# IPES-IR/UV Flame Detector Operating Manual

80010-001 R08

ESP Safety, Inc.
555 North First Street
San Jose, CA 95112
408-886-9746

November 2017

## Revision History: 80010-001

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>Description</th>
<th>Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/09/09</td>
<td>01</td>
<td>Initial Draft</td>
<td>J. Lorelli</td>
</tr>
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<td>K. Bernstein</td>
</tr>
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<td>05</td>
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<td>K. Bernstein</td>
</tr>
<tr>
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</tr>
<tr>
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</tr>
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<td>08</td>
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Commented [ab1]: Removed Revision 7 "Addendum: IPES Single Channel IPES-UV Flame Detector"
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1.0 Introduction

The IPES-IR/UV flame detector’s advanced detection technology incorporates optical filters configured for maximum sensitivity to radiation produced by flame or fire and ensures rapid flame recognition and alarm signaling. The IPES-IR/UV has a field of view of not less than 90 degrees. Upon fire recognition, it signals a change in state from normal operation to fire in any original equipment manufacturer’s OEM or proprietary alarm and response system.

It is important that this entire manual be thoroughly read and understood prior to installing or operating the IPES-IR/UV. Any manual may impair system performance and compromise safety.
In addition, via integrated infrared (IR) and ultraviolet (UV) sensors, the IPES-IR/UV monitors in specific regions of both spectral ranges. In the infrared spectrum, the device is configured for sensitivity to wavelengths in the range of 4.2 to 4.6 microns, allowing optimal sensitivity to hydrocarbon fires, and other types such as metal fires while rejecting false signals from incandescent lamps, sunlight and hot objects. For ultraviolet radiation, the device is configured for sensitivity in the range of 180 to 250 nanometers, making the sensor "blind" to sunlight and radiation from heated objects but still able to "see" the UV radiation emitted by a flame. With these settings, the IPES-IR/UV selects and alarms from those characteristic wavelength emissions from the IR-to-UV spectrum that indicate actual flame or fire.

The combination of multiple sensors and wavelength range settings makes the IPES-IR/UV an excellent choice for elimination of false positive indicators caused by non-flame sources of radiation such as artificial lighting, direct and indirect sunlight, lightning, arc welding and metal grinding.

**Our Mission**

ESP Safety, Inc.’s mission is to provide complete turn-key protection solutions beginning with the design stage, through system installation and commissioning, and on-going field service in hazardous environments. Our line of industry-leading products, services, and systems benefits society, saves lives, and preserves capital resources.

**ESP Safety, Inc. Contact Information**

Telephone: 408-886-9746  
FAX: 408-886-9757  
Address: 555 North First Street, San Jose, CA 95112
2.0 Description

Application
The IPES-IR/UV’s design and explosion-proof ratings make it an excellent choice for indoor and outdoor applications, including:
- Drilling and production platforms
- Shipping tankers, freighters, and other vessels
- Fuel loading facilities
- Refineries, bulk terminals, and tank farms
- LNG/LPG processing and storage facilities
- Compressor stations and pipeline facilities
- Petrochemical, paint, and fertilizer plants
- Power plants and gas turbine facilities
- Transportation facilities (airports and subways)
- Oil and gas fired boilers/furnaces
- Aircraft hangars

Specifications
The IPES-IR/UV meets industry certifications and requirements for Hazardous Locations.

Detection Type: Optical
Detection Method: IR and UV radiation
Spectral Range: 4.2 to 4.6 micron (IR); 180 to 250 nm (UV)
Power Supply: 18 to 32 VDC
Power Consumption:
- Stand By: 2 W max; Alarm State: 3 W max

Fire Relay Outputs:
- Single pole contact, normally open, rated 5 A @ 30 VDC; normally closed contact is available on request*
  * Normally closed configuration is not compliant with NFPA 72, ULC/ORD – C386 and FM.

Fault Relay Outputs:
- Single pole contact, normally closed, rated 5A @ 30 VDC; open on fault detection or loss of power

Communications:
- Analog output: 4-20 mA
- Digital signal: RS-485 with Modbus protocol

Wiring:
- 14 AWG (2.08 mm²) or 16 AWG (1.31 mm²). Shielded cable is recommended.

Operating Temperature: -40°F to +185°F (-40°C to +85°C)
Storage Temperature: -76°F to +185°F (-60°C to +85°C)
Humidity: 95%, non-condensing
Hazardous Location Classification: Please refer to section 13.0
Certifications

Conduit Entry: ¾” NPT approved Haz Loc bushing

Enclosure Materials: 316 SS or 6061 Aluminum

Enclosure Screws: Please refer to section 13.0 Certifications

Weight: SS = 11 lbs (5.0 kg); Aluminum = 5.5 lbs (2.5 kg)
3.0 Safety Considerations

Guidelines

Before installing and operating the IPES-IR/UV, be sure to read this entire manual. Failure to follow these guidelines could result in impaired product performance and safety hazards.

For maximum safety:

- Only persons who have thoroughly read and understood this manual, are trained in safety techniques, and have electric-safety certificates are permitted to install and operate the IPES-IR/UV.
- Never operate the IPES-IR/UV if the casing is damaged.
- Do not separate the IPES-IR/UV when energized.
- Refer to the Appendices and diagrams in this manual to ensure that the wiring is in compliance with local ordinances and the NEC.
- Perform regular testing and maintenance as outlined in the Maintenance section.
- Ensure that fire-alarm and fire-extinguishing systems and controls are switched off before any testing or maintenance to avoid unwanted operation of alarms and fire-extinguishing equipment.

Also see the individual sections in this manual for relevant specific safety guidelines.

