

## **Tools and Technologies To Streamline the Fire Alarm Commissioning Process**

**A White Paper by SimplexGrinnell**

### **INTRODUCTION:**

Contractors nearing the completion of large-scale projects often encounter unexpected delays during the fire alarm system commissioning process. Now innovative new technology is providing some answers to this longtime dilemma. A diagnostic testing tool just coming to the forefront can enable contractors and/or technicians to run an alarm system test before wiring connections are made to the fire alarm control panel. Another advancement, a fire panel software enhancement, can automate the completion of the inspection and testing report required under NFPA72®, National Fire Alarm and Signaling Code®. This white paper explores the potential of these technologies to save time, control costs, and contribute to a more efficient overall commissioning process.

### **A Common Problem**

*As the day of the fire alarm system acceptance test approaches, the general contractor is scrambling to get everything ready for occupancy. Schedules have had to be juggled because acceptance testing requires numerous people familiar with the fire alarm system to be present.*

*The local fire official arrives, the test is conducted, and the system fails. In the aftermath of the failed test, there's apt to be finger pointing. Much of it may be directed at the fire alarm installer. An occupancy permit will not be granted if the fire alarm system is not ready to go, and some jurisdictions may require an affidavit of a successful third-party system inspection prior to scheduling a retest of the system.*

The above scenario plays out at job sites on a daily basis. Contractors and others involved with fire alarm systems readily admit that problems frequently occur on the day of commissioning.

The issues tend to follow a predictable sequence, with problems often surfacing during a system check. When an unexpected problem occurs, the project can be thrown off schedule. The occupancy permit – a highly critical step as the construction process nears completion – may be delayed. This can cost the installer precious time and money – and create anxiety for the building owner and AHJ (authority having jurisdiction). In truth, fire alarm commissioning can be a major pain point for contractors, engineers, building owners and local fire officials.

Chip Carson, a fire protection engineer, life-safety expert, and *NFPA Journal*<sup>®</sup> columnist, wrote candidly that fire alarm systems do not work perfectly at the acceptance test. “I have yet to go to an acceptance test and have the fire alarm system work properly the first time. During the acceptance test, there are always problems with the system. This is why a comprehensive acceptance test is necessary.” In fact, an acceptance test is required by NFPA 72.

Given the strong sentiment in the industry that fire alarm system acceptance testing can be problematic, some AHJs are taking a practical approach that aims to guide the process. For example, the Fairfax County (Virginia) Office of the Fire Marshal Fire Prevention/Fire Inspection Division suggests a “self test” before the contractor calls for the final test. Fairfax County fire officials are also specific in identifying the paperwork needed to document the test in accordance with NFPA 72.

Fairfax County officials point to a number of major reasons for acceptance test failure:

- No pretest of system,
- No approved plans on site,
- Failure to install per building plans,
- Contractors not prepared with appropriate tools and equipment, and
- Contractors not familiar with low-voltage systems or NFPA 72 requirements.

The Fairfax County officials see that many times, the required paperwork is not being filed. And oftentimes, those involved in a project end up waiting until the acceptance test to determine whether there might be fire alarm system issues that need to be rectified.

## **Taking Control of the Process**

Considering the prevalence of alarm system problems that crop up during acceptance testing, there has been a focus in some industry circles on the development of technology solutions to help simplify and streamline the commissioning process. Significant effort has been directed at the development of diagnostic tools and software applications to improve commissioning and automate the completion of required inspection and testing forms.

In particular, it appears that significant benefit can come from a diagnostic instrument capable of verifying -- before connections are made to the fire alarm control panel-- that wiring and peripheral devices are installed correctly and operating properly. By utilizing a tool of this type, technical analysis and readiness testing can be conducted well before an acceptance test – or even as each phase of alarm system installation is completed.

These were the dynamics behind SimplexGrinnell’s development of a diagnostic and testing instrument for Simplex fire alarm systems. The company used input from contractors, engineers, building owners, fire officials and technicians who have experienced the struggles associated with commissioning, particularly in large projects with more complex fire alarm systems. Those constituencies agreed that unexpected problems can make fire alarm system commissioning more challenging, time consuming and expensive than it should be. They saw great potential value in a tool that could diagnose system problems at an early stage – allowing more time to conduct pre-testing and work out final bugs, easing project pressure, and smoothing the overall process.

## **Advanced Software Technology**

The new SimplexGrinnell tool is known as the Simplex® TrueSTART™ (System Technical Analysis and Readiness Testing) instrument. Battery-operated and simple to use, the instrument uses advanced software technology to scan hundreds of addressable fire alarm system devices and pinpoint potential problems such as ground faults, shorted wiring, or incorrect or duplicate addressing. This analysis and testing can all be performed by a contractor before a technician from the installer is brought on site to commission the system with the AHJ.

