# 7800 SERIES Relay Modules

**CHECKOUT AND TEST**

This publication provides general checkout and troubleshooting procedures for the 7800 SERIES Relay Modules.

## SYSTEM CHECKOUT

***IMPORTANT***

*Perform all Static Checkout Procedures in the applicable relay module installation instructions before starting these procedures.*

## ⚠ WARNING

**Explosion Hazard.**
**Can cause serious injury or death.**
Do not allow fuel to accumulate in the combustion chamber for longer than a few seconds without igniting to prevent danger of forming explosive mixture
Close manual fuel shutoff valve(s) if flame is not burning at end of specified time.

## ⚠ WARNING

**Electric Shock Hazard.**
**Can cause serious injury or death.**

1. Use extreme care while testing system. Line voltage is present on most terminal connections when power is on.
2. Open master switch before removing or installing 7800 SERIES Relay Module or Keyboard Display Module connector.

Make sure all manual fuel shutoff valve(s) are closed before starting initial lightoff check and Pilot Turndown tests.

Do not put the system in service until you have satisfactorily completed all applicable tests in this section and any others recommended by the original equipment manufacturer..

Limit trial for pilot to ten seconds. Limit the attempt to light main burner to two seconds after fuel reaches burner nozzle. Do not exceed manufacturer nominal lightoff time.

## ⚠ CAUTION

**Equipment Malfunction or Damage Hazard.**
Each relay module type is unique. Using existing wiring on a relay module change can cause equipment damage.
Make wiring changes when a relay module is replaced with a different 7800 SERIES Relay Module to sequence burner.

***IMPORTANT***

1. *If the system fails to perform properly, note the fault code, fault message, equipment status, and sequence time on the display. Then refer to the Troubleshooting section.*
2. *Repeat all required Checkout tests after all adjustments are made. All tests must be satisfied with the flame detector(s) in their final position.*

### Equipment Recommended

S7800A Keyboard Display Module
Volt-ohmmeter (1M ohm/volt minimum sensitivity) with:
- 0-300 Vac capability.
- 0-6000 ohm capability.
- 0-10 Vdc capability.

### Checkout Summary

Table 1 provides an overview of checkout steps performed for each applicable system.

See Installation Instructions for location of component parts and/or Q7800 Specifications for terminal locations.

**Table 1. Checkout Steps and Applicable 7800 Series Systems.**

| Checkout Step | Piloted Systems | DSI Systems | Infrared Flame Detectors | Flame Rod Systems | Ultraviolet Flame Detectors |
|---|---|---|---|---|---|
| Preliminary Inspection | X | X | X | X | X |
| Flame Signal Measurement | X | X | X | X | X |
| Initial Lightoff Check for Proved Pilot | X | | | | |
| Initial Lightoff Check for Direct Spark Ignition | | X | | | |
| Pilot Turndown Test | X | | | | |
| Ignition Interference Test | | | | X | |
| Hot Refractory Saturation Test | | | X | | |
| Hot Refractory Hold-in Test | X | X | X | X | X |
| Ignition Spark Pickup | | | | | X |
| Response to Other Ultraviolet Sources | | | | | X |
| Flame Signal with Hot Combustion Chamber | X | X | X | X | X |
| Safety Shutdown Tests | X | X | X | X | X |

## Preliminary Inspection

Perform the following inspections to avoid common problems. Make certain that:

1. Wiring connections are correct and all terminal screws are tight.
2. Flame detector(s) is clean, installed and positioned properly. Consult the applicable Instructions.
3. Combination of amplifier and flame detector(s) is correctly used. See the amplifier specifications.
4. Plug-in amplifier and purge card (if required) are securely in place.
5. Burner is completely installed and ready to fire; consult equipment manufacturer instructions. Fuel lines are purged of air.
6. Combustion chamber and flues are clear of fuel and fuel vapor.
7. Power is connected to the system disconnect switch (master switch).
8. Lockout is reset (reset button) only if the Relay Module is powered.
9. Run/Test Switch (if present) is in RUN position.
10. System is in STANDBY condition. STANDBY message is displayed in the S7800 Keyboard Display Module.
11. All limits and interlocks are reset.

## Flame Signal Measurement

See instructions provided with the amplifer.

# INITIAL LIGHTOFF CHECKS

## Proved Pilot Systems

Perform this check on all installations that use a pilot. It should immediately follow the preliminary inspection.

NOTE: Low fuel pressure limits, if used, could be open. If so, bypass them with jumpers during this check.

**1.** Open the master switch.
**2.** Make sure that the manual main fuel shutoff valve(s) is closed. Open the manual pilot shutoff valve. If the pilot takeoff is downstream from the manual main fuel shutoff valve(s), slightly open the manual main valve to supply pilot gas flow. Make sure the main fuel is shut off just upstream from the burner inlet, or disconnect power from the automatic main fuel valve(s).
**3.** Close the master switch and start the system with a call for heat by raising the setpoint of the operating controller, see the relay module sequence. The 7800 Series Relay Module should start the INITIATE sequence.
**4.** Let the sequence advance to PILOT IGN (status is displayed on the Keyboard Display Module, if used), PILOT LED turns on, ignition spark should occur and the pilot should light. If the pilot ignites, the FLAME LED is energized. Go to step 7.
**5.** If the pilot flame is not established in ten seconds (four seconds if configuration jumper JR1 is clipped), safety shutdown occurs. Let the sequence complete its cycle.
**6.** Push the reset pushbutton, and let the system recycle once. If the pilot still does not ignite, make the following ignition/pilot adjustments:
   a. Open the master switch and remove the 7800 Series Relay Module from the subbase.

b. On the subbase, jumper L1 to the ignition terminal; refer to the appropriate wiring diagram to determine the proper terminal. Disconnect the leadwire to the pilot valve if it is connected to the same terminal.
c. Close the master switch to energize only the ignition transformer.
d. If the ignition spark is not strong and continuous, open the master switch and adjust the ignition electrode spark gap setting to the manufacturer recommendation.
e. Make sure the ignition electrodes are clean.
f. Close the master switch and observe the spark.
g. After a continuous spark is obtained, open the master switch and add a jumper on the subbase from terminal L1 power to the pilot terminal 8 or 21. Reconnect the leadwire from the pilot valve if it was disconnected in step b.
h. Close the master switch to energize both the ignition transformer and the pilot valve.
i. If the pilot does not ignite and if the ignition spark is still continuous, adjust the pressure regulator until a pilot is established.
j. When the pilot ignites properly and stays ignited, open the master switch and remove the jumper(s) from the terminals of the subbase.
k. Check for adequate bleeding of the fuel line.
l. Reinstall the 7800 Series Relay Module on the subbase, close the master switch, and then return to step 4.

**7.** When pilot ignites, measure the flame signal. If the pilot flame signal is unsteady or approaching the 1.25 Vdc minimum value, adjust the pilot flame size or detector sighting to provide a maximum and steady flame signal.
**8.** Recycle the system to recheck lightoff and pilot flame signal.
**9.** When the MAIN LED turns on, make sure the automatic main fuel valve is open; then smoothly open the manual main fuel shutoff valve(s) and watch for main burner flame ignition. When the main burner flame is established, go to step 16.
**10.** If the main burner flame is not established within five seconds or the normal lightoff time as specified by the equipment manufacturer, close the manual main fuel shutoff valve(s).
**11.** Recycle the system to recheck the lightoff and pilot flame signal.
**12.** Smoothly open the manual fuel shutoff valve(s) and try lightoff again. (The first re-attempt may have been required to purge the lines and bring sufficient fuel to the burner.)
**13.** If the main burner flame is not established within five seconds or the normal lightoff time specified by the equipment manufacturer, close the manual main fuel shutoff valves(s). Check all burner adjustments.
**14.** If the main burner flame is not established after two attempts:
A. Check for improper pilot size.
B. Check for excess combustion air at low fire.
C. Check for adequate low fire fuel flow.
D. Check for proper gas supply pressure.
E. Check for proper valve operation.
F. Check for proper pilot flame positioning.
**15.** Repeat steps 8 and 9 to establish the main burner flame; then go to step 16.
**16.** With the sequence in RUN, make burner adjustments for flame stability and Btu input rating.
**17.** Shut down the system by opening the burner switch or by lowering the setpoint of the operating controller. Make sure the main flame goes out. There may be a delay due to gas trapped between the valve(s) and burner. Make sure all automatic fuel valve(s) close.
**18.** Restart the system by closing the burner switch and/or raising the setpoint of the operating controller. Observe that the pilot is established during PILOT IGN and the main burner flame is established during MAIN IGN within the normal lightoff time.
**19.** Measure the flame signal. Continue to check for the proper signal through the RUN period. Check the signal at both High and Low Firing Rate positions and while modulating, if applicable.
**20.** Run the burner through another sequence, observing the flame signal for:
a. Pilot flame alone.
b. Pilot and main flame together.
c. Main flame alone (unless monitoring an intermittent pilot). Also observe the time it takes to light the main flame. Ignition of main flame should be smooth.
**21.** Make sure all readings are in the required ranges before proceeding.
**22.** Return the system to normal operation.

