

**Fire Alarm Control Panel**  
**NFS-320/E/C**  
**Installation Manual**

Document 52745

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Rev:

**M2**

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# Fire Alarm & Emergency Communication System Limitations

*While a life safety system may lower insurance rates, it is not a substitute for life and property insurance!*

**An automatic fire alarm system**—typically made up of smoke detectors, heat detectors, manual pull stations, audible warning devices, and a fire alarm control panel (FACP) with remote notification capability—can provide early warning of a developing fire. Such a system, however, does not assure protection against property damage or loss of life resulting from a fire.

**An emergency communication system**—typically made up of an automatic fire alarm system (as described above) and a life safety communication system that may include an autonomous control unit (ACU), local operating console (LOC), voice communication, and other various interoperable communication methods—can broadcast a mass notification message. Such a system, however, does not assure protection against property damage or loss of life resulting from a fire or life safety event.

The Manufacturer recommends that smoke and/or heat detectors be located throughout a protected premises following the recommendations of the current edition of the National Fire Protection Association Standard 72 (NFPA 72), manufacturer's recommendations, State and local codes, and the recommendations contained in the Guide for Proper Use of System Smoke Detectors, which is made available at no charge to all installing dealers. This document can be found at <http://www.systemsensor.com/appguides/>. A study by the Federal Emergency Management Agency (an agency of the United States government) indicated that smoke detectors may not go off in as many as 35% of all fires. While fire alarm systems are designed to provide early warning against fire, they do not guarantee warning or protection against fire. A fire alarm system may not provide timely or adequate warning, or simply may not function, for a variety of reasons:

**Smoke detectors** may not sense fire where smoke cannot reach the detectors such as in chimneys, in or behind walls, on roofs, or on the other side of closed doors. Smoke detectors also may not sense a fire on another level or floor of a building. A second-floor detector, for example, may not sense a first-floor or basement fire.

**Particles of combustion or "smoke"** from a developing fire may not reach the sensing chambers of smoke detectors because:

- Barriers such as closed or partially closed doors, walls, chimneys, even wet or humid areas may inhibit particle or smoke flow.
- Smoke particles may become "cold," stratify, and not reach the ceiling or upper walls where detectors are located.
- Smoke particles may be blown away from detectors by air outlets, such as air conditioning vents.
- Smoke particles may be drawn into air returns before reaching the detector.

The amount of "smoke" present may be insufficient to alarm smoke detectors. Smoke detectors are designed to alarm at various levels of smoke density. If such density levels are not created by a developing fire at the location of detectors, the detectors will not go into alarm.

Smoke detectors, even when working properly, have sensing limitations. Detectors that have photoelectronic sensing chambers tend to detect smoldering fires better than flaming fires, which have little visible smoke. Detectors that have ionizing-type sensing chambers tend to detect fast-flaming fires better than smoldering fires. Because fires develop in different ways and are often unpredictable in their growth, neither type of detector is necessarily best and a given type of detector may not provide adequate warning of a fire.

Smoke detectors cannot be expected to provide adequate warning of fires caused by arson, children playing with matches (especially in bedrooms), smoking in bed, and violent explosions

(caused by escaping gas, improper storage of flammable materials, etc.).

**Heat detectors** do not sense particles of combustion and alarm only when heat on their sensors increases at a predetermined rate or reaches a predetermined level. Rate-of-rise heat detectors may be subject to reduced sensitivity over time. For this reason, the rate-of-rise feature of each detector should be tested at least once per year by a qualified fire protection specialist. Heat detectors are designed to protect property, not life.

**IMPORTANT! Smoke detectors** must be installed in the same room as the control panel and in rooms used by the system for the connection of alarm transmission wiring, communications, signaling, and/or power. If detectors are not so located, a developing fire may damage the alarm system, compromising its ability to report a fire.

**Audible warning devices such as bells, horns, strobes, speakers and displays** may not alert people if these devices are located on the other side of closed or partly open doors or are located on another floor of a building. Any warning device may fail to alert people with a disability or those who have recently consumed drugs, alcohol, or medication. Please note that:

- An emergency communication system may take priority over a fire alarm system in the event of a life safety emergency.
- Voice messaging systems must be designed to meet intelligibility requirements as defined by NFPA, local codes, and Authorities Having Jurisdiction (AHJ).
- Language and instructional requirements must be clearly disseminated on any local displays.
- Strobes can, under certain circumstances, cause seizures in people with conditions such as epilepsy.
- Studies have shown that certain people, even when they hear a fire alarm signal, do not respond to or comprehend the meaning of the signal. Audible devices, such as horns and bells, can have different tonal patterns and frequencies. It is the property owner's responsibility to conduct fire drills and other training exercises to make people aware of fire alarm signals and instruct them on the proper reaction to alarm signals.
- In rare instances, the sounding of a warning device can cause temporary or permanent hearing loss.

**A life safety system** will not operate without any electrical power. If AC power fails, the system will operate from standby batteries only for a specified time and only if the batteries have been properly maintained and replaced regularly.

**Equipment used in the system** may not be technically compatible with the control panel. It is essential to use only equipment listed for service with your control panel.

**Telephone lines** needed to transmit alarm signals from a premises to a central monitoring station may be out of service or temporarily disabled. For added protection against telephone line failure, backup radio transmission systems are recommended.

**The most common cause** of life safety system malfunction is inadequate maintenance. To keep the entire life safety system in excellent working order, ongoing maintenance is required per the manufacturer's recommendations, and UL and NFPA standards. At a minimum, the requirements of NFPA 72 shall be followed. Environments with large amounts of dust, dirt, or high air velocity require more frequent maintenance. A maintenance agreement should be arranged through the local manufacturer's representative. Maintenance should be scheduled monthly or as required by National and/or local fire codes and should be performed by authorized professional life safety system installers only. Adequate written records of all inspections should be kept.

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# Installation Precautions

*Adherence to the following will aid in problem-free installation with long-term reliability:*

**WARNING - Several different sources of power can be connected to the fire alarm control panel.** Disconnect all sources of power before servicing. Control unit and associated equipment may be damaged by removing and/or inserting cards, modules, or interconnecting cables while the unit is energized. Do not attempt to install, service, or operate this unit until manuals are read and understood.

**CAUTION - System Re-acceptance Test after Software Changes:** To ensure proper system operation, this product must be tested in accordance with NFPA 72 after any programming operation or change in site-specific software. Re-acceptance testing is required after any change, addition or deletion of system components, or after any modification, repair or adjustment to system hardware or wiring. All components, circuits, system operations, or software functions known to be affected by a change must be 100% tested. In addition, to ensure that other operations are not inadvertently affected, at least 10% of initiating devices that are not directly affected by the change, up to a maximum of 50 devices, must also be tested and proper system operation verified.

**This system** meets NFPA requirements for operation at 0-49° C/32-120° F and at a relative humidity 93% ± 2% RH (non-condensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15-27° C/60-80° F.

**Verify that wire sizes are adequate** for all initiating and indicating device loops. Most devices cannot tolerate more than a 10% I.R. drop from the specified device voltage.

**Like all solid state electronic devices,** this system may operate erratically or can be damaged when subjected to lightning induced transients. Although no system is completely immune from lightning transients and interference, proper grounding will reduce susceptibility. Overhead or outside aerial wiring is not recommended, due to an increased susceptibility to nearby lightning strikes. Consult with the Technical Services Department if any problems are anticipated or encountered.

**Disconnect AC power and batteries** prior to removing or inserting circuit boards. Failure to do so can damage circuits.

**Remove all electronic assemblies** prior to any drilling, filing, reaming, or punching of the enclosure. When possible, make all cable entries from the sides or rear. Before making modifications, verify that they will not interfere with battery, transformer, or printed circuit board location.

**Do not tighten screw terminals** more than 9 in-lbs. Overtightening may damage threads, resulting in reduced terminal contact pressure and difficulty with screw terminal removal.

**This system contains static-sensitive components.** Always ground yourself with a proper wrist strap before handling any circuits so that static charges are removed from the body. Use static suppressive packaging to protect electronic assemblies removed from the unit.

**Follow the instructions** in the installation, operating, and programming manuals. These instructions must be followed to avoid damage to the control panel and associated equipment. FACP operation and reliability depend upon proper installation.

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## FCC Warning

**WARNING:** This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual may cause interference to radio communications. It has been tested and found to comply with the limits for class A computing devices pursuant to Subpart B of Part 15 of FCC Rules, which is designed to provide reasonable protection against such interference when devices are operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user will be required to correct the interference at his or her own expense.

## Canadian Requirements

This digital apparatus does not exceed the Class A limits for radiation noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

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## Software Downloads

In order to supply the latest features and functionality in fire alarm and life safety technology to our customers, we make frequent upgrades to the embedded software in our products. To ensure that you are installing and programming the latest features, we strongly recommend that you download the most current version of software for each product prior to commissioning any system. Contact Technical Support with any questions about software and the appropriate version for a specific application.

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Send email messages to:

**FireSystems.TechPubs@honeywell.com**

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# Section 1: About This Manual

## 1.1 Standards and Other Documents



### ■ This Fire Alarm Control Panel complies with the following NFPA standards:

- NFPA 12 CO<sub>2</sub> Extinguishing Systems
- NFPA 12A Halon 1301 Extinguishing Systems
- NFPA 13 Sprinkler Systems
- NFPA 15 Water Spray Systems
- NFPA 16 Foam/Water Deluge and Foam/Water Spray Systems
- NFPA 17 Dry Chemical Extinguishing Systems
- NFPA 17A Wet Chemical Extinguishing Systems
- NFPA 72 Central Station Fire Alarm Systems (Automatic, Manual and Waterflow) Protected Premises Unit (requires Notifier UDACT/UDACT-2).
- NFPA 72 Local (Automatic, Manual, Waterflow and Sprinkler Supervisory) Fire Alarm Systems.
- NFPA 72 Auxiliary (Automatic, Manual and Waterflow) Fire Alarm Systems (requires TM-4).
- NFPA 72 Remote Station (Automatic, Manual and Waterflow) Fire Alarm Systems
- NFPA 72 Proprietary (Automatic, Manual and Waterflow) Fire Alarm Systems (Protected Premises Unit).
- NFPA 2001 Clean Agent Fire Extinguishing Systems

### ■ The installer should be familiar with the following documents and standards:

- NFPA 72 Initiating Devices for Fire Alarm Systems
- NFPA 72 Inspection, Testing and Maintenance for Fire Alarm Systems
- NFPA 72 Notification Appliances for Fire Alarm Systems

### Underwriters Laboratories



- UL 38 Manually Actuated Signaling Boxes
- UL 217 Smoke Detectors, Single and Multiple Station
- UL 228 Door Closers - Holders for Fire Protective Signaling Systems
- UL 268 Smoke Detectors for Fire Protective Signaling Systems
- UL 268A Smoke Detectors for Duct Applications
- UL 346 Waterflow Indicators for Fire Protective Signaling Systems
- UL 464 Audible Signaling Appliances
- UL 521 Heat Detectors for Fire Protective Signaling Systems
- UL 864 Standard for Control Units for Fire Protective Signaling Systems
- UL 1481 Power Supplies for Fire Protective Signaling Systems
- UL 1971 Visual Signaling Appliances
- UL 1076 Proprietary Burglar Alarm Systems
- UL 2017 Standard for General-Purpose Signaling Devices and Systems
- UL 2572 Standard for Mass Notification Systems
- UL 60950 Safety of Information Technology Equipment

### Underwriters Laboratories of Canada (ULC)



- Standard CAN/ULC-S527-M99
- CAN/ULC-S524-M91 Standard for the Installation of Fire Alarm Systems

### Other

- EIA-485 and EIA-232 Serial Interface Standards
- NEC Article 300 Wiring Methods
- NEC Article 760 Fire Protective Signaling Systems
- Applicable Local and State Building Codes
- Requirements of the Local Authority Having Jurisdiction
- C22.1-98 The Canadian Electrical Code, Part 1

## 1.2 UL 864 Compliance

### 1.2.1 Products Subject to AHJ Approval

This product has been certified to comply with the requirements in the Standard for Control Units and Accessories for Fire Alarm Systems, UL 864 9th Edition.

The following products have not received UL 864 9th Edition certification and may only be used in retrofit applications. Operation of the NFS-320/E/C with products not tested for UL 864 9th Edition has not been evaluated and may not comply with NFPA 72 and/or the latest edition of UL 864. These applications will require the approval of the local Authority Having Jurisdiction (AHJ).

- For a complete list of all peripherals that can be used with this fire alarm control panel (FACP), and which of those peripherals have not received UL 864, 9th Edition certification and may only be used in retrofit applications, see Section 2.3, “Compatible Equipment”, on page 16.

## 1.3 Related Documents

Table 1.1 below provides a list of documents referenced in this manual, as well as documents for selected other compatible devices. The document series chart (DOC-NOT) provides the current document revision. A copy of this document is included in every shipment.

<b>Compatible Conventional Devices (Non-addressable)</b>	<b>Document Number</b>
Device Compatibility Document	15378
<b>Fire Alarm Control Panel (FACP) and Main Power Supply Installation</b>	<b>Document Number</b>
NFS-320/E/C Installation, Operations, and Programming Manuals NFS-320C Canadian Applications Addendum	52745, 52746, 52747 52745CDN
SLC Wiring Manual	51253
Note: For individual SLC Devices, refer to the <i>SLC Wiring Manual</i>	
<b>Off-line Programming Utility</b>	<b>Document Number</b>
VeriFire® Tools CD help file	VERIFIRE-TCF
<b>Power Supplies, Auxiliary Power Supplies &amp; Battery Chargers</b>	<b>Document Number</b>
ACPS-2406 Installation Manual	51304
ACPS-610 Instruction Manual	53018
APS-6R Instruction Manual	50702
APS2-6R Instruction Manual	53232
CHG-120 Battery Charger Manual	50641
FCPS-24S6/FCPS-24S8 Field Charger/Power Supply Manual	51977
<b>Networking</b>	<b>Document Number</b>
High-Speed Network Communication Module	54014
High-Speed Noti•Fire•Net Instruction Manual	54013
Noti•Fire•Net Manual, Network Version 5.0 & Higher	51584
ONYXWorks™ Workstation Hardware & Software Application: Installation and Operation Manual	52342
ONYXWorks™ NFN Gateway (PC Platform) Installation & Operation Manual	52307

**Table 1.1 Reference Documentation (1 of 2)**

ONYXWorks™ NFN Gateway (Embedded Platform) Installation & Operation Manual	52306
NCM-W/F Installation Document	51533
NCS ONYX® Network Control Station Manual, Network Version 4.0 & Higher	51658
NCA-2 Network Control Annunciator Manual	52482
NCA Network Control Annunciator Manual	51482
<b>System Components</b>	<b>Document Number</b>
Annunciator Control System Manual	15842
ACM-8R Annunciator Control Module Manual	15342
FDU-80 Remote Annunciator Manual	51264
LCD-80 Liquid Crystal Display Annunciator	15037
LCD2-80 Liquid Crystal Display Annunciator	53242
LDM Series Lamp Driver Annunciator Manual	15885
SCS Smoke Control Manual (Smoke and HVAC Control Station)	15712
DPI-232 Direct Panel Interface Manual	51499
TM-4 Installation Document (Reverse Polarity Transmitter)	51490
UDACT Manual (Universal Digital Alarm Communicator/Transmitter)	50050
UDACT-2 Manual (Universal Digital Alarm Communicator/Transmitter)	54089
FireVoice-25/50 & FireVoice-25/50ZS Manual	52290
FirstCommand Emergency Communication System	LS10001-001-NF-E
RA100Z Remote LED Annunciator Installation Document	I56-0508
FSA-8000 Intelligent Aspiration Sensing Technology Document	I56-3903
FWSG Wireless Manual	LS10036-000NF-E

Table 1.1 Reference Documentation (2 of 2)

## 1.4 Cautions and Warnings

This manual contains cautions and warnings to alert the reader as follows:




---

**CAUTION:**

Information about procedures that could cause programming errors, runtime errors, or equipment damage.

---




---

**WARNING:**

Indicates information about procedures that could cause irreversible damage to the control panel, irreversible loss of programming data or personal injury.

---

### 1.4.1 Typographic Conventions




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**NOTE:** The term NFS-320 is used in this manual to refer to the NFS-320, and the NFS-320E and the NFS-320C, unless otherwise noted.

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# Section 2: System Overview

## 2.1 System Description

The NFS-320/E/C control panel is a modular, intelligent fire alarm control panel (FACP) with an extensive list of powerful features. The control panel uses the CPS-24/E integral power supply with battery charger. This is mounted in its cabinet to create a complete fire alarm control system. The panel supports FlashScan® and CLIP mode; the board provides an integral signaling line circuit (SLC) that can support up to 318 addressable points (159 detectors and 159 monitor/control modules). The panel is networkable, and can be monitored across a network by other networked panels.

Modular devices mount in the cabinet or in auxiliary backboxes to provide additional circuits. This system is available in either a 120 VAC or 240 VAC configuration. Cabinetry can be ordered in black or in red. The NFS-320/E/C chassis is removable, allowing work to be done outside the cabinet.

### 2.1.1 Standard Features

- Uses Notifier's VIEW® early warning fire detection and the FlashScan® or Classic Loop Interface Protocol (CLIP) families of detectors and modules
- Integral power supply with battery charger
- Four standard Notification Appliance Circuits (NAC), Class A or B
- Alarm, Trouble, Supervisory and Security relays
- Support for 32 annunciator addresses, with 10 special annunciator groups
- Supports Style 4, Style 6, Style 7 SLC loops
- Releasing service using on-board NACs or FCM-1 modules
- Logic Equations
- Display scroll selection
- Alarm verification supervisory indication (NYC)
- Supervisory duct detectors
- Supports ONYX® Intelligent Sensing algorithms
- Network operation
- Battery charger supports 18 to 200 amp hour sealed lead-acid batteries
- EIA-485 connections for wiring ACS annunciators (including LDM custom graphic annunciators), TM-4 transmitter
- EIA-232 connections for printer, CRT, printer/CRT, or network operation
- VeriFire Tools® off-line programming utility
- Autoprogram feature for faster device programming
- The control panel provides 6 amps of usable output power in an alarm condition; it provides 3 amps of usable output power in normal or continuous operating conditions
- Diagnostic LEDs and switches
- Ground fault detection (0 ohm impedance)
- Battery and battery-charger supervision, voltage-monitoring, and current-monitoring
- Disconnect of deeply-discharged battery (low battery disconnect)
- Programmable for strobe synchronization
- QWERTY silicone-rubber keypad with a 2x40 LCD display and eight indicator LEDs
- Mass Notification System compatible

## 2.1.2 Options

Refer to Section 2.2 “System Components” for descriptions of the various optional modules.

- Optional devices include: Wire and Fiber versions of the NCM or HS-NCM connection to the Noti•Fire•Net and High-Speed Noti•Fire•Net, UDACT/UDACT-2 Universal Digital Alarm
- Communicator/Transmitter, and ACM-8R remote relay module to increase point capacity.
- Optional annunciators connected through the EIA-485 interface allow remote system monitoring.

## 2.1.3 System Limitations

System expansion must take into consideration the following:

1. The physical limitations of the cabinet configuration.
2. The electrical limitations of the system power supply.
3. The capacity of the secondary power source (standby batteries). (Note that batteries larger than 26 AH will require a separate battery backbox.)

## 2.2 System Components

### 2.2.1 Standard Equipment

The standard, factory-assembled NFS-320/E/C system includes the following components:

- The control panel with integral power supply, and cabinet. NFS-320 (120V operation) or NFS-320E (220-240V operation), and CPS-24/E. NFS-320/E is the “control panel” itself and the heart of the system; it ships with a grounding cable, battery interconnect cables, and document kit. CPS-24/E mounts directly on the control panel. The system ships pre-installed in its cabinet.

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**NOTE:** The CPS-24/E is an integral part of the NFS-320 and is not available separately.

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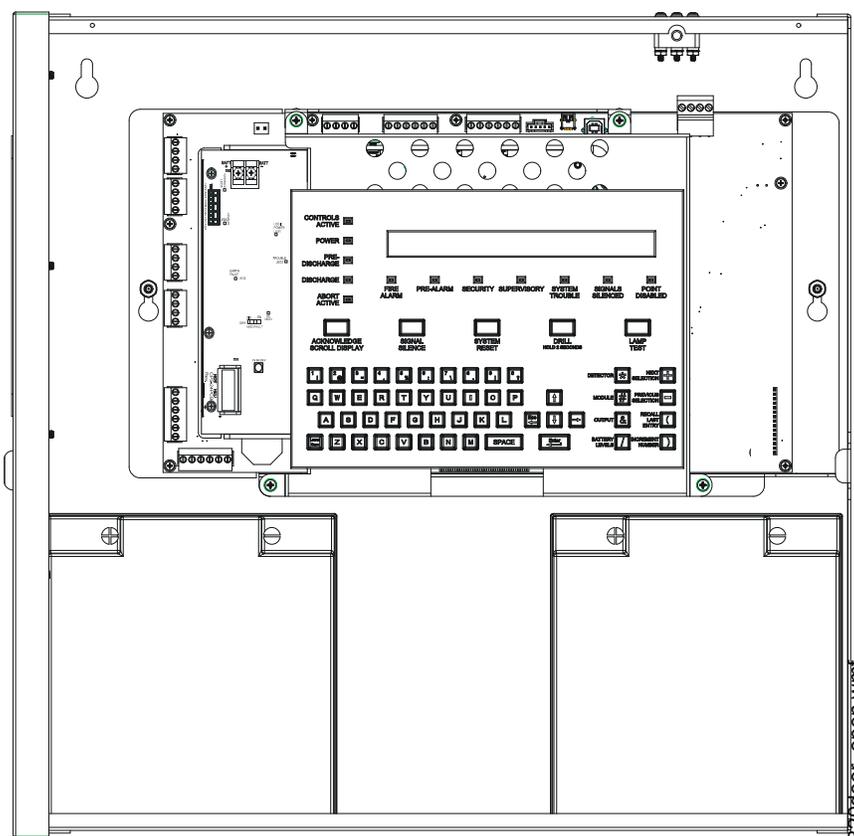
- A primary display KDM-R2 keypad/display.