Explosion Protection Means

The table below describes design features that protect the IPES-IR/UV against explosions:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Protection Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosure of Current Carrying Parts</td>
<td>The casing includes spigot joints with controlled gaps to meet explosion-proof requirements for installation in Class I, Division I, Group B, C and D, and T5 locations.</td>
</tr>
<tr>
<td>Case Mechanical Strength</td>
<td>The high mechanical strength of the case is able to withstand high explosive pressures without rupture or failures of mechanical parts. The case design is in accordance with FM 3600 and FM 361S.</td>
</tr>
<tr>
<td>Manufacturing Control Of Casing</td>
<td>Refer to Appendix A1 for manufacturing details. Important parameters include:</td>
</tr>
<tr>
<td></td>
<td>- Maximum width and minimum length of spigot joints</td>
</tr>
<tr>
<td></td>
<td>- Surface roughness of the joined parts</td>
</tr>
<tr>
<td></td>
<td>- The number of complete intact threads at the conduit entry point</td>
</tr>
</tbody>
</table>
### Feature

<table>
<thead>
<tr>
<th>Feature</th>
<th>Protection Means</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ignition Temperature</strong></td>
<td>The ignition temperature of the surrounding environment is limited by the outside surface temperature of the housing, which does not exceed 275°F (135°C).</td>
</tr>
<tr>
<td><strong>Securing of Bolts, Joints and Grounding</strong></td>
<td>Spring washers, lock washers, and lock nuts maintain the integrity of the bolted connections by preventing loosening of the bolts.</td>
</tr>
<tr>
<td><strong>Joined Parts Protection</strong></td>
<td>Anti-seize lubricant is applied on the critical joints as described on Appendix A1.</td>
</tr>
<tr>
<td><strong>Casing Ingress Protection</strong></td>
<td>The design of the casing is protection class IP 66 in accordance with IEC 60529-004.</td>
</tr>
<tr>
<td><strong>Sealing Cables at Conduit Entry</strong></td>
<td>Use approved hazardous location sealed conduit fittings. For outdoor installations, ensure sealing meets IP66 requirements.</td>
</tr>
</tbody>
</table>

### Additional Considerations

It is important to identify false alarm sources and any conditions that could prevent the IPES-IR/UV from responding appropriately to a fire. The following should be considered:

#### False Alarm Prevention

**Arc Welding and Gas Welding**

Do not perform arc or gas welding within the field of view of the IPES-IR/UV. System bypass is mandatory for gas welding and is highly recommended for all welding activity. Refer to the section on FM Compliance below for results of testing with false stimuli.

**Walkie-Talkies**

Owing to potential EMI and RFI interference, walkie-talkies should not be used within 1 foot of the IPES-IR/UV.

#### Fire Types

The IPES-IR/UV can detect hydrocarbon fires from petrochemical sources, metal fires, and fires from wood and paper products. In addition, the detector is FM-approved for detecting methane, propane, n-Heptane, JP4, and methanol fires.

#### FM Compliance

**IPES-IR/UV**

Meets FM (US and Canada) certifications and requirements for Hazardous Location classification: Class I, Division I, Group B, C and D and T5 Case design accords with FM 3600 and FM 3615. Ta = -40°C to +85°C (-40°F to +185°F) IP66
Standards

<table>
<thead>
<tr>
<th>TITLE</th>
<th>AUTHOR-NUMBER</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic Fire Alarm Signaling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic Fire Alarm Signaling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical Equipment For Use In Hazardous</td>
<td>FM Approvals - 3600</td>
<td>1998</td>
</tr>
<tr>
<td>(Classified) Locations – General Requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flame Detectors</td>
<td>ULC/ORD - C386</td>
<td>1990</td>
</tr>
<tr>
<td>Threaded Conduit Entries</td>
<td>CSA C22.2 No. 0.5 (Reaffirmed)</td>
<td>1982 (1999)</td>
</tr>
<tr>
<td>Degrees of Protection Provided by Enclosures (IP Code)</td>
<td>ANSI/IEC 60529</td>
<td>2004</td>
</tr>
<tr>
<td></td>
<td>CSA-C22.2 No. 60529</td>
<td>2005</td>
</tr>
<tr>
<td>Explosive Atmospheres, General Requirements</td>
<td>ANSI/ISA 60079-0</td>
<td>2009</td>
</tr>
<tr>
<td>Explosive Atmospheres, Equipment protection by flameproof &quot;d&quot; enclosures</td>
<td>ANSI/ISA 60079-1</td>
<td>2009</td>
</tr>
</tbody>
</table>

Flame Response Sensitivity

When an IPES-IR/UV detector is exposed to a series of test fires along the center line of the sensor as described in the table below, the alarm response of the IPES-IR/UV is below the 30-second response time required under FM Standard 3260.
**Flame Response Sensitivity**

When an IPES-IR/UV detector is exposed to a series of test fires along the center line of the sensor as described in the table below, the alarm response of the IPES-IR/UV is below the 30-second response time required under FM Standard 3260.

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Distance</th>
<th>Fire Size</th>
<th>Average Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Heptane</td>
<td>82 ft. (25 m.)</td>
<td>1 ft. × 1 ft. (32.5 cm.) pan</td>
<td>4.52 sec.</td>
</tr>
<tr>
<td>Denatured ethyl alcohol (85.4%)</td>
<td>82 ft. (25 m.)</td>
<td>1 ft. × 1 ft. (32.5 cm.)</td>
<td>4.9 sec.</td>
</tr>
<tr>
<td>JP4</td>
<td>82 ft. (25 m.)</td>
<td>2 ft. × 2 ft. (60 cm.) pan</td>
<td>Instantaneously</td>
</tr>
</tbody>
</table>

**False Stimuli Exposure**

When the IPES-IR/UV is exposed to the fires specified above, and are in the presence of the following false stimuli sources – modulated at approximately 1.5 Hz, and un-modulated – no false alarm activation or instability occurs at the minimum distances listed below.

