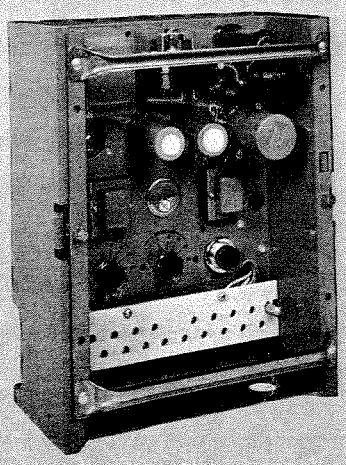
Supersedes
U13477

Bulletin CU-13
November 1986

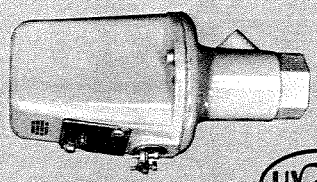
fireye®

System UVP-4S

FLAME SAFEGUARD
for burner management systems



Note: Model 4011
Supersedes Model 4111



Recognized Under the Component Program of Underwriters Laboratories, Inc.

See Table 2

Control Type 25SU5 Model 4011
in open mounting frame
120V. 50/60 Hz

Scanner Type 45UV5 Models 1000, 1010, 1101
Scanner Type 45RM1 Models 1001, 1003, 1004
Scanner Type 45RM2 Models 1000, 1001, 1002

DESCRIPTION

The solid-state Type 25SU5 Model 4011 Control, in conjunction with Type 45UV5, 45RM1, or 45RM2 remote Flame Scanners, comprises a repetitive self-checking UVP-4S Flame Safeguard System that confirms flame presence or absence to provide reliable ignition and flame failure protection.

Dimensional drawings of the control, wiring bases and scanners are shown in Figure 1. For detailed information on Type 45RM1 and Type 45RM2 Scanners, see Bulletin CU-17; for Type 45UV5 Scanners, see Bulletin CU-22.

APPLICATION

The field proven UVP-4S System, combined with appropriate auxiliary devices, enables construction of integrated safety interlock systems for single and multiple industrial burner applications firing gas, oil, pulverized coal or a combination of fuels on a continuous basis. The UVP-4S System may also be used where the 4011 Control and wiring base are installed in the safety control circuits of supervised manual, semi-automatic, and fully automatic burner management systems as the primary safety control. This Flame Safeguard System monitors flame to supervise burner and pilot performance throughout the entire burner load range.

During normal burner start-up and operation, the 4011 Control confirms flame presence and activates a sequence of appropriate auxiliary devices within the host system, in which it is employed, to indicate flame status and permit the delivery and ignition of fuel for continuous firing. Conversely, in the event of ignition failure during light-off or loss of flame while in operation, the control initiates a burner shutdown procedure. Protective devices comprising the system shutdown logic are automatically tripped to:

1. Confirm flame failure through visual indication and alarm.
2. Cut off ignition energy.
3. De-energize the fuel safety shutoff valves.

This routine prevents unburned fuel from accumulating in the combustion chamber to a dangerous level, presenting an explosion hazard.

A 4011 Control Internal Wiring Diagram is shown in Figure 2.

PRINCIPLES OF OPERATION

When flame of appropriate characteristics is detected by an ECA infrared or ultraviolet scanner, a pulse train proportional to flame strength is generated by the scanner and transmitted to the 4011 Control on ECA Scanner Cable. The presence or absence of the pulses is an indication of the presence or absence of flame; the frequency of the pulses is a measure of flame intensity.

Pulses received at the control are modified by a pulse shaping circuit which stretches the pulses and feeds them to an inverter. The amount of gain furnished by the inverter is regulated by operator adjustment of the enabled sensitivity control. Increasing the sensitivity control setting increases the gain, the rate of integration, and the reading on an optional Flame Signal Meter (refer to Figure 3) when flame is present.

