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FS System 10™
Digital Fire Detection /
Process Control System

OPTION 1-GF

Wall-Mounted Controller
with
TWO Electro-Optical
Multi-Spectral Fire Detectors

for GENERAL FINISHING

Installation Guide
and
Operating Manual

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**Read and understand this manual before
installing or operating equipment.**

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ACCTTL, ALERT-1, ALARM-2, ALERT-1: ALARM 2, ALERT-1: ALARM-2, ATAG, Clean Room Sentry, COP-i, Complete Optical Path Integrity, CM1, CM1-A, CM2, DartLogic, FireLogic, Fire Sentry Visual Smoke Detection, Fire Sentry VSD-8 Visual Smoke Detection System, Fire Signature Analysis, FireBusI, FireBusII, FirePic, FirePicII, FirePicIII, FirePix, FirePicture, FSC, Fire Sentry Corporation, Fire Sentry Corp., FSX, FS4, FS5, FS6, FS7, FS7-2000, FS7-2173, FS7-2173-RP, FS7-2173-2RP, FS System 7, FS8, FS9, FS10, FS10-2000, FS System 10, FS12, FS16, FS18, FS24, SF24, FS22, SF22, FS2000, FS System 2000, Near Band Infrared, Near Band IR, NearBand IR, Quad Graph Mode, Real Time Graph, Room Sentry, RS, RS2, RTG Mode, SM2, SS, SnapShot, SLR-BIT, SS2, SS2-A, SS3, SS3-A, SS4, SS4-A, SS4-2000, SuperBus, System 2000, T2000, T2000 Interrogator, Tri-Mode Plot, The "FS & FSC triangle logo's", Wide Band Infrared, WideBand IR, Wide Band IR, Visual Fire Detection, Visual Flame Detection, VSD Flame Detection, VSD Fire Detection, Video Flame Detection, Video Fire Detection, VSD-8 System, VSD-16, VSD-32, VSD-X Visual Smoke Detection, VSD System

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FS System 10™ Fire Detection / Process Control System
OPTION 2-GF: Wall-Mounted Controller with TWO Fire Detectors

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FS System 10™ Fire Detection / Process Control System
OPTION 2-GF: Wall-Mounted Controller with TWO Fire Detectors

SECTION 1: INTRODUCTION

1.1 Overview

The FS System 10™ is a self-contained, computerized Fire Detection / Process Control System designed specifically for applications incorporating automatic electrostatic liquid, automatic electrostatic powder, automatic airless, and air assist airless spray guns used in finishing operations. It is also designed for use in paint kitchens and paint drum storage areas.

The FS System 10, **OPTION 1-GF**, includes (1) each self-contained Wall-Mounted Controller and (2) each FS System 10 Fire Detectors, factory programmed for **Option GF**. For **120 Volt AC**, 60 Hz electrical power installations, order Part Number **OPTION-1-120-GF**. For **240 Volt AC**, 50/60 Hz electrical power installations, order Part Number **OPTION-1-240-GF**. Both Fire Detectors are pre-wired with **50 feet** of (4) conductor 22 gauge shielded twisted pair cable for connecting to the Controller. For The FS System 10 is shipped from the factory “ready to install” in typical paint booth installations.

The Wall-Mounted Controller contains FIRE EARLY WARNING, ALERT, FIRE ALARM, and Fault signal relays and (3) 10 amp PROCESS CONTROL SHUTDOWN relays. The Controller, Option 1-GF, is specifically designed to control two FS System 10 Detectors and is designed to detect spray gun booth “fireball” type fires, as well as flickering fires, within one-half second, and to initiate the paint spray booth shutdown processes. The FS System 10 complies with the re-written May 1995 NFPA 33 Fire Standard for automatic electrostatic powder and liquid paint spray booths.

1.2 Wall-Mounted Controller

The FS System 10, **OPTION 1-GF**, provides true distributed processing architecture since each Wall-Mounted Controller and each Fire Detector contains an on-board microcomputer. The Wall-Mounted Controller, which determines the final system fire detection decisions, continuously communicates to the computerized Fire Detectors. Each Detector constantly monitors its own status and makes preliminary fire status decisions.

The Wall-Mounted Controller governs and electronically records the overall operation of the FS System 10 Fire Detection/Process Control System. The Controller processes information from the Fire Detectors, is easy to operate with the integral touch keypad, and features a high contrast, wide viewing angle, 24 character, two line, backlighted LCD display. The Controller records the vital spectral FirePic™ data, and Fire Detection and Fault Event History information in the non-volatile, solid-state digital memory.

The Controller’s multi-layer printed circuit board (PCB) and associated electronics are mounted in a welded-seam steel, gasketed, NEMA 12 enclosure. The Controller contains (3) ten amp SPDT Process Control Relays for interfacing to automatic electrostatic process shutdown controls, such as the paint flow, electrostatics, and conveyor. There are also three 1 amp relays for external alarm panel activation, and a 1 amp Fault Relay.

The Wall-Mounted Controller performs the following key functions.

- Inputs external AC line voltage and transforms it to safe, low voltage regulated DC to provide electrical power for the Fire Detectors and Controller electronics.
- Sounds a built-in piezo-electric, 110-dB siren during system FIRE EARLY WARNING, ALERT or FIRE ALARM.
- Activates the (4) output signal relays during FIRE EARLY WARNING, ALERT, FIRE ALARM, or Fault condition.
- Controls the three 10 amp PROCESS CONTROL Relays.
- Displays overall System status information on the Controller’s front panel LCD screen.
- Chirps the 110-dB siren during Fault conditions and when the “Alarm Silence” button on the front panel, or the “SILENCE” key on the internal touch keypad has been pressed.
- Communicates externally to a PC desktop or laptop computer through a built-in RS-232 communication port to retrieve FirePic™ pre-fire spectral information, or using TriMode Plot™ and SnapShot™, monitor and record the System’s operation including real-time spectral data from the Detectors.
- Turns on the front panel LEDs during FIRE EARLY WARNING, ALERT, FIRE ALARM, or a Fault condition.
- Backlights the Controller’s LCD during FIRE EARLY WARNING, ALERT, FIRE ALARM, or Fault condition.
- Records FirePic™ and History (FIRE EARLY WARNING, ALERT, FIRE ALARM, and Fault) files in non-volatile memory.

