



# BBC BETA BURNER



**WARNING**

These instructions are intended for use only by experienced, qualified combustion start-up personnel. Adjustment of this equipment and its components by unqualified personnel can result in fire, explosion, severe personal injury, or even death.

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Attachment: IPG-9

These instructions are intended to serve as guidelines covering the installation, operation, and maintenance of Hauck equipment. While every attempt has been made to ensure completeness, unforeseen or unspecified applications, details, and variations may preclude covering every possible contingency. **WARNING: TO PREVENT THE POSSIBILITY OF SERIOUS BODILY INJURY, DO NOT USE OR OPERATE ANY EQUIPMENT OR COMPONENT WITH ANY PARTS REMOVED OR ANY PARTS NOT APPROVED BY THE MANUFACTURER.** Should further information be required or desired or should particular problems arise which are not covered sufficiently for the purchaser's purpose, contact Hauck Mfg. Co.



**WARNING**

This equipment is potentially dangerous with the possibility of serious personal injury and property damage. Hauck Manufacturing Company recommends the use of flame supervisory equipment and fuel safety shutoff valves. Furthermore, Hauck urges rigid adherence to National Fire Protection Association (NFPA) standards and insurance underwriter's requirements. Operation and regular preventative maintenance of this equipment should be performed only by properly trained and qualified personnel. Annual review and upgrading of safety equipment is recommended.

**A. GENERAL INFORMATION**

The BBC burners are combination gas and/or liquid fuel-fired baffle type burners designed for low pressure air operation in a wide range of applications. Available with an alloy tile for ambient combustion air and application temperatures up to 1800°F (980°C), or a refractory tile for application temperatures up to 2800°F (1540°C). High pressure atomization versions are available for use with heavy oil, or at high elevations. The 1000 and 2000 series can operate with air preheat temperatures up to 300°F (150°C), and the 3000 series can operate with air preheat temperatures up to 900°F (480°C).

The BBC burners can be configured fire any clean industrial fuel gas, liquid propane, or No. 1 through No. 6 fuel oil, as appropriate for the model selected. Fuel oils must be adequately filtered before delivery to the burner nozzle, and may require heating to ensure an oil viscosity of 90 SSU ( $1.8 \times 10^{-5} \text{ m}^2/\text{s}$ ) or less is delivered to the oil nozzle. Capacities range from 2.9 million to 109 million Btu/hr. (760 to 28,920 kW). Two tile options are available. The diverging refractory tile produces a slow mixing, long, wide flame. The converging tile, either refractory or alloy, produces a shorter, narrower more well-defined flame. Turndown is approximately 8:1 on gas and 5:1 on oil. If operating with excess air, thermal turndown is greater.

**B. RECEIVING AND INSPECTION**

Upon receipt, check each item on the bill of lading and/or invoice to determine that all equipment has been received. A careful examination of all parts should be made to ascertain if there has been any damage in shipment. Please review all drawings and instruction materials to become familiar with burner components, piping schematics, installation and operating procedures and safety precautions.



**WARNING**

Use care when handling as the equipment may be heavy, have sharp edges or dust/fibers from refractory or gasket material. Always wear personal protective gear and use appropriate equipment during handling and installation.

**IMPORTANT**

If the installation is delayed and the equipment is stored outside, provide adequate protection as dictated by climate and period of exposure. Special care should be given to all motors, bearings, refractory material and control panels, if applicable, to protect them from rain or excessive moisture.

**C. BURNER CAPACITY TABLES**

BBC 1000 AND 2000 SERIES		BURNER MODEL				
SPECIFICATIONS		xx04	xx06	xx08	xx10	xx12
Capacity	(MMBTU/hr)	3.0	6.0	12	18	25
	(kW)	800	1,600	3,200	4,800	6,600
Secondary Air Capacity	(scfh)	32,000	63,500	124,500	198,000	265,000
	(nm <sup>3</sup> /hr)	857	1,701	3,335	5,304	7,099
Secondary Air Inlet Pressure	(in.w.c.)	27.7	27.7	27.7	27.7	27.7
	(mbar)	68.9	68.9	68.9	68.9	68.9
Primary Air Capacity	(scfh)	2,400	6,200	11,000	11,000	17,500
	(nm <sup>3</sup> /hr)	64	166	295	295	469
Primary Air Inlet Pressure	(in.w.c.)	27.7	24.2	24.2	24.2	24.2
	(mbar)	68.9	60.2	60.2	60.2	60.2
Flame Length	(ft)	6	8	10	12	14
	(m)	1.9	2.4	3.0	3.7	4.3
Flame Diameter	(ft)	2.0	2.5	3.0	4.0	4.0
	(m)	0.6	0.8	0.9	1.2	1.2

BBC 1000 AND 2000 SERIES		BURNER MODEL				
SPECIFICATIONS		xx14	xx18	xx20	xx24	
Capacity	(MMBTU/hr)	38	62	84	116	
	(kW)	10,100	16,400	22,200	30,700	
Secondary Air Capacity	(scfh)	397,000	670,000	898,025	1,275,000	
	(nm <sup>3</sup> /hr)	10,635	17,948	24,056	34,155	
Secondary Air Inlet Pressure	(in.w.c.)	27.7	27.7	27.7	27.7	
	(mbar)	68.9	68.9	68.9	68.9	
Primary Air Capacity	(scfh)	31,000	31,000	36,000	37,000	
	(nm <sup>3</sup> /hr)	830	830	964	991	
Primary Air Inlet Pressure	(in.w.c.)	24.2	24.2	27.7	34.6	
	(mbar)	60.2	60.2	68.9	86.1	
Flame Length	(ft)	15	20	16	25	
	(m)	4.6	6.1	4.9	7.6	
Flame Diameter	(ft)	5.0	5.0	4.0	6.0	
	(m)	1.5	1.5	1.2	1.8	

NOTES:

1. Capacities based on Secondary and Primary Air flows listed and 20% excess air. Consult individual burner capacity tables for further details.
2. Air and fuel flows based on STP operating conditions at sea level and industry standard air and gas piping practices.
3. Primary Air Flow and Inlet pressure listed at maximum capacity. Consult individual burner capacity tables for further details.
4. Flame lengths measured from end of the combustion tile.
5. Burner is suitable for use on gaseous and liquid fuels and with combustion air other than ambient temperature; consult Hauck.

**Table 1. BBC/BBG Capacities**

**D. DIMENSIONS**

See appropriate Dimension sheet for detailed dimensional information.

**E. INSTALLATION**



**WARNING**

Use care when handling as the equipment may be heavy, have sharp edges or dust/fibers from refractory or gasket material. Always wear personal protective gear and use appropriate equipment during handling and installation. Be sure your installation conforms to appropriate safety guidelines for your application such as NFPA 86 or EN746.

**NOTE**

If the burner utilizes an ultraviolet (UV) scanner for flame supervision, the burner should be positioned so that the UV scanner is located above the horizontal centerline of the burner to prevent moisture and airborne debris from setting into the UV scanner port and blocking the lens.

Hauck BBC burners must be mounted on properly braced, rigid furnace structures capable of supporting the burner and tile weight (see Table 3). **Burners firing on oil cannot be used in up-fired applications.**

Burner Model	Approx. Burner Net Weight	Approx. Refractory Tile Net Weight	Approx. Alloy Tile Net Weight
BBG/C_04	100 lb (45 kg)	95 lb (43 kg)	45 lb (20 kg)
BBG/C_06	350 lb (159 kg)	140 lb (63 kg)	95 lb (43 kg)
BBG/C_08	350 lb (159 kg)	140 lb (63 kg)	95 lb (43 kg)
BBG/C_10	370 lb (168 kg)	210 lb (95 kg)	110 lb (50 kg)
BBG/C_12	425 lb (193 kg)	300 lb (136 kg)	130 lb (59 kg)
BBG/C_14	580 lb (263 kg)	510 lb (231 kg)	150 lb (68 kg)
BBG/C_18	675 lb (306 kg)	540 lb (245 kg)	195 lb (88 kg)
BBG/C_20	912 lb (414 kg)	540 lb (245 kg)	195 lb (88 kg)
BBG/C_24	1,600 lb (726 kg)	1,200 lb (544 kg)	275 lb (125 kg)

**Table 2. Burner and Tile Weights**

**Burner Mounting (see Figure 1 for Refractory Tile, Figure 2 for Alloy Tile)**

1. Furnish an opening in the furnace shell 1" (25mm) larger than the outside diameter of the burner tile.
2. Weld the appropriate size studs of appropriate length to the furnace shell to accept the tile mounting flange.
3. Place the tile mounting gasket on the furnace studs.
4. Wrap tile with one layer of 1" (25mm) fiber rated for a higher temperature than the furnace. Secure fiber wrap with tape or twine to compress the ceramic fiber wrap and retain the fiber during installation.
5. Install the burner tile on the furnace shell and secure with appropriate lock washers and nuts.
6. Place the tile cushion gasket into the recess in the burner tile.
7. Place the burner mounting gasket over the studs on the burner tile flange.
8. Install the BBC burner on the burner tile flange and secure with appropriate lock washers and nuts.

9. From inside the furnace, pack ceramic fiber blanket rated for a higher temperature than the furnace into the annular opening between the burner tile and the furnace wall insulation or refractory. It is important that the fiber is well packed to ensure that the furnace shell, tile flange, burner flange, and associated gaskets are not damaged. Fiber must be repacked after initial firing of the burner. (Refer to Figures 1 or 2 for illustration)



**WARNING**

Refractory can be heavy and laden with dust or fibers, use care in lifting and always wear appropriate personal protective gear such as a respirator or dust mask around refractory or gasket material.

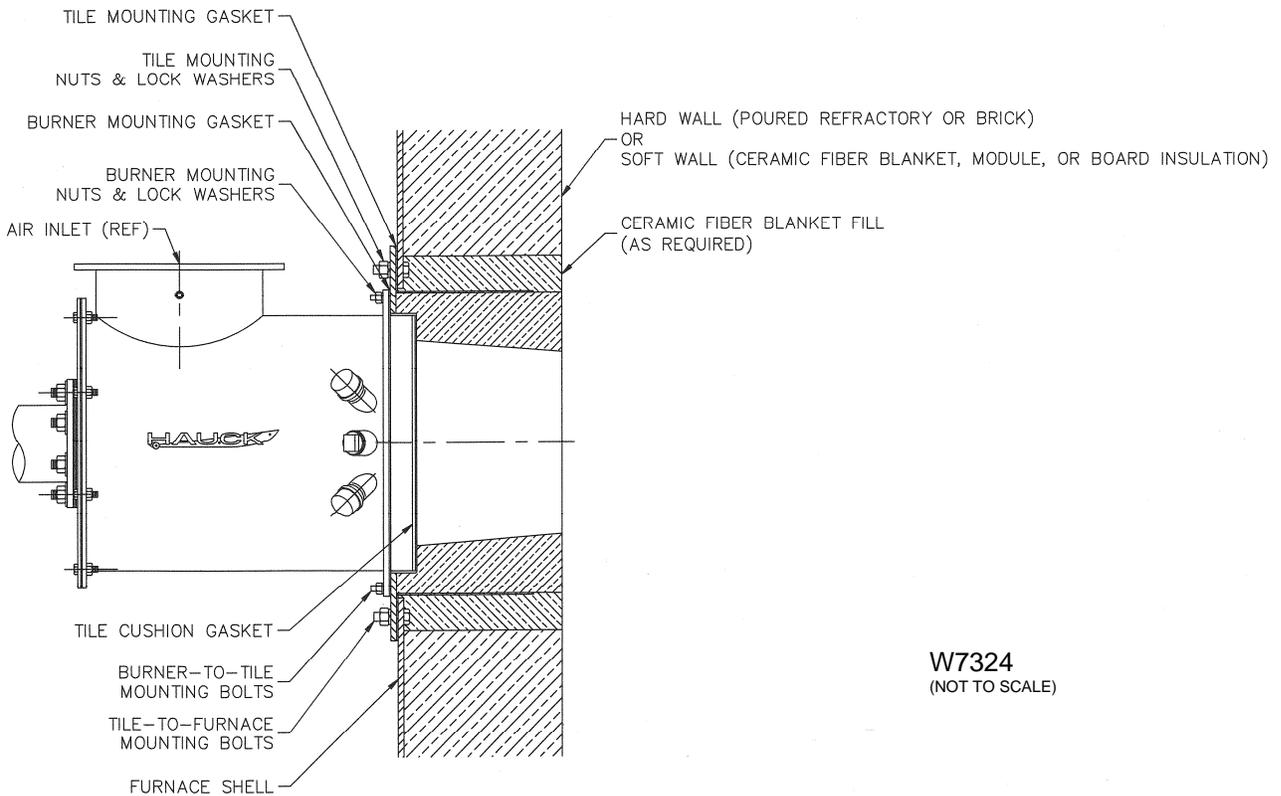
10. For installations where the furnace wall is thicker than the burner tile, a port flare must be provided at D° (see Figures 3 or 4 details). For recommended port design and features, use Figures 3 and 4 as a reference. Use high quality refractory materials with a sufficient temperature rating for the intended application.

**NOTE**

If the BBC burner was not supplied with a self-supporting refractory or alloy tile, then a field poured refractory port must be installed. Installation requirements are available for field poured refractory ports for BBC burners (reference Figure 3, including removable, reusable metal mandrels; consult Hauck.