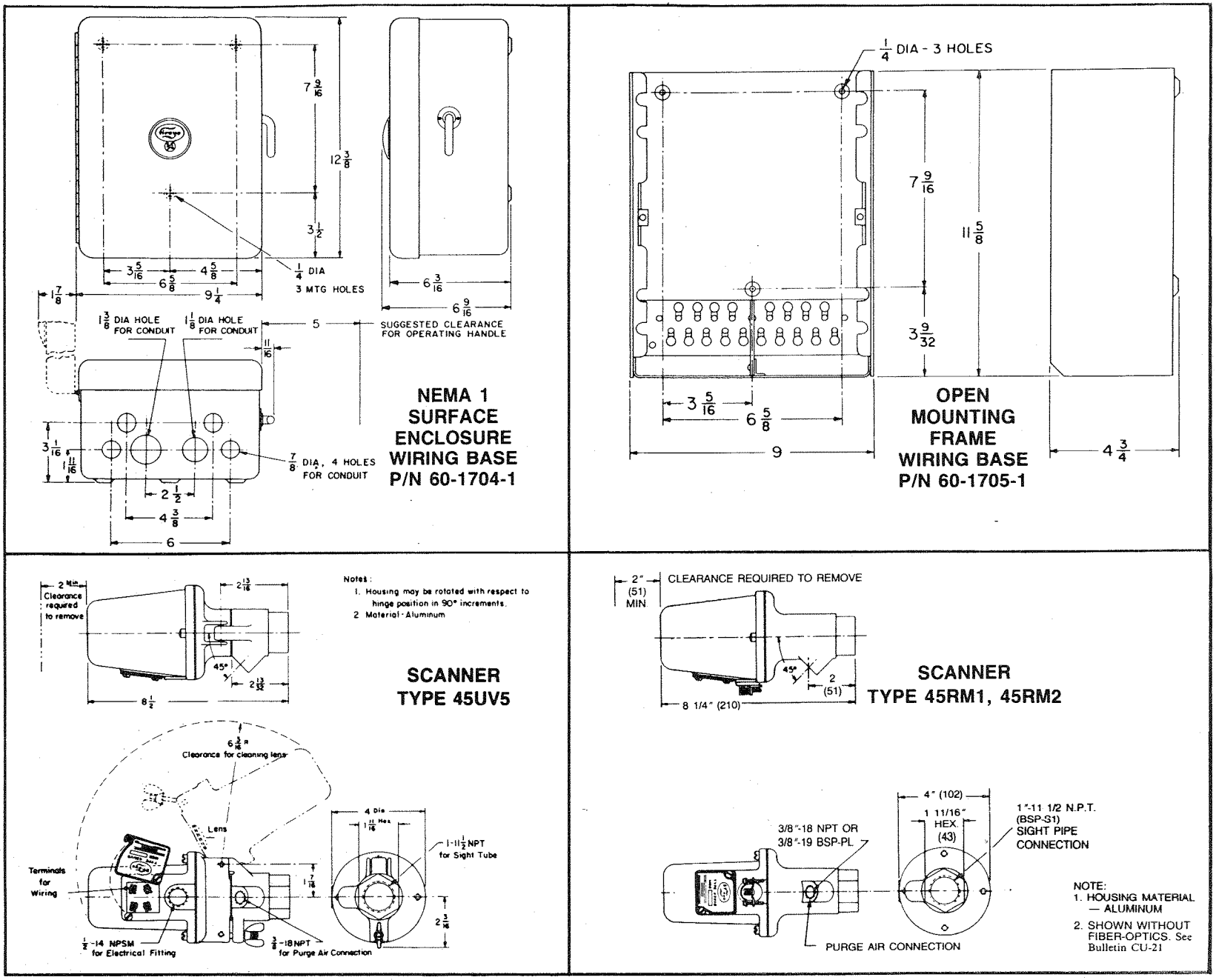
The enhanced flame signal is fed through another pulse shaping circuit and applied to a comparator circuit. When the flame signal voltage equals or is greater than the fixed comparator threshold, the circuit produces an output signal. This output is then further amplified to a magnitude sufficient to energize the Flame Relay, the contacts of which latch the Master Relay.

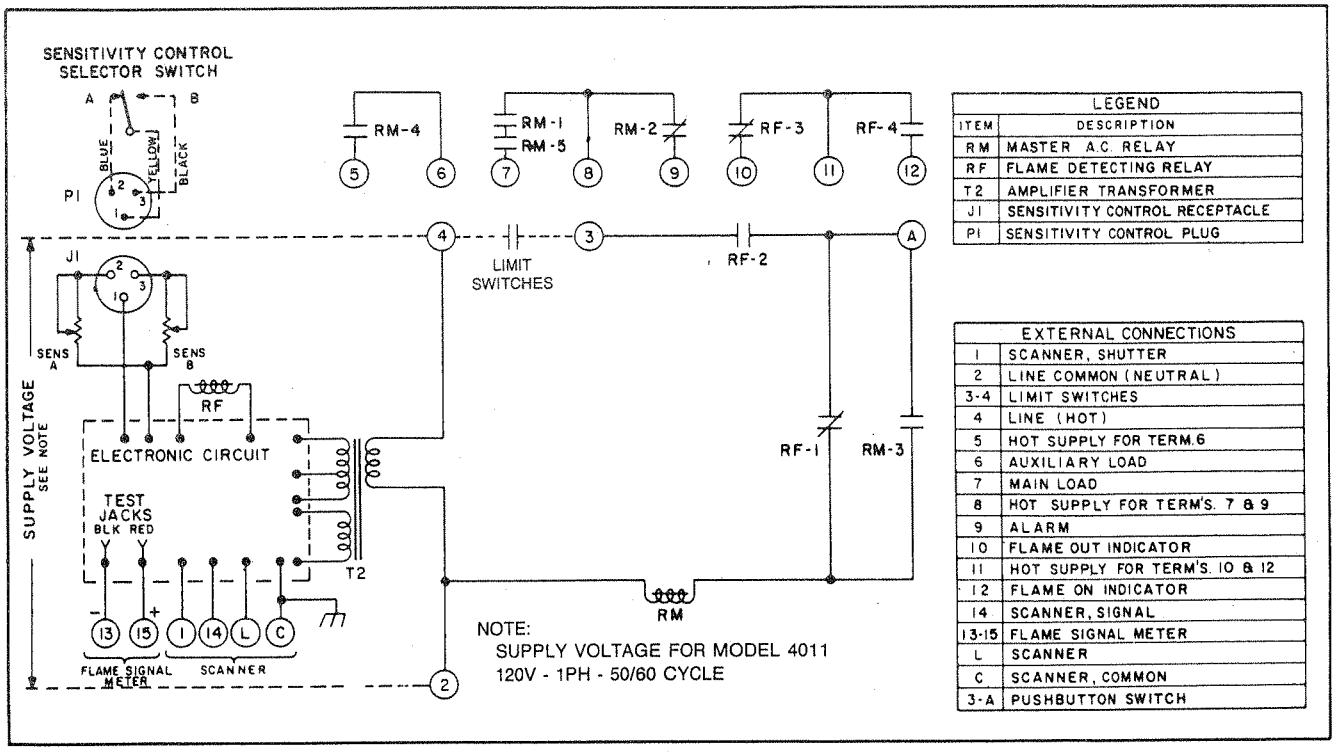
NOTE: The Master Relay is energized when the burner start