NOTE: After completing these tests, open the master switch and remove all test jumpers from the subbase terminals, limits/controls or switches.

## Direct Spark Ignition Systems

This check applies to gas and oil burners not using a pilot. It should immediately follow the preliminary inspection. Refer to the appropriate sample block diagram of field wiring for the ignition transformer and fuel valve(s) hookup.

NOTE: Low fuel pressure limits, if used, could be open. If so, bypass them with jumpers during this check.

**1.** Open the master switch.
**2.** Complete the normal ready-to-fire checkout of the fuel supply and equipment as recommended by the equipment manufacturer.
**3.** Close all manual main fuel shutoff valve(s). Check that the automatic fuel valve(s) is closed. Make sure fuel is not entering the combustion chamber.
**4.** Close the master switch and start the system with a call for heat by raising the setpoint of the operating controller; see the relay module sequencing. The program sequence should start the INITIATE sequence.
**5.** Let the sequence advance through PREPURGE (if applicable). Ignition spark should occur when the PILOT LED turns on. Listen for the click of the first stage fuel solenoid valve(s). The relay module locks out and the ALARM LED turns on.
**6.** Let the 7800 Series Relay Module complete its cycle.
**7.** Open the manual fuel shutoff valve(s).
**8.** Push the reset button and the relay module recycles the program sequence through PREPURGE (if applicable).
**9.** When the PILOT LED turns on, make sure that the first stage burner flame is established. If it is, go to step 15.
**10.** If the first stage burner flame is not established within four seconds, or within the normal lightoff time specified by the equipment manufacturer, close the manual fuel shutoff valve(s), and open the master switch.
**11.** Check all burner adjustments.

12. Wait about three minutes. Close the master switch, open the manual fuel shutoff valve(s), and try to light off the burner again. The first attempt may be required to purge the lines and bring sufficient fuel to the burner.
13. If the first stage burner flame is not established within four seconds, or within the normal lightoff time specified by the equipment manufacturer, close the manual fuel shutoff valve(s), and open the master switch.
14. If necessary, repeat steps 11 through 13 to establish the first stage burner flame. Then go to step 15.
15. When the first stage burner flame is established, the sequence advances to RUN. Make burner adjustments for flame stability and input rating. If a second stage is used, go to step 18.
16. Shut down the system by opening the burner switch or by lowering the setpoint of the operating controller. Make sure the burner flame goes out and all automatic fuel valves close.
17. If used, remove the bypass jumpers from the low fuel pressure limit and subbase.
18. If a second stage is used, make sure the automatic second stage fuel valve(s) opened. Check the lightoff as follows (or go to step 19):
    a. Open the manual second stage fuel valve(s).
    b. Restart the system by raising the setpoint of the operating controller.
    c. When the first stage burner flame is established, watch for the automatic second stage fuel valve(s) to open. Observe that the second stage lights off properly.
    d. Make burner adjustments for flame stability and input rating.
    e. Shut down the system by lowering the setpoint of the operating controller. Make sure the burner flame goes out and all automatic fuel valves close.
    f. Go to step 19.
19. Restart the system by closing the burner switch and/or raising the setpoint of the operating controller. Observe that the burner flame is established during PILOT IGN, within the normal lightoff time specified by the equipment manufacturer.
20. Measure the flame signal. Continue to check for the proper signal through the RUN period. Check the signal at both high and low firing rate positions and while modulating. Any pulsating or unsteady readings require further attention.
21. Make sure all readings are in the required ranges before proceeding.

    NOTE: On completing these tests, open the master switch and remove all test jumpers from the subbase terminals, limits/controls or switches.

22. Return the system to normal operation.

# PILOT TURNDOWN TEST (ALL INSTALLATIONS USING A PILOT)

Perform this check on all installations that use a pilot. The purpose of this test is to verify that the main burner can be lit by the smallest pilot flame that can hold in the flame amplifier and energize the FLAME LED. Clean the flame detector(s) to make sure that it detects the smallest acceptable pilot flame.

If using AMPLI-CHECK™ or self-checking amplifier and 1M ohm/volt meter, the flame signal fluctuates every time the amplifier does a self-check or a shutter check.

NOTE: Low fuel pressure limits, if used, could be open. If so, bypass them with jumpers during this test.

1. Open the master switch.
2. Close the manual main fuel shutoff valve(s).
3. Connect a manometer (or pressure gauge) to measure pilot gas pressure during the turndown test.
4. Open the manual pilot shutoff valve(s).
5. Close the master switch and start the system with a call for heat. Raise the setpoint of the operating controller. The 7800 Series sequence should start, and PREPURGE (if applicable) should begin.
6. After the PILOT LED turns on in interrupted pilot applications, set the Run/Test Switch to the TEST position to stop the sequence. The FLAME LED comes on when the pilot ignites.

   NOTE: If the sequence does not stop, reset the system and make sure you set the Run/Test Switch to TEST within the first eight seconds of the PILOT IGN sequence.

***IMPORTANT***

*You have 0.8 second or three seconds, depending on PFEP selected, to position the Run/Test Switch to the TEST position to stop the sequence after the start of the PILOT IGN period.*

7. Turn down the pilot pressure very slowly, reading the manometer (or pressure gauge) as it drops. Stop instantly when the FLAME LED goes out. Note the pressure. The pilot is at the minimum turndown position. Immediately turn up the pilot pressure until the FLAME LED comes on again or the flame signal increases to 1.25 Vdc.

   NOTE: If there is no flame for fifteen seconds with the RUN/TEST switch in the TEST position, the relay module locks out.

8. Repeat step 7 to verify the pilot gas pressure reading at the exact point the FLAME LED light goes out.
9. Increase the pilot pressure immediately until the FLAME LED comes on, and then turn it down slowly to obtain a pressure reading just above the dropout point or until the flame signal increases to 1.25 Vdc.
10. Set the Run/Test Switch in the RUN position (if used) and let the sequence proceed. When the MAIN LED turns on, make sure the automatic main fuel valve(s) opens; then smoothly open the manual main fuel shutoff valve(s) (or any other manually-opened safety shutoff valve(s), if used) and watch for main burner ignition. If the main burner flame is established, go to step 18.

    NOTE: This step requires two people, one to open the manual valve(s) and one to watch for ignition.

11. If the main burner flame is not established within five seconds, or within the normal lightoff time specified by the equipment manufacturer, close the manual main fuel shutoff valve(s) and open the master switch. If the lightoff is rough, the pilot flame size is too small.

12. Close the master switch to recycle the burner and stop the sequence in the PILOT period by using the Run/ Test Switch.
13. Increase the pilot flame size by increasing its fuel flow until a smooth main flame is accomplished.
14. Reposition the flame scanner sight tube or use orifices until the pilot flame signal voltage is in the range of 1.25 to 1.50 Vdc.
15. When the main burner lights reliably with the pilot at turndown, disconnect the manometer (or pressure gauge) and turn up the pilot gas flow to that recommended by the equipment manufacturer.
16. If used, remove the bypass jumpers from the subbase terminals, limits/controls, or switches.
17. Run the system through another cycle to check for normal operation.
18. Return the system to normal operation.

# IGNITION INTERFERENCE TEST (ALL FLAME RODS)

Ignition interference can subtract from (decrease) or add to (increase) the flame signal. If it decreases the flame signal enough, it causes a safety shutdown. If it increases the flame signal, it could cause the FLAME LED to come on when the true flame signal is below the minimum acceptable value.

