



Control Type 25RU8 Model 4580



Scanner Type 45UV5 Model 1005

**FLAME SAFEGUARD
AND PROGRAMMING
CONTROL**
for automatic burners

25RU8-4580 is specifically designed to comply with requirements of FM, and FIA for automatic gas or oil fired burners.

FEATURES:

Fireeye System UVP-2S provides ignition and flame failure protection for Industrial sizes of automatically Ignited Oil and Gas Burners. In conjunction with limit and operating controls and interlock devices, they automatically program the operation of Burner/Blower Motor, Ignition, Main Fuel Valves and Modulator.

The control cycles automatically when the operating control circuit closes and following a power interruption, but must be manually reset following a safety shutdown.

Featured are — enforced maximum air flow prepurge, pilot proving prior to energizing the main fuel valve, selectable 10-15 second trial for ignition of main flame and a postpurge following fuel shutoff.

The FLAME DETECTION circuit is repetitive self-checking for fail safe operation. A shutter in the scanner periodically interrupts the light beam from the flame.

If any component from the U-V Eye scanner tube to the Flame Relay becomes defective, a safety lockout is initiated.

A safe start interlock is incorporated which is effective on every start. Any condition which causes the flame relay to be in its energized position during the checking period will cause safety lockout. An interlock circuit is provided for a valve position interlock which proves the main fuel valve closed prior to a start-up. The modulator switching circuit drives the air dampers closed during the off period; open during the purge; to the starting position prior to lightoff; and to automatic control after the main flame is established. Interlock circuits require proof that the dampers are open during the purge and at the starting position during lightoff. An interlock circuit is provided for air flow switches, fuel pressure switches, etc., which must be closed during the prepurge and firing cycle. A safety lockout will occur if this interlock circuit opens during an operating cycle. The control systems are designed to de-energize all fuel valves within 4 seconds following flame failure. An alarm circuit actuates audible or visual alarms following a safety lockout. The controls incorporate plug-in design for ease of installation.

SPECIFICATIONS:

Fireeye System UVP-2S, consisting of control type 25RU8 Model 4580 and Scanner Type 45UV5 Model 1005.

SUPPLY VOLTAGE:

120 Volts (min. 102v, max. 132v) at 50/60 Hertz

VOLT-AMPERE RATINGS:

Power Consumption — Operating 30 va (60 va peak)
Power Consumption — Standby 15 va
Maximum connected load 2000 va
See adjacent chart for additional rating data

MAXIMUM OPERATING TEMPERATURE:

25RU8 Control (Ambient) 125 F
45UV5 flame scanner 200 F

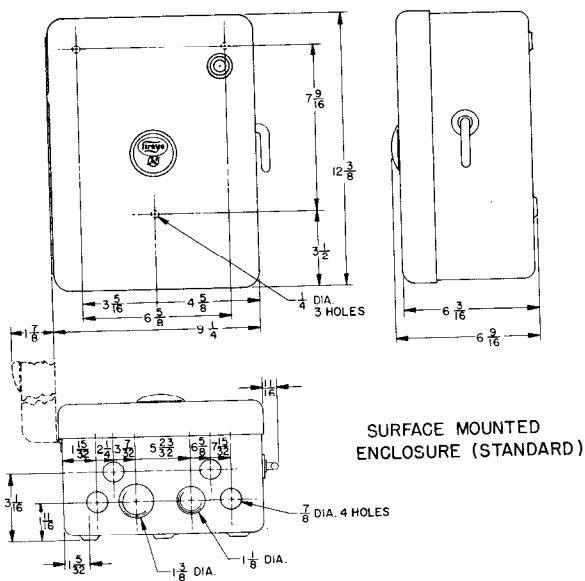
Shipping Weight Per System: 25 lbs. (approximate)

Terminal Ratings (Maximum) for
Type 25RU8 Model 4580

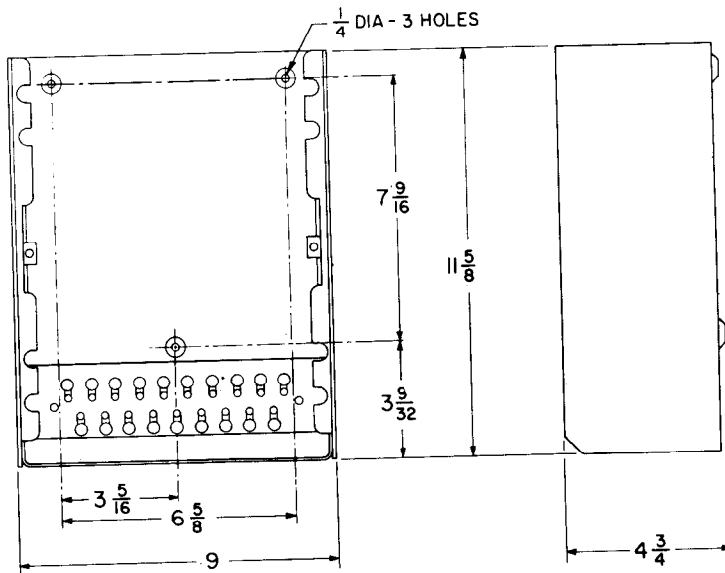
Terminal	Typical Load	A	B
		Maximum Rating at 120v-60 Hz	Alternate Rating at 120v-60Hz using Wire Rated at 75°C or Higher for Chassis Connections
5, or 6 or Combination	Ignition Transformer Gas Pilot Valve	500va (Transformer) 125va Pilot Duty or 300va (Transformer) 65va Pilot Duty 460va Opening { Motorized 120va Holding } Valve 520va L.R.	500va (Transformer) 50va Pilot Duty or 300va (Transformer) 125va Pilot Duty
7	Main Fuel Valve	130va Pilot Duty or 65va Pilot Duty 460va Opening { Motorized 120va Holding } Valve	250va Pilot Duty or 65va Pilot Duty 1250 va Opening { Motorized 500va Holding } Valve
8	Burner Motor Blower Motor Motor Starter	5.8 amps — Full Load 34.8 amps — Locked Rotor or 250va Pilot Duty	
9	Alarm	50va Pilot Duty	
1,10, 11.	Modulator	125va Pilot Duty @ 120 volts or 2 amps @ 30 volts AC maximum (N.E.C. Class 2)	

Select ALL Terminal Ratings from ONE Column, either A or B. Total connected load not to exceed 2000va.

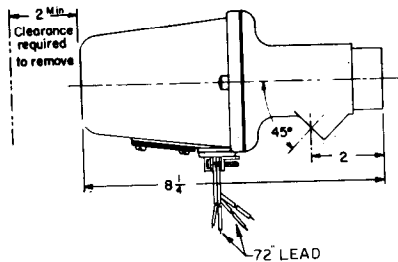
DIMENSIONS



SURFACE MOUNTED ENCLOSURE (STANDARD)



OPEN MOUNTING FRAME



Note: Material - Aluminum

SCANNER TYPE 45UV5 MODEL 1005

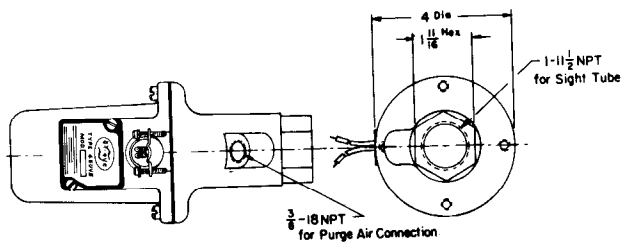


Figure 1

Scanner Installation

Install the Scanner Type 45UV5 in the manner recommended by the burner manufacturer. If no specific installation instructions are available, proceed as follows.

