



**7100 Series Fire Alarm Control  
Engineer/Architect Specification**  
Part No. 9020-0480

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## **SECTION ONE: GENERAL**

### **1.1 Scope of this Document**

This specification document provides the requirements for the 7100 Series analog/addressable, multiprocessor-based fire alarm control panel. This control panel shall include system cabinet, basic system module, associated peripheral devices, programming, wiring, and other relevant components. The control panel shall be available in configurations to accept 120 VAC 50/60 Hz, or 240 VAC 50/60 Hz input

### **1.2 Work Included**

#### **1.2.1 General Requirements**

The contractor shall furnish and install a complete 24 VDC, 7100 Series analog/addressable, multiprocessor-based fire alarm system as specified herein. The system shall include, but not be limited to; all control equipment, analog sensors, addressable modules, audible and visual notification appliances as appropriate, conduit, wiring, fittings, and all other accessories necessary to provide a complete and operable system.

#### **1.2.2 Labeling**

All equipment shall be labeled with the manufacturer's name and logotype to assure the integrity of the complete system. "Hybridized" systems (containing equipment from several different manufacturers) shall not be considered acceptable.

#### **1.2.3 Agency Approvals**

All equipment shall be listed by Underwriters Laboratories, Inc., approved by Factory Mutual Research, or as accepted by the Authority Having Jurisdiction (AHJ). The catalog

numbers specified are those of Fire Control Instruments, Inc., and are indicative of the quality and type of equipment to be furnished.

Accessory components as required shall be catalogued by the manufacturer and Listed to operate with the manufacturer's control panel.

#### 1.2.4 **Wiring**

Wire and cable shall be U.L. Listed for fire alarm use and shall be a minimum of 18 AWG or as required by local codes and Authority Having Jurisdiction.

Raceways containing conductors identified as "Fire Alarm " conductors shall not contain any other conductors. No AC current carrying conductors shall be allowed in the same raceway with the fire alarm conductors.

### 1.3 **Submittals**

The owner or his designated representative shall approve all equipment submittals.

#### 1.3.1 **General Requirements**

Manufacturers original catalog data and descriptive information shall be supplied for all major components of the equipment to be supplied. Supplier's qualifications shall indicate years in business, service policies, warranty definitions, and a list of similar installations.

Contractor qualifications shall indicate years in business and prior experience with installations that include the type of equipment that is to be supplied. All pertinent information shall be furnished regarding the reliability and operation of the equipment to be supplied. Delivery dates of the equipment to be supplied shall be furnished.

Installation and final test/acceptance dates of the equipment shall be furnished.

Sufficient information shall be furnished so that the exact function of each installed device is known.

#### **NOTE: DOCUMENTATION**

Submittal of shop drawings shall contain at least one (1) booklet of original manufacturer specification and installation instruction sheets. Subsequent booklets may be copies. All equipment and devices on the shop drawings to be furnished under this contract shall be clearly marked in the specification sheets.

#### 1.3.2 **Other than Specified Equipment**

If equipment other than that specified is supplied, it shall be the contractor's obligation to furnish appropriate documentation and submit the following in writing to the engineer ten (10) days before the bid date:

- Complete lists, descriptions and drawings of materials to be used.
- A complete list of current drain requirements during normal supervisory condition, trouble, and alarm conditions.
- Battery standby calculations showing total standby power needed to meet the system requirements as specified.

#### 1.3.3 **Satisfying the intent of these specifications**

It is the contractor's responsibility to meet the entire intent of these specifications.

Deviations from specified items shall be at the risk of the contractor until the date of final

acceptance by the architect, engineer, and owner's representative. All costs for removal, relocation, or replacement of a disapproved substituted item shall be borne by the electrical contractor.

#### 1.4 **Codes and Standards**

##### 1.4.1 **Codes**

The fire alarm system in its entirety shall be in compliance with all applicable fire and electrical codes and comply with the requirements of the local Authority Having Jurisdiction over said systems.

##### 1.4.2 **U.L. Standards**

The system shall comply with the applicable provisions of the following U.L. Standards and Classifications:

- UL STD 864, Control Units, Fire Protective Signaling Systems
- UOJZ, Control Units, System
- SYZV Control Units, releasing Device
- UOXX, Control Unit Accessories, System
- SYSW Accessories, Releasing Device Service

##### 1.4.3 **NFPA Standards**

The 7100 system shall comply with the applicable provisions of the following current National Fire Protection Association (NFPA) standards:

- NFPA 12 Carbon Dioxide Extinguishing Systems
- NFPA 12A Halon 1301 Fire Extinguishing Systems
- NFPA 13 Installation of Sprinkler Systems
- NFPA 15 Water Spray Fixed Systems
- NFPA 16 Deluge Foam-Water Sprinkler Systems
- NFPA 16A Installation of Closed Head Foam-water Sprinkler Systems
- NFPA 17 Dry Chemical Extinguishing Systems
- NFPA 17A Wet Chemical Extinguishing Systems
- NFPA 72, National Fire Alarm Code:
  - Central Station Fire Alarm Systems
  - Local Fire Alarm Systems
  - Auxiliary Fire Alarm Systems
  - Remote Station Fire Alarm Systems
  - Proprietary Fire Alarm Systems
- NFPA 90A, Installation of Air Conditioning and Ventilating Systems
- NFPA 101, Life Safety Code - Safety to Life from Fire in Buildings and Structures
- NFPA 750 Water Mist Fire Protection Systems
- NFPA 2001 clean Agent fire Extinguishing Systems

## **SECTION TWO: SYSTEM OPERATION**

### 2.1 **Multiprocessor-Based**

The system shall be of multiprocessor design to allow maximum flexibility of capabilities and operation.

## 2.2 **Field Programmable**

The system shall be capable of being front-panel programmed or by means of a Field Configuration Program (FCP) allowing programming to be downloaded via portable computer.

