

ENGINEERING SPECIFICATION
720 POINT (FX-401)
ADDRESSABLE COMMUNICATING FIRE DETECTION AND ALARM SYSTEM

PART 1.0 GENERAL

1.1 DESCRIPTION:

- A. This section of the specification includes the furnishing, installation, connection, and testing of the microprocessor controlled, fire alarm equipment required to form a complete, coordinated and operational system. It shall include but not be limited to a Fire Alarm Control Unit (FACU), alarm initiating devices, alarm notification appliances, auxiliary control devices, annunciators, polarity reversal/city tie and/or digital alarm communications to remote/central stations and wiring as shown on the drawings and specified herein. The complete installation shall be in accordance with the project specifications and as indicated on the project drawings.
- B. The fire alarm system shall comply with the requirements of NFPA 72 National Fire Alarm and Signaling Code standard for Local Protected Premises Signaling Systems except as modified by the local Authority Having Jurisdiction and supplemented by this specification. The system field devices shall be supervised either electrically and/or through software driven processes.
- C. The FACU and associated field devices shall be manufactured or supplied 100% by a single North American based manufacturer that is ISO 9001 certified.
- D. The FACU and associated field devices system shall comply with the following Underwriters Laboratories Inc. (ULI) listing standards as applicable.
 - 1. UL 38 Manually Actuated Signaling Boxes
 - 2. UL 217 Smoke Detectors, Single and Multiple Station
 - 3. UL 228 Door Closers-Holders for Fire Protective Signaling Systems
 - 4. UL 268 Smoke Detectors for Fire Protective Signaling Systems
 - 5. UL 268A Smoke Detectors for Duct Applications
 - 6. UL 346 Waterflow Indicators for Fire Protective Signaling Systems
 - 7. UL 464 Audible Signaling Appliances
 - 8. UL 521 Heat Detectors for Fire Protective Signaling Systems
 - 9. UL 864 Standard for Control Units for Fire Protective Signaling Systems
 - 10. UL 1481 Power Supplies for Fire Protective Signaling Systems
 - 11. UL 1638 Visual Signaling Appliances
 - 12. UL 1971 Signaling Devices for Hearing Impaired
 - 13. UL 2017 General-Purpose Signaling Devices and System
 - 14. UL 2075 Standard for Gas and Vapor Detectors and Sensors
- E. The FACU shall be UL ANSI 864, 10th Edition Listed. Systems listed to UL ANSI 864, 9th edition (or previous revisions) shall not be accepted.
- F. The installation company shall employ NICET (minimum Level II Fire Alarm Systems) certified technicians on site to guide the final check-out and to ensure the system's integrity.

1.2 SCOPE

- A. An intelligent, microprocessor-controlled fire alarm detection system shall be installed in accordance with the project specifications and drawings.
- B. Basic Performance:
 - 1. Addressable devices shall be connected to one of three FACP Signaling Line Circuits (SLCs)

2. The FACU Signaling Line Circuits (SLCs) shall support Class A, Class B or Class X wiring configuration.
3. The initiating device and notification appliance circuit's wiring shall not require shielded cabling.
4. The FACU notification appliance circuits shall support either Class A or Class B wiring configuration.
5. A single ground fault or open circuit on the system initiating device circuits shall not cause system malfunction, loss of operating power or the inability to report an alarm.
6. The FACU RS-485 bus shall support Class B wiring configuration.
7. All circuits shall be power limited per UL 864 requirements except for wiring to PR-300, city tie box.
8. The secondary power source of the FACU shall be capable of providing at least 24 hours of backup power with the ability to power the system for an additional 5 minutes in an alarm condition, at the end of the 24-hour backup period.

C. Basic System Operation

1. When an off normal condition occurs (Alarm, Supervisory, or Trouble) the respective LED on the FACU shall illuminate.
2. A piezo sounder shall activate at the FACU during any off normal condition until the BUZZER SILENCE buttons are pressed by an authorized user.
3. A Red LED shall illuminate when an alarm, pre-alarm or alarm verification condition exists.
4. An Amber (yellow) LED shall illuminate when a Supervisory or Trouble condition exists.
5. A backlit 4-line by 20-character LCD screen shall display all messages that refer to an off-normal condition.
6. An Alarm condition shall have priority over all other signals.
7. The FACU shall include 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 that stores all off-normal conditions and actions along with a time and date stamp of when they occurred.
8. In response to a fire alarm condition, the system's notification appliances and relay-controlled output circuits that are associated through programming with the device initiating the alarm, shall automatically activate.
9. The system shall notify an approved remote supervising station (central station, proprietary or remote) via means deemed acceptable by the local Authority Having Jurisdiction (AHJ).

1.3 SUBMITTALS:

A. General

1. Two (2) 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 are 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 if the minimum standards are met.

3. For equipment other than that specified, the contractor shall provide proof that the proposed substitute equipment equals or exceeds the form, feature, function, performance, and quality of the specified equipment.

B. Shop Drawings

1. Drawings shall be provided that include all field devices that are installed as part of the fire alarm system including the circuit, location, and type for each. Whenever possible, the drawings shall reflect other components of the building such as air diffusers, HVAC returns, lights, etc., to determine compliance.
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 annunciator layout, configurations, and terminations.
4. The drawings shall include conductor counts and wire sizes for each circuit.
5. The location and mounting configuration of the FACU, remote power supplies, and terminal cabinets shall be indicated on the drawings.

