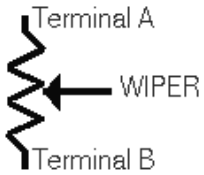
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Potentiometer

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Introduction to Potentiometer

A **potentiometer** (colloquially known as a "**pot**") is a three-terminal resistor with a sliding contact that forms an adjustable voltage divider. If only two terminals are used (one side and the wiper), it acts as a **variable resistor** or **rheostat**. Potentiometers are commonly used to control electrical devices such as volume controls on audio equipment.



A potentiometer is mainly used to measure the emf of a given cell and to compare emf's of cells. It is also used to measure the internal resistance of a given cell.

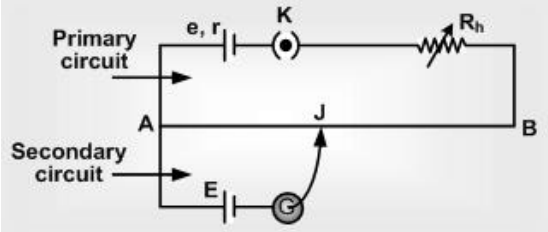
There are many instances where only a portion of the output voltage from a signal source is needed. For instance, if we allowed the full output voltage from an MP3 player to be driven into the input of an amplifier, the amplifier would play at or near full power at all times. This would become quite annoying in a very short period of time. To reduce the overall volume, we need to allow only a fraction of the full signal through to the amplifier. To control the level of the signal, we use a potentiometer.

Circuit Diagram

A potentiometer consists of a long resistive wire AB of length L (about 6 m to 10 m long) made up of mangnine or constantan and a battery of known voltage e and internal resistance r called the supplier battery or driver cell. Connection of these two forms the primary circuit.

One terminal of another cell (whose emf E is to be measured) is connected at one end of the main circuit and the other terminal is connected at any point on the resistive wire through a galvanometer G. This forms the secondary circuit. Other details are as follows

J = Jockey
K = Key
R = Resistance of potentiometer wire,
r = Specific resistance of potentiometer wire.
Rh = Variable resistance, which controls the current through the wire AB



(i) The specific resistance (r) of potentiometer wire must be high, but its temperature coefficient of resistance (a) must be low.

(ii) All higher potential points (terminals) of primary and secondary circuits must be connected together at point A and all lower potential points must be connected to point B or the jockey.

(iii) The value of the known potential difference must be greater than the value of the unknown potential difference to be measured.

(iv) The potential gradient must remain constant. For this, the current in the primary circuit must remain constant and the jockey must not slide into contact with the wire.

(v)The diameter of a potentiometer wire must be uniform everywhere.

Rheostat

The most common way to vary the resistance in a circuit is to use a variable resistor or a **rheostat**. A rheostat is a two-terminal variable resistor. These are often designed to handle much higher voltage and currents. Typically these are constructed as a resistive wire wrapped to form a toroid coil with the wiper moving over the upper surface of the toroid, sliding from one turn of the wire to the next. Sometimes a rheostat is made from resistance wire wound on a heat-resisting cylinder with the slider made from a number of metal fingers that grip lightly onto a small portion of the turns of resistance wire. The "fingers" can be moved along the coil of resistance wire by a sliding knob thus changing the "tapping" point. They are usually used as variable resistors rather than variable potential dividers.

Any three-terminal potentiometer can be used as a two-terminal variable resistor so long as it is not connected to the third terminal. It is common practice to connect the wiper terminal to the unused end of the resistance track to reduce the amount of resistance variation caused by dirt on the track.

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Reference links:

- http://physics.about.com/od/glossary/g/Current.htm
- http://en.wikipedia.org/wiki/Voltage_divider
- http://www.electronics.howstuffworks.com/amplifier.htm

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