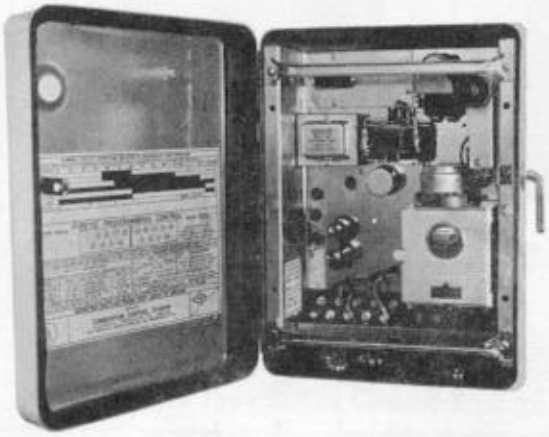
P581163
Supersedes P580863

BULLETIN CP-58

Type 26RJ8
Model 6058



Scanner Type 48PT1

fireye

System FP-2 using
Type 26RJ8–Model 6058

FLAME SAFEGUARD AND PROGRAMMING CONTROL

–for automatic burners

FEATURES

Fireye System FP-2 provides ignition and flame failure protection for industrial and commercial oil, gas, or combination oil/gas burners. In conjunction with operating, limit and interlock devices, it automatically programs each starting, operating, and shutdown period. The FP-2 System consists of a Type 26RJ8 programming control and a Type 48PT1 scanner which uses the "Firetron" cell to visually supervise both oil and gas flames.

The FP-2 System monitors both main and pilot flames and does not permit the main fuel valve to be energized unless pilot flame has been established and proved. With an alternate connection for burners having direct spark ignition, the unsupervised trial-for-ignition period is precisely restricted to a safe short interval.

The 26RJ8 control programs the operation of blower and/or burner motor, ignition system, fuel valve, and modulator system in a proper sequence which includes suitable purge periods before ignition and after burner shutdown. Additionally it is designed to de-energize all fuel valves within 1 to 4 seconds upon loss of flame signal. The control recycles automatically each time the operating or limit control closes, or after a power failure, but locks out and must be reset manually following flame failure.

The FP-2 System incorporates a safety checking circuit that is effective on every start. Any condition which will cause the flame relay to hold in during the checking period will stop the program before any ignition circuits are energized and, if sustained, will result in safety lockout.

SPECIFICATIONS

Fireye System FP-2, consisting of Control Type 26RJ8, Model 6058, and Scanner Type 48PT1

SUPPLY VOLTAGE

120 volts (Min. 102v, Max. 132v) –
60 cycles – 1 phase

VOLT-AMPERE RATINGS:

26RJ8 consumption: 35va
Max. simultaneous connected load: 1965va

MAXIMUM OPERATING TEMPERATURE:

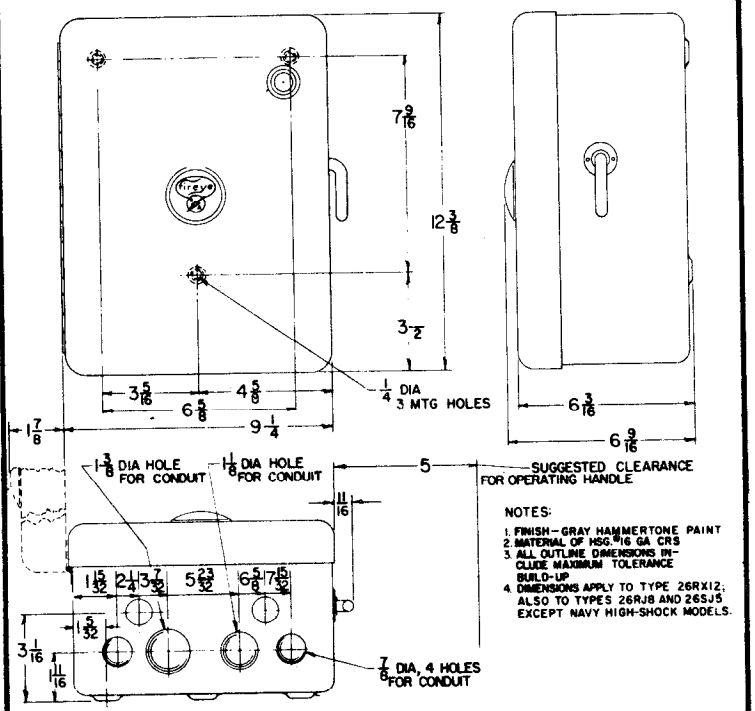
Scanner Type 48PT1 . . . . . 125°F
Control Type 26RJ8 . . . . . ambient, . . 125°F

SHIPPING WEIGHT: 22 lbs.

TERMINAL RATINGS (MAX.) FOR TYPE 26RJ8 MODEL 6058

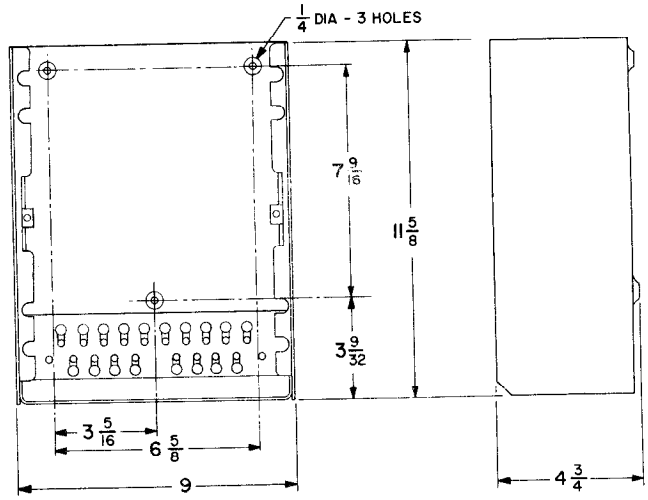
Terminal No.	Typical Load	Ratings at 120 V. 60 Cy. (except as noted)			
5 or 6 or Combination	Ignition Devices	500 va Transformer and 125 va Pilot Duty			
		Alternate: 300 va Transformer and 65 va Pilot Duty and Motorized Valve maximum – 60 va Holding, 175 va Opening, 210 va Locked Rotor			
7	Main Fuel Valve	130 va Pilot Duty			
		Alternate: 65 va Pilot Duty and Motorized Valve (max. of one, or combined load of two) – 120 va Holding, 460 va Opening, 520 va Locked Rotor			
8	Burner or Blower Motor or Starter	Amperes @ 120 Volts 60 Cycles			
		Full Load	7.4		
		Locked Rotor	44.4		
		Alternate: 250 va Pilot Duty			
9	Alarm	50 va Pilot Duty			
10, 11, 12, Combined	Modulator	125 va Pilot Duty			
		Alternate: 2a Max. @ 30v Max. (N.E.C. Class 2)			