C. Other Documentation

1. In addition to the shop drawings, the following information shall also be included with the submittal:
 - a. Complete operating and maintenance manuals listing the manufacturer's name(s).
 - b. Manufacturer's technical datasheets for each piece of equipment that will be installed.
 - a. Standby battery calculations for the FACU and any remote power supply or other panels that include their own standby batteries.
 - b. Voltage drop calculations showing the worst-case end of line voltage for all notification appliance circuits.
 - c. Detailed description of the overall operation of the system or a sequence of operations matrix.
 - d. Proof of factory training and certification of the supervising technician assigned to the project.
 - e. Proof of factory training and certification of a service technician employed by the installation company that can be onsite to troubleshoot and repair any service-related problems with the system within 4 hours of being notified of the problem.

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.

3. Provide firmware updates through USB Interface.

1.4 WARRANTY:

- A. All of the main fire alarm system components including control panels, detectors, modules, and notification devices furnished under this contract shall include a warranty from the manufacturer for a minimum period of at least three (3) years from the date of purchase. All other materials, labor and work performed under this contract shall be free of defects and shall remain so for a period of one (1) year from the date of acceptance. The full cost of materials and labor to correct any defects during these warranty periods shall be included in the installed price of the system.

1.5 MAINTENANCE:

- A. Maintenance and testing shall be on a semi-annual basis or as required by the local codes and AHJ. A preventative maintenance schedule shall be provided by the contractor describing the protocol for preventative maintenance. The schedule shall include:
 1. Systematic testing and complete inspection of the entire fire alarm system including control panels, field devices, including smoke detectors, heat detectors, manual pull stations, sprinkler system switches, wiring terminations, remote panels, remote annunciators, power supplies, terminal boxes and all other fire alarm accessories, in accordance with NFPA 72. Cleaning and adjusting of these devices shall be conducted at this time.
 2. An inspection and test of system power supplies, batteries, circuit breakers and fuses as well as a load test of the batteries shall be conducted in accordance with NFPA 72.
 3. Placing the system into an alarm condition and checking each notification device for proper operation.
 4. Removing devices from the FACU initiating device and notification appliance circuits to confirm a trouble condition occurs.
 5. Input and output mapping shall be tested to ensure proper sequence of operation.
 6. Signal transmission shall be tested to the Monitoring Station.
 7. Following each periodic maintenance and test, the owner shall be provided with a detailed report of the test results including any deficiencies found.

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. When submitting the fire alarm system bid package, the contractor shall provide a quote for the expansion of the system by 10%. The quote shall include all costs for a complete installation including labor and materials for 1/10th of the number of devices used in the original overall specification and installation. The pricing shall be itemized to show single lot individual pricing of each item.
- C. The prices quoted for system expansion will remain valid for 1 year from the date of completion.
- D. The system expansion pricing shall be all inclusive and include costs for programming or reprogramming the system as needed.

- E. Submittals that do not include a quote for expansion will be rejected.

1.7 APPLICABLE STANDARDS AND SPECIFICATIONS:

- A. 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.
- B. National Fire Protections Association (NFPA)
 - 1. NFPA 13 Sprinkler Systems
 - 2. NFPA 70 National Electric Code (NEC)
 - 3. NFPA 72 National Fire Alarm Code
 - 4. NFPA 101 Life Safety Code
 - 5. NFPA 5000 Building Construction and Safety Code
- C. State and Local Building Codes
- D. All requirements of the local Authority Having Jurisdiction (AHJ)

1.8 APPROVALS/CERTIFICATIONS:

- A. The system shall have the proper approvals/certifications from the following recognized agencies:
 - 1. UL - Underwriters Laboratories Inc. (a Nationally Recognized Test Lab – NRTL)
 - 2. CSFM - California State Fire Marshall
 - 3. NYC FD COA (New York City Fire Department - Certificate of Approval)

PART 2.0 – PRODUCTS:

2.1 EQUIPMENT AND MATERIALS:

- 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/certified for its intended purpose by a recognized national listing testing laboratory.
- B. All equipment and components shall be installed in strict compliance with the manufacturer's recommendations as indicated in the installation manuals and wiring diagrams for the system. All equipment attached to walls and ceilings shall be securely fastened. Ceiling mounted devices shall not be supported solely by suspended ceilings. Fasteners and supports shall be adequate to support the required load.
- C. A back box shall be used for mounting all equipment. A listed and compatible back box shall be used on all outdoor devices and/or those devices installed in locations subject to moisture.
- D. All equipment shall be manufactured by an ISO 9001 certified company.
- E. All equipment shall be readily available through wholesale distribution outlets to licensed installation contractors that are independent of the manufacturer.

2.2 CONDUIT AND WIRE:

- A. Conduit:
 - 1. The conduit or raceway shall be installed in accordance with the National Electrical Code, state and local requirements.

2. Where required, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40% on the interior cross-sectional area where three or more cables are contained within a signal conduit.
3. All conduit and raceway shall be listed/certified by a recognized national testing laboratory.
4. 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 the National Electric Code.
5. Conduit size shall be $\frac{3}{4}$ inches minimum.
6. Conduit shall not enter the fire alarm control unit, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACU manufacturer.
7. With the exception of telephone connections, wiring for low voltage control, alarm, notification, emergency communication and similar power-limited auxiliary functions, may be run in the same conduit as initiating 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.

