



**Model 3200
Wet Bench -- Flame Detector**

This manual provides instructions for the following Sierra Monitor products:

<u>Model</u>	<u>Description</u>
3200-01	Standard, (Normally Closed - NC Trouble Relay)
3200-02	Self-test, (NC Trouble Relay)
3200-03	Enhanced, (NC Trouble Relay)
3200-04	Standard, with SealCon and Turk connectors (NC Trouble)

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



APPROVED

Instruction Manual Part Number T15009
Rev. E

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Model 3200-XX
Wet Bench -- Flame Detector

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1. Product Description

1.1 Introduction

The Model 3200 provides reliable flame detection for the interior spaces of semiconductor production and cleaning equipment. The 3200 is sealed in an ultra-sonically welded plastic housing impervious to a broad range of acids and other materials found in production equipment. Many applications for this device are found in process tools in the semiconductor industry.

All versions of the Model 3200 Flame Detector utilize UV and IR sensors to look for flame. The Model 3200 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 3200 Detector declares a fire.

The microprocessor is continuously performing system tests looking for any faults which would impair its ability to accurately detect a flame and declare an alarm. The system tests include: input power, sensor circuits, relay circuits, and internal systems. The Model 3200 has a Fire Relay and a Fault Relay, which may be, connected as normally open or normally closed contacts.

The Model 3200 detector is mounted in a NEMA 6P sealed housing. The electronics are mounted inside a sealed polypropylene (FRPP) or polyvinylidene fluoride (PVDF) housing. The housing is fitted with a 1/4 NPT fitting for a 3/8 inch diameter polypropylene (PVDF) tube. The cabling is run inside the tube and can be sealed using a fitting at a J-box or the plenum wall. (Note: The 3200-04 has a Turck Connector).

