

# BATTERY BACKUP SOLUTIONS



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Many people don't know it but the power supplied into our homes and business is not all the same quality or even quantity. The power company does its best to deliver stable power to the public but many variables the power company cannot control affect the power quality delivered to an outlet. Distance from a substation, equipment age, building wiring, power consumption in the local area and other factors all affect the electricity delivered to an outlet.

## **SURGE PROTECTORS**

All computers should have a minimum of a surge protector for power protection but often more protection is required. A surge protector attempts to block damaging over voltages (called a 'spike') in time to prevent damage to electronic equipment. You may think that all power strips are surge protectors but this is not so. A power strip provides no protection unless it states on the box that it is a surge protector. Any surge protector you are considering purchasing should state on the box that it is intended for computer use. Inexpensive surge protectors are made for electric devices but don't offer enough protection for computers which are much more sensitive than say an electric pencil sharpener or desk lamp, for example.

## **VOLTAGE REGULATOR**

A voltage regulator provides power spike protection and some under-voltage (utility power below 110V) protection. Total loss of power cannot be protected by a voltage regulator which can only correct minor under-voltages (usually 10-20% below normal). Under-voltage is not as immediately dangerous as over-voltage, as it does not cause instantaneous hardware failure but under-voltages can cause data to be miswritten in memory or hard drives and can cause data corruption or hardware failure over time.

## **BATTERY BACKUPS**

Battery backups also called Uninterruptible Power Supplies (UPS) are the best protection you can get but they vary widely in quality. Some are little better than surge protectors with a battery for standby power. We are going to spend more time on battery backup than any other power protection because there is more than one type of battery backup and are more complicated.

1. The **Off-line Standby Power Supply (SBS)** offers the bare bones power protection of basic surge protection and battery backup. Through this type of SBS, a user's equipment is connected directly to incoming utility power with the same devices. When the incoming utility voltage falls below a predetermined level the SBS turns on its internal storage battery. Surge protection is adequate but a standby power supply offers none of the power filtering benefits of a line-interactive UPS. *Standby power supplies are recommended for workstations only, they do not provide adequate protection for a server.*

Most Off-line SBS products on the market today only provide a sine wave output when operating normally from the utility line. When they switch to their internal battery they may only provide a square wave, modified square wave or quasi-sine wave, not a pure sine wave. In many cases equipment may appear to operate normally on these waveforms, but over time may be damaged by them. When only minimal protection is needed, it is always best to select an SBS or UPS that states it has an inverter with a true sine wave output.

2. The **Line-interactive UPS** offers the same bare bones surge protection and battery back-up as the standby, except that it has the added feature of minimal voltage regulation while operating from the utility source. This line-interactive design came about due to the SBS inability to provide an acceptable output voltage to the connected equipment during “brown-out” conditions. Interestingly, however, many standby models now have a voltage regulation feature. A “brown-out” happens when the utility voltage remains excessively low for a sustained period. Under these conditions the off-line SBS would go to battery operation, and if the brown-out was sustained long enough, the SBS battery would become fully discharged, turn the power off to the connected equipment and not be able to be turned back on until the utility voltage returned to normal. To prevent this, a voltage regulating transformer was added; this feature really does help as low voltage utility conditions are common. Again when selecting a Line-interactive UPS it is always best to select a model with true sine wave output. This type of UPS typically costs more than the off-line type, but is worth the additional cost.
3. The **On-line UPS** typically cost more, but like all electronic equipment today the cost is coming down as the technology advances. The true advantage to the on-line UPS is its ability to provide an electrical firewall between the incoming utility power and sensitive electronic equipment. While the off-line and line-interactive designs merely filter the input utility power, the double-conversion on-line UPS provides a layer of insulation from power quality problems. “Double conversion” enables the output signal to be independent from the input, allowing control of output voltage and frequency regardless of input voltage and frequency.

On-line UPS are generally more expensive but may be necessary when the power environment is “noisy” such as in industrial settings, in dynamic load environments, or clients with known utility power problems.

## HOW A UPS CAN HELP

Below is a list of common power problems that UPS units are used to correct with a typical example of damage that might be caused:

- **Power failure:** Total loss of power which causes electrical equipment to stop working.
- **Voltage sag:** Short term under-voltage which may be noticeable as a flickering of lights.
- **Voltage spike:** Short term over-voltage or spikes can cause wear or damage to electronic equipment.
- **Under-voltage or brownout:** Low line voltage for an extended period of time that could cause overheating in motors.
- **Over-voltage:** Increased voltage for an extended period of time: Causes light bulbs to fail.
- **Line noise:** Distortions superimposed on the power waveform which causes electro magnetic interference.
- **Frequency variation:** Deviation from the nominal frequency (50 or 60 Hz): Causes motors to increase or decrease speed and line-driven clocks and timing devices to gain or lose time.

- **Switching transient:** Instantaneous under voltage (notch) in the range of nanoseconds: May cause erratic behavior in some equipment, memory loss, data error, data loss and component stress.
- **Harmonic distortion:** Multiples of power frequency superimposed on the power waveform: Causes excess heating in wiring and fuses.

#### FEATURES TO LOOK FOR IN UPS:

1. **VA (Volt Amps) and Wattage Rating:** These numbers represent the electrical load that the unit can supply. For a single server 500VA and 300 watts is the minimum. If the client wants to plug a second PC into the battery backup double the above numbers. These batteries are rated to supply power to a computer for a matter of minutes not hours. Note: laser printers use outlets labeled as 'surge protection only' on battery backups because they will drain a battery in seconds.
2. **On Battery Waveform:** A 'true' sine wave or sine wave is recommended. Many budget battery backups will use a 'square' or simulated waveform which has been known to damage electrical equipment if used for an extended period of time.
3. **Surge Rating:** The amount of electrical power in joules the unit can stop before being overloaded and failing, the higher the rating in joules the better. We recommend a minimum rating of 500 joules.
4. **Types of UPS:** As listed above there are three main types of battery backups: standby, line-interactive and on-line. Standby battery backups are the least effective and cheapest. A line-interactive UPS is a step up in protection and price and acceptable for servers. Lastly, the on-line battery backup offers the best protection but at higher cost. Our recommendation is to fully protect your investment with an on-line UPS.
5. **Battery Run Time:** The amount of time a battery backup will supply power while utility power is off. The amount of time varies from manufacturer to manufacturer even for units rated at the same load. Even though battery time varies from brand to brand none of them supply power for more than a few minutes.