



PFM-12
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60-2991 BurnerPRO wiring harness to replace HW RM7800 Series control with BurnerPRO Series



APPLICATION

The 60-2991-1 / 60-2991-2 adapter is used for connecting the BurnerPRO series flame safeguards to a Q7800F wiring base. This allows replacement of the RM7800 series burner control system without having to perform complete system rewiring. The mechanical adapter will allow removal of the existing RM7800 control and replacement with the Fireeye BurnerPRO. All wiring (including to the flame rod) will be maintained. The only other component requiring replacement will be the UV scanner (if used).

FEATURES OF THE 60-2991 WIRING HARNESS

- Ease of installation
- Connection of UV scanner and/or flame rod
- Lockout retained through a power cycle (non-volatile)
- Proof-of-closure (fuel valve end switch) monitoring
- Air flow switch proving
- A check/run feature that allows the program sequence to pause in purge or PTFI
- Remote reset via line voltage input
- Smart LEDs that provide operational sequence, lockout information and flame intensity
- Modbus RTU communication via RS485 with read/write capability
- Small footprint: 4.15" (105mm) L x 4.15" (105mm) W x 5.0" (127mm) H
- Expert support from the Fireeye team

This manual describes the installation, commissioning, operation and maintenance of the 60-2991 Wiring Harness. It may be used in conjunction with the following other manuals:

- BP-1003 – BurnerPRO with UV and FR flame detector, Modbus communication and valve proving system.
- SC-108 – UV scanners compatible with BurnerPRO flame safeguard system.
- SC-102 – Cenelec EExd IIC explosion proof housing with UV1AL3 scanner.
- SC-103 – Flame rods compatible with BurnerPRO flame safeguard system.



WARNING: Failure to properly install, operate, or commission the equipment in this manual could result in significant property damage, severe injury, or death. It is the responsibility of the owner or user to ensure that the equipment described is installed, operated and commissioned in compliance with this manual and other system component manuals, as well with all applicable national and local codes.



WARNING!!!



Boiler operation, maintenance, and troubleshooting shall only be conducted by trained personnel. Persons troubleshooting lockouts or resetting the control must respond properly to troubleshooting error codes as described in this product bulletin.

Jumpers being used to perform static test on the system must only be used in a controlled manner and must be removed prior to the operation of the control. Such tests may verify the external controllers, limits, interlocks, actuators, valves, transformers, motors and other devices are operating properly. Such tests must be conducted with manual fuel valves in the closed position only. Replace all limits and interlocks not operating properly, and do not bypass limits in interlocks. Failure to follow these guidelines may result in an unsafe condition hazardous to life and property.

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SPECIFICATIONS

MODEL:

60-2991-1: HW RM7800 series burner controls with modulating motor control (RM7800/RM7840/RM7845 less valve proving).

60-2991-2: HW RM7800 series burner controls with on/off motor control (RM7895).

BURNERPRO SYSTEM SPECIFICATION

Supply Voltage:

BP110 110 VAC (+20%, -15%) 50/60 Hz, single phase

Power Consumption:

7 VA

Temperature Rating:

Operating: -40°C to +60°C (-40°F to 140°F)

Storage: -50°C to +85°C (-58°F to 185°F)

Flame Amplifier Rating:

UV: Terminals 22 & 23, 300VDC/ 3mA

FR: Terminals 24 & Earth, 330VAC (max), 3uA min/10uA max flame current

Protection Category:

IP40 standard version

Control Dimensions:

With wiring base (60-2981-1 or -2); 4.15" L x 4.15" W x 5.0" H (105mm x 105mm x 127mm)

Shipping Weight:

Approx. 1.3 lbs. (0.6 kg)

Relative Humidity:

90% R.H. (Non-Condensing)

OPERATING TEMPERATURE LIMITS

CONTROL	MAXIMUM		MINIMUM	
	°F	°C	°F	°C
BP110	140°F	60°C	-40°F	-40°C
UV90L-1	194°F	90°C	-40°F	-40°C
UV1AL-3, -6	200°F	94°C	-40°F	-40°C
UV5-1, UV5-2	140°F	60°C	-4°F	-20°C

LOAD RATINGS:

Terminal	Typical Load	Maximum Rating @120V-50/60 Hz	Maximum Rating @230V-50/60 Hz	Alternate Rating
6-7	Burner/Blower Motor	2 F.L.A. * 8 L.R.A.	2 F.L.A. * 8 L.R.A.	240 VA Pilot Duty (Motor Starter Coil)
9-10-11-20	Modulator	240 VA Pilot Duty		
16-17-18-19	Fuel/Ignition	240 VA Pilot Duty		
3	Alarm	125 VA Pilot Duty		

* F.L.A. = full load amps; L.R.A = locked rotor amps

Maximum connected load must not exceed 2000VA.



