Section 6 – Multiburner Flame Safeguard Application Solutions Using the 7800 Series Control

6.1 Overview

Introduction

The challenge in developing Flame Safeguard Burner Control Systems is reliability, cost, code compliance and flexibility of design to meet process and customer requirements.

The Series 7800 burner control system is a unit component control system which meets or exceeds the requirements for industrial burner applications.

The ability to apply standard approved flame safeguard components to any single or multiburner application offers the designer unparalleled flexibility and performance unavailable in traditional solutions.

What's in this section?

This section covers the topics listed below:

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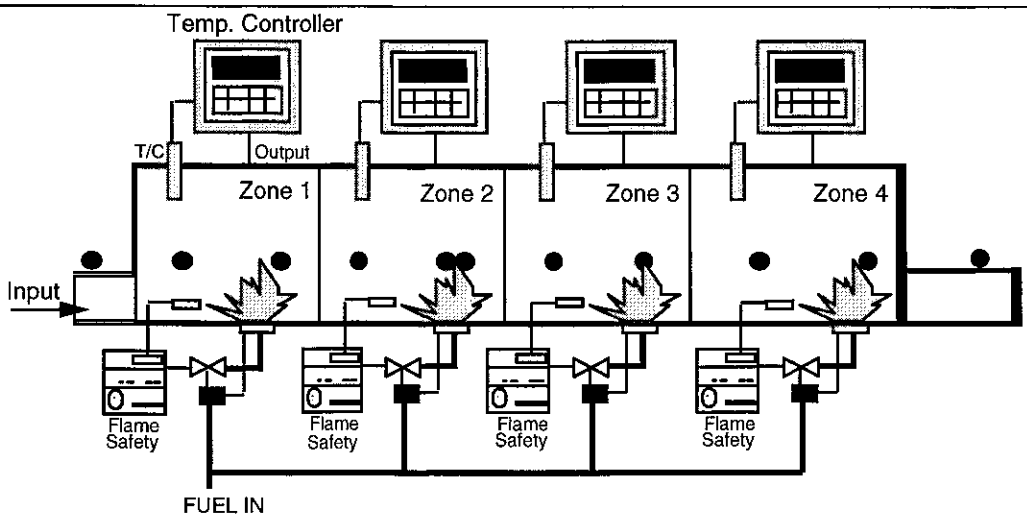
Application

Figure 6-1 shows an application on Large Multiple Zone Furnaces, Ovens, and Kilns for uniform temperature distribution and control.

Figure 6-1 Application Example



Burner configuration and light-off options;include:

- Unison Light-Off
- Sequential Light -Off
- Independent light-Off

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Solution

Mix and match the Flame Relay(s) based on the required performance criteria and follow representative burner designs shown in this section.

6.2 Multiburner Application Concepts

Solution Sets

Presented here are three, 7800 Series Multiburner Solution sets.

Table 6-1 lists the set number, the rating of the set, and a description of the set.

With each solution set is a list of performance criteria and a representative burner design diagram.

Table 6-1 7800 Series Solution Sets

Solution Set	Rating	Description
1	Good	Master Purge timer, proof of air flow, 4 air changes, RM7800 per burner Unison Light Off Figure 6-2 Sequential Light Off Figure 6-3 Independent Light Off Figure 6-4
2	Better	RM7895 provides purge timing up to 30 minutes, proof of air flow, 4 air exchanges. RM7890 used to prove burner 2, 3, 4, etc. Unison Light Off Figure 6-5 Sequential Light Off Figure 6-6 Independent Light Off Figure 6-7
3	Best	RM7838B Pre-ignition interlock, high purge rate proven, purge up to 30 minutes, proof of air flow, 4 air changes, recirculation/exhaust blower proven - separate from combustion blower, low fire start, semi-automatic sequence, trial for pilot, trial for main flame, release to modulation. Unison Light Off Figure 6-8 Sequential Light Off Figure 6-9 Independent Light Off Figure 6-10

6.3 Solution Set #1 - Multiburner Unison Light Off

Operating characteristics

The following operating characteristics refer to the burner design diagram in Figure 6-2

- Purge - 4 air changes are required for NFPA, UL, FM, IRI, plus proof of air flow
- All pilots light off at once and must be proven within the safety switch timing of the primary control.

  Typically - One pilot valve per burner
  - One main gas valve
  - Each burner and pilot has an ignition transformer
- If one pilot is lost during PFEP or burner flame is lost, all burners are shut down.

Application strengths

Low cost solution.

One pilot valve per burner and one or two main safety shut-off valves as required for the system.

Selection considerations

If one burner, pilot or main flame, shuts down, all burners are shutdown. Complete system purge for restart is required.

High amperage draw on start up, all ignition transformers are powered at the same time. (250 to 350 VA each)

- No high purge rate proven
- No low fire start proven
- No pre-ignition interlock
- No interface to temperature control