Mounting and Outline Dimensions



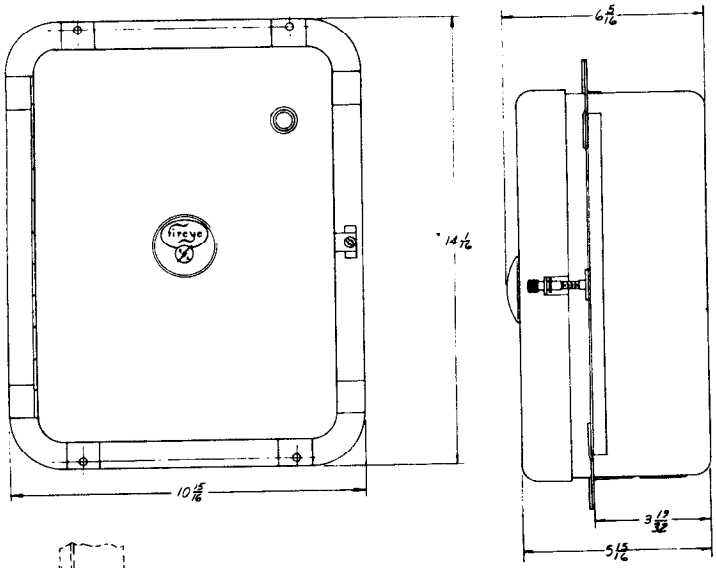
NOTES:
1. FINISH – GRAY HAMMERTONE PAINT
2. MATERIAL OF MSG. 16 GA CRS
3. ALL OUTLINE DIMENSIONS PRECLUDE MAXIMUM TOLERANCE BUILD-UP
4. DIMENSIONS APPLY TO TYPE 26RX12; ALSO TO TYPES 26RJ8 AND 26SJ5 EXCEPT NAVY HIGH-SHOCK MODELS.

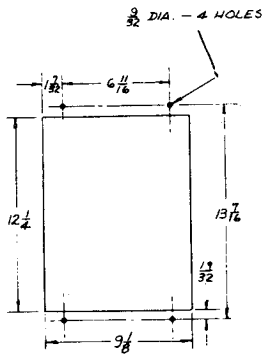
SURFACE MOUNTED ENCLOSURE (STANDARD)



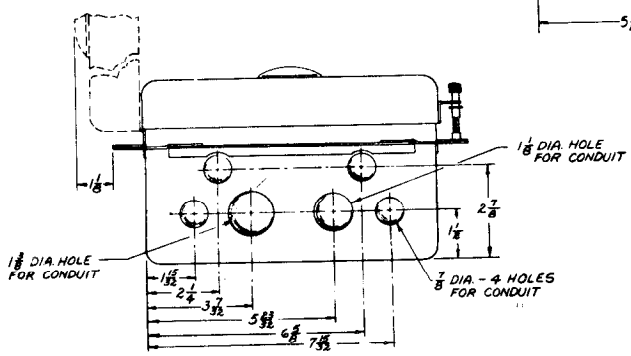
FRAME FOR CABINET MOUNTING

TO SPECIFY, ADD SUFFIX "A" TO MODEL NUMBER



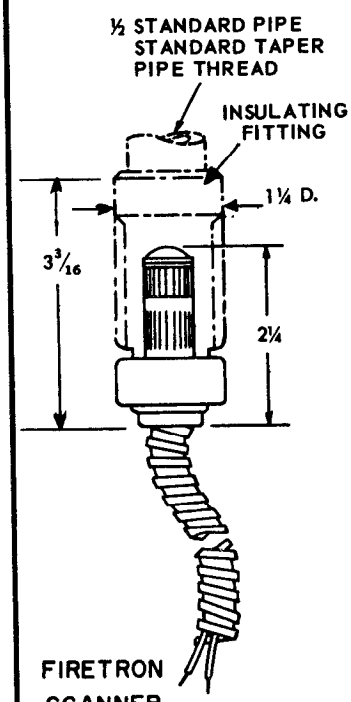


PANEL CUTOUT DIMENSIONS



FLUSH MOUNTED ENCLOSURE

TO SPECIFY, ADD SUFFIX "B" TO MODEL NUMBER



FIRETRON SCANNER

Figure 1

Figure 2

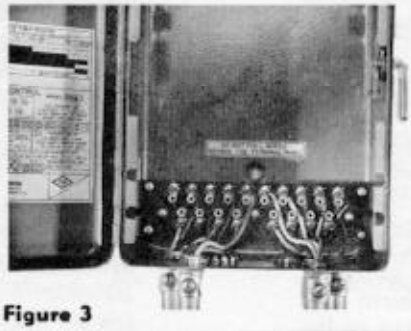


Figure 3

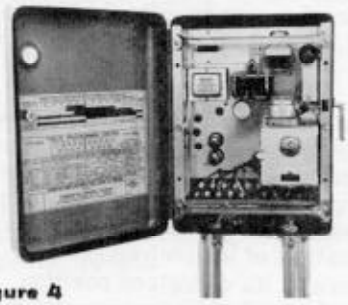


Figure 4

Installing the Type 26RJ8 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.

Control and Scanner Wiring

Make wiring connections at terminal panel at bottom of housing (Fig. 3). 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 (Fig. 5). 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.

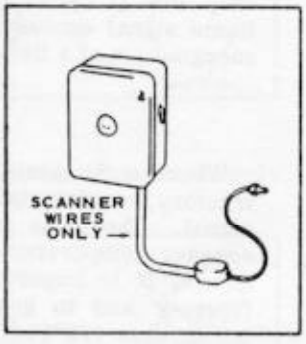


Figure 5

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.

Other electrical rating terms must be converted to VA when computing total connected load. If stated in amperes at a given voltage, multiply volts by amperes to get VA. If stated in horsepower, use the ampere figure specified in the National Electrical Code for that single phase horsepower at the appropriate voltage and convert to VA. If the connected load is rated in watts, convert to approximate VA by dividing the rating in watts by an appropriate factor as follows:

Magnetic coil (relay, solenoid valve, etc.)	.35
Motor	.75
Resistor (electric heater, lamp, etc.)	1.00

(Example: for solenoid valve rated 14 watts, divide 14 by .35; approximate VA is 40.)

The types of load permissible under the various rating terms which may be applied to Fireye controls are as follows:

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.

Electrical Rating Considerations (cont.)

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 term "Inrush" as applied here relates ordinarily to a device wherein a part of the magnetic structure is free to assume two defined positions (such as a solenoid plunger) and signifies the current which flows in the short interval between energization of the coil and seating of the movable structure in its energized position. The term also relates to resistive devices which operate at incandescent temperatures (such as a lamp) where the cold resistance is much less than the hot resistance and where accordingly the current during the short interval between energization and incandescence is considerably higher than normal operating current.

There are no universal formulas for converting one type of rating to another. Thus the VA pilot duty portion of a combination rating can not be arbitrarily increased just because the other portion (a non-pilot duty VA rating, for instance) is not being used. There is likewise no formula to convert AC ratings of isolated contacts to DC ratings. The use of contacts in DC circuits is not sanctioned unless a DC rating is specified.

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.

