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ENDEAVOR BUSINESS MEDIA

by Kerby Lecka

Voltage Drops and Troubleshooting

How to Avoid Access Control Power Problems in the Real World

Understanding voltage drop is a key concept to apply when you build an access control power system, retrofit or troubleshoot power issues.

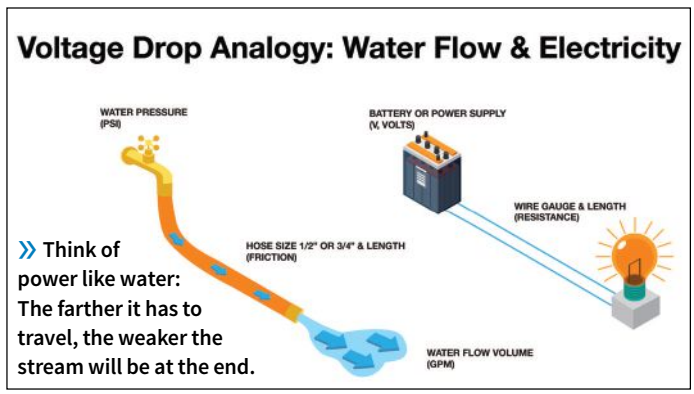
Two previous articles ("Building a Good Foundation," November 2020; and "Power Supply Selection Tips," October 2020), discussed how power supply voltage will drop over long cable distances because of wire resistance.

Voltage drop is the amount of voltage that's lost in a circuit because of resistance. Resistance in a circuit causes the load to work harder with less voltage pushing the current. A common method used to explain voltage and voltage drop is an analogy with water flowing through a hose.

Think of the water that flows out of a tap and then down a long hose: the farther you get from the tap, the weaker the stream that flows out of the hose. The same is true of electricity through wires: The farther the electricity gets from the source, the weaker the current will be.

Various online resources are available to help calculate voltage drop. SDC has a Voltage Drop Calculator that allows you to enter the wire gauge, voltage, distance and load current (amps) to obtain the voltage drop at https://sdcsecurity.com/Calculators.htm.

If you use the calculator, be sure to double the cable distance, because two conductors are being used for positive and negative DC. Larger loads or longer wire distances require heavier gauge cable. Try using different variables in the calculator to see how they affect the results. The calculator can be useful in retrofit projects for troubleshooting long runs that could have a power issue.



» Think of power like water: The farther it has to travel, the weaker the stream will be at the end.

SDC Illustration

Troubleshooting Power Problems

Speaking of troubleshooting, if you're called to service a problem electronic device, you should check the access control power. Typically, you'll look for any one or a combination of three key issues when troubleshooting access control power problems: no power, inadequate power or too much power. Here's a simple checklist to guide you when troubleshooting:

- Verify nonoperation at the problem door. Try to gain access through a prox card or keypad.
- Look for obvious damage that might explain nonoperation. Look for mechanical damage.
- Check for loose or broken wires from the access control device to the locking device.
- Measure the voltage of the access control and locking hardware wires at the door by using a voltmeter.
- If voltage isn't present at the locking device when it should be powered, check the power supply. Voltage at the power supply should be 12VDC +/- 10 percent or 24VDC +/- 10 percent.
- If no DC voltage is present at the power supply, check the AC input voltage with your voltmeter. That should be 110-115VAC.
- Repair or replace any nonoperational product.

Power Customization

Often the repairing, retrofitting or installing of access control components and devices in a system isn't as simple as opening the box and connecting the product. Having the ability to tweak or customize the access control power system per the specific application will help you to avoid problems, ensure the longevity and reliability of the system and, most important, save you time, money and your reputation by eliminating costly callbacks.

Here are some essential concepts and tactics to

integrate into the power customization of your system:

Voltage Drop

- After you calculate the voltage drop at the farthest device, some power supplies allow the voltage to be adjusted higher.
- If possible, adjust the power supply voltage to provide nominal 12VDC or 24VDC at the farthest device.
- Be cautious about overvoltage. Devices that are closest to the power supply might receive too high of a voltage.
- Never exceed 10 percent overvoltage at any device.

Overvoltage

- Overvoltage to any device can be destructive. It produces excessive heat within the device, which can lead to nonoperation or device failure.
- If a power supply voltage can't be adjusted down, a few diodes in a series will reduce the voltage by 0.6V per diode.

More Electronic System Terms

Previously, we discussed several concepts and definitions, including current, volt, amps and ohms. Some additional access control power terms you should be familiar with are:

Fail-Safe: Any lock that requires power to lock it. Without power, the lock is unlocked.

Fail-Secure: Any lock that requires power to unlock it. Without power, the lock is locked and can't be opened.

Diode: A component that allows current to flow in one direction. Diodes also are used for spike protection and can be used across electric strikes, but never magnetic locks.

Metal oxide varistor (MOV): A component that's used for surge protection to protect sensitive electronic components, including maglocks and strikes.

Diodes

- Diodes are used to rectify AC voltage to DC voltage.
- Diodes can drop voltage. Each diode has a drop of 0.6VDC. Multiple diodes can be used in a series for additional drops. (3 diodes x 0.6V = 1.8VDC)
- Diodes also can prevent voltage spikes from electric strikes and solenoids. They limit the spike generated to 0.6V.

MOV

- A metal oxide varistor (MOV) limits the voltage that they let through. When there's a spike in a voltage line, MOVs limit the peak to protect the electronic equipment.
- MOVs are used in parallel across power leads of locking hardware that have solenoids. Solenoids generate large voltage spikes when turned off. The MOV limits the spike to protect the access control equipment.
- Diodes and MOVs can be crimped securely in place to device leads. They also might be soldered to electronic device power leads, but soldering isn't as efficient in the field.

The Two Biggest Tips

The quality and reliability of hardware brands in today's industry is high. Unless it was installed improperly or damaged during installation, the device probably isn't the problem. With that in mind:

Tip No. 1: Save yourself loads of time and troubleshooting hassle on your next install or callback by isolating a suspected locking device problem to eliminate or confirm that the device is the issue before calling the manufacturer.

Start by disconnecting the device from its power source and then provide some DC power to it to see whether it works. Alarm batteries that are 12VDC and a wired lead are useful for this testing. Use one battery for 12VDC and two batteries in a series for 24VDC. SDC has a video about how you can assemble your own inexpensive portable power test kit by using simple, store-bought components

SDC illustration

» You might have to tailor access control devices to fit the power.

that you can throw on your truck. See sdcsecurity.com/Calculators.htm.

Tip No. 2: Be aware of what you plug into. Smaller access control power supplies (1–1.5 amps) might provide a power-cord option for ease of installation if an AC power outlet is nearby. Look for:

- Nontraditional power sources. These include Orange Sockets that typically are used at hospitals or critical circuits for dedicated equipment only. If you want to use a nontraditional power source for the access control system, do so only with the owner's permission.
- Solar-energy systems. Be careful, because transients and surges typically are present in these systems.
- GFCI receptacles.
- Outlets that might be used for something else. There's nothing like having a service call to find out your power supply was unplugged by someone to run a vacuum cleaner.

Maintaining fundamental knowledge of access control power is key. You'll find there always is something new to learn, even a special tip that might make all the difference on your job.

In addition, 44 states have low-voltage licensing requirements. So, it's in your interest to access the wealth of resources available for improving your low-voltage expertise. For training and maintaining professional certification, visit organizations such as ALOA, ASIS, or DHI.

Editor's note: Read the previous installments of our power series at locksmithledger.com/21151112 and locksmithledger.com/21155123.

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