

ENGINEERING SPECIFICATION
954-POINT INTELLIGENT FIRE DETECTION SYSTEM

PART 1.0 - GENERAL

1.1. DESCRIPTION:

- A. This section of the specification includes the furnishing, installation, connection and testing of the main control board, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, annunciators and/or digital alarm communications to central stations and wiring as shown on the drawings and specified herein.
- B. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for Local Protected Premises Signaling Systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.
 - 1. The Secondary Power Source of the fire alarm control panel will be capable of providing at least 24 hours of backup power with the ability to sustain 5 minutes in alarm at the end of the backup period.
- C. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of ISO 9001:2008 standards and guidelines.
- D. The FACP and peripheral devices shall be manufactured or supplied 100% by a North America manufacturer (or division thereof).
- E. Underwriters Laboratories Inc. (UL) - USA:
 - No. 38 Manually Actuated Signaling Boxes
 - No. 50 Cabinets and Boxes
 - No. 864 Control Units for Fire Protective Signaling Systems
 - No. 268 Smoke Detectors for Fire Protective Signaling Systems
 - No. 268A Smoke Detectors for Duct Applications
 - No. 346 Waterflow Indicators for Fire Protective Signaling Systems
 - No. 464 Audible Signaling Appliances
 - No. 521 Heat Detectors for Fire Protective Signaling Systems
 - No. 1971 Visual Notification Appliances
- F. The installing company shall employ NICET (minimum Level II Fire Alarm Systems) technicians on site to guide the final check-out and to ensure the systems integrity.
- G. The FACP shall meet requirements of UL ANSI 864 Ninth Edition

1.2. SCOPE:

- A. An intelligent fire alarm detection system shall be installed in accordance to the project specifications and drawings.
- B. Basic Performance:
 - 1. Initiation Device Circuits (IDC) shall be wired Class B (NFPA Style B) as part of an addressable device connected by the SLC Circuit.
 - 2. Notification Appliance Circuits (NAC) shall be wired Class B as part of an addressable device connected by the SLC Circuit.
 - 3. All circuits shall be power-limited, per UL864 requirements.
 - 4. A single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
 - 5. Alarm signals active at the main FACP shall not be lost following a primary power failure or outage of any kind until the alarm signal is processed and recorded.
- C. BASIC SYSTEM FUNCTIONAL OPERATION

When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

- 1. The system Alarm LED on the FACP shall flash.
- 2. A local sounder with the control panel shall sound.
- 3. A backlit 80-character LCD display on the FACP shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
- 4. In response to a fire alarm condition, the system will process all control programming and activate all system outputs (alarm notification appliances and/or relays) associated with the point(s) in alarm. Additionally, the system shall send events to a central alarm supervising station via either dial-up over PSTN or Internet or Intranet via PSDN or virtual private network.

1.3. SUBMITTALS

- A. General:
 - 1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.

2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams and conduit layouts.
3. Show configurations, terminations and annunciator layout.

C. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

D. Software Modifications

1. Provide the services of a qualified technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

1.4. GUARANTY:

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.5. MAINTENANCE:

A. Maintenance and testing shall be on a semi-annual schedule or as required by the local AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The schedule shall include:

1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.
2. Each circuit in the fire alarm system shall be tested semiannually.
3. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 14.

B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment and response travel costs for each year of the maintenance period.

Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

1.6. POST CONTRACT EXPANSIONS:

A. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.

B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable beam detectors, addressable monitor modules and addressable control modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).

