

# NFS-320

## Intelligent Addressable Fire Alarm System



Intelligent Fire Alarm Control Panels

### General

The NFS-320 intelligent Fire Alarm Control Panel is part of the ONYX® Series of Fire Alarm Controls from NOTIFIER.

As a stand-alone small-to-medium system, or as a large network, the ONYX Series of products meets virtually every application requirement.

Designed with modularity and for ease of system planning, the NFS-320 can be configured with just a few devices for small building applications, or for a large campus or high-rise application. Simply add additional peripheral equipment to suit the application.

**NOTE:** Unless called out with a version-specific “C” or “E” at the end of the part number, “NFS-320” refers to models NFS-320, NFS-320C, and NFS-320E; similarly, “CPU-320” refers to models CPU-320, CPU-320C, and CPU-320E.

### Features

- One isolated intelligent Signaling Line Circuit (SLC) Style 4, 6 or 7.
- Up to 159 detectors (any mix of ion, photo, thermal, or multi-sensor) and 159 modules (N.O. manual stations, two-wire smoke, notification, or relay). 318 devices maximum.
- Standard 80-character display.
- Network option — 103 nodes supported (AFP-200, AFP-300/400, NFS-320, NFS-640, NFS2-640, AFP1010, AM2020, NFS-3030, NFS2-3030, NCA/NCA-2 Network Annunciator, NCS Network Control Station, or ONYX-Works™ Network Control Station) using wire or fiber-optic connections.
- 6.0 amp power supply with four Class A/B built-in Notification Appliance Circuits (NAC). Selectable System Sensor, Wheelock, or Gentex strobe synchronization.
- Built-in Alarm, Trouble, and Supervisory relays.
- VeriFire® Tools offline program option. Sort Maintenance Reports by compensation value (dirty detector), peak alarm value, or address.
- Autoprogramming and Walk Test reports.
- Optional universal 318-point DACT.
- 80-character remote annunciators (up to 32).
- EIA-485 annunciators, including custom graphics.
- Printer interface (80-column and 40-column printers).
- History file with 800-event capacity in nonvolatile memory, plus separate 200-event alarm-only file.
- Alarm Verification selection per point, with tally.
- Autoprogramming and Walk Test reports.
- Positive Alarm Sequence (PAS) Presignal.
- Silence inhibit and Auto Silence timer options.
- March time / temporal / California two-stage coding / strobe synchronization.
- Field-programmable on panel or on PC, with VeriFire Tools program check, compare, simulate.
- Full QWERTY keypad.
- Charger for up to 90 hours of standby power.
- Non-alarm points for lower priority functions.
- Remote ACK/Signal Silence/System Reset/Drill via monitor modules.



NFS-320

- Automatic time control functions, with holiday exceptions.
- Surface Mount Technology (SMT) electronics.
- Extensive, built-in transient protection.
- Powerful Boolean logic equations.

### FLASHSCAN® INTELLIGENT FEATURES:

- Poll 318 devices in less than two seconds.
- Activate up to 159 outputs in less than five seconds.
- Multicolor LEDs blink device address during Walk Test.
- Fully digital, high-precision protocol (U.S. Patent 5,539,389).
- Manual sensitivity adjustment — nine levels.
- Pre-alarm ONYX intelligent sensing — nine levels.
- Day/Night automatic sensitivity adjustment.
- Sensitivity windows:
  - Ion – 0.5 to 2.5%/foot obscuration.
  - Photo – 0.5 to 2.35%/foot obscuration.
  - Laser (VIEW®) – 0.02 to 2.0%/foot obscuration.
  - Acclimate Plus™ – 0.5 to 4.0%/foot obscuration.
  - HARSH™ – 0.5 to 2.35%/foot obscuration.
- Drift compensation (U.S. Patent 5,764,142).
- Degraded mode — in the unlikely event that the CPU-320 microprocessor fails, FlashScan detectors revert to degraded operation and can activate the CPU-320 NAC circuits and alarm relay. Each of the four built-in panel circuits includes a Disable/Enable switch for this feature.
- Multi-detector algorithm involves nearby detectors in alarm decision (U.S. Patent 5,627,515).
- Automatic detector sensitivity testing.
- Maintenance alert (two levels).
- Self-optimizing pre-alarm.

**VIEW (VERY INTELLIGENT EARLY WARNING) SMOKE DETECTION TECHNOLOGY:**

- Revolutionary spot laser design.
- Advanced ONYX intelligent sensing algorithms differentiate between smoke and non-smoke signals (U.S. Patent 5,831,524).
- Addressable operation pinpoints the fire location.
- No moving parts to fail or filters to change.
- Early warning performance comparable to the best aspiration systems at a fraction of the lifetime cost.

