



Triple IR3 Flame Simulator

Model FS-1100

Installation Instructions



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

The Simulator 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, Inc. Product warranty.

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About this Guide

This guide describes the SharpEye Flame Simulators and their features and provides instructions on how to operate and maintain the detector.

This guide includes the following chapters and appendixes:

- **Chapter 1, Introduction**, provides a general overview of the product, principles of operation, and performance considerations.
- **Chapter 2, Operation Instructions**, describes how to operate the simulator, including instructions regarding the replacement and charging of the battery.

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1 Introduction

To comply with local standards and jurisdictional authorities, "end-to-end" loop testing of Fire Protection Alarm Systems, including detectors, should be performed periodically. Many Safety Authorities and Plant Managers of high value / high risk assets and facilities insist on quarterly "end-to-end" testing of their entire Fire Protection Systems using an external Flame Simulator.

Spectrex Flame Simulators emit electromagnetic radiation in a unique sequential pattern corresponding to and recognizable as fire by the specific SharpEye Flame Detector model. This allows the detector to be tested under real fire conditions without the associated risks of an open flame. Spectrex Flame Simulators are ATEX certified EExd for use in Zones 1 and 2, Zones 21 and 22 hazardous areas and are powered by rechargeable Lithium Ion batteries. When fully charged, the Flame Simulator will operate for at least 1,000 tests without recharging.

Using an external, portable Spectrex Flame Simulator is the best means to perform a full, functional "end-to-end" test of the Detector and the Fire Protection System without the need to start a real fire (which is not permitted in hazardous areas and can be dangerous in non-hazardous areas). The Spectrex Flame Simulator is the only non-hazardous and safe method to test the flame detector's sensors, internal electronics, alarm activation software, cleanliness of the viewing window/lens, wiring integrity, actual relay activation, and proper functionality of any other outputs used (mA, RS485, HART).

1.1 Model and Types

The FS-1100 Flame Simulator is compatible with different detector types:

Simulator	P/N	Compatible with:
Triple IR3 Flame Simulator	FS-1100	40/40I, 40/40UFI, 20/20MI, 20/20MPI, 20/20I, 20/20SI, 20/20SIS, 20/20CTIN/P

1.2 Features and Benefits

- Used for maintenance and testing of Flame Detectors
- Ability to activate the flame detector from a distance of up to 12m
- Rechargeable battery included
- Operates at least 1,000 tests before recharging the battery

1.3 Principles of Operation

The **FS-1100** emits IR energy which is filtered to emit electromagnetic radiation in a unique sequential pattern, corresponding to and recognizable as a fire by the SharpEye IR3 flame detector.

The simulator includes a reflector that accumulates the IR energy and directs it towards the detector.

The **FS-1100** includes a laser diode and a sight in order to point the simulator to the center of the flame detector.

1.4 Simulator Status

1.4.1 FS-1100 Triple IR3 Flame Simulator

For the first 5 seconds of the laser defines the simulator status

Normal Status

At normal, the laser turns on constantly for 5 seconds before the IR radiation turns on. These 5 seconds are used to aim the simulator to the center of the detector before the IR radiation turns on. The IR radiation turns on for 50 seconds. After these 50 seconds, the IR radiation turns off and the simulator cannot be operated for a further 20 seconds (delay between activations).

Fault Status

- a. **Low Battery** – The laser blinks 3 flashes 3 times. The IR radiation will be activated.
- b. **IR Fault** – The laser blinks 5 flashes 3 times. The IR radiation will not be activated.
- c. **Total Failure** – The laser does not turn on. IR radiation will not be activated.

1.5 Product Certification

The Flame Simulator is certified to ATEX and IECEx:

Ex II 2 G D

Ex d ib op is IIB + H₂ T5 Gb

Ex ib op is tb IIIC T135°C Db

-4°F to +122°F (-20°C to +50°C)

This product is suitable for use in hazardous zones 1 and 2, Zones 21 and 22 with IIB + H₂ gas group vapor present.

1.6 Simulator Structure

The Flame Simulator is built from black coated aluminum housing. It includes:

- a. Reflector
- b. Electronic chamber
- c. Battery chamber
- d. Handle

The electronic chamber includes a PC Board with the IR source or halogen lamp which is assembled on the PC Board that emits the light through sapphire window

The battery chamber includes a battery pack containing four lithium-ion batteries of total 14.8VDC and 2.2AH.

