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APPROVAL REPORT

MODELS FS10-R/A, FS SYSTEM 10 with OPTIONS 2FL, 2GE, AND 2WL, AND FS7-2173-RP, -2RP, and S7-2173-C FLAME DETECTORS; AND THE MODEL FS7-2173-2RP FLAME DETECTOR AS NONINCENDIVE APPARATUS FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C, AND D INDOOR HAZARDOUS (CLASSIFIED) LOCATIONS

Prepared for:

**Fire Sentry Corporation
593 Apollo Street
Brea, CA 92821**

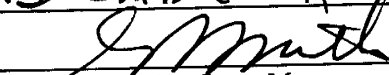
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Authorized by:


George A. Smith, Group Manager

FM Approvals
1151 Boston-Providence Turnpike
P.O. Box 9102
Norwood, MA 02062

**MODELS FS10-R/A, FS SYSTEM 10 with OPTIONS 2FL, 2GE, 2WL, AND FS7-2173-RP
-2RP, and S7-2173-C FLAME DETECTORS;
AND THE MODEL FS7-2173-2RP FLAME DETECTOR AS NONINCENDIVE APPARATUS
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HAZARDOUS (CLASSIFIED) LOCATIONS**

from

**Fire Sentry Corporation
593 Apollo Street
Brea, CA 92821**

I INTRODUCTION

- 1.1 Fire Sentry Corporation requested an Approval reexamination of their Models FS10-R/A, FS System 10 with options 2FL, 2GE, 2WL, and FS7-2173-RP, -2RP and S7-2173-C flame detectors to the August, 2000 edition of Approval Standard 3260.
- 1.2 This examination also included an evaluation of the Model FS7-2173-2RP Flame Detector as nonincendive apparatus for use in Class I, Division 2, Groups A, B, C, and D indoor hazardous (classified) locations.
- 1.3 This Report may be reproduced only in its entirety and without modification.
- 1.4 **Standards:**

Title	Class Number	Issue Date
Radiant Energy-Sensing Fire Detectors for Automatic Fire Alarm Signaling	3260	August, 2000
Electrical Equipment for use in Hazardous (Classified) Locations – General Requirements	3600	November 1998
Electrical Equipment for Use in Class I, Division 2, Class II, Division 2, and Class III, Division 1 and 2 Hazardous Locations	3611	April 1986

- 1.5 **Listing:** The listings for Fire Sentry Corporation in the *Approval Guide*, a publication of FM Approvals, will be as follows:

Fire Detection, Flame-Actuated

FS System 7 Flame Detector and Controller. Consists of the Model FS7-130-SX (2) controller module, the S7-2173-C flame detector using firmware version 3720-0009, Rev. A (4 ft sensitivity), the FS7-2173 flame detector using firmware version 3720-1001 (8 ft sensitivity) and the Model JB-4 junction box. The fuel tested for response was isopropyl alcohol (IPA). A maximum of 12 detectors can be connected to each controller module. The FS7-130-SX (2) controller module operates from 20.4 to 26.4 V dc at 410

FM APPROVALS
Project ID: 3014801

mA max via connection to a compatible FM Approved control panel providing separate circuits for alarm signaling and power. When the FS7-130-SX (2) controller module is installed inside the enclosure of an Approved fire alarm control, compatibility testing is required for each manufacturer and model of fire alarm control. The detector and controller module are suitable for indoor use, in ambient temperatures from 0° to 55°C (32° to 131°F). The flame detector housing provides IP-67 degree of protection.

Models FS7-2173-RP and FS7-2173-2RP multi-spectral flame detectors. The fuel tested for response was isopropyl alcohol (IPA). The detectors operate from 16 V dc to 28 V dc via connection to a compatible Approved fire alarm control providing separate circuits for alarm signaling and for power. The firmware version is 5724-005, Rev. A. The detector housing provides IP 67 degree of protection, and the detector is suitable for indoor use only. The model FS7-2173-2RP flame detector is nonincendive for use in Class I, Division 2, Groups A, B, C, and D, temperature class T4A at an ambient of 55°C (131°F).

