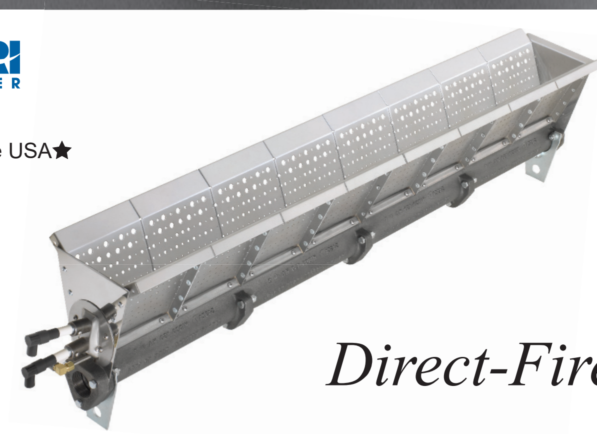
Installation and Service Instructions

Midco® INTERNATIONAL

REGISTERED ISO 9001 COMPANY

AHRI MEMBER

★MADE in the USA★



HMA 2 & HMA 2A

Direct-Fired Gas Burners

Heat Make-Up Air - HMA Series

DIRECT FIRED MAKE-UP AIR BURNERS are used in industrial and commercial applications to maintain the desired environmental temperatures required by critical processes i.e. health purposes, production systems, quality control, comfort and loss prevention where it is necessary or required to exhaust large amounts of conditioned air.

Make-up Air Systems used as stand alone heating systems or operating in combination with central heating plants systems can be cost effective in three ways: 1) reducing the initial expenditures, 2) tempering incoming air which may extend the life of expensive central heating plants and 3) reducing excessive equipment cycling or premature component failures due to increased heating demands.

Our innovative two stage combustion burner is not just a modification or improvement of the old, but a completely new approach to direct-fired combustion. The two-stage combustion improves control of the flame process, meets or exceeds the new ANSI Standards while outperforming the competition. By incorporating two separate flames within the burner combustion zone, the flame is more stable, shorter and cleaner, permitting the reduction of emissions levels and allowing for higher temperature rise and higher tolerance to varying conditions when placed in the profile opening.

Features and Benefits

Reduced NO_2 and CO Emissions: Lower emissions levels that pass the ANSI Z83.4, Z83.18 and Z83.25 standards.

Higher Temperature Rise: The two stage combustion process lowers NO_2 emissions which is the limiting factor in temperature rise.

Increased Capacity: Up to 750,000 BTU'S per foot. (Higher BTU levels can be achieved if ANSI Z83 Standards for CO and NO_2 emissions are not of a concern. Process heaters can fire up to 1,000,000 BTU'S a foot or more.)

Increased Differential Pressure Drop and Higher Velocities: HMA 2 & 2A burners can operate as low as 0.05″ to 1.4″ W.C. differential pressure range or in air velocity as low as 800 fpm to 4000 fpm.

Flame Stability: Two stage combustion provides better flame stability and emission control, allowing for a shorter flame and easier profile configuration.

Reduced Inventory Costs - HMA 2A: Single burner casting can be fired with natural, propane or butane gas [1], reducing burner inventory.

Reduced Shipping Costs: A smaller, lighter casting than the competition's, can lower your freight costs.

Turndown: 30-1 turndown can be achieved with proper modulating controls and valves. (Higher turndown possible depending on equipment design.)

Emission performance is application specific and may vary.

[1] Consult Midco for applications using butane fuels.

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Specifications

*Firing Rate	Up to 750,000 Btu/hr/ft 750,000+ Contact Midco
Burner Manifold Pressure	
Natural Gas	4.2 to 8 inch W.C.
Propane Gas	1.6 to 3 inch W.C.
Pilot Capacity	12,000 Btu/hr
Pilot Manifold Gas Pressure	
Natural Gas	3.5 inch W.C.
Propane Gas	2.0 inch W.C. **
Pressure Drop Across the Burner	0.05 to 1.4 inch W.C.
Air Velocity Across the Burner	800 to 4,000 FPM
Burner Turn-down Ratio	30 to 1 (based on Btu / ft)
Flame Length ....See page 5 for flame length Chart 5, and Tables 2 & 3	

* Firing rate is dependent on the pressure across the burner. Please see the included charts for recommended burner sizing.

** Using a natural gas pilot on propane.

	Cast Iron (CI)		Aluminum (AL)	
*** Burner Configurations	HMA 2	HMA 2A	HMA 2	HMA 2A
2″ Straight Section (2A only)	-	-	-	1020810
6″ Straight Section	1050700	1050710	1050800	1050810
6″ Straight Section with Back Inlet	1230700	1230710	1230800	1230810
12″ Straight Section	1010700	1010710	1010800	1010810
12″ Straight Section with Back Inlet	1060700	1060710	1060800	1060810
Elbow Section	1070700	1070710	1070800	1070810
Tee Section	1080700	1080710	1080800	1080810

**** Pilot Configurations	Part #	Natural #	Propane #
Brute Pilot Spark Rod and Flame Rod		1190850	1190950
Brute Pilot Spark Rod and UV Mount		1200350	1200450
Brute Pilot Spark Rod	1342-03		
Brute Pilot Flame Rod	1360-03		
(Direct) Spark Rod and Flame Rod		1190800	1190900
(Direct) Spark Rod and UV Scanner Mount		1200300	
Remote Flame Rod	1220800		
Remote UV	1240800		
Flame Rod (Direct Spark, Std + Brute)	1360-03		
Spark Rod (Direct Spark)	1342-06		

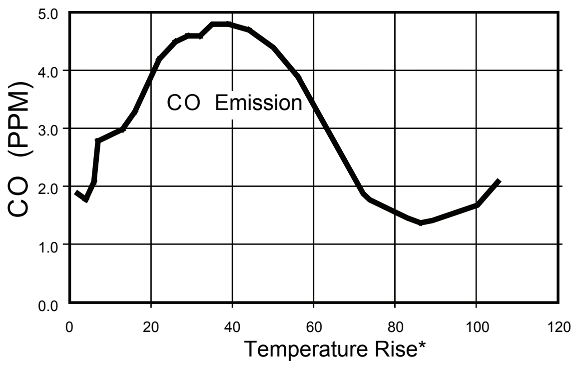
*** See Page 14, Figure 6 for burner configuration reference.

**** See Page 15, Figure 7 for pilot configuration reference

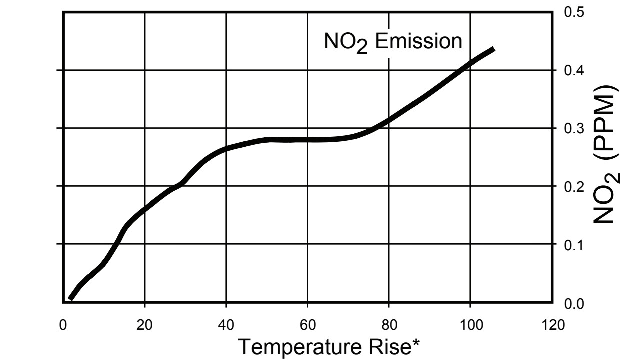
***Table 1** - Burner and Pilot Configurations*

Midco International Inc. reserves the right to change the construction or configuration of its products at any time. All information is based on laboratory testing. Different unit size and/or configurations may affect data.

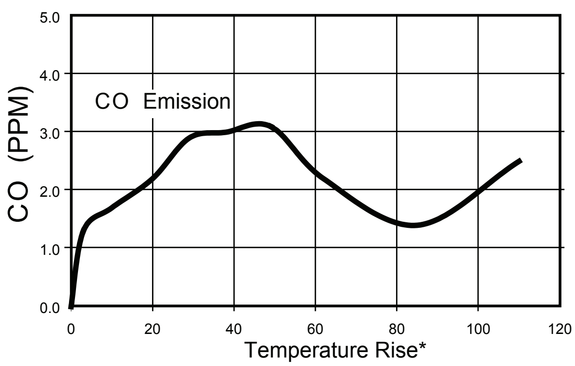
Burner Performance



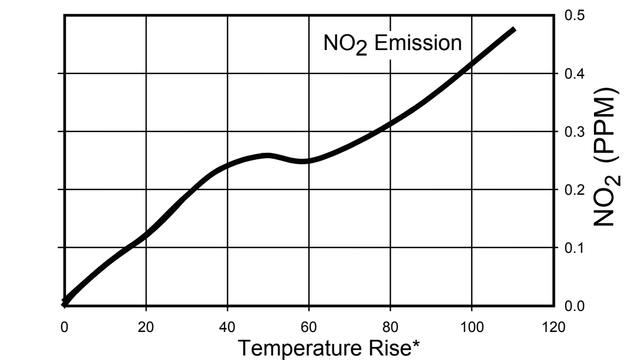
750,000 Btu/hr/ft at 1.1" W.C. pressure drop across the burner