ELECTRICAL RATINGS

VA ratings (not specified as pilot duty) permit the connection of transformers and similar devices whose inrush current is approximately the same as their running current.

VA pilot duty ratings permit the connection of relays, solenoid valves, lamps, etc. whose total operating load does not exceed the published rating and whose total inrush does not exceed 10 times the rating.

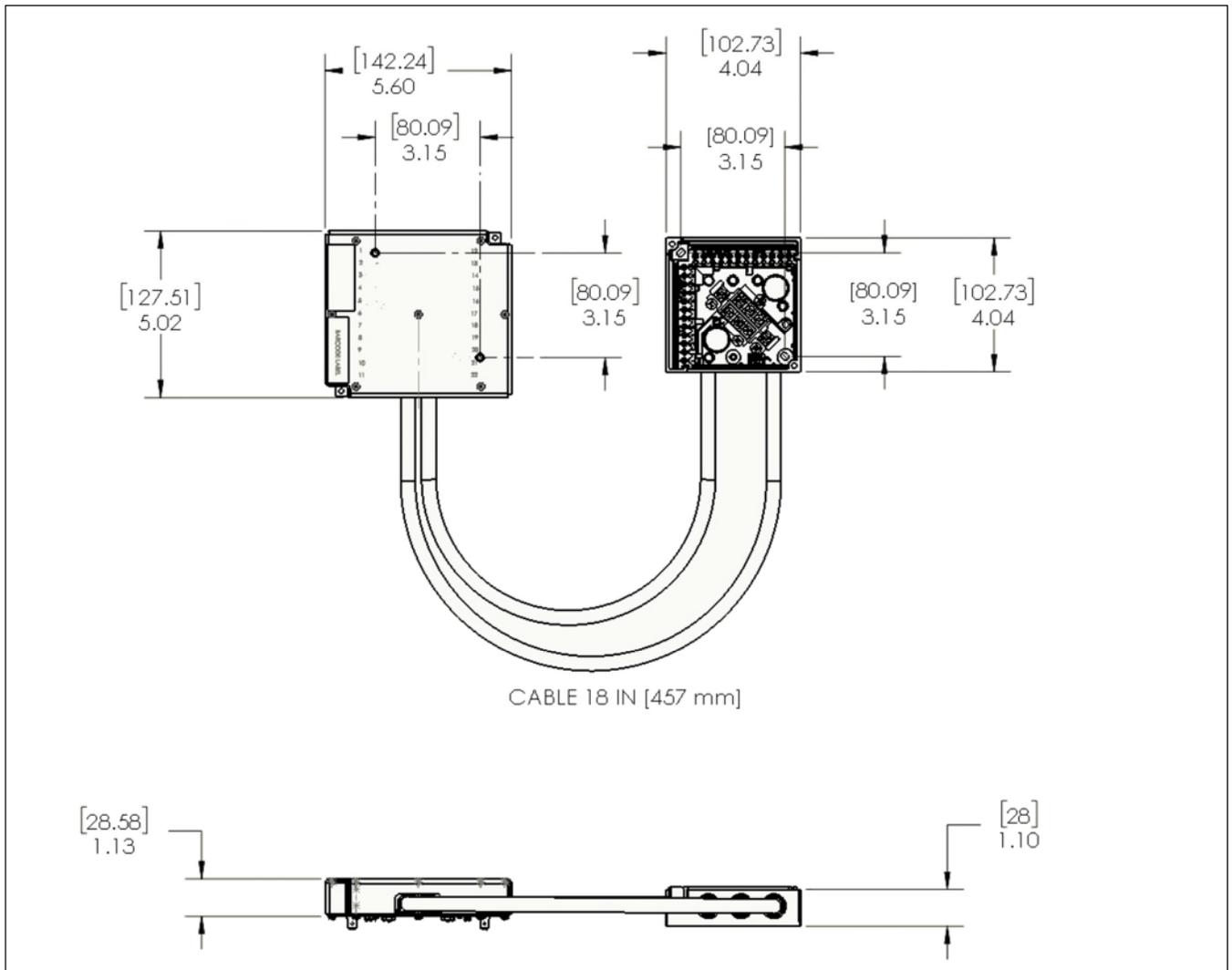
Running and locked rotor ratings are intended for motors. VA and VA pilot duty loads may be added to a motor load provided the total load does not exceed the published rating.

