APPLICATION

The FSP5075A Flame Amplifier Module is designed to accept a variety of Honeywell plug-in flame signal amplifiers (see Table 1).

Depending on the plug-in amplifier model installed, the flame amplifier module can be used with ultraviolet flame detectors, infrared flame detectors, rectifying flame rods or rectifying photocells to provide continuous flame supervision from lightoff to shutdown.

As shown in Table 1, certain flame amplifier models feature Dynamic Self-Check or Dynamic Ampli-Check™ capability. The flame amplifier module also features plug-in load and flame relays as well as an integral terminal strip mounted on its chassis.

SPECIFICATIONS

Models:
FSP5075A1, with standard plastic cover type relays.
FSP5075A3, with hermetically sealed relays.

Electrical Specifications:
Voltage Requirement: 120 Vac (-15%/+10%), 50/60 Hz.
Maximum Power Consumption:
5W running.
2.4W standby.

Maximum Terminal Ratings (terminals 6, 7, 9, 10, 11 and 12):
Motor Load: 1/4 hp, or 5.8A running and 34.8A locked rotor (inrush), at 120 Vac.

The flame amplifier module amplifier and relay circuitry combine to provide such safety features as safe-start check, safety shutdown and rapid flame failure response time.

Approval body certifications include Underwriters Laboratories Inc. component recognized, Factory Mutual approved and Industrial Risk Insurers approvable.

The zinc dichromate finish resists corrosive effects of most industrial atmospheres. A hermetically sealed relay model is also available.

The FSP5075A Flame Amplifier Module is a standard building block in a burner management system. It allows the system to meet flame safeguard requirements while adding versatility to the flame detection system.

FEATURES

• Safe Start Check
• Safety Shutdown

Contents

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Features ................................................................. 1
Specifications ......................................................... 1
Ordering Information .............................................. 2
Installation ............................................................. 3
Wiring ................................................................. 4
Checkout ............................................................... 6
Inductive Load: 10A with 0.8 power factor.
Dc Load: 10A at 28 Vdc.

**Ambient Operating Temperature:** -40°F to +140°F
(-40°C to +60°C).

**Dimensions:** See Fig. 2.

**Weight:** 3-3/4 lb (1.7 kg), without plug-in flame signal amplifier.

**Flame Failure Response Time:** One second maximum, two seconds maximum or 2- to 4-seconds, depending on the plug-in amplifier used (see Table 1).

**Flame Detection System:** Order plug-in flame signal amplifier and matching flame detector separately. See Table 1.

**Approvals:**
Factory Mutual Approved: Report No. 26098.
Industrial Risk Insurers Approvable.

**Accessories:**
W136A Test Meter, including 117053 Meter Connector Plug.
117053 Meter Connector Plug (for older W136A models).
123514A Flame Simulator for R7247A Rectification Amplifiers.
123514B Flame Simulator for R7249A Ultraviolet Amplifiers.

**Replacement Parts:**
202980 24 Vdc plug-in Flame Relay 2K (for FSP5075A1).
203056 24 Vdc plug-in Flame Relay 2K (for FSP5075A3).
202981 120 Vac plug-in Load Relay 1K (for FSP5075A1).
203055 120 Vac plug-in Load Relay 1K (for FSP5075A3).

**NOTE:** Flame relays and Load relays for FSP5075A1 are not interchangeable with Flame Relays and Load Relays for FSP5075A3, or vice versa.

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**ORDERING INFORMATION**

When purchasing replacement and modernization products from your TRADELINE® wholesaler or distributor, refer to the TRADELINE® Catalog or price sheets for complete ordering number.