- C. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional FACP hardware is required, include the material and labor necessary to install this hardware.
- D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FACP and at each intelligent addressable device. Do not include the cost of conventional peripherals or the cost of initiating devices or notification appliances connected to the addressable monitor/control modules.
- E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

1.7. APPLICABLE STANDARDS AND SPECIFICATIONS:

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

A. National Fire Protection Association (NFPA) - USA:

- No. 12 Standard on Carbon Dioxide Extinguishing Systems
- No. 12A Standard on Halon 1301 Fire Extinguishing Systems
- No. 12B Standard on Halogenated Fire Extinguishing Agent Systems
- Halon 1211
- No. 13 Sprinkler Systems
- No. 15 Standard for. Water Spray Fixed Systems for Fire Protection
- No. 16 Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems
- No. 70 National Electric Code (NEC)
- No. 72 National Fire Alarm Code
- No. 101 Life Safety Code
- No. 38 Manually Actuated Signaling Boxes
- No. 217 Smoke Detectors, Single and Multiple Station
- No. 228 Door Closers-Holders for Fire Protective Signaling Systems
- No. 268 Smoke Detectors for Fire Protective Signaling Systems
- No. 268A Smoke Detectors for Duct Applications
- No. 346 Waterflow Indicators for Fire Protective Signaling Systems
- No. 464 Audible Signaling Appliances
- No. 521 Heat Detectors for Fire Protective Signaling Systems
- No. 864 Control Units for Fire Protective Signaling Systems
- No. 1481 Power Supplies for Fire Protective Signaling Systems
- No. 1610 Central Station Burglar Alarm Units
- No. 1638 Visual Signaling Appliances
- No. 1971 Visual Signaling Appliances
- No. 2001 Standard on Clean Agent Fire Extinguishing Systems
- No. 2017 General-Purpose Signaling Devices and Systems
- CAN/ULC S524-01 Standard for Installation of Fire Alarm Systems

- 1. The FACP shall be ANSI 864, 9th Edition Listed. Systems listed to ANSI 864, 8th edition (or previous revisions) shall not be accepted.

- B. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing

standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

C. Local and State Building Codes.

D. All requirements of the Authority Having Jurisdiction (AHJ).

1.8. APPROVALS:

A. The system shall have proper listing and/or approval from the following nationally recognized agencies:

FM Factory Mutual

NYC Fire Dept. Certificate of Approval

CSFM California State Fire Marshal

PART 2.0 PRODUCTS

2.1. EQUIPMENT AND MATERIAL, GENERAL:

- A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a fire protective signaling system, meeting the National Fire Alarm Code.
- B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
- C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.2. CONDUIT AND WIRE:

A. Conduit:

- 1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
- 2. Where required, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
- 3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.

4. Wiring for 24 volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
6. Conduit shall be 3/4 inch (19.1 mm) minimum.

B. Wire:

1. All fire alarm system wiring shall be new.
2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NEC 760 (e.g., FPLR).
5. Wiring used for the multiplex communication circuit (SLC) shall be twisted and support a maximum wiring distance of 9,820 feet when sized at 12 AWG. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit. Shielded wire shall not be required.
6. All field wiring shall be electrically supervised for open circuit and ground fault.
7. The fire alarm control panel shall be capable of T-tapping Class B Signaling Line Circuits (SLCs). Systems which do not allow or have restrictions in, for example, the amount of T-taps, length of T-taps etc., is not acceptable.

C. Terminal Boxes, Junction Boxes and Cabinets:

All boxes and cabinets shall be UL listed for their use and purpose.

- D. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold copper water pipe or grounding rod.

2.3. MAIN FIRE ALARM CONTROL PANEL:

- A. The FACP shall be a Mircom Model **FX-3500** and shall contain a microprocessor-based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, Digital Dialer and Communicators and other system controlled devices.

B. Operator Control

1. Acknowledge Switch:

- a. Activation of the control panel Acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the 80-character LCD display to the next alarm or trouble condition.
- b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

2. Alarm Silence Switch:

Activation of the alarm silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silence able by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto silence timers.

3. Alarm Activate (Drill) Switch:

The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

4. System Reset Switch:

Activation of the System Reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.

5. Lamp Test:

The Visual Indicator Test Button shall activate all system LEDs and turns the buzzer on steady.

