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Model 3300-XX
UV/IR Flame Detector

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Model 3300 UV/IR Flame Detector

<u>Model</u>	<u>Description</u>
3300-01	Standard
3300-02	Self-test
3300-03	Enhanced

The instructions are effective for the above models as of November 1, 1998

Instruction Manual Part Number: T15011
Rev A



Table of Contents

1. Product Description	1
1.1 Introduction	1
2. Operation	2
2.1 General	2
2.2 Field-of-View	2
2.3 Range	2
2.4 Environment	2
2.5 Configuration	2
2.6 LED Operation	3
2.6.1 Power Up	3
2.6.2 Normal	3
2.6.3 Fire	3
2.6.4 Fault	3
2.7 Relay Operation	3
2.7.1 Fire Relay	3
2.7.2 Fault Relay	3
3. Installation	4
3.1 Housing	4
3.1.1 Mounting the Housing	4
3.1.2 Wiring	4
3.2 Connection	4
3.2.1 Power	4
3.2.2 Fire Relay	4
3.2.3 Fault Relay	4
3.3 Testing	5
4. Maintenance	6
4.1 Lens Cleaning	6
5. Troubleshooting	7
5.1 No LED Blink or Erratic LED Blink	7
5.2 Detector Indicates Fault (Table 5.1)	7
5.3 Device appears to operate normally but will not alarm to a fire.	8
6. General Specifications	9
7. Limited Warranty	9

1. Product Description

1.1 Introduction

The Model 3300 UV/IR Flame Detector is designed for use in indoor applications that do not have a hazardous area classification such as commercial applications like warehouse, exhibition hall or office spaces. It is ideal for use in areas where short line of sight is a factor. Because of its compact size, it is also used for installation in certain production equipment.

All versions of the Model 3300 Flame Detector utilize UV and IR sensors to look for flame. The Model 3300 Flame Detector is a microprocessor controlled device programmed with state-of-the-art fire algorithms. Each algorithm is designed to recognize a different type of flame signature while rejecting common false sources. When the conditions of any one of the several fire algorithms are met the Model 3300 Detector declares a fire. See tables 1.1 and 1.2 for detector's ability to tolerate false alarm stimuli and its response to various fuels.

The microprocessor is also continuously performs system tests looking for any faults which would impair its ability to accurately detect a flame and declare an alarm. The tests include: input power, sensor circuits, relay circuits, and several other internal systems. The Model 3300 has both Fire Relay and a Fault Relay, which may be, connected as normally open or normally closed contacts.

The Model 3300 detector has a polypropylene housing. The Model 3300 uses a terminal strip in a separate compartment for user connections protecting the electronics and optics from damage during installation.



Figure 1.1 - Model 3300 Flame Detector

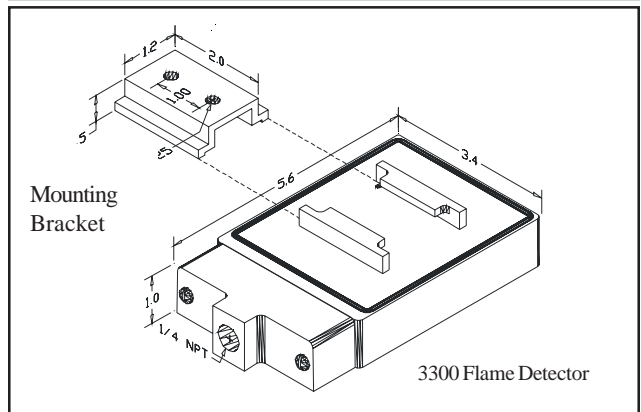


Figure 1.2 - Model 3300 Flame Detector

False Alarm Source	Distance	Unmodulated	Modulated
Resistive Elec. Heater 1320 Watt	6 ft.	No Response	No Response
Fluorescent Lights 2, 40 Watt bulbs	6 ft.	No Response	No Response
Halogen Light 500 Watt	10 ft.	No Response	No Response
Incandescent Light 100 Watt	6 ft.	No Response	No Response
Table 1.1 False Alarm Stimuli Table			

