

CHAPTER 10

Power Supplies

The Power Supply

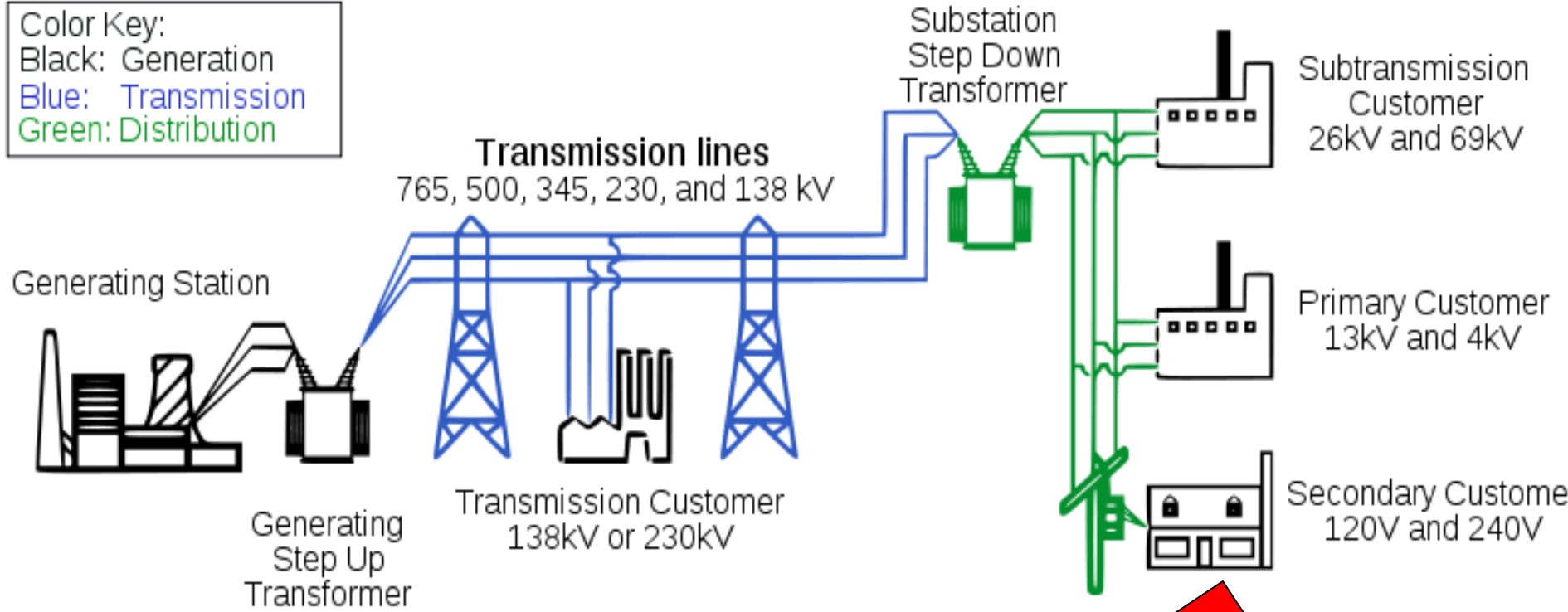


- A station's power supply (sometimes known as a power supply unit or PSU) is a device or system that supplies electrical energy to an output load or group of loads
- Stations may have one robust supply to feed all devices, or may have multiple power supplies.