C. System Capacity and General Operation

1. The control panel shall provide, or be capable of, expansion to 954 intelligent/addressable devices.
2. The control panel shall include Form-C Alarm, Trouble and Supervisory relays rated at 1.0 amps @ 28 VDC as well as 4 programmable Notification Appliance Circuits (NACs) capable of being wired as Class B or Class A. Total NAC power is 6.0A (1.5A max per circuit). It shall also include an on board DACT for communicating digital information between a fire alarm control panel and a UL-Listed central station. The main power supply for the fire alarm control panel shall provide 10.0 amps of available power for the control panel and peripheral devices.
3. The fire alarm control panel shall include an operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color-coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.
4. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel. The system shall be fully programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes. The control unit will support the ability to upgrade its operating program using FLASH memory technology. The unit shall provide the user with the ability to program from either the included keypad or from a computer running upload/download software.
5. The system shall allow the programming of any input to activate any output or group of outputs. Systems which have limited programming (such as general alarm), have complicated programming (such as a diode matrix), are not considered suitable substitutes.
6. The FACP shall be capable of coding Notification Appliance Circuits in Steady, Temporal Code, California Code, or March Time. Main panel notification circuits shall also automatically synchronize any of the following manufacturer's notification appliances connected to them:

Mircom, Potter/Amseco, System Sensor, Gentex or Wheelock with no need for additional sync modules.

7. The FACP shall provide the following features:
 - a. Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.
 - b. Detector sensitivity test, meeting requirements of NFPA 72, Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.
 - c. The ability to display or print system reports and event logs for up to 400 Alarm events and 400 General events.
 - d. Alarm verification, with counters and a trouble indication to alert maintenance personnel when a detector enters verification an excessive number of times.
 - e. Positive Alarm Sequence (PAS pre signal), meeting NFPA 72 requirements.
 - f. Quick response manual station reporting.
 - g. Non-alarm points for general (non-fire) control.
 - h. Periodic detector test, conducted automatically by the software.
 - i. One-Man Walk Test

D. Central Microprocessor

1. The microprocessor shall be a state-of-the-art and it shall communicate with, monitor and control all external interfaces. A "watch dog" timer circuit to detect and report microprocessor failure.
2. The microprocessor shall contain and execute all specific actions to be taken in the condition of an alarm. Control programming shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.
3. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file.
4. An auto configurator capability (self-learn) shall be

provided to quickly identify devices connected on the SLC and make the system operational.

5. For flexibility and to ensure program validity, an optional Windows(TM) based configurator program utility shall be available. This configurator program shall be used to off-line program the system. This program shall also have a verification utility which scans the program files, identifying possible errors. The configurator program utility uses the on board port. This shall be in compliance with the NFPA 72 requirements for testing after system modification.

E. Display

1. The display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.
2. The display shall include status information and custom alphanumeric labels for all intelligent Advanced Protocol detectors, addressable modules, internal panel circuits, and software zones.
3. The display shall contain an alphanumeric, text-type display and dedicated LEDs for the annunciation of AC POWER, FIRE ALARM, SUPERVISORY, TROUBLE, ALARM SILENCED, DISABLED, CPU FAULT INDICATOR, BATTERY and GROUND conditions.
4. The display keypad shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Three different password levels shall be provided to prevent unauthorized system control or programming.
5. The display shall include the following operator control switches: ACKNOWLEDGE, ALARM SILENCE, DRILL (alarm activate), and SYSTEM RESET.

F. Signaling Line Circuit (SLC)

1. The SLC interface shall provide power to and communicate with up to 159 intelligent Advanced Protocol detectors (photoelectric or thermal) addressable Beam Detectors, and 159 addressable pull stations, intelligent modules (monitor or control) for a system capacity of 954 devices (3 SLC). All three SLC can support Advanced Protocol (AP) and CLIP compatible devices. Each SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring.
2. The CPU shall receive information from all intelligent Advanced Protocol detectors to be processed to determine whether normal, alarm, pre-alarm, or trouble conditions exist for each detector. The software shall automatically

compensate for the accumulation of dust in each detector up to allowable limits. The information shall also be used for automatic detector testing and for the determination of detector maintenance conditions.

