

25RU8 Model 6580



45UV2-1010



26RJ8 Model 6080



48PT1-9000



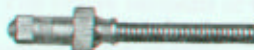
26RJ8 Model 6080

25RU8 Model 6580

FLAME SAFEGUARD AND PROGRAMMING CONTROL

— for automatic burners

26RJ8-6080, 25RU8-6580 are specifically designed to comply with requirements of FM, FIA and NFPA #85 for automatic gas or oil fired burners.



48PT1-1000



FEATURES:

Fireeye FP-2 (Model 6080) and UVP-2 (Model 6580) FLAME SAFEGUARD CONTROLS provide 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 10-15-30 second trial for ignition of main flame and a postpurge following fuel shutoff.

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 Type 25RU8-6580 control includes a circuit to de-energize the pilot spark ignitor prior to pilot flame proving to eliminate any spark ignition interference. The control systems are designed to de-energize all fuel valves within 1 to 2 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:

FP-2 — Type 26RJ8 Model 6080 Control with Type 48PT1 infrared flame scanner

UVP-2 — Type 25RU8 Model 6580 Control with Type 45UV2 ultraviolet flame scanner

SUPPLY VOLTAGE:

26RJ8 Model 6080; 48PT1 — 120 volts (max. 132v, min 102v) 50/60 cycles

25RU8 Model 6580; 45UV2 Model 1010 — 120 volts (max. 132v, min 102v) 60 cycles

25RU8 Model 6580; 45UV2 Model 1112 — 120 volts (max. 132v, min. 102) 50 cycles (Not UL-FM listed)

VOLT-AMPERE RATINGS:

FP-2, UVP-2 —

Power Consumption — Operating 30 va

Power Consumption — Standby 10 va

Maximum connected load 2000 va

See adjacent chart for additional rating data

OPERATING TEMPERATURE LIMITS:

26RJ8 - 25RU8 Controls (Ambient) Max. Min. 125 F +32 F

48PT1 flame scanner 125 F -40 F

45UV2 flame scanner 200 F -40 F

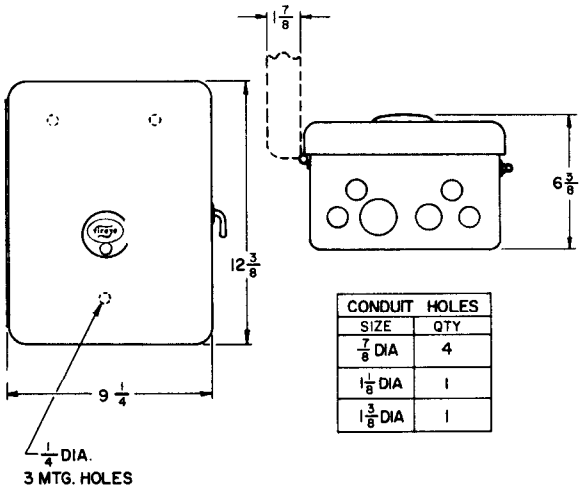
Shipping Weight Per System: 22 lbs. (approximate)

Terminal Ratings (Maximum) for
Type 26RJ8-25RU8 Controls

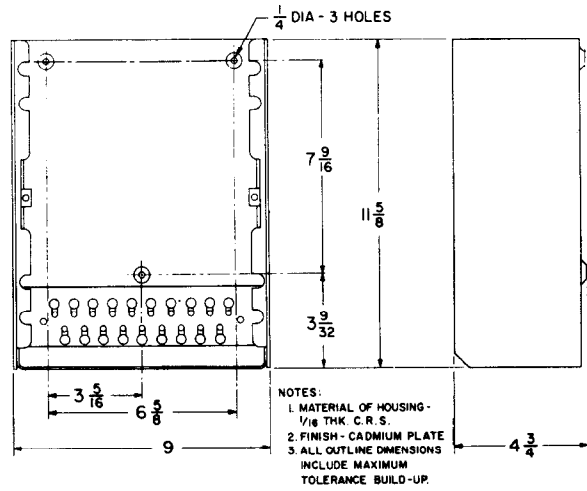
Terminal	Typical Load	Maximum Ratings at 120V 60 Cycles
1-5-6 Combined	Ignition Transformer	500 Va
	Pilot Valve	125 Va (Pilot Duty)
7	Main Fuel Valve	130 Va (Pilot Duty) (Solenoid) or 460 Va Opening (Motorized)
8	Burner or Blower Motor or Starter	Amperes @ 120 Volts 60 Cycles Full Load 5.8 Locked Rotor 34.8 Alternate: 250 va Pilot Duty
9	Alarm	50 Va (Pilot Duty)
10-11-12-13	Modulator	125 Va (Pilot Duty) or 2 Amps at 30 Volts Max.

Total connected load not to exceed 2000 va.