The Power Supply

Color Key:
Black: Generation
Blue: Transmission
Green: Distribution

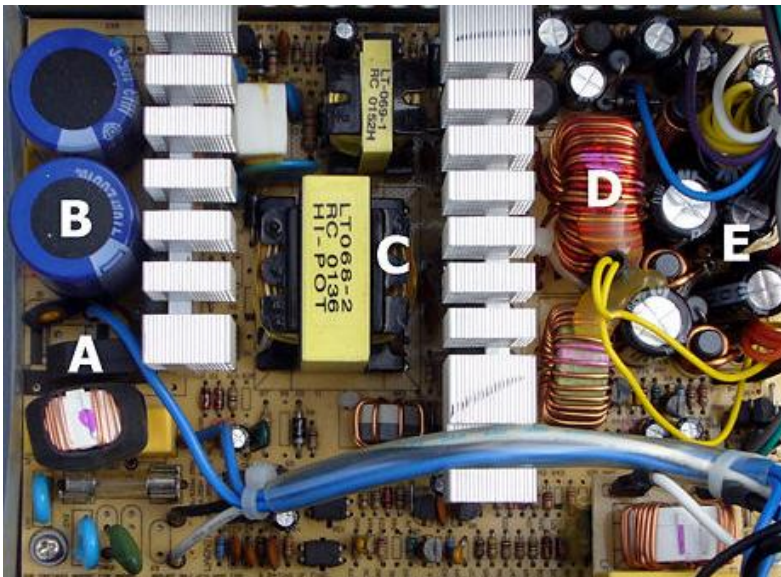
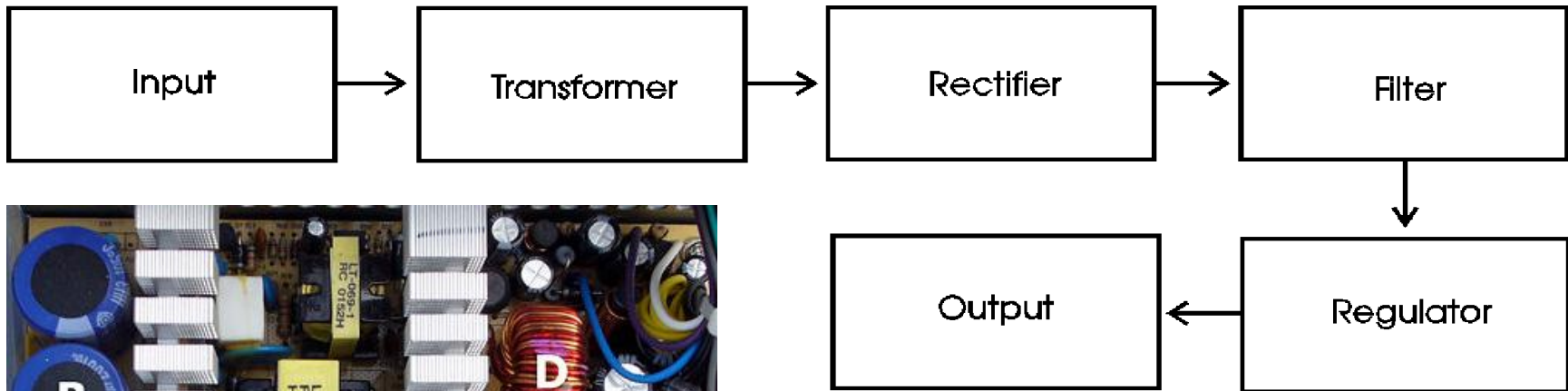


Station power supply typically provides
13.8 VDC \pm 5%



Input voltage is
120 volt AC here

Regulated Power Supply



- A - bridge rectifier
- B - input filter capacitors
- C - transformer
- D - output filter coil
- E - output filter capacitors



Transformer

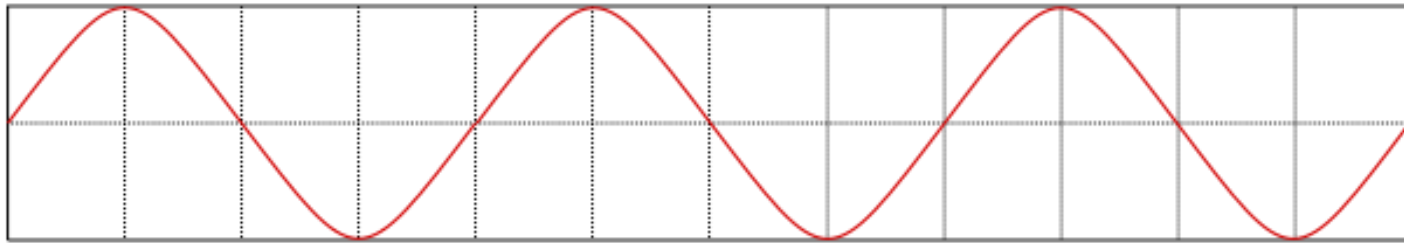


- A transformer is a device that transfers electrical energy from one circuit to another through a shared magnetic field
- A changing current in the first circuit (the primary) creates a changing magnetic field
- In turn, this magnetic field induces a changing voltage in the second circuit (the secondary)
- By adding a load to the secondary circuit, one can make current flow in the transformer, thus transferring energy from one circuit to the other