## 2.3 **RS-232C Serial Output**

A supervised RS-232C serial port shall be provided to operate remote printers and/or video terminals, accept a downloaded program from a portable computer, or provide an 80-column readout of all alarms, troubles, location descriptions, time, date, etc. The communication shall be standard ASCII code operating at a 9600-baud rate.

## 2.4 **Control-by-Event (CBE) Program**

Operation of a manual station or automatic activation of any smoke sensor, heat sensor, or waterflow zone shall activate the system control-by-event program to cause:

1. All notification appliances to sound in a temporal pattern and strobes to flash.

**OR**

All notification appliances to sound in a march time code pattern and strobes to flash.

**OR**

All notification appliances to sound in a continuous pattern and strobes to flash.

2. Shut down all air-handling units as specified herein.
3. The "SYSTEM ALARM" LED shall flash and the panel sounder shall pulse.
4. Indicate on the 80-character alphanumeric panel display the description of the specific analog/addressable device in alarm. The display shall be of the liquid crystal type (LCD), clearly visible in the dark or in poor light conditions.

**AND/OR**

5. Close all magnetically held doors automatically.
6. Energize programmed solenoids for activating sprinkler or extinguishing systems.
7. Perform any additional function as specified herein or as shown on the plans.
8. Notify the Fire Department.

## 2.5 **General System Operation**

When an alarm occurs, the control panel indicates the alarm condition until manually reset. An alarm may be acknowledged by pressing the "ALARM ACKNOWLEDGE" switch. This shall silence the panel sounder, and change the "ALARM" LED from flashing to steadily lit.

All notification appliances may be silenced by operating the "SIGNAL SILENCE" switch.

This shall steadily light the "SYSTEM SILENCED" LED. If a subsequent alarm is activated, the notification appliances shall "resound" until again silenced. Once silenced, all notification appliances may be restored again by operating the "SIGNAL SILENCE" switch. Waterflow zones shall be non-silenceable.

## 2.6 **Alarm Verification**

Smoke detector alarm verification shall be a standard option on all zones while allowing any dry contact device (i.e.: manual stations, heat detectors, etc.) to create an immediate alarm. This feature shall allow smoke sensors that are installed in environments prone to nuisance or unwanted alarms to operate per the following sequence:

- System Ready - prior to smoke sensor alarm.
- Smoke Sensor Alarm - @ time = 0.
- Prealarm Window - 15 seconds; a distinctive pre-alarm indication shall be displayed.
- Zone Reset - 5 seconds (occurs at end of pre-alarm window).
- Alarm Verification Window - 90 seconds; the system shall respond to a second alarm from the same smoke sensor as a system alarm.
- System Ready - no alarm verification.

**NOTE:** The verification sequence is suspended once a system alarm is activated.

## 2.7 Alarm Signals

All alarm signals shall be automatically latched or "locked in" at the control panel until the operated device is returned to normal and the control panel is manually reset. The alarm signals shall be programmable for "non-latching" operation when required by the Authority Having Jurisdiction. When used for waterflow, the "SIGNAL SILENCE" switch shall be bypassed.

## 2.8 Electrically Supervised

Each signaling line circuit and notification appliance circuit shall be electrically supervised for opens, shorts and ground faults.

The occurrence of any fault shall activate the system trouble circuitry but shall not interfere with the proper operation of any circuit that does not have a fault condition.

A yellow "SYSTEM TROUBLE" LED shall light and the system audible sounder shall steadily sound when any trouble is detected in the system. Failure of power, opens or short circuits on the notification appliance or signaling line circuits, disarrangement in system wiring, failure of the microprocessor or any identification module, or system ground faults shall activate this trouble circuit.

A trouble signal may be acknowledged by operating the "ALARM ACKNOWLEDGE" switch. This shall silence the sounder. If subsequent trouble conditions occur, the trouble circuitry will resound.

During an alarm, all trouble signals shall be suppressed with the exception of lighting the yellow "SYSTEM TROUBLE" LED.

## 2.9 Drift Compensation - Analog Smoke Sensors

System software shall automatically adjust each analog smoke sensor approximately once each week for changes in sensitivity due to the effects of component aging or environment (i.e.: dust). Each sensor shall maintain its actual sensitivity under adverse conditions to respond to actual alarm conditions while ignoring the factors that generally contribute to nuisance alarms.

The system trouble circuitry shall activate, display "DIRTY DETECTOR" and "VERY DIRTY DETECTOR" indications and identify the individual unit that has been compensated beyond its acceptable limits.

**2.10 Analog Smoke Sensor Test**

System software shall automatically test each analog smoke sensor a minimum of three times daily. The test shall be a recognized functional test of each ionization chamber (analog ionization sensors) and photocell (analog photoelectronic sensors) as required annually by NFPA 72. Failure of a sensor shall activate the system trouble circuitry, display a "Test Failed" indication, and identify the individual unit.

**2.11 Dual - Mode Walk Test**

The control unit shall provide a Dual-Mode Zoned Walk Test Program that shall enable an individual to test the Alarm/Supervision status of each sensor or module connected to the system. During walk test, the control unit shall automatically reset after an alarm condition enabling the technician to continue testing the system without requiring a return to the control panel.

During an Audible walk test, placing a device in alarm will cause four pulses on the notification appliance circuits. Operation of a supervisory switch will cause three pulses, while removal or disconnection of an initiating device will cause two pulses. All tests should be recorded by a printer for reference.

A Silent walk test will record all tests by a printer for reference while not activating the notification appliance circuit(s).

**2.12 Printed Circuit Boards, Control Panel Components**

The control unit shall be contained in a steel cabinet.