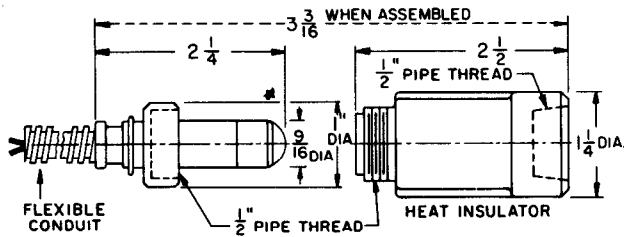
MOUNTING AND OUTLINE DIMENSIONS



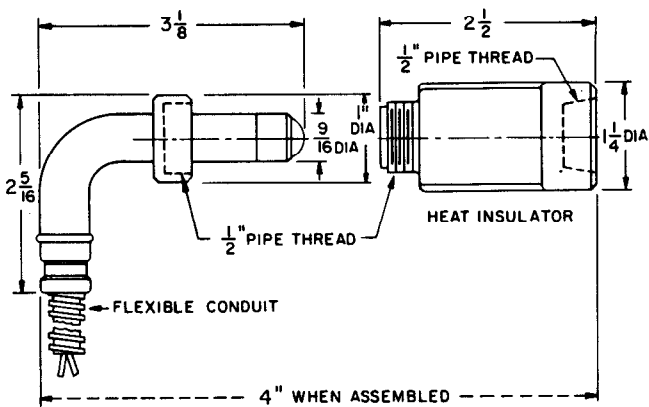
Surface Enclosure



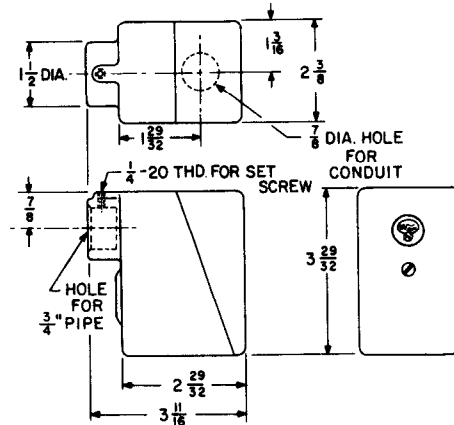
Open Mounting Frame



48PT1-1000 Scanner



48PT1-9000 Scanner



45UV2-1010 Scanner

Figure 1

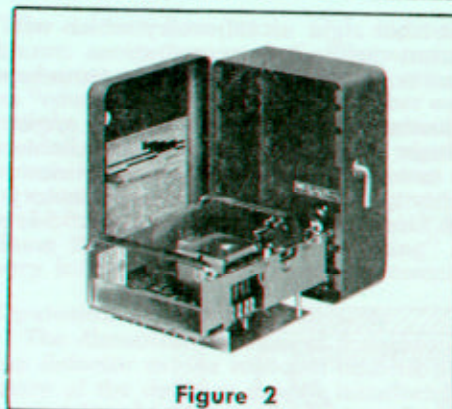


Figure 2

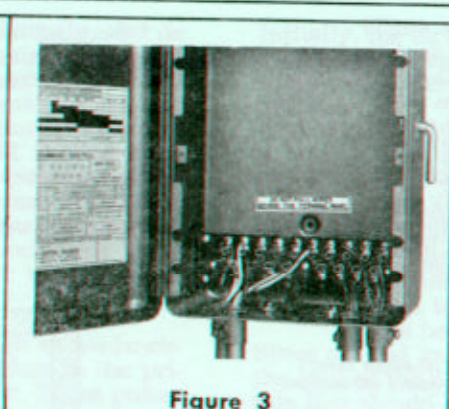


Figure 3



Figure 4

*Installing the Type 26RJ8 or 25RU8 Control

Loosen thumb screws at front of chassis. Pull out chassis and place on its back plate (Fig. 2). Select control mounting location on panel board or upright surface that is free from excessive vibration. Secure housing with screws or bolts using Figure 1 for drilling dimensions. After the housing is wired (Fig. 3), replace unused knockout plugs. Plug chassis securely into housing (Fig. 4), and tighten captive thumb screws.

Electrical Rating Considerations

Electrical ratings of Fireeye 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 Fireeye 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 currents 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 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 Fireeye 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.

INFRARED DETECTION

Scanner Type 48PT1

Install the Type 48PT1 Scanner as recommended by the burner manufacturer. If no instructions are pro-

vided, the scanner must be applied to facilitate monitoring of the pilot and main flames. The following description of operation of the Firetron cell will assist in making such an application.

Operation of Firetron® Cell

The active element of the Firetron cell is a lead sulfide (PbS) semiconductor whose electrical resistance instantaneously changes in accordance with the amount of infrared and visible radiation it receives from sources within its view. Such radiation originating in a combustion chamber may consist of a steady radiation from hot refractory or metal and an average value of flame radiation which continuously fluctuates in magnitude by an amount and at a rate which are functions of the type of fuel and combustion conditions.

When a DC voltage is impressed across the cell and a series resistor, the fluctuation of cell resistance corresponding to fluctuation of flame radiation produces a fluctuating voltage across the cell. This voltage is termed "flame signal" and is fed to an amplifier.

The amplifier responds to a fluctuating voltage but not a steady one. It therefore responds to a fluctuating flame signal but not to a steady refractory signal. Further, it is "tuned" for maximum response at a frequency of 10 cycles per second (a fluctuation rate found in all flames) and has relatively little response at power line (60 cycle) and very low (1 cycle) frequencies. When amplified flame signal exceeds a given magnitude, it causes energization of a flame relay.

Whereas the system does not "detect" hot refractory, excessive steady radiation reduces flame signal. The same effect results from excessive scanner temperature. To avoid nuisance shutdowns, it is important to avoid sighting hot refractory and to keep scanner temperature low (never over 125°F).

Control and Scanner Wiring

Make wiring connections at terminal panel at bottom of housing. Separate knockouts are provided for conduit connections for line voltage, and scanner circuits. Follow approved wiring diagrams. Connect bare wire directly to screw posts — without lugs.

Use suitable wire enclosed in rigid or flexible conduit for power connections. All wiring must comply with the National Electrical Code and local codes. Splices must be made only in troughs or junction boxes.

The control housing must be grounded either by the normal conduit ground or by an added grounding wire.

Attach the cable supplied with the scanner to a junction box. Splice the cable wires to a pair of wires not smaller than #18. Install the complete run in a separate conduit to the knockout directly under Terminal 15 of the Type 26RJ8 Control housing. Connect black wire to Terminal 14; white wire to Terminal 15. Continuous conduit bonding between scanner and control is mandatory! Scanner may be located up to 100 feet from control. Do not pass scanner wiring through any junction box containing other wires. Do not run other wires through scanner conduit. This is a UL requirement.

Application Procedure - Scanner Type 48PT1

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 installation instructions.

1. Locate scanner sight tube point of entry below and close to the burner ignition assembly (Fig. 5) and drill a 7/8" hole through the boiler or furnace wall. The sight tube, a 4"-8" length of 1/2" black iron pipe, will be fixed to the hole when the proper position has been established.

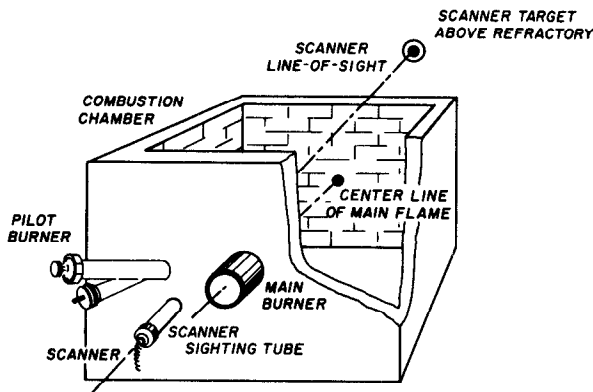


Figure 5

2. Position the scanner sight tube so that scanner line of sight will cross the intersection of pilot flame axis and main flame (Fig. 8). Tack weld the sight tube to the point of entry hole. Should it be necessary to remove refractory to obtain the proper line of sight, prepare a straight hole not less than 1-1/4" I.D. Flare this hole slightly as it enters the combustion chamber.