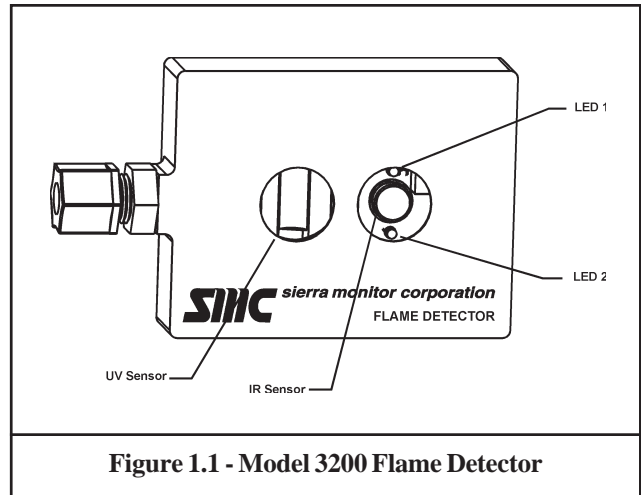


Figure 1.1 - Model 3200 Flame Detector

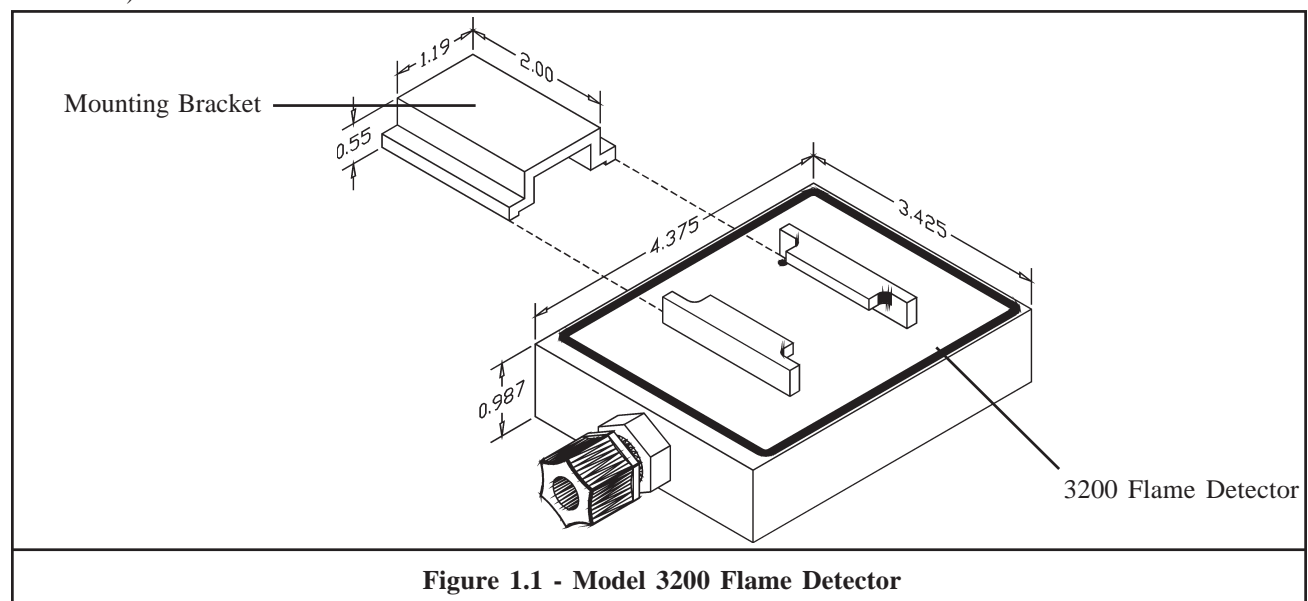


Figure 1.1 - Model 3200 Flame Detector

2. Operation

2.1 General

When the Model 3200 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 3200 will activate the Fire Relay and turn on both LEDs. The device will remain in Alarm Mode until power is removed. Thus, the Model 3200 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 3200 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 3200 is rated to a 4-inch diameter Isopropyl alcohol fire at a distance of 10 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 5 seconds.

2.4 Environment

The Model 3200 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 3200 detectors are configured at the factory. The relay connections for Normally Open or Normally Closed operation are made internally and cannot be changed. (NOTE: 3200-04 has Normally Closed Fire and Normally Closed Fault relays)

The Model 3200 comes in several configurations and models. All models of the Model 3200 have the same detection and false alarm rejection capability. The "Standard" models are designed for simple and reliable operation. The "Self Test" models have a built in self-test circuit for the UV sensor. This added self-test increases reliability and reduces regular maintenance. The "Enhanced" models have the UV self-test circuit and an RS485 communication port for data gathering with an interface box connected to a computer. The 3200-04 has a Turck Connector rather than the polypropylene tube connection. Table 2.1 shows the features of each model.

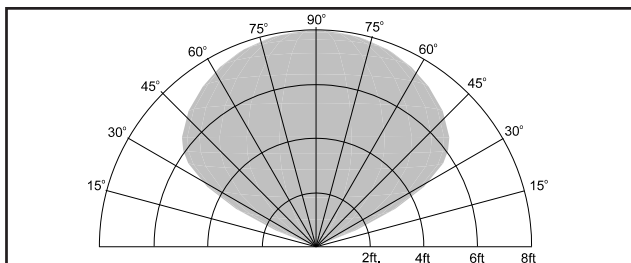


Figure 2.1
Model 3200 Field-of-View

Model	Built-in Sensor Self-test	Housing Type	Model Blinks	Fire Relay Contacts	Fault Relay Contacts*	Relay Blinks
3200-01	NO	Polypropylene	1	Normally Open	Normally Closed	1
3200-02	YES	Polypropylene	2	Normally Open	Normally Closed	1
3200-03	YES	Polypropylene	3	Normally Open	Normally Closed	1
3200-04	NO	Polypropylene	1	Normally Closed	Normally Closed	1

Table 2.1 Model 3200 Versions and Relay Configurations

* This is with the detector operating normally and the fault relay energized.

2.6 LED Operation

The status of all versions of the Model 3200 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 3200 detector will begin by flashing the LEDs in a pattern indicating the model and configuration. The first LED (the left LED when facing the detector with the cable below the LED's) will turn on while the second LED blinks a number of times. The number of times the second LED blinks defines the model of the 3200 (see Table 2.1, Model Blinks column). Both LED's will then turn off. The first LED will turn on again while the second LED blinks a number of times. The number of times the second LED blinks indicates the relay configuration of the 3200 (see Table 2.1 Relay Blinks column). 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 3200 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 (the left LED when facing the detector with the cable below the LEDs) will be “off” while the LED2 (the right LED) will begin flashing, 1/2 second “on” and 1/2 second “off”, a number of times. The number of times LED2 flashes indicates the level of fault. LED2 will stop flashing and LED1 will turn “on”. This cycle is repeated until the fault is corrected. See Table 2.2 for levels 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 2 and 3, a fire indication will override a fault indication.

2.7 Relay Operation

All Models of the Model 3200 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 3200. (NOTE: 3200-04 Fire Relay is Normally Closed)

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 #	Fault Label	Description
1	UV Test Fault	UV sensors did not detect enough UV from the internal UV source.
2	Program Failure	The program sum check is in error
3	Calibration Fault	Device is out of calibration
4	Voltage Low	Input Voiltage is below 12VDC
5	Photo. Sensor Fault	IR 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 ...	Internal device temperature Range went below - 40° C or above 85° C

**Table 2.2
Fault Table**

3. Installation

3.1 Housing

Note: The 3200-04 has special connector and wiring. See Appendix A.