SYSTEMS DIVISION
ELECTRONICS CORPORATION OF AMERICA

SURFACE ENCLOSURE, OPEN MOUNTING FRAME AND SCANNER DIMENSIONS

Figure 1

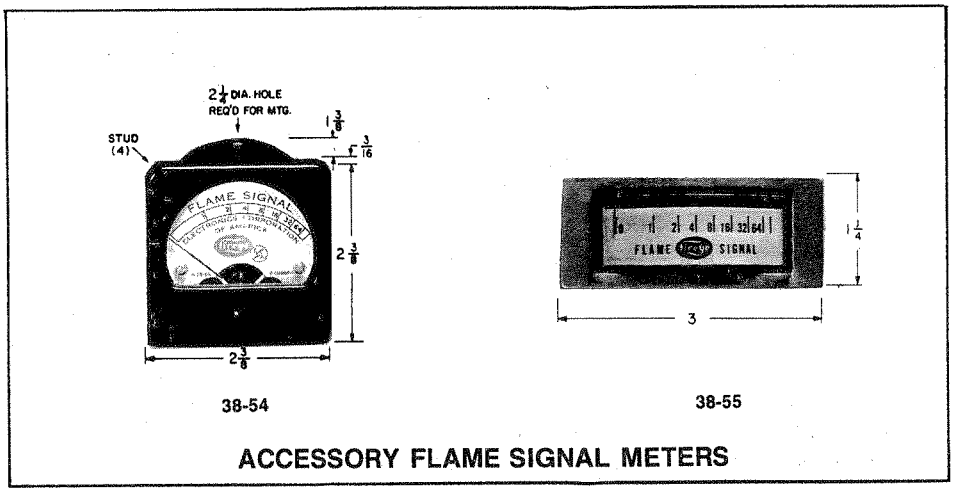




LEGEND	
ITEM	DESCRIPTION
RM	MASTER A.C. RELAY
RF	FLAME DETECTING RELAY
T2	AMPLIFIER TRANSFORMER
J1	SENSITIVITY CONTROL RECEPTACLE
P1	SENSITIVITY CONTROL PLUG

EXTERNAL CONNECTIONS	
1	SCANNER, SHUTTER
2	LINE COMMON (NEUTRAL)
3-4	LIMIT SWITCHES
4	LINE (HOT)
5	HOT SUPPLY FOR TERM.6
6	AUXILIARY LOAD
7	MAIN LOAD
8	HOT SUPPLY FOR TERM'S. 7 & 9
9	ALARM
10	FLAME OUT INDICATOR
11	HOT SUPPLY FOR TERM'S. 10 & 12
12	FLAME ON INDICATOR
14	SCANNER, SIGNAL
13-15	FLAME SIGNAL METER
L	SCANNER
C	SCANNER, COMMON
3-A	PUSHBUTTON SWITCH

TYPE 25SU5 MODEL 4011 INTERNAL WIRING DIAGRAM
Figure 2



ACCESSORY FLAME SIGNAL METERS

Figure 3

pushbutton, ECA P/N 60-1741 (optional), is depressed, provided flame is not present. On each start, a safe start check is performed. If flame (real or simulated) is detected, the Master Relay remains de-energized to prevent burner start-up.

At the time the Flame Relay is energized, the Flame Relay threshold is simultaneously lowered by means of a built-in differential circuit exhibiting hysteresis. This response holds the Flame Relay in and prevents it from pulsing in and out should the flame signal intensity approach or remain at the borderline of operation (initial Flame Relay threshold). The effect on a Flame Signal Meter is a momentary indication of approximately one unit prior to the threshold being lowered, then an abrupt jump to a reading 2½ times the preceding indication.

NOTE: The metering circuit follows an increase in signal strength much faster than a decrease.

The Flame Relay remains energized only if there is presence of a continuous, periodically interrupted, pulsed flame signal from the scanner whose intensity is equal to or greater than the lowered Flame Relay threshold. If the flame signal drops below the lowered Flame Relay threshold or is absent for a period longer than the four second (max.) flame failure response time (FFRT), the Flame Relay drops out (Flame Relay threshold returns to its initial setting) and de-energizes the Master Relay, thus initiating a burner shutdown procedure. Similarly, the opening of any switch or interlock connected in series with the Master Relay will de-energize the Master Relay and commence a burner shutdown procedure.

NOTE: The flame failure response time (FFRT) remains constant regardless of the flame intensity prior to flameout.

FEATURES

Sensitivity Controls

Two sensitivity controls (potentiometers), "Sensitivity A" and "Sensitivity B", are provided on the 4011 Control front panel to accommodate dual scanner applications and alternate fuels (refer to Figure 4). Sensitivity A is used in single fuel applications and can be selected through use of a shorting plug, supplied with the control, that plugs into the "Selector" socket located on the front panel. If alternate use of Sensitivity A and B is desired, an optional sensitivity selector plug with 6 ft. shielded cable, ECA P/N 60-1519, is required to permit connection of an external switch (refer to Figure 6).

