

Lightning Protection

Throughout time people have attempted to protect themselves and their belongings from the effects of lightning. Equipment in today's computerized world are very susceptible to lightning however, no magic bullet exists for lightning protection. Protection is achieved only through a careful investigation to identify all sensitive components and all possible paths for lightning currents and voltages, followed by the design, specification, installation and maintenance of a protection system.

Unfortunately, lightning protection methods add cost to the overall site and no solution is fool proof. The owner/operator of a site must then evaluate the trade off between the risk and the cost of additional protection. The lightning protection devices described can not guarantee no damage will result from a lightning strike, but they can minimize the damage. Remember that surge protection devices are usually of a sacrificial design. They are designed to take the brunt of the surge while protecting the attached equipment. After a major surge, these devices will probably need to be replaced.

Protecting equipment is very challenging, the path a lightning strike will take is impossible to predict. It only takes a portion of the main strike energy to hit sites electronic equipment to damage or destroy it, even if the majority of the strikes energy is directed away from sensitive electrical equipment.

How Lightning Causes Damage

Lightning strike causes damaging transient voltages and current surges that can affect equipment depending on what and where the lightning strikes. This factor determines the effectiveness of the lightning and surge protection and the amount of damage a strike can cause. Lightning can damage equipment in several ways the following describe the most common events:

1. Line Surge - Lightning enters a site through the power utility that supplies the site. This can happen through a local strike or a more distant strike at a power substation. Most substations are equipped with circuit breakers that will trip in the event that a lightning surge hits the substation or the lines that it feeds. In most cases, the circuit breaker causes a temporary power outage. This type of lightning event often causes a major power line surge or spike.

2. Ground Wave – Occurs when a nearby lightning strike sends an electrical surge through the ground. These surges can travel several miles and get picked up by wires installed at or below ground level. They usually cause only temporary interference with any connected equipment. Permanent damage rarely occurs from this type of surge.

3. Direct Strike – When lightning directly strikes a facility, its buildings, or the utility lines immediately adjacent to the site induce very large voltages and currents on all electrical wiring at the facility. A direct strike often damages large parts of a facility and its electrical and computer equipment. Wiring, electrical circuits and computer chips often get vaporized by the very large currents resulting from a direct strike.

Lightning Protection Methods

Lightning protection devices switch the threatening surge to ground around the signal connection point of the protected equipment. Thus, redirecting the threatening surge on a path-of-least resistance (impedance) to ground where it is absorbed. The composition of a lightning protection device includes a switch and a good ground connection to allow dissipation of the surge energy. We cannot emphasize the need for a good ground connection. Computer equipment has been damaged by lightning, not because of the absence of a protection device, but because inadequate attention was paid to grounding the device properly. The configuration of the grounding system depends upon soil conditions, building construction and the presence of other underground conductors.

Installers can create Grounding systems with driven ground rods, plates and possibly a counterpoise, which is a buried cable encircling the site. A counterpoise adds greatly to the protection from earth voltage rises that may injure people standing on the ground. Grounding improvements can also provide additional paths for lightning currents to flow to earth, thereby minimizing surges. These improvements usually involve interconnecting adjacent conductors, such as structural steel, conduits and ground conductors. Commonly overlooked grounding problems include conduits, metal equipment cabinets and individual components within computer rooms.

Sensitive electronic and computer equipment, and any equipment interconnected by cables over long distances, require the installation of surge suppressers. Many manufacturers provide a wide variety of surge-suppression equipment. Users must take care to select the most cost-effective device to the currents and voltages expected from a severe strike in their region. Installers must place the surge suppressors where they can easily inspect and replace them if damaged by a severe strike.

PTI Built In Protection

All PTI products include some level of surge protection on the power and communication (RS485) lines. The type of protection depends on the device and what it is used for.

PTI Falcon System:

The Falcon System uses several different methods for built-in surge protection. To protect against voltage surges from the power lines and on the RS485 communication line the Falcon uses surge suppression and self resetting fuses. In addition the RS232 port includes surge suppression devices to protect against surges coming through the computer to the Falcon or from the Falcon to the computer.

VP Series Keypads:

The VP Series Keypads have built-in surge suppression on both the RS485 communication lines and on the power supply lines that protect against voltage surges from the power source or external sources like lightning and ESD from automobiles. The keypads utilize a combination of surge suppression devices and self resetting fuses.

Grounding the housing of the VP series to a good earth ground provides an additional level of protection against power surges and spikes.

APEX Series Keypads:

The APEX series keypads improve on the VP Keypads by building in several different levels of surge protection and isolation. These improvements include surge protection on the power supply, ESD protection on the keypad and communication lines, surge protection and optical isolation on the RS485 communication lines, and isolated grounds to protect against ground faults. Grounding the housing to a good earth ground provides an additional level of protection against power surges and spikes.