All groups of circuits or common equipment shall be clearly marked. The control unit shall be red in color and shall include the following features:

- A. Auxiliary SPDT alarm and trouble dry contacts.
- B. A solid-state power transfer circuit that shall switch to standby power automatically and instantaneously if normal power fails or falls below 15% of normal ("brown out" conditions). This circuit shall allow the batteries to be effectively "floated" on the operating system to avoid upsetting normal microprocessor operation and minimize resultant nuisance troubles and/or alarms. This circuit shall be physically isolated from the power supply to facilitate service.
- C. A ground fault detector to detect positive or negative grounds on the signaling line circuits, notification appliance circuits and power circuits. A ground fault indication shall occur on the display and the general trouble devices shall operate as specified herein but shall not cause an alarm.
- D. Lightning protection shall be a standard feature of the fire alarm control panel and shall be incorporated in the power supply circuit, common control circuits and notification appliance circuits. Systems that require an optional module to provide this protection shall not be considered equal.
- E. Individual overcurrent protection shall be provided for the following: smoke detector (resettable) power, main power supply, battery standby power, and auxiliary (non-resettable) output.

F. A common reset and lamp test switch, labeled "SYSTEM RESET/LAMP TEST" shall be provided on panel.

**2.13 City Connection**

The fire alarm system shall be connected via leased telephone lines to a central station or remote station.

**OR**

The fire alarm system shall be connected to a local energy city master box.

**OR**

The fire alarm system shall be connected via Digital Alarm Communicator Transmitter (DACT) over telephone lines to a central station or remote station.

**2.13.1 Remote Station Option**

The fire department shall be consulted as to the authorized remote station serving the municipality.

The fire alarm system shall transmit both alarm and trouble signals with the alarm having priority over the trouble signal.

The contractor shall be responsible for all installation charges, while the customer shall be responsible for the line lease charges.

**2.13.2 Local Energy City Master Box Option**

The fire alarm system shall be connected to a local energy city master box via an optional Municipal Circuit Option Module (MCOM).

The city master box shall be coded and timed in accordance with the requirements of the fire department.

The box shall be (surface/flush) mounted and located as specified by the building engineer and the fire department.

**2.13.3 Central Station Option**

The fire alarm control panel shall provide an integral Digital Alarm Communicator Transmitter(DACT) for signaling to a Central Station. The DACT shall contain a "Dialer-Runaway" feature preventing unnecessary transmissions as the result of intermittent faults in the system and shall be Carrier Access Code (CAC) compliant, accepting up to 20-digit central station telephone numbers.

The fire department shall be consulted as to the authorized central station companies serving the municipality.

The fire alarm system shall transmit both alarm and trouble signals with the alarm having priority over the trouble signal.

The contractor shall be responsible for all installation charges, while the customer shall be responsible for the line lease charges.

**SECTION THREE: SYSTEM COMPONENTS**

The 7100 System shall consist of the following units, components, and peripheral devices, each of which is described in detail in this section:

- System Cabinet
- Basic System Module

- Peripheral Devices (Manual Stations, Smoke sensors, heat sensors, etc.).

**OPTIONAL:**

- Class A Option Module (CAOM)
- Municipal Circuit Option Module (MCOM)
- Printer Transient Module (PTRM)
- Integral Digital Alarm Communicator Transmitter(DACT) (Model 7100-D)
- LCD-7100 Remote Display
- LDM-7100 LED Annunciator Driver Module

**3.1 System Cabinet**

The system cabinet shall be either surface or semi-flush mounted with a texture finish and shall consist of three parts: backbox, backplate, and door. The system cabinet houses the 7100 Micro microprocessor and related system circuitry.

The cabinet shall be of dead-front steel construction; the door shall be of molded plastic. The system components shall be installed on a hinged mounting plate, which may be removed to facilitate installation and testing of field wiring. A minimum of a 1-inch wiring gutter space shall be provided behind the mounting plate. Wiring shall be terminated on removable terminal blocks to allow field servicing of all modules without disrupting system wiring.

**3.2 LED Indicator and Outputs**

A green "AC ON" LED on the lamp cluster shall indicate the presence of primary power. Power supply outputs shall be as follows:

- 24 VDC Non-resettable, 0.25 amp. max. power limited.
- 24 VDC Resettable, 0.25 amp. Max. power limited.

**NOTE:** Maximum combined output for both shall be 0.25 amperes.

**3.3 Battery Charger**

The power supply shall contain a battery charger with a maximum average charging current of 1 ampere. If the system loses AC power, a System Trouble shall occur. The output shall be supervised and overcurrent protected. The charger shall be capable of maintaining sealed lead-acid batteries up to 31-ampere/hour capacity.

**3.4 Batteries**

Batteries shall be of sufficient capacity to provide power for the entire system upon loss of normal AC power for a period of sixty (60) hours with five (5) minutes of alarm signaling at the end of this sixty-hour period as required by NFPA 72, Auxiliary Systems.

**OR**

Batteries shall be of sufficient capacity to provide power for the entire system upon loss of normal AC power for a period of twenty-four (24) hours with five (5) minutes of alarm signaling at the end of this twenty four hour period as required by NFPA 72, Local Systems.

**3.5 Connections and Circuits**

Connections to the light and power service shall be on a dedicated branch circuit in accordance with the National Electrical Code (NEC). The circuit and connections shall be mechanically protected. The circuit disconnecting means shall be accessible only to authorized personnel and shall be clearly marked "FIRE ALARM CIRCUIT CONTROL."

### 3.6 **Basic System Module**

Enclosed within the system cabinet, the basic system module shall contain the power supply, microprocessor, memory, system operating software stored on a non-volatile EPROM, system configuration memory stored on a non-volatile EEPROM, and the circuits necessary to support a fire alarm system. Volatile memory shall not be acceptable. The module shall function as the system control center, processing all messages from the field devices supervisory, trouble, alarm).

### 3.7 **Microprocessor**

The microprocessor shall execute all supervisory programming to detect and report the failure or disconnection of any module or peripheral device. An isolated "watchdog" circuit shall monitor the microprocessor and upon failure shall activate the system trouble circuits on the display.