**Burner Mounting with customer supplied port (see Figure 3 or 4)**

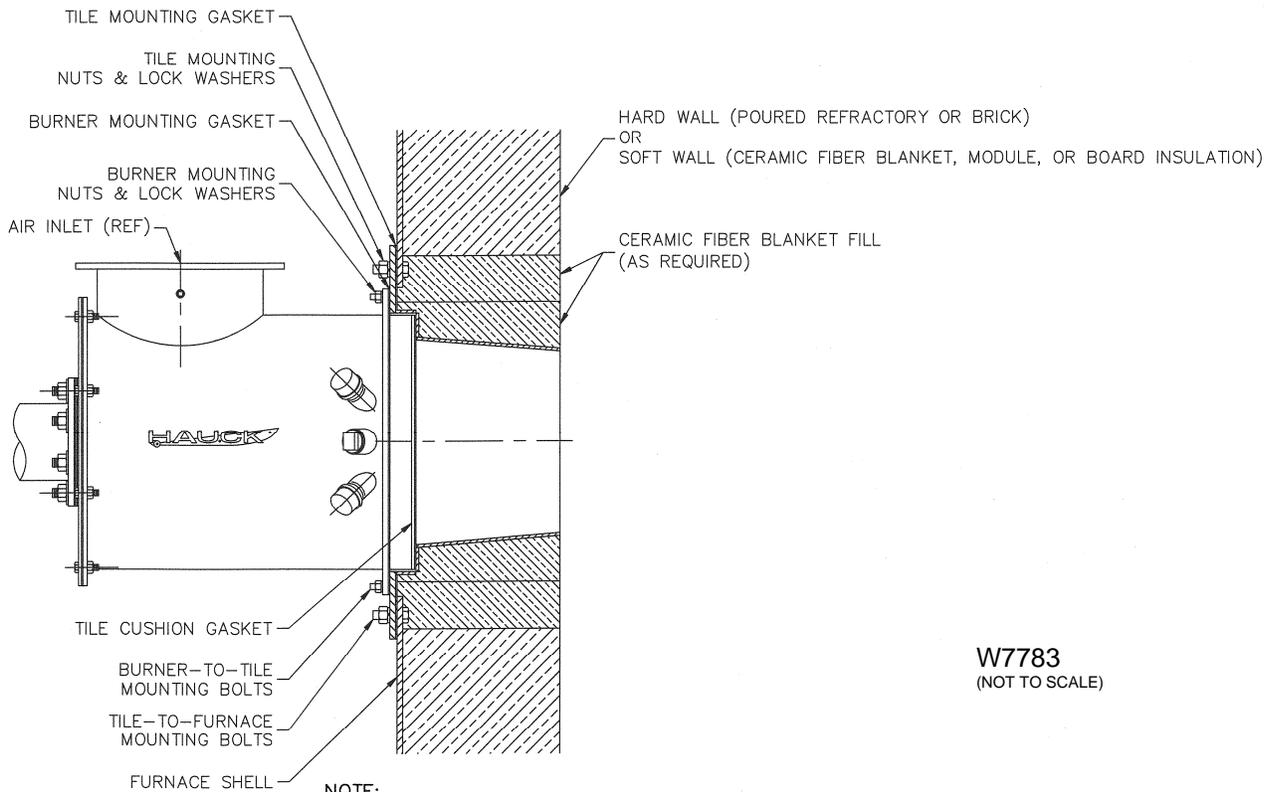
1. Furnish an opening in the furnace shell 1" (25mm) larger than the outside diameter of the burner.
2. Weld the appropriate size studs of appropriate length to the furnace shell to accept the burner mounting flange.
3. Place the burner mounting gasket on the furnace studs.
4. Place the tile cushion gasket into the recess in the burner tile.
5. Install the BBC burner on furnace wall to ensure correct fit-up.
6. Remove the burner prior to forming the burner port.
7. Form the burner port to dimensions per Figure 3 or Figure 4 using wood or metal mandrels centered on mounting plate studs. Mandrel dimensions must include sufficient draft or taper for easy removal.
8. For installations where the furnace wall is thicker than the burner port length, a port flare must be provided at D°. If required, a maximum straight extension of 6" (152mm) may be provided at the 'tile' discharge as shown in Figure 4. Use high quality refractory materials with a sufficient temperature rating for the intended application.
9. Hauck recommends refractory brick anchors or high temperature alloy anchors to secure the burner refractory mass to the furnace shell. Follow the refractory manufacturer's recommendations for anchoring and expansion joints to ensure there is no mechanical stress transmitted to the burner tile.
10. Install the burner assembly into the fully cured refractory port with the appropriate lock washers and nuts.



NOTE:

1. BURNER OUTLET MUST BE MOUNTED FLUSH WITH INSIDE WALL OR SLIGHTLY RECESSED.
2. CERAMIC FIBER BLANKET FILL MUST BE PACKED INTO ANNULAR VOID.

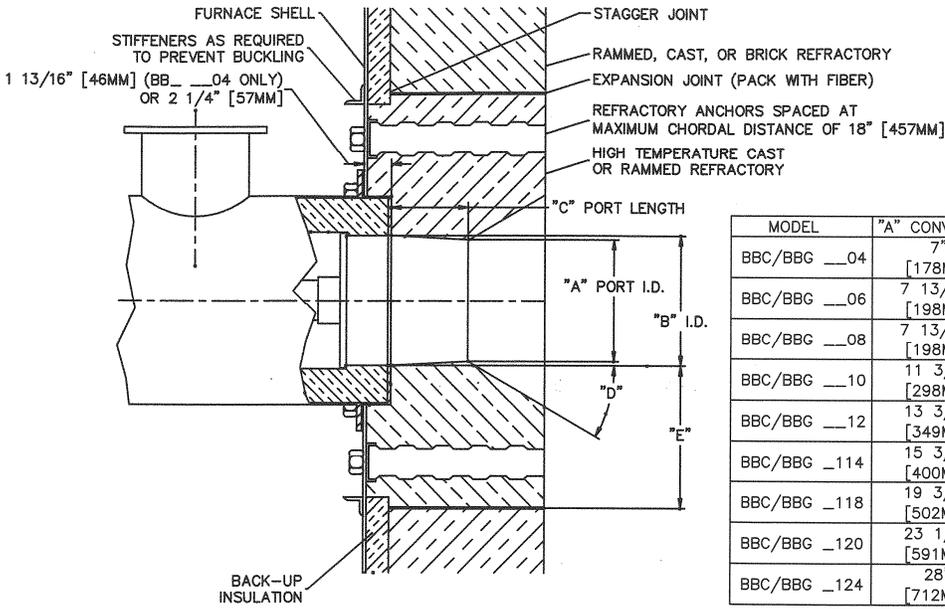
**Figure 1. Burner Installation With Refractory Tile**



NOTE:

1. BURNER OUTLET MUST BE MOUNTED FLUSH WITH INSIDE WALL OR SLIGHTLY RECESSED.
2. CERAMIC FIBER BLANKET FILL MUST BE PACKED INTO ANNULAR VOID.

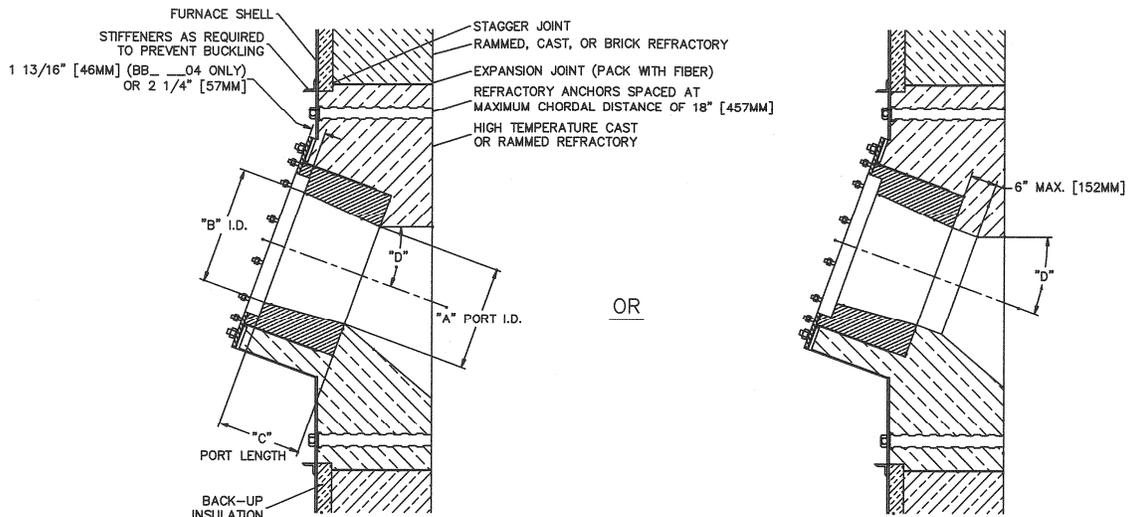
**Figure 2. Burner Installation With Alloy Tile**



MODEL	"A" CONVERGING	"A" DIVERGING	B	C	D° MIN	E
BBC/BBG ___04	7" [178MM]	N/A	7 1/2" [191MM]	5" [127MM]	20°	9" [229MM]
BBC/BBG ___06	7 13/16" [198MM]	10 1/2" [267MM]	9 13/16" [249MM]	6 5/8" [168MM]	20°	9" [229MM]
BBC/BBG ___08	7 13/16" [198MM]	10 1/2" [267MM]	9 13/16" [249MM]	6 5/8" [168MM]	20°	9" [229MM]
BBC/BBG ___10	11 3/4" [298MM]	14 5/8" [371MM]	13 3/4" [349MM]	8 1/2" [216MM]	25°	9" [229MM]
BBC/BBG ___12	13 3/4" [349MM]	16 3/4" [425MM]	15 3/4" [400MM]	10 1/2" [267MM]	25°	9" [229MM]
BBC/BBG ___114	15 3/4" [400MM]	19 1/8" [486MM]	17 3/4" [451MM]	12 3/4" [324MM]	30°	9" [229MM]
BBC/BBG ___118	19 3/4" [502MM]	24" [610MM]	21 3/4" [552MM]	16 7/16" [418MM]	30°	10" [254MM]
BBC/BBG ___120	23 1/4" [591MM]	N/A	26" [660MM]	16 7/16" [418MM]	30°	10" [254MM]
BBC/BBG ___124	28" [712MM]	N/A	30" [762MM]	18 3/4" [477MM]	30°	14" [356MM]

X4195  
(NOT TO SCALE)

Figure 3. Customer Supplied Refractory Port



OR

MODEL	A	B	C	D° MIN
BBC/BBG ___04	7" [178MM]	7 1/2" [191MM]	5" [127MM]	20°
BBC/BBG ___06	7 13/16" [198MM]	9 13/16" [249MM]	6 5/8" [168MM]	20°
BBC/BBG ___08	7 13/16" [198MM]	9 13/16" [249MM]	6 5/8" [168MM]	20°
BBC/BBG ___10	11 3/4" [298MM]	13 3/4" [349MM]	8 1/2" [216MM]	25°
BBC/BBG ___12	13 3/4" [349MM]	15 3/4" [400MM]	10 1/2" [267MM]	25°
BBC/BBG ___114	15 3/4" [400MM]	17 3/4" [451MM]	12 3/4" [324MM]	30°
BBC/BBG ___118	19 3/4" [502MM]	21 3/4" [552MM]	16 7/16" [418MM]	30°
BBC/BBG ___120	23 1/4" [591MM]	26" [660MM]	16 7/16" [418MM]	30°
BBC/BBG ___124	28" [712MM]	30" [762MM]	18 3/4" [477MM]	30°

X8427  
(NOT TO SCALE)

NOTE { INSTALLATION DETAIL SHOWN TO EMPHASIZE BURNER TILE/PORT GEOMETRY. FURNACE WALL SHOWN AS 'TYPICAL' REFRACTORY CONSTRUCTION; REFRACTORY AND WALL CONSTRUCTION DETAILS AND FABRICATION METHODS SHOULD BE COMPLETED BY QUALIFIED PERSONNEL. THE BURNER TILE AND/OR RAMMED REFRACTORY PORT MUST BE PROTECTED FROM MECHANICAL STRESS.

Figure 4. Custom Installation For Thick Wall or Angle

## Air & Fuel Connections

### NOTE

All piping must be properly supported and aligned to avoid stresses on the burner and associated equipment. Hauck recommends that flexible connections be used on all air and fuel lines to isolate the burner from piping movement due to expansion, contraction, and vibration.

1. Install the air piping to the burner body using a flexible connection. Avoid elbows and abrupt directional changes in the piping where possible as turbulence can affect flow measurement accuracy, and reduce pressure at the burner.
2. If necessary, the atomizing (primary) air connection and/or gas connection may be rotated as follows:
  - a. Remove the hex nuts and washers holding the atomizing (primary) air/gas body to the main air body.
  - b. Rotate the atomizing (primary) air/gas body to the desired position(s).
  - c. Make sure the gaskets between the atomizing (primary) air/gas body and the main air body are properly seated.
  - d. Replace washers, hex nuts and securely tighten.
3. Install the gas line to the gas inlet using a flexible connection. Avoid elbows and abrupt directional changes in the piping where possible as turbulence can affect flow measurement accuracy, and reduce pressure at the burner.
4. Install and connect the primary air line and compressed air line, if applicable.
5. Install the oil valve on burner oil inlet connection.
6. Control regulators should be as close as possible to the burner. Hauck recommends total distance of no more than 8 pipe diameters from the burner. Regulators used for an oil system should be installed 6 inches (150mm) below burner centerline. Consult component literature for details.

### IMPORTANT

All burner models are provided with two sets of connections for observation port, pilot and scanner mounting. Neither the pilot nor the flame scanner should be located below the horizontal centerline of the burner, where they could be adversely affected by dirt and debris. If the main air connection is at 6 or 12 o'clock, the accessory ports at either 3 or 9 o'clock can be used. However, both the pilot and scanner **MUST** be in adjacent ports on the **SAME** side of the burner. If the main air connection is at 3 or 9 o'clock, use the pilot and scanner connection ports located 180° from the main air connection. Scanner connection should be supplied with 1 psi of purge air.

### NOTE

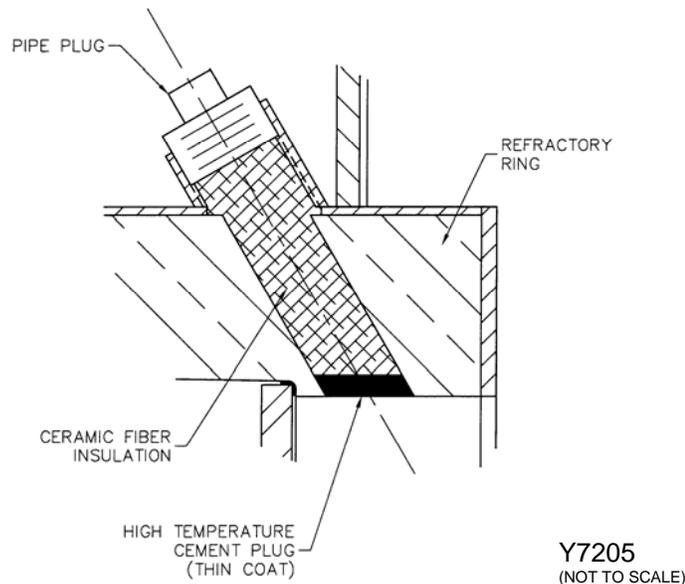
Size the pilot gas supply line to avoid excessive pressure drops. For supply lines up to 25 ft (7.6m) use 1/2" (DN 15) pipe; from 25 to 100 ft (7.6 – 30m) use 3/4" (DN 20) pipe. Prior to connecting to the pilot gas manifold, the gas line should be purged to remove debris.

