Door Security + Safety

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Access Control and Electrified Hardware

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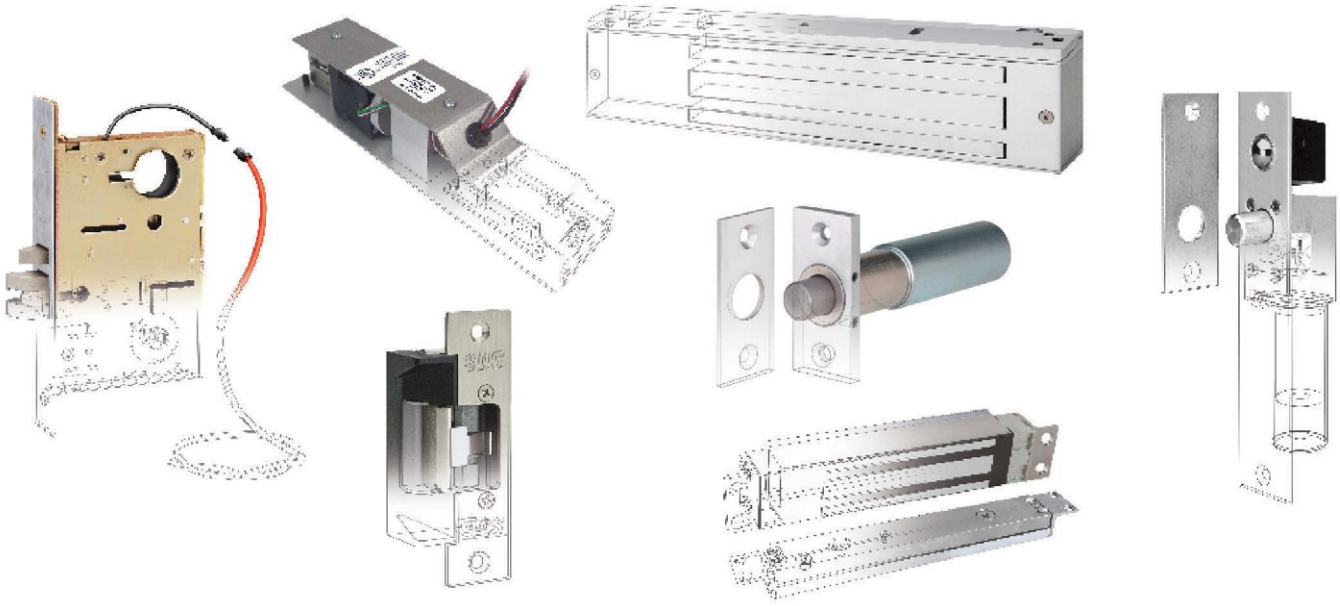
Power Supply Selection Tips



Components used in access control systems generally draw higher current during access control-related events.

Learn how to avoid access control power problems in electrified access control hardware and system installations.

BY KERBY LECKA

All power is not created equal, especially when designing and installing electrified access control (EAC) hardware and systems in new or retrofit applications. Access control systems require steady low-voltage DC current.

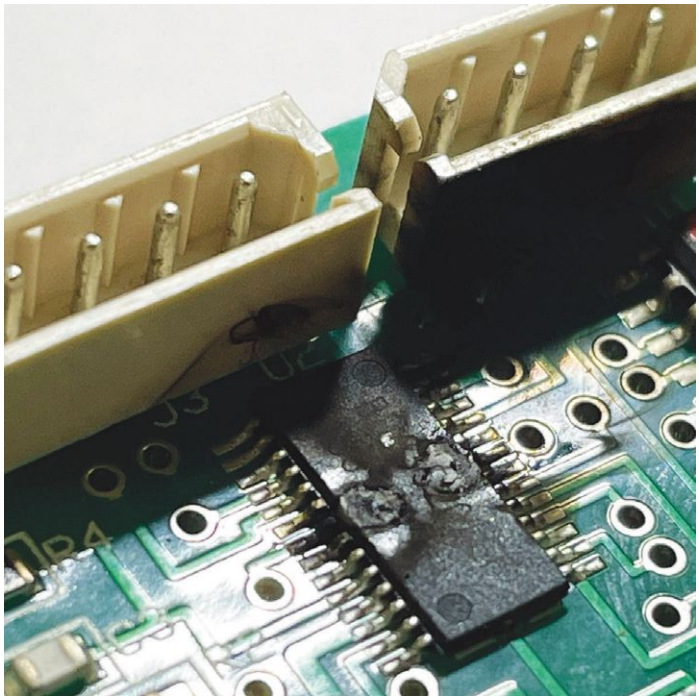
They also generally draw higher current during access control-related events to power readers, shunt and strike relays, door locking devices, gate operators, controllers and annunciators.

