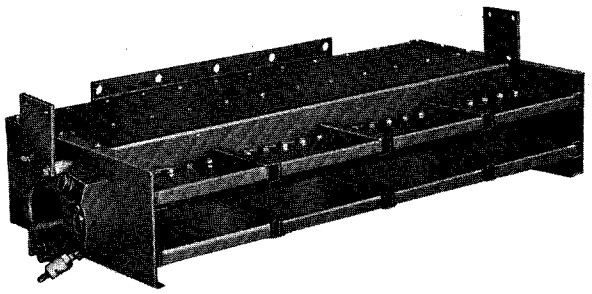
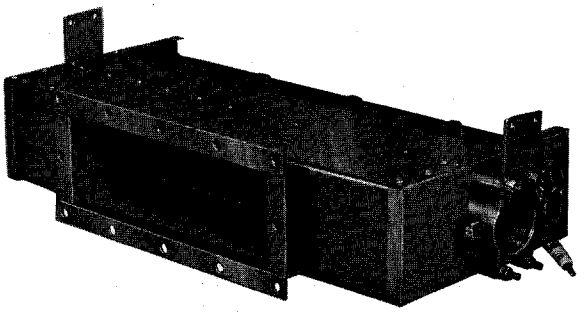
Info 170
8/87
formerly H-130

ECLIPSE INFORMATION GUIDE
RATIO-FLAME BURNERS
SERIES NML





WARNING

The burners covered in this Guide are designed to mix fuel with air and burn the resulting mixture. All fuel burning devices are capable of producing violent explosions and fires when improperly applied, installed, adjusted, controlled, or maintained. This Guide will provide information for using these burners for their limited design purpose. Do not deviate from any instructions or application limits in this Guide without written advice from the Engineering Department at the Eclipse factory in Rockford, Illinois. Read this entire Guide before attempting to light burners. If you do not understand any part of the information in this Guide, contact your local Eclipse representative or the Eclipse Engineering Department before proceeding further.

IMPORTANT NOTICES RELATING TO SAFE BURNER OPERATION

1. Store the burner inside. Exposure to the elements can damage the burner.

2. Adjustment, maintenance, and troubleshooting of the mechanical parts of this unit should be done by people with good mechanical aptitude and experience with combustion equipment.

3. Order replacement parts from Eclipse only. Any customer supplied valves, or switches, should carry UL, FM, and/or CGA approval where applicable.

4. The best safety precaution is an alert and competent operator. New operators must be thoroughly instructed and demonstrate an adequate understanding of the equipment and its operation. Regular retraining must be scheduled to maintain a high degree of proficiency. The operator must have easy access to this Information Guide at all times.

1.0 APPLICATIONS

1.1 Eclipse Ratio-Flame burners are nozzle mixing line type air heat burners designed for in-duct installation in dryers, ovens, makeup air heaters and similar equipment. Combustion air must be supplied to Ratio-Flame burners independently of the process airstream. Ratio-Flame burners may be used with any clean, dry, commercially available fuel gas.

2.0 SPECIFICATIONS AND OPERATING REQUIREMENTS

2.1 Specifications:

Maximum Input Per Foot of Burner: 1,200,000 Btu/Hr.

Maximum Air Turndown: 30:1 from on-ratio flow at maximum rated input.

Maximum Gas Turndown: 40:1 from maximum rated input

Maximum Combustion Air Temperatures: 450°F.

Maximum Airstream Temperatures
Upstream of the Burner: 450°F.
Downstream of the Burner: 1000°F.

Airstream Velocities, Flow Parallel to Flame
Maximum: 6000 fpm
Minimum: 250 fpm
Optimum: 1000 to 4000 fpm

2.2 Air flow must be uniform over the length of the burner. If necessary, a profile plate can be installed to create uniform air flow and/or a specific airstream velocity past the burner.

2.3 All operating limits in this Guide must be strictly observed.

3.0 DUCT REQUIREMENTS

3.1 A minimum of 3 inches clearance must be provided between the duct walls and the top, bottom, and sides of the burner.