OPERATIONAL TIMINGS

The BurnerPRO is pre-programmed from the factory with a set of operational timings necessary for the safe operation of the burner system. However, operational timings can be modified via the Modbus port using the 60-3000 ModBus Comms cable and BP-CON configuration software. The operational timings are governed by regional and local codes. It is important that the appropriate operational timing is selected for the burner application.

DIMENSIONS: FIG. 1

In Inches or [mm]





APPROVALS

Underwriter's Laboratories Inc.:

File MCCZ.MP1537

Controls, Primary Safety

File MCCZ7.MP1537

Controls, Primary Safety Certified for Canada

PART NUMBERS AND APPROVALS

Table 1: Agency Approvals

Fireeye Part Number				
60-2991-1	X			
60-2991-2	X			
BP110UVFR-S11M	X			
BP110UVFR-S12M	X			
BP110UVFR-S13M	X			
BP110UVFR-S14M	X			

X = CERTIFICATION IN HAND



ORDERING INFORMATION

60-2991-1	Wiring harness to convert RM7800/RM7840/RM7845 (less valve proving) to Fireye BurnerPRO
60-2991-2	Wiring harness to convert RM7895 to Fireye BurnerPRO
60-3000	USB to RS485 cable kit to communicate/configure BurnerPRO ModBus versions. Includes 60-2998
CONTROLS	
BP110UVFR-S11M	BurnerPRO, Single Modulating Gas Burner Control, 110VAC 50/60Hz, User Defined Timings, UV and FR amplifiers, Modbus
BP110UVFR-S12M	BurnerPRO, Single Modulating Oil Burner Control, 110VAC 50/60Hz, User Defined Timings, UV and FR amplifiers, Modbus
BP110UVFR-S13M	BurnerPRO, Single On/Off Gas Burner Control, 110VAC 50/60Hz, User Defined Timings, UV and FR amplifiers, Modbus
BP110UVFR-S14M	BurnerPRO, Single On/Off Oil Burner Control, 110VAC 50/60Hz, User Defined Timings, UV and FR amplifiers, Modbus
SCANNERS	
UV90L-1	UV scanner, front and side viewing, terminal block
UV5-1	UV scanner, side viewing, 78" (2000mm) flying leads
UV5-2	UV scanner, side viewing, quick disconnect connector
UV1AL-3	UV scanner, 1/2" NPT, 36" (915mm) shielded leads
UV1AL-6	UV scanner, 1/2" NPT, 72" (1830mm) shielded leads
4-742-1	Replacement tube for UV90L-1
UV1AL-CEX	Cenelec Exd IIC explosion proof housing with UV1AL-3 scanner

INSTALLATION PROCEDURE



WARNING:

Disconnect power supply before beginning installation to prevent electrical shock and equipment damage. More than one disconnect may be involved.

1. A UL listed flame safeguard system is comprised of the following items:
 - a) 60-2991-1 or 60-2991-2 wiring harness
 - b) BP110UVFR-S11M, BP110UVFR-S12M, BP110UVFR-S13M or BP110UVFR-S14M to match the functionality of the unit being replaced
2. Wiring must comply with all applicable codes, ordinances and regulations.
3. Wiring must comply with NEC Class 1 (line voltage) wiring.
4. To minimize interference from radio frequency generated by the BurnerPRO, it is necessary that all control wiring be placed in conduit.
5. Limit switches, interlocks and relay outputs must be rated to simultaneously carry and break current to the ignition transformer, pilot valve(s) and main fuel valve(s) of the BurnerPRO.
6. Recommended wire routing of lead wires:
 - a) Do not run high voltage ignition transformer wires in the same conduit with any other wires.
 - b) Do not route analog transducer cables, display communication cables, Modbus cables or servo motor cable in conduit with line voltage circuits. Use separate conduit where necessary.