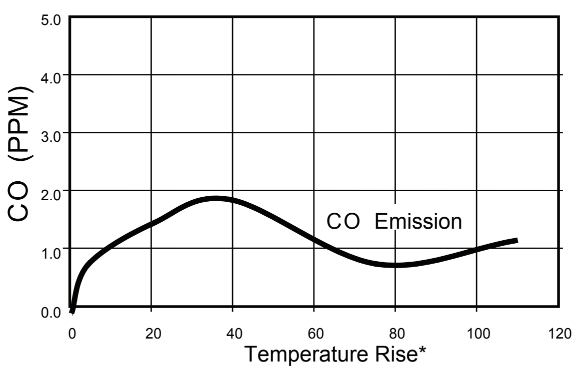
750,000 Btu/hr/ft at 1.1" W.C. pressure drop across the burner



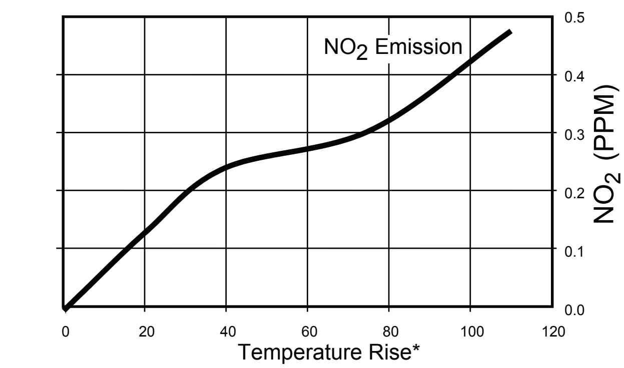
550,000 Btu/hr/ft at 0.6" W.C. pressure drop across the burner



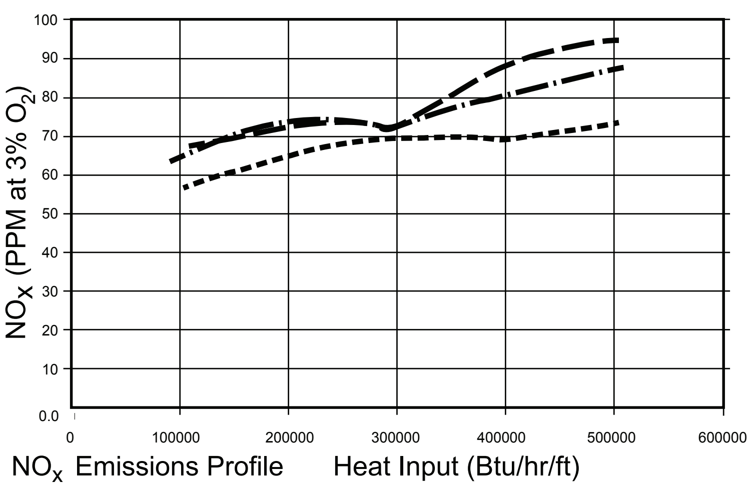
550,000 Btu/hr/ft at 0.6" W.C. pressure drop across the burner

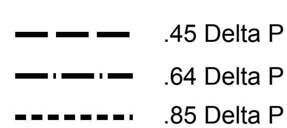


350,000 Btu/hr/ft at 0.35" W.C. pressure drop across the burner



350,000 Btu/hr/ft at 0.35" W.C. pressure drop across the burner





* For higher temperature rise contact Midco Engineering Department.

NOTE: Emission performance is application specific and will vary

***Chart 1** - CO and NO_2 Emissions Data*

Burner Performance Continued

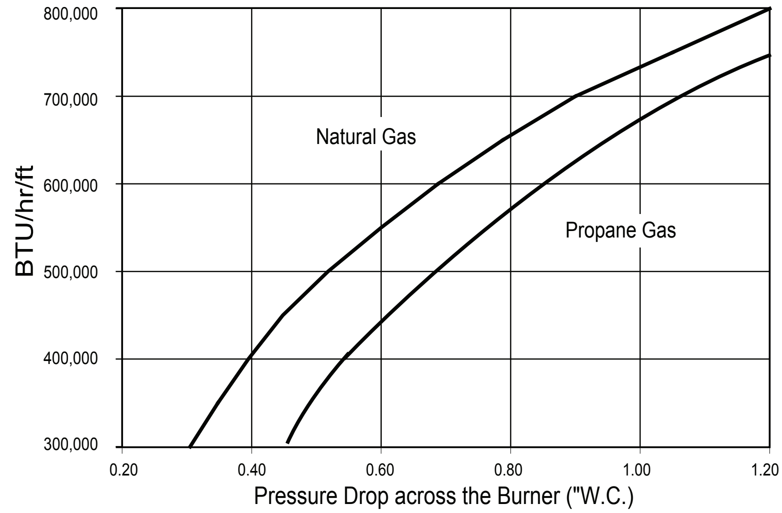


***Chart** 2- BTU's verses Pressure Drop*

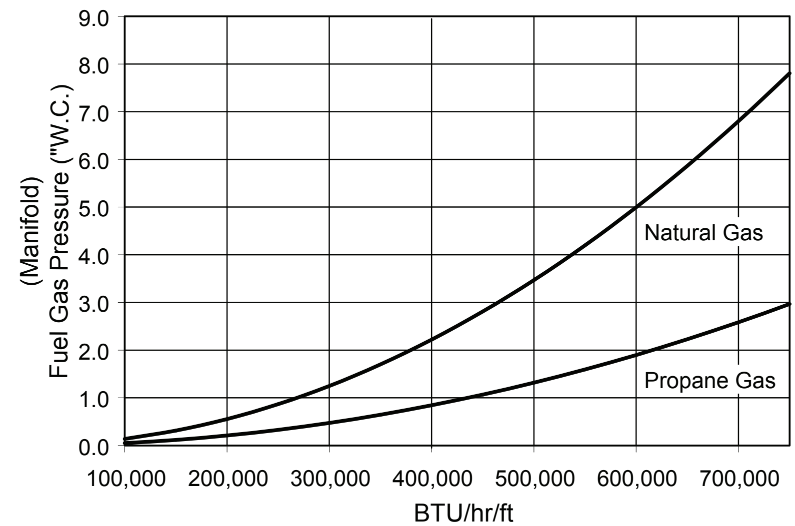


***Chart** 3- BTU's verses Gas Pressure ("W.C.)*

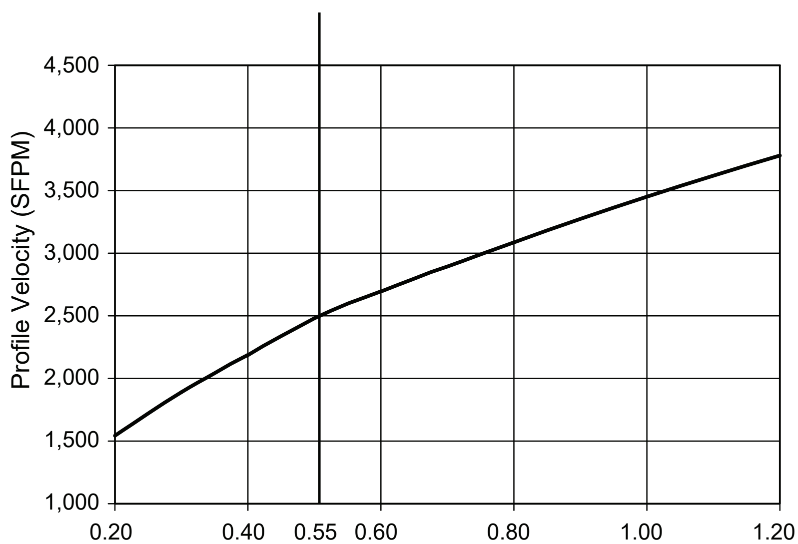


***Chart 4** - Pressure Across the Burner verses Profile Velocity*

Air Flow Variations Due to Heating in a Pull-Thru System

- Velocity and pressure drop figures shown in Table 2 apply to standard design conditions. However, these conditions apply only when air enters the heater at 70° and requires little or no heat. In practice with the burner operating, these figures will vary, especially with inlet air at the minimum design temperature. This is because the blower handles a constant volume of air regardless of its temperature. When the air is heated expansion takes place ahead of the blower and just downstream of the burner. It follows therefore that when the air is being heated a lesser volume enters the heater, causing a reduction, both in velocity and pressure drop at the burner. Table 2 shows the variation for minimum temperature air entry and with full input to the burner. Flame lengths given in Table 2 and Chart 5 apply to conditions shown in Table 2.