**ACCLIMATE PLUS**

**LOW-PROFILE INTELLIGENT MULTI-SENSOR:**

- Detector automatically adjusts sensitivity levels without operator intervention or programming. Sensitivity increases with heat.
- Microprocessor-based technology; combination photo and thermal technology.
- FlashScan or classic mode compatible with NFS2-640, NFS-320.
- Low-temperature warning signal at 40°F ± 5°F (4.44°C ± 2.77°C).

**HARSH HOSTILE-AREA SMOKE HEAD:**

- Provides early warning of smoke detection in environment where traditional smoke detectors are not practical.
- The detector's filters remove particulates down to 30 microns in size.
- Intake fan draws air into photo chamber, while airborne particles and water mist are removed.
- Requires auxiliary 24 VDC from system or remote power supply.

**RELEASING FEATURES:**

- Ten independent hazards.
- Sophisticated cross-zone (three options).
- Delay timer and Discharge timers (adjustable).
- Abort (four options).
- Low-pressure CO<sub>2</sub> listed.

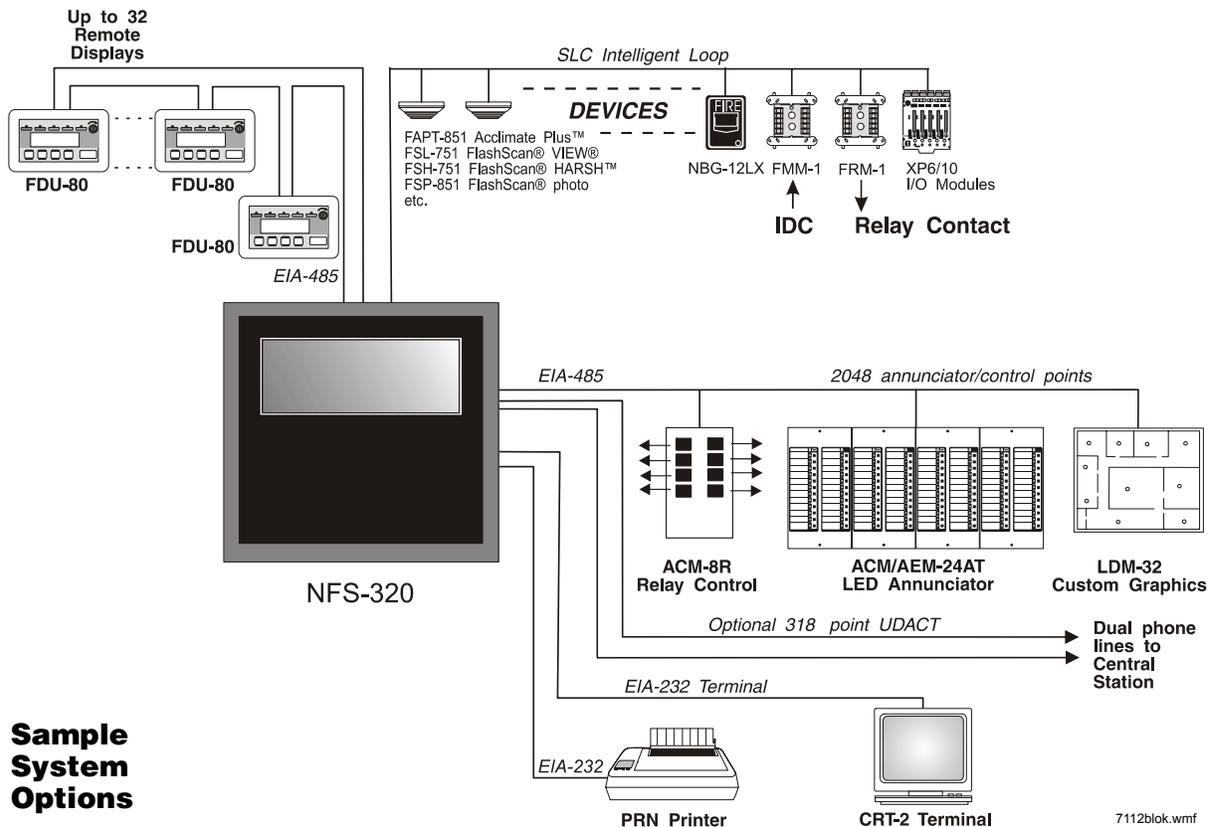
**HIGH-EFFICIENCY OFFLINE SWITCHING**

**3.0 AMP POWER SUPPLY (6.0 A IN ALARM):**

- 120 or 220/240 VAC.
- Displays battery current/voltage on panel (with display).

**VOICE FEATURES:**

- Integrates with FireVoice-25/50 Series.



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## FlashScan, Exclusive New World-Leading Detector Protocol

At the heart of the NFS-320 is a set of detection devices and device protocol — FlashScan (U.S. Patent 5,539,389). FlashScan is an all-digital protocol that gives superior precision and high noise immunity.