The microprocessor shall access the system program, for all control-by-event (CBE) functions. The system program shall not be lost upon failure of both primary and secondary power.

### 3.8 **Signaling Line Circuits**

The basic system module shall provide communication with all analog/addressable devices (initiation/control) connected to the 7100 via two (2) signaling line circuits. Each signaling line circuit shall be capable of being wired Class B, Style 4. Class A, Style 6 operation shall be possible with installation of the optional Class A Operating Module (CAOM). The circuits shall be capable of operating in an NFPA Style 7 mode when equipped with the CAOM module and isolator modules or sensor bases.

Each circuit shall communicate with a maximum of ninety nine (99) analog sensors and ninety eight (98) addressable monitor/control devices.

The first ninety-nine device addresses (1-99) on each circuit shall be dedicated to analog sensors, while addresses 101-198 shall be reserved for monitor/control devices.

### 3.9 **Real-Time Clock**

The basic system module shall contain a real-time clock capable of monitoring all real-time programming and all time control functions.

### 3.10 **Notification Appliance Circuits**

Two (2) independent notification appliance circuits shall be provided on the basic module, polarized and rated at 1.5 amperes DC per circuit, individually overcurrent protected and supervised for opens, grounds, and short circuits. They shall be capable of being wired Class B, Style Y.

With installation of the optional Class A Option Module (CAOM), they shall be capable of being wired Class A, Style Z.

Power output shall be regulated so that any UL Listed notification appliances with an operating voltage range of 17-26 VDC may be installed on the circuits. Specifications are as follows:

Voltage	Current
24 VDC Regulated	1.5 amps: Maximum alarm

**3.11 Trouble Dry Contacts**

Trouble dry contacts (Form C) shall be provided rated 2 amps @ 30 VDC (resistive) and shall transfer whenever a system trouble occurs.

**3.12 Alarm Dry Contacts**

Alarm dry contacts (Form C) shall be provided rated 2 amps @ 30 VDC (resistive) and shall transfer whenever a system alarm occurs.

**3.13 FCI Approved Sensors**

Only FCI approved compatible sensors, which are UL Listed or FM Approved for use with the 7100 system, shall be used. The table below identifies by part number those approved, acceptable models.

<b>Model</b>	<b>Description</b>
ASD-IL, IL2	Analog ionization sensor
ASD-PL2	Analog photoelectronic sensor
ASD-PTL-2, 2551T	Analog photoelectronic sensor with 135° F thermal unit
ATD-2, ATD-L2	Addressable thermal sensor, Fixed Temperature
ATD-R2, ATD-RL2	Addressable thermal sensor - Rate of Rise
ADB-F/FL	Standard analog plug-in base
B501BH,/BHT	Base/Sounder assembly
ADP/-R	Analog duct housing
M500X	Isolator Module
B524BI	Isolator Base
MCS-Acclimate2	Multi Criteria Sensor
ASD-LS	Laser Sensor

**3.14 Display**

The system display shall furnish audible and visual annunciation of all alarms and trouble signals. Dedicated LEDs shall be provided for:

<b>LED</b>	<b>Function</b>
Green	AC Power On
Red	Alarm
Yellow	Supervisory
Yellow	System Trouble
Yellow	Power Fault
Yellow	Ground Fault

Yellow	NAC 1 Silenced
Yellow	NAC 2 Silenced
Yellow	System Silenced

The 80-character alphanumeric display shall provide status of all analog/addressable sensors, monitor and control points), and a 12-key keypad which shall permit selection of functions. The display shall be of the liquid crystal type (LCD), clearly visible in the dark and under all light conditions.

The panel shall contain four (4) functional keys and three (3) programming buttons:

1. Alarm Acknowledge
2. Trouble Acknowledge
3. Signal Silence
4. System Reset/Lamp Test

Programming Buttons:

1. Menu/Back
2. Back Space/Edit
3. OK

#### **SECTION FOUR: PERIPHERAL DEVICES:**

(Specifier choose as required)

##### **4.1 Analog Photoelectronic Smoke Sensors, FCI Model ASD-PL2**

- A. Analog photoelectronic sensors shall have a low profile and be capable of being set at four sensitivity settings of: "LOW, LOW MEDIUM, MEDIUM, MEDIUM HIGH, and HIGH" levels.
- B. Automatic and manual functional sensitivity and performance tests shall be possible without the necessity of generating smoke. This method shall test all sensor circuitry and a "Failed Test" indication shall display for any failed test.
- C. Two LEDs providing 360-degree visibility of operating status and alarm indication shall be provided on each sensor. The LEDs shall pulse periodically indicating that the sensor is receiving power and communication is taking place. This feature shall be field programmable. Upon alarm, these LEDs shall light continuously. An alarm output shall be available for remote annunciation.
- D. The system shall check the sensitivity of each sensor periodically. If a sensor alarm threshold sensitivity has changed, due to aging and/or dust accumulation, the system shall automatically compensate for this change (drift compensation).
- E. Each sensor shall allow for the setting of two sensitivity levels. These levels may be programmed so that when the building is occupied, a sensor will be less sensitive than when the building is unoccupied. This feature permits sensors to be more reliable and at the same time reduces/minimizes unwanted alarms. This feature shall also provide for programmable weekend days, where the sensor will remain at an unoccupied sensitivity level.
- F. The sensor screen and cover assembly shall be removable for field cleaning.
- G. Each sensor shall be interchangeable with the ASD-IL2, ATD-L2/RL2 sensors via adapter and twistlock mounting base, to ensure matching the proper sensor to the

potential hazards of the areas being protected. In all cases the system shall recognize when an improper sensor type has been installed in a previously programmed sensor type location.

