

Control Cabinet



UV-1A Scanner



69ND1 Flame Rod

MULTIBURNER FLAME SAFEGUARD SYSTEMS

For semiautomatic and manual Burners

FEATURES

FIREYE MB-2 systems provide flame safeguard and safe lighting and operating protection for oil or gas fired multi-burner process equipment. One packaged control unit is suitable for supervising from two to twenty-four burners utilizing either Rectification Flame Rod or miniaturized UV-EYE flame scanners.

These versatile control systems include plug in modules for the solid state flame signal amplifiers, power supply, and adjustable purge timer. All load relays are industrial design, plug in, and are enclosed to protect against contamination. Signal lights provide visual indication of "Purging", "All Burners On", and "Flame Out Alarm".

Each flame signal amplifier contains a signal light which indicates flame on or off during light up. It also provides first out indication following a flame failure to assist in trouble shooting.

Clearly identified terminals provide for the direct connec-

tion of limit switches and operating controls, also fuel and air flow interlocks together with ignition systems, main fuel valves, master valves and alarms.

The system may be connected for any type ignition system – taper, spark or pilot – constant, intermittent, interrupted.

The high quality **FIREYE** MB-2 system is specifically designed to safeguard the variety of multi-burner process and industrial furnaces, ovens and heaters.

The control system is furnished in a Gray, NEMA-1, surface enclosure or is available in modular chassis form for mounting in a master control cabinet.

A safe start interlock is incorporated which is effective on every start. Any condition which causes any flame relay to be in its energized position during the checking period will prevent start up.

The control system is designed to de-energize fuel valves within 4 seconds following flame failure.

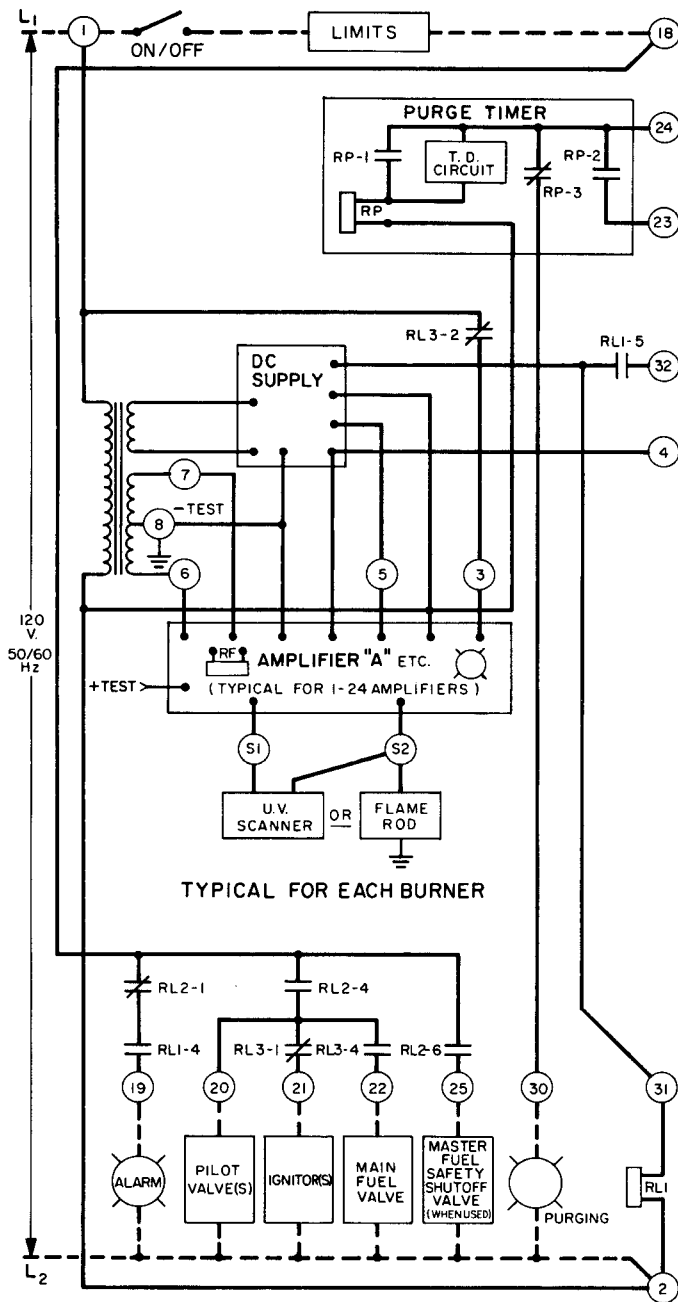
SPECIFICATIONS:

Supply Voltage:
120v – 50/60Hz

Ambient Temperature:
Control unit 0°F min., 125°F max.
UV-1A scanner -40°F min., 212°F max.
69ND1 – rod tip 2460°F

Electrical Load Ratings (maximum)

Terminal	Typical Load	Maximum Rating at 120v-60Hz
20	Pilot Valve	125va Pilot Duty
21	Ignition Transformer	500va
22	Main Fuel Valve	250va Pilot Duty (Solenoid)
25	Master Shutoff Valve	1000va Opening 400va Holding (Motorized)
19	Alarm	125va Pilot Duty



Use this Master Control Module diagram overlay in conjunction with other diagrams on pages 2, 4, 6, 8, and 10

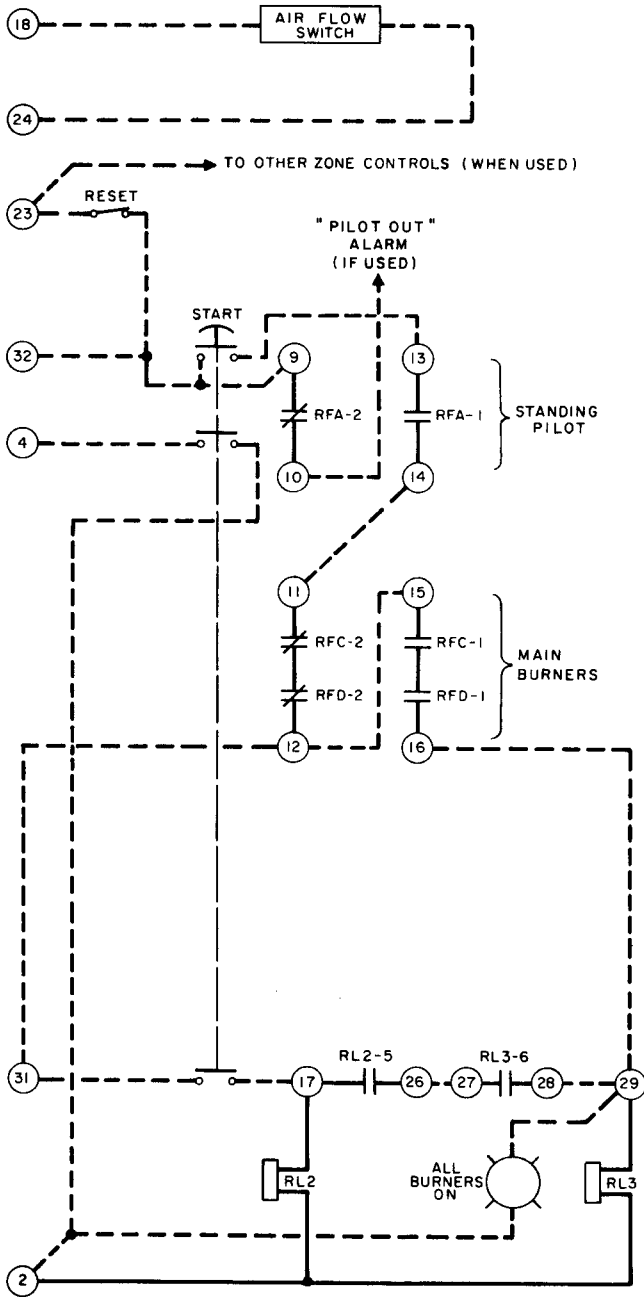
MASTER AND AUXILIARY CONTROL MODULE PLACEMENT

- 4 BURNERS - AS SHOWN ON CONTROL.
- 3 BURNERS - A BLANK. JUMP 9 TO 10 AND 13 TO 14.
- 2 BURNERS - A AND B BLANK. JUMP 9 TO 11 AND 13 TO 15.
- 1 BURNER - B, C AND D BLANK. JUMP 10 TO 12 AND 14 TO 16

NOTES

1. FOR DIRECT SPARK IGNITION: INSTALL JUMPER FROM TERMINAL 20 TO 22 AND OMIT PILOT VALVE.
2. FOR TAPER IGNITED BURNER: INSTALL JUMPER FROM TERMINAL 20 TO 22; OMIT PILOT VALVE AND IGNITER.

----- EXTERNAL WIRING _____ INTERNAL WIRING

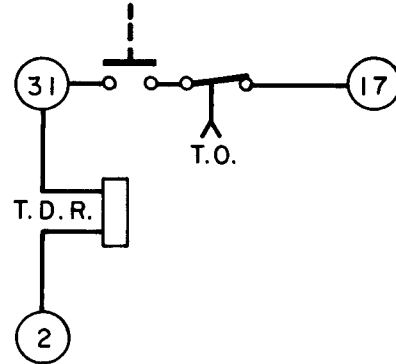


STANDING PILOT

2 BURNERS

NOTE: "B" module not used on master control. Place jumper between terminals 20 and 22.

To add trial for ignition install timer as shown below, Timer Contact T.O. in series with Start Switch contacts between terminals 31 and 17.



T.F.I. MAIN FLAME

(P.B. CONTACT IN SERIES W/ N.C. TIMER CONTACT BETWEEN TERM. 31-17)

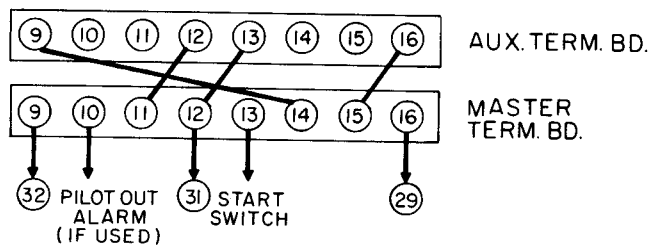
NOTE:

When adding auxiliary controls to accommodate additional burners, wire as shown for 2 burners with the exception of terminals 9-16. Interconnect terminals 9-16 between master and auxiliary controls as shown below. Then interconnect terminals 2-7 on master and all auxiliary controls.

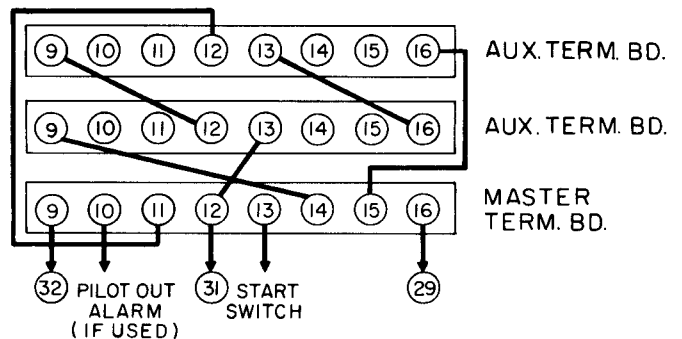
All terminals numbered "8" must be grounded.

