




Cover

Chassis

Base

**UVM-1 Control**



 **UV-1 Scanner**



**UVM-1  
COMMERCIAL  
FLAME SAFEGUARD  
CONTROL**



**FEATURES**

FIREYE UVM-1 control provides the most advanced ultraviolet-sensitive ignition and flame failure protection for commercial sizes of heating and process, gas/light oil burners. The UVM-1 control is used with a UV-1 scanner which is an ultraviolet-sensitive gas discharge tube that visually monitors the UV radiation from gas and light oil flames.

The UVM-1 control monitors both pilot and main flames and with pilot ignited burners prevents the main fuel valve from being energized until the pilot flame is proved. With spark ignited oil burners, the trial for ignition period of oil flame is safely restricted to 12 seconds.

The UVM-1 control provides terminals for the direct wiring of burner motor, ignition transformer, pilot fuel valve, main fuel valve, lockout alarm, limit controls and low voltage operating controls. Flame failure response time is .8 seconds following loss of flame. The control cycles automatically each time the operating

control closes or in the event of power failure.

The control permits a single attempt to relight following flame failure and, if flame is not re-established within 12 seconds, the control shuts off all fuel and locks out on safety. Manual reset is required for restart following a safety shutdown.

The UVM-1 control incorporates a safety checking circuit that is operative on each start. A 5 second pause for a safety check occurs each time the power is turned on. When the burner is shut down due to function of an operating control (connected to terminals T-T) a continuous safety check occurs during the entire idle period. To take full advantage of this design feature, it is recommended that the operating control be connected to the T-T terminals, whenever possible. Any malfunction which causes the flame relay to hold in at the start will result in a safety lockout.

**SPECIFICATIONS: Fireye UVM-1**

**SUPPLY:**

120 volts (Min. 102v, Max. 132v) — 60 cycles

**AMBIENT LIMIT:**

Control ..... 125°F  
Scanner ..... 212°F

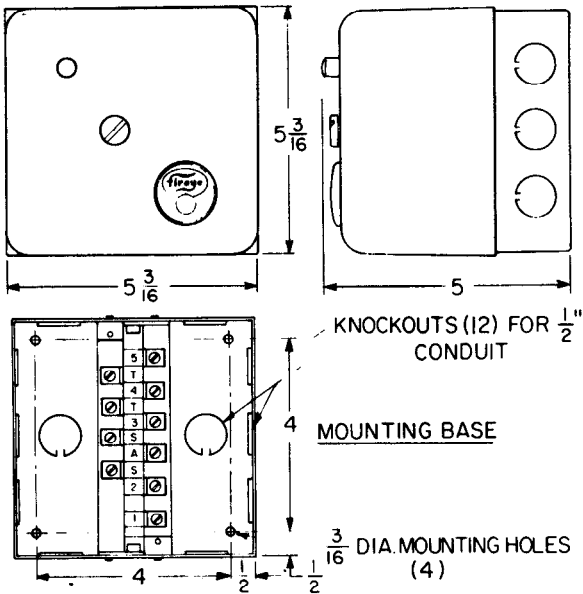
Flame Failure Response Time — .8 seconds  
Trial for Ignition Period — 12 seconds nominal

