

DESIGN MANUAL
INSTALLATION • OPERATION • MAINTENANCE



MODEL F120

**TRIPLE-MODE UV/IR
FLAME DETECTOR**

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Quick Finder

MODEL F120 UV/IR

Triple-Mode Flame Detector

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MODEL F120 UV/IR Triple-Mode Flame Detector

SAFETY INFORMATION

Please read and understand this Design Manual **BEFORE** installing, operating, or conducting maintenance on the flame detector.

Pay close attention to important messages marked as **WARNINGS** and **IMPORTANT** throughout the Design Manual.

Failure to follow the instructions and safety precautions in this Design Manual can result in serious injury or death.

Equipment that has been repaired or modified by the user, damaged as a result of an accident, improper installation or used in an environment for which it was not intended will void the warranty.

INSTALLATION WARNINGS

Installation of the detector must only be conducted by trained and in some cases a licensed personnel.

Observe the recognized standards of the appropriate authority in the in the country concerned. Follow all appropriate standards to maintain the overall certification of the detector. Ensure all local regulations and site safety procedures are followed.

Declassify the area or disconnect the equipment from the power supply before accessing the interior of the detector. Ensure that the cover for the housing is closed tight during operation.

DO NOT open the housing/enclosure or replace the electronic module in potentially hazardous atmospheres while the **POWER** is still applied to the electronics module.

DO NOT tamper, modify, repair, or disassemble the electronics module or the detector.

DO NOT expose the detector to temperatures outside the recommended ranges or damage or failure may occur.

Every effort has been made to ensure the accuracy of this Design Manual. However, Safety Systems Technology assumes no responsibility for any errors or omissions in this document. Please report any errors or omissions found in the content of the Design Manual.

Safety Systems Technology reserve the right to change or revise this Design Manual without notice and without obligation to notify any person or organization of such changes. You may request any additional information required that is not included in the Design Manual through the local distributor or Safety Systems Technology.

QUICK INSTALLATION GUIDE

Tools Required

4 mm hex wrench is required.

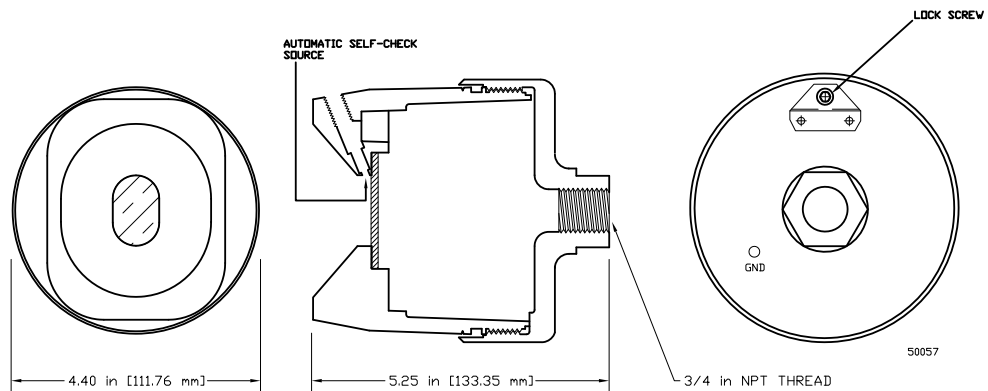
Flat head screwdriver 3/16 inch (5 mm) width for terminal block connections.

Adjustable wrench for conduit or cable gland connections.

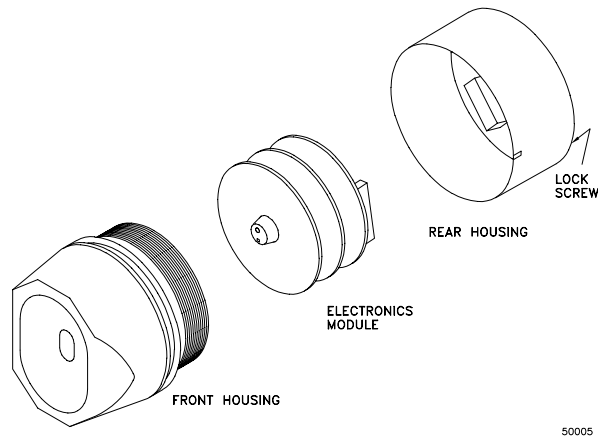
! WARNING: De-classify the area to reduce the risk of ignition of hazardous atmosphere. Combustible and flammable gases and vapors are very dangerous. Extreme caution should be taken when these hazards are present.

Quick Install Guide

1. Disassemble the flame detector. Use a 4 mm hex wrench to loosen the locking screw on rear of the detector.



2. Remove the electronics module from the rear housing.



3. Install the mounting brackets.

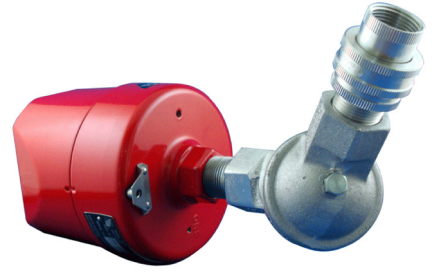
If using conduit, install the Conduit Mounting Bracket. A conduit seal fitting must be used within 18 inches (46 cm) from the flame detector.

If using a Wall/Ceiling Mounting Bracket, use a suitable cable gland with 3/4 inch NPT male thread

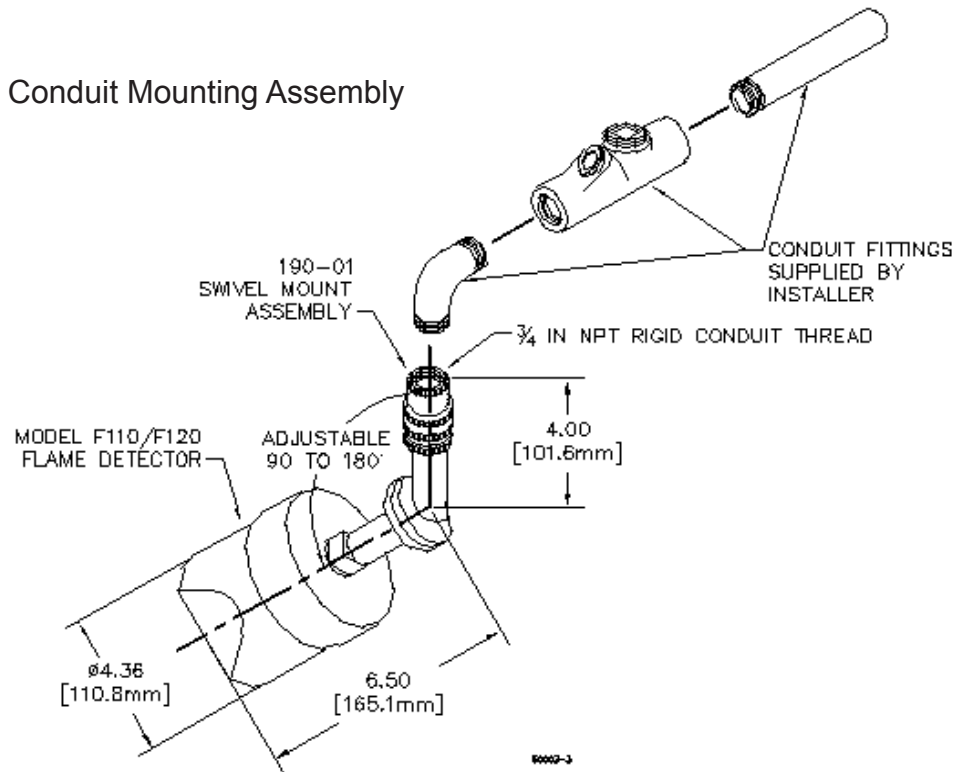
Wall or Ceiling Mounting Bracket



Conduit Mounting Bracket



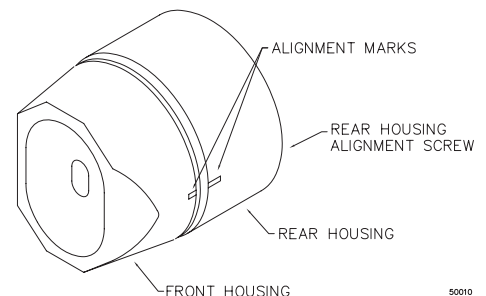
Conduit Mounting Assembly



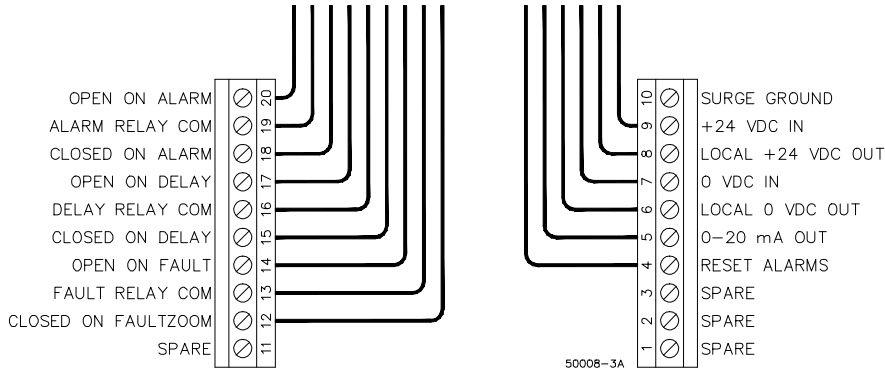
4. Run the wires through the rear housing conduit opening of the flame detector
5. Wire and connect the detector to earth ground (see Wiring Diagrams on next pages)
6. Plug the electronics module

Note that the terminal blocks of the electronics module and rear housing each have protective (RED) polarizing keys. Orient so that the Red Keys on the electronics are NOT aligned with the Red Keys on the terminal blocks.

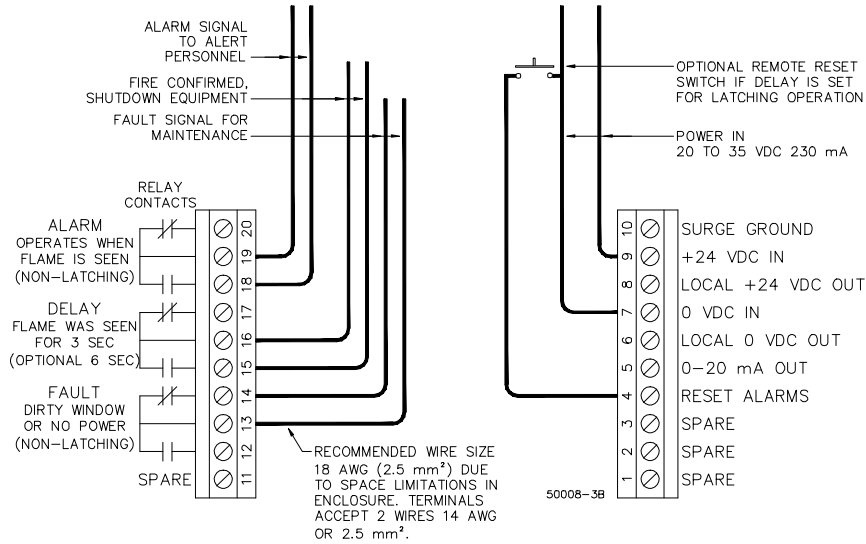
7. Screw the front housing to the rear housing, hand tight only
8. Align the “aligning marks” on the front and rear housing.
9. Apply power
10. Perform Final Operational Checkout per Design Manual
11. Install accessories, if any



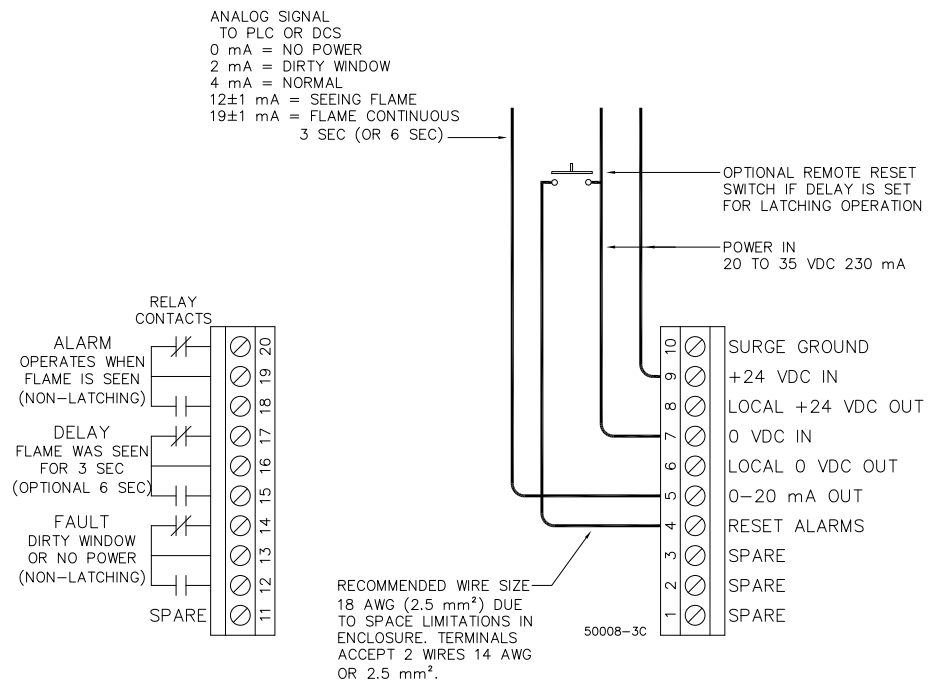
Wiring Diagram



WIRING DIAGRAM FLAME DETECTOR



TYPICAL WIRING DIAGRAM FLAME DETECTOR USING RELAY CONTACT OUTPUTS



TYPICAL WIRING DIAGRAM
FLAME DETECTOR
USING ANALOG OUTPUT

GENERAL DESCRIPTION



A fire is composed of heat and light, both visible and invisible. And during the combustion process, smoke may be generated. A fire will emit specific radiation in the infrared and ultraviolet spectrum. A flame detector uses specialized sensors to detect these radiations to report and confirm a fire.

The protection of onshore and offshore hydrocarbon process and handling facilities against any loss from fires requires positive and fast-responding optical flame detectors, with no tolerance for false alarms or nuisance alarms caused by either EMI, lighting, x-rays, gamma radiation, arc welding, reflected sunlight, or any light source such as mercury or quartz iodine flood lights. Traditional UV and UV/IR detectors can be blinded by precombustion smoke, thus rendering the detector useless under these conditions. Also, oil mist or oil deposits on the quartz lens of a UV detector or single mode UV/IR detector will seriously diminish the response to a fire. Therefore, we do not recommend using these types of detectors in a hydrocarbon environment.

Triple Mode UV/IR

Safety Systems Technology's Model F120 "Triple-Mode" UV/IR Optical Flame Detector uses the latest state-of-the-art microprocessor and circuitry, eliminating the shortcomings of currently available UV/IR detectors which are subject to the aforementioned interferences.

The F120 flame detector monitors for specific radiation emitted by a fire through the use of 3 sensors - one UV (ultraviolet) sensor and two IR (infrared) sensors. The UV sensor provides the shortest response time in detecting radiation from a fire. However, in some cases, dense precombustion smoke may blind the UV sensor. In other cases, false alarm sources such as arc welding and lightning emits UV radiation which can trigger a UV sensor. The Model F120 requires two of its three sensors to signal an alarm. Should the UV sensor be blinded by dense smoke, the two IR sensors will still detect the infrared radiation emitted by a fire. Likewise, the use of three sensors to confirm a fire allows the detector to reduce false alarms from other sources of radiation.

Outputs are either voted automatically, or can be manually selected by the end-user. Selected outputs can either be for UV only, IR flicker only, IR flicker and Temperature, or any two out of three combination. The flame detector's "Triple-Mode" operating principle or "voting" capability is what sets this detector apart from any other UV/IR detector. This detector will see a fire, while other manufacturer's detectors may not. To insure reliable operation, the detector is equipped with an automatic Optical Self-Checking feature which continuously checks the optical viewing window for cleanliness and confirms operation of the detector circuits.

User Customizable Modes

The Model F120 is a highly versatile flame detector that provides multiple modes of operation:

Triple Mode UV/IR

This mode utilizes three sensors to detect a fire, one solar-blind UV sensor and two IR sensors. The detector takes advantage of the use of these three sensors to confirm a fire and reduce false alarms and it will not be blinded by dense smoke which makes this detector superior to other brands in the market today. It is suitable for both indoor and outdoor use and offers increased false-alarm immunity over a UV detector.

UV Mode

This mode utilizes the solar-blind UV sensor only. It is ideal for use indoors and in areas not susceptible to sources of false alarms. This mode provides the shortest response rate as it will detect UV radiation instantaneously.

Dual IR Mode

This mode utilizes the two IR sensors within the detector. The two IR sensors specifically detect the IR flicker of a flame and the spike in Temperature in the Hydrocarbon CO₂ band. This combination provides a flame detector which is highly immune to false alarms.

IR Mode

This mode utilizes an IR sensor to monitor for the flicker generated by a flame. It permits the detector to ignore steady state IR sources such as hot objects.

Physical Description

The Model F120 is self-contained in a two-piece explosion-proof copper-free aluminum housing finished in a deep red color for rapid identification as a flame detector. A protective coating permits use in harsh environments, such as offshore platforms, without degradation. The detector is suitable for use in “classified” areas where ignitable concentrations of flammable gas normally exist. A sapphire window in the front of the housing permits both ultraviolet and infrared radiation to strike the sensing elements inside. Electrical connections are made through a 3/4 inch threaded outlet on the rear of the detector, suitable for connection to electrical conduit or a cable gland.

Operational Description

Contained within the Model F120 Flame Detector housing are the UV, IR and heat sensing elements and associated electronics, three (3) contact relays, and screw terminal blocks for wiring. The detector may be installed for completely self-contained operation, utilizing the relays to control local equipment directly. Additionally, the alarm and status conditions may be transmitted by the detector to a central control room. The relay contacts, if not being used for local control, may be hard-wired to the control room to transmit these conditions. Or all conditions may be transmitted over a single wire by using the available 0-20 mA signal.

When the detector is installed and operating normally, the green LED indicator light will be visible through the detector window. This provides a rapid visual check of detector operation and indicates the unit is in operation. The Model F120 Flame Detector responds to a flame with a variety of criteria and time delay settings. A multiposition selector switch sets the detector for the most appropriate mode for the exact conditions at your particular installation.

Alarm and Delayed Alarm

The Model F120's standard configuration requires at least two of its three sensors to be activated to signal an alarm. When flame radiation is initially detected, the Alarm outputs, both relay contact and current loop, are instantly activated. A red LED alarm light behind the viewing window in the detector is also activated. The detector has a default Delayed Alarm setting of six seconds to confirm a flame has been detected. Should this flame persist for this period of time, the Delayed Alarm output (relay and current loop) will be activated. The Delayed Alarm setting can also be changed from six seconds to three seconds to provide a rapid response time.

Automatic Self-Check (ASC)

Periodically, the Model F120 Flame Detector runs the Automatic Self-Check program. A source of UV radiation is transmitted, via a sapphire rod to the outside surface of the viewing window, and then passes through the window onto the sensor element. This test ensures that the sapphire window is clear of any obstruction and that the sensors inside the detector are functioning properly. Should the transmission of the window be degraded, or other circuit malfunctions detected, the yellow Malfunction LED in the detector will turn on, the malfunction relay contacts will transfer, and the 0-20 mA output will transmit a malfunction signal. This malfunction indicates a need for maintenance before the performance has been degraded enough to prevent response to flame.

SPECIFICATIONS

System Specifications

| | |
|-----------------------------|---|
| Spectral Response | UV: 185 to 245 nm IR: 4.3 microns (Hydrocarbon CO ₂ spike) |
| Detection Range | Reliably detects a one square foot n-Heptane fire at a distance of 70 feet / 20 meters |
| Response Time | < 5 seconds |
| Adjustable Time Delay | 3 or 6 seconds |
| Detection Modes | <i>Triple-mode:</i> UV, IR flicker, and Temperature (voted any two out of three sensors) <i>UV Mode:</i> UV <i>Dual IR Mode:</i> IR flicker and Temperature (Hydrocarbon CO ₂ spike) <i>IR Mode:</i> IR flicker |
| Optical Self-Test: | Automatic continuous optical path |
| Warranty: | 5 years |
| Approvals | Classified by Underwriters Laboratories for use in Class I, Groups B, C, D; Class II, Groups E, F, and G Hazardous Locations. FTRV, File No. E162517(N) |



Classified by Underwriters Laboratories for use in Class I, Groups B, C, and D; Class II Groups E, F, and G Hazardous Locations per Canadian Standard C22.2 No. 30-M1986 and 25-1966. File No. E162517 (N).

