Protect Electronic Equipment from Damaging Power Surges and Line Noise Interference

How to Choose the Best Surge Protectors for Everything from Tablets to A/V Installations to Rack-Mount Servers

Executive Summary

Every type of electronic equipment – from PCs, servers and network equipment, to home theaters, computer peripherals and mobile devices – is vulnerable to damage caused by power surges and line noise interference. With a relatively modest investment, surge protectors offer a highly effective way to protect valuable equipment (and the data on that equipment), prevent productivity loss and gain peace of mind. Given the broad range of surge protectors and features available, the challenge is choosing the surge protector best suited for your equipment, your environment and your needs.

Table of Contents

Plugging your equipment into an outlet without surge protection exposes it to damaging power problems.

Why Your Electronic Equipment is at Risk

Surge protectors – also known as transient voltage surge suppressors – protect anything with an AC plug from potentially damaging power surges, voltage spikes and line noise. It is important to understand why these occurrences put your electronic equipment at risk.

It's all about the voltage

Most homes and offices in North America have electrical wiring with a standard voltage of 120 volts. Essentially, voltage is a measure of electrical pressure. In the same way that higher pressure on one end of a hose pushes water to an area of lower pressure and makes it flow out of the hose, greater electric potential energy on one end of the wire moves electric current to the other end where the pressure is lower.

When there's too much pressure – in other words, when voltage exceeds 120 volts – it can damage electronic equipment.

Power surges and voltage spikes

When the increase in voltage lasts three nanoseconds (billionths of a second) or more, it is called a power surge, or transient voltage. If the increase lasts less than three nanoseconds, it is referred to as a spike.

Protect Electronic Equipment from Damaging Power Surges and Line Noise Interference

TRIPP·LITE

Power problems like surges, spikes and line noise can be caused by severe weather, the overburdened electrical grid or even the appliances inside your home or business.

Surges and spikes can be caused by a variety of internal and external sources, including:

• Problems with utility company equipment

• Overburdened power grids that switch between sources or disrupt power

• The switching on and off of high-powered electrical devices in a home or office building

• Lightning, wind and freezing rain

• Faulty wiring

The additional voltage in both surges and spikes generates extra heat that can seriously damage or completely destroy the circuit boards and other critical components in electronic equipment. The damage may occur all at once if the surge or spike is large enough. Or, equipment may be harmed over time by smaller, repeated power surges and spikes.

Line noise interference

Surge protectors also protect against "line noise," which is distortion on AC, telephone/modem, network or coaxial lines. Most people recognize this as audio static or video snow. Line noise is caused by Electromagnetic Interference (EMI) and/or Radio Frequency Interference (RFI), typically generated by operating other equipment on the same electrical system. For example, line noise may result from turning on fluorescent lights or a laser printer, or using a generator or major appliance.

Surge protectors typically have multiple outlets and a power cord to connect multiple devices to a single wall outlet.

How Surge Protectors Work

Surge protectors usually include multiple outlets and a power cord, allowing several electronic devices to connect to a single AC wall outlet. The electrical current passes from the outlet to the components plugged into the surge protector.

When the voltage rises above the accepted level, the surge protector suppresses the excess voltage to prevent it from causing harm (explaining why it's also referred to as a surge suppressor). Specifically, internal components absorb the excess voltage and divert it to the ground wire, preventing it from reaching sensitive connected equipment.

To function effectively, a surge protector must be connected to a properly wired and grounded AC outlet. Surge protectors sometimes include LEDs that alert users to possible wiring problems.

Protect Electronic Equipment from Damaging Power Surges and Line Noise Interference
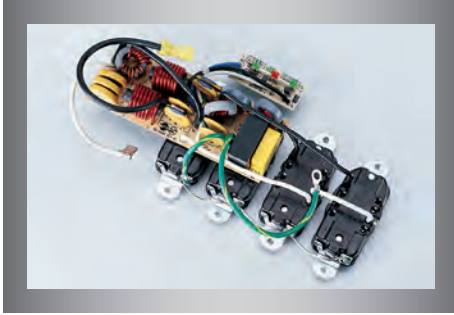
Internal surge protector components like MOVs prevent power problems from damaging your equipment.

The most common types of surge protectors include one or more metal oxide varistors, or MOVs. When the voltage spikes or surges, the MOVs absorb the excess current. Meanwhile, the acceptable current continues to flow through the line and power the connected electronic equipment safely. In essence, the MOVs serve as a pressure-sensitive valve that opens only when excess pressure must be released.

How to Measure the Effectiveness of Surge Protectors

There are a variety of ways to gauge and compare the effectiveness of surge protectors. These include:

Clamping voltage/Let-through rating

The clamping voltage indicates the voltage level that will cause the MOV to operate, while the UL 1449 voltage let-through rating defines the average amount of voltage the surge protector "lets through" to the connected equipment following a surge or spike. The lower the let-through rating, the better the protection. The UL rating levels are 330, 400, 500 and 600 volts.

Protect Electronic Equipment from Damaging Power Surges and Line Noise Interference

TRIPP·LITE

$150,000
Ultimate Lifetime Insurance
3345 Joules
More Joules Mean More Protection!