3. The detector software shall meet NFPA 72, Chapter 14 requirements and be certified by UL as a calibrated sensitivity test instrument.

G. Serial Interfaces

1. The system shall provide a means of interfacing to UL Listed Electronic Data Processing (EDP) peripherals using the RS-232 communications standard.
2. One RS-232 port shall be used to connect an UL-Listed printer. The printer shall communicate with the control panel using an interface complying with Electrical Industries Association standard EIA-232D. Power to the printer shall be 120 VAC @ 60 Hz.

H. The control panel will have the capability of Reverse Polarity Transmission or connection to a Municipal Box for compliance with applicable NFPA standards.

I. Digital Alarm Communicator Transmitter (DACT).

The On board DACT is an interface for communicating digital information between a fire alarm control panel and a UL-Listed central station.

1. Communication shall include vital system status such as:
 - Independent Zone (Alarm, trouble, non-alarm, supervisory)
 - Independent Addressable Device Status
 - AC (Mains) Power Loss
 - Low Battery and Earth Fault
 - System Off Normal
 - 12 and 24 Hour Test Signal
 - Abnormal Test Signal (per UL requirements)
 - EIA-485 Communications Failure
2. The On board DACT communicator shall support independent zone/point reporting via the Contact ID format. In this format, the DACT shall support the transmission of addressable points within the system. This format shall enable the central station to have exact details concerning the location of the fire for emergency response.

J. Stand Alone Emergency and Fire Alarm Audio System

1. A standalone Emergency and Fire Alarm Audio System shall be available from the same manufacturer of the main fire alarm system.
2. This Emergency and Fire Alarm Audio System shall be a Mircom Model **QX-Mini** and work stand alone or as a slave to the Main Fire Alarm Control Panel.

3. Shall have as minimum requirements:
 - a. Integral 30 Watt, 25 Vrms audio amplifier with a software option for 70.7 volt systems. The system shall be capable of expansion to 60 watts total via the insertion of an additional 30 watt audio amplifier module into the same cabinet and expandable to 360 Watts.
 - b. Speaker circuit shall be capable of either Class A or B wiring.
 - c. Digital Message with a memory capacity for up to 12 minutes of audio messages in total. The Digital Message shall be capable of producing twelve distinct messages. The software configurator can be used to select default messages; import custom message, record custom message and Text To Speech (Type in message produces a voice message).
 - d. Designed to meet the NFPA 72 sleeping space requirement to produce a fundamental frequency of 520 Hz +/- 10% with a square wave or its equivalent.
 - e. Built in alert tone patterns with March Code, California, Steady, Alert Tone, Temporal, 520HZ, Continuous Whoop, or No Tone is field programmable. Tone Prior to transmitting a message, the Emergency and Fire Alarm Audio System can be programmed to produce a pre-announce and post-announce tone.
 - f. The Emergency and Fire Alarm Audio System will be capable of detecting and annunciating the following conditions: Loss of Power (AC and DC), System Trouble, Ground Fault, Alarm, Microphone Trouble, Message Generator Trouble, Tone Generator Trouble, and Amplifier Fault.
 - g. Emergency and Fire Alarm Audio System will provide 2 Notification Appliance Circuit (NAC) output (2.5 Amps per NAC circuit total of 5.0 Amps) with sync generator or follower for Mircom, Potter/Amseco, System Sensor, Gentex or Wheelock protocols. The each NAC shall be capable of One (1) Style Y (Class B) or Style Z (Class A) circuit.
 - h. On-board battery charger which supports charging up to 75 AH batteries cabinet holds up to 18AH batteries).
4. The Emergency and Fire Alarm Audio System shall be fully supervised including microphone, amplifier output, message generator, speaker wiring, and tone generation.
5. Speaker outputs shall be fully power-limited.
6. Amplifiers shall be independently powered and protected to eliminate a short on one circuit from affecting other

circuits.

