

Power

When designing a CCTV system's power requirements, start with the AC power source. The system power should be a dedicated branch circuit from the breaker panel whenever possible. Sharing a circuit with other devices (especially those with motors or transformers) should be avoided. Make sure the circuit is properly grounded.

Keeping The Power On

The first step in assuring a CCTV system remains powered is to use a dedicated AC circuit. Breaker locks and/or securing the load center door are also helpful. Locating the head end equipment in a secure area (locked office or closet) will also assure continued operation.

Outlets

Electrical outlets can be quickly used up on a CCTV system head end. Finding enough outlets for monitors, recorders, image management, and camera power supplies may become a problem. The preferred solution is to add additional outlets, but this may not be practical since electrical work is required. Using a power strip is often the best option.



Power strip



UPS

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UPS

Uninterruptible power supplies (UPS) provide AC power that remains on during a power failure. UPS switch to battery power during AC loss and use an inverter to convert DC battery power to 120VAC, providing additional protection during power outages.

The total power load of devices connected to the UPS must be calculated when selecting a UPS. Cameras, image management, and image storage device wattage requirements must be considered. Monitors may or may not need to be connected to the UPS, but if they are, they must be considered also. Most UPS's are designed for 10-30 minutes of backup time at their rated wattage output. If longer time is required contact the manufacturer or visit the manufacturer's website for assistance.

Power Sources

120VAC

120VAC is usually used to power monitors, image management devices, and image storage devices. It is sometime used to power cameras and peripheral devices where there are high current requirements.

Transformer

Transformers step-down 120VAC to lower voltage levels, typically 12V or 24V for CCTV. Transformers are used to power cameras and some peripheral items. Some transformers have built in rectifiers to convert AC voltage to DC voltage.

Plug In Transformer

A plug in transformer plugs directly into an AC outlet and is held in place with a screw. This type of transformer is usually in a plastic case. This type of transformer comes in multiple wattage (VA) sizes, but usually no larger than 50VA.



Hardwire Transformers

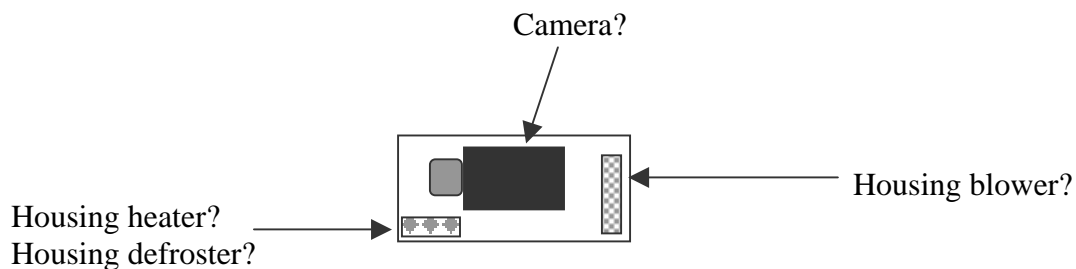
Hardwire transformers are usually open frame, meaning all wiring is exposed. Hardwire transformers require a direct connection to 120VAC. Some models come with a line cord and plug. Transformers of this type should be in a protective housing to prevent damage and accidental electrocution.



Transformer Ratings

Transformers have a rated wattage or current output. When selecting a transformer, be sure that it has sufficient wattage or current to power all the devices you will be connecting to it. Power requirements of the devices may be specified in watts or volt-amps (VA), or in milliamps or amps. Consider the camera and all camera related devices, and all peripheral items.

