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Digital Download Catalog Introduction

Transient Voltage Surge Suppressors
Protection for Systems & Devices
Commercial and Residential Applications

•AC and DC Circuit Protectors • AC Plug-In Protectors • Card Access System Protectors • Motor Control •Data Line Protectors • Fire Alarm / Loop Protectors • Gate Entry System •Generator Transfer Switch Protectors • HVAC System Protectors • LAN Protectors • Lightning System Protectors • Main Panel & Sub Panel Protectors •Modem Protectors •Protectors • Recreational Vehicle Protectors • Video Camera & Monitor Protectors •Relay Protectors • Robotics System Protectors • Satellite Protectors • UPS System Protectors

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Why Surge Protection?

Until the introduction of solid-state devices, most AC powered equipment was too insensitive to be upset by "dirty" or surging power. However, electrical power surges and the damage they can cause are commonplace today. Our home and workplace are comprised of solid-state devices vulnerable to surges. We deal daily with computers, office machines, telecommunication equipment, data, major appliances, etc. All of these depend on solid-state devices, which are vulnerable to surges.

Solid-state devices depend on consistent, good-quality power. A single powerful surge literally melts, welds, pits, and burns its way through solid-state circuits and components.

Device failure is often the result of surges, the repairing technician may or may not detect. In addition to the loss of use, the priceless stored data is lost and meaningful input or output information is turned into nonsense. The driving force to shrink device geometries to increase speed and storage capacity will continue to make solid state devices even more sensitive to AC power.

Many people think of surge damage as being caused by a single, catastrophic event such as a lightning strike. While lightning is one of the most powerful and destructive surges, it's not always the cause of most of the surge damage. In reality, surges range from the mighty to the minuscule.

Smaller surges occur several times a day, or hundreds of times an hour. Almost continuous surge can be produced by sources ranging from 250 to over 1,000 volts. Typically, they are caused by the operation of electric motors or other inductive loads such as elevators, office machines, HVAC equipment and material handling equipment. Microwave ovens, vacuum cleaners, lamp dimmers and countertop appliances are some of the surge sources in the home.

Powerful, random surges result from the switching of an inductive load such
as an electric motor starter, arc welder, furnace ignition, compressor, etc. and these momentary surge sources range from 250 to over 3,000 volts.

Over or under voltage power conditions over 250 to 6,000 volts usually accompanies a utility switching lines to meet changes in demand, or when correcting a brownout or blackout.

While mother nature provides the most visible and spectacular surges in the form of lightning, the power company, your own equipment, other equipment in the building you occupy, or from a source some distance from your facility can generate the sure damage you suffer. Surges travel AC lines, data lines, communication lines, coaxial cable, metal fences, metal conduit, metal duct work, as well as through the ground and air. Surges travel via any conductor they can find.

Surge damage can be classified into three categories: Hard Failures, Glitches and Latent Failures.

Hard failures cause damage requiring repair or replacement of electrical components.

Glitches usually do not cause permanent damage, just temporary damage or lost data.

Latent failures result from continuous exposure to smaller, non-catastrophic surges the erode equipment and its performance. In the end, the equipment suffers hard failure and the cause is unseen.

Noise is another problem in power lines. Conducted noise is the most destructive type. It is usually present in your AC power source and you are surrounded by these radiated noises.

Noises can come from the most simple device, such as an electric razor or a fluorescent lamp, cars, TV's, cellular phones, electrical transformers, lamp dimmers, office machines, etc. are other examples. The list is endless. To solid-state devices, this is an invisible and lightning-fast destructive force.

A high quality surge suppression system is your first, best and only defense against these potential threats to your equipment, data and operation.
No one can guarantee to protect you from a direct and catastrophic lightning strike.

Even the best lightning protection systems have their limits A properly designed and installed surge suppression systems can provide you the best defense against all but the catastrophic direct lightning strike.

It is important that a surge suppression system be just that – a system, not individual units of spot protection.

In designing the system, many factors should be taken into consideration. Every facility has some equipment that is critical to the overall operation of the facility. That equipment will probably require higher levels of protection.