H. The ASD-PTL2 sensor shall contain, in addition to the above, a 135° FT thermal sensor.

**OR**

**4.2 Analog Ionization Smoke Sensor, FCI Model ASD-IL2**

- A. Analog ionization sensors shall have a low profile and contain dual chamber ionization sensors. Each sensor shall be capable of being set at seven (7) sensitivity settings ranging from 3.0 to 1.0 %/ft equivalent obscuration, with a predefined setting of 3.0%.
- B. Automatic and manual functional sensitivity and performance tests shall be possible on all sensors without the necessity of generating smoke. This test method shall test all sensor circuitry and a "Failed Test" indication shall display for any failed test.
- C. Two LEDs providing 360-degree visibility of operating status and alarm indication shall be provided on each sensor. The LEDs shall pulse periodically indicating that the sensor is receiving power and communication is taking place. This feature shall be field programmable. Upon alarm, these LEDs shall light continuously. An alarm output shall be available for remote annunciation.
- D. The system shall check the sensitivity of each sensor periodically. If a sensor alarm threshold sensitivity has changed, due to aging and/or dust accumulation, the system shall automatically compensate for this change (drift compensation).
- E. Each sensor shall allow for setting of two sensitivity levels. These levels may be programmed so that when the building is occupied, a sensor will be less sensitive than when the building is unoccupied. This feature permits sensors to be more reliable and at the same time reduces/minimizes unwanted alarms. This feature shall also incorporate programmable weekend days, where the sensor will remain at an unoccupied sensitivity level.
- F. The sensor screen and cover assembly shall be removable for field cleaning.
- G. Each sensor shall be interchangeable with the ASD-PL2/PTL2 and ATD-2 Series sensors via adapters and twistlock mounting base, to ensure matching the proper sensor to the potential hazards of the areas being protected. In all cases the system shall recognize when an improper sensor type has been installed in a previously programmed sensor type location.

**4.3 Addressable Thermal Sensor, FCI Model ATD-L2/ATD-RL2 Series**

- A. Addressable thermal sensors shall have a low profile and operate on the combination "rate-of-rise" and "fixed temperature" principles with the fixed temperature set point at 135° F, FCI Model ATD-RL2. The sensor shall contain dual thermistor sensing circuitry for fast response.

**OR**

Addressable thermal sensors shall operate on the "fixed temperature" principle with the sensor having a set point of 135° F, FCI Model ATD-L2. The sensor shall contain dual thermistor sensing circuitry for fast response.

- B. Two LEDs providing 360-degree visibility of operating status and alarm indication shall be provided on each sensor. The LEDs shall pulse periodically indicating that the sensor is receiving power and communication is being supplied. This feature shall be field

programmable. Upon alarm, the LEDs shall light continuously. An alarm output shall be available for remote annunciation.

- C. Each sensor shall be interchangeable with the ADS-PL2 and ASD-IL2 sensors via twistlock mounting base, to ensure matching the proper sensor to the potential hazards of the areas being protected. In all cases the system shall recognize when an improper sensor type has been installed in a previously programmed sensor type location.

**4.4 Addressable Monitor Module, AMM-2**

An addressable monitor module with an initiating circuit wired Class B, Style B shall be furnished to provide an address for individual, normally open (N.O.) contact devices.

**4.5 Addressable Dual Monitor Module, AMM-2I**

An addressable monitor module with two (2) initiating circuits wired Class B, Style B shall be furnished to provide two addresses for individual, normally open (N.O.) contact devices.

**4.6 Addressable Monitor Module, AMM-4**

An addressable monitor module with an initiating circuit capable of being configured either Class A, Style D or Class B, Style B shall be furnished to provide an address for an individual, normally open (N.O.) contact device, or a collective address for a group of such devices.

The AMM-4 module shall contain a yellow status LED that shall flash when in a quiescent mode and light continuously when in alarm. The LED shall be field programmable not to provide quiescent status indication, if so desired.

**4.7 Addressable Sub-loop Monitor Module, AMM-4S**

An addressable monitor module with an initiating circuit capable of being configured Class B, Style B shall be furnished to provide a collective address for up to ten (10) model 1151, 2151, 1451, 2451, 1400, or 2400, conventional two-wire smoke detectors.

The AMM-4S module shall contain a yellow status LED that shall flash when in a quiescent mode and light continuously when in alarm. The LED shall be field programmable not to provide quiescent status indication, if so desired.

**4.8 Addressable Sub-loop Monitor Module, MMI-6S**

An addressable monitor module with six (6) initiating device circuits, each capable of being configured for six (6) Class B, Style B, or three (3) Class A, Style A, shall be furnished to provide a collective address for up to ten (10) model 1151, 2151, 1451, 2451, 1400, or 2400, conventional two-wire smoke detectors installed in each circuit.

Each circuit shall have a yellow status LED that shall flash when in a quiescent mode and light continuously when in alarm. The LED shall be field programmable not to provide quiescent status indication, if so desired.

**4.9 Addressable Monitor Module, MMI-10**

An addressable monitor module with ten initiating device circuits each capable of being configured Class B, Style B, or five (5) circuits each capable of being configured Class A, Style D, shall be furnished to provide an address for an individual, normally open (N.O.) contact device, or a collective address for a group of such devices.

Each circuit shall contain a yellow status LED that shall flash when in a quiescent mode and light continuously when in alarm. The LED shall be field programmable not to provide quiescent status indication, if so desired.

**4.10 Addressable Output Module, AOM-2R**

An addressable output module shall be connected to the same signaling line circuit as the analog/addressable monitor devices and shall provide a relay output (Form "C" 2 amp @ 24 VDC, resistive only).

**4.11 Addressable Output Module, AOM-2S**

An addressable output module shall be connected to the same signaling line circuit as the analog/addressable monitor devices and shall be capable of switching an external power supply or audio amplifier (up to 80 VRMS) to notification appliances. The notification appliance circuit shall be capable of being wired either Class A (Style Z) or class B (Style Y). The module shall supervise the wiring to the connected loads and report their status as Normal, Open, or Short Circuit.

