Uninterruptible Power Supplies

by Gordon Young

Uninterruptible Power Supplies are the high end of power-problem protection. If you really need quality power all the time, this is the option for you. UPSes are a common part of large mainframe computer systems. If power fails, these big systems have to shut down gracefully without losing data.

The growing size and complexity of microcomputer systems is making UPSes more common. Like most computer technology, UPSes are getting cheaper all the time.

UPSes combine two functions: power conditioning and battery-power back-up. Different models and designs do this in different ways.

Power Conditioning

Power conditioning goes on constantly in a UPS. Robust circuitry cushions the computer against power transients. It ensures the power getting to the computer is the smooth, steady AC they are meant to run on.

They protect against spikes, surges and sags by buffering the incoming power. Some protect against brown-out by sucking more current when voltage drops, then using the extra power to boost the voltage going to the computer.

Battery-power Backup

UPSes contain rechargeable batteries. When power fails, these batteries power the computer system. The batteries produce DC power, while computers are built to use AC. The battery DC must be converted to AC before being sent to the computer.

Online and Off-line

The different types of UPSes divide roughly into two classes. In an online UPS the batteries power the computer system all the time. The rest of the UPS serves to keep the batteries charged using incoming AC power. In an off-line UPS the batteries only cut in if the regular supply fails. There is a lag, a "transfer time," when this switch takes place. Errors can be caused by this switching process. Some experts think off-line UPSes don't deserve the name "uninterruptible." They prefer to hear them called Standby Power Supplies (SPSes).

UPS Strategies

Most users don't want a UPS that continues to operate when power fails. For them a UPS is for shutting down the system without losing data, time and effort—the model of grace under pressure. The size of a UPS should be matched with the power requirements of a system and the time needed for emergency back-up and shutdown.

Peripheral devices like printers may not need UPS backup. It depends how vital the function is. For example, a printer may be printing a run of cheques. If the job shut down when the power went out, and then restarted, duplicate cheques would be produced. A big-enough UPS would see the job through.

Continuing operation is possible if needed. Hospitals and other vital services keep banks of batteries big enough to run for hours. Stand-by generators can keep computers running, but power output from most generators is crude and rough. It must be passed through a good power conditioner before going to a computer or this cure can be worse than the disease.

LAN's Best Friend

The LAN (Local Area Network) has a level of system complexity sufficient to require backup with a UPS. Most LANs are used by small- to medium-sized businesses. Money is on the line if the LAN crashes.

Because of their complexity LANs are more vulnerable than single computers to power and noise problems. Even a simple LAN can form ground loops with its own wiring. This transmits electrical noise among all network nodes.

The value of the data lost in a crash can be more than the cost of the LAN system hardware. The time spent recovering from a crash caused by power failure costs even more in lost production. In the interest of speed, LAN file-server directories may be stored in volatile RAM memory. If this goes it's a real disaster.

A UPS can run out of juice if it's trying to support a LAN in unattended mode. Some LAN server software can sense power failure, shutting down the system and saving data while the batteries last.

The Boomerang

There is an option cheaper than a UPS and better than no power backup at all: the Boomerang, by Micro Sync. This DC hardware device that fits inside a computer case will bail you out when power fails.

The Boomerang cuts in as power fails From its built-in DC batteries it powers the computer for 30 seconds—long enough to shut down without loss of data. It writes all the data in conventional, expanded and extended RAM to the hard disk. It does this bail-out backup automatically—it needs no human operator.

When power comes back, the Boomerang automatically reboots and reads the data back from hard disk to RAM. This hopefully leaves the computer where it started before power failed. The Boomerang can pull off this stunt about three times a day. After that the batteries run down.

Choosing a UPS

If you decide you need a UPS there is a process to choosing one. You have to work out your computer system's power demands, then decide how long you want it to keep running if the power fails. This will give you an estimate of the size of UPS you need.

The quality of your power will tell you how important power conditioning is to you. In Third World countries power is not as clean as in Canada, for example.

Battery life is important when choosing a UPS. How long before the batteries that come with the unit wear out and must be replaced? Batteries can account for 30% of the unit's price, so the ongoing expense of battery replacement is important.

The Laptop Advantage

Portable laptop computers combine a rechargeable battery power supply with AC plug-in capacity and come with their own UPS. Benefits are limited by battery life and recharge time. If you know your computer is going to operate in a chancy power environment, consider buying a portable model.

Laptop batteries can be recharged from less-than-perfect power sources like car cigarette lighters or small portable generators. The stored charge can then produce clean, steady power for computer operation. A system of spare batteries charging up in a separate charger can ensure continuous operation.

Built-in UPSes

UPSes built right into a computer are becoming more popular. Mounting them inside the standard case cuts the cost of their having a case of their own. As more computers are made with the role of LAN server in mind, this trend will grow. The batteries are heavy, though, and add ten pounds or more to the weight of the machine.

More Information

For details on computer power, read *Computer Electrical Power Requirements* by Mark Waller, ISBN-0-672-22561-1, Howard W. Sams and Co. Emerson Computer Power distributes excellent general UPS documentation, available through Compu-Power Controls Inc., Coquitlam, B.C. American Power Corporation produces *The Power Protection Book*, with detailed technical notes.

PC Week magazine reviewed UPSes in its April 22, 1991 issue. *Byte Magazine* reviewed 27 different UPSes in its Nov. 27, 1990 issue.

Thanks

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