B. Wire:

1. All fire alarm 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. All wires shall be color coded.
3. All wire and cable shall be listed/certified by a recognized national testing laboratory 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. All field wiring shall be supervised for open circuits and earth ground faults.
6. The Signaling Line Circuit (SLC) loops shall be installed with a minimum of #18 AWG twisted pair wire, twisted shielded pair wire is acceptable.
7. Notification Appliance Circuits (NAC) shall be wired with not less than #16 AWG wire as required for proper end of line operating voltage.
8. The FACU RS-485 wiring bus shall be twisted pair and capable of operating system devices up to 4000 feet away from the main panel, without the use of additional power supplies, boosters or signal amplifiers.

C. Terminal Boxes, Junction Boxes, and Cabinets

1. All terminal boxes, junction boxes and accessory cabinets shall be listed for their intended purpose.
2. All boxes shall be sized and installed in accordance with NFPA 70.

D. Primary AC Power and Grounding

1. The FACU shall be connected to a separate dedicated AC branch circuit (120VAC, 60Hz, 10A), maximum 20 amperes. This circuit shall be labeled at the main power distribution

panel as FIRE ALARM. FACU primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold-water pipe or grounding rod.

2.3 FIRE ALARM CONTROL UNIT (FACU)

A. The FACU shall be a Mircom model FX-401 microprocessor based analog addressable type system.

B. Overview and Features:

1. The FACP shall include one (1) integral Signaling Line Circuit (SLC) and support an option to provide an additional two (2) Signaling Line Circuits (SLCs) that will power, supervise, monitor, and control a maximum of 720 analog addressable devices which may be made up of any combination of sensors and modules. The SLCs shall have the capability to be wired in an NFPA Class A, B or X configuration. The system and all associated equipment shall be fully approved, certified and listed by Underwriters Laboratories Inc., (ULI).
2. The FACU shall have three (3) form C relays dedicated to Common Alarm, Common Trouble, and Common Supervisory and one (1) form C disconnectable relay dedicated to Auxiliary Alarm. These relays shall have a contact rating of 1.0 Amps at 28VDC.
3. The FACU shall have a power supply capable of providing a maximum of 5 amps of system power to field devices and shall provide 300mA of supervised resettable 4 wire smoke detector power 24 VDC regulated, and 500mA of supervised 24 VDC power and 1.7A of unsupervised non-resettable unregulated 24 VDC.
4. The FACU shall have four (4) programmable Notification Appliance Circuits rated at no less than 1.5 amps per circuit and capable of being wired in Class A or Class B configuration. Total NAC power available shall be 6.0 Amps. These circuits shall be programmable for the following output types:
 - a. Continuous
 - b. ANSI Temporal 3
 - c. California Code
 - d. March Time
5. The FACU NACs shall include the capability to automatically synchronize notification appliances from multiple manufacturers on the same FACU without the need for a synchronization module. Systems that do not allow for multiple brands of strobes to be synchronized on the same panel are not acceptable. The following manufacturers synchronization protocol shall be supported as a minimum:
 - a. MGC
 - b. System Sensor
 - c. Gentex
 - d. Wheelock

6. The FACU shall include an integral user interface that includes a keypad, an 80-character backlit LCD display and color-coded system status LED's.
7. The FACU shall be housed in a UL listed key locked cabinet with sufficient space to house up to 18 AH, rechargeable batteries.
8. The FACU shall include an integral Digital Alarm Communicating Transmitter (DACT).
9. The FACU shall include the following features:
 - a. Initiating device circuits/zones fully programmable as: Alarm, Priority Alarm, Verified Alarm, Waterflow Alarm, Latching or Non-Latching Supervisory, Monitor, Trouble-Only, Reset, Signal Silence, Acknowledge, Drill, Total Evacuation, Aux Disconnect, Buzzer Silence, Acknowledge General Alarm, Audible Walktest, Silent Walktest, Manual Day/Night, Auto Day/Night and Auxiliary Reset.
 - b. Programmable zone configuration using initiating device to notification appliance circuit (NAC) or relay correlations, with default setting being each initiating device circuit is mapped to all notification appliance circuits, or option to map each initiating device circuit to one or more notification appliance circuits based on preferred operation such as silenceable or non silenceable.
 - c. The FACU shall include an auto program feature (reset config) to detect and enroll all system devices and make them operational quickly and automatically. A PC based configuration tool shall be used to finish setting up the job including assignment of device and zone descriptions and creating correlations.
 - d. Single and two stage operation.
 - e. Each IDC and NAC can be individually bypassed via the keypad and LCD display with Password Access.
 - f. Signal Silence options include Signal Silence, Signal Silence Inhibit, Auto Signal Silence and Silence Inhibit.
 - g. RS-485 Interface for Remote LED Annunciators, Remote LCD Annunciators and Remote Smart Relay Modules.
 - h. Optional module for City Tie/Polarity Reversal.
 - i. Programmable using configuration software tool on a locally connected PC.
 - j. 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 that stores all off-normal conditions and actions along with a time and date stamp of when they occurred.
 - k. Alarm verification feature with a programmable timer.
 - l. One person silent or audible walk-test capability with all devices tested during walk-test mode recorded in the event history buffer.
 - m. Built in trim ring for flush mounting.