**4.12 Addressable Output Module, MMO-6R**

An addressable output module shall be connected to the same signaling line circuit as the analog/addressable monitor devices and shall provide six (6) relay outputs, each with Form "C" 2 amp @ 24 VDC, (resistive only) contacts.

**4.13 Addressable Output Module, MMO -6S**

An addressable output module shall be connected to the same signaling line circuit as the analog/addressable monitor devices and shall have six (6) outputs, each capable of switching an external power supply or audio amplifier (up to 80 VRMS) to notification appliances. The notification appliance circuit shall be capable of being wired either Class A (Style Z) or class B (Style Y). The module shall supervise the wiring to the connected loads and report their status as Normal, Open, or Short Circuit.

**4.14 Fault Isolator Module - Model (M500X)**

This module enables part of the signaling line circuit to continue operating when a short circuit occurs on a section of it. An LED flashes in the normal condition and lights during a short circuit condition. The module automatically restores the entire circuit to the normal condition when the short circuit is removed. This module may be used in multiple, in any combination with other modules, providing circuit operation similar to that of NFPA Style 7, and does not require an address on the signaling line circuit.

**4.15 Manual Fire Alarm Stations:**

**4.15.1 Addressable Fire Alarm Station, MS-7A**

Furnish and install a manual station (MS-7A) as indicated on the drawings. Each station shall be of the non-coded double action type and shall be designed for installation in the signaling line circuit of any FCI analog addressable control panel. Activation of the station shall cause its assigned address to register at the control panel. The door shall contain an LED which flashes red in normal condition and lights steadily when the station has been activated. The station shall feature screw terminals.

#### **4.15.2 Stations suitable for use with Addressable Monitor Modules:**

**A. Double Action Manual Station, MS-2**

Furnish and install a manual station (MS-2) as indicated on the drawings. Each station shall be of the non-coded double action type, requiring an outer door to be lifted to expose the actuator door. Upon pulling forward of the door, the unit shall lock into a readily observable "alarm" position.

The station shall be constructed of aluminum (6063/T5), equipped with a break glass rod feature, and require a key to reset. This key shall be keyed alike with the control cabinet. The stations shall employ a highly reliable action to activate an alarm. This feature shall provide an exceptionally high resistance to accidental operation.

**OR**

**Single Action Manual Station, MS-6**

Furnish and install a manual station (MS-6) as indicated on the drawings. Each station shall be of the non-coded single action type requiring pulling forward of an actuator door to activate the alarm switch. Upon pulling forward of the door, the unit shall lock into a readily observable "alarm" position.

The station shall be constructed of aluminum (6065/T5), equipped with a break glass rod feature, and require a key to reset. This key shall be keyed alike with the control cabinet. The stations shall employ a highly reliable action to activate an alarm. This feature shall provide an exceptionally high resistance to accidental operation.

**OR**

**B. Presignal Manual Station, MS-2P**

Furnish and install a presignal manual station (MS-2P) as indicated on the drawings. Each station shall be of the non-coded double action type, requiring an outer door to be lifted to expose the actuator door. Upon pulling forward of the door, the unit shall lock into a readily observable "alarm" position.

The station shall be constructed of aluminum (6063/T5), equipped with a break glass rod feature, and require a key to reset. This key shall be keyed alike with the control cabinet. The station shall also provide an additional key operated switch (keyed differently) mounted on the front of the lower door for "general alarm" signaling.

**OR**

**C. Institutional Manual Station, MS-2L**

Furnish and install an institutional manual station (MS-2L) as indicated on the drawings. Each station shall require a special key to release the outer door before it can be activated. After unlocking the actuator door and pulling it forward, the unit shall lock into a readily observable "alarm" position.

The station shall be constructed of aluminum (6063/T5) and equipped with a break glass rod feature. Each station shall require the same key to reset.

**OR**

**D. Multiple Contact Manual Station, MS-2D**

Furnish and install a multiple contact manual station (MS-2D) as indicated on the drawings. Each station shall be of the non-coded double action type, requiring an outer door to be lifted to expose the actuator door. Upon pulling forward of the door, the unit shall lock into a readily observable "alarm" position.

The station shall be constructed of aluminum (6063/T5), equipped with a break glass rod feature, and require a key to reset. This key shall be the keyed alike with the control cabinet. Upon operation of the station, a contact shall be available for remote control or annunciation. Contact rating shall be 6 amperes @ 30 VDC.

#### 4.16 Automatic Initiating Devices

Two-wire smoke detectors approved for use with the AMM-4S Addressable Sub-loop Monitor module are as follows: (Maximum of 20 detectors per module).

##### A. Photoelectric Area Smoke Detectors, FCI Models PSD-7155, PSD-7156

Smoke detectors shall be of the photoelectric type and designed for two-wire installations. The detectors shall be factory set to detect smoke at a nominal 3.0% light obscuration per foot. A special sensitivity tester shall allow a direct readout of actual detector sensitivity in percent obscuration per foot using a standard digital voltmeter. To minimize nuisance alarms, detectors shall contain a screen protecting the sensing chamber from dust and insects, and equipped with self-compensating circuitry to provide maximum stability against the effects of aging, dust, and film accumulation. The detectors shall be equipped with a pulsed LED power supervisory indicator and full functional test feature. They shall be interchangeable with the CPD-7051 detector via twistlock mounting base to ensure matching the proper detection to the potential hazards of the areas being protected. An alarm output shall be available for remote annunciation. A Model PSD-7156 shall contain an integral 135° F heat detector that shall operate independently of the smoke detector circuitry.

**OR**

##### Photoelectronic Area Smoke Detectors, System Sensor Models 2151, 2451

Smoke detectors shall be of the photoelectronic type and have a nominal sensitivity of 3.0%/ft. and a signal to noise ratio of 2.0 nominal. It shall be possible to perform a functional sensitivity and performance test on these detectors without the need for generating smoke. The test method shall test all detector circuits. Alarm indication shall be provided by a latching LED, which shall pulse periodically indicating that power is being supplied to the detector. An alarm output shall be available for remote annunciation.

