

Security & Power: The Critical Role of Power Protection for Security

white paper

How to defend security devices against power problems
to ensure continuity in an emergency

MINUTE MAN[®]
POWER TECHNOLOGIES
by Para Systems, Inc.

Background

A compelling case can be made for how important security systems are in protecting facilities, assets, employees and customers, and few would disagree that investing in a comprehensive plan to secure a business is a wise decision.

Controlling access to facilities is essential. Having surveillance cameras and video recording is important on several levels. Fire and smoke alarms are often mandated. Intrusion detection is important. Being able to communicate in an emergency is vital. And for many businesses, including retailers, theft prevention is imperative.

All of the systems mentioned above contribute to protecting a business, and all of them have one thing in common: they all require power. Without power, none of these systems provide the function for which they were designed. In any discussion about security systems, power protection plays a very critical role and must be a part of the overall planning process. Simply stated, there is no security without power.

The purpose for this document is to provide background information on power and its associated anomalies, how power problems can affect businesses and campuses, as well as outlining the use of power protection within security applications.

The Problems with Power

Power failures can strike at any time and for many reasons. These include the travails that Mother Nature dishes out, unexpected construction accidents, a utility pole taken out by a careless driver, equipment failure, or even sabotage by a disgruntled employee or outside group. No matter the cause, businesses and all institutions must be ready when a power problem occurs or disaster strikes.

There is also an ever-increasing demand for electrical power, and in some highly populated areas, the strain on the power grid during peak hours is worthy of concern. Blackouts, brownouts and inconsistent and unreliable power are fairly consistent “exceptions”. To security managers and business owners, it’s downright scary to consider the vulnerability that comes from a total reliance on the availability of power.

Along with the obvious security implications, downtime caused by a power outage can be very costly. Consider the loss of customer good will, lost sales, dips in employee productivity, delays in business processes, not to mention the recovery time for getting things back to normal. Obviously, the longer the absence of power, the more costly it is for businesses. A comprehensive power protection plan can prove to be an invaluable investment.

Above and beyond merely causing an inconvenience, power problems can endanger the safety of employees, students, patrons and customers.

Electrical power outages, surges and spikes bring about more than \$150 billion in annual damages to the U.S. economy. Every year, an estimated \$104 billion to \$164 billion goes down the drain due to power interruptions, while another \$15 billion to \$24 billion is lost on account of poor power quality such as voltage fluctuations, power surges and spikes.

Specifically, industrial and digital business firms suffer losses amounting to \$45 billion annually. Some industries, such as manufacturing, can lose as much as \$6.45 million per hour of downtime. The benefits of investments made in necessary power backup arrangements far outweigh the shocking costs related to irreparable damages and irretrievable loss of revenues caused by downtimes.

Events that can lead to power anomalies:

Natural:

Lightning
Flooding
Ice/Winter Storms
Hurricanes & Tornadoes
Earthquakes

Manmade:

Terrorism
Utility Provider Errors
Employee Sabotage
Rolling Brownouts/Blackouts
Water Main Breaks
Fire

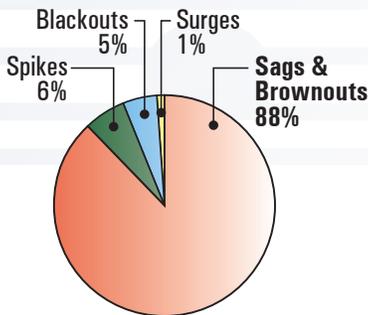
Power Quality Disturbance Cost and Frequency (Source, Duke Energy Survey, <http://www.piller.com/us/default.htm>)

Disturbance	Cost/Event	Annual Frequency
Voltage sags	\$7,964	22.9
Momentary outage	\$11,027	2.4
1-hour outage: notice	\$22,973	1.1 total for all extended outage categories
1-hour outage: no notice	\$39,459	
4-hour outage	\$74,835	

Power Anomalies

A surge can best be described as a “power tsunami.” The AC voltage rises sharply very quickly and inundates equipment power supplies with an over-abundance of voltage. When that happens, equipment power supplies and equipment components are not able to process that much voltage, thus resulting in severe damage. A surge is different from an electrical “spike”, in that, a spike is a very sudden increase in voltage that lasts only a few milliseconds. But during those few milliseconds, severe damage to power supplies and equipment components can occur. Surges and spikes make up about 6% of all power anomalies, but they both can cause catastrophic damage to critical equipment.