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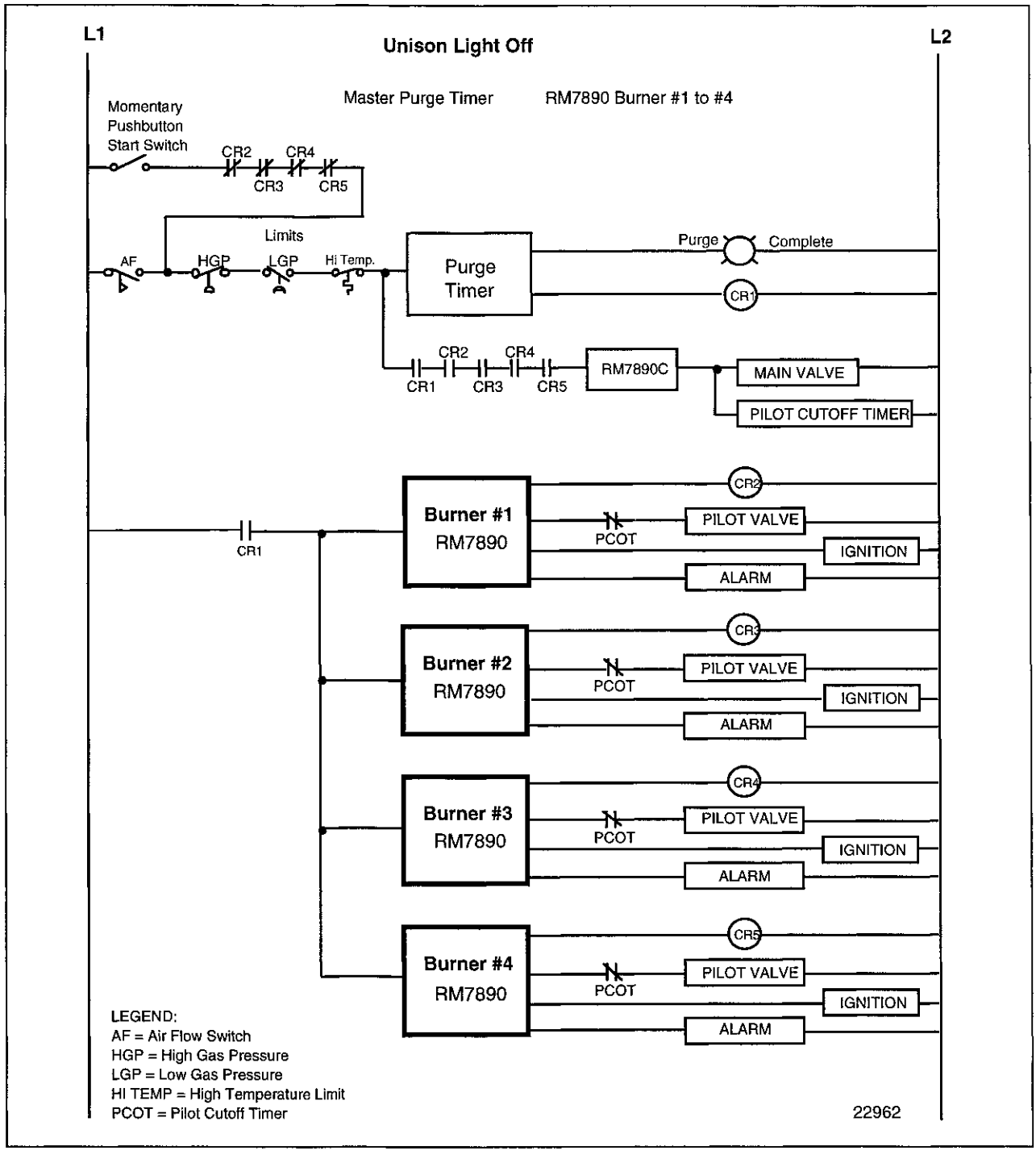
Burner design diagram Figure 6-2 is a burner design diagram for Solution Set #1 - Unison Light Off.

Figure 6-2 Burner Design Diagram for Solution **Set #1 - Unison Light Off**



6.4 Solution Set #1 - Multiburner Sequential Light Off

Operating characteristics

The following operating characteristics refer to the burner design diagram in Figure 6-3.

- Purge - 4 air changes are required for NFPA, UL, FM, IRI, plus proof of air flow, high purge rate, low fire start, pre-ignition interlock.
- The first pilot is proven, then the second, then the third, etc..., each within the safety switch timing of the primary control relay.

  Typically - each pilot has a pilot valve and ignition transformer
  - once all pilots have been proven, the two main valves are energized
- If one pilot or burner flame is lost, all burners are shut down.
- Interrupted pilot, utilizing a pilot cutoff timer.

Application strengths

Moderately priced solution.

Each burner has an ignition transformer and pilot valve

One or two main safety shut off valves as required for the system.

Selection considerations

If one burner, pilot or main flame, shuts down, all burners are shutdown. Complete system purge for restart is required.

- No high purge rate proven
- No low fire start proven
- No pre-ignition interlock
- No interface to temperature control

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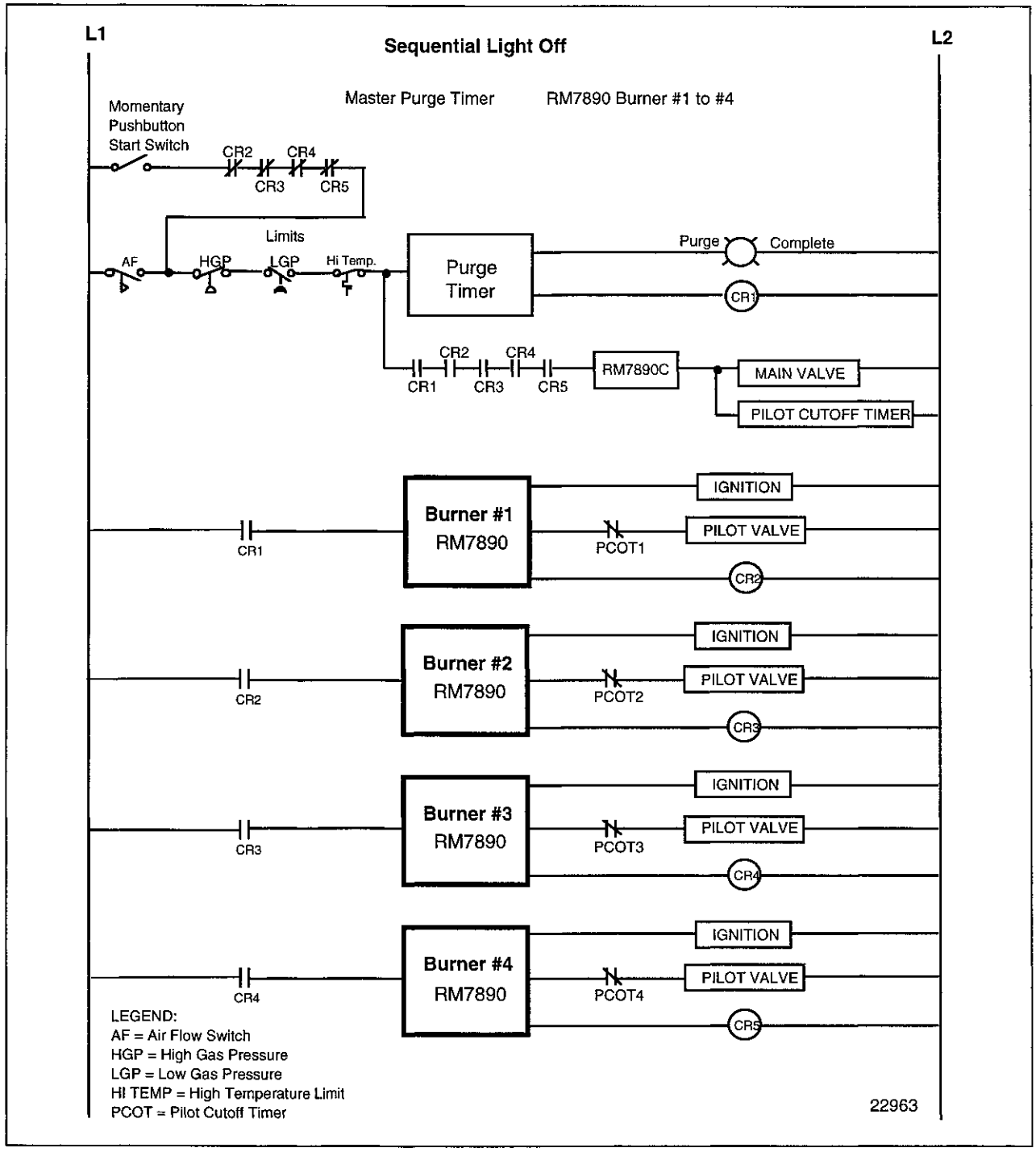
Burner design diagram Figure 6-3 is a burner design diagram for Solution Set #1 - Sequential Light Off.