3. Scanner must have unobstructed view of both pilot and main flames (Fig. 6).

SCANNER MUST HAVE UNOBSTRUCTED VIEW OF FLAME



NOT THIS NOT THIS BUT THIS

Figure 6

4. Both pilot and main flames must completely cover scanner field of view (Fig. 7).

FLAME MUST COMPLETELY COVER SIGHT OPENING



NOT THIS NOT THIS BUT THIS

Figure 7

5. Scanner must not sight on refractory which will become incandescent during burner operation.

6. Scanner must not be allowed to exceed a temperature of 125°F.

For precise adjustment of the scanner viewing angle, Fireeye Swivel Mount (Part No. 60-302) is available. If it is necessary to restrict the area the scanner views (to reduce sensitivity, or because of unsatisfactory background), use Fireeye Orifice Set (Part No. 10-88).

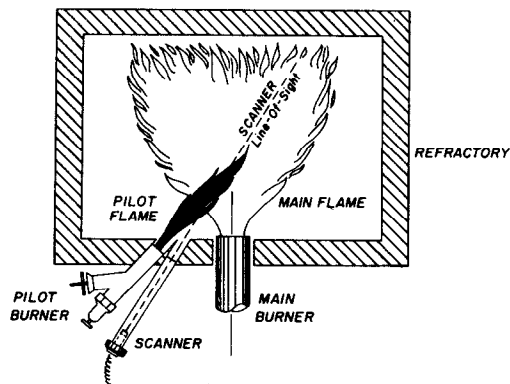
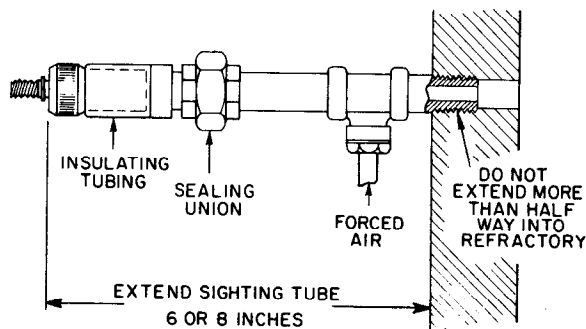


Figure 8

Reducing Scanner Temperature (Infrared)

The Firetron Scanner (Temperature Limit 125°F.) should never get too hot to grasp comfortably in the hand. Keep the scanner cool by one or more of the following methods (Fig. 9).



METHODS OF COOLING SCANNER

Figure 9

1. Use 6" to 8" length of pipe between scanner and hot furnace front plate.
2. Use insulating tube (Part No. 35-69) on the end of the iron pipe.
3. Force air into sighting tube.
4. Make sure sighting tube does not extend more than halfway into refractory wall.
5. Use Fireeye Sealing Union (Part No. 61-801) when using method 3 above.

ULTRAVIOLET DETECTION

Scanner Type 45UV2

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 wavelengths shorter than those in sunlight at the earth's surface) falls upon the electrodes, an electron is released and the interelectrode gas becomes conductive so that current flows from one electrode to the other. This current ceases as the alternating voltage reduces to zero (which it does twice during each alternating cycle). Re-establishment of current occurs on the next voltage half-cycle only if UV radiation is present to initiate it.

The current flow starts and ends abruptly and is known as an "avalanche". The maximum number of avalanches which can occur within one second (defined as "counts per second") is a number equal to twice the supply voltage frequency. A "maximum count" signal is also defined as a "saturation" signal. At less than saturating radiation there will be some average number of counts per second, said counts varying in number and occurring randomly. Upon total disappearance of flame the detector ceases "counting" excepting for a very infrequent count caused by cosmic rays.

Operation of Detection Circuitry

The discontinuous current flow through an avalanche detector causes reflected current pulses in the primary of the detector supply transformer. These pulses are retrieved and passed to a transistor type pulse amplifier — equalizer through a filter which discriminates between supply voltage sine waves and steep wave front signal pulses. The uniform pulses from the pulse amplifier 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 1 and 2 seconds, the transistor switch turns off and the flame relay is de-energized.

Control and Scanner Wiring

Make wiring connections at terminal panel at bottom of housing. 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.

Install the two wires furnished with the 45UV2 scanner in flexible or rigid conduit and connect them to terminals 14 and 15 at the 25RU8 control. A flexible conduit connector is furnished with the scanner. If additional wire length is required, splice the scanner wires in a junction box. The scanner wires may be run in a conduit with other wires of less than 600 volt potential. Type 45UV2 scanner lead lengths may be run up to 1500 ft. from 25RU8 electronic control.

Application Procedure — Scanner Type 45UV2

Install the Scanner Type 45UV2 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.

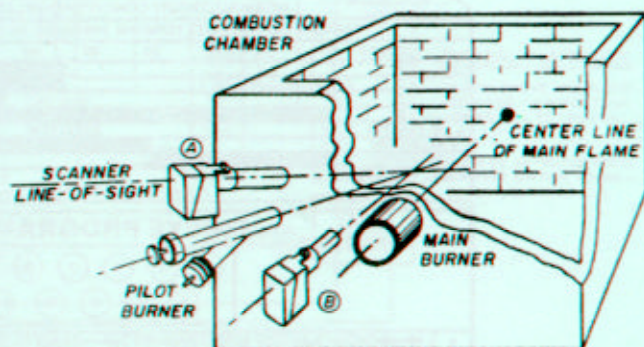
1. Locate scanner sight tube close to the burner ignition assembly (Fig. 10) and drill a 1-1/4" hole through the boiler or furnace wall. The sight tube, a 4"-8" length of 3/4" black iron pipe, will be fixed to the hole when the proper position has been established.

Initially, the sight pipe should be tack welded in place, secure enough to support the scanner weight but not so rigidly that the sighting angle cannot be changed if necessary.

2. 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. An acceptable location must assure the following:

- (a) Reliable pilot flame viewing
- (b) Reliable main flame viewing
- (c) 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.