Use "A" module on Master Terminal Board for pilot detection.

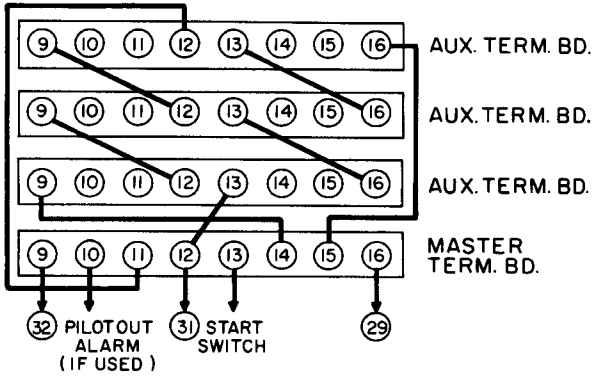
3-6 BURNERS



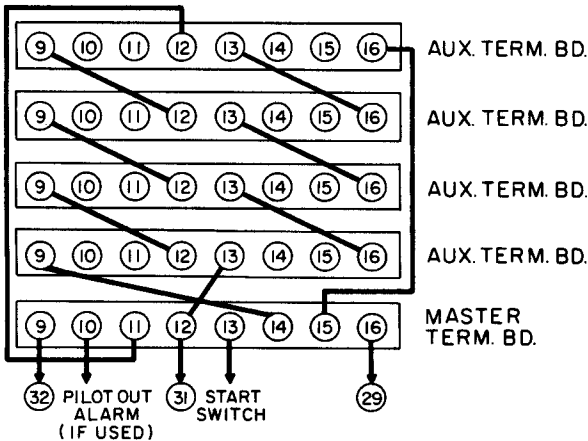
7-10 BURNERS



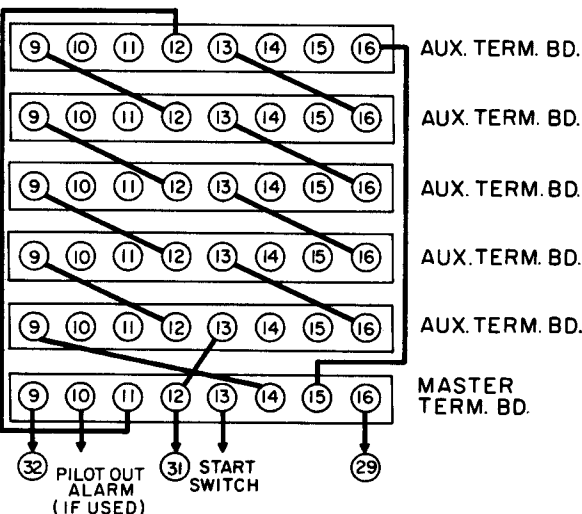
11-14 BURNERS



15-18 BURNERS

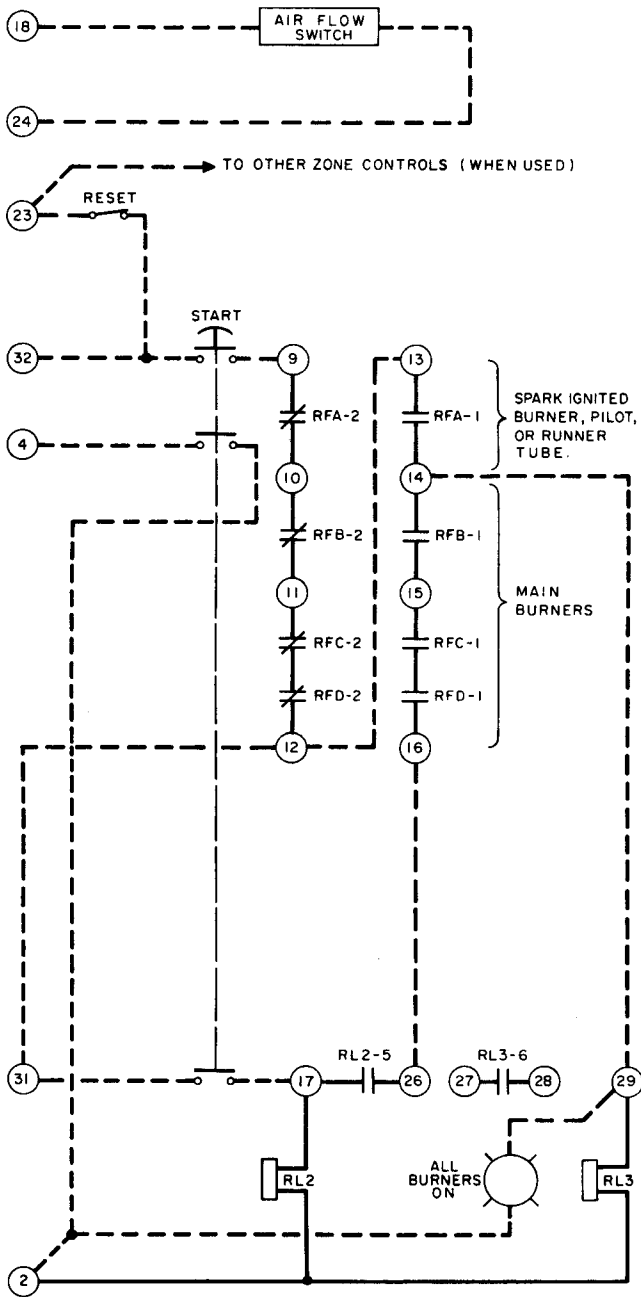


19-22 BURNERS



SEQUENCE OF OPERATION

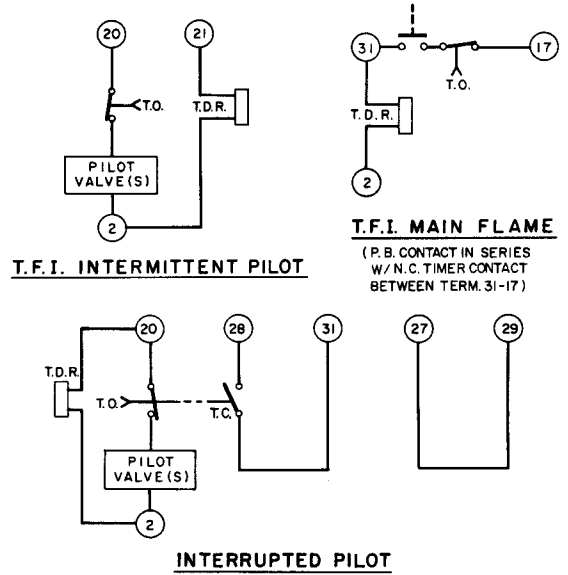
START UP PROCEDURE	SYSTEM OPERATION
1. Apply power (120v 50/60Hz) to terminals 1 and 2.	Power supply and amplifier modules energized.
2. Limits close.	Terminal 18 and line side of air flow switch powered.
3. Air flow interlock closes.	Terminal 24 is powered, energizes adjustable electronic purge timer and "Purging" indicator light.
4.	Purge timer completes cycle. "Purging" light is extinguished. Terminal 23 is powered.
5. "Reset" switch placed to "Run" position.	Terminal 32 powered.
6. "Start" switch is manually depressed and held.	With standing pilot proved and all other flame relays in de-energized position. Relays RL1 and RL2 are energized. Terminals 20, 21 and 25 are powered. With a jumper from terminal 20 to 22 the fuel valves and master valve (if used) are energized. Module lights are powered as each flame is proved. NOTE: Trial for ignition of main flame commences on those installations where a suitable auxiliary timer is applied.
7. Main flames are established.	With all flame relays energized, module lights are extinguished and "All Burners On" light is powered. Relay RL3 is energized. Terminal 21 is de-energized.
8. Release "Start" switch.	
NORMAL FIRING PERIOD	
9. Limit or air flow switch opens.	All fuel valves close immediately. Relays RL1, RL2, and RL3 de-energize. Purge timer is unpowered. "All Burners On" light is extinguished. Power supply and amplifier modules remain energized. Alarm circuit will not be powered.
FLAME FAILURE	
10. Main flame fails.	Flame relay in affected module drops out in less than 4 seconds closing all fuel valves and de-energizing RL2 and RL3 relays. Flame relays of other modules drop out. The "First Out" indicator lamp of the module detecting the flame failure will light and remain lighted while the others will remain extinguished. Alarm light and circuit are powered. Relay RL1 remains energized. Purge timer remains powered.
11. Pilot flame fails.	If used, pilot alarm powered from terminal 10 signifies loss of pilot flame. Main fuel valves remain energized provided all main flames are proved.
12. Transfer "Run" switch to "Reset" position.	Relay RL1 de-energized. Alarm circuit silenced.



**SPARK IGNITED BURNER, PILOT,
OR RUNNER TUBE**

1-4 BURNERS/PILOT

To add trial for ignition or interrupted pilot, install timer as shown below; Timer Contact T.O. in series with Start Switch contact between terminals 31 and 17.

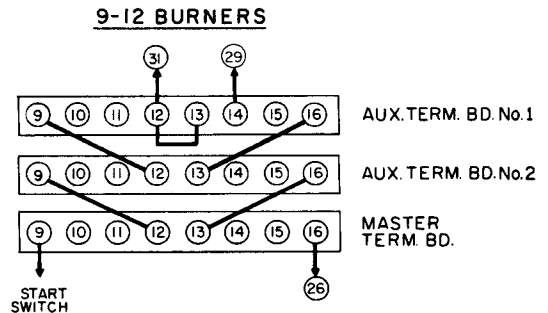
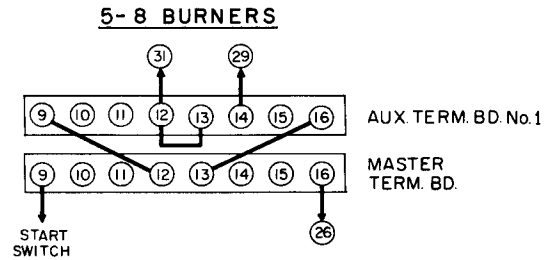


NOTE:

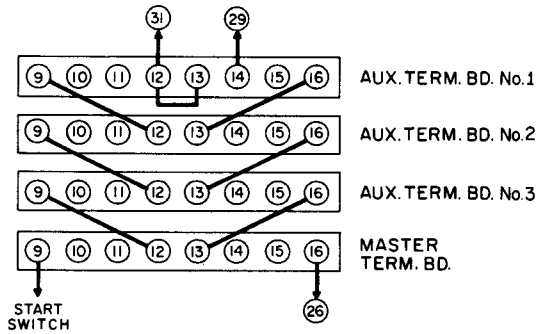
When adding auxiliary controls to accommodate additional burners, wire as shown for 1-4 burners with the exception of terminals 9-16. Interconnect terminals 9-16 between master and auxiliary controls as shown below. Then interconnect terminals 2-7 on master and all auxiliary controls.

All terminals numbered "8" must be grounded.

