

# NFS-320(E)

## 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.

In stand-alone or network configurations, ONYX Series products meet virtually every application requirement.

Designed with modularity and 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 "R" or "E" at the end of the part number, "NFS-320" refers to models NFS-320, NFS-320R, and NFS-320E; similarly, "CPU-320" refers to the main circuit board for CPU-320, and CPU-320E.

#### Features

- Listed to UL Standard 864, 9th edition.
- 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 (Addressable pull stations, normally open contact devices, two-wire smoke, notification, or relay). 318 devices maximum.
- Standard 80-character display.
- Network options:
  - High-speed network for up to 200 nodes (NFS2-3030, NFS2-640, NFS-320(C), NCA-2, DVC, ONYXWorks, NCS, NFS-3030, NFS-640, and NCA).
  - Standard network for up to 103 nodes (NFS2-3030, NFS2-640, NFS-320(C), NCA-2, DVC, ONYXWorks, NCS, NFS-3030, NFS-640, NCA, AFP-200, AFP-300/400, AFP-1010, and AM2020). Up to 54 nodes when DVC is used in network paging.
- 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, Security, and Supervisory relays.
- VeriFire® Tools online or offline programming utility. Upload/Download, save, store, check, compare, and simulate panel databases. Upgrade panel firmware.
- 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.
- Presignal/Positive Alarm Sequence (PAS).
- Silence inhibit and Auto Silence timer options.
- NAC coding functions:
  - March time.
  - Temporal.
  - California two-stage coding.
  - Canadian two-stage.
  - Strobe synchronization.



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- Field-programmable on panel or on PC, with VeriFire Tools program check, compare, simulate.
- Full QWERTY keypad.
- Battery charger supports 18 – 200 amp hour batteries
- Non-alarm points for lower priority functions.
- Remote ACK/Signal Silence/System Reset/Drill via monitor modules.
- 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 up to 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.
  - IntelliQuad – 1.0 to 4.0%/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 (NFPA-72 compliant).
- Maintenance alert (two levels).
- Self-optimizing pre-alarm.

## FSC-851 INTELLIQUAD

### ADVANCED MULTI-CRITERIA DETECTOR

- Detects all four major elements of a fire (smoke, heat, CO, and flame).
- Automatic drift compensation of smoke sensor and CO cell.
- High nuisance-alarm immunity.
- Six sensitivity levels.

### FSL-751 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.

## FAPT-851 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.
- Low-temperature warning signal at 40°F ± 5°F (4.44°C ± 2.77°C).

### 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 VAC (NFS-320); 240 VAC (NFS-320E).
- Displays battery current/voltage on panel (with display).

### VOICE FEATURES:

- Integrates with FireVoice-25/50 Series (see DN-7004).
- Integrates via serial connection with FireVoice-25/50ZS Series (see DN-7003).