7. The Emergency and Fire Alarm Audio System shall provide full supervision on both active alarm and standby conditions.

K. Speakers:

1. All speakers shall operate on 25 VRMS, with field selectable output taps from 0.25 to 2.0 Watts.
2. Speakers in corridors and public spaces shall produce a nominal sound output of 84 dBA at 10 feet (3m).
3. Frequency response shall be a minimum of 400 HZ to 4000 HZ.
4. The back of each speaker shall be sealed to protect the speaker cone from damage and dust.

L. Enclosures:

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected and painted red.
2. The back box and door shall be constructed of steel with provisions for electrical conduit connections into the sides and top.
3. The door shall provide a key lock and shall provide for the viewing of all indicators.

- M. **INX-10A** is an Intelligent Booster Power Supply that extends the power capabilities of existing notification appliance circuits as well as provide power for other ancillary devices.

1. The INX-10A shall offer up to 10.0 amps of regulated 24 volt power. It shall include an integral charger designed to charge 40.0 amp hour batteries.
2. The Intelligent Booster Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a control relay. Five NAC outputs, wired Class A or Class B, shall be available for connection to the Notification devices.
3. The INX-10A shall optionally provide synchronization of all connected strobes or horn strobe combinations when either Mircom, Potter/Amseco, System Sensor, Gentex or Wheelock devices are installed.
4. The INX-10A shall function as a sync follower as well as a sync generator.
5. The INX-10A shall include a surface or flush-mountable

backbox.

6. The Intelligent Booster Power Supply shall include the ability to delay the reporting of an AC fail condition per NFPA requirements.
7. The INX-10A shall provide 24 VDC regulated and power-limited circuitry per UL standards.

N. Power Supply:

1. The main power supply for the fire alarm control panel shall provide 10.0 amps of available power for the control panel and peripheral devices.
2. Positive-Temperature-Coefficient (PTC) thermistors, circuit breakers, or other over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery charger up to 42Ah.
3. The main power supply shall continuously monitor all field wires for earth ground conditions.
4. The main power supply shall operate on 120 VAC, 60 Hz, or 240VAC 50 Hz and shall provide all necessary power for the FACP.

O. Programmable Electronic Sounders:

1. Electronic sounders shall operate on 24 VDC nominal.
 2. Electronic sounders shall be field programmable without the use of special tools, to provide slow whoop, continuous, or interrupted tones with an output sound level of at least 90 dBA measured at 10 feet from the device.
 3. Electronic sounders shall be flush or surface mounted as shown on plans.

P. Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:

1. The maximum pulse duration shall be 2/10 of one second.
2. Strobe intensity shall meet the requirements of UL 1971.
3. The flash rate shall meet the requirements of UL 1971.

Q. Audible/Visual Combination Devices:

1. Shall meet the applicable requirements of Section A listed above for audibility.
2. Shall meet the requirements of Section B listed above for visibility.

R. System Operations

1. Alarm Verification: Each of the intelligent Advanced Protocol addressable smoke detectors in the system may be independently programmed for verification of alarm signals. The alarm verification time period shall not exceed 2 minutes.
2. Point Disable: Any Advanced Protocol addressable device or conventional circuit in the system maybe enabled or disabled through the system keypad.
3. Point Read: The system shall be able to display the following point status diagnostic functions:
 - a. Device status
 - b. Device type
 - c. Custom device label
 - d. Device zone assignments
4. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status.
5. System History Recording and Reporting: The fire alarm control panel shall contain two event history logs comprised of a 400 event alarm log for alarm related events and a 400 event general log for all other events. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history log may be manually reviewed, one event at a time, or printed in its entirety. The history log shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.
6. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent Advanced Protocol detector and shall analyze the detector responses over a period of time. If any intelligent Advanced Protocol detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
7. Pre-Alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist

in avoiding nuisance alarms.