### NOTE

The BBG/BBC\_124 scanner connections are positioned at 45° and 225° clockwise from the air connection center line. Use above guidelines to choose scanner port.

7. Connect the oil supply line to the inlet of the oil valve.

8. Consult the appropriate dimensional sheet and instructions that accompany the pilot for additional information (IPG-9).
  - a. BBC\_104 through \_120 IPG Gas Pilot  
Install the pilot tip in the connection located above the burner center line on the burner body. Connect pilot air and gas to the appropriate connections on the gas pilot.
  - b. BBC\_124 Forced Air Premix Pilot  
Install the air/fuel premix outlet of the pilot manifold assembly to the pilot assembly.
  - c. Connect pilot air and gas to the appropriate connections on the pilot manifold.
9. If an ultraviolet flame detection scanner is used, install it in the correct accessory port adjacent to the pilot connection. Provide a 1 psi air source for the scanner air purge by connecting the atomizing (primary) air line to the 3/8" NPT bushing on the scanner adapter using 3/8" OD tubing or larger and a suitable isolating valve.
10. If the observation port, pilot, and UV scanner must be relocated during installation due to interferences with piping, etc., the alternate ports can be utilized as follows (see Figure 5):
  - a. Remove the pipe plugs (or caps) from the alternate port connections.
  - b. Remove the ceramic fiber insulation from the ports.
  - c. Insert a rod into each port and gently tamp on the plug of high temperature cement to dislodge the plug. **Use caution not to chip away refractory from the opening in the refractory ring.**
  - d. Insert the ceramic fiber insulation into the unused ports. **Failure to insert ceramic fiber insulation into the unused ports may result in damage to the outer metal burner housing.**
  - e. Secure the pipe plugs (or caps) in the unused port connections.
  - f. Install a thin coat of high temperature cement over the original ports from the inside of the burner (Hauck recommends Resco Adamant or equivalent) to contain the ceramic fiber insulation.



**Figure 5. Alternate Port Sealing Instructions**

**NOTE**

Oil must be sufficiently heated to deliver a viscosity of 90 SSU or less at the oil nozzle. All heavy fuel oil piping **must be** heat traced (electric or steam) and insulated. Self regulating heat tracing is recommended to maintain the desired temperature and viscosity of a given fuel (No. 4 fuel oil @ 160°F, No. 6 fuel oil @ 250°F). Electrical heat tracing with a nominal rating of 12 w/ft (39 w/m) covered with a nominal 2" fiberglass type insulation is sufficient for most applications.

11. For a burner using high pressure atomization to function correctly, a compressed air modulating regulator is recommended (as indicated in Figure 11). This regulator modulates the compressed air as oil flow is modulated. It promotes better turndown and reduces compressed air consumption.
12. Verify that all piping connections are tight. Close all unused port openings on the burner body.
13. Inspect all bolted joints on the burner to ensure that all fasteners are tight and gaskets are properly seated.



**CAUTION**

**Before any attempt is made to start the burner, check to ensure that all bolts are sufficiently tight and conduct a gas leak test. Failure to check and ensure that a satisfactory seal exists by conducting a leak test could result in the formation of a hazardous gas leakage condition.** In order to ensure an adequate seal, it is important that the burner backplate bolts be sufficiently tight. Whenever burner internals are removed for cleaning or replacement, **be sure to tighten the backplate bolts and conduct a gas leak test.**

**F. IGNITION**



**WARNING**

Adjustment of this equipment by unqualified personnel can result in fire, explosion, severe personal injury, or even death.

BBC burners make use of an IPG gas pilot igniter **see attached instructions for detailed operating instructions. Otherwise, see pilot vendor literature.** For the pilot igniter, a 5000/6000 volt standard coil type ignition transformer or a half-wave "spark blind" solid state type transformer can be utilized. Both transformers yield satisfactory results, however, the standard coil type transformer provides reliable ignition over a wider range of air/fuel ratios than the half-wave type.



**WARNING**

When using a standard coil ignition transformer, provisions must be made to eliminate the ignition spark falsely satisfying the "flame on" UV scanner. Hauck designed flame supervisory panels accomplish this by "timing out" the spark transformer after a short (10 seconds for most applications) trial for ignition.

**NOTE**

Do not attempt manual ignition or torch lighting.

For IPG Gas Pilot Ignited Burners (BBC\_ 104 through \_120):

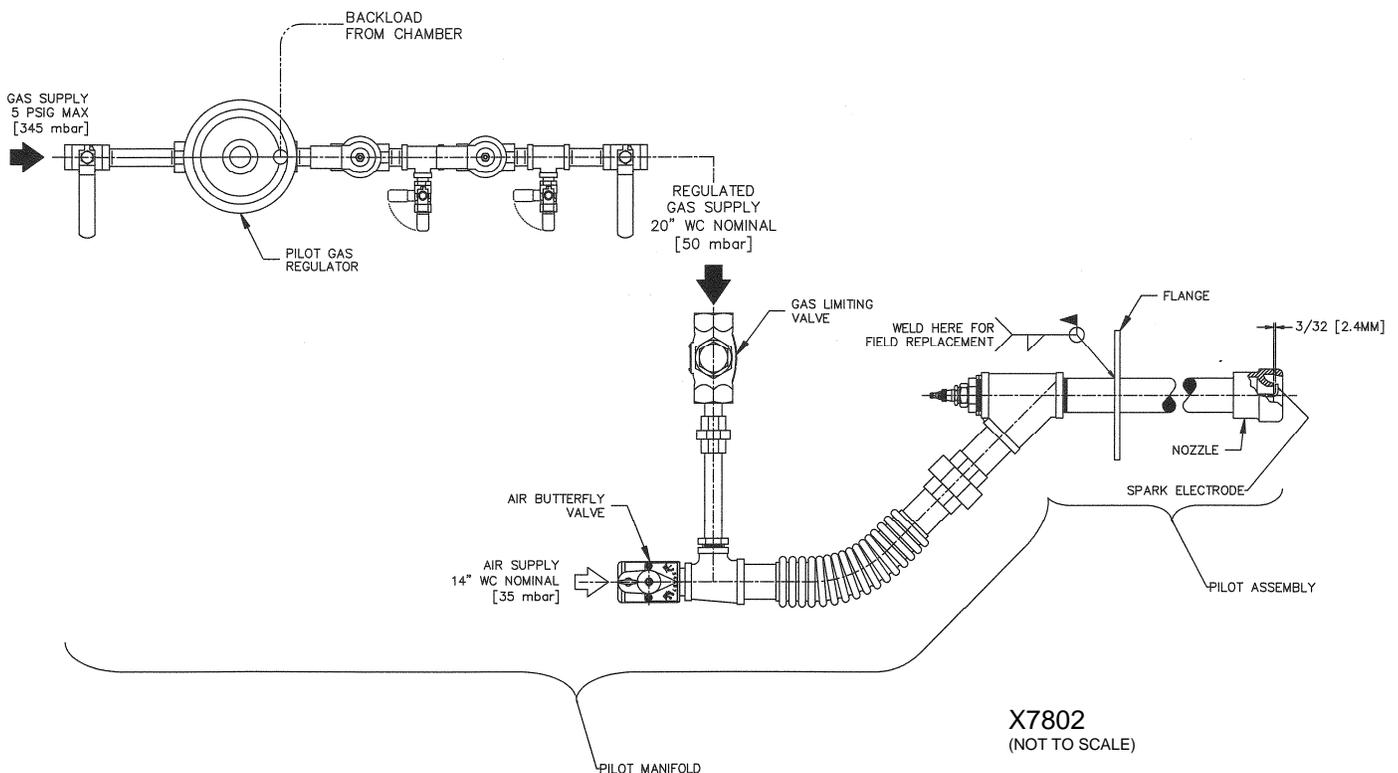
1. Ensure that the gas pilot igniter is threaded tightly into the pilot port.
2. Connect the high voltage ignition wire from the transformer to the spark plug on the gas pilot igniter. A snap-on ignition type connector is recommended.
3. **See attached IPG literature for detailed operating instruc**

**NOTE**

- Beta Burner Model \_104 uses a Hauck #1 pilot IPG5411A.
- Beta Burner Models \_106 through \_120 use a Hauck #3 pilot IPG5413A.
- Beta Burner Model \_124 uses a Hauck forced air premix pilot, 58155.

For Forced Air Premix Pilot (BBC\_124 only), the pilot is integral through the burner. Refer to Figure 6 for pilot and manifold details.

1. The maximum gas supply pressure at the inlet to the pilot gas regulator is 5 psig (345 mbar). The regulated pilot gas supply to the gas limiting valve must be a nominal 20"wc (50 mbar).
2. The pilot gas regulator should be back-loaded from the chamber into which the burner is firing to ensure optimum pilot performance.
3. Ensure that the spark wire gap in the pilot is 3/32" (2.4mm). If the gap must be adjusted, carefully remove the pilot internals and bend the spark wire as required. Reinsert the pilot internals and check the gap.
4. Ensure that premix pilot igniter is bolted securely to burner backplate.
5. Connect the high voltage ignition wire from the transformer to the spark plug on the premix pilot igniter. A snap-on ignition type connector is recommended.
6. Set pilot air butterfly valve at position 5 (i.e., half open). Pilot air supply pressure at the inlet of the air butterfly valve must be 14"wc (35 mbar) or higher.



**Figure 6. Pilot and Manifold Assembly Setup (Used With BBC\_124)**

7. Remove the hex screw cap from the gas limiting valve and set the adjustment screw 4 turns from the fully closed position. This initial setting may be changed during final pilot adjustment; clockwise rotation decreases gas flow and counterclockwise rotation increases gas flow. Replace the hex screw cap when adjustment is complete.

**CAUTION**

The pilot ignition transformer can cause an electric shock - use care around the ignition cable. When test firing the pilot, leave pilot gas on briefly. If pilot does not light quickly, shut it off and reurge before attempting to relight.

8. Energize the ignition transformer, and supply air and then gas to the pilot manifold. Observe the pilot flame through one of the observation ports on the side of the burner. Adjust the pilot gas limiting valve (and pilot air butterfly valve if necessary) until a strong stable pilot flame is obtained.
9. De-energize the ignition transformer, stop the gas supply first and then the air supply.

If replacing the forced air premix pilot, be advised that the pilot and its mounting flange are separate for ease of installation. The pilot and bracket must be welded once installed to ensure an air-tight connection through the backplate of the burner.

### **G. INITIAL BURNER SETUP**

BBC burners typically operate with automatic control systems. The burners are capable of proportional control over their entire capacity range. In a typical system, ignition will be preceded by a series of steps.

#### **CAUTION**

Failure to achieve ignition of pilot or main flame within a safe period (10 sec.) could result in a build-up of a combustible gas mixture which could lead to an explosion. In the event that the pilot or main flame does not light within the above time period, shut off fuel valves and re-purge the chamber before attempting further adjustment.

#### **CAUTION**

**All cast refractory burner components are porous and therefore subject to moisture absorption.** Refractory components should not be stored or exposed to damp conditions potentially reducing their normal expected life. Care **must** be taken at initial startups and after extended idle times to assure refractory components have been sufficiently dried prior to normal firing conditions. **At least 6-8 hours of low fire drying at 100% excess air is required** at initial startup prior to exposing refractory components to normal firing operation. Thereafter, if the refractory components are exposed to excessive moisture, condensation, or high humidity for extended periods, **at least 30 minutes of low fire drying at 100% excess air is required** before beginning normal operation. Failure to do so may cause any moisture present to expand rapidly resulting in refractory spalling and/or premature failure.

#### **CAUTION**

Initial adjustment and burner start-up should be undertaken only by trained and experienced personnel familiar with combustion systems, control and safety circuitry and overall installation procedures. Avoid burns from flame, high surface temperature, hot components and exhaust gas. Verify proper installation and condition of gaskets & seals. In addition to heat and noise; burning paint (solvents or sealing material), exhaust leaks, carbon monoxide (CO) and other by-products of the combustion process may be present at or near the combustion equipment. Always wear appropriate clothing and personal protective gear (gloves, ear plugs, safety glasses, respirator, etc.) when working with equipment in operation.

#### **CAUTION**

Ensure that all safety equipment and limits are working properly before proceeding.

### **Low Pressure Atomization with Gas or Oil Firing**

1. Once installed, the burner is ready for initial setup. The specific operation of the burner will depend on the individual system components in the entire combustion system. Refer to the instruction sheets that accompany the individual components.