The general instructions which follow apply to installations of a single scanner which monitors both pilot and main flames. If separate scanners are used for pilot and main flames, consult the burner manufacturer for specific installation instructions.

1. The sight pipe on which the scanner mounts must be aimed such that the scanner sights a point at the intersection of main and pilot flames. This usually places the sight tube in an area between main and pilot burners (Figure 2). An acceptable location must assure the following:

- Reliable pilot flame signal.
- Reliable main flame signal.
- A pilot flame too short or in the wrong position to ignite the main flame reliably shall not be detected.

Since oil and gas flames radiate more ultraviolet from the base of the flame than from further out in the flame, this fact should be considered when sighting to satisfy the three above noted requirements.

2. If combustion air enters the furnace with a rotational movement of sufficient velocity to deflect pilot flame in the direction of rotation, sight the scanner 10 to 15 degrees downstream of the pilot burner.

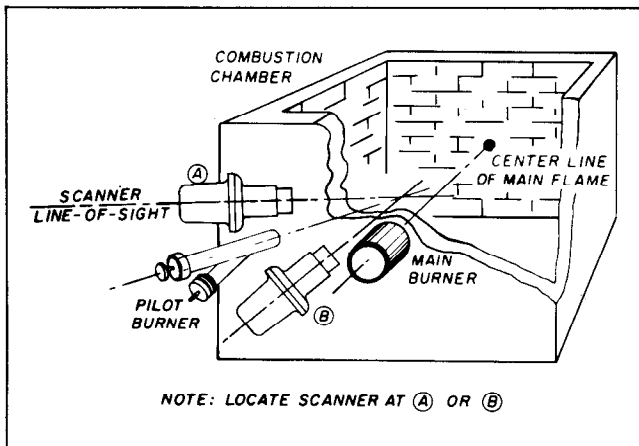


Figure 2

3. Scanner must have unobstructed view of both pilot and main flames (Fig. 3).

SCANNER MUST HAVE UNOBSTRUCTED VIEW OF FLAME

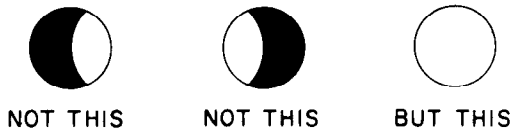


Figure 3

4. Both pilot and main flames must completely cover scanner field of view (Fig. 4).

FLAME MUST COMPLETELY COVER SIGHT OPENING



Figure 4

5. Having determined an approximate location for the sight tube, cut a 2" diameter hole through the front plate.

6. Mount scanner sight pipe by either:

- Centering a FIREYE No. 60-1178-6 swivel mount over the 2" hole and installing sight pipe on swivel mount, or
- Inserting end of sight pipe into 2" hole, aligning pipe to desired viewing angle and tack — welding in position (making sure that weld is adequate to support weight of installed scanner).

7. When a satisfactory sighting position has been confirmed by operating tests, the sight tube should be firmly welded in place; if the swivel mount is used, the ball position should be secured by tack-welding the ball to the socket hub.

8. Scanner viewing lens should be kept free of contaminants (oil, smoke, soot, dirt).

Reducing Scanner Temperature

If the scanner mounting hub exceeds the 200°F limit, inject purging air and/or extend the sight tube (see Fig. 5). If extending the sight tube results in too much reduction of signal, use 1½ or 2 inch pipe for the major sight tube and reduce to 1 inch just ahead of the scanner. Do not extend sight tube inward beyond the plate on which it mounts.

Note: Scanner air purging is recommended for keeping scanner optics clean regardless of whether or not temperature reduction is needed.

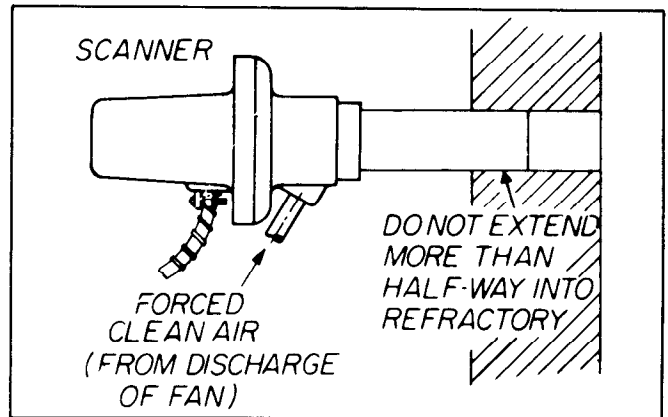


Figure 5

Scanner Wiring

Install the four leads furnished with the 45UV5 scanner in flexible conduit and connect them to the control, two RED wires (UV tube) to terminals 12, 13; two BLACK wires (shutter) to terminals 14, 15. A conduit connector is supplied with the scanner.

Six (6) feet of wire is supplied. If additional wire length is required, use a separate conduit for the scanner wiring and provide the following:

- Up to 25 foot conduit run.
 - Use #18 or heavier TW, 600v, 90°C, rated wire, installed in conduit.
- Over 25 to 300 feet maximum.
 - Use #18 or heavier TW, 600v, 90°C, rated wire for the two black leads (shutter).
 - Use RG-62/U (Belden 8254 or equal) coaxial cable for each red lead (UV tube). At the control end, splice both shields together and connect the shields to terminal 15. At the scanner end, splice both shields together and tape, do not ground the shields at the scanner end.

For multiple burner installations:

- Where more than one set of scanner leads are installed in a common conduit, follow #2 (above) for entire conduit run.



Figure 6

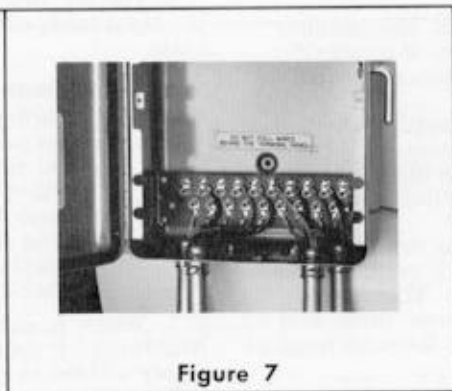


Figure 7

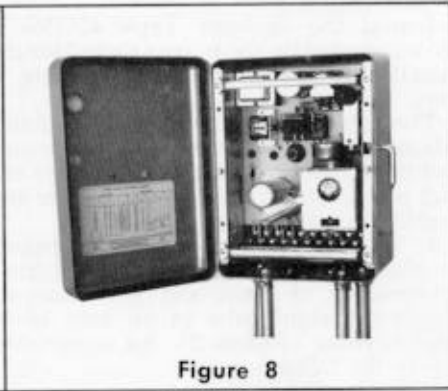


Figure 8

Control Installation

The plug-in model 4580 control chassis must be mounted in one of the enclosures illustrated in Fig. 1.

Select a control mounting location on a panelboard or upright surface that is free from excessive vibration. Secure enclosure to mounting surface with screws or bolts using Fig. 1 for drilling dimensions. The open mounting frame is only recommended for use in a larger control enclosure.

Make wiring connections at terminal panel at bottom of housing (Fig. 7). Follow approved wiring diagrams. Connections to terminals should be made either with looped bare wire ends or with UL approved wire lugs. Do not allow wires or lugs to extend beyond upper edge of terminal panel; do not pull wires behind terminal panel.