Fuel	Distance	Fire Size	Response Time
Polypropylene	8 ft.	4 in. diameter	Less than 3 sec.
Isopropyl Alcohol (IPA)	10 ft.	4 in. diameter	Less than 3 sec.
Heptane	40 ft.	1 sq. foot	Less than 3 sec.
MEK	15 ft.	4 in. diameter	Less than 3 sec.
Silane	30 ft.	18 in. jet	Less than 3 sec.
Hydrogen	15 ft.	18 in. jet	Less than 3 sec.
Table 1.2 Detector Response to Various Fuels			

2. Operation

2.1 General

When the Model 3300 Detector is powered up, the microprocessor checks the detector with a full series of self-tests. After the self-test process is complete and all tests are passed, the detector is ready to detect a fire. The power-up and test process may take up to 10 seconds.

All modes of operation are indicated by two LEDs located on the front of the detector. Normal Mode is indicated by a brief flash of the LEDs every 8 seconds. With the device in Normal Mode it is constantly monitoring the environment and ready to detect a fire.

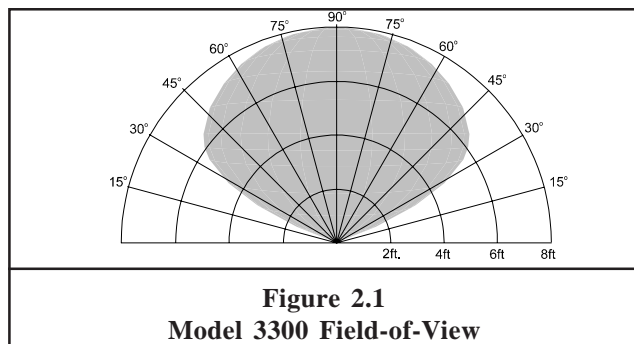
When a fire is detected the Model 3300 will activate the Fire Relay and turn on both LEDs. The device will remain in Alarm Mode until power is removed. Thus, the Model 3300 should be installed such that power can be easily removed to reset unit.

The self-test system is continuously monitoring the internal systems. When a fault is detected the Fault Relay is de-energized. In Fault Mode the LEDs will flash a code indicating the type of fault. A fault indication may mean the device is unable to detect a fire or that a device has become unreliable. (i.e. a "Voltage Low" fault) For most faults the detector will return to Normal Mode when the fault condition is corrected.

2.2 Field-of-View

Optical Flame Detectors must be able to "see" the fire to declare an alarm. Any obstruction between the detector and the threat area will impair the detector's ability to cover the threat area. An obstruction is anything that is not transparent to the sensor elements of the detector. UV sensors and some types of IR sensors cannot see through glass or plastics. The Model 3300 series of Flame Detectors has a 120° Field-of-View.

When covering a large area the detectors should be located to provide overlapping fields of view to insure complete coverage.



2.3 Range

The fuel and ambient conditions may affect the sensitivity of a detector. The Model 3300 is rated to a 1-square foot heptane at a distance of 45 feet and a polypropylene or isopropyl alcohol fire at a distance of 8 feet. Using the inverse square of the distance rule, if the device will detect a 4-inch fire at 10 feet, to detect a ¼ size fire (approximately 2-inch) the devices must be within 4 feet. The typical speed of response is 3 seconds (see table 1.2)

2.4 Environment

The Model 3300 uses an Ultraviolet sensor (185 – 260 nanometers) and an Infrared sensor (0.715 – 3.5 microns). This detector senses all radiant energy at these frequencies within their Field-of-View. Any source, which radiates energy at these same frequencies, may impact the detector's ability to discriminate against false alarms. Care should be taken to minimize such radiant energy sources within the detectors Field-of-View. Because of the variety of environments and conditions, a factory trained technician or qualified Professional Engineer should be consulted before deciding on the location of devices.

2.5 Configuration

All models of the Model 3300 detector are configured at the factory. The relay connections for Normally Open or Normally Closed operation are made at the connector. There are no user adjustable settings in the Model 3300 detector housing.

