SharpEye™

Model 20/20ML

UV/IR Mini Flame Detector

User Guide

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Table of Contents

Table of Contents ..... **v**
List of Figures ..... **ix**
List of Tables ..... **ix**
1 About this Guide **11**
1.1 Release History 11
1.2 Glossary and Abbreviations 12
1.3 Notifications 13
2 Product Overview **15**
2.1 Technical Description 15
2.2 Principles of Operation 15
2.3 Sensing Elements 16
2.4 Modbus RS-485 16
2.5 Types and Models 16
3 Performance **19**
3.1 Detection Sensitivity 19
3.1.1 Standard Fire 19
3.1.2 Sensitivity Ranges: 19
3.1.3 Other Fuels 20
3.2 Cone of Vision 21
3.3 False Alarms Prevention 21
4 Operation **23**
4.1 Visual Indications 23
4.2 Output Signals 23
4.2.1 Optional Latching 24
4.2.2 Built-In-Test 25
4.3 Detector Mode Setup 25
4.3.1 Detector Settings 25
4.3.2 Detector's Various Functions 25
4.3.3 Detector Default Setup 26
4.4 Built-In-Test 27
4.4.1 General 27
4.4.2 Principles 27
4.4.3 Automatic and Manual BIT 27

4.4.4 Manual BIT Only 28
5 Technical Specifications 29
5.1 Electrical Specifications 29
5.1.1 Operating Voltage 29
5.1.2 Power Consumption 29
5.1.3 Electric Input Protection 29
5.1.4 Electrical Outputs 29
5.2 Communications Network 30
5.3 Mechanical Specifications 30
5.3.1 Enclosure Options 30
5.3.2 Water and Dust-Tight 30
5.3.3 Electronic Modules 30
5.3.4 Electrical Connection 30
5.3.5 Dimensions 30
5.3.6 Weight 30
5.4 Environmental Specifications 30
5.4.1 High Temperature 30
5.4.2 Low Temperature 31
5.4.3 Humidity 31
5.4.4 Salt Fog 31
5.4.5 Dust 31
5.4.6 Vibration 31
5.4.7 Mechanical Shock 31
5.4.8 Electromagnetic Compatibility (EMC) 31
6 Installation Instructions 33
6.1 Scope 33
6.2 General Considerations 33
6.3 Preparation for Installation 34
6.4 Installation 34
6.4.1 Tilt Mount Kit 34
6.4.2 Tilt Installation 35
6.5 Detector Mounting 38
6.6 Wiring Function 38
6.6.1 Power Supply 38
6.6.2 Manual Bit Activation 38
6.6.3 Fault Relay 38

6.6.4 Alarm Relay 38
6.6.5 4–20mA Output 39
6.6.6 RS-485 39
6.6.7 Ground 39
6.7 Operation Mode 39
6.7.1 Programmable Function 39
6.7.2 Address 39
6.7.3 Alarm Delay 39
7 Operating Instructions 41
7.1 Scope 41
7.2 Power-Up 41
7.3 Reset 42
7.4 Functional Testing 42
7.4.1 Manual BIT Test 42
7.4.2 Testing with Flame Simulator Model FS1200 42
7.5 Safety Precautions 43
8 Maintenance Instructions 45
8.1 Scope 45
8.2 Maintenance Instrumentation and Personnel 45
8.3 Preventive Maintenance Procedures 45
8.4 Periodic Maintenance Procedures 45
8.4.1 Power-Up Procedure 45
8.4.2 Functional Test Procedure 45
8.5 Maintenance Records 46
8.6 Troubleshooting 46
8.6.1 Fault Indication 46
8.6.2 False Alarm or Warning Indication 46
Appendix A: Typical Wiring Configurations 47
A.1 RS-485 Communications Network 48
Appendix B: Flame Simulator FS-1200 53
Appendix C: Ordering Information 55
C.1 Unpacking 55
C.2 Operating Instructions 55
C.2.1 Range 56
C.2.2 Charging the Battery 56
C.2.3 Replacing the Battery 58

C.3 Technical Specifications 58
C.3.1 General 58
C.3.2 Electrical 58
C.3.3 Physical 58
C.3.4 EMI Compatibility 59
Technical Support 64

List of Figures

Figure 1: Model Definitions 17
Figure 2: UV/IR Flame Detector 17
Figure 3: Flame Detector Assembly: Outline Drawing of Cable Output Option 18
Figure 4: Horizontal and Vertical Fields of View 21
Figure 5: 20/20ML LED 23
Figure 6: Detector and Tilt Mount Assembly 36
Figure 7: Tilt Mount Assembly - Outline Drawing 37
Figure 8: Connector Interface Option 47
Figure 9: Cable Interface Option 48
Figure 10: RS-485 Networking 49
Figure 11: 4–20mA Wiring (Sink Option) 49
Figure 12: 4–20mA Wiring (Source Option) 50
Figure 13: Typical Wiring for 4 Wire Controllers 50
Figure 14: SharpEye Flame Simulator FS-1200 53
Figure 15: Flame Simulator Battery Replacement 57

List of Tables

Table 1: Response Sensitivity Ranges for Other Fuels 20
Table 2: 20/20ML - Immunity to False Alarm Faults 22
Table 3: Detector States 24
Table 4: Output Signals Versus Detector State 24
Table 5: Time Delay 26
Table 6: Function Setup 26
Table 7: Default Function Setup 27
Table 8: Contact Ratings 29
Table 9: Tilt Kit 34
Table 10: Sensitivity Ranges 56
Table 11: Immunity Tests 59
Table 12: Emission Tests 59

1 About this Guide

This guide describes the SharpEye Model 40/40L, LB, L4, L4B (UV/IR) Flame Detector and its features and provides instructions on how to install, operate, and maintain the detector.

Note:

This user guide should be read carefully by all individuals who have or will have responsibility for using, maintaining, or servicing the product.

This guide includes the following chapters and appendices:

- **Chapter 1, About this Guide**, details the layout of the guide, includes the release history, a glossary and abbreviations, and explains how notifications are used in the guide.
- **Chapter 2, Product Overview**, describes the detector's theory of operation.
- **Chapter 3, Performance**, describes the detector's features and capabilities.
- **Chapter 4, Operation**, describes the detector's operation modes, user interface and indications.
- **Chapter 5, Technical Specifications**, describes the detector's electrical, mechanical, and environmental specifications.
- **Chapter 6, Installation Instructions**, describes installation as well as wiring and mode setting.
- **Chapter 7, Operating Instructions**, describes operation and power-up procedures.
- **Chapter 8, Maintenance Instructions**, describes maintenance and support procedures.
- **Appendix A, Typical Wiring Configurations**, describes wiring diagrams for installation.
- **Appendix B, Flame Simulator FS-1200**, describes the Flame Simulator and its operation.
- **Appendix C, Ordering Information**, describes the Flame Simulator Kit, sensitivity ranges, and battery charging and replacement procedures.

1.1 Release History

Rev	Date	Revision History	Prepared by	Approved by
3	July 2017	Fourth Release	Jay Cooley	Shaul Serero

1.2 Glossary and Abbreviations

Abbreviation/Term	Meaning
Analog Video	Video values are represented by a scaled signal
ATEX	Atmosphere Explosives
AWG	American Wire Gauge
BIT	Built-In-Test
CMOS	Complementary Metal-Oxide Semiconductor image sensor
Digital Video	Each component is represented by a number representing a discrete quantization
DSP	Digital Signal Processing
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EOL	End of Line
FOV	Field of View
HART	Highway Addressable Remote Transducer – communications protocol
IAD	Immune at Any Distance
IECEx	International Electro-Technical Commission Explosion
IP	Internet Protocol
IPA	Isopropyl Alcohol
IR	Infrared
IR3	Refers to the 3 IR sensors in the VID
JP5	Jet Fuel
LED	Light Emitting Diode
MODBUS	Serial communications protocol using Master-Slave messaging
N/A	Not Applicable
N.C.	Normally Closed
NFPA	National Fire Protection Association
N.O.	Normally Open
NPT	National Pipe Thread
NTSC	National Television System Committee (a color encoding system)
PAL	Phase Alternation by Line (a color encoding system)
P/N	Part Number

Abbreviation/Term	Meaning
RFI	Radio Frequency Interference
RTSP	Real Time Streaming Protocol
SIL	Safety Integrity Level
UNC	Unified Coarse Thread
VAC	Volts Alternating Current

1.3 Notifications

This section explains and exemplifies the usage of warnings, cautions, and notes throughout this guide:

Warning:

This indicates a potentially hazardous situation that could result in serious injury and/or major damage to the equipment.

Caution:

This indicates a situation that could result in minor injury and/or damage to the equipment.

Note:

This provides supplementary information, emphasizes a point or procedure, or gives a tip to facilitate operation.

2 Product Overview

The SPECTREX Model 20/20ML UV/IR Flame Detectors are designed to sense the occurrence of fire and flames and subsequently activate an alarm or an extinguishing system, directly or through a control circuit, for maximum fire protection. They use the innovative technology of advanced digital signal processing to analyze the dynamic characteristics of fire.

Detection performance is controlled by a microprocessor and easily adapted to all environments, applications, and requirements.

These versions of the UV/IR detectors are designed for location in non-Ex/safe areas. The programmable functions are available through an RS-485 port used with a standard PC and software supplied by SPECTREX.

To use the Host software and to change the required functions, refer to *Manual TM784050* for instructions.

Warning:

The detector is not field-repairable due to the meticulous alignment and calibration of the sensors and the respective circuits. Do not attempt to modify or repair the internal circuits or change their settings, as this will impair the system's performance and void the SPECTREX product warranty.

2.1 Technical Description

- **Detection Range**: up to 50ft/15m for a 1ft^2/0.1m^2 fire
- **Two Response Levels**: Warning and detection
- **Solar Blind**
- **Microprocessor Based**: Digital signal processing
- **Built-In-Test (BIT):** Manual and automatic (see *Built-In-Test* on page 27)
- **Electrical Interface**:
  - Dry contact relays
  - Communications network RS-485
  - 4–20mA output

2.2 Principles of Operation

The Model 20/20ML UV/IR Flame Detector is an electronic device designed to sense fire and flames and subsequently activate an alarm or an extinguishing system directly or through a control circuit.