- n. Three levels of password protection.
- o. Manual or automatic day/night mode sensitivity settings.
- p. Bypass by individual device or groups of devices (Bypass Group).
- q. Positive Alarm Sequence (PAS).
- r. Printer port.
- s. Maintenance report function displays all smoke detectors detected on the SLC loop and for each detector, it shall indicate the percentage dirty. A trouble condition shall occur once the percentage dirty reaches 75%.

C. Operator Control Interface

1. The FACU 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 contain an LCD alphanumeric, text-type display, an internal buzzer and dedicated LEDs for the annunciation of system status including:

- a. AC On LED

Illuminates steady green when the main AC power is within acceptable levels. The LED turns off when the level falls below the power-fail threshold and the panel is switched to standby (battery) power.

- b. Ground Fault LED

Flashes yellow at the Trouble rate when a Ground Fault is detected on any field wiring. Clearing the Ground Fault clears the indication and turns the LED off.

- c. CPU Fault LED

Flashes yellow at the Trouble rate when the processor ceases functioning.

- d. Battery/Charger Trouble LED

Flashes yellow at the Slow Flash rate. Clearing the trouble condition clears the indication and turns the LED off.

- e. Alarm Queue Button and LED

Flashes red when there is an alarm in queue. The buzzer sounds steady. An alarm can be generated in two ways:

- When any Alarm configured point or input activates.
- Pressing the General Alarm button to activate the panel alarm.

Pressing the Alarm Queue button allows the user to cycle through and review a list of active alarms from oldest to most recent. Once all alarms in the queue have been reviewed the LED will illuminate steady. Resetting the panel clears the indication and turns the LED off.

f. Supervisory Queue Button and LED

Flashes yellow at the Fast Flash Rate when a Latching or Non-Latching circuit is activated. The buzzer sounds at the fast rate.

Pressing the Supervisory Queue button allows the user to cycle through and review a list of active supervisory alarms from oldest to most recent. Once all alarms in the queue have been reviewed the LED will illuminate steady.

If all Non-Latching Supervisory circuits are restored and there are no Latching Supervisory Circuits active, the indication will clear and the LED will turn off.

g. Trouble Queue Button and LED

Flashes yellow when any trouble condition is detected on the panel. The buzzer sounds at the slow rate.

Pressing the Trouble Queue button allows the user to cycle through and review a list of active Troubles from oldest to most recent. Once all troubles in the queue have been reviewed the LED will illuminate steady.

Clearing all Trouble conditions clears the indication and turns the LED off.

h. Building Queue Button and LED

Flashes yellow at the Trouble Flash rate when any Building condition is detected on the panel. The buzzer sounds at the fast rate.

Pressing the Building Queue button allows the user to cycle through and review a list of active Building Conditions from oldest to most recent. Once all conditions in the queue have been reviewed the LED will illuminate steady.

Clearing all Building conditions clears the indication and turns the LED off.

i. System Reset Button and LED

The System Reset button resets the Fire Alarm Control Panel and all Circuits.

Pressing the System Reset button causes a trouble to occur and the LED to illuminate steady yellow. The following events will occur:

- Resets all Latching, Trouble Conditions.
- Resets all Initiating Circuits.
- Resets 4-Wire Smoke Supply and Aux. Power Supply.
- Turns off all Indicating Circuits.
- Turns off Signal Silence, Ack & GA Indicators.
- Turns off Fire Drill.
- Stops and resets all Timers.
- Processes inputs as new events.
- Aux Disconnect is not affected.

Reset cannot be activated until the Signal Silence Inhibit timer has expired.

Resetting the System clears the indication and turns the LED off.

j. Alarm Acknowledge Button and LED - Positive Alarm Sequence

LED and Indicator are active only when the Panel is configured for PAS. Flashes yellow at the Fast Flash Rate as the Auto General Alarm Timer is timing.

If the panel is configured for Positive Alarm Sequence (PAS), activation of the Acknowledge button within 15 seconds of a PAS alarm will delay a common alarm activation for 180 seconds.

The expiring of the Auto General Alarm Timer causes the Panel to enter General Alarm, clears the indication and turns the LED off.

Resetting the panel will clear the activation of any Latching Supervisory Alarms, clears the indication and turns the LED off.

k. Automatic Alarm Signal Cancel Button and Indicator – Two Stage Operation only

LED and Indicator are active only when the Panel is configured for Two Stage Operation. Flashes yellow at the Fast Flash Rate as the Auto General Alarm Timer is timing.

Illuminates steady yellow by pressing the Acknowledge or Signal Silence buttons and cancelling the Auto General Alarm Timer.

The expiring of the Auto General Alarm Timer causes the Panel to enter General Alarm, clears the indication and turns the LED off.

l. General Alarm Button and Indicator

When pressed, this button will activate the panel into evacuation. The LED indicator will turn steadily red.

m. Signal Silence Button and Indicator

Flashes yellow at the Trouble Flash rate when Indication Circuits are silenced by the following:

- Pressing the Signal Silence button.
- The Auto Signal Silence Timer.

Any Subsequent Alarms cause the Signals to resound, clears the indication and turns the LED off.