NOTE: LOCATE SCANNER AT (A) OR (B)

Figure 10

3. Scanner must have unobstructed view of both pilot and main flames (Fig. 6).

4. Both pilot and main flames must completely cover scanner field of view (Fig. 7).

5. When a satisfactory sighting position has been confirmed by operating tests, the sight tube should be firmly welded in place.

6. The scanner viewing window should be kept free of contaminants (oil, smoke, soot, dirt).

Reducing Scanner Temperature (Ultraviolet)

If the scanner mounting hub exceeds the 200°F limit, inject purging air and/or extend the sight tube (see Fig. 11). If extending the sight tube results in too much reduction of signal, use 1-1/2 or 2 inch pipe for the major sight tube and reduce to 3/4 inch just ahead of the scanner or the purging tee. Do not extend sight tube inward beyond the plate on which it mounts.

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

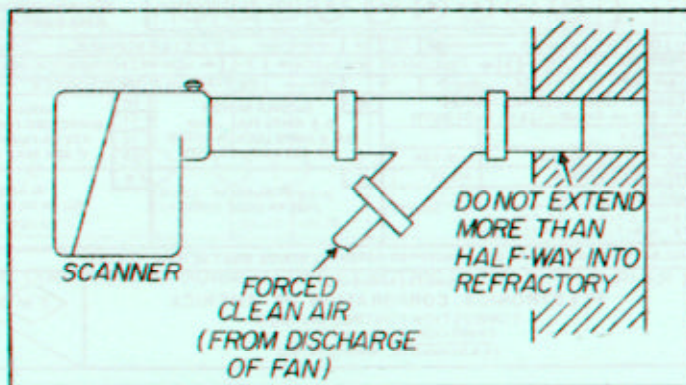
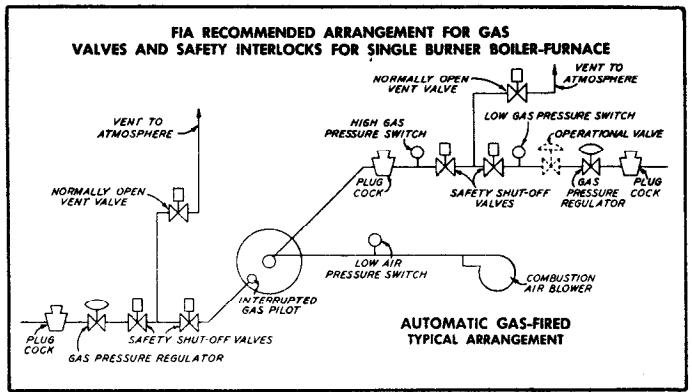
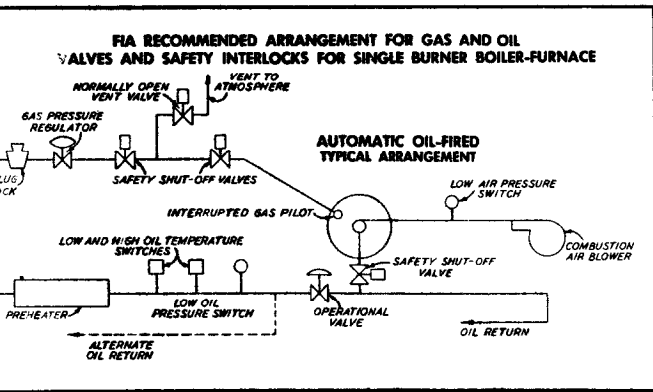


Figure 11



NORMAL CIRCUIT CONDITIONS RELATED TO SECONDS OF TIMER ROTATION
SHADED BAR INDICATES TERMINAL ENERGIZED OR CIRCUIT CLOSED BETWEEN DESIGNATED TERMINALS

SECONDS = 0	10	20	30	40	50	60	70	80	85	85	105
5											
6											
7											
8											
10-11 (AUTO)											
10-12 (LOW)											
10-13 (HIGH)											
DIAL POSITION	0										0

FLAME FAILURE RESPONSE TIME NOT MORE THAN 2 SECONDS

TYPE 26RJ8 FIREYE PROGRAMMING CONTROL MODEL 6080

U.S. PATENT NO 2,643,311 - 2,811,711
ALSO FOREIGN PATENTS ISSUED AND PENDING

4	← HOT 120V SUPPLY COMMON →	2	14	← BLACK SCANNER WHITE GROUND →	15	
4	← LIMIT AND OPERATING SWITCHES →	3	← FUEL VALVE INTERLOCK →	FV	← NON-RECYCLING INTERLOCKS →	R
8	← PURGE AIR FLOW INTERLOCK →	W	← LOW FIRE IGNITION INTERLOCK →	B		

IGNITION CONNECTIONS (TRANSFORMER - 500 VA VALVE 125 VA PILOT DUTY)			8	BURNER MOTOR 5.8 AMPS FULL LOAD 34.8 AMPS LOCKED ROTOR OR 250 VA PILOT DUTY		10	MODULATOR SWITCHING CONNECTIONS 125 VA PILOT DUTY OR IF 30V. MAX. 2A. MAX	
FUEL	TRIAL FOR IGN PERIOD	IGNITOR				11		
5 GAS OR OIL	10 SEC. SUPERVISED	PILOT	7			12		
6 GAS OR OIL	15 SEC. SUPERVISED	PILOT				13		

SEE BULLETIN C-30 FOR ALTERNATE IGNITION CONNECTIONS

FUEL VALVE (130 VA PILOT DUTY)

ALARM (50 VA PILOT DUTY)

ALL RATINGS ARE AT 120V. 60 Hz EXCEPT AS NOTED-ALL WIRING MUST BE N.E.C. CLASS I

WARNING: 260 V. AC FROM TEST JACKS TO GROUND

MANUFACTURED BY **ELECTRONICS CORPORATION OF AMERICA**
COMBUSTION CONTROL DIVISION
CAMBRIDGE, MASSACHUSETTS
E.C.A. (CANADA) LTD., TORONTO, ONTARIO

NORMAL CIRCUIT CONDITIONS RELATED TO SECONDS OF TIMER ROTATION
SHADED BAR INDICATES TERMINAL ENERGIZED OR CIRCUIT CLOSED BETWEEN DESIGNATED TERMINALS

