FIRE SENTRY CORP.™

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FSC Model No.

FS System 10™

Multi-Spectral Digital Electro-Optical

Fire Detector

with

Card Controller OPTION 2GE

for

GEMA

Powder Paint Spray Booths

Installation Guide and Operating Manual

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Read and understand this manual before installing or operating equipment.

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SECTION 1: INTRODUCTION

1.1 Application

The FS System 10 Fire Detector with Card Controller, **Option 2GE** rapidly detects both fireball and flickering fires detects for **GEMA POWDER PAINT SPRAY BOOTHS**. The **0.30**-second response time exceeds the revised National Fire Protection Association (NFPA) 33 Standard for Paint Spray Booths. Each Detector includes a separate Card Controller for use when integrating into an end-user's cabinet. The plug-in Card Controller must be mounted on a Backplane Mounting Assembly. The Detector is connected to the Card Controller with a two pair (four) conductor, 22-gauge cable that provides low DC voltage power and digital RS-485 communication. The Detector can be located up to 1000 feet from the Card Controller with 18-gauge cable (up to 500 feet with 22-gauge cable).

1.2 Responses

If the fire is a spray gun "fireball" type fire, an **ALERT** condition is declared in **0.3 seconds** (300 milliseconds) and will energize the K2 Signal Relay, which will close the K2 Relay contacts. If a non spray gun fire erupts, a **FIRE EARLY WARNING** condition is declared in **0.5 seconds** and will energize the K2 Signal Relay which will close the K2 Relay contacts. The K2 Signal Relay is open during Normal Operation and is used to initiate a Process Shutdown sequence (such as shutting off the paint flow to the sprays guns, turning off the electrostatics and/or stopping the conveyor) if either an **ALERT** or **FIRE EARLY WARNING** condition occurs. If the fire continues, a **FIRE ALARM** is declared in **5.0 seconds**, which will energize and close the K4 Relay contacts.

1.3 Input Power Requirements

The total electrical input power requirements during normal operation for the Fire Detector including its Card Controller is 0.065 amps (65 milliamps) at 24 volt DC (+10/-15%) at 1.7 watts nominal. The maximum power required with all four relays energized and all four LED's turned on (fully alarmed) is less than 100 milliamps.

1.4 FirePic

FirePic™ stores the pre-fire Detector sensor spectral data of last six fire events in the Card Controller's non-volatile digital memory. FirePic provides the numerical spectral evidence to postulate the cause of a fire. The Card Controller records the time and date for each FirePic. The FirePic data includes a graphical display of the relative spectral intensities versus time preceding and during the fire. (Note: An PC computer is required to access FirePic.)

1.5 No Silicone Used

NO silicone based sealants or silicone greases are used in the Fire Detector or Card Controller.

1.6 FS System 10 Fire Detector

The multi-spectral digital Fire Detector, spanning the Wide Band IR™, Near Band IR, and visible spectrums, has intelligent, smart computer processing to tell the difference between a real fire and false alarm radiant energy sources. The Detector simultaneously examines these three spectral radiant energy bands and all three bands are real-time signal processed by sophisticated dual microcomputer "brains." The Detector must be used with a FS System 10 Card Controller or a Wall-Mounted Controller.

The Detector's Card Controller, **Option 2GE**, is factory set using **Software Configuration 4** for ALERT, FIRE EARLY WARNING (F.E.W.), and FIRE ALARM detection range to **30 feet** for a one square foot gasoline reference fire. The ALERT response time is factory set to **0.3 seconds** (300 milliseconds), the F.E.W. response time is factory set to **0.5 seconds** (500 milliseconds), and the FIRE ALARM response time is factory set to **5 seconds**. Relays K2 and K4 are factory set for non-latching.

1.61 Physical Description

The Detector's electro-optics (electronics and sensors) are mounted inside a sealed module which is housed in a water-tight and explosion-proof enclosure; Class I Div. 1, Groups B, C, D; Class II, Div. 1 & 2, Groups E, F, G and Class III; NEMA 3 & 4; tamper-resistant with integral dual 0.75 inch NPT conduit openings; copper-free aluminum (less than 0.4%) with a red powder-coated epoxy finish with reflective assembly. The Detector's housing "O" ring material is Dupont Viton that is not affected by paint solvents. The FS System 10 Detector is 4.65 inches long and 4.75 inches in diameter. The two mounting holes are 5.50 inches apart. The Detector weighs approximately 3.5 pounds (see Figures 4 and 5).

