

Special Considerations for Multiple Fire Alarm Systems in Educational Facilities

By Michael A. Anthony, P.E., and Rodger Reiswig, S.E.T.

“Runaway reset” in fire alarm systems in large evolving educational buildings with multiple fire alarm control units can elevate risk to occupants, security personnel, and technicians. Fortunately, the fix is easy.

THE PROBLEM

Buildings with multiple fire alarm control units (FACUs) come into being because facility professionals have enough budget to install a new FACU for a limited part of a building, but not enough money to bring the entire existing system onto a single addressable platform. As life safety infrastructure evolves in a building, the FACU inter-

face evolves into something that was not the intention of the original design when only one FACU was required.

For example, assume a single FACU was installed that conformed to the Fire Alarm Code in effect at the time. When a new wing, or a new addition, is constructed ten years later, the fire alarm system is treated as a new project. The infrastructure systems are developed as separate systems. If each succeeding FACU were hardwired to reset the other in a peer-to-peer fashion you may end up with “runaway reset” or silence function as each panel is trying to reset or silence the other continually. [See Figure 1] When this happens, the fire alarm

control units will function properly during the first activation but typically not for additional activations. This is often the single most common nuisance problem that occurs when multiple control units are interconnected with relays.

The absence of an effective system that ties all the FACUs leads to cognitive problems. When multiple FACUs are not completely interconnected, there are operational costs – and elevated risk levels – associated with operator and occupant confusion. In recent years, there has been much debate over the cognitive aspects of notification devices – most notably annunciation devices that will wake up sleeping occupants. The cognitive problems associated with FACUs that cannot be reset after an alarm or trouble condition is less well known.

Figure 1. Runaway Reset

Consider two different FACUs: Zone System A built by Manufacturer A in 1978 and Addressable System B, built by Manufacturer B in 2008. The newer System B permits reset at any annunciation panel. System A requires reset at the FACU only.

Because the FACUs are installed at two different locations it takes two technicians – typically communicating by radio – to perform the procedure: (Silence A+ Silence B+ Reset A+ Reset B). Without the ability to reset the interconnected fire alarm system from a single location, both systems enter an alarm condition again (re-ring), usually within seconds.

Risk is increased when security officers, who are not trained technicians, have to deal with the re-ring condition. Multiple reset locations create hazards because if there is only a single security officer available, a multi-FACU installation cannot be reset.

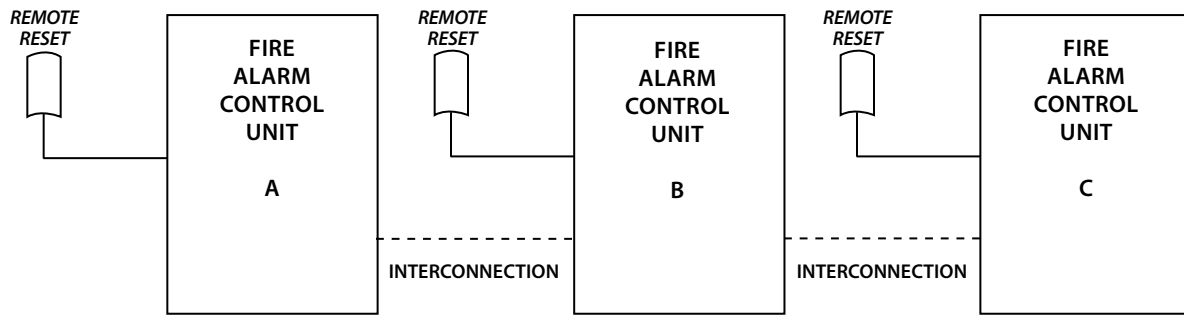
Figure 2. NFPA 72-2007 Section 6.8.2.1

Fire alarm systems shall be permitted to be either integrated systems combining all detection, notification, and auxiliary functions in a single system or a combination of component subsystems. Fire alarm system components shall be permitted to share control equipment or shall be able to operate as stand-alone subsystems, but, in any case, they shall be arranged to function as a single system.