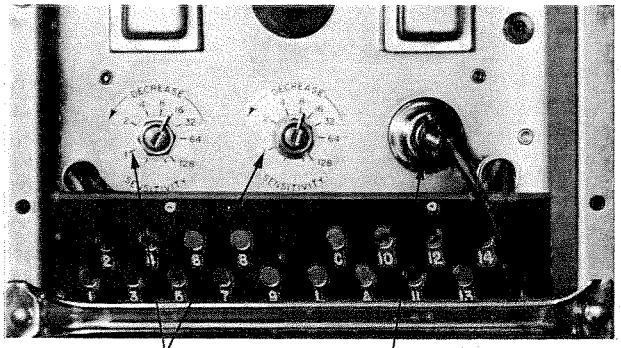


Figure 4

Each sensitivity control is continuously adjustable over a 128 to 1 ratio for regulating the acceptable flame signal level in excess of the Flame Relay threshold. Turning the enabled sensitivity control in the clockwise direction amplifies the flame signal logarithmically such that each sensitivity graduation, on the calibrated dial, yields a Flame Signal Meter reading twice that of the preceding graduation.

The selected sensitivity control must be set so that the monitored burner flame produces a Flame Signal Meter reading of at least 1 unit (refer to Table 1). With the monitored flame out, flame from other burners and/or radiation from hot refractory should yield a Flame Signal Meter reading not more than ¼ of the scale's first interval of measure. Subsequent momentary swings above ¼ unit are tolerable. If the flame signal does not drop to ¼ unit when the monitored flame is turned off, decrease the sensitivity, otherwise the control will not properly discriminate between the burner flame being monitored, adjacent burner flames and background radiation to indicate a flame failure when it occurs. If decreasing the sensitivity results in an insufficient meter reading, according to Table 1, resight the scanner to detect more of the flame being monitored.

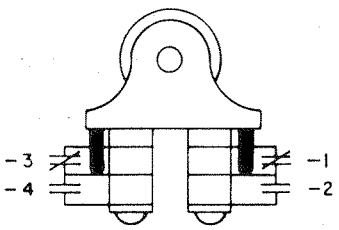
Normally, the monitored flame signal can be adjusted for a reading of 8 or 16 units on a Flame Signal Meter and the control will be capable of detecting a flame failure of the supervised burner in the presence of background radiation and adjacent burner flames. The best discrimination between different burner flames is obtained when the Flame Signal Meter reads below the saturation level of 32-64 units.

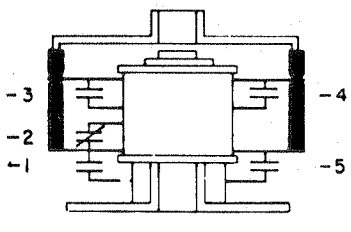
NOTE: Sensitivity Control setting does not affect the flame failure response time (FFRT).

Flame Relay

The Flame Relay (RF) is a DC, double pole double throw, flame proving relay having both sets of normally open and one set of normally closed contacts (refer to Figure 5) brought out on terminals shown in Figures 2 and 6. The fail-safe Flame Relay is energized (contacts switch position) when the following conditions are met:

1. The control is powered and
2. A continuous, periodically interrupted, pulsed flame signal greater than or equal to the Flame Relay threshold is being received from the scanner.





NOTE: Relays are shown in de-energized position, i.e., control powered and flame not detected.

TYPE 25SU5 MODEL 4011 RELAY CONTACT IDENTIFICATION

Figure 5

The Flame Relay automatically de-energizes to counteract the effect of an unsafe failure if any of the following conditions occur:

1. Loss of power for a period greater than the 4 second flame failure response time (FFRT).
2. No flame signal within the 4 second FFRT.
3. Flame signal level falls below the lowered Flame Relay threshold for one FFRT.
4. A scanner or electronic circuit fault is detected by the on-board self-checking circuit.

Master Relay

The Master Relay (RM) is an AC load relay having one set of normally closed contacts and four sets of normally open contacts (refer to Figure 5) brought out on terminals shown in Figures 2 and 6. The Master Relay is energized when the burner start pushbutton (not provided) is depressed, provided all external switches and interlocks connected in series with the Master Relay are closed and flame is not present. The Master Relay is then latched by the Flame Relay at the time flame is detected.

The action of the Master Relay contacts is such that undesired or unsafe operational sequences are "locked out" or unobtainable until the necessary conditions and sequences for energizing both the Master Relay and Flame Relay are satisfied. Proper application of the Master Relay contacts in burner safety control circuits permits automation of appropriate auxiliary devices, e.g. fuel safety shutoff valves, for safe start-up and shutdown of the burner.

Self-Checking

The UVP-4S Flame Safeguard System provides reliability in flame failure protection by repeatedly self-checking its overall system performance 10 times per minute to protect against providing a false flame signal due to failure of one of its component parts. Thus, when a failure that could result in unsafe operation is detected, the control initiates a burner shutdown procedure. This fail-safe function is obtained with the Flame Relay in combination with an electromagnetic shutter in the scanner powered by a circuit in the control that switches on and off to cycle the shutter.

During the shutter closed period the detector's optical path is blocked from flame radiation. While the shutter is open, flame presence or absence is detected. The resultant scanner output, while flame is detected, is a continuous, periodically interrupted, pulsed flame signal which is a prerequisite for energizing the Flame Relay. The self-checking circuit monitors both the open and closed periods of the shutter to cause the Flame Relay to drop out if any of the following conditions occur:

1. Power to the system is interrupted for a period longer than the 4 second flame failure response time (FFRT).
2. A continuous, periodically interrupted, pulsed flame signal from the scanner is not detected within the 4 second FFRT.
3. The shutter stops in any position.
4. Failure of any component or wiring that simulates a continuously open or closed shutter.
   a) Flame is detected when the shutter is closed for one FFRT.
   b) Flame is detected when the shutter is open for three FFRT.
5. Malfunction of the Flame Relay Circuit.