Pressing the Signal Silence button when the Panel is in Alarm turns on the Signal Silence Indicator and deactivates any Silenceable Indicating Circuits. Non-Silenceable Circuits are unaffected. Signals will re-sound upon any subsequent Alarm.

This button does not function during the following:

- Any configured Signal Silence Inhibit Timer period.
- If Fire Drill has activated the Indicating Circuits.

n. Buzzer Silence Button and Indicator

Flashes yellow at the Trouble Flash rate when the Buzzer Silence button is pressed. Any new alarm, supervisory or trouble events

resounds the buzzer and will cause the Buzzer Silence LED to turn off.

o. Auxiliary Disconnect Button and Indicator

Activating the Auxiliary Disconnect button activates the Auxiliary Disconnect function. The Auxiliary Alarm Relay is always disconnected with this button. The Common Alarm Relay, the Common Supervisory relay and all correlated alarm relays may be disconnected as selected through configuration. Activating the Auxiliary Disconnect button also causes the Common Trouble LED to illuminate steady, the common trouble relay to send a trouble message and the trouble buzzer to flash at the trouble flash rate. Pressing the Auxiliary Disconnect button again de-activates this function and the system will go back to normal.

p. Visual Indicator Test Button and Indicator

Pressing the Visual Indicator Test button illuminates all front panel LEDs on steady in the appropriate color and turns the buzzer on steady. If Visual Indicator Test is active for more than 10 seconds, Common Trouble is activated.

q. Fire Drill Button and Indicator

Illuminates steady yellow during an active Fire Drill.

Pressing the Fire Drill button activates all programmed and non-Disconnected Indicating Circuits. It does not transmit any Alarms via the City Tie, or Common Alarm Relay.

Fire Drill may be programmed to operate specific NAC Circuits. Fire Drill is cancelled by pressing the button again (toggle switch), or if the Panel goes into a real Alarm.

r. Buzzer

The buzzer is activated by any of the following events:

Fire Alarm:	Steady
Supervisory Alarm:	Fast Flash
Trouble:	Trouble Flash Rate

If the Buzzer is turned ON in response to a Non-Latching Trouble or Supervisory, it will be turned OFF if the condition causing it goes away and there is no other reason for it to be ON.

3. The LCD display and 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.
 - a. The display shall be a four-line, 20 character back-lit alphanumeric LCD. It shall display information regarding the panel, its circuits, and devices. An on-screen cursor shall be

controlled by the cursor buttons for menu selection and control.
Report information provided by the LCD display includes:

- 1) Alarm Log
 - 2) Event Log
 - 3) Current Levels
 - 4) Device Information
 - 5) Verification and Maintenance Reports
- b. Use the cursor buttons on the Numeric Keypad for menu selection and control.
- Key 2 (Up cursor)
This button shall move the cursor or scroll up lists in a continuous loop.
 - Key 4 (Left Cursor)
This button shall move the cursor or select options to the left.
 - Key 6 (Right Cursor)
This button shall move the cursor or select options to the right.
 - Key 8 (Down Cursor)
This button shall move the cursor or scroll down lists in a continuous loop.
 - Cancel Button
This button shall cancel an operation or exit a menu.
 - Menu Button
This button shall view the command menu.
 - Info Button
This button shall show detailed information about a displayed item.
 - Enter Button
This button shall select a displayed item.

2.4 SYSTEM COMPONENTS

A. Compatible FACU Accessories

1. ALC-480 - 480 Point Dual Loop Adder
 - a. The ALC-480 provides two addressable (SLC) loops for MRI 4000 Series addressable devices, 240 devices per loop, 480 devices total via the Loop Adder.
2. RAM-3500-LCD - Remote Annunciator
 - a. The RAM-3500-LCD provides remote annunciation through a 4 line by 20 character LCD display. It is a direct mimic of the main panel display so that the LCD, LEDs and switches are an exact duplicate of the main display. The RAM-3500-LCD provides control switches for System Reset, Signal Silence, Fire Drill and Acknowledge, four status queues with selector switches and LEDs for Alarm, Supervisory, Trouble and Monitor, along with a numeric keypad to access the menu functions. The RAM-3500-LCD mounts in single unit enclosures or in larger enclosures that support up to two optional RAX-1048TZDS remote LED annunciators. All remote enclosures are equipped with a CAT-30 Lock and key. The RAM-3500-LCD occupies one display position in the BB-1000 enclosure.
2. RAX-LCD-LITE - Remote LCD Annunciator
 - a. The FX-401 also supports the RAX-LCD-LITE Remote LCD Annunciator. It is

equipped with a large 4-line x 20-character back-lit alphanumeric LCD display that uses a simple menu system complete with a directional keypad and switches for Enter, Menu, Cancel and Info. The RAX-LCD-LITE occupies one display position in the BB-1000 enclosures.

3. RAM-1032TZDS-CC Conformal Coated Main Remote LED Annunciator

- a. The RAM-1032TZDS-CC Conformal Coated Main Remote LED Annunciator provides common annunciator functions and 32 points of LED annunciation. The RAM-1032TZDS-CC has indicators for A.C. On, Common Trouble and Signal Silence and controls for System Reset, Lamp Test, Fire Drill, Buzzer Silence and Signal Silence. Each display point can be identified by the slide-in label that slides in beside the LED. The RAM-1032TZDSCC occupies one display position in the BB-1001WPA and BB-1002WPA enclosures.