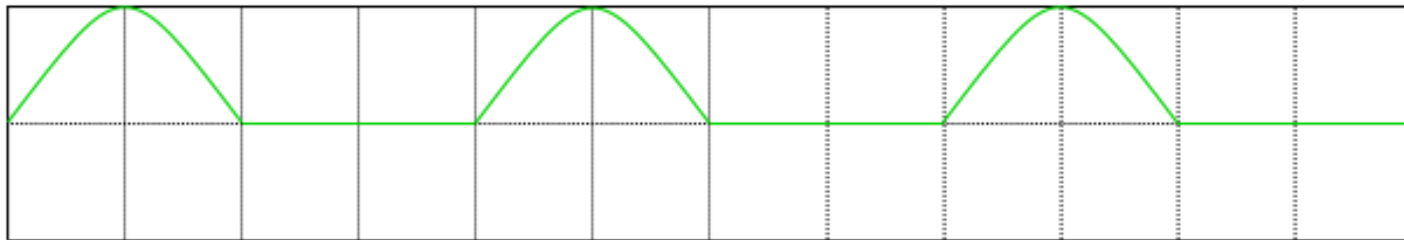
Rectifier



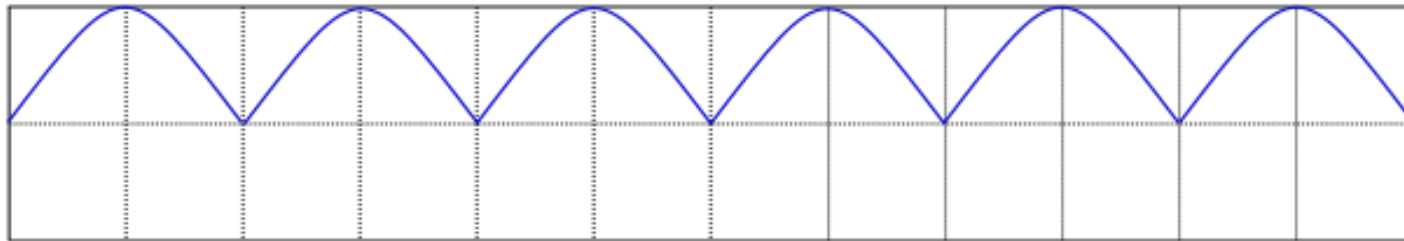
- A rectifier is an electrical device that **converts alternating current to direct current**, a process known as “rectification”
- Rectifiers are used as components of power supplies and as detectors of radio signals
- Rectifiers may be made of solid state diodes, vacuum tube diodes, mercury arc valves, or other components
- A circuit which performs the opposite function (converting DC to AC) is known as an “inverter”