The battery pack can be replaced easily by opening the back cover. This exchange must be done in a safe area and only a Spectrex battery pack, P/N 380004 should be used.



Figure 1: Flame Simulator Side View

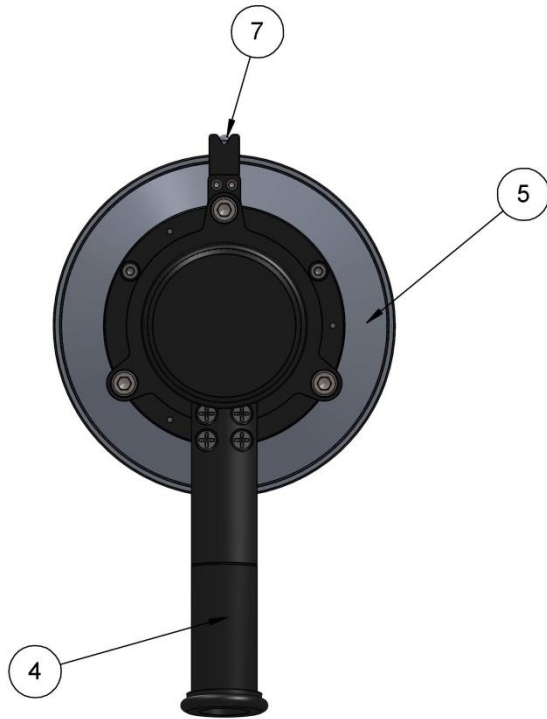


Figure 2: Flame Simulator Rear View

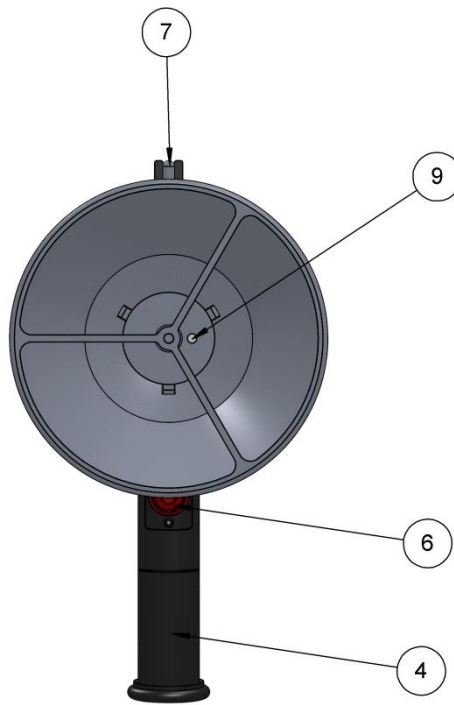


Figure 3: Flame Simulator Front View

1	Electronic Chamber	7	Sight
2	Battery Chamber	8	Back Cover Locking Screw
3	Battery Back Cover	9	Laser Diode
4	Handle		
5	Reflector		
6	Push Button		

1.7 Certification Instructions

- The marking of the equipment is:

Ex II 2 G D

Ex d ib op is IIB + H₂ T5 Gb

Ex ib op is tb IIIC T135°C Db

-20°C to +50°C (-4°F to +122°F)

- The manufacturer/importer/repair is Spectrex Inc., at 218 Little Falls Road, Ceder Grove NJ, USA.
- The equipment may be used with flammable gasses and vapors with apparatus groups IIA and IIB+H₂ T5 in the ambient temperature range of -4°F to +122°F (-20°C to +50°C).
- The dimensions of the flameproof joints are other than the relevant minimum or maximum values required by table 2 of IEC/EN 60079-1:2007 for IIB + H₂, as detailed below:

Flamepath Description	Type of Joint	Minimum Width 'L' (mm)	Maximum Gap 'ic' (mm)
Joint formed by window against the enclosure	Flanged	10.75	0.02
Enclosure end-cap spigot	Cylindrical	15	0.08

Gaps shall not be machined to be any larger than the values of 'ic', and width shall not be modified to be any smaller than the values of 'L' shown in the table above.

- Inspection and maintenance of this equipment should be carried out by suitable trained personnel, in accordance with the applicable code of practice e.g. EN 60079-17.

- The equipment shall only be charged in a safe area with the batteries removed from the flameproof enclosure. The charge conditions are as follows:

Maximum charge voltage: 4.2V per cell

Maximum charge current: 2200mA

The charge voltage shall not exceed these values.