2. Combustion air pressure should be set at the combustion air control valve. Typical combustion air pressure range from a minimum of approximately 0.3"wc (0.7 mbar) to a maximum of 27.7"wc (69 mbar) static pressure at the provided burner test points. Hauck recommends that the combustion air setting remain at minimum until the burner has been ignited (refer to the appropriate capacity sheet for burner air flow at low fire conditions).
3. Gas pressure, if applicable, should be set at the gas control valve. Nominal natural gas pressure required at the burner is approximately 6.9"wc (17.2 mbar) at maximum capacity. Actual gas pressure required may vary (refer to the appropriate capacity sheet for burner gas flow at low fire conditions).
4. Oil pressure, if applicable, should be set at the oil relief valve on the return loop between the pumping unit and the oil manifold to the burner. Nominal pressure required at the inlet to the fuel oil manifold is 45 psig (31 mbar). Actual fuel oil pressure required may vary (refer to the appropriate capacity sheet). Oil pressure required to the burner is 5 psig (345 mbar).
5. Primary air pressure should be set at the primary air butterfly valve for a minimum 24.3"wc (60 mbar) 27.7"wc (69 mbar) for BBC\_104 and 34.6"wc (86 mbar) for BBC\_124 although **all models will operate with up to 34.6"wc (86 mbar) primary air pressure** for low pressure atomization, 3.5"wc (8.6 mbar) for high pressure atomization, and 6.9"wc (17.2 mbar) for gas-fired BBC models.
6. If not previously completed, refer to Section F for setup of the gas pilot igniter.
7. Once the pilot is set and the initial gas/oil and air adjustments are made, the burner can be ignited as follows:
  - a. Be sure that all fuel shutoff valves are closed and all control valves are in the low fire position.
  - b. Start the combustion air blower
  - c. Ensure that the pilot automatic safety solenoid valves and the pilot manual gas valve are closed.
  - d. Energize the igniter transformer.
  - e. Open the pilot gas automatic safety shutoff solenoid valves and the pilot manual gas valve.
  - f. Once the pilot flame has been established (confirm using flame supervision), de-energize the ignition transformer.
  - g. Open (energize) the main automatic gas or oil safety shutoff valves.
  - h. Once flame has been established, the pilot gas automatic safety shutoff valves may close. Leave the manual pilot air valve in position.
  - i. Proceed to ignite all burners (if applicable) per the above procedure.
8. When all burners are ignited, increase the combustion air to the high fire position (refer to appropriate capacity sheet for burner air flow at high fire conditions).
9. When high fire combustion air is set, adjust the gas control valve (limiting gas valve or automatic butterfly valve) to achieve the desired gas flow at high fire, or adjust the oil control valve to achieve the desired high fire oil flow (refer to appropriate capacity sheet for burner gas flow at high fire conditions).
10. Verify air/fuel ratio using orifice meters or other flow meters in the air, gas, and/or the liquid fuel lines. Orifice flow meters require 10 pipe diameters of straight piping into the flow meter and 5 pipe diameters of straight piping downstream of the flow meter.
11. Static air pressure at the burner air inlet can be related to air flows if an air orifice meter is not available. Fuel pressure should not be used as an indicator of flow rate. An appropriate measurement device must be installed to measure fuel flow.
12. Drive the burner to the low fire position and verify that the settings are consistent. Repeat steps 6 through 9 as necessary until high and low fire settings remain constant.
13. Lock all control motor linkage or direct-couplings in place and return all control system functions to normal, if changed during initial adjustments.
14. To shut down the burner system:
  - a. Return the burner(s) to the low fire position.
  - b. Close all fuel shutoff valves.
  - c. Allow the furnace to cool to 300°F (150°C) or less before shutting off the combustion air blower.

## Liquid Propane (LP) Firing



### **WARNING**

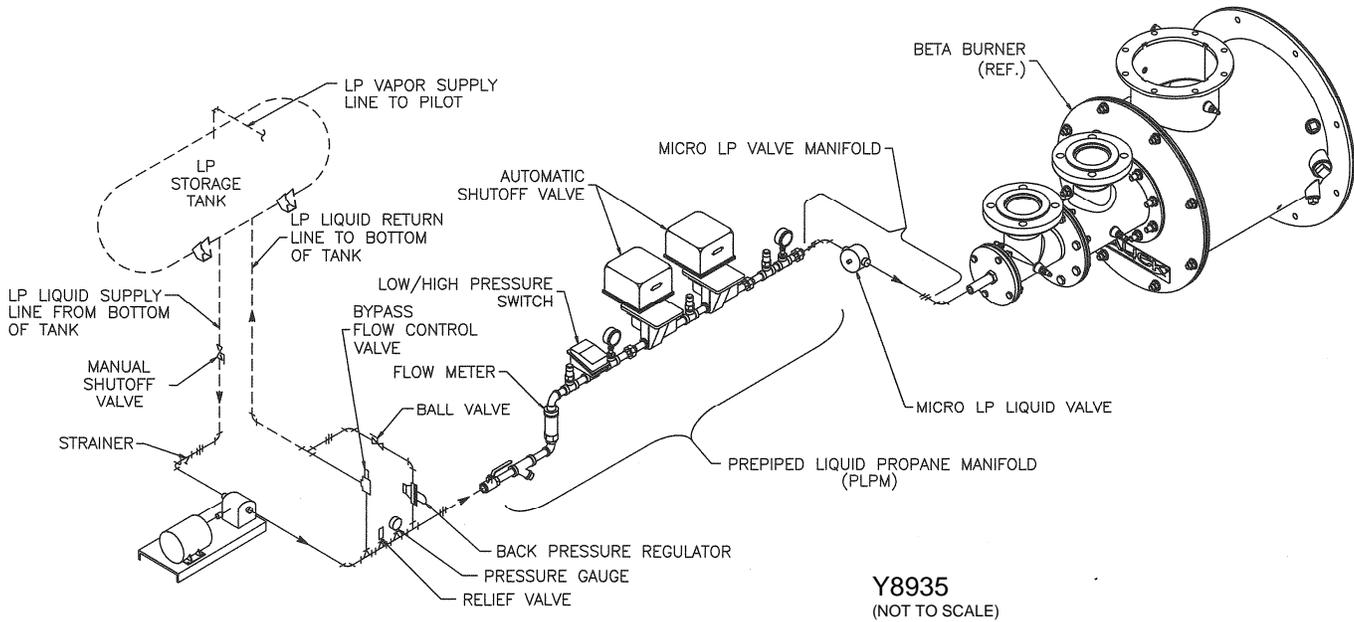
Adjustment of this equipment and its components by unqualified personnel can result in fire, explosion, severe personal injury, or even death.

LP is highly flammable and heavier than air. It will accumulate near the ground in the area of a leak and it dissipates relatively slowly.

### **NOTE**

Hauck recommends the use of LP manifolds that meet NFPA guidelines. NFPA requires two safety shutoff valves piped in series in the burner's main LP line. A low/high pressure LP switch must be interlocked with the burner's safety shutoff valves. Hauck's LP manifolds have been designed to ensure compliance to NFPA requirements.

1. Before attaching LP fuel lines, purge the lines with compressed air. Then, leak test piping with compressed air.
2. Connect the main LP line at the appropriate connection on the burner skid. All piping must be schedule 80 black iron or heavier and all valving must be suitable for 350 psig (24.1 bar) service. The capacity of the LP fuel system should be 1.5 times the rated capacity of the burner.
3. If Hauck has supplied the LP pump set for this application, consult the pump installation instructions for information on this unit, taking special care to avoid upward loops and any other conditions that may trap vapor.



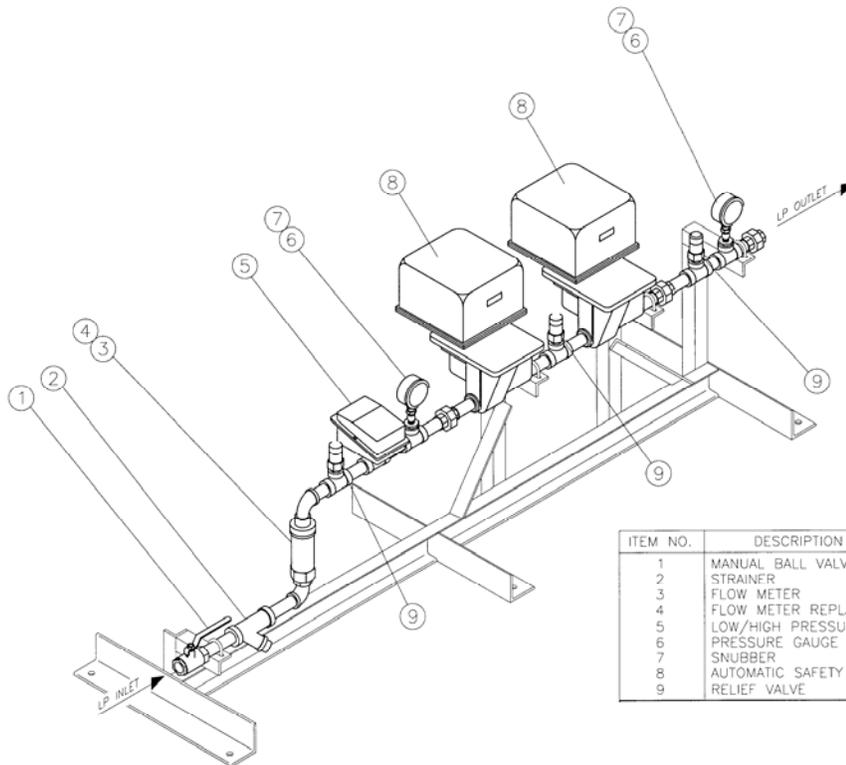
**Y8935**  
(NOT TO SCALE)

BBC MODEL NO.	MAX. LIQ. PROPANE	MAX. ΔP	APPROX. PUMP H.P. (NOTE 1)	INITIAL START-UP PRESSURE SETTINGS (NOTE 2)		DISCHARGE TO BURNER MIN. PIPE SIZE	RETURN TO SUPPLY MIN. PIPE SIZE	
				BYPASS FLOW CONTROL VALVE 50-150 PSIG SPRING [3.5 - 10.3 bar]	BACK PRESS. REGULATOR 50-230 PSIG SPRING [3.5 - 15.9 bar]			
BBC__08	99 GPH [6.2 LPM]	125 PSIG [860 KPA]	1.5	100% PROPANE 235 PSIG [16.2 bar]	100% PROPANE 210 PSIG [14.5 bar]	3/4" [DN 19]	3/4" [DN 19]	
BBC__10	147 GPH [9.3 LPM]					3/4" [DN 19]	1" [DN 25]	
BBC__12	215 GPH [13.6 LPM]		2	2	50% PROPANE 50% BUTANE 170 PSIG [11.7 bar]	50% PROPANE 50% BUTANE 145 PSIG [10.0 bar]	1" [DN 25]	1" [DN 25]
BBC__14	301 GPH [19.0 LPM]						1" [DN 25]	1" [DN 25]
BBC__18	475 GPH [29.9 LPM]						1" [DN 25]	1" [DN 25]
BBC__24	907 GPH [57.2 LPM]			3	100% BUTANE 95 PSIG [6.6 bar]	100% BUTANE 70 PSIG [4.8 bar]	1 1/4" [DN 32]	1 1/4" [DN 32]

**NOTES:**

1. PUMP H.P. MAY VARY WITH PUMP MANUFACTURER.
2. SPRING PRESSURE PLUS TANK PRESSURE.
3. ALL PIPING TO BE SCH. 80 BLACK IRON PIPE.
4. ALL COMPONENTS SUITABLE FOR 350 PSIG [24.1 bar] SERVICE.
5. PUMP SET MUST BE INSTALLED BELOW BOTTOM OF LP STORAGE TANK WITH NO UPWARD LOOPS.
6. USE RECOMMENDED PIPE SIZE OR LARGER BETWEEN PUMP SET AND BURNER MANIFOLD.
7. STANDARD PILOT IS USED WITH LP VAPOR, SUPPLY FROM TOP OF STORAGE TANK (LP VAPOR CONNECTION) OR OTHER SOURCE.
8. PIPE SIZING BASED ON FRICTIONAL PRESSURE LOSSES OF LESS THAN 1.5 PSI [103 BAR].

**Figure 7. Typical Schematic of LP Supply Piping**



**NOTE**  
LP manifold must be mounted in a horizontal position. Mount as close to the burner as possible. Mount manifold below the burner's center-line.

**X6190**  
(NOT TO SCALE)

**Figure 8. PLPM Prepiped LP Manifold Detail**

 **WARNING**

Hauck **does not recommend** installation of a line-reducing regulator in the LP supply line. If the regulator diaphragm were to rupture, total system pressure would be applied to the burner and could result in damage to equipment, including the baghouse, and **result in serious injury to personnel.**

**CAUTION**

Hauck strongly recommends that a bypass flow control valve and a backpressure regulator (available from Hauck) be installed in all LP systems and piped as shown in Figure 20. All components must be rated for 350 psig (24.1 bar) for LP use.

4. Close the manual ball valve upstream of the PLPM manifold (see Figure 8).
5. Open the manual shutoff valve on the inlet side of the pump.
6. Turn on the LP pump to start LP flow.
7. Check all LP lines and connections for leaks following accepted standards and practices.
8. Open the manual ball valve upstream of the PLPM manifold and check the manifold for leaks (see Figure 8). After burner has been ignited and LP is flowing to the burner nozzle, check all piping for leaks.



**WARNING**

Frost or icing is an indication of an LP leak. It is possible for a leak to occur without such evidence. Although the LP supply is initially in a liquid state, as it is vaporized it becomes heavier than air and accumulates near the ground and dissipates relatively slowly, becoming highly flammable. Extreme care should be exercised with LP fuels and systems.

**NOTE**

The system shown in Figure 20 is designed for optimum performance at ambient air temperatures above 40°F (5°C). For operation at temperatures below 40°F, consult Hauck for recommendations.

9. Adjustment of LP supply pressure:

- a. Install an amp probe on the LP pump power supply line.

**CAUTION**

Do not exceed the maximum LP pump motor nameplate amp load at any time while making adjustments.

- b. Close the ball valve between the backpressure regulator and the tank to temporarily take the regulator out of the system (see Figure 7).
- c. Adjust the bypass flow control valve to the following initial settings:

100% Commercial Propane	235 psig (16.2 bar)
50/50 Propane/Butane	170 psig (11.7 bar)
100% Butane	95 psig (6.6 bar)

**NOTE**

If pump motor nameplate amperage is exceeded, reduce pressure in Step 9.c to below nameplate amp rating.

- d. Reopen the backpressure regulator ball valve closed in Step b.

- e. Adjust the backpressure regulator to the following initial settings:

100% Commercial Propane	210 psig (14.5 bar)
50/50 Propane/Butane	145 psig (10.0 bar)
100% Butane	70 psig (4.8 bar)

**NOTE**

If motor amperage in Step 9.c exceeded nameplate amp rating, set backpressure regulator at 25 psig (1.7 bar) less than the bypass flow control valve setting.

These settings are initial settings only. Settings are based on 60°F (15.5°C) fuel temperature plus normal pump pressure; pump differential pressure = 100 psig (6.9 bar).

Settings will have to be readjusted for changes in temperature and operation. The bypass flow control valve should always be set approximately 25 psig (1.7 bar) above the backpressure regulator to insure pump protection.