Air flow at burner based on 70° (std) blower rating		Burner Capacity (per foot) Natural & Propane Gas			Approximate length of flame projecting beyond end of burner and profile plate *		
Design velocity FPM	Design Pressure drop ″ W.C	Max. capacity Btu/Hr	Min. capacity Btu/Hr	Turn Down	550,000 per ft	650,000 per ft	750,000 per ft
2900	.7″	550,000	19,000	29:1	13″	16″	20″
2550 (ideal)	.55″	550,000	18,000	30:1	15″	19″	22″
2300	.45″	550,000	17,000	32:1	17″	20″	24″

Reduce capacity 4% per each 1000 ft altitude over 2000 ft.

***Table 2** - Design Data for Pull-Thru System*

* Flame lengths are given to the end of the main mass of flame, excluding any isolated wisps or flashes, and for normal operations ie. with cold inlet air (design minimum)

Velocity at burner (from Table 1)	Pressure drop at burner	Air temp. rise	Actual cold air velocity at burner	Actual cold air pressure drop at burner
2900 fpm	.7″ W.C.	75°	2500 fpm	.52″ W.C.
		100°	2350 fpm	.46″ W.C.
2550 fpm	.55″ W.C.	75°	2200 fpm	.41″ W.C.
		100°	2075 fpm	.36″ W.C.
2300 fpm	.45″ W.C.	75°	1975 fpm	.33″ W.C.
		100°	1850 fpm	.29″ W.C.

***Table 3** - Air Flow Variations for Pull-Thru System*

EXAMPLE: A heater rated for 100° rise, 70° outlet temperature at a design velocity of 2550 fpm and a design pressure drop of .55″ W.C., will in actual operation pass 2075 fpm over the burner with a .36″ W.C. drop when air enters at -30°.

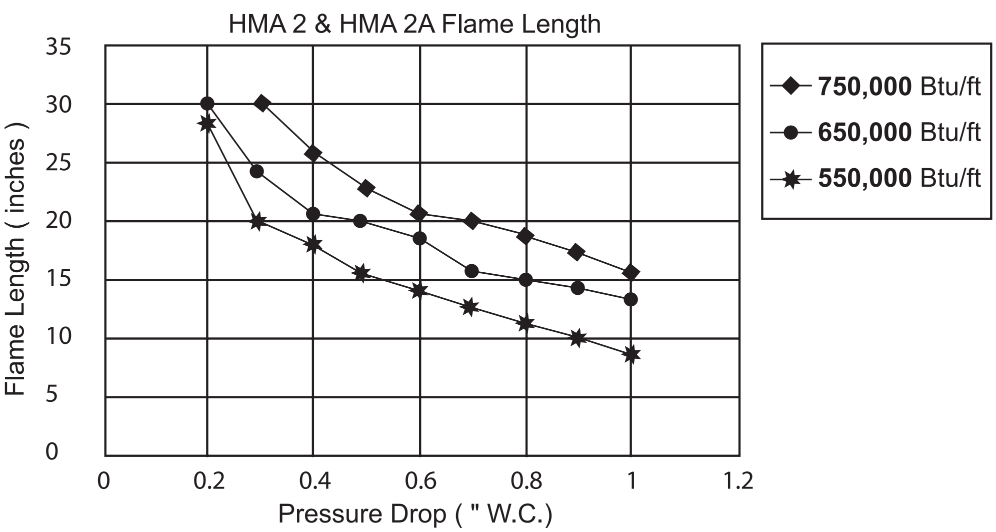


***Chart 5** - HMA 2 & 2A Flame Length*

HMA 2 & HMA 2A flame length as a function of pressure drop and firing rate applies to push and pull through systems using 100% fresh standard air.

Profile Setup

1. Required BTU:
   BTU/hr = Blower SCFM x Desired Temp. Rise x 1.08 / .92
2. Required Burner Length:
   Feet of burner = [Required BTU/hr]÷[Burner Firing Rate (BTU/hr/ft)]
   The Burner Firing Rate should correspond to the pressure drop across the burner shown in Chart 2.
3. Required Profile Area:
   Total Burner Area = Number of burner sections x burner area

(Burner Section)	Burner Area
2 inch	0.11 sq. ft.
6 inch	0.32 sq. ft.
12 inch	0.65 sq. ft.
T Section	0.77 sq. ft.
Ell Section	0.65 sq. ft.

Net Profile Area = Rated Fan (SCFM) ÷ Profile Velocity (SFPM)
The Profile Velocity can be determined from the following:

$$\text{Profile Velocity} = 945\sqrt{\frac{\Delta P}{0.075}}$$

ΔP is the pressure drop across the burner

Profile Area = Net Profile Area + Total Burner Area

Profile Setup Example

Sizing the burner and the corresponding profile for a 5,000 SCFM and a 115 degrees temperature rise.

1. Required BTU:

   BTU/hr = Blower SCFM x Desired Temp. Rise x 1.08 / .92

   BTU/hr =5,000 (SCFM) x 115 (ΔT) x1.08 / .92 = 675,000 BTU/hr

2. Required Burner Length:

   Feet of burner = [Required BTU/hr]÷[Burner Firing Rate (BTU/hr/ft)]

   To determine the optimum burner length we can choose from a combination of 12 inch or 6 inch burner sections referring to Table 1. We can either fire the burner at a rate of 675,000 BTU/hr per ft, or we can fire the burner at 450,000 BTU/hr per ft (1.5 feet of burner). Refer to Chart 3 for the fuel pressures requirements at different firing rates.

3. Required Profile Area:

   Total Burner Area = Number of burner sections x burner area

(Burner Section)	Burner Area
2 inch	0.11 sq. ft.
6 inch	0.32sq. ft.
12 inch	0.65sq. ft.
T Section	0.77sq. ft.
Ell Section	0.65sq. ft.

Total Burner Area = 1.0 (ft) x 0.65 = 0.650 ft^2
Or
Total Burner Area = 1.5 (ft) x 0.65 = 0.975 ft^2

Profile Setup Example Continued

Net Profile Area = Rated Fan (SCFM) ÷ Profile Velocity (SFPM)

The Profile Velocity should be determined based on the burner firing rates. If we choose to fire the burner at 675,000 BTU/hr/ft then the profile opening should be sized for a pressure drop of 0.8 ″ W.C. across the burner. If the firing rate is 450,000 BTU/hr/ft then the profile opening should be sized for a pressure drop of 0.4 ″ W.C. across the burner. The corresponding profile velocity across the burner should be determined from Chart 4 or use the following equation.

$$Profile\ Velocity = 945\sqrt{\frac{\Delta P}{0.075}}$$

For the 675,000 BTU/hr/ft

$$Profile\ Velocity = 945\sqrt{\frac{0.8}{0.075}} = 3086(SFPM)$$

Net Profile Area = 5000 (SCFM) ÷ 3086 (SFPM)=1.62 ft^2

For the 450,000 BTU/hr/ft

$$Profile\ Velocity = 945\sqrt{\frac{0.4}{0.075}} = 2182(SFPM)$$

Net Profile Area = 5000 (SCFM) ÷ 2182 (SFPM)=2.29 ft^2

To calculate the profile area needed for both cases:

Profile Area = Net Profile Area + Total Burner Area

For the 675,000 BTU/hr/ft
Profile Area = 1.62 + 0.650 = 2.27 ft^2

For the 450,000 BTU/hr/ft
Profile Area = 2.29 + 0.975 = 3.265 ft^2

To calculate the length of the profile opening add burner length to the desired clearance:

For the 675,000 BTU/hr/ft case
12 inch + 4 inch (2 inches on each side) = 16 inch (1.3 ft)
For the 450,000 BTU/hr/ft case
18 inch + 4 inch (2 inches on each side) = 22 inch (1.83 ft)

To calculate the height of the profile opening divide the profile area by the profile length:

For the 675,000 BTU/hr/ft case
2.27 ft^2 ÷ 1.3 ft = 1.75 ft (21 inch)
For the 450,000 BTU/hr/ft case
3.265 ft^2 ÷ 1.83 ft = 1.78 ft (21.5 inch)

1. Conversion of SCFM to Actual CFM of air
   $SCFM = CFM \times \frac{\rho}{0.075}$
2. Air density as a function of Temperature -- $\rho = 1.35 \times \frac{\text{Barometric Pressure (in Hg)}}{T_{(out)} + 460}$
3. Change in Standard Barometric Pressure as a function of Altitude
   Barometric Pressure (in.Hg) = 29.921x (1-6.8753 x 0.000001x altitude (ft))^5.2559
4. Temperature difference -- Temperature Rise = $T_{(out)} - T_{(in)}$
5. Energy equation - - BTU/hr = SCFM x Temperature Rise x 1.08 / 0.92
   Where: 1.08 is a sensible heat equation constant
   $$1.08 = 0.2397\left(\frac{BTU}{lb}\right) \times 60\left(\frac{min}{H}\right) \times 0.075\left(\frac{lb}{Ft^3}\right)$$

Burner Assembly

NOTE: If burner is over 4′, natural gas, or 5′, propane gas, a back inlet is required as shown below.