After all wiring is completed, plug the chassis into the enclosure (Fig. 8) and tighten the captive thumb screws.

Electrical Rating Considerations

Electrical ratings of Fireye controls, regardless of the terms in which they are stated, are based on normal circuit current in amperes multiplied by nominal circuit voltage, called volt-amperes and abbreviated as VA.

To convert from watts to volt-amperes or horsepower, etc., refer to the National Electric Code Handbook.

All published ratings apply to AC loads. For DC ratings, consult the factory.

Published load ratings assume that no contact be required to handle inrush current more often than once in 15 seconds. The use of control switches, solenoids relays, etc. which chatter will lead to premature failure of switches in the Fireye control. Similarly, the contacts cannot be expected to handle short circuit currents without damage. It is important to run through a test operation (with fuel shut off) following the tripping of a circuit breaker, a blown fuse or any known instance of chattering.

Running and Locked Rotor Amperes is a rating intended specifically for motors, but a non-pilot duty load (see below) may be applied if normal and inrush cur-

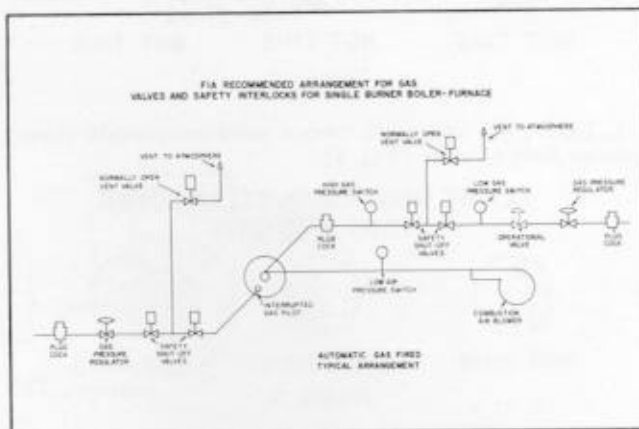
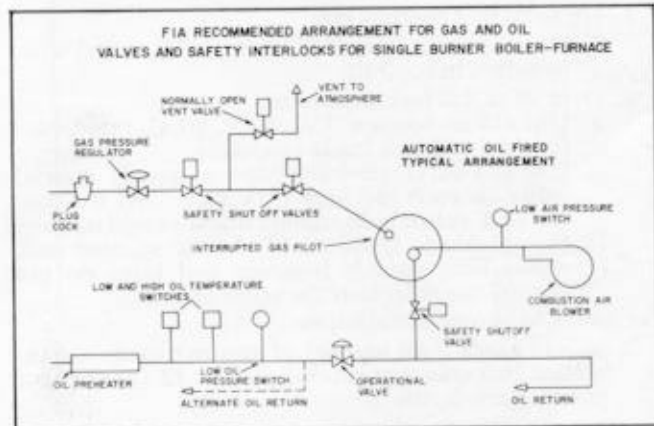
rents do not exceed running current rating. Also an indicator lamp may be combined with a motor load if the total of lamp inrush (figured at 10 times normal current) and motor locked rotor currents does not exceed the locked rotor rating.

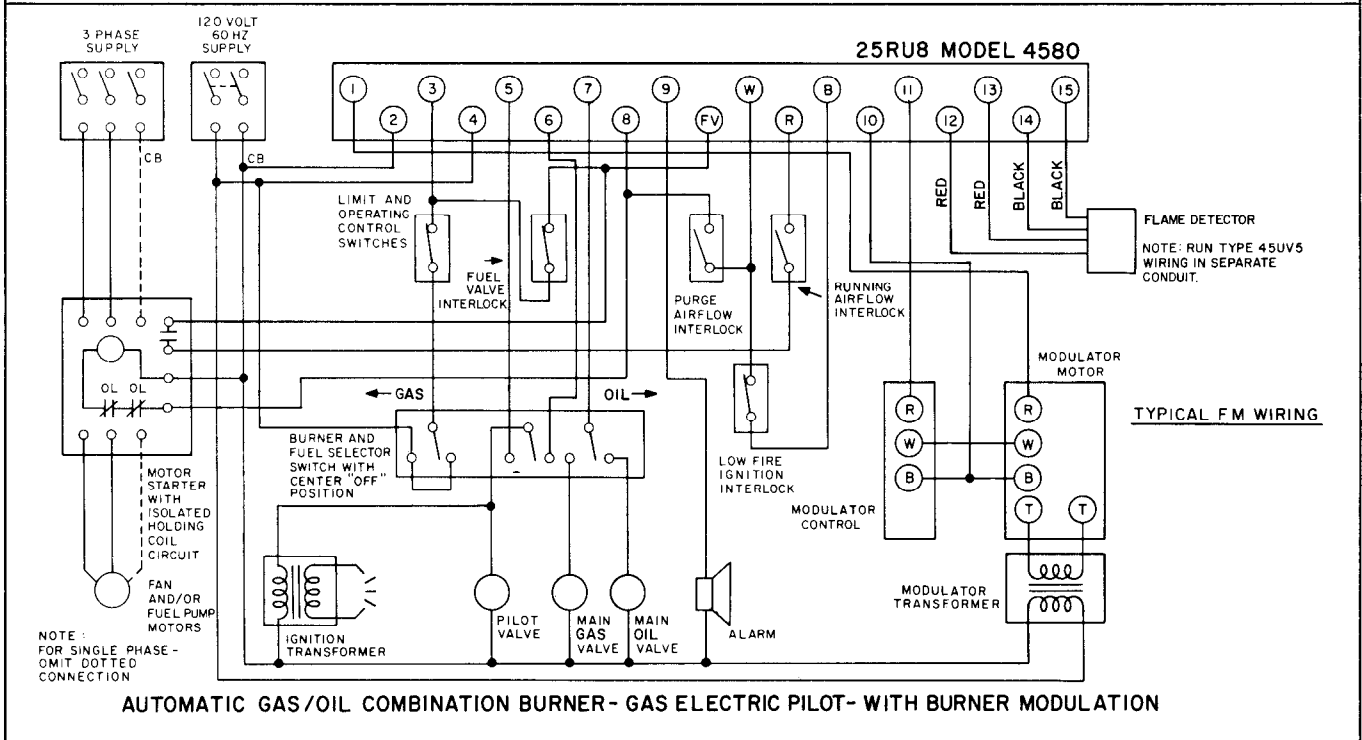
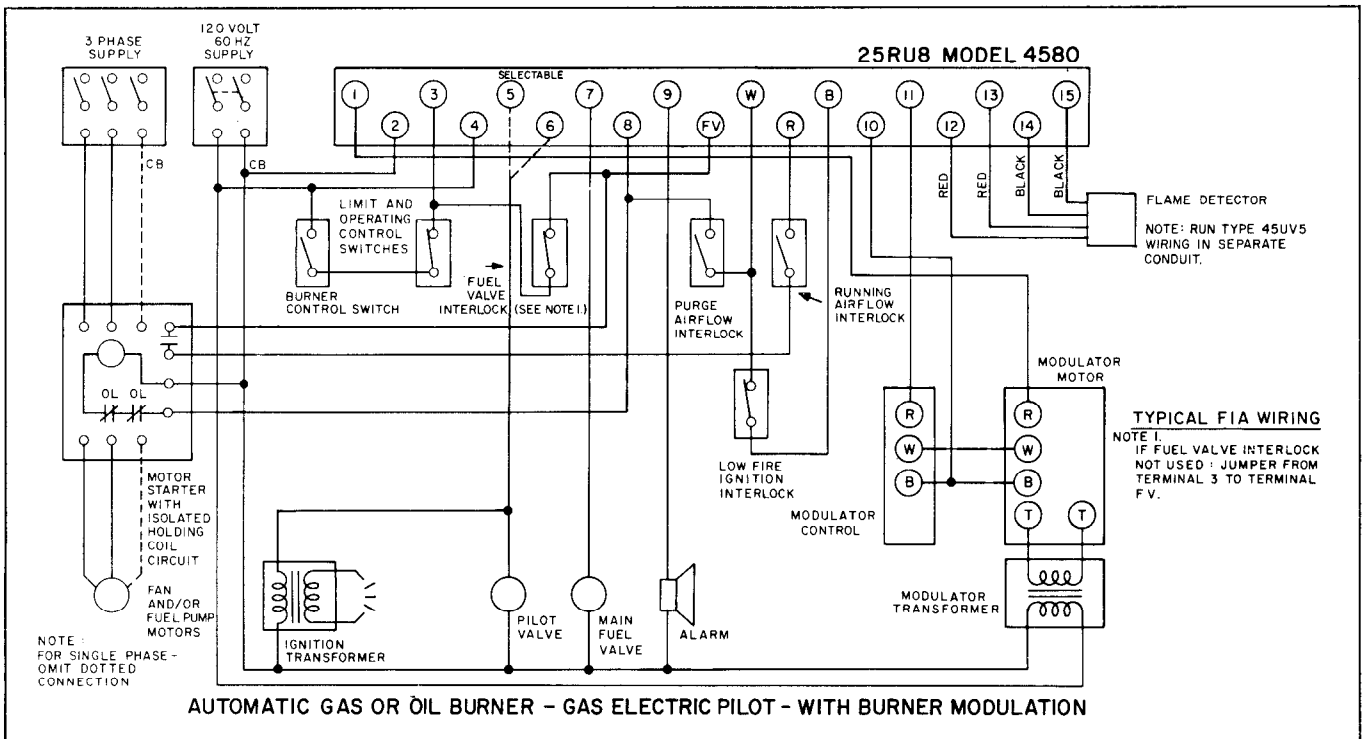
VA Pilot Duty rating permits the connection of relays, solenoid valves, small motors, indicator lamps, and other electrical VA devices under the condition that normal operating VA may not exceed the rating. Inrush (or locked rotor) VA may not exceed ten times the rating.