SECONDS = 0	10	20	30	40	50	60	70	80	85	85	105
1											
5											
6											
7											
8											
10-11 (AUTO)											
10-12 (LOW)											
10-13 (HIGH)											
DIAL POSITION	0										0

FLAME FAILURE RESPONSE TIME - NOT MORE THAN 4 SECONDS

TYPE 25RU8 FIREYE PROGRAMMING CONTROL MODEL 6580

U.S. PATENT NO 2,643,311 - 3,283,154
ALSO FOREIGN PATENTS ISSUED AND PENDING

4	← HOT 120V SUPPLY COMMON →	2	14	← U.V. EYE @ SCANNER →	15	
4	← LIMIT AND OPERATING SWITCHES →	3	← FUEL VALVE INTERLOCK →	FV	← NON-RECYCLING INTERLOCKS →	R
8	← PURGE AIR FLOW INTERLOCK →	W	← LOW FIRE IGNITION INTERLOCK →	B		

IGNITION CONNECTIONS (COMBINED RATING: IGN TRANSFORMER 500 VA VALVE 125 VA PILOT DUTY)			8	BURNER MOTOR 5.8 AMPS FULL LOAD 34.8 AMPS LOCKED ROTOR OR 250 VA PILOT DUTY		10	MODULATOR SWITCHING CONNECTIONS 125 VA PILOT DUTY OR IF 30V. MAX. 2A. MAX	
1	IGNITION TRANSFORMER					11		
FUEL	TRIAL-FOR-IGN. PERIOD	IGNITOR				12		
5 GAS OR OIL	10 SEC. - SUPERVISED	PILOT	7			13		
6 GAS OR OIL	15 SEC. - SUPERVISED	PILOT						

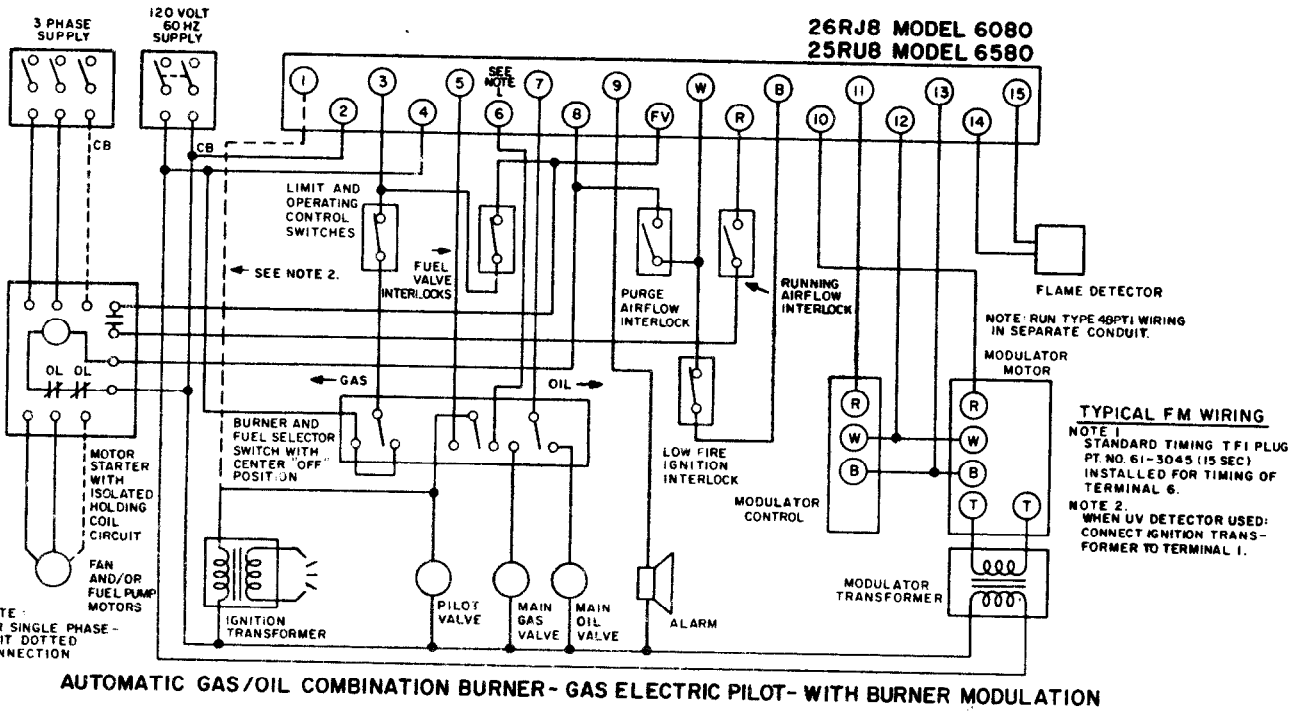
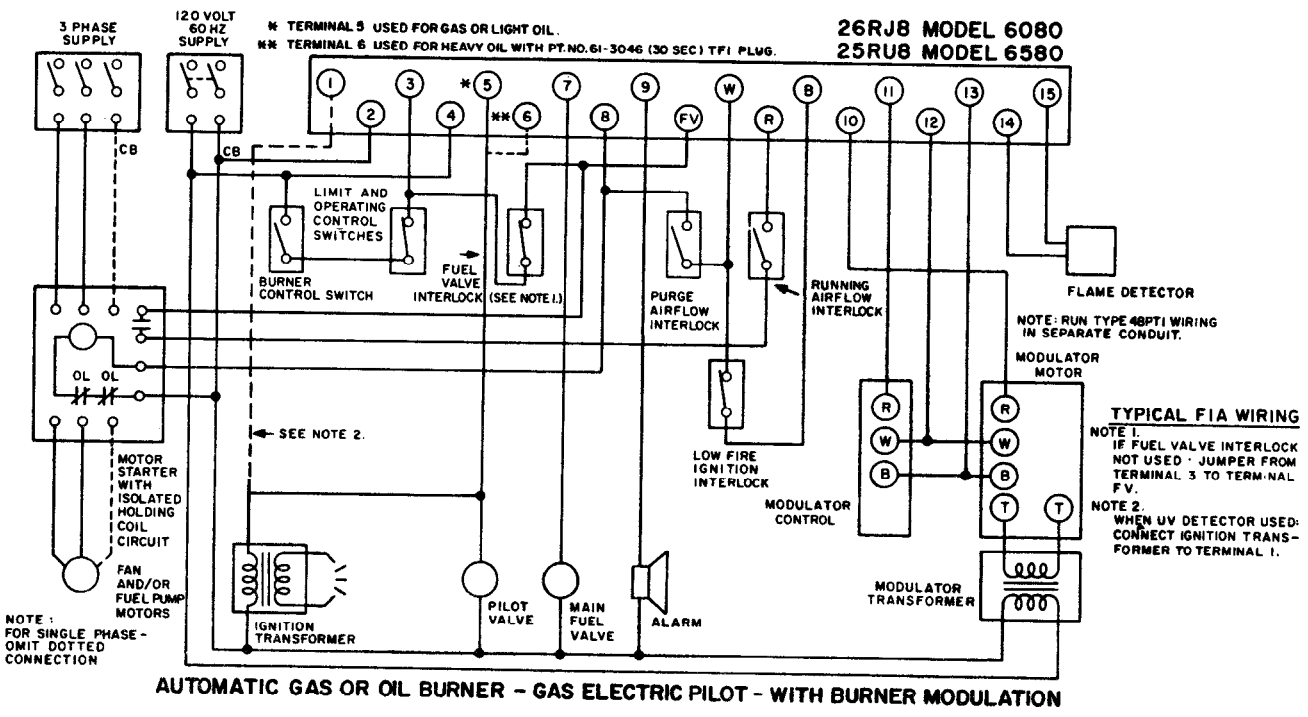
SEE BULLETIN C-30 FOR ALTERNATE IGNITION CONNECTIONS

