MSYSTEM

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Rev. 0
01
EC-8139-B 500505

Ethernet Lightning Surge Protector Ideal for Surveillance Cameras Applications

MDCAT protects both transmission and power circuits from lightning surges on PoE compatible devices!

So how compact it is!? These can even be installed on a DIN rail!

A lightning surge protection solution brought to you by the experts in instrumentation signals and transmission networks at **M-System!**

CE

Works with PoE, PoE Plus

- IEC 61643-21 (Category C1, C2) compliant
- Adheres to cable categories CAT5e, CAT6
- Can be grounded through DIN rail

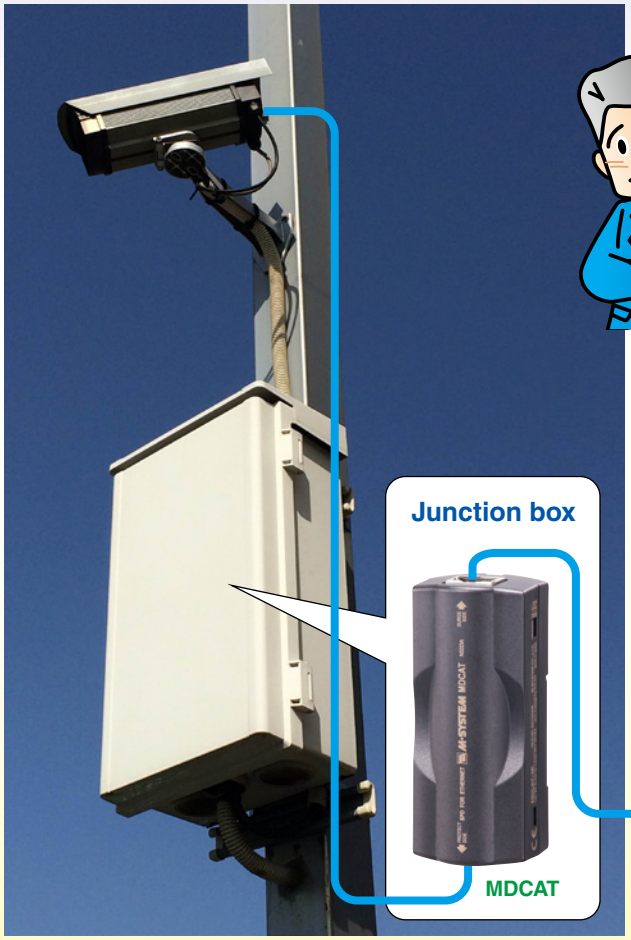
See Terminology Definitions in page 7 for further details

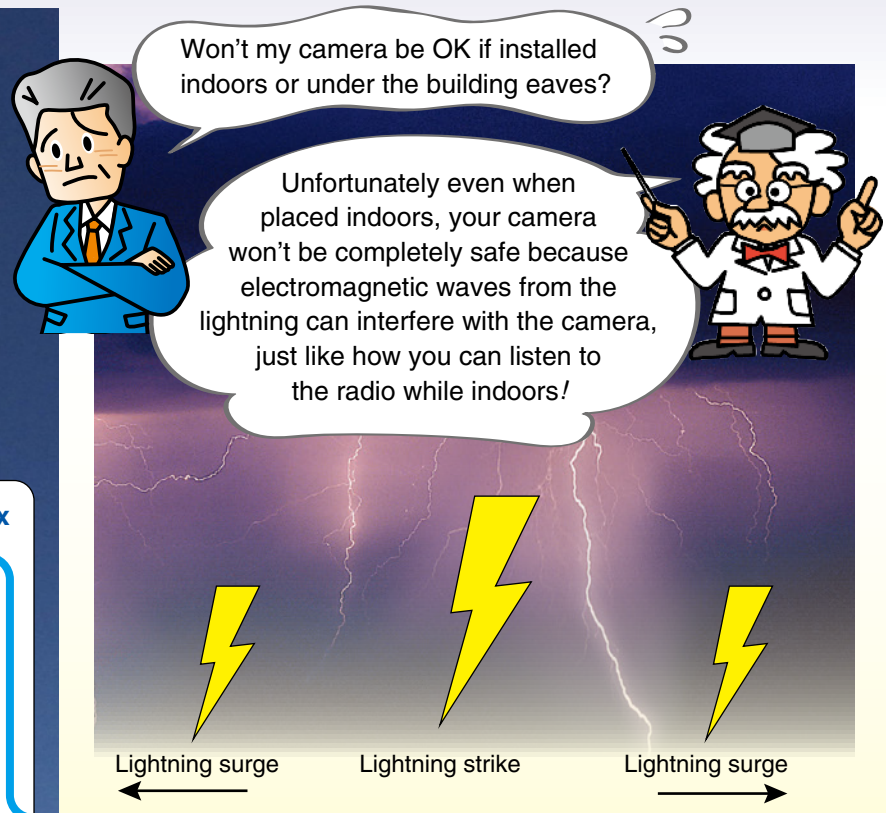
M-RESTER Series Lightning Surge Protectors for Electronics Equipment