<table>
<thead>
<tr>
<th>Source</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater</td>
<td>12 inches (30.48 cm.)</td>
</tr>
<tr>
<td>Arc welder</td>
<td>9.8 feet (3 m.)</td>
</tr>
<tr>
<td>Fluorescent</td>
<td>6 inches (15.24 cm.)</td>
</tr>
<tr>
<td>Halogen</td>
<td>6 inches (15.24 cm.)</td>
</tr>
<tr>
<td>Incandescent</td>
<td>6 inches (15.24 cm.)</td>
</tr>
<tr>
<td>Direct sunlight</td>
<td>Detectors not affected by frequency range of visible light</td>
</tr>
<tr>
<td>Indirect sunlight</td>
<td>Detectors not affected by frequency range of visible light</td>
</tr>
</tbody>
</table>

**Field of View**

The IPES-IR/UV’s viewing angle is varied from the center line up, down, left and right. The detector is exposed to each of the test fires described in “Flame Response Sensitivity” above at a distance described in the table below.

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Horizontal (Left)</th>
<th>Horizontal (Right)</th>
<th>Vertical (Up)</th>
<th>Vertical (Down)</th>
<th>Min, Distance</th>
<th>Avg. Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Heptane</td>
<td>45º</td>
<td>45º</td>
<td>45º</td>
<td>45º</td>
<td>56.1 ft. (17.1 m.)</td>
<td>4.61 sec.</td>
</tr>
<tr>
<td>Denatured ethyl alcohol 85.4%</td>
<td>45º</td>
<td>45º</td>
<td>45º</td>
<td>45º</td>
<td>41 ft. (12.5 m.)</td>
<td>4.55 sec.</td>
</tr>
<tr>
<td>JP4</td>
<td>45º</td>
<td>45º</td>
<td>45º</td>
<td>45º</td>
<td>82 ft. (25 m.)</td>
<td>Instantaneously</td>
</tr>
</tbody>
</table>
4.0 Performance Characteristics

**Appearance**

The IPES-IR/UV consists of an explosion-proof casing containing sensors which convert electromagnetic radiation from flames into electrical signals by use of electronic amplifiers and filters, digital-analog converters, a microprocessor, and LED indicators.

**Response Time**

The IPES-IR/UV response time to detecting radiation emitted by test sources of n-Heptane combustion in a 12” x 12” (0.3m by 0.3m) pan, and ethyl alcohol combustion in a 12” x 12” (0.3m by 0.3m) pan, at a distance of 82 feet (25 meters) does not exceed 30 seconds.

The sensitivity and response time can be varied in order to reduce the noise when the IPES-IR/UV identifies a fire, or the distance to the probable place of fire is short (“near/far” and “slow/fast” modes). Can be set using the ESP Commander program.

![Figure 4-1: Appearance of the IPES-IR/UV](image)
**Generation of Alarm Signals**

The IPES-IR/UV incorporates optical filters configured for maximum sensitivity to radiation produced by flame or fire, ensuring rapid flame recognition and alarm signaling. Upon fire recognition within its 90-degree field of view, the IPES-IR/UV signals a change in state from normal to fire in any Original Equipment Manufacturer’s (OEM) or proprietary alarm and response system.

In addition, via integrated infrared (IR) and ultraviolet (UV) sensors, the IPES-IR/UV monitors in specific regions of both spectral ranges. In the infrared spectrum, the device is configured for sensitivity to wavelengths in the range of 4.2 to 4.6 microns, allowing optimal sensitivity to combustible gas fires while rejecting false signals from incandescent lamps, sunlight and hot objects. For ultraviolet radiation, the device is configured for sensitivity to wavelengths in the range of 180 to 250 nanometers, making the sensor "blind" to sunlight and radiation from heated objects but still able to "see" the UV radiation emitted by a flame. With these settings, the IPES-IR/UV selects and alarms from those characteristic wavelength emissions from the IR-to-UV spectrum that indicate actual flame or fire.

The analog signals from the sensors are filtered, amplified, and then converted to digital signals which are then processed in a microcontroller via a special algorithm. This ensures the reliability of the alarm signals.

The IPES-IR/UV takes the following parameters into consideration when generating an alarm signal:

- Magnitude of signals from different optical channels
- Ratios between the signal amplitudes of different channels
- Signal modulation frequency
- Phase relationships among the channels

**Elimination of False Alarms**

The combination of multiple sensors and wavelength range settings makes the IPES-IR/UV an excellent choice for elimination of false positive indicators caused by non-flame sources of radiation such as artificial lighting, direct and indirect sunlight, lightning, arc welding and metal grinding.

See additional important considerations for eliminating false alarms in section 3.0 Safety.

An Alarm condition will normally override a Fault condition unless a loss of operating power impairs the detector’s ability to generate or maintain an alarm. The IPES-IR/UV reports both Fault and Alarm conditions exclusive of each other. This means both a Fire and Fault can be reported at the same time if they occur simultaneously.

**Serviceability**

The IPES-IR/UV remains serviceable in non-heated rooms or under sheds at temperatures from −40°F to +185°F (−40°C to +85°C).

**LED**

Normal, Fire and Fault conditions are indicated by two red LEDs located on the cover. Refer to Table 4-1: Determining LED Conditions, below.
To maintain reliability of the IPES, the optical devices are automatically self-tested for radiation transmission every 25 to 45 minutes. This routine test does not require the use of a test lamp. This test determines whether any dust or other contamination has formed on the detecting windows which would scatter the infrared radiation.

Figure 4-2: IR & UV Detectors and LED Indicators
Table 4-1: Determining LED Conditions

After completing all installation steps, refer to the illustration and LED indicator table below to determine LED conditions.

<table>
<thead>
<tr>
<th>N</th>
<th>IPES status</th>
<th>Fire relay dry contacts condition</th>
<th>Fault relay dry contacts condition</th>
<th>Output signal, mA</th>
<th>Indicator LED condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Normally closed</td>
<td>Normally open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>No power supply voltage</td>
<td>Closed</td>
<td>open</td>
<td>open</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Fault or optical interference (dust)</td>
<td>Closed</td>
<td>open</td>
<td>open</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Normal (no faults or fires during operation)</td>
<td>Closed</td>
<td>open</td>
<td>closed</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Fire, no Fault</td>
<td>Open</td>
<td>closed</td>
<td>closed</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>Fire, with Fault</td>
<td>Open</td>
<td>closed</td>
<td>open</td>
<td>18</td>
</tr>
<tr>
<td>6</td>
<td>Test mode (magnetic collar is on)</td>
<td>Closed</td>
<td>open</td>
<td>open</td>
<td>2</td>
</tr>
</tbody>
</table>

Commented [ab4]: Should blue light be included as a status light?