If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

1. Your local Home and Building Control Sales Office (check white pages of your phone directory).
2. Home and Building Control Customer Relations
   Honeywell, 1885 Douglas Drive North
   Minneapolis, Minnesota 55422-4386

In Canada—Honeywell Limited/Honeywell Limitée, 35 Dynamic Drive, Scarborough, Ontario M1V 4Z9.
International Sales and Service Offices in all principal cities of the world. Manufacturing in Australia, Canada, Finland, France, Germany, Japan, Mexico, Netherlands, Spain, Taiwan, United Kingdom, U.S.A.
### Table 1. Flame Detection Systems.

<table>
<thead>
<tr>
<th>Type</th>
<th>Color</th>
<th>Self-Checking</th>
<th>Model</th>
<th>Fuel</th>
<th>Type</th>
<th>Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectification</td>
<td>Green</td>
<td>No</td>
<td>R7247A</td>
<td>Gas</td>
<td>Rectifying Flame Rods</td>
<td>Holders(^a), C7004, C7007, C7011; Complete Assemblies: C7005, C7008, C7009, Q179.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>R7247A, R7247B(^b)</td>
<td>Gas, oil, coal</td>
<td>Ultraviolet (Purple Peeper®)</td>
<td>C7012A or C7012C</td>
</tr>
<tr>
<td>Dynamic Self-Check(^c)</td>
<td></td>
<td></td>
<td>R7247B</td>
<td>Gas</td>
<td>Rectifying Flame Rods</td>
<td>Holders(^a), C7004, C7007, C7011; Complete Assemblies: C7005, C7008, C7009, Q179.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>R7247C</td>
<td>Gas, oil, coal</td>
<td>Ultraviolet (Purple Peeper®)</td>
<td>C7012E or C7012F</td>
</tr>
<tr>
<td>Infrared</td>
<td>Red</td>
<td>No</td>
<td>R7248A</td>
<td>Infrared (Lead Sulfide)</td>
<td>C7015</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dynamic Ampli-Check(^b)</td>
<td>R7248B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultraviolet</td>
<td>Purple</td>
<td>No</td>
<td>R7249A</td>
<td>Ultraviolet (Minipeeper®)</td>
<td>C7027, C7035, C7044</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blue</td>
<td>Dynamic Self-Check(^c)</td>
<td>R7476A</td>
<td>Ultraviolet</td>
<td>C7076A</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Order flame rod separately, see instruction sheet for the holder.

\(^b\) Circuitry tests only the flame signal amplifier during burner operation and shuts down the burner if the amplifier fails.

\(^c\) Dynamic self check circuitry tests all electronic components in the flame detection system (amplifier and detector) 60 to 240 times a minute during burner operation and shuts down the burner if the detection system fails.

### INSTALLATION

**When Installing this Product...**

1. Read these instructions carefully. Failure to follow them could result in a hazardous condition or damage to the equipment.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. The installer must be a trained, experienced flame safeguard control technician.
4. After installation is complete, check out product operation as provided in these instructions.

**WARNING**

*Explosion Hazard and Electrical Shock Hazard. Can cause explosion, serious injury or death.*

1. Turn off fuel supply before starting installation.
2. Disconnect power supply before beginning installation. More than one disconnection can be involved.

**IMPORTANT**

The FSP5075 Flame Amplifier Module is factory installed in a burner management system. Do not remove the module.

**To install or replace the flame signal amplifier:**

1. Shut down the system and disconnect the power supply before removing the module cover.
2. To remove the cover from the FSP5075 Flame Amplifier Module, loosen the two screws on the front and pull the cover off.
3. Pull out the existing amplifier.
4. Make sure the replacement amplifier nameplate is on the outside (see Fig. 3). Align the circuit board with the keyed receptacle at the top of the module.

**NOTE:** The receptacle is keyed to the circuit board to prevent insertion of the amplifier if the amplifier is not aligned properly.