The ratings tabulated on page 1 are the maximum permissible for each terminal. In models where the total of maximum permissible loads on all terminals exceeds 1965 VA, it will be necessary to restrict the load on one or more terminals to stay within the 1965 VA limitation!

Ratings as they affect the contacts within the Fireye control are established on the assumption that no contact will be required to carry inrush currents more often than once in fifteen seconds. The use of limit, interlock, or operating control switches that do not make positive contact at closure and which give rise to "chattering" of relays within the Fireye control or of devices energized through it may lead to premature failure of switching members in the control. Similarly, the contacts can not be expected to handle short-circuit currents without possible damage. It is therefore of vital importance to make a "dry run" check of the control system (with manual fuel shut-off valves closed) following the automatic opening of a control system fuse or circuit breaker, or following any known instance of relay or switch chattering!

Fuel Valve Contacts

Because of the special hazards that could accompany welding of the contacts which control the fuel valve circuit, those contacts are made of a highly weld-resistant material.

Scanner Type 48PT1

Install the Type 48PT1 Scanner as recommended by the burner manufacturer. If no instructions are provided, 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).

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. 6) 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.

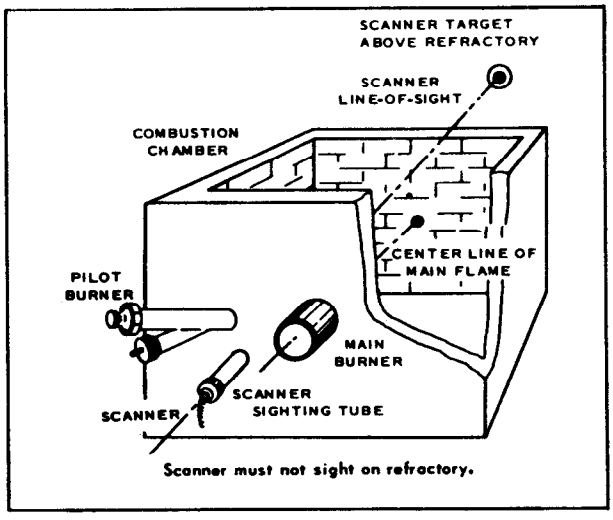


Figure 6

2. Position the scanner sight tube so that scanner line of sight will cross the intersection of pilot flame axis and main flame (Fig. 9). 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. 7).

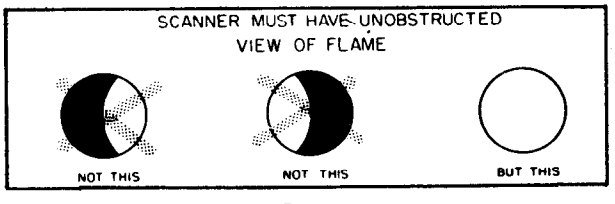


Figure 7

4. Both pilot and main flames must completely cover scanner field of view (Fig. 8).

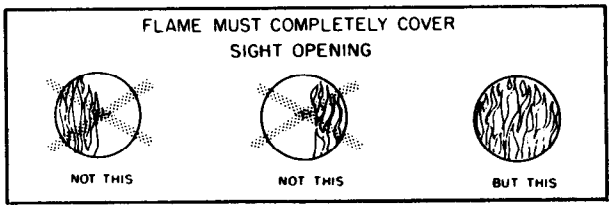


Figure 8

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, Fireye 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 Fireye Orifice Set (Part No. 10-88).

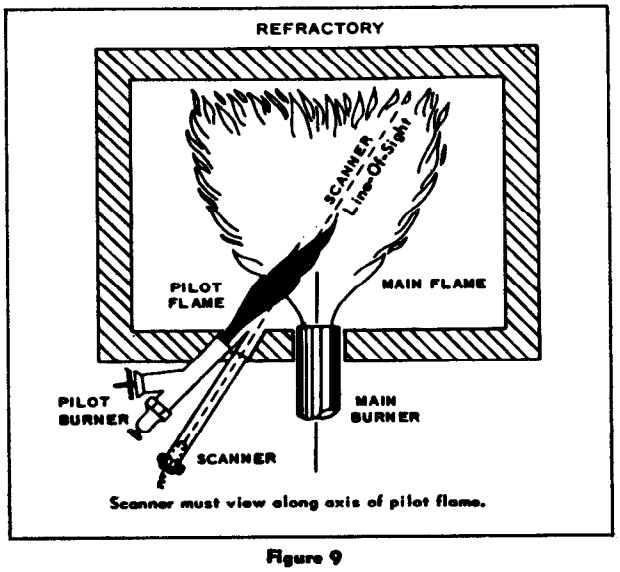


Figure 9

Keeping the Scanner Cool

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. 10).

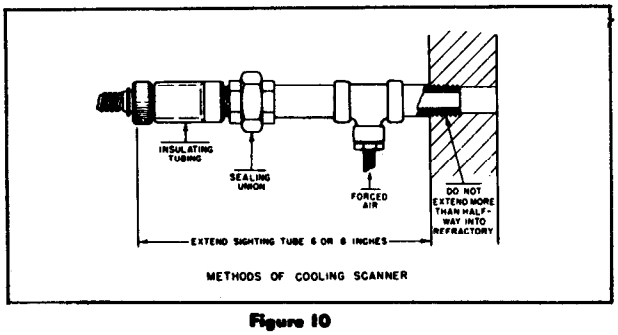


Figure 10

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 Fireye Sealing Union (Part No. 60-801) when using method 3 above.

