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Variable Power Supply

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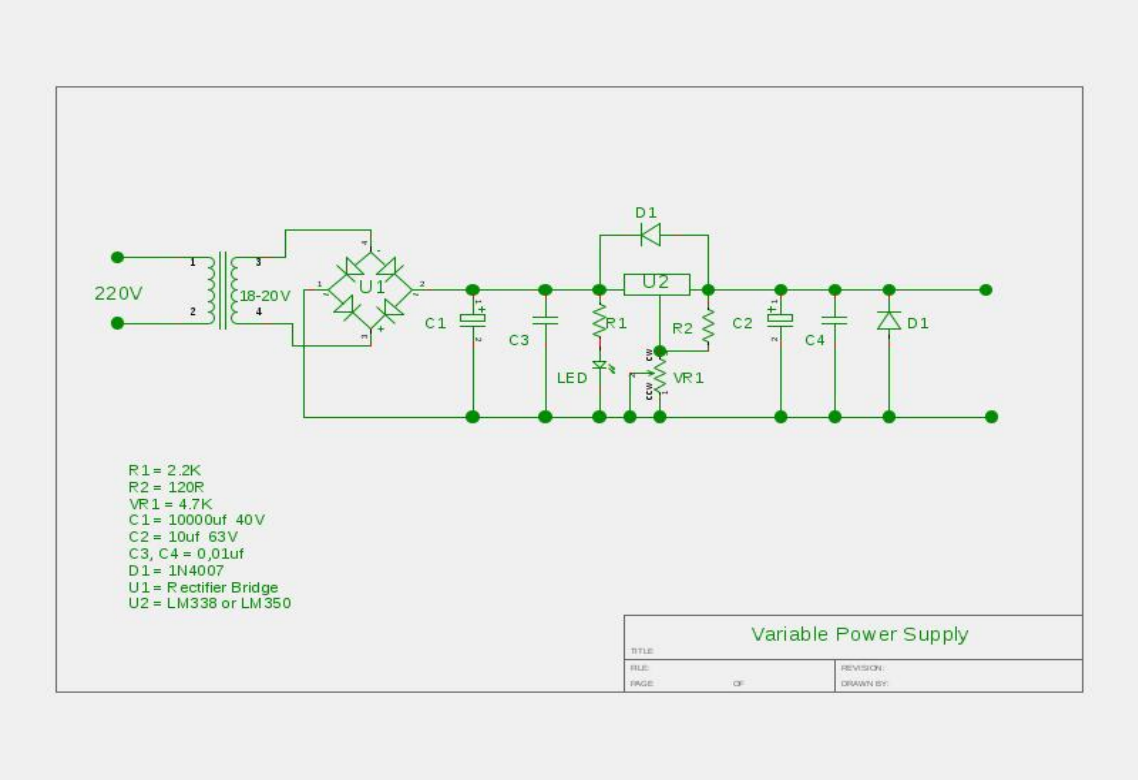
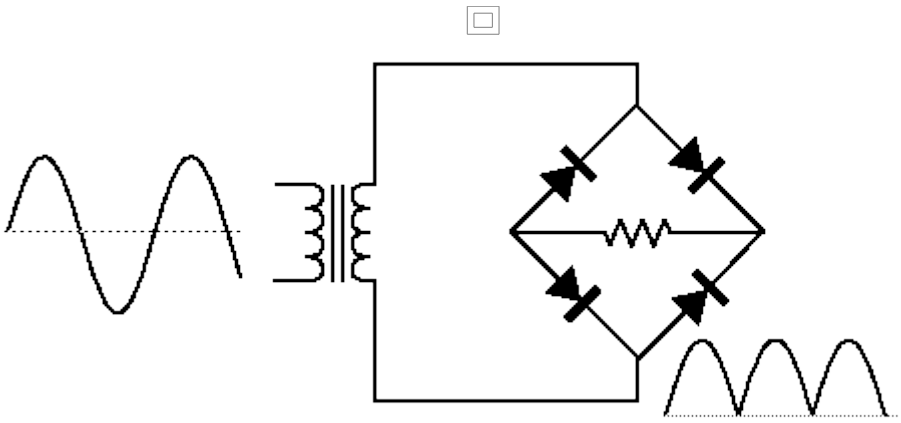
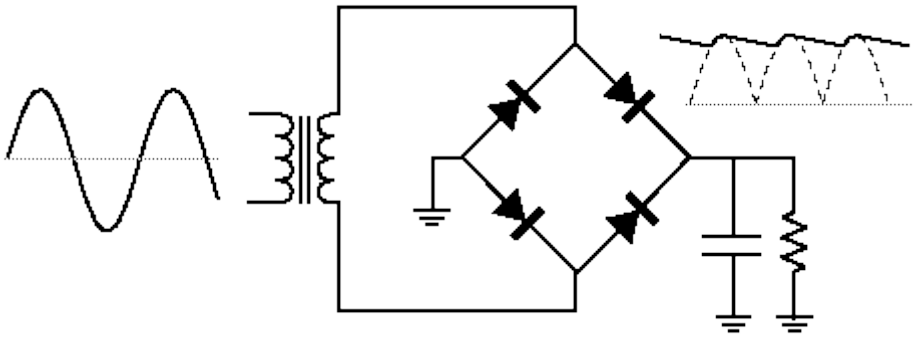