Gas Inlet Capacities

Inlet Size	Maximum Feet of Burner Natural	Maximum Feet of Burner Propane
1.5 ″ NPT End Inlet	4′	5′
2″ NPT Back Inlet Centrally Located	6.5′	8′

Table 4 - Gas Inlet Capacities

Burner Placement in the Profile

The performance of the HMA-2 & 2A burner depends on the unit in which the burner is located. The burner can perform differently in different units and can obtain different end results. Maintaining a relative laminar flow around the burner and providing a sufficient space between the burner and the blower is a key factor in obtaining best burner performance. The unit should be free of any obstructions that can create turbulent effect on the air.

Note: *Any reinforcements around the profile plates should be down stream of the profile plate.*

Static pressure probes are needed to sense the differential air pressure across the profile plates. The static pressure probes should be installed 12″ upstream from the burner and 12″ downstream from the burner centrally located in the duct. See Figure 1a and 1b for typical location.

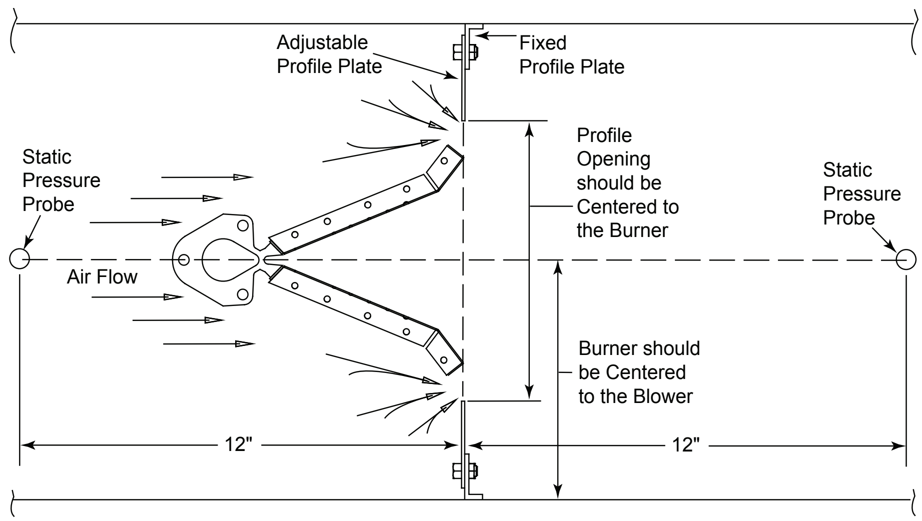


Figure 1a *- Burner Placement in the Profile*

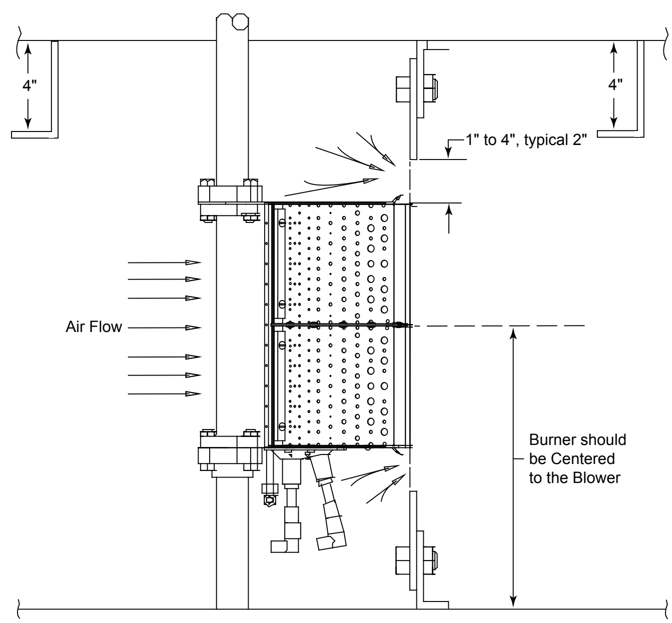


Figure 1b *- Burner Placement in the Profile*

Burner Placement in the Profile Continued

The burner performance is highly dependent on its application and installation in the heater. Factors such as airflow around the burner, positioning in the profile, as well as, the profile sizing have influence on the final emissions levels . Midco does not guarantee combustion results prior to performing actual combustion tests.

The burner should be located in the center of the profile. The profile clearance from ends of the burner should be kept at approximately 1 to 4-inches. Typically setting the profile 2″ from the end plates is recommended. Any reinforcements used on the edge of the profile opening should be on the downstream side of the profile. The burner can be mounted either vertically or horizontally. Since the airflow varies from unit to unit best results should be determined by actual testing.

Pull Thru System

The HMA-2 & 2A Burners are designed to operate in an air heater and in an air stream taken directly from outdoors for most applications. To avoid stratification of the heated air, the burners should be located on the intake side center to the blower. Such positioning will take advantage of the blower mixing effect and ensure minimum temperature stratification. It will also allow for a relatively uniform airflow across the burner resulting in a clean combustion.

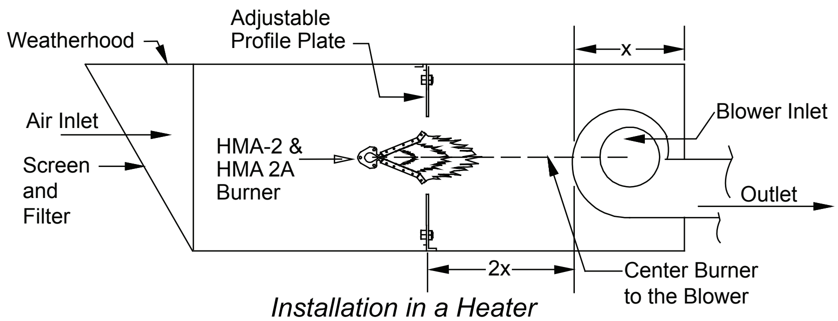


Figure 2 *- Pull-Thru System*

The total pressure of the blower must include allowance for the resistance of the heater and pressure drop across the burner, together with pressure losses at the inlet screen, inlet louvers, filters, plus the external pressure rating of the heater, if any. Contact equipment manufacturer for proper information.

Push-Thru Systems

Push-Thru System

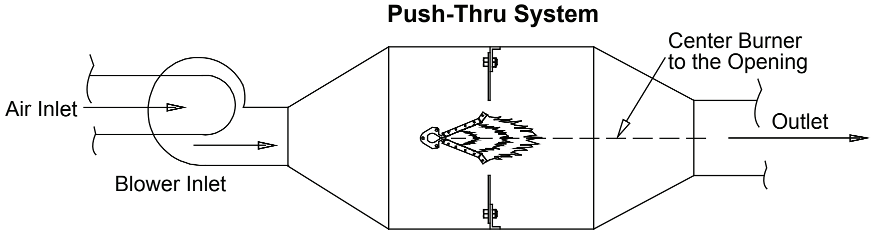


Figure 3 *- Push Thru System*

The HMA-2 & 2A Burner will operate satisfactorily when located downstream of the blower. A mixing plenum may be required at the heater discharge opening to insure minimum temperature stratification. Blower and motor selection must be made on the basis of corrections for the coldest anticipated inlet temperature. In the push-thru system the heater outlet CFM will vary due to the expansion of air.