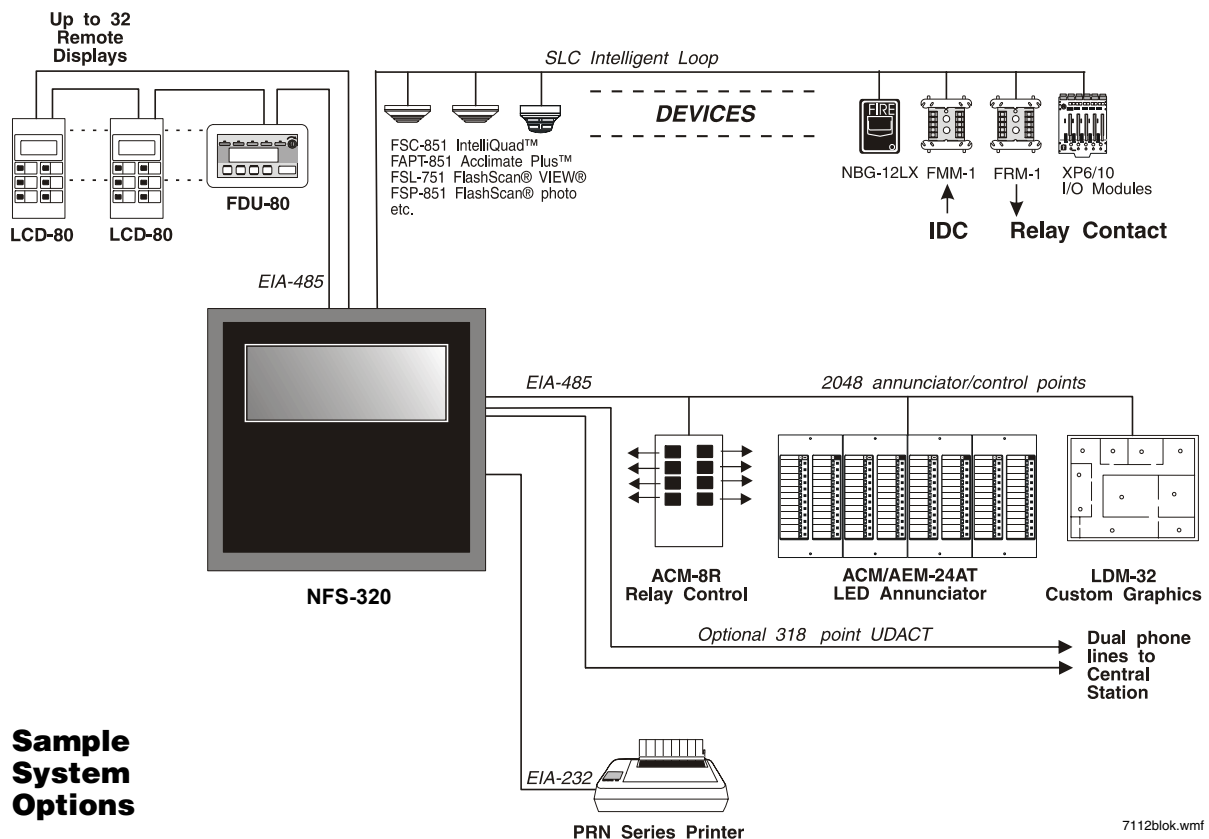
## FlashScan, Exclusive World-Leading Detector Protocol

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 high-speed microcomputer used by the NFS-320.



**Sample System Options**

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**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; (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.** This timesaving feature is a special software routine. The FACP "learns" what devices are physically connected and automatically loads 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.

## 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 Network Control Module or High-Speed Network Control Module (see "Network Options" on page 4). These modules can be installed in any option board position (see manual), and additional option boards can be mounted in front of them.

## 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.

**Keypad 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.*

*Note: Stand-alone and network systems require a main display. On stand-alone systems, the panel's keypad provides the required display. On network systems (two or more networked fire panel nodes), at least one NCA-2, NCS, or ONYXWorks annunciation device is required.*

**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); includes 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.

**NOTE:** For information on the ULC-listed version, see DN-60085.

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

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

## Option Modules

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

### COMPATIBLE DEVICES, EIA-232 PORTS

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

**VS4095/5:** Printer, 40-column, 24 V. Mounted in external back-box. See DN-3260.

### 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.*

**LCD-80/FDU-80:** 80-character, backlit LCD display. Mounts up to 6,000 ft. (1828.8 m) from panel. Up to 32 per FACP. *See LCD-80/-80TM (DN-3198) and FDU-80 (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.*

**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 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. *See DN-6985.*

**BEAMMRK:** Multi-mount kit, FSB-200(S) below. *See DN-6985.*

**BEAMSMK:** Surface-mount kit, FSB-200(S) below. *See DN-6985.*

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

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

**FSC-851:** FlashScan IntelliQuad Advanced Multi-Criteria Detector. *See DN-60412.*

**FSI-851:** Low-profile FlashScan ionization detector. *See DN-6934.*

**FSP-851:** Low-profile FlashScan photoelectric detector. *See DN-6935.*

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

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

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

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

**DNR:** InnovairFlex low-flow non-relay duct-detector housing (order FSP-851 separately). Replaces FSD-751PL/FSD-751RPL. *See DN-60429.*