The enclosure is rated NEMA Type 4X, watertight and corrosion resistant.

Electrical Specifications

| | |
|-----------------------------|---|
| Input Power | 20-35 VDC, 125 mA standby, 230 mA alarm @ 24 VDC |
| Relay Contact Ratings | 6 amps @ 28 VDC or 300 VAC resistive 1/8 HP @ 120-240VAC |
| Analog Signal | Self-powered output transmits a 0-20 mA current load of 100 to 800 ohms to indicate operating mode of detector. Delayed Alarm selectable for latching or non-latching operation. Power Fault 0 mA Malfunction 2 mA Ready 4 mA UV Alarm (special order) 8 mA Alarm 12 ± 1 mA Delayed Alarm 19 ± 1 mA |
| Relay Outputs | Alarm (instantaneous, non-latching); Delayed Alarm (3 or 6 seconds, latching or non-latching); Malfunction |
| Alarm Reset | Automatic or manual when flame is no longer detected |
| Visual Indicators | Detector Ready - Green LED Alarm/Delayed Alarm - Red LED Malfunction - Yellow LED |
| Field Connections | 0-20 mA output - three-wire shielded cable All other connections: 18 AWG (3.5 mm ²) to 14 AWG (2.5 mm ²) |

Environmental Specifications

Operating Temperature -40°F to 185°F (-40°C to 85°C)

Operating Humidity 0-100% RH, non-condensing

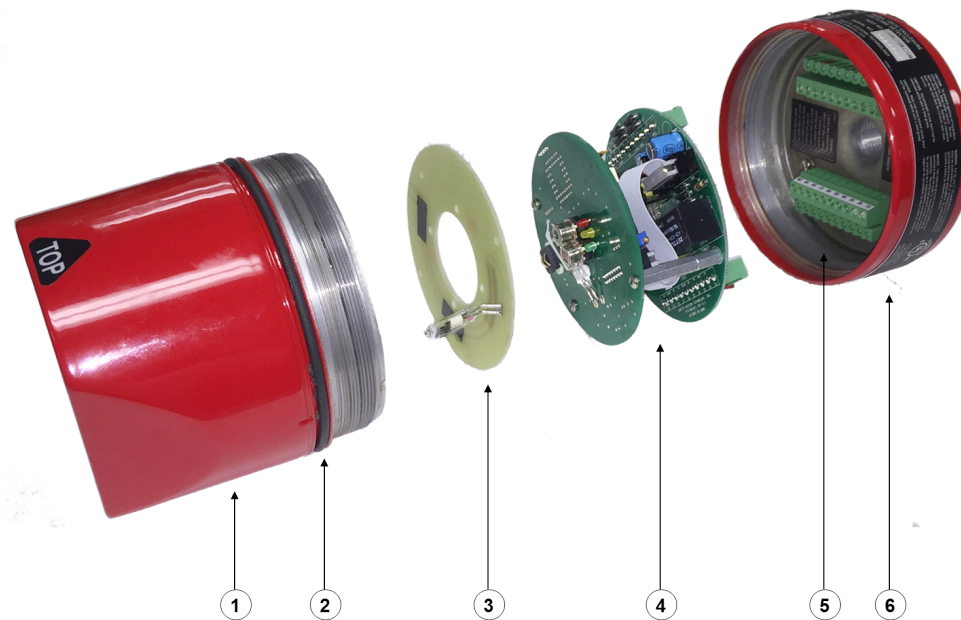
Ingress Protection IP66

Mechanical Specifications

Dimensions 4.40 x 5.25 inches (112 x 133 mm)

Weight 4.0 lbs (1.8 kg) Aluminum
10.0 lbs (4.5 kg) Stainless Steel

Housing Aluminum or Stainless Steel



- (1) Front Housing
- (2) Viton O-Ring Seal
- (3) Self-test UV Emitter
- (4) Plug-in Electronics Module
- (5) Terminal Blocks
- (6) Rear Housing

SELECTING A LOCATION FOR THE FLAME DETECTOR

NOTE: The determination of the location of flame detectors should be made in accordance with any relevant local, municipal, and national standards, codes, or legislation. Seek the advice of professionals or experts with knowledge of process plant systems and/or safety and engineering personnel.

Considerations

To insure the fastest possible detection of flames, the location of the detector is important. There are no standard rules for detector placement since the optimal placement of the detector(s) are different for each application. The following considerations should be made when locating flame detectors:

- The flame detector must have an unobstructed view of the area it is intended to protect.
- Detectors should be installed in an area as free of shock and vibration as possible
- Although the detector has been designed to recognize sources of false alarms and prevent it from being activated, it is virtually difficult to eliminate all the varying factors that may trigger a false alarm. Determine an optimum location to place the detector to reduce or eliminate these sources of false alarms.
- A clear view of the detector for visual inspection and convenient access for cleaning
- In areas with dirty atmospheric conditions, the detectors will require frequent inspection and cleaning
- In high traffic areas, the detector should be placed a minimum of 10 feet from the protected area to ensure ample coverage and to prevent obstructing the field of view of the detector by personnel working or machines passing by
- For outdoor installations exposed to intense, direct sunlight, utilize a sunshade to protect the detector from extreme temperatures
- Do not begin installation unless all considerations regarding the location of the detector have been taken into account.

Optical Sensitivity Range

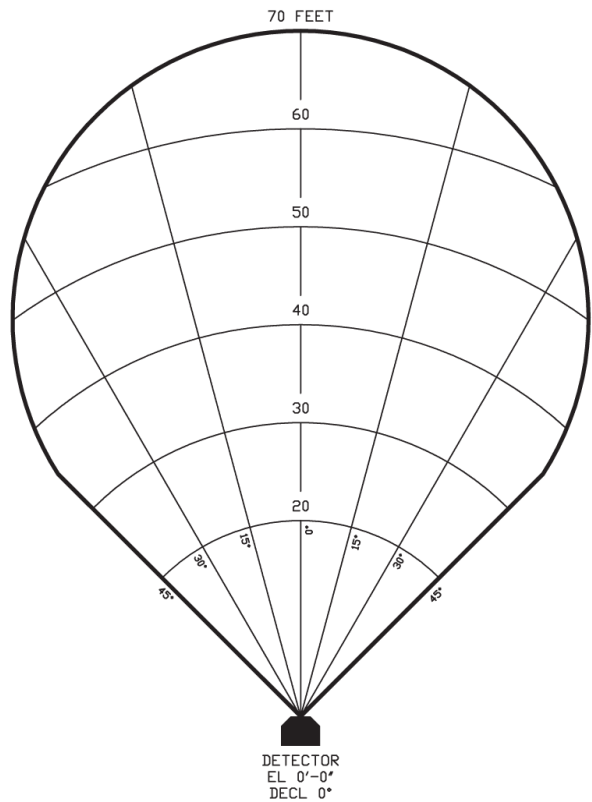
The distance at which the flame detector will respond to a fire is a function of the intensity of that fire. The F120 has a maximum detection range of 70 feet (21 m) for an n-Heptane fire with a surface area of 1 sq ft (0.093m²).

Field of View

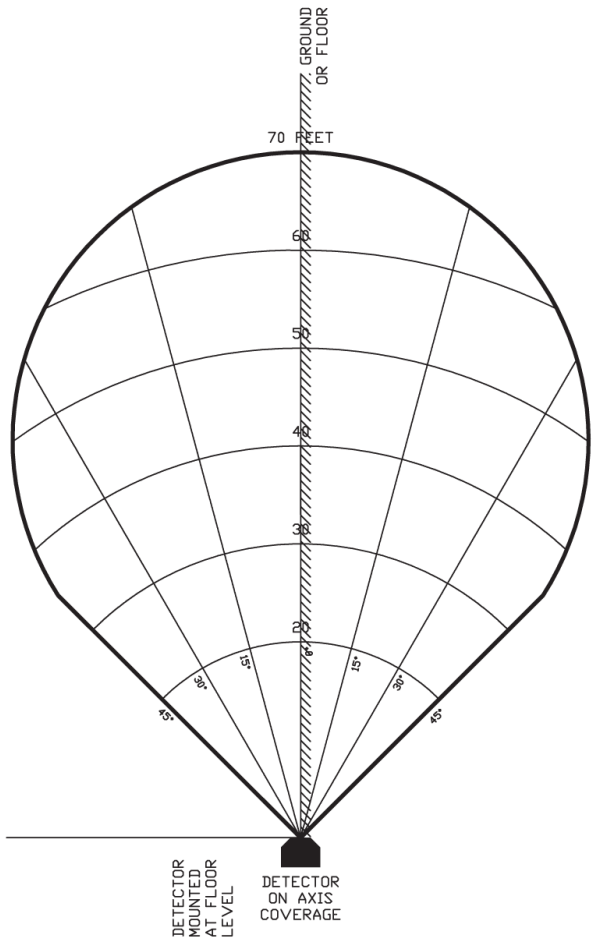
Flame detectors exhibit reduced sensitivity to flames that are not directly in front of them (on axis). Relative sensitivity at various off axis angles is described in the field of view diagram. It defines the detector sensitivity as a function of flame location in the field of view. For example, if the flame is located directly in front of the detector, an angle of zero degrees (0°) the detector will respond to the standard 1 square foot n-Heptane fire at a distance of 70 feet (21 meters). At 30° off axis, the sensor sensitivity is approximately 85% of the on-axis sensitivity; resulting in a reduction of the effective range of the detector to about 55 feet (17 meters). Note that the worst case detection range for the detector will be a range of 35 feet at 45° off-axis.

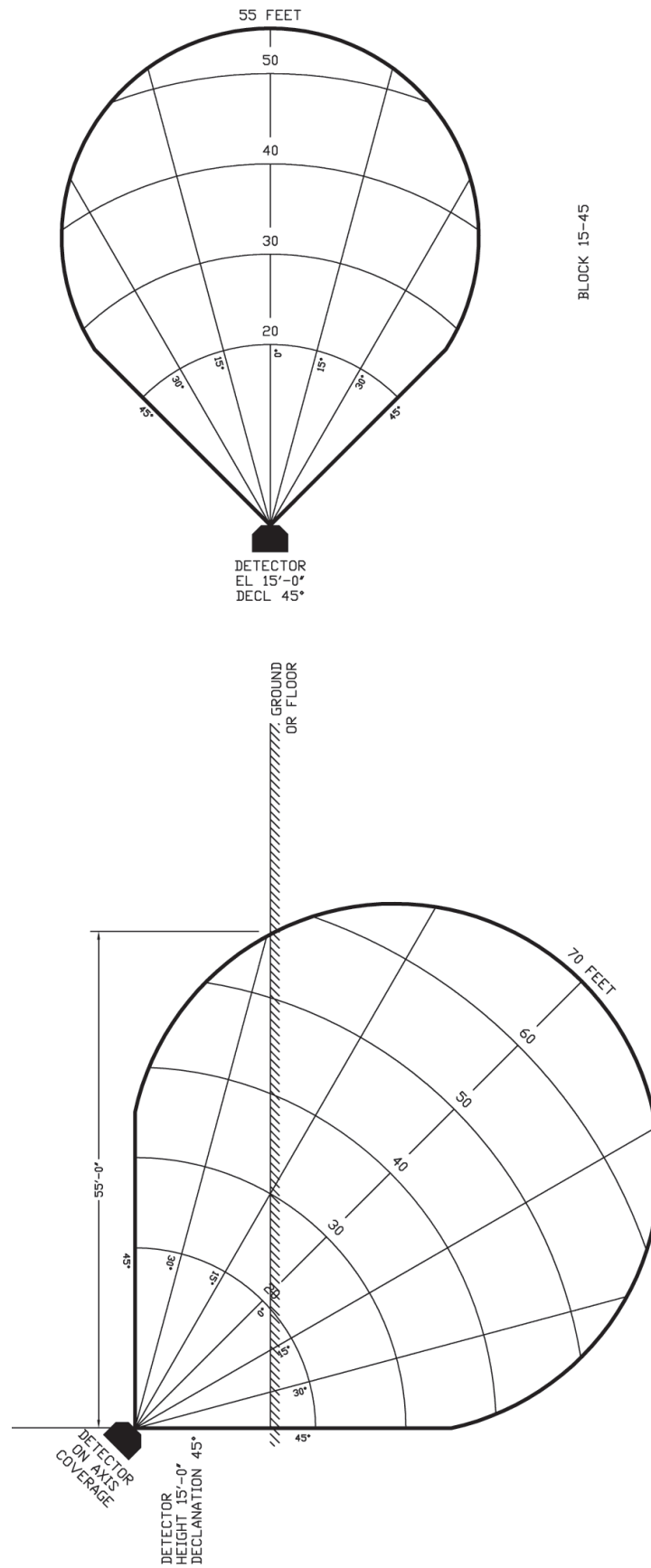
Utilize the field of view diagram and a drawing of the area to be protected in specifying the mounting elevation and detector orientation. Where required, additional F120 units should be utilized to insure adequate coverage.

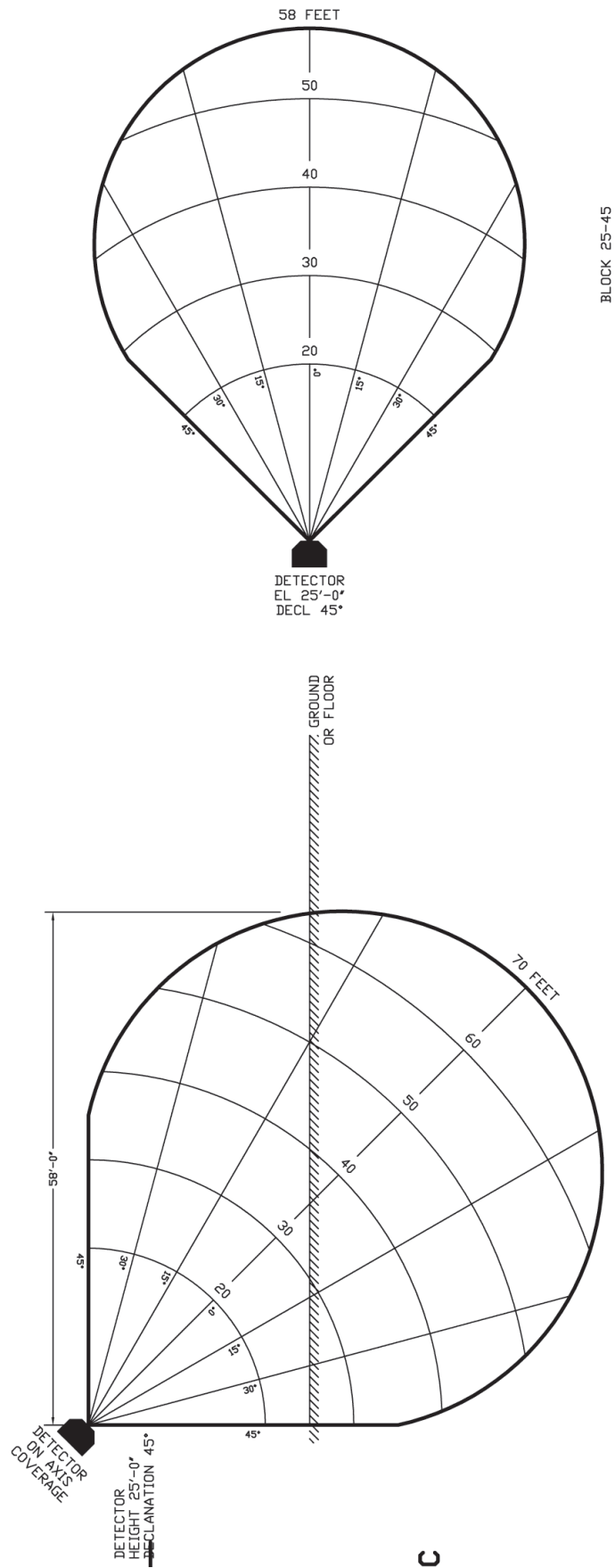
PLAN (AT FLOOR/GROUND LEVEL)



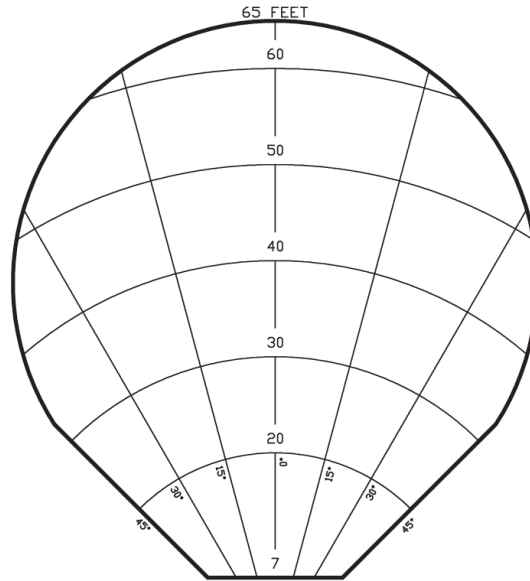
ELEVATION





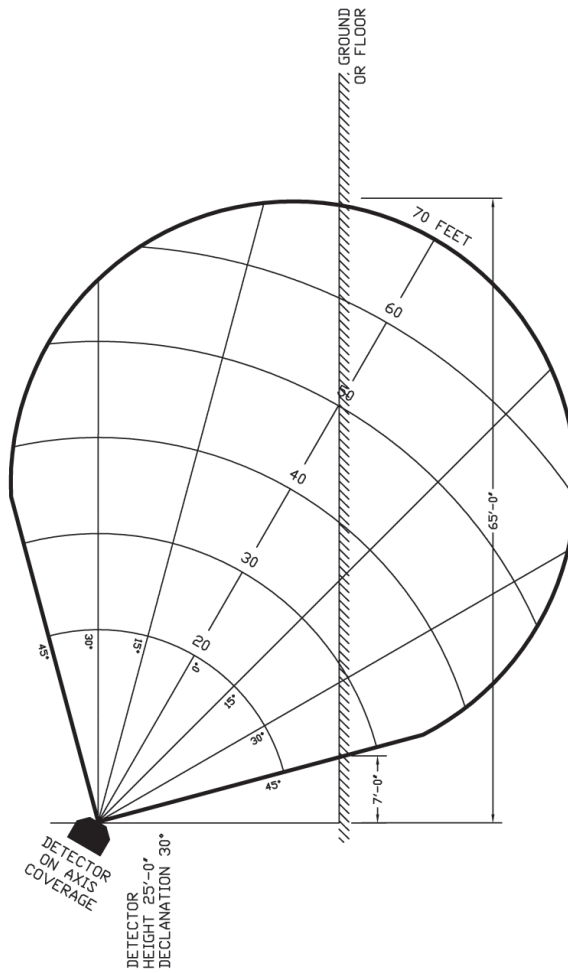


PLAN (AT FLOOR/GROUND LEVEL)



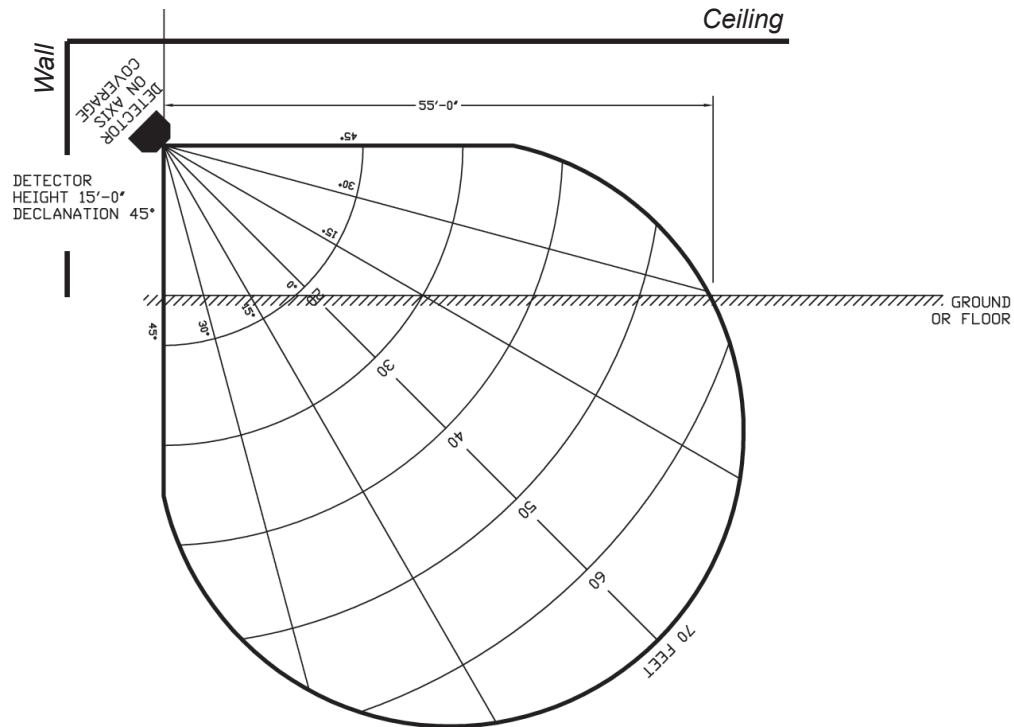
DETECTOR
EL 25'-0"
DECL 30°

ELEVATION



Orientation of the Flame Detector

The F120 will operate in any orientation. Recommended orientation is above the intended protective zone to insure a clear field of view and minimal accumulation of dust and debris on the lens surface. The detector can be mounted at a minimum declination of 20 degrees or at the recommended declination of 45 degrees. If the flame detector is installed at a corner of a room at a 45 degree angle, the coverage path of the detector will extend from the detector across the ceiling and from the detector straight down the wall and towards the floor. The F120 detector housing is marked "TOP" to identify the recommended side of the detector that should be mounted facing up. This orientation prevents the accumulation of dust and/or debris on the lens and the self-test orifice.