As the door security and safety industry transitions from solenoid-based electric locking devices to motorized devices, demand for specific power supply requirements has also increased. Following is an overview on avoiding problems by focusing on one aspect of access control power: selecting the right power supply.

Power Problems

Based on more than 50 years of manufacturing electronic access and egress control solutions, including locking hardware and power supplies, we have found that 75-85% of access control operating problems and technical support calls are due to power issues, resulting in:

- Dead systems
- Malfunctioning locks or intermittent operation of accessories and controllers
- Unreliable locking devices



This failed access control board was the cause of one EAC problem, and there are many other similar failures.

Planning and Project Evaluation

Before selecting a power supply, plan now to avoid trouble later. This means carefully evaluating a project to avoid common installation and operating problems. Key considerations include:

- **Power Needs:** Understand the power required and know the power available (if retrofitting).
- **Retrofitting:** When retrofitting, identify what modifications have been done that affect the capacity of the power supply.
- **Replacements:** Power supplies wear out. If it's more than 10 years old, replace it.
- **Integration:** Do all the products work together? Take responsibility and make sure they do.
- **Code Compliance:** Be aware of applicable regional and national codes and follow them.
- **UL 294:** Become familiar with this access control standard. Find out if your Authority Having Jurisdiction (AHJ) requires the installation to be UL 294-compliant and get the AHJ involved in the system design.
- **Battery Backup Calculations:** Determine how long the system must function after a power loss.

- **Low Voltage License:** Find out if this is required in your jurisdiction.
- **Quality Is Critical:** Always use high-quality components.
- **Do It Right:** Aim to get it right the first time, so you don't have to come back and redo it.
- **Future Expansion:** Plan for future needs. No facility has ever needed less power for its access control system as time goes forward.

Low Voltage Power

Unlike security camera and video systems typically deployed throughout a facility, access control locking hardware draws more current, especially during an access control event such as locking or unlocking a device. Providing steady, low-voltage DC current requires a power supply to convert incoming AC to DC.

Calculating Current Load

Before selecting power supplies for an access control system, calculate the power load (current) required for each door opening. Use a door checklist such as the sample shown below to fill in values and calculate the current load:

The type of devices and power loads to list include:

- Locking Device (_____ Amps)
- Rex Button (_____ Amps)
- Control Panel (_____ Amps)
- In/Out Readers (_____ Amps)
- Annunciator (_____ Amps)
- Total: (_____ Amps)

A door checklist can help organize work and make it easier to calculate power loads.

Next, add a 30% safety margin. Combine these values for an overall system total, as well as subtotals per floor or building. This will help to:

- Determine what size power supply is needed.
- Select and locate the appropriate power supply component.
- Determine wire gauge requirements based on load, cable distance and voltage drop.

Voltage Drop

Power supply voltage will drop over long cable distances due to wire resistance. Operating access control devices with inadequate or excess voltage makes them run hotter, wear out faster, operate erratically or not at all.

A good rule of thumb for access control devices is that voltage drop cannot exceed 5% of the supply voltage. There are many free voltage drop calculators available on the internet to obtain voltage drop calculation by simply entering the wire gauge, voltage, distance and load current (Amps).