The UV-IR Radiation Flame Detector is a dual spectrum optical detector sensitive to 2 separate ranges of the radiation spectrum, both of which are present in fires. The detector monitors the protected area, by measuring the radiation intensity in it, within 2 frequency ranges of the electromagnetic spectrum, namely the Ultra-Violet (UV) and the Infra-Red (IR).

The detector integrates 2 dependent channels in which appropriate detection pulses are registered and further analyzed for frequency, intensity, and duration.

2.3 Sensing Elements

The IR sensor is sensitive to radiation over the range of 2.5–3.0μ.

The IR channel will register a detection signal at the appropriate level in the following scenarios:

- When the IR sensor is exposed to radiation in the appropriate frequency range
- When there is an intermittent gleam pattern characteristic to a flickering fire
- When a preset threshold and time duration are reached

The UV sensor is sensitive to radiation over the range of 0.185–0.260μ. The UV channel incorporates a special logic circuit that eliminates false alarms caused by solar radiation and other non-fire UV sources. Furthermore, the UV channel sensitivity is stabilized over the working temperature range.

2.4 Modbus RS-485

For more advanced communications, 20/20ML has an RS-485 Modbus-compatible output that provides data communications from a network (up to 247 detectors) to a host computer on a universal controller for central monitoring.

This feature enables reconfiguration of factory settings, eases maintenance, and allows local and remote diagnostics.

2.5 Types and Models

The 20/20ML is available with a St. St. 316L housing.

The output is via either a connector (socket) or a cable tail (up to 2m long).

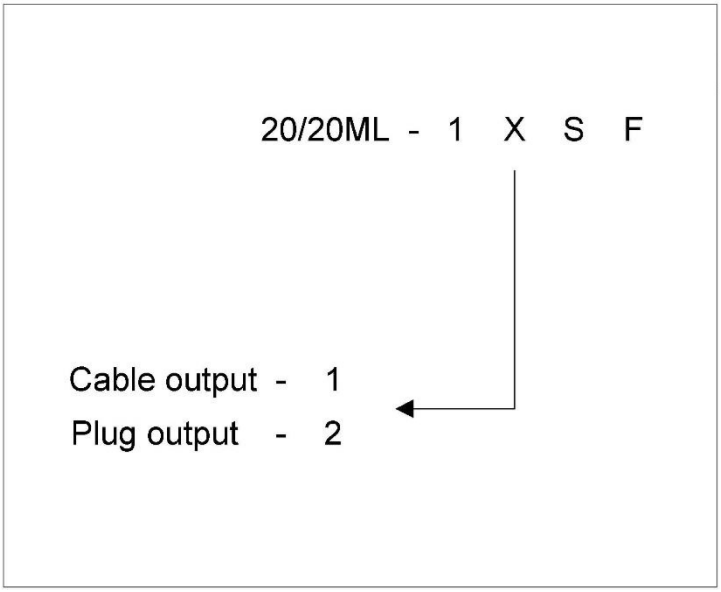


Figure 1: Model Definitions

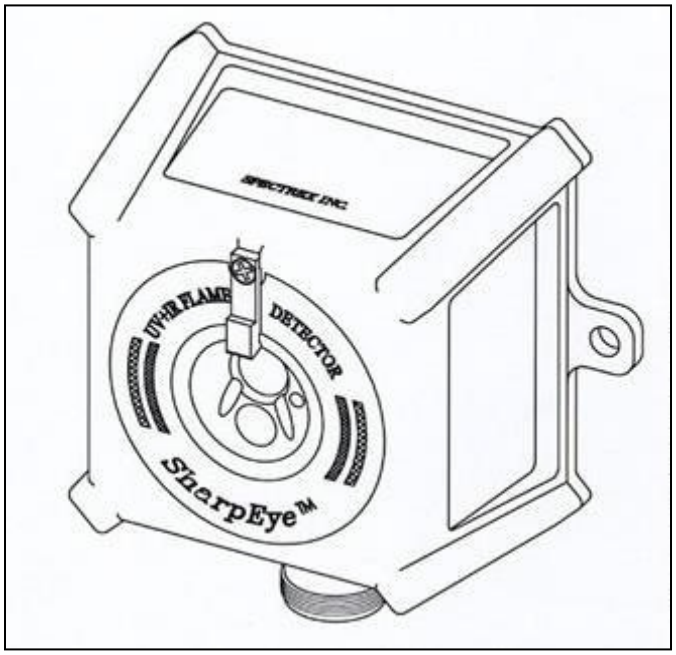


Figure 2: UV/IR Flame Detector

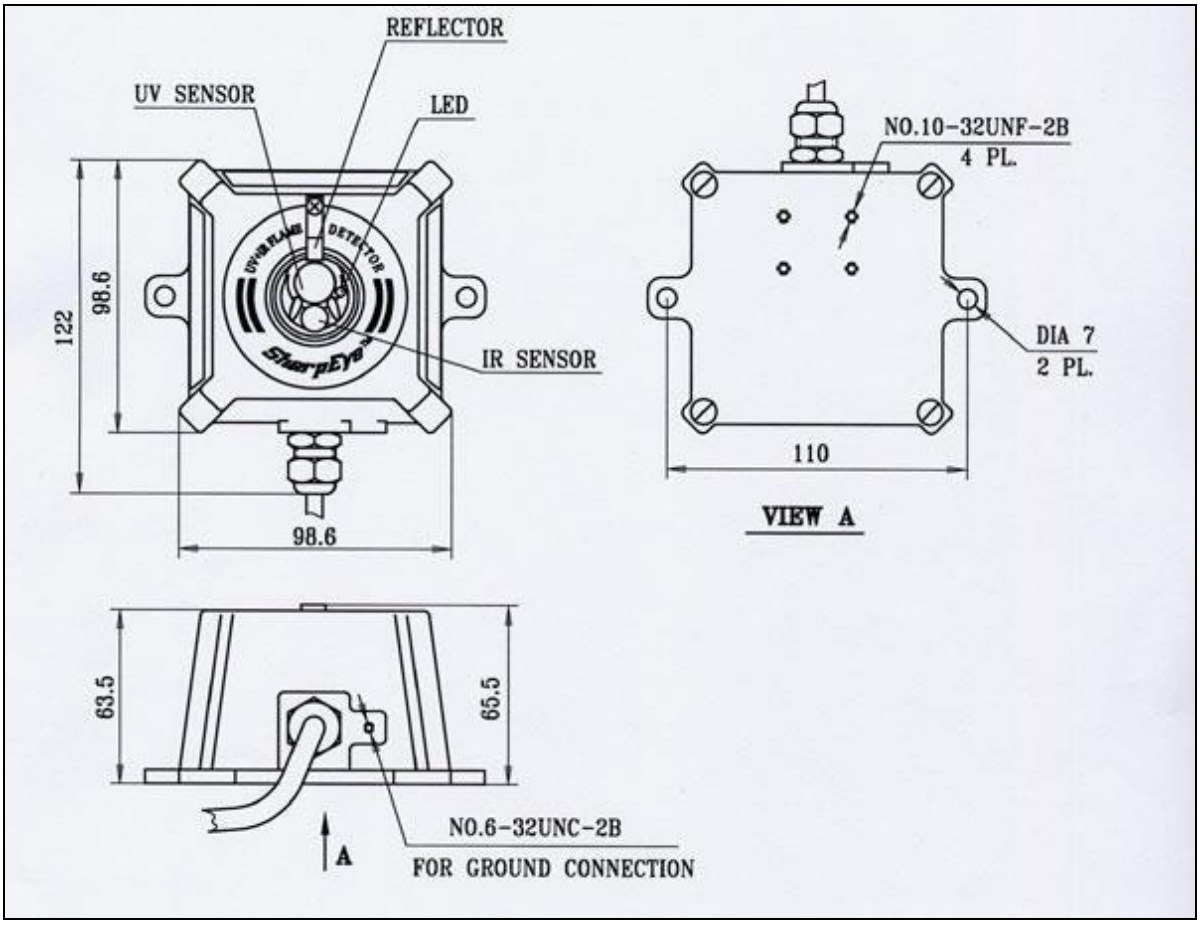


Figure 3: Flame Detector Assembly: Outline Drawing of Cable Output Option

3 Performance

3.1 Detection Sensitivity

Detection sensitivity is the maximum distance at which the detector will reliably detect a specific size of fire and a typical type of fuel (standard fire).

3.1.1 Standard Fire

A $1ft^2/0.1m^2$ gasoline pan fire with a max. wind speed of 6.5ft/sec / 2m/sec.

3.1.2 Sensitivity Ranges:

The detector has 2 user selectable sensitivity ranges. For each range there are 2 response levels:

- Warning (pre-alarm)
- Alarm

The detection distance for the warning level is approximately 10% higher than the alarm distance. Alarm response times for a "standard fire" at a specified range are shown here:

- Sensitivity Range (ft/m): 50/15
- Response Time (sec): 5

For some typical ambient conditions, the Zeta parameter as defined in NFPA 72 for the 20/20ML detector is 0.01 (1/m).

Note:

Zeta parameters may vary significantly with changes in temperature, air pressure, humidity, visibility conditions, etc.