8. The fire alarm control panel shall include Silent and Audible Walk Test functions. It shall include the ability to test initiating device circuits and Notification Appliance Circuits from the field without returning to the panel to reset the system. The operation shall be as follows:
 - a. The Silent Walk Test will not sound NACs but will store the Walk Test information in History for later viewing.
 - b. Alarming an initiating device shall activate programmed outputs, which are selected to participate in Walk Test.
 - c. Introducing a trouble into the initiating device shall activate the programmed outputs.
 - d. Walk Test shall be selectable on a per device/circuit basis. All devices and circuits which are not selected for Walk Test shall continue to provide fire protection and if an alarm is detected, will exit Walk Test and activate all programmed alarm functions.
 - e. All devices tested in walk test shall be recorded in the history buffer.
 - f. All devices not tested in walk test shall be recorded in the history buffer.
9. Waterflow Operation: An alarm from a waterflow detection device shall activate the appropriate alarm message on the control panel display; turn on all programmed Notification Appliance Circuits and shall not be affected by the Signal Silence switch.
10. Supervisory Operation: An alarm from a supervisory device shall cause the appropriate indication on the control panel display, light a common supervisory LED, but will not cause the system to enter the trouble mode.
11. Signal Silence Operation: The FACP shall have the ability to program each output circuit (notification circuit or relay) to deactivate upon depression of the Signal Silence switch.
12. Non-Alarm Input Operation: Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.

1.9. SYSTEM COMPONENTS:

- A. Addressable Advanced Protocol manual station

1. Addressable Advanced Protocol manual station shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

B. Intelligent Advanced Protocol Multi-Sensing Detector

1. The intelligent Advanced Protocol detector shall be an addressable device this is capable of detecting multiple threats by employing photoelectric and thermal technologies in a single unit. This detector shall utilize advanced electronics which react to slow smoldering fires (photoelectric and heat thermal) all within a single sensing device.
2. The multi-detector shall include two bicolor LEDs for 360-degree viewing.
3. Automatically adjusts sensitivity levels without the need for operator intervention or programming. Sensitivity increases with heat.

C. Intelligent Advanced Protocol Photoelectric Smoke Detector

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
2. The detectors shall be ceiling-mounted and available in an alternate model with an integral fixed 135-degree heat-sensing element.
3. Each detector shall contain a remote LED output and a built-in test switch.
4. Detector shall be provided on a twist-lock base.
5. It shall be possible to perform a calibrated sensitivity and performance test on the detector without the need for the generation of smoke. The test method shall test all detector circuits.
6. A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs), on the detector, which may be seen from ground level over 360 degrees? These LEDs shall periodically flash to indicate that the detector is in communication with the control panel.
7. The detector shall not go into alarm when exposed to air

velocities of up to 1500 feet per minute (fpm).

8. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
9. All field wire connections shall be made to the base through the use of a clamping plate and screw.

D. Projected Addressable Beam Detector

1. The projected beam type shall be a 4-wire 24 VDC intelligent, addressable projected beam smoke detector device.
2. The detector shall be listed to UL 268 and shall consist of a single transmitter\receiver and corresponding non powered reflector.
3. The detector shall operate in either a short range (16' - 230') or long range (16'-328') when used with an extender module.
4. The temperature range of the device shall be -22 degrees F to 131 degrees F.
5. The detector shall feature an optical sight and 2-digit signal strength meter to ensure proper alignment of unit without need of special tools.
6. The unit shall be both ceiling and wall mountable.
7. The detector shall have the ability to be tested using calibrated test filters or magnet-activated remote test station.
8. The detector shall have four standard sensitivity selections along with two automatic self-adjusting settings. When either of the two automatic settings is selected the detector will automatically adjust its sensitivity using advanced software algorithms to select the optimum sensitivity for the specific environment.

E. Intelligent Advanced Protocol Thermal Detectors

1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

F. Intelligent Advanced Protocol Duct Smoke Detector

1. The smoke detector housing shall accommodate an intelligent Advanced Protocol photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.

2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

G. Addressable Advanced Protocol Monitor Module

1. Addressable Advanced Protocol monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any normally open dry contact device) to one of the fire alarm control panel SLCs.
2. The monitor module shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box.
3. The IDC zone shall be suitable for Class A or Class B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.