With sophisticated diagnostic capabilities for Simplex fire alarm systems, the TrueSTART instrument can expedite the resolution of problems, keep projects on target for the planned occupancy date, and support compliance with the requirements of nationally recognized codes and standards such as NFPA 72® and CAN/ULC-S537.

From a technical standpoint, the diagnostic instrument can save the most time on large projects such as hospitals, office buildings, universities, government institutions, industrial complexes, sports stadiums and commercial facilities. In these installations, the fire alarm system will typically have addressable loops with hundreds of devices -- each with a specialized function -- that need to be tested. The TrueSTART instrument can run a software diagnostic test on those devices that takes just minutes and flags any problems. Without a diagnostic instrument, it could take two to three hours to conduct testing and correct addresses if they are not set properly.

### **Cross-Talk Testing**

Another benefit of the diagnostic tool is the ability to test for “cross talk” -- electrical interference between two different communication channels. Cross talk is caused by the coupling of signals from one channel onto another. The diagnostic tool can measure the level of coupling between two addressable loops and indicate the result as “pass” or “fail.” A high level of cross talk can result in slowed communications or cause intermittent faults or other problems. By detecting cross talk early in the installation process, the problem can be fixed well before the acceptance test. Leveraging the diagnostic tool can also help a contractor to determine whether a certain installation technique is responsible for cross talk or earth faults. This insight can in turn be used to alter installation methods to attain better results in the future.

### **The Workings of the Instrument**

When a diagnostic test is run, the LCD screen sequentially displays vital information as the instrument scans each channel to determine device types and addresses, identify duplicate address settings, and check the status of each device. For example, the instrument can quickly determine:

- If manual fire alarm boxes (pull stations) are normal or in alarm

- The analog value of Simplex TrueAlarm® smoke sensors
- Whether smoke sensors are out of range or possibly dirty

When the instrument detects a problem, a command is sent to the device address telling it to activate its LED. The devices set to the displayed address will have their LEDs lit as long as the instrument displays their address. The technician or electrical contractor can see the problem on the diagnostic tool's display and direct the repair.

All information generated by the diagnostic and testing instrument can easily be downloaded, via a network connection on the back of the tool, to a laptop or personal computer for report generation and archiving.

The ease of use and reliability of the diagnostic tool is further enhanced by its ability to operate from multiple power sources, allowing diagnostic testing to be performed when there is no power supply on site. The battery can operate the instrument for an eight-hour workday without recharge. If the battery is depleted, the tester may be operated from the AC adapter or from any DC source. The tool comes with a battery charger, which will recharge a fully depleted battery in about two hours.

### **Automating the Inspection and Testing Paperwork**

The Inspection, Testing, and Maintenance chapter of NFPA 72 requires inspection and testing of fire alarm systems and their components, including initiating and notification devices and circuits. As can be seen from the NFPA 72 excerpts below, documentation of system inspection and testing is central to the compliance effort.

Section 10.4.1.1 Initial Acceptance Testing of NFPA 72 states that “all new systems shall be inspected and tested in accordance with the requirements of Chapter 10. The authority having jurisdiction shall be notified prior to the initial acceptance test.”

According to NFPA 72, the contractor is responsible for turning over system information at the time of the system's commissioning. The information includes system design documents and a

record of completion. Chapter 10 of NFPA 72 requires a completed inspection and testing form to be filed with the AHJ.

Section 10.6 Records, requires that records be maintained for the life of the system and indicates that a software-based record is acceptable. Although Section 10.6.2.3 contains an inspection and testing form, a computerized version is allowed by code. An electronically generated form can be easier to produce and maintain and provide a more accurate record of the system and its components..

With these factors in mind, SimplexGrinnell has developed a software advancement for its Simplex 4100U fire alarm system that can automate the preparation of inspection and testing reports – and ensure their accuracy. The new technology enables a Simplex 4100U system programmer to create a downloadable report that mirrors the Inspection and Testing Form prescribed in NFPA 72. The report is pre-populated with a listing of all system devices – and their specific address and building location. The pre-populated form can be completed electronically or printed for use in conducting the inspection and testing. The resulting process for completing the required inspection and testing report can be simpler, cleaner and more accurate.

#### **CONCLUSION:**

Although widely acknowledged to be a key step in the successful completion of a building construction project, in many instances fire alarm commissioning remains problematic. Contractors, building owners, engineers and AHJs may derive benefits from tools and technologies that can simplify and streamline the process. For Simplex fire alarm systems, these advancements can remove guess work, save time and money, build confidence in the system, and keep a project on track for the timely issuance of an occupancy permit.