3.1.3 Other Fuels

The detector will react to other types of fires as follows:

- **Pan fire size**: 1ft^2/0.1m^2
- **Maximum wind speed**: 6.5ft/sec / 2m/sec
- **Maximum response time**: 10 sec

Table 1: Response Sensitivity Ranges for Other Fuels

Max. Detection Distance

Type Of Fuel	Fire size	20/20ML (ft/m)
Gasoline	1ft^2/0.1m^2 pan fire	15/50
n-heptane		15/50
Diesel fuel		11/37
JP5		11/37
Kerosene		11/37
Alcohol (ethanol)		7.5/25
IPA (isopropyl alcohol)		7.5/25
Methanol		7.5/25
Methane	20”/0.5m plume fire	5/15
LPG (propane)		5/15
Hydrogen		5/15
Silane	12”/0.3m plume fire	5/15
Polypropylene pellets	8”/0.2m diameter	5/5
Office paper	1ft^2/0.1m^2 pan fire	4/13

3.2 Cone of Vision

Horizontal: 100°

Vertical: 100°

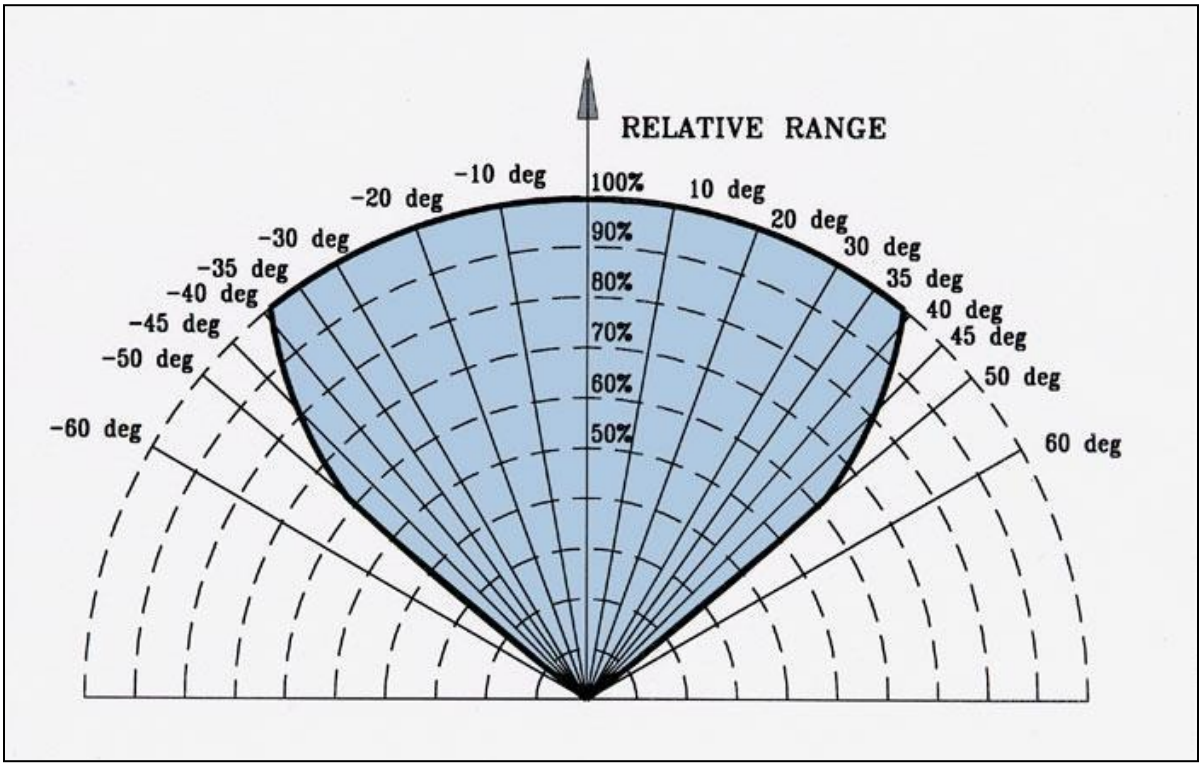


Figure 4: Horizontal and Vertical Fields of View

3.3 False Alarms Prevention

The detector will not provide an alarm or a warning signal as a reaction to the radiation sources specified below.

False alarm immunity is listed in Table 2.

Notes:
IAD = Immune at Any Distance
All sources are chopped from 0 to 20Hz

Table 2: 20/20ML - Immunity to False Alarm Faults

Radiation Source	Immunity Distance (ft/m)
Sunlight	IAD
Indirect or reflected sunlight	IAD
Vehicle headlights (low beam) conforming to MS53023-1	IAD
Incandescent frosted glass light, 100W	IAD
Incandescent clear glass light, rough service, 100W	IAD
Fluorescent light with white enamel reflector, standard office or shop, 40W (or two 20W)	IAD
Arc welding [4mm/ 5/32” rod; 240A]	9.8/3
Bright colored clothing, including red and safety orange	IAD
Electronic flash (180 watt seconds minimum output)	IAD
Red dome light conforming to M251073-1	IAD
Blue-green dome light conforming to M251073-1	IAD
Flashlight (Mx 991/U)	IAD
Radiation heater, 1500W	IAD
Radiation heater, 1000W with fan	IAD
Grinding metal	3.3/1
Lit cigar or cigarette	IAD
Match, wood, and stick, including flare-up	3.3/1
Sunlight	IAD
Sunlight	IAD
Indirect or reflected sunlight	IAD
Vehicle headlights (low beam) conforming to MS53023-1	IAD
Incandescent frosted glass light, 100W	IAD

4 Operation

4.1 Visual Indications

One 3-color LED-indicator is located in the detector front window:

Detector Status	LED Color	LED Mode
Fault, BIT Fault	Yellow	4Hz flashing
Normal	Green	1Hz flashing
Warning	Red	2Hz flashing
Alarm	Red	Steady

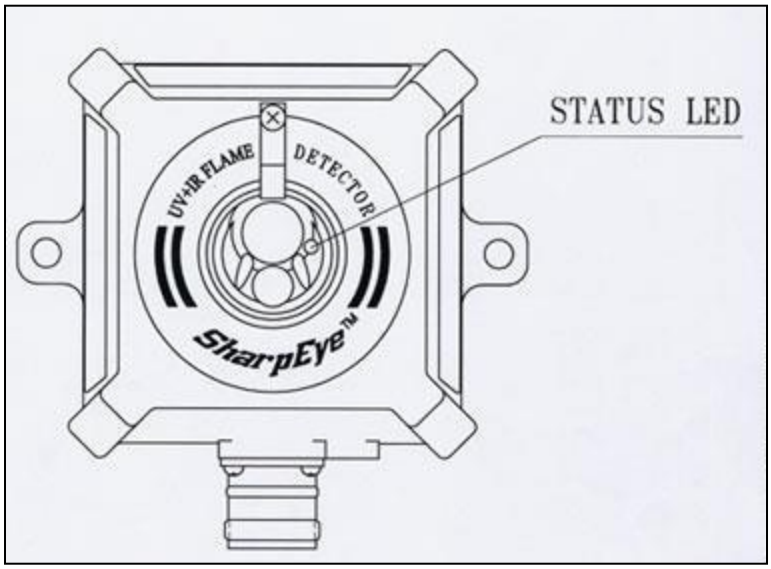


Figure 5: 20/20ML LED

4.2 Output Signals

The detector provides the following outputs:

- Alarm relay
- Fault relay
- 4–20mA current output
- RS-485 communications

The detector can be in one of the following states:

Table 3: Detector States

Detector State	Description
Normal	The detector is functioning normally.
BIT	The detector performs a Built-In-Test.
Warning	Fire detected – warming alarm (pre-alarm) state.
Alarm	Fire detected – fire alarm state.
Latched Alarm (Optional)	The alarm outputs are latched due to the detection of a fire that has already been extinguished.
BIT Fault	A fault is detected during a BIT sequence. The detector will continue to detect fire if the alarm conditions occur.
Fault	A fault is detected when the power supply is too low or during a software fault.

In each state, the detector will activate different outputs, as specified in Table 4.

Table 4: Output Signals Versus Detector State

Detector State	Color LED	Flashing LED	Alarm Relay	Fault Relay	4–20mA Output
Normal	Green	1Hz	Off	On	4mA
Warning	Red	2Hz	Off	On	16mA
Alarm[1]	Red	Steady	On	On	20mA
Latch[2]	Red	Steady	On	On	20mA
BIT Fault[3]	Yellow	4Hz	Off	Off	2mA
Warning at BIT Fault	Red	2Hz	Off	Off	16mA
Alarm at BIT Fault	Red	Steady	On	Off	20mA
Fault	Yellow	4Hz	Off	Off	0mA

[1] The Alarm outputs will be activated as long as the alarm conditions are present.

[2] The Alarm state can be latched (optional) according to the programmable function.

[3] The detector will be in its BIT Fault state until it has passed a successful BIT and will stop approximately 3 seconds after the fire is no longer detected.

4.2.1 Optional Latching

The detector has an optional latched alarm output capability, which operates according to the programmable function. If selected, upon the detection of a fire, the detection signal is latched until manually reset (disconnecting the power supply or performing a manual BIT). Latching affects the Alarm relay, 4–20mA output, and the Alarm LED.

4.2.2 Built-In-Test

When the programmable function Alarm BIT is set at Yes, a successful manual BIT will activate the Alarm relay for 3 seconds and the 4–20mA output will provide 20mA for 3 seconds

4.3 Detector Mode Setup

4.3.1 Detector Settings

See *Detector Default Setup* on page 26 for default factory settings.

The 20/20ML incorporates several functions that can be set by the customer using SPECTREX Host software, which will be supplied for each detector shipment.

The Host software enables you to change functions, as described in *Detector's Various Functions* on page 25. Refer to *Manual TM784050* for programming instructions.

4.3.2 Detector's Various Functions

4.3.2.1 Sensitivity Ranges

The detector offers 2 sensitivity settings. The detection distance for the alarm level is 50ft/15m from a standard fire.

4.3.2.2 Alarm Delay

The detector is equipped with an alarm delay option, which provides programmable time delays of 0 to 30 seconds with 8 fixed settings: 0, anti-flare, 3, 5, 10, 15, 20, and 30 seconds.

The alarm delay option will affect the alarm relay and the 4–20mA output.

When an alarm (detection) level condition is encountered, the detector delays the execution of the Alarm output relay by the specified period of time. The detector will then evaluate the condition for 3 seconds. If the alarm level is still present, the alarm outputs will be activated. If this condition no longer exists, the detector will return to its Standby state. The LED will indicate the warning level during the delay time only if the fire condition exists.

4.3.2.3 Anti-Flare

Anti-Flare mode is selected to prevent false alarms in locations where fast flares may be present. The time delay for fire alarm in this mode is from 2.5 to 15 seconds (mostly less than 10 seconds).