Dust, Debris, Salt, and Snow

If the detector is installed above the intended protective zone, angle the detector a minimum of 20 degrees down or at the recommended declination of 45 degrees to prevent any accumulation of dust, debris, salt or snow on the lens.

The internal electronics of the detector generates enough heat that no icing should occur. Utilize a shade or cover if necessary to protect the lens from heavy snow.

Enclosures Protected by Glass, and Plexiglas

The flame detector must have an unobstructed view of the area it is intended to monitor. If an area is enclosed with a glass or Plexiglas, UV and IR radiation will not travel through these materials and will not be detected by the detector. Please consult with Safety Systems Technology for recommendations regarding your specific application.

Required Quantity of Flame Detectors

The F120 has a cone of vision of 90° and a coverage area of 70 feet within its center axis. Your specific application will determine the number of flame detectors required to protect an area or monitor an area or equipment. The size of the fire determines the flame detector's sensitivity and detection range.

At a minimum, one flame detector may provide adequate protection to monitor for presence of fire. However, any obstruction, size of the protected area, and size of the equipment should be taken into consideration.

A flame detector located on the top of the equipment (looking down) may provide adequate coverage as long as the entire unit is within its field of view. However, in areas with high ceilings, placing a flame detector directly on the ceiling may not be ideal. A flame detector installed monitoring just one side of the equipment may not provide adequate coverage as the detector's field of view may be obstructed by the equipment itself. The detector may not see a fire that starts on the other side of the equipment until it has grown in size. Therefore a secondary detector must be installed on the exact opposite of the first detector to provide adequate coverage.

For applications which requires protecting an enclosed area such as a room, a minimum of 4 flame detectors should be considered located at each corner of the enclosed area with a maximum of 70 feet (21 m) on each side angled at 45 degrees. This configuration will provide coverage on all sides from the top of the ceiling, down to the walls, and the floor of the enclosure. Additional detectors should be utilized if the field of view of any of the detectors are obstructed by equipment, windows, post, or wall.

Avoiding Sources of False Alarms

Vibration

Mounting location should be as free from shock and vibration as possible. Due to the high sensitivity of the flame detector, it must be mounted to a rigid, stable support where no vibration is present. Just a very slight movement of the flame detector when viewing an object that is 70 feet (21 m) away can produce a considerable variation in the radiation signature being received. Outdoors, avoid mounting the flame detector on a light pole whenever possible. But if this is not possible, be sure that the pole is rigid enough that there will be no vibration when a vehicle drives by. This is also applicable in areas near train tracks.

When monitoring machinery such as a motor or turbine, mount the flame detector to stable supports that will not transmit the vibrations generated by the machines.

When mounted on the end of a conduit run, be sure to provide support to the conduit near the flame detector.

Oceans, Lakes, Rivers, and Water Puddles

A combination of reflected sunlight and puddle of water with wind blowing across it creating ripples in the water surface can produce varying amounts of UV or IR radiation which the flame detector will interpret as a possible flame. Likewise, natural waves in ocean water or waves produced by movement of a boat in a lake or river can produce a similar effect if there is a nearby source of radiation. Reposition or reorient the detector such that any areas where water can accumulate will not be visible.

Sunrise and Sunset

In outdoor applications, orient the flame detector so that it is pointing directly in a north facing or south facing direction. This will insure that the detector will never see the sun as it rises above the horizon or sets below the horizon. The sun of course is a very intense flame with intense amounts of radiation. As the sun rises or sets, the amount of radiation is modulated by the air currents through which it passes, resulting in a slight “flicker” of the radiation sensed by the flame detector. This can result in a false alarm at sunrise or sunset, particularly if the detector is oriented in an east facing or west facing direction. If the detector must be located with this orientation, you must point the detector downward at a large enough angle to insure that the horizon is not within the field of view of the detector. You can utilize a sunshade to limit the field of view of the detector.

Electromagnetic Interference

The UV sensor can detect other sources of electromagnetic interference such as arc welding, X-rays, reflected sunlight, industrial lighting, etc., and users should be aware of the possible presence of such radiation when determining a location for the detector. Increase the declination of the detector to limit the field of view of the detector to the area that requires monitoring. If necessary utilize a sunshade. It is important to note that UV sensors can detect arc welding up to 2 to 3 miles away. The bigger the area that the detectors sees, the higher chance it will see these other sources of radiation.

ELECTRICAL WIRING

The 0-20 mA analog output on the F120 is wired in Current SOURCE configuration.

Terminal Connections

| Terminal Number | Marking | Connection | Description |
|-----------------|------------------------------------|---|---|
| 1 | SPARE | | |
| 2 | SPARE | | |
| 3 | SPARE | | |
| 4 | RESET ALARMS | Remote Reset | Resets Latched Alarm Relays |
| 5 | 0-20 mA OUTPUT | Analog Output | Current Source Output stepped to indicate operating mode: Ready, Alarm, Delayed Alarm, Malfunction, Power Fault |
| 6 | LOCAL 0 VDC OUT | (-) Power Output | Power Source for another Flame Detector |
| 7 | 0 VDC IN | (-) Power Input | To Power Source 16 to 32 volts DC (-) |
| 8 | LOCAL +24 VDC OUT | (+) Power Output | Power Source for another Flame Detector |
| 9 | +24 VDC IN | (+) Power Input | To Power Source 16 to 32 volts DC (+) |
| 10 | SURGE GROUND | Transient Voltage Suppressors | Connect direct to Earth Ground if severe lightning possible (Otherwise jumper to terminal 7) |
| 11 | SPARE | | |
| 12 - 13 | CLOSED ON FAULT FAULT RELAY COM | Contact set closes on loss of power or detector fault | Fault Relay Voltage free contact |
| 13 - 14 | FAULT RELAY COM OPEN TO FAULT | Contact set opens on loss of power or detector fault | Fault Relay Voltage free contact |
| 15 - 16 | CLOSED ON DELAY DELAY RELAY COM | Contact set closes when alarm condition persists for 3 or 6 seconds | Delayed Alarm Relay Voltage free contact |
| 16 - 17 | DELAY RELAY COM OPEN ON DELAY | Contact set opens when alarm condition persists for 3 or 6 seconds | Delayed Alarm Relay Voltage free contact |
| 18 - 19 | CLOSED ON ALARM ALARM RELAY COM | Contact set closes when alarm condition exists | Alarm Relay Voltage free contact |
| 19 - 20 | ALARM RELAY COM OPEN ON ALARM | Contact set opens when alarm condition exists | Alarm Relay Voltage free contact |

Power

The Model F120 requires a power supply of between 20 VDC and 35 VDC. A minimum supply of 20 VDC is required at the detector, taking into account the voltage drop due to cable resistance. Each F120 draws 125 mA continuously from the power supply. Current draw increases to 230 mA when in alarm.

Wiring Considerations

A minimum of three conductors are required for the power and analog output. Six additional conductors are required to use the relay contacts. In general, the following rules should be observed:

- The analog (0-20 mA) cable should be shielded or screened to prevent interference pickup.
- Avoid running the cable close to high-powered cables or equipment or close to radio transmitters or antennas.
- Splices should be avoided and connections in junction boxes must be absolutely clean with terminal screws tight.

Factory Recommended Wires

Use 16 or 18 AWG (1.5 or 0.75 mm²) wires whenever possible.

IMPORTANT: Any electrical conduit connected to the F120 enclosure must have a conduit seal installed within 18 inches (45.7 cm) of the enclosure.

Maximum Cable Lengths

Cable length between 0-20 mA Controller and External Equipment

The total DC resistance of the wires must be less than 800 ohms. The maximum cable lengths (for 800 ohms) for various wire sizes are listed below:

| Cable Size | Maximum Cable Length (L) | |
|-------------------------------|--------------------------|---------|
| | Feet | Meters |
| 26 AWG (.14 mm ²) | 19,043 | 5,806 |
| 24 AWG (.20 mm ²) | 30,288 | 9,234 |
| 22 AWG (.35 mm ²) | 53,530 | 16,320 |
| 20 AWG (0.5 mm ²) | 78,270 | 23,863 |
| 18 AWG (1.0 mm ²) | 145,295 | 44,297 |
| 16 AWG (1.5 mm ²) | 200,624 | 61,166 |
| 14 AWG (2.5 mm ²) | 317,879 | 96,914 |
| 12 AWG (4.0 mm ²) | 499,310 | 152,229 |

DEFAULT CONFIGURATION

The Model F120 UV/IR Flame Detector is supplied with the following default configuration.

| Function | Setting | Description |
|--------------------------------------|---|--|
| Sensor Type | UV and IR | Pre-assembled |
| Signal Output | 0 mA | Power Fault |
| | 2 mA | Malfunction |
| | 4 mA | Ready |
| | 8 mA | UV Alarm (special order) |
| | 12 mA | Alarm |
| | 20 mA | Delayed Alarm |
| Alarm (Pre-Alarm) | Voting 2 out of 3 sensors | Requires minimum of 2 sensors to report an Alarm condition |
| | Contact Normally Open / Normally Closed | Set by installer upon wiring |
| | Non-Latching | Automatically resets if no fire is seen |
| Delayed Alarm | Voting 2 out of 3 sensors | Requires minimum of 2 sensors to report an Alarm condition |
| | Contact Normally Open / Normally Closed | Set by installer upon wiring |
| | Non-Latching | Automatically resets if no fire is seen |
| Time Delay Setting for Delayed Alarm | 3 second delay | The detector has seen radiation continuously for 3 seconds |

INSTALLATION

1. Shipment

Flame detectors shipped by Safety Systems Technology is fully assembled, quality tested and packaged in special containers to protect against physical damage.

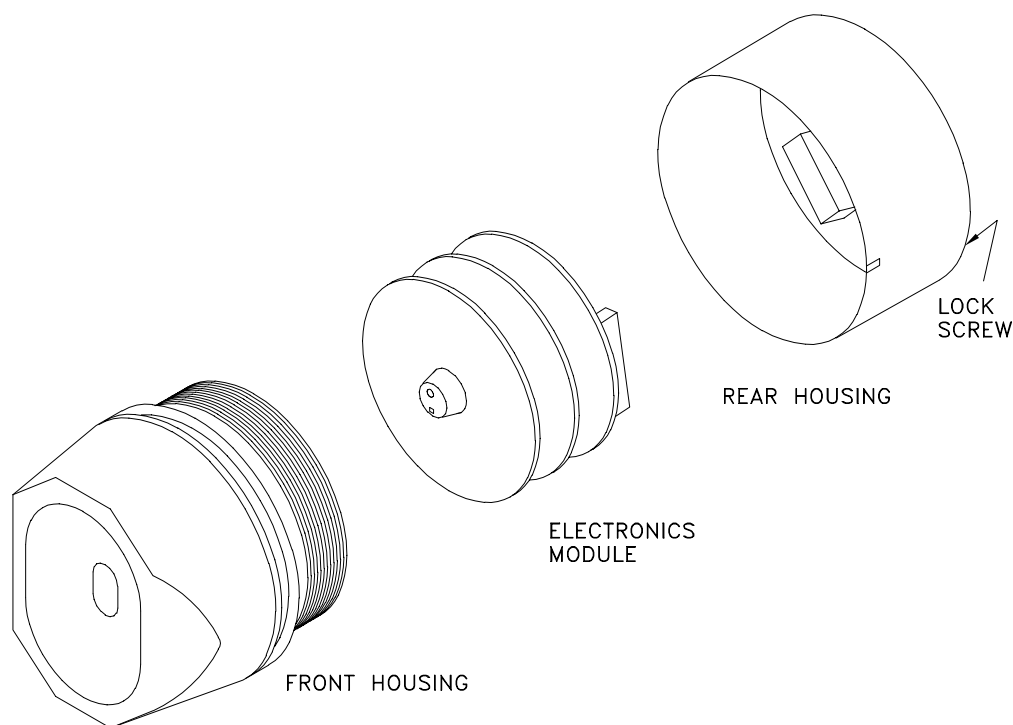
Upon receipt of the shipment, contents should be carefully removed and checked against the packing list. Contact Safety Systems Technology immediately if any damage has occurred or if there is any discrepancy in the order.

2. Tools Required

- 4 mm hex wrench to remove the enclosure cover
- Flat-head screwdriver maximum 3/16" (5 mm) width for terminal block connections
- Adjustable wrench for conduit or cable gland connections
- Multi-meter to verify power

3. Disassemble the Detector

Before installing the detector, you must disassemble the unit into three components shown below.



50005

12. Use a 4 mm hex wrench to loosen the locking screw on the rear of the detector housing
13. Unscrew the front housing from the rear housing
14. Remove the electronics module from the rear terminal blocks by gently rocking the board side-to-side. Place a finger under the top PC board and place another finger under the edge of this board on the opposite side. Gently rock the board side-to-side while pulling in order to disengage the module from the rear housing.

! WARNING: Do not allow dirt or finger marks to get onto the face of the UV or IR sensors located on the top of the electronics module.

! WARNING: Do not remove or tamper the locking screw in the rear cover. Operating the detector without the screw in place could allow moisture to enter the detector, or cause an explosion. The stainless steel cover plate over the screw prevents it from being removed.

15. Set the front housing, rear housing and electronics module aside.

The front and rear housing threads and O-ring are shipped prelubricated. This lubrication is required. It insures the ease of assembly and future disassembly. It also increases the water resistance of the unit. Should the lubrication become inadvertently contaminated (dirt, etc.) or removed, the lubrication replacement procedure in the Maintenance section of this manual must be followed.

! NOTE: The flame detector can be mounted using either a Conduit Swivel Mounting Bracket for conduit installation or a Wall/Ceiling Swivel Bracket for cable gland installation. For conduit installation, go to Step 4-A and for cable gland installation, go to Step 4-B.

4-A. Install the Conduit Swivel Mounting Bracket

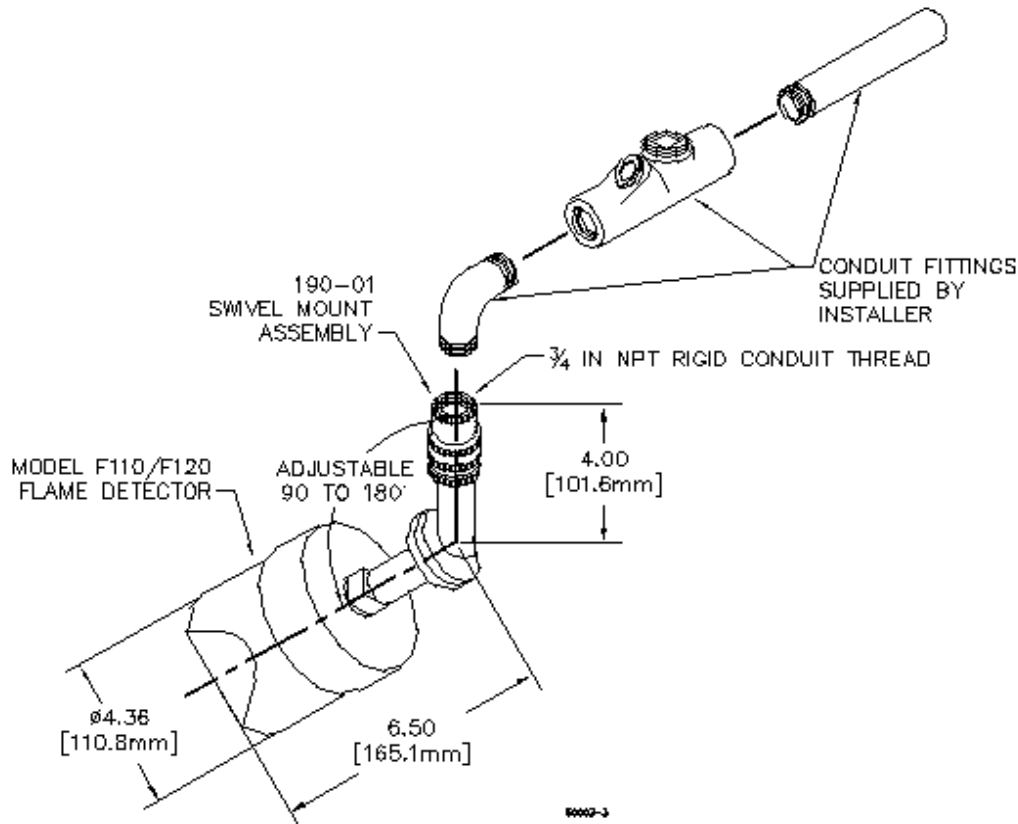
For Conduit Installation

1. Prior to installing the flame detectors, the electrical conduit must be installed.
2. Install a conduit seal fitting on end of the conduit run, no more than 18 inches from the flame detector.

! IMPORTANT: When installing with conduit, you must use a conduit seal fitting in the conduit located no more than 18 inches (46 cm) from the flame detector. The wires passing through the conduit seal must be completely sealed with packing to prevent any water that condenses inside the conduit from entering the flame detector housing. Moisture inside the flame detector housing will damage the electronics and make the flame detector inoperable. This conduit seal is also required whenever the flame detector is installed in hazardous areas that contain flammable gas or vapors to prevent explosions. In hazardous locations, the conduit seal must always be provided in compliance with local codes.

3. Mount the Conduit Swivel Bracket on the end of conduit. Screw the Conduit Swivel Bracket and make sure you have a tight fit.
4. Mount the rear housing of the flame detector on the Conduit Swivel Bracket. Tighten the rear housing on the Conduit Swivel Bracket until the metal nameplate located on the outside of the rear housing is facing downward. The "TOP" label on the rear housing will then be on top when it is installed properly.

Conduit Mounting Assembly



5. Pull the wires through the conduit and out through the rear housing.

4-B. Install the Wall/Ceiling Mounting Bracket

For Cable Gland Installation

1. Install the Wall/Ceiling Mounting Bracket at the desired location. The mounting bracket has a square mounting base for solid surfaces, 2.5" x 2.5" (63.5mm x 63.5mm), with four 0.219" (5.56mm) holes on 2.0" (50.8mm) x 2.0" (50.8mm) layout. Use four #10 or M5 screws. Screws are not included.
2. Apply the supplied thread locking adhesive to the threaded stud on the end of the swivel bracket. Also apply the thread locker to the mating tapped hole on the rear of the flame detector.