Model **MDCAT**

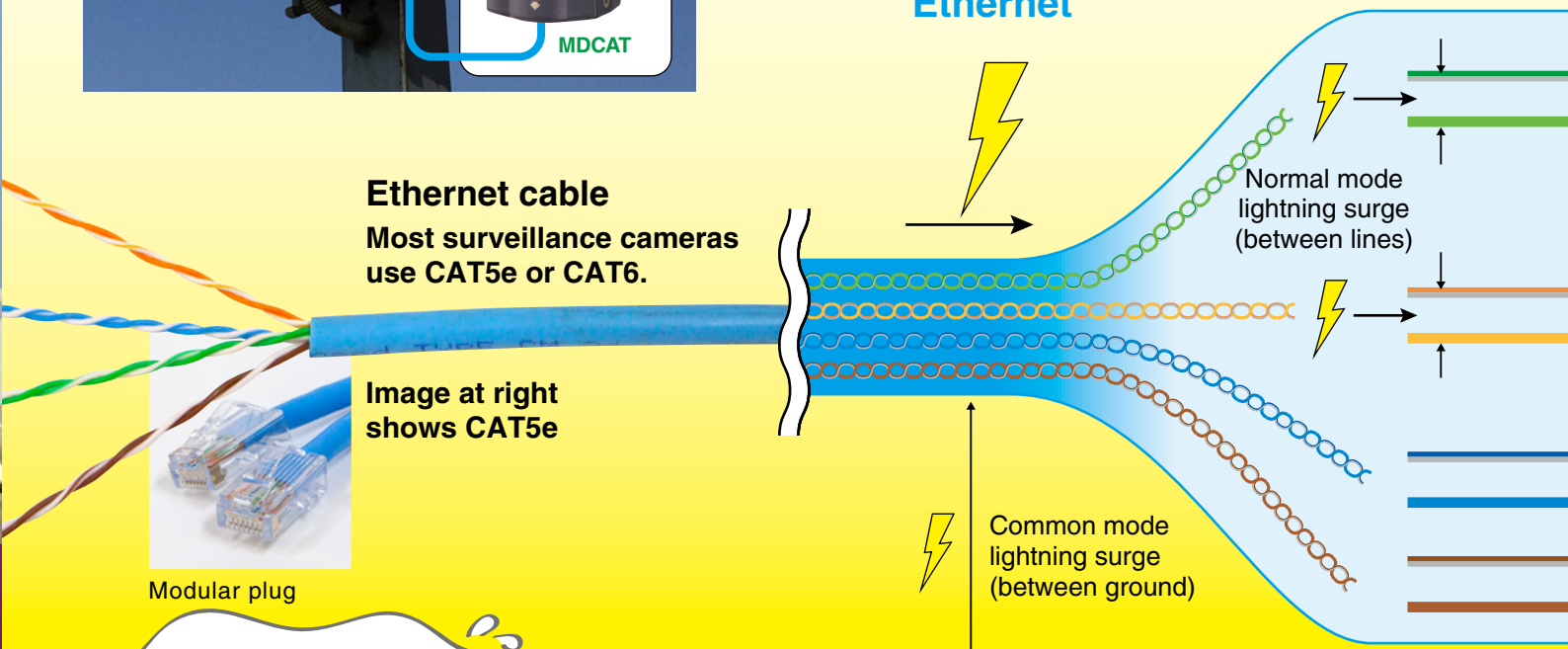
M-SYSTEM CO., LTD.

This is how surveillance cameras are protected from lightning!





Ethernet

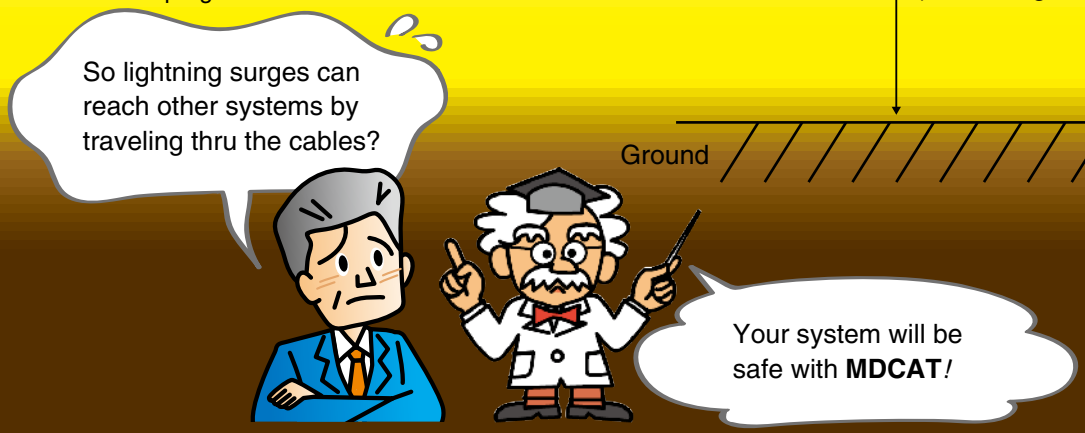


Ethernet cable

Most surveillance cameras use CAT5e or CAT6.