Table 5: Time Delay

Delay (seconds)
0
A* – anti-flare
3
5
10
15
20
30

* Default

4.3.2.4 Function Setup

The user can select the desired mode of operation by means of the host.

Table 6: Function Setup

Name	Yes	No
Alarm latch	Alarm latching enable	Alarm latching disable (default)
Automatic BIT	Automatic and manual BIT (default)	A manual BIT only
Alarm BIT	A successful manual BIT activates the alarm relay for approximately 3 seconds; the 4–20mA will provide 20mA for 3 seconds	A successful manual BIT does not activate the alarm relay (default)

4.3.2.5 Addresses Setup

Refer to *TM784050* for instructions for defining the addresses of the detectors. The detector provides up to 247 addresses (from 1 to 247) that can be used with an RS-485 communications link.

4.3.3 Detector Default Setup

The detector has 5 functions that can be programmed according to customer requirements at the factory or at the customer facility using a software host. If there are no specific requirements, the standard setup (default) that the detector is programmed to are as follows:

Table 7: Default Function Setup

Detector Default Setup	20/20ML
Delay	3
Alarm Latch	No
Automatic BIT	Yes
Alarm BIT	No

4.4 Built-In-Test

4.4.1 General

The detector's Built-In-Test (BIT) checks the following:

- Electronic circuitry
- Sensors
- Window cleanliness

The detector can be set to perform the BIT automatically and manually, or manually only.

4.4.2 Principles

If the result of a BIT is the same as the current status of the detector (Normal or BIT Fault), the detector's status is unchanged. If the result of a BIT differs from the current status of the detector, the detector's status is changed (from Normal to BIT Fault or from BIT Fault to Normal).

Note:

In BIT Fault status, the detector can continue to detect a fire.

4.4.3 Automatic and Manual BIT

4.4.3.1 Automatic BIT

The detector automatically performs a BIT every 15 minutes.

A successful BIT does not activate any indicator:

- The fault relay remains closed (Normal).
- The LED continues to flash (1Hz) at green.
- The 4–20mA output continues to indicate 4mA.

An unsuccessful BIT sequence activates the following:

- The Fault relay is opened.
- 4–20mA output indicates a BIT Fault (2mA).
- The LED flashes (4Hz) at yellow.
- A BIT procedure will be performed every minute.

4.4.3.2 Manual BIT

Functions as described in *Manual BIT Only* on page 28. In the case of an unsuccessful BIT, all outputs will function as described in *Manual BIT Only;* but the BIT will be automatically executed every minute. This mode of operation will continue until a successful BIT has been completed. As a result, the detector will resume its normal operation.

4.4.4 Manual BIT Only

The BIT is initiated manually by momentarily connecting Pin no. 3 (yellow wire) with Pin no. 2 (black wire). A successful manual BIT activates the following:

- Fault relay remains closed.
- Alarm relay is activated for 3 sec (only when the Function Alarm BIT is at Yes).
- 4–20 mA output current will be 20mA (only when the Function Alarm BIT is at Yes).
- The LED will illuminate at red for 3 sec.

An unsuccessful BIT activates the following:

- Fault relay is opened.
- 4–20 mA output indicates BIT fault condition (2mA).
- The LED flashes (4Hz) at yellow.

Note:

During a manual BIT, if the Function Alarm BIT is at Yes, the Alarm relay will be activated and the 4–20mA outputs will initiate 20mA. Therefore, automatic extinguishing systems or any external devices that should be activated under actual alarm conditions should be disconnected during a BIT.

5 Technical Specifications

5.1 Electrical Specifications

5.1.1 Operating Voltage

- 18–32 VDC

5.1.2 Power Consumption

- Max. 35mA in Standby
- Max. 80mA in Alarm

5.1.3 Electric Input Protection

The input circuit is protected against voltage-reversed polarity, voltage transients, surges, and spikes, according to MIL-STD-1275A.

5.1.4 Electrical Outputs

5.1.4.1 Dry Contact Relays

Table 8: Contact Ratings

Relay Name	Type	Normal Position	Maximum Ratings
Alarm	SPST	N.O.	2A at 30VDC
Fault*	SPST	N.C.	2A at 30VDC

* The Fault relay will be energized when closed during the detector's regular operation. The contact will be open at Fault condition or low voltage.

5.1.4.2 4–20mA Current Output

The 4–20mA is an isolated sink option. The maximum permitted load resistor is 600ohm.

State	20/20ML Output (mA)	To
Fault	0	+0.5mA
BIT Fault	2	±10%
Normal	4	±10%
IR Detect	8	±5%
UV Detect	12	±5%
Warning	16	±5%
Alarm	20	±5%

5.2 Communications Network

The detector is equipped with an RS-485 communications link that can be used in installations with computerized controllers. The communications protocol is Modbus-compatible.

- This protocol is a standard and is widely used.
- It enables continuous communications between a single standard Modbus controller (master device) and a serial network of up to 247 detectors.
- It enables connection between different types of SPECTREX detectors or other Modbus devices to the same network.

5.3 Mechanical Specifications

5.3.1 Enclosure Options

- St. St. 316L electro-chemical and passivation coating

5.3.2 Water and Dust-Tight

- NEMA 250 type 6p
- IP66 and IP67 per EN 60529

5.3.3 Electronic Modules

- Conformal coated

5.3.4 Electrical Connection

- Connector interface (mating connector is supplied with a detector)
- Cable interface

5.3.5 Dimensions

- Base: 4.3”/110mm x 3.9”/100mm
- Height: 2.6”/65.5mm

5.3.6 Weight

- St. St. 316L housing: 2.4lb/1.2kg
- Tilt mount: 0.8lb/0.37kg

5.4 Environmental Specifications

5.4.1 High Temperature

- Design to meet MIL-STD-810C, Method 501.1, Procedure II
- Operating temperature: +160°F/+70°C
- Storage temperature: +185°F/+85°C

5.4.2 Low Temperature

- Design to meet MIL-STD-810C, Method 502.1, Procedure I
- Operating temperature: -40°F/-40°C
- Storage temperature: -65°F/-55°C

5.4.3 Humidity

- Designed to meet MIL-STD-810C, Method 507.1, Procedure IV
- Relative humidity of up to 95% for the operational temperature range

5.4.4 Salt Fog

- Designed to meet MIL-STD-810C, Method 509.1, Procedure I
- Exposure to a 5% salt solution fog for 48 hours

5.4.5 Dust

- Designed to meet MIL-STD-810C, Method 510.1, Procedure I
- Exposure to a dust concentration of 0.3 frames/ft^2 at a velocity of 1750fpm, for 12 hours

5.4.6 Vibration

- Designed to meet MIL-STD-810C, Method 514.2, Procedure VIII
- Vibration at an acceleration of 1.1g within the frequency range of 5–30Hz, and an acceleration of 3g within the frequency range of 30–500Hz

5.4.7 Mechanical Shock

- Designed to meet MIL-STD-810C, Method 516.2, Procedure I
- Mechanical shock of 30g half-sin wave, for 11 msec

5.4.8 Electromagnetic Compatibility (EMC)

This product is in conformance with EMC directive 89/336/EC:

Radiated Emission	EN61000-6-3
Conducted Emission	EN61000-6-3
Radiated Immunity	EN61000-4-3
Conducted Immunity	EN61000-4-6
ESD	EN61000-4-2
Burst	EN61000-4-4
Surge	EN61000-4-5

6 Installation Instructions

6.1 Scope

The SharpEye Model 20/20ML is a self-contained optical flame detector designed to operate as a stand-alone unit, directly connected to alarm systems or to automatic fire extinguishing systems. The detector can be part of a more complex system where many detectors and other devices are integrated through a common control unit.

This chapter does not attempt to cover all of the standard practices and codes of installation. Rather, it emphasizes specific points of consideration and provides some general rules for qualified personnel. Wherever applicable, special safety precautions are stressed.

6.2 General Considerations

Note:

The detector should be aimed toward the center of the detection zone and have a completely unobstructed view of the protected area. Whenever possible, the detector face should be tilted down at a slight angle to prevent the accumulation of dust and dirt. Do not start an installation unless all conceivable considerations regarding detector location have been taken into account.

To ensure optimal performance and an efficient installation, the following guidelines should be considered:

6.2.1.1 Sensitivity

To determine the level of sensitivity, the following issues should be considered:

- Size of the fire at the determined distance to be detected
- Types of flammable materials

6.2.1.2 Spacing and Location

The number of detectors and their locations in the protected area are affected by:

- Size of the protected area
- Sensitivity of the detectors
- Obstructed lines of sight
- Cone of view of the detectors

6.2.1.3 Environment

- Dust, snow, or rain can reduce the detector's sensitivity and require more maintenance activities.
- The presence of high intensity flickering of IR sources may affect sensitivity.

6.3 Preparation for Installation

Installation should comply with local codes or NFPA as applicable to flame detectors. The detector can be installed with the use of general-purpose common tools and equipment.

1. Verify the appropriate purchase order. Record the detector's P/N, serial no., and the installation date in the appropriate logbook.
2. Open the package prior to detector installation and visually inspect the detector.
3. Verify that all components required for the detector's installation are readily available before commencing the installation. If installation is not completed in a single session, secure and seal detectors and conduits.
4. For wiring, use color-coded conductors, suitable wire markings, or labels. 12 to 20AWG (0.5mm²–3.5mm²) wires may be used for site wiring. The selection of wire gauge should be based on the number of detectors used on the same line and the distance from the control unit, in compliance with specifications.

6.4 Installation

The detector can be mounted directly on the wall through the 7mm hole (Item 7, Figure 6), or preferably with the optional tilt mount, Model 787640 (Item 1, Figure 6).

The tilt mount enables the detector to be rotated up to 60 degrees in all directions.

6.4.1 Tilt Mount Kit

Table 9: Tilt Kit

Item	Qty	Type/Model	Location
Tilt mount P/N 787639	1	787640	
Screw	4	10-32 UNF x 7/16"	Detector - holding plate
Spring washer	4	No. 10	Detector - holding plate

6.4.2 Tilt Installation

For tilt installation, see Figure 6 and Figure 7.