Batteries are ordered separately; refer to Appendix A.3 “Calculating the Battery Requirements” for system current-draw calculations.

Up to two option boards can be installed within the FACP’s cabinet; additional optional peripherals can be mounted in auxiliary backboxes. Refer to Section 2.3, “Compatible Equipment” for equipment listed for use with this FACP.

### 2.2.2 Control Panel Circuit Board

The control panel electronics are contained in NFS-320 and its built-in power supply. The printed circuit board incorporates a signaling line circuit (SLC) and the central processing unit; the power supply has an integral battery charger. A keypad/display unit is installed over the power supply as shown Figure 2.1. Wiring is shown in Figure 2.2, “NFS-320 and Power-Supply: Wiring Connections” and Figure 2.3, “NFS-320 and Power-Supply: Jumpers, LEDs and Switches”.



**Figure 2.1 NFS-320/E/C System, Shown with Door Open**

### 2.2.3 Main Power Supply CPS-24/E

The main power supply is an integral part of the NFS-320/E/C and mounts directly over the control panel's circuit board. It provides a total of 3.9 A (7.4 A in alarm) and contains an integral battery charger. This can be used for many functions including:

- Powering the NFS-320/E/C
- Powering a variety of UL-listed 24 VDC notification appliances from four built-in NAC outputs
- Providing up to 1.25 A of resettable power for four-wire smoke detectors
- Providing up to 1.25 A of non-resettable power for external devices such as the TM-4 Transmitter Module
- Providing auxiliary 24 VDC power @ 0.5 A and 5 VDC power @ 0.15 A
- Fuse: 8 amps, 250 V, 5 x 20 mm, Fast Acting, ceramic, p/n 12117

See Figure 2.2, “NFS-320 and Power-Supply: Wiring Connections” and Figure 2.3, “NFS-320 and Power-Supply: Jumpers, LEDs and Switches” for details.

## 2.2.4 Circuit Board Components

The following three figures illustrate the location of the various connections, switches, jumpers and LEDs on the NFS-320 and its power supply. Figure 2.2 shows wiring connections; Figure 2.3 shows jumpers, LEDs and switches. See Section 3 “Installation” for larger images and more details. (Larger images are referenced on these drawings.)

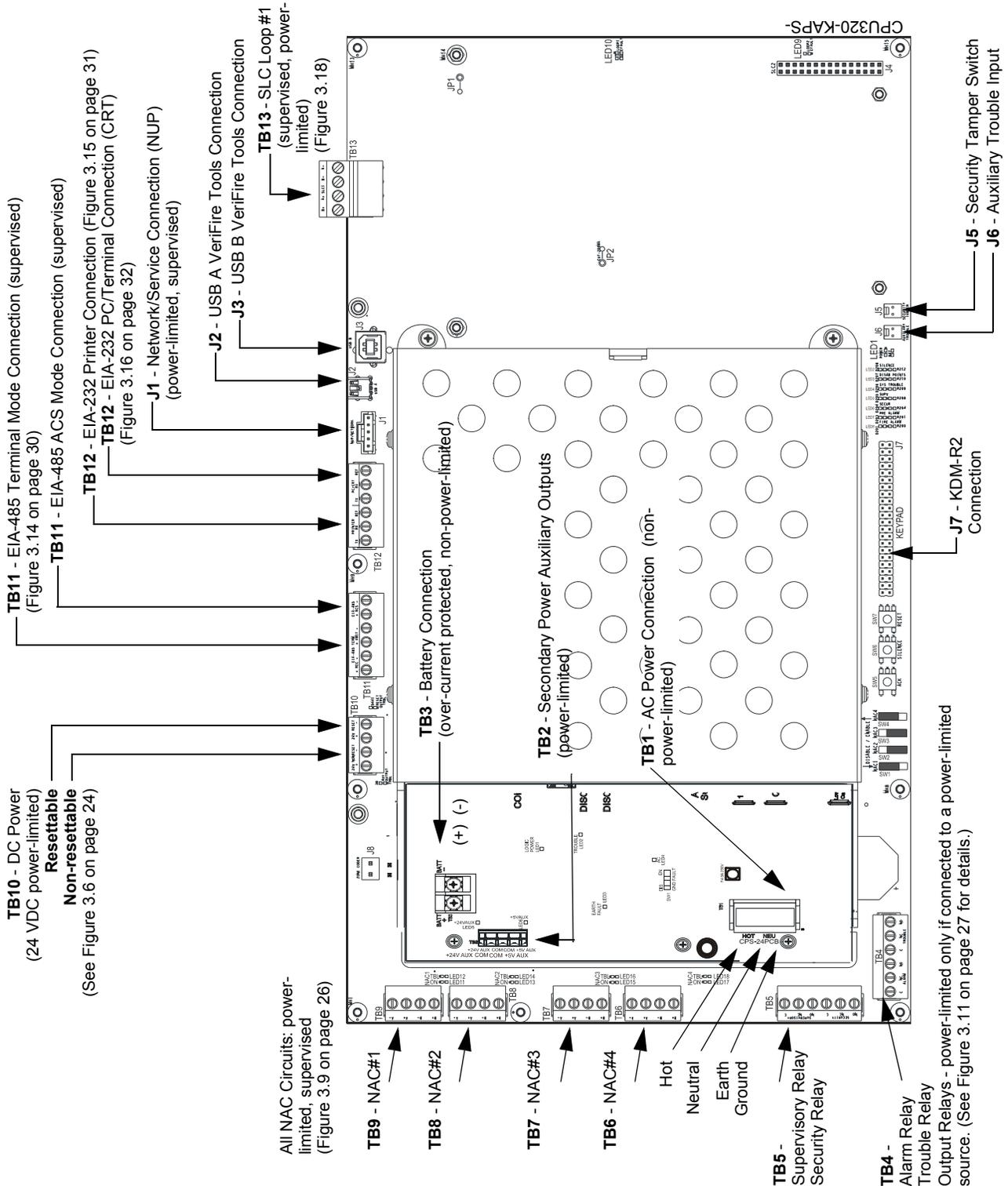


Figure 2.2 NFS-320 and Power-Supply: Wiring Connections

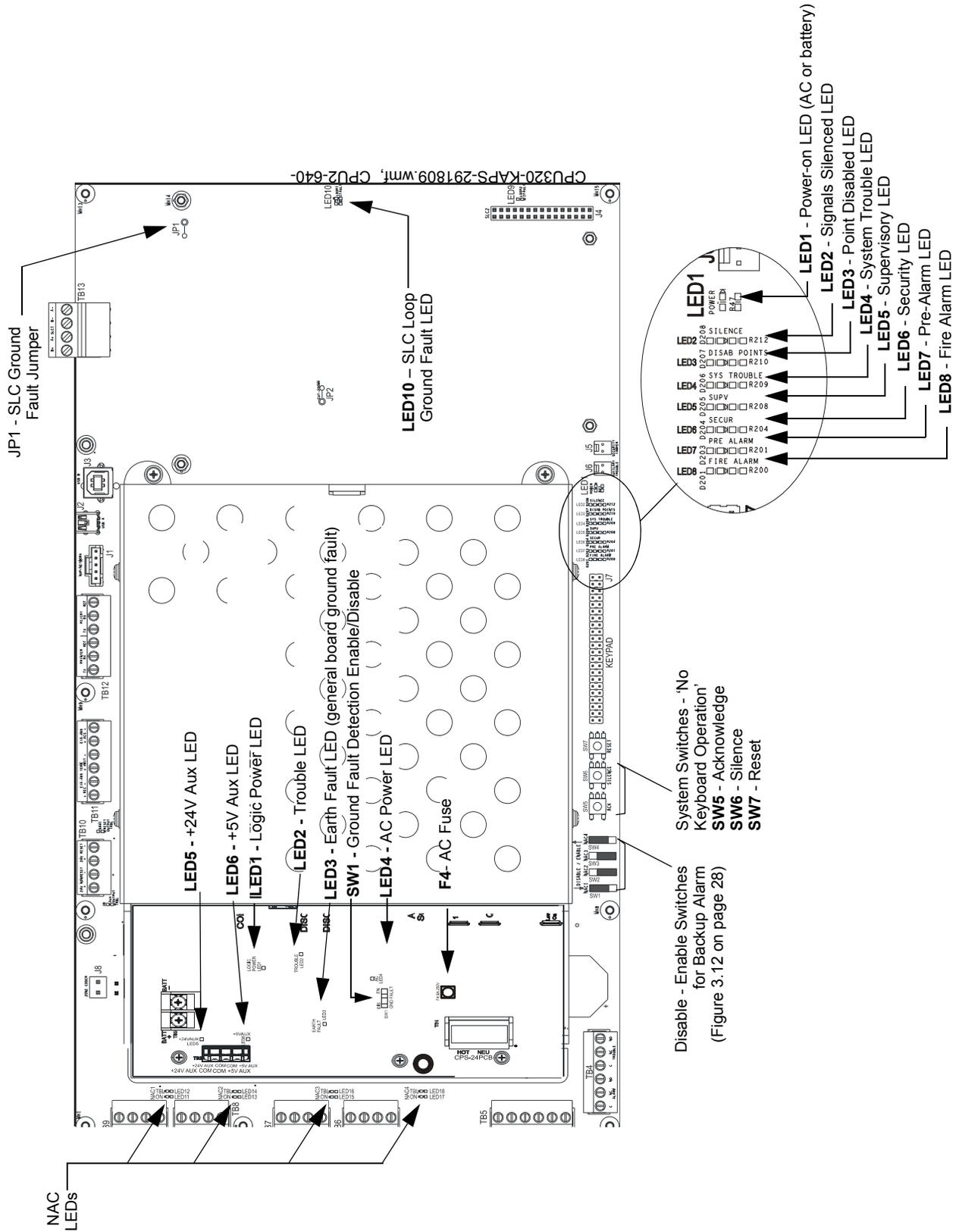


Figure 2.3 NFS-320 and Power-Supply: Jumpers, LEDs and Switches

## 2.2.5 System Cabinet

The control panel is factory installed in its backbox. The lockable door is hinged on the left and opens a full 180 degrees. Mounting methods include surface-mounting or semi-flush mounting on a wall between 16 inch (40.64 cm) on-center studs. A trim ring option is available for semi-flush mounting.

External measurements:

- Backbox: 18.12 in. (46.025 cm) width;  
18.12 in. (46.025 cm) height;  
5.81 in. (14.76 cm) depth.
- Door: 18.187 in. (46.195 cm) width;  
18.40 in. (46.736 cm) height;  
0.75 in. (1.905 cm) depth.

When using trim ring TR-320, mount backbox with at least 1 inch (2.54 cm) between wall surface and front of backbox, to allow door to open fully past the trim ring. The TR-320 molding width is 0.905 in. (2.299 cm).

### ■ Additional Options

The NFS-320/E/C control panel provides space for one or two additional option boards to be installed, as shown in Figure 3.3 on page 21. The NFS-320C fulfills ULC annunciation requirements; see *NFS-320C Canadian Applications Addendum* for details. A variety of compatible annunciators are available with their own backboxes; see Section 2.3, “Compatible Equipment”.

## 2.3 Compatible Equipment

These are the most common devices at time of publishing; the most complete list of compatible intelligent SLC loop devices is provided in the *SLC Wiring Manual*; for conventional non-addressable equipment see the *Device Compatibility Document*. These devices are UL and ULC listed unless marked otherwise (in parentheses next to the product). Other control panels and their equipment can also be connected in a network, via Noti•Fire•Net version 5.0 or the High-Speed Noti•Fire•Net; refer to the *Noti•Fire•Net Version 5.0 & Higher Installation Manual* or *High-Speed Noti•Fire•Net Installation Manual* for details. For products documented separately, see Section 1.3 “Related Documents”.



### WARNING: UL 9th Edition Compliance

This product has been certified to comply with the requirements in the Standard for Control Units and Accessories for Fire Alarm Systems, UL 864 9th Edition. Operation of the NFS-320/E/C with products not tested for UL 864 9th Edition has not been evaluated and may not comply with NFPA 72 and/or the latest edition of UL 864. These applications will require the approval of the local Authority Having Jurisdiction (AHJ).

Peripheral devices in the second list were listed under UL 8th Edition and may only be used in retrofit applications (see Section 1.2, “UL 864 Compliance”, on page 8).

### Notifier Compatible Equipment

**NOTE:** Products marked with a checkmark “✓” have not received UL 864 9th Edition certification and may only be used in retrofit applications (see Section 1.2, “UL 864 Compliance”, on page 8)

**NOTE:** The wireless option is not suitable for ULC.

#### Electronic Equipment

**A77-716B** End-of-Line Resistor Assembly  
**Acclimate Plus™ FAPT-751, FAPT-851** Combination Photoelectric/Heat Detector  
**ACM-24AT** Annunciator Control Module  
**ACM-48A** Annunciator Control Module  
**ACM-8R** Annunciator Control Module  
**ACPS-610** Addressable Charger/Power Supply  
**AEM-24AT** Annunciator Expander Module  
**AEM-48A** Annunciator Expander Module  
**AKS-1B** Annunciator Key Switch  
**APS2-6R** Auxiliary Power Supply  
**B200S** Addressable sounder base  
**B200SR** Sounder base  
**B501** Intelligent base  
**B501BH** Sounder base  
**B501BH-2** Sounder base, steady tone  
**B501BHT-2** Sounder base, temporal tone  
**B710LP/B210LP** Intelligent detector base  
**BAT-12120** Battery 12-volt, 12 amp-hour  
**BAT-12180** Battery 12-volt, 18 amp-hour  
**BAT-12250** Battery 12-volt, 25 amp-hour  
**BAT-12260** Battery 12-volt, 26 amp-hour  
**BAT-12550** Battery 12-volt, 55 amp-hour  
**BAT-12600** Battery 12-volt, 60 amp-hour  
**BX-501** Intelligent Detectors/Sensors Base  
**CCM-1** Communication Converter Module  
**CMX-1** Addressable Control Module  
**CMX-2** Addressable Control Module  
**CPU-320/E** Control Panel Circuit Board  
**CPX-551** Ionization Smoke Detector  
**CPX-751** Intelligent Ionization Smoke Detector  
**CRT-2** Video Display Monitor with Keyboard  
**DHX-501, DHX-502** Duct Detectors  
**DNR/W** Intelligent Non-Relay Photoelectric Duct Detector  
**DPI-232** Direct Panel Interface  
**FCM-1** NAC Module  
**FCM-1-REL** Control Module  
**FCO-851** IntelliQuad PLUS Multi-Criteria Fire/CO Detector  
**FCPS-24S6/S8** Field Charger Power Supply  
**FDM-1** Dual Monitor Module  
**FDRM-1** Dual Monitor/Dual Relay

**FDU-80, FDU-80G** Remote Fire Annunciator  
**FDX-551** Intelligent Thermal Sensor  
**FMM-1** Monitor Module  
**FMM-101** Mini Monitor Module  
**FRM-1** Relay Module  
**FSA-8000 FAAST** Intelligent Aspiration Detector  
**FSB-200** Single-ended beam smoke detector.  
**FSB-200S** Single-ended beam smoke detector with sensitivity testing  
**FSC-851** IntelliQuad Multi-Criteria Smoke Detector  
**FSD-751P** Photoelectric Duct Detector  
**FSD-751PL** Low-flow Duct Detector  
**FSD-751RP** Photoelectric Duct Detector with alarm relay  
**FSD-751RPL** Low-flow Duct Detector with alarm relay  
**FSH-751 HARSH™** Smoke Detector  
**FSI-751, FSI-851** Ion Detector  
**FSL-751 VIEW®** Low Profile Laser Detector  
**FSM-101** Pull Station Monitor Module  
**FSP-751, FSP-851** Photo Detector  
**FSP-751T, FSP-851T** Photo/Thermal Detector  
**FSP-851R/DNR** Remote Test Capable Photoelectric Smoke Detector  
**FST-751, FST-851** Thermal Detector  
**FST-751R, FST-851R** Thermal Detector (rate of rise)  
**FST-851H** High Temperature Detector  
**FWSG** Wireless Gateway.  
**FWD-200P** Wireless photo detector for use with the FWSG Wireless Gateway.  
**FWD-200ACCLIMATE** Wireless Acclimate detector for use with the FWSG Wireless Gateway.  
**FWH-200FIX135** Wireless, fixed-temperature heat detector for use with the FWSG Wireless Gateway.  
**FWH-200ROR135** Wireless, rate-of-rise heat detector for use with the FWSG Wireless Gateway.  
**FW-MM** Wireless Monitor Module for use with the FWUIDDJ.  
**FTM-1** Telephone Module  
**FZM-1** Monitor and Zone Interface Module  
**HPX-751** Intelligent HARSH™ Detector  
**HS-NCM-MF** High-Speed Network Communications Module (Multi-Mode Fiber)  
**HS-NCM-MFSF** High-Speed Network Communications Module (Multi-Mode Fiber to Single-Mode Fiber)  
**HS-NCM-SF** High-Speed Network Communications Module (Single-Mode)

*Continued on next page...*

Fiber)	<b>NCM-W</b> Network Communications Module (Wire)
<b>HS-NCM-W</b> High-Speed Network Communications Module (Wire)	<b>NCS</b> Network Control Station
<b>HS-NCM-WMF</b> High-Speed Network Communications Module (Wire to Multi-Mode Fiber)	<b>NFV-25/50</b> Notifier FireVoice-25/50
<b>HS-NCM-WSF</b> High-Speed Network Communications Module (Wire to Single-Mode Fiber)	<b>ONYXWorks</b> Graphical Workstation
<b>ISO-X</b> Loop Fault Isolator Module	<b>PRN-6</b> 80-Column Printer
<b>KDM-R2</b> Keypad/Display Unit	<b>R-120</b> 120 Ohm End-of-Line Resistor
<b>LCD-80</b> Liquid Crystal Display Annunciator	<b>R-2.2K</b> 2.2K End-of-Line Resistor
<b>LCD2-80</b> Liquid Crystal Display Annunciator	<b>R-27K</b> 27K End-of-Line Resistor
<b>LDM-32</b> Lamp Driver Module	<b>R-470</b> 470 End-of-Line Resistor
<b>LDM-E32</b> Lamp Driver Module	<b>R-47K</b> 47K End-of-Line Resistor
<b>LDM-R32</b> Lamp Driver Module	<b>RM-1</b> Remote Microphone
<b>LPX-751</b> VIEW® Low Profile Laser Detector (CLIP)	<b>RM-1SA</b> Remote Microphone
<b>MMX-1</b> Addressable Monitor Module	<b>RPT-485F</b> EIA-485 Repeater (Fiber)
<b>MMX-101</b> Addressable Mini Monitor Module	<b>RPT-485WF</b> EIA-485 Repeater (Wire/Fiber)
<b>MMX-2</b> Addressable Monitor Module	<b>RPT-485WF</b> EIA-485 Repeater (Wire/Fiber)
<b>N-ELR</b> Assortment ELR Pack with Mounting Plate	<b>SCS-8</b> , <b>SCE-8</b> Smoke Control Station
<b>NBG-12 Series</b> Manual Pull Station	<b>SCS-8L</b> , <b>SCE-8L</b> Smoke Control Lamp Driver
<b>NBG-12LRA</b> Agent Release-Abort Station	<b>SDX-551</b> Intelligent Photoelectric Detector
<b>NBG-12LX</b> Addressable Manual Pull Station	<b>SDX-751</b> Intelligent Photoelectric Detector
<b>NBG-12LXP</b> Portuguese-labeled Addressable Manual Pull Station	<b>STS-1/STS-200</b> Security Tamper Switch
<b>NBG-12LXSP</b> Spanish-labeled Addressable Manual Pull Station	<b>TM-4</b> Transmitter Module
<b>NCA-2</b> Network Control Annunciator	<b>UDACT</b> Universal Digital Alarm Communicator Transmitter
<b>NCM-F</b> Network Communications Module (Fiber)	<b>UDACT-2</b> Universal Digital Alarm Communicator/Transmitter

### Backboxes, Chassis, Dress Panels, etc.

<b>ABF-1B</b> Annunciator Flush Box	<b>ABS-1TB</b> Annunciator Surface Box
<b>ABF-1DB</b> Annunciator Flush Box with Door	<b>ABS-2B</b> Annunciator Surface Box
<b>ABF-2B</b> Annunciator Flush Box	<b>ABS-4D</b> Annunciator Surface Box
<b>ABF-2DB</b> Annunciator Flush Box with Door	<b>ABS-8RB</b> Annunciator Backbox for ACM-8R
<b>ABF-4B</b> Annunciator Flush Box	<b>NFS-LBB</b> Battery Box
<b>ABM-16AT</b> Annunciator Blank Module	<b>NFS-LBBR</b> Red Battery Box
<b>ABM-32A</b> Annunciator Module Blank	<b>VP-2B</b> 2" Filler Dress Plate
<b>ABS-1B</b> Annunciator Surface Box	

### System Sensor Equipment

<b>A2143-00</b> End of Line Resistor Assembly	<b>EOLR-1</b> End-of-Line Resistor Assembly
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### Retrofit Equipment: Compatible Notifier Equipment Listed Under Previous Editions of UL 864

NOTE: The products in this list have not received UL 864 9th Edition certification and may only be used in retrofit applications (see Section 1.2, "UL 864 Compliance", on page 8).

