Fire Alarm Signaling and Alarm Receiving Centres

Preamble

Throughout the evolution of the alarm signal channel, there has always been the need to provide some warning that the signal channel itself had failed. This warning would be presented to the monitoring operator who would then take appropriate action. In the case of a burglar alarm system, this action could include the dispatch of the police as the failure of the signal channel connection could be an indication of attack on the premises. If the signal channel was connecting a premises *fire alarm* system to the monitoring centre, the operator response would be to contact the premises and advise that the customer that the fire alarm or sprinkler supervisory system was no longer being monitored. Depending on the situation, a fire watch would be put in place or other similar action taken.

Historically…

The earliest alarm signal channels pre-dated the invention of the telephone by several years. DC power supplies (i.e. batteries) supplied current through closed circuit systems consisting of cloth-wound copper wires strung across rooftops connecting a “protected” premises to a monitoring station. This technology was adapted to generate code identification for separate buildings in which the activation of a fire alarm system caused a toothed code wheel to make and break the DC circuit which in turn caused a solenoid in the monitoring station to tap out a code or ink the pulses onto a moving paper ribbon. The feature of “line security” was inherent as an open or ground on the DC circuit would be immediately apparent, and an investigation of the fault would ensue.

The development of the Direct Wire and McCulloh Loop technologies for alarm signaling had their roots in this original methodology. In later years, multiplexing systems added the ability for much more premises information to be transmitted to the monitoring centre, and maintained the ability to instantly identify a failure in the signal channel. These signal channels have remained the property of the telephone company and are leased, in turn, to the alarm monitoring companies.

The alarm signal channel has always been a separate and distinct service from the telephone network. The use of such signal channels involved a cost that was often prohibitive to the homeowner for use in a private residence alarm system. The advent of a device that is referred to as the “digital dialer” allowed the home owner to use his existing telephone circuit to carry alarm messages to the monitoring centre. In this case however, the system could be compromised by cutting the telephone line serving the home, and such a compromise would go unnoticed as this type of facility is not supervised to detect a failure. The dialer is now widely used in applications where insurance ratings are not required or where the loss risk is small from a commercial point of view.

Requirements for Fire Alarm Signaling

As a general statement, ***any alarm communication method that is unsupervised against failure is not acceptable for fire alarm signaling.***

ULC requirements for fire alarm signaling are found in a document entitled "Central Station Fire Protective Signaling Systems and Services", and bears the file number ULC/ORD-C693-1994. Although this document does not specify how a fire alarm transmitter shall be designed and built, it does require that the "Signal transmitting equipment shall comply with the construction and performance requirements contained in the "Standard for Control Units for Fire Alarm Systems, CAN/ULC-S527". This means for example, that the transmitter must be line powered with the 115 VAC supply connected directly to the unit and an internal bulkhead-protected transformer. Transmitter units that are powered by plug-in or similar transformers are not acceptable for fire alarm signaling.

With respect to signaling channels, this document discusses different methodologies that have one thing in common: failure of the channel or part thereof shall be reported to the monitoring operator within 4 minutes.

The document recognizes the dialer providing that it is coupled with another signaling technology such as a radio frequency or cellular system. Each technology must be capable of recognizing that its pathway has been lost, and provide an output that will cause the secondary device to signal this change of status to the monitoring centre. If a dialer is the only available method, then two separate lines shall be used and be connected to a fire alarm transmitter listed specifically for the purpose of fire alarm signaling.

In Canada, most of the telephone companies offer a service known as Digital Voice Access Control System or DVACS®, which is actually a registered trademark of Electro Arts Limited of Scarborough, Ontario. Electro Arts manufactures a modem that is installed by Bell Canada in a premises where the alarm system, either burglary or fire, is to be connected to a monitoring centre. The modem is a dual (tone) frequency device that is part of a polling system in which the premises' control unit is interrogated with a frequency that can not exceed once per minute. Loss of a single leg (and therefor the premises transmitter) or any part of the DVAC network will be identified at the monitoring centre virtually instantly.

Updated ULC Requirements

Recently, two new standards have been issued by ULC . CAN/ULC S561-03 is titled “Installation and Services for Fire Signal Receiving Centres and Systems”. It has been developed on the basis of the ORD/C693 document and updates the requirements for performance of the monitoring centre (which is now called the “Fire Signal Receiving Centre”) and the performance requirements of the alarm signaling and receiving equipment.