In addition to providing quick identification of an active input device, this new protocol can also activate many output devices in a fraction of the time required by competitive protocols. This high speed also allows the NFS-320 to have the largest device per loop capacity in the industry — 318 points — yet every input and output device is sampled in less than two seconds. The microprocessor-based FlashScan detectors have bicolor LEDs that can be coded to provide diagnostic information, such as device address during Walk Test.

## ONYX Intelligent Sensing

Intelligent sensing is a set of software algorithms that provides the NFS-320 with industry-leading smoke detection capability. These complex algorithms require many calculations on each reading of each detector, and are made possible by the very-high-speed microcomputer used by the NFS-320.

**Drift Compensation and Smoothing:** Drift compensation allows the detector to retain its original ability to detect actual smoke, and resist false alarms, even as dirt accumulates. It reduces maintenance requirements by allowing the system to automatically perform the periodic sensitivity measurements required by NFPA 72. Smoothing filters are also provided by software to remove transient noise signals, such as those caused by electrical interference.

**Maintenance Warnings:** When the drift compensation performed for a detector reaches a certain level, the performance of the detector may be compromised, and special warnings are given. There are three warning levels: (1) Low Chamber value, usually indicative of a hardware problem in the detector; (2) Maintenance Alert, indicative of dust accumulation that is near but below the allowed limit; (3) Maintenance Urgent, indicative of dust accumulation above the allowed limit.

**Sensitivity Adjust:** Nine sensitivity levels are provided for alarm detection. These levels can be set manually, or can change automatically between day and night. Nine levels of pre-alarm sensitivity can also be selected, based on predetermined levels of alarm. Pre-alarm operation can be latching or self-restoring, and can be used to activate special control functions.

**Self-Optimizing Pre-Alarm:** Each detector may be set for “Self-Optimizing” pre-alarm. In this special mode, the detector “learns” its normal environment, measuring the peak analog readings over a long period of time, and setting the pre-alarm level just above these normal peaks.

**Cooperating Multi-Detector Sensing:** A patented feature of ONYX intelligent sensing is the ability of a smoke sensor to consider readings from nearby sensors in making alarm or pre-alarm decisions. Without statistical sacrifice in the ability to resist false alarms, it allows a sensor to increase its sensitivity to actual smoke by a factor of almost two to one.

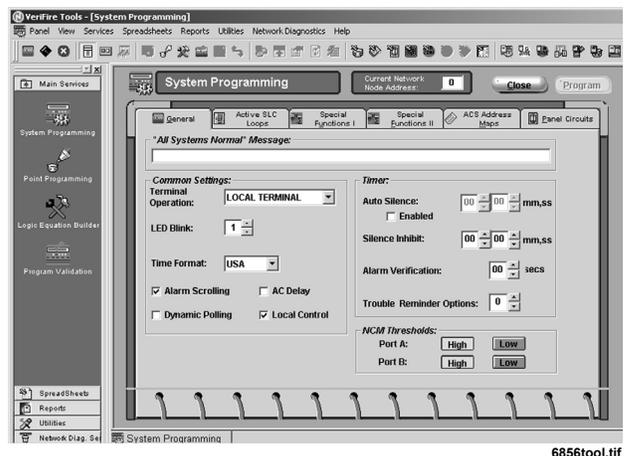
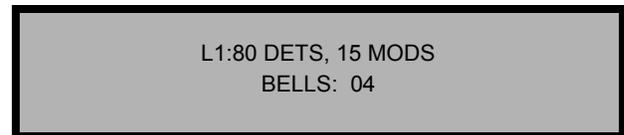
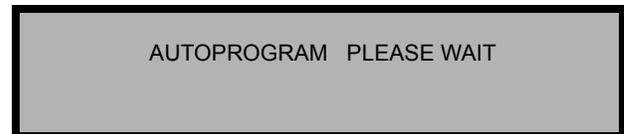
## Field Programming Options

**Autoprogram** is a timesaving feature of the NFS-320. It is a special software routine that allows the NFS-320 to “learn” what devices are physically connected and automatically load them in the program with default values for all parameters. Requiring less than one minute to run, this routine allows the user to have almost immediate fire protection in a new installation, even if only a portion of the detectors are installed.

**Keypad Program Edit (with KDM-R2)** The NFS-320, like all NOTIFIER intelligent panels, has the exclusive feature of program creation and editing capability from the front panel keypad, *while continuing to provide fire protection*. The architecture of the NFS-320 software is such that each point entry carries its own program, including control-by-event links to other points. This allows the program to be entered with independent per-point segments, while the NFS-320 simultaneously monitors other (already installed) points for alarm conditions.