7. Maximum wire lengths:
 - a) Terminal inputs (operating limits, interlocks, valves, etc.): 200 feet (61 meters).
 - b) Remote reset line voltage input: 500 feet (152 meters) NOTE: A normally open remote reset pushbutton should be used and must remain within sight and sound of the burner.
 - c) Modbus via RS-485: 1000 feet (305 meter).
8. A good grounding system should be provided to minimize the effects of poor quality AC voltage. A properly designed grounding system meeting all the safety requirements will ensure that any quality problems (spikes, surges or impulses) have a low impedance path to ground. A low impedance path to ground is required to ensure that stray currents paths created will drain to ground instead of through equipment and causing potential damage.
9. Failure to follow these instructions can cause a hazardous condition and/or equipment damage.
10. Before installation, ensure that the control is suitable for your application by verifying all ratings and functionality.
11. After installation, verify all control operation as provided in these instructions.



Published load ratings assume that the internal contacts will only get switched once every 15 seconds. Using inputs which exceed this duty cycle can lead to premature control failure. Following the tripping of a circuit breaker, a blown fuse or any known instance of excessive contact cycling, the control should be operated with the fuel shut off as a test to ensure proper functionality.

WIRING CONNECTIONS



CAUTION: Ensure that electric power is turned off. Refer to SN-100 for recommended grounding techniques. Be aware that power to some interlocks (operating controls, air flow switches, modulating circuits, etc.) may be derived from sources other than what is controlling the BurnerPRO.



60-2991-1 Wiring

Honeywell Term	Function	BurnerPro Term
4	Line Voltage Supply	1 & 4 ¹
L2	Line Voltage Common	2
F	Flame Rod ²	24
G	Flame Rod Ground	Earth Ground
	UV Scanner ²	22 ²
	UV scanner ²	23 ²
6	Operating Control & Limits	5
20	Proof of Closure Valve	12
7	Running Safety Interlock (Air Flow) ³	14 ³
10	Ignition Transformer	16
8	Interrupted Pilot Fuel Valve	17
21	Intermittent Pilot Valve	18
9	Main Fuel Valve	19
5	Blower Motor	6
18	Low Fire Start Switch	8
19	High Fire Start Switch	15
3	Alarm	3
12	High Fire	Internal relays ⁴
13	Common	Internal relays ⁴
14	Low Fire	Internal relays ⁴
15	Auto	Internal relays ⁴
22	Shutter	Not used

¹ Terminal 4 is internally jumpered to terminal 1 via the BurnerPro control.

² If the Honeywell control used a non-self check UV scanner, then the Honeywell scanner must be removed and the Fireye UV scanner must be wired into terminals 22 and 23 on the BurnerPro wiring base.

³ The BurnerPro will lockout when the Running Safety Interlock circuit opens (RM7800L)

⁴ The BurnerPro outputs 120 VAC to the Mod Motor circuit. The 60-2991-1 adapter provides relays to simulate the dry contact Mod Motor outputs of the RM7800.



60-2991-2 Wiring

Honeywell Term	Function	BurnerPro Term
5	Line Voltage Supply	1 & 4 ¹
L2	Line Voltage Common	2
F	Flame Rod ²	24
G	Flame Rod Ground	Earth Ground
	UV Scanner ²	22 ²
	UV scanner ²	23 ²
6	Operating Control & Limits	5
7	Running Safety Interlock (Air Flow) ³	14 ³
10	Ignition Transformer	16
8	Interrupted Pilot Fuel Valve ⁴	17 ⁴
9	Main Fuel Valve	18
4	Blower Motor	6
3	Alarm	3
20	Proof of Closure ⁵	12 ⁵
21	Delayed Main Fuel Valve ⁶	Confirm - 18 ⁶

¹ Terminal 4 is internally jumpered to terminal 1 via the BurnerPro control.

² If the Honeywell control used a non-self check UV scanner, then the Honeywell scanner must be removed and the Fireeye UV scanner must be wired into terminals 22 and 23 on the BurnerPro wiring base.

³ The BurnerPro will lockout when the Running Safety Interlock circuit opens. Jumper JR3 on the RM7895 selects recycle or lockout.

