TECH TALK

Nearly all of us now use computers, and many even oversee computer labs. Among the common recommendations for computer systems is a surge protection device that is designed to eliminate sharp surges or spikes in the power source.

But do they really do the job? The following article discusses why even using surge protectors may not be a good idea.

In addition, computer installations also need protection from *dips* in power (brownouts or power failures). Surge protectors provide no help for this problem, and some Uninterruptible Power Supplies (UPS) may not provide full protection.

What's best for you? Read the article before making up your mind. Unless you operate critical systems (networks, for example), you may be best advised to plug the computer directly into the wall and to unplug the system whenever there's a thunderstorm (not bad advice in any case). On the other hand, if you can't afford to have your system affected by power problems, you're probably better off spending what it takes to get real protection.

SURGE SUPPRESSORS: WORSE THAN USELESS?

Andy Baird

Zzzzzzaaaapppp!

Jolted out of my early-morning sleep by the deafening buzz of an electrical arc, I knew at once something was badly wrong. I lunged toward the sound, which came from beneath my computer desk, taking in at a glance the ominous blue-white glare from my surge suppressor, and the cloud of black soot staining the wall behind it. I ripped the Mac's plug from the outlet as the arc died and an evil smell filled the room.

After my heart had stopped pounding, I examined the remains of my surge suppressor. Looking at the charred interior of the case, I shuddered. If it had been made of plastic instead of steel, there probably would have been a fire. The MOVs (Metal Oxide Varistors) had been literally blown apart by the force of the surge; then, like a welder's rod, had arced across the bare wire leads.

I thanked my lucky stars that the MOVs had done their job and saved my Mac, while wondering whether there wasn't a better way to protect equipment—a way that didn't involve an explosive failure of the components that did the protecting.

I thought about the time, a couple of years back, when my Hayes Smartmodem had died during a thunderstorm, along with a couple of chips on my computer's motherboard. I had surge protection on the computer, but none on the telephone line. When lightning struck nearby, a spike came up the phone line, fried the modem, then continued up the serial cable to kill the line-driver chips in my computer. After that experience, I added a surge suppressor on my phone line, so I was completely protected.

Or so I thought at the time.

Now I know I was wrong. In fact, I now realize that the modem was probably killed *by my surge suppressor.* The MOVs which were supposed to protect my computer had done their job by shunting an incoming powerline surge onto the ground conductor—*the same ground used by the modem as a signal ground reference.* The result was a few thousand volts across the modem's inputs—and a dead modem.

EVERYTHING YOU KNOW IS WRONG

I want to make three main points in this article. First, the surge suppressor you own, if it's more than a year old, is probably *not* protecting your equipment, because its MOVs have degraded to the point of uselessness—and there's no practical way you can test this. Second, even if it's brand new, or uses expensive TransZorb devices instead of MOVs, it is designed to dump surge energy onto the ground conductor used as a reference by your modem, network connection or other serial device, thus endangering your peripherals or other networked computers, even if it protects your own computer. Third, there is a new device which will protect your equipment over the long term—ten to twenty years—without endangering it.

Before I tackle those three points—and try to convince you that the conventional wisdom about surge suppressors is wrong—let me tell you where this information comes from.

LIGHTNING STRIKES IN THE CAPITOL

The National Institute of Standards and Technology, in Washington, DC, has a section devoted to the study of power-line surges. The head of the group, François Martzloff, has been studying surges and other transient electrical phenomena for many years, resulting in ANSI/IEEE standards (C632.41-1980, if you're interested) defining commonly-encountered spikes and surges. A recent experiment, in which surges were artificially induced in the power wiring of an industrial building, yielded an unexpected result: suppressor-protected computers were undamaged, but serial printers connected to them were damaged *by surges on the data input lines—not the power line.*

Where had these surges come from? Martzloff and his colleagues finally concluded that the data-line spikes which had damaged the printers had been created when the computers's surge suppressors shunted the excess electrical energy to the common ground conductor. *The printers had been killed by the surge suppressors!*

Interestingly, the NIST team was not the first to arrive at this conclusion. A small New Jersey company, Zero Surge Inc., had been founded not long before by two engineers who set out to build a power

conditioning device which would *not* dump excess energy to ground. We'll talk more about the Zero Surge device later... but now let's consider my three major points.

THE MORTALITY OF MOVS

A look at GE's "MOV Design Manual" reveals several interesting facts. First, MOVs don't begin to respond to a voltage spike until 14-40 nanoseconds. That may sound fast, but the typical spike described in the IEEE standard has a rise time of just 5 nanoseconds. That means an MOV can't react fast enough to stop the most common electrical spikes–spikes the IEEE standard says can be expected many times a week in an average building!