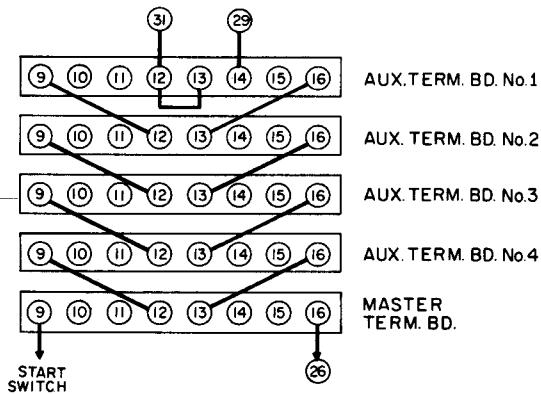
Use "A" module on auxiliary terminal board #1 for pilot detection.



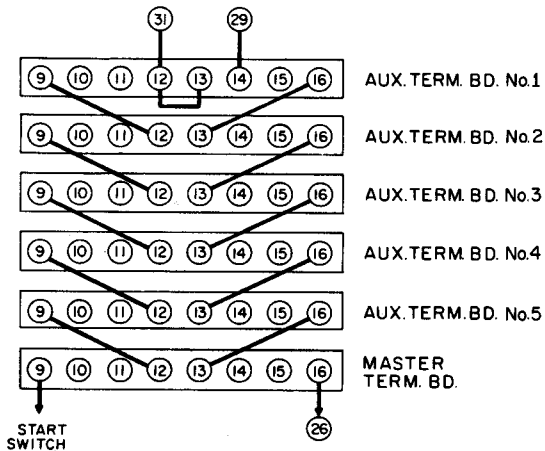
13-16 BURNERS



17-20 BURNERS

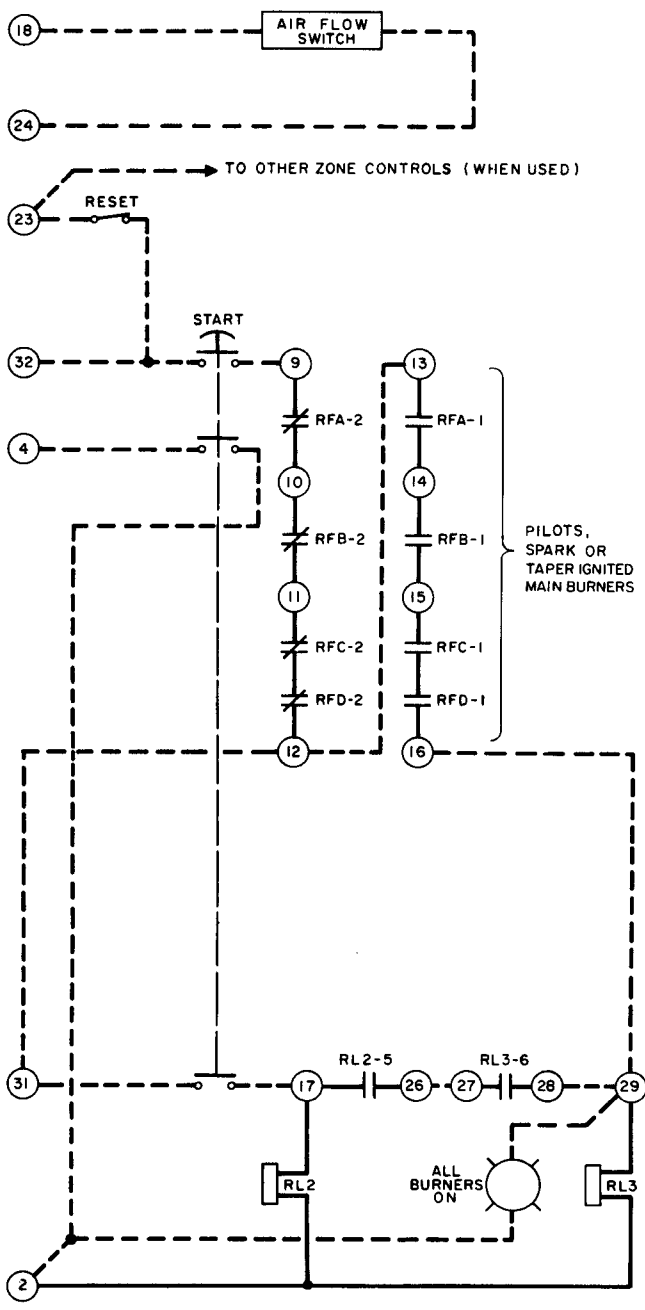


21-24 BURNERS



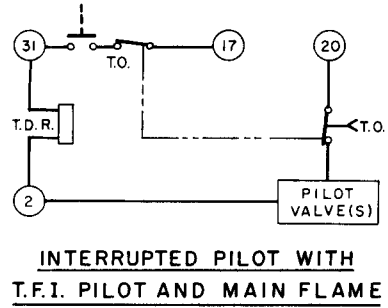
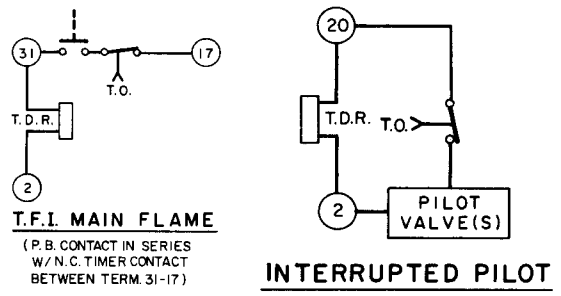
SEQUENCE OF OPERATION

START UP PROCEDURE	SYSTEM OPERATION
1. Apply power (120v 50/60Hz) to terminals 1 and 2.	Power supply and amplifier modules energized.
2. Limits close.	Terminal 18 and line side of air flow switch powered.
3. Air flow interlock closes.	Terminal 24 is powered, energizes adjustable electronic purge timer and "Purging" indicator light.
4.	Purge timer completes cycle. "Purging" light is extinguished. Terminal 23 is powered.
5. "Reset" switch placed to "Run" position.	Terminal 32 powered.
6. "Start" switch is manually depressed and held.	With all flame relays in de-energized position. Relays RL1 and RL2 are energized. Terminals 20, 21, and 25 are powered. Pilot(s), ignitor(s) and master valve (if used) are energized. Module lights are powered as each pilot flame is proved. NOTE: Trial for ignition of pilot flame or direct ignited main flame commences on those installations where a suitable auxiliary timer is applied.
7. Pilot flames or direct ignited main flames are established.	With all flame relays energized, module lights are extinguished and "All Burners On" light is powered. Relay RL3 is energized. Terminal 21 is de-energized. Terminal 22 (main fuel) is energized. NOTE: If provided, trial for ignition timing ceases when terminal 21 is un-powered.
8. Release "Start" switch.	
9. Main flame (pilot ignition) established.	On those systems equipped with a timer providing interrupted ignition and consequently trial for ignition of main flame, a safe limited period is provided to ignite the main fuel after which main flame proving is required to sustain operation.
NORMAL FIRING PERIOD	
10. Limit or air flow switch opens.	All fuel valves close immediately. Relays RL1, RL2, and RL3 de-energize. Purge timer unpowered. "All Burners On" light is extinguished. Power supply and amplifier modules remain energized. Alarm circuit will not be powered.
FLAME FAILURE	
11. Pilot and/or main flame fail.	Flame relay in affected module drops out in less than 4 seconds closing all fuel valves and de-energizing RL2 and RL3 relays. Flame relays of other modules drop out. The "First Out" indicator lamp of the module detecting the flame failure will light and remain lighted while the others will remain extinguished. Alarm light and circuit are powered. Relay RL1 remains energized. Purge timer remains powered.
12. Transfer "Run" switch to "Reset" position.	Relay RL1 de-energized. Alarm circuit silenced.



**SPARK OR TAPER IGNITED
BURNERS/PILOTS**
1-4 BURNERS OR PILOTS

To add trial for ignition or interrupted pilot, install timer as shown below; Timer Contact T.O. in series with Start Switch contact between terminals 31 and 17.

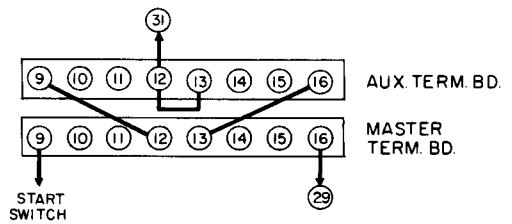


NOTE:

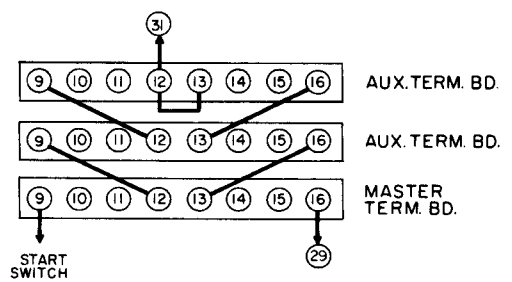
When adding auxiliary controls to accommodate additional burners, wire as shown for 1-4 burners with the exception of terminals 9-16. Interconnect terminals 9-16 between master and auxiliary controls as shown below. Then interconnect terminals 2-7 on master and all auxiliary controls.

All terminals numbered "8" must be grounded.