H. Addressable Advanced Protocol Conventional Zone Module

1. Means shall be provided for the monitoring of conventional Initiating Device Circuits populated with 2-wire smoke detectors as well as normally-open contact alarm initiating devices (pull stations, heat detectors, etc.).
2. Each IDC of conventional devices will be monitored as a distinct address on the polling circuit by an addressable module. The module will supervise the IDC for alarms and circuit integrity (opens).
3. The Conventional Zone module will be compatible, and listed as such, with all devices on the supervised circuit.
4. The IDC zone may be wired for Class A or B operation. An LED shall be provided that shall flash under normal conditions, indicating that the Zone module is operational and in regular communication with the control panel.
5. The Conventional Zone module shall be capable of mounting in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box or in an surface mount backbox.

I. Addressable Advanced Protocol Control Relay Module

1. Addressable Advanced Protocol control relay modules shall be provided to control the operation of fan shutdown and other auxiliary control functions.
2. The Advanced Protocol control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
3. The Advanced Protocol control relay module will provide a dry contact, Form-C relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relays may be energized at the same time on the same pair of wires.
4. The Advanced Protocol control relay module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

J. Addressable Control Relay Module Six Output

1. Up to 6 Addressable intelligent control relay modules combined on one circuit board shall be provided to control the operation of fan shutdown and other auxiliary control functions.
2. Using rotary address switches, the first module shall be addressed from 01 to 94 while the remaining modules shall be automatically assigned to the next five higher addresses. Note, binary dip switches for setting address are not acceptable.
3. A single isolated set of dry relay form C contacts shall be provided for each of the 6 module addresses, which shall be capable of being wired for either a normally-open or normally-closed operation.
4. The module shall allow an addressable control panel to switch these contacts on command.
5. The module shall contain removable plug in terminal blocks capable of supporting 12 AWG to 18 AWG wire.
6. The control relays mounted on the module shall be suitable for pilot duty applications and rated for a maximum of 3.0 amps at 30 VDC, resistive, non-coded and 2.0 amps at 30 VDC maximum, resistive, coded.

K. Six-Zone Interface Module

1. A six zone interface module shall be provided as an interface between the addressable panel and two-wire conventional detection zones.
2. A common SLC input shall be used for all modules, and the initiating device circuits shall share a common external supervisory supply and ground.

3. The first address on the interface module shall be addressed from 01 to 94 while the remaining modules are automatically assigned to the next five higher addresses.
4. Address shall be set using decimal encoded rotary address switches. Binary address switches are not acceptable.
5. Provision shall be included for disabling a maximum of two unused addresses of the six available.
6. All two-wire detectors being monitored shall be two-wire compatibility listed with the six zone input module.
7. The six zone input module shall transmit the status of a zone of two-wire detectors to the fire alarm control panel. Status shall be reported as normal, open or alarm.
8. Removable plug-in terminals shall be provided capable of accepting from 18 AWG up to 12 AWG wire.

L. Ten Input Monitor Module

1. A single multi input module shall be provided for the monitoring of up to 10 conventional Initiating Device Circuits populated with 2-wire smoke detectors as well as normally-open contact alarm initiating devices (pull stations, heat detectors, etc.).
2. Each IDC of conventional devices will be monitored as a distinct address on the polling circuit by an addressable point. The module will supervise the IDC for alarms and circuit integrity (opens).
3. The first address on the 10 input boards shall be set from 01 to 90 and the remaining module addresses shall be automatically assigned to the next nine higher addresses.
4. Provision shall be included for disabling a maximum of two unused addresses.
5. The supervised state (normal, open, or short) of the monitored device shall be sent back to the panel. A common SLC input shall be used for all modules, and the initiating device loops shall share a common supervisory supply and ground.
6. The IDC zone may be wired for Class A or B operation. A green LED for each circuit shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel. LEDs shall latch on when a circuit is in alarm.