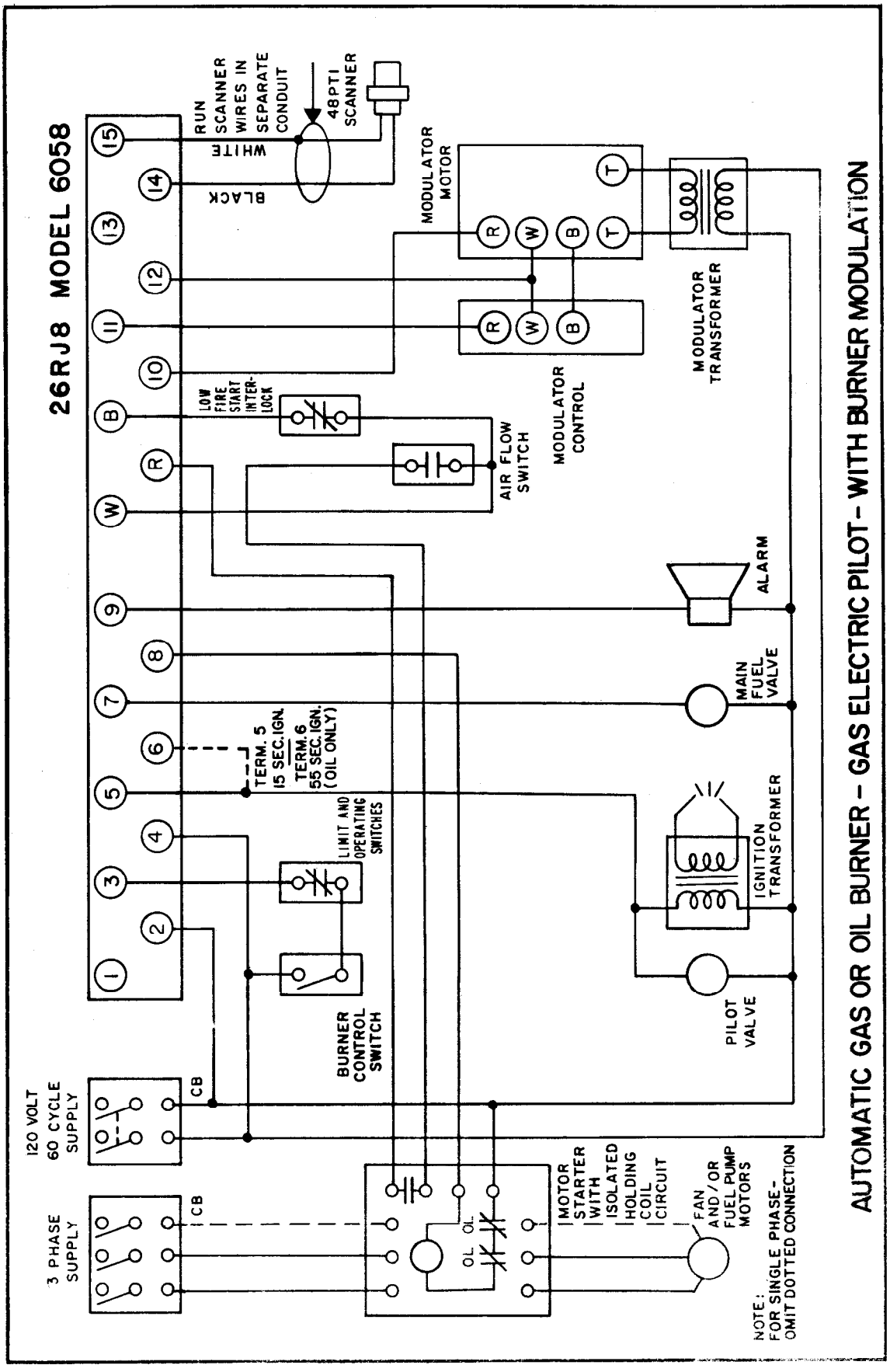
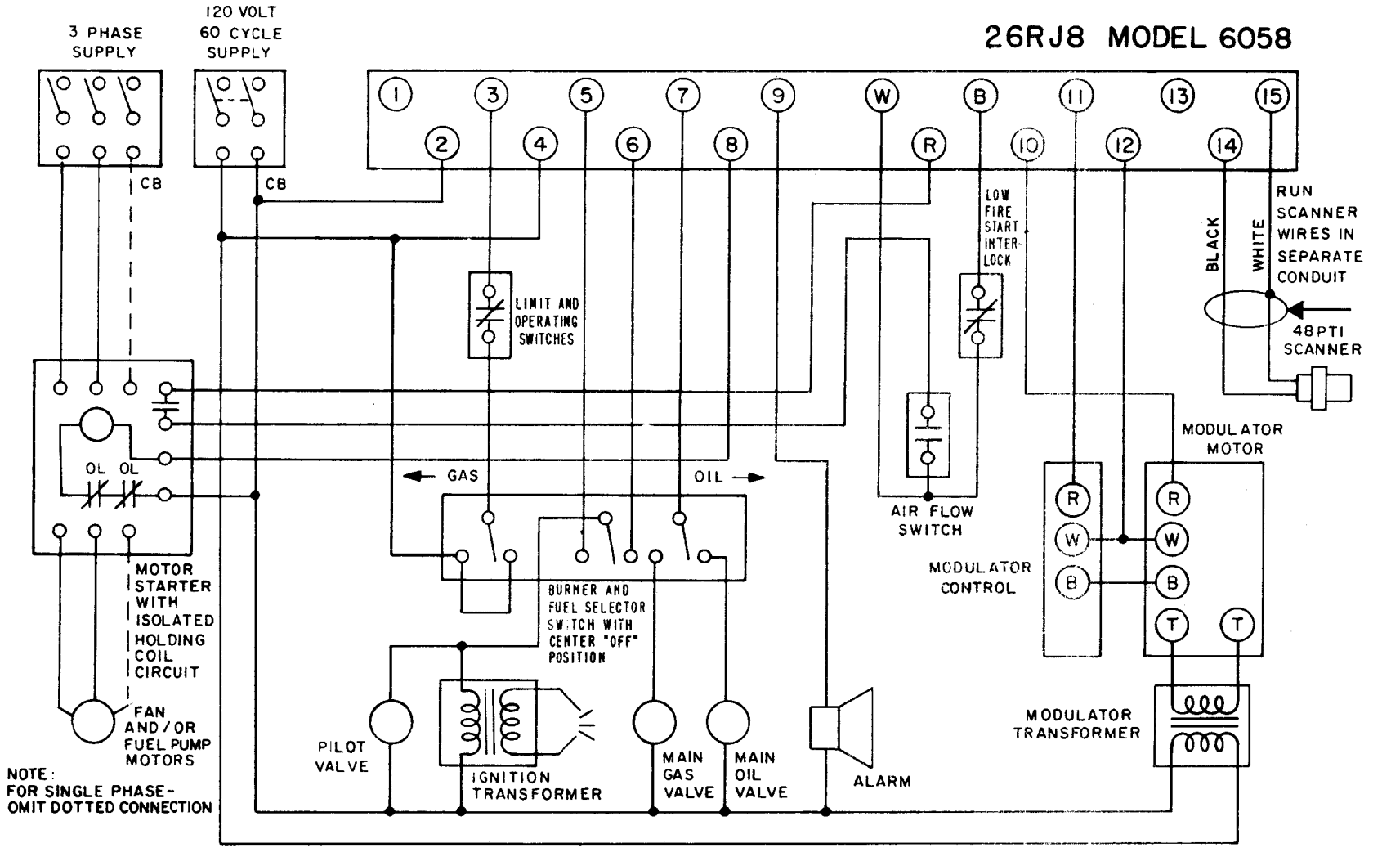

26RJ8 MODEL 6058
AUTOMATIC GAS OR OIL BURNER - GAS ELECTRIC PILOT - WITH BURNER MODULATION
RUN SCANNER WIRES IN SEPARATE CONDUIT
WHITE
BLACK
48PTI SCANNER
MODULATOR MOTOR
MODULATOR TRANSFORMER
MODULATOR CONTROL
LOW FIRE START INTER-LOCK
AIR FLOW SWITCH
ALARM
MAIN FUEL VALVE
IGNITION TRANSFORMER
PILOT VALVE
TERM. 5 15 SEC. IGN.
TERM. 6 55 SEC. IGN. (OIL ONLY)
LIMIT AND OPERATING SWITCHES
BURNER CONTROL SWITCH
120 VOLT 60 CYCLE SUPPLY
3 PHASE SUPPLY
CB
OL
MOTOR STARTER WITH ISOLATED HOLDING COIL CIRCUIT
FAN AND/OR FUEL PUMP MOTORS
NOTE: FOR SINGLE PHASE - OMIT DOTTED CONNECTION