Start the burner and measure the flame signal with both ignition and pilot (or main burner) on, and then with only the pilot (or main burner) on. Any significant difference (greater than .5 Vdc) indicates ignition interference.

## To Eliminate Ignition Interference

1. Make sure there is enough ground area.
2. Be sure the ignition electrode and the flame rod are on opposite sides of the ground area.
3. Check for correct spacing on the ignition electrode:
   a. 6000V systems—1/16 to 3/32 in. (1.6 to 2.4 mm).
   b. 10,000V systems—1/8 in. (3.2 mm).
4. Make sure the leadwires from the flame rod and ignition electrode are not too close together.
5. Replace any deteriorated leadwires.
6. If the problem cannot be eliminated, consider changing the system to an ultraviolet flame detection system.

## Hot Refractory Saturation Test (All Infrared Detectors)

Start the burner and monitor the flame signal during the warmup period. A decrease in signal strength as the refractory heats up indicates hot refractory saturation. If saturation is extreme, the flame signal drops below 1.25 Vdc and the system shuts down as though a flame failure occurred.

If hot refractory saturation occurs, the condition must be corrected. Add an orifice plate in front of the cell to restrict the viewing area, lengthen the sight pipe or decrease the pipe size (diameter). Continue adjustments until hot refractory saturation is eliminated.

## Hot Refractory Hold-in Test (Rectifying Photocell, Infrared Detectors, Ultraviolet Detectors)

This condition can delay response to flame failure and also can prevent a system restart if hot refractory is detected.

Infrared (lead sulfide) detectors can respond to infrared rays emitted by a hot refractory, even when the refractory has visibly ceased to glow. Infrared radiation from a hot refractory is steady, but radiation from a flame has a flickering characteristic. The infrared detection system responds only to flickering infrared radiation; it can reject a steady signal from hot refractory. The refractory steady signal can be made to fluctuate if it is reflected, bent or blocked by smoke or fuel mist within the combustion chamber. Be careful when applying an infrared system to verify its response to flame only.

The ultraviolet detector can respond to hot refractory above 2300°F (1371°C).

1. Operate the burner until the refractory reaches its maximum temperature (Infrared Only).
   If the installation has a multi-fuel burner, burn the heavier fuel that is most likely to reflect, bend or obscure the hot refractory steady infrared radiation
2. When the maximum refractory temperature is reached, close all manual fuel shutoff valves, or open the electrical circuits of all automatic fuel valves.
3. Visually observe when the burner flame or FLAME LED goes out. If this takes more than three seconds, the infrared detector is sensing hot refractory.
4. Immediately terminate the firing cycle. Lower the setpoint to the operating controller, or set the Fuel Selector Switch to OFF. *Do not open the master switch*.

   NOTE: Some burners continue to purge oil lines between the valves and nozzles even though the fuel valves are closed. Terminating the firing cycle (instead of opening the master switch) allows purging the combustion chamber. This reduces a buildup of fuel vapors in the combustion chamber caused by oil line purging.

5. If the detector is sensing hot refractory, correct the condition by one or more of the following procedures:
   a. Add an orifice plate in front of the cell to restrict the viewing area of the detector.
   b. Resight the detector at a cooler, more distant part of the combustion chamber. Make sure the detector properly sights the flame.
   c. Try lengthening the sight pipe or decreasing the pipe size (diameter).

For details, refer to the detector Instructions and the equipment Operating Manual. Continue adjustments until hot refractory hold-in is eliminated.

# IGNITION SPARK RESPONSE TEST (ALL ULTRAVIOLET DETECTORS)

Test to make certain that the ignition spark is not actuating the FLAME LED:

1. Close the pilot and main burner manual fuel shut-off valve(s).
2. Start the burner and use the Run/Test Switch (if available) to stop the sequence in the PILOT IGN period. Ignition spark should occur, but the flame signal should not be more than 0.5 Vdc.
3. If the flame signal is higher than 0.5 Vdc and the FLAME LED does come on, consult the equipment operating manual and resight the detector farther out from the spark, or away from possible reflection. It may be necessary to construct a barrier to block the ignition spark from the detector view. Continue adjustments until the flame signal due to ignition spark is less than 0.5 Vdc.

NOTE: The Honeywell Q624A and Q652A,B Solid State Spark Generators prevent detection of ignition spark when properly applied with C7027, C7035, C7044 or C7061 Ultraviolet Flame Detectors. The Q624A and Q652B are only for use with gas pilots; the Q652A is only for oil applications.

## Response To Other Ultraviolet Sources

Some sources of artificial light (such as incandescent or fluorescent bulbs, mercury sodium vapor lamps and daylight) produce small amounts of ultraviolet radiation. Under certain conditions, an ultraviolet detector responds to these sources as if it is sensing a flame. To check for proper detector operation, check the Flame Failure Response Time (FFRT) and conduct Safety Shutdown Tests under all operating conditions.

## Flame Signal With Hot Combustion Chamber (All Installations)

1. With all initial start-up tests and burner adjustments completed, operate the burner until the combustion chamber is at the maximum expected temperature.
2. Observe the equipment manufacturer warm-up instructions.
3. Recycle the burner under these hot conditions and measure the flame signal. Check the pilot alone, the main burner flame alone, and both together (unless monitoring only the pilot flame when using an intermittent pilot, or only the main burner flame when using DSI). Check the signal at both High and Low Firing Rate positions and while modulating, if applicable.
4. Check the FFRT of the flame amplifier and relay module.
5. Lower the setpoint of the operating controller and observe the time it takes for the burner flame to go out. This should be within the maximum FFRT.
6. If the flame signal is too low or unsteady, check the flame detector temperature. Relocate the detector if the temperature is too high.
7. If necessary, realign the sighting to obtain the proper signal and response time.
8. If the response time is still too slow, replace the Plug-in Flame Signal Amplifier.
9. If the detector is relocated or resighted, or the amplifier is replaced, repeat all required Checkout tests.

# SAFETY SHUTDOWN TESTS (ALL INSTALLATIONS)

Perform these tests at the end of Checkout, after all other tests are completed. If used, the external alarm should turn on. Press the RESET pushbutton on the relay module to restart the system.

1. Opening a Preignition Interlock during the STANDBY or PREPURGE period (only for RM7800, EC/RM7840, RM7838B, EC7810, EC7820, EC/RM7830, EC/RM7850).
   a. *Preignition ILK* fault is displayed on the Keyboard Display Module. Fault code 10 or 33 is displayed to denote the fault.
   b. Safety shutdown occurs.
2. Opening a Lockout Interlock during PREPURGE, PILOT IGN, MAIN IGN or RUN period (only for RM7800, EC/RM7840, RM7838B, EC7810, EC7820, EC/RM7830, EC/RM7850).
   a. *Lockout ILK* fault is displayed on the Keyboard Display Module. Fault code 11 or 12 or 21 or 29 is displayed to denote the fault.
   b. Safety shutdown occurs.
3. Detection of flame 40 seconds after entry to STANDBY from RUN, fault code 9. Detection of flame from ten seconds up to 30 seconds into PREPURGE time.
   a. Simulate a flame to cause the flame signal voltage level to be at least 1.25 Vdc for 40 seconds after entry to STANDBY from RUN and also simulate a flame signal for 10 seconds to 30 seconds for PREPURGE.
   b. *Flame Detected* fault is displayed on the Keyboard Display Module. Fault code 9 or 15 or 18 is displayed to denote the fault.
   c. Safety shutdown occurs.
4. Failure to ignite pilot.
   a. Close pilot and main fuel manual shutoff valve(s).
   b. Cycle burner on.
   c. Automatic pilot valve(s) should be energized but the pilot cannot ignite.
   d. *Pilot Flame Fail* fault is displayed on the Keyboard Display Module. Fault code 28 is displayed four or ten seconds, depending on the jumper configuration selection for Pilot Flame Establishing Period (PFEP) after the pilot valve(s) is energized to denote the fault.
   e. Safety shutdown occurs.
5. Failure to ignite main (only interrupted pilot application).
   a. Open the manual pilot valve(s); leave the main fuel manual shutoff valve(s) closed.
   b. Depress the RESET button.
   c. Start the system.
   d. The pilot should ignite and the flame signal should be at least 1.25 Vdc but the main burner cannot light.
   e. The flame signal should drop below 1.25 Vdc within the FFRT of the amplifier and the relay module after the interrupted pilot goes out.
   f. *Main Flame Ign.* fault is displayed on the Keyboard Display Module. Fault code 19 is displayed to denote the fault.
   g. Safety shutdown occurs.