✓ <b>ACM-16AT</b> Annunciator Control Module	✓ <b>PRN-4</b> , <b>PRN-5</b> 80-Column Printers
✓ <b>ACM-32A</b> Annunciator Control Module	✓ <b>RA400</b> Remote Annunciator
✓ <b>ACPS-2406</b> Auxiliary Charger/Power Supply	✓ <b>RA400Z</b> Remote Annunciator with diode
✓ <b>AEM-16AT</b> Annunciator Expander Module	✓ <b>XP5-C</b> Transponder Control Module
✓ <b>AEM-32A</b> Annunciator Expander Module	✓ <b>XP5-M</b> Transponder Monitor Module
✓ <b>APS-6R</b> Auxiliary Power Supply	✓ <b>XPC-8</b> Transponder Control Module
✓ <b>BGX-101L</b> Addressable Manual Pull Station	✓ <b>XPDP</b> Transponder Dress Panel
✓ <b>CHG-120</b> Battery Charger	✓ <b>XPM-8</b> Transponder Monitor Module
✓ <b>FCPS-24</b> Field Charger Power Supply	✓ <b>XPM-8L</b> Transponder Monitor Module
✓ <b>IPX-751</b> Advanced Multi-Sensor Intelligent Detector	✓ <b>XPP-1</b> Transponder Processor
✓ <b>NCA</b> Network Control Annunciator	✓ <b>XPR-8</b> Transponder Relay Module
✓ <b>P-40</b> Keltron Printer	
✓ <b>P40-KITB</b> Dress plate for Keltron Printer	

NOTE: The FWSG Wireless Gateway as part of the wireless network has been tested for compliance with the Federal Communications Commission (FCC) requirements of the United States Government. This product has not been evaluated for use outside the USA. Use of this system outside the USA is subject to local laws and rules to which this product may not conform. It is the sole responsibility of the user to determine if this product may be legally used outside the USA.

# Section 3: Installation

## 3.1 Preparing for Installation

Choose a location for the fire alarm system that is clean, dry, and vibration-free with moderate temperature. The area should be readily accessible with sufficient room to easily install and maintain it. There should be sufficient space for cabinet door(s) to open completely.

Carefully unpack the system and inspect for shipping damage. Count the number of conductors needed for all devices and find the appropriate knockouts. (Refer to Section 3.9 “UL Power-limited Wiring Requirements” for selection guidelines.)

Before installing the fire alarm system, read the following:

- Review the installation precautions at the front of this manual, including temperature and humidity limits for the system (Page 3).
- All wiring must comply with the National and Local codes for fire alarm systems.
- Do not draw wiring into the bottom 9 inches (22.86 cm) of the cabinet except when using a separate battery cabinet; this space is for internal battery installation.
- Review installation instructions in Section 3.2 “Installation Checklist”.



**CAUTION:**

Make sure to install system components in the sequence listed below. Failure to do so can damage the control panel and other system components.

---



**WARNING:**

This system contains static-sensitive components. Always ground yourself with a proper wrist strap before handling any circuits. Use static-suppressive packaging to protect electronic assemblies removed from the unit.

---

### 3.1.1 Standards and Codes

In addition, installers should be familiar with the following standards and codes:

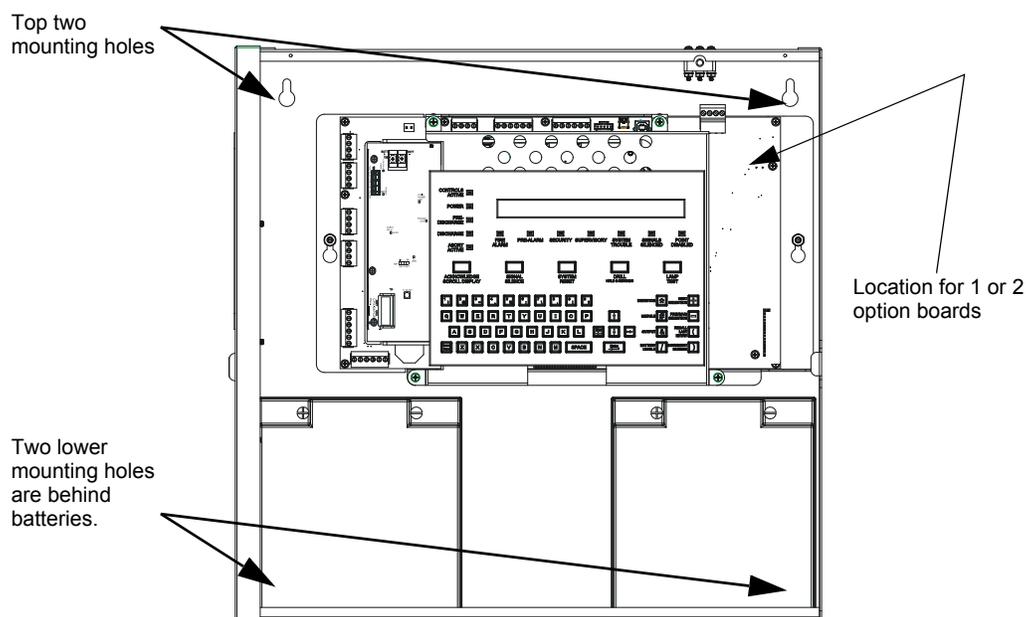
- NEC Article 300 Wiring Methods.
- NEC Article 760 Fire Protective Signaling Systems.
- Applicable Local and State Building Codes.
- Requirements of the Local Authority Having Jurisdiction.
- C22.1-98 The Canadian Electrical Code, Part 1.
- CAN/ULC-S5524-01 Standard for the Installation of Fire Alarm Systems.

## 3.2 Installation Checklist

Table 3.1 provides an installation checklist for installing, wiring, and testing the NFS-320/E/C system. It has references to installation information included in manuals listed in Section 1.3 “Related Documents”.

Seq	Task	Refer to
1.	Mount the cabinet backbox to the wall.	Section 3.3 “Mounting a Cabinet”
2.	If adding option boards such as wire and/or fiber version of the NCM/HS-NCM or TM-4: <ul style="list-style-type: none"> <li>• Remove keypad.</li> <li>• Install option boards</li> <li>• Replace keypad</li> </ul>	Section 3.4 “Installing Option Boards”, Section 1. “Remove and re-install KDM-R2 as shown in Figure 3.2. It may be convenient to do some basic field-wiring before reinstalling KDM-R2.”, and Section 3.4 “Installing Option Boards” Also see option board documentation for board-specific details.
3.	Optional: Install auxiliary power supply and/or external battery charger; set backup-alarm switches.	Auxiliary power manuals, Section 3.8 “Backup-Alarm Switches”
4.	Connect AC wiring, place batteries into backbox without connecting them, and run cable to optional power supplies, DC power outputs, NACs, and relays. <b>CAUTION: Do not apply AC or DC power at this time.</b>	Section 3.5 “Connecting the Power Cables”
5.	Optional: Install output devices such as a printer, or CRT terminal.	Section 3.11 “Installing Remote Printers and/or CRT”
6.	Wire annunciators and network connections.	Relevant product manuals
7.	Wire the Signaling Line Circuits.	Section 3.12 “Wiring a Signaling Line Circuit (SLC)”
8.	Terminate wire shielding as instructed.	SLC Wiring Manual
9.	Apply AC power to the control panel by placing the external circuit breaker to the ON position. <b>Do NOT connect batteries.</b>	
10.	Check AC power.	Table 3.2 in Section 3.5 “Connecting the Power Cables”
11.	Connect the batteries using interconnect cable, P/N 75560 and 75561.	
12.	Program the control panel.	<i>NFS-320/E/C Programming Manual and VeriFire Tools Online Help.</i>
13.	Field test the system.	Section 5 “Testing the System”

**Table 3.1 Installation Checklist**



**Figure 3.1 NFS-320/E/C in Cabinet**

### 3.3 Mounting a Cabinet

This section provides instructions for mounting the NFS-320/E/C backbox to a wall. The NFS-320/E/C is assembled with a removable chassis that can be removed to provide easier access to the backbox's mounting holes, or to allow the electronics to be worked on outside the cabinet.

Follow these guidelines when mounting the backbox:

- Locate the backbox so that the top edge is 66 inches (1.6764 m) above the surface of the finished floor.
- Access to the cabinet shall be provided in accordance with NFPA 90, article 110.33.
- Allow sufficient clearance around cabinet for door to swing freely. (See Section 2.2.5 “System Cabinet”.)
- Use the four holes in the back surface of the backbox to provide secure mounting. (See Figure 3.1 on page 19.)
- Mount the backbox on a surface that is in a clean, dry, vibration-free area.



---

**CAUTION:**

Unless you are familiar with the placement of components within this backbox, only use the knockout locations provided for conduit entry.

---

Follow the instructions below:

1. Mark and pre-drill holes for the top two keyhole mounting bolts (0.25 inch, 0.635 cm). Use mounting hardware appropriate for the mounting surfaces; see UL 2017 Pull-Test Requirements.
2. Select and punch open the appropriate knock-outs. (For selection guidelines, see Section 3.9 “UL Power-limited Wiring Requirements”.)
3. Using the keyholes, mount the backbox over the two screws.
4. Mark the location for the two lower holes, remove the backbox and drill the mounting holes.
5. Mount the backbox over the top two screws, then install the remaining fasteners. Tighten all fasteners securely.
6. Feed wires through appropriate knockouts.

### 3.4 Installing Option Boards

The NFS-320/E/C ships fully assembled with in its cabinet. One or two option boards can be mounted inside the NFS-320 cabinet, under the keypad, as shown in Figure 3.3. Option boards that can be installed internally include the wire and/or fiber versions of the NCM or HS-NCM, TM-4, and UDACT or UDACT-2. See Section 2.3, “Compatible Equipment” for a complete list. When installing option boards, temporarily remove the KDM-R2 keypad/display unit to provide full access to hardware connections. It may be convenient to do some basic field-wiring before reinstalling KDM-R2.



---

**NOTE:** *UDACT or UDACT-2 only:*

If using UDACT or UDACT-2 inside the cabinet, do not install a second option board. See the *UDACT Manual* or *UDACT-2 Manual* for instructions on using the mounting bracket.

---

1. Remove and re-install KDM-R2 as shown in Figure 3.2. It may be convenient to do some basic field-wiring before reinstalling KDM-R2.
2. Lay the first option board over the four stand-offs already installed on the CPU, so that the holes and stand-offs align.

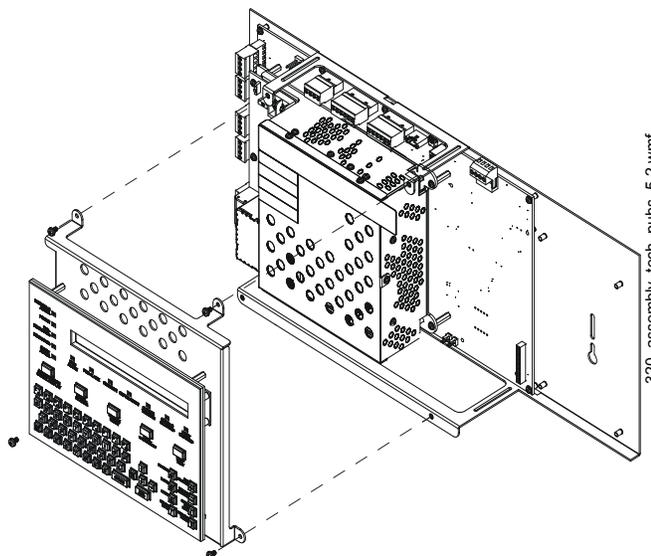


Figure 3.2 Removing and Reinstalling KDM-R2

3. If attaching a second option board, use its standoffs to secure the first option board, then lay the second option board over the standoffs. Two sizes of standoffs are shipped with the option boards; select standoffs that allow sufficient clearance for electronics on the lower option board.
4. Secure the top option board with four #4-40 screws (supplied).
5. Re-attach KDM-R2.

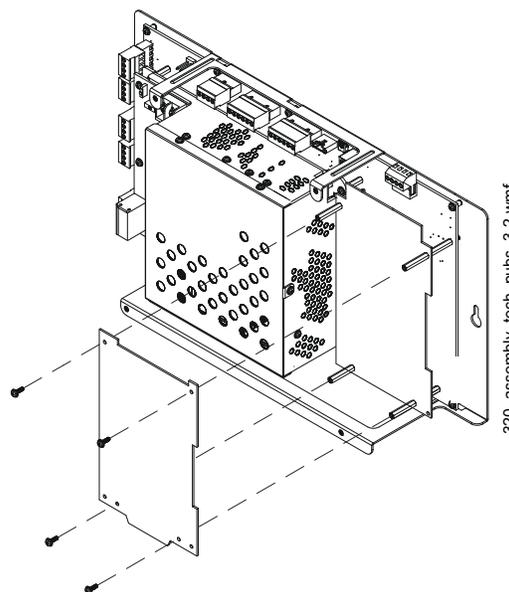


Figure 3.3 Installing Option Boards



**CAUTION:**

It is critical that all mounting holes of the NFS-320/E/C are secured with a screw or standoff to insure continuity of Earth Ground.



**NOTE:** It may be convenient to field-wire the SLC loop before installing any option boards, and to make wiring connections on the first option board before installing a second option board in front of it.

### Installing a Transmitter Module TM-4

TM-4 is power-limited. Connections are on TB10 nonresettable output and TB11 EIA-485 ACS Mode. Refer to the *Transmitter Module TM-4* installation document for installation details.

## Network Communications Module

If networking two or more control panels or network control annunciators, each unit requires a Network Communications Module (NCM) or a High-Speed Network Communications Module (HS-NCM); wire and fiber versions are available for each. The wire and/or fiber versions of the NCM or HS-NCM can be installed in any standard option-board position (see Section 3.4, “Installing Option Boards”; the default position is immediately to the right of the control panel.

1. Mount the NCM/HS-NCM in the selected position and screw firmly in place.
2. Connect J1 on the control panel to J3 on the NCM or J6 of the HS-NCM using the network cable provided (P/N 75556) as described in the *NCM Installation Document* and the *HS-NCM Installation Document*. Do not connect two NCM/HS-NCMs via NUP ports (“NUP to NUP”).
3. **When installing the NCM:** Connect Channel A and/or Channel B as described in the *NCM Installation Document*.  
**When installing the HS-NCM:** Connect Channel A to Channel B as described in the *HS-NCM Installation Document*.




---

**NOTE:** See the *Noti•Fire•Net Manual* or the *High-Speed XLS-NET Manual* and *NCM Installation Document* or the *HS-NCM Installation Document* for wiring diagrams and system configuration information. See the *BMP-1 Product Installation Drawing* if considering mounting the module behind blank module plate in a dress plate or annunciator backbox.

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**NOTE:** Over-bending fiber-optic cable can damage it. Do not exceed a 3 inch (7.62 cm) minimum bend radius.

---




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**NOTE:** NCM hardware is not compatible with HS-NCM hardware and should not be mixed on the same network.

---

## 3.5 Connecting the Power Cables



### WARNING:

Remove all power sources to equipment while connecting electrical components. Leave the external, main power breaker OFF until installation of the entire system is complete.

---



### WARNING:

Several sources of power can be connected to the control panel. Before servicing the control panel, disconnect all sources of input power *including the battery*. While energized, the control panel and associated equipment can be damaged by removing and/or inserting cards, modules, or interconnecting cables.

---

### 3.5.1 Overview

Complete all mounting procedures and check all wiring before applying power. Electrical connections include the following:

- Primary AC power source – 120 VAC, 50/60 Hz, 5.0 A from line voltage source (with NFS-320E use 220-240 VAC, 50/60 Hz, 2.5 A). Overcurrent protection for this circuit must comply with Article 760 of the National Electrical Code (NEC) and/or local codes. Use 12 AWG (3.31 mm<sup>2</sup>) wire (maximum) with a 600-volt rating.
- Secondary power source – 24 VDC from batteries, installed in the control panel (or in an optional battery cabinet). Secondary (battery) power is required to support the system during loss of primary power.

- External power sources – 24 VDC power for Smoke Detectors (4 wire), NACs, and Annunciators.
- Auxiliary power source – 24 VDC power @ 0.5 A and 5 VDC power @ 0.15 A from TB2 on the CPS-24/E.

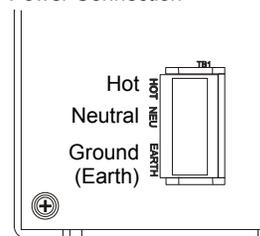
See Appendix B “Electrical Specifications” for details and overall installation guidelines.

### 3.5.2 Connecting the Control Panel to AC Power

Connect primary power as follows (see Figure 3.4):

1. Turn off the circuit breaker at the main power distribution panel.
2. Open the hinged insulating cover on TB1.
3. Connect the service ground to terminal marked Ground (Earth).
4. Connect the primary neutral line to terminal marked NEUTRAL and the primary Hot line to terminal marked HOT.
5. Close the hinged insulating cover over TB1.

TB1 - AC Power Connection



CPS-24\_TB1.wmf

**Figure 3.4 CPS-24/E:  
AC Power Connections**

### 3.5.3 Checking AC Power

Table 3.2 contains a checklist for checking the system with AC power applied:



**CAUTION:**

While checking AC power, make sure batteries are not connected. Follow the sequence of steps in Section 3.2 “Installation Checklist”, Table 3.1; this is Step 10.

Component	Status
Control panel circuit board	The green AC Power indicator on; the system Trouble indicator on because batteries are not connected.
Each option board	In an unconfigured system, the yellow Trouble indicator may come on for approximately 10 seconds after applying AC power.
Each auxiliary power supply	The yellow Trouble indicator comes on because batteries are not connected.

**Table 3.2 AC Power Checklist**

### 3.5.4 Installing and Connecting the Batteries


**WARNING:**

Battery contains sulfuric acid which can cause severe burns to the skin and eyes, and can destroy fabrics. If contact is made with sulfuric acid, immediately flush skin or eyes with water for 15 minutes and seek immediate medical attention.


**WARNING:**

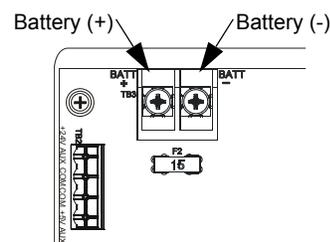
Do not connect the Battery Interconnect Cables (P/N 75560 and 75561) at this time. Make this connection AFTER initial system primary powerup. Follow sequence of steps in Section 3.2 "Installation Checklist", Table 3.1; this is Step 11.

Batteries are installed in the control panel cabinet or in a separate battery cabinet which can be mounted below the control panel or up to 20 feet (6.096 m) away from the control panel, in conduit in the same room.

Connect the battery as follows (see Figure 3.4 above):

1. Install batteries into bottom of cabinet or into separate battery cabinet.
2. Connect the red cable from TB3(+) on the CPS-24/E power supply to the positive (+) terminal of one battery.
3. Connect the black cable from TB3(-) on the CPS-24/E power supply to the negative (-) terminal of the **other** battery.
4. Connect the remaining cable between the negative (-) terminal on the first battery to the positive (+) terminal on the second battery.

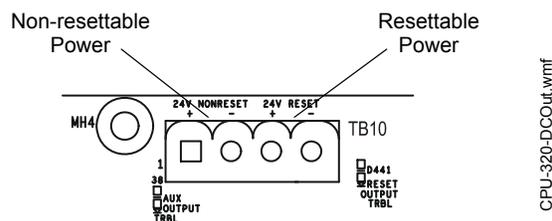
**TB3 - Battery Connection**



**Figure 3.5 CPS-24/E:  
DC Power Connections**

### 3.5.5 External DC Power Output Connections

Terminal TB10 provides two (2) power outputs, resettable and non-resettable. Each output is power-limited. Follow sequence of steps in Section 3.2 "Installation Checklist", Table 3.1; this is part of Step 4.



**Figure 3.6 Power Supply DC Outputs - TB10**

**24 VDC Resettable Power Circuit (Four-Wire Smoke Detectors).** The power supply provides a single 24 VDC filtered, power-limited, resettable power circuit for devices that require resettable power (such as four-wire smoke detectors). This circuit is power-limited, but must be supervised. To provide supervision, install a UL-listed end-of-line power supervision relay (such as the EOLR-1) after the last device. Connect the power supervision relay normally open contact in series with an Initiating Device Circuit (IDC). The four-wire power circuit energizes the power supervision relay. When you reset the system, the control panel removes power from these terminals for approximately 15 seconds.