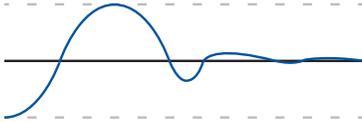
Power Problem Frequency



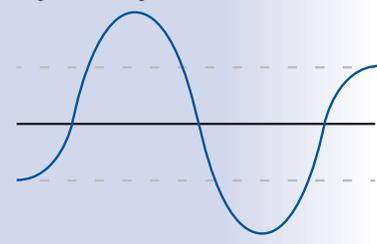
The most common power problem is a brownout, which is a slight drop in voltage that can cause equipment to reboot. During a brownout, system component power supplies are essentially starved of the correct amount of voltage, thus causing them to fail. We often see the effect of a brownout when lights dim or flicker. Although brownouts do not often cause physical damage, they can wreak havoc by causing data corruption and a disruption of productivity while systems reboot or reset.

Types of Power Problems

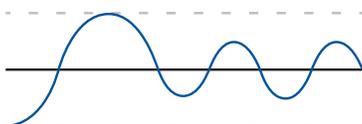
Blackout



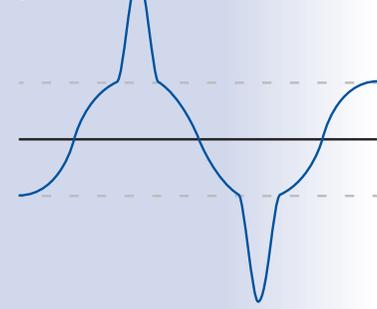
Surge/Overvoltage



Sag/Brownout



Spike



The opposite of a brownout is an over-voltage condition which can also result in system reboots because the power supply will not be able to tolerate a voltage beyond the usual range. An over-voltage condition can be observed when the lights shine a little brighter for several seconds. Brown-outs and over-voltages combine to make up 88% of all power problems

The most noticeable power problem is a blackout, which obviously is a total loss of power. Blackouts can also cause corrupted data files if a server or DVR is in the middle of a write cycle. Of course, the most devastating result of an outage is loss of the use of all electrical equipment. Everyone has experienced an outage of some sort, and blackouts often remind us how important power is to businesses and consumers.

Power outages can range from a few seconds to several hours, and can even go on for days. There are UPS solutions that allow for the addition of external battery packs, allowing critical equipment to stay up-and-running for an extended period. Keeping a security system fully functional during an extended power outage can be very beneficial for any type of institution.

Power Protection Solutions for Security

The most basic type of power protection is the surge protector. These products are designed to protect attached equipment from catastrophic damage caused by spikes and surges. Surge protectors are an inexpensive solution that can pay huge dividends should a spike or surge occur. Investing in expensive security devices and not protecting them from catastrophic damage is not a prudent choice.

Power protection, in the form of an uninterruptible power supply (UPS), has been around for several decades now, yet surveys find that up to 60% of small businesses do not utilize any power protection. UPSs protect against all types of power problems; from sudden spikes or surges to brownouts and blackouts, along with electrical noise. Each of these anomalies can result in damage to equipment or disruption of important applications.

The most crucial function of a UPS is, of course, its battery back-up capability. Certainly, all power glitches can cause serious damage, but things change dramatically

when power fails. Without adequate battery backup, security systems go down, thus putting businesses and campuses in a vulnerable position.

Security Components that Require Power Protection

Cameras & Recording Devices

Access Control Systems

Fire Alarm Systems

Emergency Communications

Telephone Systems

Intrusion Detection

Loss Prevention

Where is Power Protection Necessary?

Power protection is needed wherever there are cameras, video recording devices, access control systems, fire alarms, intrusion detection devices, emergency communications equipment, asset protection or loss prevention systems. All these mission critical systems play a part in protecting a business or other institution.

Cameras & Recording Devices

Security cameras and recording devices are a critical protection tool for businesses. Whether a business has a 4-camera system or 400 cameras, if complete power protection is not provided, these devices become vulnerable to electrical damage or will become inoperable during a power outage.

Just like any other electronic device, Network Video Recorders (NVRs) or Digital Video Recorders (DVRs) cannot function without power, and they are also susceptible to brownouts, surges and spikes. Should power fail for any reason, the NVR or DVR will cease to function unless adequate backup power is available from a UPS. A small DVR can be cost-effectively backed up by a 400VA to 900VA UPS.