Test Jacks/Optional Flame Signal Meters

An indication of signal strength varying over 64-to-1 in amplitude can be obtained with a calibrated logarithmic Flame Signal Meter (refer to Figure 3), ECA part No. 38-54 or 38-55 (20,000 ohms per volt voltmeter on a 3 volt DC Scale). Meter connections are made at the red (+) and black (−) test jacks on the 4011 Control front panel which are approximately 20 volts above chassis potential, or at terminals 13(−) and 15(+) shown in Figure 6.

Note: Although the scale on a standard test meter is not logarithmic, the readings obtained are just as meaningful.

The Flame Signal Meter can be used in making adjustments as well as monitoring. When the sensitivity control is set to a maximum, actual flame intensity is measured which is valuable in setting up the system because the absolute signal level will determine what operating margin exists. Having the sensitivity set at less than maximum permits continuous monitoring of the "excess" flame signal. Thus, the meter indicates how much margin there is over the flame intensity, of essentially one unit, at which the Flame Relay de-energizes, regardless of the position of the sensitivity control.

NOTE: The metering circuit on control models having Codes 13 and lower show Flame Signal Meter and voltmeter readings which dip to approximately zero for 1½ seconds out of each six seconds due to the shutter cycling during its normal self-checking cycle. Flame signal readings should be taken at the top of the swing. On Codes 14 and higher the dip is minimal.

SPECIFICATIONS

25SU5 Model	Max. Flame Failure Response Time (FFRT)	Nominal Shutter Total Cycle Period	Supply Voltage and Frequency	45UV5* Scanner Model 50 HZ	60 HZ
4011	4 sec.	1.5/4.5 sec.	120 (102 min., 132 max.) 50/60 Hz	1101	1000/1010

*45RM1 and 45RM2 Scanners, any Model, may be used at either frequency.

Power Input

(With normal supply voltage and no loads connected to relay contacts)

Control with 1 scanner:
13VA, Power Factor 70% typ.

Inrush Current at turn-on: 2.5A instantaneous peak

Operating Temperature

25SU3 Control:
125°F (52°C) max., 32°F (0°C) min., ambient

45UV5 Scanner:
200°F (93°C) max., −40°F (−40°C) min. at housing flange

45RM1 Scanner:
150°F (65°C) max., −40°F (−40°C) min. at housing flange

45RM2 Scanner:
150°F (65°C) max., −40°F (−40°C) min. at housing flange

Storage Temperature

Scanner and Control:
185°F (85°C) max., −40°F (−40°C) min.

Shipping Weights

Type 25SU5, Model 4011	25 lbs.	(11.3 kg)
Open Mounting Frame Wiring Base P/N 60-1705-1	6 lbs.	(2.75 kg.)
NEMA 1 Surface Enclosure Wiring Base P/N 60-1704-1	11 lbs.	(5 kg.)
DPDT Pushbutton W/Special Signal Light (Oil Tight) P/N 60-1741	2 lbs.	(.9 kg.)

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.

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 moveable 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 is no formula to convert AC ratings of isolated contacts to DC ratings. The use of contacts in DC circuits is not sanctioned unless DC rating is specified.

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 shortcircuit currents without possible damage. Therefore, it is 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!

LOAD RATINGS (MAXIMUM)
FOR TYPE 25SU5 MODEL 4011

Terminal No.	Ratings at 120 volts, 60 Hz.
6-10-12	125 VA Pilot Duty each
7	250 VA Pilot Duty or Motor: 9.8 amperes full load 58.8 amperes locked rotor Alternate Rating — 300 VA transformer; and 130 VA pilot duty; and maximum combined load of not more than 3 motorized valves — Holding — 180 VA Opening — 635 VA Locked Rotor — 730 VA
9	50 VA Pilot Duty

INSTALLATION

Caution: Installer must be a trained safety control technician. Verify that electrical power is disconnected before starting installation.

Installation of 45UV5 Scanners — See Bulletin CU-22
Installation of 45RM1, 45RM2 Scanners — See Bulletin CU-17
Installation of 45RM1 Model 1004 Fiber-Optic Scanner — See Bulletin CU-21

Installing the Type 25SU5-4011 Control

The 4011 Control can be plugged into either of the two wiring bases shown in Figure 1. Use the drilling dimensions given to mount the wiring base on an upright surface that is flat and free from excessive vibration.

NOTE: A protective enclosure is required when using the open mounting frame wiring base.

Prior to plugging in the chassis, connect the external wiring to the terminal strip positioned at the bottom of the wiring base as indicated in the following section entitled "Control and Scanner Wiring". After all wiring connections are made, plug the chassis into the wiring base and tighten the captive thumb screws securely.

Control and Scanner Wiring

Following approved wiring diagrams, make wiring connections on the terminal strip provided at the bottom of the wiring base. Connect bared wires directly to the screw posts or use insulated lugs. All wiring should be enclosed in an approved raceway and must comply with the National Electrical Code and with local codes. Splices must be made only in troughs or junction boxes.

It is important that cross-phasing be prevented on multi-phase installations. The common of all control components (magnetic starter coil, ignition transformer, pilot and main fuel valves, etc.) powered by the 4011 Control must be connected to the common of the control, terminal 2.