FS System 10 Flame Detector and Card Controller. The fuels tested for response were: n-heptane and isopropyl alcohol (IPA). Consists of the Option 2xx Series FS10 card controller, the FS System 10 flame detector using firmware version 3716-0004, and the CCBPMA1-1, -2 or -4 backplane mounting assembly. One detector is connected to each card controller which in turn must be connected to the initiating device circuit of an Approved control panel. The detector and card controller are suitable for indoor use, the card controller in ambient temperatures from 0° to 50°C (32° to 122°F) and the detector in ambient temperatures from -40° to +85°C (-40° to +185°F). The detector enclosure is rated NEMA Type 3 and Type 4. The detector is suitable for use in Class I, Divisions 1 and 2, Groups B, C and D; Class II, Divisions 1 and 2, Groups E, F and G; and Class III hazardous (classified) locations. This detector reacts to the presence of flame within one-half second.

Model FS10-R and FS10-A multi-spectral flame detectors. The fuels tested for response were: n-heptane, isopropyl alcohol (IPA), and methane. The detectors operate from 18 V dc to 28 V dc via connection to a compatible Approved fire alarm control providing separate circuits for alarm signaling and for power. The firmware is version 5723-007 for 15 ft sensitivity latching, 5723-107 for 30 ft sensitivity latching, 5723-209 for 45 ft sensitivity latching, 5723-301 for 15 ft non-latching, 5723-401 for 30 ft non-latching, and 5723-502 for 45 ft non-latching. In addition to relay outputs, rated at 1 A at 24 V dc, for alert, alarm and fault, the Model FS10-A flame detector also has a 4-20 mA output current source capable of driving a max load impedance of 330 Ohms. The Model FS10-R has relay outputs only. The detector housing is suitable for NEMA 3 and 4, and for indoor use only. The detector is suitable for use in Class I, Divisions 1 and 2, Groups B, C and D; Class II, Divisions 1 and 2, Groups E, F and G; and Class III hazardous (classified) locations. Operating temperature is from -40° to 185°F (-40° to 85°C). This detector reacts to the presence of flame within one-half second.

- 1.6 This report supplements 0Z3A7.AY, 0Z9A4.AY, 3000769, and 3001746 and the subsequent revision reports. The examination was limited to the application of new requirements in the above referenced standard.
- 1.7 Except as described in this report, components and applications described in the Fire Sentry Corporation manuals are not covered by this Approval.

II DESCRIPTION

FM APPROVALS
Project ID: 3014801

- 2.1 A detailed description of specific operation and options can be found in the Installation Guide and Operating Manuals, Documents Nos. 1526-002, Rev. D and 1519-001, Rev. C.
- 2.2 The FS10 flame detectors are mounted to either the SM2 swivel mount or the SM4 stainless steel swivel mount. The FS7-2173-RP flame detector has a chassis mount slide bracket.
- 2.3 No major changes have been made to the construction or operation of these flame detectors since the original Approval. A software change was made to the FS10 to improve its response to a methane fire, and that result is documented below.
- 2.3.1 The firmware for the Model FS7-2173-2RP is 5724-005, Revision A. The firmware for Model FS10-R is 5723-007 for 15 ft. sensitivity latching; 5723-107 for 30 ft. sensitivity latching; 5723-209 for 45 ft. sensitivity latching; 5723-301 for 15 ft. non-latching; 5723-401 for 30 ft. non-latching; and 5723-502 for 45 ft. non-latching.

