

Trouble-Free Reporting With Long-Range Wireless

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*By Fire Professionals
For Fire Professionals*

In the fall of 1871, Chicago experienced one of the most devastating fires of all times, for in less than three hours, nearly the entire city was consumed by fire. Before 24 hours had elapsed, the *Great Chicago Fire* had killed 300 people, 17,000 structures had been destroyed, and 100,000 people were left homeless. Finally, in the end, the community in general had realized \$400 million in property damages.

From all historical accounts, it appears that the Great Chicago Fire started in a barn owned by Patrick and Catherine O'Leary. It was October 8th, 1871, when Daniel Sullivan, a friend of the family, spotted a fire in the O'Leary's barn at approximately 8:30 P.M.

At the time, there were only two ways in which to alert the fire department of a fire in progress. One was to proceed to the fire station so to alert firefighters of the problem. While the other was to activate a public fire pull in a call box.

It appears that when Sullivan tried to gain access to the public fire pull, he found that the call box was locked. Only trusted merchants in the area were given a key, but none were present at that hour of the evening. Subsequently, more than an hour had passed before someone with a key was found to unlock the box. By the time the alarm pull was activated, the entire city block surrounding the O'Leary's was engulfed in flames.

The second notable municipal-wide fire that contributed heavily to advancements in the fire industry, as we know it today,

was that of *The Great Boston Fire*, which took place the following year, in 1872. Like O'Leary's barn, it was not until the fire was well underway that firefighters received the signal.

The Boston fire took place at 83-85 Summer St. A day and a half later, 776 structures lay in ruin, 13 people were dead, and upwards to \$76 million in public and private funds were lost.



A technician from Protection Systems, Phoenix, Arizona programs a long-range AES Intellinet transceiver for a new fire alarm system about to be installed in the Phoenix area.

Lessons Learned

Certainly, there were two primary lessons learned from these two catastrophic fires that occurred in 1871 and 1872. The first one was the need for automatic fire detection, and the second was in the area of automatic fire reporting.

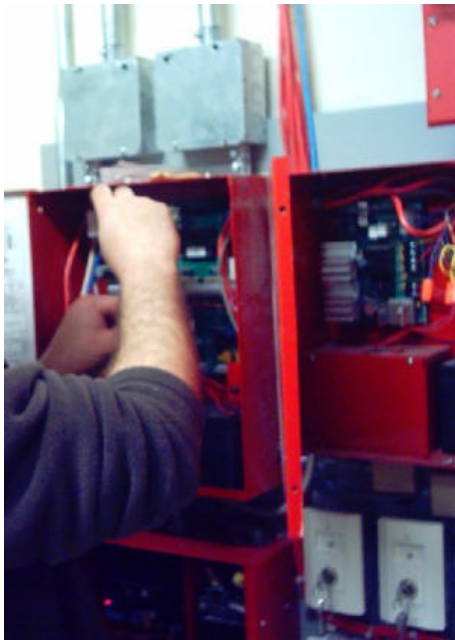
Concerning the first, it became obvious to experts after these two catastrophic fires that something had to be done to guard society against a repeat performance. Thus, within a year the fire industry had produced automatic sprinklers and soon afterward automatic heat thermostats.

Concerning the second lesson, and the object of this story, the fire industry responded by developing the means of automatically alerting firefighters when a fire has been detected, thus eliminating the need for a live person to sound the alarm.

“Public fire alarm systems served cities well on many occasions in the late 1800s. But these two conflagrations exposed the limits of alarm systems activated by humans. A major reason that both [the Chicago and Boston] fires spread out of control was the time lost between their ignition and the alarm” (*A History of Alarm Security*, William Greer, published by the National Burglar & Fire Alarm Association, March 1979).

The Vulnerability of Metallic Wires

The earliest method used for transporting fire signals to a central point involved the use of metallic wires. Signals were sent from the protected premises to a central location over metallic cable, much as they are today.



A fire alarm technician installs an addressable fire alarm in a commercial facility using a combination of telephone and long-range wireless for reporting.

Some of these early systems relied on overhead cable arrangements; but, by the late 1800s, many municipalities across the nation enacted laws that forced alarm companies to remove these overhead wires, placing them underground.

