

SURGE PROTECTION FOR CCTV

By Jim Hertrich

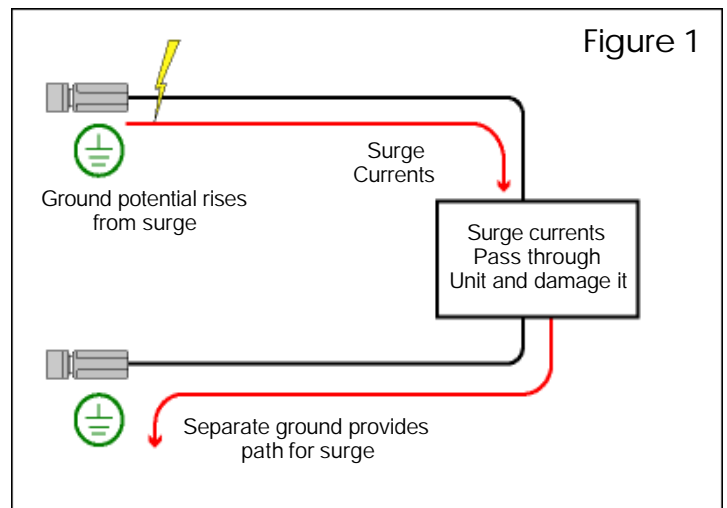
Continuous operation of a CCTV security system is a key element in the protection of assets and providing safety. Some of the most unpredictable disruptions to the proper operation of a security system are lightning strikes and electrical surges. The currents produced by surges can be carried over any metallic conductor including plumbing and electrical wiring. Proper installation of surge protection is the best way to protect your system. The need for surge protection is further illustrated by a State Farm Insurance study showing over 307,000 claims annually.

Why is my camera system more likely to be damaged than other building systems?

There are several factors that combine to make a CCTV system an easy target for damage from electrical surges.

First is the broad reach of the camera network. With cameras mounted all over a building, a CCTV system consists of a wire structure with multiple ground points. This means, if one node in the system becomes electrically elevated, current will flow from the other system nodes. This network of cables is connected

through the central CCTV control equipment. Current flow will be felt directly by the heart of the camera system. Refer to figure 1.



Another factor is the sensitivity of the central processing equipment used in CCTV systems. Most of the central equipment is microchip based and none of it is designed to handle surge currents. The DVR (Digital Video Recorder) is the most critical of these units. It is looking for 1 volt peak to peak on its input and can be easily overloaded. It also represents the largest single cost in the system.