The other new standard, CAN/ULC S559-04 entitled “Equipment for Fire Signal Receiving Centres and Systems” clarifies the requirements for the construction and functionality of a Fire Alarm signal transmitter.

The Fire Alarm Monitoring industry is now clearly defined by two standards, a performance standard and a hardware standard. These standards remove Fire Alarm signaling from other types of alarms that are transmitted and received, and set it apart as a service separate and distinct.

Both CAN/ULC S561 and CAN/ULC S559 discuss fire alarm signaling in sections 10 and 5 respectively. From the hardware point of view, alarm signals must be reliably communicated with either appropriate repetition and/or parity that ”…provides a certainty of 99.99% that the received message is identical to the transmitted message”. It goes on to specify that, “The ***integrity*** of ***all*** communication systems and communication channels, including redundant channels, shall be monitored at the Fire Signal Receiving Centre.”

When it comes to describing the different types of signal communication systems, both standards categorize these systems into two categories, Active Communication Systems and Passive Communication Systems. As one might expect, the Active system is typified as a single technology which is capable of reporting a failure of any part of the system within 180 seconds of the occurrence of the fault. A typical example of this type of system is the DVACS® network discussed above.

An even more typical example is the Series 5000 Direct Wire Fire Alarm Signaling system from Electronic Surveillance Corporation, Ontario Canada. As a system in which only one subscriber is connected on one pair of dedicated lines, any line fault is reported immediately. This is because the interrogation-response communication process, a process that takes place every 800 milliseconds, is interrupted and is instantly displayed to the operator.

Both standards reflect the requirements for a Passive Communication System, that is a system where dual (or multiple) systems that are themselves not continuously monitored for integrity, may be coupled in such a way that the failure of one communication channel within the Passive Communication System,

results in a trouble signal being sent by a “buddy” signal channel within 180 seconds. A further requirement is that each channel making up the Communication system be tested every 24 hours. If a Fire Alarm signal is to be transmitted, it shall be sent over both (or all) signal channels that make up the Passive Communication System. As discussed previously, Passive Systems could be comprised of telephone line, cell, internet or radio signal channels.

With respect to marking, i.e. the requirement for the transmitter to bear a ULC label describing the type of service that the transmitter is providing, ULC standard S561, Section 9.2.1, says that the construction and performance of the transmitting unit(s) shall comply with standard S559. Looking, then, at S559, Section 9.1, we see that “Marking requirements shall be in accordance with ULC-S527, Control Units for Fire Alarm Systems.” This standard in brief, describes the required construction and operation of a Fire alarm Control Panel, and indicates that a ULC label containing the phrase “Signal System Control Unit-Fire Alarm” be clearly evident. For a fire alarm signal transmitter, using either Active or Passive Communication Systems, a ULC label shall be affixed to the unit with the phrase “ Subscriber Unit-Fire Alarm” as part of the label. (see ULC List of equipment and Materials, Burglar and Fire alarm Systems and Components, July, 1999, p.147).

The Authority Having Jurisdiction (AHJ)

Generally speaking, the AHJ is the serving Fire Department for the community. The AHJ operates under the provincial Attorney General’s office, and enforces the Fire Code of the province which has been legislated into law.

The AHJ has the right to inspect buildings other than private residences, to ensure that the conditions in the Fire Code are being met. With respect to fire alarm systems, the Fire Code requires inspection schedules and also dictates which building or occupancy will require fire alarm monitoring. In the province of Ontario, the Ontario Fire Code requires that any Fire Alarm Monitoring system that is required by the Code, be monitored in accordance with the requirements contained in NFPA standard 72, and the ULC/ORD-C639 document discussed earlier. (Note: Due to its recent release, CAN/ULC S561 is not referenced in the 1997 (current) Ontario Fire Code.) NFPA 72 states that where required, Fire Alarm Monitoring systems shall be listed by an approved listing authority. This includes the Receiving Centre equipment as well as the field alarm transmitting equipment.

If there is no evidence of ULC listing on any piece of equipment that is an integral part of a fire alarm system and its related protective signaling system, it is deemed to be unacceptable by the AHJ.

The Simple Solution

In cases where the AHJ wishes to ensure that there will be no question about whether or not a premises is being monitored for Fire Alarm in the required fashion, he simply has to ask the owner to provide a ULC certificate for “Central Station Fire Protective Signaling Systems” service. It is apparent that fire authorities are taking an interest in enforcing the monitoring requirements. It is expected that certificates will be required in ever increasing numbers.