IMPORTANT: Apply the adhesive to the threaded stud on the end of the swivel bracket and the mating tapped hole on the rear of the flame detector. If locker is only applied to the stud, air pressure will force the liquid thread locker to escape as you torque it down. Lack of uniform coverage creates air pockets, causing incomplete adhesive cures which may result in the bracket coming loose from the flame detector.

3. Insert the threaded stud into the tapped hole on the rear housing and hand tight ONLY. The thread locker will cure in 10 minutes at room temperature, and at that time it will be acceptable to **carefully** continue with the installation. Full strength thread bonding will occur after 24 hours.

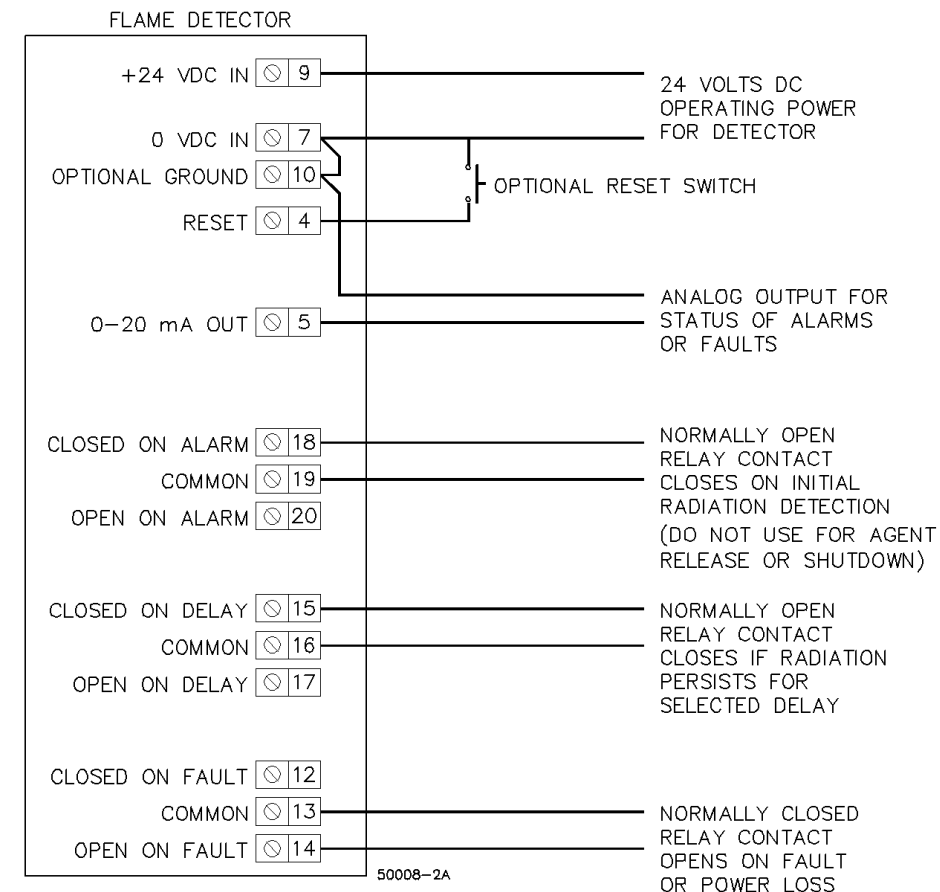
IMPORTANT: Do not use any tools to tighten the threaded stud into the tapped hole on the rear housing. The detector housing is cast aluminum; excessive tightening will strip the aluminum threads.

4. Run the cable assembly to the location of the flame detector.
5. Use a suitable cable gland with a 3/4 inch NPT male thread installed in the conduit opening of the flame detector.



6. Run the wires through the cable gland and through the rear housing of the flame detector. Tighten the cable gland and seal.

5. Wire the Detector



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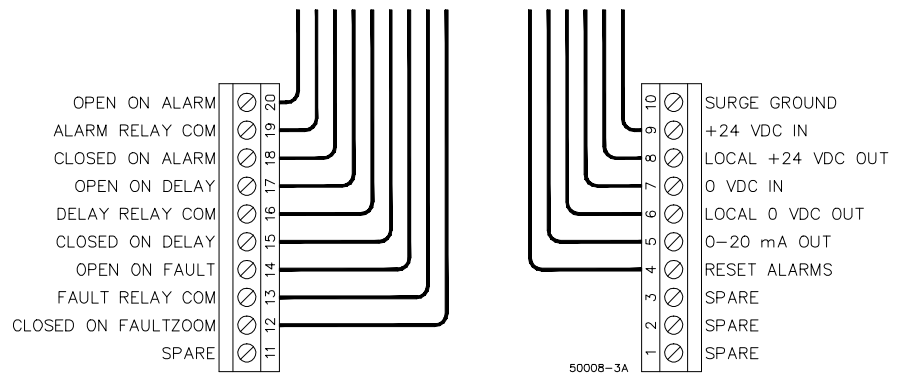
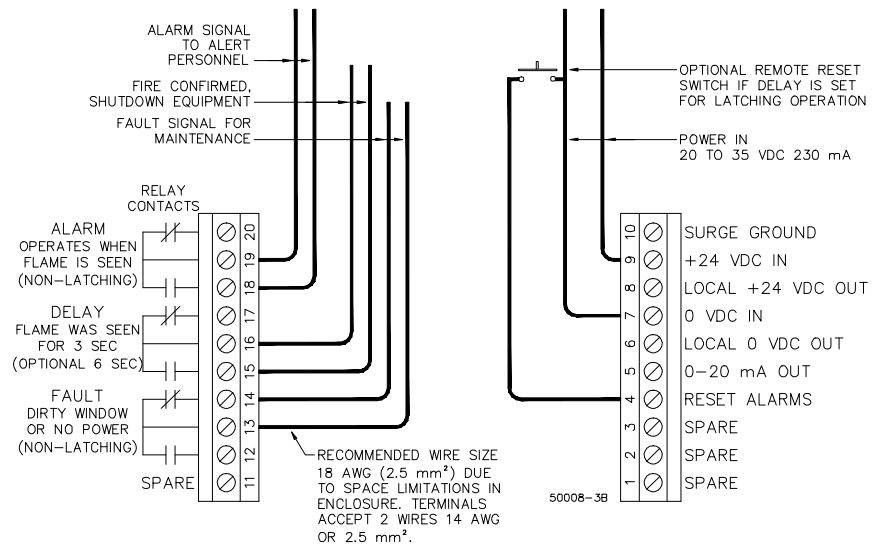
Factory Recommended Wires

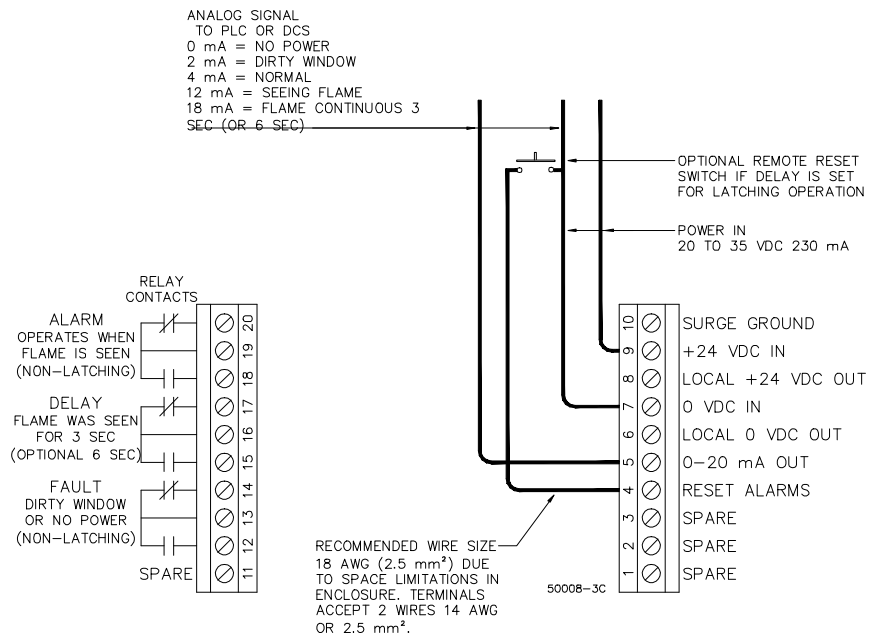
Use 16 or 18 AWG (1.5 or 0.75 mm²) wires whenever possible.

Terminal Connections

| Terminal Number | Marking | Connection | Description |
|-----------------|------------------------------------|---|---|
| 1 | SPARE | | |
| 2 | SPARE | | |
| 3 | SPARE | | |
| 4 | RESET ALARMS | Remote Reset | Resets Latched Alarm Relays |
| 5 | 0-20 mA OUTPUT | Analog Output | Current Source Output stepped to indicate operating mode: Ready, Alarm, Delayed Alarm, Malfunction, Power Fault |
| 6 | LOCAL 0 VDC OUT | (-) Power Output | Power Source for another Flame Detector |
| 7 | 0 VDC IN | (-) Power Input | To Power Source 16 to 32 volts DC (-) |
| 8 | LOCAL +24 VDC OUT | (+) Power Output | Power Source for another Flame Detector |
| 9 | +24 VDC IN | (+) Power Input | To Power Source 16 to 32 volts DC (+) |
| 10 | SURGE GROUND | Transient Voltage Suppressors | Connect direct to Earth Ground if severe lightning possible (Otherwise jumper to terminal 7) |
| 11 | SPARE | | |
| 12 - 13 | CLOSED ON FAULT FAULT RELAY COM | Contact set closes on loss of power or detector fault | Fault Relay Voltage free contact |
| 13 - 14 | FAULT RELAY COM OPEN TO FAULT | Contact set opens on loss of power or detector fault | Fault Relay Voltage free contact |
| 15 - 16 | CLOSED ON DELAY DELAY RELAY COM | Contact set closes when alarm condition persists for 3 or 6 seconds | Delayed Alarm Relay Voltage free contact |
| 16 - 17 | DELAY RELAY COM OPEN ON DELAY | Contact set opens when alarm condition persists for 3 or 6 seconds | Delayed Alarm Relay Voltage free contact |
| 18 - 19 | CLOSED ON ALARM ALARM RELAY COM | Contact set closes when alarm condition exists | Alarm Relay Voltage free contact |
| 19 - 20 | ALARM RELAY COM OPEN ON ALARM | Contact set opens when alarm condition exists | Alarm Relay Voltage free contact |

Wiring Diagram

WIRING DIAGRAM
FLAME DETECTORTYPICAL WIRING DIAGRAM
FLAME DETECTOR
USING RELAY CONTACT OUTPUTS



TYPICAL WIRING DIAGRAM
FLAME DETECTOR
USING ANALOG OUTPUT

Alarm Contact Relays Connection

Wire your external equipment to the following terminals to activate the Alarm contact relays as desired.

Normally Open

| Terminal Number | Marking | Connection |
|-----------------|-----------------|---|
| 18 | CLOSED ON ALARM | Contacts set to Normally Open and Closed on Alarm |
| 19 | ALARM RELAY COM | |

Normally Closed

| Terminal Number | Marking | Connection |
|-----------------|-----------------|---|
| 19 | ALARM RELAY COM | Contacts set to Normally Closed and Open on Alarm |
| 20 | OPEN ON ALARM | |

Delayed Alarm Contact Relays Connection

Wire your external equipment to the following terminals to activate the Delayed Alarm contact relays as desired.

Normally Open

| Terminal Number | Marking | Connection |
|-----------------|-----------------|---|
| 15 | CLOSED ON DELAY | Contacts set to Normally Open and Closed on Alarm |
| 16 | DELAY RELAY COM | |

Normally Closed

| Terminal Number | Marking | Connection |
|-----------------|-----------------|---|
| 16 | DELAY RELAY COM | Contacts set to Normally Closed and Open on Delayed Alarm |
| 17 | OPEN ON DELAY | |

Fault Contact Relays Connection

Wire your external equipment to the following terminals to activate the Fault contact relays as desired.

Normally Open

| Terminal Number | Marking | Connection |
|-----------------|-----------------|---|
| 12 | CLOSED ON FAULT | Contacts set to Normally Open and Closed on Fault |
| 13 | FAULT RELAY COM | |

Normally Closed

| Terminal Number | Marking | Connection |
|-----------------|-----------------|---|
| 13 | FAULT RELAY COM | Contacts set to Normally Closed and Open on Fault |
| 14 | OPEN ON FAULT | |

6. Connect the Detector to Earth Ground

A Ground Terminal is provided on both the inside and outside walls of the rear housing for use in applications where the conduit does not provide adequate grounding to the F120, or the System Designer determines that additional grounding is required.

A minimum 18 AWG (0.75 mm²) wire is required for ground connection.

Circuitry that protects against damage from lightning, miscellaneous transients and power surges are internally connected to terminal # 10 on the terminal block. As shipped from the factory, a jumper wire is installed between rear terminal # 10 and the 0 volt terminal #7, thus connecting the transient protection to the grounded 0 volt power line. The 0 volt power line must always be grounded, either at the F120 or elsewhere in the system.

| Terminal Number | Marking | Connection | Description |
|-----------------|--------------|-------------------------------|--|
| 7 | 0 VDC IN | (-) Power Input | To Power Source 16 to 32 volts DC (-) |
| 10 | SURGE GROUND | Transient Voltage Suppressors | Connect direct to Earth Ground if severe lightning possible (Otherwise jumper to terminal 7) |

7. Set the Detection Mode DIP Switch

The flame detector has 4 operational modes of detection:

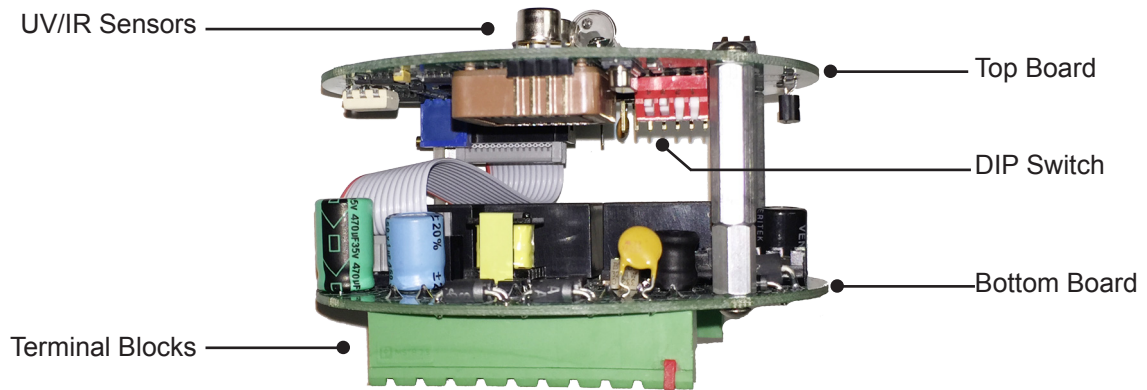
1. Triple-mode UV/IR
2. UV Only Mode
3. Dual IR Mode
4. IR Mode

DIP Switch Location

The DIP Switch is located on the underside of the upper board in the electronics module. Turn the electronics module upside down to easily view the switch, being careful not to disturb the 3 sensors. Switches #1 and #2 sets the operational mode of the detector.

There are four switch sections; these are identified by the numbers 1 through 4 marked on the printed circuit board next to the switch.

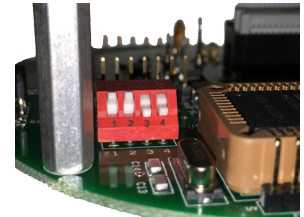
The units are manufactured with switches that have the operating mechanism on the side of the switch, as shown in the picture. With this type of switch, which can be set in the UP or DOWN position, use the instructions below to set the switches.



Default Setting

The factory default setting for the flame detector's operational mode is "Triple-mode" - the one UV sensor and two IR sensors are activated and for the detector to signal an Alarm condition, the detector uses a voting logic where a minimum of two out of the three sensors reports a fire.

Confirm that the Default Setting for the flame detector is set to Triple-mode. The UP position means that the switch is moved to the upper position, farthest from the printed circuit board. The DOWN position means that the switch is moved to the lower position or closest to the printed circuit board.



| Switch # 1 | Switch # 2 | Description |
|------------|------------|---|
| UP | UP | Triple-mode UV/IR detection, voted any two out of three sensors |

Changing the Detection Mode

To change the detection mode of the flame detector, follow the table below to adjust the DIP Switch settings. Please note that the factory default setting for the flame detector is set to Triple-mode.

| Switch # 1 | Switch # 2 | Description |
|------------|------------|---|
| UP | UP | Triple-mode UV/IR detection, voted any two out of three sensors (Default Setting) |
| UP | DOWN | UV Only |
| DOWN | DOWN | Dual IR (IR/IR) |
| DOWN | UP | IR Flicker Only |

8. Set the Time Delay for the Delayed Alarm Output

The Model F120's standard configuration requires at least two of its three sensors to be activated to signal an alarm. When flame radiation is initially detected, the Alarm outputs, both relay contact and current loop, are instantly activated. A red LED alarm light behind the viewing window in the detector is also activated.

The detector has a default Delayed Alarm setting of 3 seconds to confirm a flame has been detected. Should this flame persist for this period of time, the Delayed Alarm output (relay and current loop) will be activated. The Delayed Alarm setting can also be changed from 3 seconds to 6 seconds to provide a rapid response time.

Default Setting

The factory default setting for the Time Delay for the Delayed Alarm Output is 3 seconds.

| Switch # 3 | Description |
|------------|-------------------------------------|
| DOWN | Sets the Delayed Alarm at 3 seconds |

Changing the Time Delay for the Delayed Alarm Output

To change the Time Delay for the Delayed Alarm Output, follow the table below to adjust the DIP Switch settings.

| Switch # 3 | Description |
|------------|---|
| DOWN | Sets the Delayed Alarm at 3 seconds (Default Setting) |
| UP | Sets the Delayed Alarm at 6 seconds |

9. Set the Latching Mode for the Delayed Alarm

The flame detector's Delayed Alarm latching mode can be set as non-latching or latching.

Default Setting

The factory default setting for the Delayed Alarm is NON-LATCHING. This means that when the detector no longer detects any fire, the Delayed Alarm contacts will reset automatically.

| Switch # 4 | Description |
|------------|--|
| DOWN | Sets the Delayed Alarm to NON-LATCHING. The Delayed Alarm contacts will reset automatically when the flame detector no longer sees any fire. |

Changing the Latching Mode for the Delayed Alarm

To change the Latching Mode for the Delayed Alarm contacts, follow the table below to adjust the DIP Switch settings.

| Switch # 4 | Description |
|------------|--|
| DOWN | Sets the Delayed Alarm to NON-LATCHING. The Delayed Alarm contacts will reset automatically when the flame detector no longer sees any fire. (Default Setting) |
| UP | Sets the Delayed Alarm to LATCHING. In this mode, you must activate the manual reset input on the flame detector to clear the alarm. |

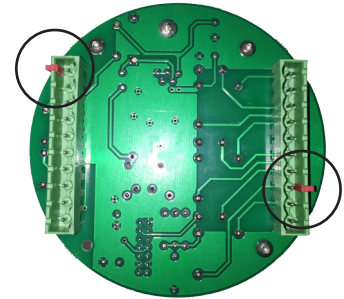
If setting the Delayed Alarm contacts to LATCHING, make sure to install a RESET button (not provided) to allow for the manual reset of the detector to clear the alarm. Terminal # 4 has been provided to wire a RESET button to the detector.

10. Install the Electronics Module

1. Check the position of all wires on the terminal blocks inside the rear housing. Make sure that all wires to the terminal blocks are properly secured so that they do not interfere when the plug-in module is inserted. The wires must not protrude upward, above the terminal blocks.
2. Connect polarized terminal blocks.

The mating terminal blocks of the electronics module and the rear housing each have protective (RED) polarizing keys. This key is used to protect against improper mating of the terminal blocks.

CAUTION: The RED key of the Electronics Module WILL NOT FIT over the Red Key of the rear housing connector. Orient the electronics module so that the Red Keys are NOT aligned. Do not force the electronics module or damage may occur to the terminal blocks.



3. Plug the electronics module.
4. Secure the electronics module in place by placing a thumb over each screw head on the top PC board of the electronics module and gently push the electronics module in place. Make sure the module is firmly secured on the rear housing terminal blocks.

