Fire Protection Series

Proper Installation and Care of Rechargeable Batteries

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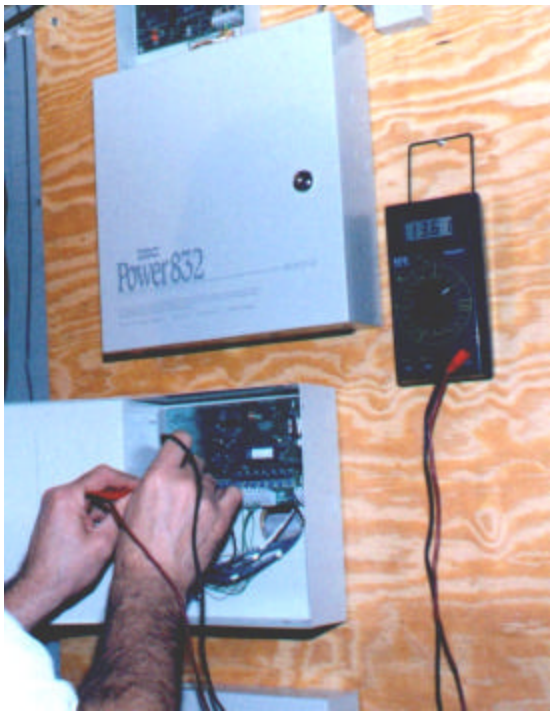
BY FIRE PROFESSIONALS FOR FIRE PROFESSIONALS



An alarm tech checks battery voltage during a load test in a burglar and fire alarm system.

Of the many areas that concern fire technicians, secondary power is one of the most important. For example, without a reliable source of power--both primary and secondary--life safety cannot be assured. Thus, it is the secondary power supply, in this case the rechargeable battery that must maintain operations when the public electric bus fails.

Section 1-5.2.6 of NFPA 72, National Fire Alarm Code, 1999 Edition, requires that the fire alarm panel switch from primary to secondary power within 30 seconds of a power failure. In this case when switchover occurs, there must be a ready and able supply of power waiting. In the 2002 Edition (Section 4.4.1.6.1) the requirements for switchover changed from 30 seconds in 1999 to 10 seconds.

"The secondary power supply shall automatically provide power to the protected premises fire alarm system within 10 seconds, whenever the primary power supply fails to provide the minimum voltage required for proper operation" (Section 4.4.1.6.1, NFPA 72, 2002).

Another requirement that fire alarm professionals must adhere to is that of a standby and alarm time. According to Section 4.4.1.5.3.1, NFPA 72, 2002, the secondary power supply, in this case the rechargeable batteries, must sustain the system in standby mode for a period of 24 hours with a subsequent ring time of 5 minutes. Prior to the 2002 Edition, NFPA 72 included a provision for 60 hours of standby for auxiliary and remote station systems with a subsequent ring time of 5 minutes. Now the accepted norm is 24 hours, unless the AHJ uses the 1999 Edition or an earlier one.

There are two exceptions to this and the first one is when you work with residential systems. Here the required standby time is 24 hours with a subsequent ring time of 4 minutes. In the case of emergency voice/alarm communications systems (voice evacuation), the required standby time is 24 hours with a subsequent alarm notification period of 15 minutes (Section 4.4.1.5.3.1[A]).

In order to assure that these systems operate in the prescribed manner, fire technicians must understand the nature of the rechargeable batteries they use as well as the environmental conditions that can have an adverse affect on them.

The installer of this system marked the battery so the next technician will know how old it is.

Proper Charging of Fire Alarm System Batteries

Fire alarm technicians can cook the ledgers they keep or the cheese omelets they eat in the morning if they wish, but the one thing they're not allowed to cook are the batteries they use in the fire alarm systems they install. Over charging a sealed lead-acid battery in a fire alarm panel can reduce its power/capacity. Not only that but it will reduce its life expectancy as well.