1 Place the tilt mount (Item 1) in its designated location and secure it with 3 fasteners through 3 holes of dia. 5.2mm.

Note:

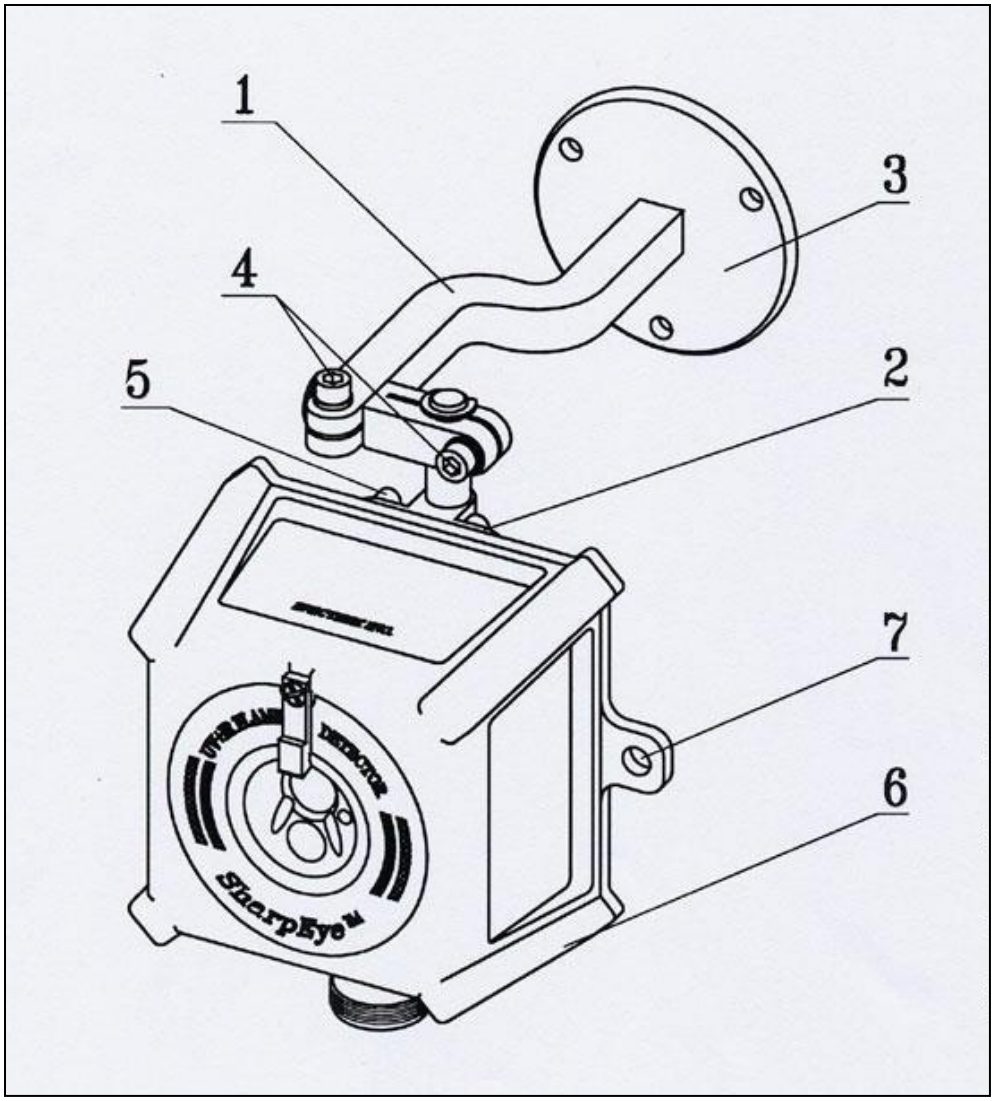
Skip this step if the tilt mount is already installed. Also, detector removal does not require tilt mount removal for maintenance purposes.

2 Unpack the detector.

3 Place the detector, with its connector or cable pointing down, on the holding plate of the tilt mount (Item 2). Secure the detector to the tilt mount using four 10-32 UNF x 7/16” screws with no. 10 spring washers. Use a 5/32 Hex key for 10-32 screws (Item 5).

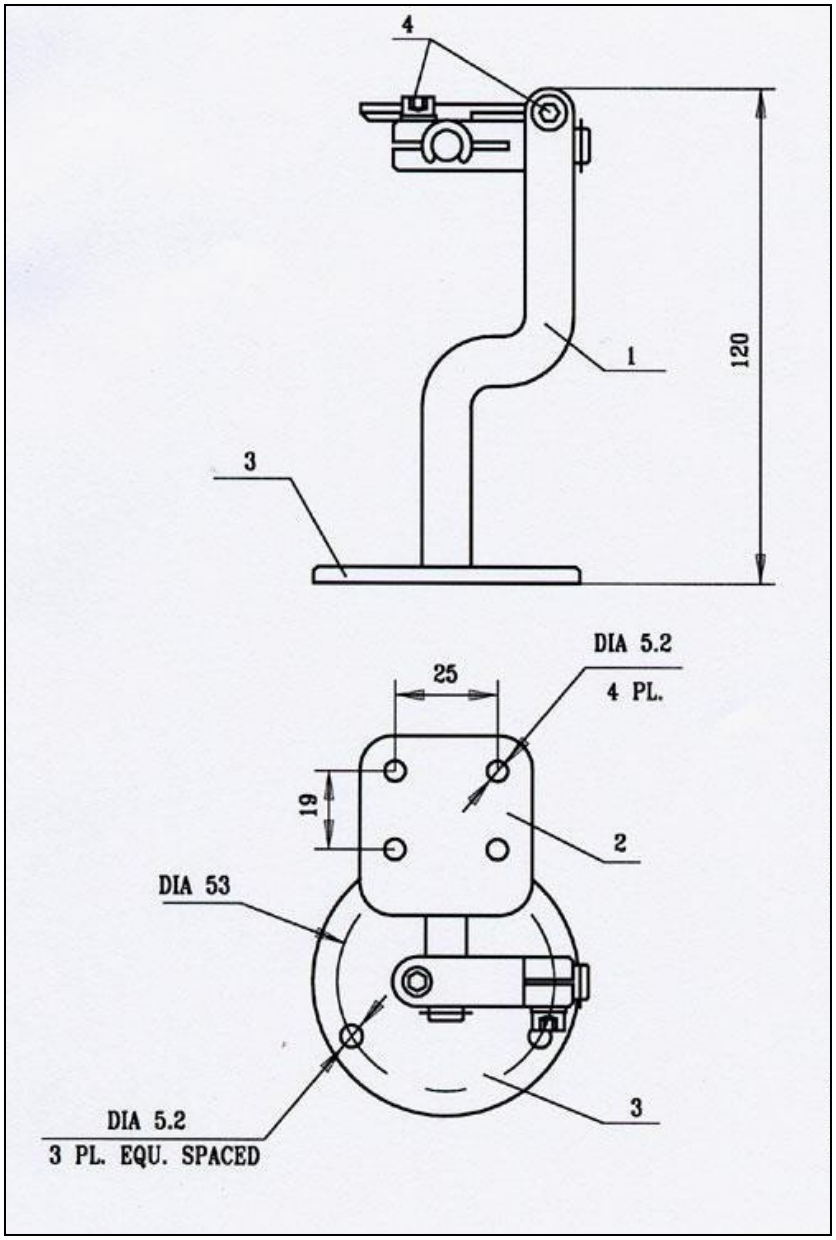
4 Release the locking screw (Item 4) in such a way that allows for rotation of the detector. Point the detector towards the protected area and make certain that the view of the area is unobstructed. Secure the detector in that position by tightening the locking screws (Item 4) on the tilt mount. (Make sure the detector is in the correct position.)

The detector is now correctly located, aligned, and ready to be connected to the system.



Item	Description
1	Tilt mount plate
2	Detector holding plate
3	Mounting plate
4	Locking screw
5	Holding screws
6	Washers
7	IR detector direct mounting holes

Figure 6: Detector and Tilt Mount Assembly



Item	Description
1	Tilt mount
2	Detector holding plate
3	Mounting plate
	Locking screw

Figure 7: Tilt Mount Assembly - Outline Drawing

6.5 Detector Mounting

These detectors are not approved for location in hazardous classified areas.

1. Choose the wiring configuration according to *Appendix A:* on page 47.
2. Connect the wire to the required PIN on the connector or choose the required color on the cable, according to your wiring diagram.
3. Connect the grounding wire to the general screw outside the detector (Figure 2 and Figure 3). The detector must be well grounded to earth ground for proper operation.

6.6 Wiring Function

The following describes the function of each electrical wire of the detector (see Figure 8 and Figure 9):

6.6.1 Power Supply

- Pin no. 1 (red wire) - input power
- Pin no. 2 (black wire) - return

6.6.2 Manual Bit Activation

- Pin no. 11 (yellow wire) - manual BIT activation.

  The manual BIT is initiated by a momentary connection of the Pin no. 11 (yellow wire) to the power supply return line.

6.6.3 Fault Relay

The Fault output is a N.C. SPST contact relay:

- Pin no. 5 (brown wire)
- Pin no. 6 (light blue wire)

The contact is normally energized closed when the detector is in its normal operational condition.

6.6.4 Alarm Relay

The Alarm output is a N.O. SPST contact relay:

- Pin no. 7 (orange wire)
- Pin no. 8 (violet wire)

6.6.5 4–20mA Output

This output is used for analog, 4–20mA current output as specified in *Electrical Specifications* on page 29:

- Pin no. 11 (pink wire) - output (+)
- Pin no. 12 (blue wire) - input (-)

See *Appendix A:* on page 47 for more details.

6.6.6 RS-485

This output is used for the communications network as specified in *Appendix A*: on page 47.

- Pin no. 10 (white wire) - positive (+) lead
- Pin no. 9 (gray wire) - negative (-) lead

6.6.7 Ground

- Pin no. 12 (green wire) - ground connection

6.7 Operation Mode

The detector is supplied with a default function setup (see Table 7). The function setup can be reprogrammed by the user through RS-485 using a PC with SPECTREX host software or through use of a handheld unit. Refer to *TM784050* for instructions.