**SHIPPING WEIGHT: 6 lbs.**

Load Ratings — UVM-1 Control  
Maximum Connected Load — 1,600 va

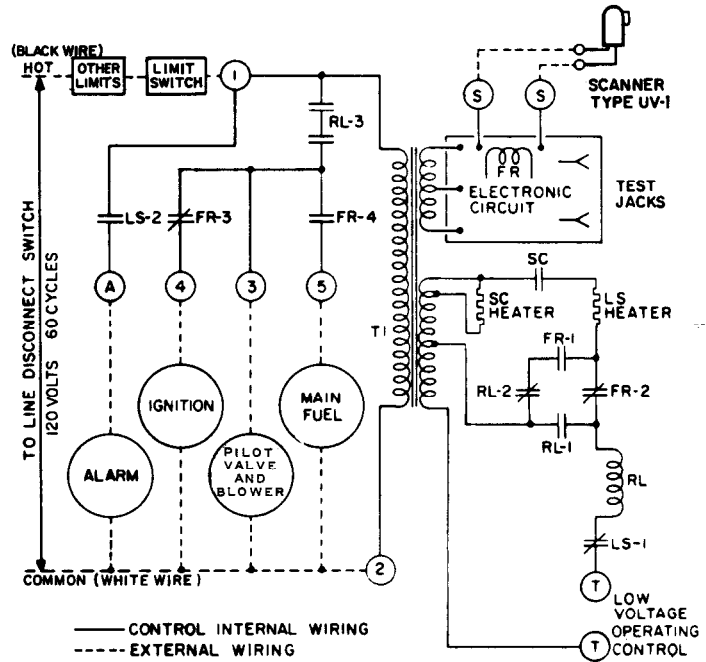
Terminal	Typical Load	Maximum Rating At 120 v, 60 Cycle
3	Motor Solenoid Ignition Transformer	5.8 Amp — Full Load 34.8 Amp — Locked Rotor 125 va — Pilot Duty 300 va
4	Ignition Transformer	300 va
5	Main Fuel Valve	125 va — Pilot Duty
A	Alarm	50 va — Pilot Duty

### MOUNTING DIMENSIONS



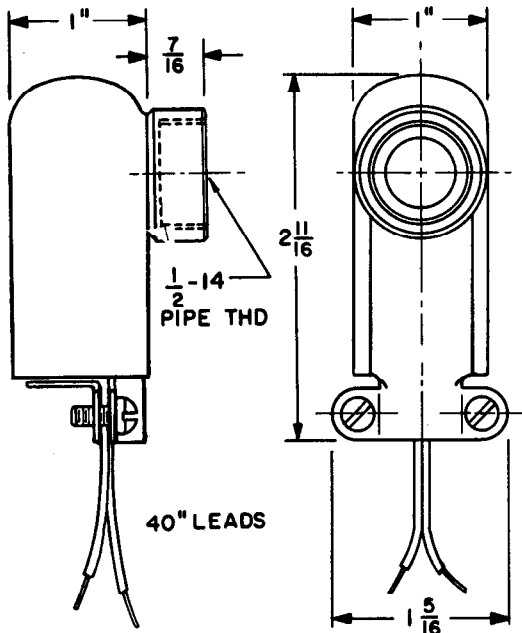
**CONTROL**

### ELECTRICAL DATA



- TI TRANSFORMER
- SC SAFE START CHECK
- LS LOCKOUT SWITCH
- FR FLAME RELAY
- RL MASTER (AC) RELAY

**SCHEMATIC DIAGRAM**



**SCANNER**

**FIREYE FLAME SAFEGUARD CONTROL**  
TYPE UVM-1 SEE BULLETIN CU-70

<p>THERMOSTAT OR OPERATING CONTROL</p> <p>UV-1 SCANNER</p>		<p><b>RATINGS</b></p> <p>IGNITION 300VA</p> <p>ALARM 50 VA PILOT DUTY</p> <p>VALVE 125 VA PILOT DUTY</p> <p>MOTOR - AMPS FULL LOAD 5.8</p> <p>LOCKED ROTOR 34.8</p> <p><b>SUPPLY</b></p> <p>120V / 60CY</p>
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ELECTRONICS CORPORATION OF AMERICA  
COMBUSTION CONTROL DIVISION  
ONE MEMORIAL DRIVE, CAMBRIDGE, MASSACHUSETTS 02142

**COVER LABEL DATA**

## INSTALLATION:

Follow the burner manufacturer's instructions, if supplied. Otherwise, proceed as follows:

### A. Control:

Mount the control sub-base on the burner or on a panel. The location selected should be free from excessive vibration and within the specified ambient temperature rating. The sub-base may be mounted in any position.

All wiring should comply with applicable electrical codes, regulations and local ordinances. Circuit recommendations are provided on Pages 4 and 5. Consult the factory for assistance with non-standard applications.

The control chassis is retained on the base with two screws which should be securely tightened.