Push-Thru Systems Continued

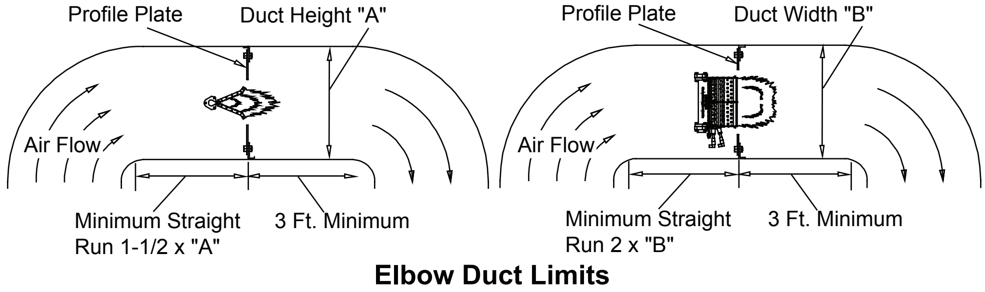


Figure 4 *- Installation in a Duct*

Typical Gas Train Assembly

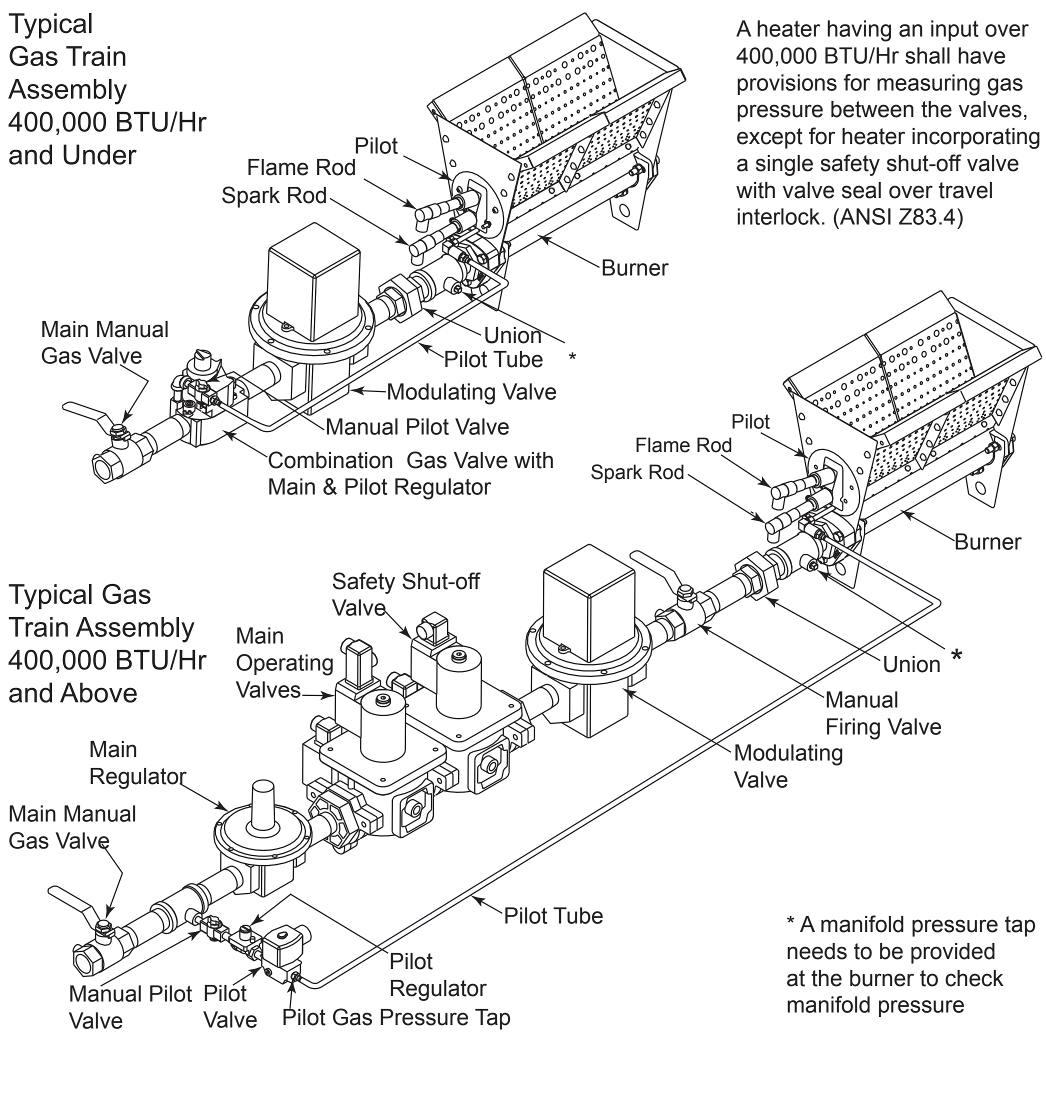
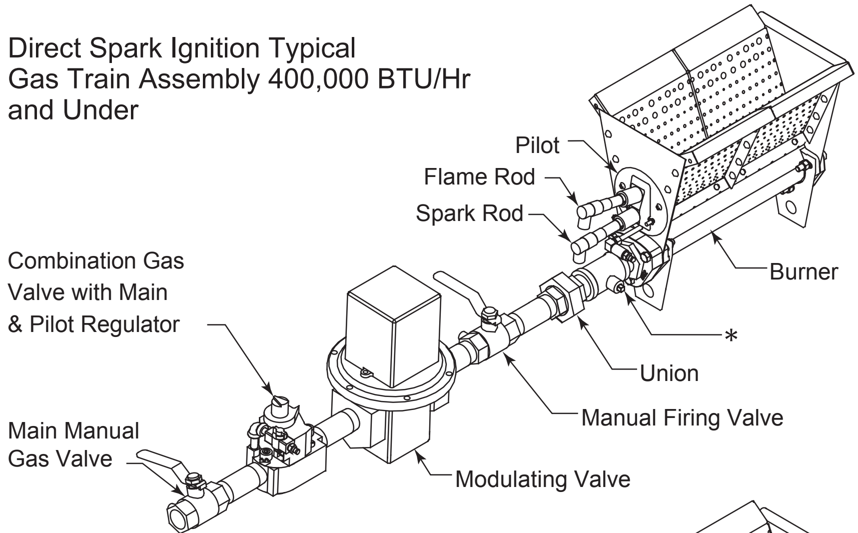


Figure 5a *- Gas Train Assemblies*

Typical Gas Train Assembly Continued



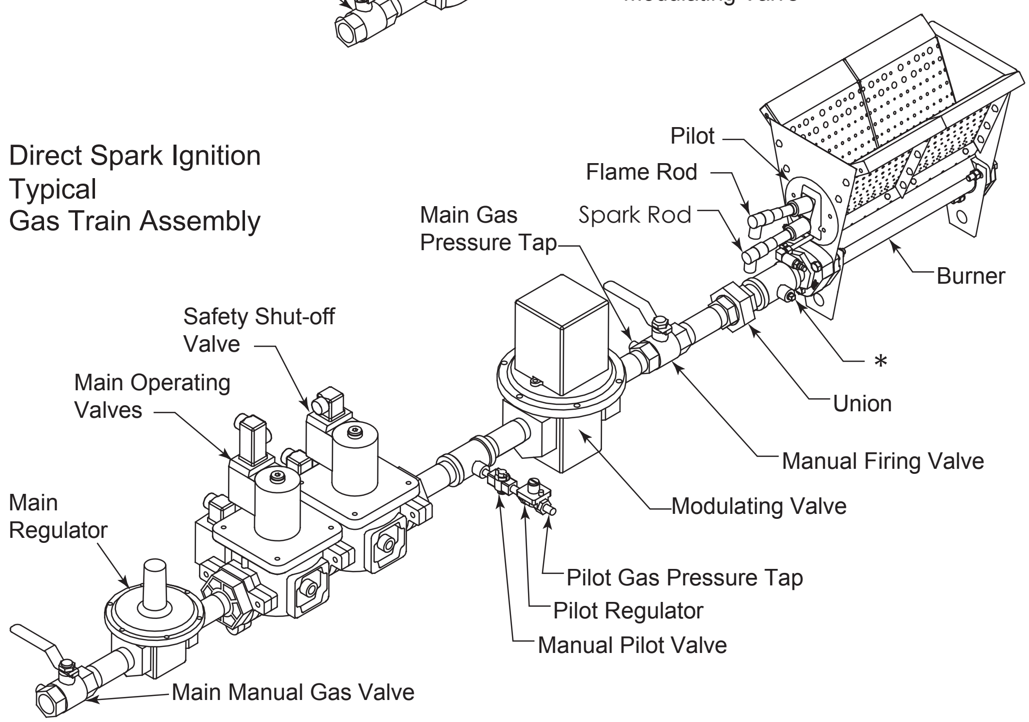


***Figure 5b** - Direct Spark Gas Train Assemblies*

Burner Setup

Burner operation depends on the unit control setup in which the HMA-2 & 2A burner is used. A typical setup should consist of a Flame Safety Control with appropriate air flow proving system and a Modulating Gas Control System.

1. Verify the pressure across the burner. The pressure across the burner can be measured by placing two static pressure probes, one downstream and one upstream of the profile opening and measure the differential pressure. The pressure should be within burner operating specifications and within the expected calculated pressure. See Chart 2

2. With the burner off check the Flame Safety Air Proving System
    a. Check the operation of the air proving system for low and high airflow setting. Refer to the Specifications of the Flame Safety Control for setup instructions and air switch operational characteristics.

Burner Setup Continued

3. For intermittent, or interrupted ignition systems. See Figure 5a for typical piping.
   a. Pipe the pilot gas supply line up stream of the main gas valve.
   b. With the unit running adjust the pilot pressure regulator to 3.5 inch W.C. for natural gas or 2.0 inch W.C. for propane gas. Using a natural gas pilot or 5″ to 7″, using a propane pilot with orifice # 4957-07 (#58 Drill .042)

4. For direct spark ignition system when using a pilot for ignition. See Figure 5b.
   a. Pipe the pilot gas supplied line to the main gas line downstream of the main gas valve.