Connect external field wires to the power supply terminals TB10 RESET(+) and (–) to provide up to 1.25 A of current for powering four-wire smoke detectors. See Figure 3.6 above. TB2 (on CPS-24), TB10 and all 4 NACs share a maximum of 3.0 A in standby and 6.0 A in alarm.

**24 VDC Non-resettable Power Circuit** The power supply provides one 24 VDC filtered, power-limited, non-resettable power output, capable of up to 1.25 A. Use this circuit to power devices that require low-noise 24 VDC power (such as Notifier annunciator model ACM-24AT or the transmitter module TM-4).

Connect external field wires to power supply terminals TB10 NONRESET (+) and (–) to provide up to 1.25 A of non-resettable current for powering external devices such as annunciators. See Figure 3.6 above. TB2 (on CPS-24), TB10 and all 4 NACs share a maximum of 3.0 A in standby and 6.0 A in alarm.



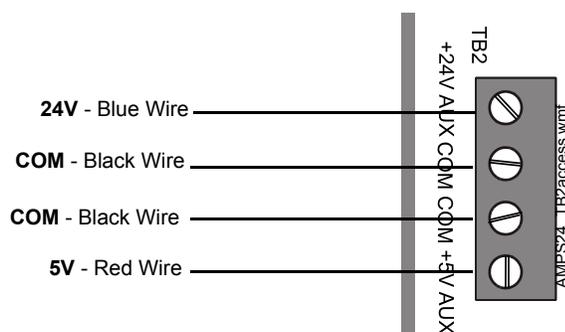
**CAUTION:**

During system reset, power remains at terminals TB10 NONRESET (+) and (–).

### 3.5.6 Accessories DC Power Output Connections

Terminal TB2 supplies one (1) non-resettable, power-limited 24 VDC circuit and one nonresettable, power-limited 5 VDC circuit available to power external devices. Applications that require a 5V connection to the Accessories Output, such as an UZC-256, must be within 10 feet (3.658 meters) of the power supply. The distance from the power supply to the accessory requiring power must not extend past the length of the supplied cable, P/N 75657 (supplied with UZC-256), which is 10 feet long. Do not splice or otherwise extend P/N 75657. Refer to section B.2, "Wire Requirements" of this manual for all applications requiring a 24V connection. Connect wiring with all power sources off.

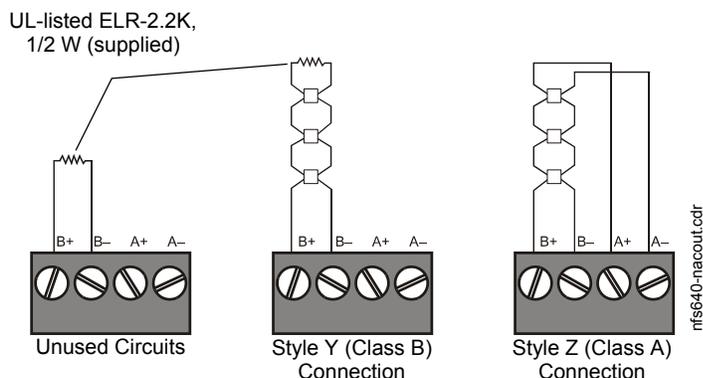
- 24 VDC (nominal) @ 0.5 A max
- 5 VDC (nominal) @ 0.15 A max



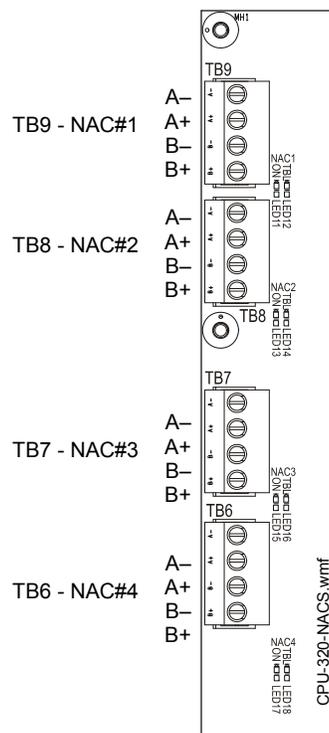
**Figure 3.7 Connecting to the Accessories Output TB2 on CPS-24/E**

### 3.6 NAC Connections and Releasing Circuits

The control panel provides four NAC terminals as shown in Figure 3.9. Each can be configured as Style Y (Class B) or Style Z (Class A) as shown in Figure 3.8. Each circuit can provide 1.5 A of current, but the total current drawn from the main power supply cannot exceed 7.4 A in alarm condition (refer to Table A.2). Additionally, TB2 (on CPS-24), TB10 and all 4 NACs share a maximum of 3.0 A in standby and 6.0 A in alarm. NAC circuits are supervised and power-limited. Use UL-listed 24 VDC notification appliances only (refer to the *Device Compatibility Document*).



**Figure 3.8 Notification Appliance Circuit (NAC) Connections**



**Figure 3.9 NAC Terminals and NAC LEDs**

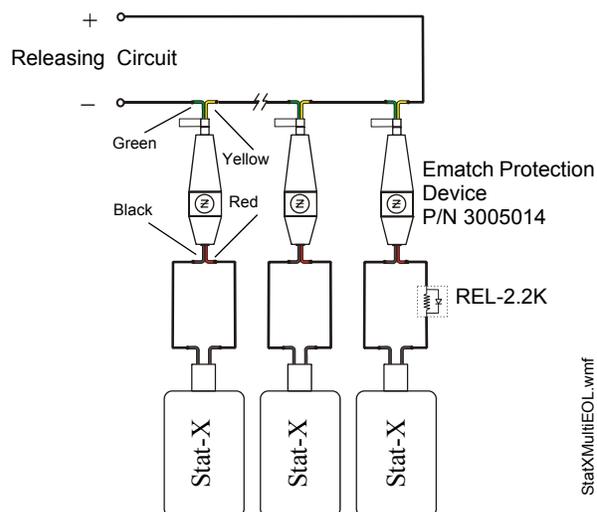


**NOTE:** Any NAC can be programmed as a releasing circuit, and the releasing circuit must be supervised; For more information, refer to Section 4.7 “Releasing Applications” in this manual and the *NFS-320/E/C Programming Manual*. Refer to the *Device Compatibility Document* for UL-listed compatible releasing devices. Sample connections for NAC terminals are shown in Figure 3.8. Follow sequence of steps in Section 3.2 “Installation Checklist”, Table 3.1; this is part of Step 4.

### 3.6.1 Stat-X Devices

Figure 3.10 shows typical wiring for STAT-X devices using the Ematch Protection Device (P/N 3005014). Note the following:

- Each Stat-X device requires an Ematch Protection Device to protect against high-voltage transient signals, such as lightning, that may cause the device to accidentally release.
- Multiple Stat-X devices can be connected in series (as shown).
- No more than ten (10) Stat-X devices can be connected on a single releasing circuit.
- A REL-2.2K can be installed on a single Stat-X device for short circuit detection. For multiple Stat-X devices installed in series, the REL-2.2K is installed on the last device on the releasing circuit (as shown). A REL-2.2K is required for ULC applications.
- Stat-X devices are not to be used with the FCM-1 or FCM-1-REL.



**Figure 3.10** Wiring Diagram for Stat-X Devices

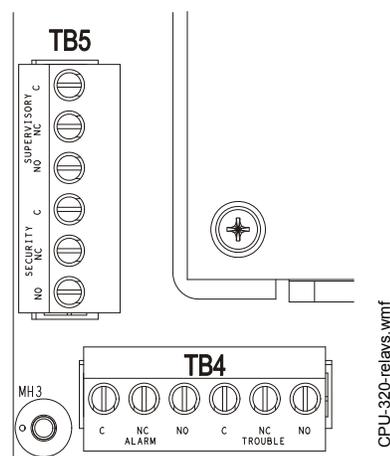
## 3.7 Output Relay Connections

The panel provides a set of Form-C relays. These are rated for 2.0 A at 30 VDC (resistive):

- Alarm - TB4
- Trouble - TB4
- Supervisory - TB5
- Security - TB5

These are power-limited only if connected to a power-limited source.

Using VeriFire Tools, the Supervisory and Security contacts can also be configured as Alarm contacts. Follow instructions in the VeriFire Tools online help.



**Figure 3.11** Form-C Relay Connections

## 3.8 Backup-Alarm Switches

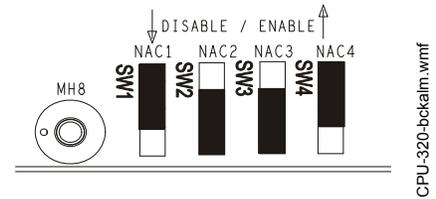

**WARNING:**

Do not enable the BACKUP option switch for any of the four Notification Appliance Circuits (NACs) if they are used for releasing functions!

Backup alarm switches are provided that enable NACs and the alarm relay to activate during a backup alarm condition. If the main board's microcontroller fails and an alarm is reported by any detector or a monitor module that has backup reporting enabled, the NAC will turn on if the corresponding switch was enabled. The alarm will activate during microcontroller failure regardless of the settings of switches SW1-SW4.

- SW1 - NAC#1
- SW2 - NAC#2
- SW3 - NAC#3
- SW4 - NAC#4

So, for example, if SW1 and SW4 were enabled at the time of an alarm during microcontroller failure, NAC#1 and NAC#4 would activate. Follow sequence of steps in Section 3.2 "Installation Checklist", Table 3.1.

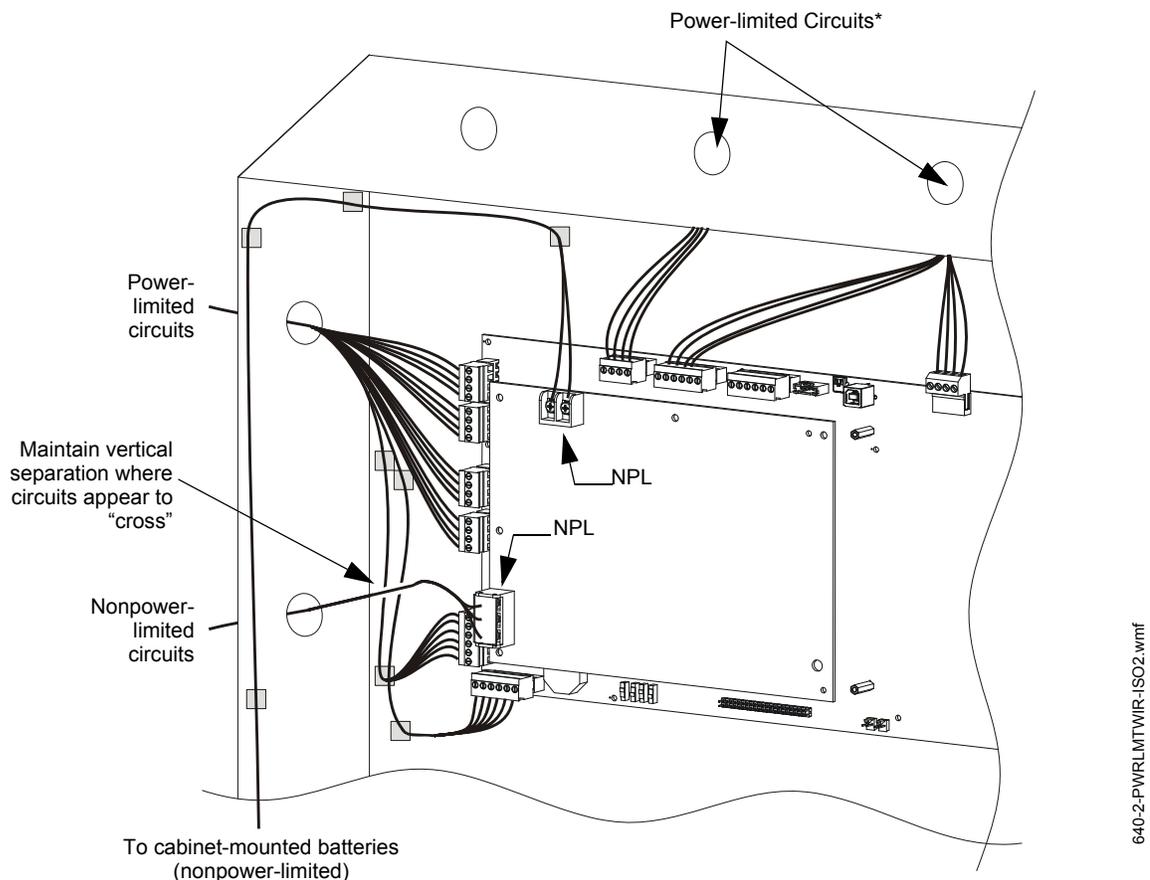


**Figure 3.12 Backup Alarm Switches**

### 3.9 UL Power-limited Wiring Requirements

Power-limited and nonpower-limited circuit wiring must remain separated in the cabinet. All power-limited circuit wiring must remain at least 0.25 inches (6.35 mm) from any nonpower-limited circuit wiring. All power-limited and nonpower-limited circuit wiring must enter and exit the cabinet through different knockout and or conduits. To maintain separation, group non-power limited modules together, i.e., group modules on the same side of the enclosure or in separate rows.

Figure 3.13 shows one configuration that meets these UL requirements. Equipment is configured with at least a 0.25 inch (6.35 mm) separation between power-limited and nonpower-limited wiring; AC and battery wiring is routed away from power-limited wiring.



**Figure 3.13 Typical Wiring for UL Power-limited Wiring Requirements (Shown with relays as connected to power-limited modules)**



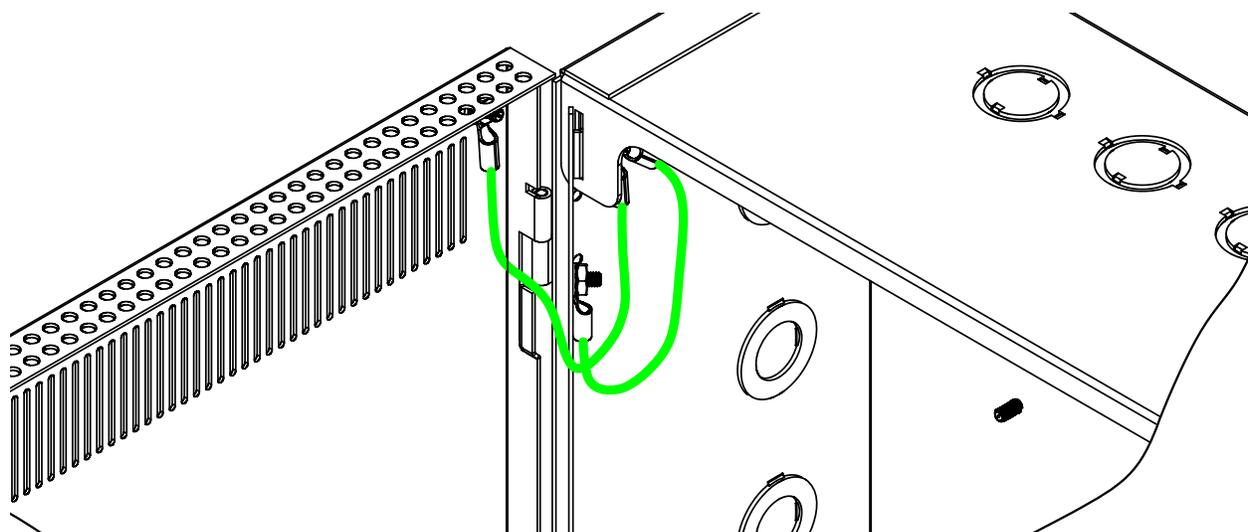
**NOTE:** AC and battery wiring are not power-limited. Maintain at least 0.25 inches (6.35 mm) between power-limited and non power-limited circuit wiring. Install tie wraps and adhesive squares to secure the wiring. Use a power-limited source for relay output on terminals TB5 and TB4.

See Figure 2.2, “NFS-320 and Power-Supply: Wiring Connections” on page 13 to identify power-limited and non-powerlimited circuits.

**NOTE:** Drawing is not to scale; proportions and angles are exaggerated to show wire-placement more clearly.

**NOTE:** If additional knockouts are added to the backbox, proper separation of power-limited and nonpower-limited wiring should be maintained.

**NOTE:** In order to meet UL wiring requirements, please install grounding straps as shown below.



### 3.9.1 Labeling Modules and Circuits

At the time of installation, each nonpower-limited circuit connected to ACM-8R, and LDM-R32 modules must be identified in the space provided on the cabinet door label when connected to a non-power-limited source of power.

The label lists all compatible power-limited modules and circuits; also see Figure 2.2 on page 13.

The LDM-R32 is power-limited only when connected to power-limited sources. When connected to a non-power-limited source, the power-limited marking must be removed.

## 3.10 Installing EIA-485 Devices

Figure 3.14 provides a closer view of the EIA-485 connections provided on TB11. Because specific connections can vary by the type of device being connected, refer to the product installation manual for details.

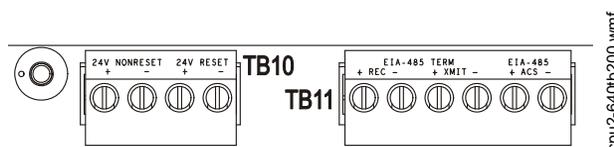


Figure 3.14 EIA-485 Connections

## 3.11 Installing Remote Printers and/or CRT

### 3.11.1 Custom Cable Fabrication

A custom cable needs to be fabricated to connect the PRN Printer or the CRT-2 Monitor to the system. Length of the cable will vary with each installation, but should not exceed a maximum length of 20 feet (6.1 m). Printer must be installed in the same room as the panel, and the cable be installed in conduit. Construct cable as follows:

1. Using overall foil/braided-shield twisted-pair cable, properly connect one end to the DB-25 Connector using the wiring specifications shown in the table below. (Custom cable kit P/N 90106 is provided.)

2. Tighten clamp on connector to secure cable.

DB-25 Connector (Custom cable kit 90106)	TB12 on Control Panel
Pin 3	TX
Pin 2	RX
Pin 7	REF

### 3.11.2 Installing and Configuring the PRN Series Printer

When connected to the Control Panel via an EIA-232 interface, the PRN prints a copy of all status changes within the control panel and time-stamps the printout with the time of day and date the event occurred. It provides 80 columns of data on standard 9" by 11" tractor-feed paper.



**NOTE:** You can also use the EIA-232 printer interface with UL-listed information technology equipment, such as personal computers, to monitor the control panel for supplementary purposes.

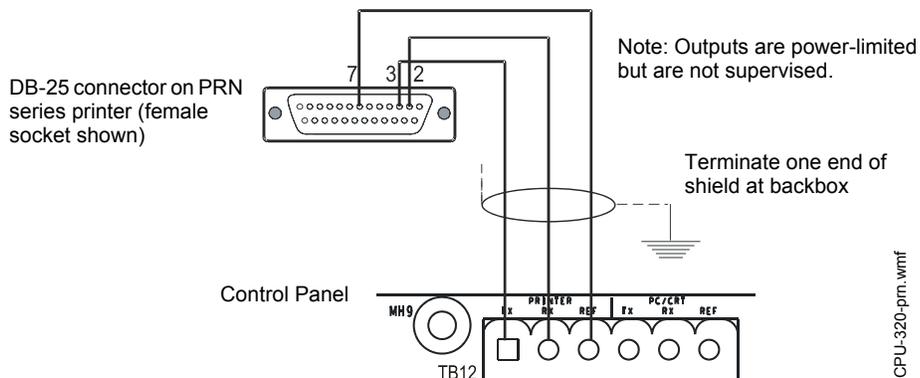
This section contains information on connecting a printer to the control panel and for setting the printer options.

#### Connecting a Remote PRN Series Printer

Remote printers require a 120 VAC, 50/60 Hz primary power source. If required for the fire alarm system configuration (for example, a Proprietary Fire Alarm System), a remote printer requires a secondary power source (battery backup). Because a secondary power source is not provided, use a separate Uninterruptable Power Supply (UPS) that is UL-listed for Fire Protective Signaling. You may use your building emergency power supply, so long as it meets the power continuity requirements of NFPA 72. Refer to NFPA 72 for further details.

Connect the remote printer to the Control Panel as follows:

1. Connect the three (3) open leads of the custom cable to the TB12 terminal block on the control panel as shown in Figure 3.15.
2. Plug the DB-25 connector end of the custom cable into the EIA-232 port of the remote printer. Tighten securely.



**Figure 3.15 Remote Printer Connections**

## Setting Printer Options

Refer to the documentation supplied with the PRN series printer for instructions on using the printer menu controls. Set the printer options (under the menu area) according to the settings listed in Table 3.3.