A special test meter shall be available to check the sensitivity of the detectors. Metering points shall be accessible on the exterior of the detectors.

The detectors shall not alarm when exposed to wind gusts up to 2500 feet per minute.

The detector screen and cover assembly shall be removable for field cleaning. Wire connections shall be made by a clamping plate and screw.

The detectors shall be interchangeable with the 1151/1451 detectors via twistlock mounting base, to ensure matching the proper detection to the potential hazards of the areas being protected.

A Model 301PT/PTL shall contain an integral 135° F, heat detector that shall operate independently of the smoke detector circuitry.

**OR**

##### Photoelectronic Area Smoke Detectors, System Sensor Models 2400/T

Smoke detectors shall be of the photoelectronic type and have a nominal sensitivity of 3.0%/ft. It shall be possible to perform a functional test on these detectors without the need for generating smoke. The test method shall test all detector circuits.

An alarm indication shall be provided by a latching LED, which shall pulse periodically indicating that power is being supplied to the detector. An alarm output shall be available for remote annunciation.

The detector screen and cover assembly shall be removable for field cleaning. Wire connections shall be made by a clamping plate and screw.

A Model 2400T detector shall contain an integral 135° F heat detector that shall operate independently of the smoke detector circuitry.

**B. Ionization Area Smoke Detectors, FCI Model CPD-7051**

Smoke detectors shall be of the dual chamber, ionization type, operate with 0.7 microcurie or less of Americium 241 and be designed for two-wire installations. The detectors shall have 360-degree angle orientation (circumference) smoke entry characteristics, permitting maximum response to both visible and invisible products of combustion from any direction. A special sensitivity tester shall allow a direct readout of actual detector sensitivity in percent per foot using a digital voltmeter.

The detectors shall be capable of operation in air velocities up to 2,000 FPM and at altitudes up to 7,500 feet without adjustments.

To minimize nuisance alarms, the detector shall be equipped with gated output circuitry requiring three different and simultaneous signals before detector actuation. The detector shall be interchangeable with the PSD-7155/7156 detectors via twist-lock mounting base to ensure matching the proper detection to the potential hazards of the areas being protected.

**OR**

**Ionization Area Smoke Detector, System Sensor Model 1451**

Smoke detectors shall be of the dual chamber, ionization type, and shall have a nominal sensitivity of 1.5%/ft. It shall be possible to perform a calibrated sensitivity and performance test on the detector without the need for generating smoke. The test method shall test all detector circuits. A special test meter shall be available to check the sensitivity of the detectors. Metering points shall be accessible on the exterior of the detectors.

An alarm indication shall be provided by a latching LED, which shall pulse periodically indicating that power is being supplied to the detector. An alarm output shall be available for remote annunciation.

The detector shall be capable of operation in air velocities up to 2,500 FPM and altitudes up to 10,000 feet without adjustment.

The detector screen and cover assembly shall be removable for field cleaning. Wire connections shall be made by a clamping plate and screw.

The detectors shall be interchangeable with the 2151/2451 detectors via twistlock mounting base to ensure matching the proper detection to the potential hazards of the areas being protected.

**OR**

**Ionization Area Smoke Detectors, System Sensor Model 1400**

Smoke detectors shall be of the dual chamber, ionization type, and have a nominal sensitivity of 1.5%/ft. It shall be possible to perform a functional test on these detectors without the need of generating smoke. The test method shall test all detector circuits. An alarm indication shall be provided by a latching LED, which shall pulse periodically indicating that power is being supplied to the detector. An alarm output shall be available for remote annunciation.

The detectors shall not alarm when exposed to wind gusts up to 300 feet per minute. The detector screen and cover assembly shall be removable for field cleaning. Wire connections shall be made by a clamping plate and screw.

C. Duct Smoke Detectors, FCI Model DH-60

The contractor shall furnish and install where shown on plans photoelectric (DH-60/PSD-7155D) or ionization (DH-60/CPD-7051D) duct smoke detectors wired in a two or four-wire configuration.

The detectors shall be UL Listed under UL Standard 268A for duct smoke detectors and allow remote functional testing without generating smoke.

**OR**

Four-wire Duct Smoke Detectors, FCI Model DH100

The contractor shall furnish and install where shown on plans, ionization or photoelectronic duct smoke detectors wired in a 4-wire configuration. The detectors shall be UL Listed under UL Standard 268A for duct smoke detectors and allow remote functional testing without generating smoke.

D. Rate of Rise Heat Detectors, FCI Model 600 Series

Rate of rise heat detectors shall function on both the "rate of rise" and "fixed temperature" principles of operation. They shall be of low profile design, white in color and be provided with locking base for mounting on a standard electrical box.

These detectors shall be installed where indicated on the plans.

**OR**

Rate of rise heat detectors FCI Model 500 Series

Rate of rise heat detectors shall function on both the "rate of rise" and "fixed temperature" principles of operation. They shall also be available in explosion-proof and combined weather/moisture-proof versions. The explosion-proof models shall be UL and FM approved/listed for Class I, Groups C and D, and Class II, Groups E, F and G. The detectors shall be installed where indicated on the plans.

**OR**

E. Fixed Temperature Heat Detectors, FCI Model 600 Series

Fixed temperature detectors shall function on the "fixed temperature" principle of operation. They shall be provided either with SPST or DPST contact arrangements and temperature set points of 135 or 200o F. These detectors shall be of low profile design, white in color, and be provided with locking base for mounting on a standard electrical box.

The detectors shall be installed where indicated on the plans.

**OR**

Fixed temperature detectors, FCI Model 500 Series

Fixed temperature detectors shall function on the "fixed temperature" principle of operation. They shall have temperature set points of 136 or 190o F. These detectors

shall also be available in explosion-proof and combined weather/moisture-proof versions. The explosion-proof models shall be UL and FM approved/listed for Class I, Groups C and D, and Class II, Groups E, F & G  
The detectors shall be installed where indicated on the plans.

