



PBG PACKAGED GAS 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.

TABLE OF CONTENTS

<u>Subject</u>	<u>Page</u>
A. General Information.....	2
B. Receiving and Inspection.....	2
C. Capacities.....	3
D. Dimensions.....	4
E. Installation.....	10
F. Electrical Power Supply.....	10
G. Gas Supply.....	10
H. Initial Setup.....	11
I. Ignition.....	12
J. Operation.....	13
K. Flame Monitoring.....	13
L. Shut-Off Valve Leak Testing.....	14
M. Maintenance.....	15
N. Spare Parts List.....	15

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 PBG Packaged Gas Burners are designed for applications where it is desirable to have all of the necessary components for a high turndown combustion system contained in one assembly. Three configured versions are available: Basic Burner, Configurable Burner and Custom Engineered Burner. The basic burner includes the burner assembly with spark igniter, straight tube combustor, blower, gas ratio regulator, fixed high fire gas orifice, adjustable low fire bypass and flame rod. The menu-built version can be assembled from the list of items below. Modifications can be made to these standard configurations to meet other customer specifications to provide a custom engineered product.

Configurable Burner Options:

Option	Component
1	Burner Size
2-1	Tube Assy., Straight Combustor
2-2	Tube Assy., Elbow Combustor
2-3	Tile Assy., Refractory Combustor
3-1	Blower Assembly, MBA
3-3	Companion Flange, Air Inlet
4-1	Kit Assy, Control Motor & Coupling
5-1	Manifold Assy., Standard Natural Gas
5-2	Manifold Assy., Standard Propane
6-1	Flame Rod Assembly
6-2	UV Scanner
7-1	Kit Assy., Ignition Transformer

Option	Component
8-1	Filter Assy., Blower Inlet
9-1	Kit Assy., Low Fire Limit Switch
9-2	Kit Assy., High Fire Limit Switch
9-3	Kit Assy. Low & High Fire Limit Switch
10-1	Switch, Air Pressure (1-20"wc/0.25-5kPa)
11-1	Valve, N.O. Vent
Refer to PBG-4 for complete selection data for PBG burners. Any variation outside the listed selections constitutes a custom engineered burner. Consult Hauck to discuss special requirements and pricing.	

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. CAPACITY TABLES (Standard and Metric)

Model No.	Capacity (1000 Btu/hr)		Motor HP	Air Static Pressure ("wc)	Air Flow (SCFH)	Gas Flow (SCFH)	Excess Air (%)	Gas Turndown	Flame Length (Inches)
PBG 300	Max.	440	1/3	5.9	4560	425	10	43:1	14
	Min.	10		0.25	950	10	875		
PBG 500	Max.	670	1/3	5.5	6950	650	10	33:1	17
	Min.	21		0.25	1450	20	645		
PBG 750	Max.	890	3/4	6.4	9210	860	10	48:1	20
	Min.	19		0.25	1820	18	940		
PBG 1000	Max.	1290	3/4	5.5	13340	1245	10	42:1	23
	Min.	31		0.25	2840	30	870		
PBG 2000	Max.	2265	3/4	5.4	23500	2190	10	73:1	45
	Min.	31		0.2	4520	30	1450		
PBG 3000	Max.	2550	3/4	4.8	26400	2465	10	46:1	48
	Min.	55		0.2	5400	53	945		
PBG 5000	Max.	4660	3	6.0	48300	4510	10	46:1	64
	Min.	101		0.1	6200	98	550		

Notes:

1. Capacities based on integral blower with 60Hz motor, natural gas HHV of 1034 Btu/ft³ and 0.59 S.G., and stoichiometric air/gas ratio of 9.74:1 with burner firing into chamber under no pressure; for applications under positive or negative pressure (i.e., back pressure or vacuum), consult factory for re-rated capacity.
2. Air and gas flows based on 60°F.
3. Air static pressure measured at burner body air pressure tap.
4. For altitudes above sea level, consult factory for re-rated capacity.
5. Flame lengths are based on the straight combustor tube firing into a chamber without forced air flow.

