

Overview

Electrostatic Discharge (ESD) is a significant problem on many sites. ESD is the buildup of electrical energy and its sudden release. It is typically noticed when a person has been moving and then touches a metal object such as a door handle. ESD often involves large voltages (up to three hundred times the voltage of a power point) but rarely causes injury because of its short duration. It does, however, have detrimental effects on electronic components.

CS Technologies' devices have built in protection against normal levels of static. Excessive static, however, can cause temporary or permanent damage to the system. Other systems at risk include PCs, laptops, telephones and other electronic devices.

It is usually obvious when an area has excessive ESD problems. If people are able to feel the "zap" then there is a possible ESD problem. If they are able to see the spark or hear it, then there is definitely a problem. Also, "zapping" a computer can be doing long term damage. Don't assume that the computer has to crash for damage to have occurred.

Static is created from a number of sources. Air conditioning and carpet are the two main causes. Other causes include clothing, furniture, travelling and wind. It is typically worst during winter because of air conditioning. In Sydney it peaks during the period of July to October.

The best solution for offices is to coat the carpet with a special chemical to remove static. The chemical will not effect the colour or texture of the carpet, but will limit static build up. The coating should be done once a year.

Many customers wait until their system is damaged before they try to fix ESD problems. We strongly recommend that you save yourself the time, money and inconvenience of a failure and protect yourself now.

Static and Silicon Keys

The Silicon Key system is extremely durable under most electrical conditions. However the very nature of the system means that a processor pin on the main controller is linked to the "real world" through each reader. On the circuit board various devices are installed to stop external interference blowing up pins on the controller. However it seems that in some cases a large electrical discharge (static or other source) in the region of a reader can, while causing no permanent damage, upset the firmware in the controller to such an extent that the chip needs to be reprogrammed.

Symptoms of static discharge will be typically a controller 'losing' all of its programming periodically and having to be reloaded from the PC. The static can be quite seasonal, and systems which run perfectly for months during warmer months will suddenly start to exhibit erratic behaviour as colder (and drier) conditions arrive.

Carpet

The most common cause of problems with a system is a static discharge at the reader. In many buildings synthetic carpet is installed which causes a static buildup on personnel as they move around the premises. By dragging one's feet along the carpet then touching something metal a spark is generated, often with some associated discomfort.

This is a normal phenomenon; however when the spark jumps to a Silicon Key reader the energy released travels directly to the processor and can cause problems in the ROM or RAM of the system.

Static discharges are typically of the order of several hundred volts (up to 1000V) and are very low in current.

Avoid Static

Wherever possible it is best to reduce the static. Static not only affects the access control system, but will also affect other electrical equipment, including computers. Typically the life span of the equipment is shortened and the problem may not be evident for a year.

One of the most effective and simplest ways of reducing static is to spray the carpet with a special coating. This should be done on a regular basis (as specified by the manufacturer) to ensure full protection. Another solution is to use antistatic mats and straps when working with sensitive equipment.

Air conditioning plays a major role in the creation of static. When the amount of outside air used is reduced (which is typical in winter) then static is more likely. Static can indicate that more fresh air should be used. This is a health issue as well.

Zener diodes

One possible way to reduce the problem is to arrest the spark at the reader. A component to do this is a 5.6V zener diode. As the voltage at the reader exceeds this voltage the zener diode breaks down to absorb the excess voltage and this can mitigate the effects of static on the controller. Because the current involved in the static discharge is low the zener diode does not need to have a large power rating and in fact the usual rating of 400mW or 500mW seems to be ample. In situations where static discharges are being artificially induced say by high voltage discharge devices a zener diode with a higher wattage should be used to ensure that the diode does not get blown up.

CS Technologies Silicon Key readers are equipped with an in-built zener diode. OEM readers may require this to be fitted. The diode should be installed close to the reader. On the circuit board another zener diode is installed across all the reader lines however having one near the reader stops the spikes and surges from getting anywhere near the controller.

Extending cabling

The zener diode solution has been successful in reducing some of the effects of static. However if there is a short run of cabling to the controller, the diode may be made more effective by extending the cabling. A zener diode breakdown time is of the order of 5-10ns and if the cabling is short the spike can reach the controller before the zener has time to act, and the processor again gets upset.

The electrical pulses travel along the cabling at the speed of light, 3×10^8 ms⁻¹. This means that they take about 3.3ns to travel one metre. Thus the cabling should be longer than say 5-10 metres to ensure that the zener diode has plenty of time to break down before the spike reaches the controller. Where static is a problem at a particular reader, lengthening the cable and installing a zener diode can assist in reducing some of the effects of static.

Conclusion

To reduce some of the problems with static discharge on a CS Technologies Silicon Key system it is strongly advisable to install a 5.6V zener diode across all readers on the system. All standard CS Technologies Silicon Key readers have these fitted already.

It is also advisable to ensure that cabling runs are longer than 10m to ensure that the diode is able to operate in time.

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Tech Bulletin 1.doc 27/04/00 3:35 PM