4. RAM-1032TZDS Main Remote LED Annunciator

- a. The RAM-1032TZDS Main Remote LED Annunciator provides common annunciator functions and 32 points of LED annunciation. The RAM-1032TZDS has indicators for A.C. On, Common Trouble and Signal Silence and controls for System Reset, Lamp Test, Fire Drill, Buzzer Silence and Signal Silence. The RAM-1032TZDS occupies one display position in the BB-1000 enclosure.

5. RAX-1048TZDS-CC Conformal Coated Programmable LED Annunciator Module

- a. The RAX-1048TZDS-CC Conformal Coated Programmable LED Annunciator Module provides 48 programmable bi-colored LEDs. The RAX-1048TZDS-CC connects to the main control unit or main annunciator module (RAM-1032TZDS) when mounted remotely. Each display point can be identified by the slide-in label that slides in besides the LED. The RAX-1048TZDS occupies one display position in the BB-1001WPA and BB-1002WPA Series enclosures.

6. RAX-1048TZDS Programmable LED Annunciator Module

- a. The RAX-1048TZDS Programmable LED Annunciator Module provides 48 programmable bi-colored LEDs. The RAX-1048TZDS connects to the main control unit or main annunciator module (RAM-3500) and can be mounted inside the FX-401 enclosure (maximum of two (2) modules) or remotely. Each display point can be identified by the slidein label that slides in beside the LED. The RAX-1048TZDS occupies one display position in the BB-1000 Series enclosures.

7. AGD-048 Graphic Annunciator Adder Driver Board

- a. The AGD-048 Adder Graphic Driver Module can be used with the MGD-32 Master Graphic Driver modules, or if located remotely it must be connected and mounted with the RAX-LCD Shared Display. The AGD-048 will support an additional 48 supervised outputs. As with the master modules, the AGD-048 will support both LEDs and incandescent lamps.

8. MGD-32 Master Graphic Driver Module

- a. For use with FX-401 Fire Alarm Control Panel. The MGD-32 Master Graphic Driver Module provides common control inputs for the switches such as System Reset, Signal Silence, Auxiliary Disconnect, Fire Drill, Lamp Test and Acknowledge.

9. PR-300 Polarity Reversal/City Tie Module

- a. The PR-300 provides outputs for city box and polarity reversal applications. As a city tie module, the PR-300 provides an interface between the control panel indicating circuits and a master box. It provides off-premises signal transmission for systems that must comply with NFPA requirements for Auxiliary Protective Systems. As a polarity reversal module, the PR-300 provides an interface between the control panel and a reverse polarity receiver. It provides off-premises signal transmission for systems that must comply with NFPA requirements.

10. SRM-312R Smart Relay Module

- a. The SRM-312R provides twelve configurable relay circuits, rated @ 28 VDC, 1 amp (resistive). Each circuit can be configured as a Normally Open (N.O.) or Normally Closed (N.C.) contact. Each relay is equipped with an LED that is lit when the relay is energized. The relays can be configured as relay per zone (1 to 1), Common on Alarm, Common on Supervisory or programmable for a logical or adjacent zone configuration. An adjacent zone configuration will turn on an adjacent zone when the configured zone is active. A chaining configuration allows for multiple relays to turn on. The SRM-312R is DIP switch configurable and connects to the RS-485 bus. The SRM-312R comes complete with a red enclosure and a CAT-30 lock and key.

11. UDACT/Digital Communicator

- a. The FX-401 is equipped with a fully integrated UDACT/Digital Communicator which allows for the reporting of events to a remote monitoring facility. The UDACT/Digital Communicator can be configured for single or dual line operation and uses the Security Industry Association (SIA) and Contact ID protocols. The UDACT/Digital Communicator is configured via the main display and keypad on the main panel. The integrated UDACT/Digital Communicator can be configured for either DACT or UDACT operation. In DACT mode, the Digital Communicator reports common alarm, trouble and supervisory information. In UDACT mode, the Digital Communicator reports point specific information.

12. RTI-1 Remote Trouble Indicator

- a. The RTI-1 Remote Trouble Indicator provides remote annunciation of fire alarm troubles. It mounts onto a standard single gang electrical box.

13. MP-300 End of Line Plates

- a. Mircom's MP-300 is a 3.9K End of Line resistor module that mounts to a single gang electrical box.

B. Compatible FACU Field Devices

- 1. SLC Compatible Analog Addressable Devices – any combination of 240 devices per SLC.