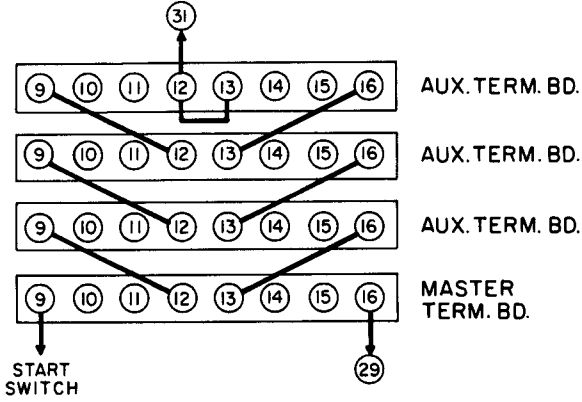
5-8 BURNERS



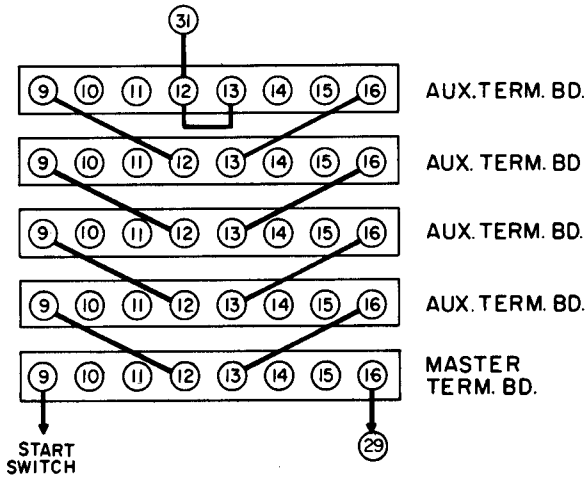
9-12 BURNERS



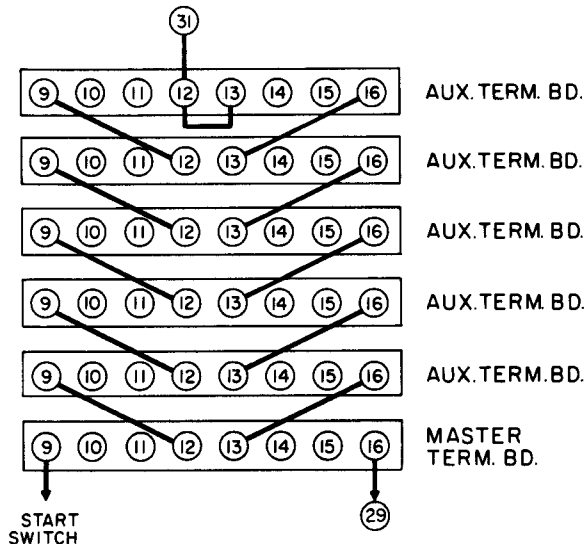
13-16 BURNERS



17-20 BURNERS

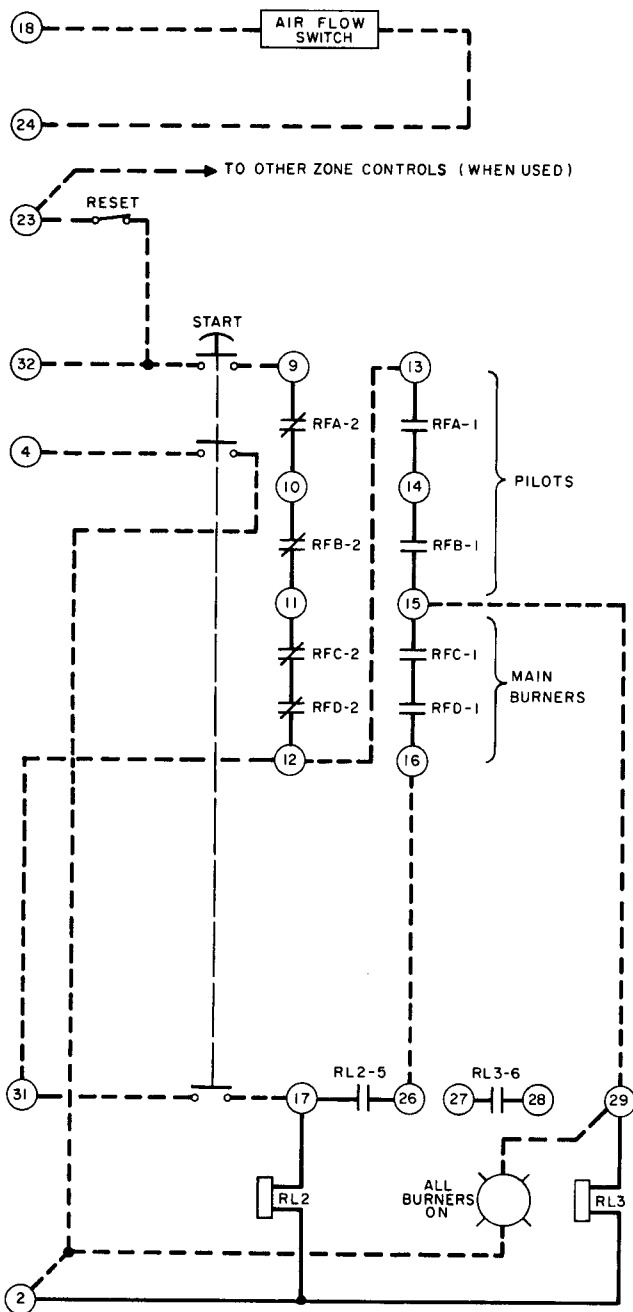


21-24 BURNERS



SEQUENCE OF OPERATION

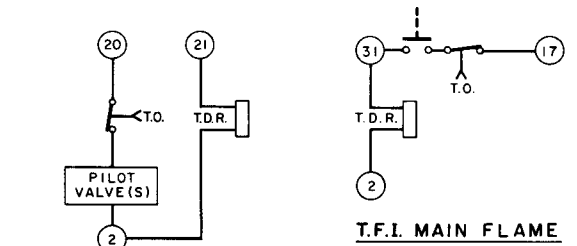
START UP PROCEDURE	SYSTEM OPERATION
1. Apply power (120v 50/60Hz) to terminals 1 and 2.	Power supply and amplifier modules energized.
2. Limits close.	Terminal 18 and line side of air flow switch powered.
3. Air flow interlock closes.	Terminal 24 is powered, energizes adjustable electronic purge timer and "Purging" indicator light.
4.	Purge timer completes cycle. "Purging" light is extinguished. Terminal 23 is powered.
5. "Reset" switch placed to "Run" position.	Terminal 32 powered.
6. "Start" switch is manually depressed and held.	With all flame relays in de-energized position. Relays RL1 and RL2 are energized. Terminals 20, 21, and 25 are powered. Pilot(s), ignitor(s) and master valve (if used) are energized. Module lights are powered as each pilot flame is proved. NOTE: Trial for ignition of pilot flame or direct ignited main flame commences on those installations where a suitable auxiliary timer is applied.
7. Pilot flames or direct ignited main flames are established.	With all flame relays energized, module lights are extinguished and "All Burners On" light is powered. Relay RL3 is energized. Terminal 21 is de-energized. Terminal 22 (main fuel) is energized. NOTE: If provided, trial for ignition timing ceases when terminal 21 is un-powered.
8. Release "Start" switch.	
9. Main flame (pilot ignition) established.	On those systems equipped with a timer providing interrupted ignition and consequently trial for ignition of main flame, a safe limited period is provided to ignite the main fuel after which main flame proving is required to sustain operation.
NORMAL FIRING PERIOD	
10. Limit or air flow switch opens.	All fuel valves close immediately. Relays RL1, RL2, and RL3 de-energize. Purge timer unpowered. "All Burners On" light is extinguished. Power supply and amplifier modules remain energized. Alarm circuit will not be powered.
FLAME FAILURE	
11. Pilot and/or main flame fail.	Flame relay in affected module drops out in less than 4 seconds closing all fuel valves and de-energizing RL2 and RL3 relays. Flame relays of other modules drop out. The "First Out" indicator lamp of the module detecting the flame failure will light and remain lighted while the others will remain extinguished. Alarm light and circuit are powered. Relay RL1 remains energized. Purge timer remains powered.
12. Transfer "Run" switch to "Reset" position.	Relay RL1 de-energized. Alarm circuit silenced.



PILOT IGNITED MAIN BURNER
(Individual Pilot & Main Flame Scanners)

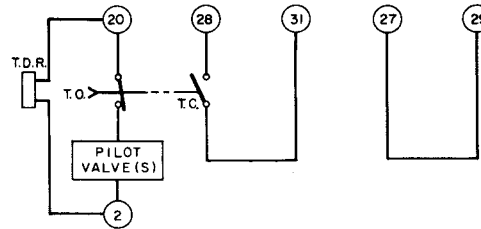
2-4 BURNERS & PILOTS

To add trial for ignition or interrupted pilot, install timer as shown below; Timer Contact T.O. in series with Start Switch contact between terminals 31 and 17.



T.F.I. INTERMITTENT PILOT

T.F.I. MAIN FLAME
(P.B. CONTACT IN SERIES W/ N.C. TIMER CONTACT BETWEEN TERM. 31-17)



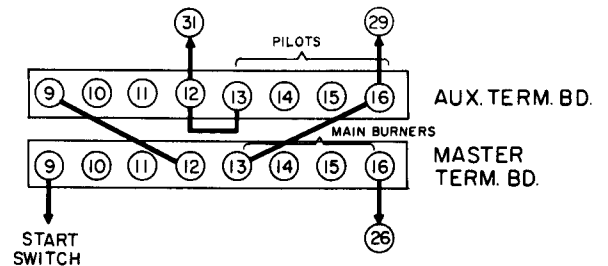
INTERRUPTED PILOT

NOTE:

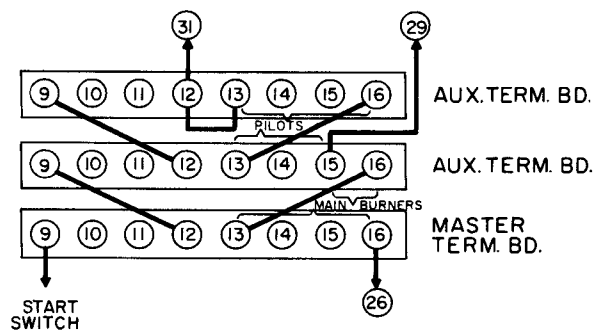
When adding auxiliary controls to accommodate additional burners, wire as shown for 1-4 burners with the exception of terminals 9-16. Interconnect terminals 9-16 between master and auxiliary controls as shown below. Then interconnect terminals 2-7 on master and all auxiliary controls.

All terminals numbered "8" must be grounded.