III EXAMINATIONS AND TESTS

- 3.1 Four samples each of the Models FS7-2173-RP and FS10-R flame detectors, representative of production units and considered to be representative of the various models, were examined and tested at FM Approvals in Norwood, Massachusetts and at Fire Sentry Corporation in Brea, CA. One each of the Models FS7-2173-RP and FS10-R flame detector was examined and compared to the manufacturer's drawings. All documentation applicable to this program is on file at FM Approvals.
- 3.2 **Stability Test** - One each of the Models FS7-2173-RP and FS10-R flame detector was energized and tested to verify proper operation under normal, standby conditions. Continuous operation of the flame detectors was monitored for 30 days in clean-air (working office type); there was no evidence of instability or false signal during that period.
- 3.3 **Baseline Sensitivity Test** - Four samples each of the Models FS7 (normal sensitivity), FS10-R, FS10-2FL, FS10-2GE, and FS10-2WL flame detectors were subjected to a small-scale sensitivity test consisting of a 2 in. dia. (5.1 cm) n-heptane flame at distances shown below. The average results were as follows:
 - Model FS10-2FL at 18 in. (46 cm): 4.3 sec
 - Model FS10-2GE at 3 ft. (1 m): 4.7 sec
 - Model FS10-2WL at 14 in. (35 cm): 4.5 sec
 - Model FS10-R at 2 ft (0.6 m): 3.2 sec
 - Model FS7-NS at 17 in. (43 cm): 3.1 sec
- 3.4 **Flame Response Sensitivity Test** - All four samples of the Models FS7-NS, FS7-LS, FS10-2FL, FS10-2GE, FS10-2WL, FS10-R45, FS10-R30, and FS10-R15 were exposed to the standard test consisting of a 12 in. × 12 in. (0.3 m × 0.3 m) pan fire using fuels as noted below. The tests were conducted at Fire Sentry Corporation in Brea, CA, and the average results are as follows:

FM APPROVALS
Project ID: 3014801

Model FS7-NS (normal sensitivity):

12 in. × 12 in. (0.3 m × 0.3 m) IPA at 16 ft. (4.9 m): 3.1 sec.

Model FS7-LS (low sensitivity):

12 in. × 12 in. (0.3 m × 0.3 m) IPA at 8 ft. (2.5 m): 3.3 sec.

Model FS10-2FL with card controller:

12 in. × 12 in. (0.3 m × 0.3 m) n-Heptane at 15 ft. (4.6 m): 4.2 sec

Model FS10-2FL with card controller:

fireball at 15 ft. (4.6 m): 0.5 sec to "Alert"

Model FS10-2GE with card controller:

12 in. × 12 in. (0.3 m × 0.3 m) n-Heptane at 30 ft. (9 m): 5.0 sec

Model FS10-2GE with card controller:

12 in. × 12 in. (0.3 m × 0.3 m) n-Heptane at 25 ft. (7.6 m): 4.8 sec.

Model FS10-2GE with card controller:

IPA bugspray fireball at 15 ft. (4.6 m): 0.3 sec to "Alert"

Model FS10-2WL with card controller:

12 in. × 12 in. (0.3 m × 0.3 m) n-Heptane at 15 ft. (4.6 m): 5.0 sec

Model FS10-2WL with card controller:

IPA bugspray fireball at 15 ft. (4.6 m): 0.5 sec to "Alert"

Model FS10-R45:

12 in. × 12 in. (0.3 m × 0.3 m) n-Heptane at 45 ft. (13.7 m): 3.1 sec

Model FS10-R30:

12 in. × 12 in. (0.3 m × 0.3 m) n-Heptane at 30 ft. (9 m): 3.5 sec

Model FS10-R30:

IPA bugspray fireball at 30 ft. (9 m): 0.3 sec to "Alert"

Model FS10-R15:

IPA bugspray fireball at 15 ft. (4.6 m): 0.3 sec to "Alert"

Model FS10-R45:

30 in. (76 cm) plume methane through 3/8 in. (.95 cm) dia. orifice at 45 ft. (13.7 m): 3.2 sec

- 3.5 **Field of View Test** - One test sample each of the Models FS7-2173-2RP and FS10-2FL flame detectors was exposed to the 12 in. × 12 in. (0.3 m × 0.3 m) pan fire of fuel shown below during which time the viewing angle was varied from the centerline along the horizontal and vertical axes. The following average results were obtained:

Model FS7-2173-2RP using IPA:

<u>Angle (Approx.)</u>	<u>Distance</u>	<u>Average Response Time (sec)</u>
on centerline	15 ft (4.6 m)	3.1 seconds
+60° horizontal (right)	7.5 ft (2.3 m)	3.6 seconds
-60° horizontal (left)	7.5 ft (2.3 m)	3.1 seconds
+60° vertical (up)	7.5 ft (2.3 m)	3.0 seconds
-60° vertical (down)	7.5 ft (2.3 m)	3.2 seconds

Model FS10-2FL using n-Heptane:

<u>Angle (Approx.)</u>	<u>Distance</u>	<u>Average Response Time (sec)</u>
on centerline	15 ft (4.6 m)	4.2 seconds
+60° horizontal (right)	7.5 ft (2.3 m)	4.0 seconds
-60° horizontal (left)	7.5 ft (2.3 m)	4.4 seconds
+60° vertical (up)	7.5 ft (2.3 m)	4.4 seconds
-60° vertical (down)	7.5 ft (2.3 m)	4.7 seconds

3.6 **False Stimuli Response Test** - All four samples of the Models FS7-2173, FS10-R45, and FS10-2GE flame detectors, considered representative of the group, were tested in the presence of modulated and non-modulated artificial sources of light and other heated bodies, then, in the presence of each of the false stimuli, were exposed to the standard test consisting of a 12 in. × 12 in. (0.3 m × 0.3 m) N-heptane pan fire. The false stimuli sources were as follows:

3.6.1 Resistive Electric Heater (1500 W) at 1 ft. (0.3 m)

3.6.2 Fluorescent Light (40 W) at 1 ft. (0.3 m)

3.6.3 Halogen Light (500 W with lens) at 1 ft. (0.3 m)

3.6.4 Incandescent Light (100 W) at 1 ft. (0.3 m)

3.6.5 Arc welding with setting at 190 Amperes at 15 ft (4.6 m) using 7018 rod and steel plate.

3.7 **Switching** - One test sample each of the Models FS10-R and FS7-2173-2RP was exposed to flame radiation, and its response, at maximum delay setting, was found to be less than 30 seconds in all cases. These are satisfactory results.

3.8 **Humidity Cycling and Conditioning** - One powered sample each of the Models FS10-R and FS7-2173-2RP was conditioned in an atmosphere of 95% relative humidity at 140°F (60°C) for a period of 24 hours. Additionally, the powered samples were subjected to a change from 70°F (21°C) and 50% RH to 100°F (38°C) at 90% RH within 15 minutes. There was no trouble signal and no false indication of fire during this test, and there was less than 10% shift in sensitivity as measured by the baseline sensitivity test at the end of the conditioning.

3.9 **Temperature Extremes** – These tests were not conducted as the flame detectors have been previously tested at their specified temperature extremes. The FS7-2173RP detector was satisfactorily tested in project 3000769, and the FS10-R and –A detector was satisfactorily tested in project 3001746. In both cases, response distance was at least 90% of the baseline measurement.