5. Push in the amplifier until the circuit board is fully inserted into the receptacle.
6. Make sure the amplifier is firmly in place, then replace the module cover.
To install or replace the plug-in relay:

1. Shut down the system, disconnect the power and remove the cover from the FSP5075 Flame Amplifier Module as described in steps 1 and 2 above.
2. Pull the hold-down spring off to the side of the existing relay and pull the relay out of the module socket.
3. Hold the spring off to the side and align the replacement relay terminals with the socket (see Fig. 4).

NOTES:
1. Do not try to install a relay in the wrong socket. The relays are keyed so that the 24 Vdc relay (relay 2K) cannot be inserted into the 120 Vac relay (relay 1K) socket. However, the 120 Vac relay can be inserted into the 24 Vdc relay socket; if this is done, the circuit will not function.
2. Do not remove the relay cover.

4. Push in the relay until the terminals are fully inserted into the socket.
5. Release the hold-down spring and make sure it springs back into place over the relay.
6. Make sure the relay is firmly in place and that the spring is holding it securely.
7. Replace the module cover.
8. Restore power to the system.

**WIRING**

⚠️ **WARNING**

**Electrical Shock Hazard and Equipment Damage Hazard.**

Can cause severe injury, death or equipment damage.

Disconnect the power supply before making wiring connections. More than one disconnection may be necessary.

Refer to Fig. 5 and Table 2 for typical flame detector wiring connections made to the flame amplifier module terminal strip.

For normal installations:

1. Use moisture-resistant No. 14 wire, rated for 194°F (90°C) or higher, as required by Underwriters Laboratories Inc.

For high temperature installations:

1. Use Honeywell specification no. 32004766-003 wire or equivalent for the F leadwire. This wire is rated up to 480°F (250°C) for continuous duty. It is tested for operation up to 20,000 volts and for breakdown up to 35,000 volts. For other leadwires, use moisture-resistant No. 14 wire selected for a temperature rating above the maximum operating temperature.

All wiring must be NEC Class 1 and conform to local electrical codes, ordinances and regulations. If the leadwires are not long enough to reach the terminal strip, make splices in a junction box.
Fig. 5. Typical wiring diagram for FSP5075 Flame Amplifier Module and burner management system.

Referring to Fig. 5:

1. All relay contacts are shown in the de-energized position.
2. Terminal 13 is used only to drive the shutter on a C7012E, C7012F or C7076 ultraviolet flame detector with self-checking feature. Power to drive the shutter is applied to terminal 13 from terminal 5 through a solid-state switch in the R7247C or R7476A dynamic self-check amplifier.
3. Power is removed from terminal 12 to de-energize the optional auxiliary alarm when a flame is detected and relay contact 2K5 opens.
4. The safety shutoff valve, connected to terminal 11, has either automatic or manual opening and automatic closing.
5. An independent power supply in the burner management system (connected to terminal 10) may be used instead of L1 and L2 to provide power to operate the burner safety shutoff valve, annunciator alarm and auxiliary circuit (if used).
6. The safe start circuit in the burner management system (connected between terminals 7 and 8) allows the control circuit contacts to close and the igniter to light only if relay contact 2K3 in the FSP5075 Flame Amplifier Module is closed.
7. Power is applied to terminal 6 to energize the optional auxiliary circuitry when a flame is detected and relay contact 2K4 closes.
8. An optional safe start control circuit may be obtained by connecting to terminal 4 if the burner management control circuit is disconnected from terminal 3. During normal operation, this circuit provides power to energize relay 1K when the ignition transformer is energized. However, if a flame or a condition simulating a flame is detected at startup, relay 2K pulls in, relay contact 2K1 opens and relay 1K cannot be energized.
9. The burner management control circuit, connected to terminal 3, provides power to energize relay 1K when the ignition transformer is energized.
10. For flame detector wiring, refer to Table 2.
Table 2. Typical Flame Detector Wiring Connections.