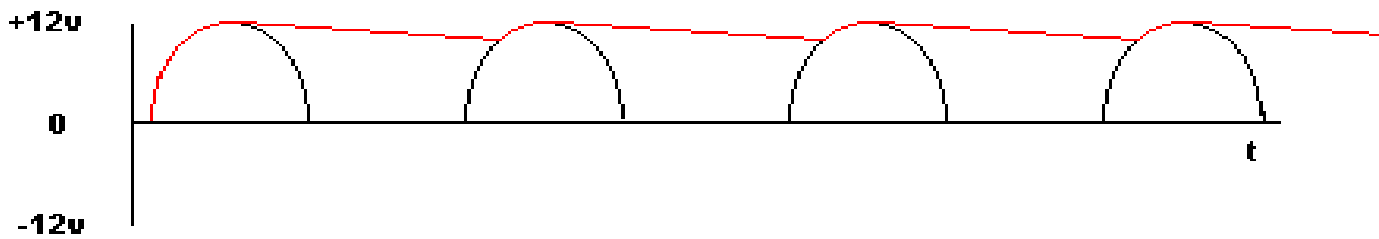
Sinusoidal Signal



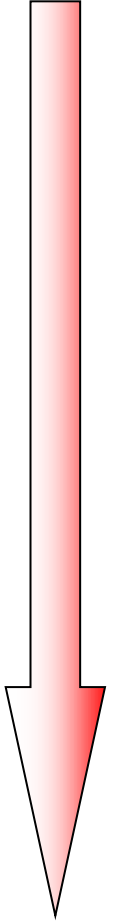
Half-wave Rectification



Full-wave Rectification



AC



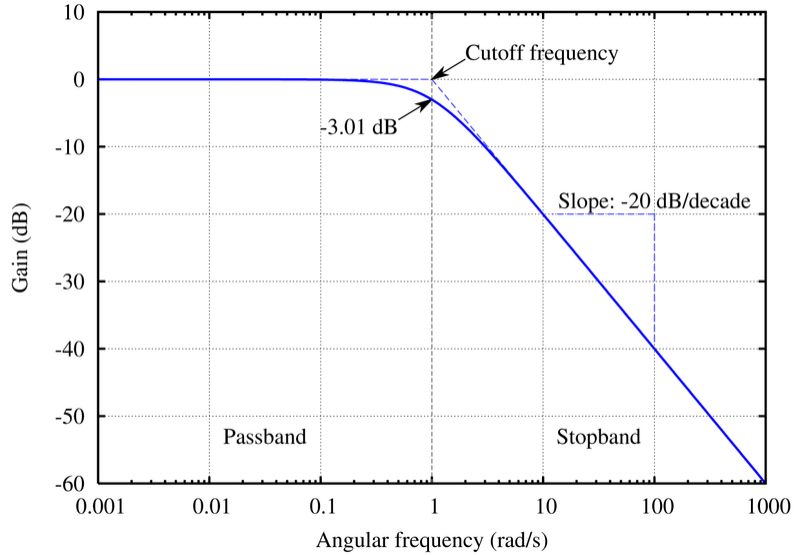
DC

Filter

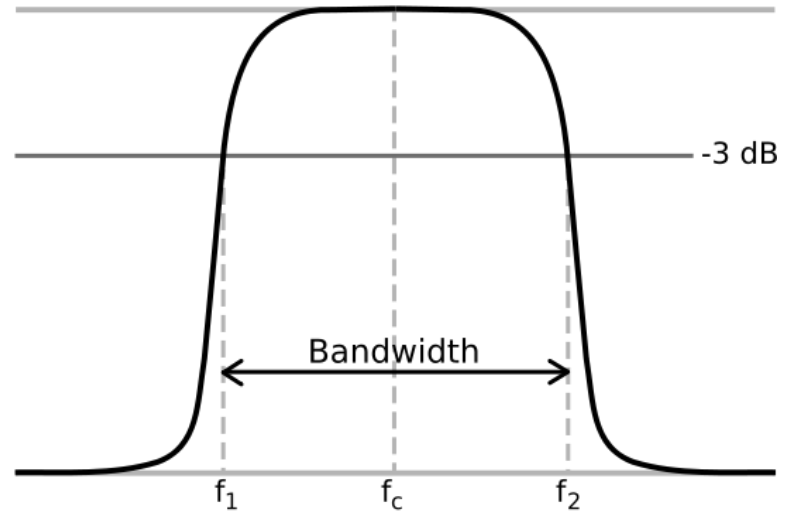


- Electronic circuits which perform signal processing functions, specifically intended to remove unwanted signal components and/or enhance wanted ones
- Low-pass filter - Low frequencies are passed, high frequencies are attenuated **
- High-pass filter - High frequencies are passed, low frequencies are attenuated **
- Band-pass filter - Only frequencies in a frequency band are passed
- Band-stop filter - Only frequencies in a frequency band are attenuated **
- ** Attenuated or attenuation is the reduction in amplitude and intensity of a signal