5. Pilot ignition
   a. Make sure the main gas valve to the burner is closed for intermittent or interrupted ignition.
   b. Observe the pilot flame, the flame should be blue and should extend approximately to half of the burner end plate.
   c. Check the flame signal.
   d. Flame signal should be between 2-5 UA or 2-5 VDC

6. Depending on the pilot configuration make following adjustments, if required.
   a. For Spark rod and flame rod configurations
      Make sure the flame rod is pointing towards burner manifold.
      Make sure the flame rod is not touching baffles or burner manifold.
      Make sure the spark rod is positioned above the pilot gas tube and that it will spark to the end of the gas tube. See Pilot Detail Drawings for this setting on page 15.
   b. Spark rod and UV
      Make sure the spark rod is positioned above the pilot gas tube and that it will spark to the end of the gas tube.

7. Main burner ignition
   Close the manual gas valve.
   a. Set the Modulating Gas Control System to low fire position.
      · Slowly open the manual gas valve.
      · The flame should be evenly extending in the burner.
      · The flame should be located in the casting of the burner.
      · Check the flame signal.
   Close the manual gas valve.
   b. Set the Modulating Gas Control System to high fire position.
      · Slowly open the manual gas valve.
      · Observe the flame at high fire; the flame should be blue approximately 10 to 12″ long. If the flame is long, lazy and orange the air to fuel ratio is not correctly adjusted . The pressure across the burner should be increased, refer to Chart 2.
      · Check the flame signal.
      · Check the manifold pressure to the corresponding firing rate. If the manifold pressure does not correspond to the pressures shown in Chart 3. Re-adjust if necessary.

For a high fire start system the first gas port next to the pilot might require to be blocked using furnace cement to prevent potential pilot blow outs and flame failures. See Figure 7 - Pilot Configuration.

Slight redness and warpage of the baffle plates may occur at the high and intermediate fire inputs. This will not harm the burner. Once an initial discoloration and warp has taken (“set”) no further permanent change will take place.

If the end plates redness occurs during high and intermediate fire inputs, the distance between the end plates and the profile opening might not be sufficient for the air to cool the end plates. Profile readjustments might be necessary.

Burner Trouble Shooting

The Midco Burner is only a component of the complete system. For trouble shooting of the equipment contact the OEM (Original Equipment Manufacturer) or the component manufacturer.

If the pilot fails to light: install a manometer on the pilot pressure tap. Check for 3.5″ W.C. for natural gas or 2″ W.C. for propane, using a natural gas pilot or 5″ to 7″ using a propane pilot with orifice # 4957-07 (#58 Drill .042). If no gas check for voltage to pilot solenoid valve. If no voltage check operating controls or primary flame safeguard. If voltage to pilot solenoid valve is present and if there is 3.5″ W.C. gas pressure at pilot pressure tap then check for spark or flame rod settings. See Figure 7. If there is no voltage to pilot solenoid valve, refer to Flame Safety control specifications or contact the original equipment manufacturer.

If Main Burner fails: If no main flame check manifold pressure. If no manifold pressure check for voltage to the gas solenoid valve and check if main manual firing valve is open. If no voltage to gas valve refer to Flame Safety control specifications or contact the original equipment manufacturer.

If the pilot fails as main gas valves open, the first adjacent gas port hole (next to the pilot) might need to be plugged with furnace cement. For high fire start units see Figure 7 - Pilot Configuration.

Burner Maintenance

Annual maintenance of HMA 2 & HMA 2A burner is recommended to ensure trouble free operation.

Direct Gas-Fired Heater Burner Maintenance

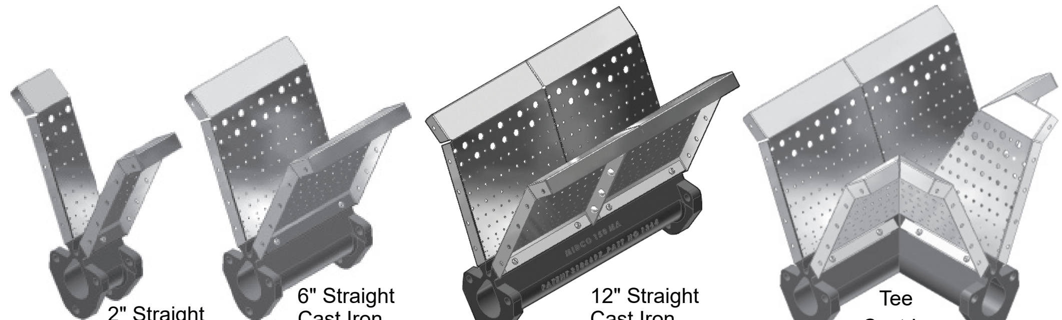
1. Clean the burner plates
2. Clear the burner gas and air ports
3. Change the spark rod igniter
4. Insure the flame sensor is in good condition

Use a stiff wire brush to clean the burner plates. Scrub both sides of the stainless steel burner plates to remove any soot or other crud, which may be on the burner. All of the burner plate holes must be clear so air can pass through them unrestricted. The holes in the burner plate allow air to mix with the gas in increasing amounts, as the flame gets longer. Scrub the rust, soot and other foreign material from the burner orifice area. After the burner plates are cleaned inspect them for cracking. Cracks occurring between one or two holes are normal and should be of no concern. If the cracking is more extensive, the affected plates should be replaced. Clean the burner gas and air ports using a drill or piece of wire of the appropriate size. See the Table 5 for drill size. After the orifices are drilled to the correct size and using compressed air or a vacuum, remove any debris from the manifold. Debris left in the manifold will prematurely clog the orifices in the future.

Burner Section and Gas Type		Gas Port Drill Size Wire Gauge	Decimal	Air Port Drill Size Wire Gauge	Decimal
HMA 2	Natural / Propane	1/8″	.125	43	.089
HMA 2A	Natural / Propane	1/8″	.125	42	.093

Table 5 - Drill Sizes for HMA 2 / 2A

After the burner plates and orifices are cleaned inspect the spark rod. The tip should be clean and free of dirt and carbon. The porcelain must be intact. If it is cracked, replace it. Pull the flame rod or ultraviolet scanner as well. If the flame sensor is a scanner, clean the lens with a clean damp soft rag. The flame rod's metal rod should be clean and free of dirt and carbon. Like the spark rod igniter, the porcelain on the flame rod must be intact as well. Replace it if it is cracked.

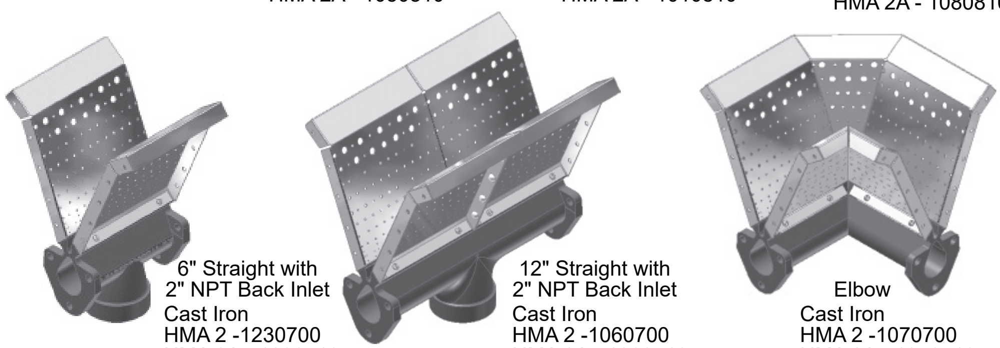


2" Straight
Aluminum
HMA 2A - 1020810

6" Straight
Cast Iron
HMA 2 -1050700
HMA 2A - 1050710
Aluminum
HMA 2 - 1050800
HMA 2A - 1050810

12" Straight
Cast Iron
HMA 2 -1010700
HMA 2A - 1010710
Aluminum
HMA 2 - 1010800
HMA 2A - 1010810

Tee
Cast Iron
HMA 2 -1080700
HMA 2A - 1080710
Aluminum
HMA 2 - 1080800
HMA 2A - 1080810



6" Straight with
2" NPT Back Inlet
Cast Iron
HMA 2 -1230700
HMA 2A - 1230710
Aluminum
HMA 2 - 1230800
HMA 2A - 1230810

12" Straight with
2" NPT Back Inlet
Cast Iron
HMA 2 -1060700
HMA 2A - 1060710
Aluminum
HMA 2 - 1060800
HMA 2A - 1060810

Elbow
Cast Iron
HMA 2 -1070700
HMA 2A - 1070710
Aluminum
HMA 2 - 1070800
HMA 2A - 1070810

⚠ Caution:
Under no circumstances are the HMA-2 baffles and the HMA-2A baffles or castings to be mixed. For further details see service bulletin # 8449-83.

