



The Value—and Necessity—of External Surge Protection in PoE Applications

White Paper

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Overview

In the not-too-distant past, making a cell phone call and taking a photo required two separate devices. The integration of cameras into cell phones is a perfect example of how combining two separate items or technologies into one has wide-spanning benefits.

Integrating surge protection into radios, power injectors, mid-spans, and other critical power-over-Ethernet (PoE) devices, however, is an example of combining two devices that should remain separate. Unfortunately, many providers of this equipment promote their built-in surge protection as an added benefit rather than the potential weak link it truly is.

Instead, PoE network engineers should deploy high-quality external surge protection devices (SPDs) to help ensure safe, secure network operation, reduce downtime, minimize site visits, and ultimately, decrease overall equipment costs.

Ethernet Surge Issues

When running an Ethernet line outdoors it has always been best practice to properly surge protect, shield and ground the system. Without this the system is susceptible to interruption and damage due to transient and surge events.

There are three different ways a nearby lightning event can populate onto an Ethernet line.

1. Far-field electromagnetic coupling
2. Near-field electromagnetic coupling
3. Ground potential rise

Far-field event damage occurs when a lightning strike nearby induces energy onto the cable and flows to the equipment at either end. Near-field event damage occurs when a direct strike to a facility results in lightning energy on a down conductor, which then is induced onto an adjacent Ethernet line.

Ground potential rise damage occurs when lightning strikes the ground and currents up to 100 kA flow through the soil. In this situation two devices, each with a separate reference to ground, can see a voltage difference of several thousand volts, resulting in transmission interruption and damaged equipment.

Advantages of External Surge Protection

During the majority of these events, well designed surge protectors will engage, diverting the energy to ground, and then reset, ready to protect again. Under extreme events the surge protectors will self-sacrifice, protecting the equipment. These surge protectors can be easily replaced with minimum impact on the systems operational status.

If the end user selected to rely on surge protection integrated into critical equipment the results can be far different. Low-level events can degrade the integrated protection inside the equipment, resulting in a shorter life span and a premature need for replacement. It is possible for a POE injector to still have its main functionality intact but require replacement because the surge protection is no longer intact. Events with higher energy levels can turn the equipment with integrated surge protection into sacrificial lambs, requiring immediate replacement and shutting down the system.

External surge protection, ideally from a provider of versatile, reliable surge protection solutions, adds a significant—and crucial—level of security to all types of Ethernet applications.

Reduced Downtime: First, an external surge protection device (SPD) performs a single function, and performs it well—instead of being a type of “add-on” to more advanced equipment, which is typical for gear with integrated surge protection.

PoE Architectures face exposure to outdoor EMI/EMP, lightning and other surge threats. Installations should include high-quality SPDs at both ends of the link—for example, at the radio or camera mounted on the pole or tower and at the POE switch in the cabinet down below. Shielded cables should be used and Shield to ground protection should be a part of the surge protection equipment. These practices provide safe, reliable, long-term protection, minimizing the potential for system downtime.

Fewer Site Visits: Put simply, reduced downtime potential means fewer costly site visits. Time, expense and inconvenience come with each unnecessary site visit. A simple preventative solution such as independent surge protection can help to minimize situations where engineers or techs must service vital equipment due to a surge.

Overall Cost Reduction: Put the above two factors together, and ultimately users reduce overall equipment costs, even when purchasing SPDs as separate components. In the big picture, an SPD is a relatively low-cost product and the protection it provides for vital equipment carries a significant return on investment. In the long term, the potential damage to equipment with poorly functioning integrated surge protection can be much greater and much more costly.

Conclusion

Using external surge protection results in a much more effective and robust protection system without the risk of losing equipment necessary to the system’s functionality. Integrated surge protection can remain in place, but should not be relied on as the primary form of equipment protection.