Larger capacity DVRs will require a larger UPS, and with many DVRs now being rack-mounted, a larger capacity UPS can support several DVRs. It is recommended that security recording devices have at least 1 hour of battery backup time, and most businesses will find it affordable to provide even 3 or 4 hours of runtime.

The camera power supply should be backed up with a UPS. Although many camera power supplies offer basic battery backup, a UPS is far superior, providing complete protection from surges, spikes, brownouts and blackouts. In addition, the internal battery within the power supply will only provide a few minutes of backup time, while a UPS will keep the system operating much longer, with the option to have several hours of backup time with an extended runtime UPS along with external battery packs.

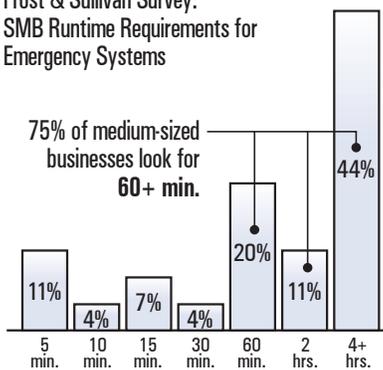
When using Power Over Ethernet (POE) cameras, it is also essential to provide protection for the power supply for the cameras. Again, if left unprotected, the POE power supply and cameras will cease to operate.

Access Control Systems

Access control readers require power in order to operate as designed, whether entry or exit is for a building, campus, parking lot, or gated community. The need for power protection is important to ensure entrance and exit of facilities, no matter what the condition. Many reader device power supplies have an internal battery for emergency operation, but again, the battery backup function may only operate for a few minutes, and if it is a busy building entrance or exit, the built-in battery may prove to be inadequate. In addition, these power supplies do not provide any further protection from all power anomalies.

Gate access systems have similar considerations, and all states have regulations on emergency access for gated communities, apartment complexes, condominiums, private homes and businesses. A UPS is the smartest choice for access control applications to

Frost & Sullivan Survey:
SMB Runtime Requirements for
Emergency Systems



ensure continuous operation. The power requirement for most access control equipment is relatively small, so backing these systems up with a UPS can be inexpensively accomplished.

Fire Alarm Systems

The National Fire Alarm and Signaling Code lists power requirements for fire alarms and signaling systems which specify the conditions under which a system must perform and the parameters necessary for system power supplies. The National Fire Protection Association and many new state codes require a fire alarm system to have a single UPS or two sources of power, either primary or secondary.

NFPA Fire Alarm Backup Requirements Explained

Type 0

True on-line, zero response time during a power outage

Class 24

At least 24 hours of backup capacity for the attached devices must be provided

Level 1

operation of the device is critical; failure could result in loss of human life or serious injury

The type of UPS that some states require is a Type 0, Class 24, Level 1 system. A Type 0 (on-line) UPS essentially means there is no switchover time when the power is being transferred from the primary source of power to the UPS.

This is very important for mission critical systems and can prevent system malfunctions from happening when a system switches from AC power to battery backup. It is not specified in many state codes that the UPS can only serve the fire alarm, but sharing the UPS should not be done unless the UPS can serve the entire connected load for the time needed or have load-shedding capability. Also in many states, the UPS must be Class 24, meaning 24 hours of capacity must be provided.

Check your local regulations and codes to ensure compliance. Fire alarm systems are not immune from power problems, and it is essential that these systems have appropriate power protection.

Emergency Communications

During any type of disaster, or even in a temporary power outage, it is absolutely essential that communications are not interrupted. Businesses must be able to communicate with employees and customers. Educational institutions must be able to communicate with students and faculty. Retail stores must communicate with employees and customers. Without emergency communications and mass notification systems, people are further endangered and liability issues are magnified.

In many states and localities, emergency communication systems require a 24-hour quiescent load capability, meaning that when the system is not being used, there is at least 24 hours of battery backup capacity should power fail. Other regulations may require a minimum of fifteen minutes of full-load alarm capacity from a UPS.

These systems may have to function at long periods of time during an emergency. Actual use time may be 30-60 minutes, but typically only a partial load when an announcement is being made is needed. The code requirements should be evaluated by a system designer to determine if a larger capacity or longer back-up time should be provided.