Option	Setting	Option	Setting
Font	HS Draft	CPI	10 CPI
LPI	6 LPI	Skip	0.5
ESC Character	ESC	Emulate	Epson FX-850
Bidirectional Copy	ON	I/O	
CG-TAB	Graphic	Buffer	40K
Country	E-US ASCII	Serial	
Auto CR	OFF	Baud	9600, 4800, or 2400
Color Option	Not Installed	Format	7 Bit, Even, 1 Stop
Formlen		Protocol	XON/XOFF
Lines	6LPI=60	Character Set	Standard
Standard	Exec 10.5	St.Zero	On
		Auto LF	Off
		PAPER	
		BIN 1	12/72"
		BIN 2	12/72"
		SINGLE	12/72"
		PUSH TRA	12/72"
		PULL TRA	12/72"
		PAP ROLL	12/72"

Table 3.3 PRN Setup Options

### 3.11.3 Installing and Configuring a CRT-2

A CRT-2 can only be used in a non-networked application when used with the NFS-320/E/C. For further details on setting up the CRT-2, refer to the *NFS-320/E/C Operations Manual*.

Connect a CRT-2 to the Control Panel as follows:

1. Connect the three (3) open leads of the custom cable to the TB12 terminal block on the control panel as shown in Figure 3.16.
2. Plug the DB-25 connector end of the custom cable into the EIA-232 port of the CRT-2. Tighten securely.
3. Set parameters as discussed in Table 3.16.

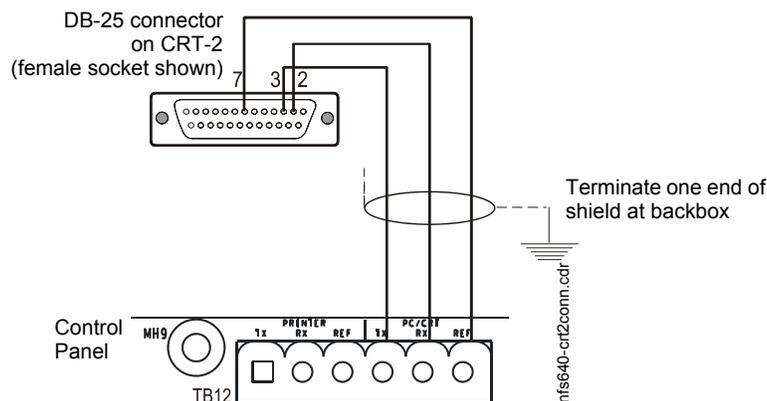


Figure 3.16 Connecting a CRT-2

### Setting CRT-2 Parameters

The CRT-2 communicates with the control panel through a protocol defined by thirteen groups of parameters. To access a parameter group, press the corresponding function key (F1-F12) as shown in Table 3.4 below. You can then program parameters in each group.

Enter the CRT-2 setup menu by pressing and holding the <Ctrl> key while pressing the <Scroll Lock> key. Use arrow keys to move through the selections in each setup group; press the space bar to view the options for each parameter. When finished programming all setup groups, press the <Pause> key. To save all changes, press <Y>.

Table 3.4 shows the standard settings for using the CRT-2 with the NFS-320/E/C; for one instance where these settings may change slightly see Section 3.11.4 “Connecting Multiple Printers, CRTs, or CRT/PRN Combination”. The basic settings for using the CRT-2 with NFS-320/E/C are:

- Baud Rate 9600
- Data format 8 1 N
- Protocol xon/off.



**NOTE:** This section covers installation only; for information on how the CRT-2 functions as part of the fire alarm system, see the *NFS-320/E/C Operations Manual*.



**NOTE:** The CRT cannot be connected at the same time as the network.

Function Key	CRT-2 Parameters		
F1: Quick ("Read Status" key)	Emulation=CRT-2 Comm Mode=Full Duplex Enhanced=On	EIA Baud Rate=9600 Aux Baud Rate=9600 Language=U.S.	EIA Data Format=8/1/N Aux Data Format=8/1/N Host/Printer=EIA/Aux
F2: Genrl ("Alter Status" key)	Emulation=CRT-2 Auto Font Load=On Monitor Mode=Off Host/Printer=EIA/Aux	Enhanced=On Auto Page=Off Bell Volume=09	Auto Wrap=Off Auto Scroll=On Warning Bell=On
F3: Displ ("Prog" key)	Page Length=24 Display Cursor=On Columns=80 Scroll=Jump	Screen Length=26 Lines Cursor=Blink Line Width Change Clear=Off Refresh Rate=60 Hz	Screen Video=Normal Auto Adjust Cursor=On Speed=Normal Overscan Borders=Off
F4: Kybd ("Spl Funct" key)	Language=U.S. Keyclick=Off Key Lock=Caps	Char Set Mode=ASCII Key Repeat=Off Keyboard Present=Yes	Key Mode=ASCII Margin Bell=Off
F5: Keys ("Prior" key)	Enter Key=<CR> Alt Key=Meta Pound Key=U.S.	Return Key=<CR> Disconnect=Pause	Backspace=<BS>/<DEL> Desk Acc=Disabled
F6: Ports ("Next" key)	EIA Baud Rate=9600 Aux Baud Rate=9600 EIA Xmt=Xon-Xoff Aux Xmt=Xon-Xoff EIA Break=Off Aux Break=Off	EIA Data Format=8/1/N Aux Data Format=8/1/N EIA Recv=Xon-Xoff(XPC) Aux Recv=Xon-Xoff(XPC) EIA Modem Control=Off Aux Modem Control=Off	EIA Parity Check=On Aux Parity Check=On EIA Xmt Pace=Baud Aux Xmt Pace=Baud EIA Disconnect=2 sec Aux Disconnect=2 sec
F7: Host ("Auto Step" key)	Comm Mode=Full Duplex Recv <DEL>=Ignore Send Block Term=<CR>	Local=Off Send ACK=On Null Suppress=On	Recv <CR>=<CR> Send Line Term=<CR><LF>
F8: Print ("Activ Signal" key)	Prnt Line Term=<CR><LF>	Prnt Block Term=<CR>	Secondary Recv=Off
F9: Emul	Attribute=Page WPRT Intensity=Dim WPRT Blink=Off Status Line=Off	Bright Video=Off WPRT Reverse=Off Display NV Labels=Off Fkey Speed=Normal	Page Edit=Off WPRT Underline=Off Save Labels=On
F10	Setup Group F10 does not affect communications with the control panel.		
F11	Setup Group F11 does not affect communications with the control panel.		
F12: Prog ("Ack Step" key)	Program the function keys as follows: F1 ~A F2 ~B F3 ~C F4 ~D F5 ~E F6 ~F F7 ~G F8 ~H F9 ~I F10 ~J F11 ~K F12 ~L F13 ~M F14 ~N F15 ~O F16 ~P Shift F13 ~Q		

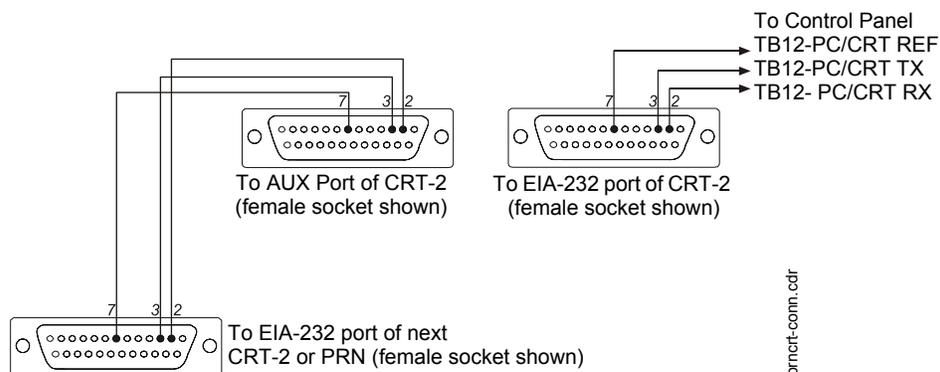
**Table 3.4 Standard CRT-2 Settings for Use with NFS-320/E/C**

### 3.11.4 Connecting Multiple Printers, CRTs, or CRT/PRN Combination

Connecting multiple devices requires changing the CRT-2 setup using the F1(Quick) menu:

- Set Host/Printer=EIA/AUX.
- Set EIA Data Format=8/1/N.
- If the AUX device is a printer, set the Printer and AUX Data Format=7/1/E.
- If the AUX device is a second CRT-2, set the AUX Data Format=8/1/N.

Connect multiple devices as shown in Figure 3.17.



Note: For wire requirements, see Table B.1 in Appendix B “Electrical Specifications”.

**Figure 3.17 Connecting Multiple Devices on the EIA-232 Circuit**

## 3.12 Wiring a Signaling Line Circuit (SLC)

### ■ Overview

Communication between the control panel and intelligent and addressable initiating, monitor, and control devices takes place through a Signaling Line Circuit (SLC). You can wire an SLC to meet the requirements of NFPA Style 4, Style 6, or Style 7 circuits.

This manual provides requirements and performance details specific to this control panel; for installation information and general information, refer to the *SLC Wiring Manual*.

### ■ Wiring

Maximum wiring distance of an SLC using 12 AWG (3.31 mm<sup>2</sup>) wire is 12,500 feet (3810 meters) total twisted-pair for Style 4, Style 6 and Style 7 circuits.

### ■ Capacity

The NFS-320/E/C provides one (1) SLC, with a total capacity of 318 intelligent/addressable devices:

- 01-159 intelligent detectors
- 01-159 monitor and control modules

Units employing multiple detector operation shall include a minimum of two detectors in each protected space and reduce the detector installation spacing to 0.7 times the linear spacing in accordance with National Fire Alarm Code, NFPA. For spacing requirements refer to the detector’s installation instructions.



**NOTE:** To meet the ten-second response time required by UL 864, 9th edition, when SLC loops are configured to run in CLIP mode, all input modules must be mapped to address 19 and lower. There are no limits to detectors or output modules.

### ■ Installation

This control panel supports one SLC loop, which connects to TB13 on the control panel. For details on designing, installing and configuring SLC loops, see the *SLC Wiring Manual*.

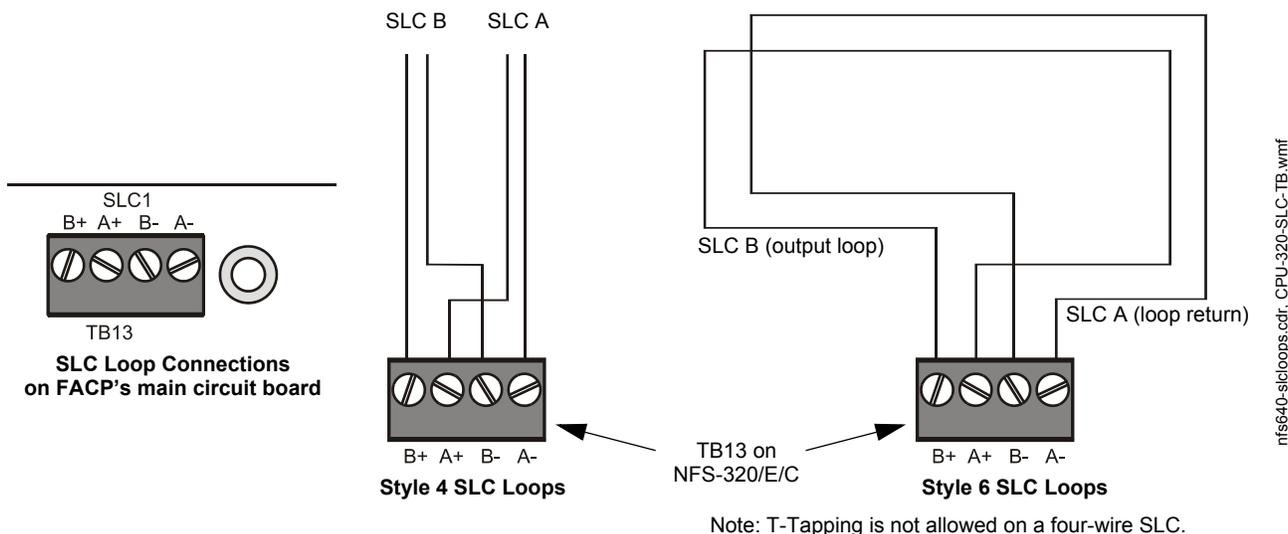


Figure 3.18 SLC Loop Connections and Wiring

## 3.13 Connecting a PC for Off-Line Programming

A PC can be hooked up to the control panel to allow the VeriFire Tools programming utility to upload and download the operating program. Refer to the insert in the VeriFire Tools CD and to the program's on-line help function for instructions. There are two options for connection:

Two options are available.

1. For PCs with USB Ports, connect the PC to USB B via a standard USB B cable.
2. For PCs without USB Ports, connect the PC's serial port to the Control Panel's Network/Service Connection (J1, NUP).



**NOTE:** Download operations that change the basic program of the control panel must be performed by responsible service personnel in attendance at the control panel. After downloading a program, test the control panel in accordance with NFPA 72.

# Section 4: Applications

## 4.1 Overview

Chapter	Covers the following topics
Section 4.3 "NFPA 72 Central or Remote Station Fire Alarm System (Protected Premises Unit)"	How to install UDACT/UDACT-2 with the control panel for use as a NFPA Central or Remote Station Fire Alarm System (Protected Premises Unit)
Section 4.5 "NFPA 72 Proprietary Fire Alarm Systems"	How to set up a Protected Premises Unit to communicate with a listed compatible Protected Premises Receiving Unit.
Section 4.6 "Fire/Security Applications"	How to use the control panel as a combination Fire/Security system, including the following: <ul style="list-style-type: none"> <li>• Installing a Security Tamper Switch into the cabinet</li> <li>• Circuit Wiring</li> </ul>
Section 4.7 "Releasing Applications"	How to install the following releasing applications: <ul style="list-style-type: none"> <li>• Releasing Device to the Control Panel (NAC integral circuits)</li> <li>• Releasing Device to the FCM-1 Module</li> <li>• NBG-12LRA Agent Release-Abort Station</li> </ul>

### Municipal Box (Auxiliary)

Municipal Box applications require a TM-4 Transmitter module. Refer to the *TM-4 Transmitter Module* installation document for installation details.

## 4.2 Devices Requiring External Power Supervision

With version 12.0 and higher, certain type codes have external power supervision (FlashScan only) built into the software. An external power-supervision relay is required (see Figure 4.1) unless one of the following typecodes is selected for the device:

- Control
- Strobe
- Horn
- (Blank)
- Release Ckt
- Rel Ckt Ulc
- Nonreset Ctl
- Alarms Pend
- Gen Alarm
- Gen Supervis
- Gen Trouble
- Gen Pend
- Trouble Pend

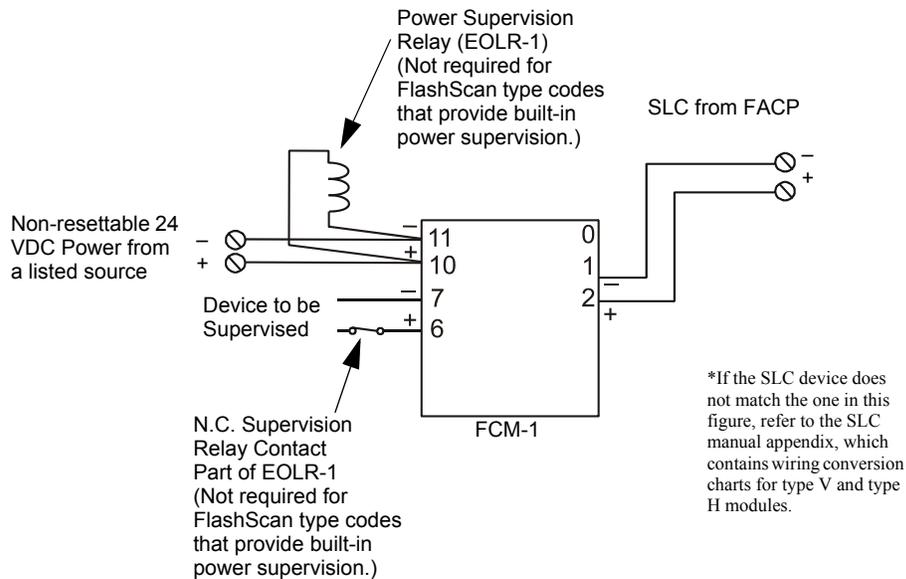


Figure 4.1 Enabling External Power Supervision Using Relays

### 4.3 NFPA 72 Central or Remote Station Fire Alarm System (Protected Premises Unit)

Figure 4.2 shows typical wiring diagram for a NFPA 72 Central Station Fire Alarm System (Protected Premises Unit) or a Remote Station Fire Alarm System (Protected Premises Unit) using the Universal Digital Alarm Communicator/Transmitter (UDACT or UDACT-2) and control panel. This provides typical wiring only; connect and program the UDACT or UDACT-2 according to the directions given in the *UDACT Instruction Manual* or *UDACT-2 Instruction Manual*.



**NOTE:** An NFPA 72 Central Station or Remote Station requires 24 hours of standby power and 5 minutes in alarm.

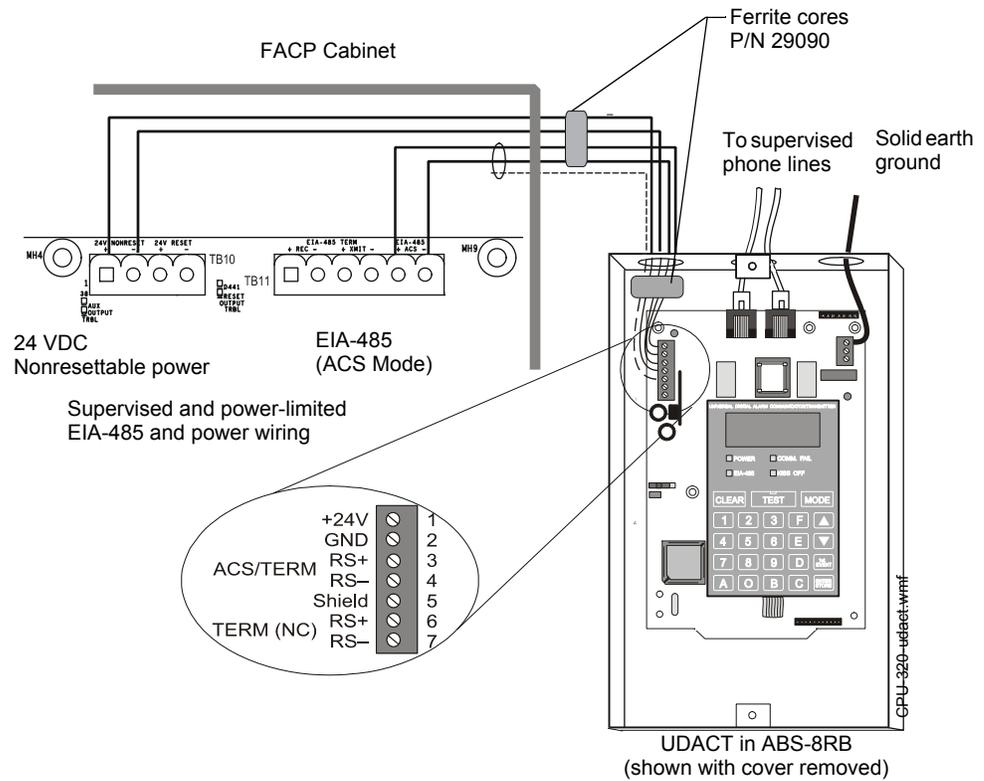


**NOTE:** This application can also be done with the TM-4 Transmitter; refer to the *TM-4 Transmitter Module* installation document for more details.



**NOTE:** For additional setup information for the UDACT-2, refer to the *UDACT-2 Instruction Manual*.

3030-external-power-suppl1.wmf



**Figure 4.2 Typical Wiring Diagram for a Central Station Fire Alarm System**



**NOTE:** Install a UL-listed 120 ohm End-of-Line resistor (P/N 71244) UDACT TB1 terminals 3 and 4 if this is the last or only device on EIA-485 line.