### B. Scanner Wiring

1. The UV-1 scanner is furnished with 40' of lead wire. If it is necessary to lengthen the wiring the following instructions should be observed:
  - a. Use wire with 80°C, 600 volt insulation, TW or better.
  - b. Use #14 wire size for short runs, #16 or 18 for longer runs.
  - c. Asbestos insulated wire should be avoided because of its moisture absorbing characteristics.
  - d. Do not use coaxial or microphone-type shielded cable because of its excessive distributed capacitance for this application.
2. When the control is located within 10 feet of the scanner, the scanner wires may be run in the same conduit or raceway with any other wiring.
3. When the control is located over 10 feet from the scanner, (up to a maximum of 50 feet) the scanner wires should be installed in a separate conduit.
4. When several pairs of scanner wires are to be installed in a single conduit, the maximum acceptable length of run must be halved compared to that acceptable for a single pair. For example, if 4 wires from 2 scanners are installed in one conduit, the total run must not exceed 25 feet.

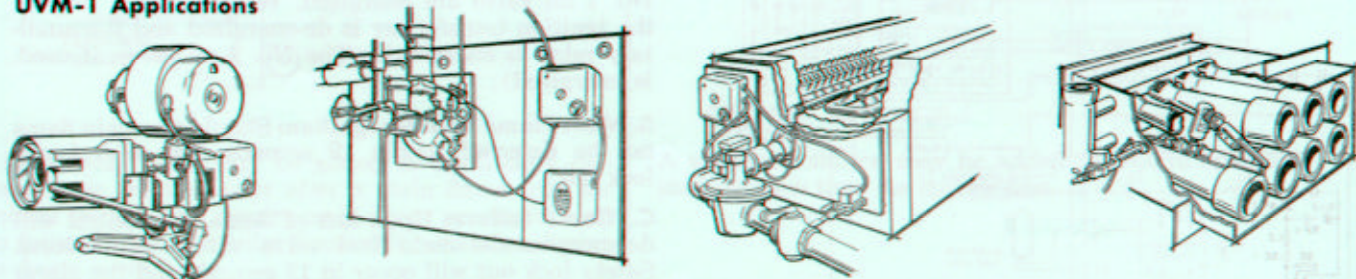
### C. Scanner Mounting

Where possible, obtain the burner manufacturer's instructions for mounting the scanner. This information is available for most standard burners manufactured. The scanner mounting must comply with the following general instructions:

1. Locate the scanner within 18 inches of the flame to be monitored, closer if possible.

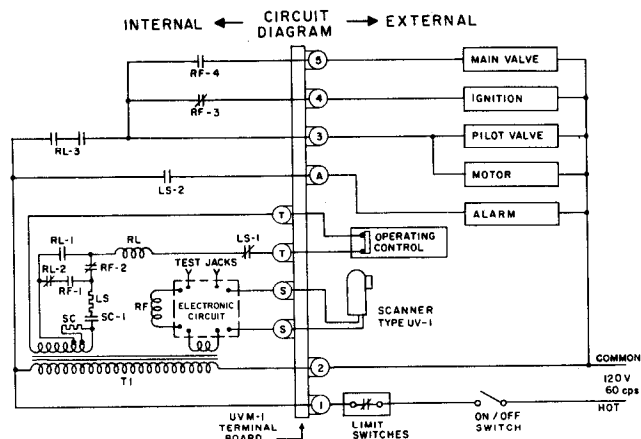
2. Select a scanner location that will remain within the ambient temperature limits of the UV-1 scanner (212°F). If cooling is required use (a) an insulating coupling to reduce conducted heat, (b) a sealing union to seal off furnace or burner pressure, or (c) cooling air to reduce the scanner sight pipe temperature.
3. Mount rigidly a short length (4" to 8") of 1/2" or 3/8" black iron pipe in a position that permits an unobstructed view of the pilot and/or main flame.
4. The scanner must not sight the spark directly or any part of the burner that can reflect the spark back to the scanner.
5. The maximum UV signal from a flame is found in the first one-third of the visible flame taken from the point where the flame begins. The scanner sight pipe should be aimed at this area.
6. A correct scanner application will not see a pilot flame that is too small to ignite the main flame reliably. Note particularly the test for minimum pilot that is described on Page 6.
7. A small hole (1/8" or 3/16") drilled in the sight pipe will assist in keeping the pipe clean and free from smoke, on installations having negative pressure combustion chambers.
8. Two scanners may be installed on one burner if it is necessary to view two areas to obtain reliable detection of the flame. The scanners should be wired in parallel.
9. The UV-1 scanner should be installed in an upright position to prevent moisture from collecting in the base of the scanner and short-circuiting it.
10. It is possible to oversaturate the UV-1 scanner with an excessive amount of UV radiation from a gas flame. This is evidenced by a reduction in DC volts measured at the test jacks. The test voltage may be improved by lengthening the sight pipe or reducing the sight pipe size. However, with the UVM-1 system, it is preferable to have an installation with an oversaturated scanner, even though the DC test voltage is reduced, as it provides additional operating margin to accommodate any change in the burner operating characteristics or deterioration of the scanner viewing of the flame.
11. The UV-1 scanner is designed to seal off the sight pipe up to pressures of 1 psi when the scanner lock nut is firmly tightened.