**VeriFire Tools** is an offline programming and test utility that can greatly reduce installation programming time, and increase confidence in the site-specific software. It is Windows®-based and provides technologically advanced capabilities to aid the installer. The installer may create the entire program for the NFS-320 in the comfort of the office, test it, store a backup file, then bring it to the site and download from a laptop into the panel.

Below: Autoprogram function.



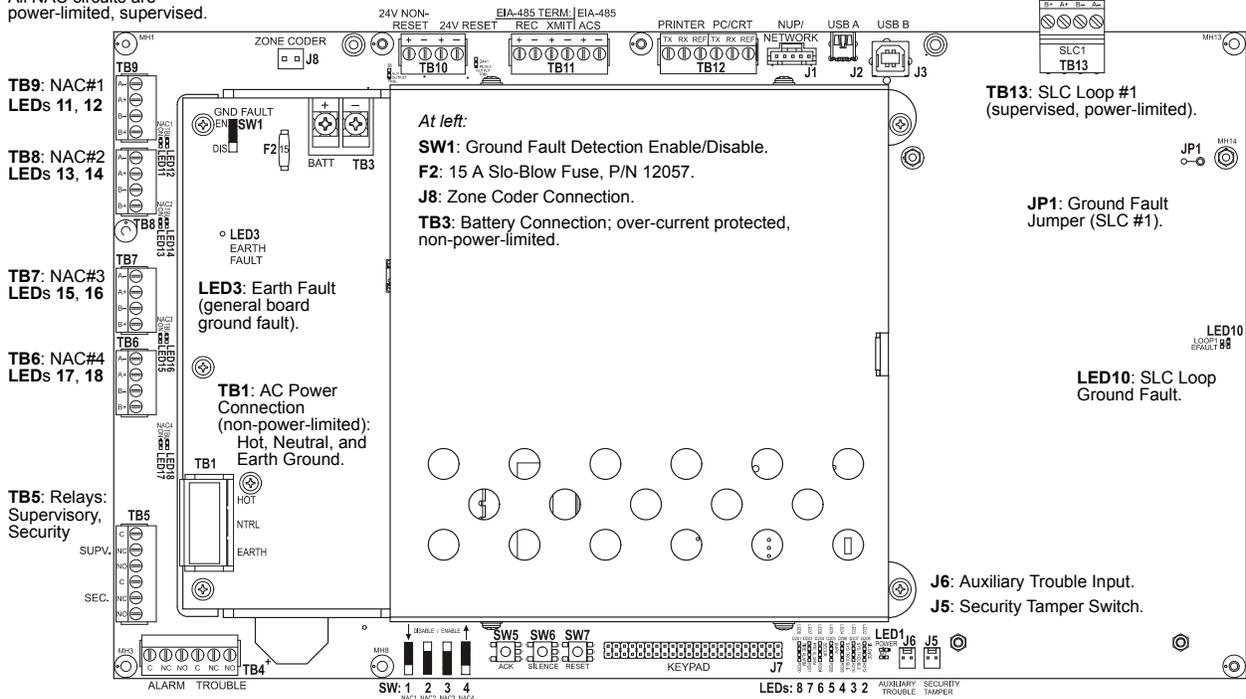
VeriFire Tools System Programming screen

# CPU-320 Board Diagram

**TB10:** DC Power (24 VDC, power-limited); Non-Resettable, Resettable.  
**TB11:** EIA-485 Connection (supervised); Terminal Mode, ACS Mode.  
**TB12:** EIA-232 Connection; Printer, PC/Terminal (CRT).

**J1:** Network/Service Connection (NUP), power-limited, supervised.  
**J2:** USB A *VeriFire Tools* Connection.  
**J3:** USB B *VeriFire Tools* Connection.

All NAC circuits are power-limited, supervised.