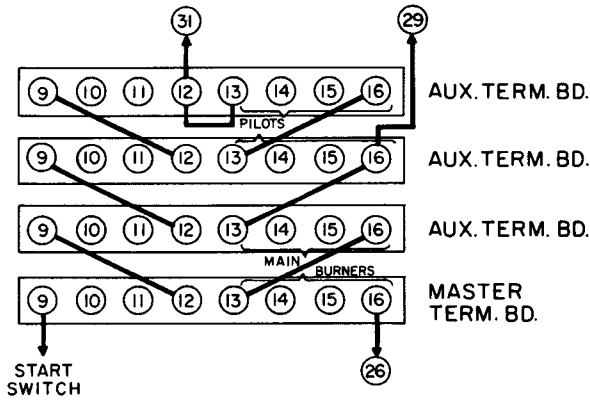
5-8 BURNERS



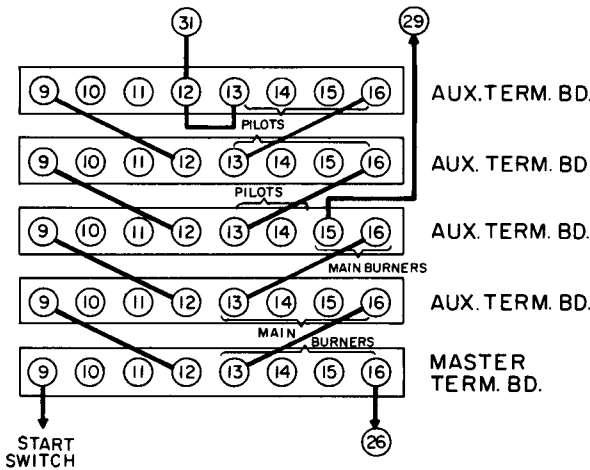
9-12 BURNERS



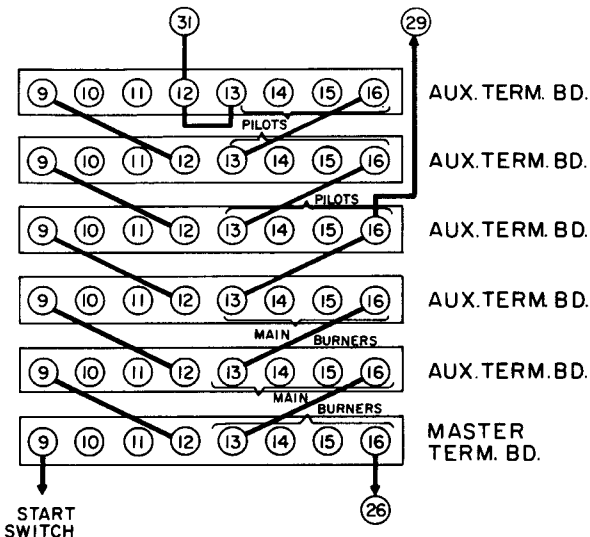
13-16 BURNERS



17-20 BURNERS

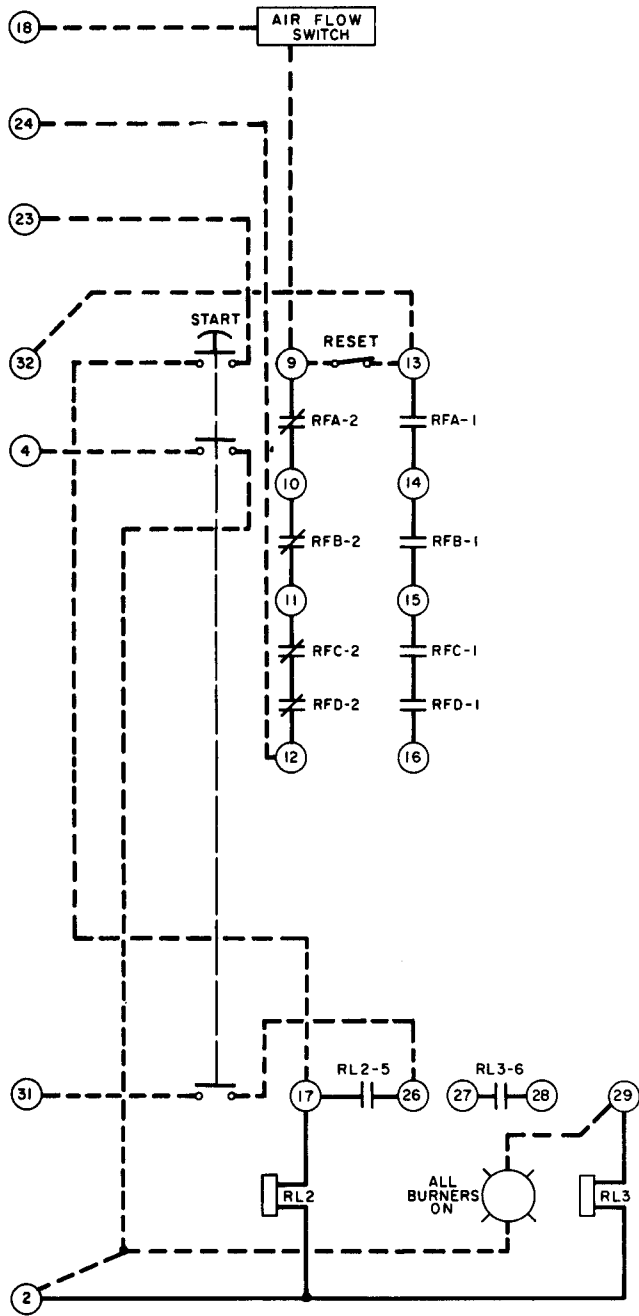


21-24 BURNERS



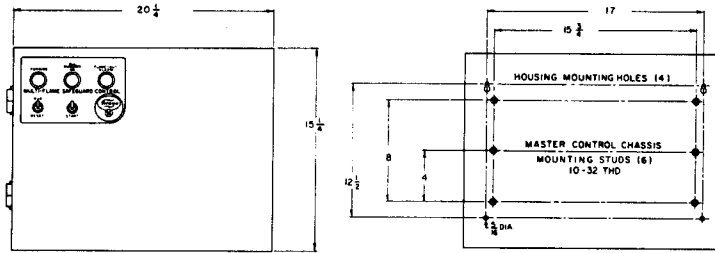
SEQUENCE OF OPERATION

START UP PROCEDURE	SYSTEM OPERATION
1. Apply power (120v 50/60Hz) to terminals 1 and 2.	Power supply and amplifier modules energized.
2. Limits close.	Terminal 18 and line side of air flow switch powered.
3. Air flow interlock closes.	Terminal 24 is powered, energizes adjustable electronic purge timer and "Purging" indicator light.
4.	Purge timer completes cycle. "Purging" light is extinguished. Terminal 23 is powered.
5. "Reset" switch placed to "Run" position.	Terminal 32 powered.
6. "Start" switch is manually depressed and held.	With all flame relays in de-energized position. Relays RL1 and RL2 are energized. Terminals 20, 21, and 25 are powered. Pilot(s), ignitor(s) and master valve (if used) are energized. Module lights are powered as each pilot flame is proved. NOTE: Trial for ignition of pilot flame or direct ignited main flame commences on those installations where a suitable auxiliary timer is applied.
7. Pilot flames or direct ignited main flames are established.	With all flame relays energized, module lights are extinguished and "All Burners On" light is powered. Relay RL3 is energized. Terminal 21 is de-energized. Terminal 22 (main fuel) is energized. NOTE: If provided, trial for ignition timing ceases when terminal 21 is un-powered.
8. Main flame established.	On those systems equipped with a timer providing interrupted ignition and consequently trial for ignition of main flame, a safe limited period is provided to ignite the main fuel after which main flame proving is required to sustain operation.
9. Release "Start" switch.	
NORMAL FIRING PERIOD	
10. Limit or air flow switch opens.	All fuel valves close immediately. Relays RL1, RL2, and RL3 de-energize. Purge timer unpowered. "All Burners On" light is extinguished. Power supply and amplifier modules remain energized. Alarm circuit will not be powered.
FLAME FAILURE	
11. Pilot and/or main flame fail.	Flame relay in affected module drops out in less than 4 seconds closing all fuel valves and de-energizing RL2 and RL3 relays. Flame relays of other modules drop out. The "First Out" indicator lamp of the module detecting the flame failure will light and remain lighted while the others will remain extinguished. Alarm light and circuit are powered. Relay RL1 remains energized. Purge timer remains powered.
12. Transfer "Run" switch to "Reset" position.	Relay RL1 de-energized. Alarm circuit silenced.



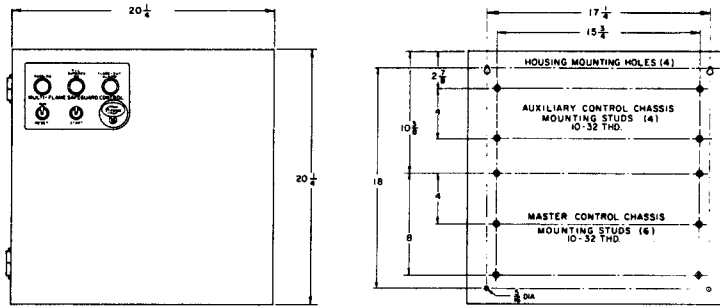
Where it is desirable or mandatory that a system have automatic repurge on recycle or flame failure, interconnect master control as shown in wiring schematic at left.

For aid in developing the remainder of this or any MB-2 system, call your local Fireye office or consult the factory.



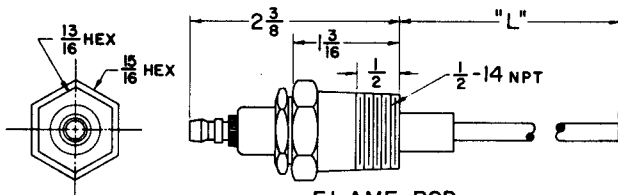
MOUNTING HOLES INFORMATION

4 - BURNER



MOUNTING HOLE INFORMATION

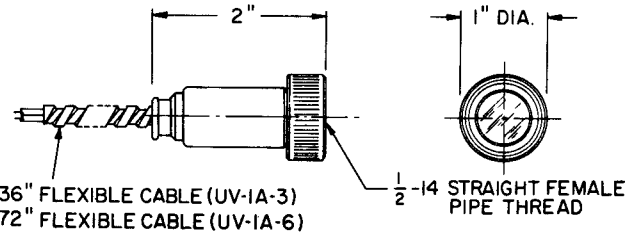
8 - BURNER



FLAME ROD

"L" LENGTH AS SPECIFIED (12", 18", 24")

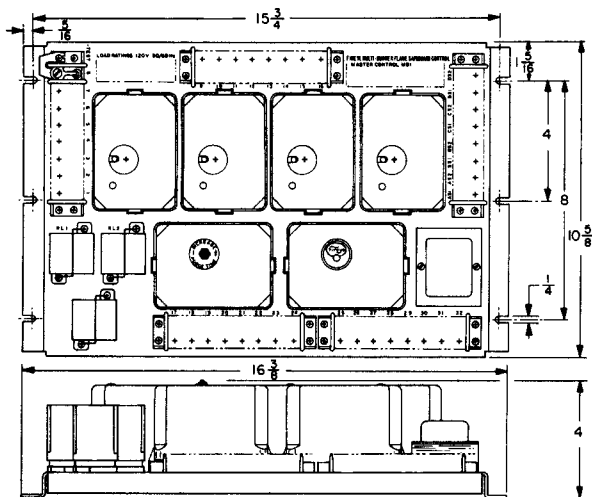
69ND1



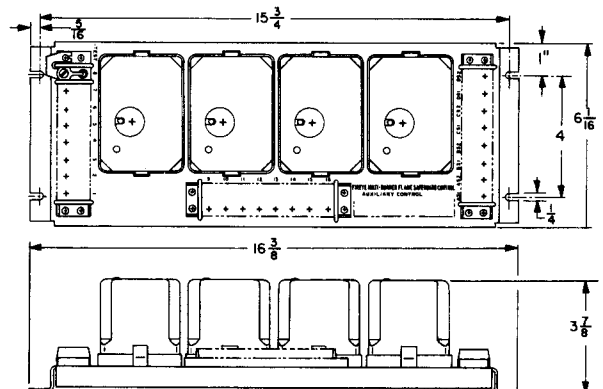
36" FLEXIBLE CABLE (UV-1A-3)
72" FLEXIBLE CABLE (UV-1A-6)