6.7.1 Programmable Function

Modes of operation are programmable with a PC or handheld unit according to the selection table in *Detector's Various Functions* on page 25. Refer also to *TM784050*.

6.7.2 Address

The detector has the capability of acting as an addressable device.

The detector provides 247 addresses, which can be used by the RS-485 communications link as described in *Function Setup* on page 26. Refer also to *TM784050*.

6.7.3 Alarm Delay

An alarm delay may be required for certain applications. The detector has an alarm delay that permits time delays from 0, anti-flare, 3, 5, 10, 15, 20, and 30 seconds respectively. The delay can be defined by the RS-485.

Refer also to *TM784050.*

7 Operating Instructions

7.1 Scope

The following instructions are designed to obtain optimal performance from the detector over its lifecycle.

7.2 Power-Up

1 Turn on the detector and wait approximately 60 seconds for the detector's automatic self-test.

Note:

Turning on the detector initiates the following sequence:

- The LED flashes (4Hz) yellow
- A BIT is executed

If successful:

- The LED flashes (1Hz) green
- Fault relay contacts close

2 **Wiring Inspection**: If a short circuit or line discontinuity exists, indications appear on the control unit display panel. Review your wiring.

3 The detector goes into its Fault state when supply voltage drops below 16.5V. The detector status goes back to Normal when the supply voltage is above 17.5V.

4 **Detector inspection**: Visually inspect the detector's viewing window. It should be clean and clear.

- LED should flash (1Hz) green
- Alarm relays should be N.O.
- Fault relay should be N.C.
- The 4–20mA output should be 4mA

5 If any of the outputs or indications is different from the description in step 4, see *Troubleshooting* on page 46.

The flame detector is now ready for functional testing.

7.3 Reset

To reset a detector when in its Alarm state:

- Disconnect power

  Or

- Initiate a manual BIT

Caution:

Reset only when the optional latching alarm has been selected.

7.4 Functional Testing

Following is a testing procedure for proper functioning of the detector. The detector can be tested using the manual Built-in-Test or the SPECTREX Flame Simulator FS-1200.

7.4.1 Manual BIT Test

Momentarily connecting Pin no. 11 (yellow wire) with Pin no. 2 (black wire) performs a manual BIT.

Caution:

If the function setup Alarm BIT is at Yes, then the Alarm and 4–20mA output will be activated during a manual BIT. Therefore, automatic extinguishing systems or any external devices that may be activated during BIT must be disconnected.

1. Verify that the detector is operating properly.
2. Initiate a manual BIT. After a few seconds the following occurs:
   - An Alarm relay will be activated and the 4–20mA output changes to 20mA for 3 seconds (only if Alarm BIT is at Yes).
   - The LED should be a constant red for 3 seconds.
   - The Fault relay should stay N.O. during the test.

7.4.2 Testing with Flame Simulator Model FS1200

This test simulates an exposure of the detector to a real fire condition (see *Appendix B*:) using Flame Simulator Model FS1200. The detector is exposed to radiation at the required detection level. As a result, the detector must generate a fire alarm signal.

Note:

If the detector is exposed to a flame simulator, the Alarm relay and 4–20mA will be activated during the simulation. Therefore, automatic extinguishing systems or any external devices, which may be activated during this process, must be disconnected.

1. Turn on the system and wait up to 60 seconds for the detector to turn to Normal state and the LED to flash (1Hz) green. If the detector is on, skip this step.
2. Aim the SPECTREX Flame Simulator Model FS1200 at the detector's target point (see Figure 15), in a way that the radiation emitted by it is facing directly towards the detector. (See Flame Simulator FS-1200 on page 53).
3. Press the operation button once. After few seconds:
   - The LED should light a steady red for a few seconds.
   - The 4–20mA output should turn to 20mA for a few seconds and then return to 4mA.
   - The Alarm relay should also turn on during this period.

This completes the installation procedure. The detector and system are now ready for operation.

7.5 Safety Precautions

After powering up, the detector requires hardly any attention in order to function properly, but the following should be noted:

- Follow the instructions in the user guide and refer to the drawings and specifications issued by the manufacturer.
- Do not expose the detector to radiation of any kind unless required for testing purposes.
- Do not open the detector housing while power is supplied.
- Do not touch internal parts other than the 3 functional switches. Interference with internal circuits may impair detector performance and will invalidate the manufacturer's warranty.

Disconnect external devices, such as automatic extinguishing systems, before carrying out any maintenance.

8 Maintenance Instructions

8.1 Scope

This chapter deals with preventive maintenance, describes possible faults in detector operation, and indicates corrective measures. Ignoring these instructions may cause problems with the detector and may invalidate the warranty. Whenever a unit requires service, please contact the manufacturer or its authorized distributor for assistance.

8.2 Maintenance Instrumentation and Personnel

Detector maintenance requires ordinary tools and suitably qualified personnel, who should be familiar with local codes and practices.

8.3 Preventive Maintenance Procedures

The detector must be kept as clean as possible. The detector's viewing window and the reflector must be cleaned periodically. The frequency of cleaning operations depends on the environmental conditions and specific applications. The fire detection system designer will give his or her recommendations.

1. Disconnect power to the detector before proceeding with any maintenance including lens cleaning.
2. To clean the detector viewing window and reflector, use water and detergent and then rinse with clean water.
3. Where dust, dirt, or moisture accumulates on the window, first clean with a soft optical cloth and detergent then rinse with clean water.

8.4 Periodic Maintenance Procedures

In addition to preventive cleaning and maintenance, the detector should be functionally tested every 6 months. This test should also be carried out if, for any reason, the detector has been opened.

8.4.1 Power-Up Procedure

Perform the power-up procedure every time power is restored to the system. Follow the instructions in *Power-Up* on page 41.

8.4.2 Functional Test Procedure

Perform a functional test of the detector, as described in *Functional Testing* on page 42.

8.5 Maintenance Records

It is recommended to record maintenance operations performed on a detector in a system logbook. The record should include information that identifies the unit, the installation date, contractor, and entries for every maintenance operation performed including the description of the operation, date, and personnel ID. If a unit is sent to the manufacturer or distributor for service, a copy of the maintenance records should accompany it.

8.6 Troubleshooting

8.6.1 Fault Indication

1. Check power supply for correct voltage, polarity, and wiring.
2. Check detector window and reflector for cleanliness. If necessary, clean the window, as indicated in Preventive Maintenance Procedures on page 45, and repeat the test.
3. Disconnect the power supply to the system and check the detector's internal wiring.
4. Reconnect power supply and wait approximately 60 seconds. Repeat the test. If the indicator LED is still flashing (4Hz) yellow, the unit requires service.

8.6.2 False Alarm or Warning Indication

5. Disconnect the power supply from the system and check internal wiring.
6. Reconnect the power supply and wait approximately 60 seconds. If the indication remains, the unit requires service.