6. Loss of flame during RUN.
   a. Open the main fuel manual shutoff valve(s) and open manual pilot shutoff valve(s).
   b. Depress the RESET button.
   c. Start the system. Start-up should be normal and the main burner should light normally.
   d. After the sequence is in the normal RUN period for at least ten seconds with the main burner firing, close the manual main fuel shutoff valve(s) to extinguish the main burner flame. (On intermittent pilot applications, also, close the pilot manual shutoff valve.)
   e. The flame signal should drop below 1.25 Vdc within the FFRT of the amplifier and the relay module after the main flame and/or pilot goes out.
   f. *Main Flame Fail* fault is displayed on the Keyboard Display Module. Fault code 17 is displayed to denote the fault.
   g. Safety shutdown occurs. (EC/RM7890, EC/RM7895, RM7896 relay modules will recycle if jumper JR2 is intact, then lock out on failure to light the pilot.)
7. Opening a Preignition Interlock after the first five seconds of POSTPURGE.
   a. Open the main fuel manual shutoff valve(s) and open manual pilot shutoff valve(s).
   b. Depress the RESET button.
   c. *Preignition ILK* fault is displayed on the Keyboard Display Module. Fault code 33 is displayed to denote the fault.
   d. Safety shutdown occurs.

***IMPORTANT***

1. *If the relay module fails to shut down on any of these tests, take corrective action; refer to Troubleshooting and the relay module diagnostics and return to the beginning of all Checkout tests.*
2. *When all Checkout tests are completed, reset all switches to the original status.*

# TROUBLESHOOTING

## System Diagnostics

Troubleshooting control system equipment failures is easier with the relay module self-diagnostics and first-out annunciation. In addition to an isolated spst alarm relay (audible annunciation), the relay module provides visual annunciation by displaying a fault code and fault or hold message at the S7800 Keyboard Display Module (standard on RM7800 and RM7838A,B devices; optional on all others). The relay module provides 127 diagnostic messages for troubleshooting the system (see Table 3).

Self-diagnostics of the relay module enables it to detect and annunciate both external and internal system problems. Fault messages, such as interlock failures, flame failures and false flame signals are displayed at the KDM, and annunciated at the 7800 SERIES Relay Module by the ALARM LED.

The KDM displays a sequence status message indicating: STANDBY, PURGE, PILOT IGN, MAIN IGN, RUN and POSTPURGE. The selectable messages also provide visual indication of current status and historical status of the equipment such as: Flame Signal, Total Cycles, Total Hours, Fault History, Diagnostic Information and Expanded Annunciator terminal status (if used). With this information, most problems can be diagnosed without extensive trial and error testing.

Table 2 provides the sequence and status hold messages. Table 3 is a summary of all relay module fault messages, fault codes, and troubleshooting suggestions. In addition, Diagnostic Information and History Data are available to assist in troubleshooting the relay module.

The relay module provides diagnostic information to aid the service mechanic in obtaining information when troubleshooting the system. Information available in the Diagnostic Information includes Device Type, Device Suffix, Software Revision, Manufacturing Code, Flame Amplifier Type, Flame Failure Response Time, Selectable Jumper Configuration Status, Run/Test Switch Status and Terminal Status.

### Diagnostic Information Index

The relay module monitors input/output terminals and can display the status of the terminal at the KDM (see Table 2) (example: Pilot Valve T8 1). See the applicable relay module installation instructions for a complete terminal description and number. The display shows the actual status of the terminal. If voltage is detected at the terminal, 1 is displayed, but if no voltage is detected at the terminal, 0 is displayed.

### Historical Information Index

The relay module has nonvolatile memory that allows the Relay Module to retain historical information for the six most recent lockouts. Each of the six lockout files retains the cycle when the fault occurred, the hour of operation when the fault occurred, a fault code, a fault message and burner status when the fault occurred.

***IMPORTANT***

*Some older relay modules can not operate without a KDM, extension cable assembly with KDM or a Data ControlBus Module™ installed.*

**SERVICE NOTES**:

1. If the KDM is scrambled, remove and reinstall the KDM, and reset the 7800 Relay Module.
2. Reset the 7800 Series Relay Module by pressing the RESET pushbutton on the 7800 Series Relay Module, or pressing a remote reset pushbutton wired through the KDM, Data ControlBus Module™ or Remote Reset Module. A power-up reset causes an electrical reset of the relay module but does not reset a lockout condition.
3. Use the access slots on the sides of the Q7800A,B to check terminal voltage.
4. Maximum ambient operating temperature of a C7012E,F; Series 1 through 6, is reduced to 125°F because of the duty cycle operation of the relay module.

**Table 2. Keyboard Display Module Sequence and Status Hold Messages.**

| Sequence | Status |
|---|---|
| **INITIATE mm:ss** | The Keyboard Display Module (KDM) indicates the burner status, INITIATE, a stabilization period for the relay module to check for any fluctuations in ac line voltage inputs or control inputs on power up or during normal operation. The timing of the INITIATE period is either two seconds or ten seconds, depending on the model, before entering STANDBY. |
| If the relay module is in an INITIATE HOLD status, the following conditions could exist: | |
| INITIATE HOLD: (AC Frequency/Noise) | The KDM indicates the burner status and that it is waiting for excess line noise to clear up, which prevents sufficient reading of the line voltage inputs. The burner sequence does not advance into STANDBY until the excess line noise ceases or a line frequency error occurs; this is caused by using a 60 Hz device on a 50 Hz line, or vice versa on devices with a date code earlier than 9804, is corrected. |
| INITIATE HOLD: (AC Line Dropout) | The KDM indicates the burner status and that ac line power has momentarily dropped out. The burner sequence does not advance into STANDBY until the ac line voltage has stabilized throughout the INITIATE sequence. |
| INITIATE HOLD: (AC Frequency) | The KDM indicates the burner status and that line frequency is faster than the expected value. The burner sequence does not advance into STANDBY until the line frequency returns to the proper value; this is perhaps caused by using a 60 Hz device on a 50 Hz line for devices with a date code earlier than 9804. |
| INITIATE HOLD: (Low Line Voltage) | The KDM indicates the burner status and that low line voltage (10% lower than rated voltage) has occurred. The burner sequence does not advance into STANDBY until the line voltage is at a sufficient level for proper operating parameters. |
| **STANDBY** | The KDM indicates the burner status, STANDBY. The burner can be placed in STANDBY by opening the burner switch or if the operating controller indicates its setpoint is satisfied. If a demand is present for burner operation, the burner sequence does not advance from STANDBY to PURGE until the recycle limits close. If an Expanded Annunciator is connnected, the display messages are enhanced. |
| If the relay module is in a STANDBY HOLD status, the following conditions could exist: | |
| STANDBY HOLD: F/G (Flame Detected) | The KDM indicates the burner status and that a flame is detected. A demand is present for burner operation. The sequence does not advance to PREPURGE until the flame signal clears. If the flame signal does not clear within 40 seconds, the relay module locks out. |
| STANDBY HOLD: T20 (Preignition Interlock) | The KDM indicates the burner status and that the Preignition Interlock is not closed. A demand is present for burner operation, but the burner sequence does not advance to PREPURGE until the Preignition Interlock proves closed. If this time exceeds a 30 second hold, the relay module locks out. |
| STANDBY HOLD: T7 (Lockout Interlock) | The KDM indicates the burner status and that the Lockout Interlock is closed. A demand is present for burner operation, but the burner sequence does not advance to PREPURGE until the Lockout Interlock proves open. If this time exceeds the 120 second hold, the relay module locks out. |
| STANDBY HOLD: T7 (Running Interlock) T17 for EC/RM7810, 7820, 7830, 7850 devices | The KDM indicates the burner status and that the Running Interlock is closed. A demand is present for burner operation, but the burner sequence does not advance to PREPURGE until the Running Interlock proves open. If this time exceeds the 120 second hold, the relay module locks out. |
| **PURGE** | The KDM indicates the burner status, PURGE, which is the period of time the blower motor is running before the Ignition period. The timing of the PURGE period is selectable. |
| If the relay module is in a PURGE HOLD status, the following conditions could exist: | |
| PURGE HOLD: T19 (High Fire Switch) | The KDM indicates the burner status and that the High Fire Switch is not closed. The firing rate motor is driving to its PURGE rate position. If this time exceeds four minutes and fifteen seconds, the relay module locks out. |
| PURGE DELAY: T19 (High Fire Switch Jumpered) | The KDM indicates the burner status and that the High Fire Switch is jumpered. The High Fire Switch is bypassed, welded or otherwise prematurely closed. The system automatically adds 30 seconds to allow the firing rate motor additional drive time to reach or near the open damper position before starting the PURGE sequence. |
| PURGE HOLD: TEST (Run/Test Switch) | The KDM indicates the burner status and that the Run/Test Switch is in the TEST position. The sequence does not continue until the Run/Test Switch is placed in the RUN position. |

NOTE: **Normal sequences** are in **bold type**, while abnormal sequences are in regular type. This table is for all 7800 SERIES Relay Modules so all listed steps may not apply to the unit installed.