Figure 11



AUTOMATIC GAS/OIL COMBINATION BURNER- GAS ELECTRIC PILOT- WITH BURNER MODULATION

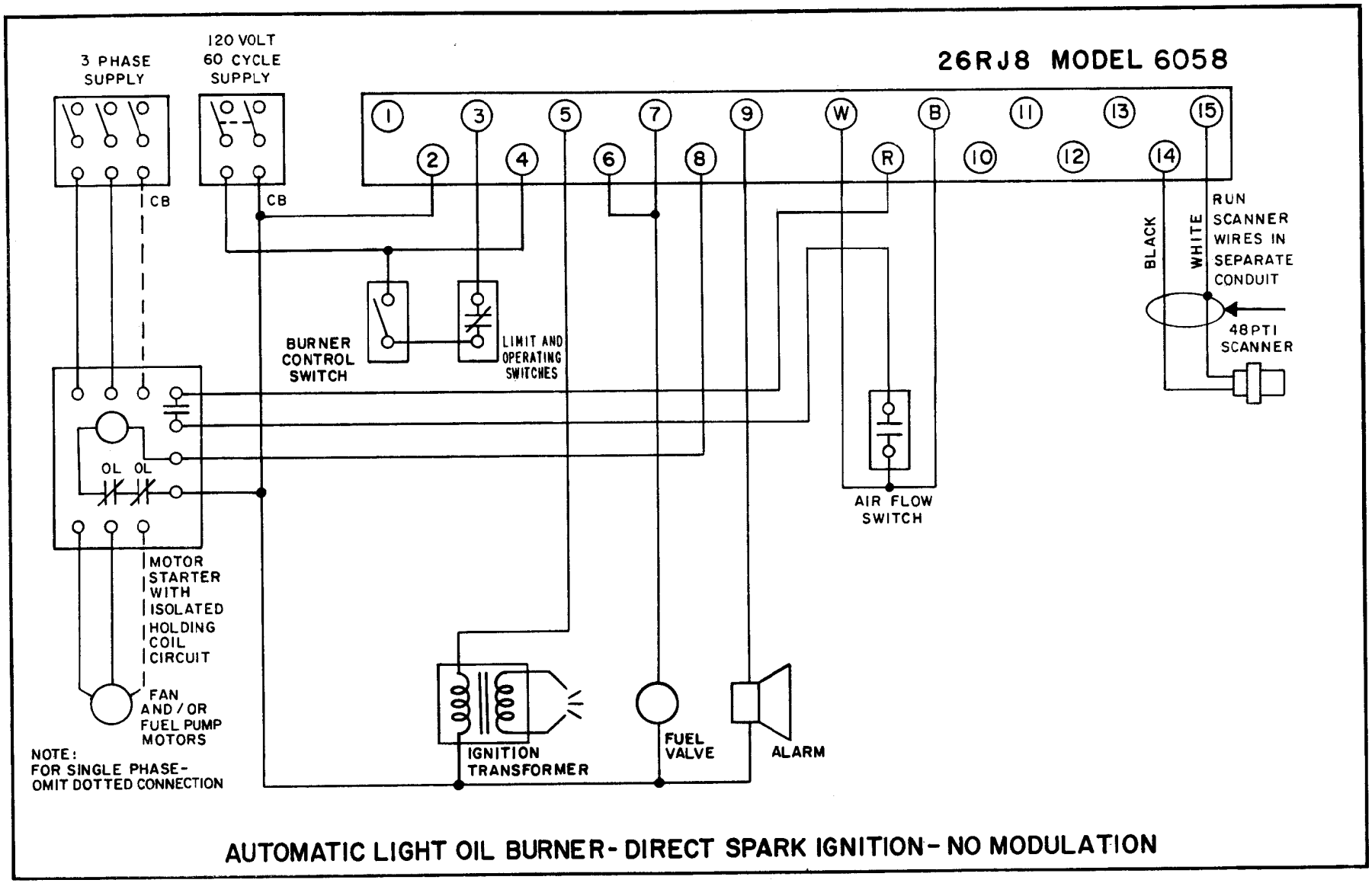

3 PHASE SUPPLY
120 VOLT 60 CYCLE SUPPLY
26RJ8 MODEL 6058
1
2
3
4
5
6
7
8
9
W
R
B
10
11
12
13
14
15
CB
CB
BURNER CONTROL SWITCH
LIMIT AND OPERATING SWITCHES
BLACK
WHITE
RUN SCANNER WIRES IN SEPARATE CONDUIT
48PTI SCANNER
OL OL
AIR FLOW SWITCH
MOTOR STARTER WITH ISOLATED HOLDING COIL CIRCUIT
FAN AND/OR FUEL PUMP MOTORS
NOTE:
FOR SINGLE PHASE-
OMIT DOTTED CONNECTION
IGNITION TRANSFORMER
FUEL VALVE
ALARM
AUTOMATIC LIGHT OIL BURNER - DIRECT SPARK IGNITION - NO MODULATION

Figure 13

Relay, Lockout Switch and Timer Operation

A. Master Relay (RL1) is located slightly above center of chassis. When all starting circuits are closed, RL1 pulls in. Only with RL1 energized is power made available to the ignition and fuel valve switching circuits. RL1 remains energized from the start of a program until a limit or operating control opens or the lockout switch trips. It also is de-energized in the event of power interruption and cannot be re-energized until the timer has reset to starting position.

B. Flame relay (RL2) is located at top right of chassis. During the prepurge period this relay must be energized in response to an internal checking signal and must become de-energized when checking signal is removed. Failure of the relay to either pull in or drop out during this two-way check cycle will stop the timer motor and, if the condition persists, safety lockout will occur. After flame is established, RL2 is energized in response to flame signal. It then remains energized until flame is extinguished, due to opening of an operating or limit control, or as the result of flame failure.

C. The lockout switch (LS) is located to the right of RL2 on the chassis. It trips (contacts transfer to safety position) following flame failure, ignition failure, or failure of RL2 to assume its correct position during the safety check period. 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 a cooling period of two or more minutes.