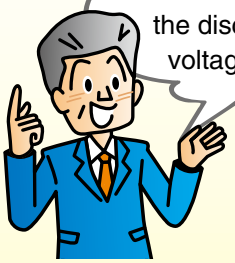
Image at right shows CAT5e

Modular plug

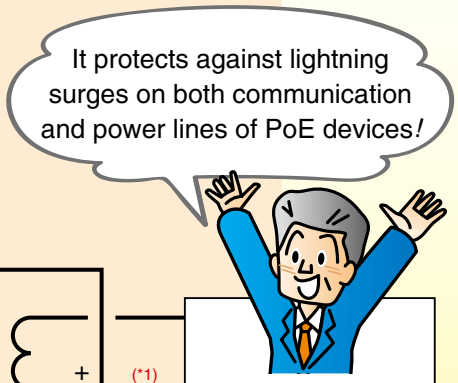


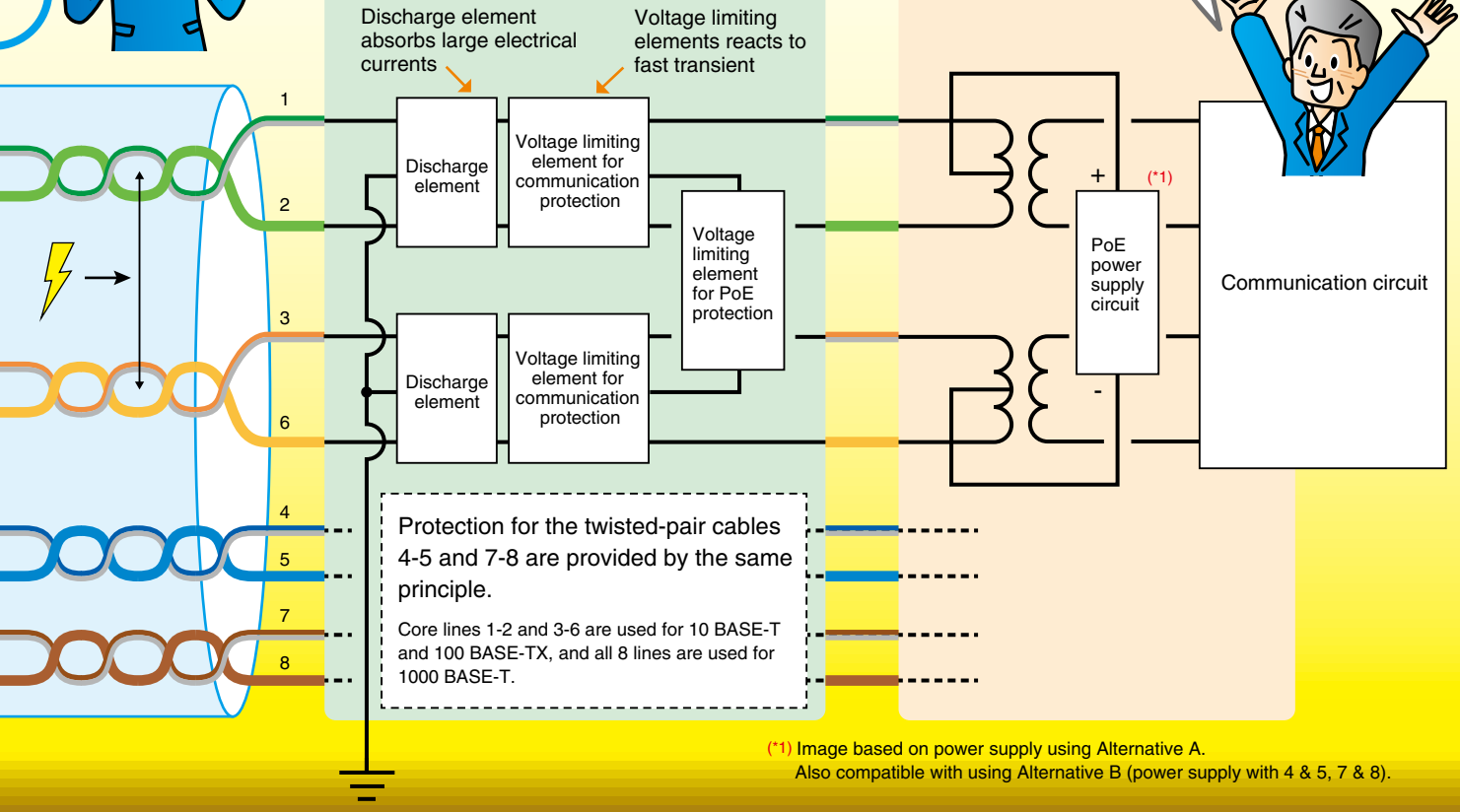
MDCAT function diagram

PoE hub/switch function diagram



PoE hub/switch

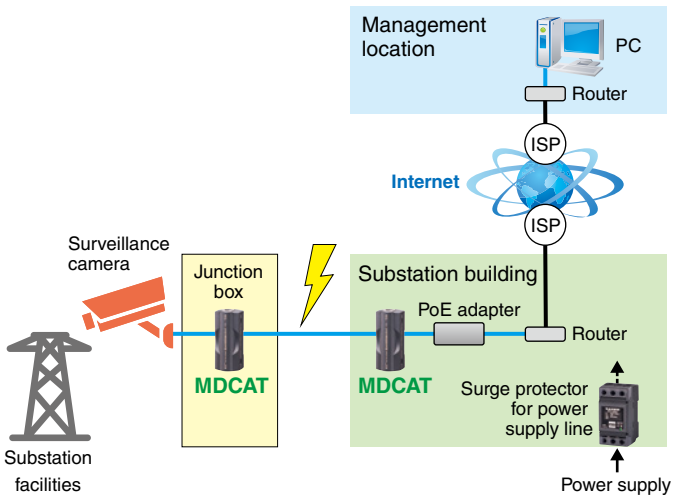




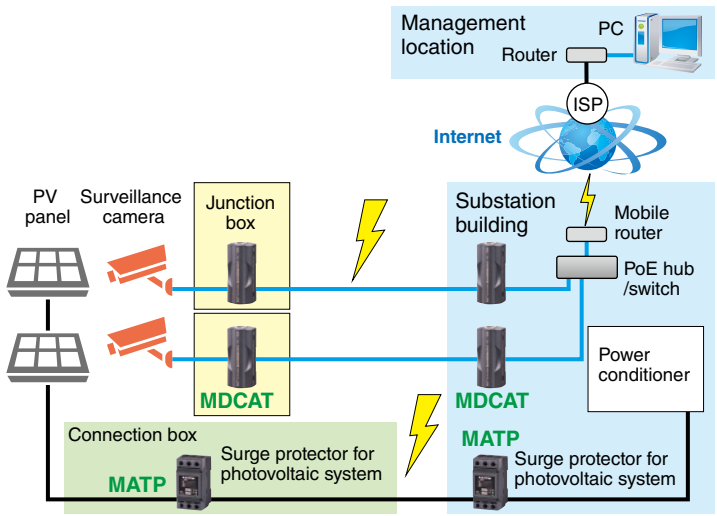
(*1) Image based on power supply using Alternative A.
Also compatible with using Alternative B (power supply with 4 & 5, 7 & 8).

Recent surveillance camera technology capable of higher-resolution image quality has made such devices an integral component of social support systems for providing safety and security, such as those used in disaster mitigation and anti-terrorism. Protecting expensive camera systems from lightning surges is not only important from a security standpoint but also to protect system cost.
On the other hand, as camera monitoring systems increase in size, the longer cables required for communications and power supply lines provide more and more opportunity for lightning surges to infiltrate the system. Lightning surge voltages are an issue for both between individual lines (normal mode) and between the line and ground (common mode), with both pathways requiring ways to mitigate over-voltage to protect system devices. And in the case of camera monitoring systems that typically get a power feed over a PoE (Power over Ethernet) line, it is also important the PoE line be covered by some form of surge protection.
M-System's lightning surge protectors specifically designed to electrical components are installed in a system along the route of lightning surge infiltration to absorb surges from multiple sources, and completely eliminate most risk from lightning surges.