Three distinct fire detection outputs are generated by the FS System 10 to provide fire protection against the various types of fires that occur in the finishing industry:

1. **ALERT:** For fireball-type spray gun fires, this can provide response in milliseconds and the Wall-Mounted Controller’s three 10 amp PROCESS CONTROL RELAYS are de-energized in order to initiate booth shutdown processes, such as interrupting the electrostatics, paint flow to the spray guns, and stopping the conveyor.
2. **FIRE EARLY WARNING:** For flickering, non-fireball type fires, this can provide response in milliseconds (factory set to 500 milliseconds) and the Wall-Mounted Controller’s three each 10 amp PROCESS CONTROL RELAYS are de-energized in order to initiate paint spray booth shutdown processes, such as interrupting the electrostatics, paint flow to the spray guns, and stopping the conveyor.
3. **FIRE ALARM:** This can be used to signal an external fire alarm panel if a fire does not self-extinguish or is not successfully manually suppressed. If an automatic fire suppression system is installed, the FIRE ALARM can be used to signal an external fire alarm panel to initiate a suppression process with fire extinguishment agents such as water, FM200, or CO₂.

1.3 Fire Detectors

FS System 10™ Fire Detection / Process Control System

OPTION 2-GF: Wall-Mounted Controller with TWO Fire Detectors

The FS System 10, OPTION 1-GF, includes (1) self-contained Wall-Mounted Controller and (2) FS System 10 Fire Detectors that are pre-wired with **50 feet** of (4) wire, 22 gauge, twisted pair cable, for connecting to the Controller for simplified installation. This equipment combination is intended for typical spray booths. Longer cable lengths are available from your Fire Sentry Distributor, (See SECTION 7 - Ordering Information).

USE (4) WIRE, TWISTED PAIRS SHIELDED CABLE FOR WIRING DETECTOR TO CONTROLLER.
CABLE LENGTHS LESS THAN 250 FEET: 22 to 24 GAUGE
CABLE LENGTHS FROM 250 to 500 FEET: 22 GAUGE

TABLE 1: Fire Detector Cable Wire

The FS System 10 Detectors are directly connected to a Wall-Mounted Controller, using a (4) wire 22 gauge twisted pairs shielded cable. The Fire Detectors communicate 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 return.

Each microcomputerized FS System 10 Detector utilizes an electro-optical multi-spectral array of five sensors. Each Fire Detector's spectral array simultaneously senses wide band IR radiant energy, near band IR radiant energy, and visible radiant energy spectrums. The FS 10 Fire Detectors simultaneously examine these three spectral radiant energy bands and these bands are real-time signal processed by dual microcomputer "brains" to quickly detect fires, while virtually eliminating false alarms.

The Detectors are housed in a Class I, Division 1 Explosion-Proof copper-free aluminum enclosure for use in applications such as automatic liquid or powder paint spray booths.

The FS System 10 Fire Detection / Process Control Systems are factory programmed to react to a one (1) square foot sized fire within a **15 foot range**, over a circular **90 degree field-of-view**, within **one-half (0.5) second**, for the typical spray booth. The **ALERT** response is factory set for **300 milliseconds** (0.30 seconds). The **FIRE EARLY WARNING** response is factory set for **500 milliseconds** (0.5 seconds). **FIRE ALARM** response is factory set for **5 seconds**.

SECTION 2: INSTALLATION

2.1 Wiring Requirements

2.1.1 AC Power

BE SURE and DOUBLE CHECK that the external AC voltage electrical power is TURNED OFF.
With OPTION 1-GF-120: Connect 120 Volts AC LAST
With OPTION 1-GF-240: Connect 240 Volts AC LAST

Install an electrical junction box underneath the Wall-Mounted Controller's leads in order connect the external AC voltage (120 volt AC, 60 Hz for **OPTION 1-GF-120** or 240 volt AC, 50 Hz for **OPTION 1-GF-240**) electrical power leads. There is no "OFF" or "ON" switch in the Wall-Mounted Controller. When external AC power is applied, the FS System 10 turns "ON".

Connect the external AC electrical power wires to the input wires of the Wall-Mounted Controller's voltage transformer inside this junction box. Each Wall-Mounted Controller should have its own circuit breaker.

<u>Black</u>	<u>Green</u>	<u>White</u>
L	G	N
LINE	GROUND	NEUTRAL

Do not handle or touch the Controller's printed circuit board without being adequately grounded. Printed circuit boards and their solid-state components are susceptible to damage from (ESD) electrostatic discharge. Electronic circuit damaging electrostatic voltages are easily generated with ungrounded human beings, especially during days with low humidity. Grounding may be accomplished by wearing an anti-static wrist strap connected to an earth ground.

2.1.2 Conduit Installation and Wiring

When planning the installation of conduit to the Wall-Mounted Controller, observe the following recommendations.

- In areas where moisture may accumulate, install an approved conduit trap or drain.
- To maintain the NEMA 12 Dust-Tight rating, an approved dust-tight conduit hub must be used.

