

White Paper # 204

If it breaks, we'll fix it.
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Beware of Those Power Protection Guarantees

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Introduction

Protecting electronic systems from electrical power related failure is big business. Users today are better educated about the necessity of providing “power protection” for their investment, and manufacturers have wasted no time in making certain that customers have a perplexing array of power protection products from which to choose.

The selection process can be confusing. Terms like nano-seconds, joules, watts, and msec. of transfer time, etc. have caused such significant confusion that there is little, if any, distinction between the multitude of protection products in the eye of the user. In an effort to create some measure of product differentiation, many manufacturers have begun offering “protection guarantees” covering the cost of repair or replacement of a system damaged by power disturbances while protected by their device.

Do these guarantees truly distinguish one product from another? How much security do they offer the user? Who determines the replacement value of damaged equipment? Is lost data or productivity covered under the guarantee, or are these hidden costs left un-addressed? An examination of some key issues will help answer these and other questions.

Getting Back to the Basics

Integrated circuits in modern electronics systems derive their speed and processing power by virtue of their low operating voltages and compact geometry. These design characteristics allow signaling speeds far higher than those of their high voltage vacuum tube predecessors. As with other improvements, however, a cost is involved. Integrated circuits are far more fragile than vacuum tubes.

Electrical power disturbances affect these fragile circuits in three ways. Power disturbances may cause **Destruction,**

Degradation, and **Disruption.** Each of these failure modes has distinct symptoms, and the power disturbances that cause them have distinctly different characteristics as well.

Power disturbances that cause outright system destruction can be readily identified. The relationship between cause and effect is an obvious one when lightning, severe weather, or a massive power outage, for example, is followed by system failure. **Destructive** power disturbances are high voltage-high energy events that cause catastrophic breakdown of the low voltage-low power solid state junctions found inside the modern integrated circuit. Destructive disturbances generally leave charred components, exploded integrated circuits and other visible tell-tale signs of their visit. Destructive disturbances, however, are relatively infrequent and often seasonally related.

Lower energy disturbances, while not capable of destroying components, damage integrated circuits by degrading them physically. Integrated circuits are designed to handle low voltage signals and each integrated circuit junction is able to handle a finite amount of power, usually adequate to power the circuitry following it.

When subjected to **degrading** power disturbances, erosion of the semiconductor material occurs. This erosion is often referred to as “electronic rust” because the damage weakens the component - often without visible signs. Each time a small amount of semiconductor material is destroyed, the effective cross-sectional area of the solid state junction is reduced. Since the junction is still required to handle the same amount of power, the operating temperature increases marginally. As this process continues, the operating temperature becomes so high that the semiconductor eventually experiences thermal runaway and fails. The cause is usually due to the cumulative effects of degrading power disturbances.

Even more insidious are the power disturbances that neither destroy nor degrade

system hardware. These disturbances disrupt system operations. Such power problems are capable of causing CPU lockups, communications errors, disc or file corruption, non-repeatable failures and data collisions or beaconing in LAN systems. In fact, one study showed that up to 20% of a system's processing power could be wasted through exposure to **disruptive** power events.

These types of power problems are often associated with common mode power line noise, neutral to ground voltage, poor wiring practice, safety ground impedance problems or indiscriminate installation and distribution of electrical loads. Disruptive power disturbances often cause logic signals to be misinterpreted resulting in process, checksum, CRC errors and other "soft" problems.

It is important to recognize that neither degrading nor disruptive power disturbances are likely to cause any visible damage. There are no scorch marks and no exploded components. In short, one minute the system is working, the next minute it's not, and no one can explain why. Degrading and disruptive power disturbances leave no evidence of their visit, and as a result, most of the damage they cause is attributed to some other cause.

It is this circumstance that leads to questions about the value of power protection product guarantees.

Reading the Fine Print

The fine print in most power protection guarantees is critical. Many of these documents define a host of conditions under which a claim can be instantly invalidated. Failure to send in the product warranty registration is a simple oversight that can lead to such results. One manufacturer requires that the user register the products he intends to protect by model and serial number. While this is good protection for the manufacturer, it offers

little to the user but a restriction in flexibility of use.

Most such protection programs require that some visible evidence of damage exist to both the protection device and the protected product. This area is of the most concern. Since neither degrading nor disruptive disturbances cause visible damage, it is likely that the manufacturer will only be liable for those failures that occur from a destructive power disturbance. And since many recent studies indicate that destructive disturbances are far less frequent than degrading and disruptive ones, the power protection guarantee becomes useful only in a very small number of instances.

It is also valuable to ask about the specific items that are covered under such programs. In most cases, the only liability is to repair or replace the hardware. In today's business environment, hardware costs are minimal in comparison to the value of the information they process. Does the guarantee cover the cost of lost productivity? Who pays for downtime? In most cases, the answer is "You do!" The majority of cost is still borne by the user, and the "power protection guarantee" is really only a clever marketing tactic designed to make one company's product look more desirable than those of a competitor.

The Real World

Offices, factories, stores, hospitals, and laboratories in the real world experience costly power problems every day because users have been incorrectly educated to believe that the only protection they require is protection from either the single destructive power surge or a complete power outage.

Real power problems, like the expense they create, often lie hidden. Destructive power surges are relatively infrequent and devices like surge protectors are capable of *limiting* but not *eliminating* their effects. Other power disturbances are far more frequent and are, in fact, present to

some extent almost all the time. Power line noise, small voltage impulses, neutral to ground voltages, EMI, and RFI all cause systems to fail. Unfortunately, the cause of the failure is often misdiagnosed and power disturbances do not receive the blame.

The conclusions are clear. Promises to repair or replace hardware damaged by power disturbances is of limited value when coverage does not extend to the most common power problems or to the real expense they create.

Who pays for replacing lost data? What is the cost of a missed deadline, production/schedule slippage, late billing, production line downtime or other problems associated with computer system failure? How much does it cost a company if power quality problems cause a company's employees to mistrust the system that was installed to make them more productive? What if company image is damaged when customers become the victim of an unreliable computer system?

What costs are associated with loss of use? Shipping charges for damaged hardware? What does it cost to re-key or restore lost data? Who pays for renting temporary equipment while damaged equipment is being "evaluated" and repaired? Who sets a fair replacement value for damaged equipment? Who defines the term "properly connected?" Are "protection guarantees" really a valuable benefit to the user or really only a marketing ploy that provides a questionable sense of security?

POWERVAR's Position

All these questions are valid and should not only be asked but answered as well before a single penny changes hands in a power protection purchase. The products you purchase to protect your systems and your business should be true solutions to the range of power quality problems that are most like to affect you.

We do not offer power protection guarantees, repair/replacement warranties, or

other similar programs. What we do offer is the knowledge, expertise, experience and power quality solutions to make sure you'll never have to collect on any promises.

In the final analysis, power protection warranty programs are nothing more than a life insurance policy that pays off in the event of the death of your system. We suspect you'd rather have us show you how to keep your business alive and productive instead.