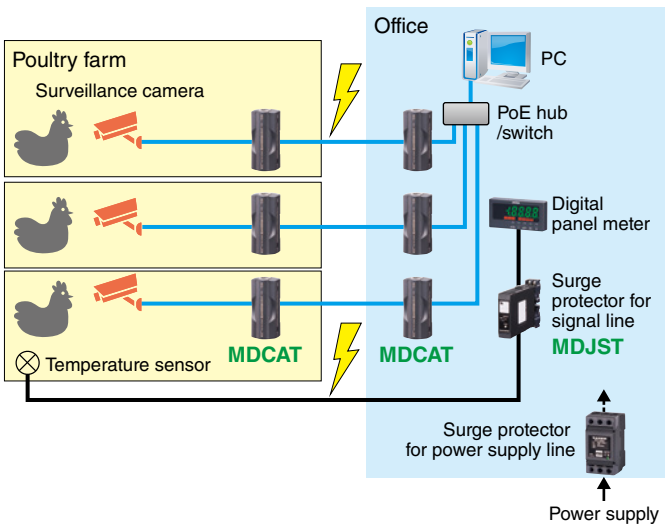
Transformer substation



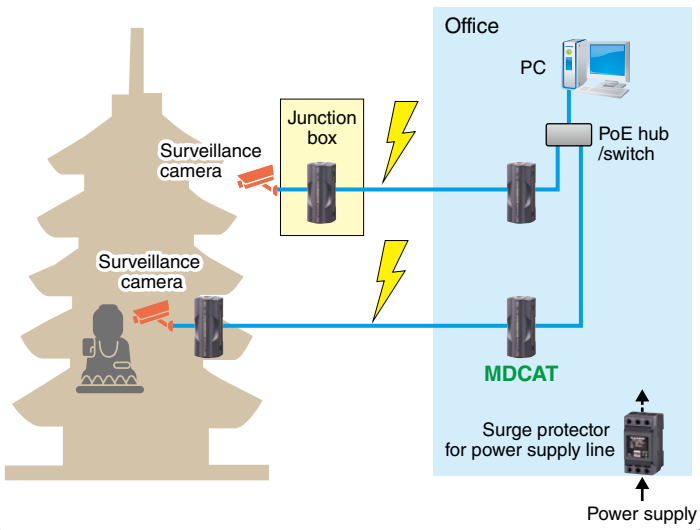
Mega solar power plant



Poultry farm

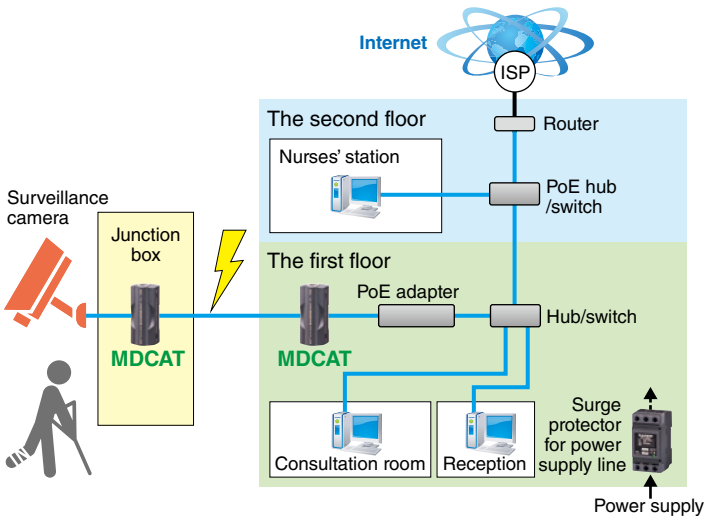


Cultural assets

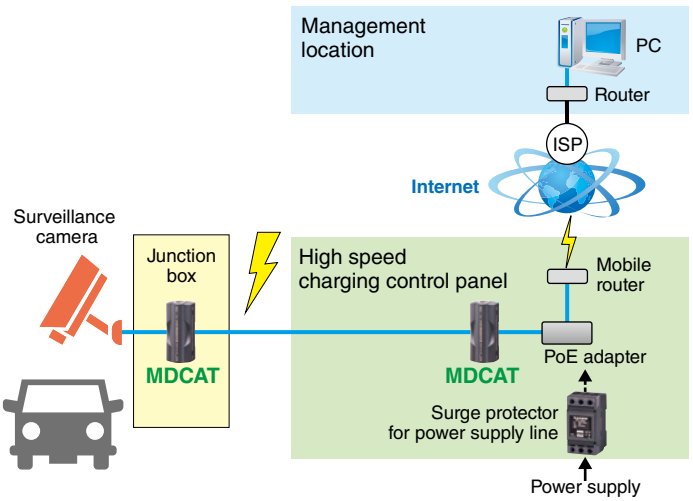


Other Ethernet Applications

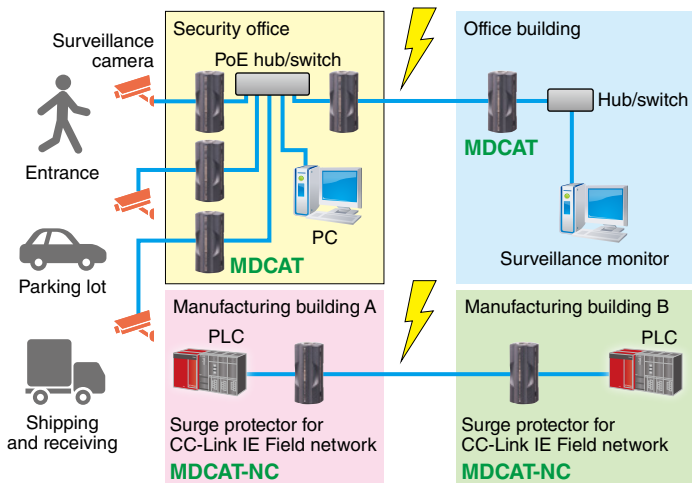
Hospital



Electrical vehicle charging station

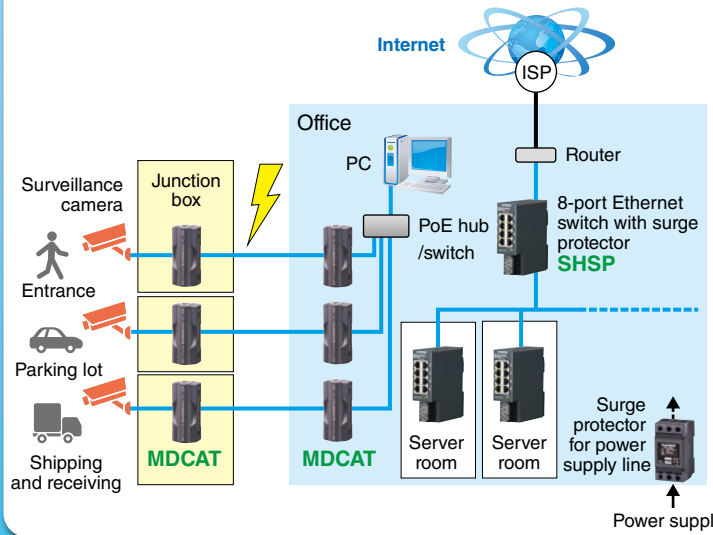


Factory



Surge protectors for power supply line are required in each building.