3.2 A minimum distance of 46 inches must be provided between the burner face and the nearest point of possible flame impingement.

3.3 If a reducing duct transition is used downstream of the burner, a straight section equal to one duct width or height (whichever is greater) or one duct diameter should be provided between the burner and the transition. This will allow the air flow to equalize throughout the duct before entering the transition.

3.4 A viewing port for observing the flame should be installed downstream of the burner. The materials used in this port must be suitable for the operating conditions. If the port is located on the duct wall opposite the gas inlet end of the burner, the pilot flame will be visible burning in a few ports at the inlet end of the main flame manifold. In this case, the peepsight supplied with the burner need not be used and can be replaced with a 3/4" N.P.T. pipe plug.

3.5 Access should be provided for routine maintenance of the ignition plug and flame monitoring device.

4.0 IGNITION

4.1 Burners 18" in length or shorter may be ignited by direct spark at low fire or by an Eclipse NMP-S nozzle mixing pilot specially adapted to this burner. If direct spark ignition is planned, the burner must be ordered with inlet casting 03877-1 and ignition plug 16927.

4.2 Burners longer than 18 inches must be ignited by an Eclipse NMP-S nozzle mixing pilot specially adapted to this burner.

4.3 Power supplied to the ignition electrode must be 6000 VAC at 120 VA minimum.

FIGURE 1 - PERFORMANCE DATA

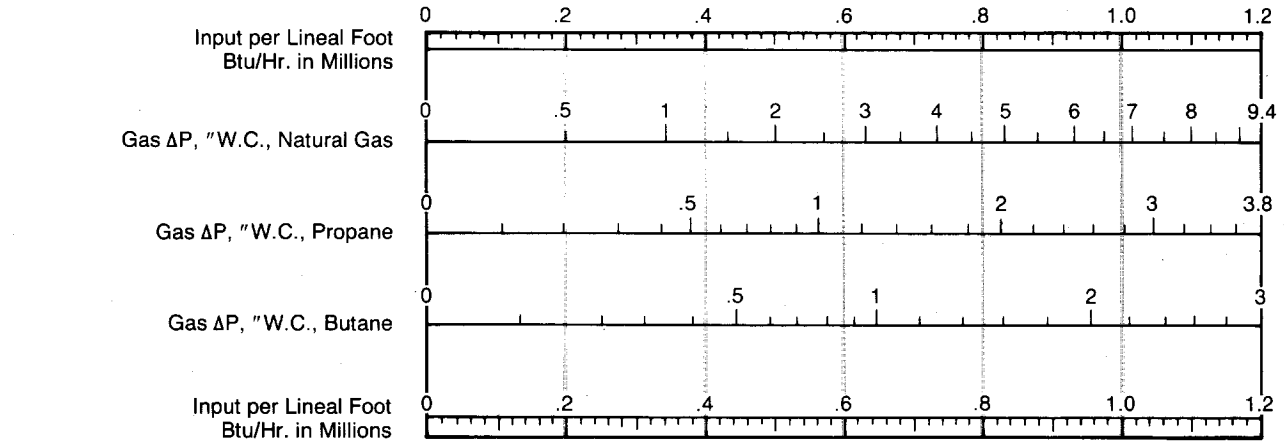
CAPACITIES

Burner Catalog Number	Linear Feet	Maximum Burner Capacity Btu/Hr. in Millions	On-Ratio High Fire Combustion Air Flow	
			SCFH in Thousands	Air ΔP,* "W.C.
6 NML	0.5	0.6	6	9.2
12 NML	1.0	1.2	12	11.5
18 NML	1.5	1.8	18	12.4
24 NML	2.0	2.4	24	13.0
30 NML	2.5	3.0	30	13.3
36 NML	3.0	3.6	36	13.5
42 NML	3.5	4.2	42	13.6
48 NML	4.0	4.8	48	13.7
54 NML	4.5	5.4	54	13.8
60 NML	5.0	6.0	60	13.9
66 NML	5.5	6.6	66	13.9
72 NML	6.0	7.2	72	14.0
78 NML	6.5	7.8	78	14.0
84 NML	7.0	8.4	84	14.1
90 NML	7.5	9.0	90	14.1
96 NML	8.0	9.6	96	14.2
102 NML	8.5	10.2	102	14.2
108 NML	9.0	10.8	108	14.3
114 NML	9.5	11.4	114	14.3
120 NML	10.0	12.0	120	14.3