Appendix A: Typical Wiring Configurations

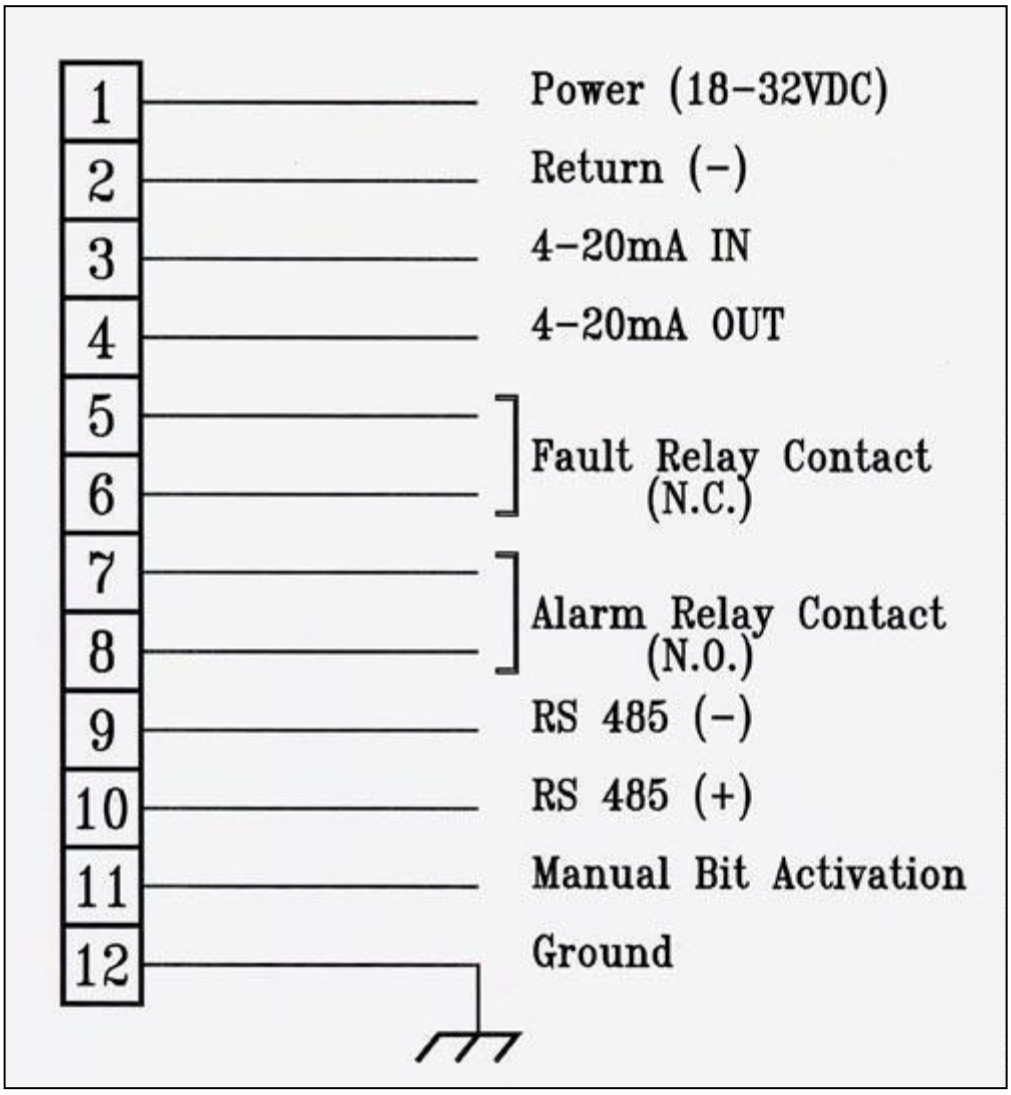


Figure 8: Connector Interface Option

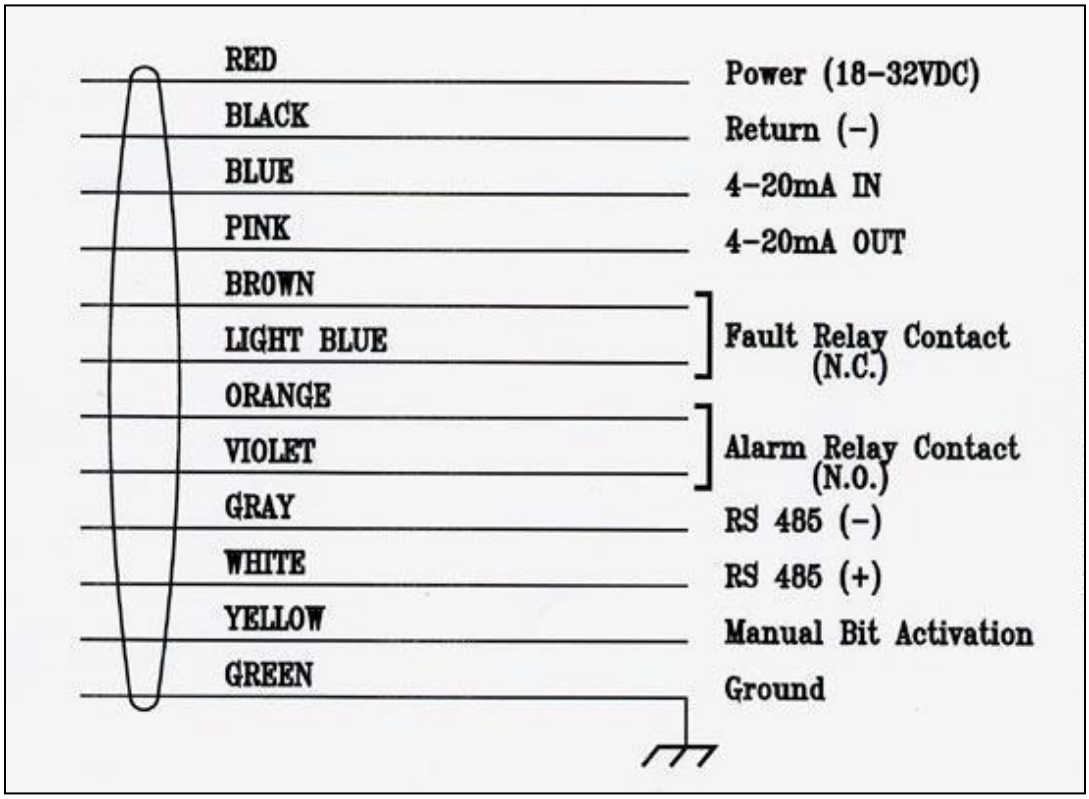


Figure 9: Cable Interface Option

A.1 RS-485 Communications Network

Using the RS-485 network capability of the IR detector and control software, it is possible to connect up to 32 detectors in an addressable system with 4 wires only (2 for power and 2 for communications). Using repeaters, the number of detectors can be much larger (32 detectors for each repeater); up to 247 on the same 4 wires. When using the RS-485 network, it is possible to read each detector status (Fault, Warning, and Alarm) and to initiate a BIT for each detector individually.

For more details, consult the factory.

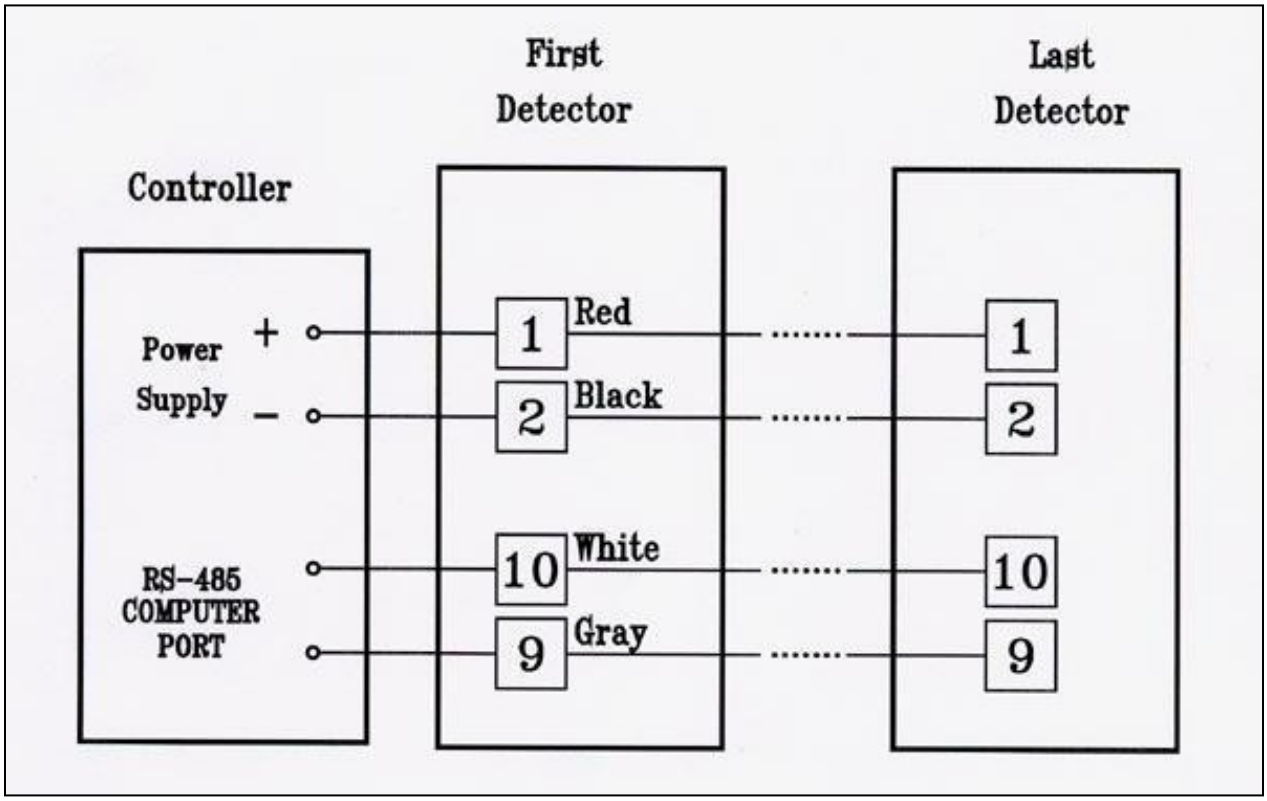


Figure 10: RS-485 Networking

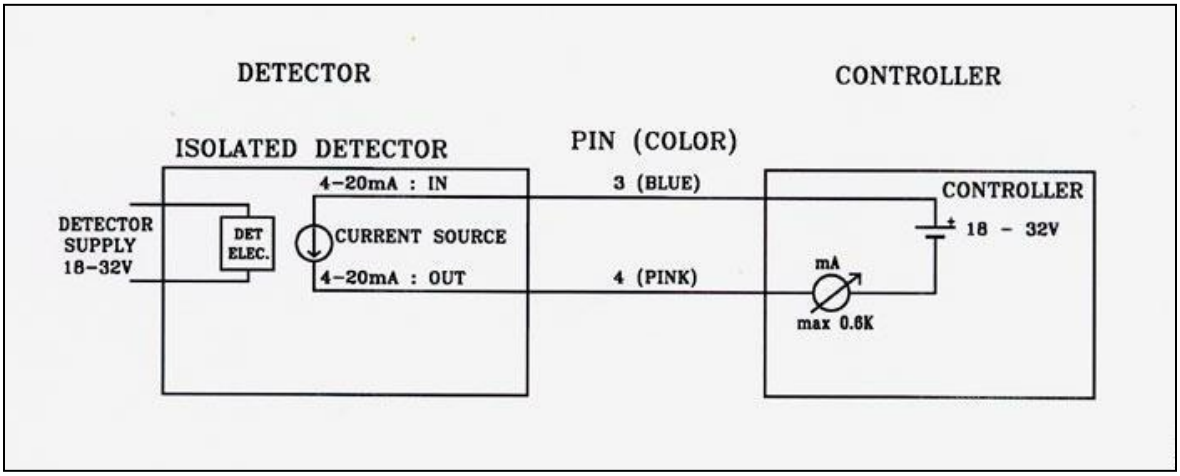


Figure 11: 4–20mA Wiring (Sink Option)

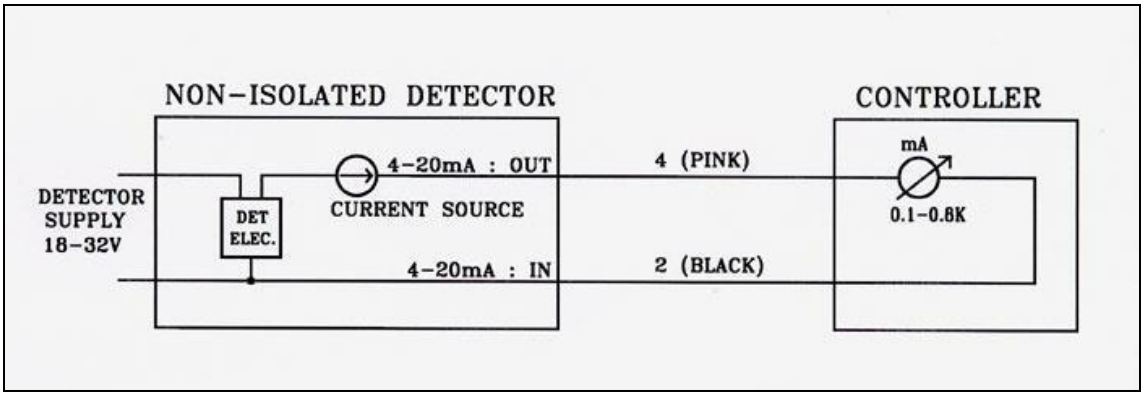


Figure 12: 4–20mA Wiring (Source Option)

Notes:

- The detectors are factory set to isolated 4-20mA-sink version.
- To work at non-isolated 4–20mA source version, connect Pin 3 (blue wire) to Pin 1 (red wire). This can be done on the mating connector or in the junction box in the cable option.
- The 4–20mA will be measured between Pin 4 (pink wire) and Pin 2 (black wire).