Data center

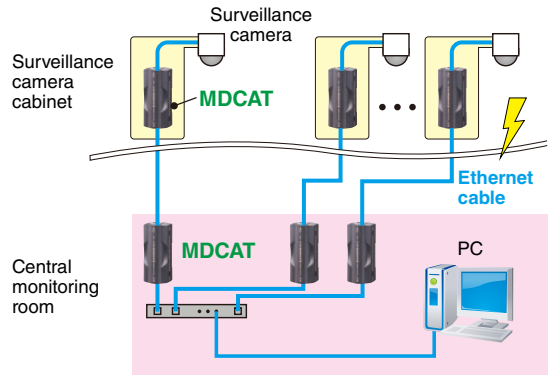


Example of MDCAT System Set Up

MDCAT has passed communication tests using cables up to 100 meters in length for CAT5e and for CAT6 (for **MDCAT-6**). Even with an **MDCAT** lightning surge protector installed, the system offers limited interference on communications allowing users to fully leverage the performance of 1000BASE-T compliant Ethernet devices. As indicated in the following diagrams, **MDCAT** can be used for small scale systems where surveillance cameras are connected in a star configuration to a hub in a central monitoring room, or in mid-scale systems connected in a cascading configuration to hubs located in individual surveillance camera cabinets. Lightning surges don't always enter a system from the communication lines, but can also enter over the power line, which surge protectors dedicated for power lines are also be used for.