Fire Sentry Corporation recommends that all conduit entries are made through the bottom of the enclosure, in the area underneath the touch keypad cover. For access, remove the three slotted screws, lift and slide UP the cover. If it is not possible to install the conduit hubs in this manner, exercise extreme caution when cutting holes in other areas of the Controller enclosure.

FS System 10™ Fire Detection / Process Control System
OPTION 2-GF: Wall-Mounted Controller with TWO Fire Detectors

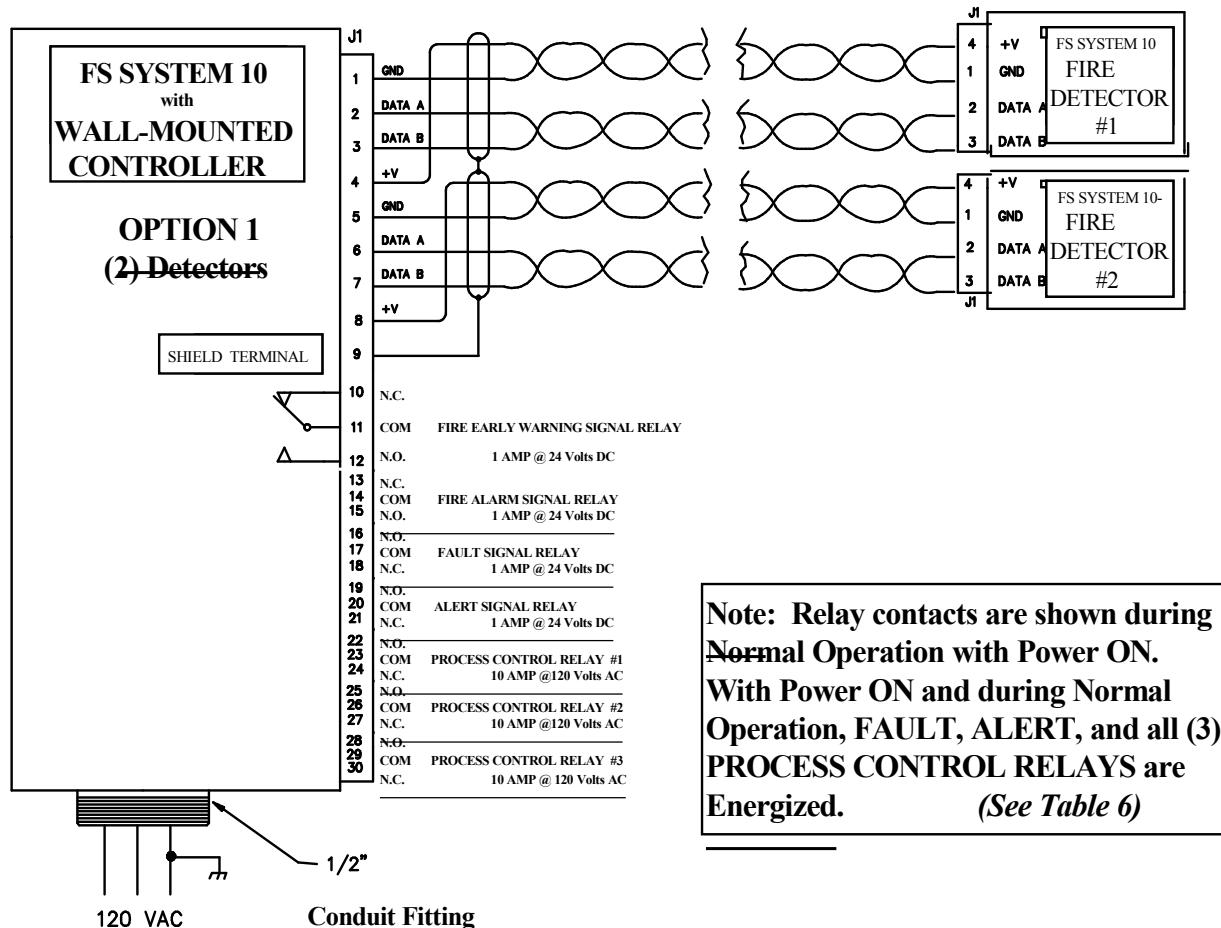


Figure 1: Power, Relay, and Fire Detector Terminations

Before drilling and/or cutting holes in the Controller's metal enclosure such as to install conduit, it is recommended the large printed circuit board (PCB) be removed to protect it from possible damage from metal fragments, and to allow more room to work inside the enclosure. To remove the PCB, follow these steps:

1. Unplug the (2) connectors (located at the top corners of the PCB) connecting twin wires from the front panel push button and siren first. To remove these two plugs, use a small screwdriver to slightly bend the locking tab away from the connector and gently pull each plug off the PCB.
2. Unplug the (4) wire low voltage AC connector at the right hand bottom corner of the PCB. Use a small screwdriver to slightly bend the locking tab away from the connector and gently pull it off.
3. Carefully pull on the touch keypad's ribbon cable's flat connector plug located on the lower left-hand side of the PCB that connects the touch keypad to the PCB. **Note:** A small triangle is stamped on the top of the flat plug. When re-installing, the small triangle must be at the bottom or the plug will be inserted backwards on the PCB.
4. **Use a grounded wrist strap** and unscrew the (5) slotted screws securing the PCB one by one.
5. Put the PCB in a safe, non-ESD location while working on the metal enclosure.
6. After the conduit holes are drilled and the conduit installed, reverse the previous steps to re-install the PCB. Re-install ALL of the slotted screws.

Use the supplied interconnecting cable for connecting the Wall-Mounted Controller to the Detectors. If the factory supplied cabling is **NOT** used, the cable characteristics shall conform to the specifications for RS-485 or RS-232 communications cabling.