DVRPROTECTOR™



Model DVRPTR16

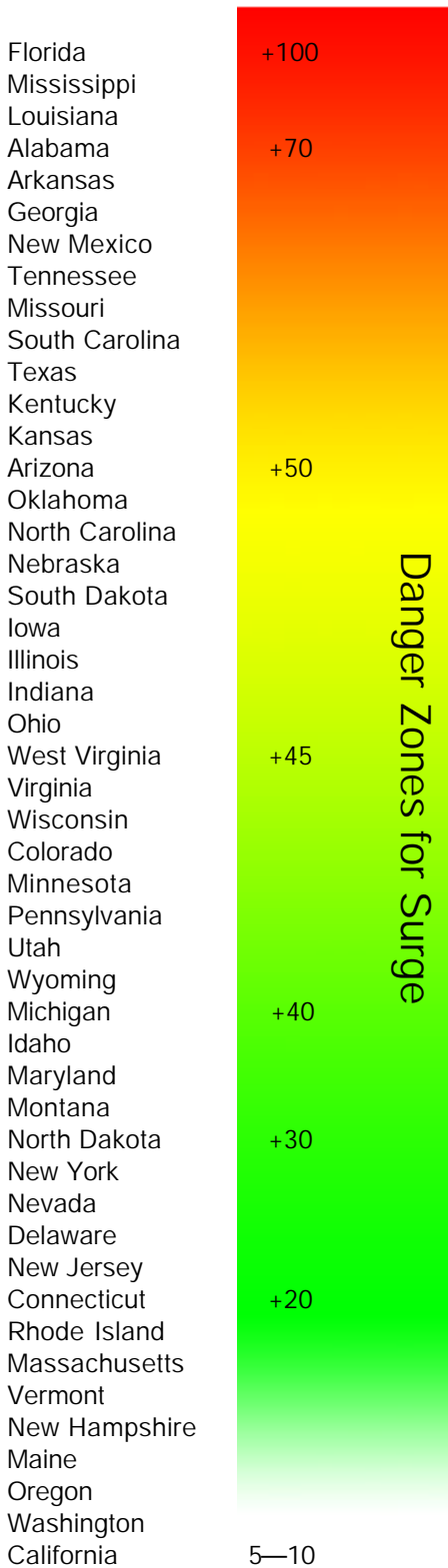
Features

- 2.8v Clamping Voltage
- 16 Protected Inputs
- Unique Multi-Stage Protection
- Single RU Construction
- Insertion Loss <0.2dB
- Lifetime Warranty

SURGE PROTECTION

Do You Know Your Zone?

Average Number of Thunderstorm Days Per Year



Source:
1999 Oklahoma Climatological Survey

My system is indoors; therefore, surge protection is not needed

Many people do not install surge protection because their equipment is located indoors. While this may be true, it is difficult to imagine a fully self contained CCTV system, that does not cross paths or interconnect with any wiring, plumbing or structural metal which extends outside of a building. Consider how often cameras are mounted on the sides and outer corners of buildings and how they are often mounted to the metal structure of the building.

The following warning comes directly from the National Weather Service and their studies of lightning.

There are three main ways lightning enters homes and buildings: a direct strike, through wires or pipes that extend outside the structure, and through the ground. Regardless of the method of entrance, once in a structure, the lightning can travel through the electrical, phone, plumbing, and radio/television reception systems. Lightning can also travel through any metal wires or bars in concrete walls or flooring.

How does single point grounding protect my DVR?

We are all familiar with the concept of seeing birds land on electric wires. We know they will be just fine as long as they do not touch two wires or a wire and ground. Protecting equipment from surges is much the same. The most important thing is to prevent current flow through the electronics of the system. Isolating the whole system from any electrical grounding is not practical. So we must look for a way to prevent these currents from entering our equipment.

While we are not able to isolate the entire CCTV system, we can block these surge currents from entering the components of the system. The use of surge protection equipment will do this by providing a safe path to ground for over voltage signals. Refer to figure 2.

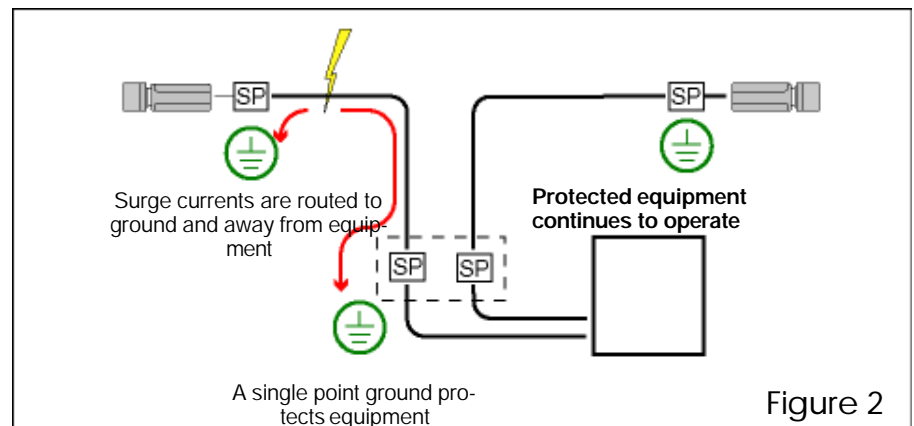


Figure 2

SURGE PROTECTION

Properly installed surge protection provides a single ground point for the unit it is protecting. The protected equipment no longer sees any signal larger than the clamping voltage and with the single point ground there is no path for current flow through the unit.