⚠ Caution:
Under no circumstances should grade hardware or Aluminum rivets be used.

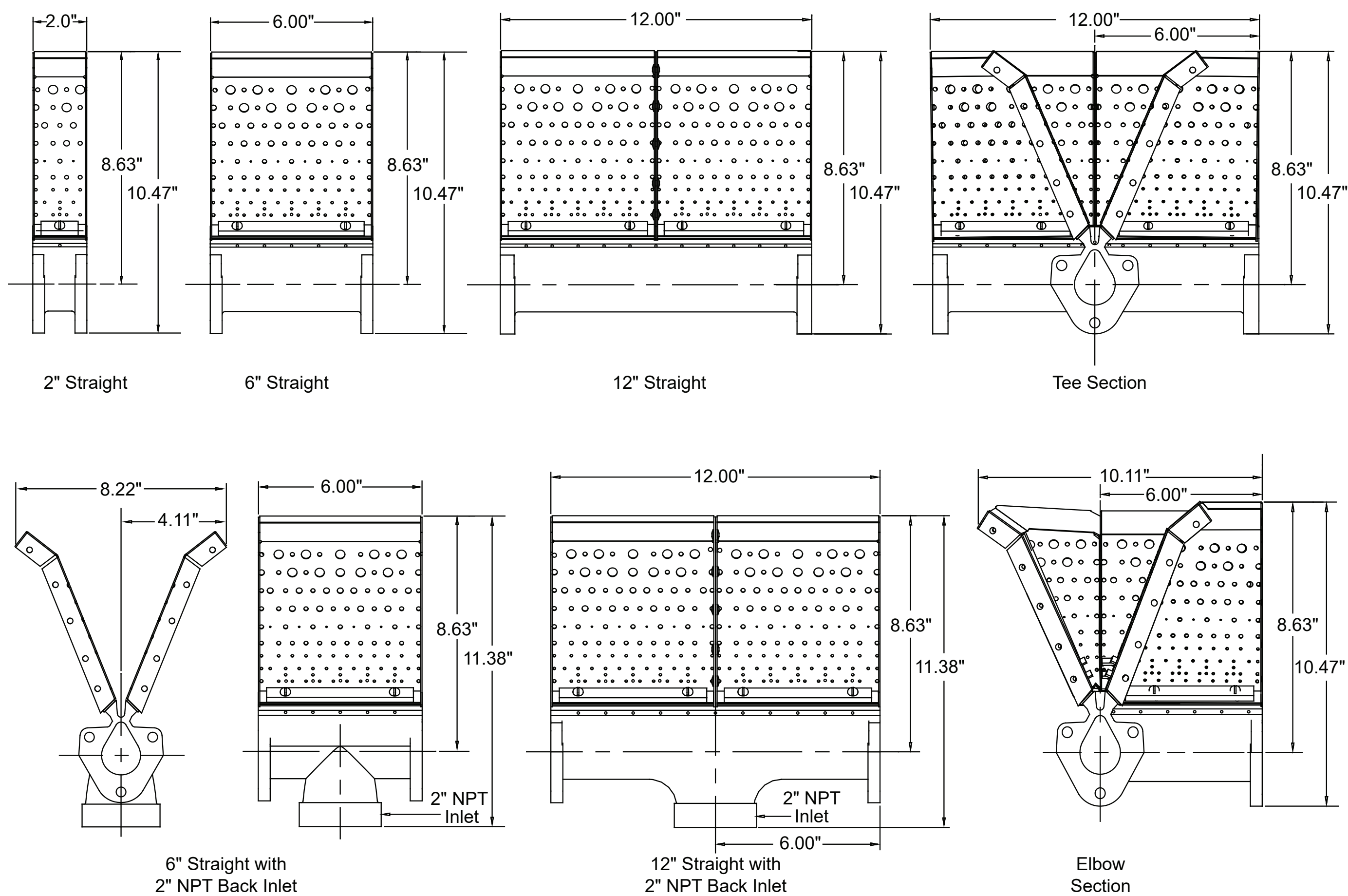


Figure 6 - *Burner Sections - Assembly*

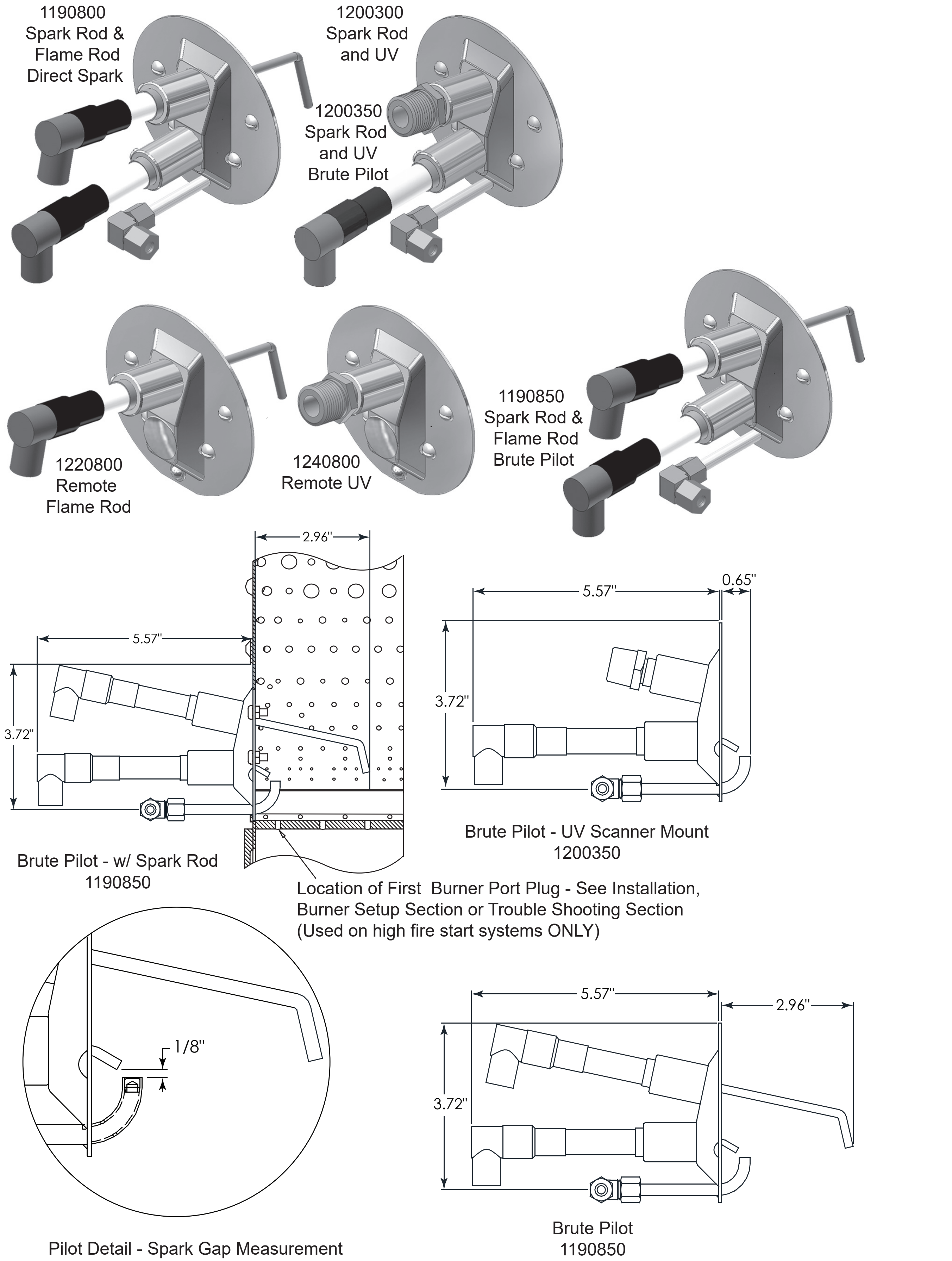


***Figure** 7 - Pilot Configuration*

Parts - Isometric View - HMA 2 & HMA 2A

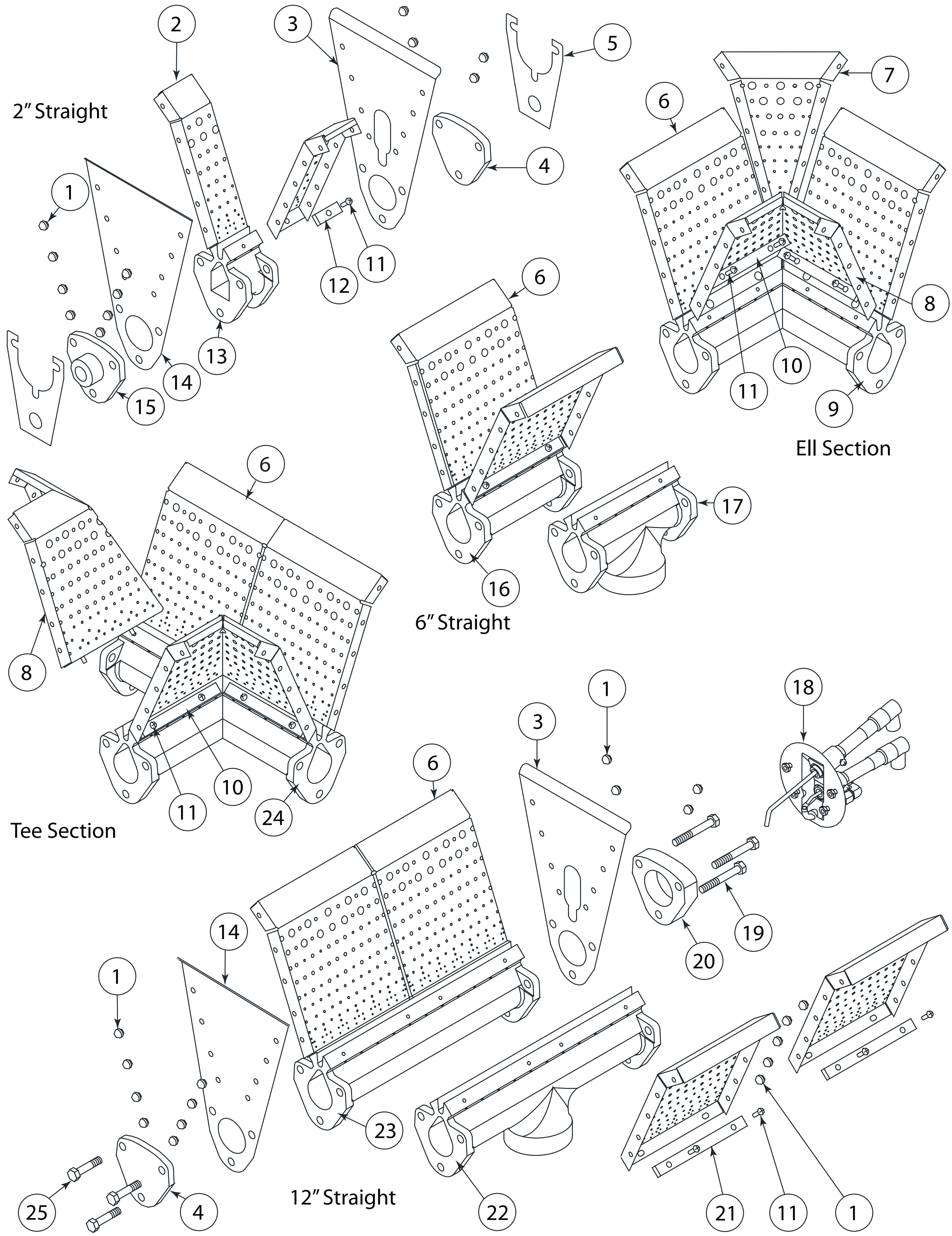


Figure 8 *- Typical Burner Assembly Parts - Isometric View*

Item Number in Isometric View *		#12	#15	#16	#23	#22	#6	#28
Burner Castings		2″ Straight	6″ Straight	6″ Back Inlet	12″ Straight	12″ Back Inlet	Elbow Section	Tee Section
Part #s for Cast Iron	HMA 2	N/A	1359-25	1398-25	1364-25	1361-25	1362-25	1365-25
Part #s for Cast Iron	HMA 2A	N/A	1359-30	1398-30	1364-30	1361-30	1362-30	1365-30
Part #s for Aluminum	HMA 2	N/A	1359-75	1398-75	1364-75	1361-75	1362-75	1365-75
Part #s for Aluminum	HMA 2A	1370-18	1359-80	1398-80	1364-80	1361-80	1362-80	1365 -80

Item No.	Part Description	Part No	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity
1	S62 Steel Rivet Body	Hardware	12	12	12	22	22	22	26
2	HMA-2A 2″ Baffle	1355-55	2						
3	HMA Pilot End Plate	1354-60	Select the correct required end plates						
4	Blank End Flange	1372-52	Select the correct required end plates						
5	Mounting Bracket	1130100	2	2	2	2	2	2	3
6	HMA-2A 6″ Baffle	1395-23		2	2	4	4	2	2
7	HMA-2A Outside Corner Baffle	1395-35						1	
8	HMA-2/2A Tee Baffle	1395-11						1	2
9	Elbow Casting Section		* See above listing for proper selection						
10	Inside Baffle Clamp	1356-10						2	4
11	10-24x9/16 Phillips Rd Hd S.S. Mach Screw	Hardware	2	4	4	8	8	8	12
12	Baffle Clamp - 2″	1356-20	2						
13	2″ Casting (2A only)		* See above listing for proper selection						
14	HMA Blank End Plate	1354-50	Select the correct required end plates						
15	1/2″ NPT Inlet Flange	1372-05	Select the correct required end plates						
16	6″ Straight Casting		* See above listing for proper selection						
17	6″ Back Inlet Casting		* See above listing for proper selection						
18	Pilot		See pilot listing on Page 15 - Pilot Configuration (For selection)						
19	5/16-18 x 2″ Hex Head Cap Screw	Hardware	3	3	3	3	3	3	6
20	Inlet Flange (Tapered)	1352-52	(Select the correct required end plates						
21	Baffle Clamp	1356-00		2	2	4	4	2	2
22	12″ Back Inlet Casting		* See above listing for proper selection						
23	12″ Straight Casting		* See above listing for proper selection						