11. Install the Front Housing

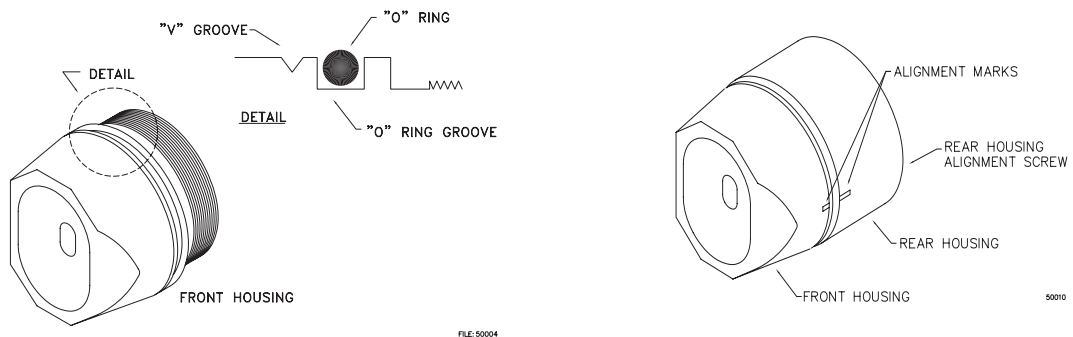
IMPORTANT: The front and rear housing threads and O-ring are shipped prelubricated. This lubrication is required. It insures the ease of assembly and future disassembly. It also increases the water resistance of the unit. Should the lubrication become inadvertently contaminated (dirt, etc.) or removed, the lubrication replacement procedure in the Maintenance section of this manual must be followed.

1. Engage the threads of the front and rear housings.

It is often helpful to rotate the front cover backwards (counterclockwise) one to two turns. This will assist in locating the threads prior to tightening the front housing into the rear housing. While rotating the front housing counterclockwise and applying slight rearward pressure, a slight “click” can be heard. The “click” is a useful indication that the front and rear housings are aligned and can be tightened together.

2. Tighten the front and rear housings BY HAND. Turn the front housing into the rear housing by turning it clockwise. If necessary, the rear housing can be held in correct orientation by placing a 1 1/4 inch open end wrench over the rear mounting hex shaped conduit entrance while tightening the front housing.

WARNING: Do not over tighten the front and rear housings. Do not use a wrench or other mechanical device to tighten the housings. Over tightening may damage the threads and or prevent the unit from operating.



3. After five (5) complete turns, the O-ring will begin to engage the rear housing.

Take note of the alignment “V” groove located on the front housing and alignment marks on both the front and rear housings.

When the O-ring disappears and the rear-most side of the alignment “V” groove has disappeared below the leading edge of the rear housing, the front cover is adequately engaged to insure an explosion-proof and water resistant junction. It also indicates that the spring-loaded lamp contacts are engaging the top PC board.

4. Continue to rotate the front housing until all the alignment marks on the front and rear housings are aligned. When both alignment marks are aligned, the rear housing alignment screw must be fully seated to insure a water resistant seal.

WARNING: The alignment screw must be fully seated to insure proper operation and flame detection protection. Neglecting to fully seat the alignment screw may cause moisture to accumulate in the flame detector, and can cause the housing to no longer be explosion-proof.

12. Apply Power

! WARNING: Verify that there are NO combustible gases present before power to the flame detector is turned on.

Power can be applied for the first time, when the rear housing has been properly mounted, wired, tested, and the electronics module is in place and the front housing sufficiently tightened onto and aligned with the rear housing.

! WARNING: DO NOT TOUCH any part of the electronics module when power is on. Voltages in excess of 300 volts DC are present on the electronics module.

Warm-up

On power up, the detector goes through a “warm-up” sequence. Initially, the green, yellow, and red LEDs are activated for 1 second each. Then the green LED flashes for the remainder of the warm-up period, approximately 3 minutes.

When the green LED changes to a steady ON condition, the detector is in normal operation.

Automatic Self-Check (ASC)

Ten seconds after warm-up is complete, and every 10 seconds thereafter, the green LED will remain “ON” and the detector will enter the Automatic Self-Check (ASC) mode. The test lamp is activated, and the electronic circuits are checked. Please note that the test lamp signal is not visible to the naked eye during this test.

A single green LED displayed at the end of the ASC indicates a “pass” condition.

A yellow LED indicates a fault (malfunction) condition.

If the flame detector signals a malfunction, check to make sure that the front and rear housings are sufficiently engaged and that the aligning notches and aligning screw is in position.

Additional troubleshooting instructions can be found in the Troubleshooting Section of this manual.

13. Perform Final Operational Checkout

Once the flame detector has entered normal operation, a final comprehensive output test of all detector inputs and outputs can be performed. The test exercises all outputs, including ALARM and DELAYED ALARM states to verify installation wiring.

WARNING: Do not execute the flame detector output test until all equipment connected to the detector is properly configured to receive (and possibly ignore) alarm signals from the detector. Failure to do so may result in an unnecessary release of fire extinguishant or unnecessary dispatching of emergency personnel.

Tools Required

- A source of UV/IR radiation such as the Model FT194 Flame Detector Test Lamp, sold separately.
- Or if the protected area is known to be non-hazardous (meaning no flammable gases present), you can use a suitable flame.

Checklist

Prior to starting the final operational checkout verify the following:

- Inhibit external devices such as suppression systems which you do not want activated.
- You have verified that the wiring is correct.
- You have verified that the power supply is properly connected. If the DC voltage at the power terminal block inside the detector is less than 20.0 VDC, the detector will report a Power Fault.
- Verify the flame detector is properly mounted and installed. Verify the conduit/cable gland entries are pointed downward.
- Verify the flame detector's field of view covers the intended area for protection

Fault Test

The Automatic Self-Check occurs when a source of flame radiation inside the front housing is activated. This invisible test "light" shines through a tiny hole in the front cover, just in front of the viewing window, and through the window onto the sensor elements.

To simulate a dirty lens fault, place your finger or a piece of opaque tape over the tiny hole in the front cover, located just in front and towards the top of the viewing window.

The Automatic Self-Check is performed every 10 seconds and the detector allows another 10 seconds to complete the check. The detector will go into Fault mode within 20 seconds and the following will occur:

- Yellow LED will illuminate
- 0-20 mA Loop output changes to 2 mA
- Fault relay toggles "Open on Fault" and "Closed on Fault"

At the conclusion of the Fault Test, remove any tape from the tiny hole in the front cover and once the Automatic Self-Check turns on, the detector will return to normal operation.

Alarm and Delayed Alarm Test

To simulate an alarm condition, activate the flame detector test equipment within its field of view for at least 3 or 6 seconds, depending on the time delay settings on the detector. When flame radiation is detected, the following will occur:

1. Red LED will illuminate to signal an Alarm (Pre-Alarm)
2. 0-20 mA Loop output changes to 12 mA
3. Alarm relay toggles between “Open on Alarm” and “Closed on Alarm”
4. When the detector continues to detect the fire after the time delay (3 or 6 seconds), the detector will signal the Delayed Alarm
5. 0-20 mA Loop output changes to 20 mA
6. Delayed Alarm relay toggles between “Open on Alarm” and “Closed on Alarm”
7. If the flame detector is set to NON-LATCHING, when the flame detector test equipment has been turned off then the detector will automatically reset to normal operation.

Reset Test

If the Delayed Alarm is set for LATCHING operation, the alarm condition will remain upon completion of the Alarm and Delayed Alarm Test.

Activate the detector’s RESET input to return the detector to normal operation. Or you may momentarily interrupt the power to the flame detector. The following will occur upon RESET:

- Red LED will turn OFF; only green LED remains illuminated
- 0-20 mA Loop output changes to 4 mA
- Delayed Alarm relay resets and returns to normal

14. Install Accessories

At this time the flame detector is fully functional. Install any accessories at this time, if available.

ROUTINE OPERATION

The Model F120 Triple-Mode UV/IR Flame Detector is designed to monitor for the presence of flame(s) 24 hours a day, 7 days a week with no regular intervention required.

LED Indicator

Located inside the flame detector's viewing window are 3 colored LED indicators:

- POWER - Green LED
- Alarm / Delayed Alarm - Red LED
- FAULT - Yellow LED

Normal Operation

The POWER LED indicator illuminates a green light indicating normal operation of the flame detector.

Under normal operation, all relay contacts are in the normal, non-alarm and non-fault condition, and the detector will transmit a 4.0 mA signal to any connected external equipment.

Alarm and Delayed Alarm Mode

The red LED indicator is activated when the detector reports an Alarm condition. The red LED indicator will remain on when the detector has confirmed the fire activating the Delayed Alarm and contact relays.

When a fire or flame has been detected, the detector will transmit a 20 mA signal and the Delayed Alarm contacts are activated.

The red LED indicator turns off when the detector no longer sees a fire and resets the detector to normal operation.

If the Delayed Alarm is set to LATCHING, the red LED will remain on and the contact relays will remain engaged until the detector is manually reset.

! IMPORTANT: If the red LED alarm indicator does not turn off when the fire has been extinguished or is no longer present, the detector has been configured with a latching Delayed Alarm. The detector has to be manually reset to return to normal operation.

System Fault

The flame detector is designed to continually monitor its own operation and to alert personnel when it is not functioning properly. This condition is reported as a FAULT. When a fault condition is active, the following occur:

- The yellow FAULT LED indicator turns on (if failure is not due to power source failing)
- The 0-20 mA signal to external equipment decreases to 2.0 mA or 0.0 mA
- The fault relay contact to external equipment changes state

The yellow FAULT LED indicator will remain on until the fault is resolved.

The FAULT may indicate a dirty lens or debris has accumulated on the lens. It may also indicate the Automatic Self-Check has become inoperable or the electronics module needs repair or replacement.

! WARNING: While in FAULT mode the flame detector may not be able to report an alarm condition. The source of fault condition should be corrected as soon as possible for safety reasons.

MAINTENANCE

Factory Recommended Maintenance

The flame detector has been designed with very little to no required maintenance. Depending on your application and safety guidelines in your facility, additional maintenance may be necessary to ensure the installed equipment are functioning properly.

Periodic maintenance should be performed per the manufacturer's recommendations and instructions. Factory recommended regular maintenance schedule is as follows:

- Monthly Operation Test
- Quarterly Lens Cleaning
- Annual Verification

Maintenance intervals should be independently established through a documented procedure such as a maintenance log maintained by plant/safety personnel or third party testing services.

Monthly Operation Test

We recommend that a short performance test be performed at least every 30 days to verify that your flame detector is operational. Even though the flame detector has a number of built-in self checks, there can be cases where these checks cannot properly report a malfunction in the detector.

Each flame detector should be tested with a source of UV and IR radiation on a periodic basis to generate a test alarm.

Tools Required

Safety Systems Technology has specifically designed a portable flame detector test lamp to test its flame detectors.



| SST Part # | Description |
|------------|---|
| 194-1 | Model FT194 Flame Detector Test Lamp with rechargeable batteries and 120 volt battery charger, carrying case included |
| 194-2 | Model FT194 Flame Detector Test Lamp with standard "D" cell batteries, carrying case included |
| 194-3 | Model FT194 Flame Detector Test Lamp with rechargeable batteries and 240 volt battery charger, carrying case included |

! WARNING: The Model FT194 Flame Detector Test Lamp is not rated for use in hazardous locations. De-classify the area to reduce the risk of ignition of hazardous atmosphere. DO NOT use the test lamp where combustible and flammable gases are present.

Quarterly Lens Cleaning

! WARNING: NEVER clean the sensor window with Windex or other commercial glass cleaners. These often contain silicone or other UV inhibitors that will prevent the sensor from detecting a fire. Only use water or alcohol to wipe the lens clean. The viewing window is not glass. The viewing window material is sapphire.

Cleaning the outside surface of the viewing lens of any accumulated dust, dirt, film or debris will insure trouble free operation.

A clean, soft, lint-free cloth, tissue (lotion-free) or cotton swab should be used.

1. Wet the viewing window with water or alcohol.
2. Rub with a clean and dry cloth until the window is free of dirt, dust, or debris.
3. Let the viewing window dry completely.
4. Also check the small hole located just in front of the lens towards the top part. Remove any dirt, dust or debris that may have accumulated in this part. The small hole houses the Automatic Self-Check test source lamp.

Cleaning the lens once every 3 months will be sufficient in most cases. However, if the detector is located in a dirty area, a shorter period between cleanings may be necessary to eliminate faults due to a dirty lens.

Front and Rear Thread Lubrication

Should contamination to the existing lubricant occurs during installation or inspection, replace with a high performance, high temperature, Molybdenum and Graphite grease. MOLYPLATE® and MOLYGRAPH® are two readily available greases that meet the requirements.

O-Ring Lubrication

The front housing O-ring may require additional lubrication when disassembling the detector housing. A multipurpose synthetic lubricant with Teflon, such as SUPER LUBE by Permatex Industrial should be utilized. Petroleum jelly should not be used as lubricant. While it will not attack the Viton O-ring, it does not provide the same lasting protection available with synthetic Teflon based lubricants.

Annual Verification

Factory recommends a system verification should be performed at least annually to verify wiring, terminal connections and stability of mounting for all integral safety equipment including but not limited to:

- Power supplies
- Field detection devices
- Control modules
- Audible and visual alarm devices
- Installed accessories

MONTHLY OPERATING TEST INSTRUCTIONS

! WARNING: The Model FT194 Flame Detector Test Lamp is not rated for use in hazardous locations. De-classify the area to reduce the risk of ignition of hazardous atmosphere. DO NOT use the test lamp where combustible and flammable gases are present.

The Model FT194 Flame Detector Test Lamp is specifically designed portable sources of ultraviolet and infrared radiation for testing UV/IR flame detectors. The test lamp emits a wide band of UV radiation which includes the region of 1850 to 2450 Angstrom, corresponding to the response of the UV sensor of the detector. In addition to the UV radiation, the test lamp pulsates an IR radiation at a slow rate to simulate the “flicker” of a real fire.

The Model FT194 is a specially designed test lamp which consists of a highly specialized sapphire lens. The sapphire lens allows transmission of the ultraviolet (UV) and infrared (IR) radiation. This lens is extremely expensive and must never be replaced with a standard glass or plastic lens. Always handle the test lamp with extreme caution to prevent damage to the special lens. Store the test lamp in the provided carrying case when not in use.

Factory Recommended Test Schedule

Factory recommends testing the flame detectors on a monthly basis to ensure proper operation.

When to Test the Flame Detector

The following lists when to test the flame detector:

- After initial installation
- Every 30 days after the last operational test
- After a FAULT has been resolved
- After cleaning the lens
- In areas where severe lightning storms occur, it is recommended to test the flame detectors after a severe lightning storm

! NOTE: The Monthly Operational Test can be performed by one person. No manual adjustments are required for testing.

Tools Required

Safety Systems Technology has specifically designed a portable flame detector test lamp to test its flame detectors.



| SST Part # | Description |
|------------|---|
| 194-1 | Model FT194 Flame Detector Test Lamp with rechargeable batteries and 120 volt battery charger, carrying case included |
| 194-2 | Model FT194 Flame Detector Test Lamp with standard "D" cell batteries, carrying case included |
| 194-3 | Model FT194 Flame Detector Test Lamp with rechargeable batteries and 240 volt battery charger, carrying case included |

WARNING: The Model FT194 Flame Detector Test Lamp is not rated for use in hazardous locations. De-classify the area to reduce the risk of ignition of hazardous atmosphere. DO NOT use the test lamp where combustible and flammable gases are present.

Step-by-step Test Procedure

WARNING: DO NOT look directly into the test lamp while it is on. Never point the test lamp at another person while it is on. When operating the flame detector test lamp, shortwave ultraviolet radiation is emitted which can damage your eyesight.

1. To test a flame detector, position the flame detector test lamp within 5 feet (1.5 meters) from the flame detector and directly within its field of view.
2. While aiming directly at the detector, PRESS and HOLD the test lamp switch. The response of the detector will depend on the distance between the detector and the test lamp.
3. Once the detector has detected the UV and IR radiation from the test lamp, the red LED will illuminate which can be seen from the viewing window of the detector.
4. Depress the test lamp switch once detector's red LED is turned on.

For flame detectors with the Delayed Alarm set to NON-LATCHING, the detector will automatically reset and the red LED will turn off.

For flame detectors with the Delayed Alarm set to LATCHING, the detector will have to be manually reset to return to normal operation.

This concludes your test and you have confirmed the detector is operating normally.

Failed or Incomplete Test

When testing the flame detector, make sure to account for the time delay settings of the detector. The flame detector has a factory default time delay setting of 3 seconds and a user selectable setting of 6 seconds. During this time, the flame detector confirms the presence of radiation emitted by the fire before reporting an alarm condition.

The response time of the detector will depend on the distance between the detector and the test lamp.

Causes of Failed or Incomplete Tests

If the flame detector does not respond to the test lamp, check the following:

1. Confirm the flame detector has power.

A green LED indicator is illuminated on the viewing window of the detector to indicate it is powered and operating.

2. Verify the test lamp is working.

While the unit is off, check that there are no dust, debris, finger marks, or any type of oily residue on the lens. Clean the lens using a clean, soft, lint-free, tissue (lotion-free), or cotton swab with water or alcohol. DO NOT use Windex or any commercial glass cleaners.

3. Confirm the test lamp has power.

Point the test lamp on the floor or a wall while pressing and HOLDING the power switch. DO NOT look directly on the lens of the test lamp while it is on. The test lamp should light up and "flicker." Reduced intensity may indicate the batteries are low. Recharge the batteries or replace them if using a disposable type.

4. Make sure the test lamp is within 5 feet (1.5 meters) from the flame detector and pointed directly at the viewing window of the detector.

The test lamp must be within the detector's field of view. Move closer to the flame detector and repeat the test.

5. Make sure you press and HOLD the power switch while pointing the test lamp directly into the viewing window of the detector for at least 10 seconds or until the red LED comes on.
6. SEE "Troubleshooting" section of this manual if the flame detector doesn't respond to the test lamp.

CHANGING THE DETECTION MODE

The Model F120 is a highly versatile flame detector that provides multiple modes of operation. The end-user has the capability to change the mode of operation of the detector based on their protection needs and/or reduce susceptibility to false alarm sources.

Detection Modes

Triple Mode UV/IR

This mode utilizes three sensors to detect a fire, one solar-blind UV sensor and two IR sensors. The detector takes advantage of the use of these three sensors to confirm a fire and reduce false alarms and it will not be blinded by dense smoke which makes this detector superior to other brands in the market today. It is suitable for both indoor and outdoor use and offers increased false-alarm immunity over a UV detector.

UV Mode

This mode utilizes the solar-blind UV sensor only. It is ideal for use indoors and in areas not susceptible to sources of false alarms. This mode provides the shortest response rate as it will detect UV radiation instantaneously.

Dual IR Mode

This mode utilizes the two IR sensors within the detector. The two IR sensors specifically detects the IR flicker of a flame and the spike in Temperature in the Hydrocarbon CO₂ band. This combination provides a flame detector which is highly immune to false alarms.

IR Mode

This mode utilizes an IR sensor to monitor for the flicker generated by a flame. It permits the detector to ignore steady state IR sources such as hot objects.

Tools Required

The following are required to change the detection mode of the detector:

- 4 mm hex wrench to unlock the locking screw of the detector

Steps to Change the Detection Mode

! WARNING: Access to the interior of the flame detector or removal of the electronics module must only be conducted by trained personnel.

! WARNING: De-classify the area to reduce the risk of ignition of hazardous atmosphere. Combustible and flammable gases and vapors are very dangerous. Extreme caution should be taken when these hazards are present.

Disassemble the Detector

1. De-classify the area. Power to the detector can be left on.
2. Use a 4 mm hex wrench to loosen the locking screw on the rear of the detector housing
3. Unscrew the front housing from the rear housing. Avoid touching the threads of the front and rear housing. The threads are lubricated. Prevent any contamination (dirt, etc.) or removal of the lubrication.
4. Remove the electronics module from the rear terminal blocks by gently rocking the board side-to-side. Place a finger under the top PC board and place another finger under the edge of this board on the opposite side. Gently rock the board side-to-side while pulling in order to disengage the module from the rear housing.