<table>
<thead>
<tr>
<th>Detector Model or Type</th>
<th>Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Detector Leadwire</td>
</tr>
<tr>
<td>C7012A,C Ultraviolet Flame Detectors&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Blue</td>
</tr>
<tr>
<td></td>
<td>Yellow</td>
</tr>
<tr>
<td></td>
<td>Black 2</td>
</tr>
<tr>
<td></td>
<td>Black 5</td>
</tr>
<tr>
<td>C7012E,F Self-Checking Ultraviolet Flame Detectors&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Blue</td>
</tr>
<tr>
<td></td>
<td>Yellow</td>
</tr>
<tr>
<td></td>
<td>Black 2</td>
</tr>
<tr>
<td></td>
<td>Black 5</td>
</tr>
<tr>
<td></td>
<td>White 2</td>
</tr>
<tr>
<td></td>
<td>White 13</td>
</tr>
<tr>
<td>C7015A Lead Sulphide Infrared Flame Detector&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Leads are interchangeable</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>C7027A, C7035A, C7044A Ultraviolet Flame Detectors</td>
<td>Blue</td>
</tr>
<tr>
<td></td>
<td>White</td>
</tr>
<tr>
<td>C7076A,D Adjustable Sensitivity Self-Checking Ultraviolet Flame Detector&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Rectifying Flame Rod</td>
<td>Flame Rod</td>
</tr>
<tr>
<td></td>
<td>Ground</td>
</tr>
</tbody>
</table>

<sup>a</sup> Two C7012 or C7076 Flame Detectors can be connected in parallel on the FSP5075 terminals listed.

<sup>b</sup> Run C7015A leadwires alone in separate conduit from the detector to the module. Ground the conduit at the module terminal strip only. (See form 60-2306 for details.)

**CHECKOUT**

**WARNING**

Electrical Shock Hazard and Explosion Hazard. Can cause severe injury, death or equipment damage.

1. Open the master switch before removing or replacing the module cover.
2. Do not remove covers from the plug-in relays 1K and 2K.

Use the following procedures to check out the FSP5075 Flame Amplifier Module installation before putting the system into service. Then check out the entire system according to instructions in the burner management system manual.

**Preliminary Inspection**

Perform this inspection to avoid common problems. Make sure that:

1. Wiring connections are correct and all terminal screws are tight.
2. Flame detector(s) is (are) clean and installed and positioned properly. Refer to the appropriate flame detector instructions.
3. Correct combination of amplifier and flame detector is used. Refer to Table 1.
4. Voltage rating of the flame detector is 120 Vac.
5. The plug-in flame signal amplifier is securely mounted on the module.
6. The hold-down springs are correctly positioned and are holding the plug-in relays (1K and 2K) securely in place.
Flame Signal Measurement

⚠️ CAUTION
Equipment Damage Hazard.
Improper procedures can damage the equipment.
Follow the lightoff instructions in the burner management system manual and the burner manufacturer instructions.

Measure the flame signal at the appropriate times defined in the checkout tests for the burner management system. The flame signal should be as described in Table 3 after all tests have been completed and all adjustments have been made. Refer to the appropriate flame detector and flame amplifier instructions for the complete checkout procedure.

1. Read the flame signal in microamperes on the meter installed on the system panel. Make sure that you are reading the meter for the correct flame detector and burner.
2. You can also use another meter as a cross-check (see Fig. 6). Use a microammeter with a 0- to 25-microamp dc range, such as a Honeywell W136A, which has a plug for inserting into the meter jack. (A 117053 Meter Connector Plug may be ordered separately, if needed.)
3. Connect the plus (red) meter lead to the red spade tip and the minus (black) meter lead to the black spade tip before inserting the plug into the meter jack.
4. The flame signal must be as specified in Table 3.