FUEL VALVE (130 VA PILOT DUTY)

ALARM (50 VA PILOT DUTY)

ALL RATINGS ARE AT 120V. 60 Hz EXCEPT AS NOTED-ALL WIRING MUST BE N.E.C. CLASS I

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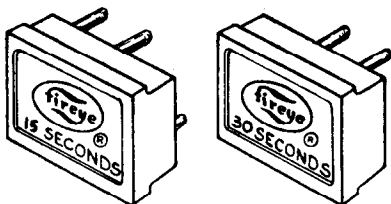
TIMING SEQUENCE: 26RJ8-6080; 25RU8-6580

Gas or Oil Proven Pilot (No connection between terminals 6 and 7)		
Timer Rotation (Seconds)	Dial Indications	<u>BURNER STARTUP ACTION</u>
0	0	Operating control closes. Fuel valve interlock closed. Non-recycling relay (RL3) and master relay (RL1) relay energized. Burner motor (terminal 8) energized. Modulator control switches go to high fire position (10-12 opens, 10-13 closes.)
0	0	Purge airflow interlock must be satisfied before timer motor will start.
8	—	Non-recycling interlock circuit (FV-R) must be satisfied for cycle to continue. See Note 2 below.
30	—	Modulator control switches go to low fire position (10-13 opens, 10-12 closes).
35	—	If low fire ignition interlock (W to B) is not satisfied, timer motor stops until interlock is satisfied.
45	1	Ignition (terminal 1) * and 10 second trial for ignition (terminal 5) on. Selectable 15 second or 30 second trial for ignition (terminal 6) on. See Note 3 below.
52	—	Ignition (terminal 1) * off.
55	2	Fuel valve (terminal 7) on (provided pilot is proven).
65	3	10 second trial for ignition (terminal 5) off.
70	4	Selectable 15 second trial for ignition (terminal 6) off. Modulator control switches go to automatic position. (10-12 open, 10-11 closed).
85	Dot (Index)	Selectable 30 second trial for ignition (terminal 6) off. End of initiating cycle; timer motor stops. Burner operates until heat demand is satisfied.
85	Dot (Index)	<u>Burner Shutdown Action</u>
85	Dot (Index)	Operating control opens; RL1, RL3, and fuel valve (terminal 7) de-energized. Timer motor energized. Modulator control switches go to low fire position (10-11 open, 10-12 closed).
105	0	Burner motor (terminal 8) circuit and cycle timer motor de-energized.
		<u>System is ready for startup whenever operating control closes again.</u>

* — 25RU8-6580 only

NOTES:

1. For Direct Spark Ignition or Unproven Pilot, terminals 6 and 7 must be jumpered.
2. Non-Recycling relay (RL3) must be energized continuously after 8 seconds in the cycle. If RL3 drops out, lockout and safety shutdown will occur.
3. Selectable trial for ignition plug data:



Part No. 61-3045. (15 second T.F.I.) standard on all units.

Part No. 61-3046. (30 second T.F.I.) special — must be ordered separately. Note: not to be used on F.M. applications.

4. 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.

Installation Testing

1. Flame Signal Measurement

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. Meter of 1,000 ohms per volt minimum is suitable for 26RJ8 controls.

	Minimum	Average	Saturation
26RJ8	80VDC	90-110VDC	115
25RU8	10VDC	15-18 VDC	30VDC

2. Test Switch (Figure 12), when in "check" position, electrically disconnects the timer motor, permitting manual control of timer until main fuel valve is energized.

3. 26RJ8 Control

Flame Signal Attenuator. Directly above the vacuum tubes on the chassis is a recessed pin, which when grounded to the chassis by a clip cord (Fig. 13), will reduce the sensitivity of the flame signal amplifier 40% for test purposes.



Figure 12 — Test Switch



Figure 13 - Test Attenuator

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. (Optional) Ground the attenuator pin to the chassis. 26RJ8 Control only.

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

4. Turn burner switch on. Let timer progress normally from dial "O" past dial "X". As it nears dial "1", place the test switch in the "check" position.

5. 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 4. Repeat as necessary until pilot flame is established.

6. Observe reading on voltmeter. 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.

25RU8 Control

7. If the spark transformer is connected to terminal 5 or 6, 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 4. 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

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

9. 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.

10. When main flame is established, leave burner on and let timer progress until ignition shuts off (dial position 3 or "dot"). 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.

11. With step 10 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.

12. With all steps through 11 satisfactorily completed, remove attenuator connection (if used) and proceed with minimum pilot test.

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. Note: 26RJ8 Control — Do not conduct this test with the attenuator pin grounded!

13. Repeat step 4. When the timer has slightly passed dial "1" and the pilot is ignited, place the test switch in the "check" position.