FM APPROVALS
Project ID: 3014801

- 3.10 **Voltage Range** – This test was not conducted as the flame detectors have been previously tested over their specified voltage ranges. The FS7-2173RP detector was satisfactorily tested in project 3000769, and the FS10-R and –A detector was satisfactorily tested in project 3001746. In both cases, response distance was at least 90% of the baseline measurement.
- 3.11 **Vibration Test** - One powered sample each of the Models FS10-R and FS7-2173-2RP was subjected to a four-hour vibration test of 0.02 inches (0.5 mm) displacement at a frequency sweep of 10 to 30 Hz. The detectors operated properly during and after this vibration test, and there was no loosening of parts or permanent deformation as a result of this test. There was less than 10% shift in measured sensitivity using the baseline test at the conclusion of the test.
- 3.12 **Dielectric Strength** – Since these flame detectors are rated at 60 V dc or less, a test potential voltage of 710 V dc was applied to the sample FS7-2173-2RP and FS10-R45 flame detectors between the 24 V dc power leads and ground. A second test was conducted with 710 V dc applied to the output terminals and return from ground. Finally, a test was conducted with 710 V dc applied between the input leads and output leads for each detector sample. In all cases, the voltages were applied for one minute, and there was no evidence of leakage or breakdown.
- 3.13 **Bonding** - This test was waived, since all voltage ratings are less than 30 V rms or 60 V dc.
- 3.14 **Durability** – One sample each of the FS7 and FS10 flame detector was cycled through 500 on-alarm-reset operations. A natural gas flame was used to initiate each alarm condition. The alarm relay was controlling the maximum specified load of 1 A, 24 V dc resistive during the test. Operation was observed to be satisfactory during and after this test, and there were no false alarm or trouble signals.
- 3.15 **Software failure** - A software failure that renders the detector inoperable shall result in a trouble condition at the detector and be appropriately transmitted to the fire alarm control. A software failure was simulated in the sample Models FS7-2173-2RP and FS10-R by pulling the chip containing the software. This action caused operation of the trouble relay in each case. This is satisfactory.
- 3.16 **Extraneous Transients** - The following tests were conducted on one powered sample of the Models FS7-2173-2RP and FS10- (card controller) flame detectors:
- 3.16.1 Radio frequency transmissions with radiation power levels equivalent to 5 Watts at 24 in. (0.6 m) in the 27 MHz, 154 MHz, 467 MHz, 850-870 MHz, and 900-920 MHz bands.
- 3.16.2 A sequential arc (Jacob's ladder) generated between two 15 in. (0.4 m) long, No. 14 AWG (2.1 mm) solid copper conductors attached rigidly in a vertical position to the output terminals of an oil burner ignition transformer rated 120 V, 60 Hz primary; 10,000 V, 60 Hz, 23 mA secondary. The two wires are formed in a taper, starting with a 1/8 in. (3.2 mm) separation at the bottom (adjacent to terminals) and extending to 1.25 in (32 mm) at the top.
- 3.16.3 Operation of an electric drill rated 120 V, 60 Hz, 2.5 A.
- 3.16.4 Operation of a soldering gun rated 120 V, 60 Hz, 2.5 A.
- 3.16.5 Operation of a 6 in. (150 mm) diameter solenoid-type vibrating bell with no arc suppression and rated 24 V dc.

FM APPROVALS
Project ID: 3014801

- 3.16.6 The flame detectors produced no false alarm or trouble signal in the presence of these extraneous transients, and they responded satisfactorily to a test fire source in the presence of these extraneous transients.
- 3.17 **Surge Transient Test** – The flame detector samples were tested for protection against surge transients. All input and output circuits of the powered sample of the Models FS10-R and FS7-2173-2RP were subjected to five transient waveforms having peak levels of 100, 500, 1000, 1500, and 2400 V dc, as delivered into a 200 ohm load. The samples did not exhibit any instability such as alarm signals and non-restoring trouble signals during the test, and they performed satisfactorily at the conclusion of the test.
- 3.18 **Nonincendive Examination** – Division 2 equipment acceptability is based on the inability of the device to release sufficient electrical or thermal energy under normal operating conditions to cause ignition of the specific hazardous atmospheres. The following tests verify the suitability of the equipment for use in Class I, Division 2, Group A, B, C and D hazardous (Classified) locations. The unit was evaluated for mechanism for marking and breaking electrical circuits as well as hot spot temperatures. The nonincendive examination was conducted using the manufacturer's maximum normal ratings.
- 3.18.1 **Make/break Contacts** - The only make/break contacts accessible to the operator under normal conditions are the relays, which are located inside the enclosure.
- 3.18.2 **Fuses** - As there are no fuses within the unit, no evaluation was necessary.
- 3.18.3 **Connectors** - All Connector contacts in the system are mechanically fastened therefore no further evaluation was necessary.
- 3.18.4 **Sealed Device (Relays)**