Commented [ab5]: Page rotated to landscape.
### Analog Signal

<table>
<thead>
<tr>
<th>Analog signal (4-20 mA)</th>
<th>Detector State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal level</td>
<td></td>
</tr>
<tr>
<td>(+0.1) mA</td>
<td>Circuit opening</td>
</tr>
<tr>
<td>(2 ± 0.1) mA</td>
<td>Fault</td>
</tr>
<tr>
<td>(4 ± 0.1) mA</td>
<td>Normal</td>
</tr>
<tr>
<td>(18 ± 0.1) mA</td>
<td>Fire</td>
</tr>
<tr>
<td>(2 ± 0.1) mA</td>
<td>Test</td>
</tr>
</tbody>
</table>

**Digital Signal**

Informational digital signals are standard RS-485 communication with Modbus:

- Hardware self-test Fault
- Optical interference Fault
- Fire detected

(The digital channel protocol Modbus RTU is described in Appendix B.)

**Relay Dry Contact Signal**

Relay dry contact signal:

- Operation of the normally open Fire relay dry contacts *
  - FIRE relay – two-directional single-pole contact, which allows the state to be changed at the output to normally closed or normally open by using the ESP Commander program. The contact relay is rated for currents ranging from 10 mA to 5 A at DC voltage of 30 V.

  The output signal “Fire” can be cleared after eliminating the source of the alarm signal.

  * A normally closed condition of the Fire relay contacts does not comply with the requirements of NFPA 72 or ULC/ORD – C386 and is not approved by FM approvals.

- Operation of the normally open Fault relay dry contacts
  - FAULT relay – single-direction pole contact which is normally open. The relay is designed to handle currents of 10 mA to 5 A at DC voltage of 30 V.

Refer to Table 4-1: Determining LED Conditions above.
Possible detector configurations using ESP Commander

The IPES-IR/UV has the following detector operating modes:

- "Near/far" and "slow/fast" modes – To provide maximum sensitivity.
- "Latching/non-latching mode" – To select either latching or non-latching functionality of the fire relay, which provides latching alarm state for the fire-alarm relay in compliance with NFPA 72 and ULC/ORD – C386.

The manufacturer's default settings correspond to far and fast. To change the manufacturer's settings connect the flame detector to the computer and use the ESP Commander program.
5.0 Installation

**Component Parts and Delivery Set**

The IPES-IR/UV detector component parts and delivery set consists of the following:

- One IPES-IR/UV Detector with one mounting base.
  (10010-001/10011-001 Stainless Steel or 10010-002/10011-002 Aluminum)
- One Operating Manual 80010-001
- Accessory Kit (bolts, nuts, washers, etc.). Refer to Appendix A-1, Drawing 80025-001, for further details.
- Optional magnetic collar (delivered only by special request).

Compare the contents of the set to the packing list to be sure all items were received. If any items are missing, contact ESP Safety Inc.

**Visual Examination**

Before installing the IPES-IR/UV, examine the detector to be sure that:

- The nameplates and warning labels are in place.
- The external surfaces of the elements and joined surfaces of the casing are free of dents or damage. (Refer to Appendix A1, Drawing 80033-001, and Appendix A2, Drawing 80025-001.)
- The tamper-proof screw is intact on the front cover (See Appendix A2, Drawing 80025-001.)

**Pre-Installation Steps**

Make sure all removable parts are joined to the casing as tightly as possible.
Installation  

Positioning the Detector

1. Position the detector to provide an unobstructed view of the area to be protected. The detector’s 90° viewing angle is most sensitive along the central axis; therefore, position the central axis so that it has the best unobstructed view of the place of probable fire. Use line of sight or laser level for more precise targeting.

2. Identify all high risk fire sources, to determine the number of detectors needed for adequate coverage.

3. Locate the detector(s) for ease of cleaning and servicing. Ensure that probable fire sources are within the detector(s) field of view and detection range.

4. When installing multiple detectors in the same area, be aware of overlapping fields of view and detector hierarchy. Overlapping fields of view can be used to provide additional protection against false positives or false negatives, depending on the control system logic connected to the detectors.

   **Note:** To mitigate false positives, position the detector so that its field of view does not cover any areas outside the hazardous area.

5. Mount the detector on a rigid surface which minimizes vibrations. Use the mounting hardware provided along with the rubber bushings to further isolate the detector from vibrations (see Appendix A-2, Drawing 80025-001, Sheet 1).

   **Note:** ESP Safety Inc recommends bolting the mounting base plate to the mounting surface. If bolting is not possible, the mounting plate can be welded to the mounting surface if it is a similar metal (either 316 Stainless Steel or 6061 aluminum). Before welding, be sure to remove the detector from the base plate before attempting any weld operation.

Moisture Damage Protection

- It is the responsibility of the installer to take proper precautions during installation to protect the electrical connections and components from moisture.

- Anti-seize lubricant is provided for easy assembly and corrosion protection of the joints between the enclosure/cover and enclosure/base. After disassembly, wipe these surfaces clean with a soft cotton or wool cloth and then re-apply a thin layer of lubricant prior to assembly. See Appendix A-2 (Drawing 80025-001, Sheet 1).
- If installing wiring cable in conduit, do not use conduit for wiring to other equipment.
- Care should be taken to not install the detector where heavy condensate, rain, or fog can cover the lens and reduce the sensitivity of the detector.

If possible, conduct fire tests to confirm detection.

Figure 5-1: View of IPES-IR/UV with Base Removed

The table on page 19 describes the arrangement of Electrical Connections
Table 5-1: Arrangement of Electrical Connections

Arrangement of Electrical Connections

Arrange the electrical connections as described in Table 5-1, Table 5-2 and Figure 5-3 below.