## 4.4 Central Station Fire Alarm System Canadian Requirements

For Canadian applications requiring a second dial-out option, refer to the following illustration for UDACT/UDACT-2 and TM-4 setup:

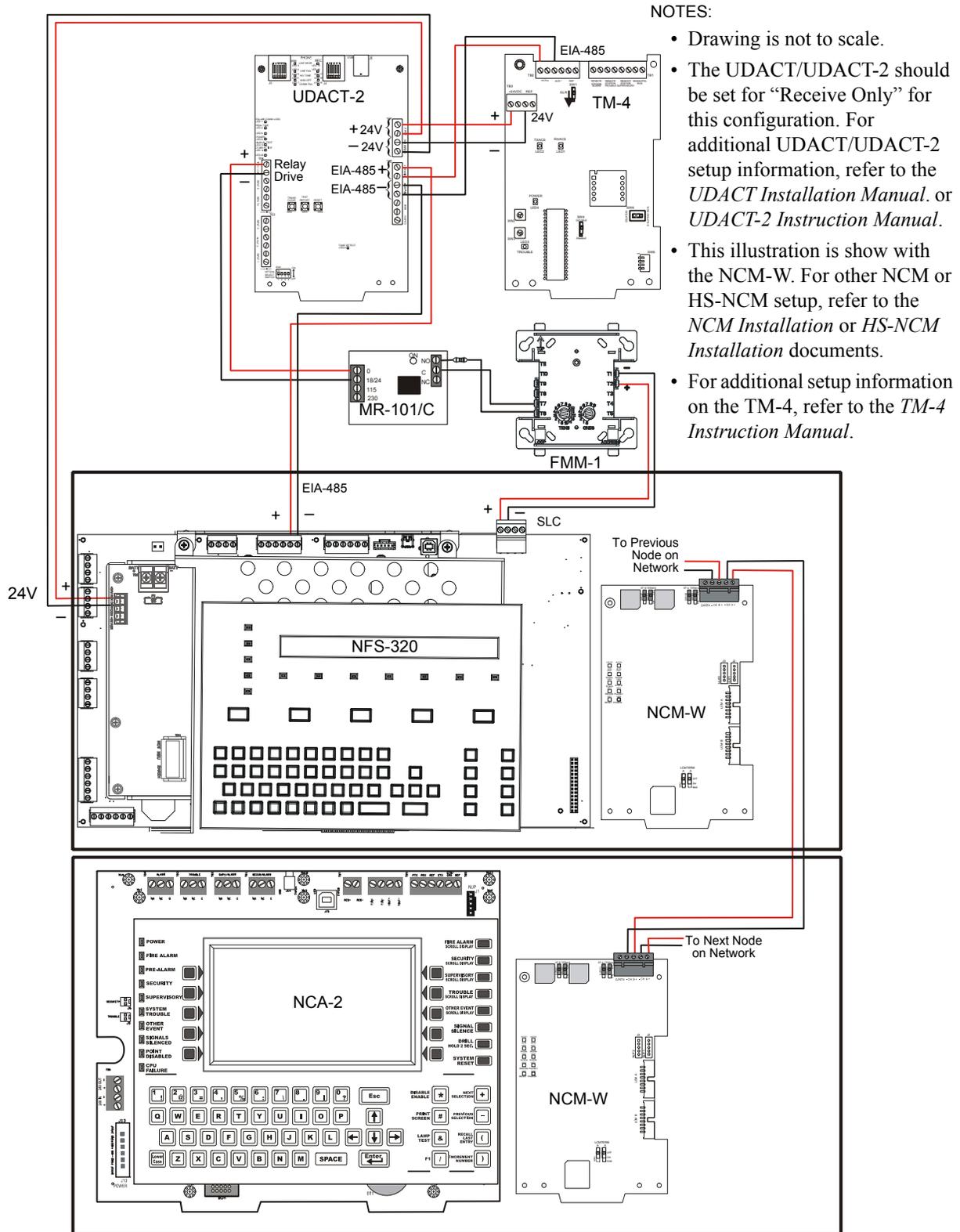


Figure 4.3 Central Station Canadian Requirements for Second Dial-Out Connection

## 4.5 NFPA 72 Proprietary Fire Alarm Systems

When connected and configured as a protected premises unit with UDACT or UDACT-2, the NFS-320/E will automatically transmit General Alarm, General Trouble, and General Supervisory signals to a listed compatible Protected Premises Receiving Unit. See the *UDACT Manual* or *UDACT-2 Manual* for compatible receiving units. A simplified drawing of connections between the receiving unit and the NFS-320/E protected premises unit is shown in Figure 4.4.

Connect the receiving unit to the protected premises unit as shown in Section 4.3 “NFPA 72 Central or Remote Station Fire Alarm System (Protected Premises Unit)”.

For information on installing and programming the Receiving unit, refer to the documentation for that control panel.

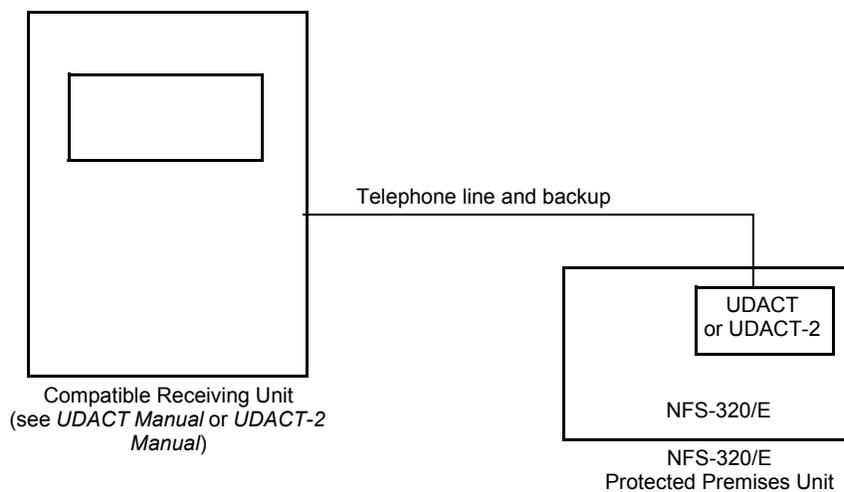


Figure 4.4 Typical Proprietary Fire Alarm Systems Wiring Connections

## 4.6 Fire/Security Applications



**NOTE:** NFS-320/E/C is not approved for use in security applications in Canada.

### 4.6.1 General Operation

The control panel can be used as a combination Fire/Security system when installed and operated according to the instructions in this section.

For security applications, program one or more monitor modules (listed for security applications) with the SECURITY Type Code, and wire as shown in Figure 4.6. Activating this type of module lights the SECURITY LED, and displays a security alarm condition on the control panel LCD display. The panel sounder will sound until the Security alarm is acknowledged. You can also program additional sounders or output devices to activate with the security alarm initiating device. The SECURITY Type Code is designed to indicate an alarm as follows: (a) on an open or short circuit; or (b) on a  $\pm 50\%$  change in resistance value from the End-of-Line resistor value.

A tamper switch installed in the cabinet door will indicate a door tamper condition whenever the door is open. If the control panel indicates a Security alarm, you can acknowledge, silence, and reset the condition from the control panel.

When the system resets, a 30-second exit timer starts. During this time the tamper switch and all Security alarms are ignored. There is no entrance delay timer.

For bypass of security zones, use the DISABLE routine (covered in the *Status Change* section of the *NFS-320/E/C Operations Manual*) for Security type devices.



**WARNING:**  
Damage can result from incorrect wiring connections.

## 4.6.2 Installing a Security Tamper Switch

To wire the cabinet with a Security Tamper Switch kit model STS-200, refer to Figure 4.5:

1. Install the STS-200 Tamper Switch into the location shown in Figure 4.5. Push the switch through the opening until it snaps into place.
2. Connect the STS-200 connector to J5 (Security Tamper) on the Control Panel. (As shown in Figure 4.5, J5 is located on the circuit board, underneath the edge of KDM-R2.)

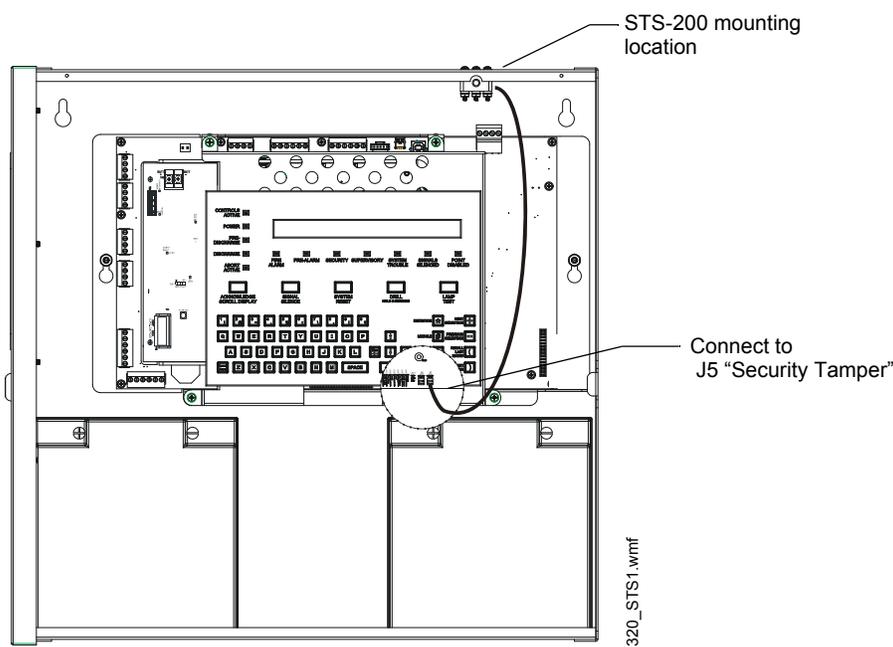


Figure 4.5 Installing the STS-200 Security Tamper Switch

## 4.6.3 Receiving Unit

For applications requiring transmission of security alarm information to a central receiving unit, the control panel may be connected via the UDACT or UDACT-2 to a compatible receiving unit (see the *UDACT Manual* or *UDACT-2 Manual*). For information on configuring the Receiving unit for Combination Fire/Security applications, refer to the documentation for that control panel.

## 4.6.4 Programming

The control panel can communicate with any number of security devices. To do so, program the points as follows:

1. Select the address of the module(s) to be used for security.

2. Select the Type Code SECURITY.

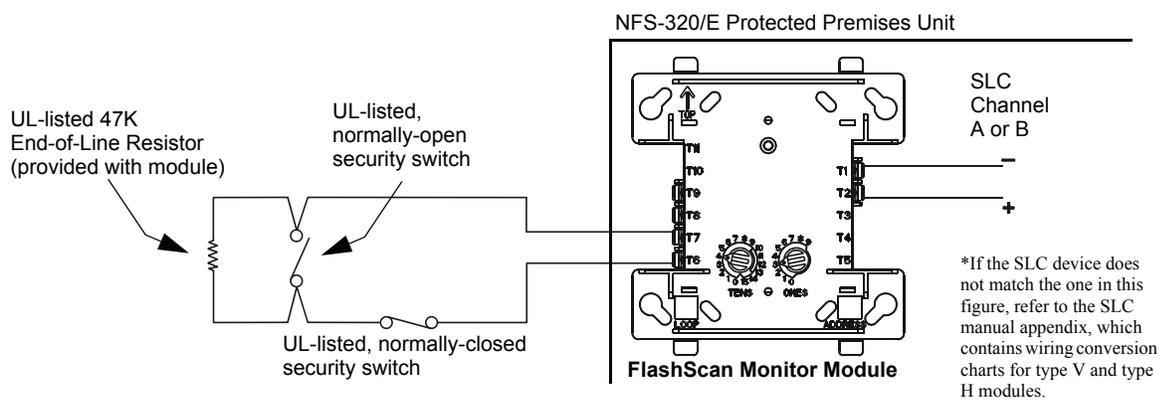


**NOTE:** For detailed instruction on programming Type Codes, refer to the *NFS-320/E/C Programming Manual*.

## 4.6.5 Wiring for Proprietary Security Alarm Applications

Table 4.6 shows typical wiring for proprietary security alarm applications with modules. Note the following:

- The module is programmed with software SECURITY Type Code.
- For use with UL listed systems only; application not for ULC security usage.
- NAC devices used for security cannot be shared with fire NAC devices.
- Refer to the *Device Compatibility Document* for compatible NAC devices.
- All monitor modules used for security application must be installed in the *NFS-320/E* cabinet with STS-1 Security Tamper Switch.



**Figure 4.6 Wiring Diagram for Proprietary Security Alarm Applications**

## 4.7 Releasing Applications


**WARNING:**

When used for CO<sub>2</sub> releasing applications, observe proper precautions as stated in NFPA 12. Do not enter the protected space unless physical lockout and other safety procedures are fully completed. Do not use software disable functions in the panel as lockout.


**WARNING:**

Do not enable the BACKUP option switch for any of the four Notification Appliance Circuits (NACs) if they are used for releasing functions!

### 4.7.1 Overview

This control panel can be used for agent release or preaction/deluge control applications. In a properly configured system with compatible, listed actuating and initiating devices, this control panel complies with the following NFPA standards for installation in accordance with the acceptable standard:

Standard	Covers
NFPA 12	CO <sub>2</sub> Extinguishing Systems
NFPA 12A	Halon 1301 Extinguishing Systems
NFPA 13	Sprinkler Systems
NFPA 15	Water Spray Systems
NFPA 16	Foam-Water Deluge and Foam-water Spray Systems
NFPA 17	Dry Chemical Extinguishing Systems
NFPA 17A	Wet Chemical Extinguishing Systems
NFPA 2001	Clean Agent Fire Extinguishing Systems

**Table 4.1 NFPA Standards for Releasing Applications**

### 4.7.2 Programming

The control panel supports up to ten releasing software zones. You can map these zones to activate Control Panel releasing outputs and FCM-1 modules. Program the FCM-1 module for the appropriate type code according to the chart below:

Type Code: RELEASE CKT <ul style="list-style-type: none"> <li>• For use in UL applications.</li> <li>• Do not use REL device at the solenoid.</li> <li>• Cannot use power-limited wiring.</li> <li>• Supervised for open circuit only.</li> <li>• Supervised for power loss with power-supervision relay.</li> </ul>	Type Code: REL CKT ULC <ul style="list-style-type: none"> <li>• For use in UL or ULC applications.</li> <li>• Requires REL device at solenoid.</li> <li>• Power-limited wiring.</li> <li>• Supervised for open circuit and shorts.</li> <li>• Supervised for power loss with power-supervision relay.</li> </ul>
--	--

For more information, refer to the *NFS-320/E/C Programming Manual*.

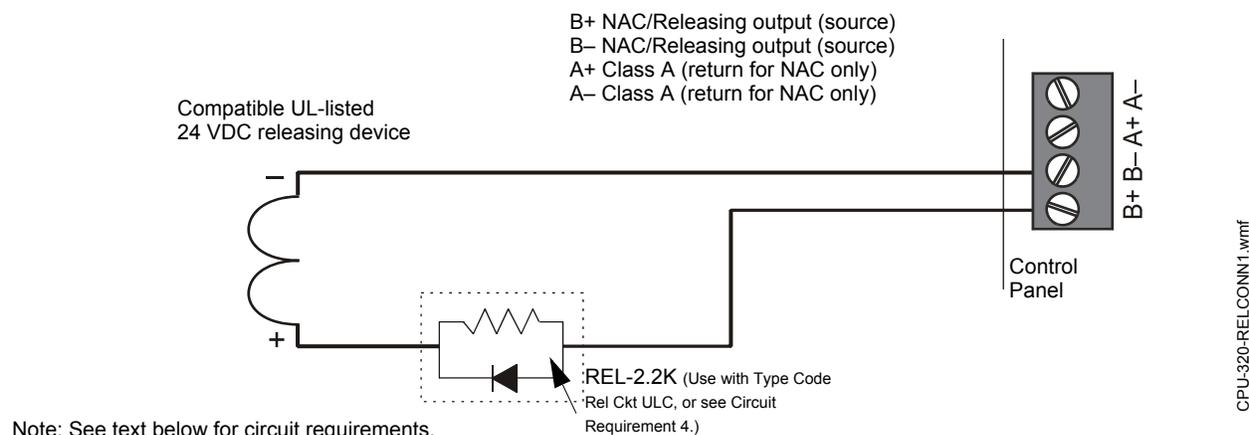
### 4.7.3 Wiring

References to wiring diagrams for releasing applications:

To connect	Refer to
A releasing device to the control panel.	Section 4.7.4 "Connecting a Releasing Device to the Control Panel".
A releasing device to the FCM-1 Module.	Section 4.7.5 "Connecting a Releasing Device to the FCM-1 Module".
An NBG-12LRA Agent Release-Abort Station.	Section 4.7.7 "Connecting an NBG-12LRA Agent Release-Abort Station".

## 4.7.4 Connecting a Releasing Device to the Control Panel

Use TB6 (NAC#4), TB7 (NAC#3), TB8 (NAC#2), or TB9 (NAC#1) on the control panel for NAC/Releasing Circuits. The releasing circuit must be supervised and use listed, compatible releasing devices.



**Figure 4.7 Typical Style 4 Connection of a Releasing Device to Control Panel**



**WARNING:**

Do not enable the BACKUP option switch for any of the four Notification Appliance Circuits (NACs) if they are used for releasing functions!

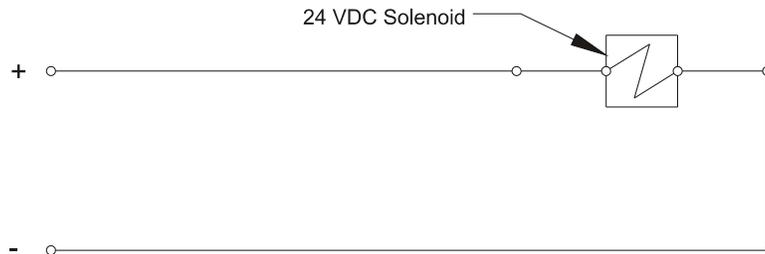
**Circuit Requirements.** When connecting a releasing device, note the following:

1. The control panel provides four NAC/Releasing Circuits (Style Y or Z). Each circuit can provide 1.5 A. Total current drawn from the power supply cannot exceed 7.4 A in an alarm condition (refer to Table A.2, “System Draw Current Calculations,” on page 54). Use compatible UL-listed 24 VDC appliances only. For more information on compatible appliances, refer to the *Device Compatibility Document*.
2. Refer to the Releasing Applications appendix in the *NFS-320/E/C Programming Manual* for configuration details (such as setting the Soak Timer).
3. For applications using power-limited circuits:
  - a) Use an in-line supervisory device (P/N REL-2.2K) with control panel releasing circuits. Connect the End-of-Line device as shown in Figure 4.7.
  - b) Program the releasing circuit for Type Code REL CKT ULC.
  - c) Circuits are supervised against opens and shorts.
4. For applications not requiring power-limited circuits –
  - a) If the application does not require supervising the releasing device against shorts, in-line supervisory devices (P/N REL-2.2K) are not required.
  - b) In non-power-limited applications, program the releasing circuit for Type Code RELEASE CKT.
  - c) Limited energy cable cannot be used to wire a non-power-limited releasing device circuit
  - d) Maintain a 0.25 inch (6.35 mm) spacing between the non-power-limited releasing circuit device wiring and any power-limited circuit wiring.)

- The releasing circuit must be programmed with a releasing type code listed in the *NFS-320/E/C Programming Manual*.

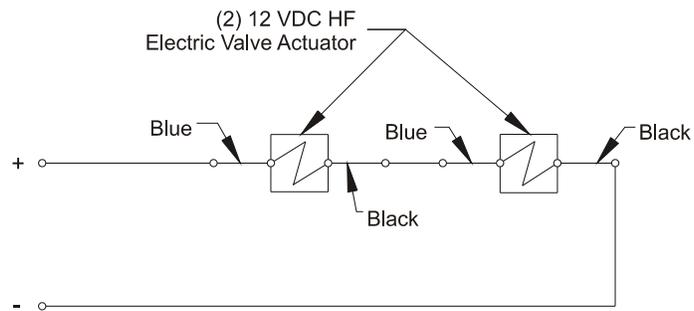


**NOTE:** As per UL 864 9<sup>th</sup> Edition, a supervisory signal must be indicated at the panel whenever a releasing circuit is physically disconnected. Use a monitor module to monitor dry contacts off the switch. See 4.11.



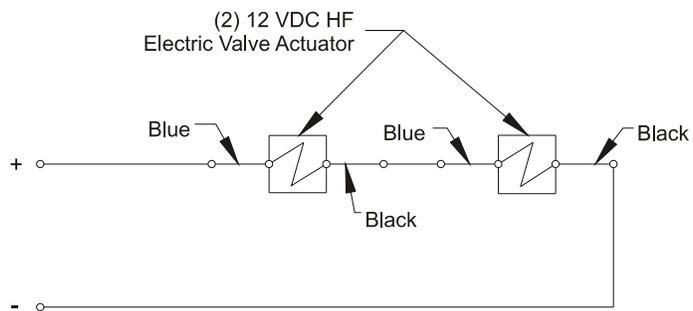
IQActuatorsa.wmf

**Figure 4.8 Releasing Circuits (Option 1)**



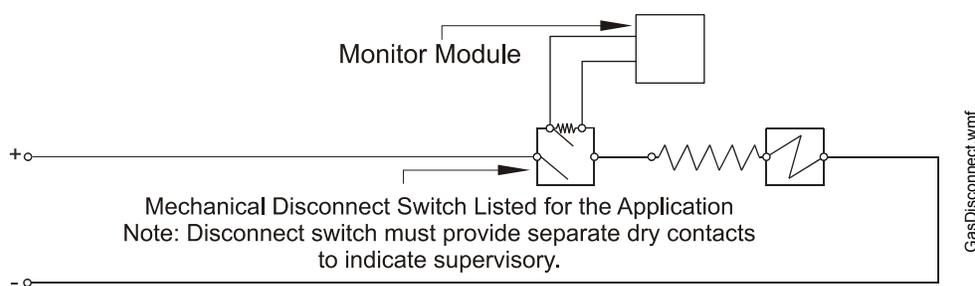
IQActuatorsb.wmf

**Figure 4.9 Releasing Circuits (Option 2)**



IQActuatorsb.wmf

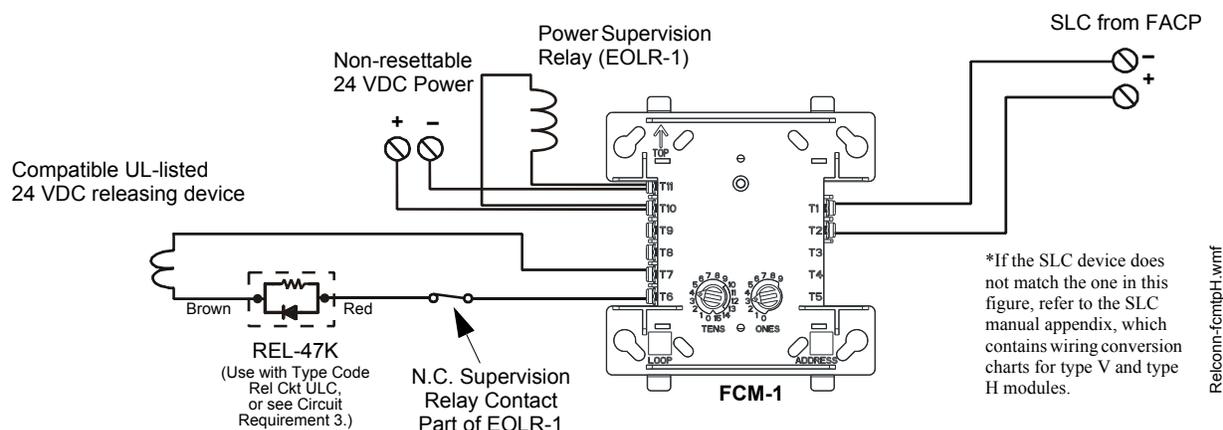
**Figure 4.10 Releasing Circuits (Option 3)**



**Figure 4.11 Release Circuits (Mechanical Disconnect Switch)**

## 4.7.5 Connecting a Releasing Device to the FCM-1 Module

The module can control 1 A of current. Make sure to keep total system current within the limits of the power supply. You can power the module from the power supply of the Control Panel or any UL/ULC listed 24 VDC regulated power-limited power supply for Fire Protective Signaling. For more information, refer to the *Device Compatibility Document*.