If the signal is unsteady, or less than the minimum acceptable current, check the flame detector installation and circuitry as follows:

1. Check the voltage supply at the master switch; it should be between 102 and 132 Vac.
2. Check the detector wiring for defects, including:
   a. Wrong type or size of wire.
   b. Deteriorated wire.
   c. Open circuits.
   d. Short circuits.
   e. Leakage paths caused by moisture, soot or accumulated dirt.
3. For a flame rod, make sure:
   a. There is enough ground area.
   b. The flame rod is properly located in the flame.
   c. The temperature at the flame rod insulator is no greater than 500°F (260°C).
   d. Ignition interference is not present.
4. For all other detectors, clean the detector lens, filter, viewing window and sighting pipe (as applicable).
5. Check that the temperature at the detector does not exceed its maximum rated temperature.
6. Make sure that the flame adjustment is not too lean.
7. Make sure the detector is sighting the flame properly.
8. If necessary, resight or reposition the detector.

If you cannot obtain proper operation, replace the plug-in amplifier. If you still cannot obtain proper operation, replace the flame detector. See the Installation instructions in this document for details.

![Fig. 6. Cross-check measurement of the flame signal.](image)

**IMPORTANT**
If using an R7247B or C Dynamic Self-Check Amplifier, allow a few seconds for the current to stabilize. (If using another meter as a cross-check as shown in Fig. 6, set the selector switch on the meter to the SPL or damped position.) The red flame indicating lamp on the amplifier should blink about 1 to 4 times a second (depending on the flame detector used). If the lamp is steady ON or OFF while reading the flame signal, replace the amplifier.
Table 3. Flame Signal Strength by Flame Detector.

<table>
<thead>
<tr>
<th>Flame Detector</th>
<th>Flame Signal Amplifier (Color)</th>
<th>Minimum Acceptable Current (Microamperes)(^a)</th>
<th>Maximum Current Expected (Microamperes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectifying Flame Rod</td>
<td>R7247A (green)</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>R7247B (green; self-check)</td>
<td>1.25</td>
<td>2.5</td>
</tr>
<tr>
<td>C7012A,C, Ultraviolet (Purple Peeper(^TM))</td>
<td>R7247A (Green)</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>R7247B (green, self-check)</td>
<td>1.25</td>
<td>4</td>
</tr>
<tr>
<td>C7012E,F, Ultraviolet (Purple Peeper(^TM))</td>
<td>R7247C (green, self-check)</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>C7015A Infrared (Lead Sulfide Cell)</td>
<td>R7248A (red)</td>
<td>2.25(^b)</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>R7248B (red, Ampli-Check(^TM))</td>
<td>3.5(^c)</td>
<td>5</td>
</tr>
<tr>
<td>C7027A, C7035A or C7044A Ultraviolet (minipeeper)</td>
<td>R7429A (purple)</td>
<td>3.5</td>
<td>7.5</td>
</tr>
<tr>
<td>C7076A Ultraviolet (Adjustable Sensitivity)</td>
<td>R7476A (blue)</td>
<td>2.5</td>
<td>5.5</td>
</tr>
</tbody>
</table>

\(^a\) This minimum or stronger signal should be easily obtained if the detector is correctly installed and positioned to sense flame properly. This current must be obtained before completing checkout.

\(^b\) The lead sulfide cells are available in two ranges of sensitivity: 104662B, middle range of sensitivity and 104662D, highest sensitivity. If a sufficiently strong signal cannot otherwise be obtained, try a different cell of the same range. If necessary, substitute a cell of higher sensitivity.

**OPERATION**

The following operating sequence for the FSP5075 Flame Amplifier Module is divided into two parts: normal system operation and typical safety feature operation. See Fig. 5 for circuit details.

This operating sequence is for a typical burner management system. Refer to the burner management system manual for specific details. Italics in the tables below denote special applications.
### Table 4. Normal System Operation.