- a. Photoelectric Smoke Detector
 - 1) The detector shall use photoelectric technology to measure smoke density and employ integral advanced algorithms for smoke detection and false alarm prevention.
 - 2) The detector shall support multiple sensitivity settings.
 - 3) The detector shall provide two tri-color LEDs included on the detector with 360-degree visibility.
 - 4) The detector shall provide an anti-tamper feature.
 - 5) The detectors shall be Mircom Models MIX-4010 and MIX-4010-ISO (with built-in isolator)
- b. Multisensor Detector
 - 1) The detector shall be capable of detecting multiple threats through the use of photoelectric and thermal technologies housed in a single unit. The detector shall employ integral advanced algorithms for smoke and heat detection and prevention of false alarms.
 - 2) The detector shall provide a photoelectric detector with 135 F fixed and 135F rate of rise thermal detectors.
 - 3) The detector shall provide multiple sensitivity settings.
 - 4) Two tri-color LEDs shall be included on the detector with 360-degree visibility.
 - 5) An anti-tamper feature shall be provided.
 - 6) The detectors shall be Mircom Models MIX-4020 and MIX-4020-ISO (with built-in isolator)
- c. Tri-Mode Heat Detector
 - 1) The detector shall be capable of two fixed temperature settings and rate of rise settings and employ integral advanced algorithms for heat detection and false alarm prevention.
 - 2) The detector shall provide 135 F fixed, 135 F Rate of Rise, and 175 F fixed thermal detectors.
 - 3) Two tri-color LEDs shall be included on the detector with 360-degree visibility.
 - 4) An anti-tamper feature shall be provided.
 - 5) The detectors shall be Mircom Models MIX-4030 and MIX-4030-ISO (with built-in isolator)
- d. Six Inch Detector Base
 - 1) The six-inch detector base shall provide a breakable flat tab in the center of the base that can be cut and inserted in the base outer edge to identify the device.
 - 2) The base shall support mounting to a standard 4" square, or single gang electrical back box.
 - 3) The six-inch detector base shall be Mircom Model MIX-4001.
- e. Four Inch Detector Base

- 1) The four-inch detector base shall provide a breakable flat tab in the center of the base that can be cut and inserted in the base outer edge to identify the device.
 - 2) The base shall mount to electrical back box.
 - 3) The four-inch detector base shall be Mircom Model MIX-4002.
- f. Sounder Base
- 1) The sounder base shall support Continuous, Temporal 3, March Time, and 20 BPM patterns.
 - 2) Two volume levels, high and low shall be provided.
 - 3) The base shall be compatible with Regulated 24VDC and VFWR power.
 - 4) The base shall mount to a standard 4" square, single-gang or double gang electrical back box.
 - 5) The sounder base shall be Mircom Model MIX-4003-S.
- g. Relay Base
- 1) The relay base shall provide one form C (SPDT) contact rated at 2A at 30Vdc, or 0.5A at 125V.
 - 2) The base shall mount to a standard 4" square, single-gang or double gang electrical back box.
 - 3) The relay base shall be Mircom Model MIX-4003-R.
- h. DUCT Detector
- 1) The DUCT detector shall operate within an air velocity range between 300ft/min and 4,000 ft/minute, shall contain a clear cover that allow for visual inspection, shall support a one-pipe design that ensures correct operation for air sampling inflow and outflow, and shall contain a photoelectric smoke detector that employs integral advanced algorithms for smoke detection and false alarm prevention.
 - 2) The DUCT detector shall provide multi-function status LED indicators for Alarm and Trouble conditions.
 - 3) The detector shall provide remote LED indicator function.
 - 4) The detector shall provide an advanced customizable remote test function.
 - 5) A test port shall provide functional smoke testing access with cover in place.
 - 6) The DUCT detector shall be Mircom Model MIX-401-DUCT.
- i. Dual Input Module
- 1) The dual input module shall support 1 Class A or 2 Class B IDCs.
 - 2) The modules shall mount to a standard 4" square or double gang electrical back box.
 - 3) An indicating LED shall provide module status.
 - 4) The dual input module shall be Mircom Model MIX-4040.
- j. Dual Mini Input Module
- 1) The dual mini-input modules shall support 1 Class A or 2 Class B IDCs.
 - 2) The module shall fit in a single gang junction box.
 - 3) An indicating LED shall provide module status.

- 4) The dual mini-input module shall be Mircom Model MIX-4041.

k. Conventional Zone Module

- 1) The conventional zone module shall be compatible with conventional two wire smoke detectors and 4-20mA devices.
- 2) The module shall be configured for one (1) Class A or one (1) Class B IDC.
- 3) The module shall mount to a standard 4" square or double gang electrical back box.
- 4) An integral indicating LED shall provide module status.
- 5) The conventional zone module shall be Mircom Model MIX-4042.

l. Dual Relay Module

- 1) The dual relay module shall provide two form C (SPDT) contacts rated at 2A @ 30VDC or 0.5A at 125VAC.
- 2) Each relay shall be controlled independently by FACU.
- 3) The module shall mount to a standard 4" square or double gang electrical back box.
- 4) An integral indicating LED shall provide module status.
- 5) The dual relay module shall be Mircom Model MIX-4045.

m. Supervised Output/Fire Phone Module

- 1) The supervised output/fire phone module shall control Notification Appliance Devices or Fire Fighter Phones.
- 2) The module shall support a single Class A or B circuit for:
 - i. One circuit rated 2A, 24VDC (NAC)
 - ii. One circuit rated 2A 25VRMS (Speaker)
 - iii. One circuit rated 0.5A 70VRMS (Speaker)
 - iv. Fire Phone
- 3) The module shall mount to a standard 4" square or double gang electrical back box.
- 4) An integral indicating LED shall provide module status.
- 5) The supervised output/fire phone module shall be Mircom Model MIX-4046.

n. Sync Module

- 1) The Sync Module shall synchronize the strobe flashes with the audio signal pattern. The same protocol shall be used to silence the horn while maintaining the strobe flashes.
- 2) The module shall synchronize one (1) class A or two (2) class B NAC lines without the need for programming.
- 3) The module shall be fail-safe and shall provide power to the NAC line by default through a relay.
- 4) The module shall have an isolated sync input/output to link up to 20 modules together.
- 5) The module shall mount to a standard 4" square or double gang electrical back box.
- 6) The module shall support two-stage alarm function of Alert (20 strokes per minute) and Evac (temp 3).