The Model 3300 comes in three models. The 3300-01 or standard model was designed for simple and reliable operation at the least expense. The 3300-02, or self-test model, has a built-in self-test circuit for the sensors to improve reliability and reduce maintenance. The 3300-03 or enhanced models incorporate internal self-test and a RS-485 computer interface for downloading real time spectral data and pre-fire spectral data.

Model	Built-in Sensor Self-test	RS-485 Comm Port	Blinks
3300-01	No	No	1
3300-02	Yes	No	2
3300-03	Yes	Yes	3

Table 2.1 Model 3300 Configurations

2.6 LED Operation

The status of all versions of the Model 3300 detectors can be determined from the LEDs located behind the lens on the front of the detector. The LEDs will flash at intervals or remain on to indicate the detector's status. (Fault Mode, Normal Mode, Alarm Mode)

2.6.1 Power Up

At power up all versions of the Model 3300 detector will begin by flashing the LEDs in a pattern indicating the model and configuration. Looking at the 3300 face with the connector to the left there are two LED in the right hand window. LED1 is on top, LED2 is on the bottom. LED1 will turn on while LED2 blinks a number of times. The number of times the LED2 blinks defines the model of the 3300 (see Table 2.1, Model Blinks column). Both LED's will then turn off. LED1 will turn on again while LED2 blinks a number of times. After the configuration pattern flashes the LEDs will flash once every 8 seconds while in normal mode. If the detector is powered up and a fault is detected the LEDs will flash in a pattern indicating the type of fault.

2.6.2 Normal

In Normal Mode the LEDs will flash briefly every 8 seconds. Whenever the device is in any other mode the "flash every 8 seconds" is suspended until the detector returns to Normal Mode.

2.6.3 Fire

When the Model 3300 declares a fire both LEDs will come "on" and the Fire Relay will energize. The detector will stay in alarm mode until power is removed.

2.6.4 Fault

When the detector has power and is in Fault Mode LED1 will be "off" while the LED 2 will begin flashing, 1/2 second "on" and 1/2 second "off", a number of times. The number of times LED2 flashes indicates the type of fault. LED 2 will stop flashing and LED1 will turn "on". This cycle is repeated until the fault is corrected. See Table 2.2 for types of fault. Only the lowest level fault is indicated. Once a fault is corrected the next level fault will be indicated until all faults are cured. Except for fault level 3, a fire indication will override a fault indication.

2.7 Relay Operation

All Models of the Model 3300 have two relays. One Fire Relay for indicating fire conditions and one Fault Relay for indicating detector fault conditions.

2.7.1 Fire Relay

The Fire Relay will energize whenever the detector declares a fire. The Fire Relay will remain energized until power is removed from the Model 3300.

2.7.2 Fault Relay

The Fault Relay is a normally energized relay. It will de-energize when a Fault occurs. This means the detectors Fault Relay is in the "Fault" state when the detector has no power, and remains in the "Fault" state until the detector is powered up and operating normally.

Fault# (LED Flash)	FaultType	Description
1	UV TestFault	UV sensors did not detect enough UV from internal UV source.
2	Program Fault	Program sum check is in error
3	Calibration Fault	Device is out of calibration
4	Voltage Low	Input Voltage is below 12 VDC
5	Photo Sensor Fault	R Sensor failed to detect internal test source.
6	Relay Fault	Relay coil circuit is open
7	Voltage High	Input Voltage was above 32 VDC
8	Temp. Out of Range	Internal device temperature range went below 40° or above 85° C
Table 2.2 Fault Table		

3. Installation

3.1 Housing

3.1.1 Mounting the Housing

The housing is mounted by using the bracket located on the back of the housing. The detector should be mounted securely to a flat surface. Remove the bracket from the housing by sliding the bracket down. The bracket may be welded (plastic weld) or screwed to the mounting surface. The mounting location must be strong enough to allow the detector to be snapped into place. Although the detector is not vibration sensitive the detector should not be exposed to excessive vibration. The detector has been tested to meet the vibration standard set in FM's Approval Standard Class 3820, Sept. 1979. (.022" displacement, 10 Hz to 30 Hz sweep cycled at 2 cpm for 4 hours)

3.1.2 Wiring

The wiring termination for the Model 3300 is located inside the connection box. The terminal block located under the connection box cover will handle 14 to 24 gauge wire.