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 cabling is encased within a tube. Mount a 3/8 tubing fitting into the wall where the cabling is to be run through or to a junction box. Secure the tubing as needed for the application. Run the cabling to the connections of the controller or junction box. Cut the tubing to fit. Secure the cabling as needed for the application.

Care should be exercised not to put excessive strain on the tube ends. Strain on the tube ends may allow fluid to enter the housing. In addition, both tube fittings must be adequately tightened to prevent fluid from entering the detector housing.

3.2 Connection

All connections are made at the cable end. Connect the cable wiring to the appropriate connection points in the controller or junction box. See the Table 3.1 for wiring.

3.2.1 Power

Supply power must be "OFF" before connecting the Model 3200 Detector. Power for the Model 3200 detector is connected to the Red and Black wires in the cable. Connect the Red wire to the positive side of the 24VDC supply. Connect the Black wire to the negative side of the 24VDC supply. Check the controller manufacturer's manual for proper connection points.

3.2.2 Fire Relay

The Fire Relay is connected with the Blue, Orange, Brown, and Yellow wires in the cable. Connect the Blue wire to one side of the Fire Signal Circuit and the Orange wire to the other side of the Fire Signal Circuit. Connect the Brown wire to the Blue wire of the next detector in the chain and the yellow wire to the Orange wire of the next detector in the chain.. Connect the EOL resistor across to the Yellow and Brown wires on the last detector in a chain. The Fire Relay wires are not polarized. The Orange and Yellow wires are connected internally to one side of the Fire Relay and the Blue and Brown wires are connected internally to the other side of the Fire Relay. 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 with the White and Green wires in the cable. Connect the White wire to one side of the Fault Signal Circuit and the Green wire to the other side of the Fault Signal Circuit or the Green wire of the next device if more than one device is being used. The Fault Relay wires are not polarized. Refer to the controller manufacturer's manual for proper connection points.

Wire	Description	Internal Connection
Red	Positive power 12 to 30 VDC	+
Black	Negative side of power	-
Blue	Fire Relay In	Fire relay common
Orange	Fire Relay In	Fire relay NO
Brown	Fire Relay Out	Fire relay common
Yellow	Fire Relay Out	Fire relay NO
White	Fault Relay	Fault relay common
Green	Fault Relay	Fault relay NC or NO
Purple'	RS-485A	"A"
Grey'	RS-485B	"B"

**Table 3.1
Cable Wiring**

' Only applies to enhanced models.

3.3 Testing

The Model 3200 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 10 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 3200 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.

