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Surge Protectors: Purpose and Selection

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TOPIC -----

Do you have any tips on protecting Macintosh analog boards against electrical surges?

DISCUSSION -----

The usual techniques for protecting any computer product apply. Surges are the biggest cause of product failure.

Background

Electrical power surges can and do occur in all environments. In some areas, they occur regularly. In some cities, the power is very stable, while in others, the power can cut off two or three times a day, if only for a second. Even within cities or neighborhoods, there are variations.

Other factors that contribute to power fluctuations and surges include:

- Quality of the building's wiring
- Number of electrical devices
- Overloaded circuits
- Circuitry and wiring design

All of the above have a bearing on how often a particular system is prone to sustaining damage from electrical surges or spikes, brownouts, or blackouts.

At times, you may encounter situations where power surges produced damage to a system connected to a surge protector. Unfortunately, not all surge protectors give the same amount of protection.

Systems protected with surge protection devices still may sustain varying degrees of damage (from a slow leak on a chip that caused intermittent failures for months, to an outright failure, to melted chips). For example, a lightning strike 2,000 miles away from your system may be able to electronically zap a system through the phone lines. In one known case, the surge carried through the modem, into the computer, damaging the logic board, disk-drive controller board, modem, and two peripheral cards.

Which surge protection device should you buy? How much protection does a device really provide? Can it protect your system in view of your particular environmental condition?

Surge Protector Selection Tips

A single-line surge protector usually protects between hot and neutral wires. This provides minimal protection, which may be adequate for areas and environments that are very stable.

A three-line surge protector usually protects between:

- Hot and neutral wires
- Hot and ground wires
- Neutral and ground wires

This offers more comprehensive protection.

A three-line surge protector protects between:

- Hot and neutral wires
- Hot and ground wires
- Neutral and ground wires

and has a separate fuse for each line. This offers better protection than the previously mentioned devices.

Don't forget about surge protection to your phone line, if you have a modem connected!

Surges attack over four electrical pathways: hot, neutral, ground, and via phone lines. Protecting only one can leave you vulnerable to damage. On a single-fuse system, if a surge takes out the fuse, all three sources of protection are nullified. In a three-line surge protector with three fuses, if a spike or surge takes out the first fuse, or catches only the "leading edge" of a surge, the second circuit takes over to block or reroute the surge with the third circuit absorbing the remainder.

The effectiveness of three-line protectors also depends on the construction of the device. This includes the speed with which it works and the voltages it can handle, block, or absorb. Price alone is not a reliable indicator, and not everyone needs the same type of device.

There are far more sophisticated systems for surge protection than those mentioned here. These include systems providing emergency power backup, which can cost many hundreds and thousands of dollars. The type of protection your equipment requires must be examined on a case-by-case basis.

Getting Selection Help

To determine your needs, see a qualified expert. Your electric company can conduct measurements to determine electrical activity. Have a consulting electrical engineer or electrician check your electrical environment to determine power loads and the necessary level of protection. Then, the consultant can advise you of appropriate surge-protection requirements.

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