The joule rating of a surge protector indicates how much electrical energy it can absorb without failing.

Joule rating

A joule is a basic unit of electrical energy. Surge protectors have joule ratings that indicate the total amount of energy they can absorb without failing, whether in a single event or over a series of spikes and surges. Also, for every joule absorbed by a MOV, additional joules may be diverted into the electrical ground. Typically, the higher the joule rating, the greater the protection provided. Choose surge protector joule ratings based on the value, importance and sensitivity of the equipment that will be connected, with an absolute minimum joule rating in the 200 to 400 range. For more sensitive or costly equipment, such as computers, displays, printers and audio/video equipment, select a surge protector with a joule rating of at least 1,000.

Protect Electronic Equipment from Damaging Power Surges and Line Noise Interference

In addition to protecting equipment, surge protectors also help protect the important data stored on computers and other devices.

When to Use a Surge Protector

Think of a surge protector like an insurance policy. You hope you never have to use it, but you're very glad you have it when you need it. Very large surges, which are primarily caused by lightning and temporary interruptions resulting from storm damage, occur infrequently. They may occur a few times a year or as often as 40 times, depending on the area. However, normal equipment operation may cause surges over 1,000 volts multiple times per day.

The sensitive microprocessors and other components integral to the electronic devices commonly found in homes, offices, data centers, manufacturing plants, hospitals, schools and virtually everywhere else are highly susceptible to fluctuations in electric current. Given the multiple possible sources of power surges and uneven power flow in today's electricity distribution system, a better-safe-than-sorry approach makes the most sense, especially since the investment required is relatively modest.

Surge protectors not only prevent harm to the device itself, they protect against catastrophic loss of data stored on the device, whether it's family photos or business documents. They also protect against the loss of productivity that comes from being without the electronic devices everyone increasingly depends on in homes, schools and workplaces. And, of course, surge protectors save money by eliminating the need to replace equipment damaged by excess voltage.

TRIPP·LITE

Among the devices that should be protected are:

- Desktop computers, laptops, notebooks, tablets
- Printers, displays, peripherals, modems, wireless routers
- Smartphones, MP3 players and other mobile devices
- Servers, network hardware and other rack-mountable equipment
- TVs and video game systems
- Home theaters, projectors, sound systems, DVRs, cable and satellite receivers
- Medical and lab equipment
- Office equipment
- Small appliances
- Power tools
- Battery and device chargers

When to Replace a Surge Protector

The more MOVs in a surge protector, and the higher its joule rating, the longer the surge protector is likely to continue functioning properly before requiring replacement. However, MOVs can burn out after a single overwhelming power surge or degrade after repeated smaller surges. As a result, it's important to make sure the surge protector has an indicator light to confirm its protection status. If the LED goes out, it's time to replace the surge protector.

Damaged by repeated surges over time, a surge protector will eventually lose its ability to protect against additional surges. It should have an LED to indicate whether surge protection is functional.

Some manufacturers provide a product warranty that guarantees lifetime replacement. After all, if the surge protector stops working, it has successfully absorbed the potentially damaging excess energy. And, like a bike helmet, once the surge protector has done its job, it needs to be replaced because it can no longer continue to provide the desired protection.

How to Select the Right Surge Protector

Surge protectors are available in a wide range of sizes, styles and price points. To help you select the options that best match your needs, here are 10 key questions to consider:

1. How valuable is the equipment you're trying to protect?

Are you seeking to protect a $1,000 desktop PC, a $10,000 home theater or a $100,000 data center installation? The value of the equipment you want to protect is the single most important factor driving your surge protector selection process. Obviously, the higher the value, the higher the quality of surge protector required. When calculating total value, be sure to include not only the direct cost of replacing damaged equipment but also the cost of lost productivity, and of replacing or recovering lost data.

TRIPP·LITE

A right-angle plug reduces the clearance required at the wall outlet, allowing furniture to be placed closer to the wall.
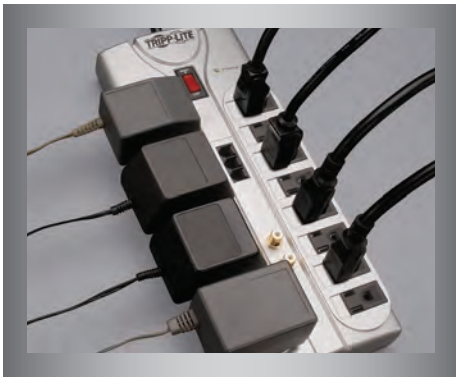
Some surge protectors include widely spaced outlets that allow you to plug in bulky AC adapters without blocking adjacent outlets.

2. What level of protection do you need?

A surge protector's joule rating indicates how much energy it can absorb before it fails. The higher the number, the greater the protection provided. The type and value of the equipment are key factors in determining the optimal amount of protection, as is the region of the country where the equipment is located. If lightning storms are frequent occurrences, for example, a higher level of protection should be strongly considered.