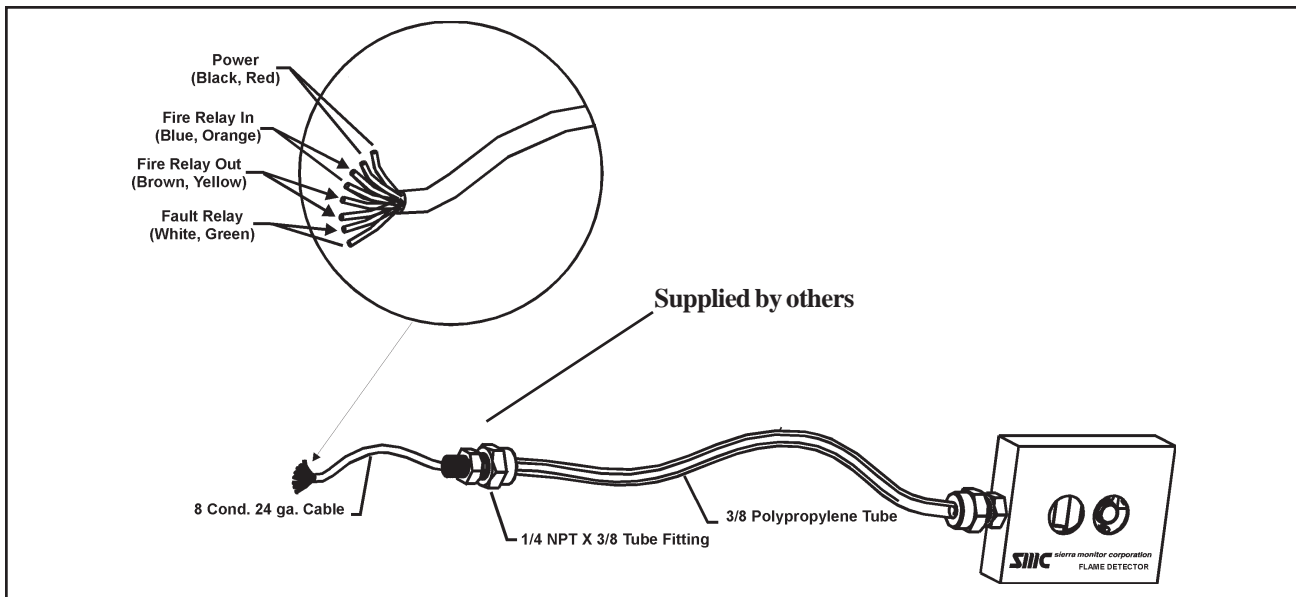


Figure 3.1
Cabling

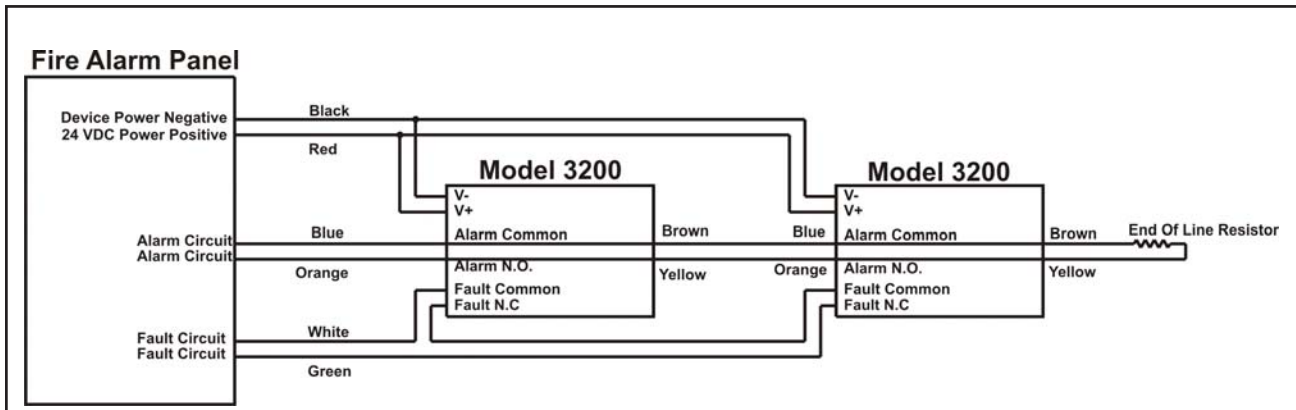


Figure 3.2
Wiring to Alarm Panel

4. Maintenance

The self-test functions eliminate the need for most regular maintenance procedures. 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.

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 3200 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. The Red wire should be positive; the Black wire should be negative. There should be between 12 and 32 volts DC across the Red and Black wires.
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 #	Fault Label	Description
1	UV Test Fault	UV sensors did not detect enough UV from the internal UV source.
2	Program Failure	The program sum check is in error
3	Calibration Fault	Device is out of calibration
4	Voltage Low	Input Voiltage is below 12VDC
5	Photo. Sensor Fault	IR 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	Internal device temperature Range went below - 40° C or above 85° C

**Table 2.2
Fault Table**

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 the Red wire and the Black wire on the cable. The voltage should be between 12 - 32 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.

5.2.6 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.

5.2.7 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.

5.2.8 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 wires (Green and Blue) at the cable. 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.

NOTE: With software and a computer, more extensive diagnostics can be performed. Contact the factory for information on software and the minimum requirements for a computer.