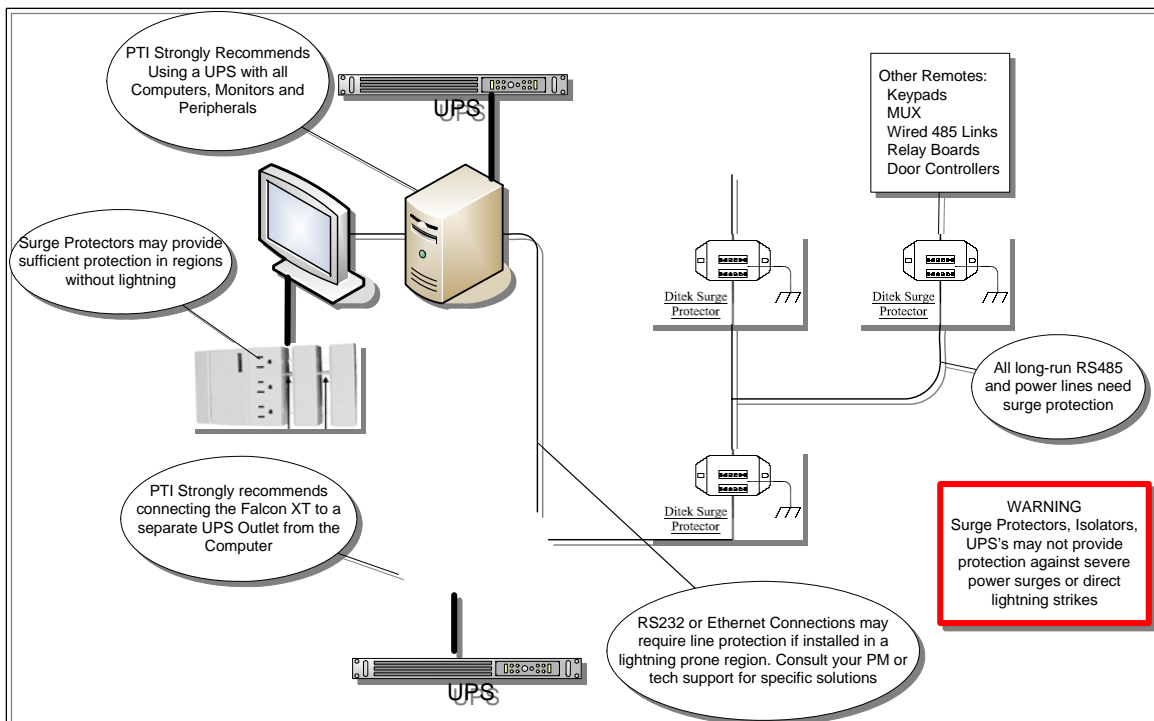
Door Alarm Multiplexers:

The multiplexers have surge and ESD protection on the power, communication, and door switch lines. Mirroring the protection found on the VP it helps protect against voltage surges induced through the power or communication lines or those coupled through the door switch wires. Grounding the housing to a good earth ground provides an additional level of protection.

FalconXT

Learning from 20 years of design the FalconXT utilizes the latest in cost effective surge protection to protect the internal circuitry and communications interfaces. This advanced protection does not affect the strength of the communication signals as previous solutions had. The good earth ground provides additional protection from power surges and spikes.

Surge Protection Recommendations



- Keypads, Card Readers and other remote devices – Use the Ditek surge protection on the power line for each device, PTI part number VCAM-CRD-RDR-PRTCTR (Ditek part number DTK-4LVLPCR)
- Camera's need protection from power surges via a surge protector at the source of their power (generally an electrical outlet) and their communication link either Ethernet which is quite well protected (but Ethernet line protection devices are available) by specification or Coax which requires a line protector.
- Alarm Panels, MUX panels and other equipment using 22 Gauge wiring for power should use the Ditek surge protection for each device. PTI offers two versions; Single Wire Pair – VCAM-1PR-TERM-STRIP (Ditek part number DTK-1LVLP-LV) and 4 Wire Pair – VCAM-4PR-TERM-STRPI (Ditek part number DTK-4LVLP-LV).
- UL rated power supplies adequately rated to provide at least 12 volts (AC or DC) and no more than 18 volts (AC or DC) at each PTI remote.
- Critical Computer Systems – Install the appropriate Uninterruptible Power Supply, available from multiple vendors, check the rating, intelligence and battery backup time. Note that these systems will protect systems from power surges from the

power company and allow them to shut down gracefully in the event of a prolonged power outage.

- FalconXT Controller – Connect to a separate UPS from the critical computer system
- Plasma or LCD displays – Minimally connect to a surge protector (available from many sources) or a UPS as required for protection.
- DVR's and other Computer Room Equipment – These devices have the same requirements as mission critical computers and need the appropriate Battery Back-up units installed in the rack.

Other Considerations

Consult with your contractor and installers -- The best methods to protect site from damage due to lightning are done during the design and installation of the facility. Architects and Contractors can design buildings with lightning rods and other grounding methods that direct strikes away from the core of the building. The installation of lightning rods at key points throughout the facility can assist in directing the lightning away from the electrical wiring. In areas with a high lightning risk, contractors may even install lightning rod arrays. The phone company can provide telephone line protection devices and power line surge suppressors. In addition, contractors can install special surge protection devices on low voltage systems like intercoms and video cameras that will help suppress surges caused by lightning.

Insurance – PTI strongly recommends adequate lightning insurance coverage especially if you live in lightning prone regions of the world.

Links

www.lightningsafety.com/nlsi_lhm/lpts.html

www.lightning.org/?page=home

www.noaa.gov

www.ieee.org

www.ditekcorp.com – Ditek is a leading supplier of surge protection devices.

<http://www.atlanticscientific.com> – This web site has detailed information about how to protect a site against lightning and surges including some good technical applications notes.

<http://www.arrl.org/tis/info/lightning.html>

<http://focus.ti.com/general/docs/techdocsabstract.tsp?abstractName=slva233a>