Second, MOVs wear out. Every little jolt shortens the lifetime of an MOV, until finally it fails to provide any protection. Those little jolts include the several-times-a-week spikes described in the IEEE standard. A recent article in the industry journal *LAN Times* (May 1990) says: "if your surge protectors have been in use for a while (six months is a reasonable time), the MOVs may be incapable of proper performance. Moreover, as the [MOV] ages, its clamping voltage decreases and it may begin a process called thermal runaway, which has resulted in fire." (Remember, I spent a long time scrubbing the soot off my walls after my surge suppressors burned up!)

A dead MOV—more precisely, one which has deteriorated to the point where it offers not protection—can only be detected with expensive, sophisticated test gear. That ten-cent LED which glows so reassuringly on your present surge suppressor may make a good night light, but it tells little or nothing about whether your MOVs are really doing their job, or have gotten tired and given up. I've been shown several commercial surge suppressors (a Kensington MasterPiece, among others) which *appeared*

fully functional, but provided no surge protection whatsoever!

In short, MOVs provide inadequate protection; they wear out in the course of normal use, and they fail without warning, posing a possible fire hazard.

WHAT ABOUT TRANSZORBS?

I've always figures I was extra safe, because my Mac was plugged into an expensive power strip using TransZorbs instead of MOVs. TransZorbs (avalanche diodes) are semiconductor devices which respond faster than MOVs and don't degrade with time. However, I've recently discovered that they have another problem: when a really big surge hits, they fail "open," so they can't divert the surge voltage, just when they're needed most!

But that's minor. The real problem is this: just about all presently available surge suppressors, whether they use MOVs or TransZorbs, are wired to divert, or shunt, energy to ground. As the NIST researchers found, this almost guarantees contamination of data lines, resulting in garbled data at best, and fried equipment at worst. The same design flaw which cooked my Hayes modem and those printers in Washington is built into almost every surge suppressor made, from the cheapest tot he most expensive. The *LAN Times* sums it up this way: "Networks should only employ surge protectors that do not shunt surges to ground. If [existing] power conditioning devices contaminate the reference ground by introducing surges, it may be wise to remove such devices from a network or to replace them with something better."

Some people may think they're protected by the use of UPS (uninterruptible power supply) equipment, which by definition is a 100% battery-fed system. But not only are UPSs quite expensive, their inputs are

protected by the same fifteen-cent MOVs used in the average surge suppressor. (The single exception, Abacus Controls, licenses its technology from Zero Surge, the small company I mentioned earlier.)

A SINGULAR SOLUTION

So how *can* you protect your expensive computer equipment? The LAN Times has this to say: "The ideal surge protector would be a circuit that presents a high impedance to the surge and a low impedance to the [normal] power wave, while protecting the integrity of the ground circuit. It should also contain no degrading components like MOVs." Such devices exist; they are made by Zero Surge, Inc.

If I tell you that the Zero Surge units appear to be the only surge suppressors on the market which work properly, you'll have a right to be skeptical. After all, the power conditioning business is full of snake oil salesmen, each claiming that only *his* product is worth buying.

Well, I don't blame you. I was certainly skeptical at first. But after reading articles in LAN Times, PC Week, and Power Quality magazines and talking with electrical engineers as well as the president of Zero Surge, I believe the Zero Surge protectors are the only ones which 1) will adequately protect equipment and 2) won't contaminate data lines by dumping surges onto the ground circuit.

The Zero Surge unit differs in four fundamental ways from ordinary surge protectors:

1. It's a series circuit with zero response time. It intercepts all surges, including the common 5 nanosecond surges which are too fast for MOVs to divert.

2. It contains no MOVs or other sacrificial or degrading parts, and no components are overstressed by surges of unlimited current up to 6000 volts (the IEEE standard). Its service life is equal to the shelf life of its components, which is why Zero Surge warrants its products for 10 years, and thereafter offers to upgrade any unit to new condition at any time for 20% of whatever the unit then sells for.

3. Critical for networks and modems (BBS and LAN users take note), Zero Surge does not use ground as a surge sink, but instead stores the surge energy temporarily, then slowly releases it to the neutral line. This preserves the integrity of the ground for its role as voltage reference by all dataline interconnections.

4. Zero Surge takes the sharp leading edges off surges and noise, eliminating their ability to couple into computer circuitry.

Zero Surge protectors range from about $150 to $200. They can be contacted at (201) 766-4144.