1/2-14 STRAIGHT FEMALE PIPE THREAD

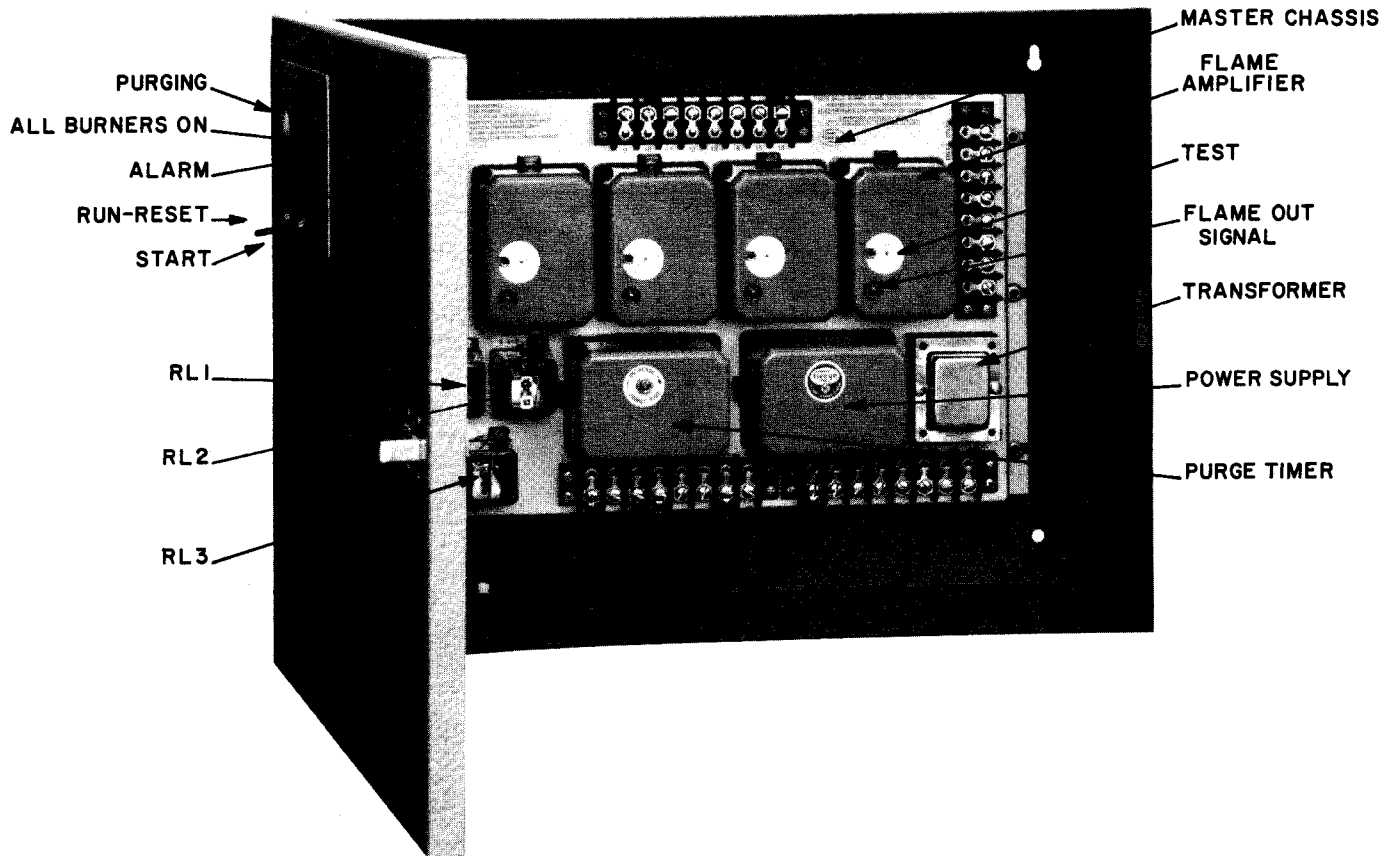
UV-1A



MASTER CHASSIS



AUXILIARY CHASSIS



CONTROL PANEL INSTALLATION

Installation

Select a location for the panel where ambient temperature is within the specified rating, and free from excessive vibration and dust.

It is recommended that the control cabinet be mounted in a position such that the operator can see all burners when standing in front of the cabinet.

All wiring to numbered terminals must be N. E. C. Class 1 wire. No. 14 TW (moisture resistant) wire is recommended.

ELECTRICAL RATING CONSIDERATIONS

“VA” ratings (not specified as pilot duty) permit the connection of transformers and similar devices whose inrush current is approximately the same as their running current.

“VA pilot duty” ratings permit the connection of relays, solenoid valves, lamps, etc. whose total operating load does not exceed the published rating and whose total inrush current does not exceed 10 times the rating.

“Running and locked rotor” ratings are intended for motors. VA and VA (pilot duty) loads may be added to a motor load provided the total load does not exceed the published rating.

This bulletin contains all of the information required for applying any of the following detectors to the MB System

Ultraviolet (UV) Detection, page 13.

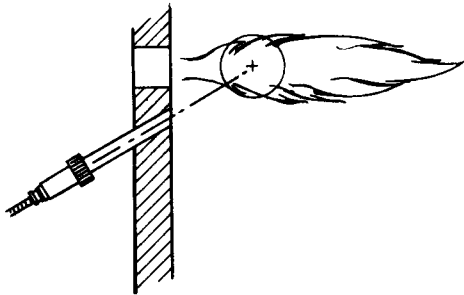
Flame Rod Detection, page 14.

APPLYING THE UV SCANNERS

GENERAL REQUIREMENTS

1. As close as possible – 18” or closer.
2. As cool as possible – Not over 212°F.
3. Avoid sighting the spark – Resight scanner, shield between spark and scanner, or orifice to reduce reflected signal from spark.
4. Must see pilot and/or main flame – Scanner view must be unobstructed.
5. Minimum pilot test – See Testing.

The maximum UV signal from a flame is found in the first one-third of the visible flame taken from the point where the flame begins. The scanner sight pipe should be aimed at this area.



A. Scanner Wiring

The UV-1A scanner is supplied with a flexible conduit connector and 3 feet of wire. If it is necessary to extend the scanner leads, the following instructions apply:

1. *Selection of wire*
 - a. Use #14, 16 or 18 wire with 75C, 600 volt insulation for up to 200 foot distance (approximately 20% signal loss at 100 feet, 40% loss at 200 feet.)
 - b. Use shielded wire (Belden 8254-RG-62 Coax Cable or equal) for each scanner wire up to 500 feet (max).
 - c. Asbestos insulated wire should be avoided.
 - d. Multiconductor cable is not recommended without prior factory approval.
2. *Installation of extended wiring*
 - a. For runs up to 10 feet (max.) the scanner leads may be run in a common conduit with other wires.
 - b. For runs over 10 feet the scanner leads must be installed in a separate conduit.
 - c. Multiconductor cable is not recommended without prior factory approval.
3. *Multiple scanners installations*
 - a. The wiring from multiple UV scanners may be installed in a common metallic conduit.
 - b. Multiconductor cable is not recommended without prior factory approval.
4. High voltage ignition wiring should not be installed in the same conduit with flame detector wires.

B. Scanner Mounting

Where possible, obtain the burner manufacturer’s instructions for mounting the scanner. This information is

available for most standard burners manufactured. The scanner mounting must comply with the following general instructions:

1. Locate the scanner as close as possible to the flame.
2. Select a scanner location that will remain within the ambient temperature limits of the UV-eye scanner (212°F). If cooling is required, use (a) an insulating coupling (Fireeye part no. 35-69) to reduce conducted heat; (b) a quartz window union (Fireeye part no. 60-1257) to seal off furnace or burner pressure; (c) cooling air to reduce the scanner sight pipe temperature.
3. Mount rigidly a short length of black iron pipe in a position that permits an unobstructed view of the pilot and/or main flame.
4. The scanner must not sight the spark directly or any part of the burner that can reflect the spark back to the scanner.
5. The maximum UV signal from a flame is found in the first one-third of the visible flame taken from the point where the flame begins. The scanner sight pipe should be aimed in this area.
6. A correct scanner application will not see a pilot flame that is too small to ignite the main flame reliably. Note particularly the test for minimum pilot.
7. On installations having negative pressure combustion chambers, a small hole (1/8” or 3/16”) drilled in the sight pipe will assist in keeping the pipe clean and free from smoke.
8. Two scanners may be installed on one burner if it is necessary to view two areas to obtain reliable detection of the flame. They should be wired in parallel.
9. The UV-eye scanner should be installed in an upright position to prevent moisture from collecting in the base.
10. The UV-eye scanner is designed to seal off the sight pipe up to pressures of 1 psi when the scanner lock nut is firmly tightened. Pressures in excess of 1 psi should be blocked from the scanner. A quartz lens union (Part no. 60-1290) or quartz window union (Part no. 60-1257) may be used. Each is rated from –3 to +100 psi max.
11. To increase scanner sensitivity, a quartz lens union (Part no. 60-1290) may be used. The quartz lens permits location of the UV-eye at twice the normal distance. Use 1/2” x close nipple between scanner and union.

69ND1 FLAME ROD – General Description

The 69ND1 flame rod proves a gas pilot flame and/or main gas flame.

It is a “spark plug” type unit consisting of a 1/2” N.P.T. mounting base, a KANTHAL flame rod, a glazed porcelain insulating rod holder and a spark plug connector for making electrical connection. The 69ND1 is available in 12”, 18” or 24” lengths.

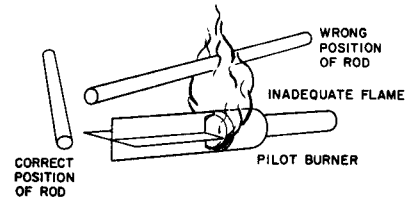
Installation

The flame rod may be located to monitor only the gas pilot flame or both the gas pilot and main gas flames. It is mounted on a 1/2” N.P.T. coupling.

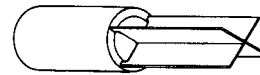
The following instructions should be observed:

1. Keep flame rod as short as possible.
2. Keep flame rod at least 1/2” from any refractory.
3. Flame rod should enter the pilot flame from the side so as to safely prove an adequate pilot flame under all draft conditions.
4. If the flame is nonluminous (air and gas mixed before burning), the electrode tip should extend at least 1/2” into the flame, but not more than half way through.
5. If the flame is partly luminous, the electrode tip should extend only to the edge of the flame. It is not necessary to maintain absolutely uninterrupted contact with the flame.
6. It is preferable to angle the rod downward to minimize the effect of sagging and to prevent it from coming in contact with any object.

7. An adequate grounding surface for the flame must be provided. The grounding surface in actual contact with the flame must be at least four times greater than the area of the portion of the flame rod in contact with the flame. It is essential to adjust the flame rod and ground area ratio to provide a maximum test meter reading.

**FLAME ROD INSTALLATION**

8. Two proven types of flame grounding adapters as shown below may be used to provide adequate grounding surface. High temperature stainless steel should be used to minimize the effect of metal oxidation. This assembly may be welded directly over the pilot or main burner nozzle.



BOMB FIN GROUNDING ASSEMBLY



THREADED ROD ASSEMBLY

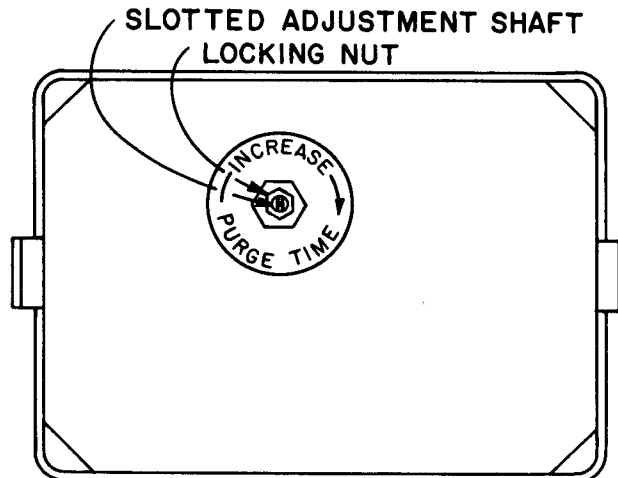
PURGE TIMER ADJUSTMENT

The plug in purge timer is adjustable over a range of 30 to 300 seconds.

To adjust timer:

1. Loosen lock nut on shaft.
2. Increase time by rotating slotted shaft clockwise; decrease timing by rotating shaft counterclockwise.
3. After checking to assure proper timing, secure adjusting shaft by tightening lock nut.