M. Fault Isolator Module

1. Fault Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or

Class B. The Fault isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one Fault isolator module shall be provided for each floor or protected zone of the building.

2. If a wire-to-wire short occurs, the Fault isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the Fault isolator module shall automatically reconnect the isolated section.
3. The Fault isolator module shall not require any address-setting and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The Fault isolator module shall mount in a standard 4-inch (101.6 mm) deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

N. Annunciator

1. The annunciator shall communicate with the fire alarm control panel via a two wire RS 485 communications circuit.
2. The annunciator shall require no more than four wires for operation. Annunciation shall include: intelligent addressable points, system software zones, control relays, and notification appliance circuits. The following operations shall also be provided:
 - a. Up to 7 annunciators be installed on the system.
 - b. The annunciator shall provide alarm and trouble resound, with flash for new conditions.
 - c. This unit shall provide for each zone: alarm indications, using a red alarm and yellow trouble LEDs, and switches for the control of fire alarm control panel functions. The annunciator will also have local piezo electric signal, local acknowledge/lamp test switch, and custom slide-in zone/function identification labels.
 - d. Switches shall be available for remote annunciation and control of output points in the system, system acknowledge, telephone zone select, speaker select, global signal silence, and global system reset within the confines of all applicable standards.
3. This system shall provide a means of interfacing to a graphic style annunciator.

4. The graphic annunciator interface will possess the capability of individually annunciating each individual addressable device in the system.

O. Alphanumeric LCD Type Annunciator:

1. The alphanumeric display annunciator shall be a supervised, remotely located back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.
2. The LCD annunciator shall display all alarm and trouble conditions in the system.
3. An audible indication of alarm shall be integral to the alphanumeric display.
4. The display shall be UL listed for fire alarm application.
5. It shall be possible to connect up to 7 LCD displays and be capable of wiring distances up to 6,000 feet from the control panel.
6. The annunciator shall connect to RS-485 serial link. This is a two-wire loop connection and shall be capable of distances to 8,000 feet. Each annunciator LCD display shall mimic the main control panel.

1.10. SYSTEM COMPONENTS - ADDRESSABLE DEVICES

A. Addressable Devices - General

1. Addressable devices shall employ the simple-to-set decade addressing scheme. Addressable devices which use a binary-coded address setting method, such as a DIP switch, are not an allowable substitute.
2. Detectors shall be addressable and intelligent, and shall connect with two wires to the fire alarm control panel signaling line circuits.
3. Addressable smoke and thermal (heat) detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.
4. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as

meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 14.

5. Detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base options shall include a base with a built-in local) sounder rated for a minimum of 85 DBA, a relay base and an isolator base designed for Style 7 applications.
6. Detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel.
7. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (PHOTO, THERMAL).
8. Detectors shall provide address-setting means using decimal switches.

1.11. BATTERIES:

- A. Upon loss of Primary (AC) power to the control panel, the batteries shall have sufficient capacity to power the fire alarm system for required standby time (24 or 60 hours) followed by 5 minutes of alarm.
- B. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.
- C. If necessary to meet standby requirements, external battery/charger systems may be used.

PART 3.0 - EXECUTION

3.1. INSTALLATION:

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
- B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- D. Manual pull stations shall be suitable for surface mounting or

semi flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2. TEST:

The service of a competent, NICET level II technician shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 14.

- A. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
- B. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
- C. Verify activation of all waterflow switches.
- D. Open initiating device circuits and verify that the trouble signal actuates.
- E. Open and short signaling line circuits and verify that the trouble signal actuates.
- F. Open and short notification appliance circuits and verify that trouble signal actuates.
- G. Ground all circuits and verify response of trouble signals.
- H. Check presence and audibility of tone at all alarm notification devices.
- I. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
- J. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
- K. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3. FINAL INSPECTION:

- A. At the final inspection, a minimum NICET Level II technician shall demonstrate that the system functions properly in every respect.

3.4. INSTRUCTION:

- A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- B. The contractor or installing dealer shall provide a user manual indicating "Sequence of Operation."