14. 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. 14, 15, 16.)

15. Repeat step 8. 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.

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

26RJ8 Control

Checking Detection with Hot Combustion Chamber

With all the foregoing tests and final burner adjustments completed, operate the burner (observing manufacturer's warm-up instructions) until combustion chamber is at maximum expected temperature. Recheck for adequate signal with main flame only and with pilot only. If steady output voltage of 90 or more volts DC is not measured at the test jacks, realign scanner sighting to obtain suitable output voltage and then repeat all steps through 16.

For Burner with Spark Ignition (No Pilot) Checking Scanner Viewing of Main Flame

1. Proceed according to steps 1, 2, and 3 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 and then becomes unsteady, readjust burner to obtain stable flame both with and without ignition on.

5. Remove attenuator connection (if used).

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 10 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. With 2 seconds after the flame fails, the main fuel valve will close and after approximately 60 seconds, the lockout switch will trip.
4. Following a 15-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).

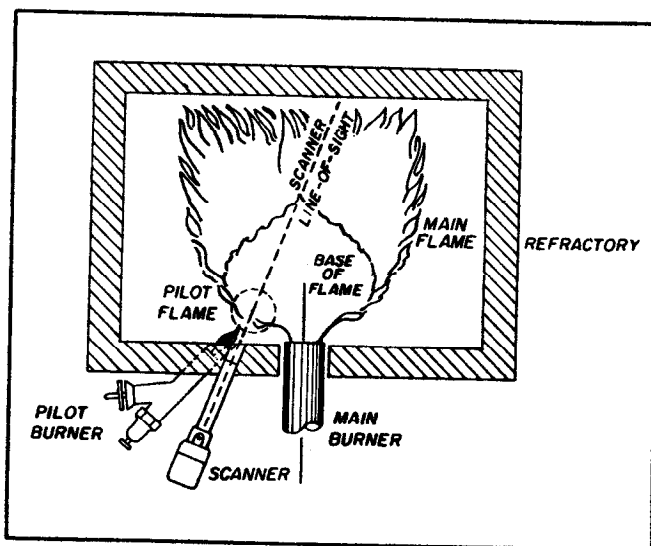


Figure 14

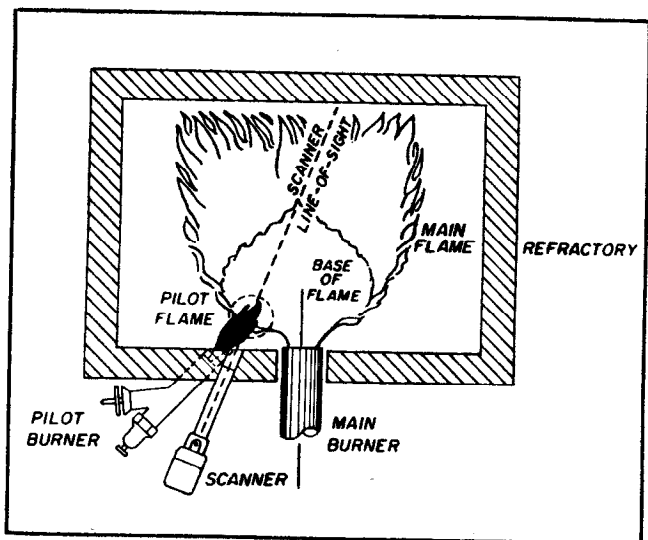


Figure 15

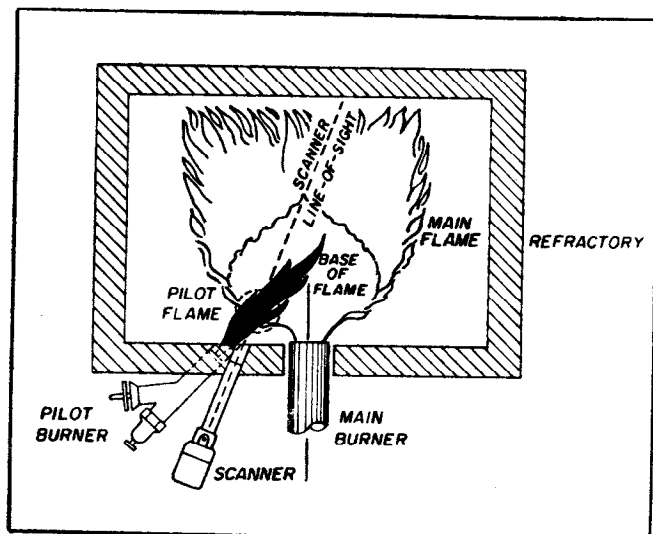
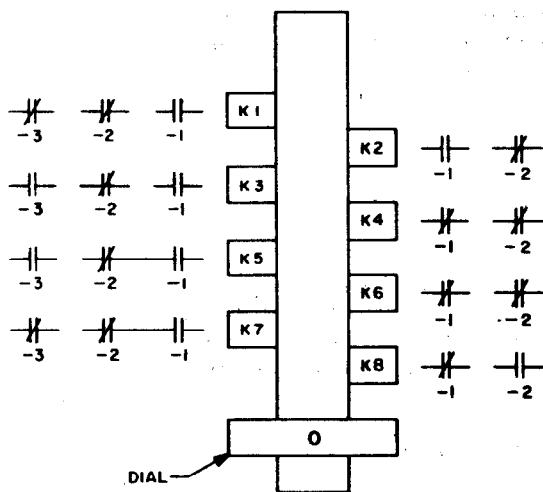
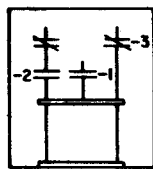
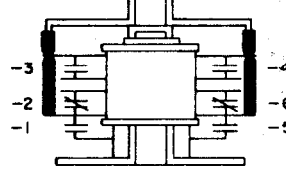
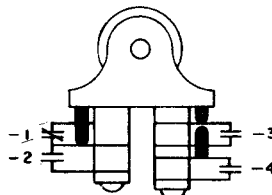
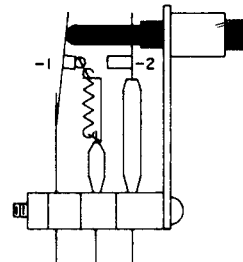


Figure 16

CAM SWITCH ASSEMBLY (FRONT VIEW)

RELAY (AC)
RL3MASTER RELAY (AC)
RL1FLAME RELAY (DC)
RL2LOCKOUT SWITCH
LSTYPE 26RJ8 MODEL 6080
CAM AND RELAY CONTACT IDENTIFICATION

Troubles in FP-2/UVP-2 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 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. If a UVP-2 System is operated from 50 cycle supply, the scanner must be rated for 50 cycles; the standard 60 cycle scanner is not suitable for operation on 50 cycles!