**OR**

Fixed temperature detectors, FCI Model FL Series  
Fixed temperature detectors shall function on the "fixed temperature" principle of operation. They shall have temperature set points of 135 or 200o F. The detectors shall have a replaceable plug-in detecting element,  
The detectors shall be installed where indicated on the plans.

**4.17 Optional Remote Serial Annunciator (LCD-7100)**

Furnish and install where shown on the plans a remote serial annunciator, Model LCD-7100. The annunciator shall provide an 80-character display, which shall duplicate all information on the basic system display with the exception of menus. It shall also contain the following function keys: Alarm Acknowledge, Trouble Acknowledge, Signal Silence, System Reset/Lamp Test and System Drill Test.

The cabinet shall contain a keylock which will enable the switches only when placed in the "ON" position, with the exception of the Trouble Acknowledge which is used to silence the local trouble audible sounder.

The annunciator shall also contain the following LEDs: Alarm, Supervisory, System Trouble, Power Fault, System Silenced, NAC #1 Silenced, NAC #2 Silenced.

The annunciator shall mount on a standard three-gang surface or flush electrical box. The 7100 Series control panel shall accommodate up to five (5) remote LCD-7100 annunciators, which can be located up to 4,000 feet from the control panel.

**4.18 Optional LED Driver Module (LDM-7100)**

Furnish and install a serial LED Driver Module, LDM-7100, capable of driving up to 33 remote LEDs. As many as three modules may be installed inside a remote, Listed annunciator allowing the annunciation of up to 99 points per annunciator. The annunciator shall be capable of operation up to 4,000 feet from the control panel. The panel shall be capable of accommodating up to five (5) such annunciators.

**SECTION FIVE: AUXILIARY FUNCTIONS**

**5.1 HVAC Control**

Designated HVAC units shall be controlled through auxiliary contacts of heat detectors or four-wire duct type smoke detectors as shown on the plan.

**OR**

Designated HVAC units shall be controlled through the auxiliary contacts of the control panel after an alarm has been initiated from any zone as shown on the plans.

**OR**

Designated HVAC units shall be controlled through the auxiliary zone contacts of the control panel after an alarm has been initiated from the particular zone that is designated to control HVAC units as shown on the plans. The disconnect switch shall be supervised.

**OR**

Designated HVAC units shall be controlled by means of addressable output modules programmed to activate according to the areas to be covered.

## 5.2 **Electromagnetic Door Holders**

Electromagnetic door holders shall be provided to hold fire and smoke barrier doors open until released by an alarm. The holders shall have approximately 35 lb. (15.9 kg) holding power and offer fail safe operation. The door holders shall be capable of operation on 12 VDC, 24 VAC, 24 VDC, or 120 VAC interchangeably without need of any configuration. Furnish and install FCI Model FM-900 Series where shown on plans.

All holders shall release through the contacts of the control panel after an alarm has been initiated from any zone on the plans. All circuits shall be separately fused.

## **SECTION SIX: WIRING**

### 6.1 **Installers' Responsibilities**

The installer shall coordinate the installation of the fire alarm equipment with the manufacturer or his authorized distributor.

All conductors and wiring shall be installed according to the manufacturer's recommendations.

It shall be the installer's responsibility to coordinate with the supplier, regarding the correct wiring procedures before installing any conduits or conductors.

### 6.2 **Installation of System Components**

System components shall be installed in accordance with the latest revisions of the appropriate NFPA Standards, the requirements contained herein, National Electrical Code, local and state regulations, the requirements of the fire department and other applicable authorities having jurisdiction (AHJ).

All wire used on the fire alarm system shall be U.L. Listed as fire alarm protection signaling circuit cable per the National Electrical Code, Article 760.

## **SECTION SEVEN: WARRANTY AND FINAL TEST**

### 7.1 **General**

The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defects for one year (365 days) from the date of final acceptance.

### 7.2 **Final Test**

Before the installation shall be considered completed and acceptable by the awarding authority, a test of:

1. The contractor's job foreman, in the presence of a representative of the manufacturer, a representative of the owner, and the fire department shall operate every installed device to verify proper operation and correct annunciation at the control panel.
2. At least one half of all tests shall be performed on battery standby power.
3. Where application of heat would destroy any detector, it may be manually activated.
4. The signaling line circuits and notification appliance circuits shall be opened in at least two (2) locations to verify the presence of supervision.

5. When the testing has been completed to the satisfaction of both the contractor's job foreman and the representatives of the manufacturer and owner, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the owner and the fire department.
6. The contractor shall leave the fire alarm system in proper working order, and, without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within one year (365 days) from the date of final acceptance by the awarding authority.
7. Prior to final test, the fire department must be notified in accordance with local requirements.

### 7.3 **Operating and Instruction Manuals**

Operating and instruction manuals shall be submitted prior to testing of the system. Four (4) complete sets of operating and instruction manuals shall be delivered to the owner upon completion.

#### 7.3.1 **"As-Built" Drawings**

A complete set of reproducible "as-built" drawings showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment and internal wiring of the equipment shall be delivered to the owner upon completion of the system.

#### 7.3.2 **Testing Instructions**

Complete, accurate, step-by-step testing instructions giving recommended and required testing frequency of all equipment, and methods for testing each individual piece of equipment shall be delivered to the owner upon completion of the system.

#### 7.3.3 **Maintenance Instructions**

Maintenance instructions shall be complete, easy to read, understandable and shall provide the following information:

1. Instructions for replacing any components of the system, including internal parts.
2. Instructions for periodic cleaning and adjustment of equipment with a schedule of these functions.
3. A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item.
4. User operating instructions shall be provided prominently displayed on a separate sheet located next to the control unit in accordance with UL Standard 864.

The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defects for one year (365 days) from the date of final acceptance.