The FS7-2173-2RP contains relays for the Output Option. The 12 volts SPDT (K1, K2) relays are designed as P/N MCSY-DC12V (SY-12-K) and manufactured by Takamisawa with a rating of 0.5A, 120VAC or 1A, 24VDC. Three samples of the relay were exposed to a temperature of 250°F (121°C) for 312 hours. After the test, with the samples at an initial temperature of 25°C, The three samples were immersed in water at a temperature of 50°C to a depth of 1 inch (25mm) for one minute. Bubbles did not emerge from any of the samples during this test. This result is satisfactory.

3.18.5 **Temperature Test**

Temperature testing was conducted on the sample with maximum voltage and load applied. The maximum Temperature tests were based on ambient temperature of 23°C. The maximum temperature of 65.4°C resulted from IC, 5V regulator 2.2A (VR2), P/A 3041-0005 Model L7805CV. The maximum theoretical temperature would be 103 °C based at a maximum operating temperature of 55°C including a 5K uncertainty. In accordance with the National Electrical Code, a temperature Classification of T4A with Ta = 55°C ambient must be marked on the label.

DATA

Supply Voltage: $V_{max} = 28V_{dc}$

Current Supply: $I_{max} 55mA \& 80mA$

Operating temperature: $T_o = 55^{\circ}C$, $T_{amb} = 22.7^{\circ}C$

Calculations:

$$T_{max} = T_r + T_o - T_a + 5K$$

$$T_{max} = 65.4^{\circ}C + 55^{\circ}C - 22.7^{\circ}C + 5^{\circ}C$$

$$T_{max} = 103^{\circ}C @ T_a = 55^{\circ}C$$

The temperature Code of T4A is required for the unit

Temperature marking: T4A (120°C) $T_a = 55^{\circ}C$

- 3.19 Because of testing conducted on the previously Approved versions, no further testing was required.

IV MARKING

- 4.1 The following information appears on the adhesive label affixed to the outside of the enclosure and meets Standard requirements:

- Manufacturer's name
- Model number
- Part Number
- Electrical ratings
- The FM Approval mark

- 4.2 The firmware revision level is shown by a paper adhesive label on the EPROM of each flame detector.

V REMARKS

- 5.1 Installations shall comply with the latest edition of the manufacturer's instruction manual.
- 5.2 **Division 2 Wiring Method** - The connection of the units is incendive; therefore, it is required that the installation be in accordance with the National Electrical Code (ANSI-NFPA-70) Division 2 hazardous (Classified) locations wiring techniques.

FM APPROVALS
Project ID: 3014801

VI FACILITIES AND PROCEDURES AUDIT

The manufacturing site in Brea, CA is currently included in the FM Approvals Facilities and Procedures Audit program. The facilities and quality control procedures in place have been found to be satisfactory to manufacture product identical to that examined and tested as described in this report.

VII MANUFACTURER'S RESPONSIBILITIES

- 7.1 Documentation considered critical to this Approval is on file at FM Approvals and listed in the Documentation File, Section VIII of this report. No changes of any nature shall be implemented unless notice of the proposed change has been given and written authorization obtained from FM Approvals. The Approved Product Revision Report, Form 797, shall be forwarded to FM Approvals as notice of proposed changes.
- 7.2 A copy of the latest version of the Instruction Manual must be provided with each shipment.

VIII DOCUMENTATION

The following documents have been revised and are filed under Project 3014801. The rest of the drawings have not changed, and they are filed under the previous Projects 3000769 and 3001746.