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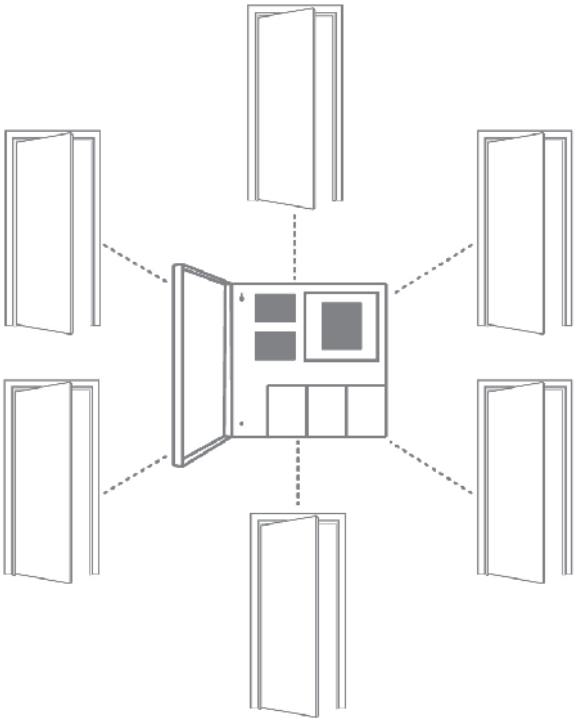
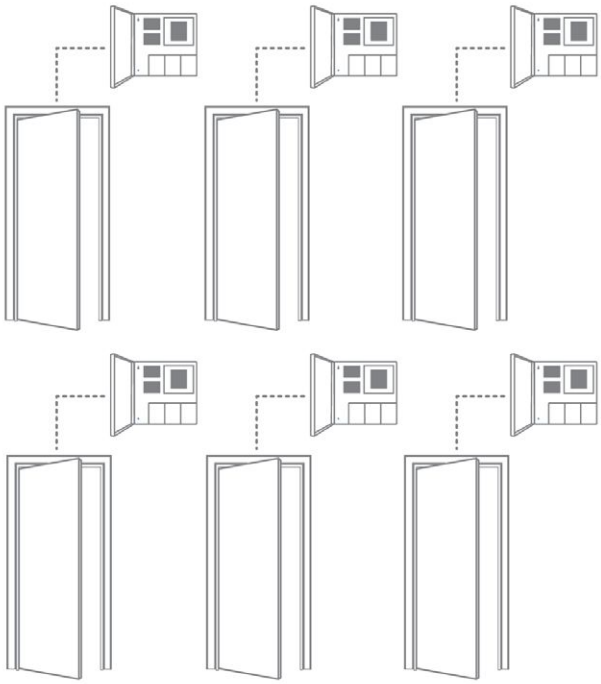
Centralized Power vs. Distributed Power

Before proceeding with a project, consider what type of power system — centralized or distributed — is best for the installation as it will greatly affect voltage drop calculations. If the project involves multiple doors, there are pros and cons to using one large, centralized power supply to meet the system



A centralized power configuration.



A distributed power configuration.

requirements. The pros and cons of centralized power deployment include:

PROS

- Supplies are protected from vandalism.
- Single location for fire system interface.
- Easier to monitor/maintain the power system.
- Lower cost per door (based on cable distance, labor costs, etc.).

CONS

- Single point of system-wide failure (especially when using one large supply).
- Difficult to reconfigure for system expansion.
- Longer, heavier cabling required for large installations with centralized power.

Distributed power refers to using a power supply for each door. The pros and cons of distributed power deployment include:

PROS

- Adequate power will be provided for each new door.
- Easier to accommodate system expansion.
- Shorter, lighter gauge cabling can be used.

CONS

- Higher cost per door.

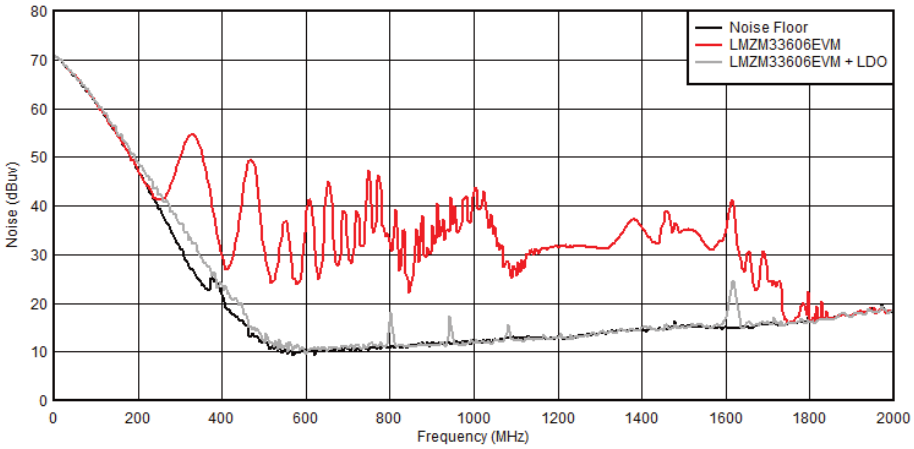
It is also easier to service everything at the point of failure in a distributed power system.