Figure 6-3 Burner Design Diagram for Solution **Set #1 - Sequential Light Off**



6.5 Solution Set #1 - Multiburner Independent Light Off

Operating characteristics

The following operating characteristics refer to the burner design diagram in Figure 6-4.

- Purge - 4 air changes are required for NFPA, UL, FM, IRI, plus proof of air flow.
- All pilots can be independently lit, each within the designed safety switch timing.
- Each pilot has a pilot valve and ignition transformer
- If one pilot or burner flame is lost, only that burner is shut down.

Application strengths

If one burner shuts down, the remaining burners are uninterrupted.

Less chance for loss of production or non-spec. products if a burner is shut down. The out-of-service burner can be restarted without affecting the operating burners.

Selection considerations

- No high purge rate proven
- No low fire start proven
- No pre-ignition interlock
- No interface to temperature control
- Interrupted pilot requires an extra timer for each burner.

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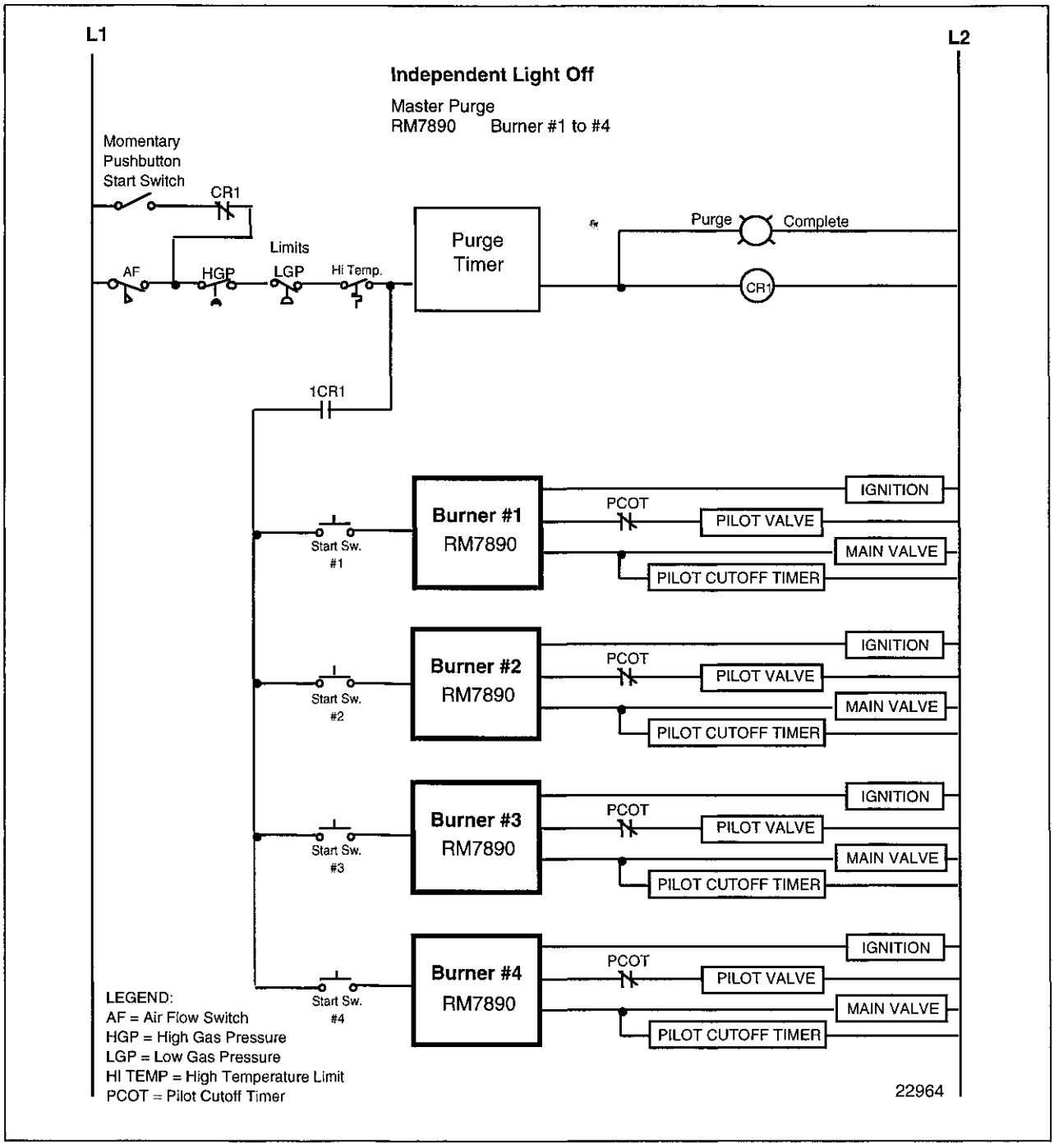
Burner design diagram Figure 6-4 is a burner design diagram for Solution Set #1 - Independent Light Off.

Figure 6-4 Burner Design Diagram for Solution **Set #1 - Independent Light Off**



6.6 Solution Set #2 - Multiburner Unison Light Off

Operating characteristics

The following operating characteristics refer to the burner design diagram in Figure 6-5.

- Purge - 4 air changes are required for NFPA, UL, FM, IRI, plus proof of air flow.
- All pilots light off at once and must be proven within the safety switch timing of the primary control.

  Typically - one pilot valve or one for each burner
  - one main gas valve
  - each burner and pilot has an ignition transformer
- If one pilot or burner flame is lost, all burners are shut down.

Application strengths

Low cost solution.

One pilot valve and one or two main safety shut-off valves as required for the system.