To connect the IPES-IR/UV to external devices, use armored control cables 4 x 1.5, which are used in all classes of explosive zones including indoor and outdoor sites, channels, tunnels, ground (trenches) with corrosive medium, and in zones containing roaming currents.

Wiring Requirements

- The temperature rating of all field wiring conductors shall be at least 10°C greater than the maximum ambient temperature
- Communications: 14 AWG (2.08 mm²) or 16 AWG (1.31 mm²) shielded cable, twisted pair is recommended to protect against EMI and RFI interference; Power: 14 AWG (2.08 mm²) or 16 AWG (1.31 mm²) wires.
- Ground wire shall be 14 AWG (2.08 mm²)
- The wiring color and type shall comply with local codes, ordinances, and the NEC. It is recommended that the local authority be consulted in case of doubt.
- Follow the wiring instructions in this manual to ensure correct functioning of the detector.

Setting the Modbus Address and Baud Rate

To ensure proper communications, a unique address must be assigned to each device, as duplicate addresses are not automatically detected. Modules with duplicate addresses will report with the same address, confusing latest updates. Record all addresses and device types after completing the installation.

Refer to Appendix B for setting the Modbus address and baud rate.
Completing the Installation

For the following, refer to the illustrations in Appendix A2 (Drawing 80025-001, Sheets 1 and 2).

1. Unscrew the M5 Socket Head Cap screws from the base. Remove the detector from the base.
2. Detach NPT conduit bushing from base.
3. Install the base on a suitable work platform and secure using the 4 mounting screws, washers, nuts, and rubber grommets.
4. Run the power, control, and ground wires from the conduit into the conduit bushing and connect to the wiring terminals in the base. Follow Figure 5-2, Arrangement and Functions of Mounting Connection Terminals, for details.
5. Tighten the conduit bushing to 4-1/2 + - 1 turns of engagement. Seal the conduit entry with an approved hazardous location conduit sealant.
6. Run the earth ground wire to the external ground stud on the base.
7. After completing all wiring, refer to Table 4-1 to verify the functionality of the front cover LEDs.
8. Inspect base and re-apply a thin film of anti-seize compound if required; re-install the detector on the base and evenly tighten the M5 screws to 40 in-lbs.
9. Upon completing the installation, check the resistance of the earth ground lug to ground which should not exceed 1 ohm.
Figure 5-2: Arrangement and Functions of Mounting Connection Terminals
Arrangement and Function of Mounting Connection Terminals

The arrangement and function of mounting connection terminals used to connect the IPES-IR/UV to a control system are shown below.

Table 5-2: Connecting Terminals

<table>
<thead>
<tr>
<th>Receptacle</th>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>X3</td>
<td>+24V</td>
<td>24VDC from system power source (External User Provided)</td>
</tr>
<tr>
<td></td>
<td>GND</td>
<td>System Ground from system power source (External User Provided)</td>
</tr>
<tr>
<td></td>
<td>+4/20</td>
<td>Industry Standard +4-20mA current loop output</td>
</tr>
<tr>
<td></td>
<td>RS485A</td>
<td>RS-485 MODBUS</td>
</tr>
<tr>
<td></td>
<td>RS485B</td>
<td>RS-485 MODBUS</td>
</tr>
<tr>
<td></td>
<td>R_WORK</td>
<td>Fault / Obstruction Relay Normally Closed (NC Type B) When Energized</td>
</tr>
<tr>
<td>X4</td>
<td>+24V</td>
<td>Output to next device if required</td>
</tr>
<tr>
<td></td>
<td>GND</td>
<td>Output to next device if required</td>
</tr>
<tr>
<td></td>
<td>+4/20</td>
<td>Industry Standard +4-20mA current loop output</td>
</tr>
<tr>
<td></td>
<td>RS485A</td>
<td>Output to next device if required</td>
</tr>
<tr>
<td></td>
<td>RS485B</td>
<td>Output to next device if required</td>
</tr>
<tr>
<td></td>
<td>R_FIRE</td>
<td>Alarm Relay Normally Open (NO Type A) When Energized</td>
</tr>
<tr>
<td>X5</td>
<td></td>
<td>Factory Use</td>
</tr>
<tr>
<td>X6</td>
<td></td>
<td>Factory Use</td>
</tr>
</tbody>
</table>

1) When using an RS-485 bus connection, it is advisable to connect the IPES-IR/UV to the bus via the terminal box. To connect the detector to the terminal box, use a cable not longer than 1.64 feet (0.5 m). The cable characteristics should meet the requirement of the cable entries mounted on the IPES-IR/UV casing and those of the terminal box.

2) Arrange the power-supply system so that the power-supply voltage across the device terminals ranges from 18 to 32 V (taking into account the IPES-IR/UV consumption).
Connection to Digital Circuit RS485

Figure 5-3:
IPES-IR/UV Connection to Digital Circuit RS 485
6.0 Startup and Operation

**Startup**

**Performance Test**

After installation is complete, conduct a performance test as follows, to ensure that the detector is functioning properly.

**Test Equipment**

ESP Safety, Inc.’s ITES Test Lamp (part number 50020-001) is designed to assist in the functional testing of the detectors without the need to remove the detector from the application. The Test Lamp generates directed modulated radiation with sufficient intensity to signal a flame or fire response to the detector, indicated by a continuous LED on the IPES-IR/UV.

Each Test Lamp is supplied pre-assembled with an emission source, housing, batteries, and an Operating Manual.

*Commented [ab7]: Changed lamp P/N to dual test lamp*
**Procedure**

Perform this test on all detectors in the system.

1. Apply power to the detector. After 1 to 5 seconds, the output current will increase to 4 mA, and the indicating LEDs will start blinking.

2. If it is necessary to isolate the detector fire relay from the alarm system, apply the magnetic collar over the enclosure as shown in Figure 6-1. Placing the collar over the enclosure as shown allows the fire relay contacts to remain in the non-alarm state during testing.