10. a. Be sure the Micro LP valve is in the low fire position. This valve is factory set to travel approximately 90 degrees starting at position 1 to 10. These positions can be modified to adjust to a higher or lower firing rate. If adjusting high fire, low fire must be reset.
- b. Read and record Micro LP valve settings and flow rates using the in-line LP flow meter (gal/min or liters/min LP liquid) provided with the PLPM.
11. The low/high LP pressure switch is factory set at a low set point of 165 psig (11.4 bar) and a high set point of 230 psig (15.9 bar). Set point adjustments may be required depending on the burner and LP piping specifics.

Low Pressure Atomization with LP Firing

1. Once installed, the burner is ready for initial setup. The specific operation of the burner will depend on the individual system components in the entire combustion system. Refer to the instruction sheets that accompany the individual components.
2. Combustion air pressure should be set at the combustion air control valve. Typical combustion air pressure range from a minimum of approximately 0.3"wc (0.7 mbar) to a maximum of 27.7"wc (69 mbar) static pressure at the provided burner test points. Hauck recommends that the combustion air setting remain at minimum until the burner has been ignited (refer to the appropriate capacity sheet for burner air flow at low fire conditions).
3. Primary air pressure should be set at the primary air butterfly valve for a minimum 24.2"wc (60 mbar) 27.7"wc (69 mbar) for BBC\_104 and 34.6"wc (86 mbar) for BBC\_124 although **all models will operate with up to 34.6"wc (86 mbar) primary air pressure**.
4. If not previously completed, refer to Section F for setup of the pilot igniter.

5. Once the pilot is set and the initial LP and air adjustments are made, the burner can be ignited as follows:
  - a. Be sure that all fuel shutoff valves are closed and all control valves are in the low fire position.
  - b. Start the combustion air blower
  - c. Ensure that the pilot automatic safety solenoid valves and the pilot manual gas valve are closed.
  - d. Energize the igniter transformer.
  - e. Open the pilot gas automatic safety shutoff solenoid valves and the pilot manual gas valve.
  - f. Once the pilot flame has been established (confirm using flame supervision), de-energize the ignition transformer.
  - g. Open (energize) the main automatic gas or oil safety shutoff valves.
  - h. Once flame has been established, the pilot gas automatic safety shutoff valves may close. Leave the manual pilot air valve in position.
  - i. Proceed to ignite all burners (if applicable) per the above procedure.
6. When all burners are ignited, increase the combustion air to the high fire position (refer to appropriate capacity sheet for burner air flow at high fire conditions).
7. When high fire combustion air is set, adjust the micro LP valve to achieve the desired LP flow at high fire, (refer to appropriate capacity sheet for burner fuel flow at high fire conditions).
8. Verify air/fuel ratio using orifice meters or other flow meters in the air, gas, and liquid fuel lines. Orifice flow meters require 10 pipe diameters of straight piping into the flow meter and 5 pipe diameters of straight piping downstream of the flow meter.
9. Static air pressure at the burner air inlet can be related to air flows if an air orifice meter is not available. Fuel pressure should not be used as an indicator of flow rate. An appropriate measurement device must be installed to measure fuel flow.
10. Drive the burner to the low fire position and verify that the settings are consistent. Repeat steps 6 through 9 as necessary until high and low fire settings remain constant.
11. Lock all control motor linkage or direct-couplings in place and return all control system functions to normal, if changed during initial adjustments.
12. To shut down the burner system:
  - a. Return the burner(s) to the low fire position.
  - b. Close all fuel shutoff valves.
  - c. Allow the furnace to cool to 300°F (150°C) or less before shutting off the combustion air blower.

**NOTE**

Different nozzles are required when burning liquid propane, butane, or a mixture of propane/butane. Consult Hauck for your specific fuel nozzle requirements.



**WARNING**

**Do not attempt to reposition the LP nozzle while the burner is firing.** Considerable pressure exists under firing conditions. Attempting to adjust the LP nozzle while the burner is firing may result in equipment damage or injury to personnel.

To change the LP nozzle position:

1. Shut the LP manual ball valve upstream of the LP safety shutoff valves.
2. Disconnect the burner LP insert assembly from the LP valve manifold, using the union located downstream of the flexible hose.
3. Note the present orientation of the LP nozzle while assembled in the burner. Determine if the nozzle must be retracted into or extended out of the primary tube (see Dimensional Sheet).
4. Remove the four bolts securing the backplate to the burner.
5. Loosen the jam nut on the backplate of the burner LP insert assembly.
6. Rotate the backplate to effect the required retraction or extension of the nozzle. One full rotation of the backplate will move the nozzle approximately 0.1" (2.5mm).
7. Once the proper positioning of the nozzle is completed:
  - a. Tighten the jam nut.
  - b. Attach the burner LP insert assembly to the LP valve manifold, using the union provided.
  - c. Open the LP valve upstream of the safety shutoff valves.

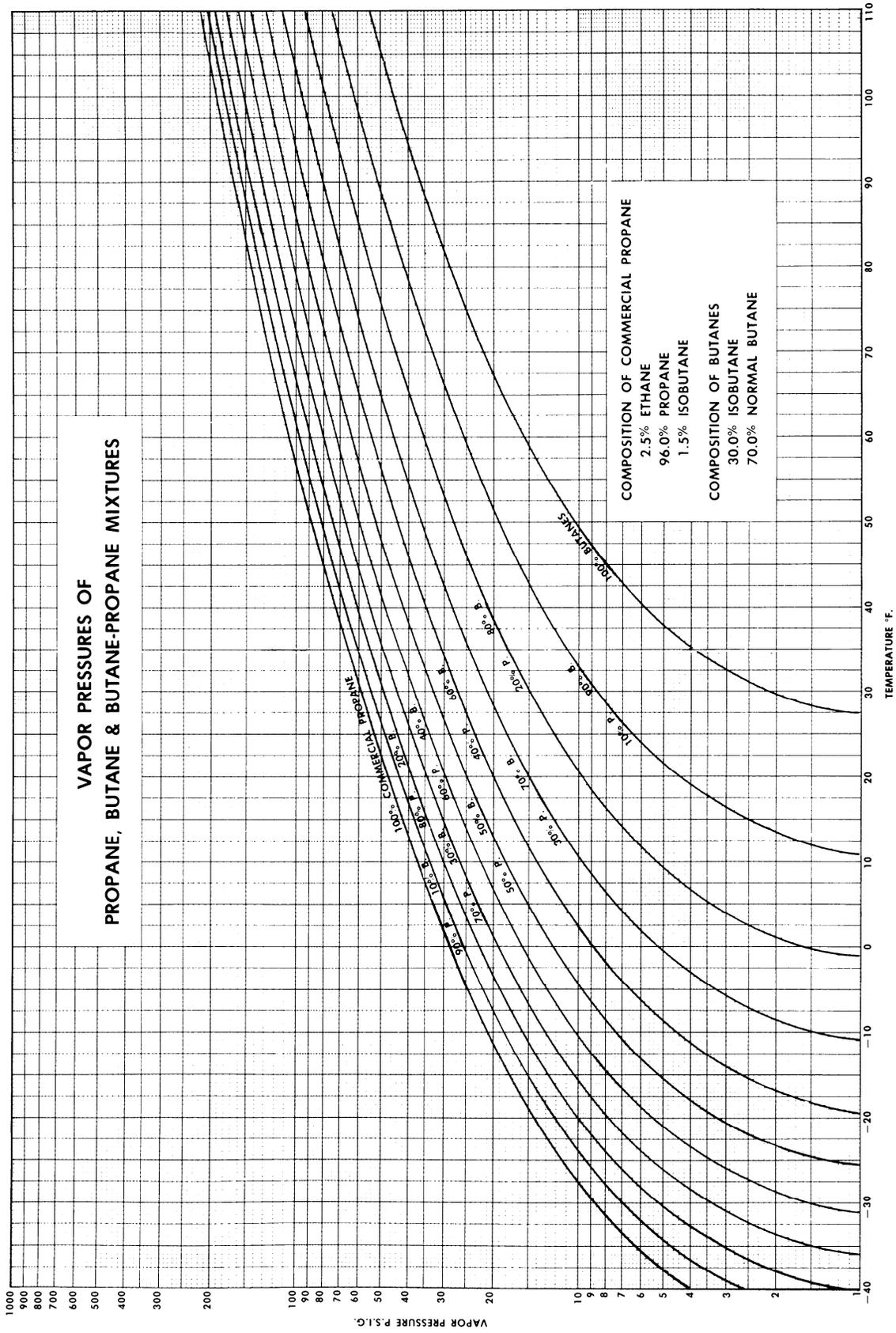


Figure 9. Vapor Pressures of Propane, Butane & Butane-Propane Mixtures

### Compressed Air Atomization Oil Firing

Compressed air pressure to the compressed air manifold **must** remain constant at 90 psig (6.2 bar). The compressed air pressure downstream of the air modulating regulator should be set at 40 psig (2.8 bar) when the burner is at high fire. To function as intended, fuel oil should be properly filtered and supplied to the burner inlet at a viscosity of **90 SSU ( $1.8 \times 10^{-5} \text{ m}^2/\text{s}$ ) or less, via heating if required.**

1. Ignite the pilot and main burner. Ensure high pressure atomizing air flow for ignition. Refer to IPG-9 and BBC supplemental data for low fire reference points for lighting. **DO NOT ATTEMPT TO LIGHT BURNER AT HIGH FIRE.**
2. Gradually increase the secondary air for the burner to desired high fire flow rate.
3. With the secondary air at high fire:
  - a. Set the primary air according to the static air pressure or flow. Consult specific capacity sheets for details. Primary air is used to keep the nozzle cool, prevent oil from going into the burner body, and shape the flame.
  - b. Ensure that the oil control motor is fully open. Set the desired oil flow rate by adjusting the oil supply pressure.
  - c. Set the high pressure atomizing air to the proper flow rate. Consult supplemental data for details. See Figure 10 for details on reading compressed air flow:
    1. Read the inlet pressure to the compressed air flow meter in the bottom horizontal scale.
    2. Follow inlet pressure vertically to intersection of horizontal flow indicator.
    3. Interpolate flow rate in scfm.
  - d. Adjustments to high fire pressure atomizing air flow should be made on the trim valve downstream of the pressure regulator, with the regulator bias in the midrange. It may be necessary to bleed the regulator to remove air from the sensing line.
  - e. High pressure atomizing air and oil flows are dependent upon one another. As one flow is adjusted, the other flow is also affected. Flow rates may have to be adjusted multiple times to achieve the recommended flows.

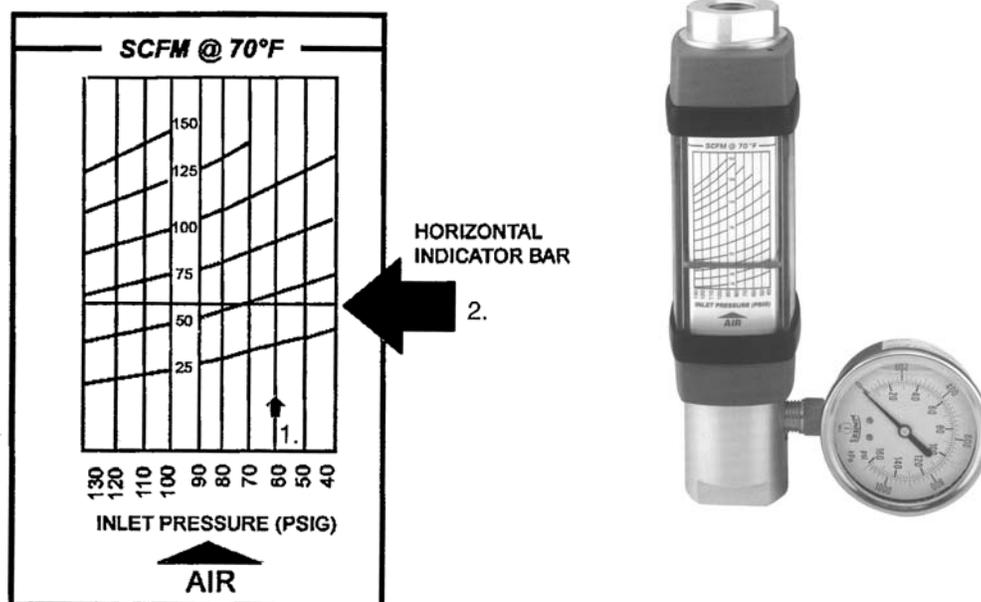


Figure 10. Compressed Air Flow Meter and Scale

4. After high fire adjustments have been completed, gradually reduce the burner output to the desired low fire secondary air setting. Consult supplemental data for details:
  - a. The primary air may not have to be adjusted from the high fire setting. Consult supplemental data for details.
  - b. Adjust the oil flow to the desired low fire flow rate. The oil control valve can then be stroked to accommodate the range of travel from high to low fire.
  - c. Adjust the high pressure atomizing air flow to the recommended setting. (This adjustment is made by using the bias adjustment on the compressed air modulating regulator.) Consult supplemental data.
5. After low fire adjustments have been completed, return the burner to high fire, check the high pressure atomizing air, secondary air, and oil flows. Ensure that flows agree with recommended settings in supplemental data or desired application settings.
6. After high fire adjustments have been completed, return the burner to low fire, check the high pressure atomizing air, primary air, secondary air, and oil flows. Ensure that flows agree with recommended settings in supplemental data or desired applications settings.
7. Shut burner off.
8. Repeat steps 1-7 to confirm reliable ignition and recommended settings in the supplemental data.

NOTE: See Figure 11 for regulator details. Bias is adjusted on top of the regulator, while the oil vent valve is located on the side of the regulator.