D. 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.

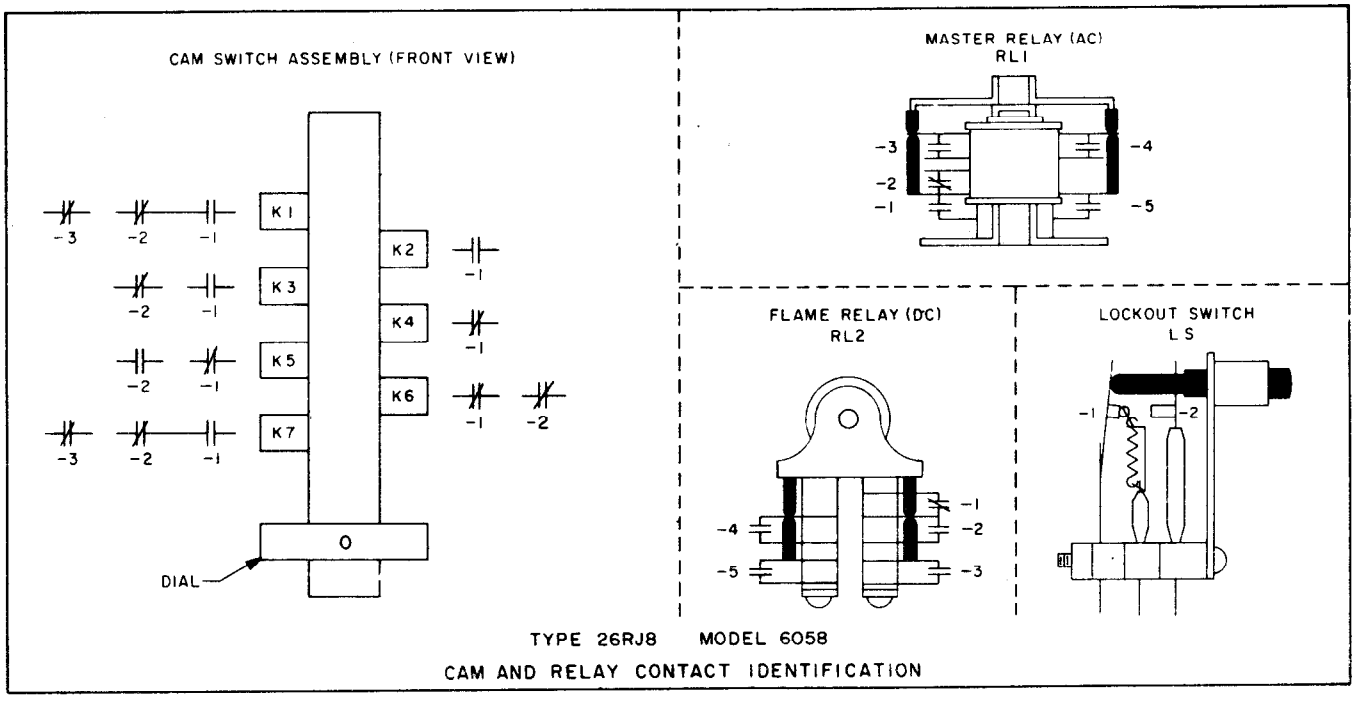


Figure 14

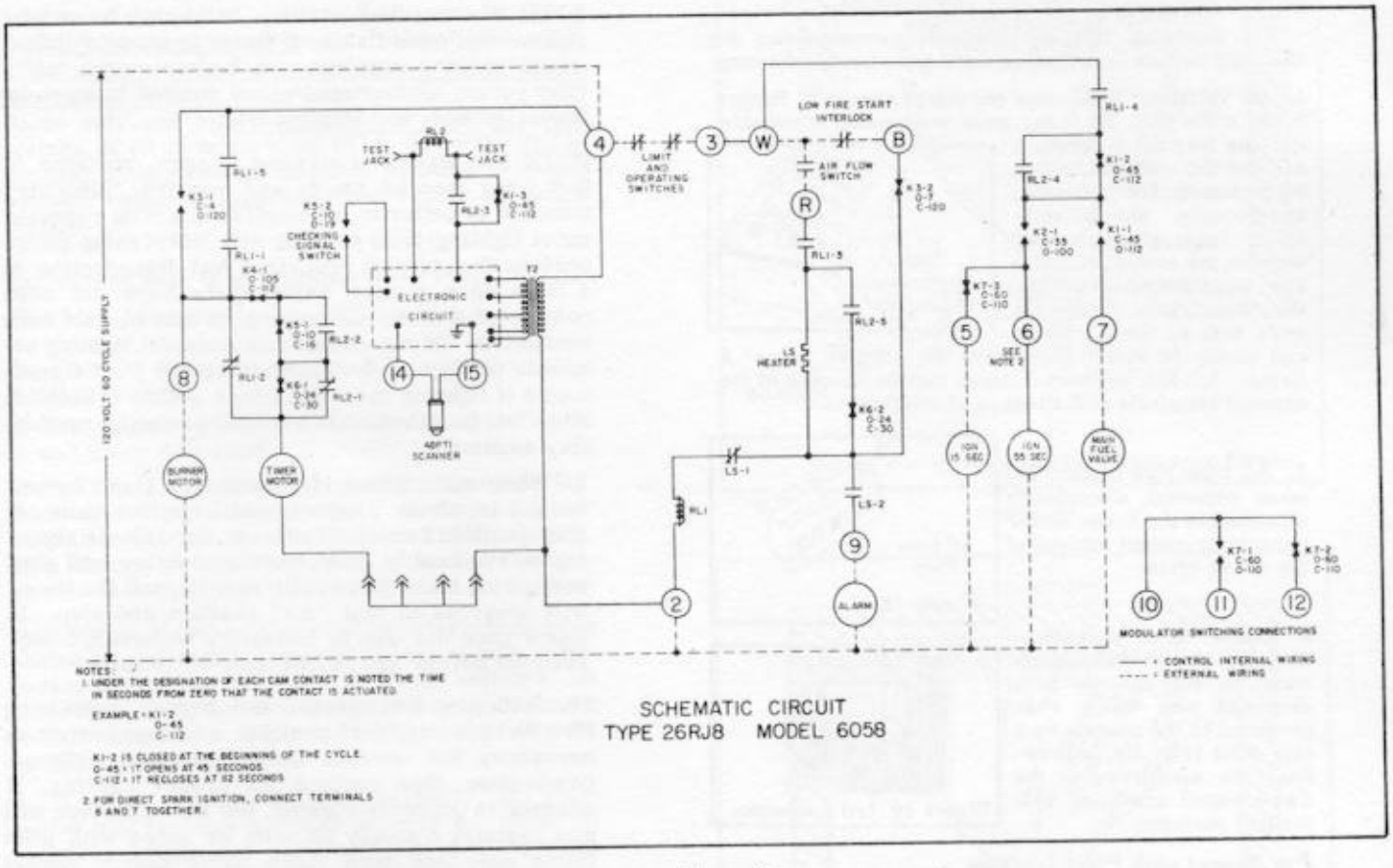
TIMING SEQUENCE: FP-2 SYSTEM WITH TYPE 26RJ8 MODEL 6058

Gas or oil proven pilot.
(No connection between terminals 6 and 7)

Timer Rotation (Seconds)	Dial Indication	BURNER STARTUP Action
0	0	Operating control closes. Master relay, timer motor and burner motor (Term. 8), energized. Modulator circuit is in low fire position (10-12 closed, 10-11 open).
10		Checking signal on - Flame relay energized. Timer will pause if vacuum tubes are not warmed up.
19		Checking signal off - Flame relay deenergized.
24	X	If for any reason flame relay is energized, timer stops until lockout switch trips. With normal operation there is no pause here.
35	1	Ignition (Terminals 5 and 6) on.
45	2	Fuel valve (Term. 7) on (assuming pilot is proven).
60	3	Terminal 5 ignition off. Modulator control switches go to demand position (10-12 open, 10-11 closed).
100	4	Terminal 6 ignition off.
105	DOT (Index)	End of starting cycle; timer motor stops. Burner operates until heat demand is satisfied.
		BURNER SHUTDOWN
105	DOT (Index)	Operating control opens: master relay and fuel valve (Term. 7) de-energized; timer motor energized.
112		Modulator control switches go to low fire position.
120	0	Burner motor (Term. 8) circuit and timer motor de-energized.
		System is ready for startup whenever operating control closes again.

