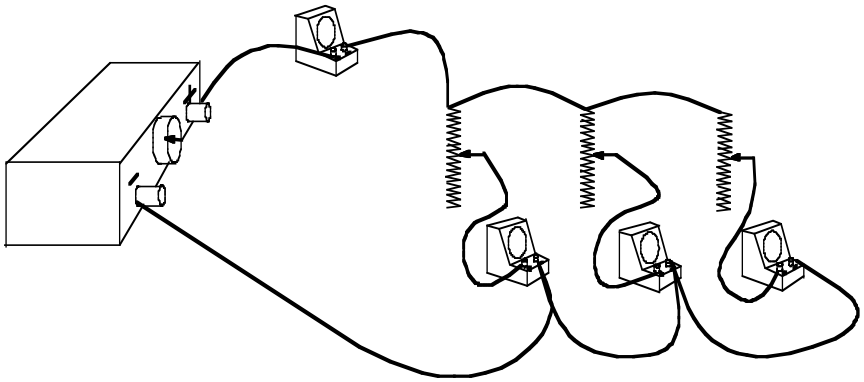
The rheostat shown on the left can be expensive and is often discarded by University physics labs as they replace them with digital equipment. The configuration on the right is still used as volume controls, tone controls, etc. in assorted analog electronic equipment and can be obtained at very low cost in places like All Electronics. (www.allelectronics.com) Radio Shack and Freys will have them but at a higher price.

Shown and discussed below are simple demonstrations involving variable resistors and several meters that help students to understand the basics of simple series and parallel circuits.



Students often think that changing a specific resistor in a series circuit will only change the current before the resistor. Set up several variable resistors with ammeters in between each. Set each variable resistor at approximately the same value. With the current on showing all the same ammeter readings, ask what will happen to the current in each ammeter when only one variable resistor is changed.

With the resistors and ammeters wired in parallel as shown on the right, students will see that changing an individual resistor will change the current through its loop as well as the sum of the current through the total circuit. Using a voltmeter across each variable resistor will show that the sum of the individual voltages equals the total across the series circuit yet the voltage is the same across each resistor in the parallel circuit.



Important use of language:

It is important to stress in all discussions of current and potential difference in DC circuits that the current flows <u>through</u> the device and the potential difference (voltage) is <u>across</u> the device. Again:

Current through **Voltage across**

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