NOTE: If Purge Timer not used, jumper terminal 23 to 24.

**PURGE TIMER MODULE**

INSTALLATION TESTING

To test the amplifier modules for flame signal, a 20,000 ohms/volt D.C. voltmeter should be used, and set on the proper scale to read the voltages noted in the table below.

FLAME SIGNAL D.C. VOLTAGE			
	Pull In	Normal	Maximum
U.V.	3	7	9
Flame Rod	6	15	16-25

To assure sufficient signal margin to hold in the flame relay during random momentary downward fluctuations of signal, it is recommended that a signal as close to normal be obtained.

A. Normal Pilot Test

1. Plug DC voltmeter lead (+) into test jack on amplifier module. Attach other lead (-) to terminal 8.
2. Proceed through a normal startup to the point where the pilot flame is turned on.
3. Observe the DC voltmeter reading which should be steady. See chart for correct reading.
4. If a fluctuating voltage reading is observed with either a cool or hot combustion chamber, adjust the pilot flame or realign the scanner or flame rod position until a steady voltage reading is obtained.
5. Pilot failure protection may be observed by proceeding through a normal startup with pilot fuel shut off. Because no pilot flame is detected, the "Burner On" signal light will not light and the main fuel valve cannot be energized.

B. Minimum Pilot Test

This test insures that the Fireeye scanner or flame rod will not detect a pilot flame too small to light off the main flame. It must be made on every new installation and following any repositioning of the detector.

1. Plug DC voltmeter lead (+) into test jack on amplifier module. Attach other lead (-) to terminal 8.
2. Proceed through a normal startup to the point where the pilot flame is turned on.
3. Reduce the fuel supply to the pilot until the scanner no longer detects the flame and then increase it until the scanner energizes the flame relay. This is minimum pilot.
4. Release the pushbutton and turn on main fuel. The main fuel must light immediately from the reduced pilot flame.

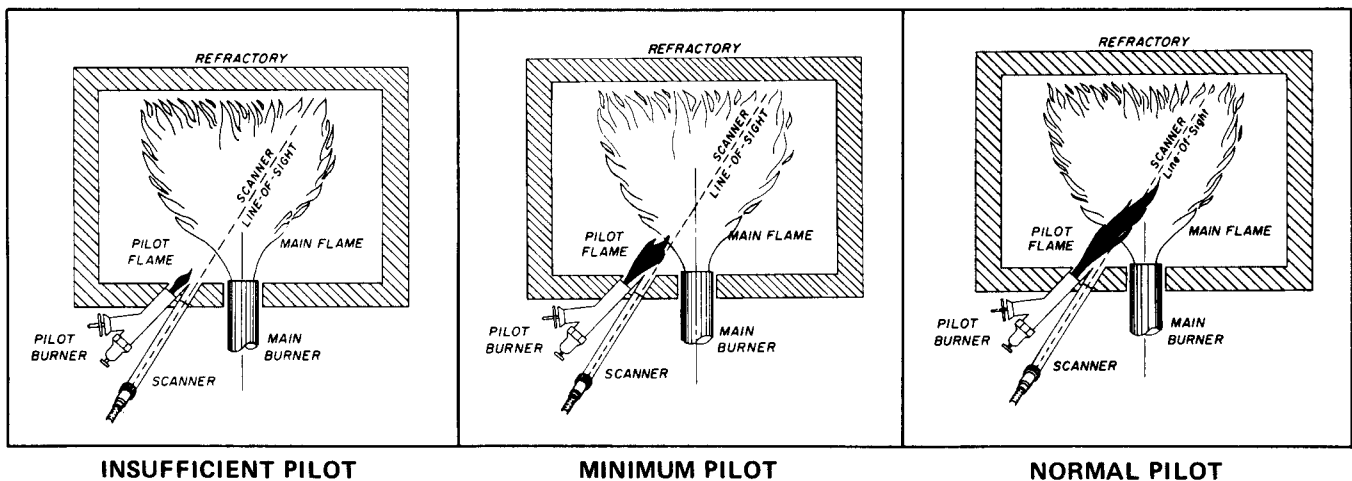
CAUTION: If main flame does not ignite in approximately the same time as with normal full pilot flame, immediately turn the burner switch off. Realign the scanner sighting pipe or flame rod so that detection requires a larger pilot flame. Then repeat the minimum pilot test until main flame lights reliably on several trials.

5. When minimum pilot test is completed, increase the pilot flame to normal size.

C. Main Flame Test

1. Proceed through a normal startup.
2. Shut off pilot flame, observe the reading on the test voltmeter. If the voltmeter reading is low, attempt to increase by readjusting main flame or realigning detector.
3. Check main flame failure protection by manually shutting off the main fuel supply. Within 4 seconds after main flame goes out, the flame relay (RF) will drop out. The alarm circuit will be energized.

CAUTION: Jumping test jack terminals can cause burner operation. Test amplifier flame signals separately.



Troubles in Packaged Flame Failure Safeguard Control System installations can be readily isolated by following the approved procedure in the sequence given below. Before beginning any troubleshooting, however, make sure that:

1. Installation is in accordance with instructions in this bulletin, and wiring conforms to the diagram supplied with the Control System.
2. Module boards are clean and receptacle contacts are not deformed or protruding.
3. Modules are securely plugged in.
4. Circuit breaker is ON.

NOTE

The following instruction applies to the No. 1 Burner only. Where switching action is duplicated in other burner circuits, substitute letters B, C, and D.

Example:

In a four burner system RFA-2, RFB-2, RFC-2, RFD-2 must all be closed to permit the latching relay to be energized; the following would say only that RFA-2, etc. must be closed.

A. Zero voltage at terminals 1-2.

1. Disconnect switch off.
2. Blown fuse.
3. Broken wire.
4. Incorrect wiring.

B. Low voltage at terminals 1-2.

1. Minimum operating voltage is 102 volts.

C. Zero voltage at terminals 18-2.

1. Open limit switch.
2. Broken wire or loose connection.

D. Zero voltage at terminals 24-2.

1. Open limit switch.
2. Open airflow interlock switch.
3. Broken wire or loose connection.

E. "Purging" light does not illuminate with power on term. 24.

1. Light burned out.
2. Dirty RP-3 contacts.

F. Zero voltage at terminals 23-2.

1. Purge timer doesn't time out.
2. Purge timer defective.
3. Dirty or open RP-2 contacts.

G. Zero voltage at terminals 32-2.

1. Reset switch not in "Run" position.
2. See notes under "A," "D," and "F" above.

H. With power to terminal 9, RL1 relay does not pull in.

1. Defective relay.
2. Detectors viewing flame.

3. Flame relay(s) held in energized position electrically or mechanically.
4. Dirty RFA-2, etc. contacts.
5. Incorrect or missing jumpers due to unused module sockets.

I. RL1 relay drops out when pilot proved.

1. Dirty RL1-5 contact.

J. Pilot flame is not established when start switch is depressed.

1. Defective or improperly adjusted ignition electrodes.
2. Defective ignition transformer.
3. Defective pilot fuel valve.
4. Plugged or misadjusted pilot burner.
5. No pilot fuel.
6. Incorrect wiring or loose connection.
7. Dirty RL2-4 contact.
8. Dirty RL3-1 contact (spark).
9. RL2 relay not energized.
10. Reset switch not in "Run" position.

K. Flame relay (RF does not pull in when flame is established.

1. Detector does not sense flame.
2. Detector dirty.
3. Flame relay blocked open mechanically.
4. Broken detector wire.
5. Defective detector or control.

L. Pilot(s) go out when start switch released.

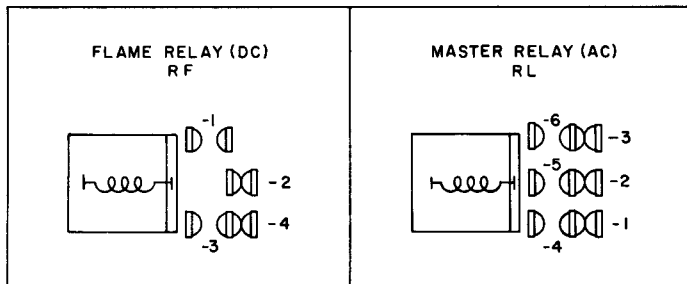
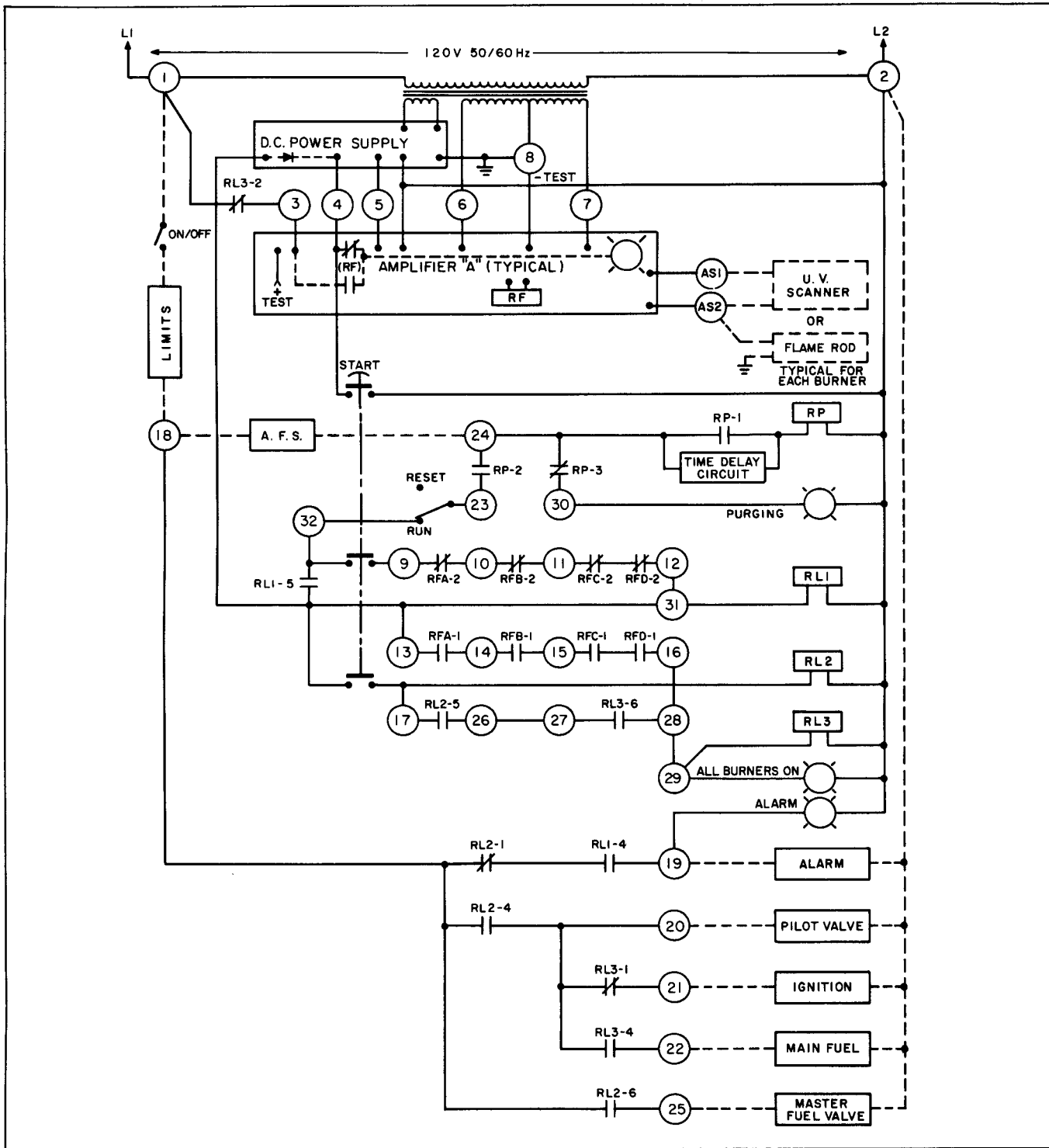
1. Detector(s) do not sense flame.
2. Dirty RFA-1, etc. contacts.
3. Dirty RL2-5 contact.
4. RL2 relay not pulling in.
5. Incorrect

M. "All Burners On" light does not illuminate with all pilots lit.

1. Light burned out.
2. Flame relay(s) defective, held open mechanically or open coil.
3. RFA-1, etc. contact(s) dirty.
4. Detector(s) do not sense flame; readjust detector.
5. Incorrect or missing jumpers due to unused module sockets.