VA rating not specified as pilot duty permits the connection of transformers and similar devices wherein the inrush current is not considered to exceed the normal current.

The maximum simultaneous running current load on the circuit supplying the Fireye control may not exceed 2000 VA. Since the control itself is rated at up to 35 VA, the total load connected to the control (exclusive of flame failure alarm devices) may not exceed 1965 VA.

Because of the special hazards that could accompany fusing of the fuel valve circuit contacts, they are constructed of a weld-resistant material.





RELAY, LOCKOUT SWITCH AND TIMER OPERATION

- A. Master Relay (RL1) is located slightly above center of chassis. Non-recycling relay RL3 pulls in RL1. RL1 remains energized from the start of a program until a limit or operating control opens or the lockout switch trips.
- B. Flame Relay (RL2) is located at top right of chassis. It is energized in response to flame signal. It is energized as soon as flame is detected and remains energized until the flame goes out.
- C. Non-recycling Relay (RL3) is located to the left of RL1 on the chassis. It is energized by the fuel valve interlock, and held in by the non-recycling interlocks.
- D. The lockout switch (LS) is located to the right of RL2 on the chassis. It trips (contacts transfer to safety position) if RL2 assumes its energized position

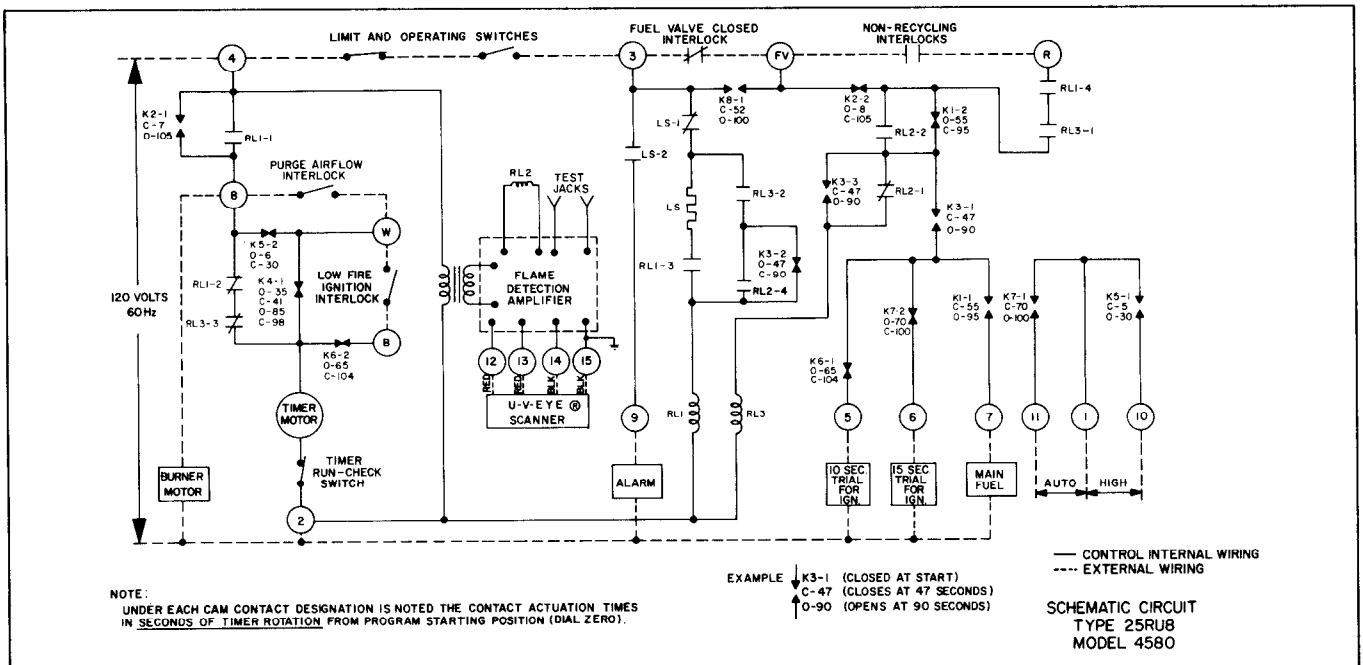
- tion prior to "ignition on" or if RL2 assumes its de-energized position due to ignition failure or flame failure. It is a thermally actuated device which trips after its heater is continuously energized for about one minute. Its contacts will not automatically release from the safety position and must be manually reset after cooling period of two or more minutes.
- E. The timer (K) is located at the lower right hand side of the chassis. It consists of multiple-leaf switches actuated by cams driven by a synchronous motor. The switches operate in a non-adjustable timed program to control (in association with RL1, and RL2) all external loads except alarm. The timer itself is variously controlled by RL1 and RL2 and its own contacts. Timer shaft position is indicated by a drum-type dial.