Selection considerations

If one burner, pilot or main flame, shuts down, all burners are shutdown. Complete system purge for restart is required (NFPA-86 requirement).

High amperage draw on start up, all ignition transformers are powered at the same time. (250 to 350 VA each)

- No high purge rate proven
- No low fire start proven
- No pre-ignition interlock
- No interface to temperature controller

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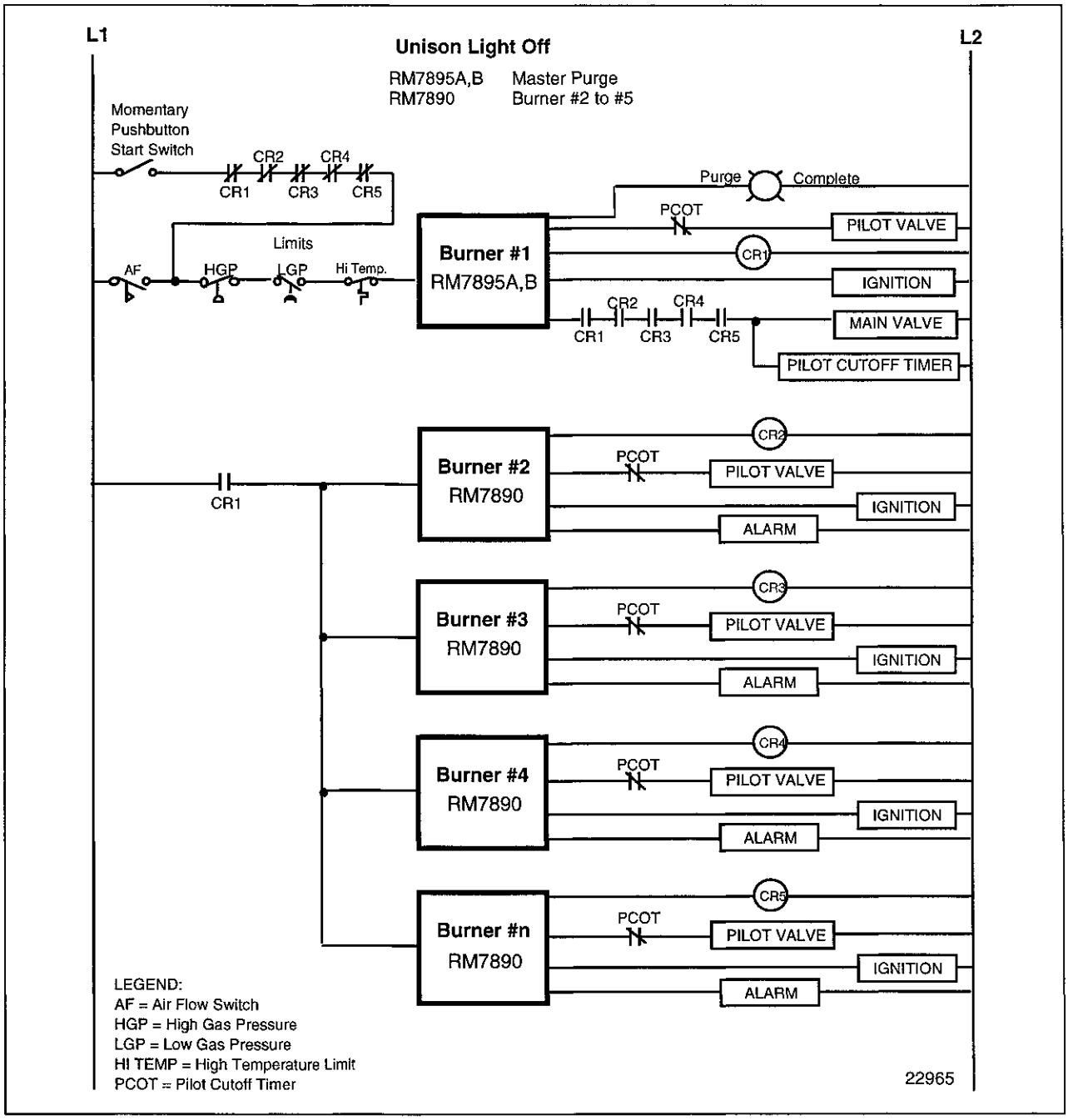
Burner design diagram Figure 6-5 is a burner design diagram for Solution Set #2 - Unison Light Off.

Figure 6-5 Burner Design Diagram for Solution **Set #2 - Unison Light Off**



6.7 Solution Set #2 - Multiburner Sequential Light Off

Operating characteristics

The following operating characteristics refer to the burner design diagram in Figure 6-6.

- Purge - 4 air changes are required for NFPA, UL, FM, IRI, plus proof of air flow.
- The first pilot is proven, then the second, then the third, etc...., each within the safety switch timing of the primary control relay.

  Typically - each pilot has a pilot valve and ignition transformer
  - once all pilots have been proven, one main valve is energized
- If one pilot or burner flame is lost, all burners are shut down.
- Interrupted pilot, utilizing a pilot cutoff timer to meet NFPA-86.

Application strengths

Moderately priced solution.

Each burner has an ignition transformer and pilot valve.

One or two main safety shut off valves as required for the system.

Selection considerations

If one burner, pilot or main flame, shuts down, all burners are shutdown. Complete system purge for restart is required.

- No high purge rate proven
- No low fire start proven
- No pre-ignition interlock
- No interface to temperature control