### UVM-1 Applications



# TYPICAL WIRING DIAGRAMS

## A. Pilot Ignited Gas or Light Oil Burner



### Operation:

**A. Start-Up:** Burner motor, pilot valve and ignition transformer are energized. When pilot flame is proved, the main fuel valve is energized and the spark ignition transformer is de-energized.

**B. Pilot Trial for Ignition:** Should the pilot flame not be detected within 12 seconds, the control will lock out. The main fuel valve will not be energized.

**C. Flame Failure:** Upon loss of flame, the control will de-energize the main fuel valve and re-energize the ignition transformer. If pilot flame is not detected within 12 seconds, the control will lock out, and the alarm will be actuated.

### Operation:

**A. Start-Up:** Burner motor, ignition transformer and No. 1 oil valve are energized. When flame is proved, the ignition transformer is de-energized (and the No. 2 oil valve, if used is energized).

**B. Main Flame Trial for Ignition:** Should the main flame not be detected within 12 seconds, the control will lock out.

**C. Flame Failure:** Upon loss of flame, the ignition transformer will be re-energized and, if flame is not detected within 12 seconds, the control will lock out, de-energizing the burner and the alarm will be actuated.

### Operation:

**A. Start-Up:** Burner motor, pilot valve, ignition transformer, and time delay relay are energized. When pilot is proved, terminal 5 is energized, and at 15 seconds, the time delay relay closes TDR-2, and opens TDR-1. The main fuel valve opens, and the ignition transformer is de-energized.

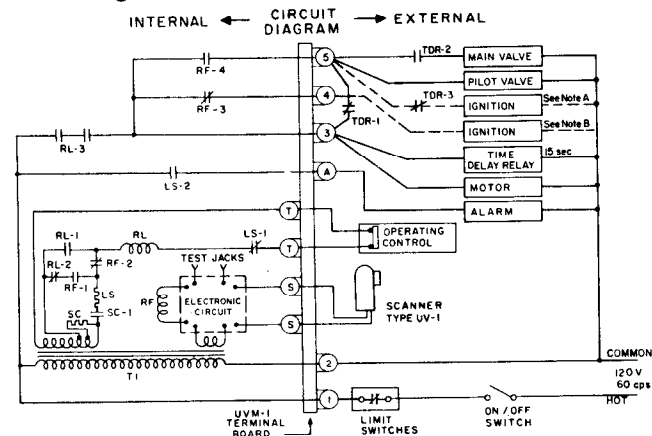
**B. Pilot Trial for Ignition:** Should the pilot flame not be detected within 12 seconds, the control will lock out. The main fuel valve will not be energized.

**C. Flame Failure:** Upon loss of flame, terminal 5 will be de-energized closing the main fuel valve, and the pilot gas valve within one second. Safety lockout will occur in 12 seconds and the alarm will be actuated.

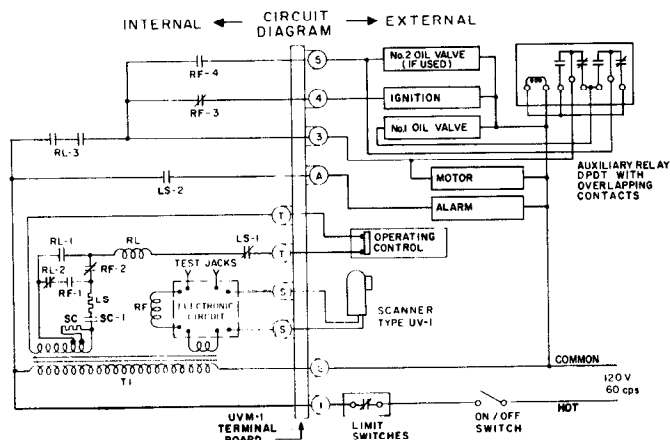
*Note A* — Wired in this manner, ignition transformer is de-energized on flame failure. Additional TDR-3 contact required.