The RS-485 and RS-232 communications cabling specifications stipulate that the cable shall have a characteristic impedance in the general range of a minimum of 70 ohms to frequencies greater than 100 kHz. Mutual pair capacitance between the two (2) communication wires shall not exceed forty (40) picofarads per foot. Stray capacitance between any other pair of wires shall not exceed forty (40) picofarads per foot. The conductor resistance shall not exceed ten (10) ohms per conductor, regardless of length.

FS System 10™ Fire Detection / Process Control System

OPTION 2-GF: Wall-Mounted Controller with TWO Fire Detectors

2.1.3 Relay Connections

CONNECT RELAYS - Wire the (3) heavy-duty ten amp **normally energized** PROCESS CONTROL relays (Controller PINS 22 to 30) to the spray booth operations. (**Note:** the (3) PROCESS CONTROL relays are Single Pole, Double Throw - "SPDT"). Usually, one of these PROCESS CONTROL relays is used to electrically shut down the spray guns' solenoid (in order to shut off the spray gun paint flow in milliseconds). The second PROCESS CONTROL relay usually is used to shut off the electrostatics to the spray guns (in order to shut off the spray guns' high voltage ignition source in milliseconds) and a third PROCESS CONTROL relay usually is used to shut down the booth conveyor. For some installations, one PROCESS CONTROL RELAY can control all of the shutdown processes.

The Fault relay (pins 16, 17 and 18) is **normally energized**. This is to insure, that in addition to other Faults, a loss of input power will cause the Fault relay to de-energize to the **ON** (Fault) state. The FIRE EARLY WARNING, ALERT, FIRE ALARM, and Fault relays are shown in the Figures in their NORMAL operating conditions; that is, the condition of **no** FIRE EARLY WARNING, ALERT, FIRE ALARM condition or **no** Fault condition.

2.2 Detector Wiring

2.2.1 Wiring Detectors with Junction Boxes and Flying Leads

It is recommended that each Fire Detector is wired with the supplied cable directly to the Wall-Mounted Controller. If required, different length Fire Detector cables are available from Fire Sentry Corporation or one of their Distributors (*see Section 7 - Ordering Information*). If junction boxes with terminals are used, cut the supplied cable to the length required to wire into a junction box. Wire each conductor of the (4) conductors to the on the Fire Detector Terminal Strip. Cut the wire shield flush to the cable insulation to prevent the shield from touching anything conductive. The Detector cable shield must only be connected at the other end to PIN 9 of the Wall-Mounted Controller. (*see Figure 1*).

Figure 2: Detector Connector Cable Terminations

Black	Green	White	Red
TERMINAL #1	TERMINAL #2	TERMINAL #3	TERMINAL #4
GROUND RETURN	DATA "A"	DATA "B"	VOLTAGE
(NOT CHASSIS GRD.)	(COMM A)	(COMM B)	(+V)

(**Note:** COMM as it is used in this document is an abbreviation for Communications.)

2.3 Mounting Locations

2.3.1 Mounting Fire Detectors

Each Detector has a ninety (90) degree horizontal and vertical Field-of-View (viewing angle). It is recommended each Fire Detector be positioned with the spray guns aimed in the center of the Detector's Field-of-View. Remember, a Fire Detector must "see" a fire in order to detect it. Avoid line-of-sight blockage by conveyors, robot arms, etc.

2.3.2 Mounting Wall-Mounted Controller

The Wall-Mounted Controller is designed to be mounted in a non-hazardous location outside of the spray booth. To provide eye level sight for the Controller's LCD display screen, mount the Controller at a height from (4) feet to (6) feet from the floor.

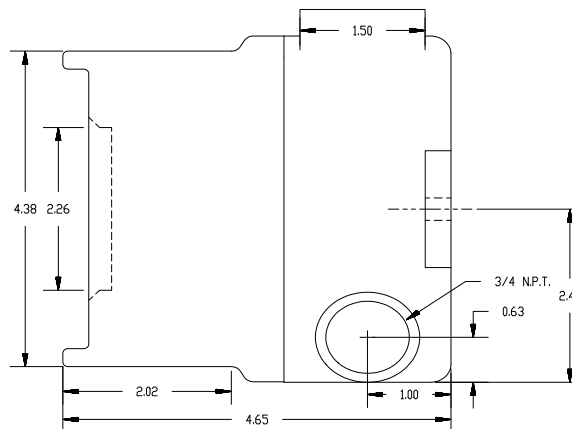


Figure 3: Fire Detector Housing - Side View

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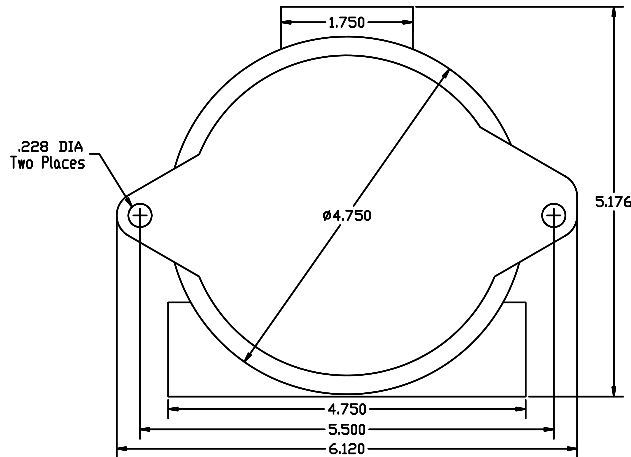


Figure 4: Detector Housing - Rear View

SECTION 3: CONTROLLER OPERATION

3.1 Wall-Mounted Controller Touch Keypad

The Wall-Mounted Controller does NOT have an “ON/OFF” switch - the System turns ON when the external Power is applied. The touch keypad is mounted behind the Controller’s key-controlled access door below the Controller’s large Printed Circuit Board (PCB). A description of each of the keys is given in Figure 5, Controller Touch Keypad Description.