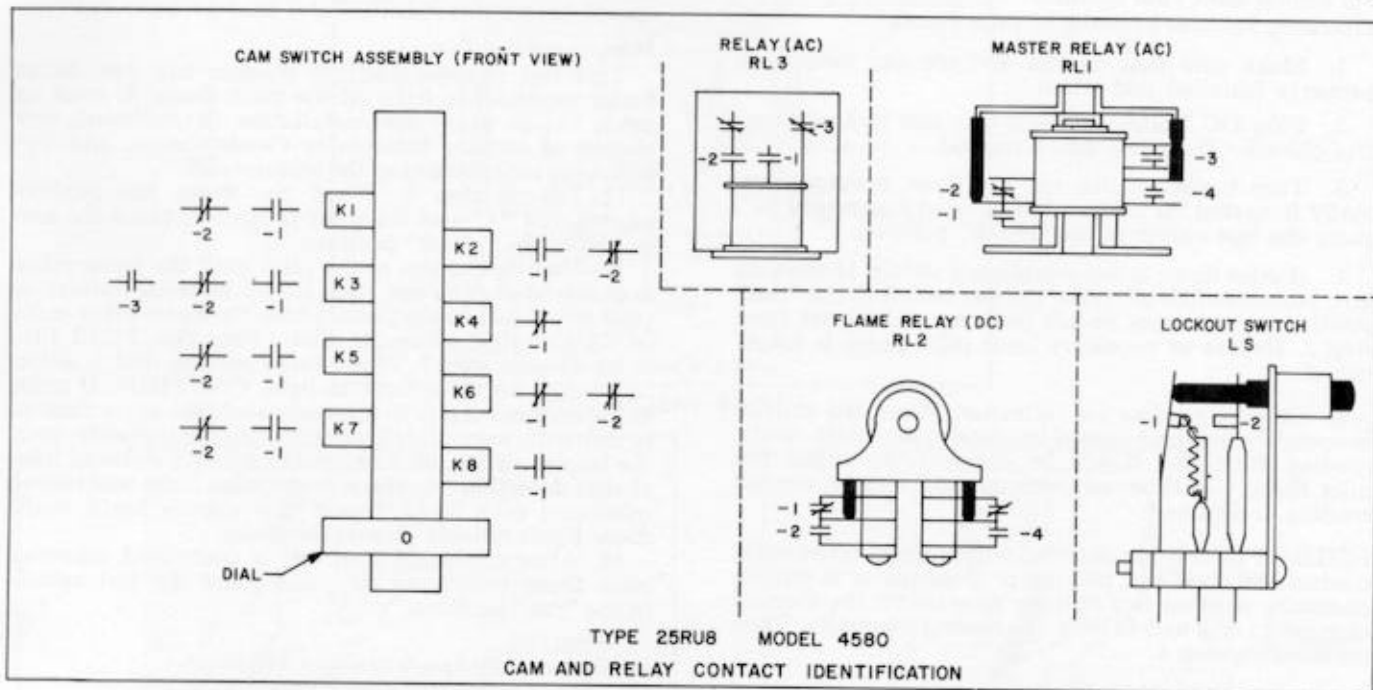
TIMING SEQUENCE: 25RU8 Model 4580

Gas or Oil Proven Pilot (No connection between terminals 6 and 7)		
Timer Rotation (Seconds)	Dial Indications	BURNER START-UP ACTION
0	0	Limit switches and fuel valve closed interlock (Term. 3 to FV) must be closed. Operating control closes, energizing Relay RL3. Relay RL1 is energized. Timer starts. Burner motor starts (Terminal 8).
5	—	Modulator drives to high fire (Term. 10).
6	—	Purge airflow interlock must be proven (Term. 8-W) or timer will stop.
8	—	Non-recycling interlocks must be closed (Term. FV-R) or lockout will occur.
30	—	Modulator drives to low fire position (Term. 10 de-energized).
35	—	Low fire ignition interlock must be proven (Term. W-B) or timer will stop.
47	1	Ignition on (Term. 5 or Term. 6).
55	2	If pilot flame is detected, fuel valve opens (Term. 7).
65	3	Term. 5 ignition off.
70	4	Term. 6 ignition off. Modulator drives to auto (Term. 11).
85	Dot	Ignition cycle complete. Burner fires until operating control is satisfied.
BURNER SHUTDOWN ACTION		
85	Dot	Operating control opens. Fuel valve closes (Term. 7). Relays RL1 and RL3 are de-energized. Timer starts.
100	—	Modulator goes off auto (Term. 11 de-energized).
105	0	Timer stops. Burner motor stops (Term. 8). Control is ready for the next cycle.
		System is ready for startup whenever operating control closes again.

NOTES:

- For Direct Spark Ignition or Unproven Pilot, terminals 6 and 7 must be jumpered.
- Non-Recycling relay (RL3) must be energized continuously after 8 seconds in the cycle. If RL3 drops out, lockout and safety shutdown will occur.
- The safe start check component feature is part of the non-recycling relay (RL3) circuit. If the flame relay (RL2) should be in an energized position at any time preceding the trial for ignition, RL3 will be de-energized and lockout will occur.





OPERATION AND TESTING

Principles of Operation U-V-Eye Detector

The detector is a sealed, gas filled, ultraviolet-transmitting envelope containing two electrodes which in use are connected to a source of AC voltage. When ultraviolet (UV) radiation of sufficient energy (at wave lengths shorter than those in sunlight at the earth's surface) falls upon the electrodes, an electron is released and the inter-electrode gas becomes conductive so that current flows from one electrode to the other. The current flow starts and ends abruptly and is known as an "avalanche." A very intense source of UV radiation will produce several hundred avalanches or pulses per second. With less radiation there will be a lesser number of pulses per second, varying in number and occurring randomly. Upon total disappearance of flame, the detector output ceases excepting for very infrequent single pulses caused by cosmic rays, to which the circuitry does not respond.

A magnetically operated shutter mechanism periodically blocks the flame radiation from the U-V detector.

Operation of Detection Circuitry

The pulses from the detector tube are passed to a transistor type pulse amplifier and are integrated in a capacitor. When the integrated voltage reaches a predetermined trigger level, a transistor switch energizes the flame responsive relay. If the integrated voltage falls below a predetermined level for a period of between 2 and 4 seconds, the transistor switch turns off and the flame relay is de-energized.

The flame failure response time is the same regardless of the intensity of the flame prior to flame out.

A voltmeter (20,000 ohms per volt, 10 volt scale or higher) connected to the test jacks indicates a measure of the flame intensity. Under normal operation, there is a periodic drop in test jack voltage due to the scanner shutter operation.

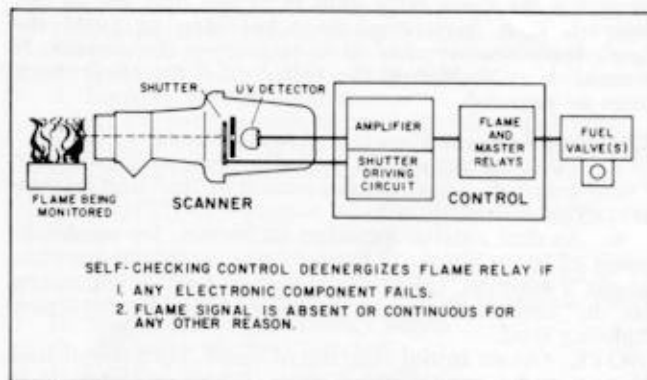


Figure 9

INSTALLATION TESTING

Flame Signal Measurement with shutter open

1. Flame signal voltage may be measured with a suitable DC voltmeter having a resistance of at least 20,000 ohms per volt connected at the test jacks of the 25RU8.