Camera Transformer Loads



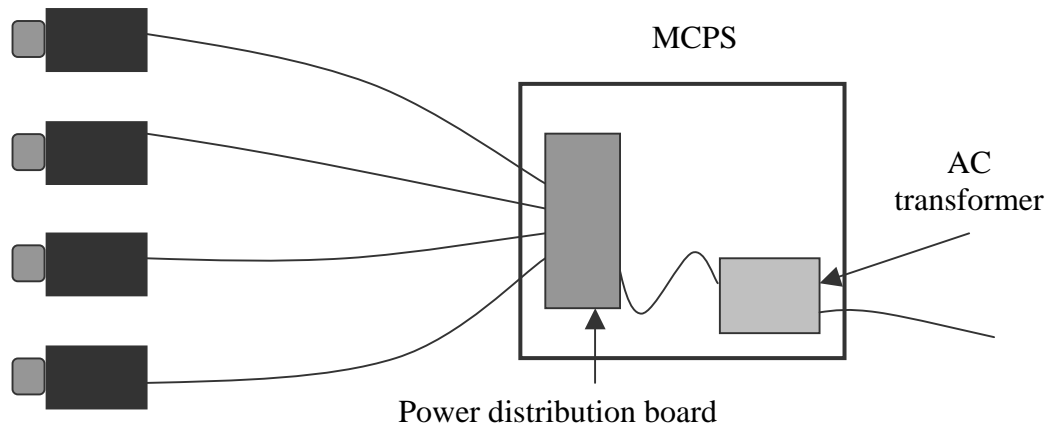
Peripheral Items?
-Pan/tilt?
-Zoom lens?
-Illuminator?
-Video transmitter?
-Other devices?

Single Transformer

Single transformers are desirable for smaller applications (1-2 cameras), remotely powered cameras, or camera with high current requirements. Individual transformers are inexpensive, but require an outlet per transformer.

Multiple Camera Power Supply (MCPS)

Multiple camera power supplies allow 2 or more cameras to be powered from a single power point. MCPS's are typically a single transformer housing in a metal cabinet with a circuit board for distributing power to the cameras individually.



Advantages of MCPS

MCPS's help make a neat, organized installation. They have individual circuits and individual fuses for each camera, so if a single camera goes down due to a short or other problem, it does not affect the other cameras. They have a master power switch that allows all cameras to be powered down at the same time. Some even feature individual power switches for each camera. They conserve outlet real estate: they only require a single outlet to power multiple cameras. They come in multiple camera output configurations (4,8,16 or 32 cameras). They may have fuses or self-restoring circuit breakers. Some models include surge protection.

MCPS Special Options

Some MCPS's have optional features that make the unit more flexible. Dual voltage units have both 12VDC and 24VAC in the same cabinet so cameras of different voltages can be run off the same power supply. Some units are available in weatherproof cabinets so they can be mounted outside. Higher voltage/adjustable voltage units allow the unit to compensate for longer cable runs or undersized cable.

AC/DC Converter

Some manufacturers offer a 24VAC to 12VDC converter for single cameras. This device allows a single 12VDC camera to be powered off the same power supply as 24VAC cameras. It eliminates the need for a separate power supply just for that camera.

Peripheral Power

Some peripheral devices have significant power requirements. If using an MCPS to power these devices, make sure the MCPS has enough wattage to power these devices and the cameras. Heavy duty MCPS's are available with larger wattage outputs for powering cameras and peripheral items. Another option would be to use a separate power source to power the peripheral item directly.

Lightning facts: A lightning strike can carry up to 1 million volts and up to 100,000 amps. A lightning strike 1 mile away can induce a 70V surge on a 3 foot piece of cable.

Surge Protection

Surge protection devices are designed to route voltage surges on equipment cabling away from the equipment and safely to ground.