The power supply, of which the circuit diagram appears above, is a proven design of which a number have already been built.
The voltage output can be varied between approximately 1.2 V and 32 V depending on the transformer used.
With the LM338 IC a delivered current of up to 5 A are possible, more than adequate for experimenting with electronic circuits.
An added plus feature is that this power supply circuit is completely protected against short circuits in the supply line, a must for experimental work.

Bridge Rectifier

A bridge rectifier makes use of four diodes in a bridge arrangement to achieve full-wave rectification. This is a widely used configuration, both with individual diodes wired as shown and with single component bridges where the diode bridge is wired internally.





The Charging of a Capacitor

Consider the following circuit: A battery or some DC source is connected in series with a resistor to a capacitor. On switch on a current will flow through the resistor charging the capacitor. When the capacitor charge equals that of the battery, all current flow ceases and everything comes to a halt. When the connection with the battery is broken, the capacitor will remain charged.

Taking a closer look at the charging cycle, one finds that on switch on, a relatively large current flows through the resistor. This current flow however gradually diminishes with time as the capacitor becomes charged.

Should one measure the voltage difference over the resistor you will find for all practical purposes that initially there would exist a difference equal to the voltage of the battery. Cap uncharged. This difference will also diminish over time until it becomes zero when the capacitor is charged.

Should you replace the resistor and the capacitor in the circuit with components with different values you will experience exactly the same phenomena. However, apart from the voltage and current, one factor changes every time a resistor or capacitor is altered, and that is the time it takes for the capacitor to charge. You will find that the larger the resistor or the larger the capacitor, the longer the time is, which if one thinks about it, is quite logical.

Inductors in Series Circuits

An inductor is purely a coil of wire. With an electric current passing through the wire a magnetic field is created in the immediate vicinity of the coil. This field can be concentrated by including a magnetic material in the centre of the coil, increasing the capacity of the inductor, which is usually expressed in micro or milli Henries.

Should we now connect this inductor in series with a resistor and feed a low frequency AC into this combination as we did with capacitors, we will find a large voltage drop across the resistor This shows that a substantial current is flowing in the circuit, indicating that the inductor is offering virtually no resistance to the AC at that frequency. By increasing the AC frequency and measuring the voltage drop across the resistor, we find that it decreases as the frequency goes up, indicating that less and less current is flowing in the circuit.
Note that this is just the opposite of what was observed with capacitors.

One can now connect another circuit across either the resistor or the inductor.
Should it be connected across the inductor, low frequency signals will easily flow through the inductor thus virtually shorting them back to the source. These low frequency signals will therefore be greatly reduced in amplitude or attenuated, and will not flow through to the connected circuit.
We have here a circuit that passes higher frequencies on to the next circuit forming a high pass filter.
Connecting the receiving circuit across the resistor has the effect that only the low frequency signals are passed while the higher frequencies are blocked. A low pass filter in effect.