KEY	FUNCTION
“MENU”	Allows access to FS System 10 Menu Choices and Date/Time.
“+”	Steps UP / FORWARD through MENU.
“-”	Steps DOWN / BACKWARD through MENU.
“ENTER”	Enters selected MENU Item or setting & stores changes in non-volatile memory.
“DET TEST”	Manual Fire Detector Test (use the FS-846 Test Lamp)
“SYS TEST”	Complete End-to-End System Integrity Test Using ACCTL™ “through the lens” test without using the FS-846 Test Lamp.
“SILENCE”	Silences Wall-Mounted Controller’s built-in siren.
“RESET”	Resets Alarms and returns System to NORMAL Operation.

Figure 5: Controller Touch Keypad Description

3.2 Initial System Start Up

APPLY EXTERNAL AC POWER. At this time, turn the external electrical power ON and make certain the Controller is operating correctly. At initial start up, carry out PROCESS CONTROL SHUTDOWN/ FIRE ALARM Test Sequence as follows:

1. Test the system “end-to-end” by activating each Fire Detector. (Note: It is recommended that a Portable Test Lamp, the Fire Sentry Model FS-846, be used to activate the Detectors).
2. If applicable, disconnect any alarm outputs to suppression systems and/or external audible/visual alarms, (unless required as part of the test).
3. Start the spray booth system.
4. Activate either Fire Detector. The spray booth process should appear to shut down instantaneously (within milliseconds).
5. Press RESET on the touch keypad to return the FS System 10 to NORMAL OPERATION.

For manual testing of the FS System 10 after initial setup, use the “SYS TEST” and “DET TEST” key on the touch keypad described in Section 3.37, Manual Detector Test and Section 3.3.8, System Test. Also refer to Figure 5, Controller Touch Keypad Description.

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3.3 System Operating Modes

3.3.1 NORMAL OPERATION

In the NORMAL OPERATION mode, the FS System 10 is ready to respond to fires and spray gun fireball type fires, and report Faults, should any occur. In the NORMAL OPERATION mode, the Wall-Mounted Controller's Green LED will be turned **ON** and the Yellow, Orange, and Red LEDs will be turned **OFF**, and the following message will be on the LCD Display:

**FS SYSTEM 10
NORMAL OPERATION**

3.3.2 FIRE EARLY WARNING

During a FIRE EARLY WARNING condition, the Wall-Mounted Controller will:

- rapidly blink the Orange LED,
- rapidly cycle the siren on and off at a sound level of 110 dB,
- record the event in the Event History file,
- record FirePic™ in non-volatile memory,
- energize the FIRE EARLY WARNING signal relay,
- de-energize the three (3) 10 amp PROCESS CONTROL relays,
- backlight the LCD display, and
- show on the LCD display the following message:

**PROCESS SHUTDOWN
FIRE EARLY WARNING**

3.3.3 ALERT

During an ALERT condition, the Wall-Mounted Controller will:

- turn ON the Orange "ALERT" LED continuously,
- turn ON the siren at a sound level of 110 dB,
- record the event in the Event History file,
- record FirePic™ in non-volatile memory,
- de-energize the ALERT signal relay,
- de-energize the three (3) 10 amp PROCESS CONTROL relays,
- backlight the LCD display, and
- show on the LCD display the following message:

**PROCESS SHUTDOWN
ALERT CONDITION**

3.3.4 FIRE ALARM

During a FIRE ALARM condition, the Wall-Mounted Controller will:

- turn ON the Red LED,
- turn ON the siren at a sound level of 110 dB,
- record the event in the Event History file,
- record FirePic™ in non-volatile memory,
- energize the FIRE ALARM Relays,
- de-energize the three 10 amp PROCESS CONTROL Relays,
- backlight the LCD display, and
- show on the LCD display the following message:

**PROCESS SHUTDOWN
FIRE ALARM CONDITION**

If the "ALARM SILENCE" button on the Controller's front panel or the "SILENCE" key on the internal touch keypad is pressed, the siren will change from continuous to chirp mode (one loud beep every 3 seconds) and the Yellow Fault LED will turn **ON** and the Fault relay will de-energize. The "ALARM SILENCE" button or "SILENCE" key will only work when the Controller has already

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declared a FIRE EARLY WARNING, ALERT, or FIRE ALARM condition. The LCD display message will state that the siren has been "Silenced", (changed to chirp mode).

To return to NORMAL OPERATION, press and release the "RESET" key located on the Controller's touch keypad located behind the front door.

3.3.5 Fault

During a Fault condition, the Wall-Mounted Controller will:

- slowly blink the Yellow Fault LED,
- fast blink the Yellow LED if the "through the lens" test fails, usually indicating a dirty window lens and/or lens guard ring,
- chirp the siren,
- show a Fault message on the LCD display,
- de-energize the Fault relay, and
- record the event in the Event History File.

Where possible, the Fault condition is self-resetting; i.e. if the action causing the Fault is remedied, then the Controller will stop reporting a Fault condition. After a COMM fault is corrected, press the RESET key to reset system.

Faults generally occur for the following reasons:

- failure in the wiring such as a severed cable, loose terminations, or
- the System's internal self-checking reported a hardware failure in one of the Fire Detectors, or
- a System problem has been encountered, such as a contaminated Fire Detector window viewing lens.

Refer to SECTION 4.2, Wall-Mounted Controller Faults.