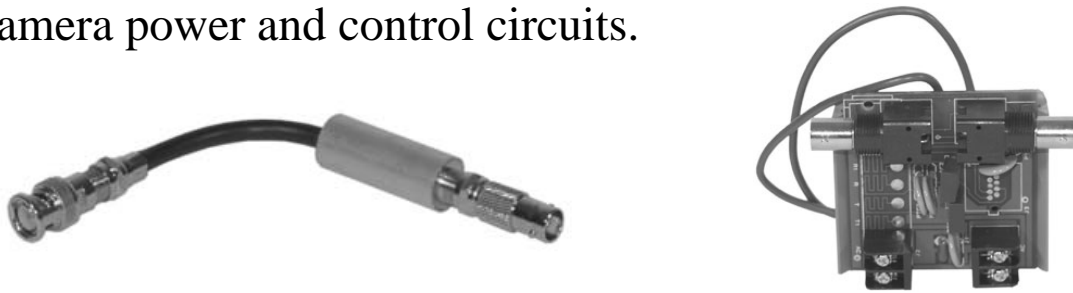
120VAC Power Surge Protection

120VAC power surge protection helps protect equipment from surges that come in over the AC power source. The protection devices may be hardwired to the AC wiring, or plug in. Plug in types support single outlet and multiple outlet.



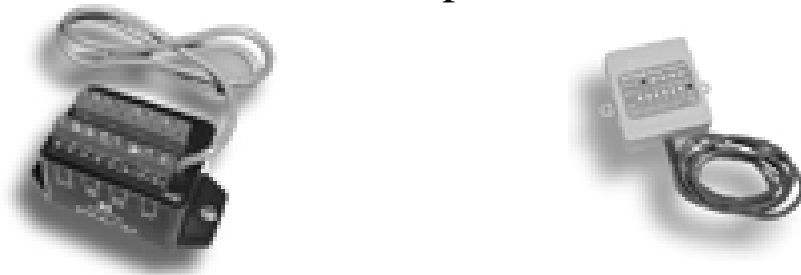
Video Surge Protection

Video surge protection helps protect equipment from surges that come over the video cable. This type is usually an in-line connection with 2 female BNC's. It is installed at or near the head end equipment at minimum. For additional protection, surge protectors are installed at the camera end also. As with AC surge protection, this type is also available to protect individual camera runs and multiple camera runs. Some also feature protection for camera power and control circuits.



Control Circuits

Control circuit protection helps protect equipment from surges that come in over the control circuit cable. This type may be terminal, wire lead, or other connection.. It is installed at or near the head end equipment at minimum. For additional protection, surge protectors are installed at the controlled device end also. As with AC and video surge protection, this type is also available to protect individual camera runs and multiple camera runs. Some also feature protection for power and video as well.



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Selecting Surge Protection

The number one rule of surge protection: you get what you pay for. A cheap surge protection device will not perform nearly as well as an expensive one. Surge protection selection involves weighing the factors of equipment cost (equipment, labor, and warranty issues) against the surge protection cost. It will help protect against damage to equipment from acts of God, but will add to the overall cost of the system. When selecting surge protection, look for devices that are fast acting and self-restoring. Devices that protect and against voltage and current surges offer the best protection.

Selling Surge Protection

A tactic that dealers use when offering surge protection is making it a value added item on the proposal. List it as a separate line item at additional cost, or as a requirement (or part of) and extended warranty program. Surge protection is an insurance policy, and like insurance, nobody likes to buy it, but they are happy they had it when they needed it.

Grounding

Surge protection is only as good as the ground it is connected to. The device needs a place to route the surge to so that equipment is not damaged. Grounding for the surge protection and the system head end should be common. Separate grounds invite ground loop problems and may allow surges to bypass protection. A ground rod provides the best protection. Cold water pipe is acceptable

when a ground rod is not practical or available, but beware of plastic piping.

The National Electrical Code

The NEC states that ground rods shall be at least 8 feet long, 3/8" in diameter, and connected by a green ground wire at least 14AWG. If a metal underground water pipe is used it shall have at least 10 feet of direct contact with the soil and the point grounding attachment shall be within 5 feet of where it enters the building. The NEC states that if multiple grounds are used, they must be bonded (connected together)

This document is part of a complete book entitled:
CCTV System Design & Installation

By Charles Aulner and Bryan McLane
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