⁴ Terminal 17 on the BurnerPro provides interrupted operation of the pilot fuel valve. If intermittent operation is required, an external jumper between terminals 17 and 19 on the BurnerPro wiring base must be added. The jumper could also be installed between terminals 8 and 21 on the Honeywell wiring base. The timing of terminal 17 can also be programmed via Modbus for continuous (intermittent) operation.

⁵ Proof of Closure used on RM7897

⁶ Delayed Main Valve used on RM7897C



The timings on the BurnerPro must match the timings as selected on the Honeywell RM7800 / RM7895.
 Purge timing on the RM7800 is determined by which Honeywell ST7800A purge card is selected.

RM7800L

Honeywell Terminals and Timings				BurnerPro Terminals and Timings			
Honeywell Term	PTFI	MTFI	Comments	BP term	PTFI	MTFI	Function
10	5 sec	-		16	10 sec	-	Ignition
8	10 sec	10 sec		17	10 sec	S11M = 10 sec S12M = 15 sec	Interrupted Pilot
21	10 or 4 sec	15 sec	Jumper JR1 intact = 10 sec PTFI Jumper JR1 clipped = 4 sec PTFI	18	-	-	Intermittent Pilot

Existing Honeywell RM7800L Installation	Action
Firing Natural Gas / Light Oil– Ignition & Pilot on Term 8	Use S11M with defaults
Firing Heavy Oil – Ignition & Pilot on Term 21, JR intact	Use S12M with defaults, Move wire from Term 21 to Term 8 on Honeywell wiring base
Firing Heavy Oil – Ignition & Pilot on Term 21, JR clipped	Use S12M, Change TSA / TSA' to 5 sec, Move wire from Term 21 to Term 8 on Honeywell wiring base.
Ignition on Term 10' Pilot on Term 8	Change TSA / TSA' to 5 sec, change t7 to 5 sec,
RM7800L 1053, RM7840L 1026 provide intermittent operation on Term 21.	Use S11M with defaults. Install jumper wire from Term 8 to 21 on the Honeywell wiring base.



RM7800G

Honeywell Terminals and Timings				BurnerPro Terminals and Timings			
Honeywell Term	PTFI	MTFI	Comments	BP term	PTFI	MTFI	Function
10	5 sec	-		16	10 sec	-	Ignition
8	10 sec	10 sec		17	10 sec	S11M = 10 sec S12M = 15 sec	Interrupted Pilot
21	10 or 4 sec	15 sec, 30 sec, or Intermittent	Jumper JR1 intact = 10 sec PTFI, Jumper JR1 clipped - 4 sec PTFI	18	-	S11M = 10 sec S12M = 15 sec	Intermittent Pilot
			Jumper JR2 intact – Intermittent Jumper JR2 clipped – 15 sec MTFI				
			Jumper JR2 clipped, Term 5 & 19 jumpered = 30 sec MTFI				

Existing Honeywell RM7800G Installation	Action
Firing Natural Gas / Light Oil – Ignition & Pilot on Term 8	Use S11M with defaults. Jumper Term 4 to 19 on MH wiring base
Firing Heavy Oil – Ignition & Pilot on Term 21, JR1 intact	Use S12M with defaults, Move wire from Term 21 to Term 8 on Honeywell wiring base. Jumper Term 4 to 19 on Honeywell wiring base.
Firing Heavy Oil – Ignition & Pilot on Term 21, JR1 clipped	Use S12M, Change TSA' to 5 sec, Move wire from Term 21 to Term 8 on Honeywell wiring base. Jumper Term 4 to 19 on Honeywell wiring base.
Ignition on Term 10, Pilot on Term 8	Use S11M. Change TSA' to 5 sec, Change t7 to 5 sec,

Note: The BurnerPro will lockout when any Running Safety Interlock (e.g., air flow) opens. The RM7800G will attempt to recycle.



