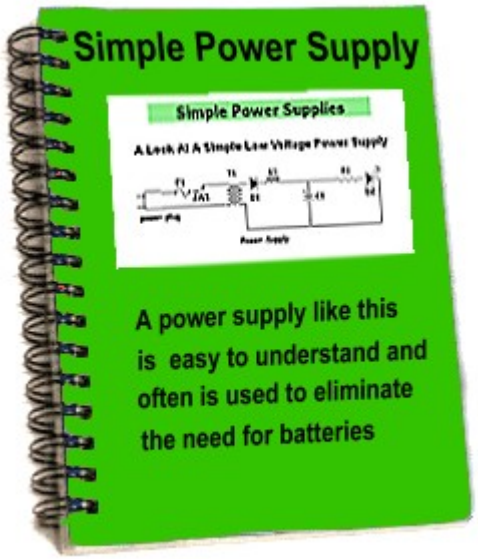
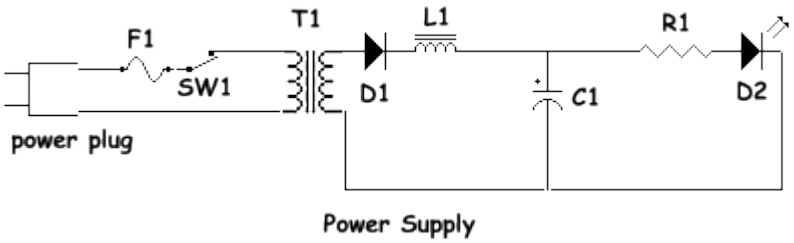


Simple Power Supplies

Step By Step Look At A Schematic Of A Simple Low Voltage Power Supply



Power Supply

Let's start at the left side with the power plug. The top wire connects to "F1" and as you guessed it's a fuse. From there it goes to SW1 which is a off-on switch shown in the 'on' state and then to the top of T1 the power transformers "primary" winding. The bottom of the winding returns to the power plug to complete the circuit.

Remember, we are using AC voltage here so the primary winding of the transformer is 'seeing' a changing current and changing magnetic field.

This changing field induces a voltage in the "secondary" winding of T1. The amount of voltage depends on the turns ratio of the windings. If the secondary has fewer turns then the primary you have a "step down" transformer more than the primary is a "step up" transformer. In this low voltage power supply we will call for a step down to 12 volts AC.

If we used a 10:1 transformer and applied 120 volts AC to the primary we would see 12 volts AC on the secondary. (Tip) Back in the 'old days' this would be called a filament transformer and would be used to power (light up) the filaments of 12 volt vacuum tubes.

OK, from the top of T1's secondary a wire connects to the anode of diode D1. It's very important to connect to the anode as we want a positive voltage. If it got connected to the cathode we would get a negative voltage and the supply would not work. It would damage the capacitor and if the capacitor failed as a short then the fuse would blow and hopefully protect the diode and the transformer! So watching polarities is utmost important.

The diode conducts only on the positive half cycles of the alternating current so the output of the diode is positive pulses, the top half of the sinewave. Next a wire connects to the inductor L1 and then from L1 to capacitor C1.

The combination of L1 and C1 form a low pass filter. Each time a positive pulse arrives at C1 it charges up, then during the time between pulses it discharges supplying current to the load until the next pulse arrives. This filtering action is what gives a nice smooth DC output.

Next a wire connects to R1. This resistor is called a dropping resistor and is used to reduce or drop the voltage supplied to D2 the LED diode. The LED is forward biased and will light when the power supply is turned on.

If there is no load on the power supply (as in this drawing) then the LED will slowly go out when the supply is switched off due to the capacitor C1 discharging though the LED until it has completly discharged.

Depending on the size of C1 the LED could run for four or five seconds after the supply is turned off. Finally, a wire connects from the cathode of D2 (LED) back to the secondary of T1 completing the circuit.

I know, that's a whole bunch of information but now you can "read" a schematic and you understand how a simple power supply operates. Now be sure to check out my complete basic electronics mini course.

Other Links Of Interest:

http://www.gregsbasicelectronics.com/resistors/resistors.htm

http://www.gregsbasicelectronics.com/capacitors/capacitors_inductors.htm

http://www.gregsbasicelectronics.com/soldering/soldertip.htm

http://www.gregsbasicelectronics.com/circuits/ledoscillator.htm

http://www.gregsbasicelectronics.com/circuits/audio_oscillator.htm