

DEMONS IN YOUR DUPLEX!

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No, this article is not about your weird neighbors next door who've joined a cult and practice witchcraft on weekends. It's about another type of duplex. It's your 120V duplex electric wall outlet and the demons that lurk therein. You see, inside your common everyday duplex wall outlet is not only man's friend and workhorse, normal electricity, which powers our modern high-tech computer gadgetry, but also there can be and usually are, all kinds of devastating monsters and demons such as voltage spikes, surges, and high frequency noise. These devils ride into your home, or maybe even come to life there in your refrigerator compressor (and you thought the only thing growing in your fridge was the fungus on the old cheese). They ride in on the power line side-by-side with or, shall I say more correctly, piggy-backing right on top of your normal AC electricity. These bad types of electricity can cause erratic operation of software and hardware and even complete destruction on your computer power supply or CPU and memory chips. They can cause total loss of entire data files and diskette directories. What exactly are these enemies and how do you protect against them?

Spikes are very fast pulses (<100MICROSEC) of high-voltage electricity super-imposed on the normal 120VAC electric sine wave. They typically range from a few hundred volts to 6000 volts which is about the limit you can get at a duplex wall outlet. However, these guys can be devastating. Since they are fast moving they couple right through many power supplies through stray internal capacitance without sufficient attenuation. Once inside the logic section, they punch through silicon junctions and capacitors like bullets destroying these vital parts and bringing down the hardware in a puff of smoke. Lesser ones may just weaken a junction causing latent damage and premature failure (and you guessed it) after your warranty has expired. Or it could cause a logic upset state causing a program error or bad read/write operation on a disk causing temporary and/or permanent loss of data. There are two types of spikes: Normal (transverse/differential) mode line-to-line and common mode line-to-ground. Spikes are caused by lightning and on-off switching of heavy inductive loads such as refrigerators, oil burners, and even fluorescent lights. Spikes can only be observed with an oscilloscope. Surges are longer lived rises in the average power line voltage for several cycles or more. These surges generally result from sudden power company voltage changes throughout the day or from electrical equipment load changes in your own building. If surges last more than a few seconds and if they exceed the normal power line by 25% or more, damage can occur in some equipment power supplies due to excess stress on the parts. If they do not immediately fail they can be weakened over a period of time by repeated surges. Surges can be observed with a good undamped AC voltmeter. If surges are present the needle will bounce violently up and down about the nominal 120V value.

High frequency noise is low voltage level (one volt or less) signals of a frequency more than 1000 times the normal AC power line frequency of 60Hz. Thus, we are talking about 60KHz

up to say 50MHz or even more. They can be in common and differential mode. Since computer clock circuitry operates around two to 10MHz, noise signals in this frequency range on the power line can pass through power supplies and cause confusion in the logic circuitry causing erratic operation, logic upsets, and glitches in programs but generally not hardware damage. These gremlins can be very annoying. They can be seen on the normal sine wave as a fussy hairy looking wiggle on the normal clean AC sine wave. The source of this problem is generally other computer equipment, microwaves, motorized equipment with brushes such as vacuum cleaners, and RF electromagnetic signals picked up via the power lines acting as antennas.

OK, now we know a little more about these demons. How do we get rid of them. Well, spikes and surges are suppressed by what is commonly called a surge suppressor. High frequency noise is filtered out by series-parallel LC low-pass noise filters. Many equipment suppliers put these devices in their equipment but many also do not. In addition, because of the fast movement of these anomalies, it's generally too late once they are already in the equipment. The best defense is to stop it at the source and if that can't be done--stop it at your duplex outlet with a product that combines surge/spike suppression and high frequency noise filtering in a synergistic circuit to provide what is called power conditioning. There are many low cost devices that provide just one function but your best protection is with a combined unit having multiple stages(at least three) of surge and noise protection. Acceptable units range in price from \$50.00 to \$150.00 and the higher priced one may not be any better than the \$50.00 unit. The enclosure may be just a pretty shape or color. Ask to see the detailed literature and specifications.

Well, what do we look for when buying these products? For spike and surges look for the max let through or clamping voltage (lower is better), number of stages, the joule rating (higher is better), common and differential mode protection, and a response time one nanosecond or faster. For high frequency noise, look for multistage filtering in both common and differential mode, the db insertion loss at 10MHz (the more db insertion loss the better), and series-parallel LC load-bearing type filtering circuitry -- not just parallel capacitors across the line.

This type of protection is essential for any serious computer user who values his hardware and data base. They also are great for protecting any other electronic equipment such as TV's, VCR's, microwave ovens, digital phone systems, and test instruments. So, if you don't have one yet, get one. It's low cost insurance for a very serious problem. Remember, though, nothing is perfect. Even a surge protector can be overloaded and put out of action by a very large surge. It's a lot simpler and cheaper to fix the power conditioner than it is to fix thousands of dollars worth of high-tech equipment. Don't let those demons get out of your duplex and into your equipment. Stop them with a power conditioner!

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