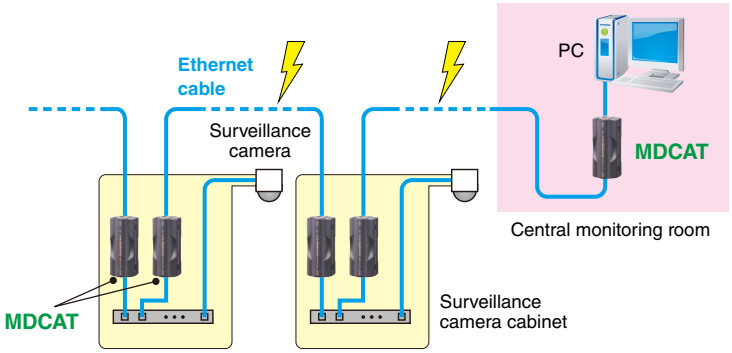
Small scale system: star configuration

■ **Star type connection**

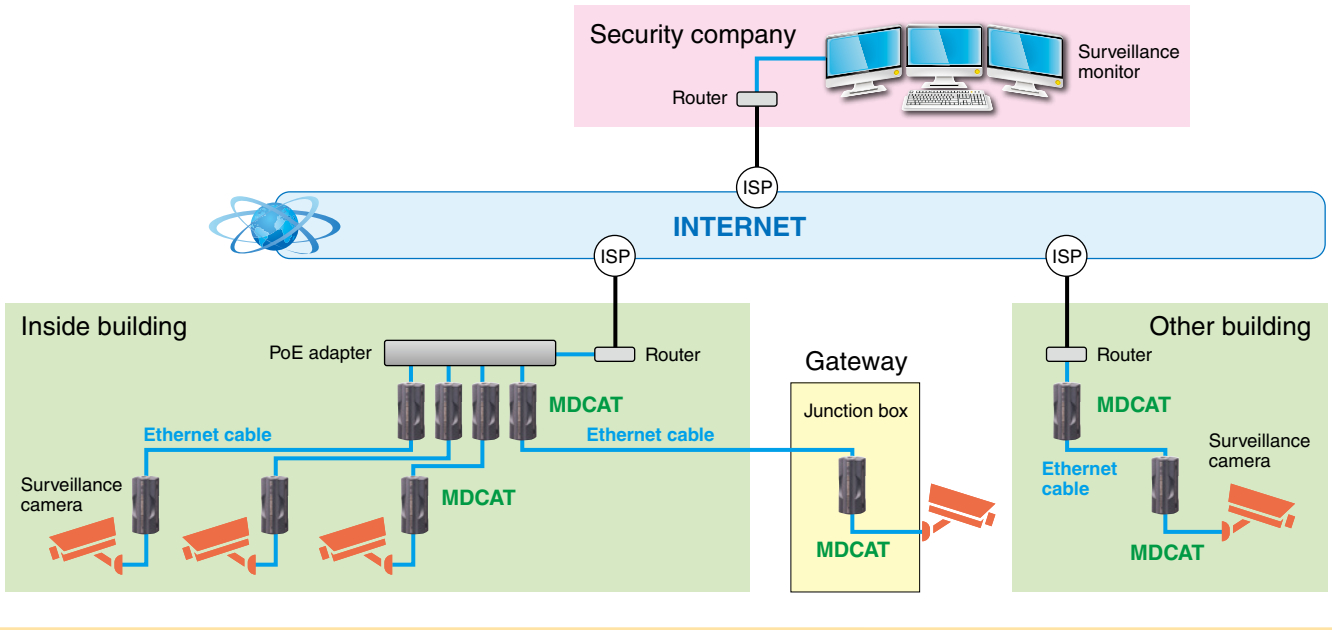


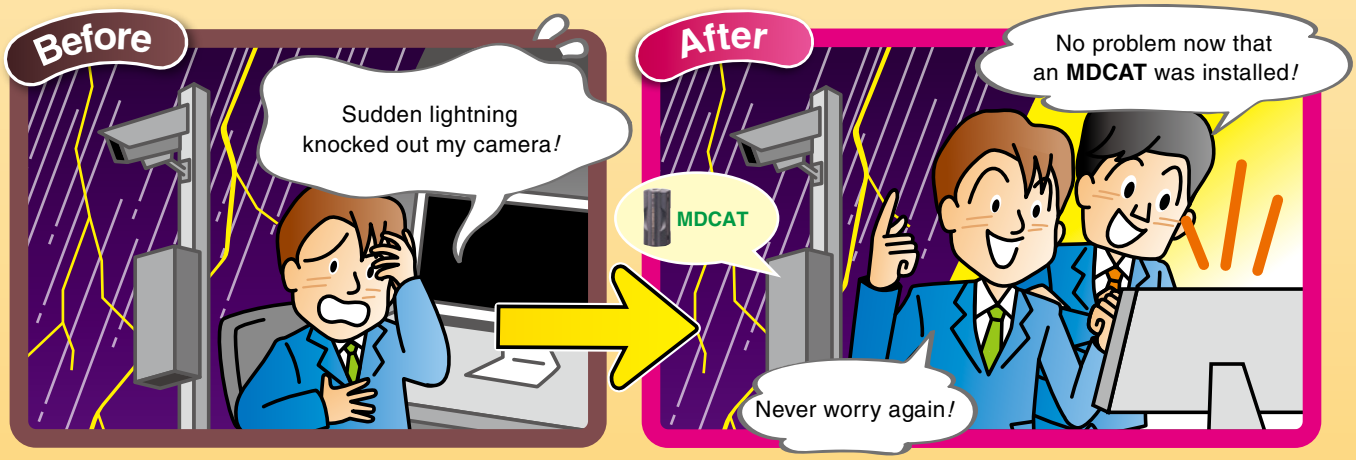
Mid-scale system: cascade configuration

■ **Cascade type connection**



Large scale systems where private security companies observe customer sites over the internet





Terminology Definitions

Categories of lightning surge protectors

In IEC standards (IEC 61643-21), lightning surge protectors are categorized into categories A1 through D2 (Table 1) according to the expected level of lightning surge. Each category has designated testing procedures, so individual models of surge protectors can be used across several categories by complying with the corresponding testing requirements of each category. Categories A1 and A2 are based on rather slow lightning surges like commercial cycle frequencies. Categories B1, B2 and B3 are based on frequent attacks by relatively weak lightning surges around 10 A. Generally, induced lightning surges register current waveforms around 8/20 µs, versus 10/350 µs for direct lightning strikes. Categories C1 and C2 are based on induced lightning strikes, and Category D1 is based on direct lightning strikes. In the case of communications equipment like surveillance cameras, it is mostly induced lightning strikes that enter a system across communication lines that pose a risk. The **MDCAT** is a category C1 and C2 surge protector designed to mitigate induced lightning strikes.

Table 1 **Categories of lightning surge protectors for communication and signal lines**