RM7800M

Honeywell Terminals and Timings				BurnerPro Terminals and Timings			
Honeywell Term	PTFI	MTFI	Comments	BP term	PTFI	MTFI	Function
10	5 sec	-		16	10 sec	-	Ignition
8	10 sec	10 sec		17	10 sec	S11M = 10 sec S12M = 15 sec	Interrupted Pilot
21	10 or 4 sec	Intermittent	Jumper JR1 intact = 10 sec PTFI, Jumper JR1 clipped = 4 sec PTFI	18	-	S11M = 10 sec S12M = 15 sec	Intermittent Pilot

Existing Honeywell RM7800M Installation	Action
Firing Natural Gas / Light Oil – Ignition & Pilot on Term 8	Use S11M with defaults. Jumper Term 4 to 18 & 19 on MH wiring base.
Firing Natural Gas or Heavy Oil – Ignition on Term 8, Pilot on Term 21, JR1 intact	Use S11M with defaults, move wire from MH Term 8 to Term 10. Jumper Term 8 to 21 on MH wiring base. Jumper Term 4 to 18 & 19 on Honeywell wiring base.
Firing Natural Gas or Heavy Oil – Ignition on Term 10, Pilot on Term 21, JR1 clipped	Use S11M with defaults, set TSA / TSA' to 5 sec, Jumper Term 8 to 21 on MH wiring base. Jumper Term 4 to 18 & 19 on Honeywell wiring base.
Ignition on Term 10, Pilot on Term 8	Use S11M with defaults, set TSA / TSA' to 5 sec, Jumper Term 8 to 21 on MH wiring base. Jumper Term 4 to 18 & 19 on Honeywell wiring base.

Note: The BurnerPro will lockout when any Running Safety Interlock (e.g., air flow) opens. The RM7800M will attempt to recycle.

Note” The BurnerPro cannot replace the RM7800M with On – Off – On Firing Rate Circuit.



TIMING

		BP110UVFR-S11M RM7800	BP110UVFR-S12M RM7800	BP110UVFR-S13M RM7895	BP110UVFR-S14M RM7895
PARAMETER	Description	GAS	OIL	GAS	OIL
t1	Purge time	30s	30s	5s	5s
t3	Pre-ignition time (direct fired)	0s	0s	0s	0s
t3'	Pre-ignition time (piloted)	0s	0s	0s	0s
TSA	Ignition safety time (directed ignition)	10s	10s	5s	10s
TSA'	Ignition safety time (PTFI)	10s	10s	5s	10s
t4	Interval between voltage on pilot/ main fuel direct and main fuel piloted	5s	5s	5s	5s
t4'	Interval between start of TSA and the main fuel piloted	5s	5s	5s	5s
t5	Interval between main fuel piloted and release to modulation	15s	15s	15s	15s
t6	Post-purge time	15s	15s	5s	5s
t7	Pilot stabilization period	0s	0s	0s	0s
t9	Interval between main fuel piloted and removal of pilot (MTFI)	10s	14.9s	10s	14.9s
t11	Air damper running time to the high fire position	Optional	Optional	Optional	Optional
t12	Air damper running time to the low fire position	Optional	Optional	Optional	Optional
t13	Permissible after burn time (post-purge + 60 sec)	75s	75s	65s	65s
FFRT	Flame failure response time (FFRT)	4s	4s	4s	4s



BurnerPRO with 60-2991-1 Adapter (Modulating)

SEQUENCE LEGEND

- Is on or must be on**
- Is off or must be off**
- No effect or not applicable**
- Must be on by end of state**
- POC** Voltage must be present on terminal 12 within time specified for POC (default 60s)
- FS** A flame signal in standby/afterburn for longer than the time allowed for flame standby (default 60s) will result in a lockout
- FB** Voltage must be present on terminal within time specified for feedback (default 60s)

STATE

TYPE	TERMINAL	BP	DESCRIPTION
OUTPUT	3	3	Alarm
OUTPUT	4	4	Power to limits
INPUT	6	5	Recycle limits
INPUT	20	12	Proof of closure
INPUT	7	14	Combustion air proven
OUTPUT	5	6	Blower
OUTPUT	10	16	Ignition
OUTPUT	8	17	Interrupted pilot gas valve
OUTPUT	21	18	Intermittent pilot gas valve
OUTPUT	9	19	Main gas valve
INPUT	18	8	Actuator feedback low fire
INPUT	19	15	Actuator feedback high fire
OUTPUT	---	9	Actuator open (high fire purge)
OUTPUT	10	10	Actuator minimum (low fire ignition)
OUTPUT	11	11	Actuator economy (closed)
OUTPUT	---	20	Release to modulate
INPUT	---	22,23	Flame signal LVV
INPUT	F, G	24, G	Flame signal flame rod
			Flame signal results in lockout
			Flame fail results in postpurge