Attach ½" flexible conduit to the connection provided on the scanner. Run three wires from the scanner screw terminals 1-P-C or 1-L-C to the 4011 Control wiring base. Use shielded wire (min. 18 AWG) for connection No. 14, and connect the shield to terminal C at the control end only; the shield at the scanner end should be left disconnected.

All wiring to the scanner should be rated at 600 volts and 90 deg. C. For runs less than 1000 feet the use of ECA Scanner Cable (1 shielded; 3 unshielded 16 AWG wires), Part No. 59-221, is recommended. For runs in excess of 1000 feet consult the factory.

If the intended use requires that the flame input signal comes from one of two or more scanners, the power and shutter drive signals should be switched between scanners using a single relay or selector switch. This permits the operation of one scanner at a time. When a BGC type scanner (such as the type 45RM series) is used in parallel with a UV scanner, a blocking diode,

ECA Part No. 101-78, should be connected in series with the lead from terminal 14 in the UV scanner as shown in Figure 6. This is to avoid overloading the BGC scanner output circuit. If two UV scanners are used, the diode indicated is not required.

NOTE: Do not use two scanners simultaneously.

OPERATION, SET UP AND TESTING

Starting and Operation of A Typical Burner System

Many variations of a single burner system arrangement are possible depending on the requirements of the particular job and applicable codes. A typical system arrangement is shown in Figure 6. It is important to emphasize that the 25SU5-4011 Control is contained within the dark dashed line. All other relays, limit switches, alarms, timers, etc., are not provided although some of these items, depending on ratings and sizes, may be obtained from ECA.

The system shown in Figure 6 is set up with one scanner for pilot flame detection and one for main burner flame detection. The operation of the system is as follows:

1. To start:
   a. Turn on AC power to system.
      1.) Check that "Flame Out" light is illuminated.
   b. Position fuel selector switch to desired fuel.
   c. Start fans and assure that air flow switch is closed.
   d. Assure that all limit switches and appropriate fuel and purge interlocks are closed.
   e. Close burner switch. This action activates the purge timer circuit (TD1).
   f. After purge period, purge complete light is illuminated and burner circuit is enabled for light off.
   g. Depress and hold the pushbutton at burner start station, a safe start check is performed. If satisfactory, the following occurs:
      1) Master Relay (RM) is energized.
      2) Alarm Latch Relay (R1) is energized.
      3) The main flame ignition timer and ignition transformer are energized to establish a pilot flame.
      4) Pilot scanner is selected.
      5) Pilot fuel valve is energized.
   h. When the pilot flame is detected by the pilot scanner, the Flame Relay (RF) is energized.
      1) Master Relay (RM) is latched.
      2) The "Flame Out" light will go out and the "Flame On" light will go on.
   i. The operator may now release the burner start pushbutton, which energizes the main fuel valve.
      1) Timer TD2 is de-energized, timing cycle begins.
   k. After the main burner flame establishing period (ignition timer contacts TD2 open) the pilot fuel valve is de-energized (unless pilot is continuous, not per Figure 6).
      1) If the fuel selector switch "S1" is in the oil position, scanner switching relay (R3) is energized and
      2) Main oil scanner is selected.
2. Constant burner operation depends on the scanner detecting the continued presence of the main burner flame.
3. In the event of an opening of a limit switch, or fuel or air interlock, the pilot and the main fuel valves will be de-energized immediately.
4. In the event of an ignition or flame failure, the pilot and main fuel valves will be de-energized within the 4 second flame failure response time and the flameout alarm will be activated. The operator may silence the alarm by placing the fuel selector switch in the "Off" position.
5. Manual restart is required following any shutdown.

Setup and Adjustment with 45UV5-1000, 1010, 1101 Scanners

The above named U-V Eye Scanners all have a UV detector tube within the scanner housing that may be placed in one of four different positions resulting in varying degrees of sensitivity. The scanners are shipped with the detector tube set in the maximum sensitivity position. The maximum sensitivity position results when the detector electrodes are approximately in-line with the shutter slot. Check the scanner to verify that the detector is set in its maximum sensitivity position. The scanner should then be aimed at the base of the flame as described in Bulletin CU-22.

Setup and Adjustment with the 45RM1 and 45RM2 Scanners

These BGC scanners have a sensitivity adjustment located under a screw on the rear of the scanner housing. This sensitivity adjustment should initially be turned clockwise to its maximum level. The scanner should then be aimed at the base of the flame in the region of the flame front (primary combustion zone) where relatively higher frequencies of flame pulsation are present than occur further out along the flame envelope.

In the case of multiple burners, the scanner should be aimed so that if the burner being monitored is extinguished, the scanner line of sight does not intersect another burner's flame envelope in the region of high frequency flame pulsations. This will achieve the desired flame discrimination in most cases. If it does not, reduce the scanner sensitivity by turning the scanner sensitivity control counterclockwise only enough to achieve the desired discrimination. See Bulletin CU-17.

Testing and Adjustment Procedure.

1. Check to see that the selector plug or shorting plug is in selector socket J1 (refer to Figures 2 and 4). Turn the selected sensitivity control to 128.
2. Plug a Flame Signal Meter into the red (+) and black (−) test jacks on the 4011 Control front panel or connect at terminals 13 (−) and 15 (+), see Figure 6.
3. Establish the flame at the operating level.
4. During aiming of the scanner, it may be helpful to disconnect the shutter drive (terminal 1) so there will be a continuous signal. However, this is not a necessity and of course the Flame Relay will drop out.
5. If the meter reading is off scale, decrease the control sensitivity until the reading is on scale.
6. Referring to Table 1: choose a control sensitivity setting which meets the minimum requirements of the Table.

