

Wiring and Voltage Loss

Wiring is usually the most disregarded subject associated with electric locks. Most people use a wire gage that they are familiar with, usually 18 or 22 gage. Recently I was reminded of the importance of proper wire size. This was on a project where over 800 low voltage locks were used. The electrical contractor specified a gage wire that was sufficient for the continuous current draw but he neglected to calculate the voltage drop during the inrush cycle. This resulted in a 10 volt drop in a 24 volt circuit and the lock would not properly unlock. The original blame was put on the lock manufacturer but after expending many hours of time (and money) the truth came out: the problem was with the wiring.

I have a simple formula for figuring out the voltage drop in a given current. You take the resistance per 1000 feet of wire and multiply it by the current. This equals the voltage loss.

Gage Wire Resistance / 1000 Feet in Ohms @ 77°F

12 Gage	1.62
14 Gage	2.58
16 Gage	4.09
18 Gage	6.51
20 Gage	10.4
22 Gage	16.5



(Figures from the Circ. 31, U.S. Bureau of Stds.)

Problem:

1500 ft. of 18 gage wire w/ an electric strike drawing .3 amps.

Formula:

Ohms x (Wire Length/1000) x Current = Voltage Drop

Equation: 6.51 x (1500/1000) x .3 Amps =

Simplified: .51 x 1.5 x .3 = 2.91 Volts

Solution: 2.91 Voltage Drop

Example:

If you have an electric strike that takes .3 amps at 24 volts, by the time you send the power out you only have 21.09 volts at the strike. This would usually fall within the tolerances of the electric strike and not be a problem. But, if you had a 12 volt electric strike at the same current and wire length, you would only have 9.09 volts at the strike which would not fall within the nominal 10%+15% variance given by most manufacturers. In this case you would only have 75% of the rated voltage needed to power the strike. Obviously its operation would be marginal.

As a rule of thumb, if you increase your wire length you must increase your wire gage. Likewise, the lower your voltage, the larger your wire gage must be. In any case you should calculate the voltage loss and make your wire selection based on your findings.

If you have any technical questions or need more information please feel free to call me or any of my sales technicians.

Sincerely,

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