*Combustion air differential pressure is measured as shown on page 6. To correct for combustion air temperature, multiply the pressure by the following factor:

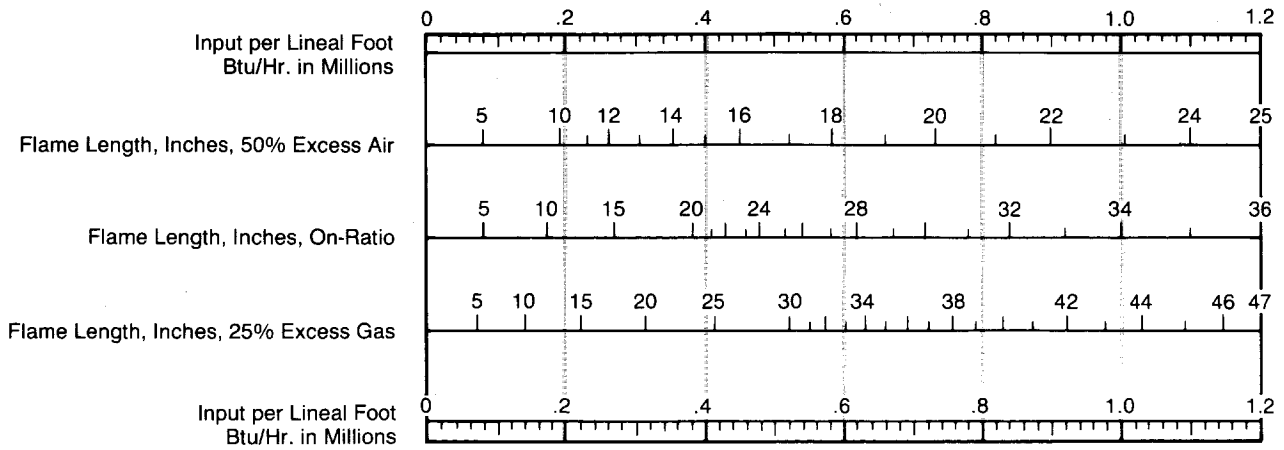
Air Temp, °F	Air ΔP Multiplier
70°F	1.00
150°F	1.15
250°F	1.34
350°F	1.53
450°F	1.72

GAS PRESSURES*



*Measured as shown on page 6.

