ECP Magazine

Keeping Electronic Systems Running

Updated: August 30th, 2005 01:46 PM EDT

A Review of Transformer Based Filtering Device Features

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Although it is relatively simple to identify damage caused by a large power spike, such as a lightening strike to electronic equipment that includes ATMs, point of sale (POS) devices, electronic registers, and the like, the insidious effects of power surges (less than 200 volts) are far more difficult to pinpoint. Yet, according to studies by well-known manufacturers and independent labs, 87 percent of power-related failures result from low-voltage surges that cause logic confusion; yielding system errors and frozen screens.

New TBF power conditioners have been specifically customized for POS applications with a small footprint and built-in IEC and/or 5-15R receptacles.

Oftentimes, line-voltage problems are caused by poor wiring in old buildings. Yet, even new buildings can suffer from the immediate effects of power surges and sags from line-voltage variations within the building, such as when an HVAC system cycles on and off or an elevator starts and stops. Even attempts to ensure a dedicated circuit cannot always guarantee computer grade power to electronic devices.

In the past, standard surge protectors and higher priced power filters have been used to protect against high-voltage spikes. However, these devices are not intelligent enough to handle the relatively small spikes and over-voltages that momentarily disrupt sensitive electronic equipment.

Although isolation transformers (ITs) — a traditional choice by some technicians —

have been available to help avoid power surges, they are prohibitively expensive and unwieldy in size and weight for the tight spatial constraints of many applications such as a kiosk or ATM. In addition, Uninterruptible Power Supplies (UPSs) have traditionally lacked the ability to safely close down an open application before they run out of power.

Some UPSs offer software that is specifically designed to handle critical kiosk or ATM applications.

Transformer Based Filters

Recent technological advancements in the field of power conditioning have now yielded devices that provide computer grade power — a clean, filtered power supply to the protected equipment — at the same price as limited-function surge protectors or filters and traditional UPSs. These new electronic power conditioners are known as transformer based filtering (TBF) devices. Some newly developed TBF-equipped UPSs even offer a USB port and "watch dog" software that has the unique capability to reboot the program which is locked up, without restarting other open programs, to safely preserve the data.

A 2005 report prepared by *PowerCET* — a power quality consulting, education and training firm based in Santa Clara, CA — discusses the testing of TBF technology versus ITs by applying IEEE C.62.41 surges of 3000 volts. The results showed that TBF surge attenuation on common mode was less than 0.5 volts, the same as an IT. These results placed the TBF units in the "power conditioning" category, yet the TBF units cost much less and take up a smaller footprint than an IT. The smart electronic circuits explain why TBF is referred to as "electronic" power conditioning, versus the electric circuits found in an IT.

These TBF units stop massive spikes up to 6000 volts from passing through, but they also guard against the more common small spikes and surges. The circuitry constantly monitors the line power. If it goes too high (>160VAC) for more than five cycles (80 milliseconds) — which is powerful enough to blow out the power supply and motherboard of electronic cash registers, for example — then it cuts the power off to the protected device.

In addition, the TBF products removed output power when applied voltages exceeded preset limits, and automatically reset when applied voltage returned to normal levels; whereas tested products from other manufacturers passed the over-voltage conditions through to their outputs. The report also found that when encountering wiring faults, TBF products removed power for their outputs with open ground and with line/neutral reversals. As a result, a TBF power conditioner protects electronic devices from mis-wired outlets, while reducing the risk of shock.

TBF circuitry also addresses a particularly perplexing problem in many installations — that of ground loop current. While most electricians intentionally link earth-grounds for safety's sake, it can create a voltage differential between the two separate groundings. The resultant current can create havoc in sensitive microprocessors embedded within electronic devices. For this reason, some TBF units include an impedance matcher that eliminates ground loop current and voltage differential.

The digital circuitry in TBF "electronic power conditioners" also filters out induced noise (EMI and RFI). This is particularly important since excessive noise decreases the speed of data transmission. For instance, TBF is available in a model specifically designed to help eliminate zero cross problems in copiers.

Since all of this functionality occurs without the need for a heavy isolation transformer, TBF units manage to compress this functionality into a 17-ounce package the size of a man's fist — making it particularly fitting for space-constrained applications.

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