**Table 2. Keyboard Display Module Sequence and Status Hold Messages (continued).**

| Sequence | Status |
|---|---|
| If the relay module is in a PURGE HOLD status, the following conditions could exist *(continued)* | |
| PURGE HOLD: T18 (Low Fire Switch Jumpered) | The KDM indicates the burner status and that the Low Fire Switch is jumpered. The Low Fire Switch is bypassed, welded or otherwise prematurely closed. The system automatically adds 30 seconds to allow the firing rate motor additional drive time to reach or near the closed damper position before starting the ignition sequence. |
| PURGE HOLD: F/G (Flame Detected) | The KDM indicates the burner status and that a flame is detected. The burner sequence does not advance through PREPURGE because a flame is detected as being present. The sequence holds waiting for the flame signal to clear. If the time exceeds 30 seconds, the relay module locks out. |
| PURGE HOLD: T18 (Low Fire Switch) | The KDM indicates the burner status and that the Low Fire Switch is not closed. The firing rate motor is driving to its Low Fire position in preparation for Ignition Trials. If this time exceeds four minutes and fifteen seconds, the relay module locks out. |
| PURGE HOLD: T7 (Running Interlock) | The KDM indicates the burner status and that the Running Interlock is not closed. The sequence does not advance to ignition until the Running Interlock proves closed. If this time exceeds 30 seconds, the relay module locks out. |
| **PILOT IGN mm:ss** | The KDM indicates the burner status, PILOT IGN, and the timing of the PILOT IGN trial begins, in seconds. During this period, the relay module permits the pilot valve to open and the pilot flame to establish. |
| If the relay module is in a PILOT HOLD status, the following condition could exist: | |
| PILOT HOLD: TEST (Run/Test Switch) | The KDM indicates the burner status, PILOT IGN, and that the Run/Test Switch is in the TEST position. The sequence does not continue until the Run/Test Switch is placed in the RUN position. |
| **MAIN IGN mm:ss** | The KDM indicates the burner status, MAIN IGN, and the timing of the MAIN IGN trial begins, in seconds. During this period, the relay module permits the main valve to open and the main flame to establish. |
| **RUN** | The KDM indicates the burner status, RUN, which is the period of time after the Ignition Trials and before the operating controller setpoint is reached. During this time, the burner is firing under control of the firing rate control. |
| If the relay module is in a RUN HOLD status, the following condition could exist: | |
| RUN LOWFIRE: TEST (Run/Test Switch) | The KDM indicates the burner status and that the Run/Test Switch is in the TEST position. Normal modulation or operation does not continue until the Run/Test Switch is placed in the RUN position. |
| **POSTPURGE mm:ss** | The KDM indicates the burner status, POSTPURGE, which is the period of time after the RUN period when the blower motor continues to run. The timing of the POSTPURGE period is fifteen seconds. |
| Waiting for connection... | The KDM has power but is waiting to receive a signal from the relay module to continue operation. |
| RESET/ALARM TEST | The KDM indicates the burner status, RESET/ALARM TEST. This condition indicates that the reset button is pressed. If it is held for more than four seconds, the alarm output is energized. The alarm output is de-energized when the reset button is released. |
| **Additional Sequence Status Information When An Expanded Annunciator Is Connected To The Relay Module:** | |
| BURNER OFF: T6 (Burner Switch) | The KDM indicates the Burner Switch is not closed. The burner sequence does not advance to PREPURGE until the Burner Switch closes. |
| STANDBY | The KDM indicates the burner status, STANDBY, and that the Operating Control is not closed. The burner sequence does not advance to PREPURGE until the Operating Control closes. |
| STANDBY HOLD: T6 (EA Hold Message) | The KDM indicates the burner status, STANDBY, and that a limit is not closed. The burner sequence does not advance to PREPURGE until one or all limits close downstream from the Operating Control. |
| STANDBY HOLD: T6 (Circuit Fault) | The KDM indicates the burner status, STANDBY, and that the control input is not closed. The burner sequence does not advance to PREPURGE until the control input closes. |

NOTE: **Normal sequences** are in **bold type**, while abnormal sequences are in regular type. This table is for all 7800 SERIES Relay Modules so all listed steps may not apply to the unit installed.

**Table 3. Hold and Fault Message Summary.**

| Fault Code | System Failure | Recommended Troubleshooting |
|---|---|---|
| Fault 1<br>*No Purge Card* | No card is plugged into the purge card slot. | 1. Make sure the purge card is seated properly.<br>2. Inspect the purge card and connector on the relay module for damage or contaminants.<br>3. Reset and sequence the relay module.<br>4. If the fault code reappears, replace the purge card.<br>5. Reset and sequence the relay module.<br>6. If the fault persists, replace the relay module. |
| Fault 2<br>*AC Frequen/Noise* | Excess noise or device running on slow ac. | 1. Check the relay module and display module connections.<br>2. Reset and sequence the relay module.<br>3. Check the relay module power supply and make sure that both frequency and voltage meet the specifications.<br>4. Check the backup power supply, as appropriate. |
| Fault 3<br>*AC Line Dropout* | Ac line dropout detected. | |
| Fault 4<br>*AC Frequency* | Device running on fast ac. | |
| Fault 5<br>*Low Line Voltage* | Low ac line detected. | |
| Fault 6<br>*Purge Card Error* | Purge card timing changed since card was initially read. | 1. Make sure the purge card is seated properly.<br>2. Inspect the purge card and connector on the relay module for damage or contaminants.<br>3. Reset and sequence the relay module.<br>4. If the fault code reappears, replace the purge card.<br>5. Reset and sequence the relay module.<br>6. If the fault persists, replace the relay module. |
| Fault 7<br>*Flame Amplifier* | Flame sensed when flame not present. | 1. Check wiring and correct any errors. Make sure that flame sensor wires are in separate conduits. Check for noise coupling into the flame detector leadwires.<br>2. Make sure that flame detector and flame amplifier are compatible.<br>3. Remove the flame amplifier and inspect connections. Reseat the amplifier.<br>4. Reset and sequence the relay module.<br>5. If the code reappears, replace the amplifier and/or the flame detector.<br>6. If the fault persists, replace the relay module. |
| Fault 8<br>*Flame Amp/Shutr* | Flame sensed when no signal expected during shutter-check or Ampli-Check™ versions. | |
| Fault 9<br>*Flame Detected* | Flame sensed when shutter open and no flame is expected during STANDBY. | 1. Check that flame is not present in the combustion chamber; correct any errors.<br>2. Check wiring and correct any errors. Make sure that flame sensor wires are in separate conduits. Check for noise coupling into flame detector leadwires.<br>3. Remove the flame amplifier and inspect its connections. Reseat the amplifier.<br>4. Reset and sequence the relay module.<br>5. If the code reappears, replace the amplifier and/or the flame detector.<br>6. If the fault persists, replace the relay module. |
| Fault 10<br>*Preignition ILK* | Preignition Interlock fault during STANDBY *EC/RM7800, 7840, 7838B only). | 1. Check wiring and correct any errors.<br>2. Check Preignition Interlock switches to assure proper functioning.<br>3. Check fuel valve operation.<br>4. Reset and sequence the relay module; monitor the Preignition Interlock status.<br>5. If the code persists, replace the relay module. |