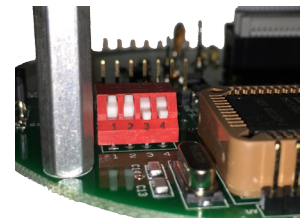
! WARNING: Do not allow dirt or finger marks to get onto the face of the UV or IR sensors located on the top of the electronics module.

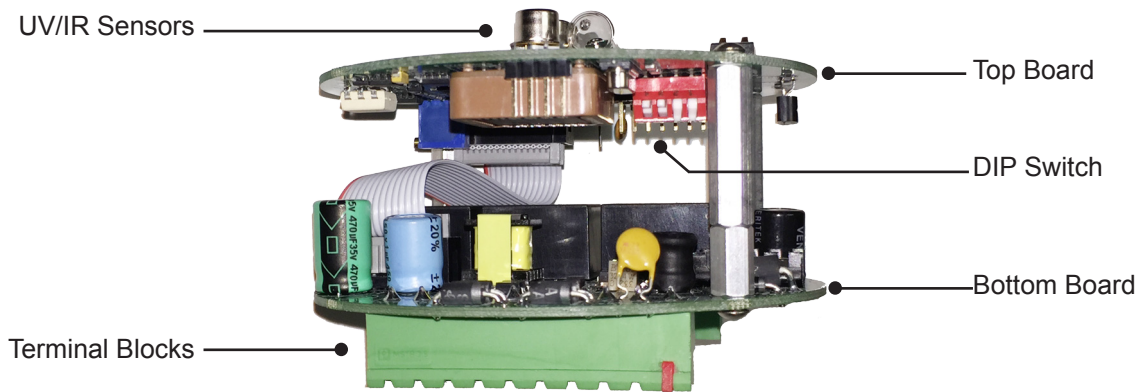
Locate the DIP Switch

The DIP Switch is located on the underside of the upper board in the electronics module. Turn the electronics module upside down to easily view the switch, being careful not to disturb the 3 sensors. Switches #1 and #2 sets the operational mode of the detector.

There are four switch sections; these are identified by the numbers 1 through 4 marked on the printed circuit board next to the switch.

The units are manufactured with switches that have the operating mechanism on the side of the switch, as shown in the picture. With this type of switch, which can be set in the UP or DOWN position, use the instructions below to set the switches.





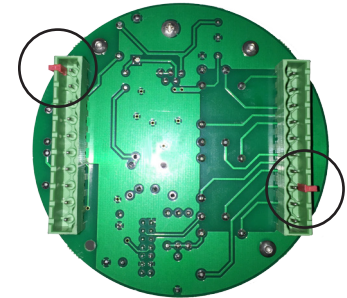
Changing the Detection Mode

5. To change the detection mode of the flame detector, follow the table below to adjust the DIP Switch settings. Please note that the factory default setting for the flame detector is set to Triple-mode.

| Switch # 1 | Switch # 2 | Description |
|------------|------------|---|
| UP | UP | Triple-mode UV/IR detection, voted any two out of three sensors (Default Setting) |
| UP | DOWN | UV Only |
| DOWN | DOWN | Dual IR (IR/IR) |
| DOWN | UP | IR Flicker Only |

6. Connect polarized terminal blocks.

The mating terminal blocks of the electronics module and the rear housing each have protective (RED) polarizing keys. This key is used to protect against improper mating of the terminal blocks.



CAUTION: The RED key of the Electronics Module WILL NOT FIT over the Red Key of the rear housing connector. Orient the electronics module so that the Red Keys are NOT aligned. Do not force the electronics module or damage may occur to the terminal blocks.

7. Plug the electronics module.
8. Secure the electronics module in place by placing a thumb over each screw head on the top PC board of the electronics module and gently push the electronics module in place. Make sure the module is firmly secured on the rear housing terminal blocks.

IMPORTANT: The front and rear housing threads and O-ring are lubricated. This lubrication is required. It insures the ease of assembly and future disassembly. It also increases the water resistance of the unit. Should the lubrication become inadvertently contaminated (dirt, etc.) or removed, the lubrication replacement procedure in the Maintenance section of this manual must be followed.

9. Engage the threads of the front and rear housings.

It is often helpful to rotate the front cover backwards (counterclockwise) one to two turns. This will assist in locating the threads prior to tightening the front housing into the rear housing. While rotating the front housing counterclockwise and applying slight rearward pressure, a slight “click” can be heard. The “click” is a useful indication that the front and rear housings are aligned and can be tightened together.

10. Tighten the front and rear housings BY HAND. Turn the front housing into the rear housing by turning it clockwise. If necessary, the rear housing can be held in correct orientation by placing a 1 1/4 inch open end wrench over the rear mounting hex shaped conduit entrance while tightening the front housing.

WARNING: Do not over tighten the front and rear housings. Do not use a wrench or other mechanical device to tighten the housings. Over tightening may damage the threads and or prevent the unit from operating.

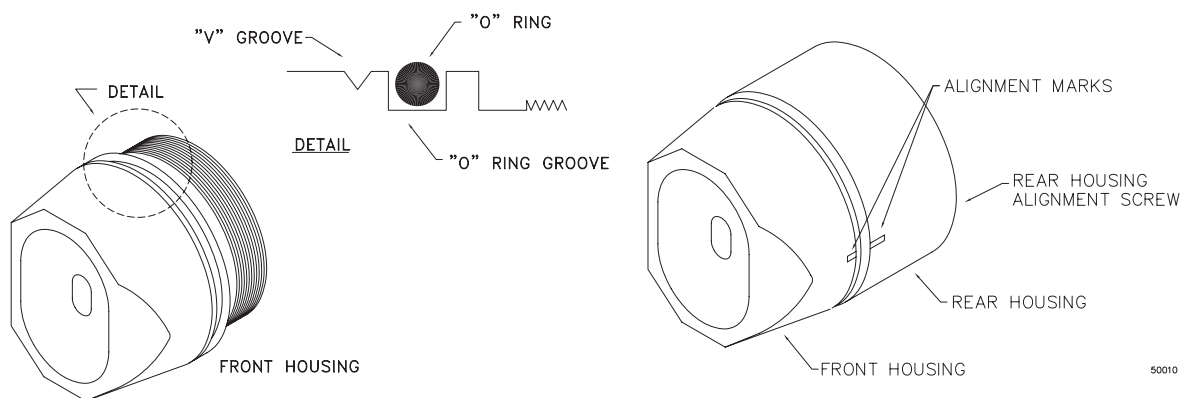
11. After five (5) complete turns, the O-ring will begin to engage the rear housing.

Take note of the alignment “V” groove located on the front housing and alignment marks on both the front and rear housings.

When the O-ring disappears and the rear-most side of the alignment “V” groove has disappeared below the leading edge of the rear housing, the front cover is adequately engaged to insure an explosion-proof and water resistant junction. It also indicates that the spring-loaded lamp contacts are engaging the top PC board.

12. Continue to rotate the front housing until all the alignment marks on the front and rear housings are aligned. When both alignment marks are aligned, the rear housing alignment screw must be fully seated to insure a water resistant seal.

WARNING: The alignment screw must be fully seated to insure proper operation and flame detection protection. Neglecting to fully seat the alignment screw may cause moisture to accumulate in the flame detector, and can cause the housing to no longer be explosion-proof.



REPLACING THE ELECTRONIC MODULE

! WARNING: Access to the interior of the flame detector or removal of the electronic module must only be conducted by trained personnel.

! WARNING: De-classify the area to reduce the risk of ignition of hazardous atmosphere. Combustible and flammable gases and vapors are very dangerous. Extreme caution should be taken when these hazards are present.

The flame detector's electronics module is located within the detector housing. The UV and two IR sensors are installed on the top board of the electronics module. If any of the sensors are damaged or non-functional, the entire electronics module must be replaced. Tampering with the sensors or the electronics module will invalidate the warranty.

Contact the factory to order a new replacement module for the flame detector.

Ordering Information

| SST Part # | Description |
|------------|--|
| 40120-12 | Replacement plug-in UV/IR electronics module |

! NOTE: Replacement electronics module is shipped with factory default settings. Confirm the current settings on your existing electronics module prior to replacement.

Tools Required to Replace the Electronic Module

The following are required to replace the electronic module:

- "4 mm" hex wrench to unlock the set screw on the housing

Steps to Replace the Electronic Module

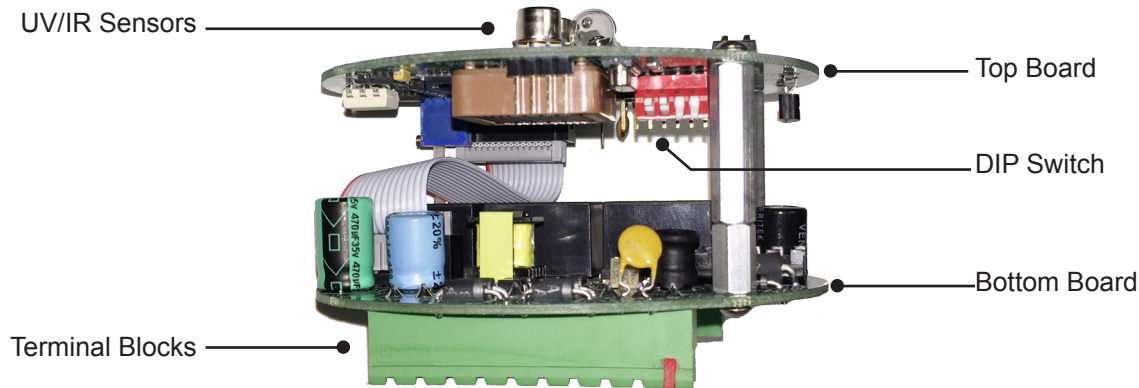
Disassemble the Detector

1. De-classify the area. Power to the detector can be left on.
2. Use a 4 mm hex wrench to loosen the locking screw on the rear of the detector housing
3. Unscrew the front housing from the rear housing. Avoid touching the threads of the front and rear housing. The threads are lubricated. Prevent any contamination (dirt, etc.) or removal of the lubrication.
4. Remove the electronics module from the rear terminal blocks by gently rocking the board side-to-side. Place a finger under the top PC board and place another finger under the edge of this board on the opposite side. Gently rock the board side-to-side while pulling in order to disengage the module from the rear housing.

! WARNING: Do not allow dirt or finger marks to get onto the face of the UV or IR sensors located on the top of the electronics module.

Modify the Settings on the New Module

5. Confirm the settings from the old electronics module and copy the settings on the new electronics module.

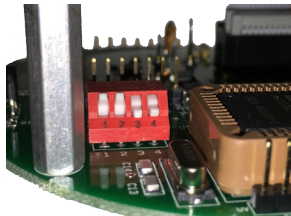


Locate the DIP Switch

6. The DIP Switch is located on the underside of the upper board in the electronics module. Turn the electronics module upside down to easily view the switch, being careful not to disturb the 3 sensors. Switches #1 and #2 sets the operational mode of the detector.

There are four switch sections; these are identified by the numbers 1 through 4 marked on the printed circuit board next to the switch.

The units are manufactured with switches that have the operating mechanism on the side of the switch, as shown in the picture. With this type of switch, which can be set in the UP or DOWN position, use the instructions below to set the switches.



Default Setting

The factory default setting for the flame detector's operational mode is "Triple-mode" - the one UV sensor and two IR sensors are activated and for the detector to signal an Alarm condition, the detector uses a voting logic where a minimum of two out of the three sensors reports a fire.

Confirm that the Default Setting for the flame detector is set to Triple-mode. The UP position means that the switch is moved to the upper position, farthest from the printed circuit board. The DOWN position means that the switch is moved to the lower position or closest to the printed circuit board.

| Switch # 1 | Switch # 2 | Description |
|------------|------------|---|
| UP | UP | Triple-mode UV/IR detection, voted any two out of three sensors |

Changing the Detection Mode

7. To change the detection mode of the flame detector, follow the table below to adjust the DIP Switch settings. Please note that the factory default setting for the flame detector is set to Triple-mode.

| Switch # 1 | Switch # 2 | Description |
|------------|------------|---|
| UP | UP | Triple-mode UV/IR detection, voted any two out of three sensors (Default Setting) |
| UP | DOWN | UV Only |
| DOWN | DOWN | Dual IR (IR/IR) |
| DOWN | UP | IR Flicker Only |

Time Delay for the Delayed Alarm Output

The Model F120's standard configuration requires at least two of its three sensors to be activated to signal an alarm. When flame radiation is initially detected, the Alarm outputs, both relay contact and current loop, are instantly activated. A red LED alarm light behind the viewing window in the detector is also activated.

The detector has a default Delayed Alarm setting of 3 seconds to confirm a flame has been detected. Should this flame persist for this period of time, the Delayed Alarm output (relay and current loop) will be activated. The Delayed Alarm setting can also be changed from 3 seconds to 6 seconds to provide a rapid response time.

Default Setting

The factory default setting for the Time Delay for the Delayed Alarm Output is 3 seconds.

| Switch # 3 | Description |
|------------|-------------------------------------|
| DOWN | Sets the Delayed Alarm at 3 seconds |

Changing the Time Delay for the Delayed Alarm Output

8. To change the Time Delay for the Delayed Alarm Output, follow the table below to adjust the DIP Switch settings.

| Switch # 3 | Description |
|------------|---|
| DOWN | Sets the Delayed Alarm at 3 seconds (Default Setting) |
| UP | Sets the Delayed Alarm at 6 seconds |

Latching Mode for the Delayed Alarm

The flame detector's Delayed Alarm latching mode can be set as non-latching or latching.

Default Setting

The factory default setting for the Delayed Alarm is NON-LATCHING. This means that when the detector no longer detects any fire, the Delayed Alarm contacts will reset automatically.

| Switch # 4 | Description |
|------------|--|
| DOWN | Sets the Delayed Alarm to NON-LATCHING. The Delayed Alarm contacts will reset automatically when the flame detector no longer sees any fire. |

Changing the Latching Mode for the Delayed Alarm

9. To change the Latching Mode for the Delayed Alarm contacts, follow the table below to adjust the DIP Switch settings.

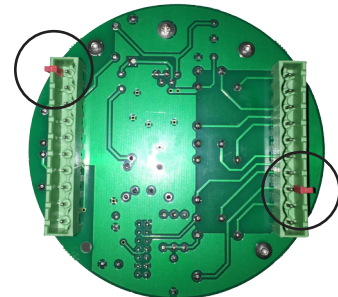
| Switch # 4 | Description |
|------------|--|
| DOWN | Sets the Delayed Alarm to NON-LATCHING. The Delayed Alarm contacts will reset automatically when the flame detector no longer sees any fire. (Default Setting) |
| UP | Sets the Delayed Alarm to LATCHING. In this mode, you must activate the manual reset input on the flame detector to clear the alarm. |

If setting the Delayed Alarm contacts to LATCHING, make sure to install a RESET button (not provided) to allow for the manual reset of the detector to clear the alarm. Terminal # 4 has been provided to wire a RESET button to the detector.

Install the New Electronics Module

10. Check the position of all wires on the terminal blocks inside the rear housing. Make sure that all wires to the terminal blocks are properly secured so that they do not interfere when the plug-in module is inserted. The wires must not protrude upward, above the terminal blocks.
11. Connect polarized terminal blocks.

The mating terminal blocks of the electronics module and the rear housing each have protective (RED) polarizing keys. This key is used to protect against improper mating of the terminal blocks.



CAUTION: The RED key of the Electronics Module WILL NOT FIT over the Red Key of the rear housing connector. Orient the electronics module so that the Red Keys are NOT aligned. Do not force the electronics module or damage may occur to the terminal blocks.

12. Plug the new electronics module.
13. Secure the electronics module in place by placing a thumb over each screw head on the top PC board of the electronics module and gently push the electronics module in place. Make sure the module is firmly secured on the rear housing terminal blocks.

Install the Front Housing

IMPORTANT: The front and rear housing threads and O-ring are shipped prelubricated. This lubrication is required. It insures the ease of assembly and future disassembly. It also increases the water resistance of the unit. Should the lubrication become inadvertently contaminated (dirt, etc.) or removed, the lubrication replacement procedure in the Maintenance section of this manual must be followed.

14. Engage the threads of the front and rear housings.

It is often helpful to rotate the front cover backwards (counterclockwise) one to two turns. This will assist in locating the threads prior to tightening the front housing into the rear housing. While rotating the front housing counterclockwise and applying slight rearward pressure, a slight “click” can be heard. The “click” is a useful indication that the front and rear housings are aligned and can be tightened together.

15. Tighten the front and rear housings BY HAND. Turn the front housing into the rear housing by turning it clockwise. If necessary, the rear housing can be held in correct orientation by placing a 1 1/4 inch open end wrench over the rear mounting hex shaped conduit entrance while tightening the front housing.

WARNING: Do not over tighten the front and rear housings. Do not use a wrench or other mechanical device to tighten the housings. Over tightening may damage the threads and or prevent the unit from operating.

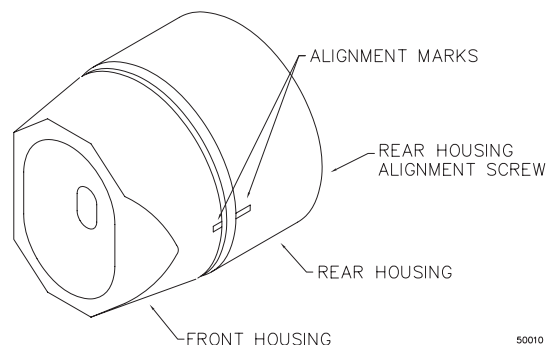
16. After five (5) complete turns, the O-ring will begin to engage the rear housing.

Take note of the alignment “V” groove located on the front housing and alignment marks on both the front and rear housings.

When the O-ring disappears and the rear-most side of the alignment “V” groove has disappeared below the leading edge of the rear housing, the front cover is adequately engaged to insure an explosion-proof and water resistant junction. It also indicates that the spring-loaded lamp contacts are engaging the top PC board.

17. Continue to rotate the front housing until all the alignment marks on the front and rear housings are aligned. When both alignment marks are aligned, the rear housing alignment screw must be fully seated to insure a water resistant seal.

WARNING: The alignment screw must be fully seated to insure proper operation and flame detection protection. Neglecting to fully seat the alignment screw may cause moisture to accumulate in the flame detector, and can cause the housing to no longer be explosion-proof.



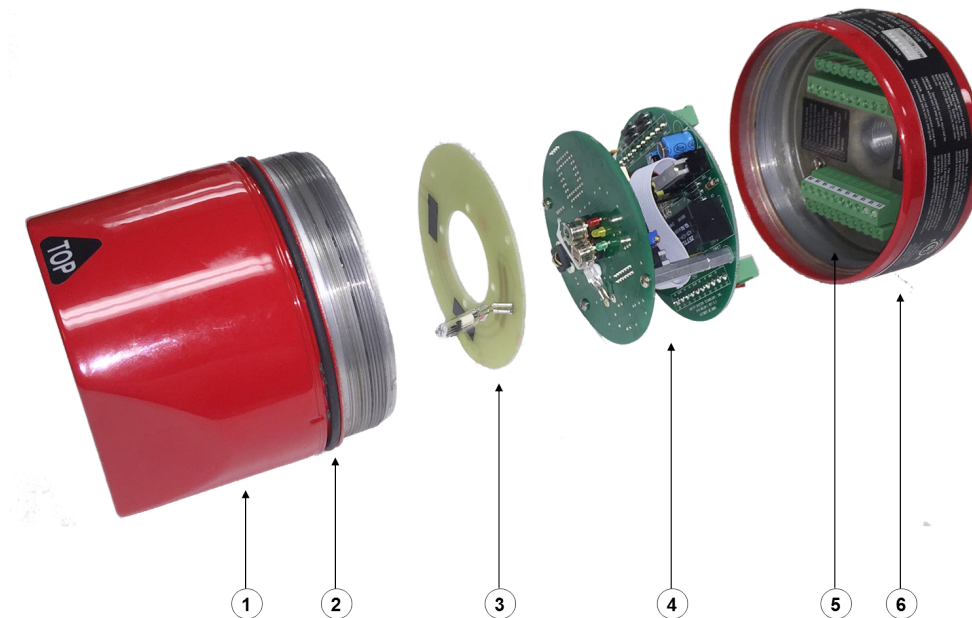
REPLACING THE SELF-TEST LAMP

! WARNING: Access to the interior of the flame detector or removal of the electronic module must only be conducted by trained personnel.