**TB4:** Alarm Relay, Trouble Relay. Output relays; power-limited only if connected to a power-limited source.

**SW1, SW2, SW3, SW4:** Disable-Enable switches for Backup Alarm, NACs 1 – 4 respectively.

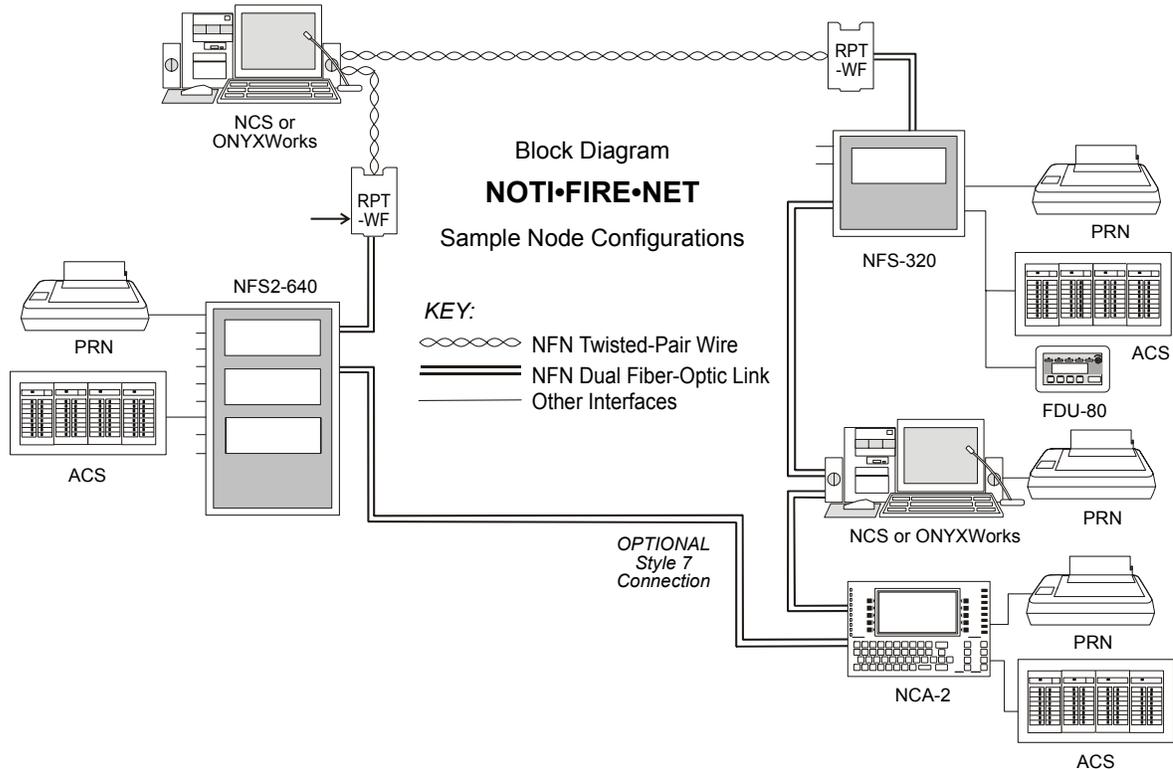
System switches, "No Keyboard Operation":  
**SW5** Acknowledge  
**SW6** Silence  
**SW7** Reset

**J7:** KDM-R2 Connection

**LED1:** Power On (AC or battery)  
**LED2:** Signals Silenced  
**LED3:** Point Disabled  
**LED4:** System Trouble  
**LED5:** Supervisory  
**LED6:** Security  
**LED7:** Pre-Alarm  
**LED8:** Fire Alarm

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# Network Diagram



## Placement of Equipment in Chassis and Cabinet

The following guidelines outline the NFS-320's flexible system design.

**Wiring:** When designing the cabinet layout, consider separation of power-limited and non-power-limited wiring as discussed in the NFS-320 Installation Manual.

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

**Networking:** If networking two or more control panels, each unit requires a **NCM-W** (wire) or **NCM-F** (fiber) Network Control Module. The NCM-W/F can be installed in any option board position (see manual). **Option boards** can be mounted in front of the NCM modules.

## KDM-R2 Controls and Indicators

**Program Keypad:** QWERTY type (keyboard layout).

**12 LED Indicators:** Power; Fire Alarm; Pre-Alarm; Security; Supervisory; System Trouble; Signals Silenced; Points Disabled; Control Active; Abort; Pre-Discharge; Discharge.

**Membrane Switch Controls:** Acknowledge/Scroll Display; Signal Silence; Drill; System Reset; Lamp Test.

**LCD Display:** 80 characters (2 x 40) with long-life LED backlight.

## Configuration Guidelines

*The NFS-320 system ships assembled; description and some options follow.*

**NFS-320:** The standard, factory-assembled NFS-320 system includes the following components: one CPU-320 control panel mounted on chassis (120 V operation — ships with grounding cable, battery interconnect cables, and document kit); one KAPS-24 integral power supply mounted to the CPU-320; one primary display KDM-R2 keypad/display; and one cabinet for surface or semi-flush mounting. *Purchase batteries separately. One or two option boards may be mounted inside the NFS-320 cabinet; additional option boards can be utilized in remote cabinets.*

