

# REPORTER

## What does surge protection have to do with home inspection?

by Paul Bugge, ASHI Member

**P**ower surges cost close to \$26 billion in damaged equipment and lost work time last year in the U.S., according to the estimates of Telmatic Limited, a UK-based international distributor of surge and lighting protection devices.

U.S. insurance companies reported 307,000 separate lightning claims, totaling \$332 million annually or about 5 percent of all paid insurance claims.

Because much of this damage occurs in homes, the topic warrants more attention from home inspectors than it currently receives. It's my hope this article will motivate ASHI Chapters to include the topic in educational agendas, and it will encourage home inspectors to seek current information on their own as the need to know about power quality continues to increase.

### Why is the quality of power a concern?

Despite the best efforts of an electric utility, the electricity to a home may have occasional power quality problems, such as voltage surges, swells and sags, along with interruptions. Surges or transients last a microsecond. A swell is a momentary increase of the powerline voltage, lasting up to several seconds. All types of power quality problems can be caused by lightning strikes or other weather-related items, accidents, animals in contact with power line equipment, utility equipment malfunctions, a neighbor's equipment, or even appliances or tools in the home.

Ideally, alternating current switches from positive to negative in a smooth, even fashion. Instruments would display this even switching as a smooth sine wave. Unfortunately because of variations in the



Photo by Slavisa Marinkovic

power supply, the wave is seldom smooth -- seldom perfect. In past years, these variations had little effect. Today, modern electronic equipment is sensitive to power quality problems. Less than perfect power can slowly damage or destroy semiconductor devices, such as microprocessors and dedicated-purpose electronic circuit chips. These chips are the brains for computers, telephone answering devices, stereos, televisions, fax machines, copiers, small home appliances, washing machines, dishwashers, furnaces, GFCIs, and power tools. In other words, chips can be found in most appliances and equipment in a home. And, the number of intelligent home appliances that need to be protected from power quality problems will continue to multiply.

### Basic precautions

Keeping in mind that a transient is an abnormal overvoltage of microsecond duration, often called a surge or spike, the best way to protect an intelligent appliance or piece of electrical equipment from damage caused by this type of occurrence is to unplug it. Any-thing that may cause a power interruption can cause power quality problems. Power line transients are most likely during lightning storms, high winds, wet, heavy snowfalls etc. Because it is not always possible to unplug something at the appropriate time, installing surge protection is a more practical solution.

Installing a heavy-duty surge suppressor at the service entry provides an attractive path to ground for



*Pictured is a Leviton panel mounted surge protector with LED display. Photo courtesy of Leviton Manufacturing, Inc.*

the surge current. This also can limit the surge voltage to safe levels. In most cases, this is the most important protector. Installing local protection for sensitive equipment and telecommunication lines will add further protection.

The geographical location of the house being inspected is one factor to consider in evaluating whether or not an existing service entrance protector is appropriate. Homes in areas of high lightning occurrence, such as Tampa, Fla, will require a protector with higher handling capability than a home in a less intensive area, such as Portland, Maine.

But the causes of potentially damaging occurrences do not always come from outside the house. Household appliances can generate damaging transients on a home's electrical system

To avoid this, sensitive electronic equipment needs to be plugged into a different circuit than electrical appliances and equipment with motors (inductive loads like refrigerators, freezers, air conditioners, washing machines etc.), and high-amperage appliances (switching loads like toasters, electric frying pans, portable heaters etc.). If house wiring is not flexible enough to allow separating inductive and switching loads from sensitive loads, the homeowner may want to add a dedicated, isolated ground circuit for electronic equipment only.

Also it's possible house wiring may not be supplying power of correct polarity or not be providing proper grounding. A three-prong cord should never

be plugged into a two-prong outlet. An adapter should be used. In homes built before the early 1970s, there may be a two-wire system that has three pronged outlets installed. The house system may have high impedance, improper neutral-ground bonds, or ground loops that allow unpredictable voltages to float on the grounding circuit. These house wiring problems increase the likelihood electronic equipment will act strange or be damaged, and they can prevent even the best surge suppressor from protecting equipment.

## **Surge suppressors**

Minimum specifications for an effective surge suppressor or protector are as follows:

- The Underwriters Laboratories (UL) TVSS 1449 listing clearly noted on the package or device. Some strip outlets look like surge suppressors; have advertising on the box showing them connected to a computer; may even have a UL label, but are actually UL listed extension cords. Use only UL 1449 listed devices as surge suppressors. (*UL 1449 is a safety testing specification for powerline surge suppressors based in large part on ANSI C62.41 and C62.45 Waveform and Testing Standards. ANSI C62.41 is a technical standard that characterizes the electrical power line surge environment. It is now recognized as an American National Standard. TVSS is Transient Voltage Surge Suppressor.*)
- A quality surge suppressor or protector will have two indicator lights. One confirms that the suppressor is connected to a properly grounded and polarized house electrical circuit. The other provides an alert if the protection circuitry has been destroyed. This light answers the question: Is it still a surge protector or just an outlet strip? Be aware that most surge protectors eventually fail as a result of repeated hits by high-energy sources. Some have audible alarms that go off when the protector is damaged. The best ones cut off the power flowing through them when they are ready to fail.
- Insurance and a lifetime guarantee to cover replacement cost of equipment are included in the purchase price of most quality suppressors. The dollar amount and length of guarantee are indicators of how much faith the manufacturer has in its product.

## **Rating surge protection**

Joule ratings - A joule is used to measure how much energy the suppressor can absorb before

passing a transient through to your equipment. 1 joule = 1 watt x 1 second. A suppressor rated for use with a computer will have at least 750 joules capacity and can be rated into the thousands of joules. The higher the joule rating the better.

### **Clamping response time**

Look for a clamping response time of 1 nanosecond or less. (There are 1000 picoseconds in 1 nanosecond, so 1 picosecond is faster than 1 nanosecond) The faster the surge suppressor responds the better.

### **UL 1449 Voltage Let-through Ratings**

Underwriters Laboratories tests each surge suppressor and rates them according to the amount of voltage they let through equipment. The lower the let-through voltage the better the surge suppressor. UL established the 330-volt let-through as the benchmark because lower rating added no real benefit to protection.

If this overview of power quality and surge protection has whetted your appetite for more information, I encourage you to pursue your interest. At one time we talked about “Smart Houses” of the future. The future has arrived, and we can expect to see protection for intelligent appliances and equipment in homes with increasing frequency. ■

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*For more information about panel-mounted surge protection, visit the Web sites of power quality device manufacturers, such as [www.leviton.com](http://www.leviton.com), product information, PDF library, surge protection.*

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