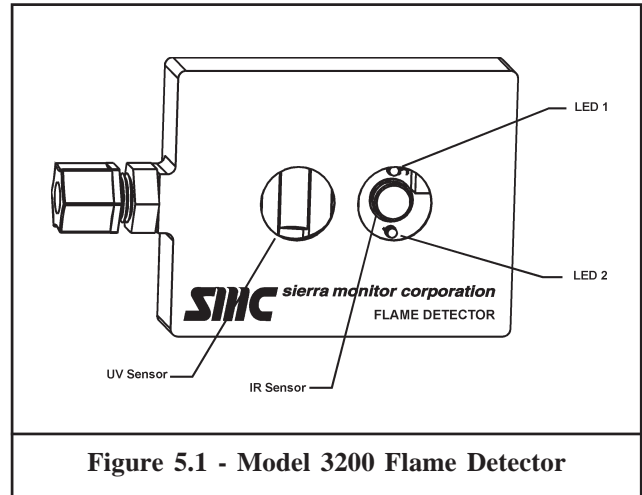


Figure 5.1 - Model 3200 Flame Detector

6. General Specifications

Input voltage:	12 to 30 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:	24 gauge, 8 wire cable. (6' standard length)
Weight:	Approx. 1lb (.0.5 Kg)
Housing:	
Dimensions:	3.4" x 4.2" x 1" (7.9 x 10.2 x 2.5 cm)
Material:	FR Polypropylene (UL 94 flammability rating VO or polyvinylidene fluoride (PVDF)
Rating:	IP67
Sensitivity:	
Responsivity:	UV - 180 to 260 nanometers; IR - .715 to 3.5 microns
Range:	3 seconds to a 4-inch diameter isopropl alcohol or polypropylene fire at 10 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.

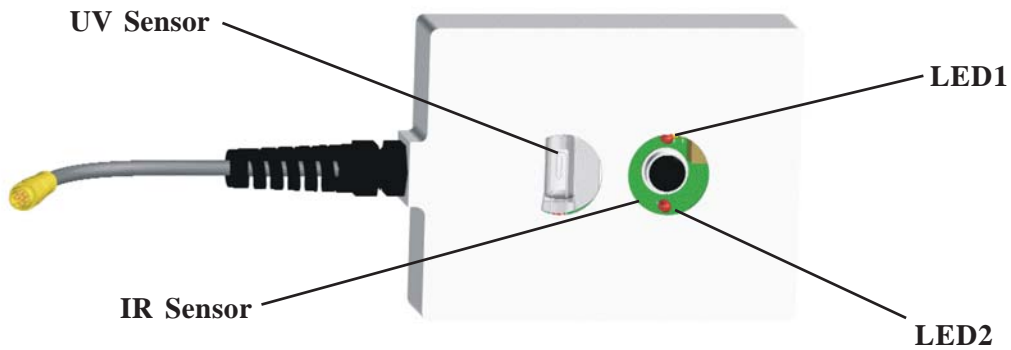
All warranties hereunder are contingent upon proper use in the application for which the product was intended and do not cover products which have been modified or repaired without SMC approval or which have been subjected to accident, improper maintenance, installation or application, or on which original 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.

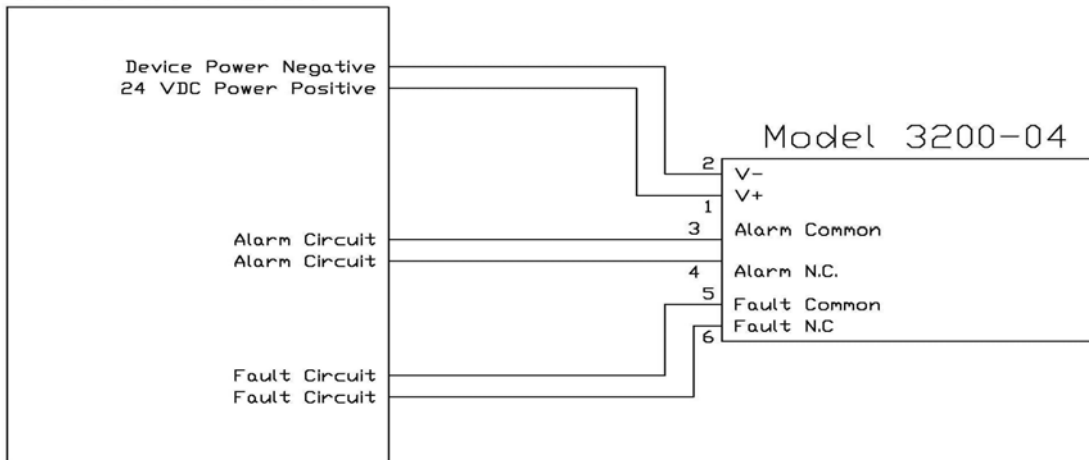
Appendix A Model 3200-04 with Turck Connector Wiring

The wiring termination for the 3200-04 detector is via the turck connector, see table A-1.

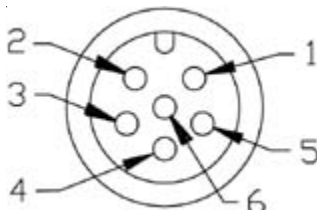


3200-04 Layout (Sensor & LED)

Control Panel



3200-04 Wiring



3200-04	PSG 6-0.2 Turck Connector	
Function	Wire Color	Pin #
- 24 VDC	White	2
+24 VDC	Brown	1
Fire Common	Blue	3
Fire Normally Closed	Black	4
Fault Common	Grey	5
Fault Normally Closed	Pink	6

Table A-1 Turck Connector Wiring