3. Perform the test with the ITES Test Lamp as follows:
   a) Position the Test Lamp at a distance of 0.5 to 1 meters from the front cover of the detector.
   b) Turn the Test Lamp on and adjust the beam of light so it covers the front cover of the detector.
   c) The detector’s front red indicator LED will light, confirming detection. If the Test Lamp is turned off, the red indicator will stay lit for up to 10 seconds, depending on the detector’s internal switch configuration.
   d) The Test Lamp can be used to verify the field of view of the detector up to a distance of 2 meters away.

4. If any detector fails this test, refer to Section 7.0, Troubleshooting.

5. Once testing is complete, remove the magnetic collar before reconnecting the detector to the fire-alarm or burglar-fire alarm system.

**NOTES:**

- Always make sure that the Test Lamp has fresh batteries.
- Keep the Test Lamp lens free from dust, dirt, and moisture. If necessary, clean the lens with a soft wool or cotton cloth.

![Alignment Notch](image)

Fig. 6-1: IPES IR/UV with Magnetic Switch Collar
Operation

It is important that this entire manual be thoroughly read and understood prior to operating the IPES-IR/UV detector, to avoid compromising performance and safety. Only personnel trained in safety techniques who have electric-safety certificates and experience in dangerous explosive zones, and are familiar with the design of the IPES-IR/UV and have thoroughly read and understood this Operating Manual, should operate the IPES-IR/UV.

Always observe all local site safety precautions while working with the IPES-IR/UV.

- Ensure that the detector is equipped with internal and external grounding devices and grounding marking.
- See Section 5.0, Installation, Tables 5-1 and 5-2, and Figure 5-3 for the recommended circuits and digital outputs to connect the detector to fire-alarm and burglar-fire alarm systems.
- Within 1 to 5 seconds after switching on the IPES-IR/UV, it will produce an electrical current of 4 mA. The indicating LEDs will begin blinking.
### 7.0 Troubleshooting

The sensor module (‘front’ half of the detector) contains no user-serviceable components and should never be opened. The terminal compartment is the only part of the enclosure that should be opened by the user in the field.

**Troubleshooting Table**

If testing reveals a Fault condition or failure to detect a flame, follow the troubleshooting procedures in the table below. The table describes a variety of possible failures and corrective actions.

If the troubleshooting procedures do not correct the problem, contact ESP Safety Inc.

#### Table 7-1: Troubleshooting Symptoms, Causes and Procedures

<table>
<thead>
<tr>
<th>Failure Symptoms</th>
<th>Possible Cause</th>
<th>Corrective Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red LEDs do not glow.</td>
<td>No power supply.</td>
<td>Detach the base with the cable entry from the IPES: IR/UV casing and ensure that the terminals are supplied with voltage of 24±5 V.</td>
</tr>
<tr>
<td>Fault relay contacts are open;</td>
<td>Optical interference (dust)</td>
<td>Wipe the protection windows with a soft cloth wetted with denatured isopropyl alcohol (IPA) and then wipe with a clean dry cloth to remove any residue of dirt.</td>
</tr>
<tr>
<td>signaling LEDs blink frequently.*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPES does not react to the test flame.</td>
<td>Optical interference (dust, or</td>
<td>Wipe the protection windows with a soft cloth wetted with denatured isopropyl alcohol (IPA) and then wipe with a clean dry cloth to remove any residue of dirt.</td>
</tr>
<tr>
<td></td>
<td>contaminated with substances)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>preventing passage of radiation to the detector.</td>
<td></td>
</tr>
</tbody>
</table>

* Refer to Table 4-1, Determining LED Conditions, in Section 4.0 Performance Characteristics.

Commented [ab8]: Should a section be included to troubleshoot if blue light is out???
8.0 Maintenance

Maintenance Activities

IPES-IR/UV maintenance includes the following activities:

- Visual examination
- Cleaning
- Checking the grounding and explosion-protection systems
- Performance test.

This section describes maintenance activities to be performed once a day or every six months. Automatic testing is also discussed.

Daily Maintenance

Visual Examination

Perform a daily examination of the IPES-IR/UV, checking for any visible mechanical damage such as dents to the enclosure or a cracked lens. If any damage is noted, immediately pull the detector from service and replace with a new detector.

Every Six Months

Clean the IPES-IR/UV every six months (if there is no visible severe contamination) or as required if the signal "Fault" arises; also clean the surface of the detector if it is covered with dust. To clean the detector:

- **Enclosure** – Remove dust from the enclosure with a brush or a soft cloth slightly wetted with denatured isopropyl alcohol (IPA). After wiping the surface with alcohol, wipe again with a clean dry cloth to remove any residual dirt.

- **Protection windows** – Clean with a soft cloth wetted with denatured isopropyl alcohol (IPA). After wiping the surface with alcohol, wipe again with a clean dry cloth to remove any residual dirt.
Grounding and Explosion-Protection Systems

Check to be sure that the joints are sufficiently tight. Thoroughly clean the external grounding wire and apply anti-seize lubricant (supplied by the manufacturer) on the critical joints as referenced in Appendix A1 (Drawing 80033-001).

Perform this test on all detectors in the system.

1. Apply power to the detector. After 1 to 5 seconds, the output current will increase to 4 mA, and the indicating LEDs will start blinking.

2. If it is necessary to isolate the detector fire relay from the alarm system, apply the magnetic collar over the enclosure as shown in Figure 6-1. Placing the collar over the enclosure as shown allows the fire relay contacts to remain in the non-alarm state during testing.

3. Perform the test with the ITES Test Lamp as follows:
   a) Position the Test Lamp at a distance of 0.5 to 1 meters from the front cover of the detector.
   b) Turn the Test Lamp on and adjust the beam of light so it covers the front cover of the detector.
   c) The detector’s front red indicator LED will light, confirming detection. If the test lamp is turned off, the red indicator will stay lit for up to 10 seconds, depending on the detector’s internal switch configuration.
   d) The Test Lamp can be used to verify the field of view of the detector up to a distance of 2 meters away.