3. How many outlets do you need?

Determine how many different items will be plugged into the surge protector, and invest in one with a minimum of that many outlets. If some of the items include bulky transformer plugs (also known as AC adapters) rather than standard ones, allow for possible outlet blockage or select a surge protector designed specifically to accommodate the wider plugs without blocking adjacent outlets.

4. How far is the equipment from the wall outlet?

Surge protectors come with different cord lengths. Determine the distance the surge protector will be located from the grounded AC outlet, and ensure the cord of the surge protector is at least that long. If furniture will be placed flush against the wall in front of the outlet, select a style with a right-angle plug.

Protect Electronic Equipment from Damaging Power Surges and Line Noise Interference

TRIPP·LITE

Surge protectors come in many shapes and sizes suitable for use in homes, offices, audio/video installations, job sites, healthcare and mobile applications.

5. Where will the surge protector be used and in what type of environment?

Surge protectors are available in a variety of form factors to accommodate numerous applications. Options include:

- Strip, in-line, direct plug-in and under-monitor surge protectors meet many standard needs in homes and offices.

- Clamp-mount models are convenient for desks, workbenches or tables.

- Some models feature a rugged design and high visibility to provide safe surge protection at construction sites or in industrial, automotive or factory environments.

- Hospital-grade surge protectors have safety-enhanced outlets and plugs, and may also include special features to help protect patients and staff from electric shock.

- Highly portable compact designs with fold-down plugs can easily be tossed in luggage, purses, briefcases and backpacks to keep handy for charging mobile devices such as tablets, smartphones and MP3 players.

Protect Electronic Equipment from Damaging Power Surges and Line Noise Interference

Surge protectors with isolated filter banks provide extra protection against line noise generated by equipment connected to the same strip.

6. Do you need USB charging ports?

Surge protectors with built-in USB charging ports make it easy to charge devices such as smartphones, tablets and MP3 players without plugging in additional chargers. Some models can charge several devices simultaneously.

7. Do you need data line protection?

Surges on telephone, network and cable lines also pose a risk to your electronic equipment, just like power line surges. To avoid opening this "back door" to harmful surges, safeguard equipment on all inputs, including telephone, DSL, Ethernet, coaxial and USB connections.

8. How important is line noise reduction?

If line noise reduction is critical, such as for televisions, video game systems and other audio/video components, look for surge protectors with higher EMI/RFI filtering ratings. Surge protectors with isolated filter banks also provide an extra measure of line noise filtering, eliminating disruptions generated by printers or other peripherals connected to the same surge protector as the audio/video equipment.

9. What kind of warranty does the manufacturer offer?

Most surge protectors come with two types of warranties. The first is a product warranty. Ideally, surge protectors should have a lifetime product warranty since they need to be replaced when they have successfully suppressed enough power surges to burn out their MOVs. The second warranty, called connected equipment insurance, covers replacement costs for connected equipment damaged in the unlikely event that the surge protector fails during a surge event. Ensure that the amount of connected equipment insurance will provide sufficient reimbursement for the full value of the connected equipment.

10. What other features are important to you?

Surge protectors also offer a broad array of other features that can help meet specific needs:

Eco-friendly surge protectors help you save electricity and reduce your utility bills.

- Eco-friendly designs reduce energy consumption and lower utility bills.

- Audible alarms provide notification if the "protected" LED goes out, which is useful when the surge protector is hidden from view under a desk or behind a media cabinet.

- Remote control switches can be valuable in factory, workshop or retail environments.

- LED displays show the total amperage load of all connected equipment and incoming voltage, as well as identify power problems before they cause damage.

- A locking safety cover on the on/off switch prevents accidental power loss for rack-mount installations and other high-availability applications.

- Surge protectors that comply with TAA (the Trade Agreements Act) are ideal for GSA Schedule contracts and other government contracts.

Small Investment, Big Benefit

Every piece of electronic equipment is at risk for sustaining debilitating damage from power surges and spikes. Whether you're protecting a single TV or laptop, or thousands of PCs and a data center full of rack-mount servers, surge protectors are a smart investment. For a fraction of the cost of replacing damaged equipment and lost data – not to mention the cost of lost productivity – surge protectors safeguard equipment and provide invaluable peace of mind.

TRIPP·LITE

TRIPP·LITE

OVER
90
YEARS

ISO 9001
CERTIFIED QUALITY SYSTEMS

Manufacturing
Excellence.

Multiple solutions are available to meet any need and any budget. The key is to carefully evaluate your needs and choose the surge protector with the quality and features that best match them. Visit tripplite.com to see Tripp Lite's full line of surge protectors and find the right models for your applications.

About Tripp Lite

Customers in the IT, telecom, industrial, commercial, corporate, healthcare, government and education sectors choose Tripp Lite for complete solutions to power, protect, connect and manage servers, network hardware and other equipment in data centers and related facilities. Tripp Lite makes more than 3,000 products, including UPS systems, battery packs, PDUs, rack enclosures, cooling solutions, surge protectors, KVM switches, cables, power strips and inverters. For more information about Tripp Lite's full line of data center solutions, visit **www.tripplite.com.**

Protect Electronic Equipment from Damaging Power Surges
and Line Noise Interference

TRIPP·LITE

14-02-236