

Sources of Current

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Introduction to Sources of Current

Electric current, conventional current, direct, active, displacement, etc. currents... are all kinds of sources of current. A current source is an electrical device that is used to deliver current. Voltages and currents in a circuit are imposed by sources. In practical circuits, there are many types of sources, such as batteries and solar cells, but from a circuit analysis viewpoint, we need to consider only two ideal sources: the voltage source and the current source.

The simplest current source consists of a [voltage source](#) connected in a series with a resistor. The current available from such a source is given by the [ratio](#) of the voltage across the voltage source to the [resistance](#) of the resistor. A source may be represented either as a current source or voltage source. The two types of representation have the same resistance and are related as

$$E = ir$$

For a nearly ideal current source, the value of this resistor should be very large, but this also implies that, for a specified current, the voltage source must also be very large. An ideal current source has infinite internal resistance. Consequently, changes in load resistance will not change the current supplied.

There are two commercially important sources of electrical pressure -- chemical and mechanical.

a. Chemical:

Chemical energy includes energy produced by a chemical reaction between two dissimilar substances. This principle is employed in batteries.

b. Mechanical

Dynamos and generators transform mechanical energy into electrical energy by electromagnetic induction.

Several different devices can supply the voltage needed to generate an electric current. The two most common sources are generators and electrolytic cells.

A. Generators produce electricity using mechanical energy, such as water pouring through a dam or the motion of a turbine driven by steam. The electric outlets on the walls of homes and other buildings, which lights and other appliances draw electricity from, are connected to giant generators that are located in electric power stations. Each outlet contains two terminals. The voltage between the terminals drives an electric current through the appliance that is plugged into the outlet. See Electric Power Systems.

B. Electrolytic cells use chemical energy to produce electricity. Chemical reactions within an electrolytic cell produce a potential difference between the cell's terminals. An electric battery consists of a cell or group of cells connected together.

C. Other sources: Certain sources of electric current operate on the principle that some metals hold onto their electrons more strongly than other metals do. Platinum, for example, holds its electrons less strongly than aluminum does. If a strip of platinum and a strip of aluminum are pressed together under the proper conditions, some electrons will flow from the platinum to the

aluminum. As the aluminum gains electrons and becomes negative, the platinum loses electrons and becomes positive.

The strength with which a metal holds its electrons varies with temperature. If two strips of different metals are joined and the joint is then heated, electrons will pass from one strip to the other. Electricity produced directly through heat is called thermoelectricity.

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Reference links:

- <http://www.splung.com/content/sid/3/page/emf>
- http://en.wikipedia.org/wiki/Voltage_source
- <http://www.en.wikipedia.org/wiki/Electron>

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