1.62 Field of View

The Detector's field-of-view is a full ninety (90) degrees (horizontal and vertical).

1.63 Environment Range

The operating and storage temperature range of the Detector is -40 ^{o}F to +185 ^{o}F (-40 ^{o}C to +85 ^{o}C). The Detector humidity range is 10% to 90%.

1.64 Location

For proper booth installation, each Detector should located within **30 feet** of the spray guns and have a clear view of the spray gun area at all times.

1.65 Self-Test

The Card Controller activates "Automatic Computer Controlled Through The Lens (ACCTTL)™ Test" for checking the Detector's window lens for contamination and for checking the FS System 10 "end-to-end". If the Detector's lens needs cleaning, the Card Controller's Yellow Fault LED blinks.

1.66 Communication

Detector 'talks" to the Card Controller via a differentially driven RS-485 digital communication link that eliminates spurious crosstalk and random noise problems.

1.67 Warranty

The Detector warranty is ten years from defects in material and workmanship as well as premature internal parts failure.

1.7 Card Controller

The FS System 10 Detector is directly connected (home run) to its Card Controller using four wire, 18 to 22 gauge, twisted pair shielded cable. The Fire Detector communicates to the Controller using a two-wire serial digital differentially driven RS-485 communication link, with the other two wires providing low voltage DC power and ground.

The Card Controller features real-world time and date stamped "Event History" files of its Fire Detector, that are stored in non-volatile solid-state memory. The Card Controller is mounted in an enclosed aluminum housing which contains 2 captive screws for quick mounting to the Backplane Mounting Assemblies (Part Nos. CCBPMA1-1, CCBPMA1-2, and CCBPMA1-4).

The Card Controller contains four 24 volt, 1 amp signal output relays (K1, K2, K3, and K4). Major Fault Relay K1 has both Normally Open (N.O.) and Normally Closed (N.C.) contacts and is energized during Normal Operation. Minor Fault Relay K3 and FIRE ALARM Relay K4 are de-energized with open contacts during Normal Operation. Process Control Relay K2 is de-energized with open contacts during Normal Operation.

The Card Controller performs the following functions:

- Provides safe, low voltage (9 volts) DC electrical power for the Fire Detector.
- De-energizes Major Fault Relay K1 if the wiring fails or trouble occurs with either the Card Controller, or the Detector.
- Energizes Process Control Relay K2 if ALERT or FIRE EARLY WARNING.
- Energizes Minor Fault Relay K3 if the Detector's lens needs cleaning.
- Turns on the Card Controller's LED's to indicate Normal Operation, FIRE EARLY WARNING, ALERT, FIRE ALARM, or Fault conditions.
- Using optional PC Software Kit (Part No. FS10COM-1), communicates externally to an IBM-compatible PC desktop or laptop computer through the built-in RS-232 communication channel.

1.71 Physical Description

The Card Controller consists of a plug-in Printed Circuit Board (PCB) with four status LED's that provide visual display of **NORMAL OPERATION**, **ALERT** (spray gun fire), **FIRE EARLY WARNING** (non-spray gun flickering fire), **FIRE ALARM**, and **Fault** conditions. The PCB is housed in a 6.69 long x 4.50 high x 1.00 inch thick rectangular aluminum enclosure and features a DB-9 type RS-232 interface port for accessing FirePic™. The Card Controllers must be mounted to a FS System 10 Backplane Mounting Assembly.

1.72 Environment Range

The operating temperature range of the Card Controller is +32 ^{o}F to +122 ^{o}F (0 ^{o}C to +50 ^{o}C). The storage temperature range is -4 ^{o}F to +158 ^{o}F (-20 ^{o}C to +70 ^{o}C). The humidity range is 10% to 90%

1.73 Fire Signal Relays

1.731 ALERT and FIRE EARLY WARNING Relay K2

During Normal Operation, **Relay K2** is de-energized with open contacts. During an ALERT or FIRE EARLY WARNING condition, Relay K2 is energized which close the contacts. The relay is rated for one amp at 24 volts DC.