If that's not enough incentive to assure proper charging, over cooking the secondary batteries in a fire alarm system can result in personal injury or even a fire. Overcharging can occur when a fire alarm's float charger outputs more voltage than needed.

One way to assure that overcharging does not happen is to routinely check the float charger's voltage with the batteries disconnected. Do this using a voltmeter set to the appropriate function (voltage, not current) and voltage scale (24 VDC+).

The output from a good float charger should be approximately 14% higher than the voltage rating of the panel. For example, if the fire alarm panel is rated for 24 VDC, the float charger should be outputting somewhere in the vicinity of 27.3 VDC.

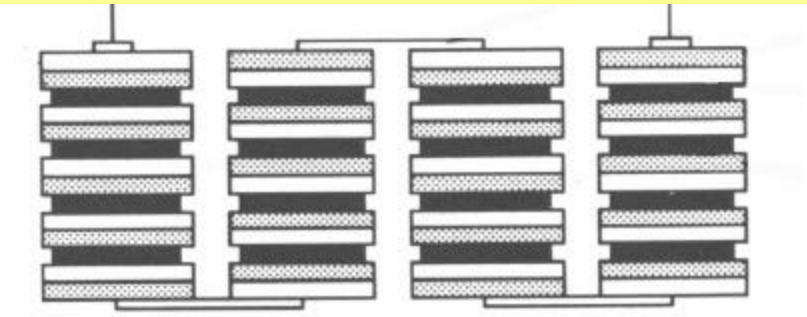
Historical Considerations

Since the first spiral wound, the lead-acid battery, developed by Gaston Plante in 1859, has come a long way. The first lead-acid battery featured two thin lead plates, separated by a thin rubber sheet. The assembly was wrapped and immersed in a solution of diluted sulfuric acid.

Capacity was limited in this lead-acid battery design because of the limited size of the lead plates. But due to the process of lead cycling, the positive plate was eventually converted to a lead dioxide. This invariably increased capacity, which helped assure that aspects of the same procedure survived the years of subsequent development. A similar process of lead cycling is still in use today.

With the advent of the motorcar and the electric starter, the flooded lead-acid battery saw a significant increase in use. This was especially so whenever General Motors adopted the flooded lead acid battery. However, these early rechargeable batteries were problematic because they used a liquid sulfuric acid instead of a gel. Of course, this constituted a safety problem for those who handle them, plus they were very difficult to transport and store.

It was about 1881 when a newly improved battery was developed that used a paste, comprised of lead oxide rather than a wet sulfuric acid electrolyte. Then, in the 1960's, a gel-type lead-acid battery was developed in Germany that used a silica gel. This new process increased the viscosity of the electrolyte while removing the safety and storage concerns, such as spillage in older flooded lead-acid batteries.



To do the math, use the following formula, where PV = Panel Voltage, OV = Overvoltage, and CV = Charger Voltage:

Step 1: PV x 0.14 (14%) = OV
Step 2: OV + PV = CV

Let us do the math using a 24-VDC fire alarm panel:

Step 1: PV x 0.14 (14%) = OV
24 x 0.14 (14%) = 3.36

Step 2: OV + PV = CV
3.36 + 24 = 27.36 VDC

When using a 12-VDC panel, use the same formula. Here, the float charger should output approximately 13.68 VDC.

The built-in float charger in a fire alarm control panel can also output less voltage than it should. In this case, the batteries may not overcharge, but they probably will not be able to perform to the published AH specifications.

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When primary power failes the occupants of a home equipped with an automatic fire alarm system meeting NFPA 72 requirements should have ample time to evacuate because of the system's rechargeable batteries. (photo by Nick Markowitz)

About The Author

Al Colombo is a technical writer in the electronic security and fire protection markets. For more than 20 years now he has provided technical direction for security dealers and fire alarm technicians. Al is especially known for his Fire Side Chat column in *Security Sales & Integration* (SSI) magazine and Kinks & Hints in *Security Distributing & Marketing* magazine, formerly published between 1987 and 2001. He's also director with FireNetOnline.com and webmaster with Tpromo.com.