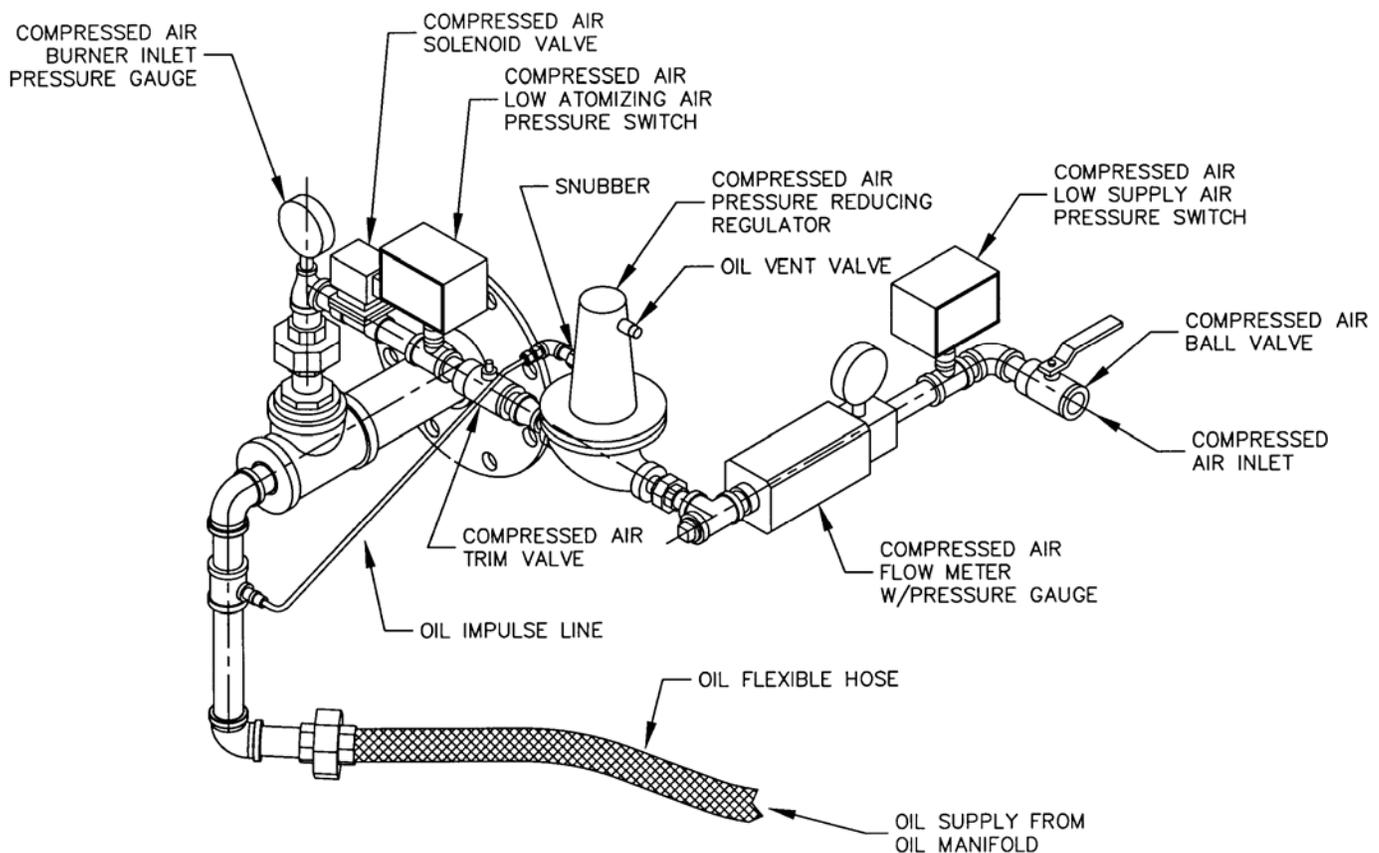


Figure 11. Compressed Air Manifold Detail

## **H. BURNER OPERATION**

Once properly installed, ignited, fired, and the refractory has been dried, the burner is ready for operation. The operation of the burner will depend on the individual system components comprising the combustion system. Refer to the instruction sheets and system piping schematics which accompany the individual items. The burner should always be ignited under low fire conditions. When the burner is firing, the spark igniter or gas pilot should be shut off. If the burner ignition tile is exposed to excessive moisture or extended periods of dampness, **at least 30 minutes of low fire drying at 100% XSA is required before beginning normal operation. Failure to do so will cause any moisture present to expand rapidly, causing damage to the refractory.**

## **I. MAINTENANCE**

### **CAUTION**

Be sure burner internals have cooled sufficiently before attempting to disassemble any components. Use care when separating gasket surfaces to avoid damage to the gaskets. All maintenance work should be accomplished by trained and experienced personnel only.

Hauck Beta Burners have been carefully engineered to provide dependable performance while requiring low maintenance. As with any product, it is very important to follow operating instructions and all procedures carefully to obtain optimum performance. Please refer to the applicable Beta Burner Parts List to become familiar with the various burner components and assemblies.

1. Burner components which should be checked periodically and cleaned, if necessary, include:
  - a. Oil valve (separately purchased item)
  - b. Oil atomizer
    - (1) Disconnect oil line from burner.
    - (2) Remove bolts from atomizer backplate.
    - (3) Completely remove backplate/oil tube/atomizer from burner.
    - (4) Measure the distance from the inside of the backplate to the rear of the oil nozzle.
    - (5) Inspect parts and disassemble to clean, if needed.
    - (6) Reassemble after cleaning, making sure that above dimension (step #4) is maintained.
    - (7) Reinsert the assembly into burner body, making sure that the gasket is properly seated.
    - (8) Replace bolts and securely tighten.
    - (9) Reconnect oil line to oil valve.
  - c. Atomizer assembly
    - (1) Disconnect oil and atomizing (primary) air lines from burner.
    - (2) Remove rear set of hex bolts from gas body backplate.
    - (3) Remove atomizer assembly from burner.
    - (4) Verify nozzle location, inspect and clean, if needed.
    - (5) Inspect gas tube, looking into rear of gas body, and clean if any oil or residue exists.
    - (6) Reinsert atomizer assembly into burner body, making sure that the gasket is properly seated and the primary air inlet is properly repositioned.
    - (7) Replace hex bolts and securely tighten.
    - (8) Reconnect oil and atomizing (primary) air lines.

**CAUTION**

Failure to check and ensure that a satisfactory seal exists by conducting a gas leak test could result in a hazardous condition.

- d. Gas body assembly
  - (1) Disconnect fuel and atomizing (primary) air lines (if used).
  - (2) Remove front set of nuts and washers from the air body backplate.
  - (3) Remove gas tee from the burner.
  - (4) Inspect internal parts. Clean the interior walls of gas body assembly and gas tube assembly of any oil or residue.
  - (5) Check condition of internal baffle and clean main air openings in baffle, if needed.
  - (6) Clean the atomizer assembly, if necessary.
  - (7) Reinsert gas body assembly, making sure that the gasket is properly seated and inlets are properly repositioned.
  - (8) Replace nuts and washers and securely tighten.
  - (9) Reconnect fuel and atomizing (primary) air lines.

## 2. Replacement of Internal Baffle

In certain situations, it may become necessary or desirable to replace the internal baffle of the burner. The baffle on the 1000 series Beta Burner is made of stainless steel, while the baffles on 2000 and 3000 series burners are made of high temperature refractory. In order to replace the internal baffle, use the following procedure:

- a. Disconnect fuel line.
- b. Loosen the backplate bolts.
- c. Remove burner backplate and gas tube. Be careful not to damage the internal body insulation (BBC 3000 series).

### For 1000 series (stainless steel baffle):

- 1) Remove the brass nuts on the baffle retaining clips inside the burner.
- 2) Remove the old stainless steel baffle and replace with the new part, making sure it seats against the step in the refractory ring.
- 3) Coat the edge surface between the stainless steel baffle and the refractory ring to ensure that air does not penetrate the joint. Hauck recommends a high temperature sealant such as Fiberfrax QF-150 or equivalent.
- 4) Replace the baffle retaining clips and brass nuts.

### For 2000 and 3000 series (refractory baffle):

- 1) Break the seal around refractory baffle edges at the refractory ring and remove from burner.
- 2) Remove the old refractory baffle and replace with the new part, making sure it seats against the step in the refractory ring. Coat the edge surface between the refractory baffle and the refractory ring to ensure that air does not penetrate the joint. Hauck recommends a high temperature sealant such as Fiberfrax QF-150 or equivalent.
- d. Replace the burner backplate gasket if required.
- e. Replace the burner backplate assembly, re-torquing all bolts to 30 ft-lb (41 Nm).
- f. Reconnect the seal at the backplate bolts and any other joints where the possibility of a gas leak exists.



**WARNING**

Use care when handling as the equipment may be heavy, have sharp edges or dust/fibers from refractory or gasket material. Always wear personal protective gear and use appropriate equipment during handling and installation. Verify proper installation and condition of gaskets & seals. Damaged gaskets or seals could allow the escape of hot gases or eject hot material.

2A. Replacement of Internal Baffle (04,14,18,20 and 24 size burners)

In certain situations, it may become necessary or desirable to replace the internal baffle of the burner. The baffle on Beta Burner 1\_00 series models is made of high temperature stainless steel, while the baffles on 2\_00 and 3\_00 series burners are made of high temperature refractory. In order to replace the internal baffle, use the following procedure:

- a. Disconnect fuel line.
- b. Loosen the backplate bolts.
- c. Remove burner internals after breaking the seal between the internal baffle and the main tile. Be careful not to damage the internal body liners (BBG 3\_00 models).
- d. For 1\_00 series models (stainless steel baffle):
  - (1) Remove (3) 1/4" hex head cap screws and baffle from gas tube.
  - (2) Place new baffle on gas tube.
  - (3) Replace hex screws and tighten.
- e. For 2\_00 and 3\_00 series models (refractory baffle):
  - (1) If baffle has remained attached to gas tube, separate baffle from tube.
  - (2) If baffle has remained inside burner after removal of gas tube, break seal around baffle edges and remove from burner.
  - (3) Clean any residue from gas tube.
  - (4) Replace gasket around gas tube.
  - (5) Carefully place new baffle on gas tube and press fit.
- f. For all models:
  - (1) Coat outer edges of new baffle with 1/8" (3mm) thick layer of high temperature coating cement (Hauck recommends Fiberfrax QF-150 or equivalent).
  - (2) Replace the existing gasket (if undamaged).
  - (3) Carefully replace entire assembly, making sure baffle is centered in burner and has seated against refractory step.
  - (4) Reattach internal assembly to the main air body by tightening the backplate bolts.
  - (5) Torque the backplate bolts to 30 ft-lb (41 Nm).
  - (6) Reconnect the seal at the backplate bolts and any other joints where the possibility of a gas leak exists.

### 3. Replacement of Burner Tile

Refractory tiles should be checked for coke/residue build-up or damage. If this cannot be done from inside the furnace, it will be necessary to gain access to the tile by removing the burner backplate assembly as described in step 2. Should it ever become necessary to replace the burner tile, use the following procedure:

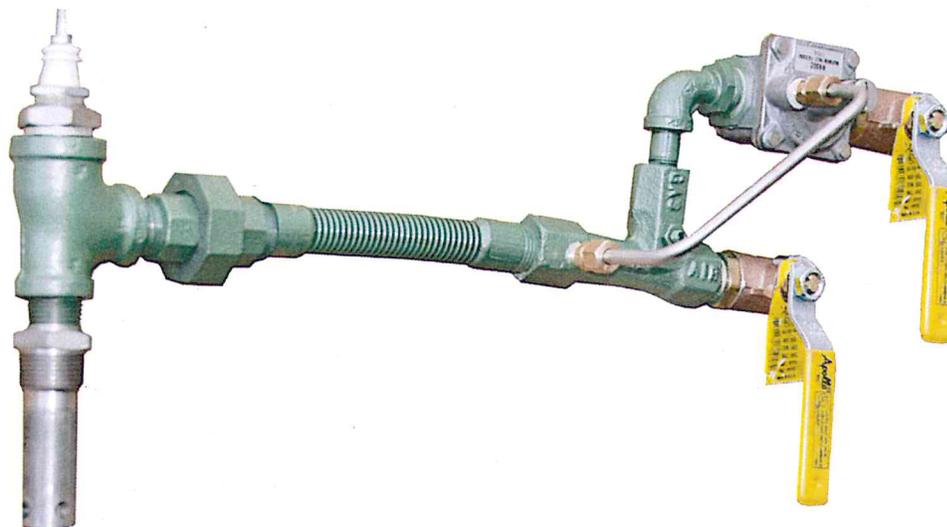
- a. Disconnect all fuel and air piping from burner.
- b. Remove flame scanning equipment and pilot from accessory ports.
- c. Support the burner weight before loosening mounting nuts.
- d. Loosen the burner mounting nuts from the burner mounting studs and remove the burner assembly from the tile.
- e. Loosen and remove the tile mounting nuts from the mounting plate studs.
- f. Remove the existing burner tile from the furnace wall and clean the tile port opening.
- g. Inspect the furnace wall insulation or refractory in the area surrounding the tile and repair any damage.
- h. Replace the burner tile mounting gasket.
- i. Replace the tile cushion gasket into the recess in the burner tile.
- j. Mount the new burner refractory tile.
- k. Replace tile mounting nuts and tighten.
- l. Reinstall all flame scanning equipment and gas pilot in appropriate ports (if applicable).
- m. Reconnect all fuel and air piping to the burner and check for gas leaks before restarting the burner.

## **J. RECOMMENDED SPARE PARTS LIST**

Item	Qty.	Part Number	Description
1	1	See Parts List	Gas Pilot, Igniter (If Applicable)
2	1	See Parts List	Direct Spark Igniter Assembly (If Applicable)
3	1	See Parts List	UV Scanner (If Applicable)
4	1	See Parts List	Flamerod (If Applicable)
5	1	See Parts List	Gasket

**Table 3. Recommended Spare Parts**

## IPG GAS PILOT BURNERS



**WARNING**

These instructions are intended for use only by experienced, qualified combustion start-up personnel. Adjustment of this equipment and its components by unqualified personnel can result in fire, explosion, severe personal injury, or even death.

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These instructions are intended to serve as guidelines covering the installation, operation, and maintenance of Hauck equipment. While every attempt has been made to ensure completeness, unforeseen or unspecified applications, details, and variations may preclude covering every possible contingency. **WARNING: TO PREVENT THE POSSIBILITY OF SERIOUS BODILY INJURY, DO NOT USE OR OPERATE ANY EQUIPMENT OR COMPONENT WITH ANY PARTS REMOVED OR ANY PARTS NOT APPROVED BY THE MANUFACTURER.** Should further information be required or desired or should particular problems arise which are not covered sufficiently for the purchaser's purpose, contact Hauck Mfg. Co.