Drawing No	Drawing Title	Revision
MN209	FS System 10 Flame Detector with option 2FL manual	F
MN210	FS System 10 Flame Detector with option 2GE manual	F
MN219	FS System 10 Flame Detector with option 2WL manual	F
SP209	FS System 10 with option 2FL – specifications	E
SP210	FS System 10 with option 2GE – specifications	E
SP219	FS System 10 with option 2WL – specifications	E
1526-001	FS10-R/A 15, 30, and 45 flame detectors –specs	C
1526-002	FS10-R/A 15, 30, 45 Flame Detectors manual	D
3718-4002	S10 Card Controller Software Configuration 4	2002
3718-5002	S10 Card Controller Software Configuration 5	2002
4003-0	FS10-R/A Interface Circuit Assembly	D
4004-0	FS10-R/A Detector Module Assembly	E
4062-0	FS10-R/A, CS Sensor Fab Drawing	D
5723-007	FS10-R/A Firmware – 15 ft. sensitivity latching	A
5723-107	FS10-R/A Firmware – 30 ft. sensitivity latching	A
5723-209	FS10-R/A Firmware – 45 ft. sensitivity latching	A
5723-301	FS10-R/A Firmware – 15 ft. sensitivity non-latching	A
5723-401	FS10-R/A Firmware – 30 ft. sensitivity non-latching	A
5723-502	FS10-R/A Firmware – 45 ft. sensitivity non-latching	A
1517-001	FS7-2173-R w/ J Box, manual	B
1520-001	FS7-2173 Flame Detector specifications	D
1520-002	S7 2173 C Flame Detector Specification	D
1519-001	FS7-2173-RP Flame Detector manual	C
1515-001	FS7-2173-2RP Flame Detector manual	C
SP303	Model S7-2173-C Flame Detector specifications	G
1518-001	Model FS7-2173-R Flame Detector specifications	B

FM APPROVALS
Project ID: 3014801

Drawing No	Drawing Title	Revision
1525-001	FS7-2173-RP Flame Detector Specification	C
1516-001	Model FS7-2173-2RP Flame Detector specifications	C
SP340	Model FS7-2173 Flame Detector specifications	G
2172-00	S7 Detector Circuit Assembly	M
2173-00	S7 Detector Complete Assembly	N
3720-0010	S7 Detector Firmware	A
4026-0	S7 Detector Circuit Assembly	F
4027-0	FS7 Detector Complete Assembly	G
5724-005	FS7 Detector Firmware	A

IX CONCLUSION

The Models FS10-R/A, FS System10 with options 2FL, 2GE, and 2WL, and FS7-2173-RP, -2RP, and S7-2173-C flame detectors described in Section II meet FM Approvals requirements. Since a duly signed Master Agreement is on file for this manufacturer, Approval is effective the date of this report.

FM APPROVALS
Project ID: 3014801

EXAMINATION AND TESTING BY: P. K. Schoenheiter
R. W. Elliott
C. Mace
S. Petit-Maitre

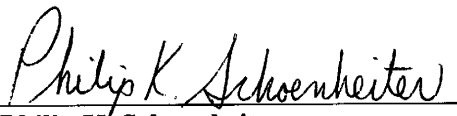
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ORIGINAL TEST DATA: 3000769
3001746

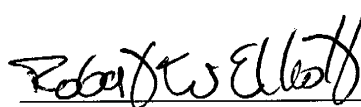
ATTACHMENTS: Specifications, Documents Nos. 1516-001, Rev. C and
1526-001, Rev. C

REPORT BY:

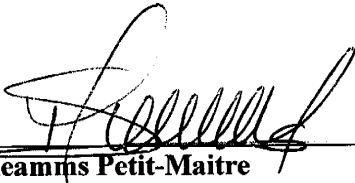
REPORT REVIEWED BY:



Philip K. Schoenheiter
Senior Engineer
Electrical Systems



Robert W. Elliott
Senior Engineering Specialist
Electrical Systems



Sleamms Petit-Maitre
Associate Engineer
Hazardous Locations



Nicholas Ludlam
Technical Team Manager
Hazardous Locations