- 7) The module shall be compatible with MGC branded NAC devices.
 - 8) The sync module shall be Mircom Model MIX-4050.
- o. Short Circuit Isolator
 - 1) The Isolator Module shall allow part of the SLC communication loop to continue operating when a short circuit occurs on it.
 - 2) The isolator shall mount to a standard 4" square or double gang electrical back box.
 - 3) An integral indicating LED shall provide module status.
 - 4) Automatic action, no device address shall be required.
 - 5) The modules shall be self-restoring
 - 6) The short circuit isolator shall be Mircom Model MIX-4070.
 - p. Multi-Input Module
 - 1) The multi-input module shall support 12 class B or 6 class IDCs.
 - 2) The modules shall be Mircom Module MIX-4040-M.
 - q. Multi-Relay Module
 - 1) The multi-relay module shall support 8 Form C Relays.
 - 2) The module shall be Mircom Module MIX-4045-M.
 - r. Multi-Output Module
 - 1) The multi-output module shall provide 6 supervised output circuits for NAC devices.
 - 2) The module shall be Mircom Module MIX-4046-M.
 - s. Multi-Isolator Module
 - 1) The module shall be Mircom Module MIX-4047-M
2. Pullstations
 - a. The pullstation(s) shall be one of the models listed below as required and as specified on the project plans:
 - 1) MPS-810MPU – Addressable Dual Action Manual Pull Station. LEXAN material, Closed-fist operation (ADA – Americans with Disability Act), Symbols and icons in place of words. Symbols are raised to be easily recognized by touch. Accessible from the front for wiring while mounted. Mounts on a single gang backbox. Reset key (included). Temperature range: -40°C to 66°C / -40°F to 151°F.
 - i. MS-800 Surface Mount Backbox for 800 series Lexan pull stations.
 - 2) MS-401MPU - Single Stage Addressable Manual Pull Station. C/W Glass Rod, Durable Extruded Aluminum Construction, Attractive, Low-Profile Design, Standard Single Gang Mount, Glass Rod Optional (one provided).
 - 3) MS-710MPU - Key Resettable Die Cast Addressable Double Action Pull Station. Dual Action, Key resettable, Terminal connectors, Gold plated SPST contacts, Optional auxiliary contacts, High-gloss red enamel finish.

Mounts on standard single gang box or Mircom's MS-700 surface metal backbox or MS-700WP weather protected backbox.

3. Notification Appliance Devices

a. Audible Notification Appliances

- 1) All audible sounding devices shall operate on regulated, full wave rectified, 24 VDC and be UL listed as compatible with the FACU.
- 2) All audible devices shall be programmed to sound in the ANSI Temporal 3 sound pattern.
- 3) Audible appliances shall be MGC FH-400 devices.

b. Visual Notification Appliances

- 1) All visual notification appliances shall operate on regulated, full wave rectified, 24 VDC and be UL listed as compatible with the FACU.
- 2) All visual notification appliances shall support an adjustable candela feature that is set for the appropriate coverage area per NFPA 72.
- 3) Visual notification appliances shall meet UL and ADA requirements.
- 4) Visual notification appliances shall be MGC FS-400 series devices.

c. Audible/Visual Notification Appliances

- 1) All audible/visual notification appliances shall operate on regulated, full wave rectified, 24 VDC and be UL listed as compatible with the FACU.
- 2) All audible/visual notification appliances shall support an adjustable candela feature that is set for the appropriate coverage area per NFPA 72.
- 3) All audible/visual notification appliances shall be programmed to sound in the ANSI Temporal 3 sound pattern.
- 4) All audible/visual notification appliances shall meet UL and ADA requirements.
- 5) Audible/visual notification appliances shall be MGC FHS series devices.

C. Batteries

1. Batteries used for backup power to the main FACU, or remote power supply panels, shall be of the sealed lead acid, maintenance free type.
2. Batteries shall be sized according to the power requirements of the FACU and be capable of operating the system in standby mode for a minimum of 24 hours followed by 5 minutes in alarm condition.
3. Battery calculations shall be supplied showing the calculated standby battery size after factoring in a minimum 20% efficiency/derating factor.

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 semi-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:

- A. 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.
- B. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
- C. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACU.
- D. Verify activation of all waterflow switches.
- E. Open initiating device circuits and verify that the trouble signal actuates.
- F. Open and short notification appliance circuits and verify that the trouble signal actuates.
- G. Ground all circuits and verify response of trouble signals.
- H. Verify the installation is in accordance with the approved drawings.
- I. Test audibility of all audible notification appliances and that the output volume is in accordance with NFPA 72.
- J. Test all visual notification appliances for synchronization and proper operation.
- K. Check installation, supervision, and operation of all devices using the walk test feature.
- L. 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 FACU and the correct response.
- M. 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 input to output response, alarm verification, silence inhibit, and similar such features.

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. Instructions 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."
- C. A user operating instruction sheet shall be prominently displayed next to the FACU in accordance with NFPA 72 and UL 864 Standard requirements.