Of course, there is no denying that, under normal conditions, metallic wire works quite well at transporting alarm signals from one location to another. However, veteran dealers will agree that this method is not without its potential problems. A good example of this can be, upon occasion, witnessed at today's typical central station. For example, over the course of time, problems can develop with the telephone lines that central stations lease from telephone companies. When this occurs, service is often lost for a period of time, until the problem is discovered and the telephone company notified.

One recent example of this was witnessed in the author's office building in the Northeast. A *communication failure* on a keypad led our technician to investigate, beginning at the RJ31X jack. Because the line appeared to be clear and in working order, he called the central station whom then confessed that they were experiencing a problem with a telephone line. At the time a technician was on the job working to correct it.

Radio Offers Redundancy & Flexibility

As the decades have pressed on, so has the fire community where it comes to improvements in how alarm signals reach the central station. For example, because metallic wires can be severed, shorted, or faulted to earth ground, engineers have worked to devise a radio-based method whereby fire reporting can be assured regardless of the integrity of conductors.

Throughout the years, many dealers have come to believe that radio-based reporting, whether used for back-up or as a primary means, offers greater redundancy where it involves the transmission of critical signals to a central station.

Two signal paths and a DACT (Digital Alarm Communications Transmitter) have become the de facto standard. However, as radio reporting technology and the physical network have improved, so has the industry's devotion to a radio-based solution.

In many cases, radio-based central station reporting involves the use of one hard-line telephone circuit and one radio channel. Under Section 5-5.4.1, *Other Transmission Technologies*, NFPA 72, 1999 Edition, fire technicians are required to utilize two signal paths to the central station—either two hard-line telco (telephone company) circuits or one radio and one hard-line circuit.

“If a portion of this communication path cannot be monitored for integrity, a redundant communications path shall be provided” (Section 5-5.4.4.3, NFPA 72, 1999 Edition).

When used in this manner, failure of signal path must be reported to the central station, also termed a *supervising station* in NFPA 72, within 5 minutes of said failure.

If both signal paths have been disrupted for any reason, known or unknown, this condition must be announced locally to those at the protected premises. Such a catastrophic failure must also be reported to the supervising station within 24 hours. If the failure occurs at the supervising station, this condition must be rectified within 30 minutes.

There are, of course, a host of other criteria to which dealers must adhere when addressing the fire reporting system that they install. For more information, see Section 5-5.3.3.2 on.

As Primary Signal Path

There is an even higher order of long-range radio technology available to fire technicians that preclude the use of an additional telco line. It, in fact, enables fire alarm installation companies to use radio as the primary and only means of signal transmission! This has enabled fire technicians to exclude the use of telco connections altogether.

“We use radio alone to send signals to our central station, as oppose to using a telephone line with radio as a backup,” said Irv Berger, President, Protection Systems, Phoenix, Arizona.

The Birth of the Central Station

In the Midwest, early fire monitoring was performed from central control panels located at each fire station. According to Greer, this arrangement became too difficult to maintain because of the growing number of fire alarm systems that had to be monitored.

It was in 1882 when ADT (American District Telegraph) formed what may very well have been the first central station.

"ADT made history that year when it set up a central station to render night watch and fire alarm service," said Greer.

Additionally, in 1898, Charles Potter formed the Potter Electric Signal Company, St. Louis, where fire alarm systems were monitored by operators on duty around the clock.

Case In Point

"In a 20-story office complex we recently installed an AES transceiver to cover the building, but we experienced trouble hitting another subscriber unit. That was when we decided to install not one, but two additional units on the roof. Not only did this provide the retransmission of fire signals that we needed for the one [radio transceiver] in the bowls of the building, but it also enabled us to meet Type 4 requirements under U.L. and NFPA," said Protection Systems' Berger.

The additional two units on this quite high, 20-story building also enables Berger's company to offer Type 4 service elsewhere in the vicinity.

"Everyone of our units comply with Type 4 requirements. UL [and NFPA] requires redundancy, and because of our U.L. (Underwriters Laboratories) Certificate, we don't have a choice. Besides, it's easy to achieve," said Berger.