Minimum	Average	Saturation
6VDC	7VDC	9VDC



2. Test Switch (Figure 10), when in "check" position, electrically disconnects the timer motor, permitting manual control of timer.

Figure 10 — Test Switch

For Burner with Pilot Ignition Checking Scanner Viewing of Pilot Flame

1. Make sure that control and scanner have been properly installed and wired.

2. Plug DC Voltmeter leads into test jacks on control chassis (Red-plus; Black-minus).

3. Turn burner switch on. Let timer progress normally from dial "0". After dial "1" and before dial "2", place the test switch in the "check" position.

4. If pilot flame is not established within 15 seconds turn burner switch off, place the test switch in the "run" position, turn burner switch back on and repeat from step 3. Repeat as necessary until pilot flame is established.

5. Observe reading on voltmeter. When the shutter is open, the reading should be steady; see chart. If the reading fluctuates, it will be necessary to adjust the pilot flame. Continue adjustment until steady, correct reading is obtained.

NOTE: If pilot is not detected within about 60 seconds, control will lock out, making it inoperative. It will be necessary to allow two or three minutes for the thermal element to cool and to reset the control manually. Then repeat from step 4.

6. IMPORTANT: A test is required for non-detection of ignition spark. For this test, manually shut off fuel to pilot burner and leave fuel to main burner shut off. Repeat step 3. Just after dial "1", with ignition spark energized, place the test switch in the "check" position. The test voltmeter should now register zero. Keep system energized in this state until lockout switch trips, noting whether or not the flame relay pulls in at any time during this interval. If it does, steps must be taken to shield the spark from scanner view or to re-position the scanner. If scanner is re-positioned the entire pilot detection check must be repeated.

Checking Scanner Viewing of Main Flame

7. Turn burner switch to "off", place test switch in "run" position, return burner switch to "on" and let control cycle normally.

8. As dial reaches position "2" watch for establishment of main flame. If flame is not established within about 5 seconds, turn burner switch "off", then return to "on" and allow control to recycle normally for a new lighting trial.

NOTE: On an initial starting attempt, portions of fuel lines may be empty and require "bleeding" time. It is better to accomplish this with repeated short lighting-trial periods with intervening purge periods than to risk prolonged fuel introduction at a time when burner adjustments have not been completed and the minimum pilot test has not been conducted. Do not repeat unsuccessful lighting attempts without rechecking burner and pilot adjustments if lighting does not occur within 5 seconds after fuel introduction is verified or can be reasonably assumed.

9. When main flame is established, leave burner on and let timer progress until ignition shuts off (dial position 3 or 4). If scanner main flame sighting is reasonably good, the flame relay will stay energized, main flame will stay lit, and the timer will progress to dial "dot" position and stop. If flame goes out due to instability without ignition, readjust burner and repeat light-off procedure.

10. With step 9 completed and burner remaining lit with timer at "dot" position, readjust burner as necessary for correct flame size and optimum combustion, then recheck for proper lighting. If scanner is properly sighted, the DC voltmeter will now register a steady signal voltage with pilot flame only and with

main flame only. Repeat burner adjustment as necessary to obtain this condition if it does not exist initially.

Minimum Pilot Test

This test assures that the scanner will not detect flame too small to light off the main flame. It must be made (a) on every new installation (b) following any change of scanner location or viewing angle, and (c) following replacement of the scanner cell.

11. Repeat step 3. When the timer has slightly passed dial "1" and the pilot is ignited, place the test switch in the "check" position.

12. Reduce the size of the pilot until the flame relay is observed to drop out, then slowly increase the size of pilot flame just to the point where the flame relay pulls in. This is called minimum pilot. (Note Figs. 11, 12, 13).

13. Repeat step 7. When timer reaches dial position "2", watch for main flame to light. CAUTION: If main flame does not ignite in approximately the same time as it did with normal full pilot flame, immediately turn the burner switch off. Realign the scanner sighting tube so that detection requires a larger pilot flame and repeat minimum pilot test. Repeat this process until main flame lights reliably on several trials.

14. After minimum pilot test is completed, increase pilot flame to normal size, and place the test switch in the "run" position.

For Burner with Spark Ignition (No Pilot)

Checking Scanner Viewing of Main Flame

1. Proceed according to steps 1 and 2 as outlined previously.

2. Turn burner switch on. Master relay will pull in and timer will start.

3. As timer reaches dial position 1, watch for main flame to be established. If flame is not established by the time dial position "2" is reached, turn burner switch off and then on again and allow control to recycle normally.

CAUTION: If fuel is observed to enter combustion chamber and ignition does not occur at once, shut burner switch off and check electrode settings. Do not repeat ignition attempts unless a good spark can be observed in a position where the fuel will be readily ignited.

4. If burner ignites and burns properly, DC voltmeter will register a steady signal voltage. If voltmeter registers satisfactorily until ignition shuts off at dial position 3 or 4 and then becomes unsteady, readjust burner to obtain stable flame both with and without ignition on.

Checking Pilot Flame Failure Protection

1. Shut off the fuel to the pilot burner.

2. Start the control cycle.

3. After the purge period, the pilot assembly will be energized.

4. Because no pilot flame is detected, the pilot assembly will shut off after 8 seconds. The main fuel valve will not be energized.

5. The programming timer will complete its cycle during which time the lockout switch will trip, effecting a safety lockout and actuating the alarm (if used).

Checking Main Flame Failure Protection

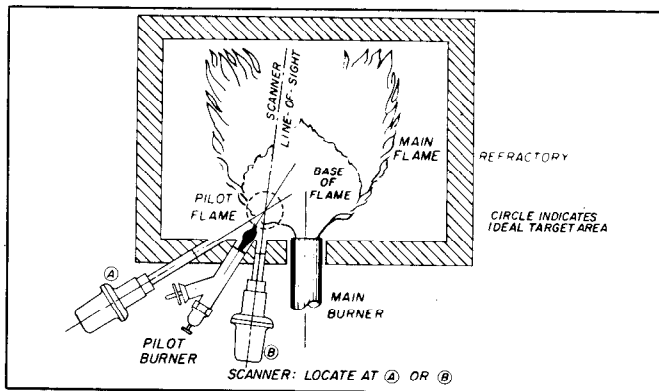
1. Start the burner in the normal manner.

2. After the startup programming has been completed, shut off the main fuel supply.

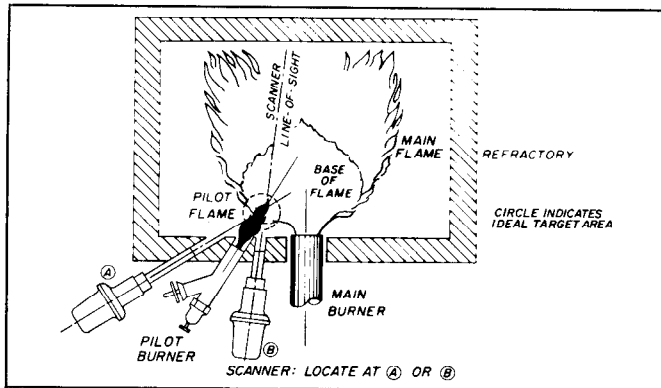
3. Within 4 seconds after the flame fails, the main fuel valve will close and after approximately 60 seconds, the lockout switch will trip.

