

## **What is an Inverter?**

An inverter changes DC voltage, almost always from batteries, into standard household AC voltage so that it is able to be used by common appliances. Basically, it does the opposite operation a "converter" or battery charger does. DC is usable for some small appliances, lights, and pumps and is usually suitable for small home or cabin systems, RV's and boats. However, most larger home systems should include an inverter. Although some DC appliances are available, with the exception of lights there is not a wide selection. The most common battery voltage inputs for inverters are 12, 24, and 48 volts DC - a few models from some companies are also available in other voltages.

An inverter takes the DC input and runs it into a pair (or more) of power switching transistors. By rapidly turning these transistors on and off, and feeding opposite sides of a transformer, it makes the transformer think it is getting AC. The transformer changes this 12, 24, or 48 volts "alternating DC" into 115 volts AC at the output. Depending on the quality and complexity of the inverter, it may put out a square wave, a "quasi-sine" (sometimes called modified sine) wave, or a true sine wave. Square wave inverters are usually only suitable for running some type of electrical tools and motors and incandescent lights.

Quasi-sine (modified sine, modified square) wave inverters have more circuitry beyond the simple switching, and put out a wave that looks like a stepped square wave - it is suitable for most standard appliances, but may not work well with some electronics. Also, some of the chargers used for battery operated tools (such as Makita) may not shut off when the battery is charged, and should not be used with anything but sine wave inverters unless you are sure they will work. Sine wave inverters put out a wave that is the same as you get from the power company - in fact, it is often better and cleaner. Sine wave inverters can run anything, but are also more expensive than other types. The quality of the "modified sine" (actually modified square wave), Quasi-sine wave, etc. can also vary quite a bit between inverters, and may also vary somewhat with the load. The very bottom end put out a wave that is nothing but a square wave, and is too "dirty" for all but universal motor driven tools, coffee makers, toasters, and other appliances that have only a heating element.

One solution to the problem of a few small appliances not working well with modified sine wave inverters is to get a large standard inverter, and a small true sine wave for use only with that equipment. This would also allow you to keep the small appliance (such as an answering machine) powered up without having to run the larger inverter full time.

## **What is an UPS?**

UPS stands for "Uninterruptible Power Supply" but is commonly referred to as UPS systems or UPS power supplies. As the name suggests, a UPS system will maintain a continuous supply of electric power to components connected to the system. The main reason a business or company has a UPS system is to ensure that there is no damage to electronic office components especially computers when there is a power surge. Spikes in electricity flow can be experienced during thunderstorms and a UPS system can provide an insurance policy against any costly electrical damage to computer motherboards or even injury to employees.

A UPS system also provides a source of power in the event of a blackout or power outage. An off-line UPS remains idle until a power failure occurs. At this point, it then switches from utility power to its own power source almost instantaneously. An on-line UPS continuously powers the protected load from its reserves (usually lead-acid batteries) while simultaneously replenishing the battery from the AC power. A business or company can save on lost productivity if there is a backup or emergency power supply. A sudden power cut can also mean lost work or data if the person hadn't saved their computers files in time. UPS systems can provide an uninterrupted power source so that computers won't be shut down and employees can continue to work.

A UPS system functions by filtering out the electricity supplied by the electric company and storing some of it in a special battery. Areas that may experience significant thunderstorms or frequent power outages should seriously consider a big enough UPS system to guard their machines and data. The costs may be significant depending on how much protection against power surges a company or business wants.

An additional feature to a UPS system is the USB connectivity. You can monitor the amount of times the UPS system protects you against power surges or power drops by connecting a USB cable from the system to a computer and then analyzing the results of power fluctuations. A power drop of only a few seconds can mean that all computers need to be rebooted and lost data whereas power surges can also cause immense damage to hardware so it is prudent for proper UPS systems to be installed.