! WARNING: De-classify the area to reduce the risk of ignition of hazardous atmosphere. Combustible and flammable gases and vapors are very dangerous. Extreme caution should be taken when these hazards are present.

The flame detector's self-test lamp is located within the front detector housing. The self-test lamp is installed on the electronics board that is attached on the front housing. If the self-test lamp is damaged or non-functional, the entire self-test lamp electronics module must be replaced.

Contact the factory to order a new replacement self-test lamp and electronics board for the flame detector.



- (1) Front Housing
- (2) Viton O-Ring Seal
- (3) Self-Test Lamp and Electronics Board
- (4) Plug-in Electronics Module
- (5) Terminal Blocks
- (6) Rear Housing

Ordering Information

| SST Part # | Description |
|------------|--|
| 40110-21 | Replacement self-test lamp with ring-type PC board |

IMPORTANT: Never touch the lamp with your fingers. Use caution when handling the replacement self-test lamp. Do not touch or bend the test lamp.

Tools Required to Replace the Electronic Module

The following are required to replace the electronic module:

- “4 mm” hex wrench to unlock the set screw on the housing

Steps to Replace the Self-Test Lamp Electronic Module

Disassemble the Detector

1. De-classify the area. Power to the detector can be left on.
2. Use a 4 mm hex wrench to loosen the locking screw on the rear of the detector housing
3. Unscrew the front housing from the rear housing. Avoid touching the threads of the front and rear housing. The threads are lubricated. Prevent any contamination (dirt, etc.) or removal of the lubrication.
4. Set aside the rear housing with the electronics module still attached.

WARNING: Do not allow dirt or finger marks to get onto the face of the UV or IR sensors located on the top of the electronics module.

Remove the Existing Self-Test Lamp Electronics Board

5. Inside the front housing, the self-test lamp electronics module can be seen attached with four screws.
6. Unscrew the four screws and gently remove the self-test lamp electronics board from the front housing.



Install the New Self-Test Lamp Electronics Board

7. Handle the new self-test lamp electronics board gently by holding it around the electronics board. DO NOT touch the test lamp with your bare fingers.
8. Position the test lamp into the orifice of the front housing and gently insert. The four screw holes on the electronics board should match with the holes on the front housing.
9. Secure the electronics board in place by using the four new screws supplied and attach the electronics board on the front housing. Use a small phillips screwdriver and hand tighten only. DO NOT use any power tools as it may damage the electronics board and the housing.

Install the Front Housing

IMPORTANT: The front and rear housing threads and O-ring are shipped prelubricated. This lubrication is required. It insures the ease of assembly and future disassembly. It also increases the water resistance of the unit. Should the lubrication become inadvertently contaminated (dirt, etc.) or removed, the lubrication replacement procedure in the Maintenance section of this manual must be followed.

10. Engage the threads of the front and rear housings.

It is often helpful to rotate the front cover backwards (counterclockwise) one to two turns. This will assist in locating the threads prior to tightening the front housing into the rear housing. While rotating the front housing counterclockwise and applying slight rearward pressure, a slight “click” can be heard. The “click” is a useful indication that the front and rear housings are aligned and can be tightened together.

11. Tighten the front and rear housings BY HAND. Turn the front housing into the rear housing by turning it clockwise. If necessary, the rear housing can be held in correct orientation by placing a 1 1/4 inch open end wrench over the rear mounting hex shaped conduit entrance while tightening the front housing.

WARNING: Do not over tighten the front and rear housings. Do not use a wrench or other mechanical device to tighten the housings. Over tightening may damage the threads and or prevent the unit from operating.

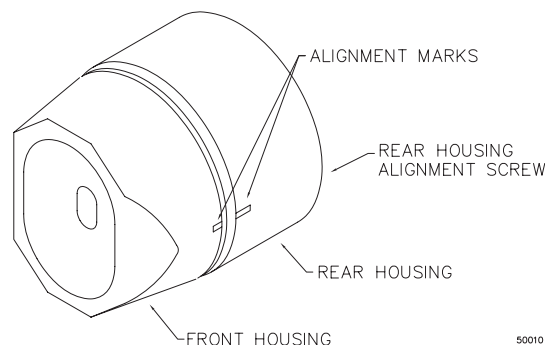
12. After five (5) complete turns, the O-ring will begin to engage the rear housing.

Take note of the alignment “V” groove located on the front housing and alignment marks on both the front and rear housings.

When the O-ring disappears and the rear-most side of the alignment “V” groove has disappeared below the leading edge of the rear housing, the front cover is adequately engaged to insure an explosion-proof and water resistant junction. It also indicates that the spring-loaded lamp contacts are engaging the top PC board.

13. Continue to rotate the front housing until all the alignment marks on the front and rear housings are aligned. When both alignment marks are aligned, the rear housing alignment screw must be fully seated to insure a water resistant seal.

WARNING: The alignment screw must be fully seated to insure proper operation and flame detection protection. Neglecting to fully seat the alignment screw may cause moisture to accumulate in the flame detector, and can cause the housing to no longer be explosion-proof.



REPLACING THE SENSOR

The UV and two IR sensors are installed on the top board of the electronics module. If any of the sensors are damaged or non-functional, the entire electronics module must be sent to the factory for repairs or replacement.

! WARNING: Do not tamper or in any way disassemble the sensors from the electronics module. Dispose sensors and electronic modules in an environmentally safe manner. Disposal should be according to local waste management requirements and environmental guidelines or legislation. You may return sensors and electronic modules to Safety Systems Technology clearly marked for environmental disposal.

How to Replace the Sensors

The sensors used in the electronics module of the flame detector have no serviceable parts. The sensors along with the electronics module must be replaced when it has reached the end of their operational life.

SEE “Repairs” section of this manual on how to send your non--functioning electronics module to Safety Systems Technology for evaluation, repair and replacement.

Upon receiving your repaired electronics module or replacement, SEE Replacing the Electronics Module section of this manual for instructions on how to install your new module.

TROUBLESHOOTING

CAUTION: All repairs shall only be performed at a Safety Systems Technology facility and by its authorized service personnel. Failure to comply will invalidate the warranty on the detector.

Disconnect or inhibit external alarm wiring before troubleshooting the unit, which might send the detector into alarm.

Automatic Self-Check

The Automatic Self-Check is a comprehensive set of tests which insures proper operation of the detector. The Automatic Self-Check is automatically performed during normal operation, and is performed each time the system power is reapplied. If the detector Reset input is wired, the operator can also request the Automatic Self-Check by activating the Reset input of the detector.

Should any test fails, the flame detector will signal a Fault condition and attempt continued operation. A Fault at time of initial installation is usually due to incorrect assembly of the housing. It could also indicate a dirty or contaminated viewing window.

SEE "Maintenance" section of the manual for instructions on how to clean the lens of the detector.

LED Indicator

A non-functioning LED indicator may indicate damage. Send the electronics module to the factory for repair or replacement. SEE "REPAIRS" section of this manual for instructions.

Fault Yellow LED Indicator is On

After Installation or Maintenance

If the Fault yellow LED turns on after initial installation of the unit, this may indicate the following:

- Front and rear housings are not properly aligned.

Inside the front housing, a spring-loaded lamp contacts must engage with the top PC board when the detector is fully assembled. If the connection is loose, the detector will report a fault.

Make sure the front and rear housings are screwed tight together. DO NOT overtighten. Look for the alignment marks on the side of the front and rear housings. Align these marks together. You may have to turn the front housing counterclockwise to align the marks.

- The Automatic Self-Check has detected a dirty lens.

Clean the outside surface of the viewing lens of any accumulated dust, dirt, film or debris. SEE "Maintenance" section of the manual on how to clean the lens.

- The Automatic Self-Check has become inoperable.

To determine if the Automatic Self-Check has become inoperable, use a UV/IR test lamp to test if the detector is still working. Ensure that the lens is free from any dust or debris. The green Power and yellow Fault LED lights will be on. If the detector pass the operation test, this could mean that the Automatic Self-Check has stopped working. The front housing has to be repaired or replaced.

Remove the front housing and return to Safety Systems Technology for evaluation, repair or replacement. SEE "Repairs" section of the manual for instructions on how to return the unit to be repaired.

Make sure to remove the electronics module and wrap it in a static free bag and keep in a dry, cool place until a new front housing can be installed.

During Normal Operation

There are several factors that may trigger a system fault:

- The Automatic Self-Check has detected a dirty lens. Clean the outside surface of the viewing lens of any accumulated dust, dirt, film or debris.

SEE "Maintenance" section of the manual for instructions on how to clean the lens of the detector.

- A problem with the power supply. The 24 volt DC power supplied to the detector may be less than 20 volts or greater than 35 volts. Replace or service the power supply.
- An internal failure has occurred in the electronics module. Replace the electronics module and send to factory for repairs.
- The Automatic Self-Check has become inoperable.

To determine if the Automatic Self-Check has become inoperable, use a UV/IR test lamp to test if the detector is still working. Ensure that the lens is free from any dust or debris. The green Power and yellow Fault LED lights will be on. If the detector pass the operation test, this could mean that the Automatic Self-Check has stopped working. The front housing has to be repaired or replaced as the Automatic Self-Check is located in this part of the detector.

Remove the front housing and return to Safety Systems Technology for evaluation, repair or replacement. SEE "Repairs" section of the manual for instructions on how to return the unit to be repaired.

Make sure to remove the electronics module from the rear housing and wrap it in a static free bag and keep in a dry, cool place until a new front housing can be installed. Deactivate power to the detector while the unit is inoperable.

After Cleaning the Lens

The Automatic Self-Check may report a Fault immediately after the lens of the detector has been cleaned. This may result from using Windex or other commercial grade glass cleaners. Use of these cleaners inhibit the transmission of UV or IR signals to the sensors.

Only use water or alcohol to clean the lens of the detector.

SEE "Maintenance" section of the manual for instructions on how to clean the lens of the detector.

False Alarms

Location and Orientation of the Detector

The flame detector has been designed to reduce or eliminate instances of false alarms. In some cases, the flame detector may be picking up other sources of false alarms because it is positioned incorrectly.

Consider limiting the field of view of the detector to the intended area which requires protection or monitoring. SEE "Selecting a Location for the Flame Detector" section of the manual on how to best position the flame detector to ensure trouble-free operation.

In addition, increase the time delay setting of the Delayed Alarm from 3 seconds (default factory setting) to 6 seconds. The increased time will allow the detector to discriminate against false alarm sources.

Vibration

Mounting location should be as free from shock and vibration as possible. Due to the high sensitivity of the flame detector, it must be mounted to a rigid, stable support where no vibration is present.

Severe Lightning

Lightning produces the same UV and IR radiation that a flame does. Extended periods of lightning strikes may trigger the flame detectors due to the intensity of the UV it generates.

Consider changing the time delay of the Delayed Alarm from 3 seconds (default factory setting) to 6 seconds.

To change the Time Delay for the Delayed Alarm Output, follow the table below to adjust the DIP Switch settings.

| Switch # 3 | Description |
|------------|---|
| DOWN | Sets the Delayed Alarm at 3 seconds (Default Setting) |
| UP | Sets the Delayed Alarm at 6 seconds |

If the detector continues to report significant false alarms due to lightning, consider turning off the UV sensor and change the detection mode to Dual IR.

To change the detection mode of the flame detector, follow the table below to adjust the DIP Switch settings. Please note that the factory default setting for the flame detector is set to Triple-mode.

| Switch # 1 | Switch # 2 | Description |
|------------|------------|---|
| UP | UP | Triple-mode UV/IR detection, voted any two out of three sensors (Default Setting) |
| UP | DOWN | UV Only |
| DOWN | DOWN | Dual IR (IR/IR) |
| DOWN | UP | IR Flicker Only |

SEE "Changing the Detection Mode" section of this manual for detailed instructions.

Transient Interference or Power Surges

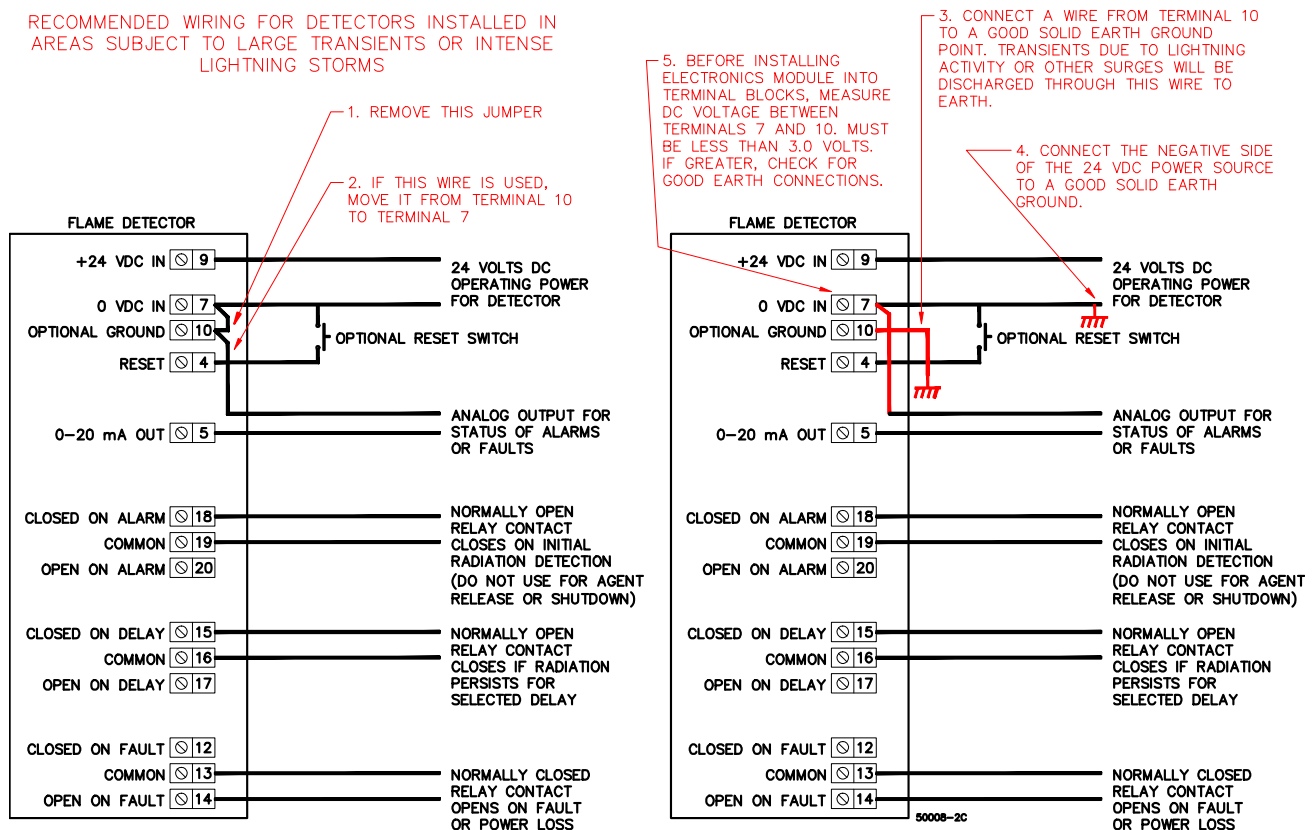
Transient voltage suppressors in the electronics module protect the electronics from transients that may be induced into the field wiring during operation.

The terminal marked Terminal # 10, SURGE GROUND, inside the enclosure is factory connected to Terminal # 7, 0 VDC IN, to complete the suppression path.

In areas where there are severe high energy transients, including those caused by lightning, you may get more effective transient suppression by removing the factory jumper and connecting Terminal # 10, SURGE GROUND, to the earth ground screw inside the detector enclosure.

WARNING: The above change can be made only if the enclosure is firmly connected to earth ground and the voltage measured between the earth ground screw and the 0 VDC IN terminal is not greater than the 2.0 volts DC.

RECOMMENDED WIRING FOR DETECTORS INSTALLED IN AREAS SUBJECT TO LARGE TRANSIENTS OR INTENSE LIGHTNING STORMS



Technical Support

Headquarters

Safety Systems Technology, Inc.
23282 Mill Creek Drive, Suite 215
Laguna Hills, CA 92653
U.S.A.

Phone Numbers

1.866.507.2264 Toll-free (USA only)
+1.949.583.1857 Main
+1.949.340.6643 FAX

E-Mail Addresses

| | |
|-------------------------|-------------------|
| techalert@safetysys.com | Technical Support |
| sales@safetysys.com | Sales |

SPARE PARTS AND ACCESSORIES

To order spare parts and/or accessories, please contact the nearest Safety Systems Technology's authorized distributor or Safety Systems Technology Customer Care Department and provide the following information:

- Part number
- Description
- Quantity

Replacement Electronics Module

| | |
|----------|---|
| 40120-12 | Model F120 Replacement electronics module with built-in UV/IR sensors |
|----------|---|

Replacement Housing

| | |
|---------|------------------------------------|
| 40120-7 | Replacement front housing assembly |
| 40120-8 | Replacement rear housing assembly |

Test Equipment

| | |
|-------|---|
| 194-1 | Model FT194 Flame Detector Test Lamp with rechargeable batteries and 120 volt battery charger, carrying case included |
| 194-2 | Model FT194 Flame Detector Test Lamp with standard "D" cell batteries, carrying case included |
| 194-3 | Model FT194 Flame Detector Test Lamp with rechargeable batteries and 240 volt battery charger, carrying case included |



Accessories

| | |
|-----------|--|
| 190-01 | Conduit Swivel Mounting Bracket <i>Class I Division I, Group D</i> |
| 191-01 | Wall/Ceiling Swivel Mounting Bracket, aluminum |
| 191-01-SS | Wall/Ceiling Swivel Mounting Bracket, stainless steel |
| 191-51 | Cable Gland, 3/4 inch NPT to 18.4 mm <i>For hazardous locations</i> |
| 195-01 | Sunshade / Protection Hood |
| 20231-1 | Stainless steel tag |

Spare Parts

| | |
|-----------|--|
| 20041-241 | Viton O-ring seal for front housing |
| 40110-21 | Replacement self-test lamp with ring-type PC board |
| 40110-8 | Replacement rear housing with terminal blocks |

Power Supplies

NOTE: The required power supply is based on the number of detector units and other devices installed. Contact the factory to determine the appropriate power supply for your application.

NEMA4 weatherproof enclosure for use in non-hazardous locations. 120/240 VAC input.

| | |
|----------|---|
| 35501-17 | 24 VDC @ 1.7 amps DC Output |
| 35501-34 | 24 VDC @ 3.4 amps DC Output |
| 35501-63 | 24 VDC @ 6.3 amps DC Output |
| 35503-07 | 24 VDC @ 1.7 amps Output w/ 7 amp-hour backup battery provides up to 24 hours reserve power |

Rated explosion-proof for Class I Group C or D hazardous locations.

| | |
|----------|-----------------------------|
| 35502-06 | 24 VDC @ 0.6 amps DC Output |
|----------|-----------------------------|

WARRANTY

Safety Systems Technology, Inc. warrants the Model F120 to be free of defects in materials or workmanship under normal use and will repair or replace any unit that is found to be defective for five years after the date of manufacture. Flame detection elements that are damaged by exposure to contaminants, incorrect hookup, abuse, accident, or abnormal operating conditions are not covered by this warranty.

Defective or damaged equipment must be shipped to Safety Systems Technology accompanied by a detailed description of any issue.

Safety Systems Technology reserves the right to make the final determination of the nature of and responsibility for defective or damaged equipment. Equipment that has been repaired or modified by the user, damaged as the result of an accident, incorrectly installed or used in an application or environment for which it was not intended is not covered by this warranty. Safety Systems Technology's responsibility under this warranty shall be limited to the repair or replacement of the defective equipment at its option when it is returned to the factory transportation prepaid. The defective unit will be repaired or replaced free of charge to the customer and returned transportation prepaid. In all cases, this warranty is limited to the cost of the equipment.

REPAIRS

All equipment requiring repair must be shipped to Safety Systems Technology accompanied by a Return Material Authorization (RMA) form. The form can be downloaded through SST's website at www.safetysys.com.