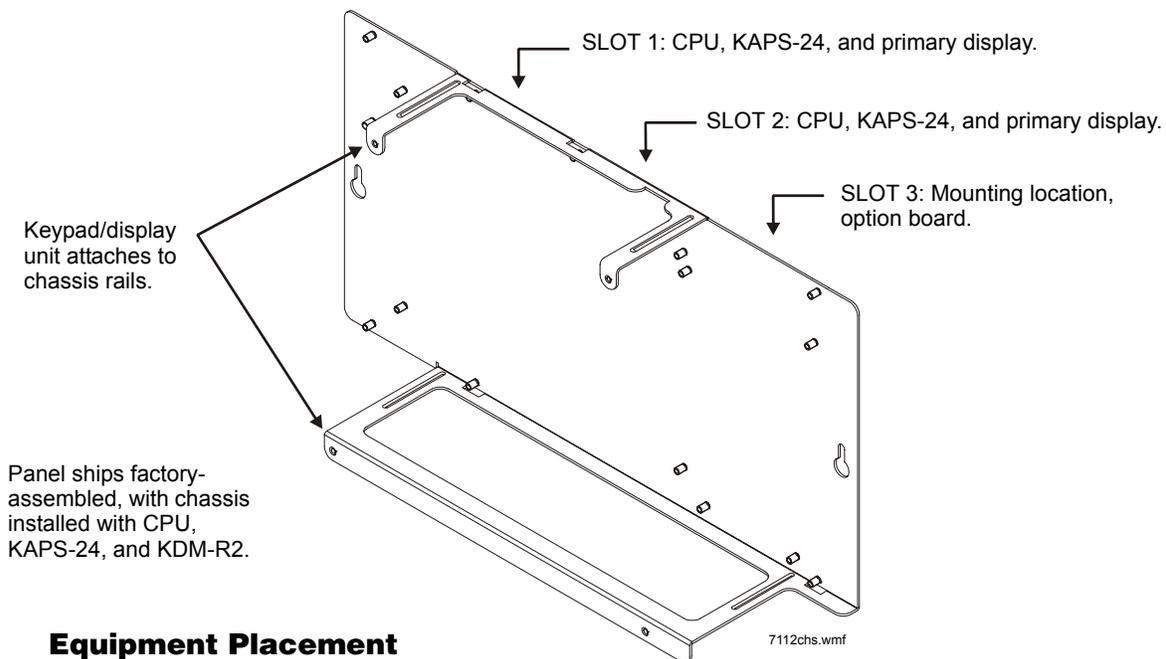
**NFS-320R:** Same as NFS-320 above, but in red enclosure.

**NFS-320C:** Same as NFS-320 above, but with ULC listing. *See Canadian applications manual addendum 52747.*

**NFS-320E:** Same as NFS-320 above, but with 240 V operation.

**BMP-1:** Blank module for unused module positions.

**TR-320:** Trim ring for the NFS-320 cabinet.



## Equipment Placement in NFS-320 Chassis

## Option Modules

**FCPS-24S6/-24S8:** Remote six-amp and eight-amp power supplies with battery charger. See *FCPS-24S6/-24S8 data sheet, DN-6927*.

### COMPATIBLE DEVICES, EIA-232 PORTS

**PRN-6:** 80-column printer. See *DN-6956*.

**VS4095/S2:** Printer, 40-column, 24 V. Mounted in external backbox. See *DN-3260*.

**CRT-2:** Video display terminal. See *DN-3756*.

### COMPATIBLE DEVICES, EIA-485 PORTS

**ACM-24AT:** ONYX Series ACS annunciator – up to 96 points of annunciation with Alarm or Active LED, Trouble LED, and switch per circuit. Active/Alarm LEDs can be programmed (by powered-up switch selection) by point to be red, green, or yellow; the Trouble LED is always yellow. See *DN-6862*.

**AEM-24AT:** Same LED and switch capabilities as ACM-24AT, expands the ACM-24AT to 48, 72, or 96 points. See *DN-6862*.

**ACM-48A:** ONYX Series ACS annunciator – up to 96 points of annunciation with Alarm or Active LED per circuit. Active/Alarm LEDs can be programmed (by powered-up switch selection) in groups of 24 to be red, green, or yellow. Expandable to 96 points with one AEM-48A. See *DN-6862*.

**AEM-48A:** Same LED capabilities as ACM-48A, expands the ACM-48A to 96 points. See *DN-6862*.

**TM-4:** Transmitter Module. Includes three reverse-polarity circuits and one municipal box circuit; mount on NFS-320 chassis or remotely. See *DN-6860*.

**FDU-80:** Remote LCD display, 80 characters, with LEDs. See *DN-6820*.

**LDM:** Lamp Driver Modules LDM-32, LDM-E32, and LDM-R32; remote custom driver modules. See *LDM data sheet, DN-0551*.

**ACM-8R:** Remote Relay Module with eight Form-C contacts. Can be located up to 6,000 ft. (1828.8 m) from panel on four wires. See *ACM-8R data sheet, DN-3558*.

**RPT-485 Series:** Repeater, isolator and/or fiber-optic modem; repeats EIA-485 over twisted pair or converts to fiber-optic medium. See *RPT data sheet, DN-4737*.