4. If any detector fails this test, refer to Section 7.0, Troubleshooting.

5. Once testing is complete, remove the magnetic collar before reconnecting the detector to the fire-alarm or burglar-fire alarm system.

NOTES:

- Always make sure that the Test Lamp has fresh batteries.
- Keep the Test Lamp lens free from dust, dirt, and moisture. If necessary, clean the lens with a soft wool or cotton cloth.

Automatic Testing

If the lens becomes dirty or coated, a change in radiation transmissibility could reduce the detector’s sensitivity. To safeguard against this, the IPES-IR/UV continuously tests the lens for optical clarity and sends a Fault alarm when the radiation transmissibility reaches a critical threshold.

In addition, the sensors are routinely tested every 25 to 45 minutes by use of internal test lamps. If the IR or UV sensor does not pass the self-test, a Fault alarm is sent. This routine test does not require the use of an external Test Lamp.
9.0 Transportation and Storage

Transportation
When shipped in the factory-supplied carton, the model IPES-IR/UV can be shipped via any method of transportation from the manufacturer's site to any destination regardless of distance.

Storage
Until use, store the detector in the manufacturer's original carton. The storage facility should be free of dust, acid and alkaline vapors, corrosive gases and other harmful substances.
10.0 Warranties

ESP Safety, Inc. ("ESP") warrants the IPES-IR/UV Flame Detector to be free from defects in material and workmanship under normal use and service for a period of five (5) years, beginning on the date of shipment to the buyer. This warranty extends only to the sale of new and unused products to the original buyer. ESP's warranty obligation is limited, at ESP's option, to refund of the purchase price, repair, or replacement of a defective product or a component thereof, to the extent that the product is properly returned to ESP within the warranty period.

Expected Service Life of Unit

The average expected life of the IPES-IR/UV is not less than 10 years.

Refer to APPENDIX C: Warranty and Return Policy for warranty details
11.0 Repair and Return

Field Repair

The IPES-IR/UV detector is not intended to be repaired in the field. If a problem should develop, refer to Section 7.0 Troubleshooting of this manual. If it is determined that the problem is caused by a manufacturing defect, please return the device to the factory for repair or replacement.

Return Material Authorization (RMA) Number

Refer to APPENDIX C: Warranty and Return Policy for warranty details

ESP Safety, Inc. recommends that an inventory of spare detectors be kept on hand to enable rapid field replacement and minimize downtime.
12.0 Parts Ordering Information

The following items for the IPES-IR/UV may be ordered:

- IPES Mounting Hardware, part number 120-0048
- ITES Test Lamp, part number 120-0007
- Magnetic collar, part number 120-0006

Order from:
ESP Safety Inc
555 North First Street
San Jose, CA 95112
Ph: 408-886-9746
Fax: 408-886-9757

Please note that shipping charges will be added to your order.
13.0 Certifications

The IPES–IR/UV meets the following certifications:

**FM (U.S. & Canada)**

- Hazardous Locations
  - Class I, Division 1, Groups B, C & D,
  - T5, Ta = -40°C to +85°C (-40°F to +185°F)
  - IP66

- Zone Locations
  - Class I, Zone 1, AEx d IIC, T5, Gb

1. ISO Class 12.9, M5 x 20 socket-head cap screws (Yield Stress 1100 MPa) shall be used to replace the cover fasteners.
2. ISO Class 12.9, M5 x 25 socket-head cap screws (Yield Stress 1100 MPa) shall be used to replace the base fasteners.

**Fire Protection Equipment**


- Supporting Standards: ANSI/FM3260 (2004); ANSI/NFPA 72 (2002); ULC/ORD – C386 (1990); CAN/ULC – S529 (2002); CSA C22.2 No. 0.5 (reaffirmed 1999); C22.2 No. 32 (reaffirmed 2003); ANSI/IEC 60529 (2004); CSA-C22.2 No. 60259 (2005)

**ABS**

- Class I, Division 1, Groups B, C & D,
- T5 Ta = -40°C to +85°C (-40°F to +185°F)
- IP66
ATEX/
CE

Flameproof “d”

Ex d IIC T5 Gb Ta = -40°F to +185°F (-40°C to +85°C)


ATEX Certificate Number: FM10ATEX0043X

Specific Conditions of Use:

1. ISO Class A2-70, M5 X 16 socket-head cap screws (Yield Stress 450 MPa) shall be used to replace the cover fasteners.

2. ISO Class A2-70, M5 X 16 socket-head cap screws (Yield Stress 450 MPa) shall be used to replace the base fasteners.

3. Consult the manufacturer if dimensional information on the flameproof joints is necessary.

Certificate of Conformity: CE Mark for EMC (TUV)

CE Mark for ATEX

IP66

IEC/
IECEx

Flameproof “d”

Ex d IIC T5 Gb Ta = -40°F to +185°F (-40°C to +85°C)


IECEx Certificate Number: IECEx FMG 10.0016X

Specific Conditions of Use:

1. ISO Class A2-70, M5 X 16 socket-head cap screws (Yield Stress 450 MPa) shall be used to replace the cover fasteners.

2. ISO Class A2-70, M5 X 16 socket-head cap screws (Yield Stress 450 MPa) shall be used to replace the base fasteners.

3. Consult the manufacturer if dimensional information on the flameproof joints is necessary.

Ingress Protection

IP66 = Dust Tight, Powerful Jetting
Appendix A1: IPES-IR/UV Explosion Protection Means

Figure A-1: Explosion Protection Means
Appendix A-2: IPES-IR/UV Installation

Figure A-2: Installation
Figure A-2: Installation
Appendix B: IPES Digital Communications Protocol

IPES Commands

In addition to supporting analog signals (current loop and relays), IPES-IR/UV flame detectors are also capable of digital communications with remote consoles. IPES-IR/UV detectors use a standard RS-485 interface with a Modbus RTU protocol layer defining the transactions between the IPES-IR/UV and the console. Refer to the document "MODBUS APPLICATION PROTOCOL SPECIFICATION v1.1b" available online at www.modbus.org for complete details of the Modbus protocol.