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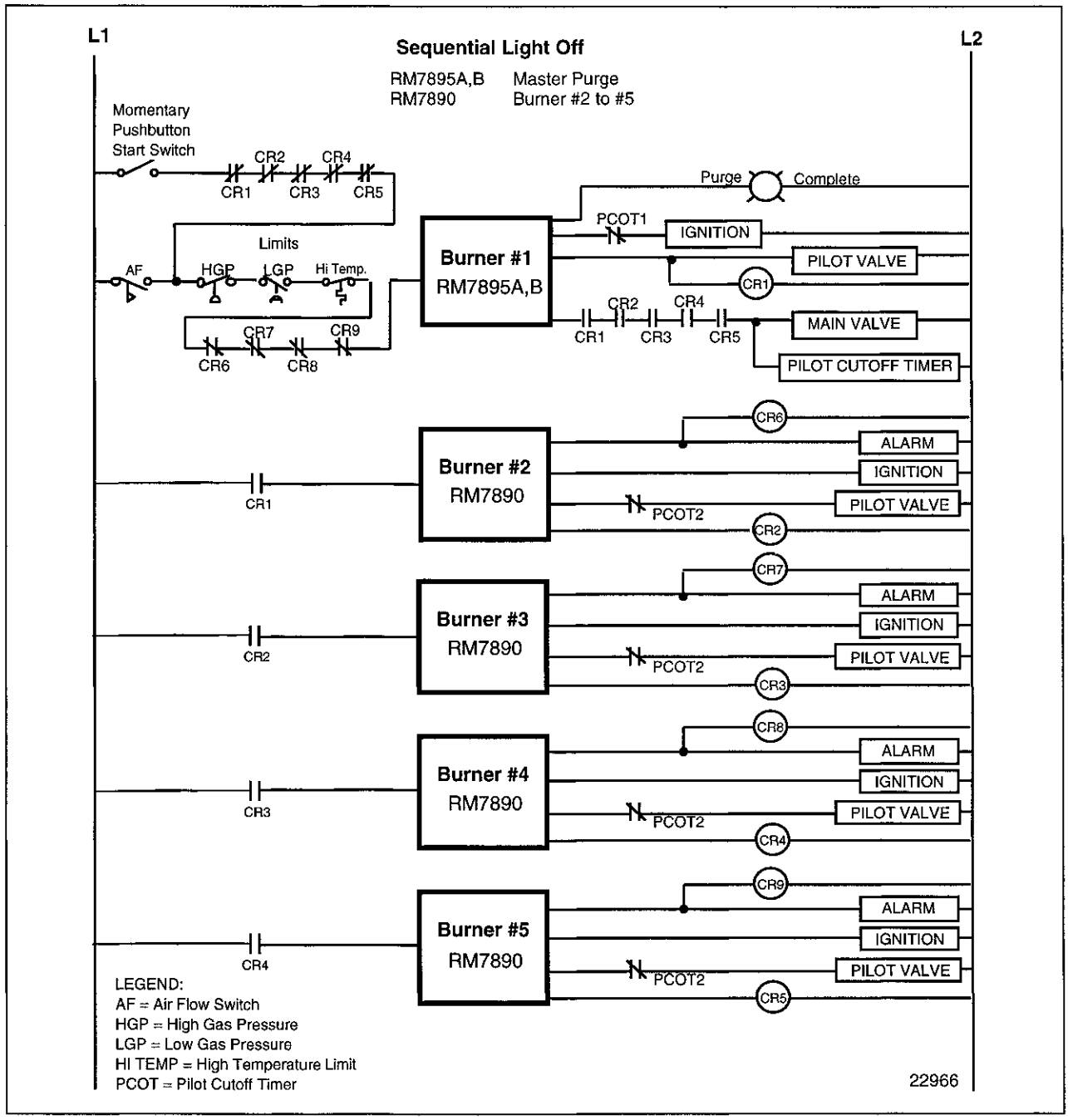
Burner design diagram Figure 6-6 is a burner design diagram for Solution Set #2 - Sequential Light Off.

Figure 6-6 Burner Design Diagram for Solution **Set #2 - Sequential Light Off**



6.8 Solution Set #2 - Multiburner Independent Light Off

Operating characteristics

The following operating characteristics refer to the burner design diagram in Figure 6-7.

- Purge - 4 air changes are required for NFPA, UL, FM, IRI, plus proof of air flow.
- Burner #1 - RM7895A,B provides master purge.
- Burner #2 to #5 permitted to start-up once1st burner pilot is proven.
- Each burner has a separate pilot, ignition, and main safety shut off valve.

Application strengths

If any one burner shuts down, the others remain ON. However, If master RM7895 shuts down, all burners are shut down.

Selection considerations

- No high purge rate proven
- No low fire start proven
- No pre-ignition interlock
- No interface to temperature control
- Interrupted pilot requires an external timer for each burner.

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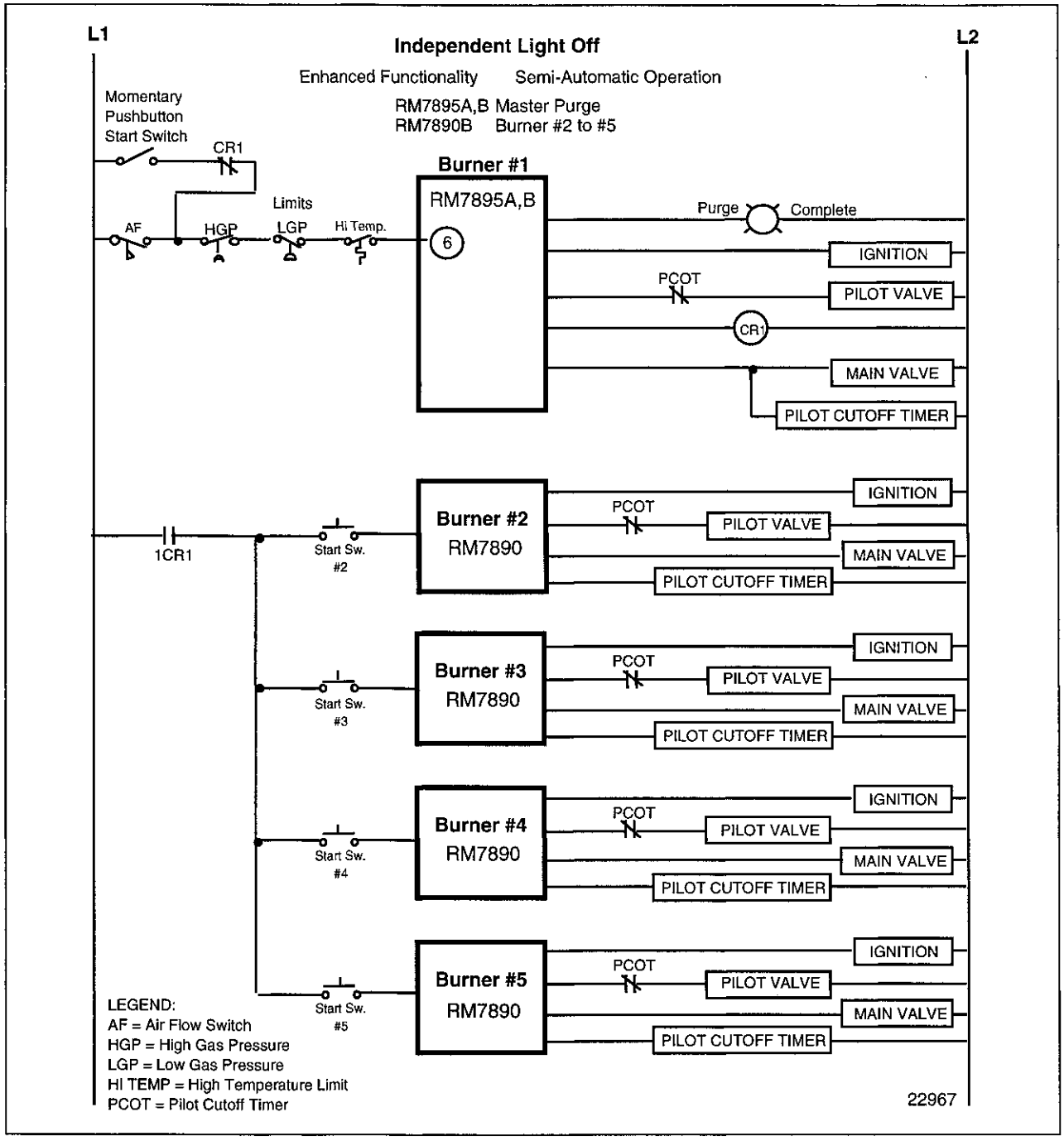
Burner design diagram Figure 6-7 is a burner design diagram for Solution Set #2 - Independent Light Off.