Metric Capacities

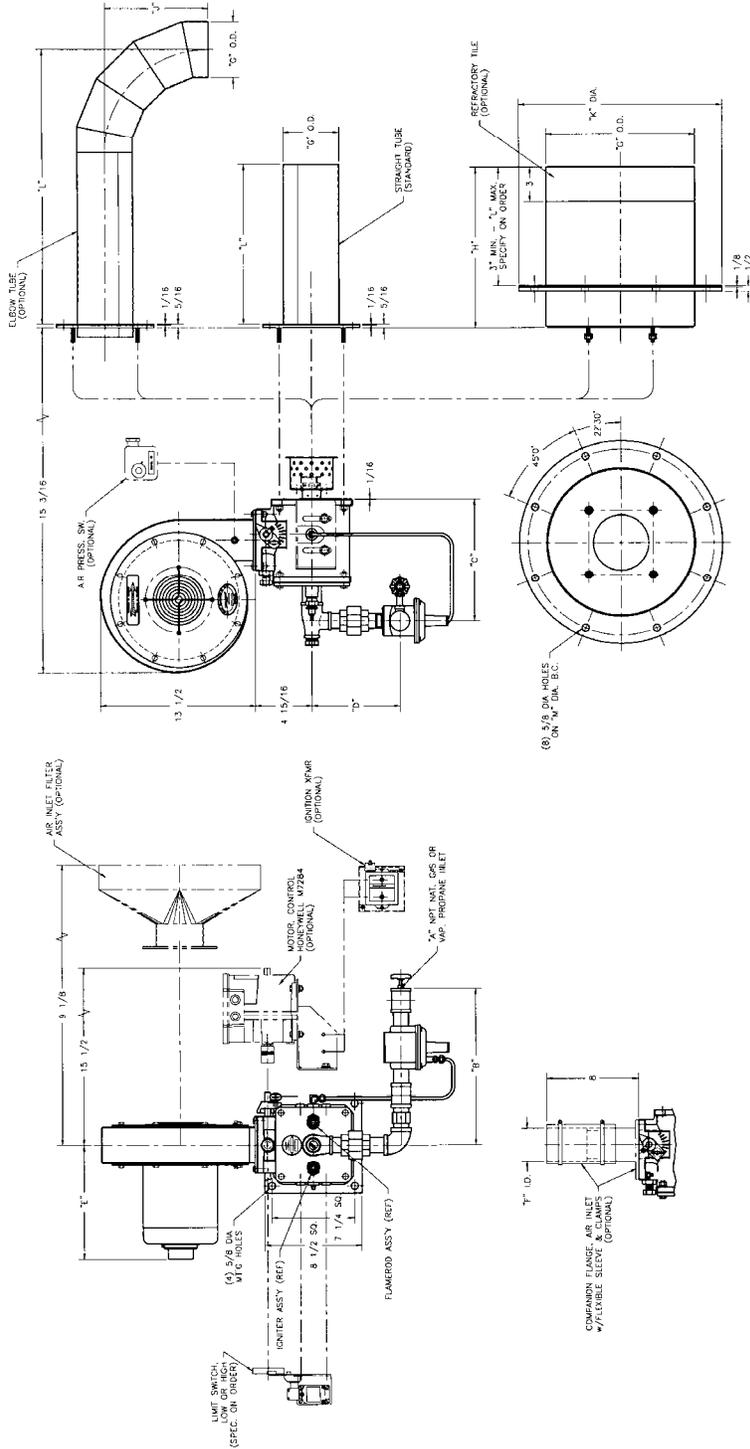
Model No.	Capacity (kW)		Motor kW	Air Static Pressure (Pa)	Air Flow (Nm ³ /hr)	Gas Flow (Nm ³ /hr)	Excess Air (%)	Gas Turndown	Flame Length (mm)
PBG 300	Max.	100	0.25	1019	102	9.5	10	35:1	355
	Min.	3		43	21.2	0.27	710		
PBG 500	Max.	150	0.25	950	155	14.5	10	27:1	430
	Min.	5		43	32.4	0.54	520		
PBG 750	Max.	200	0.56	1106	206	19.2	10	40:1	510
	Min.	5		43	40.6	0.48	770		
PBG 1000	Max.	280	0.56	950	298	27.8	10	35:1	585
	Min.	8		43	63.4	0.80	710		
PBG 2000	Max.	500	0.56	933	525	49.0	10	61:1	1140
	Min.	8		35	101	0.80	1190		
PBG 3000	Max.	560	0.56	829	589	55.0	10	39:1	1220
	Min.	14		35	121	1.42	770		
PBG 5000	Max.	1030	2.24	1037	1078	100.6	10	38:1	1630
	Min.	27		17	138	2.63	440		

Notes:

1. Capacities based on integral blower with 50Hz motor, natural gas LHV of 36.74 MJ/Nm³ and 0.59 S.G., and a stoichiometric air/gas ratio of 9.74:1 with burner firing into chamber under no pressure; for applications under positive or negative pressure (i.e., back pressure or vacuum), consult factory for re-rated capacity.
2. Air and gas flows based on 0°C.
3. Air static pressure measured at burner body air pressure tap.
4. For altitudes above sea level, consult factory for re-rated capacity.
5. Flame lengths are based on the straight combustor tube firing into a chamber without forced air flow.