Setting Address/Baud Rate Command

The factory default Modbus address for the IPES-IR/UV is 247. The factory default baud rate for each detector is 9600.

The following 8-byte Modbus command must be sent to the IPES-IR/UV in order for the Modbus address and baud rate to be changed:

<table>
<thead>
<tr>
<th>Byte</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Current Modbus address (247 if IPES-IR/UV set to factory default)</td>
</tr>
<tr>
<td>1</td>
<td>6 (Modbus function code for writing to the device)</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>New Modbus address (must be in the range 1 to 247)</td>
</tr>
<tr>
<td>5</td>
<td>New baud rate (must be one of the following values): 1 – 1200 baud, 2 – 2400 baud, 4 – 4800 baud, 8 – 9600 baud, 16 – 19200 baud</td>
</tr>
<tr>
<td>6</td>
<td>Low byte of 16-bit CRC</td>
</tr>
<tr>
<td>7</td>
<td>High byte of 16-bit CRC</td>
</tr>
</tbody>
</table>
The IPES-IR/UV will respond to the host by transmitting an identical packet to the host at the original baud that was used to receive the command. After the response has been transmitted, the IPES-IR/UV will change its Modbus address and baud rate to the ones specified in the command. At that point, the remote console must change its baud rate in order to communicate further with the detector. The new Modbus address and baud rate are stored in non-volatile memory and these parameters will be retained through power cycles.

Poll Status Command

The following 8-byte Modbus command may be sent in order to poll the status of the IPES-IR/UV:

<table>
<thead>
<tr>
<th>Byte</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Current Modbus address (247 if IPES-IR/UV set to factory default).</td>
</tr>
<tr>
<td>1</td>
<td>4 (Modbus function code for reading from the device)</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Low byte of 16-bit CRC</td>
</tr>
<tr>
<td>7</td>
<td>High byte of 16-bit CRC</td>
</tr>
</tbody>
</table>
The IPES-IR/UV responds with a 7-byte packet with the following format:

<table>
<thead>
<tr>
<th>Byte</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Current Modbus address</td>
</tr>
<tr>
<td>1</td>
<td>4 (Modbus function code for reading from the device)</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
| 3    | Status:  
  Bit 0: 1 = fast detection, 0 = slow detection  
  Bit 1: 1 = high sensitivity, 0 = medium sensitivity  
  Bit 2: 1 = latching on, 0 = latching off  
  Bit 3: 1 = fire relay enable, 0 = fire relay disable  
  Bit 4: 1 = fault relay enable, 0 = fault relay disable  
  Bit 5: 1 = heater enable, 0 = heater disable  
  Bit 6: mfr use  
  Bit 7: mfr use |
| 4    | Detector status  
  Bit 0: 1 = fire detected, 0 = no fire detected  
  Bit 1: 1 = hardware fault, 0 = no hardware fault  
  Bit 2: 1 = dust fault, 0 = no dust fault  
  Bits 3-7: not used. |
| 5    | Low byte of 16-bit CRC |
| 6    | High byte of 16-bit CRC |

Sending any commands other than the ones specified is not permitted.
Appendix C: Warranty & Return Policy

ESP Safety, Inc. ("ESP") warrants the IPES-IR/UV Flame Detector to be free from defects in material and workmanship under normal use and service for a period of five (5) years, beginning on the date of shipment to the buyer. This warranty extends only to the sale of new and unused products to the original buyer. ESP’s warranty obligation is limited, at ESP’s option, to refund of the purchase price, repair, or replacement of a defective product or a component thereof, to the extent that the product is properly returned to ESP within the warranty period.

This warranty does not include:

a) fuses, disposable batteries or the routine replacement of parts due to the normal wear and tear of the product arising from use;

b) any product or component which in ESP’s opinion, has been misused, altered, abused, tampered with, improperly maintained or used, neglected or otherwise damaged by accident or abnormal conditions of operation, handling or use, or to have deteriorated due to aging of any component made of rubber or any other elastomer; or

c) any damage or defect attributable to repair of the product by any person other than an authorized dealer, or the installation of unapproved parts on the product.

The obligations set forth in this warranty are conditional on:

a) proper storage, installation, calibration, use, maintenance and compliance with the product manual instructions and any other applicable recommendations of ESP;

b) the buyer promptly notifying ESP of any defect and, if required, promptly making the product available for correction. No goods shall be returned to ESP until receipt by buyer of shipping instructions from ESP. A return authorization number must be obtained from ESP prior to shipment; and

c) all warranty returns being shipped directly to ESP Safety, Inc.;

d) the right of ESP to require that the buyer provide proof of purchase such as the original invoice, bill of sale or packing slip to establish that the product is within the warranty period.

THE BUYER AGREES THAT THIS WARRANTY IS THE BUYER’S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ESP SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES. ESP WILL NOT BE LIABLE FOR LOSS OR DAMAGE OF ANY KIND CONNECTED TO THE USE OF ITS PRODUCTS OR FAILURE OF ITS PRODUCTS TO FUNCTION OR OPERATE PROPERLY. IN NO EVENT SHALL
ESP'S LIABILITY HEREUNDER EXCEED THE PURCHASE PRICE ACTUALLY PAID BY THE BUYER FOR THE PRODUCT.

To the extent any provision of this warranty is held invalid or unenforceable by a court of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

Field Repair

The IPES-IR/UV Flame Detector is not intended to be repaired in the field. If a problem should develop, refer to the troubleshooting section of this manual. If it is determined that the problem falls within this warranty, please return the product to ESP as instructed hereunder.

Return Material Authorization (RMA) Number

Contact ESP Safety Inc. at +1-408-886-9746 to obtain a Return Material Authorization (RMA) number. Please provide the following information during your call:

- Your Company Name
- Product Type
- Serial Number
- Date of Shipment
- Brief explanation of malfunction

Pack the unit properly to ensure that no shipping damage occurs and ship to:

ESP Safety, Inc.
555 North First Street
San Jose, CA 95112 USA

Write the RMA number on the front of the shipping carton.