Figure 6-7 Burner Design Diagram for Solution **Set #2 - Independent Light Off**



6.9 Solution Set #3 - Multiburner Unison Light Off

Operating characteristics

The following operating characteristics refer to the burner design diagram in Figure 6-9.

- Purge - 4 air changes are required for NFPA, UL, FM, IRI, plus proof of air flow, pre-ignition interlock, proven high purge rate, and low fire start.
- All pilots light off at once and must be proven within the safety switch timing of the primary control.

Application strengths

- one pilot valve or one for each burner
- one or two main gas valves
- each burner and pilot has an ignition transformer

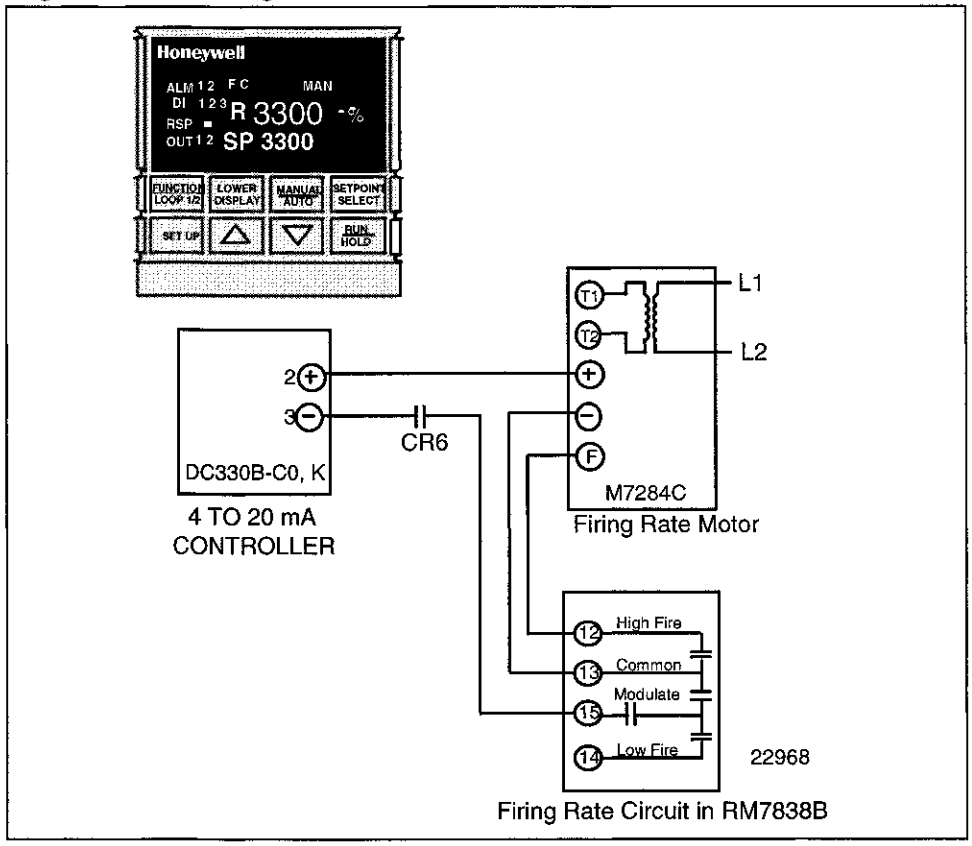
Selection considerations

- If one pilot or burner flame is lost, all burners are shut down.
- Firing rate motor is held at low fire position until main gas valve is proven open.

Firing rate circuit in RM7838B

Figure 6-8 shows the firing rate circuit in RM7838B.