	Category	Type of test	Short-circuit current
	A1	Very slow rate of rise	10 A
	A2	AC (48 Hz – 62 Hz)	0.1 A - 20 A
	B1	Slow rate of rise	100 A
Based on induced lightning	B2		25 A - 100 A
	B3		10 A - 100 A
	C1	Fast rate of rise	0.25 kA - under 1 kA
	C2		1 kA - 5 kA
	C3		10 A - 100 A
Based on direct lightning	D1	High energy	0.5 kA - 2.5 kA
	D2		0.6 kA - 2.0 kA

PoE

PoE (Power Over Ethernet) functionality refers to technology that provides a power supply superimposed over the communication lines like LAN cables used for sending data signals. Using PoE functionality requires the electrical device being powered, like the surveillance camera, to be PoE compliant, as well as using PoE compliant power supply switching hubs and PoE adapters. Depending on the size of the load consumption being supplied, options are available for PoE and PoE Plus which are both standardized by IEEE (Table 2). Using PoE avoids the need for installing power supply wiring or using AC adapters. PoE occurs in two power supply methods, Alternative A or Alternative B depending on the method in which the power supply line is integrated into the Ethernet line. **MDCAT** is compliant with both methods.

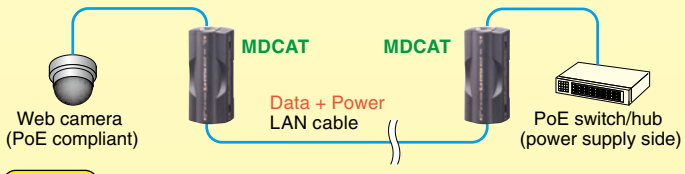


Table 2 **Table 2. PoE / PoE Plus specifications**

	PoE	PoE Plus
Standard	IEEE 802.3af	IEEE 802.3at
Current	Maximum 0.35 A	Maximum 0.60 A
Maximum power consumption	15.4 W	30 W
Compliant cable	Category 5e and higher(*2)	Category 5e and higher

(*2) Standards call for Category 3 and higher, but some commercially available Category 3 cables are not compliant.

