Power Supply

DC power supplies are available in either switch-mode (also called switching) or linear designs. While both types supply DC power, the method used to produce this power is different. Depending on the application, each type of power supply has advantages over the other one. Let's look at the differences between these two technologies as well as each design's respective advantages and disadvantages.

A switch-mode power supply converts the AC line power directly into a DC voltage without a transformer, and this raw DC voltage is then converted into a higher frequency AC signal, which is used in the regulator circuit to produce the desired voltage and current. This results in a much smaller, lighter transformer for raising or lowering the voltage than what would be necessary at an AC line frequency of 60 Hz. These smaller transformers are also considerably more efficient than 60 Hz transformers, so the power conversion ratio is higher.

A linear power supply design applies the AC line voltage to a power transformer to raise or lower the voltage before being applied to the regulator circuitry. Since the size of the transformer is indirectly proportional to the frequency of operation, this results in a larger, heavier power supply.

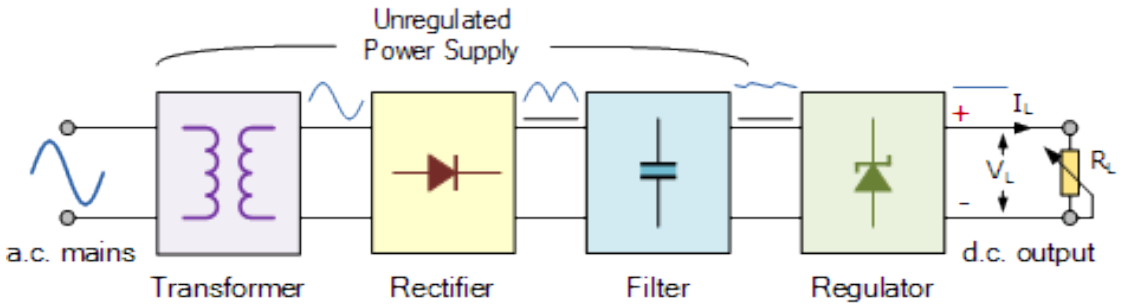
Each type of power supply operation has its own set of advantages and disadvantages. A switch-mode power supply is as much as 80% smaller and lighter than a corresponding linear power supply, but it generates high-frequency noise that can interfere with sensitive electronic equipment. Unlike linear power supplies, switch-mode power supplies are able to withstand small losses of AC power in the range of 10-20 ms without affecting the outputs.

A linear power supply requires larger semiconductor devices to regulate the output voltage and therefore generates more heat, resulting in lower energy efficiency. A linear power supply normally operates around 60% efficiency for 24V outputs, whereas a switch-mode power supply operates at 80% or more. Linear power supplies have transient response times up to 100 times faster than their switch-mode counterparts, which is important in certain specialized areas.

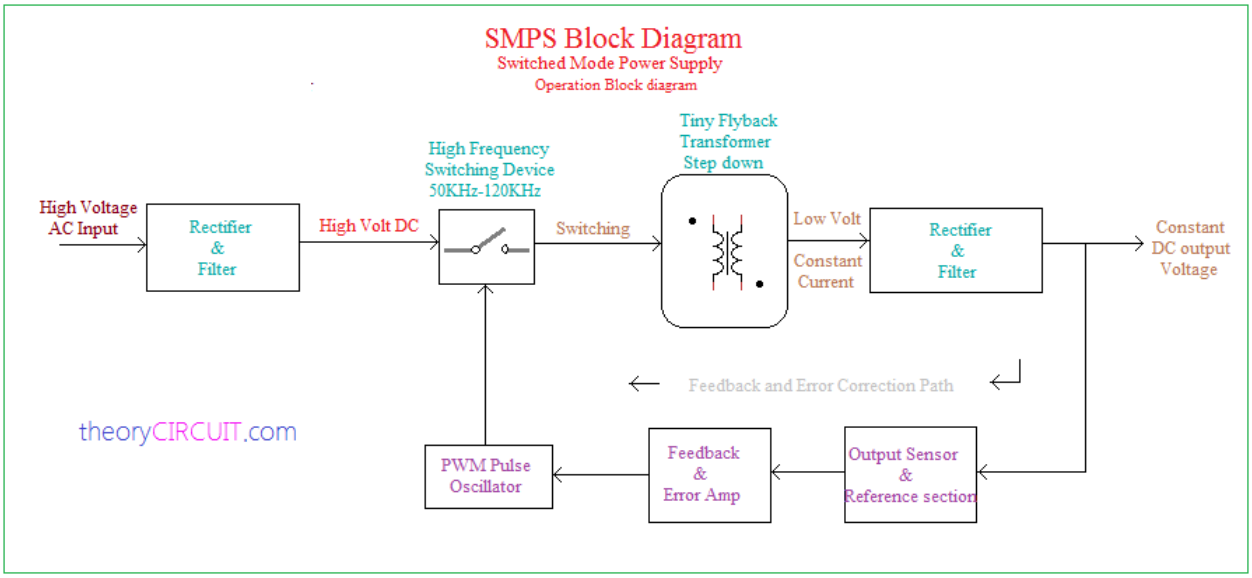
In general, a switch-mode power supply is best suited for portable equipment, since it is lighter and more compact. Because the electrical noise is lower and easier to contain, a linear power supply is better suited for powering sensitive analog circuity.

The switching power supplies are much lighter, more efficient, durable, and have limited high frequency noise due to the design. For this reason, the switching power supplies are not suitable for high frequency audio applications but are great for high power applications. Other than that, these two types are pretty much swappable for various applications, and they cost about the same to make. Switching power supplies are used more broadly nowadays than linear power supplies.

Typical DC Power Supply



These typical power supply designs contain a large mains transformer (which also provides isolation between the input and output) and a dissipative series regulator circuit. The regulator circuit could consist of a single zener diode or a three-terminal linear series regulator to produce the required output voltage. The advantage of a linear regulator is that the power supply circuit only needs an input capacitor, output capacitor and some feedback resistors to set the output voltage.



It is fed from high voltage AC Input and low frequency which is available on power outlet, the first stage of SMPS is Rectifier and filter hence the high AC becomes High Voltage DC from this operation we eliminate high spikes and surge, High voltage DC is controlled by High Frequency switching device (50KHz-120KHz) vary depends on design this switching block samples the high voltage DC with feedback path reference.

The flyback or tiny ferrite core transformer step down the voltage as required depends on design, then the second stage is Rectifier and filter section, it gives Rectified constant DC output Voltage without current fluctuations.

Some portion of output is taken as feedback signal and this signal compared with reference voltage and the error (if present) is amplified depends on the error PWM pulse changes its frequency hence the switching device regulates the output. So the minimum changes in output DC regulated instantly without affecting load.