**WARNING**

This equipment is potentially dangerous with the possibility of serious personal injury and property damage. Hauck Manufacturing Company recommends the use of flame supervisory equipment and fuel safety shutoff valves. Furthermore, Hauck urges rigid adherence to National Fire Protection Association (NFPA) standards and insurance underwriter's requirements. Operation and regular preventative maintenance of this equipment should be performed only by properly trained and qualified personnel. Annual review and upgrading of safety equipment is recommended.

**A. GENERAL INFORMATION**

The Hauck Series IPG Gas Pilot provides a means of lighting the flame of Hauck burners and many other industrial gas or oil burners. IPG pilots are engineered for exceptional flame stability and long life, even under the most severe and adverse operating conditions. IPG pilots are designed for electric spark ignition. The standard IPG Gas Pilots are suitable for firing into neutral, negative or positive pressure applications.

The back-loaded feature offers the capability to compensate the pilot air/fuel ratio for variations in furnace or burner pressure.

**B. RECEIVING AND INSPECTION**

Upon receipt, check each item on the bill of lading and/or invoice to determine that all equipment has been received. A careful examination of all parts should be made to ascertain if there has been any damage in shipment.

**IMPORTANT**

If the installation is delayed and the equipment is stored outside, provide adequate protection as dictated by climate and period of exposure. Special care should be given to all motors and bearings, if applicable, to protect them from rain or excessive moisture.

**C. CAPACITIES**

**IPG\_411 Pilot**

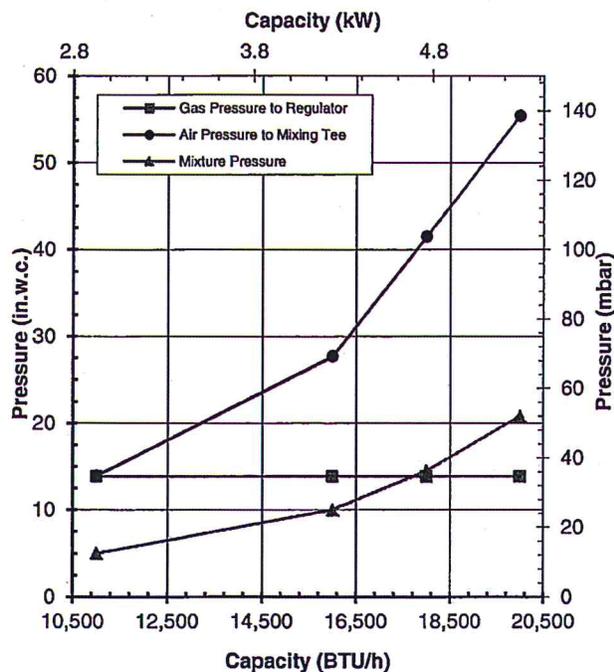
**NATURAL GAS, AMBIENT COMBUSTION AIR OPERATION**

SPECIFICATIONS		OPERATIONAL INFORMATION			
Capacity (at 10% Excess Air)	(BTU/hr)	11,000	16,000	18,000	20,000
	(kW)	2.9	4.2	4.8	5.3
Air Capacity	(SCFH)	115	160	180	208
	(nm <sup>3</sup> /hr)	3.1	4.3	4.8	5.6
Air Pressure (to the mixing tee)	(in.w.c.)	13.9	27.7	41.5	55.4
	(mbar)	34.6	68.9	103.3	137.8
Gas Pressure (to inlet of regulator)	(in.w.c.)	13.9	13.9	13.9	13.9
	(mbar)	34.5	34.5	34.5	34.5
Pilot Mixture Pressure	(in.w.c.)	5.0	10.0	14.5	20.8
	(mbar)	12.4	24.9	36.1	51.8
Flame Length (at 10% Excess Air)	(in)	6.0	6.0	7.0	7.0
	(mm)	152	152	178	178
Operating Limits	(λ Max)	2.25	2.00	1.85	1.75
	(λ Min)	0.65	0.85	0.90	0.95

NOTES

1. Capacities based on Natural Gas with HHV of 1034 BTU/ft<sup>3</sup> (Standard), and LHV of 10.21 kWh/nm<sup>3</sup> (Metric), 0.62 S.G., and a stoichiometric ratio of 9.74:1 with burner firing into chamber under no pressure at 10% excess air.
2. Air and fuel flows based on STP operating conditions at sea level and industry standard air and gas piping practices.
3. Air flow to the pilot to be ambient temperature air with a minimum supply pressure of 13.9 in.w.c., or 34.5 mbar, up to a maximum supply pressure of 56 in.w.c., or 140 mbar.
4. Fuel flow to the pilot to be ambient temperature with a minimum supply pressure of 13.9 in.w.c., or 34.5 mbar, up to a maximum supply pressure of 28 in.w.c., or 70 mbar.
5. Pilot is suitable for use on gaseous fuels other than Natural Gas, consult Hauck.

**IPG\_411 Burner Pressure Curves**



**IPG\_411 Operating Window**

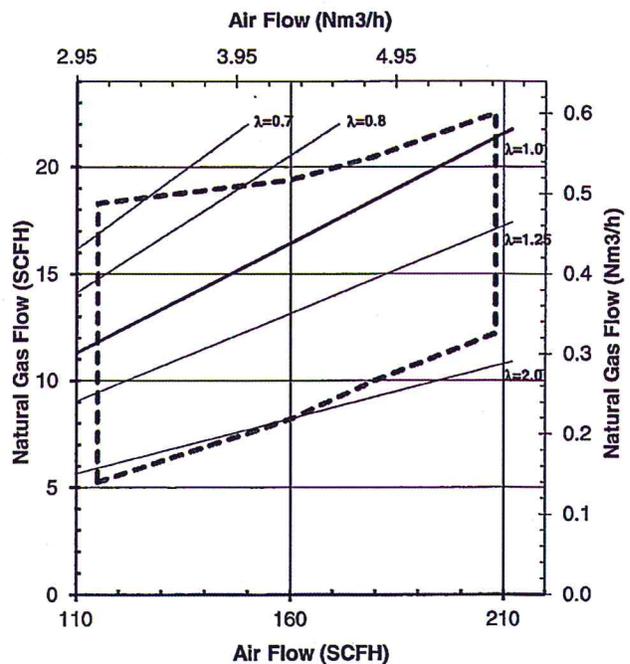


Table 1. IPG\_411 Pilot

**C. CAPACITIES (Continued)**

**IPG\_412 Pilot**

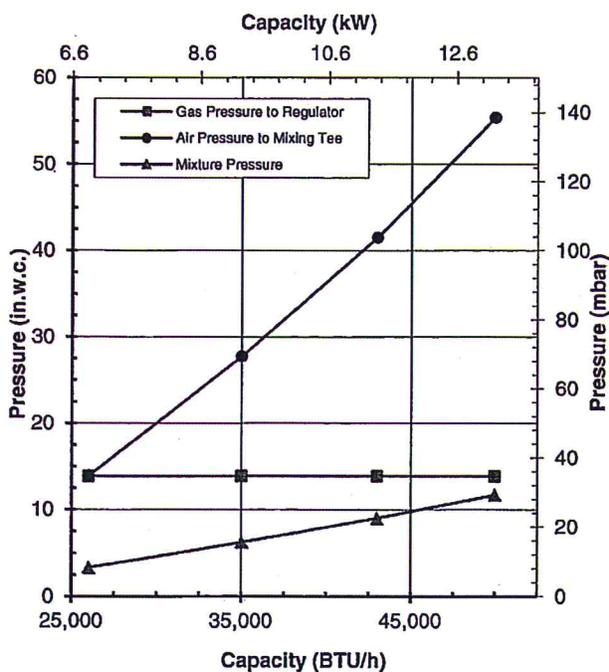
**NATURAL GAS, AMBIENT COMBUSTION AIR OPERATION**

SPECIFICATIONS		OPERATIONAL INFORMATION			
Capacity (at 10% Excess Air)	(BTU/hr)	26,000	35,000	43,000	50,000
	(kW)	6.9	9.3	11.4	13.2
Air Capacity	(SCFH)	265	365	441	510
	(nm <sup>3</sup> /hr)	7.1	9.8	11.8	13.7
Air Pressure (to the mixing tee)	(in.w.c.)	13.9	27.7	41.5	55.4
	(mbar)	34.6	68.9	103.3	137.8
Gas Pressure (to inlet of regulator)	(in.w.c.)	13.9	13.9	13.9	13.9
	(mbar)	34.5	34.5	34.5	34.5
Pilot Mixture Pressure	(in.w.c.)	3.3	6.2	9.0	11.7
	(mbar)	8.2	15.4	22.4	29.1
Flame Length (at 10% Excess Air)	(in)	8.0	9.0	10.0	12.0
	(mm)	203	229	254	305
Operating Limits	(λ Max)	2.00	1.75	1.60	1.55
	(λ Min)	0.62	0.86	1.00	1.05

NOTES

1. Capacities based on Natural Gas with HHV of 1034 BTU/ft<sup>3</sup> (Standard), and LHV of 10.21 kWh/nm<sup>3</sup> (Metric), 0.62 S.G., and a stoichiometric ratio of 9.74:1 with burner firing into chamber under no pressure at 10% excess air.
2. Air and fuel flows based on STP operating conditions at sea level and industry standard air and gas piping practices.
3. Air flow to the pilot to be ambient temperature air with a minimum supply pressure of 13.9 in.w.c., or 34.5 mbar, up to a maximum supply pressure of 56 in.w.c., or 140 mbar.
4. Fuel flow to the pilot to be ambient temperature with a minimum supply pressure of 13.9 in.w.c., or 34.5 mbar, up to a maximum supply pressure of 28 in.w.c., or 70 mbar.
5. Pilot is suitable for use on gaseous fuels other than Natural Gas, consult Hauck.

**IPG\_412 Burner Pressure Curves**



**IPG\_412 Operating Window**

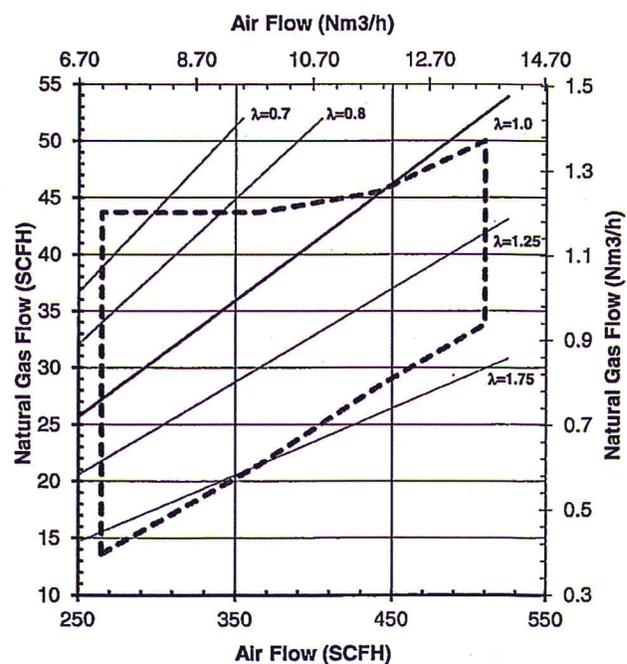


Table 2. IPG\_412 Pilot

**C. CAPACITIES (Continued)**

**IPG\_413 Pilot**

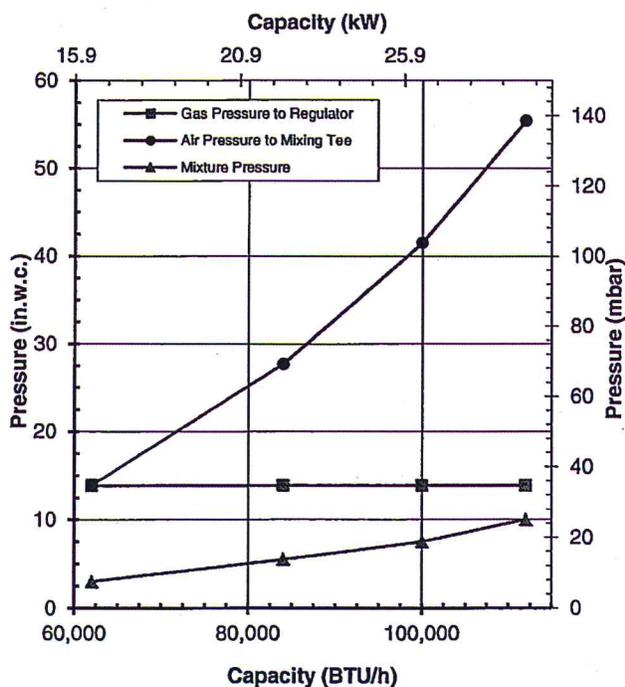
**NATURAL GAS, AMBIENT COMBUSTION AIR OPERATION**

SPECIFICATIONS		OPERATIONAL INFORMATION			
Capacity (at 10% Excess Air)	(BTU/hr)	62,000	84,000	100,000	112,000
	(kW)	16.4	22.2	26.5	29.6
Air Capacity	(SCFH)	640	865	1,025	1,155
	(nm <sup>3</sup> /hr)	17.1	23.2	27.5	30.9
Air Pressure (to the mixing tee)	(in.w.c.)	13.9	27.7	41.5	55.4
	(mbar)	34.6	68.9	103.3	137.8
Gas Pressure (to inlet of regulator)	(in.w.c.)	13.9	13.9	13.9	13.9
	(mbar)	34.5	34.5	34.5	34.5
Pilot Mixture Pressure	(in.w.c.)	3.0	5.5	7.5	10.0
	(mbar)	7.5	13.7	18.7	24.9
Flame Length (at 10% Excess Air)	(in)	8.0	9.0	10.0	12.0
	(mm)	203	229	254	305
Operating Limits	(λ Max)	1.45	1.40	1.30	1.20
	(λ Min)	0.85	0.91	0.96	0.99

NOTES

1. Capacities based on Natural Gas with HHV of 1034 BTU/ft<sup>3</sup> (Standard), and LHV of 10.21 kWh/nm<sup>3</sup> (Metric), 0.62 S.G., and a stoichiometric ratio of 9.74:1 with burner firing into chamber under no pressure at 10% excess air.
2. Air and fuel flows based on STP operating conditions at sea level and industry standard air and gas piping practices.
3. Air flow to the pilot to be ambient temperature air with a minimum supply pressure of 13.9 in.w.c., or 34.5 mbar, up to a maximum supply pressure of 56 in.w.c., or 140 mbar.
4. Fuel flow to the pilot to be ambient temperature with a minimum supply pressure of 13.9 in.w.c., or 34.5 mbar, up to a maximum supply pressure of 28 in.w.c., or 70 mbar.
5. Pilot is suitable for use on gaseous fuels other than Natural Gas, consult Hauck.