Note: See text for circuit requirements.

**Figure 4.12 Typical Connection of a 24 VDC Releasing Device to the FCM-1 Module**

**Circuit Requirements** When connecting a releasing device to the FCM-1 module, note the following:

1. Refer to the Releasing Applications appendix in the *NFS-320/E/C Programming Manual* for configuration details (such as setting the Soak Timer).
2. For applications using power-limited circuits:
  - a) Use an in-line supervisory device (P/N REL-47K) with the FCM-1 module. Connect the in-line supervisory device as shown in Figure 4.12.
  - b) Program the releasing circuit for Type Code REL CKT ULC.
  - c) Circuits are supervised against opens and shorts.
3. For applications not requiring power-limited circuits:
  - a) In-line supervisory devices (P/N REL-47K) are not required; however, the releasing device circuit is not supervised against shorts.
  - b) In non-power-limited applications, program the releasing circuit for Type Code RELEASE CKT.

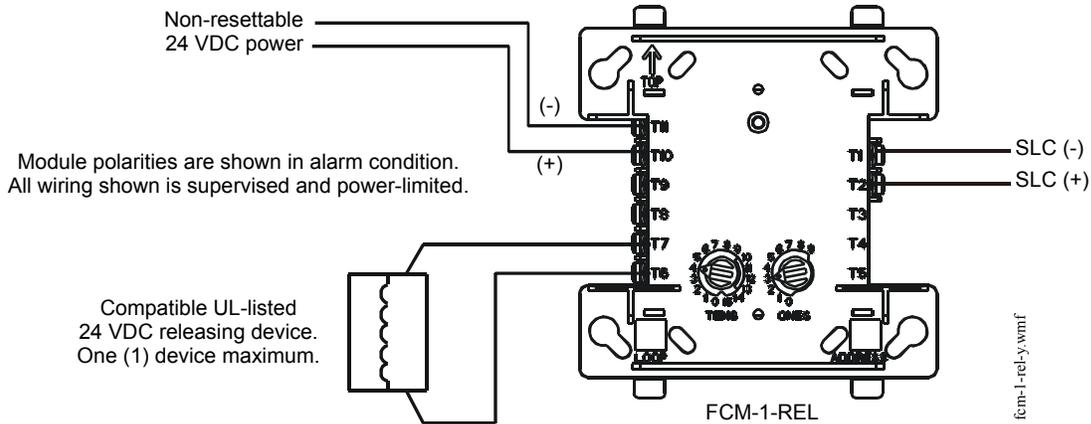
- c) Limited energy cable cannot be used to wire a non-power-limited releasing device circuit.
- d) Maintain a 0.25 inch (6.35 mm) spacing between the non-power-limited releasing circuit device wiring and any power-limited circuit wiring.



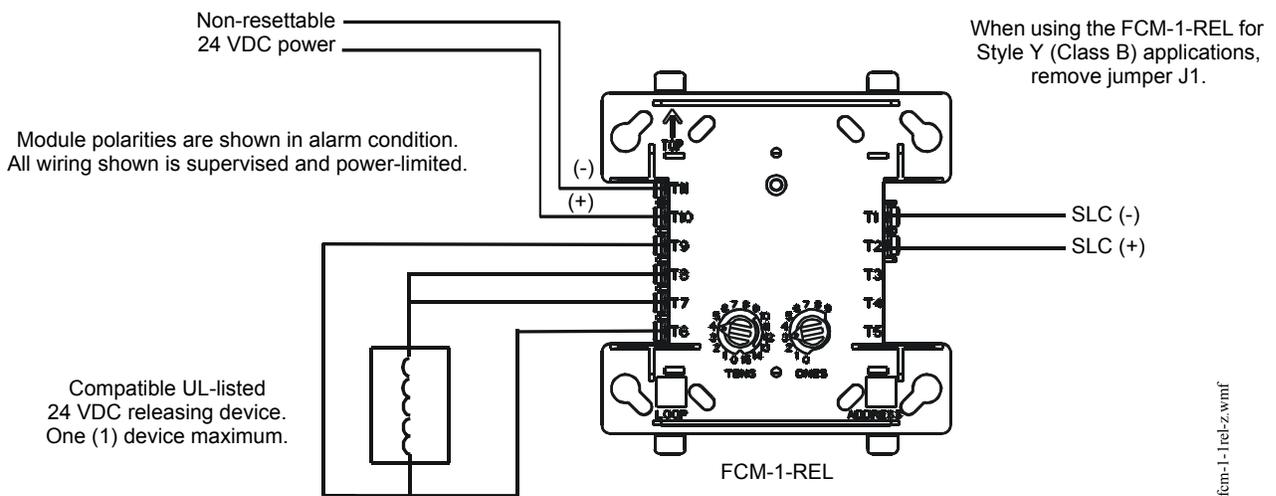
**WARNING:**  
The XP6-C is not listed for releasing applications and cannot be substituted for FCM-1.

### 4.7.6 Connecting a Releasing Device to the FCM-1-REL

**Typical Connections** Figure 4.13 shows typical connections for wiring a releasing device to the FCM-1-REL. Refer to the Device Compatibility Document for compatible releasing devices.



**Figure 4.13 NPFA Style Y (Class B) Wiring of the FCM-1-REL**



**Figure 4.13 NPFA Style Z (Class A) Wiring of the FCM-1-REL**

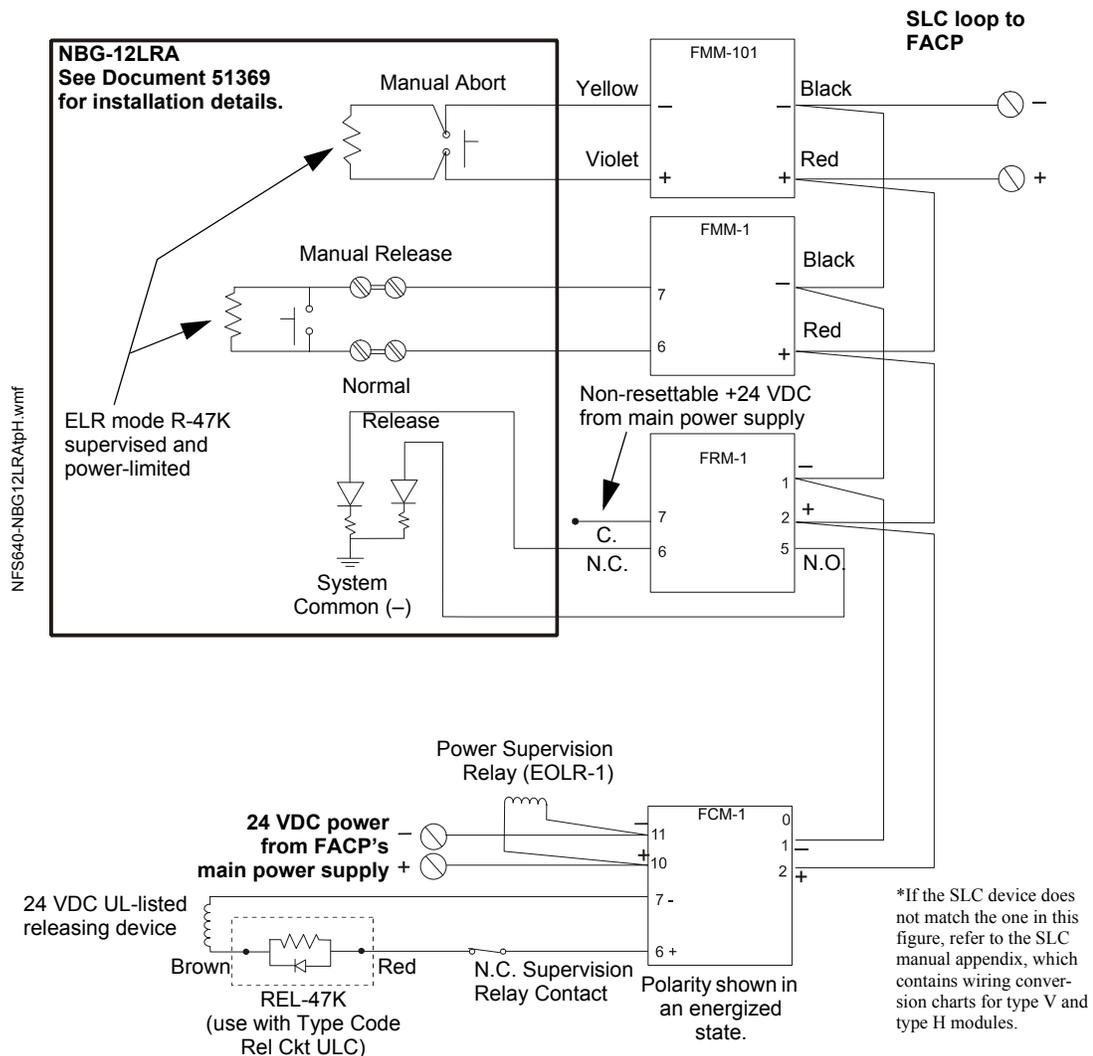
**NOTE:** With software version 12.0 or higher ALL new FlashScan Mode SLC releasing applications require the FCM-1-REL control module. The V-type FCM-1 control module may be used in SLC releasing applications with software version 12.0 or higher. H-type FCM-1 control modules do not support FlashScan Mode releasing applications with software version 12.0 or higher. Use H-type FCM-1 for CLIP mode releasing applications.

**Critical Requirements.** When connecting a releasing device to the FCM-1-REL module, note the following:

1. See “Power Considerations” on page 52 for information on monitoring 24 VDC power.
2. Do not T-tap or branch a Style Y or Style Z circuit.
3. Only one (1) 24V solenoid or two (2) 12V solenoids in series can be connected to the FCM-1-REL.
4. Do not loop wiring under the screw terminals. Break the wire run to provide supervision of connections.
5. All applications using the FCM-1-REL are power-limited:
  - a. Program the releasing circuit for Type Code REL CKT ULC or RELEASE CKT.
  - b. Circuits are supervised against opens and shorts.
6. Refer to the *NFS-320/E/C Programming Manual* for instructions on setting the Soak Timer.

The FCM-1-REL module must be programmed with the correct releasing type code listed in the *NFS-320/E/C Programming Manual*.

### 4.7.7 Connecting an NBG-12LRA Agent Release-Abort Station



**Figure 4.14 Typical Connections for an NBG-12LRA Agent Release-Abort Station**



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**NOTE:** If using the on-board NACs, see Circuit Requirements for Section 4.7.4 “Connecting a Releasing Device to the Control Panel” on page 44. If using FCM-1, see Circuit Requirements for Section 4.7.5 “Connecting a Releasing Device to the FCM-1 Module” on page 46.

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# Section 5: Testing the System

## 5.1 Acceptance Test

When finished with the original installation and all modifications, conduct a complete operational test on the entire installation to verify compliance with applicable NFPA standards. Testing should be conducted by a factory-trained fire alarm technician in the presence of a representative of the Authority Having Jurisdiction and the owner's representative. Follow procedures outlined in NFPA Standard 72's section on *Inspection, Testing and Maintenance*.

## 5.2 Periodic Testing and Service

Periodic testing and servicing of the control panel, all initiating and notification devices, and any other associated equipment is essential to ensure proper and reliable operation. Test and service the control panel according to the schedules and procedures outlined in the following documents:

- NFPA Standard 72's section on *Inspection, Testing and Maintenance*.
- Service manuals and instructions for the peripheral devices installed in the system. Correct any trouble condition or malfunction immediately.

## 5.3 Operational Checks

Between formal periodic testing and servicing intervals, the following operation checks should be performed monthly, or more frequently when required by the Authority Having Jurisdiction.

- Before proceeding: a) notify the fire department and the central alarm receiving station if transmitting alarm conditions; b) notify facility personnel of the test so that alarm sounding devices are disregarded during the test period; and c) when necessary, disable activation of alarm notification appliances and speakers to prevent their sounding.
- Disconnect all releasing devices to prevent accidental activation in accordance with NFPA 2001 and NFPA 12A releasing agents.



**WARNING:**

Do not rely on disable/enable software settings to lockout releasing devices.

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- Check that the green POWER LED lights.
- Check that all status LEDs are off.
- Press and hold the LAMP TEST key. Verify that all LEDs and all LCD display segments work.
- Activate an Initiating Device Circuit using an alarm initiating device or an addressable initiating device on the SLC and check that all programmed active notification appliances function. Reset the alarm initiating device, the control panel, and any other associated equipment. Select the paging function and confirm that the message can be heard in the affected fire zones. Repeat the above step with each Initiating Device Circuit and each addressable device.
- Remove AC power, activate an Initiating Device Circuit through an alarm initiating device or an addressable initiating device on the SLC, and check that programmed active notification appliances sound, and alarm indicators illuminate. Measure the battery voltage with notification appliances active. Replace any battery with a terminal voltage less than 21.6 VDC and reapply AC Power

*Continued on next page...*



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**NOTE:** The battery test requires fully charged batteries. If batteries are new or discharged due to a recent power outage, allow the batteries to charge for 48 hours before testing.

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- Return all circuits to their pretest condition.
- Check that all status LEDs are off and the green POWER LED is on.
- Notify fire, central station and/or building personnel when you finish testing the system.

## 5.4 Battery Checks and Maintenance

Maintenance-free sealed lead-acid batteries used in the system do not require the addition of water or electrolyte. These batteries are charged and maintained in a fully charged state by the main power supply's charger during normal system operation. A discharged battery typically reaches the voltage of 27.6 VDC within 48 hours; the charge rate depends on the battery size (2.0A for 18-26AH; 5.0A-5.7A for 26AH-200AH).

Immediately replace a leaking or damaged battery. Batteries should be replaced in accordance with the battery manufacturer's recommendations.



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**WARNING:**

Batteries contain Sulfuric Acid which can cause severe burns to the skin and eyes and damage to fabrics.

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- If a battery leaks and contact is made with the Sulfuric Acid, immediately flush skin and/or eyes with water for at least 15 minutes. Water and household baking soda provides a good neutralizing solution for Sulfuric Acid.
- If Sulfuric Acid gets into eyes, seek immediate medical attention.
- Ensure proper handling of the battery to prevent short circuits.
- Take care to avoid accidental shorting of the leads from uninsulated work benches, tools, bracelets, rings, and coins.



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**WARNING:**

Shorting the battery leads can damage the battery, equipment, and could cause injury to personnel.

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# Appendix A: Power Supply Calculations

Calculations must be done to determine standby and alarm DC current loads. Ampere-hour requirements must be calculated as well to determine battery size.

The CPS-24/E power supply provides filtered 24VDC power that may be used for operating external devices. Use Table A.2 to determine if external loading is within the capabilities of the power supply.

## A.1 Calculating AC Branch Circuit Current

Use Table A.1 below to determine the total amount of current, in AC amperes, that a 120 VAC, 50/60 Hz service must be able to supply to the fire alarm system. Devices rated for 220-240 VAC operation will draw approximately one-half the current listed in Table A.1.

Device Type	No. of Devices		Current (amps)		Total Current
CPS-24 Power Supply	[ 1 ]	X	5.0	=	5.0
CPS-24/E Power Supply	[ ]	X	2.5	=	
FCPS-24S6/S8	[ ]	X	3.2	=	
ACPS-2406	[ ]	X	2.7	=	
ACPS-610	[ ]	X	5.0	=	
ACPS-610/E	[ ]	X	2.5	=	
APS-6R	[ ]	X	2.5	=	
CHG-120	[ ]	X	2.0	=	
Sum column for AC Branch Current required=amps					

**Table A.1 120 VAC Fire Alarm Circuit**

- \* Separate calculations are required for any devices powered by the ACPS-610 or ACPS-2406. They have their own integral battery charger and batteries can be connected directly to them. Refer to the *ACPS-2406* or *ACPS-610 Installation Manuals* for battery calculations.

### AC Branch Circuit Installation

For guidelines on wiring the AC branch circuit current, see “Operating Power: AC Branch Circuit” on page 60 in Appendix B.1 “Electrical Specifications”.

## A.2 Calculating the System Current Draws

The control panel’s main power supply must be able to power all internal system devices (and several types of external devices) continuously during non-fire alarm conditions. Use column 1 in Table A.2 to calculate the Non-Fire Alarm Load on the power supply regulator when applying primary power. The main power supply must also provide a finite amount of additional current during a fire alarm condition. Use column 2 in Table A.2 to calculate the additional current needed during fire alarms. The requirements for non-fire alarm and fire alarm current loads cannot exceed the capabilities of the power supply as listed below:

- 3.9 A at 24 VDC during Standby; and
- 7.4 A at 24 VDC during Alarm.

The current draw from all NACs plus DC output from TB10 and TB2 is 3.0 A during standby, and 6.0 A in alarm.

## How to Use the Calculating Tables

As used in this section, “Primary” refers to the control panel’s on-board power supply, its primary source of AC power. “Secondary” refers to the control panel’s backup batteries (or any other 24 VDC power supply listed for Fire Protective Signaling and connected in place of the batteries). The term “standby” refers to the output current required when no fire alarm is present. The term “alarm” refers to the output current required when a fire alarm is present.

The Primary Power Source Non-Alarm Current and Alarm Current columns are DC current calculations. These calculations confirm that the power supply can provide enough current to support the system during Primary Non-Fire Alarm and Fire Alarm conditions.

**Quantities** List the number of devices powered by the FACP and its power supply. Devices powered by the Accessories Output (TB10 and TB2) draw current directly from the panel. Devices powered by the Panel Output draw current through the fire panel’s connection to the power supply. Use these quantities to calculate total current draw of each set of devices in calculation columns 1, 2, and 3.

**Calculation Column 1 (Primary, Non-Fire Alarm Current in amps)** Add the contents of calculation column 1 to get the current drawn from the power supply during a non-alarm condition, with AC power applied. This current draw cannot exceed 3.9 A without an auxiliary power supply.

**Calculation Column 2 (Primary, Fire Alarm Current in amps)** Calculation column 2 lets the system designer determine the current load that the power supply must support during a fire alarm. The total current draw during a fire alarm cannot exceed 7.4 A without an auxiliary power supply.

Typically, a system should contain capacity to activate all output circuits and relays, and support fire alarms on no less than 10% of Initiating Device Circuits, subject to the requirements of the Authority Having Jurisdiction (AHJ).

The Control Panel provides power for Notification Appliance Circuits. Refer to the Device Compatibility Document for 24 VDC notification appliances that are UL- and ULC-listed for fire alarm systems.

**Calculation Column 3 [Secondary (Battery) Non-Alarm Current]** Column 3 lets the system designer calculate the non-fire alarm current drawn from the secondary source in a non-fire alarm condition during AC power loss. The non-fire alarm current is required to complete the standby battery calculations. After summing all current draws, insert the total in Table A.3.