Telephone Systems

The telephone may also be a critical part of emergency communications and certainly requires power to operate. Using a UPS to back up a telephone system is an absolute necessity and can be accomplished very economically. IP telephony systems do require additional considerations because not only does the main system have to be backed up, all telephone hand-set stations are also individually powered.

The recommendation is to utilize a UPS on the main controller system, but also using a small UPS on individual stations. With unified communications also running on a desktop or laptop computer, the same UPS can be utilized to back up the computer and telephone station.

Intrusion Detection

Intrusion detection systems, commonly called burglar alarms, provide alarm notification should a door or window be opened or breached. These systems are primarily focused on identifying possible intrusion incidents, logging information about them, and reporting those attempts. For secured facilities, intrusion detection systems are a crucial component for protecting both facilities and personnel.

While intrusion detection systems run on DC voltage, they must have an AC power supply. The usual power supplies installed to support intrusion systems typically include basic battery backup which provides minimal backup time and no protection from any other power problem. Since these power supplies are generally low wattage, they can be cost-effectively backed up with a UPS and they can benefit from complete protection.

Annual Retail Store Losses due to Shoplifting

Total Lost Revenue:

 \$10+ Billion due to 'Shrinkage' by both customers & employees

Total caught/prosecuted:

 Over 1 million perpetrators caught by store mechanisms & teams annually

Preventative Equipment to backup:

AC-powered Electronic Article System (EAS) which detect tags on merchandise

Loss Prevention

Businesses, especially retailers, utilize anti-theft, or loss prevention systems, to deter shoplifting and employee theft. "Shrinkage," as the retail community calls it, costs store owners more than \$10 billion annually, and in excess of 1 million perpetrators are caught and prosecuted annually. Electronic Article Surveillance (EAS) systems are placed at all store exits, and camera surveillance systems can also be incorporated. High-value goods are tagged with devices that sound an alarm when the tag enters the field of an EAS system.

These anti-theft systems are AC powered, and the reader or sensor devices typically have low power requirements. This enables retailers and other businesses that employ these systems to provide full power protection at an economical price by using a small UPS. When power fails, EAS systems do not have any built-in battery backup, thus making retailers very vulnerable to theft.

Conclusions

Making power protection an integral part of a security system installation and disaster plan is essential, no matter the type of business or institution. Business owners and managers are selling their security system short and doing their business a tremendous disservice in not providing complete power protection.

Some security system dealers have even made it a point not to sell a security system without adequate power protection. This not only protects the customer from possible liability and safety issues, it also protects the dealer from having a very unhappy customer and being dragged into litigation.

By the time a power incident occurs or disaster strikes, it is too late to take many of the important steps to protect a business. Too many business owners and managers take the supply of power for granted and do not plan accordingly. Things happen unexpectedly, and all too often, Murphy's Law catches us by surprise at the most inopportune times.

Security systems are designed and installed for protection – not protecting them with proper power solutions can negate any benefit of the investment in a security system. Security shouldn't end when the power goes out, especially when it's completely preventable and affordable.

Security Power Prep Quiz

The following questions should be considered when planning power protection strategies in security applications:

- If the power goes out, which security system components will require battery backup?
- How much battery backup time is required for each security system component?
- What will happen to my system if my backup battery becomes completely depleted?
- How can a security incident disrupt the ability to conduct business and serve customers or put employee's safety at risk?
- If you do have a disaster plan currently, how is security addressed?
- How are mission critical security functions prioritized?
- Are all peripheral devices that support security systems fully protected from power problems?
- In case of an extended power outage, in what order will systems be brought down?
- When power has been restored after an outage, what is the order for re-starting security system components?

About Minuteman Power Technologies

Minuteman Power Technologies products are manufactured by Para Systems, Inc. Founded in 1982, Para Systems, Inc. is a privately held corporation headquartered in Carrollton, Texas. Our power technology products are sold in more than 100 countries throughout the world.

Minuteman single-phase UPS products are available in sizes ranging 400VA to 24KVA, and we also offer three-phase UPSs from 10kVA to 300kVA. Additional products include surge suppressors, remote power management (RPM) tools, power distribution units (PDU), and power management and monitoring software.

The Minuteman brand has been synonymous with quality and reliability since 1982, and our products represent better value in terms of price vs. performance and reliability. In addition, we pride ourselves on providing superior product warranties, and the industry's most responsive customer service both before and after the sale.

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