What factors are important in good surge protection?

Now that we have looked at how surge protection works, we must consider some of the important performance requirements of a surge protector.

Lightning is a large, fast rising, high current pulse. Factors to consider are turn-on time of the protection device, does the device provide multiple stages of protection and what is the clamping voltage from what type of device?

Any surge that comes down the wire will have a rise time to it. A typical lightning pulse has a rise time of 2usec to the 90% point and a 10 to 40usec decay time to the 50% point. Turn on time is clearly important in limiting the potential voltage felt on the electronics of the protected equipment. The Nitek equipment employs TVS Thyristor technology with turn-on times in the picoseconds.

In addition to a fast response time, there is a need to handle high amounts of current. The problem with devices that handle high current loads is that the clamping voltage is high. While gas arrestors handle high currents, they can operate in the 90V to 1KV range. By the time it turns on your camera or DVR will have been damaged. If you use a device that clamps to a low voltage they can never handle enough current to protect your equipment. The only workable method is to use multiple devices with isolation between stages. Each stage drops more current and reduces the voltage level. However multi-stage design usually means loss of signal from stage to stage. Nitek avoids this by using a unique inductor system tuned for base band video. The result is multi-stage protection down to 2.8 volts without meaningful signal loss. This ultra low voltage protection is most important to DVRs.

Finally, Nitek uses Solid State TVS Thyristor technology instead of the more common MOV technology. MOV technology fails in two areas. It has high capacity which hurts frequency response and it loses effectiveness each time it activates. The use of TVS Thyristor technology avoids these two problems. Junction capacity is only in the picofarads and the nature of the junction never changes so you're always protected as well as the day it was installed.



Model CAMPVC24 Features

The CAMPVC24 clamps the video to 2.8 volts, though a unique multistage circuit. Easy installation is provided via BNC connectors for the video and large screw terminal connectors for the power and the control wires. The all-in-one design makes single point grounding a simple task and maximizes your equipment protection. A small package design with two mounting tabs provides easy mounting. The CAMPVC24 comes combined with a Lifetime warranty for your peace of mind.

NITEK

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SURGE PROTECTION

What is the right unit for my application?

Selecting a unit for your application should not be difficult. Figure 3 lists the features of each unit and what type of equipment to use them with. Simply select the one that best fits your application from these listed below. Each unit often fits several applications. For example the CAMPVC24 has protection for the power, control and the video signals. If your camera is a fixed camera then use the same unit just disregard the control pair connection.

Part Number	When to use it
CAMPVC24	Used on fixed or PTZ cameras with a coaxial video output. Camera power can be 12 or 24 volts. Unit should be installed at the camera end.
CAMUTP24	Used on fixed or PTZ cameras which have a UTP ready video output. Camera power can be 12 or 24 volts. Unit should be installed at the camera end.
DVRPTR16	Used for up to 16 channel head end equipment such as a DVR or Image Multiplexer. Unit should be mounted near head end equipment.
CAMPTR1	Used at a head end where only a few channels are needed for equipment such as a DVR or Image Multiplexer. Unit should be mounted near head end equipment.

Figure 3



References:

1. NWS, National Weather Service, Office of Climate, Water, and Weather Services
1325 East West Highway
Silver Spring, MD 20910
WWW.NWS.NOAA.GOV
2. National Lightning Safety Institute
891 N. Hoover Ave Louisville, CO 80027
WWW.LIGHTNINGSAFETY.COM
3. Lab Notes - Lightning Protection - Part 1
QST October 1994, pp. 81-82
4. Lab Notes - Lightning Protection - Part 2
QST December 1994. pp. 45-46
5. AFM 88-9, Chapter 3, Electrical Design Lightning and Static Electricity Protection.
6. NFPA 780, Standard for the Installation of Lightning Protection System

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