TIMINGS / STATE SEQUENCE

PRESET	FFRT	t11		t1	t12	TSA'	t9	t5	t6		
38	LOCKOUT										
4	STANDBY										
6	CALL FOR HEAT										
17	HIGH FIRE PURGE INTERLOCK PROVE										
7	COMBUSTION AIR PROVE TEST	Actuator travel time (max = feedback)									
18	PREPURGE	30s									
30s											
19	LOW FIRE PURGE INTERLOCK PROVE	Actuator travel time (max = feedback)									
10s											
10s	IGNITION/PTFI										
15s	MTFI										
15s	MAIN FLAME PROVING PERIOD										
30,31	RUN										
33	SHUTDOWN										
34	POSTPURGE										
35											
36											



FLAME SCANNERS



INSTALLATION - UV SCANNERS

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

1. Position the UV1AL, UV90L or UV5 scanner within 39 inches (1 meter) of the flame to be monitored.
2. Select a scanner location that remains within the ambient temperature limits of the UV scanner.
3. The UV1AL scanner is designed to seal off the sight pipe up to 1 PSI pressure. Higher furnace pressures must be sealed off. To seal off positive furnace pressure up to 50 PSI for the UV1AL scanner, install a quartz window coupling (P/N: 60-1257). Add cooling air to reduce the scanner sight pipe temperature.
4. Install the scanner on a standard NPT pipe (UV1AL: ½") whose position is rigidly fixed. If the scanner mounting pipe sights through the refractory, do not extend it more than halfway through. Swivel flanges are available if desired (P/N: 60-302). The sight pipe must permit an unobstructed view of the pilot and/or main flame, and both pilot and main flames must completely cover the scanner field of view.

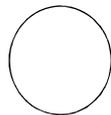
SCANNER MUST HAVE UNOBSTRUCTED
VIEW OF FLAME



NOT THIS



NOT THIS



BUT THIS

FLAME MUST COMPLETELY COVER
SIGHT OPENING



NOT THIS



NOT THIS



BUT THIS



5. Smoke or unburned combustion gases absorb ultra-violet energy. On installations with negative pressure combustion chambers, a small hole drilled in the UV1AL sight pipe assists in keeping the pipe clean and free from smoke. For positive pressure furnaces, provide clean air to pressurize the sight pipe, if necessary.
6. Two UV1AL scanners may be installed on the burner if it is necessary to view two areas to obtain reliable detection of the flame. They must be wired in parallel.
7. To increase scanner sensitivity with UV1AL scanner, a quartz lens permits location of the scanner at twice the normal distance. Use 1/2" x 1 1/2" pipe nipple between UV1AL scanner and the coupling.
8. Request the assistance of any Fireeye field office for recommendations of a proper scanner installation on a non-standard application.

TYPICAL UV SCANNER INSTALLATIONS

WIRING - UV SCANNERS

To connect the scanner to the control, the UV1AL scanner is supplied with UV1AL-3 (36") or UV1AL-6 (72") (0.9 m or 1.8 m) of flexible cable. The UV90L is supplied with a terminal board. Use two #18 AWG conductors to connect the UV90L to the control. The UV5 is supplied with 80" (2m) of flexible cable (detachable).

If it is necessary to extend the scanner wiring, the following instructions apply:

There is no polarity associated with the scanner wiring. Scanner wires must be installed in a separate conduit. The wires from several scanners may be installed in a common conduit.

1. Selection of Wire
 - a. Wiring: For extended scanner wiring up to 500 feet (152 M), and for shorter lengths to reduce signal loss, use a shielded wire (Belden 8254-RG62 coaxial cable, or equal) for each scanner wire. The ends of the shielding must be taped and not grounded.
 - b. Avoid asbestos insulated wire.
 - c. Multi-conductor cable is not recommended without prior factory approval.
2. High voltage ignition wiring must not be installed in the same conduit with flame detector wires.



