

## 7800 SERIES Primary Control

### A GUIDE SPECIFICATION FOR THE ENGINEER

## A. GENERAL

### A.1 Overview

The contractor shall furnish, install, and place in operating condition a Primary Control as described herein. The system shall be located in accordance with these specifications.

### A.2 Type of System

#### A.2.1 Major functions of the Primary Control shall provide:

- a. Automatic sequencing of the burner system through Initiation, Standby, Purge, Pilot Flame Establishing Period, Main Flame Establishing Period and Run<sup>a</sup>.
- b. Flame proving and lockout on flame failure during pilot flame proving, main flame proving, or run<sup>a</sup>.
- c. Status light emitting diodes (LED) indicating:
  - Power present, green.
  - Pilot valve, yellow.
  - Flame, red.
  - Main valve, yellow.
  - Alarm, red.
- d. NEMA 1 rated enclosure.
- e. Line voltage terminal inputs for lockout and recycle limits and interlocks<sup>a</sup>.
- f. Separate annunciation faults including Primary Control, flame failure and lockout interlocks<sup>a</sup>.
- g. Self-test for proper operation.
- h. Monitor system circuit status.
- i. Tamper resistant internal safety logic and timing.
- j. First-out annunciation and diagnostics including display of flame signal, total burner cycles, burner hours and fault history of last six lockouts, and diagnostic voltage tests of burner I/O via a Keyboard Display Module (KDM). The KDM shall be able to be mounted remotely within 4000 feet of the Primary Control.
- k. Nonvolatile lockup and history files.

- l. Dynamic ampli-check flame amplification protection.
- m. Dynamic self-check flame amplification protection.
- n. Characterization to the applied burner.
- o. Capability for remote or local communication to a personal computer.
- p. Ability to be installed in a continuous 0.5G environment.
- q. Run/Test switch to pause the burner sequence in prepurge and pilot ignition trials to support startup testing and burner adjustments<sup>a</sup>.
- r. Remote resetting of safety lockouts via a momentary pushbutton. Remote reset switch can be placed up to 1000 feet from the Primary Control.

<sup>a</sup> Device specific.

#### A.2.2 Major System Components

- a. Relay Module:
  - EC7810A—Atmospheric.
  - EC7820A—Atmospheric with fan.
  - EC/RM7890A,B,C,D—On-off.
  - EC/RM7895A,B,C,D,E,F—On-off with Purge.
  - RM7896A,B,C,D—On-off with Purge and Postpurge.
- b. Keyboard Display Module, S7800A, optional.
- c. Flame Amplifier:
  - Ultraviolet, R7849A/B, R7861A, R7886A.
  - Infrared, R7848A/B.
  - Rectification, R7847A/B/C.
  - Optical, R7851B.
- d. Flame Sensor:
  - Ultraviolet, C7012, C7027, C7035, C7044, C0761, C7076.
  - Infrared, C7015.
  - Rectifying flame rod/photocell.
  - Optical, C7927, C7935 (UV), C7915 (IR), C7962 (Visual Light).
- e. Mounting Subbase:
  - Q7800A/B.
- f. Prepurge Timing Module<sup>a</sup>:
  - ST7800A.

<sup>a</sup> Device specific.

## A.3 Codes and Standards

### A.3.1 The Primary Control shall be an accepted system by:

- UL
- CSA
- FM
- IRI
- NFPA
- Kemper
- CSD-1
- European Directives (CE)—EC7810A, EC7820A

NOTE: European Directives (CE) and the CE logo apply only to the EC7810A and EC7820A for this specification.

## A.4 Wiring

### A.4.1 All Primary Control wiring shall be in accordance with the National Electrical Codes (NEC) and local electrical codes.

## B. SEQUENCE OF OPERATION

### B.1 Safety Provisions

#### B.1.1 The Primary Control shall provide the following safety provisions:

- a. Dynamic self check safety circuit. The Primary Control microcomputer shall test itself and related hardware for correct circuit operation.
- b. Examination of all load terminals to check its ability of recognizing the true status of external controls, limits and interlocks. If any input fails this test, the Primary Control should lockout on safety shutdown.
- c. Closed loop logic test of all safety critical loads (main valve, ignition transformer and pilot valve) and must be able to lock out on safety shutdown if any safety critical load is identified as operating incorrectly.
- d. Dynamic safety relay and contact to check the correct operation of the safety circuit and the ability to open and close the relay contact so the Primary

Control is capable of de-energizing all safety critical terminals (main valve, pilot valve, and ignition transformer).