*Note B* — Wired in this manner, ignition transformer is re-energized on flame failure for 12 seconds until lockout occurs.

## C. Pilot Ignited Gas or Light Oil Burner — Nonrecycling



## D. Spark Ignited Oil Burner — Nonrecycling



### Operation:

**A. Start-Up:** Burner motor, ignition transformer and No. 1 oil valve are energized. When flame is proved, the ignition transformer is de-energized and the auxiliary relay is energized. (The No. 2 oil valve, if used, is energized).

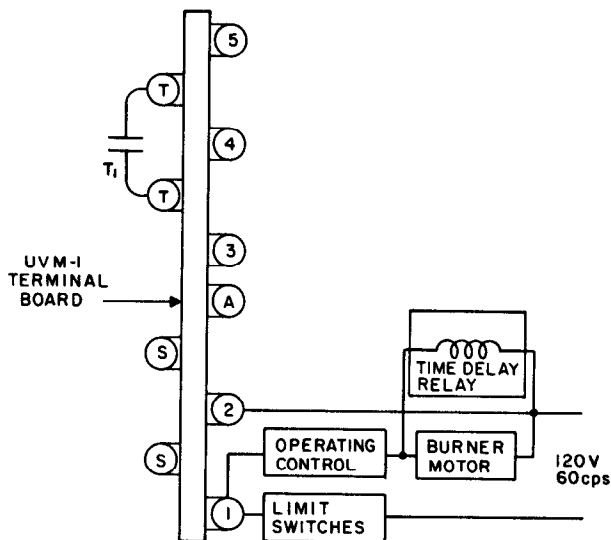
**B. Main Flame Trial for Ignition:** Should the main flame not be detected within 12 seconds, the control will lock out.

**C. Flame Failure:** Upon loss of flame, the control will de-energize the main fuel valve within one second. Safety lock out will occur in 12 seconds and the alarm will be actuated.

*Note* — A time delay relay may be used if *Note A* operation is desired. See C above.

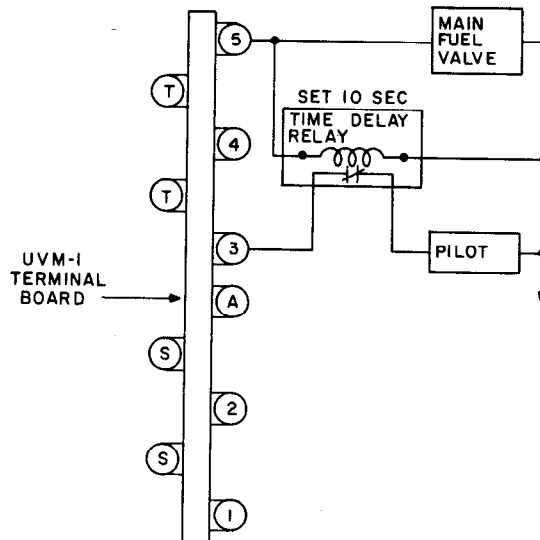
### Additional Circuit Functions

#### E. For Prepurge



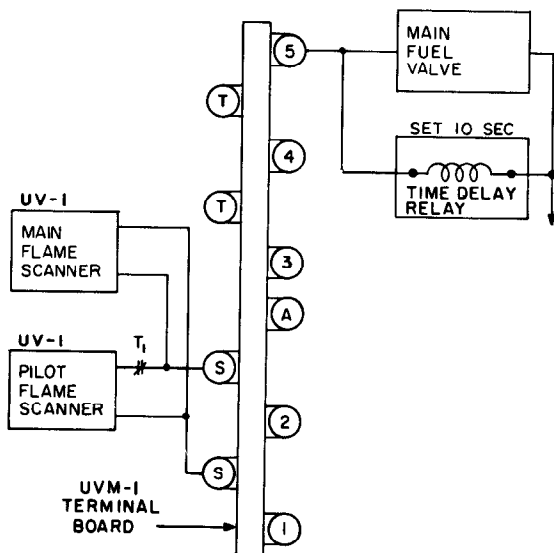
A time delay relay may be added to provide for a specified prepurge interval prior to each start-up.