**IPG\_413 Burner Pressure Curves**



**IPG\_413 Operating Window**

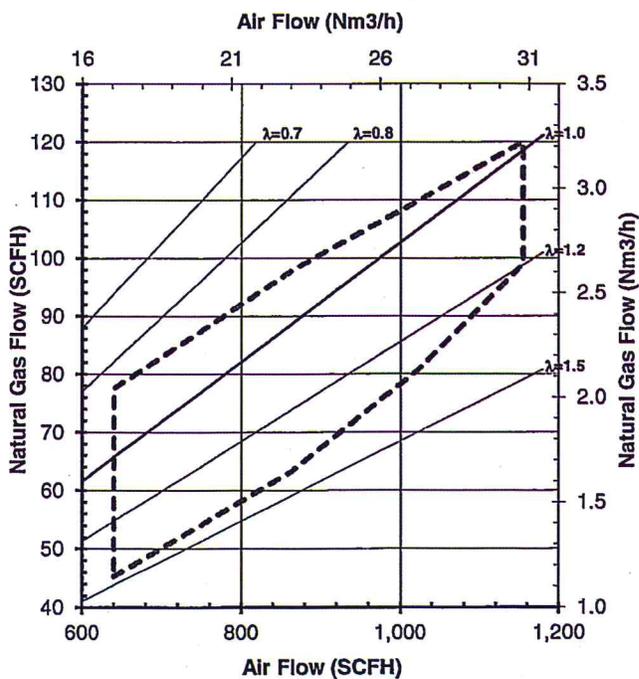


Table 3. IPG\_413 Pilot

#### **D. DIMENSIONS**

See appropriate Dimension sheet for detailed dimensional information.

#### **E. INSTALLATION**

1. Ensure that all components of the factory assembled pilot are present and properly connected. The pilot unit consists of a low pressure gas regulator, air ball valve, gas ball valve, gas mixer, pilot nozzle assembly, union (threaded pilots only), and flexible pipe nipple.
2. Install the pilot assembly in the air and gas lines. The gas pressure regulator is used as a zero governor and is suitable for any mounting position without restriction.
  - a. Connect the air piping to the inlet side of the air ball valve. Low pressure air should be supplied at a constant pressure ranging from 14 - 55"w.c. (35 – 137 mbar) at the inlet of the ball valve.
  - b. Connect the gas piping to the inlet side of the gas ball valve. Low pressure gas should be supplied at approximately 14"w.c. (35 mbar) at the inlet of the regulator. The regulator is designed to operate from 13.9 - 27.7"w.c. (34.5 – 68.9 mbar); maximum allowable inlet pressure is 27.7"w.c. (68.9 mbar).
  - c. Ensure that the air and gas ball valves are fully closed.

#### **F. IGNITION**



#### **WARNING**

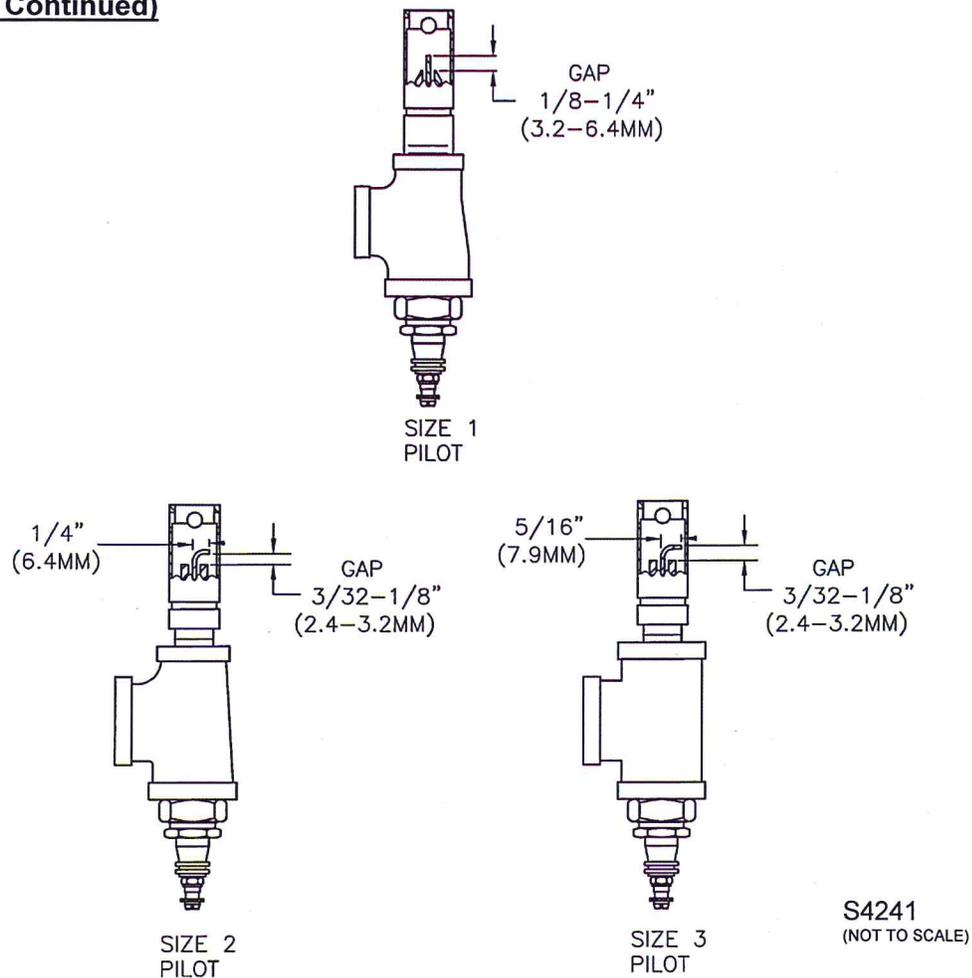
Adjustment of this equipment by unqualified personnel can result in fire, explosion, severe personal injury, or even death.

#### **NOTE**

To reduce pressure losses, use adequate sized pipe and minimize elbows in the air and gas lines to the pilot assembly. It is recommended that the air and gas supply be equal to or greater than their respective pilot air and gas connection sizes. If the pilot is installed at the end of a long run of pipe or will be operated in a dirty environment, it is recommended that a sediment trap be installed in the pilot air line.

1. Be sure the spark plug is set as shown in Figure 1. Ideally, initial pilot set-up should be done with the pilot outside of the burner.
2. Connect a 5000/6000 volt standard coil type ignition transformer to the spark plug on the spark igniter using a high voltage ignition wire. Ensure that the spark plug's wire electrode is centered in the pilot nozzle.

**F. IGNITION Continued)**



**Figure 1. Spark Gap Setting and Electrode Positioning**

**NOTE**

Ensure pilots are properly grounded to prevent equipment damage or personal injury. Exercise care to avoid over-tightening the spark plug holding nut as this may crack the ceramic insulator of the plug. Avoid, where possible, the use of long ignition wires. Long ignition wire can cause rapid spark plug wear or erosion. Suggested methods to avoid this problem are explained in Application Sheet GJ57.

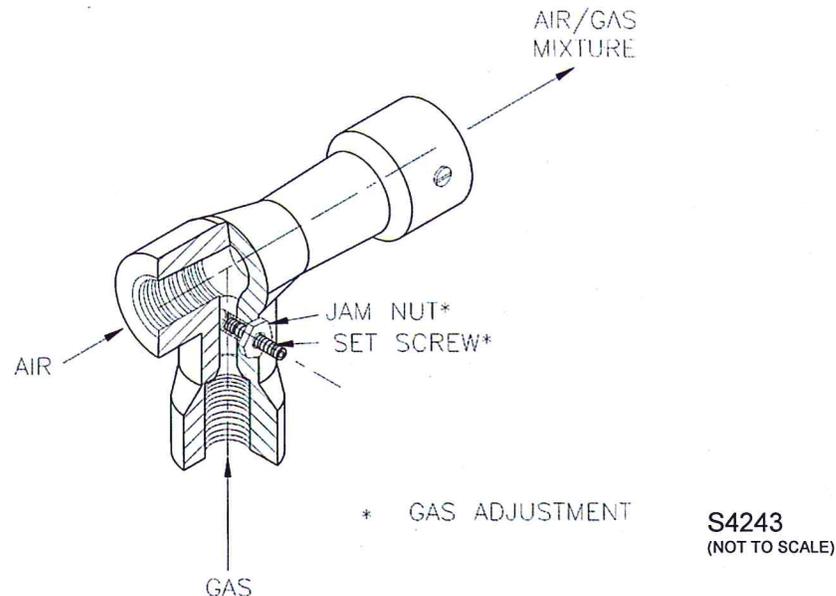
**CAUTION**

Ignition of the pilot results in a high voltage spark in excess of 5000 volts and an open flame. Remain clear of ignition wire, spark plug and pilot nozzle while firing the pilot.

**CAUTION**

The ignition transformer can cause an electric shock. Use care around the ignition cable. The igniter should be electrically grounded and should **NOT** be handled while the transformer is energized.

3. Ensure that the gas ball valve is closed.
4. Start the blower or air supply.
5. Open the air ball valve to the full open position.
6. Energize the ignition transformer and verify that an adequate spark is produced.
7. **Open the gas ball valve fully. This ball valve should be open fully at all times when the pilot is burning.**
8. The set screw on the air/gas mixer (Figure 2) is used to control the air/fuel ratio of the IPG pilot. The pilot **MUST** be properly set up prior to use as a burner ignition source. If the pilot is not set up, it may fail to light burner. The pilot should be set according to the following procedure with pilot outside of the burner:
  1. Ignite the pilot.
  2. Loosen the jam nut on the mixer.
  3. Rotate the set screw to adjust the mixer to the desired air/fuel ratio; clockwise for leaner, and counter clockwise for richer.
  4. The pilot will be at the proper air/fuel ratio when small flames become visible at the holes in the pilot nozzle. Some reddening of the pilot nozzle may occur. The flame should appear short, sharp, and blue. A yellow flame indicates that the mixture is too rich and adjustment is required for proper ignition.
  5. Hold the set screw in place at the desired position and tighten the jam nut.



**Figure 2. Pilot Mixer Adjustment**

9. To extinguish the pilot:
  - a. Close gas ball valve first.
  - b. Close air ball valve last (if desired).
10. Insert a slip-fit pilot into the burner and tighten the setscrew on the burner to lock the pilot nozzle in place (if applicable).

11. Insert a threaded pilot as follows:
  - a. Disconnect the union between the pilot nozzle and flex nipple.
  - b. Thread the pilot into the port and wrench tighten until snug.
  - c. Reconnect the union.

**NOTE**

The pilot nozzle tip should be located slightly behind the main burner nozzle discharge area so that it will not obstruct or be affected by the air/fuel discharge of the main burner.

**G. OPERATION**

When properly adjusted, the pilot should produce a sharp, short, blue flame. If adjustment is necessary, refer to the Ignition section.

**H. SHUTOFF VALVE LEAK TESTING**

Both safety shutoff valves in the gas pilot manifold must be leak tested by qualified personnel as recommended by NFPA 86.



**WARNING**

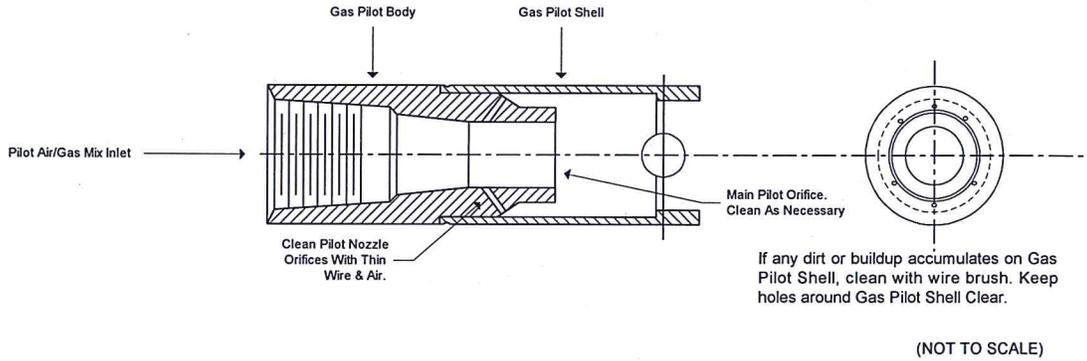
Do not attempt to operate a combustion system with leaks present.

**I. MAINTENANCE**

All components of the pilot assembly are engineered to provide maintenance free operation. It is sometimes necessary, however, to clear the mixer jet of any debris as this causes mixer capacity to diminish. The mixer jet is easily cleaned by removing the air piping downstream of the air ball valve and running a wire into the mixing tee opening through the jet. The gas inlet of the mixer can also be cleaned by the same method. Fully removing the adjustment screw also provides access to clean the mixer.

The pilot nozzle may become plugged with debris or carbon buildup. To clean the nozzle, remove the pilot assembly from the burner. Disconnect the nozzle from the pilot assembly and remove the spark plug assembly. **Check carefully to ensure the ceramic insulator is not broken.** Clean the small tangential holes that surround the main hole and blow the nozzle out with air when complete. Reassemble the pilot assembly, test fire, and reinsert the pilot into the burner.

Periodically remove and inspect the spark plug. If the ceramic insulator is cracked or broken, replace it. Clean the unit of any carbon buildup. **When replacing the plug, avoid over-tightening the nut holding the plug to avoid cracking the plug's ceramic insulator.** Before use, ensure the plug's wire electrode is centered in the pilot nozzle (see Figure 1 for setting spark plug).



**Figure 3. Cleaning Pilot Nozzle and Piloting Holes**