Switching Power Supplies

Switching power supplies are typically designed for use with resistive or capacitive loads such as low voltage lamps, alarm panels, cameras and signaling devices. They are lighter weight, efficient and cheaper to manufacture. The low price of switching power supplies often encourages their misapplication.

Switching power supplies are not recommended for use with access controls and electric locks for several reasons. Typical switching power supplies have trouble handling the inductive loads produced by locking devices with coils or solenoids due to the limited current reserve available to handle periods of high inrush. Excessive current draw, even for a short time, will briefly stop a switching supply from operating and may permanently damage it.

Another byproduct of the switching power supply is a high-frequency noise component that appears in the DC voltage output. A properly designed supply includes a filter circuit to reduce or eliminate this noise. Many do not include more effective output filtering due to cost constraints. The filter part of the supply can cost as much as the regulator circuit, so a good high-frequency filter is often left out. Although the noise will not harm a simple device like an electric strike, it may cause erratic operation of electronic equipment such as access controls, electronically controlled locks, panic bars and door controllers, causing them to malfunction and even damage these units.



Switching power supplies have high-frequency noise that appears in the DC voltage output.

Hybrid power supplies combine the efficiency, or low heat generation, of a switching supply and the rugged inductive load capability of a linear power supply.

These low-cost switching supplies often require that you supply your own power transformer and assemble these two components in your own box. This could result in a non-UL-listed power supply, leading to potential disapproval from local inspectors during installation.

Linear Power Supplies

Linear power supplies have been used for years for powering resistive, capacitive and inductive loads — devices with coils or solenoids, such as electromechanical and electromagnetic locks and strikes — due to their ability to handle large inrush currents.

Since most of the DC filtering is done with large filter capacitors, there is plenty of reserve power. They can provide extra current for short periods of time without malfunction or damage. The output is also free of high-frequency noise found in switching power supplies, making them practical for use with access controls.

However, the penalty in using a linear power supply is the heat generated by the regulator component of the supply due to its moderate efficiency. The heat generated can lead to early failure of the temperature sensitive components housed near the supply board.

Hybrid Power Supplies

Hybrid power supplies are ideal for powering resistive, capacitive and inductive loads — the type of unique power loads common to access control locking devices. Hybrid power supplies combine the efficiency, or low heat generation, of a switching supply and the rugged inductive load capability of a linear power supply. Enough current reserve is available to reliably power inductive loads.

Including built-in inductive kickback protection will enable high inrush protection caused by electric lock solenoids and motors. This type of hybrid power supply is a good overall choice for powering access control system components.

Dual Voltage Output

Dual Voltage Output is frequently required when powering access control panels at 12VDC and door locking devices at 24VDC. Look for 12/24VDC linear power supplies with various current output capabilities and/or add-in 12VDC regulator modules to provide output for access controllers, readers or other devices.

Additional Power Supply Options

Much of the selection criteria for a power supply depends on specific project applications. Additional options include:

- Field selectable 12 or 24VDC, regulated and filtered.
- Auto resetting output circuit protection.
- Backup battery with isolated battery charger.
- Low battery disconnect.
- Emergency release input (also the fire alarm input).
- Input, output and battery status LEDs.

Using the right power supply helps ensure high performance and reliability.

Continuing Education on Access Control Power

Maintaining current knowledge of access control power is key. Learning basic access control power skills helps

address possible conflicts between what was designed versus what was installed, repaired or upgraded for most access control projects.

Selecting the right power supply is just one component to avoiding access control power problems. Understanding basic electricity concepts is also important. Many people with years of industry experience have never had any training in electronics.

With the increasing use of more sophisticated electronic systems and circuitry, as well as increasing utility reliability issues from the aging power grid, it's important to have a strong foundation to avoid creating future issues.

Industry associations such as DHI and other manufacturers have a wealth of information, tools and training in electrified door controls. One resource is the Education section of the DHI website at *www.dhi.org*, where some of the courses include:

COR133 – *Electrified Architectural Hardware*

EHC403 – *Electrified Hardware Drawings and Documentation*

EHC413 – *Advanced Electrified Hardware Drawings*

EHC423 – *Advanced Electrified Architectural Hardware*

EAH-91 – *Electrified Architectural Hardware (TECH Talk)*

There's always something new to learn or a tip that may benefit a door opening project. These resources, combined with real-life experience,

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will help ensure success in all electronic access power installations. +

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