3.2 Connection

All connections are made inside the connection box. Remove the two connection box screws and the connection box cover. Run the wires through the conduit opening in the connection box cover. Connect the wires to the terminal strip. Replace the connection box cover and the two screws. Connect the wiring to the appropriate connection points in the controller or junction box. See the chart 3.1 for wiring.

3.2.1 Power

Supply power must be "OFF" before connecting the Model 3300 Detector. D.C. power for the Model 3300 detector is connected to terminal 1 and 2 of the terminal block. Connect the negative or ground side of the power supply to

terminal 1. Connect the positive side (24 VDC) of the power supply to terminal 2. Check the controller manufacturer's manual for proper connection points.

3.2.2 Fire Relay

The Fire Relay is connected using terminals 3, 4, 5, 6, and 7. The Fire Relay wires are not polarized and are isolated from the rest of the detectors circuitry.

For Normally Open Operation: Connect one side of the Fire Signal Circuit to terminals 3 or 4. Connect the other side of the Fire Signal Circuit to terminals 5 or 6. Terminals 3 and 4 are connected internally to the Normally Open side of the Fire Relay, and terminals 5 and 6 are connected internally to the Common of the Fire Relay. If multiple detectors are being used on a single Fire Signal Circuit or an EOL (End of Line) resistor is used, connect the unused terminal 3, 4 and 5, 6 to the Fire Relay of the next detector.

For Normally Closed Operation: Connect one side of the Fire Signal Circuit to terminals 5 or 6. Connect the other side of the Fire Signal Circuit to terminal 7.

Refer to the controller manufacturer's manual for proper connection points and value of End-of-Line resistor.

3.2.3 Fault Relay

The Fault Relay is connected using terminals 8, 9 and 10. The Fault Relays are not polarized and are isolated from the rest of the detectors circuitry.

For Normally Closed Operation: Connect one side of the Fault Circuit to terminal 8 and the other side to terminal 9.

For Normally Open Operation: Connect the Fault Circuit to terminal 9 and the other side to terminal 10.

Refer to the controller manufacturer's manual for proper connection points.

Terminal #	Description	Internal Connection
1	Negative side of power	-
2	Positive power 12 to 30 VDC	+
3	Fire Relay Normally Open In	Fire relay N.O.
4	Fire Relay Normally Open In	Fire relay N.O.
5	Fire Relay Common In	Fire relay common
6	Fire Relay Common Out	Fire relay common
7	Fire Relay Normally Closed	Fire relay N.C.
8	Fire Relay Normally Closed*	Fault relay N.C.
9	Fault Relay Common*	Fault relay common
10	Fault Relay Normally Open*	Fault relay N.O.

Table 3.1
Cable Wiring

*Fault relay is normally energized relay. When there is no power the Normally Closed contact is open and the Normally Open contact is closed. Normal means that the device has power and there is no fire and no fault.

3.3 Testing

The Model 3300 detector uses ongoing self-test functions, which will indicate a fault if any of the functions fail to pass. If an end-to-end test is required the detector may be put into alarm with a small butane lighter (Bic) with a flame approximately 1 inch high. Hold the lighter about 2 feet directly in front of detector's face. Light the lighter and wiggle it about 1/2 inch at about 2 - 4 Hz. The detector should alarm within 3 seconds. A 4 in. dia. pan with isopropyl alcohol set 8 feet may also be used. If you choose to use this method, the detector field of view should be blocked until the fire has achieved maximum size. Remove the shield. Again the detector should alarm within 3 seconds of ignition of the fire. The 3300 may also be tested using a factory-

approved hand held tester (Model 3240-01). Hold the tester approximately 2 feet directly in front of the detector. Activate the Tester. The detector should alarm within 3 seconds.