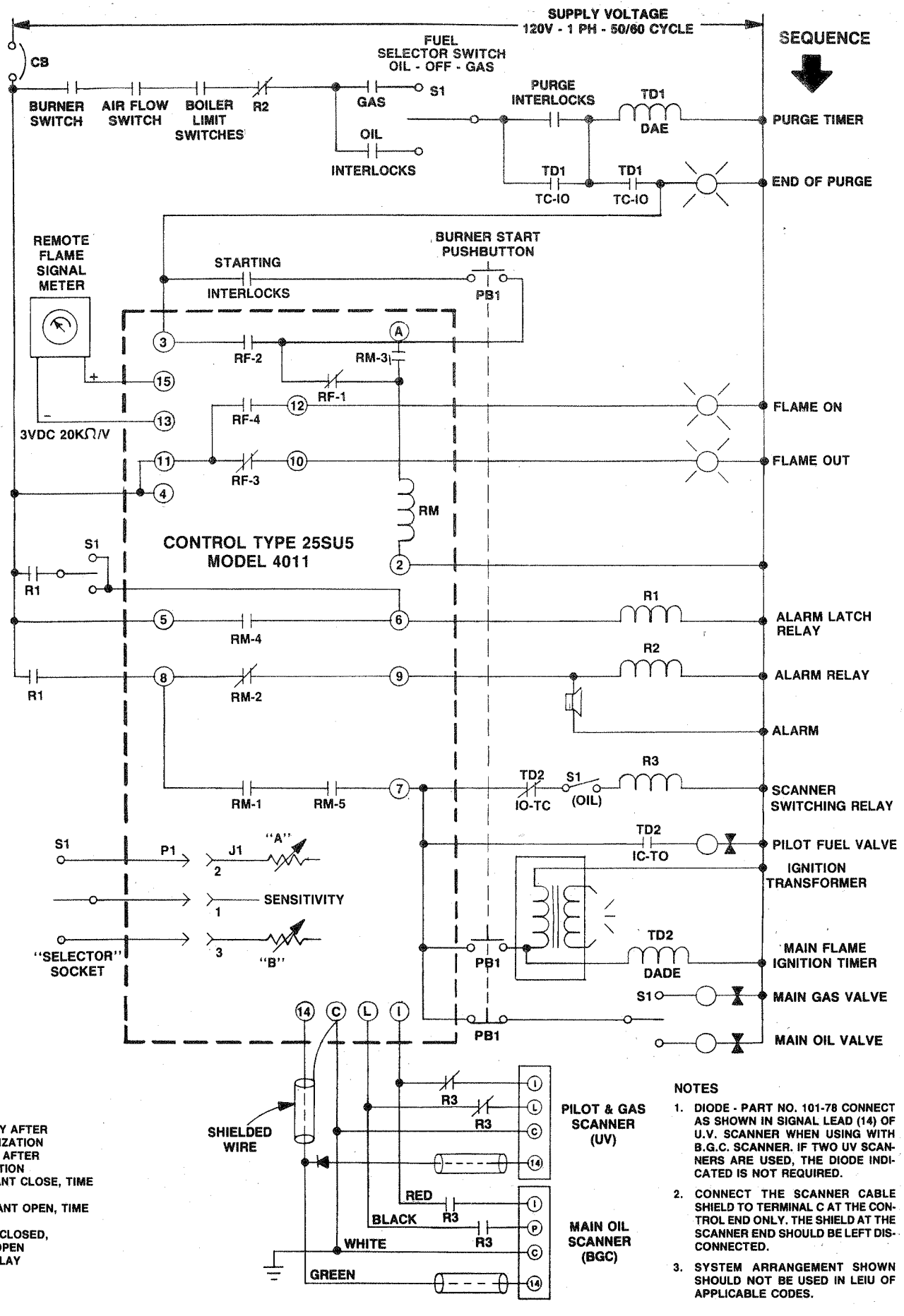
Example I. If the control sensitivity is set at maximum (128), the Flame Signal Meter should read at least 4 units (1.7 volts). If the reading is less than this, unreliable operation may result. Realign the scanner to pick up more signal.

Example II. If the control sensitivity had been reduced to bring the meter indication on scale, set the control to an even dial number, read the Flame Signal Meter, and compare it with that required by Table I. If the reading is too low, increase the control sensitivity until the requirements are satisfied. If burner discrimination is no problem, use the highest sensitivity that keeps the Flame Signal Meter reading under 32 units. (2.6 volts).

Example III. If it is desired to adjust the control for reliable hold-in but to no greater sensitivity than necessary, as in multiple burner installations, use the minimum setting dictated by Table 1.

After determining the setting, the margin over the interfering burner may be found as follows:

a. Turn off the burner being supervised.
b. Increase the sensitivity until the Flame Relay pulls in due to the presence of an adjacent burner(s) or hot refractory.
c. The new sensitivity setting compared to the original normal setting is an indication of the degree of discrimination.



LEGEND

DADE — DELAY AFTER DE-ENERGIZATION
DAE — DELAY AFTER ENERGIZATION
IC-TO — INSTANT CLOSE, TIME OPEN
IO-TC — INSTANT OPEN, TIME CLOSED
TC-IO — TIME CLOSED, INSTANT OPEN
TD — TIME DELAY

NOTES

1. DIODE - PART NO. 101-78 CONNECT AS SHOWN IN SIGNAL LEAD (14) OF U.V. SCANNER WHEN USING WITH B.G.C. SCANNER. IF TWO UV SCANNERS ARE USED, THE DIODE INDICATED IS NOT REQUIRED.
2. CONNECT THE SCANNER CABLE SHIELD TO TERMINAL C AT THE CONTROL END ONLY. THE SHIELD AT THE SCANNER END SHOULD BE LEFT DISCONNECTED.
3. SYSTEM ARRANGEMENT SHOWN SHOULD NOT BE USED IN LEIU OF APPLICABLE CODES.