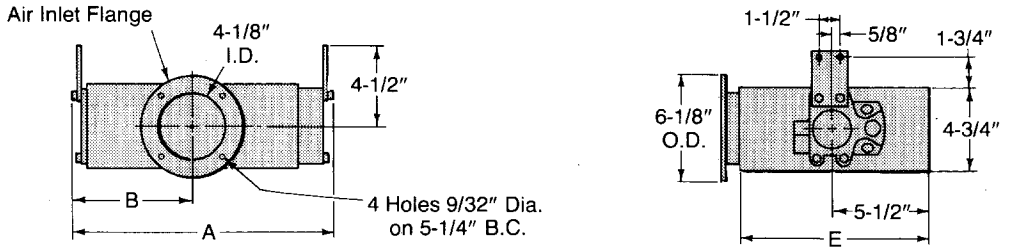
FLAME LENGTHS*



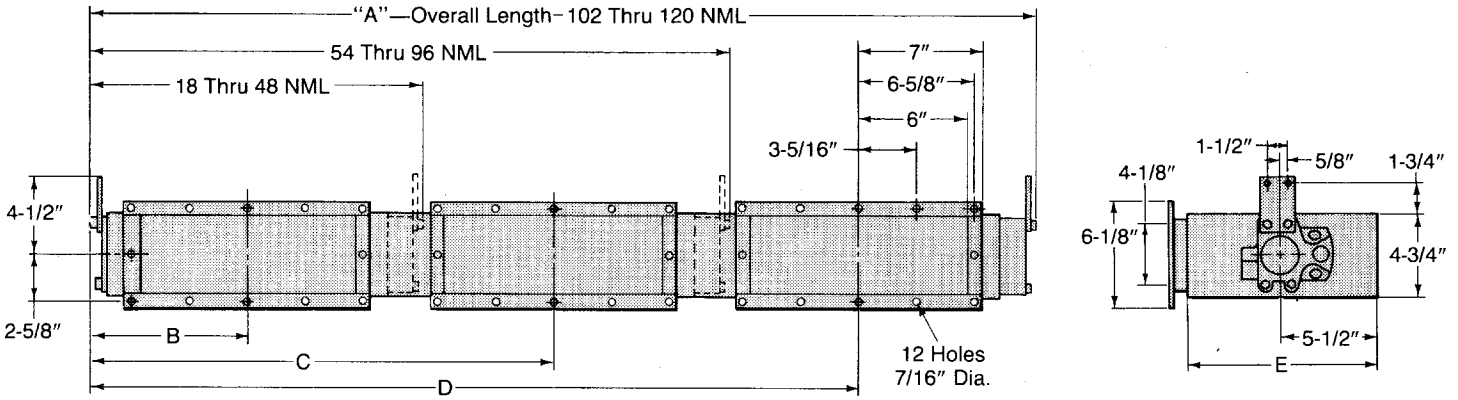
*Add 10% to flame length for 6 NML and 12 NML.

FIGURE 2 - DIMENSIONS

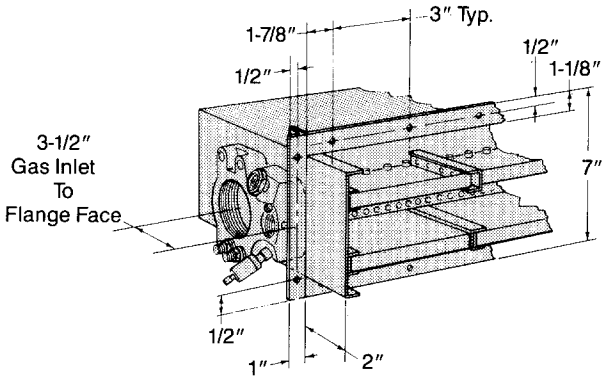
6 & 12 NML



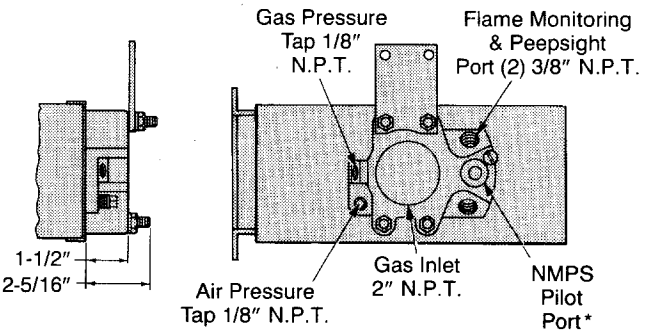
18 THROUGH 120 NML



OPTIONAL CONTINUOUS MOUNTING FLANGE



GAS INLET CASTING



*On casting #03877-1 for direct spark ignition of 6, 12, & 18 NML burners, this hole is tapped for spark plug #16927.