D. DIMENSIONS

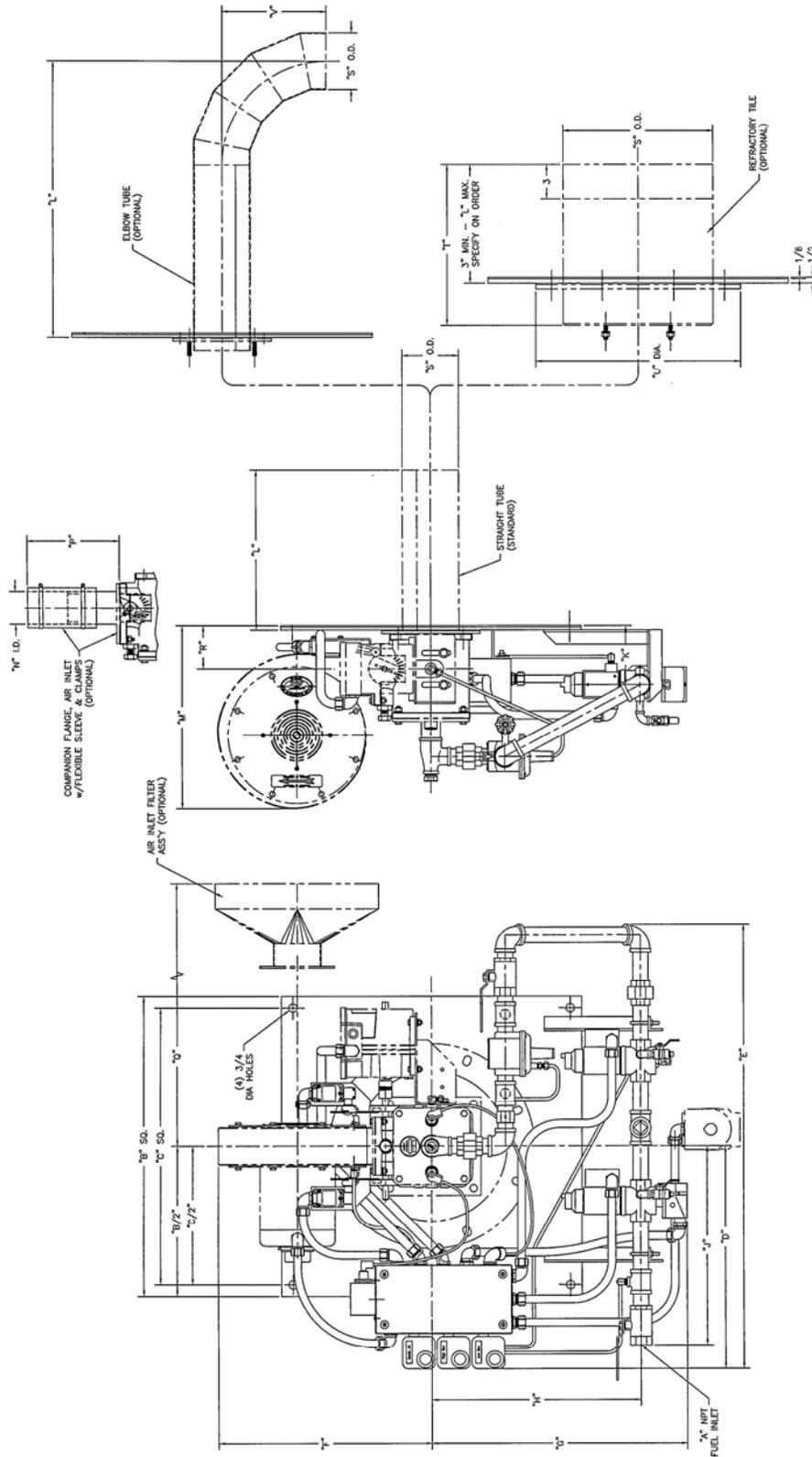
BASIC BURNER OPTIONS PBG 300-1000



MODEL	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"J"	"K"	"L"	"M"
PBG 300C	3/4 NPT	11-1/2	9-3/4	6-7/16	9-7/8	2-7/8	3-3/4	10	6	17-1/2	10	---
PBG 500C	3/4 NPT	11-1/2	9-7/8	6-7/16	9-7/8	2-7/8	4-1/2	12	6	---	12	---
PBG 750C	1 NPT	13 3/4	10-11/16	7-11/16	10-1/4	3-1/2	4-7/8	14	9	---	14	---
PBG 1000D	1 NPT	13 3/4	10-11/16	7-11/16	10-1/4	3-1/2	5-9/16	13	9 3/4	---	14	---
											13	16-1/4

Y6846
(NOT TO SCALE)