**SCS:** Smoke control stations SCS-8, SCE-8, with lamp drivers SCS-8L, SCE-8L; eight (expandable to 16) circuits. See *SCS data sheet, DN-4818*.

**UDACT:** Universal Digital Alarm Communicator Transmitter, 636 channel. See *DN-4867*.

**UZC-256:** Programmable Universal Zone Coder provides positive non-interfering successive zone coding. Microprocessor-controlled, field-programmable from IBM®-compatible PCs (requires optional programming kit). See *UZC-256 data sheet, DN-3404*.

### COMPATIBLE INTELLIGENT DEVICES

**BEAMHK:** Heating kit for transmitter/receiver unit of FSB-200(S) below. See *DN-6985*.

**BEAMHRK:** Heating kit for use with the reflector of FSB-200(S) below. See *DN-6985*.

**BEAMLRK:** Long-range accessory kit, FSB-200(S) below.

**BEAMMRK:** Multi-mount kit, FSB-200(S) below.

**BEAMSMK:** Surface-mount kit, FSB-200(S) below.

**FSB-200:** Intelligent beam smoke detector. See *DN-6985*.

**FSB-200S:** Intelligent beam smoke detector with integral sensitivity test. See *DN-6985*.

**FSI-851:** Low-profile FlashScan ionization detector, will replace FSI-751. See *DN-6934*.

**FSI-751:** Low-profile FlashScan ionization detector. See *DN-6714*.

**FSP-851:** Low-profile FlashScan photoelectric detector, will replace FSP-751. See *DN-6935*.

**FSP-751:** Low-profile FlashScan photoelectric detector. See *DN-6714*.

**FSP-851T:** Low-profile FlashScan photoelectric detector with 135°F (57°C) thermal, will replace FSP-751T. See *DN-6935*.

**FSP-751T:** Low-profile FlashScan photoelectric detector with 135°F (57°C) thermal. See *DN-6714*.

**FST-851:** FlashScan thermal detector 135°F (57°C), will replace FST-751. See *DN-6936*.

**FST-751:** FlashScan thermal detector 135°F (57°C). See *DN-6716*.

**FST-851R:** FlashScan thermal detector 135°F (57°C) with rate-of-rise, will replace FST-751R. See *DN-6936*.

**FST-751R:** FlashScan thermal detector 135°F (57°C) with rate-of-rise. See *DN-6716*.

**FST-851H:** FlashScan 190°F (88°C) high-temperature thermal detector. See *DN-6936*.

**FSD-751P:** FlashScan photo duct detector with housing. See *DN-6821*.

**FSD-751PL:** Low-flow FlashScan photo duct detector with housing, will replace FSD-751P. See *DN-6955*.

**FSD-751RP:** FlashScan photo duct detector with relay and housing. See *DN-6821*.

**FSD-751RPL:** Low-flow FlashScan photo duct detector with relay and housing, will replace FSD-751RP. See *DN-6955*.

**FAPT-851:** FlashScan Acclimate Plus low-profile multi-sensor detector, will replace FAPT-751. See *DN-6937*.

**FAPT-751:** Acclimate Plus low-profile multisensor detector. See *DN-6833*.

**FSH-751:** FlashScan HARSH Hostile Area Smoke Head. See *DN-6875*.

**FSL-751:** FlashScan VIEW laser photo detector, will replace LPX-751. See *DN-6886*.

**LPX-751:** Low-profile VIEW laser photo detector. See *DN-5306*.

**B224RB:** Low-profile relay base.

**B224BI:** Isolator base for low-profile detectors.

**B710LP:** Low-profile base. Standard U.S. style.

**B501:** European-style, 4" (10.16 cm) base.

**B501BH:** Sounder base, includes B501 base above.

**FMM-1:** FlashScan monitor module. See *DN-6720*.

**FDM-1:** FlashScan dual monitor module. See *DN-6720*.

**FZM-1:** FlashScan two-wire detector monitor module. See *DN-6720*.

**FMM-101:** FlashScan miniature monitor module. See *DN-6720*.

**FCM-1:** FlashScan NAC control module. See *DN-6724*.

**FRM-1:** FlashScan relay module. See *DN-6724*.

**NBG-12LX:** Manual fire alarm station, addressable. See *DN-6726*.

**ISO-X:** Isolator module. See *DN-2243*.

**XP6-C:** FlashScan six-circuit supervised control module. See *DN-6924*.

**XP6-MA:** FlashScan six-zone interface module; connects intelligent alarm system to two-wire conventional detection zone. See *DN-6925*.

**XP6-R:** FlashScan six-relay (Form-C) control module. See *DN-6926*.

**XP10-M:** FlashScan ten-input monitor module. See *DN-6923*.

## **OTHER OPTIONS**

**DPI-232:** Direct Panel Interface, specialized modem for extending serial data links to remotely located FACPs and/or peripherals; mount on NFS-320 chassis. See *DN-6870*.

