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TRANSIENT VOLTAGE SURGE SUPRESSION

By RON HRANAC

Among the highlights of this year's International Consumer Electronics Show in Las Vegas was Panasonic President Toshihiro Sakamoto's introduction of the company's Life Screen, a concept 150-inch high definition (HD) plasma display panel. At 4,096 x 2,160 pixels, this HDTV set has four times the resolution of 1,080p displays and an effective viewing area of 11 x 6-1/4 feet. No price was given, but Panasonic showed a 103-inch HD plasma display at the 2007 CES that was said to cost $70,000. Some estimates have pegged the 150-incher in the $150,000 range.

Assuming you could get one of these beasts through the front door, how would you go about ensuring its longevity? Certainly transient voltage surge suppression (TVSS) would be near the top of the list. After all, it would be anything but cool if an electrical surge zapped that shiny new über TV set. If a Life Screen were in my house, I'd probably also think about an uninterruptible power supply (UPS) and line regulation. At the least, it would make sense to follow Panasonic's recommendations.

These days, the typical household has a lot of expensive gadgets connected to commercial power and in many cases also to the cable drop. What, if anything, should we be thinking about when it comes to subscriber premises TVSS and other ways to deal with electrical gremlins? I found some useful definitions of power quality in Chapter VII ("Power Grid Interconnection Optimization") of the 1992 CableLabs document Outage Reduction.

Outages (Interruptions)—An outage is a complete loss of voltage usually lasting from as short as 30 cycles up to several hours (or in some cases even days). Outages are usually caused by the fault induced operation of circuit breakers or fuses. Some of these interruptions might be classified as permanent while others might be classified as temporary (momentaries).

Impulses (Lightning or Switching Surges)—A surge is a transient voltage or current which can have extremely short duration and high magnitude. Typically, surges are caused by switching operations or lightning. Surges can be generated by customers due to the switching of their own loads or may be caused by utility switching operations (capacitors, breakers, etc.).

Undervoltage (Voltage Drop)—A customer who experiences a long duration (several seconds or longer) service or utilization voltage less than the proper nominal operating low voltage limits (the ANSI Range [A] service and utilization low voltage limits are 114 volts and 110 volts respectively) can be considered to be experiencing an undervoltage situation. Such a condition may be caused by a number of factors such as overloaded or poor house wiring, poor connections and/or voltage drop on the utility system.

Harmonics—These are the non-fundamental frequency components of a distorted 60 Hz power wave. They have frequencies which are integral multiples of the 60 Hz fundamental frequency. Harmonics are not generally produced by the utility but rather by the customer's equipment. For example, a large non-linear industrial load may produce harmonics which, if they are of sufficient magnitude, can travel back through the power system and affect other customers.

Voltage Sags—A short severe momentary voltage dip that may last for several seconds is classified as a voltage sag. Voltage sags may be caused by faults on the transmission or distribution system or by the switching of loads with large amounts of initial starting/inrush currents (motors, transformers, large DC power supplies). Voltage sags may be sufficiently severe especially in the case of faults to cause sensitive loads (computers, VCRs, clocks, etc.) to reset.

Voltage Swell—When a fault occurs on one phase of a 3 phase, 4 wire system, the other two phases rise in voltage relative to ground (about 20 percent). This steady state rise in voltage is referred to as a swell. Referred to by some as surges.

Overvoltage—Any steady state (several seconds or longer) voltage delivered to the customer's meter which is above the ANSI Standards upper service voltage limit of 126 volts is classified as an overvoltage. Overvoltages usually occur as a result of improper regulation practices (misadjustments of regulators and capacitors).

If you're using a PC at home, you probably have it plugged it into a surge suppression-equipped AC strip, also known as point-of-use TVSS. What about your cable modem or embedded multimedia terminal adapter (EMTA)? Your TV set, stereo and other audio-visual equipment? Telco twisted-pair wiring? If you're a regular reader of this column, the odds are pretty good that you're technically saavy and probably have some type of point-of-use TVSS installed on most, if not all of your home electronics gear.

What about the subs?

But what about our cable subscribers?

One of the first things to do is ensure that the drop installation complies with relevant local, county or state codes, which are usually based upon the National Electrical Code (NEC). For more on this, see the October 2007 CT article "Give Me Your Bond" by Jonathan Kramer (www.cable360.net/ct/operations/bestpractices/25971.html).

A second step is to consider the use of ground blocks that incorporate surge suppression. These are available from industry vendors such as Cable Innovations, Extreme Broadband, Regal, Signal Vision, tii Network Technologies and Viewsonics. Some drop splitters also include surge suppression. Be sure to follow your corporate engineering department's guidelines for these devices.

Beyond that, should we even tell our subscribers that they ought to install point-of-use TVSS? That's a potentially controversial area. Cable operators fall into the "darned if we do, darned if we don't" arena. I can envision a scenario in which a cable company recommends that its subscribers install those devices, then a direct or nearby lightning strike takes out a bunch of consumer electronics connected to a subscriber's drop. Yep, the subscriber goes after the cable company even though the cable operator's intent was to help that same subscriber protect his or her own equipment. Another scenario that's possible is one in which we don't recommend TVSS devices, and a subscriber's home gets hit with a nasty surge that takes out a bunch of electronics gear connected directly or indirectly to the drop. This time the subscriber goes after the cable company for not suggesting that third-party TVSS devices might have been a good idea.

It's important to understand that consumer grade point-of-use TVSS is not suitable protection from a direct lightning strike. Whole-house lightning protection is beyond the scope of this column and tends to get complicated and fairly expensive to implement.

What to do

What, then, should we do? If we tell our subscribers anything, it should be along the lines of "consider installing third party surge suppression devices" and "consult with a licensed electrician, the computer or

consumer electronics device manufacturer, etc., regarding whether external surge suppression devices are warranted, along with the specific surge suppression device types and installation guidelines."

Why the legalese? To avoid being perceived as promising subscribers that we're going to pay for damaged equipment because TVSS was recommended by the cable company. I had a discussion about this with an industry friend and colleague who holds a high-level engineering position with a major cable operator.

He noted: "Customers are my first priority. They pay my salary. Over the years I've observed that the majority of customers are terrific. They understand how business works and will give you a break if problems with service are promptly and courteously resolved. However, a small percentage will attempt to take advantage of every business they interact with, and the cable operator is not an exception. A lightning strike on a customer's home is not the cable operator's fault, but a few customers will attempt to play it that way."

The seemingly ubiquitous electronic gadgets in subscribers' homes are an invitation to problems if at least some attempt isn't made to combat the electrical gremlins discussed previously. An analogy might be made to the PC and whether up-to-date antivirus software is installed and in use. Is it the PC manufacturer's fault that a user's computer gets infected with a virus because that user didn't bother to keep the antivirus software's definitions up to date?

We have to assume that our subscribers are responsible for their homes, automobiles, TV sets, microwaves, and whatever else they own. Does it makes sense for cable operators to suggest that subscribers at least consider third party TVSS for devices connected to the cable? Somewhere in all of this there has to be a clear separation maintained between the respective responsibilities of subscribers and the cable company. At the same time, we need to think about how we can educate our subscribers while minimizing our own legal and financial exposure.
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