*(continued)*

**Table 3. Hold and Fault Message Summary (continued).**

| Fault Code | System Failure | Recommended Troubleshooting |
|---|---|---|
| Fault 11<br>*Running ILK On* | Running Interlock powered at improper sequence point. | 1. Check wiring to make sure that interlocks are connected properly between terminals 6 and 7. Correct any errors.<br>2. Reset and sequence the relay module.<br>3. If the fault persists, measure the voltage between terminals 6 and G (ground), then terminals 7 and G. If there is line supply voltage present at terminal 6 when the controller is off, the controller switch may be bad or is jumpered.<br>4. If steps 1 through 3 are correct and there is line supply voltage present at terminal 7 when the controller is closed and the fault persists, check for a welded or jumpered Running Interlock, Lockout Interlock, or Airflow Switch. Correct any errors.<br>5. If steps 1 through 4 are correct and the fault persists, replace the relay module. |
| Fault 12<br>*Lockout ILK On* | Lockout Interlock powered at improper point in sequence. | |
| Fault 13<br>*Airflow Sw. On* | Combustion airflow interlock fault during STANDBY. | |
| Fault 14<br>*High Fire Sw.* | High Fire Interlock Switch failure to close during PREPURGE. | 1. Check wiring and correct any errors.<br>2. Reset and sequence the relay module.<br>3. Use either the manual motor potentiometer to drive the motor to the High Fire position or use the Run/Test Switch option, if available. Sequence to Prepurge drive to High Fire and place in the Test position. Adjust the High Fire Switch while in this state to make sure that it closes properly.<br>4. Measure the voltage between terminal 19 and G (ground) while in the Prepurge drive to High Fire state. Line supply voltage should be present. If not, the switch adjustment is incorrect and/or the switch is defective and needs replacing.<br>5. Reset and sequence the relay module. If line supply voltage was present between the High Fire Switch and terminal 19, and the fault still persists, replace the relay module. |
| Fault 15<br>*Flame Detected* | Flame sensed when no flame is expected during STANDBY. | 1. Check that the flame is not present in the combustion chamber; correct any errors.<br>2. Make sure that the flame amplifier and flame detector are compatible.<br>3. Check wiring and correct any errors.<br>4. Remove the flame amplifier and inspect the connections. Reseat the amplifier.<br>5. Reset and sequence the relay module.<br>6. If the code reappears, replace the amplifier and/or the flame detector.<br>7. If the fault persists, replace the relay module. |
| Fault 16<br>*Flame-Out Timer* | No-flame detected during Pilot Flame Establishing Period. | 1. Measure the flame signal. If one exists, make sure it meet specifications. Make any necessary burner adjustments using manufacturer instructions.<br>2. Make sure that the flame amplifier and flame detector are compatible.<br>3. If the code reappears, replace the amplifier and/or the flame detector.<br>4. If the fault persists, replace the relay module. |
| Fault 17<br>*Main Flame Fail* | Main flame failure during RUN after flame is established and on for at least 10 seconds. | 1. Inspect the main fuel valve(s) and connection(s).<br>2. Make sure that the fuel pressure is high enough to supply fuel to the combustion chamber.<br>3. Check the flame detector sighting for adequate flame signal throughout the burner firing rate. |

*(continued)*

**Table 3. Hold and Fault Message Summary (continued).**

| Fault Code | System Failure | Recommended Troubleshooting |
|---|---|---|
| Fault 18<br>*Flame Detected* | Flame sensed when shutter is open and no flame is expected during PREPURGE. | 1. Check that flame is not present in the combustion chamber. Correct any errors.<br>2. Make sure that the flame amplifier and flame detector are compatible.<br>3. Check the wiring and correct any errors. Make sure F and G wires are in individual conduits and protected from stray noise pickup.<br>4. Remove the flame amplifier and inspect the connectors. Reseat the flame amplifier.<br>5. Reset and sequence the relay module.<br>6. If the code reappears, replace the flame amplifier and/or the flame detector.<br>7. If the fault persists, replace the relay module. |
| Fault 19<br>*Main Flame Ign.* | Flame was lost during MFEP or the first 10 seconds of the RUN state. | 1. Inspect the main fuel valve(s) and connection(s).<br>2. Make sure that the fuel pressure is high enough to supply fuel to the combustion chamber.<br>3. Make sure the flame detector is positioned to obtain the required flame signal strength; reset and recycle. |
| Fault 20<br>*Low Fire Sw. Off* | Low Fire Interlock switch failure to close during PREPURGE. | 1. Check wiring and correct any errors.<br>2. Reset and sequence the relay module.<br>3. Use either the manual motor potentiometer to drive the motor to the Low Fire position or use the Run/Test Switch option, if available. Sequence to Prepurge drive to Low Fire and place in the Test position. Adjust the Low Fire Switch to make sure that it closes properly.<br>4. Measure the voltage between terminal 18 and G (ground) while in the Prepurge drive to Low Fire state. Line supply voltage should be present. If not, the switch adjustment is incorrect and/or the switch is defective and needs replacing.<br>5. Reset and sequence the relay module. If line supply voltage was present between the Low Fire Switch and terminal 18, and the fault still persists, replace the relay module. |
| Fault 21<br>*Running ILK* | Running Interlock fault during PREPURGE. | 1. Check wiring; correct any errors.<br>2. Inspect the fan; make sure there is no blockage of the air intake and that it is supplying air.<br>3. Make sure the Interlock Switches are working properly and that all switch contacts are free of contaminants.<br>4. Reset and sequence the relay module to PREPURGE (place the Run/Test Switch in the Test position, if available). Measure the voltage between terminals 7 and G (ground). Line voltage should be present.<br>5. If steps 1 through 4 are correct and the fault persists, replace the relay module. |
| Fault 22<br>*Lockout ILK* | Lockout Interlock fault during PREPURGE. | |
| Fault 23<br>*Airflow Switch* | Combustion airflow interlock fault during PREPURGE. | |
| Fault 24<br>*Call Service* | The flame interlock (relay module) was on when it should be off. | 1. Check for F leadwire routing. Make sure routing is in its conduit and isolated from noise-producing circuits. |
| Fault 25<br>*Call Service* | The flame interlock (relay module) was off when it should be on. | |
| Fault 26<br>*Man-Open Sw. Off* | The Manual Open Valve Switch was off when it should be on (RM7838B only). | 1. Check wiring and correct any errors.<br>2. Make sure that the Manual Open Valve Switch is fully open.<br>3. Make sure that the Manual Open Valve Switch is functioning properly and that the switch contacts are free from contaminants.<br>4. Reset and sequence the relay module.<br>5. Make sure that the Manual Open Valve Switch provides an electrical path when closed. Verify that the relay module is receiving power at terminal 17.<br>6. If steps 1 through 5 are correct and the fault persists, replace the relay module. |

*(continued)*

**Table 3. Hold and Fault Message Summary (continued).**

| Fault Code | System Failure | Recommended Troubleshooting |
|---|---|---|
| Fault 27<br>*Start Switch On* | Start Switch was on during PREPURGE (RM7838A, RM7838B only). | 1. Start Switch held on too long.<br>2. Check wiring; verify that Start Switch is correctly connected.<br>3. Make sure that the Start Switch is functioning properly and that the switch contacts are free of contaminants.<br>4. Reset and sequence the relay module to PREPURGE; set the Run/Test Switch to Test. Make sure there is no power at terminal 6 during PREPURGE.<br>5. If steps 1 through 3 are correct and the fault persists, replace the relay module. |
| Fault 28<br>*Pilot Flame Fail* | Pilot flame failure. | 1. Check pilot valve wiring and operation. Correct any errors.<br>2. Check fuel supply.<br>3. Check pilot pressure and repeat pilot turndown test.<br>4. Check ignition transformer electrode, flame detector, flame detector sighting and flame amplifier.<br>5. If steps 1 through 4 are correct and the fault persists, replace the relay module. |
| Fault 29<br>*Lockout ILK* | Lockout Interlock fault. | 1. Check wiring; correct any errors.<br>2. Inspect the fan; make sure that there is no blockage of the air intake and that it is supplying air.<br>3. Make sure that the Lockout Interlock Switches are working properly and that all switch contacts are free of contaminants.<br>4. Reset and sequence the relay module to PREPURGE (place the Run/Test Switch in the Test position, if available). Measure the voltage between terminals 7 and G (ground). Line voltage should be present.<br>5. If steps 1 through 4 are correct and the fault persists, replace the relay module. |
| Fault 30<br>*Running ILK* | Running Interlock fault. | 1. Inspect the Running Interlocks, including the Airflow Switch, and the connections.<br>2. Make sure that the Running Interlocks, including the Airflow Switch, are functioning properly and that switch contacts are free of contaminants.<br>3. Reset and sequence the relay module to PREPURGE. Set the Run/Test Switch, if available, to Test. Measure the voltage between terminal 7 and G (ground). Line voltage should be present.<br>4. If steps 1 through 3 are correct and the fault persists, replace the relay module. |
| Fault 31<br>*Low Fire Sw. Off* | Low Fire Interlock Switch failure to close during RUN (RM7838B only). | 1. Check wiring; correct any errors.<br>2. Reset and sequence the relay module.<br>3. Use either the manual motor position to drive the motor to the Low Fire position, or use the Run/Test Switch option, if available. Sequence to Run drive to Low Fire and place in the Test position. Adjust the Low Fire Switch while in this state to make sure it is closing properly.<br>4. While in Run, drive to Low Fire state, measure the voltage between terminal 18 and G (ground). Line voltage should be present. If not, the switch adjustment is incorrect and/or the switch is defective and needs replacement.<br>5. Reset and sequence the relay module. If line voltage was present between the Low Fire Switch and terminal 18 and the fault persists, replace the relay module. |