Burner Cat. No.	Assembly Number: Standard Burner	Assembly Number: Burner With Continuous Mounting Flange	Linear Feet	Dimensions in Inches: A	B	C	D	E
6 NML	107000	107014-1	.5	9-5/8	4-3/16	—	—	11-3/4
12 NML	107004	107014-2	1.0	15-5/8	7-3/16	—	—	11-3/4
18 NML	107007-18	107014-3	1.5	21-5/8	9	—	—	11-3/4
24 NML	107007-24	107014-4	2.0	27-5/8	12	—	—	11-3/4
30 NML	107007-30	107014-5	2.5	33-5/8	15	—	—	15-3/4
36 NML	107007-36	107014-6	3.0	39-5/8	18	—	—	15-3/4
42 NML	107007-42	107014-7	3.5	45-5/8	21	—	—	15-3/4
48 NML	107007-48	107014-8	4.0	51-5/8	24	—	—	15-3/4
54 NML	107007-54	107014-9	4.5	57-5/8	13-1/2	40-7/16	—	15-3/4
60 NML	107007-60	107014-10	5.0	63-5/8	15	44-15/16	—	15-3/4
66 NML	107007-66	107014-11	5.5	69-5/8	16-1/2	49-7/16	—	15-3/4
72 NML	107007-72	107014-12	6.0	75-5/8	18	53-15/16	—	15-3/4
78 NML	107007-78	107014-13	6.5	81-5/8	19-1/2	58-7/16	—	15-3/4
84 NML	107007-84	107014-14	7.0	87-5/8	21	62-15/16	—	15-3/4
90 NML	107007-90	107014-15	7.5	93-5/8	22-1/2	67-7/16	—	15-3/4
96 NML	107007-96	107014-16	8.0	99-5/8	24	71-15/16	—	15-3/4
102 NML	107007-102	107014-17	8.5	105-5/8	17	51	84-15/16	15-3/4
108 NML	107007-108	107014-18	9.0	111-5/8	18	54	89-15/16	15-3/4
114 NML	107007-114	107014-19	9.5	117-5/8	19	57	94-15/16	15-3/4
120 NML	107007-120	107014-20	10.0	123-5/8	20	60	99-15/16	15-3/4

5.0 FLAME MONITORING

5.1 Flame monitoring may be by flame rod or ultra-violet flame sensing device (U.V. scanner). Flame sensing equipment should be UL, FM and/or CGA approved.

5.2 If multiple burners are mounted in the same duct, each burner must be fitted with flame monitoring equipment.

5.3 **CAUTION: Failure to use suitable flame sensing devices and automatic fuel shut-off valves can cause explosions and fires.**

6.0 LIMIT CONTROLS AND SAFETY EQUIPMENT

6.1 Installation of limit controls and safety equipment should comply with current NFPA Standards* 86A, B, C, D, and all applicable local codes and/or standards.

Available from:

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269

7.0 CONTROL METHODS

7.1 Figure 3 shows a typical control system. The air control valve is a butterfly valve fitted with an electric motor or pneumatic actuator. The temperature controller operates this valve. Changes in combustion air flow are transmitted to the top diaphragm of the adjustable bias proportionator valve (ABP) which varies gas flow accordingly. The ABP, described in Eclipse Bulletin M-405, maintains the high fire air/gas ratio over a turndown of approximiately 30:1. The ABP may be adjusted if necessary to shift the air/gas ratio toward excess air or excess gas operation as the system turns down.

7.2 The check valve in Figure 3 improves flame stability at low fire. At high fire, the gas pressure at the burner is higher than the pressure in the combustion air manifold, and the check valve is closed. As burner input is decreased, the gas pressure at the burner falls below the air pressure and the check valve opens, allowing a partial premix to flow to the burner. In addition to increasing flame stability, this pressurizes the gas manifold for uniform gas flow through the ports.

WARNING: Do not install any valve or controlling device in the gas line between the burner and the check valve tee. Because this section of the gas line carries a partial premix at low fire, the flame can propagate back through the pipe to the tee. Valves or devices installed in this section can melt, releasing gas to the atmosphere and causing fires or explosions.