N. Main flame does not light (Pilot ignited burner).

1. Defective main fuel solenoid valve.
2. No main fuel or burner out of adjustment.
3. Inadequate pilot flame.
4. Incorrect wiring, broken wire or loose connection.
5. Dirty RL3-4 contacts.
6. RL2 relay not energized.

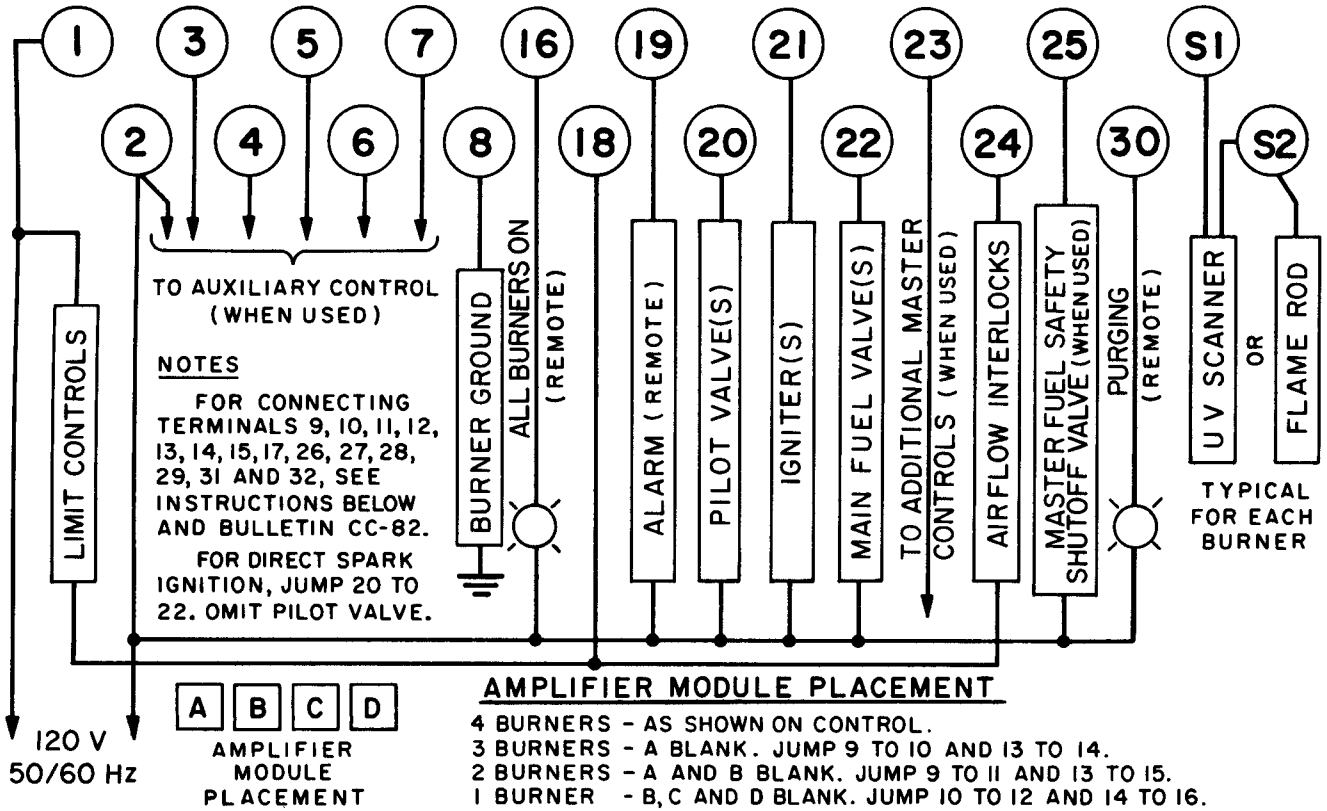


CONTACT IDENTIFICATION

ORDERING INFORMATION

A. MB-2 SYSTEM WITH CONTROL CABINET	
Part Number	Description
60-1363-2	Cabinet, master chassis, power supply, relays, switches and lights for 1 to 4 burners.
60-1364-2	Cabinet, master and 1 auxiliary chassis, power supply, relays, switches and lights for 5 to 8 burners.
61-3359	UV amplifier, plug in module (one per burner).
61-3358	TF amplifier, plug in module (one per burner).
61-3357	Purge Timer, plug in module (one per system).
UV-1A	UV scanner.
69ND1-K4	Flame Rod 1/2" connection, 12" length.
69ND1-K6	Flame Rod 1/2" connection, 18" length.
69ND1-K8	Flame Rod 1/2" connection, 24" length.
B. MB-2 SYSTEM WITHOUT CONTROL CABINET	
61-3381-2	Master chassis with relays (for 1 to 4 burners).
61-3380-1	Auxiliary chassis (one for each additional 4 burners).
61-3359	UV amplifier plug in module (one per burner).
61-3358	TF amplifier plug in module (one per burner).
61-3357	Purge timer, plug in module (one per system).
61-3356	Power supply, plug in module.
UV-1A	UV scanner.
69ND1-K4	Flame rod, 1/2" connection, 12" length.
69ND1-K6	Flame rod, 1/2" connection, 18" length.
69ND1-K8	Flame rod, 1/2" connection, 24" length.
27-198	Indicating light assembly – white (purge).
27-196	Indicating light assembly – amber (burner on).
27-197	Indicating light assembly – red (alarm).
6-220	Switch assembly – run – reset.
6-221	Switch assembly – start.
C. ACCESSORIES	
35-69	1/2" Heat insulator for scanner.
60-1257	1/2" Sealing union with quartz window (100 PSI).
60-1290	1/2" Sealing union with quartz lens (100 PSI).
45-63	Timer, 115 V. 60 Hz, 10 amp. S.P.D.T. (5 sec. to 5 min. adjustable)
D. REPLACEMENT PARTS	
61-3381-2	Master chassis with relays.
61-3380-1	Auxiliary chassis.
8-449	Relay RL1, RL2, RL3.
61-3359	UV amplifier, plug in module.
61-3358	TF amplifier, plug in module.
61-3357	Purge timer, plug in module.
61-3356	Power supply, plug in module.
UV-1A	UV scanner.
69ND1-K4	Flame rod 12".
69ND1-K6	Flame rod 18".
69ND1-K8	Flame rod 24".
27-198	Indicating light assembly – white – purge.
27-196	Indicating light assembly – amber – burner on.
27-197	Indicating light assembly – red – alarm.
6-220	Switch assembly – run – reset.
6-221	Switch assembly – start.

FIREYE MULTI-BURNER FLAME SAFEGUARD CONTROL MODEL MB2



SEE CHASSIS LABEL FOR ELECTRICAL RATINGS-SEE BUL. CC-82 FOR ALTERNATE CONNECTION ARRANGEMENTS & MORE THAN 4 BURNERS





MAINTENANCE

Flame Rod: Type 69ND1 –

Replace as necessary. Routine cleaning of the rod and insulator with soap and water or solvent recommended.

Contacts –

All relay contacts are designed with adequate wiping action for self cleaning under normal conditions. In atmospheres carrying excessive dust or oily vapors, contacts may require occasional cleaning. Use a burnishing tool or fine grade of crocus cloth for cleaning. Never file, sandpaper or apply liquid or aerosol spray cleaners.

Scanner UV-1A

The viewing window must be kept clean. Even a small amount of contamination will reduce the flame signal reaching the detector. A routine schedule should be set up. Wipe the window with a clean soft cloth. If necessary, dampen the cloth with concentrated detergent.

Periodic Safety Checks –

It is recommended that a procedure be established to test, at least once a month, the complete flame safeguard system. This test should verify flame failure safety shut-down and fuel valve tightness.

ROTATION

It is recommended that units purchased as spares be rotated periodically, so that each unit will be placed in operation at least every 90 days.

MB-2 SPECIFICATION

The multiple burner unit shall be equipped with an FM approved and Underwriters Laboratories component recognized flame safeguard control system which shall provide the following:

1. Prepurge with proven air flow prior to each firing cycle, the integral plug in purge timer to be adjustable from 30 to 300 seconds.
2. Pilot proving prior to energizing main fuel valve on pilot ignited burners.
3. Flame failure response time not to exceed 4 seconds.
4. Manual start.
5. Flame detection to be accomplished by A. Rectification flame rod, or B. miniaturized UV-EYE scanner designed to mount on and sight through 1/2" sight pipe.
6. Signal lights shall be provided that indicate Purging, All Burners On, and Alarm.
7. The flame signal amplifiers shall have solid state electronics, shall be of plug in modular construction, with plastic enclosure for protection against contamination. The amplifier modules shall have name off/on indication, designed to indicate first out to simplify trouble shooting. There shall be provisions for readily attaching a DC test voltmeter for flame signal strength measurement.
8. Integral alarm circuit.
9. The unit shall be suitable for zone control whereby name failure of any one burner shall shut down only its zone; at the option of the system designer.
10. The name safeguard system shall be Fireeye MB-2.

NOTICE

When Fireeye products are combined with equipment manufactured by others and/or integrated into systems designed or manufactured by others, the Fireeye warranty, as stated in its General Terms and Conditions of Sale, pertains only to the Fireeye products and not to any other equipment or to the combined system or its overall performance.

WARRANTIES

FIREYE guarantees for one year from the date of shipment of its products to replace, or, at its option, to repair any product or part thereof (except lamps, electronic tubes and photocells) which is found defective in material or workmanship or which otherwise fails to conform to the description of the product on the face of its sales order. **THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES AND FIREYE MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.** Except as specifically stated in these general terms and conditions of sale, remedies with respect to any product or part number manufactured or sold by Fireeye shall be limited exclusively to the right to replacement or repair as above provided. In no event shall Fireeye be liable for consequential or special damages of any nature which may arise in connection with such product or part.



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