- Repair of this equipment should be carried out by suitable trained personnel, in accordance with the applicable code of practice e.g. EN 60079-19.

- The certification of this equipment relies upon the following materials used in its construction:

- Enclosure: Aluminum 6061T6
- Window: Sapphire glass
- Seals: EPDM

- If the equipment is likely to come into contact with aggressive substances (described below), then it is the responsibility of the user to take suitable precautions (described below) to prevent it from being adversely affected, thus ensuring that the type of protection provided by the equipment is not compromised.

- Aggressive substances: for example, acidic liquids gases that may attack metals or solvents that may affect polymeric materials.
- Suitable precautions: for example, regular checks as part of routine inspections or establishing from the material's data sheets that it is resistant to specific chemicals.

2 Operation Instructions

2.1 Ordering Information

The P/N of the Flame Simulator Kit is 380114-1.

The Kit is supplied in a carry case that includes:

1. Flame Simulator FS-1100
2. Charger
3. Tool Kit
4. Technical Manual TM380002

2.2 Unpacking

Verify that you have received the following content:

- Delivery form
- Flame Simulator with integral battery
- Battery charger
- Tool keys
- User manual
- FAT forms
- EC Declaration
- Storage case

2.3 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 this is not desired, disconnect/inhibit them before the test and reconnect after simulation.

- a. Verify you are using the correct simulator that fits the tested detector, per the following table:

Simulator	Compatible with:
FS-1100	40/40I, 40/40UFI, 20/20MI, 20/20MPI, 20/20I, 20/20SI, 20/20SIS, 20/20CTIN/CTIP

Table 1: Flame Simulator Compatibility

- b. Verify you are at the correct distance from the detector according to the type of detector (see 2.3), and the detector sensitivity.
- c. **For FS-1100** - Aim the Flame Simulator using the mechanical sight towards the center of the detector.
Push the activate button then use the laser spot for fine adjustment towards the center of the detector.
- d. Keep the simulator aimed at the detector for up to 50 seconds until you receive an alarm.
- e. Wait 20 seconds before repeating the test.

2.4 Detection Ranges per Detector/ Flame Simulator

Model	Detector Types	Detector Sensitivity Setting	Testing Distance
FS-1100	40/40I, 40/40UFI, 20/20I, 20/20SI, 20/20XI, 20/20CTIx	50ft (15m)	6.6ft (2m)
		100ft (30m)	19.6ft (6m)
		150ft (45m)	29.5ft (9m)
		200ft (60m)	39.3ft (12m)
	20/20MPI	33ft (10m)	6.6ft (2m)
		65ft (20m)	8.2ft (2.5m)
		100ft (30m)	19.6ft (6m)
		132ft (40m)	26.2ft (8m)
	20/20MI-1	33ft (10m)	N/A
		65ft (20m)	8.2ft (2.5m)
		100ft (30m)	19.6ft (6m)
		132ft (40m)	26.2ft (8m)
20/20MI-3		N/A	

Table 2: Detection Ranges per Detector / Flame Simulator

Notes:

- The minimum distance from the detector is 30" (75cm)
- At extreme temperatures there is a 15% reduction in the testing range.



Important: Keep the Flame Simulator in a safe place when not in use.

2.5 Charging the Battery

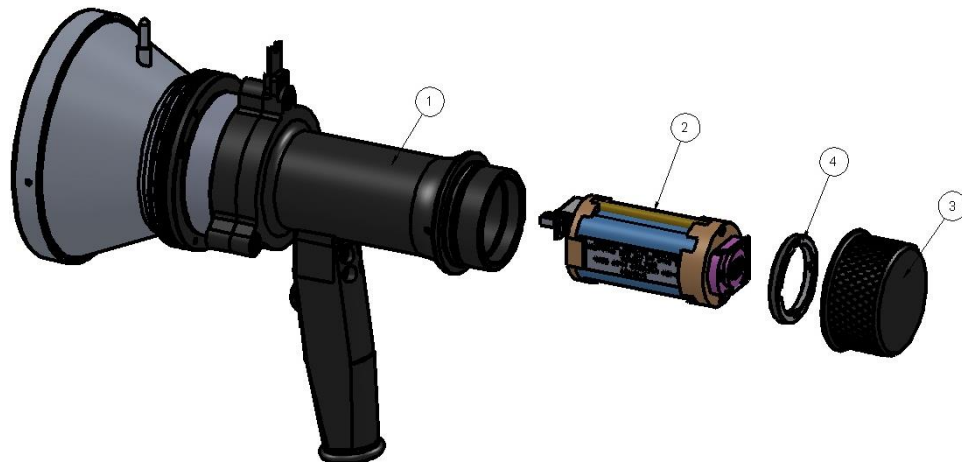
The Flame Simulator uses Lithium Ion batteries as a rechargeable power source. When the batteries are fully charged, the simulator operates for at least 1,000 times without recharging. When the voltage from the batteries is lower than the required operational level, the simulator will not operate.