Figure 6-8 Firing Rate Circuit in RM7838B



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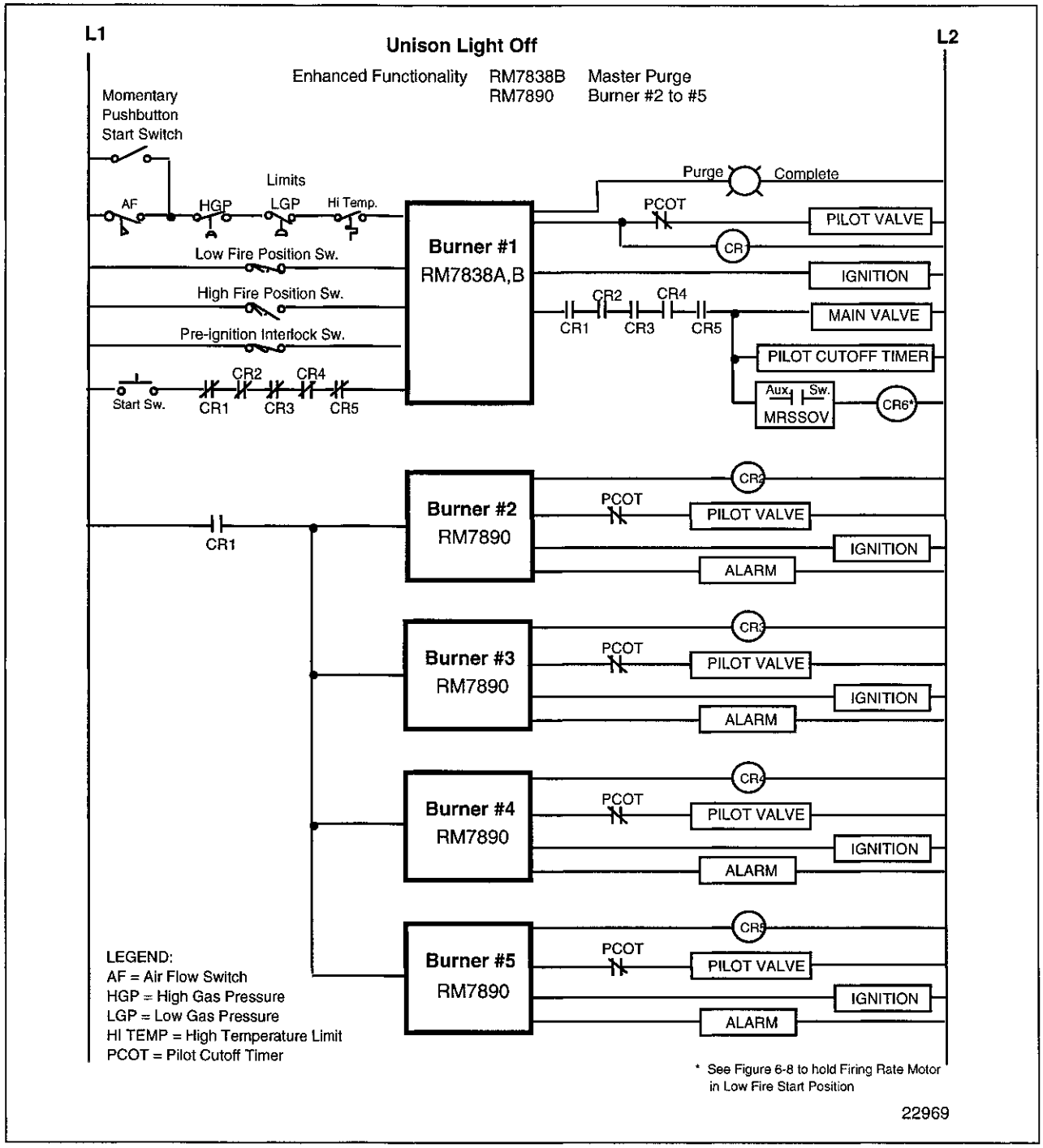
Burner design diagram Figure 6-9 is a burner design diagram for Solution Set #3 - Unison Light Off.

Figure 6-9 Burner Design Diagram for Solution **Set #3 - Unison Light Off**



6.10 Solution Set #3 - Multiburner Sequential Light Off

Operating characteristics

The following operating characteristics refer to the burner design diagram in Figure 6-11.

- Purge - 4 air changes are required for NFPA, UL, FM, IRI, plus proof of air flow, proven high purge rate, low fire start, and pre-ignition interlock.
- The first pilot is proven, then the second, then the third, etc..., each within the safety switch timing of the primary control relay.
  Typically - each pilot has a pilot valve and ignition transformer
  - once all pilots have been proven, one main valve is energized
- If one pilot or burner flame is lost, all burners are shut down.
- Interrupted pilot, utilizing a pilot cutoff timer to meet NFPA 86.
- Firing rate motor held at low fire until main gas valve is proven open.

Application strengths

Moderately priced solution.

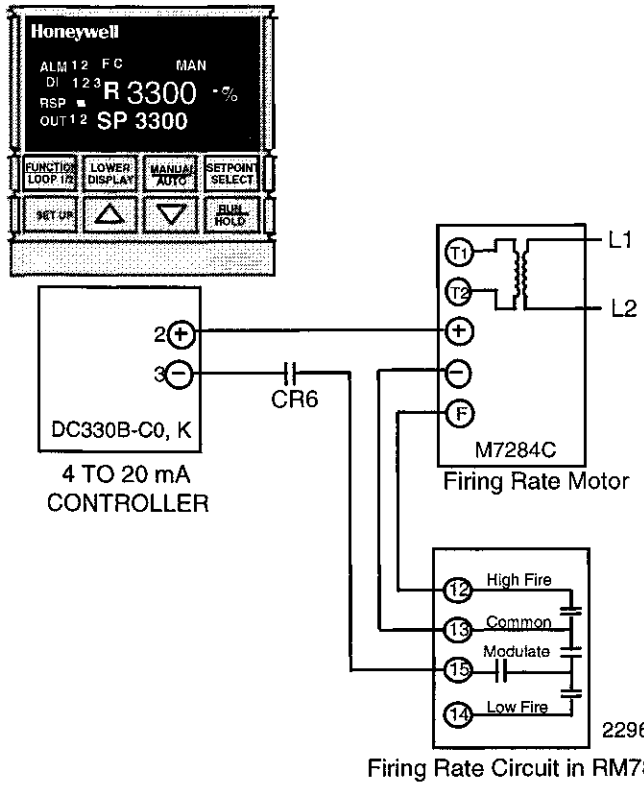
Each burner has an ignition transformer and pilot valve.

One or two main safety shut off valves as required for the system.

Firing rate circuit in RM7838B

Figure 6-10 shows the firing rate circuit in RM7838B.