3.3.6 Automatic Detector Tests

The Controller performs ACCTL™ automatic computer controlled "through the lens" tests every (10) minutes to check the operation of each Detector. The Controller will display a Fault message on its LCD and will rapidly blink the yellow Fault LED if a Detector detects an inadequate ACCTL™ signal reflected back through the viewing window. This may indicate a dirty window which needs to be cleaned or a missing or dirty reflector lens guard grill (i.e., the Fire Detector's front cover not installed.) While these tests are occurring, the system is still functional and able to react to a fire.

3.3.7 Manual Detector Test

To start a *manual* Detector test, first press the "DET TEST" key on the Controller's touch keypad. The Controller's LCD will display "DET TEST MODE" and the yellow Fault LED will illuminate and the Fault relay will de-energize. At this time, the System may be checked using a Fire Sentry Handheld Test Lamp without activating the FIRE ALARM relay. During this test, the Spray Booth processes will be shut down (by de-energizing the ALERT and PROCESS CONTROL relays) in order to test the system "end-to-end".

Go to each Detector location and point the Test Lamp at the Detector. Turn ON the Handheld Test Lamp until obtaining the ALERT, FIRE EARLY WARNING, or FIRE ALARM explained in Sections 3.3.2, 3.3.3, and 3.4.5 (Note: the FIRE ALARM signal relay will NOT be activated). Repeat this action for both Detectors.

To return to NORMAL OPERATION from "DET SYS" mode, press RESET. (Note: If the "RESET" key is not pressed after several minutes, the Controller will automatically return to NORMAL OPERATION).

3.3.8 System Test

The operational integrity of the FS System 10 can be tested by pressing the "SYS TEST" key on the touch keypad. This action initiates a complete electro-optic and electronic diagnosis of the System components and relays, as well as initiating an optical and electronic "self-check" for the Fire Detector. The FS System 10 will return to NORMAL operating mode automatically after the "SYS TEST".

3.4 Advanced System Diagnostics

Advanced user communication with the built-in RS-232 port is possible using an IBM PC Compatible computer with the Wall-Mounted Controller, using Fire Sentry Software package Part No. S10COM-1 which includes instructions on how to set up the PC interface. Contact your Fire Sentry Distributor for more information.

3.5 Setting Time and Date

To set the system TIME/DATE or to set up the system for use in non-typical applications, press the **MENU** key on the touch keypad to view menu choices on the LCD screen. Use the "**+ / UP**" and "**- / DOWN**" **ARROW** keys to display a time/date value. Use the **ENTER** key to make a selection. To resume NORMAL Operation of the FS System 10 at any time, use the **MENU** key.

3.6 Additional MENU Options

Press the **MENU** key on the touch keypad to view menu choices on the LCD. Use the "**+ / UP**" and "**- / DOWN**" **ARROW** keys to display options. Use the **ENTER** key to make a selection. To resume NORMAL Operation at any time, use the **MENU** key.

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TABLE 2: Wall-Mounted Controller Settings (Option GF)

FIRE ALARM Response Time (seconds)	FIRE ALARM Signal Relay	FIRE ALARM and FIRE EARLY WARNING Sensitivity (One square foot gasoline reference fire) Distance (feet)	ALERT Sensitivity (One foot Diameter Gasoline "Fireball") Distance (feet)
5	Latching until RESET Pressed	15	15
ALERT Signal Relay	ALERT Response Time (seconds)	FIRE EARLY WARNING Response Time (seconds)	FIRE EARLY WARNING Signal Relay
Latching until RESET Pressed	0.3	0.5	Latching until RESET Pressed

SECTION 4: MAINTENANCE AND TROUBLESHOOTING

4.1 Personnel

The following will aid in troubleshooting the FS System 10. Tests must be performed by qualified factory authorized personnel observing standard safety practices.

WARNING: Hazardous voltages are present during Wall-Mounted Controller testing procedures since it contains a 120 Volt or 240 Volt AC power supply and 120 Volt AC rated relay contacts. SERIOUS INJURY OR DEATH MAY RESULT IF PERSONNEL FAIL TO OBSERVE SAFETY PRECAUTIONS.

4.2 Wall-Mounted Controller Faults

4.2.1 Wall-Mounted Controller Messages

The Fault messages reported by the Wall-Mounted Controller are shown in the following table. The Fault messages are displayed on the top line of the Wall-Mounted Controller's 24-character, two-line LCD display. The recommended actions for each respective Fault condition are next to each Fault message. If any message codes not shown in Table 3 are displayed, please contact Fire Sentry for assistance.

TABLE 3: CONTROLLER SYSTEM Faults

LCD MESSAGE

ACTION

PROCESS SHUTDOWN Fault CONDITION (01)	Controller Fault, such as a broken relay coil. If condition persists, return the Controller PCB to Fire Sentry for service. Slow blinking Yellow Fault LED. See Section 4.6.
PROCESS SHUTDOWN Fault CONDITION (02)	Communications Fault with Detector and Controller. Check wiring for broken, crimped cables or loose terminations. Slow blinking Yellow Fault LED. See Section 4.4
NO PROCESS SHUTDOWN Fault CONDITION (04)	Fire Detector "through the lens" test failure. Clean the lens and grill. It is important to clean underneath the grill. Fast blinking Yellow Fault LED. See Section 4.3
SILENCE MODE	ALARM SILENCE button or the SILENCE key on the touch keypad has been pressed to HUSH the siren. To clear, press "RESET on the Controller " touch keypad.