Equipment controlled by solid-state device is more susceptible to surge damage. Each facility is different and will require different levels of protection for perhaps even similar pieces of equipment.

The Institute of Electrical and Electronic Engineers (IEEE) has developed a schematic showing the levels of surge severity relative to location and showing even the point of entry of the electrical line. If surge sensitive equipment is located on the same circuit as equipment that generates surges, it must have protection. The only way to properly design a system of protection is careful evaluation of each and every facility.

Different surge suppression units offer varying levels of protection. All have the same basic job, to prevent damaging voltage spikes from reaching the device it is intended to protect. More sophisticated suppression units also filter noise.

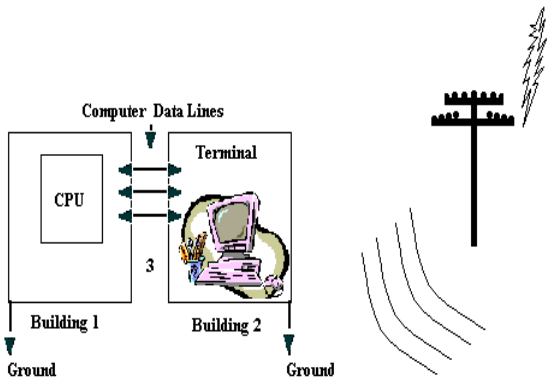
Only a thorough survey of your facility and it power supply, an examination of electrical layout, circuit plans and inventory of devices (present and future) connected to all circuits can provide the information to form a recommended plan of protection.

High quality surge suppression units, when properly applied in surge suppression systems, are one of the best investments you can make. Considering the small cost, it will be hard to find a higher return on any investment.

Checklist for Surge Protection Devices:

- ✓ Are all building electrical and systems ground common and bonded together?
- ✓ Do you have a low resistance grounding system? Has it ever been checked or measured? Is there any bonding of the AC neutral and ground at electrical sub-panels? Are all your electrical outlets equipped with life safety ground?
- ✓ Are metallic plumbing and sewer pipes entering your building(s) bonded to ground? Is the steel reinforcement and framing of your building bonded to your common ground?
- ✓ Are all metal fences attached to your building bonded to your grounding system? Are parking lot or exterior pole lights grounded properly?
- ✓ Is your main electrical service equipped with a panel protector on the load side of the main breaker? Are your sub-panels equipped with panel protectors? Do you have an isolated ground electrical panel with panel protector for your sensitive load such as computers?
- ✓ Are terminals and CPU in different buildings? If so, surge suppressors should be installed at both ends of the wires that connect them.
- ✓ If all terminals and CPU are in the same building, make sure there is only one meter (electrical service) providing power to the building. If there is more than one meter, the grounds must be electrically bonded. If the electrical services are not bonded, a difference in the ground potential will exist. Problems associated with this condition will show up as I/O port problems on computer systems.
- ✓ Are telecommunication lines running between buildings from your computer network, PBX, key telephone system, security system, video security system, fire alarm system, PA system or environmental control system? Any metallic lines must be surge protected at both ends of the wires entering or leaving the buildings. (Remember they must share a common ground reference.)
- ✓ Are long runs of low voltage cable surge protected? Are these lines in conduit, underground or just lying on the ceiling system? Are they within 12 inches of fluorescent light fixtures?
- ✓ Are roof top electrical/mechanical systems surge protected? Do you have a bonded lightning protection system on your building? Are satellite earth stations, coaxial cable, and power or control lines surge protected?

Differential in Ground Potential and Distance:

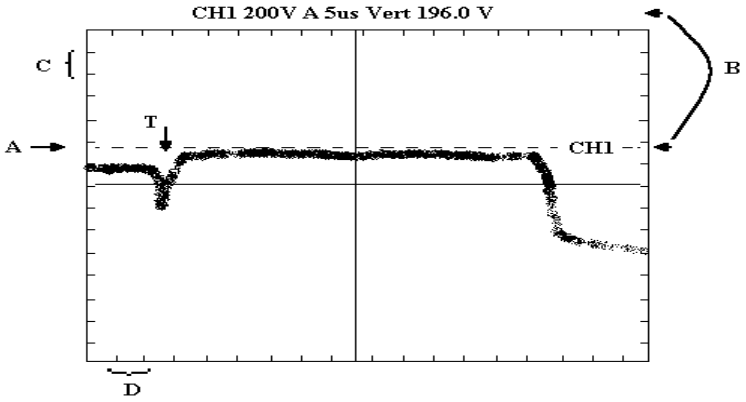
1. Lightning touches ground. 2. Rings of high energy radiate out from lightning strike and cross-ground rod on building #2, causing the power grid to go high in building #2. Building #1 still at normal. 3. Data line #3 between building #1 and #2 cause equipment in building #2 to be at great potential difference to building #1. Bus lines on computer are at 5-volts or 12-volts and ground has gone way up in voltage. Input and output ports see this tremendous difference and pop in Integrated Circuits. This did not go through the data line surge suppressors where they could have suppressed the over voltage. It was a difference of potential coming in on ground and coming in behind the surge suppressors bypassing them. 4. Solution: Bond the grounds together with heavy cable so building voltage potential will rise and fall as if both buildings were one. Options: Install fiber optic communication cables between buildings or isolation transformer(s) for remote equipment (terminal in above example). Fiber optic cable will not carry electrical charges. Isolation transformers provide electrical isolation for the remote terminal(s) or equipment. The terminal in the example will think it is grounded in building #1. NOTE: The less resistance in the building ground lines, the less voltage induced when lightning energy rings cross it. Good grounds are of prime importance.	

What Is Important When Choosing Surge Suppression:

Pass Voltage: This is probable the most important specification since this informs you how much voltage the equipment you are trying to protect will see after the surge protector has done its job. These ratings are in peak volts, which are not the same as outlet voltage. If you wish to convert peak to RMS (outlet voltage), multiply peak by .707. The ANSI test given to surge suppressors that cause the most damage to equipment is called a Category B Impulse which is 6,000V 1.2 x 50 microseconds, 3,000 amp 8 x 20 microseconds. This is actually a bi-wave or two waves combined the voltage at one time frame and the current at another. The 1.2 micro second refers to the rise time or how fast it builds to maximum. The "50" refers to how long it takes to decay to half power. The same applies to 8 x 20 microseconds, as the current is the deciding factor of damaging effect.

Understanding Surge Suppressor Tests:

The ability of a surge suppressor to reduce an over voltage can be measured by testing. This performance testing at ITA, Inc. is performed with certified test equipment. We use a Key-Tek Model 711 BK surge generator and measure the test results with a Tektronix Model 2430 Oscilloscope and a Hewlett Packard Jet printer prints the results. To understand the test results as shown on the next illustration, you should know the surge generated at a specific voltage, amperage and for a specific time interval. The test voltage is 6,000 volts. The test amperage is 3,000 amperes. The time is the impulse is measured in microseconds (1 µs = 1 millionth of a second) the voltage and amperage are applied in what is termed a bi-wave impulse, or at the same time. The ANSI/IEEE "B3" impulse is 6,000V for 1.2 x 50 microseconds and 3,000A for 8 x 20 microseconds. The dotted line "A" is a movable voltmeter built in the oscilloscope. When this line is placed upon the peak of the surge voltage recorded by the oscilloscope, the "peak" pass voltage of the surge suppressor is shown at the top of the screen. This point is marked on the test as "B" In the print above, each increment going up or down is equal to 200 volts (marked as "C"). Each increment going from left to right is the time measured in increments of 5 microseconds (marked as "D"). The "T" shown on the print is the trigger point or where the impulse (surge) started. Oscilloscopes measure in peak-to-peak volts. To convert this to normal outlet voltage (115-120AC), you need to convert the measured "peak-to-peak" volts to RMS (root mean squared) voltage. Normal outlet voltage, when measured in peak volts, is approximately 170 VPP.