NOTE: Because of the danger involved with fire testing all safety precautions must be observed. If an extinguishing system is present, make sure to disable the outputs to the extinguishing system prior to testing. After testing re-enable the extinguishing system outputs.

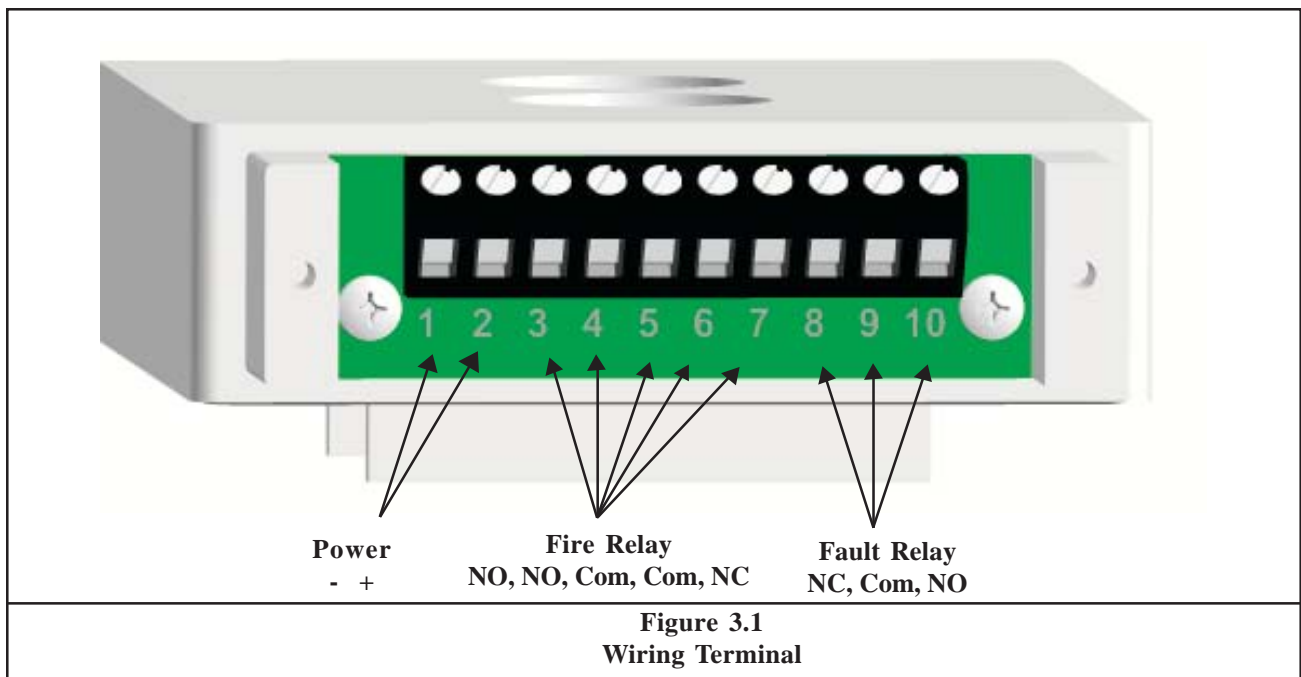


Figure 3.1
Wiring Terminal

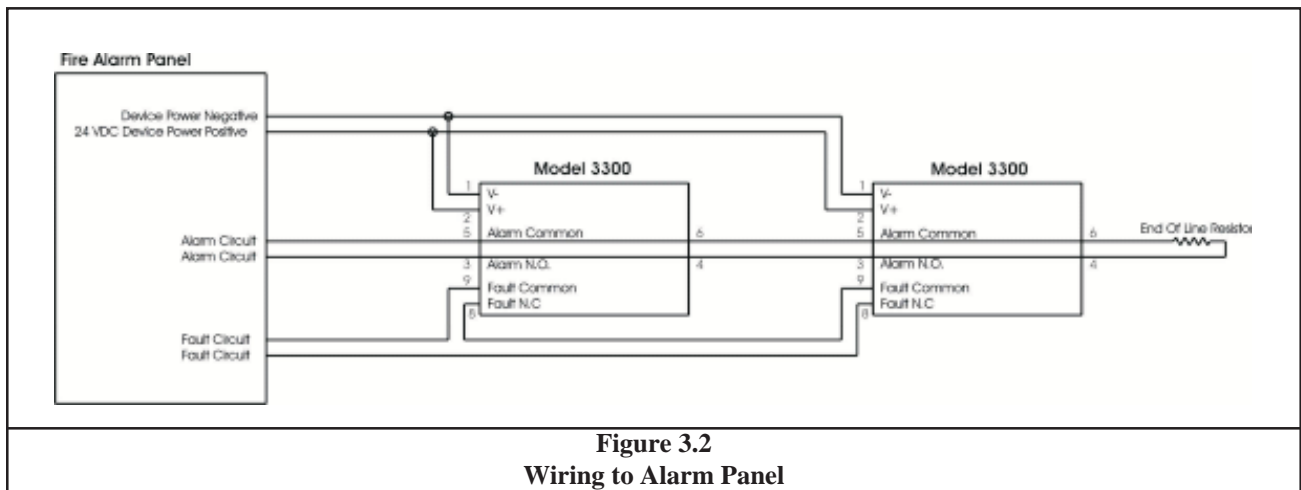


Figure 3.2
Wiring to Alarm Panel

4. Maintenance

If a detector indicates a fault, use the troubleshooting section of this document to correct the fault. Contact the local "authority having jurisdiction" or consult the local codes for any maintenance they may require for the type of system installed. The detector should be tested quarterly or more frequently as required by local codes.

4.1 Lens Cleaning

To clean the lens: Wipe the lens surface with a clean lint free cloth. If more extensive cleaning is required use denatured or Isopropyl alcohol and a clean lint free cloth. Do not use any silica based solvents. (Most common glass cleaners are silica based and should not be used to clean the lens.)

5. Troubleshooting

The Model 3300 detector has several built-in self test mechanisms which verify function and calibration. The following procedure covers most faults and problems, which may occur during installation or during the course of normal operation.

5.1 No LED Blink or Erratic LED Blink

With power connected to the detector the LEDs on the front of the detector module should begin blinking and blink about every 8 seconds. If they do not blink or blink in an abnormal fashion