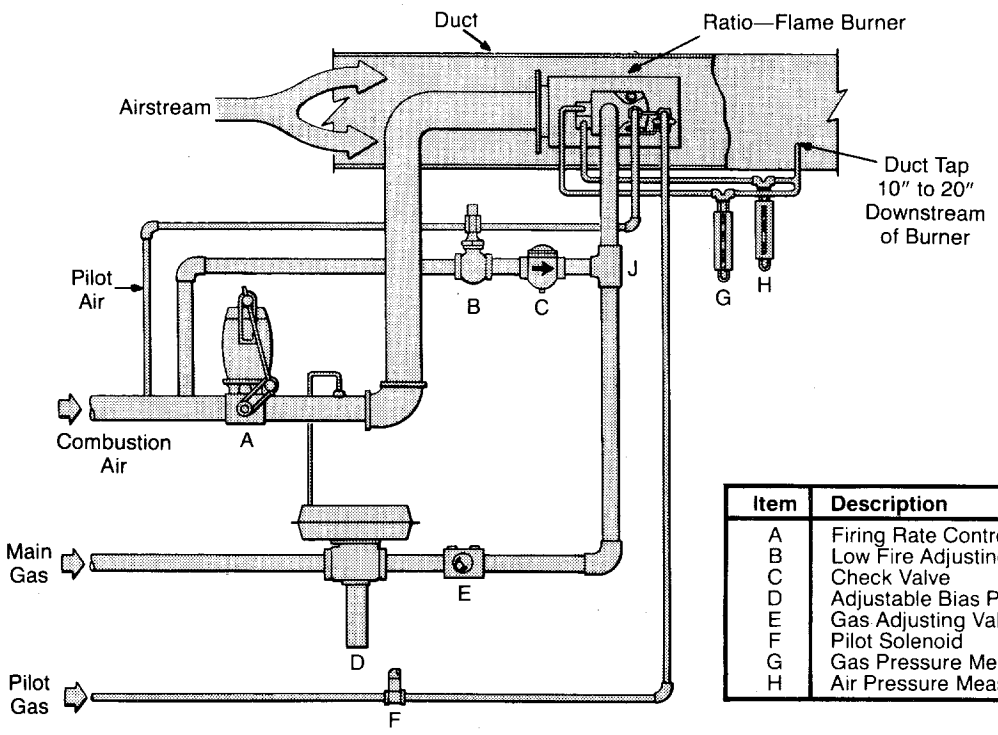
7.3 To prevent burner input from changing with fluctuations in duct pressure, the top diaphragm chamber of the pilot and main gas regulators are loaded to the duct air pressure.

8.0 BURNER INSTALLATION

8.1 A thorough inspection should be made when uncrating and before installing the burner. If any parts appear broken, bent, or damaged, contact your Eclipse representative or the Eclipse factory before installing the burner.

8.2 Two mounting brackets are provided at the top of the burner. These brackets must be bolted to a structure capable of supporting the weight of the burner. The mounting brackets will support only the weight of the burner. Burner supply piping must be adequately and independently supported.

FIGURE 3 - TYPICAL SYSTEM



Item	Description	Bulletin No.
A	Firing Rate Controller	M-150
B	Low Fire Adjusting Valve	M-311
C	Check Valve	MN-1000
D	Adjustable Bias Proportionator	M-405
E	Gas Adjusting Valve	M-150
F	Pilot Solenoid	M-500, M-501
G	Gas Pressure Measuring Device	—
H	Air Pressure Measuring Device	—

Item "C" stabilizes burner operation at low fire by introducing a partial premix to burner. **WARNING: Do not install any valve or controlling device in the piping between tee "J" and the burner.**

8.3 A minimum of three inches of clearance must be provided between the duct walls and the top, bottom, and sides of the burner.

8.4 If two or more burners are stacked in a duct, provide at least three inches of open space between burners.

8.5 Figure 4 illustrates the specially adapted NMP-S pilot available for this burner. The air cock, gas cock, and regulator are shipped loose so that they may be located outside of the duct for easy pilot adjustment. The loading line tap on the pilot body must be connected to the loading line connection on the pilot regulator with a 1/8" line.

9.0 SYSTEM INSTALLATION

9.1 The internal area of the customer supplied piping must be at least as large as the internal area of the inlet piping of the burner.

9.2 Provide a straight run at least ten pipe diameters upstream and at least five diameters downstream of all orifice meters. **Failure to comply will result in inaccurate meter readings.**

9.3 All valves must be installed so that the arrow on the side of the valve body points in the direction of gas or air flow through the valve. If the handle of a manual plug type gas cock is removable, be sure that the handle is properly installed. When the valve is in the "off" position, the handle must be 90° or at a right angle to the valve body.