4.3 Cleaning Fire Detector Windows and Grills

Clean the Detector window lens and grills on each Detector immediately after installation, after handling, on a regular, periodic schedule, and whenever a Controller Fault occurs for which that is the recommended action. Use a blast of air from an air hose or a clean cloth to clean the Detector's window lens and the lens guard ring. It is important to clean underneath the lens guard. Alcohol can be used to clean the windows, but do not use acetone or MEK solvents. To keep the Detectors' window lens and grill clean, use the Fire Sentry Disposable Protective Covers, Part No. DPC-10. (See SECTION 7: Ordering Information).

4.4 Detector Faults

If a Detector has a Fault, the green LED will not blink every ten (10) seconds in the Fire Detector and the Controller's front panel Yellow Fault LED will slowly blink. If the Yellow Fault LED blinks quickly, this usually indicates a dirty lens and/or lens guard

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grill. See Section 4.3 on how to clean the Detectors' windows and lens. If cleaning the Detector's lens and grills does not correct the Fault, return the Detector module to FSC for service or replacement. See Section 4.5 for how to remove a Detector module.

4.5 Fire Detector Replacement

To replace an improperly operating Fire Detector, loosen the hex nut that secures the top cover to the Detector housing base. Next, turn the Fire Detector top cover counter-clockwise until the top cover is removed. Using a screwdriver, turn the three (3) captive screws securing the Detector Module to the housing base counter-clockwise until the Detector Module is free. Gently lift the Detector Module out of the housing base. Using a screwdriver, turn the two captive screws securing the four-wire cable plug counter-clockwise until the cable plug can be removed.

Handle the Fire Detector's black-colored Module with care and do not touch the sensor windows. Carefully wrap the Fire Detector Module in static protection material and ship back to Fire Sentry for repair. (If static protection material is not available, wrap the Detector Module in aluminum foil before shipping.)

To install a Fire Detector Module, just reverse the removal steps listed above.

4.6 Fire Detector and Controller Repair

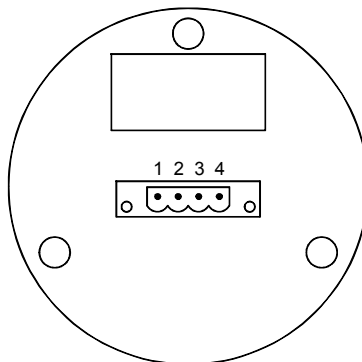
If a Fire Detector Module or Controller Printed Circuit Board (PCB) must be shipped back to the factory for repair or service, it **MUST** be packed in static protected material. If this material is not available, carefully wrap the Fire Detector Module or Controller PC Board in aluminum foil. An RMA (Return Material Authorization) is required for all returns to Fire Sentry Corporation. Contact Customer Service for an RMA number before shipping a Detector Module or Controller PCB back to FSC.

THE WALL-MOUNTED CONTROLLER'S PRINTED CIRCUIT BOARD (PCB) AND ITS COMPONENT PARTS ARE SUSCEPTIBLE TO PERMANENT DAMAGE DUE TO ELECTROSTATIC DISCHARGE (ESD). DO NOT HANDLE THE PCB'S UNLESS PROPERLY GROUNDED WITH A WRIST STRAP. THERE ARE NO USER SERVICEABLE PARTS IN A FIRE DETECTOR MODULE OR ON A WALL-MOUNTED CONTROLLER'S PRINTED CIRCUIT BOARD (PCB). ANY EVIDENCE OF TAMPERING OR ATTEMPTED REPAIRS BY NON-FACILITY PERSONNEL VOIDS THE WARRANTY.

SECTION 5: WIRING INSTALLATION DATA

TABLE 4: Fire Detector Connector Pinouts

PIN		WIRE COLOR
1	Ground Return (Not Chassis Ground)	BLACK
2	Data "A" (RS-485 COMM A)	GREEN
3	Data "B" (RS-485 COMM B)	WHITE
4	DC (+) Voltage	RED



NOTE: DO NOT CONNECT SHIELD AT FIRE DETECTOR

(Note: **COMM** as it is used in this document is an abbreviation for Communications)

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TABLE 5: Controller Connector Pinouts to Detector

J1

1	Ground Return	DETECTOR #1
2	Data A (COMM A)	
3	Data B (COMM B)	
4	+Voltage	
5	Ground Return	DETECTOR #2
6	Data A (COMM A)	
7	Data B (COMM B)	
8	+Voltage	
9	Shield Termination	(Both Detectors #1 and #2)

TABLE 6: Controller Relay Connector Pinouts

J1

10	N.C.	FIRE EARLY WARNING RELAY (1 amp @ 24 Volts DC; 0.5 amps @ 120 Volts AC)
11	COMMON	
12	N.O.	
13	N.C.	FIRE ALARM RELAY (1 amp @ 24 Volts DC; 0.5 amps @ 120 Volts AC)
14	COMMON	
15	N.O.	
16	N.O.	Fault RELAY (1 amp @ 24 Volts DC; 0.5 amps @ 120 Volts AC)
17	COMMON	
18	N.C.	
19	N.O.	ALERT RELAY (1 amp @ 24 Volts DC; 0.5 amps @ 120 Volts AC)
20	COMMON	
21	N.C.	
22	N.O.	PROCESS CONTROL RELAY #1 (10 amps @ 24 Volts DC; 10 amps @ 120 Volts AC)
23	COMMON	
24	N.C.	
25	N.O.	PROCESS CONTROL RELAY #2 (10 amps @ 24 Volts DC; 10 amps @ 120 Volts AC)
26	COMMON	
27	N.C.	
28	N.O.	PROCESS CONTROL RELAY #3 (10 amps @ 24 Volts DC; 10 amps @ 120 Volts AC)
29	COMMON	
30	N.C.	