1. Check voltage at power connections. Terminal 1 should be positive; terminal 2 should be negative. There should be between 12 and 32 volts DC across terminals 1 and 2.
2. If Main power is correct and the detector is not indicating a fault The detector should be returned to the factory.

5.2 Detector Indicates Fault (Table 5.1)

Use the fault table to determine what type of fault is occurring and see appropriate section below to correct. If the corrective actions listed below do not correct the fault, contact the factory for further diagnostic instructions or instructions on returning the detector for servicing.

Fault	FaultType	Description
1	UV TestFault (3300-02 only)	UV sensors did not detect enough UV from internalUV source.
2	Program Fault	Program sum check is in error
3	Calibration Fault	Device is outofcalibration
4	Voltage Low	InputVoltage is below 12 VDC
5	Photo SensorFault	IR Sensor failed to detect internaltestsource.
6	Relay Fault	Relay coilcircuit is open
7	Voltage High	InputVoltage was above 32 VDC
8	Temp. Out of Range	Internaldevice temperature range went below 40° or above 85° C

**Table 5 2
FaultTable**

5.2.1 Fault Type 1 - “UV Test Fault” (1 blink of LED2)

During the UV self-test the UV sensor did not see enough UV from the UV source. This test is available on the "self-test" and "enhanced" versions. Factory service is required.

5.2.2 Fault Type 2 - "Program Failure Fault" (2 blinks of LED2)

The program has been damaged. Factory service is required.

5.2.3 Fault Type 3 - “Calibration Fault” (3 blinks of LED2)

Calibration constants have been corrupted. Factory service is required.