4. Following a 20-second post purge or spin-down period, the blower motor will stop, and the alarm circuit will be energized.

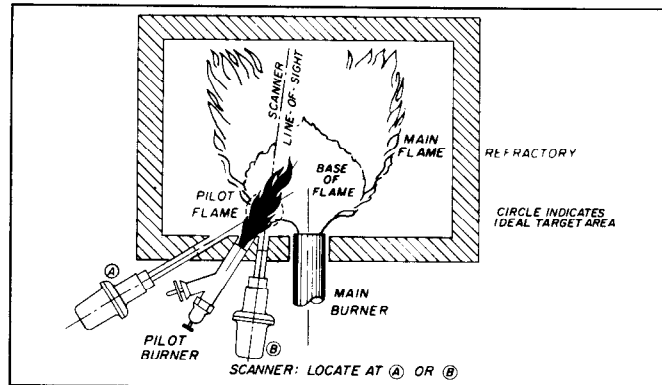
5. The lockout switch may be reset after allowing the thermal element to cool (approximately 2 minutes).



INSUFFICIENT PILOT



MINIMUM PILOT



NORMAL PILOT

Troubles in UVP-2S System installations can be readily isolated by following the approved procedure in the sequence given below. Before beginning any trouble-shooting, however, make sure that:

1. Installation and wiring have been made in accordance with instructions.
2. Chassis is securely plugged in and thumbscrews tightened; lockout switch is reset.
3. Make sure that voltage source to the control (whether supplied directly from the line or from a control circuit transformer) complies with the voltage and frequency ratings shown on page 1. NOTE: 60 cycle programming controls can be operated from 50 cycle supply if the voltage is within the range specified for 60 cycles, but all program timings will be increased by 20 percent.

In the following tabulation, troubles appear within boxes and possible causes are listed below the boxes.

CONDITION: Zero voltage between terminals 2 and 4.

1. Disconnect Switch Off.
2. Blown fuse.
3. Broken wire.
4. Incorrect wiring.

CONDITION: Zero voltage between terminals 2 and 3.

1. Open limit switch circuit (Pressure, LWCO etc.)
2. Broken wire.
3. Incorrect wiring.

CONDITION: Non-recycling relay (RL3) does not pull in.

1. Fuel valve interlock circuit (3-FV) not closed.
2. Contacts K2-2, K1-2, RL2-1 dirty or open.
3. Supply voltage is too low (see page 1 for rated minimum).
4. RL3 armature may be mechanically stuck open.
5. Timer not at dial O position.
6. Defective programming control or detector. Replace.

CONDITION: Master relay (RL-1) does not pull in.

1. Contacts RL3-2, K3-2 dirty or open.
2. Lockout switch tripped.
3. RL1 armature may be mechanically stuck open.
4. Supply voltage is too low.
5. Defective programming control; replace.

CONDITION: Master relay pulls in but burner motor does not start.

1. Insufficient voltage between terminals 2 and 8.
2. Blown motor fuse or motor starter overloads tripped.
3. Burner motor incorrectly wired.
4. Defective motor or starter.
5. Contact RL1-1 dirty or open.

CONDITION: Master relay pulls in but timer does not start.

1. Test switch in check position.
2. Contacts K5-2, K4-1 dirty or open.

CONDITION: Timer motor starts but modulator motor does not drive toward open damper position.

1. Modulator motor not powered.
2. Linkage jammed.
3. Incorrect wiring.
4. Contact K5-1 dirty or open.
5. Defective modulator equipment.

CONDITION: Timer motor is off after modulator has driven to high fire position.

1. Purge airflow interlock circuit (8-W) open.

CONDITION: RL3 drops out during purge period (lockout condition).

1. Non-recycling interlock circuit (FV-R) open.
2. Contacts RL1-4, RL3-1 dirty or open.
3. RL2 must not pull in during purge period.

CONDITION: Modulator motor does not drive toward closed-damper position.

1. Linkage jammed.
2. Incorrect or faulty wiring.
3. Contacts K5-1, K7-1 must be open.
4. Defective modulator equipment.

CONDITION: Timer motor stops when modulator motor returns to low fire position.

1. Low fire ignition interlock (W-B) open.
2. Contact K6-2 dirty or open.

CONDITION: RL3 drops out at dial position "1".

1. Momentary or sustained opening of limit circuit (4-3), or interlock circuit (FV-R).
2. Contact K3-3 dirty or open.

CONDITION: Timer dial reaches position "1". Pilot flame is not established.

1. Insufficient voltage between Terminals 2 and 5 or 6.
2. Contacts K3-1, K6-1, K7-2 dirty or open.
3. Defective gas valve.
4. Defective ignition transformer or electrode.
5. Improper electrode setting.
6. Plugged pilot burner.
7. Insufficient gas pressure.
8. Improper pilot burner adjustment.
9. Ignition assembly incorrectly wired.

CONDITION: Flame relay (RL2) does not pull in when pilot flame lights.

1. Pilot flame too small. Make sure gas pressure is not less than that specified for the pilot burner.
2. Scanner sight tube obstructed or scanner lens dirty.
3. Scanner sighting is incorrect.
4. Scanner is incorrectly wired.
5. Flame relay is mechanically bound.
6. Defective Scanner.
7. Defective control.

CONDITION: Timer dial reaches position "2". Main fuel valve stays shut.

1. Insufficient voltage between Terminals 2 and 7.
2. Contacts RL2-2 or K1-1 dirty or open.
3. Defective valve.
4. Incorrect wiring.
5. Pilot flame not detected.

CONDITION: Fuel valve is energized. Main flame does not light.

1. Inadequate pilot.
2. Incorrect burner adjustment.
3. No main fuel.

CONDITION: Main flame lights and then goes out.

1. Lockout switch has tripped. Allow to cool for two minutes and reset.
2. Limit and operating control circuit or non-recycling interlock circuit open.

CONDITION: Safety shutdown initiated at or after dial position "2".

1. Ignition failure.
2. Flame failure.
3. Inadequate flame signal.
4. Non-recycling interlock circuit (FV-R) open.
5. Contacts K8-1, RL2-4, K3-3 dirty or open.

CONDITION: Timer dial reaches position "3". 10 sec. TFI pilot flame does not go out.

1. Gas pilot valve is stuck open.
2. Contact K6-1 does not open.
3. Valve incorrectly wired.

CONDITION: Timer dial reaches position "4". 15 second TFI pilot flame does not go out.

1. Contact K7-2 does not open.
2. See 10 second TFI for additional data.

CONDITION: Timer dial reaches position "4". Modulator motor does not respond to modulation controller.

1. Modulator motor not powered.
2. Setting of modulation controller incorrect.
3. Linkage jammed.
4. Incorrect wiring.
5. Contact K7-1 dirty or open.
6. Defective modulator equipment.

CONDITION: Main flame goes out when pilot shuts off.

1. Scanner does not "see" main flame.
2. Incorrect burner adjustment.
3. Incorrect wiring to main fuel valve.

CONDITION: Timer does not stop at "dot".

1. Contacts K4-1 or RL1-2 stuck closed.

CONDITION: Timer does not rotate to "O" when operating or limit control opens.

1. Contacts RL1-2, RL3-3 or K2-1 dirty or open.
2. Limit switches incorrectly wired.

CONDITION: During post purge period modulator motor does not drive toward damper-closed position.