*(continued)*

**Table 3. Hold and Fault Message Summary (continued).**

| Fault Code | System Failure | Recommended Troubleshooting |
|---|---|---|
| Fault 32<br>*Airflow Switch* | Combustion Airflow Interlock fault. | 1. Check wiring; correct any errors.<br>2. Inspect the fan; make sure there is no blockage of the air intake and it is supplying air.<br>3. Make sure the Airflow Interlock Switches are working properly and all switch contacts are free of contaminants.<br>4. Reset and sequence the relay module to PREPURGE. Place the Run/Test Switch in the Test position, if available. Measure the voltage between terminals 7 and G (ground). Line voltage should be present.<br>5. If steps 1 through 4 are correct and the fault persists, replace the relay module. |
| Fault 33<br>*Preignition ILK* | Preignition interlock fault. | 1. Check wiring; correct any errors.<br>2. Inspect the Preignition Interlock switches and make sure they function properly.<br>3. Check fuel valve operation. Valve must close within five seconds.<br>4. Reset and sequence the relay module.<br>5. During STANDBY or PREPURGE, measure the voltage between terminal 20 and G (ground). For EC/RM7810, 7820, 7830, 7850, check voltage between terminal 17 and G. Line voltage should be present. If not, the Preignition Interlock switches can be defective and need replacing.<br>6. If the fault persists, replace the relay module. |
| Fault 34<br>*Control On* | CTL input was energized at the wrong time for the relay module. This fault implies a field wiring error. | 1. Check wiring; correct any errors.<br>2. Reset and sequence the relay module.<br>3. If fault persists, replace the relay module. |
| Fault 35<br>*Call Service* | Safety relay was off when it should be on or a fuse has blown. | 1. Reset and sequence the relay module. If fault repeats, replace relay module, but be sure to test for excessive loads on appropriate terminals described by fault code.<br>2. If fault does not repeat on next cycle check for electrical noise being coupled into the relay module through the loads on appropriate terminals described by the fault code.<br>3. If fault persists, replace the relay module. |
| Fault 36<br>*Call Service* | Main valve terminal was off when it should be on. | |
| Fault 37<br>*Call Service* | Pilot (ignition) valve terminal was off when it should be on. | |
| Fault 38<br>*Call Service* | Ignition terminal was off when it should be on. | |
| Fault 39<br>*Call Service* | V2S valve terminal (usually terminal 21) was off when it should be on. | |
| Fault 40<br>*Call Service* | Safety relay was on when it should be off. | |
| Fault 41<br>*Main Valve On* | Main valve terminal was on when it should be off. | **⚠ WARNING**<br>**Explosion Hazard.**<br>**Can cause explosion, serious injury or death.**<br>1. Remove system power, turn off fuel supply.<br>2. Check for wiring errors that could provide power to terminals described by the fault. Correct any errors.<br>3. Re-power system; reset and sequence the relay module.<br>4. If fault persists, replace the relay module.<br>5. When fault is corrected, turn on fuel supply. |
| Fault 42<br>*Pilot Valve On* | Pilot (ignition) valve terminal was on when it should be off. | |
| Fault 43<br>*Ignition On* | Ignition terminal was on when it should be off. | |
| Fault 44<br>*Pilot Valve 2 On* | V2S valve terminal, used as a pilot, is on when it should be off. | |

*(continued)*

**Table 3. Hold and Fault Message Summary (continued).**

| Fault Code | System Failure | Recommended Troubleshooting |
|---|---|---|
| Fault 45<br>*Low Fire Sw. Off* | Low Fire Interlock switch failure to close or stay closed. | 1. Check wiring; correct any errors.<br>2. Reset and sequence the relay module.<br>3. Use either the manual motor position to drive the motor to the Low Fire position, or use the Run/Test Switch option, if available. Sequence to Run, drive to Low Fire and place in the Test position. Adjust the Low Fire Switch while in this state to make sure it is closing properly.<br>4. While in Run, drive to Low Fire state, measure the voltage between terminal 18 and G (ground). Line voltage should be present. If not, the switch adjustment is incorrect and/or the switch is defective and needs replacement.<br>5. If steps 1 through 4 are correct and the fault still persists, replace the relay module. |
| Fault 46<br>*Flame Amp Type* | This fault indicates:<br>a. The Flame Failure Response Time (FFRT) or TYPE input from the amplifier changed while the device was powered; or<br>b. A standard amplifier was used in a pilot valve application; or<br>c. A three-second FFRT Amplifier was used with the relight option on the RM7890 Relay Module. | 1. Remove power to the device.<br>2. Reseat the flame amplifier and reset and sequence the relay module.<br>3. For EC/RM7890 only; make sure that Jumper JR2 is completely clipped if a three-second FFRT amplifier is being used. If Jumper JR2 is intact (relight option is selected), use 0.8 second FFRT amplifier.<br>4. For RM7838B only; make sure that a Shutter Check Flame Amplifier is being used with the Pilot Valve Hold option selected. |
| Fault 47<br>*Jumpers Changed* | The configuration jumpers differ from the sample taken at startup. | 1. Inspect the jumper connections. Make sure that clipped jumpers are completely removed.<br>2. Reset and sequence the relay module.<br>3. If fault persists, replace the relay module. |
| Fault 48<br>*Delayed MV On* | V2S valve terminal, used as a delayed main valve, was on when it should be off. | **⚠ WARNING**<br>**Explosion Hazard.**<br>**Can cause explosion, serious injury or death.**<br>1. Remove system power, turn off fuel supply.<br>2. Check wiring; correct any errors.<br>3. Inspect the V2S Fuel Valve and its connections. Make sure the switch is working correctly and is not jumpered or welded.<br>4. Reset and sequence the relay module.<br>5. If fault persists, replace the relay module. |
| Fault 49<br>*Man-Open Sw. On.* | The manual open switch was on when it should be off. | **⚠ WARNING**<br>**Explosion Hazard.**<br>**Can cause explosion, serious injury or death.**<br>1. Remove system power, turn off fuel supply.<br>2. Check wiring; correct any errors.<br>3. Inspect the Manual-Open Switch and its connections. Make sure the switch is working correctly and is not jumpered or welded.<br>4. Reset and sequence the relay module.<br>5. If fault persists, replace the relay module. |
| Fault 50<br>*Jumpers Wrong* | The sequence logic detected a combination of jumpers that is illegal for the sequence eg, if it is correct to clip Jumper JR1 or Jumper JR2, but not both, this fault would be used when both are clipped (RM7888 only). | 1. Inspect the jumpers and refer to the installation instructions for compatible jumper configurations.<br>2. Make sure that clipped jumpers are completely removed.<br>3. Reset and sequence the relay module.<br>4. If fault persists, replace the relay module. |