5.2.4 Fault Type 4 - “Voltage Low Fault” (4 blinks of LED2)

The input voltage is below 12 VDC. With the detector connected to power, measure the voltage between terminal 1 and 2 at the detector. The voltage should be between 12 - 30 VDC. If the voltage is out of range check external wiring and power supply. There should not be more than 1 volt of AC ripple at 24 VDC. If the measured voltage is in range and there is no AC ripple. Contact the factory for return and service information.

5.2.5 Fault Type 5 - “Photo Sensor Fault” (5 blinks of LED2) This test only applies to "self-test" and "enhanced" versions.

The IR Sensors did not pass the internal self-test. If the lens is clean. The fault may be in the sensors or the self-test circuit. Contact the factory for further diagnostic information.

5.2.5 Fault Type 6 - “Relay Fault” (6 blinks of LED2)

One of the Relay’s coil circuits is open. There is no corrective action. Contact the factory for return and service information.

5.2.6 Fault Type 7 - “Voltage High” (7 blinks of LED2)

The Detector was exposed to an input voltage above 30 Volts. There is no corrective action. Contact the factory for return and service information.

5.2.7 Fault Type 8 - “Temperature Out of Range” (8 blinks of LED2)

The internal measured temperature was below 0° C or above 85° C. There is no corrective action. Contact the factory for return and service information.

5.3 Device appears to operate normally, but will not alarm to a fire

When the detector declares an alarm two things should happen. One, both the LEDs on the front of the detector should come on. Two, the fire relay should energize. Connect an ohmmeter across the Fire relay Common and N.O. terminals. Run a fire test per section 3.3.

1. If the relay closes (0 ohms on the meter) and the LEDs come on the detector is operating normally. Check external alarm initiating circuit wiring.
2. If the relay closes and the LEDs remain off, or the relay remains open and the LEDs come on, the detector needs factory service.
3. If the relay remains open and the LEDs remain off, contact the factory for further diagnostic information.

6. General Specifications

Input voltage:	12 to 32 Volts DC, typically 24 Volts DC
Current draw:	@ 24 Volts DC: 28 mA normal mode; 54 mA alarm mode
Temperature Range:	
Operating:	0° to 75° C operating, 0° to 167°F
Storage:	-40° to 85° C storage, -40° to 185°F
Relay contacts:	1.0 Amp @ 30 VDC resistive
Connections:	14-24 gauge wire recommended
Weight:	Approx. 1lb (0.5 Kg)
Housing:	
Dimensions:	3.4" x 5.3" x 1" (7.9 x 10.2 x 2.5 cm)
Material:	FR Polypropylene (UL 94 flammability rating VO)
Sensitivity:	
Responsivity:	UV - 185 to 260 nanometers; IR - .715 to 3.5 microns
Range:	within 3 seconds to a 4-in. diameter Isopropyl Alcohol fire at 10 feet or within 5 seconds to a 1 sq. ft. gasoline (heptane) fire at 40 feet.
Field-of-View:	120° full cone

7. Limited Warranty

SIERRA MONITOR CORPORATION warrants its products to be free from defects in workmanship or material under normal use and service for two years after date of shipment. SMC will repair or replace without charge any equipment found to be defective during the warranty period. Final determination of the nature and responsibility for defective or damaged equipment will be made by SMC personnel.

All warranties hereunder are contingent upon proper use in the application for which the product was intended and do not cover products which have been modified or repaired without SMC approval or which have been subjected to accident, improper maintenance, installation or application, or on which original identification marks have been removed or altered. This Limited Warranty also will not apply to interconnecting cables or wires, consumables (ie. calibration gases, batteries, sensors), nor to any damage resulting from battery leakage.

In all cases SMC's responsibility and liability under this

warranty shall be limited to the cost of the equipment. The purchaser must obtain shipping instructions for the prepaid return of any item under this warranty provision and compliance with such instruction shall be a condition of this warranty.

Except for the express warranty stated above, SMC disclaims all warranties with regard to the products sold hereunder including all implied warranties of merchantability and fitness and the express warranties stated herein are in lieu of all obligations or liabilities on the part of SMC for damages including, but not limited to, consequential damages arising out of/or in connection with the use or performance of the product.