**DNRW:** Same as above with NEMA-4 rating, watertight. *See DN-60429.*

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

**FSL-751:** FlashScan VIEW laser photo detector. *See DN-6886.*

**B224RB:** Low-profile relay base. *See DN-60054.*

**B224BI:** Isolator base for low-profile detectors. *See DN-60054.*

**B710LP:** Low-profile base. Standard U.S. style. *See DN-60054.*

**B501:** European-style, 4" (10.16 cm) base. *See DN-60054.*

**B501BH-2:** Standard sounder base *See DN-60054.*

**B501BHT-2:** Temporal tone sounder base. *See DN-60054.*

**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-REL:** FlashScan releasing control module. *See DN-60390.*

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

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

**NBG-12LX:** Manual pull 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.*

### NETWORK OPTIONS

**NCM-W, NCM-F:** Standard Network Communications Modules. Wire and multi-mode fiber versions available. *See DN-6861.*

**HS-NCM-W/MF/SF/WMF/WSF/MFSF:** High-speed network communications modules. Wire, single-mode fiber, multi-mode fiber, and media conversion models are available. *See DN-60454.*

**RPT-W, RPT-F, RPT-WF:** Standard-network repeater board with wire connection (RPT-W), fiber connection (RPT-F), or allowing a change in media type between wire and fiber (RPT-WF). *See DN-6971.*

**NCS5-W-ONYX:** Network Control Station, Wire. UL-Listed graphics PC with mouse, 19" color flat-screen LCD monitor. Order as necessary for network systems. Each NCS consumes one of 103 network addresses. *See ONYX DN-6869.*

**NCS5-F-ONYX:** Network Control Station, Fiber. UL-Listed graphics PC with mouse, 19" 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:** UL-listed graphics PC workstation for standard NOTI•FIRE•NET with wire media. Includes NFN Gateway wire version (NFN-GW-PC-W) and 19" color flat-screen LCD monitor. Each ONYXWorks workstation consumes one of 103 network addresses. *See DN-7048.*

**ONYXWORKS-HNW:** UL-listed graphics PC workstation for wire high-speed NOTI•FIRE•NET. Includes HS-NFN Gateway (NFN-GW-PC-HNW) and 19" color flat-screen LCD monitor. Each ONYXWorks consumes one of up to 200 network addresses. *See DN-7048.*

**ONYXWorks-NF:** UL-listed graphics PC workstation for standard NOTI•FIRE•NET with fiber media. Includes NFN Gateway wire version (NFN-GW-PC-F) and 19" color flat-screen LCD monitor. Each ONYXWorks workstation consumes one of 103 network addresses. *See DN-7048.*

**ONYXWORKS-HNSF:** UL-listed graphics PC workstation for single-mode-fiber high-speed NOTI•FIRE•NET. Includes HS-NFN Gateway (NFN-GW-PC-HNSF) and 19" color flat-screen LCD monitor. Each ONYXWorks consumes one of up to 200 network addresses. *See DN-7048.*

**ONYXWORKS-HNMF:** UL-listed graphics PC workstation for multi-mode-fiber high-speed NOTI•FIRE•NET. Includes HS-NFN Gateway (NFN-GW-PC-HNMF) and 19" color flat-screen LCD monitor. Each ONYXWorks consumes one of up to 200 network addresses. *See DN-7048.*

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

## **OTHER OPTIONS**

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

**VeriFire-TCD:** VeriFire Tools CD-ROM. Contains programming software for the ONYX Series. Includes local panel connection cable. *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 larger than 25 AH).

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

**411:** Slave Digital Alarm Communicator. *See DN-6619.*

**411UDAC:** Digital Alarm Communicator. *See DN-6746.*

# 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.
- Non-resettable 5V power: 0.15 A.
- 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
- **CSFM:** 7170-0028:244; 7165-0028:243
- **FM Approved**
- **MEA:** 128-07-E, **FDNY** Certificate #6007, #6025
- **FDNY COA # 6022** (HS-NCM)
- **City of Chicago**

**NOTE:** For ULC-listed model NFS-320C, see DN-60085.

## 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 TM-4).
- **REMOTE STATION** (Automatic, Manual, Waterflow and Sprinkler Supervisory) (requires TM-4).
- **PROPRIETARY** (Automatic, Manual, Waterflow and Sprinkler Supervisory). *Not applicable for FM.*
- **CENTRAL STATION** (Automatic, Manual, Waterflow and Sprinkler Supervisory) (requires UDACT).
- **EMERGENCY VOICE/ALARM.**

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