#### F. For Pilot Cutoff



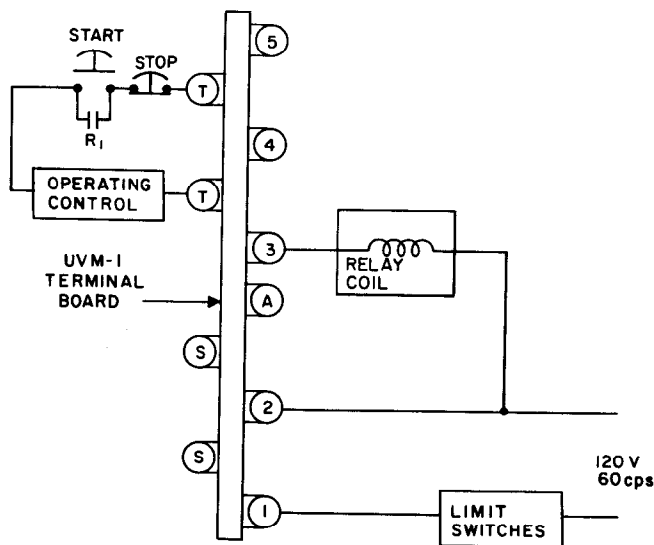
A time delay relay may be added to shut off the pilot after a main flame trial for ignition period; and require main flame proving during the firing period.

#### G. For Pilot and Main Flame Scanners



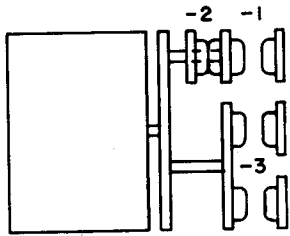
A time delay relay may be added to electrically disconnect the pilot scanner after a main flame trial for ignition period; and require main flame proving during the firing period. The pilot flame will remain on during the firing period.

#### H. For Manual Start

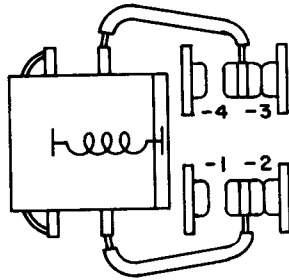


A start-stop station may be added to require operator start-up each time the burner fires.

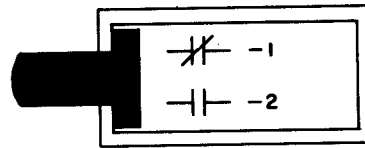
MASTER RELAY (AC) - RL



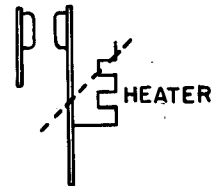
FLAME RELAY (DC) - FR



LOCKOUT SWITCH - LS



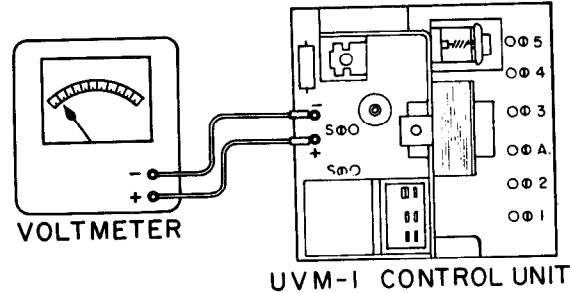
SAFE START CHECK - SC



## INSTALLATION TESTING

Testing the UVM-1 is easily accomplished with a volt/ohm meter (20,000 ohms/volt). With the meter set on a 10 volt DC scale, and the probes inserted in the test jacks, the meter will read zero when no flame is present. It will read between 3.5 and 6 volts DC when the scanner is viewing a stable flame. The flame relay pulls in at approximately 2.5 volts DC when flame is detected.

The test meter set on a 150 volt AC scale may be used to check line and load voltages at the identified terminal studs on the right side of the chassis.



## I. Flame Signal Testing:

A. For pilot test on intermittent pilot ignited burners, manually shut off fuel supply to main burner and follow test procedure below (C).