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 3 and 2.

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: RL1 pulls in but modulator motor does not drive toward open-damper position.

1. Modulator motor not powered.
2. Linkage jammed.
3. Incorrect wiring.
4. Contacts RL1-5, K7-2, K5-2 dirty or open.
5. Contact RL1-6 does not open.
6. Defective modulator equipment.

CONDITION: RL3 drops out after 8 seconds.

1. Non-recycling interlock circuit (FV-R) open.
2. Contact RL3-1, RL1-4 dirty or open.

CONDITION: Timer motor does not start when modulator motor reaches high fire position.

1. Purge airflow interlock circuit (8-W) open.
2. Contact K4-2 dirty or open.

CONDITION: Modulator motor does not drive toward closed-damper position at 30 seconds.

1. Modulator motor not powered.
2. Linkage jammed.
3. Incorrect or faulty wiring.
4. Contacts RL1-5, K7-2, K5-1 dirty or open.

CONDITIONER: 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 1 or 5 or 6.
2. Contacts K3-1, K8-1, K7-3, K6-1, K4-1 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.
10. Selector plug loose (15 or 30 sec. plug).

CONDITION: Timer dial at position 1. RL1 drops out.

1. LS heater coil open.
2. RL1-3 contact dirty or open.

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 — correct connection is to terminals 14 and 15.
5. Flame relay is mechanically bound or K1-3 dirty or open.
6. Defective Scanner, or (cell-48 PT1).
7. Defective control.
8. 26RJ8 only. Scanner is too hot or sees hot refractory. Tubes reversed or inoperative.

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.
3. RL2-3 dirty or 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.

CONDITION: Timer dial reaches position "3" or "dot". 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 K7-3 does not open.
2. See 10 second TFI above 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. Contacts K7-1, RL1-5 dirty or open.
6. Defective modulator equipment.
7. Contact RL1-6 does not open.

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 K4-2 or RL1-2 stuck closed.

CONDITION: Timer dial reaches "dot" position. 30 second TFI pilot flame does not go out.

1. Contact K4-1 does not open.
2. See 10 second TFI above for additional data.

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. Modulator motor not powered.
2. Linkage jammed.
3. Incorrect wiring.
4. Contacts RL1-6 dirty or open.
5. 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

45UV2 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. Estimated tube life 20,000 hours when operating within ambient temperature limits.

48PT1 Scanner

FIRETRON Cell: Estimated life 20,000 hours, when operated within ambient temperature limits. The scanner lens should be cleaned as often as operating conditions demand.

26RJ8 Control

Tubes: Types 12AX7; 12BH7A; have an estimated life of 10,000 hours. Annual replacement recommended. Replacement tubes are available from local radio tube supply sources.

FP-2/UVP-2 Control

Humidity Effects: To protect against high resistance leakage in the electronic circuit resulting from high humidity, it is recommended that the 26RJ8 Control be left powered continually even when not in operation. If it is necessary to shut down completely for an extended period, power should be turned on for 48 hours before putting the control back in operation.

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 ENGINEERING CORP. (FM)
FACTORY INSURANCE ASSOCIATION (FIA)
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

	F.M. AUTOMATIC LIGHTED BOILERS	F.I.A. AUTOMATIC SINGLE BURNER	N.F.P.A. 85
PRE-PURGE	<ul style="list-style-type: none"> • 4 AIR CHANGES @ 50% avg. Air Flow-Supervised • AUTOMATIC DAMPERS which close during downtime 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 	<ul style="list-style-type: none"> • 8 AIR CHANGES reaching not less than 70% Air Flow-Supervised
PILOT PROVING	10 Sec.	10 Sec. Max.	10 Sec.
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. 	<ul style="list-style-type: none"> • #2 & 4 - 10 Sec. • #5 & 6 - 15 Sec.
MAIN FLAME TRIAL for IGNITION (GAS)	10 Sec.	15 Sec. Max.	10 Sec.
FLAME FAILURE RESPONSE TIME	2-4 Sec.	2-4 Sec.	2 Sec. Max.
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. • 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. 	<ul style="list-style-type: none"> • Low Fire Start • Manual Start from cold Start. • Prove Safety Shut-off Valve closed. • NON-RECYCLE • Power Failure • Loss of Control System activating energy. • Low Oil Press. and Temp. • High & Low Gas Press. • Atomizing Medium. • Minimum Air Flow.
OTHER	<ul style="list-style-type: none"> • Code Applicable to Gas Fired Boilers over 50 H.P., and Oil Fired Boilers over 100 H.P. 		<ul style="list-style-type: none"> • Code Applicable to Single Burner, oil or gas fired Water-tube Boiler Furnaces, 10,000 #/Hr. Steam and 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. Safety shutdown shall be accomplished within 2 sec. following a flame failure, loss of minimum combustion air flow or the opening of any running interlock.
 - f. 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.
 - g. 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. The control chassis shall be of plug in design to facilitate replacement without disconnecting any external wiring.

FLAME DETECTION

4. Infrared (PbS)
 - a. The pilot and main flame shall be monitored by an infrared-sensitive flame scanner sensitive to flame radiation. The scanner shall not be actuated by hot refractory or any other source of infrared radiation.
 - b. The scanner shall mount and sight through a 1/2 inch standard pipe.
 - c. The scanner shall be suitable for operation over a temperature range of -20°F to 125°F.
5. 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 3/4 inch standard pipe.
 - c. The scanner shall be suitable for operation over a temperature range of -40°F to 200°F, as measured on the mounting hub.
The flame safeguard control system shall be FIREYE FP-2 (Infrared) or UVP-2 (Ultraviolet) with Control type, 26RJ8 (Infrared) or 25RU8 (Ultraviolet), model 6080 (Infrared) or 6580 (Ultraviolet).

* See page 14 for specifications (F.M., F.I.A., N.F.P.A.)