Figure 6-10 Firing Rate Circuit in RM7838B



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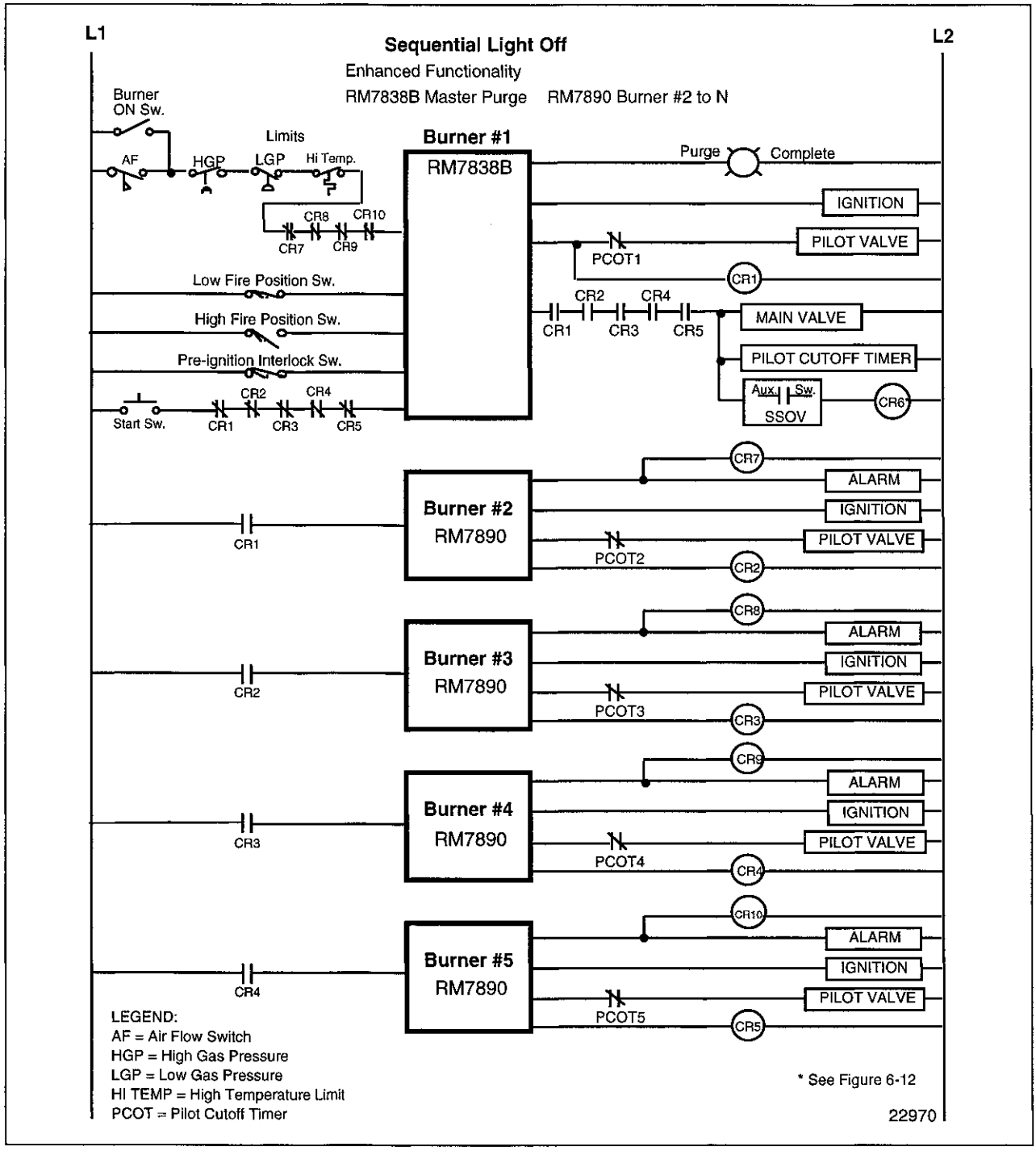
Burner design diagram Figure 6-11 is a burner design diagram for Solution Set #3 - Sequential Light Off.

Figure 6-11 Burner Design Diagram for Solution **Set #3 - Sequential Light Off**



6.11 Solution Set #3 - Multiburner Independent Light Off

Operating characteristics

The following operating characteristics refer to the burner design diagram in Figure 6-13.

- Purge - 4 air changes are required for NFPA, UL, FM, IRI, plus proof of air flow, pre-ignition interlock, high purge rate, low fire start interlock, trial for main flame.
- Burner #1 - RM7838B provides master purge.
- Burner #2 to #5 permitted to start up once the first burner pilot is proven.
- Firing rate motor is held at low fire until main SSOV is proven OPEN.
- Each burner has a separate pilot, ignition, and main safety shut off valve.

Application strengths

If any one burner shuts down, the others remain ON.

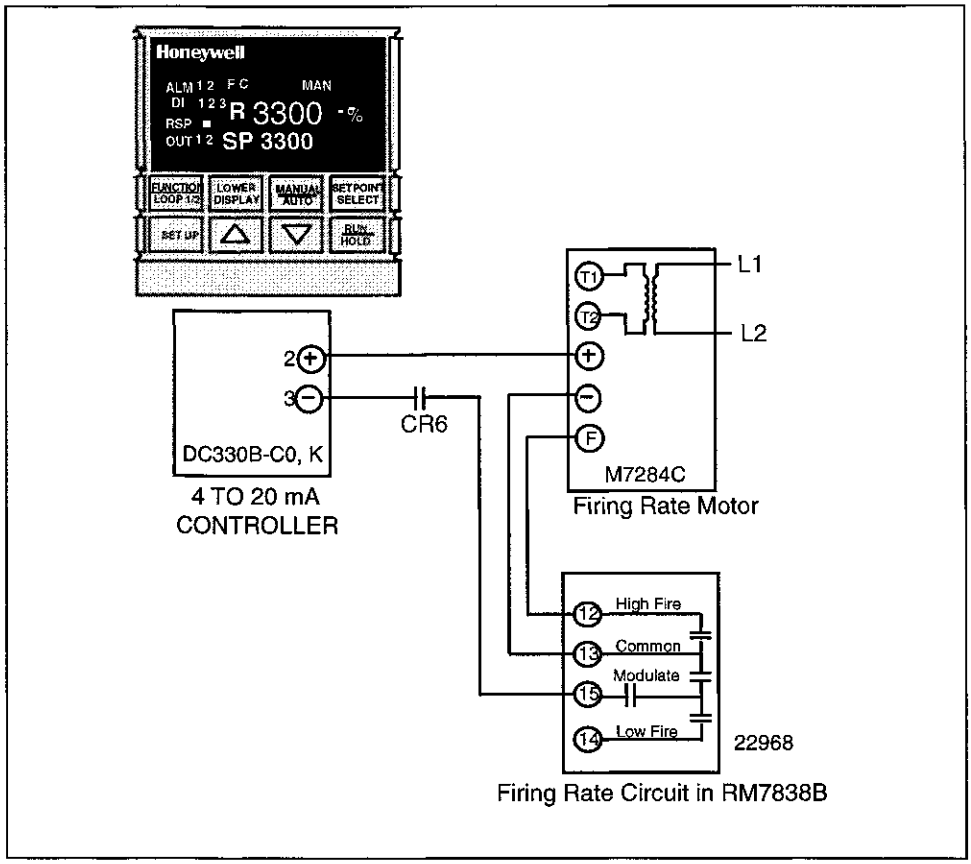
Selection considerations

Interrupted pilot requires an external timer for each burner unless RM7895C is used then all stages have PFEP, MFEP, and interrupted.

Firing rate circuit in RM7838B

Figure 6-12 shows the firing rate circuit in RM7838B.

Figure 6-12 Firing Rate Circuit in RM7838B



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Burner design diagram Figure 6-13 is a burner design diagram for Solution Set #3 - Independent Light Off.

Figure 6-13 Burner Design Diagram for Solution **Set #3 - Independent Light Off**