Cable Categories CAT5e and CAT6, etc

Category 5e (CAT5e) and Category 6 (CAT6) refer to ANSI/TIA/EIA-568 standards for twisted-pair cables (stranded cable). The standards cover not only LAN cables, but also include RJ-45 connectors and modular jacks. Ever faster Ethernet connection speeds have heightened performance demands on LAN cables. Cables now come in CAT3, CAT5, CAT5e, CAT6 versions, with higher numbers indicating higher cable performance. Currently, typical Ethernet connection speeds are at around 100 Mbps for 100BASE-TX or 1 Gbps for 1000BASE-T, which require either CAT5e or CAT6 type cables (Table 3). **MDCAT** can be used for both cable categories CAT5e and CAT6.

Image 1

Cross section of each cable category

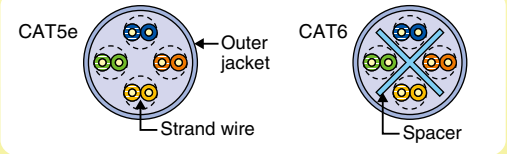


Table 3

IEEE802.3 and category compliance

Category \ Connection speed	10 BASE-T IEEE 802.3 i	100 BASE-TX IEEE 802.3 Xu	1000 BASE-T IEEE 802.3 ab
	10 Mbps	100 Mbps	1 Gbps
CAT 3	Y	---	---
CAT 4	Y	---	---
CAT 5	Y	Y	(*3)
CAT 5 e	Y	Y	Y
CAT 6	Y	Y	Y

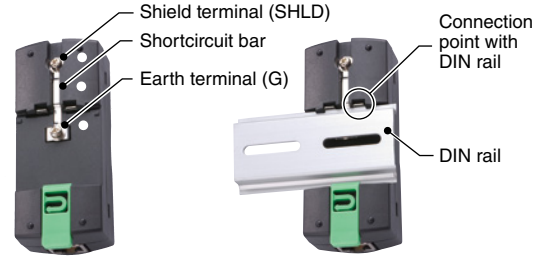
MDCAT compliant categories

(*3) Some commercially available cables non-compliant

Grounding is a key element of lightning surge protectors!

By using a steel or copper DIN rail, **MDCATs** can be installed in a highly compact configuration because they allow a ground connection without using a designated ground wire. However, it is recommended a ground connection be made with a cable and ground terminal when the **MDCAT** is used with an aluminum rail, due to an oxidization layer causing potential interference between the **MDCAT** and ground connection. A cable and ground terminal connection is also recommended if the DIN rail is not used.

Shortcircuit bar and DIN rail installation



DIN rail: TH35-7.5, 1 mm thick type

45 years of history - Total number of lightning surge protectors shipped 1,276,815!(*4)

(*4) as of September, 2016

M-System offers a product lineup of lightning surge protectors to defend your transmission network!

45 years have passed since M-System first started delivering lightning surge protectors for standard instrumentation signals. Since then our lineup of surge protectors has evolved to make the most of our expertise in remote measurement and control systems that use M-System products like signal conditioners, telemetering equipment and remote I/O devices, and even better defend important network devices. M-System lightning surge protectors comply with the relevant network standards.

Network	Ethernet		CC-Link	CC-Link IE Field	RS-485/422			
	Conforms with PoE and PoE Plus				Ultra-slim	Plug-in type	Life monitor, Plug-in type	Full-duplex
								
Model	MDCAT	MDM5E-A	MDW5-CC	MDCAT-NC	MD74R	MDP-4R	MDW2A-4R	MDW5-4R

Network	DeviceNet	PROFIBUS-PA		LonWorks			Foundation Fieldbus
		Ultra-slim	Plug-in type	Life monitor, FTT-10A	Ultra-slim	Plug-in type	Plug-in type
							
Model	MD-DNM MD-DNS	MD7PA	MDP-PA	MDW5ALW	MD7LWA	MDP-LWA	MD7FB

Please contact us regarding surge protectors for power lines and signal lines.

8-port Ethernet switch with surge protector

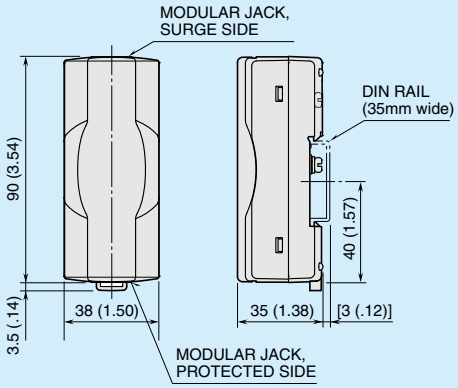
Ethernet switching hub with lightning surge protection

Model	POWER INPUT
SHSP	100-240V AC
	24V DC

CE marking for 24V DC power supply type

The M-RESTER lightning surge protector was specifically designed and developed for lightning protection on electrical components.
Please refer to our homepage for further details on lightning surge conditions, and techniques for protecting electrical components against lightning surges.
http://www.m-system.co.jp/mssenglish/service/emmrester.pdf

MDCAT EXTERNAL DIMENSIONS unit: mm (inch)



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Specifications are subject to change without notice. When ordering, use the latest data sheets