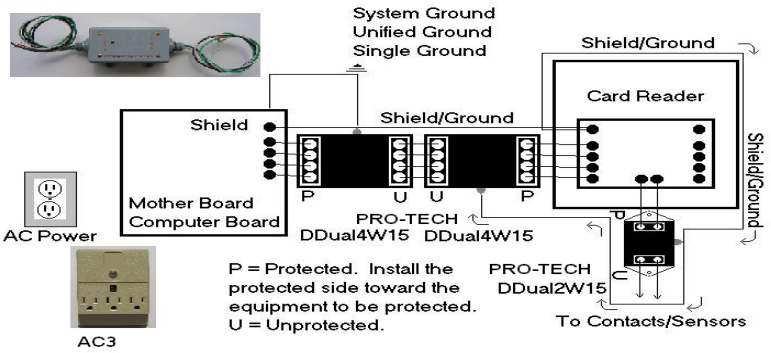


Example Calculation: 196 Volts (peak) X .707 = 138.57 Volts (RMS) The above test example shows the model 3NF has a RMS pass voltage of 138.57 volts.

What Surge Protection Gives You

- Reduced equipment maintenance cost and employee downtime.
- Improved equipment efficiency and extended equipment life.
- Reduced maintenance costs of electrical systems, i.e.; lights, ballast, motors, HVAC systems, etc.
- Protects your ability to serve your customers.
- Protects your computer and sensitive electronic equipment
- Protection against lightning induced transients on electrical, data and telecommunication lines.

Card Access Layout



Surge Protection Function, Ratings, Testing and Warranties:

Surge Suppression: is by definition over voltage suppression. This is suppression of momentary over voltage of any cause. Surge suppressors are technically called TVSS (Transient Voltage Surge Suppression) devices.

Surge Protector Rating: The rating of surge suppressors and their pass voltage is normally measured by UL standards or ANSI/IEEE standards. All PRO-TECH/ BPI's surge suppressors are tested to ANSI/IEEE "B3" impulse standards

Surge Suppressors Pass Voltage: The actual pass voltage of a surge suppressor (TVSS) is the most important measure of performance and is the voltage level to which the connected equipment can be expected to be subjected to. If the pass voltage is above the damage threshold of the equipment, it is not providing you equipment with adequate protection.
Exaggerated Claims: Over the past few years, manufacturers have been claiming their surge suppressors can withstand very high amperage surges. Some of these claims are for a withstanding ability of 100,000 amps or more. These claims can be impressive if taken on face value and not compared to the way UL and ANSI/IEEE test and rate surge suppressors. *Surge suppressors are only rated in pass voltage by UL.* The highest recognized testing level is the ANSI/IEEE "C" impulse of 20,000 volts and 10,000 amperes.

The ability of a surge suppressor to withstand "100,000 amps" is only telling you the surge suppressor may survive a massive surge, not that your equipment will not be damaged or destroyed. The function of a surge suppressor is to protect equipment from over-voltage, not to protect itself from a massive surge. If a surge suppressor is sacrificed while protecting your equipment, it has done its job! Would you be happy if your surge suppressor is unharmed after a massive surge and your equipment was destroyed? Warranties: High quality surge suppressors normally have a lifetime warranty. If they are damaged due to surge (lightning included), the surge suppressor is replaced free of charge.

BPI's www.steadyvolt.com Philosophy of Surge Suppressors & Warranty Policy: Our surge Suppressors are manufactured with the finest components available and are tested numerous times during and after production to be sure they function properly. They are designed to protect your equipment. They will withstand all but the most massive surges and restore themselves automatically after a surge occurs. All our surge suppressors carry a lifetime warranty and will be replaced free of charge (see product warranty for details). We will be happy to provide you with test results for any of our products. We will test to ANSI/IEEE B3 impulse test standard any product you are considering purchasing, side-by-side with our equivalent product. You can then make a price versus performance evaluation of the surge suppressors you are considering.

How do you decide which surge suppressor meets your needs? The first step is to determine the threshold level at which the equipment will be damaged by momentary over voltage. We can assist you, or you may contact the manufacturer of the equipment requiring protection. The next step is to determine the style, type connector type etc. required for your equipment. Last step is to make a price versus performance evaluation.

Thank you for your interest in our company and the quality products we have to offer you.
James Bergeron.