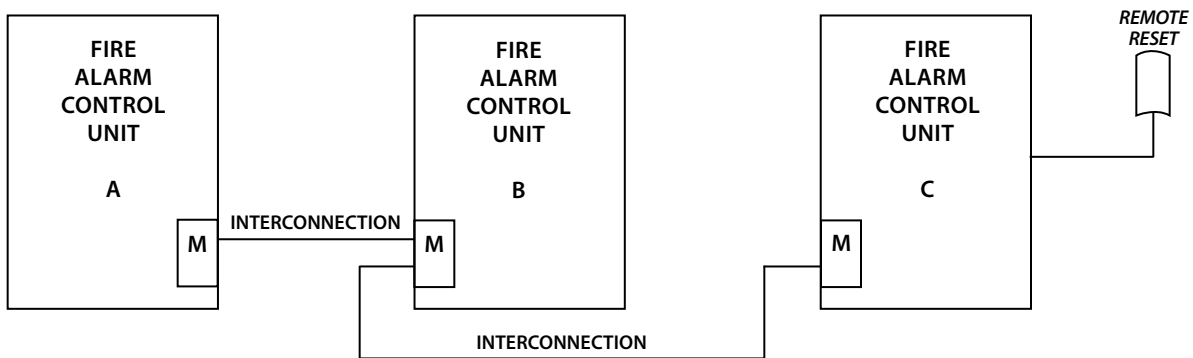
The language in NFPA 72 that seems to address this condition appears in Figure 2; language that has existed in NFPA since 1999. A careful reading of 6.8.2.1 reveals some ambiguity, however. It starts out reading like permissive language but ends with a phrase that sounds prescriptive – and mandatory. The difficulty in

Figure 3.

Upper Diagram shows three FACUs in different locations, all interconnected, without single reset. Lower Diagram: The same three FACUs with a single reset.



MULTIPLE RESET FIRE ALARM SYSTEM CONFIGURATION WHICH CAN CONFUSE OCCUPANTS, TECHNICIANS AND SECURITY PERSONNEL WHEN THE FACU'S ARE WIDELY SEPARATED AND ARE A MIX OF NEW AND LEGACY TECHNOLOGIES FROM DIFFERENT MANUFACTURERS



SINGLE RESET CONFIGURATION ADDRESSED BY NFPA 72-2007, SECTION 6.8.2.1

Drawing by John Birkle & Ted Nicholson, University of Michigan Fire Alarm Shop

According to Dan Decker at Fire Safety Systems (www.safetysystemsinc.net), \$250 for each FACU would cover the cost of providing components, related programming, and commissioning for the addressable modules (shown as Ms in this figure). The cost of running signaling conduit and wiring would have to be added to this cost. The entire installation would obviously vary depending on the specific locations of the circuits and panels involved.

the interpretation 6.8.2.1, as well as its position in the NFPA 72 text, may explain why it is easy for fire alarm designers to overlook its implications.

THE SOLUTION

When two addressable systems are linked together to function as a single system, resetting the panel that is the source of the alarm should stop the alarm signals from sounding on the interconnected panel. You only need to install non-latching monitor modules to monitor the status of the alarm contacts on a panel, and utilize resettable addressable output relays for alarm trigger and alarm reset functions. (See Figure 3) When your technicians do this they will want to define which control unit will be the primary FACU and which

FACU will be the secondary. This will cause the FACU to function properly during the first activation but not cause nuisance activation of the secondary FACU.

APPA's Code Advisory Task force submitted a proposal to amend the 2011 Fire Alarm Code in order to put this issue in front of the country's top fire alarm experts. At the very least, we have started a discussion on an issue that is rather common in our industry, and may become more common as facility executives struggle try to squeeze the most functionality from existing legacy life safety infrastructure. ☹

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