IMPORTANT NOTES

1. **N.O.** is “Normally Open” and **N.C.** is “Normally Closed relay contacts.
2. All Controller relay contacts are shown above as they are during **NORMAL** Operation during “power on”, with **no** Fire or Fault condition.
3. The **FIRE EARLY WARNING**, **ALERT**, and **FIRE ALARM** signal relays are **de-energized** during **NORMAL** Operation during “power on”, with **no** Fire or Fault condition.
4. The **PROCESS CONTROL**, and **Fault** relays are **energized** during **NORMAL** Operation during “power on”, with **no** Fire or Fault condition.

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SECTION 6: ALARM AND Fault ACTIONS

TABLE 7: QUICK REFERENCE GUIDE

FIRE EARLY WARNING	ALERT	FIRE ALARM	Fault
<i>De-energize</i> the (3) ten amp Process Control Relays and <i>Energize</i> the FIRE EARLY WARNING one amp signal relay.	<i>De-energize</i> the (3) ten amp Process Control Relays and the one amp ALERT signal relay.	<i>De-energize</i> the (3) ten amp Process Control Relays and the one amp ALERT signal relay and <i>Energize</i> the FIRE ALARM one amp signal relay.	<i>De-energize</i> Fault one amp signal relay.
Rapidly Blink Orange LED.	Turn ON Orange LED continuously	Turn ON Red LED continuously	a. <u>Fast</u> blink Yellow LED if Detector lens dirty. b. For all other Faults, <u>slowly</u> blink Yellow LED.
Cycle siren ON and OFF .	Turn ON siren continuously.	Turn ON siren continuously.	Chirp Siren every 10 secs.
<i>Backlight</i> LCD and <i>Display</i> "PROCESS SHUTDOWN FIRE EARLY WARNING"	<i>Backlight</i> LCD and <i>Display</i> "PROCESS SHUTDOWN ALERT CONDITION"	<i>Backlight</i> LCD and <i>Display</i> "PROCESS SHUTDOWN FIRE ALARM CONDITION"	<i>Backlight</i> LCD and <i>Display</i> (See Section 4.2.1 for Fault messages)
Record FirePic™ and Event History File	Record FirePic™ and Event History File	Record FirePic™ and Event History File	Record Fault in Event History File

SECTION 7: ORDERING INFORMATION

FS System 10 Wall-Mounted Controller with Two Fire Detectors

DESCRIPTION	PART NUMBER
Wall-Mounted Controller and two (2) Detector: 120 VAC @ 60 Hz	OPTION-1-120-GF
Wall-Mounted Controller and two (2) Detector: 240 VAC @50/60 Hz	OPTION-1-240-GF

FS System 10 Accessories

DESCRIPTION	PART NUMBER
Fire Detector Swivel Mount	FSSM-2
Detector Interconnection Cable for Wall Mounted Controller- 50 feet	WMAB-50
FS System 10 Fire Detector Disposable Protective Cover, (12/pkg.)	DPC-12
Extension Pole to Install/Remove Disposable Protective Covers	EXPL-1
Fire Detector Air Shield Assembly for Powder Coating Applications	DASA1-P
FS System 10 Test Lamp for remotely testing Fire Detector	FS-846

FS System 10 PC Software Kit

Description	Part Number
FS System 10 PC Software Kit (IBM-compatible) for Controller's RS-232 Port for TriMode Plot™, SnapShot™ and retrieving FirePic™.	FS10COM-1

APPENDIX “A” - System FAULT CODES
FS10 Wall-Mounted Controller System

LCD Code No.	Fault Description	Notes Action
00	Normal	
01	<i>Comm. Fault</i> - Controller	1
02	<i>Comm. Fault</i> – one or both Detectors	2
03	<i>Comm. Fault</i> – Detector & Controller	2
04	<i>Self-Test Fault</i> – EVEN Serial Number Detector	3
05	<i>Self-Test Fault</i> – EVEN Serial Number Detector and/or Controller internal. Fault	4
06	<i>Self-Test Fault</i> – EVEN Serial Number Detector and/or Detectors/Controller Comm. Fault	2,3
07	<i>Self-Test Fault</i> – EVEN Serial Number Detector and/or Detectors/Controller Comm. Fault and/or Controller internal Fault	2,4
08	<i>Self-Test Fault</i> – ODD Serial Number Detector	3
09	<i>Self-Test Fault</i> – ODD Serial Number Detector and/or Controller internal. Fault	4
0A	<i>Self-Test Fault</i> – ODD Serial Number Detector and/or Detectors/Controller Comm. Fault	2,3
0B	<i>Self-Test Fault</i> – ODD Serial Number Detector and/or Detectors/Controller Comm. Fault and/or Controller internal Fault	2,4
0C	<i>Self-Test Fault</i> – both Detectors	3
0D	<i>Self-Test Fault</i> – both Detectors and/or Controller internal Fault	4
0E	<i>Self-Test Fault</i> – both Detectors and/or Detectors/Controller Comm. Fault	2,3
0F	<i>Self-Test Fault</i> – both Detectors and/or Detectors/Controller Comm. Fault and/or Controller internal Fault	2,4
1X	Controller NV-RAM Corrupted	5

Notes/Action:

1. Return the Controller Motherboard (PC board) to factory.
2. Check wiring, if FAULT persists, return both detector electronic modules to factory.
3. Self-Test FAULT, clean detector lens and back of the front grill.
4. Clean detector lens and back of the front grill, if FAULT does not clear return detector electronic module and controller motherboard to factory.
5. In the code “1X” the letter “X” represents any character from A-F or a digit, example: 16 or 1D. If this code is displayed it indicates that Controller has a faulty component, return the Controller Motherboard (PC board) to factory.