9.4 Gas piping must comply with American National Standard entitled "National Fuel Gas Code"* (NFPA No. 54 or ANSI Z223.1), or must be acceptable to the authority having jurisdiction.

9.5 Electrical wiring must comply with the National Electric Code*, (NFPA Std. 70 or ANSI-CI 1981), or must be acceptable to the authority having jurisdiction.

*Available from:

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269

American National Standard Institute
1430 Broadway
New York, New York 10018

10.0 AIR AND GAS FLOW MEASUREMENT

10.1 Air flow to the burner inlet is estimated by measuring the differential pressure between tap "A", Figure 2, and a hole in the duct wall 10" to 20" downstream of the burner. The capacity table in Figure 1 relates differential pressure to the combustion air flow and cooling air flow through the burner.

10.2 Gas flow to the burner is estimated by measuring the differential pressure between tap "B", Figure 2, and a hole in the duct wall 10" to 20" downstream of the burner. The gas flow chart in Figure 1 relates differential pressure to gas flow.

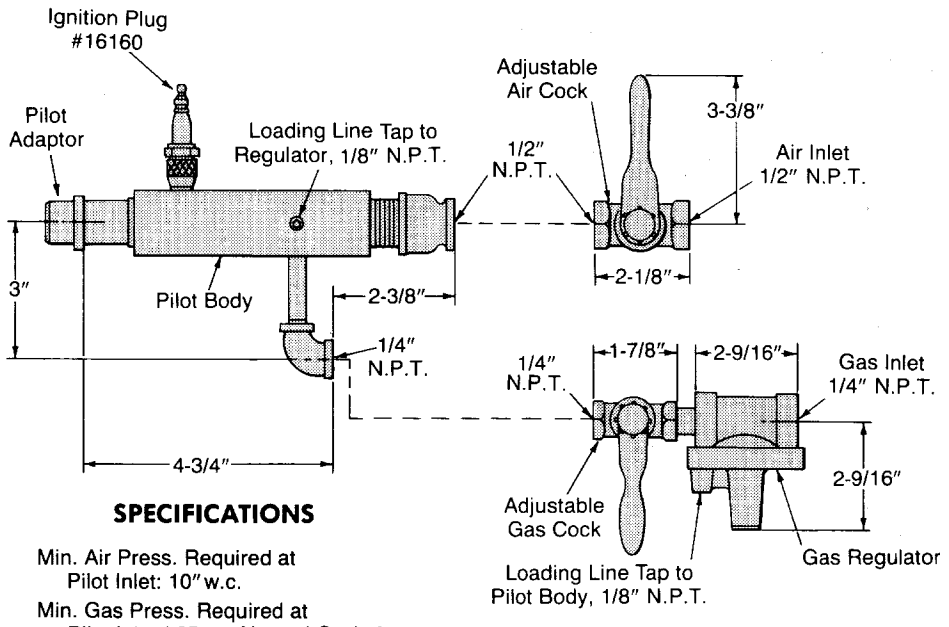
10.3 For more accurate measurement of gas flow, a flow metering device may be installed in the air and gas lines to each burner. If metering orifices are used, provide a straight run at least ten pipe diameters upstream and at least five diameters downstream of each orifice. Failure to comply will cause inaccurate meter readings.

FIGURE 4 - PILOT FOR RATIO-FLAME BURNER

ASSEMBLY NO. 107013

Air cock, gas cock and regulator are shipped loose for mounting outside of the duct.
The 6, 12, & 18 NML may be ignited by direct spark at low fire instead of using this pilot.
For direct spark ignition, specify ignition plug #16927 and direct spark casting #03877-1 when ordering.

DIMENSIONS



SPECIFICATIONS

Min. Air Press. Required at Pilot Inlet: 10" w.c.
Min. Gas Press. Required at Pilot Inlet (.65 sp. Natural Gas): 8" w.c.
Approximate Capacity: 15,000 Btu/Hr.

