**Power supply**

A power supply is an electronic device that supplies electric power to an electrical load. The primary function of a power supply is to convert one form of electrical energy to another one and, as a result, power supplies are sometimes referred to as electric power converters. Some power supplies are discrete, stand-alone devices, whereas others are built into larger devices along with their loads. Examples of the latter include power supplies found in desktop computers and consumer electronics devices.

Every power supply must obtain the energy it supplies to its load, as well as any energy it consumes while performing that task, from an energy source. Depending on its design, a power supply may obtain energy from various types of energy sources, including electrical energy transmission systems, energy storage devices such as a batteries and fuel cells, electromechanical systems such as generators and alternators, solar power converters, or another power supply.

All power supplies have a power input, which connects to the energy source, and a power output that connects to the load. In many power supplies the power input and output consist of electrical connectors. Some power supplies have other types of inputs and outputs as well, for functions such as external monitoring and control.

Power supplies are categorized in various ways, including by functional features. For example, a regulated power supply is one that maintains constant output voltage or current despite variations in load current or input voltage. Conversely, the output of an unregulated power supply can change significantly when its input voltage or load current changes. Adjustable power supplies allow the output voltage or current to be programmed by mechanical controls (e.g., knobs on the power supply front panel), or by means of a control input, or both. An adjustable regulated power supply is one that is both adjustable and regulated.

Power supplies are packaged in different ways and classified accordingly. A bench power supply is a stand-alone desktop unit used in applications such as circuit test and development. Open frame power supplies have only a partial mechanical enclosure, sometimes consisting of only a mounting base; these are typically built into machinery or other equipment. Rack mount power supplies are designed to be secured into standard electronic equipment racks.

Power supplies can be broadly divided into linear and switching types. Linear power converters process the input power directly, with all active power conversion components operating in their linear operating regions. In switching power converters, the input power is converted to AC or to DC pulses before processing, by components that operate predominantly in non-linear modes (e.g., transistors that spend most of their time in cutoff or saturation). Power is "lost" (converted to heat) when components operate in their linear regions and, consequently, switching converters are usually more efficient than linear converters because their components spend less time in linear operating regions.

Here are some common power supply types descriptions. A DC power supply is one that supplies a voltage of fixed polarity (either positive or negative) to its load. Depending on its design, a DC power supply may be powered from a DC source or from an AC source such as the power mains.

Some DC power supplies use AC mains electricity as an energy source. Such power supplies will sometimes employ a transformer to convert the input voltage to a higher or lower AC voltage. A rectifier is used to convert the transformer output voltage to a varying DC voltage, which in turn is passed through an electronic filter to convert it to an unregulated DC voltage. The filter removes most, but not all of the AC voltage variations; the remaining voltage variations are known as ripple.

The electric load's tolerance of ripple dictates the minimum amount of filtering that must be provided by a power supply. In some applications, high ripple is tolerated and therefore no filtering is required. For example, in some battery charging applications it is possible to implement a mains-powered DC power supply with nothing more than a transformer and a single rectifier diode, with a resistor in series with the output to limit charging current.

The function of a linear voltage regulator is to convert a varying DC voltage to a constant, often specific, lower DC voltage. In addition, they often provide a current limiting function to protect the power supply and load from overcurrent (excessive, potentially destructive current).

A constant output voltage is required in many power supply applications, but the voltage provided by many energy sources will vary with changes in load impedance. Furthermore, when an unregulated DC power supply is the energy source, its output voltage will also vary with changing input voltage. To circumvent this, some power supplies use a linear voltage regulator to maintain the output voltage at a steady value, independent of fluctuations in input voltage and load impedance. Linear regulators can also reduce the magnitude of ripple and noise present appearing on the output voltage.