Protecting Telecom Equipment from Lightning Strikes with CrossPATH*

Application Note

Overview

Lightning strikes and surges can cause Channel Service Unit (CSU) equipment failures and T1/DS1 circuit outages at cell sites. It doesn't matter if the strike hit a facility directly or traveled down copper wires from more than 10 miles away. When these strikes or surges occur, it is usually necessary to replace the existing equipment, so a technician must be dispatched (often after hours) if they have the new equipment in stock.

This appication note addresses the following aspects of protecting telecommunications equipment from lightning strikes and surges:

- Protection requirements
- CrossPATH for lightning protection
- Self-healing circuitry

Protection Requirements

CrossPATH® from Kentrox is a network access device that has been designed to withstand secondary voltages and currents, so the circuit will recover and return to service without any user intervention. Reducing product inventory required by a carrier and improving technician efficiency, especially in lightning-prone regions, is possible by installing the CrossPATH.

The telecom industry has applied standards to network equipment specifically for lightning protection. There are several industry standard bodies that regulate lightning protection requirements for network elements. FCC Part 68/ACTA TIA 968A, Telcordia/Bellcore GR1089, and UL 60950 are the top three standards that all telecom equipment providers verify compliance with. The lightning surge tests used in these standards are of a short duration but use very high power levels to simulate a lightning strike. These voltage levels are referred to as Hazardous Voltages. CrossPATH has tested to Level 1 of the Bellcore/Telcordia GR1089 procedure and withstood the tests with no damage.

The protection from hazardous voltages provides several benefits to the end user. The most important is operator safety followed by continued proper and reliable operation of network equipment during and after a detected hazard. Additionally, highly expensive customer-owned equipment that is connected to the protected equipment (typically a CSU) is not destroyed. The lightning protection circuitry is designed to suppress excessive or hazardous voltages and to stop the current flow at a safe and acceptable limit to protect the equipment side of the CSU interface.

There are two classes of hazardous voltage protection: primary protection and secondary protection. Primary protection devices are typically located at the building entrance of telecommunications terminals. This is the first set of devices in the signal path to see the over-voltage or over-current surges. They are typically referred to as carbon filter blocks. Secondary-protection elements are typically built into a line interface card or CSU device. The Kentrox CrossPATH is a secondary-protection device.

* CrossPATH refers to CrossPATH 3G and CrossPATH 4.

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CrossPATH for lightning protection

The CrossPATH product family incorporates secondary lightning protection directly into the design of the product. The lightning protection circuitry provides additional protection over the standards by using self-healing components, PTCs (Positive Temperature Coefficients), clamping current diodes, and proper grounding techniques. Because the components are internal to the CrossPATH, Kentrox has tested the protection circuitry to the standard to ensure that the products protect the internal functions of the unit itself, thus it will recover from the lightning-related incident.

By installing CrossPATH in front of network equipment, damage inflicting hazardous voltages and current spikes induced by a lightning strike will be properly handled and diffused at the CrossPATH network interface, hence protecting your expensive radio and telecommunications equipment investment.

Self-healing circuitry

CrossPATH is not a typical CSU. CSUs are placed in front of telecommunications terminal equipment primarily for lightning protection and network diagnostics/performance. A CSU lightning protection circuitry fuse is designed to blow when a hazardous voltage/current is identified in order to prevent the surge from damaging equipment behind the CSU. Once the protection circuit blows, the network span is out of service and will require a truck roll to replace the broken CSU. This could possibly take several hours to get the span back into service.

CrossPATH expands the CSU functionality and implements a lightning protection circuit design that is self-healing. The CrossPATH uses the latest PTC technology available for lightning surge protection. The protection circuitry acts like a gate on a fence. When a hazardous voltage is detected, the protection circuitry opens the network span connection and shunts the hazardous voltages to ground, protecting not only the network equipment behind the CrossPATH but also the internal components of the CrossPATH. When the surge goes below a hazardous level, the gate closes and service is restored in a matter of seconds. There is no need for a truck roll to the site to replace a broken device, to carry numerous spare units on a truck, or to risk having technicians on the road during a lightning storm.

A PTC device is also referred to as a thermistor. The most obvious difference between a PTC and a fuse is that a PTC can be repeatedly used and will provide protection many times, while a fuse must be replaced once it is tripped. A PTC device is able to keep a high resistance state until the fault is removed, therefore protecting your equipment and verifying that the threat has been removed prior to resetting the circuit.

Summary

CrossPATH from Kentrox has been designed to be a highly reliable, low maintenance, network access device. When using CrossPATH, be assured that expensive networking equipment will be well protected from hazardous voltage situations and operations and maintenance teams will have the confidence that the CrossPATH will continue to operate after a strike condition occurs. This functionality alone saves time and associated maintenance costs and increases your network uptime.

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