Led (Light-Emitting Diode) Encyclopedia Article

Led (Light-Emitting Diode)

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Led (Light-Emitting Diode)

LEDs (light-emitting diodes) can often be found in electronic toys, science kits, calculators, and many other household devices. LEDs are first and foremost diodes, special kinds of crystals or transistors that allow electrical current to pass through in one direction only. The first diodes were invented by Karl Ferdinand Braun in 1874 as a solution to the problem of incompatible current. Specifically, Braun needed a device that could convert easy-to-produce alternating current (AC) into easy-to-use direct current (DC). The problem was that AC currents move in a sine-wave pattern, moving forward and then backward as it goes, while most electronic devices require single-direction DC. While experimenting, Braun noticed that certain crystals would allow current to pass in one direction, but hindered its passage in the opposite direction. These crystal rectifiers were used for years in radios and other types of communication equipment. The next stage in diode development came in 1906 when John Ambrose Fleming invented the vacuum tube valve diode. This diode consisted of two electrodes, a cathode and an anode, encased within a vacuum-sealed glass tube. When a current was applied so that the cathode was negatively charged, electrons would flow to the anode and, thus, complete the circuit. However, if the current was reversed, no electrons would flow, and the diode would remain in the "off" position. Just like its crystal cousin, the valve diode would allow current to pass in one direction only. The modern diode is essentially a modified transistor. A piece of semiconducting material (such as silicon or germanium) is coated at each end with two different substances, so that one end is positively-biased and the other negatively-biased. When a current is sent through the diode negative-end first, the charge is allowed to pass; however, if the current is applied positive-end first, an electrical barrier is created within the diode, effectively blocking the current. LEDs are of this last variety. Commonly made of gallium arsenide, the diode will give off radiation when in the "on" position. In order for the radiation to be within the spectrum of visible light, the diode must first be treated with phosphorus or a similar substance, otherwise it will glow in the infrared range.