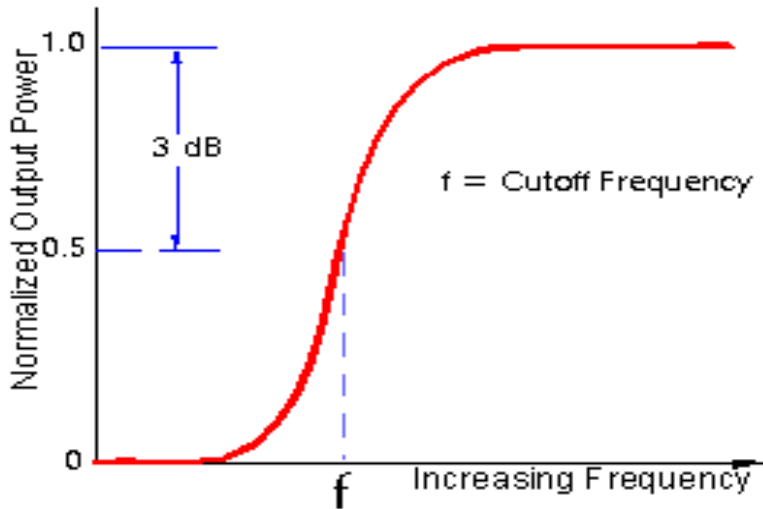
Filters



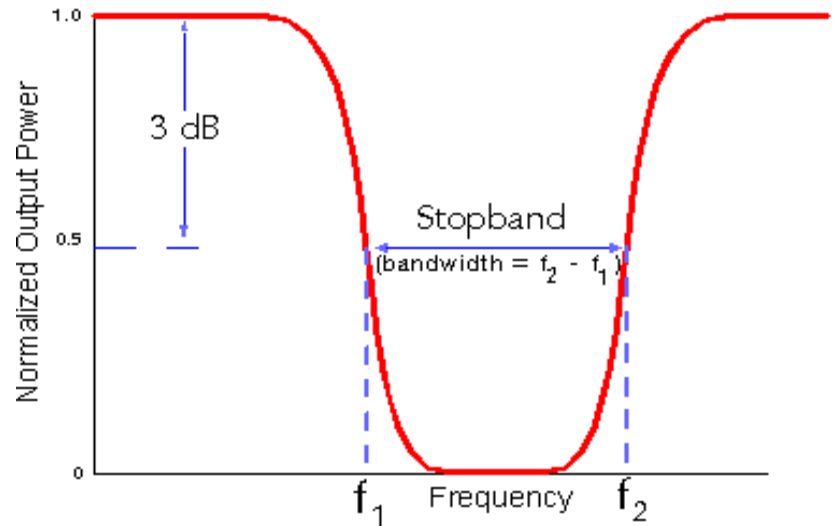
LOW PASS



BAND PASS



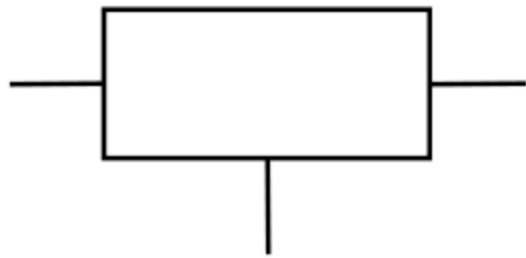
HIGH PASS



BAND STOP

Regulator

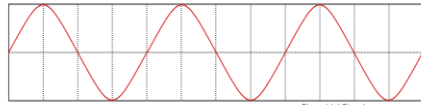
- A voltage regulator is an electrical regulator designed to automatically maintain a constant voltage level.



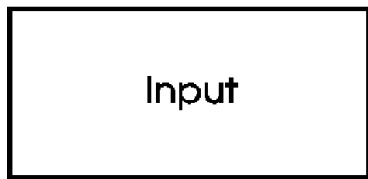
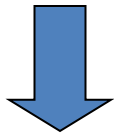
Voltage-Regulator-IEC-Symbol



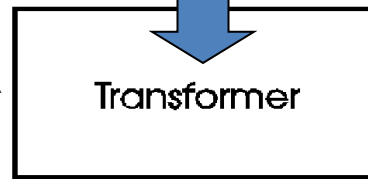
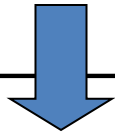
Regulated Power Supply



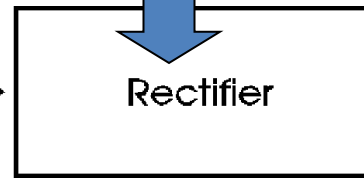
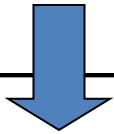
120 or 240 volt AC



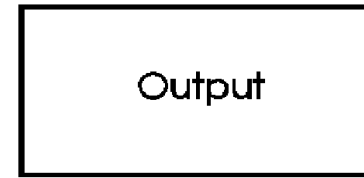
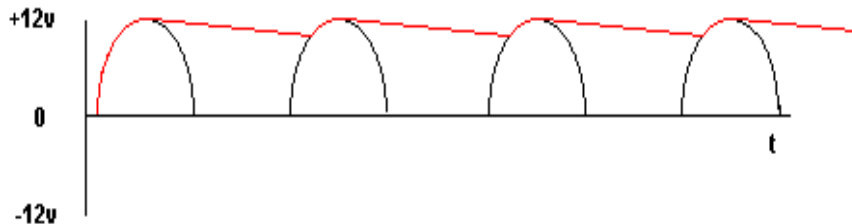
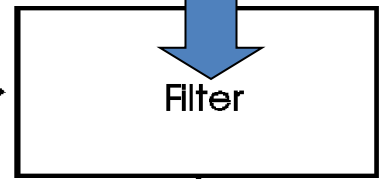
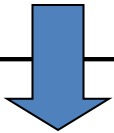
Transfers electrical energy from one circuit to another



Converts alternating current to direct current



Remove unwanted signal components and/or enhance wanted ones



Well-regulated lower DC voltage of 13.8v

Regulator



Automatically maintain a constant voltage level