Unproven pilot or direct spark ignition
(Terminals 6 and 7 jumpered)

Timer Rotation (Seconds)	Dial Indication	BURNER STARTUP Action
0	0	Operating control closes. Master relay, timer motor and burner motor (Term. 8), energized. Modulator circuit is in low fire position (10-12 closed, 10-11 open).
10		Checking signal on - Flame relay energized. Timer will pause if vacuum tubes are not warmed up.
19		Checking signal off - Flame relay deenergized.
24	X	If for any reason flame relay is energized, timer stops until lockout switch trips. With normal operation there is no pause here.
35	1	Ignition (Term. 5) and fuel valve (Term. 7) on.
45	2	No action unless flame has not been established and/or detected, in which case fuel valve and ignition are de-energized.
60	3	Ignition (Term. 5) off. Modulator control switches go to demand position (10-12 open, 10-11 closed).
100	4	No action.
105	DOT (Index)	End of starting cycle; timer motor stops. Burner operates until heat demand is satisfied.
		BURNER SHUTDOWN
105	DOT (Index)	Operating control opens: master relay and fuel valve (Term. 7) de-energized; timer motor energized.
112		Modulator control switches go to low fire position.
120	0	Burner motor (Term. 8) circuit and timer motor de-energized.
		System is ready for startup whenever operating control closes again.



SCHEMATIC CIRCUIT
TYPE 26RJ8 MODEL 6058

Figure 15

Cover Label Data

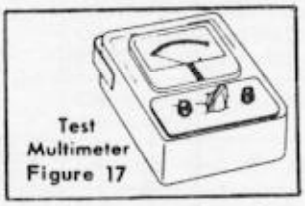
Figure 16

Installation Testing

Test Accessories

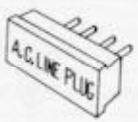
The following test equipment is recommended for checking out new installations and routine troubleshooting:

1. DC Voltmeter (1000 ohms per volt or greater). Range: 0-150 volts (Fig. 17). Any good multimeter is suitable and can be used to measure AC and DC voltages, check for continuity, short circuits, and grounds. The DC voltmeter leads plug into test jacks on the control chassis. For satisfactory operation, the meter will read zero volts with no flame present and steady 60 to 100 volts when the scanner "sees" a flame. AC line and lead voltages may be checked at the exposed terminals at the bottom of the chassis



Test Multimeter
Figure 17

2. AC Line Plug (Figure 18) when removed, electrically disconnects the timer motor permitting manual control of the firing cycle.



AC Line Plug
Figure 18

3. 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. 19), will reduce the sensitivity of the flame signal amplifier 40% for test purposes.

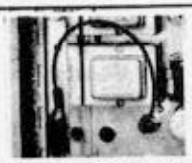


Figure 19 Test Attenuator

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.

3. Plug DC Voltmeter leads in to 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", grasp the AC line plug (located at top left of chassis) ready to withdraw it.

5. When timer has slightly passed dial "1" and ignition is energized withdraw the AC line plug to stop the timer. If pilot flame is not established within 15 seconds, turn burner switch off, reinstall the AC line plug, 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, between 60 and 100 volts, dc. 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.

Checking Scanner Viewing of Main Flame

7. Turn burner switch "off", replace AC line plug, return burner switch to "on", and let control recycle 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 60 volts or more with pilot flame only and with main flame only. Repeat burner adjustments as necessary to obtain this condition if it does not exist initially.

11. With all steps through 10 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. Do not conduct this test with the attenuator pin grounded!

12. Repeat step 4. When the timer has slightly passed dial "1" and the pilot is ignited, withdraw the AC line plug to stop the timer.

13. 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. 20, 21, 22.)

14. 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.

15. After minimum pilot test is completed, increase pilot flame to normal size.

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 60 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 15.

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 60 volts or more. 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 35 seconds' 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. Within 4 seconds after the flame fails, the main fuel valve will close and after approximately 60 seconds, the lockout switch will trip, actuating the alarm.
4. Following a 15-second post purge or spin-down period, the blower motor will stop.
5. The lockout switch may be reset after allowing the thermal element to cool (approximately 2 minutes).