To Charge the Battery:

1. Place the Flame Simulator on a table in a safe area, not exceeding 40°C.
2. Release the locking screw, item 8 fig. 1.
3. Unscrew the battery back cover, item 3, fig. 1 & 4, counter-clockwise.
4. Unscrew the locking disc clockwise, item 4 fig. 4.
5. Pull out the battery, item 2, fig. 4, 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 max. charging voltage 16.8V (4.2 V x 4) with max. 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, item 2, fig. 4, to the Flame Simulator.
10. Screw the locking disc, item 4 fig. 4.
11. Screw the back cover, item 3 fig. 1 & 4.
12. Lock the back cover with the locking screw, item 8 in Fig. 1.

To Replace the Battery:

1. Place the Flame Simulator on a table in a safe area, not exceeding 40°C.
2. Release the locking screw, item 8 fig. 1.
3. Unscrew the battery back cover, item 3 fig. 1 & 4, counter-clockwise.
4. Unscrew the locking disc clockwise, item 4 fig. 4.
5. Pull out the battery, item 2, fig. 4, from the Flame Simulator.
6. Insert the new battery pack in the simulator housing. Use only Spectrex battery pack, P/N 380004.
7. Screw the locking disc, item 4 fig. 4.
8. Screw the back cover, item 3 in Fig. 1 & 4.
9. Lock the back cover with the locking screw, item 8 in Fig. 1.



1	Simulator
2	Battery Pack
3	Back Cover
4	Locking Disc

Figure 4: Flame Simulator Battery Replacement

2.6 Maintenance

1. Ensure the Flame Simulator is charged before operation.
2. Ensure the reflector and the windows are clean.
3. Before replacing the battery, ensure you have a Spectrex Battery Pack, P/N 380004
4. When the simulator is not in use, recharge at least every 6 months.



Warning: Use only Spectrex Replacement Battery Pack, P/N 380004

2.7 Troubleshooting

Model	Problem	Solution
FS-1100	Laser flashes 3 times	1. Recharge the battery.
	Laser flashes 5 times	1. Operate the Flame Simulator again. 2. Send the Flame Simulator for repair.
	Laser does not turn on	1. Recharge the battery. 2. Replace the battery. 3. Send the Flame Simulator for repair.
	Flame Simulator seems to work properly but does not activate the detector	1. Verify you are at the correct distance. 2. Verify the Flame Detector is at the correct sensitivity. 3. Verify the Flame detector is operating. 4. Verify the Flame Detector is clean.

2.8 Technical Specifications

2.8.1 General Specifications

Temperature Range: -4° to +122°F (-20° to +50°C)

Vibration Protection: 1g (10-50Hz)

2.8.2 Electrical Specifications

Power: 14.8V (4 x 3.7V Rechargeable Lithium Ion Battery)

Max. Current: 4A

Battery Capacity: 2.2AH

Charging Time: 2Hr at 2A

2.8.3 Physical Specifications

Dimensions: 9 x 7.3 x 5.35 inch (230 x 185 x 136 mm)

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

Ex ib op is tb IIIC T135°C Db

-20°C to +50°C (-4°F to +122°F)

Water and Dust Tight: IP65

2.8.4 EMI Compatibility

Immunity Tests		
Title	Basic Standard	Level to be tested
Electrostatic discharge (ESD)	IEC 61000-4-2	6 kV/8 kV contact/air
Radiated Electromagnetic Field	IEC 61000-4-3	20 V/m (80 MHz to 1 GHz) 10 V/m (1,4 GHz to 2 GHz) 3 V/m (2,0 GHz to 2,7 GHz)
Conducted Disturbances	IEC 61000-4-6	10 Vrms (150 kHz to 80 MHz)
Immunity to main supply voltage variations	MIL-STD-1275B	

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

Technical Support

For all technical assistance or support, contact:



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