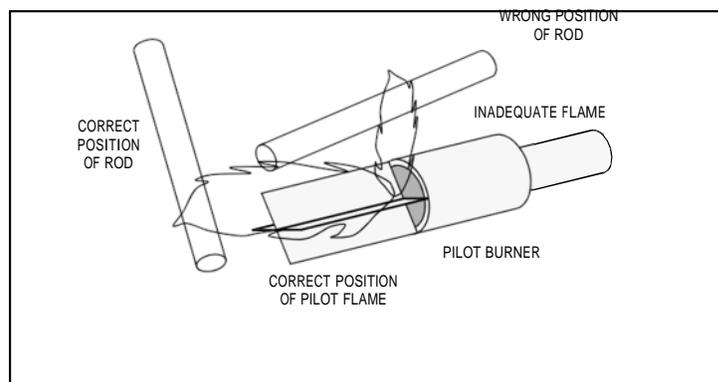
INSTALLATION - 69ND1 FLAME ROD

The 69ND1 flame rod proves a gas pilot flame and/or main gas flame. It is a spark plug type unit. It consists of 1/2" "NPT" mount, a KANTHAL flame rod, a glazed porcelain insulating rod holder and a spark plug connector for making electrical connections. The 69ND1 is available in 12", 18" or 24" (0.3m, 0.46m, 0.6m) lengths.

The flame rod may be located to monitor only the gas pilot flame or both the gas pilot and main gas flames. Mount it with a 1/2" "NPT" coupling.

The following instructions should be observed:

1. Keep your flame rod as short as possible.
2. Keep your flame rod at least 1/2" from any refractory.
3. Your flame rod must enter the pilot flame from the side so as to safely prove an adequate pilot flame under all draft conditions.
4. If the flame is nonluminous (air and gas mixed before burning), extend the electrode tip at least 1/2" into the flame, but not more than halfway through.



5. If the flame is partly luminous, the electrode tip must extend only to the edge of the flame. It is not necessary to maintain uninterrupted contact with the flame.
6. It is preferable to angle the rod downward to minimize the effect of sagging and to prevent it from coming in contact with any object.
7. An adequate grounding surface for the flame must be provided. The grounding surface in actual contact with the flame must be at least 4 times greater than the area of the portion of the flame rod in contact with the flame. It is essential to adjust the flame rod and ground area ratio to provide a maximum, signal reading.

Note: Interference from the ignition spark can alter the true signal reading by adding to, or subtracting from it. This trend sometimes may be reversed by interchanging the primary wires (line voltage) to the ignition transformer. This interference can also be reduced by the addition of grounded shielding between the flame rod and ignition spark.

8. Proven types of flame grounding adapters, as shown below, may be used to provide adequate grounding surface. High temperature stainless steel should be used to minimize the effect of metal oxidation. This assembly may be welded directly over the pilot or main burner nozzle.



WIRING - FLAME ROD

For proper operation of flame rectification systems, it is necessary to maintain at least 20 megohms insulating resistance in the flame rectification circuit.

1. The scanner should be wired using metal cable or rigid conduit.
2. High voltage wiring must not be installed in the same conduit with scanner wiring.

SELECTION OF SCANNER WIRE

1. Use #14, 16, or 18 gauge wire with 90 C, 600 volt insulation for up to 20 feet distance.
2. The type of insulation used with flame rectification is important, since it must protect against current leakage resistance to ground. Use Belden 8254-RG62 coaxial cable (or equal) for runs greater than 20 feet. **Maximum wiring run not to exceed 100 feet.**

MAINTENANCE FLAME ROD

Type 69ND1 Flame Rod

1. The flame rod and its insulator should be kept clean by washing routinely with soap and water.
2. Rods should be routinely replaced as they oxidize.

Flame Signal Strength

Routine observation of the flame signal strength will forewarn any deterioration in the capability of the flame detector or its application.

NOTICE

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

WARRANTIES

FIREYE guarantees for *one year from the date of installation or 18 months from date of manufacture* of its products to replace, or, at its option, to repair any product or part thereof (except lamps, electronic tubes and photocells) which is found defective in material or workmanship or which otherwise fails to conform to the description of the product on the face of its sales order. **THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES AND FIREYE MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.** Except as specifically stated in these general terms and conditions of sale, remedies with respect to any product or part number manufactured or sold by Fireye shall be limited exclusively to the right to replacement or repair as above provided. In no event shall Fireye be liable for consequential or special damages of any nature that may arise in connection with such product or part.

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