<table>
<thead>
<tr>
<th>External Action</th>
<th>Internal Module Operation</th>
<th>System Operation</th>
</tr>
</thead>
</table>
| 1. Operator closes the master switch. | Power is applied to terminal 5.  
   a. Transformer T1 energizes the plug-in amplifier.  
   b. Power is applied to terminal 16 on the plug-in amplifier. | Standby to start.  
   a. The flame detection system is activated.  
   b. If a C7012E, F or C7076A Ultraviolet Flame Detector (with self-checking feature) is used, the shutter is energized. |
| 2. The independent power supply (in the burner management system) is turned on. | Power is applied to terminal 10, and to terminal 9 through 1K2. | The annunciator alarm turns on; if used, the external audible alarm sounds. |
| 3. Operator holds in the IGNITER START button to energize the ignition transformer. Contacts close in the control circuit. | Power is applied to terminal 3 (from terminal 4 through 2K1 if the optional safe start control circuit is used), and load relay 1K pulls in.  
   a. Contacts 1K1 and 1K3 close.  
   b. Contact 1K2 opens, removing power from terminal 9. | Start.  
   a. The optional auxiliary alarm (if used) is energized.  
   b. The annunciator alarm is de-energized and the external audible alarm is silenced. |
| 4. Igniter safety shutoff valves open and the igniter lights. The flame detector senses the igniter flame. When flame is proven, operator releases the button and the ignition transformer is de-energized. | Flame relay 2K pulls in.  
   a. Contact 2K6 closes. Power is applied from terminal 10, through 1K3 and 2K6, to terminal 11.  
   b. Contact 2K3 opens, removing the circuit between terminals 7 and 8.  
   c. Contact 2K2 closes. Power is applied from terminal 5, through 2K2 and 1K1, to terminal 3. Relay 1K remains in until flame is no longer detected and 2K2 opens.  
   d. Contact 2K4 closes; power is applied from terminal 7, through 2K4, to terminal 6.  
   e. Contact 2K5 opens. | Ignition.  
   a. The burner safety shutoff valve is energized. If it is automatic, the valve opens and the main burner is ignited, the system is in the run condition. (If a manually opened valve is used, the main burner will not be ignited until step 5 is completed.)  
   b. The safe start circuit is disabled.  
   c. The control circuit (connected to terminal 3 or 4) is bypassed.  
   d. Optional auxiliary circuitry connected to terminal 6 (if used) is energized.  
   e. The optional auxiliary alarm (if used) is de-energized. |
| 5. Operator opens the manually-opened burner safety shutoff valve (if used). | Normal operation, including self-checking of the flame detection system (if a self-checking system is used). | The main burner is ignited. The system is in the run condition. |

The igniter safety shutoff valves close and the igniter flame goes out. The flame detector is sensing only the main burner flame. Normal operation, including self-checking of the flame detection system (if a self-checking system is used). The system stays in the run condition.
## Table 5. Typical Safety Feature Operation.