TYPICAL SYSTEM ARRANGEMENT FOR SEMI-AUTOMATIC PILOT IGNITED GAS OR OIL BURNER WITH PREPURGE, MAIN FLAME TFI AND INTERRUPTED PILOT

Figure 6

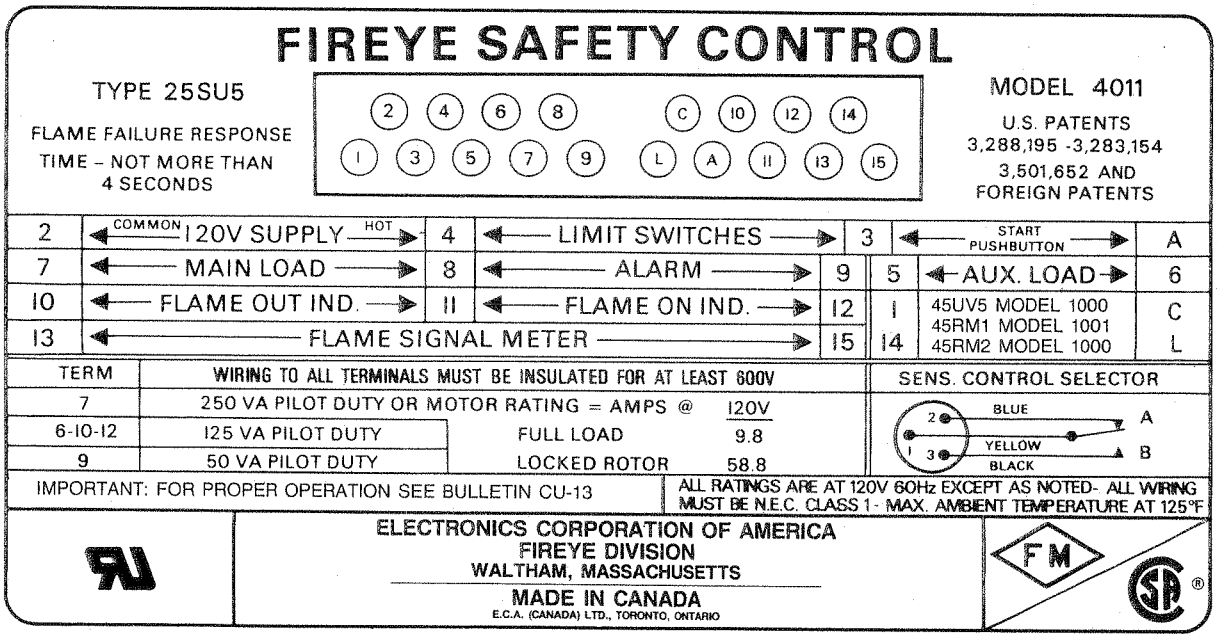
TABLE 1

Minimum Flame Signal Readings for Reliable Flame Relay Hold-In: Code 14 and later.

Sensitivity Dial Set At	Test Meter Should Read At Least	Flame Signal Meter Should Read At Least
128	1.7 Volts	4 Units
64	1.6 Volts	3.5 Units
32	1.5 Volts	3 Units
16	1.4 Volts	3 Units
8	1.3 Volts	2.5 Units
4	1.25 Volts	2 Units
2	1.25 Volts	2 Units
1	1.2 Volts	1.75 Units

NOTE: The meter readings should be re-checked after a stabilizing period of a few hours to allow the scanner to reach equilibrium temperature. If the flame signal readings are fluctuating due to variations in the flame itself, use the low limit of these fluctuations in Table 1.

In setting up an installation involving discrimination between multiple burners, Table 1 is used as a guide to insuring an adequate signal margin for reliable hold-in without using an unduly high sensitivity setting which might allow the scanner to "see" an unwanted flame. This table automatically takes into account the requirement that a flame of low intensity will require more margin than one of high intensity. The minimum reliable setting can thus be established quickly and easily for a given set of conditions.



TYPE 25SU5 MODEL 4011 LABEL

NOTE: Only CSA approved scanners shown.

TABLE 2
AGENCY APPROVALS

TYPE	MODEL	FM	UL	CSA
25SU5	4011	X	X	X
45UV5	1000	X	X	X
	1010		X	
	1101	X		
45RM1	1001	X		X
	1003	X		
	1004	X		
45RM2	1000	X		X
	1001	X		
	1002	X		

MAINTENANCE

Humidity Effects: It is considered good practice to minimize any possible adverse effects of high humidity by keeping electronic equipment continuously powered, even during periods when it is not in use.

Scanner: If continuous air purging of the scanner sight pipe is not completely effective in preventing viewing window contamination, a schedule should be set up for periodically cleaning the window. Always use a soft, clean (non-oily) cloth to wipe the window. For maximum assurance that oily films will be removed, wash first with a cloth dampened (not dripping) with a concentrated detergent solution.

Caution: Disconnect or shut off electric power when working on scanner.

Use original ECA repair parts to maintain optimum operation.

NOTICE

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

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