1.732 FIRE ALARM Relay K4

During Normal Operation, **Relay K4** is de-energized with open contacts. During a FIRE ALARM condition, Relay K4 is energized which closes the contacts. The relay is rated one amp at 24 volts DC.

1.74 Fault Relays

1.741 Major Fault Relay K1

During Normal Operation, **Relay K1** is energized with both open and closed contacts available. When a Fault condition occurs, Relay K1 is de-energized. A Fault is when Detector Communication is Lost, Input Power is Lost, Detector has Failed Self-Test, Controller has Failed, etc. (Note: Fault is delayed 15 seconds during startup.) The relay is rated one amp at 24 volts DC.

1.742 Minor Fault Relay K3

During Normal Operation, **Relay K3** is de-energized with open contacts. During Minor Fault condition (dirty Detector lens), Relay K3 is energized which will open the contacts. The relay is rated one amp at 24 volts DC. Relay K3 is reset when the lens is cleaned. The Minor Fault Relay is used for Powder Coating Paint Spray Booths using the recommended Part No. DASA1-P Air Shield.

1.75 Non-Latching Mode for Relays K2 and K4

The Card Controller Relays K2 and K4 are non-latching. Both relays automatically reset after 5.0 seconds..

1.76 Warranty

The Card Controller has a two-year warranty against defects in material and workmanship. For further information, see the Card Controller warranty policy.

1.8 Backplane Mounting Assemblies

The Card Controller Backplane Mounting Assemblies are required for Card Controller installations. The Part No. CCBPMA1-4 Backplane Mounting Assembly accommodates up to four Card Controllers. The Part No. CCBPMA1-1 Backplane Mounting Assembly accommodates one Card Controller and Part No. CCBPMA1-2 accommodates up to two Card Controllers. For example, if 12 Fire Detectors are required for a particular installation, three Part No. CCBPMA1-4 Backplane Mounting Assemblies will be required.

Each Card Controller, which is mounted to an aluminum bracket that is secured to the Backplane Mounting Assembly with two captive screws, can also be easily “unplugged” and replaced by turning its captive screws.

All field terminations and relay outputs are wired from the Backplane Mounting Assemblies. There is no direct wiring from the Fire Detector to the Card Controller and the Card Controller cannot be used without a Backplane Mounting Assembly.

Note: The Backplane Mounting Assemblies require 24 Volt DC.
***Under NO circumstances* should 120 Volts AC or 240 Volt AC**
be applied to the input power or any other connection terminals.

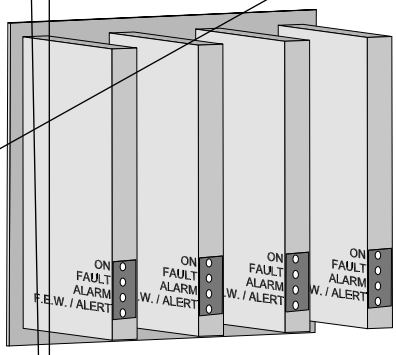
The four Card Backplane Mounting Assembly (Part No. CCBPMA1-4) includes one 9.00-inch high x 9.50 inch wide rectangular, 0.093-inch thick printed circuit board (PCB). The clearance behind the Backplane Mounting Assembly must be a minimum of 0.25 inches. The depth dimension from the bottom side of a Backplane Mounting Assembly PCB to the top of a Card Controller is less than 5 inches. (See Figure 1: Backplane Mounting Assembly for Four Cards). This Backplane Mounting Assembly PCB contains four Card Controller connectors and three removable 20 pin screw-down terminals (J5, J6, and J7) for interfacing up to four FS System 10 Detectors.