Category	Calculation Column 1 Primary, Non-Fire Alarm Current (amps)			Calculation Column 2 Primary, Fire Alarm Current (amps)			Calculation Column 3 Secondary, Non-Fire Alarm Current (amps)		
	Qty	X [current draw]=	Total	Qty	X [current draw]=	Total	Qty	X [current draw]=	Total
NFS-320/E	1	x [0.250]=		1	x [0.250]=		1	x [0.250]=	
# NACs in use (0, 1, 2, 3 or 4)*	[ ]	x [0.035]		[ ]	x [0.035]		[ ]	x [0.035]	
CPS-24/E	n/a	n/a		n/a	n/a		1	x [0.040]	
KDM-R2 (Backlight on)	[ ]	x [0.100]=		[ ]	x [0.100]=		[ ]	x [0.100]=	
SLC loop†:	1	x [0.200]=		1	x [0.200]=		1	x [0.200]=	
NCA, NCA-2 Back-light ON	[ ]	x [0.400]=		[ ]	x [0.400]=		[ ]	x [0.400]=	
NCA, NCA-2 Back-light OFF	[ ]	x [0.200]=		[ ]	x [0.200]=		[ ]	x [0.200]=	
NCM-W/F	[ ]	x [0.110]=		[ ]	x [0.110]=		[ ]	x [0.110]=	
HS-NCM-W/MF/SF/WMF/WSF/MFSF	[ ]	x [0.400]=		[ ]	x [0.400]=		[ ]	x [0.400]=	
TM-4	[ ]	x [0.110]=		[ ]	x [0.175]=		[ ]	x [0.110]=	
DPI-232 (Refer to manual**)	[ ]	x [ ]=		[ ]	x [ ]=		[ ]	x [ ]=	
APS-6R							[ ]	x [0.025]=	
ACPS-2406, ACPS-610							[ ]	x [0.0013]=	
ACM-24AT	[ ]	x [0.016]=		[ ]	x [0.070]=		[ ]	x [0.016]=	
ACM-48A	[ ]	x [0.016]=		[ ]	x [0.070]=		[ ]	x [0.016]=	
AEM-24AT	[ ]	x [0.002]=		[ ]	x [0.056]=		[ ]	x [0.002]=	
AEM-48A	[ ]	x [0.002]=		[ ]	x [0.056]=		[ ]	x [0.002]=	
Maximum number of LEDs illuminated on these annunciators during non-fire conditions:	[ ]	x [0.0054]=					[ ]	x [0.0054]=	
AFM-16AT, AFM-32A	[ ]	x [0.040]=		[ ]	x [0.056]=		[ ]	x [0.040]=	
ACM-16AT, ACM-32A	[ ]	x [0.040]=		[ ]	x [0.056]=		[ ]	x [0.040]=	
AEM-16AT, AEM-32A	[ ]	x [0.002]=		[ ]	x [0.018]=		[ ]	x [0.002]=	
AFM-16A	[ ]	x [0.025]=		[ ]	x [0.065]=		[ ]	x [0.025]=	
ACM-8R (refer to manual**)	[ ]	x [ ]=		[ ]	x [ ]=		[ ]	x [ ]=	
LDM (refer to manual**)	[ ]	x [ ]=		[ ]	x [ ]=		[ ]	x [ ]=	
FDU-80	[ ]	x [0.0643]=		[ ]	x [0.0643]=		[ ]	x [0.0643]=	
LCD-80	[ ]	x [0.100]=		[ ]	x [0.100]=		[ ]	x [0.050]=	
LCD2-80	[ ]	x [0.100]=		[ ]	x [0.100]=		[ ]	x [0.050]=	
FZM-1, MMX-2 Auxiliary power	[ ]	x [0.0115]=		[ ]	x [0.090]=		[ ]	x [0.0115]=	
RPT-W, RPT-WF, RPT-F RPT-485W, RPT-485WF	[ ]	x [0.017]=		[ ]	x [0.017]=		[ ]	x [0.017]=	
UDACT Communicator	[ ]	x [0.040]=		[ ]	x [0.100]=		[ ]	x [0.040]=	
UDACT-2 Communicator	[ ]	x [0.052]=		[ ]	x [0.087]=		[ ]	x [0.052]=	
NFV-25/50 (see manual**)	[ ]	x [ ]=		[ ]	x [ ]=		[ ]	x [ ]=	
FWSG (only if powered by the FWSG 24V connections TB:A2 and TB:A3)	[ ]	x [0.040]=		[ ]	x [0.040]=		[ ]	x [0.040]=	
Four-Wire Smoke Detectors‡	[ ]	x [ ]=		[ ]	x [ ]=		[ ]	x [ ]=	
	[ ]	x [ ]=		[ ]	x [ ]=		[ ]	x [ ]=	
Power Supervision Relay EOLR-1	[ ]	x [0.020]=		[ ]	x [0.020]=		[ ]	x [0.020]=	
Notification Appliance powered from Main Power Supply				[ ]	x [ ]=				
				[ ]	x [ ]=				
DHX-501, FSD-751RPFSD-751RPL(Duct Detectors with internal relays) Refer to installation document	[ ]	x [ ]=		[ ]	x [ ]=		[ ]	x [ ]=	
	[ ]	x [ ]=		[ ]	x [ ]=		[ ]	x [ ]=	
CHG-120 Battery Charger							[ ]	x [0.060]=	
Local Energy Municipal Box				[ ]	x [ ]=				
Compatible Devices not listed above††	[ ]	x [ ]=		[ ]	x [ ]=		[ ]	x [ ]=	
	[ ]	x [ ]=		[ ]	x [ ]=		[ ]	x [ ]=	
Sum each column for totals		Primary, non-alarm:			Primary, alarm:			Secondary, non-alarm:	

**Table A.2 System Draw Current Calculations**

- \* Maximum current draw for all NACs plus DC output from TB10 and TB2 is 3.0 A during standby.
- † Value represents an SLC's maximum current draw. Refer to device datasheets for individual current draws.
- ‡ The total regulated load current supplied to four-wire smoke detector and power supervision relays cannot exceed 1.25 A.
- \*\* Enter the total notification appliance draw from the Main Power Supply, excluding the current from APS-6R supplies. Refer to Device Compatibility Document.
- †† Refer to manual and/or Device Compatibility Document. See Table 1.1, "Reference Documentation," on page 8 for specific documentation part numbers.

## A.2.1 Calculating the Maximum Secondary Power Fire Alarm Current Draw

Use Table A.3 below to determine the maximum current requirements of secondary power source during fire alarm conditions. The result obtained is the amount of current that the batteries must be able to supply to the fire alarm system. Use the result in Table A.4 to determine the size of the batteries needed for the fire alarm system.

Results taken from Table A.3 below assume that, while in a fire alarm condition, batteries must feed the main power supply (and any additional supplies such as the APS2-6R) with the maximum rated power each supply can provide.

Device	Quantity	Current (in amps)	Total Current/Type
Alarm Current, from Table A.2, col 2		=	
APS2-6R*	[ ] X	6 =	
Sum Column for Secondary Fire Alarm Load		=	

**Table A.3 Maximum Secondary Power Fire Alarm Current Draw**

\* Actual load current may be used in place of maximum rated supply current. To calculate actual load current, sum the current draws for each appliance connected to APS-6R supplies.



**NOTE:** The Secondary Fire Alarm Load cannot exceed the following:

- 12 A with BAT-12260 batteries (12 V, 26 AH).
- 20 A with BAT-12550 batteries (12 V, 55 AH).

## A.3 Calculating the Battery Requirements

### A.3.1 Calculating the Battery Capacity

Use this table to determine the battery capacity needed for the system:

Current (amps)	X	Time (hours)	=	AH
Secondary Non-Fire Alarm Current (from column 3 in Table A.2) (see Note 8)		Required Secondary Non-Fire Alarm Standby Time (24 or 60 hours)		
_____	X	_____	=	_____AH
APS-6R Standby Load Current		Required Secondary Non-Fire Alarm Standby Time (24 or 60 hours)		
_____	X	_____	=	_____AH
Secondary Fire Alarm Load (from Table A.3) (see Note 8)		Required Fire Alarm Standby Time: (for 5 minutes, enter 0.084; for 15 minutes, enter 0.25)		
_____	X	_____	=	_____AH
Sum Column for Total Secondary Amp Hours calculated			=	_____AH
Multiply by the derating factor x 1.2 (see Note 7)			=	_____AH
Battery Size – Total Secondary Amp Hours Required			=	_____AH
<ol style="list-style-type: none"> <li>NFPA 72 Local, Proprietary, and Central Station systems requires 24 hours of standby power followed by 5 minutes in alarm.</li> <li>NFPA 72 Auxiliary and Remote Station Systems require 24 hours of standby power followed by 5 minutes in alarm.</li> <li>Batteries installed in a system powered by an automatic starting engine generator need to provide at least 4 hours of standby power.</li> <li>Factory Mutual requires 90 hours of standby for deluge-preaction systems.</li> <li>Emergency voice/alarm communications systems require 2 hours of operation in the alarm condition. Due to the sporadic nature of voice operation, however, NFPA 72 permits 15 minutes of operation at a maximum connected load to equal 2 hours of normal use.</li> <li>If the total exceeds 26 AH, the system requires a separate NFS-LBB, BB-100 or BB-200 battery enclosure for two larger capacity batteries.</li> <li>The following battery derating factors must be used for Canadian installations using NFS-320C charger: <ul style="list-style-type: none"> <li>For a 26 AH battery, use derating factor of 1.5</li> <li>For a 55 AH battery, use derating factor of 1.8</li> <li>For a 100 AH battery, use derating factor of 2.5</li> <li>For a 200 AH battery, use derating factor of 2.5</li> </ul> </li> <li>For 26 AH batteries: maximum standby current cannot exceed 0.65A; maximum alarm current cannot exceed 6.75A</li> </ol>				

**Table A.4 Secondary Power Standby and Fire Alarm Load**

### A.3.2 Calculating the Battery Size

Use this table to choose the battery size, in amp-hours, needed to support the fire alarm system. The CPS-24/E can charge batteries from 18 to 200 AH. Select batteries that meet or exceed the Total Amp-Hours calculated in Table A.4 and that are within the acceptable battery charger range. Write the amp-hours requirements on the Protected Premises label.

The maximum battery size that can be mounted inside the NFS-320's cabinet is 26AH.

Battery Size	Voltage Rating	Number Required	Part Number*	Backbox Part Number <sup>†</sup>
18 AH	12 volts	two	BAT-12180	NFS-320 enclosure, BB-25
26 AH	12 volts	two	BAT-12260	NFS-320 enclosure, BB-25
100 AH	12 volts	four for 100 AH two for 200 AH	BAT-121000	BB-100 BB-200
*Manufactured to our specifications.				
<sup>†</sup> Red version available; add "R" to part number listed here				

**Table A.5 Selecting Battery and Battery Backbox**

# Appendix B: Electrical Specifications

## B.1 Electrical Specifications

### AC Power

Component	Values
Main Power Supply	120 VAC, 50/60 Hz, 5.0 A; or 220-240 VAC, 50/60 Hz, 2.5 A
Wire size	Maximum 12 AWG (3.31 mm <sup>2</sup> ) with 600 VAC insulation



**NOTE:** If using an auxiliary power supply such as FCPS-24S6/S8 or APS-6R, refer to the documentation for that equipment.

### Batteries

The control panel uses **only** sealed lead-acid batteries for secondary standby power. Maximum battery capacity for the CPS-24/E main power supply is 200 AH. The NFS-320 enclosure provides space for up to two 26 AH batteries. Use external battery boxes if the installation requires larger capacity batteries; see Table A.5, “Selecting Battery and Battery Backbox,” on page 57.

When AC Power is lost, the deeply-discharged battery cutoff protection will be invoked at 17 volts. The power supply will be disconnected from the batteries. The power supply’s normal operation will be restored when AC power returns.

The table below contains battery charger specifications.

Charger	Description	Specifications
CPS-24/E Main Power Supply	An internal battery charger for 18 AH to 200 AH	Normal Charge: 27.6 VDC +/- 0.24 VDC Charging Current: 2.0 A or 5.7 A (Software selectable)
CHG-120 Battery Charger	An external battery charger designed to charge lead-acid batteries between 26 AH and 120 AH	Dual Rate: High Charge: 28.1 VDC Normal Charge: 27.6 VDC Charging Current: 4.5 A
ACPS-2406 Auxiliary Charger/Power Supply	An internal battery charger for 7 AH to 26 AH	Normal Charge: 27.6 VDC Charging Current: 1.1 A max (0.750 A typical)
ACPS-610 Addressable Charger/Power Supply	An internal battery charger for 12 AH to 200 AH	Normal Charge: 27.6 VDC +/- 0.24 VDC Charging Current: 2A, 5A, or OFF (Software Selectable)

### Signaling Line Circuit (SLC)

Item	Value
Voltage	24 VDC nominal, 27.6 VDC maximum
Maximum length	12,500 ft. (3810 m) total loop length (NFPA Style 4, 6, and 7) <b>Note:</b> Refer to Appendix B.2 “Wire Requirements” for limitations.
Maximum current	400 mA peak, (max short circuit; circuit will shut down until short is fixed). For battery calculations use 200mA.
Maximum resistance	50 ohms (supervised and power-limited)

## Notification Appliance Circuits and Releasing Circuits

Item	Value
Max. wiring voltage drop	2 VDC (Retrofit note: SLCs with old CMX modules are restricted to 1.2 VDC.)
NAC Nominal operating voltage	24 VDC regulated; 1.5 A max.
Special Applications for Releasing Circuits	20.16 - 26.42 VDC
Current for all external devices connected to the control panel's power supply	7.4 A in alarm (3.9 A continuous) TB10 and all 4 NACs share a maximum of 3.0 A in standby and 6.0 A in alarm.
Optional ACPS-2406	Total 6 A in alarm (5 A continuous)
Optional ACPS-610	Total 6 A in alarm (1.5 A single output)
Optional APS-6R	Total 6 A in alarm (4 A continuous)
Maximum signaling current/circuit per NAC	1.5 A Note: Some devices have maximum draws less than this; refer to the device's documentation.
End-of-Line Resistors (ELRs)	Control Panel NACs (TB6, TB7, TB8, TB9): 2.2K, 1/2 watt XP6-C, FCM-1 Modules: 47K, 1/2 watt
NOTE: For a list of compatible Notification Appliance Circuits and Releasing Circuits see Notifier Device Compatibility Document 15378.	

### Output Relays (common)

Output relays for Alarm and Trouble are common on TB4; Supervisory, and Security are programmable on TB5. See Figure 3.11, "Form-C Relay Connections" on page 27).

Contact ratings: 2.0 A @ 30 VDC (resistive)

### Four-wire Smoke Detector Power

Control Panel terminals TB10 RESET (+) and (–) supply filtered, low-noise power for four-wire smoke detectors. Specifications are:

- Nominal voltage: 24 VDC special applications.
- Maximum rated current: 1.25 A DC
- Maximum ripple voltage: 176 mVrms
- TB10 and all 4 NACs share a maximum of 3.0 A in standby and 6.0 A in alarm.

Refer to the *Device Compatibility Document* for compatible 24 VDC detectors.

### Power Output

Control Panel terminals TB10 NONRESET (+) and (–) supply one (1) power-limited circuit available to power external devices, such as notification appliances and annunciators.

- Nominal voltage: 24 VDC regulated, special applications, 1.5 A max.
- Maximum rated current: 1.25 A DC
- Maximum ripple voltage: 176 mVrms
- TB10, TB2, and all 4 NACs share a maximum of 3.0 A in standby and 6.0 A in alarm.

Refer to the *Device Compatibility Document* for compatible devices and notification appliances.



**NOTE:** The Control Panel provides a total of 7.4 A of power in alarm (3.9 A in standby), shared by all internal circuitry and external provisions (24 V resettable and non-resettable). TB10 and all 4 NACs share a maximum of 3.0 A in standby and 6.0 in alarm. For power requirements, refer to the power supply calculation tables in Appendix A.

### Operating Power: AC Branch Circuit

The control panel requires connection to a separate dedicated AC branch circuit. Follow these guidelines when connecting the AC branch circuit:

- Label the branch circuit “Fire Alarm”. This must be a separate dedicated AC fire alarm circuit.
- Connect the branch circuit to the line side of the main power feed of the protected premises.
- Do not power other equipment from the fire alarm branch circuit.
- Run the AC branch circuit wire continuously, without any disconnect devices except for overcurrent protection, from the power source to the fire alarm control panel.
- Overcurrent protection for the AC branch circuit must comply with Article 760 of the National Electrical Codes, as well as local codes.
- Use 12 AWG (3.31 mm<sup>2</sup>) wire with 600 VAC insulation for the AC branch circuit.

Connect the ground terminal (TB1-Earth) to a solid earth ground (a metallic, cold water pipe may be suitable in some installations). This connection is vital in reducing the panel’s susceptibility to transients generated by lightning and electrostatic discharge.

### Operating Power: Secondary Power Source (Batteries)

The battery charger is current-limited and can recharge sealed lead-acid type batteries. The battery charger shuts off when the control panel is in alarm.

## B.2 Wire Requirements

Each type of circuit within the Fire Alarm Control System requires use of a specific wire type to ensure proper circuit operation. The wire gauge of a particular circuit depends on the length of that circuit and the current traveling through it. Use Table B.1 below to determine the specific wiring requirements for each circuit.

Compliance with the Federal Communications Commission (FCC) and Canadian Department of Communication regulations on electrical energy radiation requires the following: Use twisted-pair shielded wire for any non-SLC-loop wiring entering or exiting the cabinet that is not enclosed in conduit. Use twisted-pair unshielded wiring for SLC-loop wiring.



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**NOTE:** If running an SLC in conduit with Notification Appliance Circuits, you can reduce problems by exclusively using electronic sounders (such as the SpectrAlert, SpectrAlert Advanced or MA/SS-24 Series) instead of more electronically noisy notification appliances (such as electromechanical bells or horns).

---

Circuit Type	Circuit Function	Wire Requirements	Distance (feet/meters)	Typical Wire Type
SLC (power limited)	Connects to intelligent and addressable modules.	Twisted-unshielded pair, 12 to 18 AWG (3.31 to 0.82 mm <sup>2</sup> ). 50 ohms maximum per length of Style 6 and 7 loops. 50 ohms per branch maximum for Style 4 loop.	12,500 ft. (3,810 m) 9,500 ft. (2,895.6 m) 6,000 ft. (1,828.8 m) 3,700 ft. (1,127.76 m)	12 AWG (3.31 mm <sup>2</sup> ) 14 AWG (2.08 mm <sup>2</sup> ) 16 AWG (1.31 mm <sup>2</sup> ) 18 AWG (0.82 mm <sup>2</sup> )
		Twisted-shielded pair	5,000 ft. (1,524 m)	12 to 16 AWG (3.31 to 1.31 mm <sup>2</sup> )
		<b>NOTE:</b> • Shields must be isolated from ground. • Shields should be broken at each device.	3,700 ft. (1,127.76 m)	18 AWG (0.82 mm <sup>2</sup> )
		Untwisted, unshielded wire, in conduit or outside of conduit.	5,000 ft. (1,524 m) 3,700 ft. (1,127.76 m)	12 to 16 AWG (3.31 to 1.31 mm <sup>2</sup> ) 18 AWG (0.82 mm <sup>2</sup> )
	<b>Note:</b> Maximum total capacitance of all SLC wiring (both between conductors and from any conductor to ground) should not exceed 0.5 microfarads.			
EIA-485 (power limited)	Connects to FDU-80, ACS modules, LCD-80, or TM-4 Transmitter	Twisted-shielded pair with a characteristic impedance of 120 ohms. 18 AWG (0.82 mm <sup>2</sup> ) minimum.	6,000/1829 (max)	16 AWG (1.31 mm <sup>2</sup> )
EIA-232 (power limited)	Connects to Printers, CRT, or PC.	Twisted-shielded pair in conduit. 18 AWG (0.82 mm <sup>2</sup> ) minimum.	20 feet (6.1 m) (without modem)	16 AWG (1.31 mm <sup>2</sup> )
IDC Initiating Device Circuit	FMM-1, FMM-101, FDM-1, XP10-M, XP6-MA (power limited)	12-18 AWG (3.31 to 0.82 mm <sup>2</sup> ). Maximum circuit resistance is 20 ohms.		12 to 18 AWG (3.31 to 0.82 mm <sup>2</sup> )
NAC Notification Appliance Circuit	FCM-1*, XP6-C (power limited)	12-18 AWG (3.31 to 0.82 mm <sup>2</sup> ). At alarm current level, no more than a 1.2 V drop at the end of the circuit, or sized to provide the minimum rated operating voltage of the appliances used.	To meet 1.2 V drop, or sized to provide the minimum rated operating voltage of the appliances used.	12 to 18 AWG (3.31 to 0.82 mm <sup>2</sup> )
Releasing Module	FCM-1-REL	12-18 AWG (3.31 to 0.82 mm <sup>2</sup> ). 5 ohms maximum per circuit for class A or class B, or sized to provide the minimum rated operating voltage of the appliances used.	To meet 5 ohms maximum current resistance, or sized to provide the minimum rated operating voltage of the appliances used.	12 to 18 AWG (3.31 to 0.82 mm <sup>2</sup> )
24 VDC Power Runs (power-limited)	To TM-4 Transmitter, Annunciator and FCM-1 modules	12-18 AWG (3.31 to 0.82 mm <sup>2</sup> ). Size wire so that no more than 1.2 V drop across wire run from supply source to end of any branch.	To meet 1.2 volt drop	12 to 18 AWG (3.31 to 0.82 mm <sup>2</sup> )
CHG-120	External battery charger	12 AWG (3.31 mm <sup>2</sup> ) in conduit	20/6.1 (max)	12 AWG (3.31 mm <sup>2</sup> )
*FCM-1 can not be used for synchronized strobe/sounder applications.				

Table B.1 Wire Requirements



**NOTE:** Lightning arresters required on circuits extending between buildings; 999 meter length maximum to meet UL 60950.

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