11.0 **INITIAL START-UP AND ADJUSTMENT** (See Figure 3)

11.1 Close all manual and automatic gas valves including the gas adjusting valve.

11.2 Close the valve directly upstream of the check valve.

11.3 Loosen the linkage of the firing rate controller and close the butterfly valve.

11.4 Start the combustion air blower. Visually confirm that the fan or impeller is rotating in the correct direction. If rotation is wrong, have a qualified electrician change the wiring to the blower motor.

11.5 Start the duct fan to produce full process air flow past the burner.

11.6 Measuring air flow as described in Section 10.1 of this guide, adjust the linkage of the firing rate controller to produce the desired high fire and low fire air flows. Cycle the firing rate controller several times checking high fire and low fire air flow measurements. When adjustment is complete, cause the firing rate controller to move to the low fire position.

11.7 Measure the differential pressure between the burner gas manifold and the duct as described in step 10.2 of this guide. Adjust the valve directly upstream of the check valve to produce a pressure of 0.2" w.c. in the gas manifold.

11.8 Energize the ignition transformer and pilot solenoid.

11.9 Ignite and adjust the pilot. For the specially adapted Eclipse NMP-S pilot, refer to the sections of Information Guide P-83 applying the 3.5 NMP-S pilot.

11.10 Open all gas cocks upstream of the gas adjusting valve. Gradually open the gas adjusting valve to produce a low fire flame.

11.11 If necessary, adjust the valve directly upstream of the check valve to produce a stable blue flame. If this valve is opened too far, the burner will become noisy and the flame will tend to lift off the face of the manifold. If opened too little, the flame will appear yellow and will not extend evenly down the length of the burner.

11.12 Cause the firing rate controller to move to the high fire position. Check to be sure the burners remain lit.

11.13 Measuring gas flow as described in Section 10.2 of this Guide, adjust the gas adjusting valve to provide the desired high fire gas flow.

11.14 Cause the firing rate controller to move to the low fire position. Check to be sure the flame remains lit. If the system includes the Eclipse ABP valve, change low fire gas flow if necessary by turning the ABP bias adjusting screw. See section 4.0 of Information Guide M-405.

11.15 When the correct low fire input is established, turn the low fire adjusting valve if necessary to produce a stable blue flame.

11.16 Cycle the firing rate controller several times to be sure the burners are properly adjusted at all firing rates.

12.0 **MAINTENANCE**

A program of scheduled maintenance should be set up based on the conditions under which the burner will be operated. Some conditions to consider include frequency of operation,

the amount of dirt in the surrounding atmosphere, and the ambient temperatures. Any program should include at least the following steps:

12.1 Examine and, if necessary, replace any gas or air filter elements used.

12.2 Check all bolts for tightness.

12.3 Check all piping connections for leaks.

12.4 Inspect the flame monitoring device and maintain in accordance with the manufacturer's instructions.

12.5 Oil the linkage swivels of any electrically or pneumatically controlled valve.

13.0 TROUBLE-SHOOTING

CAUTION: Trouble-shooting of panels and electrical circuits should be performed by qualified plant electricians, technicians, or engineers who are experienced in handling all facets of this type of combustion equipment.

13.1 Pilot Fails to Light:

a) Air in the gas line may cause failure to light on initial start-up. Several trials for ignition may be necessary before gas line is purged of air.

b) Check spark electrode and ignition transformer to see that they are functioning properly. Clean and gap spark electrode. Replace if necessary.

c) Pilot solenoid valve may not be opening. Faulty electrical circuits or excessive gas inlet pressure can prevent pilot solenoid valves from opening.

d) Pilot may be out of adjustment.

13.2 Pilot Lights, Main Gas Valve Does Not Open:

a) Flame monitoring device may be dirty or improperly installed.

13.3 Main Gas Valve Opens, Burner Fails to Light:

a) Air in the gas line may prevent the burner(s) from lighting on initial start-up. Several trials for ignition may be necessary before gas line is purged of air.

b) System out of adjustment. Re-adjust according to the information in this Guide.

13.4 Burner Flame is Yellow, Unstable at Low Fire:

a) The check valve may be sticking shut.

13.5 Burner Goes Out on Moving to High Fire:

a) The check valve may be sticking open.

Offered By:
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Fax (804) 236-3882

www.peconet.com