24	Tee Section Casting		* See above listing for proper selection						
25	5/16-18x 1-3/4″ Hex Head Cap Screw	Hardware	3	3	3	3	3	3	3
Not Shown									
	5/16 Lock Washer	Hardware	6	6	6	6	6	6	9
	5/16-18 Hex Nut	Hardware	6	6	6	6	6	6	9

Burner Configurations: see page 14 for complete burner sections

Table 5 *- Burner Assembly Parts*

Burner Assembly Instructions

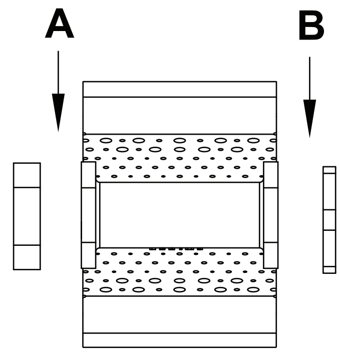


Figure 9 - *Typical HMA 2 & HMA 2A 6″ Direct Fire Burner Assembly*

Figure 9 shows the assembly of a typical HMA 2 and HMA 2A direct fired burner assembly for both “in field” and factory assembly line.

A) 1-1/2″ Inlet Flange With Pilot Mount or Blank Plate Hardware Required:

	Furnace Cement (See Notes # 1)
8	Stainless Steel Pcs of 10-24 X 3/8″ Slotted Round Head Screw, 10-24 Hex Nut, 10-24 Lock Washer (Rivet Gun Required)
3	Pcs 5/16″ X 2″ Hex Cap Screws
3	Pcs 5/16″ Lock Washers
3	Pcs 5/16″-18 Nuts

B) Blank Flange With Blank Plate or Pilot Mount Plate Hardware Required:

	Furnace Cement (See Notes # 1)
8	Stainless Steel Pcs of 10-24 X 3/8″ Slotted Round Head Screw, 10-24 Hex Nut, 10-24 Lock Washer (Rivet Gun Required)
3	Pcs 5/16″ X 1-3/4″ Hex Cap Screws
3	Pcs 5/16″ Lock Washers
3	Pcs 5/16″-18 Nuts

Notes:

1) Furnace cement is to be applied between the casting and either blank plate, pilot plate and end flanges only, not between baffles and end plates.
2) The hardware listed on instructions A and B applies to each end of any size burner with such configuration.
3) For definition and views of burner section, plates, flanges, or hardware refer to page 16 and 17 of the Installation and Service Instructions manual.
4) Burner drawing symbols represent a view of the burner from side opposite the flame exit.
5) In the absent of a rivet gun, use the hardware specified on these instructions, stainless steel hardware is highly recommended.

   UNDER NO CIRCUMSTANCES SHOULD STANDARD GRADE OR ALUMINUM RIVETS BE USED.

6) Hardware used between burner sections is the same as the hardware used on Instructions B.
7) Pilot hardware Is Included with the pilot assembly.
8) If Installing mounting brackets, they must be Installed on the exterior side of the Inlet or blank flange.

   UNDER NO CIRCUMSTANCES SHOULD THEY BE INSTALLED BETWEEN THE FLANGE AND THE BURNER CASTING.

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