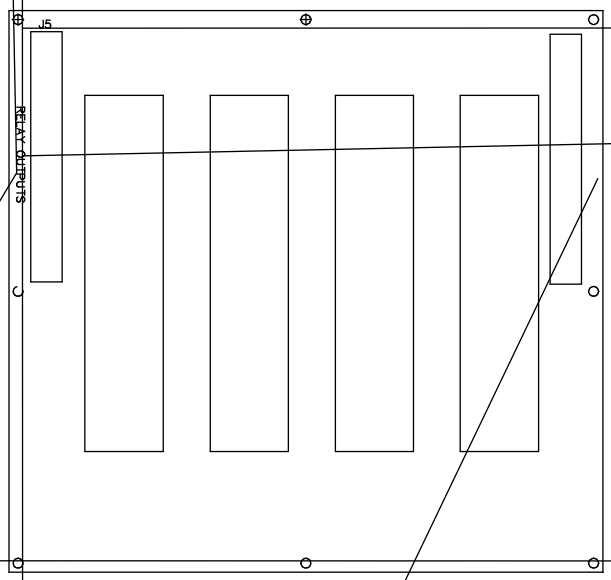
The two Card Backplane Mounting Assembly (Part No. CCBPMA1-2) includes one 9.00-inch high x 4.90-inch wide rectangular, 0.093-inch thick printed circuit board (PCB). The clearance behind the Backplane Mounting Assembly must be a minimum of 0.25 inches. The depth dimension from the bottom side of a Backplane Mounting Assembly PCB to the top of a Card Controller is less than 5 inches. (See Figure 2: Backplane Mounting Assembly for Two Cards). The Part No. CCBPMA1-2 Backplane Mounting Assembly PCB contains two Card connectors and two removable 20 pin screw-down terminals (J3 and J4).

The one Card Backplane Mounting Assembly (Part No. CCBPMA1-1) includes one 9.00-inch high x 3.00-inch wide rectangular, 0.093-inch thick printed circuit board (PCB). The clearance behind the Backplane Mounting Assembly must be a minimum of 0.25 inches. The depth dimension from the bottom side of a Backplane Mounting Assembly PCB to the top of a Card Controller is less than 5 inches. (See Figure 3: Backplane Mounting Assembly for One Card). The Part No. CCBPMA1-1 Backplane Mounting Assembly PCB contains one Card connector and one removable 20 pin screw-down terminal (J2) for interfacing one FS System 10 Fire Detector.

Fire Sentry recommends that the Backplane Mounting Assemblies be installed with a clear view of the LEDs and their function labels as may be required by the Authority Having Jurisdiction. A viewing angle of about 20 degrees from the left should be available as shown in Figure 1.

Figure 1: Backplane Mounting Assembly for Four Cards





SECTION 6: ACCESSORIES for Powder Spray Booths

6.1 Detector Heavy Duty Swivel Mount (Part No. FSSM-2)

6.2 Backplane Mounting Assemblies

These Backplane Mounting Assemblies (BMA's) are required for mounting Card Controllers. Three separate BMA's are available for mounting one, two, or four Card Controllers. (Note: The FS System 10 Card Controllers and BMA's are NOT required if the FS System 10 Wall-Mounted Controller is used.) Each BMA is a rectangular printed circuit board with removable external wiring connector(s). Each "plug-in" Card Controller is secured to a BMA with two captive screws. Each BMA must be offset 0.25 inches from the mounting surface.

- **Part No. CCBPMA1-1:** 9.00 x 3.00 inch BMA mounts one Card Controller.
- **Part No. CCBPMA1-2:** 9.00 x 4.90 inch BMA mounts up to two Card Controllers.
- **Part No. CCBPMA1-4:** 9.00 x 9.50 inch BMA mounts up to four Card Controllers.

6.3 Test Lamp (Part No. FS-846)

This portable, hand-held test lamp is battery-powered for remote activation of the FS System 10 Fire Detectors. This allows the entire Fire Protection System to be tested during startup or routine maintenance. This test lamp simulates the radiant energy emitted by an actual fire in order to test the Detectors without the need for an open flame. The Test Lamp is powered by four "D" sized replaceable flashlight batteries.

6.4 Air Shield for Dirty Applications (Part No. DASA1-P)

The Detector air shield mounts to the FS System 10 Fire Detector housing for installation in areas with high levels of airborne contaminants. Air line fitting accepts 1/4'' O.D. nylon tubing for instrument grade air supply of 5 to 15 psi at 6 cubic ft. per minute.

6.5 PC Software Kit (Part No. FS10COM-1)

The PC Software Kit allows access to FirePic™ as well as monitoring of the operation of the Detectors through the RS-232 serial port located on the FS System 10 Card Controller using a Desktop or portable Laptop IBM compatible PC computer. This Kit includes a Personal Computer (PC) Software Diskette, a plug-in interface cable to connect the RS-232 port on the FS System 10 Card Controller to the PC computer's RS-232 serial port and instructions.

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