*(continued)*

**Table 3. Hold and Fault Message Summary (continued).**

| Fault Code | System Failure | Recommended Troubleshooting |
|---|---|---|
| Fault 51<br>*Flame Too Strong* | Flame signal value is too high to be valid. | 1. Make sure that flame detector and flame amplifier are compatible.<br>2. Remove the flame amplifier and inspect the connections. Reset the flame amplifier.<br>3. Reset and sequence the relay module.<br>4. Check the flame detector sighting position, reset and cycle.<br>5. Verify that no ignition noise is present in the F lead due to wire routing.<br>6. Measure the flame strength. Verify it meets specifications. If not, refer to the flame amplifier and/or flame detector checkout procedures.<br>7. If the code reappears, replace the flame amplifier and/or the flame detector.<br>8. If the fault persists, replace the relay module. |
| Fault 52<br>*Call Service* | Pilot Valve 2 (terminal 21) was off when it should be on. | 1. Inspect terminal 21 and connections. Make sure that the valve is operating properly.<br>2. Reset and sequence the relay module.<br>3. If the fault persists, replace the relay module. |
| Fault 53<br>*Lockout Switch* | Lockout Input fault (EC/RM7810, 7820, 7830, 7850 only). | 1. Check wiring; correct any errors.<br>2. Inspect the Lockout Switch to make sure it is working properly.<br>3. Reset and sequence the relay module. During STANDBY or PREPURGE, measure the voltage between terminal 20 and G (ground). Supply voltage should be present. If not, the lockout switch is defective and needs replacing.<br>4. If the fault persists, replace the relay module. |
| Fault 54<br>*Comb. Pressure* | Combustion pressure switch fault (Fulton pulse only). | 1. Check wiring; correct any errors.<br>2. Inspect the Combustion Pressure Switch to make sure it is working correctly.<br>3. Reset and sequence the relay module.<br>4. During STANDBY or PREPURGE, measure the voltage between terminal 20 and G (ground). Supply voltage should be present. If not, the Combustion Pressure Switch is defective and needs replacing.<br>5. If the fault persists, replace the relay module. |
| Fault 55<br>*Purge Fan Sw. On* | Purge fan switch is on when it should be off (Fulton pulse only). | 1. Check wiring; correct any errors.<br>2. Inspect the Purge Fan Switch terminal 18 and its connections. Make sure the switch is working correctly and is not jumpered or welded.<br>3. Reset and sequence the relay module.<br>4. If the fault persists, replace the relay module. |
| Fault 56<br>*Block Intake* | Block intake fault (Fulton pulse only). | 1. Check wiring; correct any errors.<br>2. Inspect the Block Intake Switch and make sure it is working properly.<br>3. Reset and sequence the relay module.<br>4. During PREPURGE, measure the voltage between terminal 7 and G (ground). Supply voltage should be present. If not, the Block Intake Switch is defective and needs replacing.<br>5. If the fault persists, replace the relay module. |
| Fault 57<br>*Purge Fan Sw. Off* | Purge Fan Switch is off when it should be on (Fulton pulse only). | 1. Inspect the Prepurge Fan Switch terminal 18 and the connections. Make sure the switch is working properly.<br>2. Reset and sequence the relay module.<br>3. If the fault persists, replace the relay module. |
| Faults 58 - 66<br>*Call Service* | Unused faults | — |
| Fault 67<br>*AC Phase* | L1 and L2 miswired/exchanged (EC/RM7810, 7820, 7830, 7850 only). | 1. Check L1 and L2 for proper line phasing. |

*(continued)*

**Table 3. Hold and Fault Message Summary (continued).**

| Fault Code | System Failure | Recommended Troubleshooting |
|---|---|---|
| Fault 68<br>*Preignition ILK* | Preignition Interlock fault. | 1. Check wiring; correct any errors.<br>2. Inspect the Preignition Interlock switches and make sure they work properly.<br>3. Check fuel valve operation. Valve must close within five seconds.<br>4. Reset and sequence the relay module.<br>5. During STANDBY or PREPURGE, measure the voltage between terminal 17 and G (ground). Supply voltage should be present. If not, the Preignition Interlock switches are defective and need replacing.<br>6. If the fault persists, replace the relay module. |
| Fault 69 - 70<br>*Call Service* | Unused faults. | — |
| Fault 71<br>*Dynamic LFS* | Low Fire Switch closed, High Fire Switch must be open (EC/RM7850 only). | 1. Check firing rate position switches (usually in Modutrol® Motor) for proper operation.<br>2. Check wiring, correct any errors.<br>3. Reset and sequence the relay module.<br>4. If the fault persists, replace the relay module. |
| Fault 71<br>*Limits Complete* | Limit input (terminal 7) is off when it should be on (RM7888 only). | 1. Check limits to make sure they are satisfied after resetting.<br>2. Check electrical connections to terminal 7 of wiring subbase.<br>3. Reset relay module.<br>4. If the fault persists, replace the relay module. |
| Fault 72<br>*Dynamic HFS* | High Fire Switch closed; Low Fire Switch must be open (EC/RM7850 only). | 1. Check firing rate position switches (usually in Modutrol® Motor) for proper operation.<br>2. Check wiring, correct any errors.<br>3. Reset and sequence the relay module.<br>4. If the fault persists, replace the relay module. |
| Fault 72<br>*Spec.Func.2* | Special Function 2 Input (terminal 17) is off when it should be on. | 1. Check operation of Special Function 2 of PLC.<br>2. Check electrical connection to terminal 17 of wiring subbase and confirm presence of supply power when Special Function 2 is activated.<br>3. Reset relay module.<br>4. If the fault persists, replace the relay module. |
| Fault 73<br>*Spec.Func.3* | Special Function 3 Input (terminal 19) is off when it should be on. | 1. Check operation of Special Function 3 of PLC.<br>2. Check electrical connection to terminal 19 of wiring subbase and confirm presence of supply power when Special Function 3 is activated.<br>3. Reset relay module.<br>4. If the fault persists, replace the relay module. |
| Fault 75<br>*Flame Proven Feedback* | Flame Indication Feedback (terminal 21) either on when it should be off or off when it should be on. | 1. Remove wire to terminal 21 and reset relay module.<br>2. If the fault persists, replace relay module.<br>3. Reconnect wire to terminal 21. If the fault returns, verify wiring. |
| Fault 76 - 93<br>*Accessory Fault* | — | — |
| Fault 94 - 104<br>*Call Service* | — | — |
| Fault 105<br>*Call Service* | Relay Module self-test failure. | 1. Reset and sequence the relay module.<br>2. If the fault reappears, remove power from the relay module and reapply the power; reset and sequence the relay module.<br>3. If the fault persists, replace the relay module. |
| Fault 106<br>*Call Service* | Relay Module self-test failure. | |
| Fault 107<br>*Call Service* | Relay Module flame signal crosscheck failure. | |

*(continued)*

**Table 3. Hold and Fault Message Summary (continued).**

| Fault Code | System Failure | Recommended Troubleshooting |
|---|---|---|
| Fault 109<br>*Call Service* | Negative cycle test failed, earth ground absent or line voltage phasing improper. | 1. Make sure a good earth ground connection exists at the installation site and all earth ground connections are complete and correct.<br>2. Make sure the relay module and all loads operate at the same line voltage phase.<br>3. Reset and sequence the relay module.<br>4. If the fault persists, replace the relay module. |
| Fault 110<br>*Call Service* | The configuration jumpers differ from stored values. | 1. Inspect the jumper connections. Make sure they match the original selection and clipped jumpers are completely removed.<br>2. Reset and sequence the relay module.<br>3. If the fault persists, replace the relay module.<br>4. Configuration jumpers must be selected prior to 200 hours of operation. If configuration jumpers are changed after 200 hours of operation, lockout 110 occurs. Relay module *cannot* be reset and *must* be replaced. |
| Fault 111<br>*Call Service* | Relay Module configuration jumper test failure. | 1. Inspect the jumper connections. Make sure they match the original selection and clipped jumpers are completely removed.<br>2. Reset and sequence the relay module.<br>3. If the fault persists, replace the relay module. |
| Fault 112 - 126<br>*Call Service* | Relay Module self-test failure. | 1. Reset and sequence the relay module.<br>2. If the fault persists, replace the relay module. |
| Fault 127<br>*Call Service* | Safety relay feedback circuit was in an improper state. | 1. Reset and sequence the relay module.<br>2. If the fault persists, replace the relay module. |

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