1. Linkage jammed.
2. Incorrect wiring.
3. Contact K7-1 did not open.
4. Defective modulator equipment.

CONDITION: Timer does not stop at "O".

1. Contacts RL1-1, or K2-1 stuck closed.
2. Limit and operating switch circuit closed.

CONDITION: Burner motor does not stop when timer dial reaches "O".

1. Contacts RL1-1, or K2-1 stuck closed.
2. Limit and operating switch circuit closed.
3. Motor starter is mechanically stuck.
4. Motor starter is incorrectly wired.

MAINTENANCE

45UV5 Scanner

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

25RU8 Control

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.

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 only a fine grade of crocus cloth for cleaning. Do not file.

Periodic Safety Check: 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 shutdown and fuel valve tightness.

WARRANTY

We guarantee for one year from date of shipment to replace or, at our option, to repair any products or parts thereof (except lamps, electronic tubes and photocells) which are found defective in material or workmanship or which otherwise fail to conform to the contract description or to any warranty, express or implied.

We make no warranties which extend beyond the description of our product on the face of our sales orders.

The Purchaser's remedies with respect to any product or part sold by us shall be limited exclusively to the right to replacement or repair f.o.b. Cambridge, as above provided. In no event shall we be liable for consequential or special damages of any nature which may arise in connection with such product or part.

CODE REQUIREMENTS

FACTORY MUTUAL RESEARCH CORP. (FM)
FACTORY INSURANCE ASSOCIATION (FIA)

	F.M. AUTOMATIC LIGHTED BOILERS	F.I.A. AUTOMATIC SINGLE BURNER
PRE-PURGE	<ul style="list-style-type: none"> • 4 AIR CHANGES @ 50% avg. Air Flow-Supervised • AUTOMATIC DAMPERS which close during down-time on natural draft boiler must be opened 90 sec. prior to each start. 	<ul style="list-style-type: none"> • 4 AIR CHANGES @ 60% minimum Air Flow-Supervised
PILOT PROVING	10 Sec.	10 Sec. Max.
MAIN FLAME TRIAL for IGNITION (OIL)	<ul style="list-style-type: none"> • #2 & 4 - 10 Sec. • #5 & 6 - 15 Sec. 	<ul style="list-style-type: none"> • #2 & 4 - 15 Sec. • #5 & 6 - 30 Sec.
MAIN FLAME TRIAL for IGNITION (GAS)	10 Sec.	15 Sec. Max.
FLAME FAILURE RESPONSE TIME	2 - 4 Sec.	2 - 4 Sec.
INTER-LOCKS REQUIRED	<ul style="list-style-type: none"> • Minimum Air Flow • Low Oil Temp. • Low Fire Start • Prove Fuel Valve closed prior to and during Purge (over 250 H.P.) NON-RECYCLING • High & Low Gas Press. • Low Oil Press. • Atomizing Medium. 	<ul style="list-style-type: none"> • High & Low Oil Temp. • Low Fire Start NON-RECYCLING • Supervised Atomizing Air or Steam. • High & Low Gas Press. • Low Oil Press. • Minimum Combustion Air. • Rotary Cup-Power Outage to Motor.
OTHER	<ul style="list-style-type: none"> • Code Applicable to Gas Fired Boilers 50 H.P., and over Oil Fired Boilers 100 H.P. & over 	

SUGGESTED SPECIFICATIONS FOR FLAME SAFEGUARD CONTROL FOR AUTOMATIC COMMERCIAL-INDUSTRIAL BURNERS

GENERAL

1. Each automatically fired burner shall be equipped with a UL listed and FM approved Electronic Flame Safeguard and Programming Control having the following functions:
 - a. The control shall accomplish a safe start component check during each start, which will prevent the burner from firing under any condition which causes the flame relay to assume and hold its energized position due to the presence of an actual flame, a flame simulating component failure or mechanical failure.
 - b. A purge period to purge the combustion chamber and heat exchanger at a minimum rate of _____ maximum air flow, for sufficient time to accomplish _____ air transfers of the entire volume shall be provided. The control system shall be interlocked to prevent the burner from firing until the desired purge is accomplished.*
 - c. A pilot proving period of not more than 10 sec. prior to energizing the main fuel valve shall be provided.
 - d. Limited trial-for-ignition of main flame _____ sec. maximum for gas or light oil, _____ sec. maximum for heavy oil shall be provided.*
 - e. Flame detection scanner and amplifier must be repetitive self checking.
 - f. Safety shutdown shall be accomplished with 4 sec. following a flame failure, loss of minimum combustion air flow or the opening of any running interlock.
 - g. A post-purge period of not less than 15 sec. shall be accomplished following each normal shutdown and not less than 60 sec. following a safety shutdown.
 - h. The control system shall recycle automatically under control of the operating control, and when power is restored following power failure. Manual reset shall be required following any safety lockout.
2. The control shall permit direct connection of safety limit switches, operating controls, fuel valve interlock, starting interlocks, air flow switches, fuel temperature and pressure switches, running interlocks and lockout alarms.

MECHANICAL AND ELECTRICAL

3. The control system shall be designed for 120 volt operation with one side grounded. All switching shall be accomplished in the hot circuit. The control shall have the following features:
 - a. The program timing shall be accomplished by cam driven heavy duty switch assembly readily accessible for inspection. The timing periods must not vary more than 5% through an ambient temperature range of 0°F to 125°F and through a supply voltage range of plus 10% or minus 15% of nominal line voltage.
 - b. The contacts in the fuel valve shall be of a weld-resistant tungsten alloy material.
 - c. The safety lockout which shall be temperature compensated and contain alarm contacts rated at not less than 50 va at 120 volts ac.
 - d. Test jacks shall be provided for direct connection of a DC voltmeter to measure flame signal voltage.
 - e. Flame detection scanner and amplifier must be repetitive self checking.

FLAME DETECTION

4. Ultraviolet (UV)
 - a. The pilot and main flames shall be monitored by an ultraviolet sensitive flame scanner which shall not be actuated by hot refractory.
 - b. The scanner shall mount on and sight through a 1 inch standard pipe.
 - c. The scanner shall be suitable for operation to 200°F, as measured on the mounting hub. The flame safeguard control system shall be UVP-2S with Control type 25RU8, model 4580.

* See page 13 for specifications (F.M., F.I.A.).



ELECTRONICS CORPORATION OF AMERICA COMBUSTION CONTROL DIVISION One Memorial Drive — Cambridge, Massachusetts 02142

Electronics Corporation of America (Canada) Ltd.
520 Kipling Avenue South
Toronto 18, Ontario

Electronics Corporation of America (France) S.A.
15, Rue Drouot, Paris 9e, France

Electronics Corporation of America
(Deutschland) G.m.b.H.
Königsallee 30
D-4000 Düsseldorf, Deutschland

Electronics Corporation of America (Great-Britain) Ltd.
7 Duke of York Street
London S.W. 1, England

Electronics Corporation of America
(Deutschland) G.m.b.H.
Bockenheimer Landstrasse 51-53
D-6000 Frankfurt/Main 1, Deutschland

Electronics Corporation of America (Nederland) N.V.
Singel 540
Amsterdam, Holland

Electronics Corporation of America (Europe) N.V.
Schepen A. Gossetlaan, 20
B-1720 Groot Biigaarden, Belgium

Electronics Corporation of America (Italia) S.p.A.
2, Corso Europa, Milan, Italy