- e. Safe start check and expanded check to include monitoring flame signal during Standby.
  - f. Dynamic airflow check to monitor the airflow switch and check that the switch is proven open before prepurge<sup>a</sup>.
  - g. Tamper resistant timing and safety logic.
- <sup>a</sup> Device specific.

## B.2 Annunciation and Diagnostics: The Primary Control Shall Provide:

- a. First-out annunciation plus time in sequence of fault occurrence.
- b. Indication of sequence failures at startup or during normal sequence operation.
- c. Test of itself for failure, detecting and isolating an alarm, and reporting internal circuit faults.
- d. Display of limit, interlocks, and switched outputs at Keyboard Display Module (KDM).
- e. Multi-language display gives description of system fault.
- f. System fault log history.

## C. MAJOR EQUIPMENT

### C.1 System Specifications

- a. Temperature—Primary Control shall be able to operate in a  $-40^{\circ}\text{F}$  to  $+140^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ ) temperature range environment. The Primary Control should be able to be shipped and stored in a  $-40^{\circ}\text{F}$  to  $+150^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$  to  $+66^{\circ}\text{C}$ ) temperature range environment.
- b. Humidity—Primary Control shall be able to operate in an 85% RH continuous, noncondensing environment.
- c. Vibration—Primary Control shall be able to operate in a 0.5G continuous environment.
- d. Electrical:
  - Voltage/Frequency—Primary Control shall be able to operate in a 120 Vac (+10/-15%) 50 or 60 Hz ( $\pm 10\%$ ) environment. EC devices operate in 220 to 240 Vac (+10/-15%) 50 or 60 Hz ( $\pm 10\%$ ) environment.
  - Load Capacity—Primary Control shall be able to provide a 2000 VA maximum connected load.

## C.2 Model Description

**Table 1. Model Description .**

<b>Model Number</b>	<b>Description</b>	<b>Function</b>
EC/RM7890A,B,C,D	Relay Module	Provides burner logic for safe startup and shutdown of on/off burners. The Relay Module is the location of the system microcomputer that generates fault messages and descriptions and processes burner I/O.
EC/RM7895A,B,C,D,E,F RM7896A,B,C,D EC7810A EC7820A	Relay Module	Provides burner logic for safe startup and shutdown of on/off burners utilizing purge (RM7896 has 15 seconds Postpurge). The Relay Module is the location of the system microcomputer that generates fault messages and descriptions and processes burner I/O.
R7849	Ultraviolet Flame Amplifier	Provides flame signal amplification when used with an ultraviolet power tube flame sensor. An option shall be a dynamic ampli-check of the flame signal amplifier circuitry, checks the ability of the amplifier to respond to a flame loss.
R7848	Infrared Flame Amplifier	Provides flame signal amplification when used with an infrared flame sensor. An option shall be a dynamic ampli-check of the flame signal amplifier circuitry, checks the ability of the amplifier to respond to a flame loss.
R7847	Rectification Flame Amplifier	Provides flame signal amplification when used with a rectification flame sensor. An option shall be a dynamic ampli-check of the flame signal amplifier circuitry, checks the ability of the amplifier to respond to a flame loss. An option shall be a dynamic self-check of the flame signal amplifier circuitry and ultraviolet flame detector sensing tube to check the ability of the amplifier and flame detector to respond to a flame loss.
R7861 R7886	Dynamic Ultraviolet Amplifier	Provides flame signal amplification when used with a dynamic self-check ultraviolet detector. This provides dynamic self-check of the flame signal amplifier circuitry and the ultraviolet flame detector sensing tube to check the ability of the amplifier and flame detector to respond to flame loss.
R7851	Optical Flame Amplifier	Provides flame signal amplification when using the solid state detectors C7927, C7935 (UV), C7915 (IR), or C7962 (Visual Light). This provides dynamic ampli-check of the flame signal amplifier circuitry.
ST7800	Prepurge Timer	Provides prepurge timing (15 selectable types from 2 seconds to 30 minutes) to purge the combustion chamber of unburned fuels.