**NCM-W:** Network Communications Module, Wire. Order one NCM per network node (CPU-640 or NCA). See *DN-6861*.

**NCM-F:** Network Communications Module, Fiber. Order one NCM per network node (CPU-640 or NCA). See *DN-6861*.

**NCS5-W-ONYX:** Network Control Station, Wire. UL-Listed graphics PC with mouse, 17" color flat-screen LCD monitor. Order as necessary for network systems. Each NCS consumes one of 103 network addresses. See *DN-6868*, *ONYX DN-6869*.

**NCS5-F-ONYX:** Network Control Station, Fiber. UL-Listed graphics PC with mouse, 17" color flat-screen LCD monitor. Order as necessary for network systems. Each NCS consumes one of 103 network addresses. See *ONYX DN-6869*.

**ONYXWORKS-NW:** Workstation with NFN **wire** PC card. ONYXWorks workstation GUI software and hardware package for NOTI•FIRE•NET. Includes NFN Gateway (NFNGW-PC-W) wire version.

**ONYXWORKS-NF:** Workstation with NFN **fiber** PC card. ONYXWorks workstation GUI software and hardware package for NOTI•FIRE•NET. Includes NFN Gateway (NFNGW-PC-F) fiber version.

**ONYXWORKS-EW:** Workstation with Echelon **wire** PC card. ONYXWorks workstation GUI software and hardware package for Building Systems Integration, WSSUP Workstation Supervisor. Includes Echelon® Gateway (ECH-GW-PC-W) wire version.

**NFN-GW-EM:** NFN Gateway, embedded.

**VeriFire-TCD:** VeriFire Tools CD-ROM. Contains programming software for the ONYX Series. Includes local panel connection cable. Programming PC requires a serial port connection. See *DN-6871*.

**BAT Series:** Batteries. NFS-320 utilizes two 12 volt, 18 to 200 AH batteries. This series of products replaces the previous PS Series. See *DN-6933*.

**NFS-LBB:** Battery Box (required for batteries over 25 AH).

**NFS-LBBR:** Same as above, but red.

# SYSTEM SPECIFICATIONS

## System Capacity

- Intelligent Signaling Line Circuits ..... 1
- Intelligent detectors ..... 159
- Addressable monitor/control modules ..... 159
- Programmable internal hardware and output circuits ..... 4
- Programmable software zones ..... 99
- Special programming zones ..... 14
- LCD annunciators per CPU-320/-320E ..... 32
- ACS annunciators per CPU-320/-320E ..... 32 addresses x 64 points

## Specifications

- Primary input power, **CPU-320 board**: 120 VAC, 50/60 Hz, 3.0 A. **CPU-320E board**: 220/240 VAC, 50/60 Hz, 1.5 A.
- Total output 24 V power: 6.0 A in alarm.

**NOTE:** The power supply has a total of 6.0 A of available power. This is shared by all internal circuits.

- Standard notification circuits (4): 1.5 A each.
- Four-wire detector power: 1.25 A.
- Non-resettable regulated power outputs: 1.25 A each.
- Battery charger range: 18 AH – 200 AH. Use separate cabinet for batteries over 25 AH.
- Optional high-capacity (25 – 120 AH) battery charger: CHG-120 (see CHG-120 data sheet, DN-6040).
- Float rate: 27.6 V.

## Cabinet Specifications

NFS-320 cabinet dimensions: **BACKBOX, OUTSIDE**: 18.240" (46.33 cm) height, 5.77" (14.656 cm) deep. **WITH DOOR**: 18.870" (47.93 cm) wide x 18.469" (46.911 cm) high x 5.817" (14.775 cm) deep. **BACKBOX, INSIDE**: 18.120" (46.025 cm) inner width, 5.175" (13.145 cm) inner depth.

## Temperature and Humidity Ranges

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) 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.

## Agency Listings and Approvals

The listings and approvals below apply to the basic NFS-320 control panel. In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL** Listed: file S635.
- **ULC** Listed: file S635.

## Standards

The NFS-320 complies with the following UL Standards and NFPA 72 Fire Alarm Systems requirements:

- **UL 864** (Fire).
- **UL 1076** (Burglary).
- **LOCAL** (Automatic, Manual, Waterflow and Sprinkler Supervisory).
- **AUXILIARY** (Automatic, Manual and Waterflow) (requires 4XTMF).
- **REMOTE STATION** (Automatic, Manual and Waterflow) (requires 4XTMF).
- **PROPRIETARY** (Automatic, Manual and Waterflow). *Not applicable for FM.*
- **EMERGENCY VOICE/ALARM.**



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