1. The following information is required:

- Model Number or Part Number
- Serial Number - imprinted on the nameplate of the detector
- Brief description of the problem
- Contact information
- Complete shipping address for the return of the repaired items

2. Contact Safety Systems Technology to obtain an RMA number at:

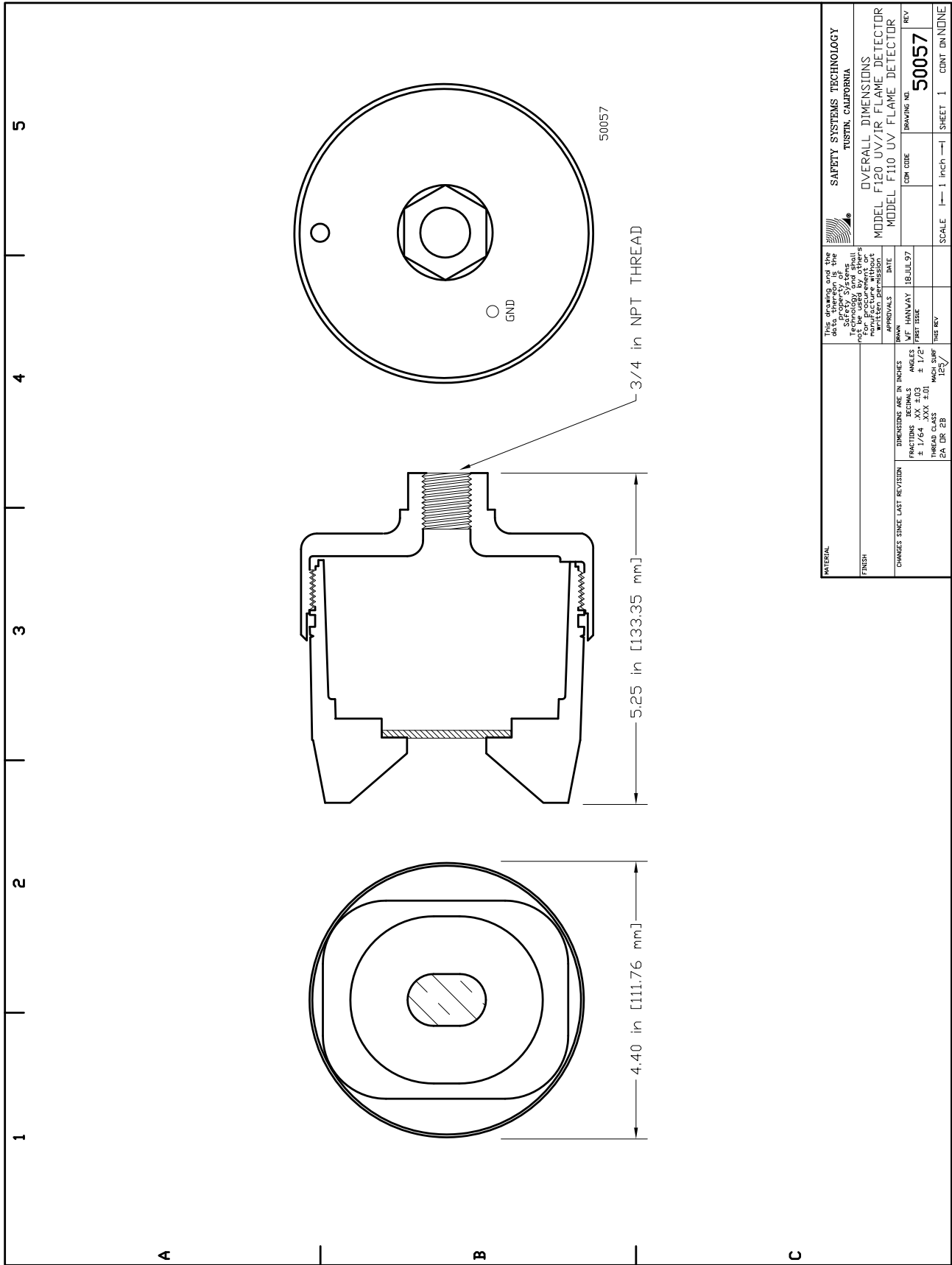
+1.949.583.1857 Main
+1.866.507.2264 Toll-free number (USA only)
or via e-mail at techalert@safetysys.com

3. Ship the unit(s) prepaid to with a copy of the RMA form inside the package:

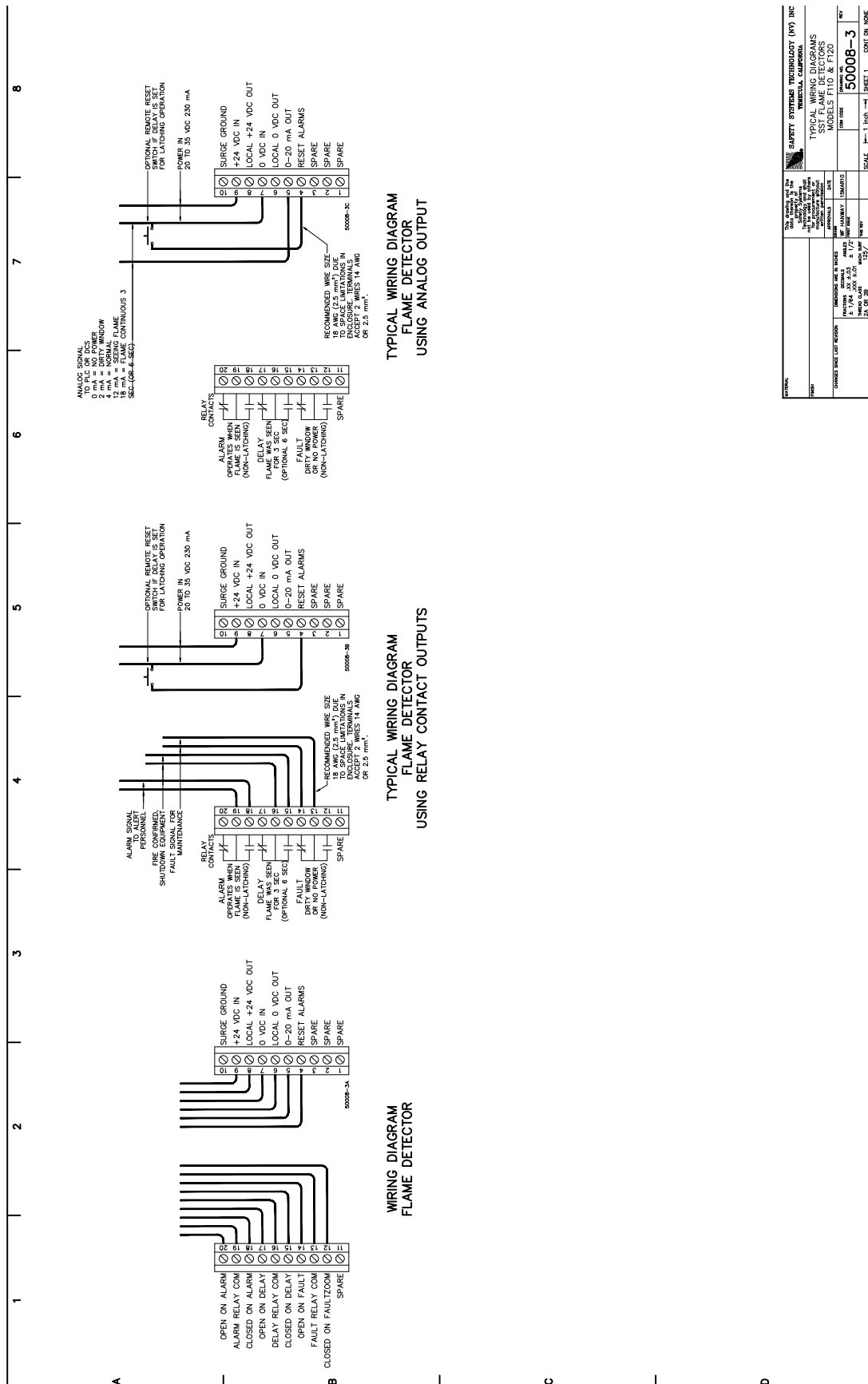
**Safety Systems Technology
Attention: Repair Department
23282 Mill Creek Drive, Suite 215
Laguna Hills, California 92653
U.S.A.
+1.949.583.1857 Phone**

Upon receipt of your equipment, a repair estimate will be sent to you and repairs will be made only after your authorization. Repair and shipping costs will be invoiced to account holders or charged to a credit card.

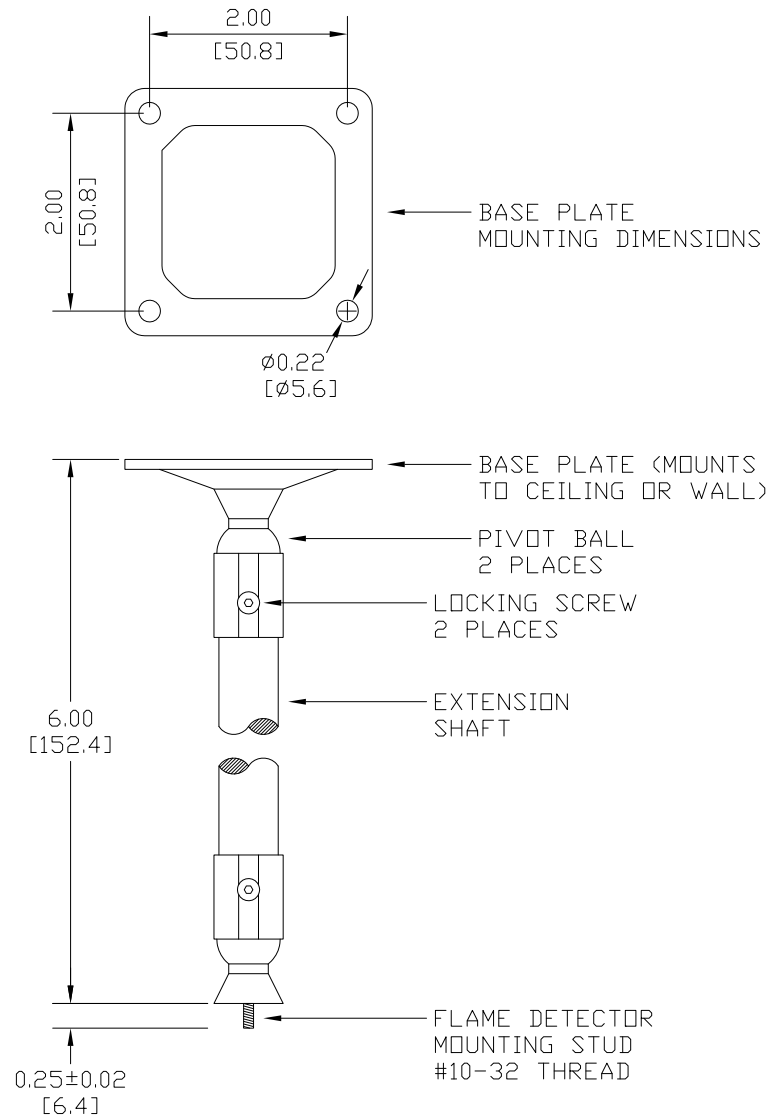
ENCLOSURE DRAWING



WIRING DIAGRAM



SWIVEL BRACKET DRAWING



MATERIAL: ALUMINUM
FINISH: BLACK

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SAFETY SYSTEMS TECHNOLOGY INC
LAGUNA HILLS, CALIFORNIA

DIMENSIONAL DETAILS
SWIVEL BRACKET FOR FLAME DETECTORS
ORDER NO. 191-01

| APPROVALS | DATE |
|--------------------------|-----------|
| DRAWN WF HANWAY | 06 JUN 02 |
| FIRST ISSUE WF HANWAY | 06 JUN 02 |
| THIS REV WF HANWAY | 11 MAY 04 |

| CDM CODE | DRAWING NO. | REV |
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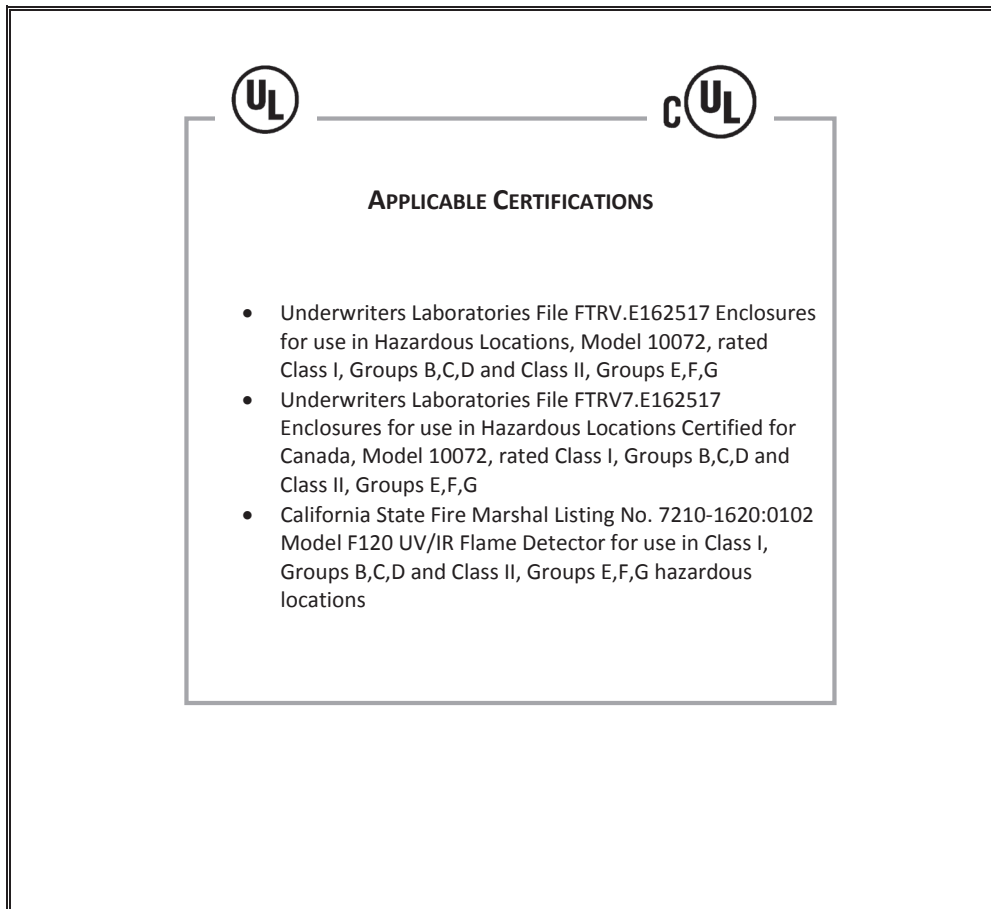
APPROVALS



ENGINEERING QUALITY AND RELIABILITY

CERTIFICATION

Model F120 Triple Mode UV/IR Flame Detector
Order No. 120-01



U:\CERTS\F120 Certs.doc.pdf 18-Sep-15

23282 MILL CREEK DRIVE, SUITE 215
LAGUNA HILLS · CALIFORNIA · 92653 · U.S.A.
TELEPHONE: 1 (949) 583-1857 · FAX: 1 (949) 340-6643
WWW.SAFETYSYS.COM

**FTRV.E162517**
Enclosures for Use in Hazardous Locations[Page Bottom](#)**Enclosures for Use in Hazardous Locations**[See General Information for Enclosures for Use in Hazardous Locations](#)**SAFETY SYSTEMS TECHNOLOGY INC**

E162517

SUITE 215
23282 MILL CREEK DR
LAGUNA HILLS, CA 92653-1678 USA

Class I, Groups B, C and D; Class II, Groups E, F and G.

Model 10072.

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Enclosures for Use in Hazardous Locations Certified for Canada

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SAFETY SYSTEMS TECHNOLOGY INC
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E162517

Class I, Groups B, C and D; Class II, Groups E, F and G.

Model 10072.

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FTRV.GuideInfo Enclosures for Use in Hazardous Locations

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Enclosures for Use in Hazardous Locations

Guide Information for Equipment for Use in and Relating to Class I, II and III, Division 1 and 2 Hazardous Locations

GENERAL

This category covers enclosures intended for use in one or more of the following hazardous locations, as indicated on the individual product, in accordance with ANSI/NFPA 70, "National Electrical Code": Class I, Groups A, B, C and D; Class II, Groups E, F and G; and Class II, Groups F and G, Division 2 only.

This category covers only the enclosures. Electrical devices that may be mounted within these enclosures are not covered under this category. Limitations on the maximum interrupting rating of arcing contacts and temperatures are provided on a label secured to the inside of the enclosure.

Unless otherwise noted in the individual Classifications, enclosures are investigated for enclosing electrical equipment intended for connection to circuits having a maximum available fault current of 10,000 rms symmetrical amperes.

RELATED PRODUCTS

Certain enclosures in this category have also been investigated for use aboard marine vessels in accordance with United States Coast Guard (USCG) Electrical Engineering Regulations 46CFR110, "General Provisions," 46CFR111, "Electrical Systems - General Requirements," 46CFR112, "Emergency Lighting and Power Systems," and 46CFR113, "Communication and Alarm Systems and Equipment." Such enclosures are identified by a Marine Listing Mark. Enclosures marked "For Use On Vessels Over 65 Feet" have not been subjected to shock and vibration tests. Enclosures that have been subjected to shock and vibration tests are not marked with a vessel length limitation and may be used on any size vessel.

ADDITIONAL INFORMATION

For additional information, see Equipment for Use in and Relating to Class I, II and III, Division 1 and 2 Hazardous Locations ([AAIZ](#)).

REQUIREMENTS

The basic standard used to investigate explosion-proof and dust-ignition-proof enclosures in this category is [ANSI/UL 1203](#), "Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations."

The basic standard used to investigate dust-tight enclosures for Class II, Groups F and G, Division 2 in this category is [UL 1604](#), "Electrical Equipment for Use in Class I and II, Division 2, and Class III Hazardous (Classified) Locations," or ANSI/ISA-12.12.01, "Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations."

[UL Subject 2062](#), "Outline of Investigation for Enclosures for Use in Hazardous (Classified) Locations," is also used to investigate explosion-proof, dust-ignition-proof and dust-tight enclosures.

UL MARK

The Classification Mark of Underwriters Laboratories Inc. on the product is the only method provided by UL to identify products manufactured under its Classification and Follow-Up Service. The Classification Mark for these products includes the UL symbol, the word "CLASSIFIED" above the UL symbol (as illustrated in the Introduction of this Directory) and the following additional information:

**ENCLOSURE FOR USE IN HAZARDOUS LOCATIONS
AS TO EXPLOSION AND FIRE HAZARD ONLY
Control No.**

UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. UL shall not incur any obligation or liability for any loss, expense or damages, including incidental or consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Guide Information.

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CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



LISTING SERVICE

LISTING No. 7210-1620:0102 Page 1 of 1

CATEGORY: 7210 -- FLAME DETECTOR

LISTEE: SAFETY SYSTEMS TECHNOLOGY23282 Mill Creek Drive, Suite 215, Laguna Hills, CA 95653
Contact: William Hanway (949) 583-1857 Fax (949) 340-6643
Email: whanway@safetysys.com

DESIGN: Model F120 UV/IR flame detector consisting of Model 10072 hazardous location enclosure for flame detector. For use in Class I, Groups B, C, and D; Class II, Groups E, F, and G hazardous locations. Refer to listee's data sheet for detailed product description and operational considerations.

RATING: 20 - 30 VDC

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances, and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, rating, and UL label.

APPROVAL: Listed as an infrared flame detector. Authority having jurisdiction should be consulted prior to installation. Refer to listee's Installation Instruction Manual for details.

10-09-08 bh



This listing is based upon technical data submitted by the applicant. CSFM Fire Engineering staff has reviewed the test results and/or other data but does not make an independent verification of any claims. This listing is not an endorsement or recommendation of the item listed. This listing should not be used to verify correct operational requirements or installation criteria. Refer to listee's data sheet, installation instructions and/or other

Date Issued: **July 01, 2015**

Listing Expires **June 30, 2016**

Authorized By: **JAMES PARSEGAN, Program Coordinator**

Fire Engineering Division

Headquarters:

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