According to NFPA 72, *Type 5* systems are required to have at least one RF receiving site and one RF transmitting site. *Type 6* systems are required to have one radio alarm supervising station receiver and a minimum of two radio alarm repeater station receivers. *Type 7* systems are required to have more than one radio alarm supervising station receiver and a minimum of two radio alarm repeater station receivers.

Berger's company turned to AES, Peabody, MA, for long-range radio because the manufacturer of the conventional radio system that they were using quite suddenly announced their intention to phase out portions of their product offering.

"It's a cornerstone to our Fire Alarm offering" says Jeremy Berger, Irv's son and Operations Manager at Protection Systems. "We save the time and the recurring expense of dedicated telephone lines for our customers"

In general, fire technicians, like the Bergers, have, or will, turn to long-range radio to solve a variety of fire reporting problems. Much of the problems encountered by dealers involve the growing obsolescence of metallic telco technology.

"In Phoenix, as in many areas of the country, it is not uncommon for the owners of a new building under construction to experience trouble obtaining a certificate of occupancy in a timely fashion. This is because of a scarcity of telephone lines," said Berger. *"With radio, however, there is absolutely no wait—we can have them up and running by the same afternoon."*

The highest order of long-range radio, and that which Irv Berger of Protection System uses, is that of *Type 4*. A type 4 system, as defined and specified by NFPA (Section 5-5.3.4.4, NFPA 72, 1999), must be situated so they are in constant and ready contact with at least two RF (Radio-Frequency) receiving sites.

The system must also contain two transmitters that have the ability to supervise all RF transmitters on site or dispersed throughout the site amongst all other RF transmitters on site. Failure of any RF unit must be reported to the supervising station.

How Long Range Radio Works

There are two types of long-range radio systems in use, public and private. The system that Berger uses, the Intellinet system, manufactured by AES, is a *private* network. Alarm dealers who sell it either own a franchise, giving them the legal right to sell specific products and radio capacity, or they contract with an AES Intellinet dealer who does.

Berger's radio system operates on the distributed intelligence concept where every subscriber unit has the capacity to route signals from other subscriber units to a main

“UL Listing of the product requires that if you use products, such as AlarmNet, that you hit at least two towers with a certain signal strength and that the signal be repeated to constitute good reception,” said Berger. “The problem is that the sub location must be positioned in an area conducive to hitting two towers with the radio. You cannot build your area of coverage beyond the radio system’s ability to receive. Whereas, with a network like the Intellinet system, you can build your radio network as subscriber location requires.”

If something should change in the environment, such as a nearby radio subscriber unit suddenly ceases to operate, other subscriber units in the area will adjust to the change, picking up the slack by retransmitting signals that were previously assigned to the missing unit.

Another benefit to the system that Berger uses, as pointed out earlier in the story, is the fact that telephone lines are no longer necessary, providing fire technicians comply with the relevant sections of NFPA 72. radio receiver at a remote location. Not only does this concept forego the need for expensive towers every 20 to 50 miles, but it also eliminates the need for maintenance and other on-going costs so typical of a multiple-repeater system.

Fire Statistics—Serious Business

More than 3,740 people died in fires across the U.S. during 2001 and 3,110 of them did so in residential structures. Another 2,451 died the same year in the 911 tragedy. All total, 17 people lost their lives each and every day by a raging fire, this according to the National Fire Protection Association (NFPA) of Quincy, Mass.

Fire departments responded to 1,550,500 fires in the U.S. during 2004, which represents a 2.2 percent decrease over the year before. Outside fires also saw a decrease of 3.4 percent compared to 2003 (727,500). Nationwide, there was a civilian fire death every 135 minutes.

The fire service community is certainly doing all they can to prevent and protect people from fires, including NFPA, ICC, UL, American Fire Sprinkler, Campus Fire Safety, and many other organizations, many of which you may not have heard of.

All of the people associated with these organizations are caring life-safety professionals who work hard each and every day to minimize fire deaths, injuries, and property loss across this nation.

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 of FireNetOnline.com and webmaster of Tpromo.com.