<table>
<thead>
<tr>
<th>Abnormal Conditions</th>
<th>Internal Module Operation</th>
<th>System Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safe Start Check—A flame, or a condition simulating a flame, is present before the</td>
<td>Relay 2K pulls in. Contact 2K3 opens, opening the circuit between terminals 7</td>
<td>The safe start circuit (in the burner management system) prevents the burner</td>
</tr>
<tr>
<td>control circuit contacts close.</td>
<td>and 8. (Contact 2K1 opens, opening the circuit between terminals 3 and 4. The optional</td>
<td>management control circuit contacts from closing. The igniter cannot be lighted.</td>
</tr>
<tr>
<td></td>
<td>safe start control circuit cannot energize relay 1K.)</td>
<td></td>
</tr>
<tr>
<td>The igniter does not light.</td>
<td>No flame is detected, so relay 2K does not pull in.</td>
<td>The burner cannot be started.</td>
</tr>
<tr>
<td></td>
<td>a. Contact 2K6 stays open; power cannot be applied to terminal 11.</td>
<td>a. The burner safety shutoff valve cannot be energized.</td>
</tr>
<tr>
<td></td>
<td>b. Contact 2K2 stays open; power cannot be applied to terminal 3 from terminal 5. Relay</td>
<td>b. The annunciator alarm turns on; if used, the external audible alarm sounds.</td>
</tr>
<tr>
<td></td>
<td>1K drops out when the control circuit (in the burner management system) removes power</td>
<td>c. The optional auxiliary alarm (if used) is de-energized.</td>
</tr>
<tr>
<td></td>
<td>from terminal 3. Contact 1K2 closes.</td>
<td>d. Optional auxiliary circuitry connected to terminal 6 (if used) cannot be</td>
</tr>
<tr>
<td></td>
<td>c. Contact 1K3 opens.</td>
<td>energized.</td>
</tr>
<tr>
<td></td>
<td>d. Contact 2K4 stays open; power cannot be applied to terminal 6.</td>
<td></td>
</tr>
<tr>
<td>The main burner is not ignited.</td>
<td>When the igniter goes out, relay 2K drops out.</td>
<td>Shutdown occurs.</td>
</tr>
<tr>
<td></td>
<td>a. Contact 2K6 opens, removing power from terminal 11.</td>
<td>a. The burner safety shutoff valve is de-energized and the valve closes.</td>
</tr>
<tr>
<td></td>
<td>b. Contact 2K3 closes, making the circuit between terminals 7 and 8.</td>
<td>b. The safe start circuit is ready for the next startup.</td>
</tr>
<tr>
<td></td>
<td>c. Contact 2K2 opens, removing power from terminal 3. Relay 1K drops out and contact 1K2</td>
<td>c. The annunciator alarm turns on; if used, the external audible alarm sounds.</td>
</tr>
<tr>
<td></td>
<td>closes.</td>
<td>d. The optional auxiliary alarm (if used) is de-energized.</td>
</tr>
<tr>
<td></td>
<td>d. Contact 1K3 opens.</td>
<td>e. Optional auxiliary circuitry connected to terminal 6 (if used) is de-energized.</td>
</tr>
<tr>
<td></td>
<td>e. Contact 2K4 opens, removing power from terminal 6.</td>
<td></td>
</tr>
<tr>
<td>The flame goes out during the run period.</td>
<td>Relay 2K drops out. Operation is the same as if the main burner is not ignited.</td>
<td>Shutdown occurs.</td>
</tr>
<tr>
<td></td>
<td>a. The burner safety shutoff valve is de-energized and the valve closes.</td>
<td>a. The burner safety shutoff valve cannot be energized.</td>
</tr>
<tr>
<td></td>
<td>b. The safe start circuit is ready for the next startup.</td>
<td>b. The safe start circuit is ready for the next startup.</td>
</tr>
<tr>
<td></td>
<td>c. The annunciator alarm turns on; if used, the external audible alarm sounds.</td>
<td>c. The annunciator alarm turns on; if used, the external audible alarm sounds.</td>
</tr>
<tr>
<td></td>
<td>d. The optional auxiliary alarm (if used) is de-energized.</td>
<td>d. The optional auxiliary alarm (if used) is de-energized.</td>
</tr>
<tr>
<td></td>
<td>e. Optional auxiliary circuitry connected to terminal 6 (if used) is de-energized.</td>
<td>e. Optional auxiliary circuitry connected to terminal 6 (if used) is de-energized.</td>
</tr>
<tr>
<td>If Using a Self-Checking Flame Detection System:</td>
<td>Relay 2K cannot pull in when the system is started—same operation as if the igniter</td>
<td>Shutdown occurs.</td>
</tr>
<tr>
<td>The flame detection system fails while the system is turned off or during the purge</td>
<td>does not light.</td>
<td></td>
</tr>
<tr>
<td>period.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The flame detection system fails during the run period with the burner firing.</td>
<td>Relay 2K drops out—same operation as if the flame goes out.</td>
<td>Shutdown occurs.</td>
</tr>
</tbody>
</table>