B. For main flame test on spark ignited oil burner, follow test procedure below (C).

## C. Test Procedure:

1. Connect ignition transformer to terminal 3.
2. Connect test meter to test jacks. Set on 10 volt DC scale; if meter reads backwards during the test, reverse the meter leads at the test jacks.
3. Initiate a normal start-up.
4. When flame is established, the test meter reading should be between 3.5 and 6 volts DC. It is normal for the meter to fluctuate.
5. Inadequate flame signal may be improved by one of the following:
  - a. Insure the scanner "sees" the flame and the scanner UV tube is clean.
  - b. Improve scanner viewing by increasing the sighting pipe diameter or by moving the scanner closer to the flame.
  - c. The scanner should be sighted at a point between 6 and 8 inches out in the combustion chamber, measured from the nearest part of the flame where visible combustion occurs.
  - d. Adjust the burner to insure a clean fire. A smoky fire will decrease the scanner's ability to see the UV radiation from the flame.
5. a. Check flame failure by manually shutting off all fuel. (Ignition transformer should be temporarily connected to terminal 3 for this test.)
- b. The DC test meter reading should drop to zero within .8 seconds following loss of flame. If the meter reading does not drop to zero, the scanner is being actuated by UV radiation from the spark ignitor. This effect may be corrected by realigning the scanner sight pipe so that it does not sight the spark or any surface that can reflect the spark radiation.
- c. Reconnect ignition transformer to terminal 4.

## II. Minimum Pilot Test:

This test insures that the U-V-eye scanner will not detect a pilot flame too small to light the main flame reliably. It must be made on each new installation and following repositioning of the scanner.

- A. Manually shut off the fuel to the main burner.
- B. Connect test meter to test jacks. Set on 10 v DC scale.
- C. Initiate a normal start-up.
- D. Reduce the fuel to the pilot until the flame relay just holds in. This is minimum pilot.
- E. Turn on the main fuel and insure that the main flame lights off promptly and normally.
- F. If lightoff is delayed, shut off the power to the installation. Realign the scanner sight pipe so that pilot flame detection requires a larger pilot flame. Repeat this test until main flame lights reliably with minimum pilot.
- G. After the minimum pilot test is completed satisfactorily, increase the pilot flame to normal size.

### **Application Note**

A line voltage operating control may be used by placing a jumper between terminals T and T and wiring the operating control in series with the on/off switch and limit switches to terminal 1.

### **SERVICE NOTE**

A safety lockout caused by a malfunction during the safety check period will prevent the burner from starting. Under this condition the lockout switch cannot be reset.

First determine that the scanner is not sighting flame during downtime. If flame is not being sighted, replace the scanner; then the control chassis.

### **MAINTENANCE**

**Control:** Keep the control dry and clean. If the relay contacts require servicing, use a burnishing tool, crocus cloth or a good spray-on liquid burnisher.

**Scanner:** The scanner UV tube must be kept clean. Use a clean cloth with detergent as often as operating conditions require.

**Periodic Safety Check:** Test the complete flame safeguard system at least once a month. This test should verify flame failure safety shutdown and positive fuel cutoff when the fuel valve is de-energized.

### **WARRANTY**

We guarantee for one year from date of shipment to replace or, at our option, to repair any products or parts thereof 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.

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

Each burner shall be equipped with a UL listed and FM approved flame safeguard control which shall provide all of the following:

1. 12 second trial for ignition timing.
2. .8 second flame failure response timing.
3. With pilot ignited burners the main fuel valve shall not be energized until a suitable pilot flame is proved.
4. An integral alarm circuit shall be energized following a safety shutdown.
5. Manual reset is required following a safety shutdown.
6. Test jacks shall be provided to read out flame signal voltage with a DC voltmeter.
7. The control shall be suitable for use at nominal - 120 volts, 50/60 cycle supply.
8. In the event of a flame failure during the firing cycle of a pilot ignited burner, the main fuel valve will be de-energized within .8 seconds. The spark ignition will be turned on and a 12 second trial for ignition of the pilot will be initiated. If the pilot flame is not re-established, the control will lock out on safety.
9. Flame detection shall be accomplished by an ultraviolet sensitive scanner, having a high ambient limit of not less than 212 F and designed to mount on not larger than 1/2 inch standard pipe.

The flame safeguard control shall be Fireye UVM-1.



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