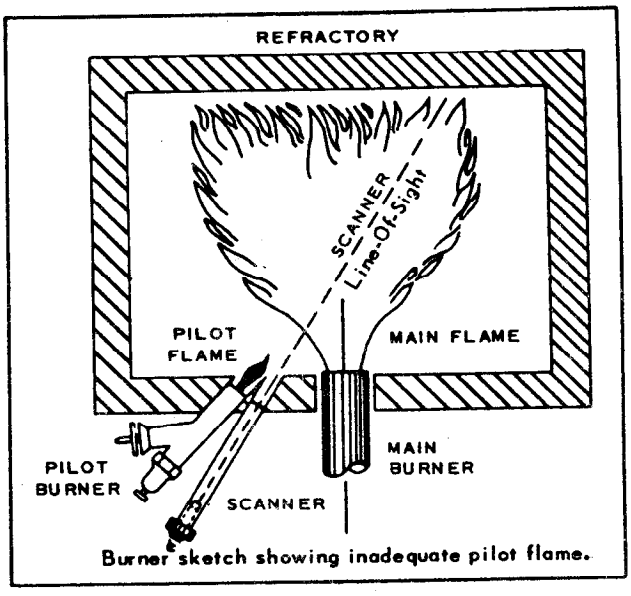


Figure 20

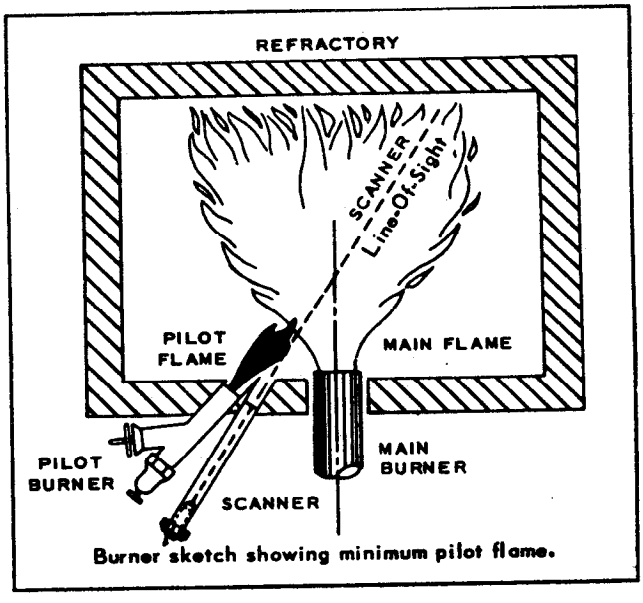


Figure 21

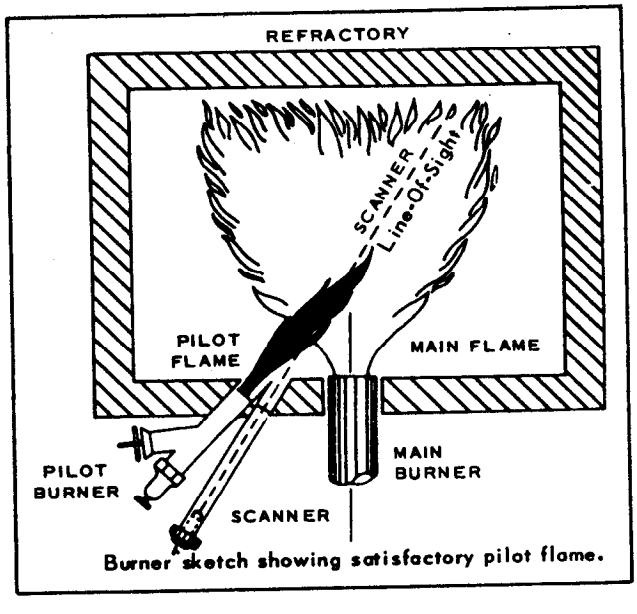


Figure 22

Troubles in FP-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 in this bulletin.
2. Chassis is securely plugged in and thumbscrews tightened, lockout switch is reset.

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

CONDITION: Zero voltage at Terminals 2 and 4.

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

CONDITION: Insufficient voltage at Terminals 2 and 4.

1. Minimum operating voltage is 102 volts.

CONDITION: Zero voltage at Terminals 2 and 3.

1. Open limit switch and operating control circuit (Pressure, LWCO, etc.).
2. Broken wire.
3. Motorized stack damper control in closed position.
4. Incorrect wiring.

CONDITION: Master relay (RL1) does not pull in.

1. RL1 armature may be mechanically stuck open.
2. Defective programming control; replace.

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

1. Contacts RL1-1-5 or K4-1, K5-1, K6-1 are dirty or open.
2. Defective programming control; replace.

CONDITION: Programming timer starts. Blower motor does not start.

1. Insufficient voltage between Terminals 2 and 8.
2. Blown motor fuse.
3. Motor starter overloads tripped.
4. Burner motor incorrectly wired.
5. Defective motor or starter.

CONDITION: Timer stops at 10 second point, RL2 does not pull in, lockout switch trips.

1. Defective vacuum tube.
2. Contacts K5-2, K1-3 dirty or open.

CONDITION: Flame relay RL2 is not deenergized when "X" appears on timer dial.

1. Incorrect scanner wiring.
2. Scanner sees flame caused by leaky fuel valves, burning carbon, or soot, or an adjacent burner in multiple burner installations.
3. Flame relay is mechanically held in.
4. Defective vacuum tube.
5. Contacts K5-2 do not open.
6. Defective control or scanner.

CONDITION: Master relay drops out after timer starts.

1. Contacts RL1-3, dirty or open.
2. Air flow switch is not closed (W to R).
3. Lockout switch heater is open.

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

1. Insufficient voltage between Terminals 2 and 5, 6.
2. Contacts RL1-4, K1-2, K2-1 or K7-3 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. (See page 12).
4. Scanner is incorrectly wired—correct wiring is white wire to Terminal 15; black wire to Terminal 14.
5. Scanner is too hot.
6. Scanner views hot refractory.
7. Flame relay is mechanically bound.
8. Defective tube or cell, or tubes reversed.
9. Contacts K1-3, dirty or open.
10. Defective scanner.
11. Defective control.

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

1. Insufficient voltage between Terminals 2 and 7.
2. Contacts RL2-3, RL2-4 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 off.

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, operating control circuit, or air flow switch open.
3. Contacts RL2-5, K6-2 dirty or open.
4. Scanner is "blinded" by too bright reflection of flame on inside surface of sighting tube, or by sighting incandescent refractory. If scanner is correctly installed, restrict view with orifice in sighting tube.

CONDITION: Timer dial reaches position "3" or "4". Pilot flame does not go out.

1. Gas pilot valve is stuck open
2. Contacts K7-3 or K2-1 are stuck closed.
3. Control circuit wiring is incorrect or cross-phased.

CONDITION: Timer dial reaches position "3". 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, 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 solenoid fuel valve.

CONDITION: Timer does not stop at "dot".

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

CONDITION: Timer does not rotate to "0" when operating or limit control opens.

1. Contacts RL1-2 or K3-1 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 K7-2 dirty or open.
5. Defective modulator equipment.

CONDITION: Timer does not stop at "0".

1. Contacts RL1-1-5, or K3-1 stuck closed.
2. Limit or operating switch circuit closed.

CONDITION: Burner motor does not stop when timer dial reaches "0".

1. Contacts RL1-1-5 or K3-1 stuck closed.
2. Limit or operating switch circuit closed.
3. Motor starter is mechanically stuck.
4. Motor starter is incorrectly wired.

Maintenance

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.

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.

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.

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.

Guarantee

We guarantee to replace or, at our option, repair any products or parts thereof (except electronic tubes and cells) which are found defective in material or workmanship within one year from date of shipment. Our obligation with respect to such products or parts shall be limited to replacement or repair f.o.b. Cambridge, Mass., and in no event shall we be liable for consequential or special damages, or for transportation, installation, adjustment, or other expenses which may arise in connection with such products or parts.

Suggested specifications for Flame Safeguard Control for Automatic Commercial-Industrial Burners.

A. The automatically fired burner shall be equipped with a UL listed and FM approved flame safeguard control system that provides the following operating sequence:

1. Purging prior to and following each firing period.
2. Pilot proving prior to energizing the main fuel valve.
3. Limited trial for ignition of main flame (15 seconds for gas or light oil, 60 seconds for heavy oil).
4. Fuel shutoff within 4 seconds and subsequent lockout of the control system following loss of flame.

B. The pilot and main flame shall be monitored by an infrared sensitive detecting system which shall not be actuated by hot refractory.

C. The control shall permit direct connection of safety limit switches, operating controls, starting interlocks, air flow switches, fuel temperature and pressure switches and lockout alarms.

D. The control system shall be designed for 120-volt supply and the timing periods of the programming sequence shall not vary more than 5% due to ambient temperature variations or normal supply voltage variations.

E. The control system shall recycle automatically under the control of the operating controls, and when power is restored following power failure. Manual reset is required following any safety lockout.

F. The flame safeguard control shall include a safety check system, effective on every start, which will prevent the burner from firing under any condition which causes the flame relay to assume and hold its energized position improperly.

G. The flame safeguard control system shall be Fireye FP-2, Model 6058.

fireye®

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