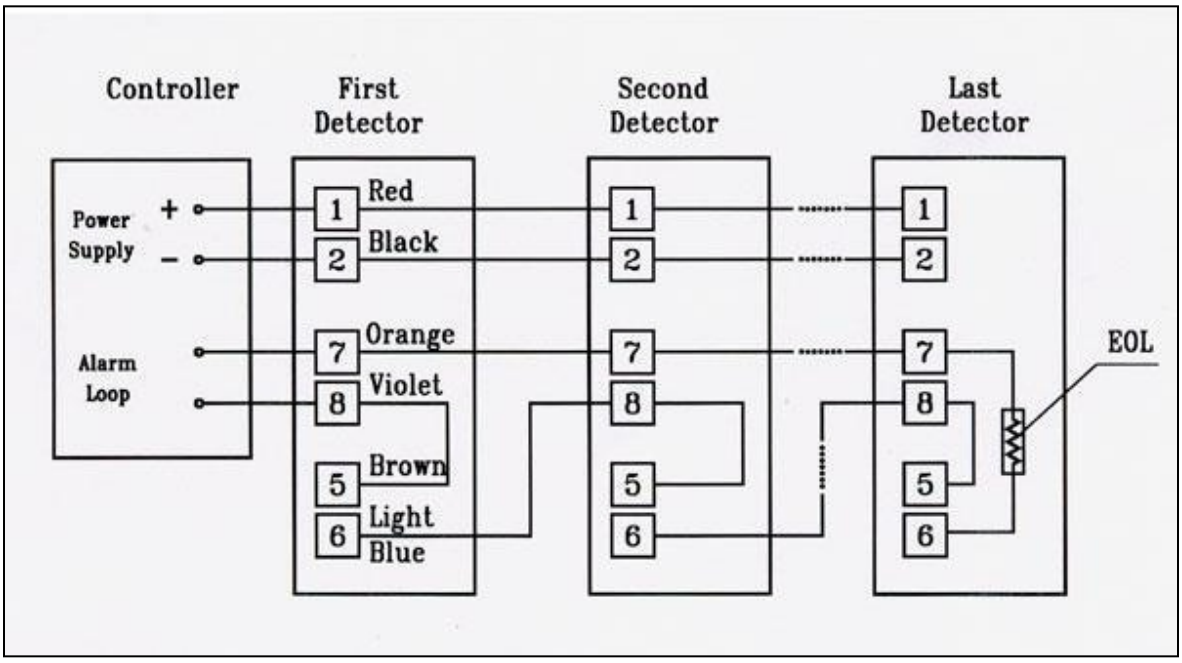


Figure 13: Typical Wiring for 4 Wire Controllers

Notes:

- For EOL resistor value, see the *Controller Manual*.
- The color wire refers to the color of the cable output option. The Pin no. refers to the connector option

.

Appendix B: Flame Simulator FS-1200

The Flame Simulator FS-1200 is designed specifically for use with SharpEye flame detectors.

The FS-1200 includes a halogen lamp that emits UV and IR energy. This energy is accumulated by a reflector directed towards the detector, which allows the detectors to be tested under simulated fire conditions without the associated risks of an open flame.

Figure 14: SharpEye Flame Simulator FS-1200

Appendix C: Ordering Information

The P/N of the Flame Simulator Kit is 380114-2.

The kit is supplied in a carry case that includes:

- Flame Simulator FS-1200
- Charger
- Tool Kit
- Technical Manual TM380102

C.1 Unpacking

Verify that you have received the following contents:

- Delivery form
- Flame simulator with integral battery
- Battery charger
- Tool keys
- User manual
- FAT forms
- EU declaration
- Storage case

C.2 Operating Instructions

Warning:

Do not open the flame simulator to charge the batteries or for any other reason in a hazardous area.

Caution:

The following test simulates a real fire condition and may activate the extinguishing system or other alarms. If activation is not desired, disconnect/inhibit them before the test and reconnect after the simulation.

- **To simulate a fire:**

1. Verify you are at the correct distance from the detector according to the type of detector and the detector sensitivity.
2. Using the mechanical sight, aim the flame simulator toward the center of the detector.
3. Push the activate button, and then use the laser spot for fine adjustment toward the center of the detector.
4. Keep the simulator aimed at the detector for up to 50 seconds, until you trigger an alarm.

C.2.1 Range

Table 10: Sensitivity Ranges

Detector Types	Detector Sensitivity Setting (ft/m)	Maximum Testing Distance (ft/m)
20/20ML	50/15	20/6

Notes:

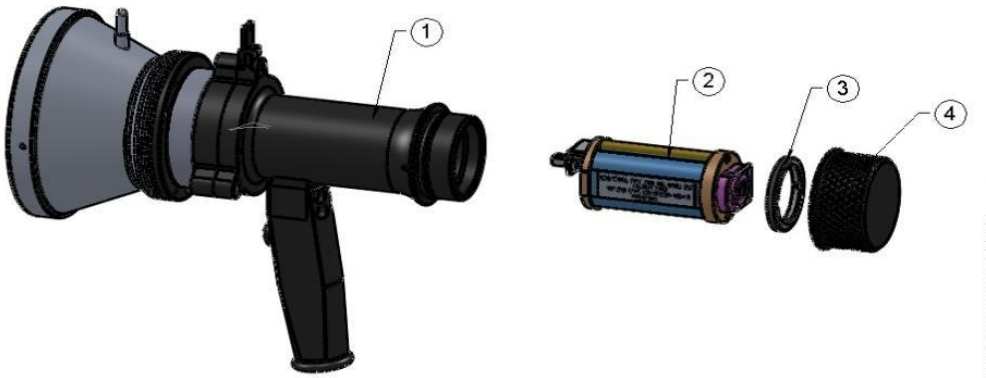
- The minimum distance from the detector is 20”/50cm.
- At extreme temperatures, there is a 15% maximum reduction in the range.

Caution:

Store the flame simulator in a safe place when not in use.

C.2.2 Charging the Battery

The flame simulator uses lithium-ion batteries as a rechargeable power source. When the batteries are fully charged, the simulator operates at least 1,000 times without having to be recharged. The simulator will not operate when the voltage from the batteries is lower than the required operational level.



Item	Description
1	Simulator
2	Battery pack
3	Locking disc
4	Back cover

Figure 15: Flame Simulator Battery Replacement

- **To charge the battery:**

1. Place the flame simulator on a table in a safe area, not exceeding 104°F/40°C.
2. Release the locking screw.
3. Unscrew the battery back cover (Item 4) counterclockwise.
4. Unscrew the locking disc (Item 3) clockwise.
5. Pull out the battery from the flame simulator.
6. Connect the battery to the charger. Verify that the charger is the one supplied with the flame simulator model FRIWO MPP15 with a maximum charging voltage of 16.8V (4.2V x 4), and with a maximum current of 700mA.
7. Charge for a maximum of 2–3 hours, until the green LED on the charger turns on.
8. Disconnect the charger.
9. Insert the battery into the flame simulator.
10. Screw on the locking disc (Item 3).
11. Screw on the back cover (Item 4).
12. Lock the back cover with the locking screw.

C.2.3 Replacing the Battery

- **To replace the battery:**

1. Place the flame simulator on a table in a safe area, not exceeding 104°F/40°C.
2. Release the locking screw.
3. Unscrew the battery back cover (Item 4) counterclockwise.
4. Unscrew the locking disc (Item 3) clockwise.
5. Pull out the battery from the flame simulator.
6. Insert the new battery pack in the simulator housing. Use only the SPECTREX battery pack, P/N 380004.
7. Screw on the locking disc (Item 3).
8. Screw on the back cover (Item 4).
9. Lock the back cover with the locking screw.

For more information, refer to *TM380002*.

C.3 Technical Specifications

C.3.1 General

- **Temperature Range**: –4°F to +122ºF / –20ºC to +50ºC
- **Vibration Protection**: 1g (10–50Hz)

C.3.2 Electrical

- **Power**: 14.8V (4 x 3.7V rechargeable lithium-ion battery)
- **Max. current**: 4A
- **Battery capacity**: 2.2AH
- **Charging time**: 2A at 2hr

C.3.3 Physical

- **Dimensions**: 230 x 185 x 136mm
- **Weight**: 5.5lb/2.5kg
- **Enclosure**: aluminum, heavy-duty, copper-free black zinc coating.

- **Explosion proof enclosure**:
  - ATEX and IECEx
  - Ex II 2 G D
  - Ex d ib op is IIB +H2 T5 Gb
  - –20°C to +50°C / –4°F to +122°F

C.3.4 EMI Compatibility

Table 11: Immunity Tests

Immunity Tests		
Title	**Basic Standard**	**Level to be Tested**
Electrostatic Discharge (ESD)	IEC 61000-4-2	6kV/8kV contact/air
Radiated Electromagnetic Field	IEC 61000-4-3	20V/m (80MHz–1GHz) 10V/m (1.4–2GHz) 3V/m (2.0–2.7GHz)
Conducted Disturbances	IEC 61000-4-6	10Vrms (150kHz–80MHz)
Immunity to Main Supply Voltage Variations	MIL-STD-1275B	

Table 12: Emission Tests

Emission Tests			
Title	**Basic Standard**	**Level to be Tested**	**Class**
Radiated Emission	IEC 61000-6-3	40dbuv/m (30–230MHz), 47dbuv/m (230MHz–1GHz)	Like Class B of EN 55022

Technical Support

For technical assistance or support, contact:

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Website: www.spectrex.net