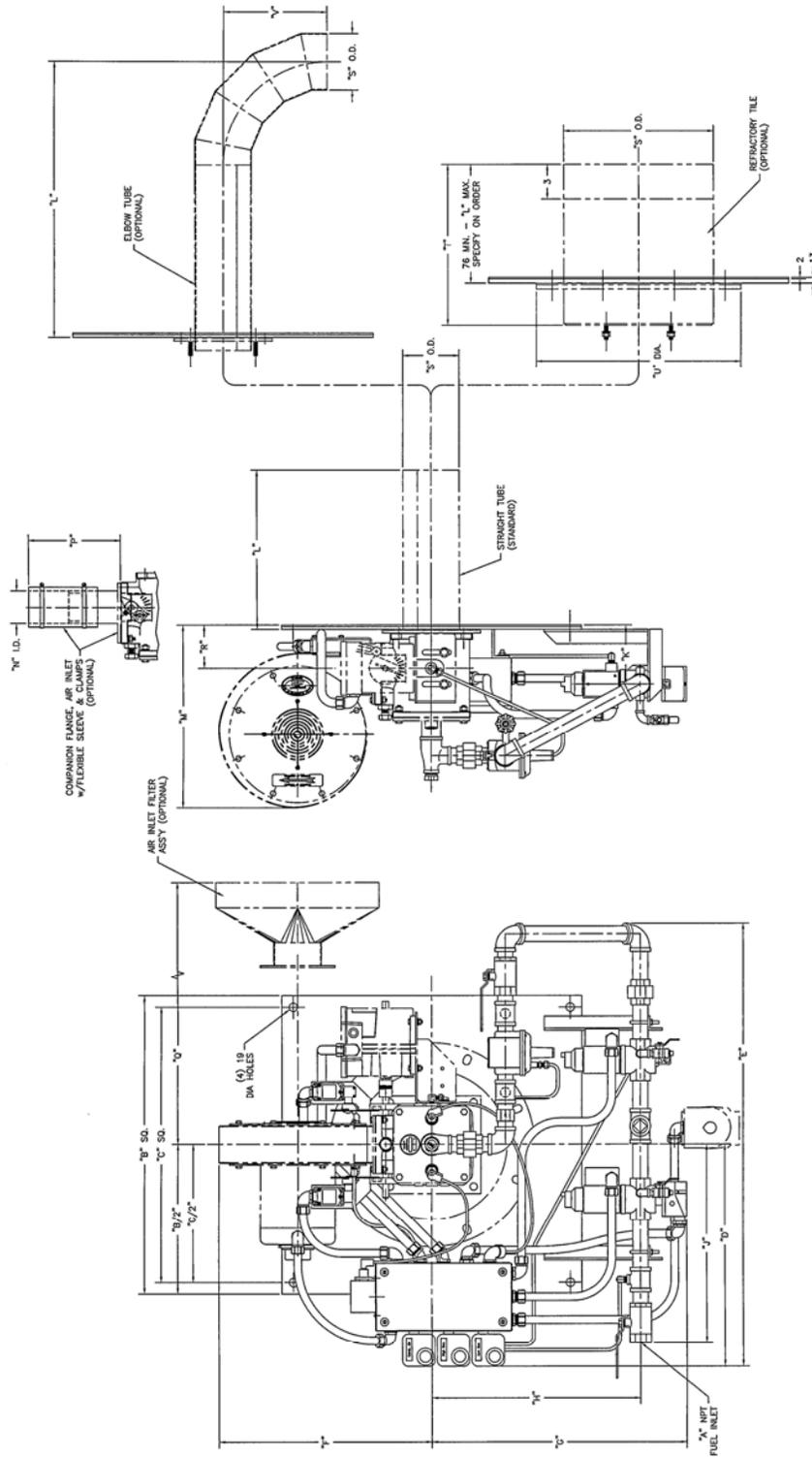
NFPA MANIFOLD OPTIONS PBG 300-5000



MODEL	A"	B"	C"	D"	E"	F"	G"	H"	J"	K"	L"	M"	N"	P"	Q"	R"	S"	T"	U"	V"
PBG 300C	3/4 NPT	26	24	19 1/4	36 3/8	18 7/16	22 5/8	18 5/8	18 1/16	5 1/8	10	15 7/8	2 7/8	8	9 1/8	3 3/4	3-3/4	—	—	—
PBG 500C	3/4 NPT	26	24	19 1/4	36 3/8	18 7/16	22 5/8	18 5/8	18 1/16	5 1/8	12	15 7/8	2 7/8	8	9 1/8	3 3/4	4-1/2	—	—	—
PBG 750C	1 NPT	26	24	19 1/4	38 1/2	18 7/16	22 1/8	18 1/16	17 1/4	5 1/8	14	16-1/4	3 1/2	8	9 1/8	3 3/4	4-7/8	—	—	—
PBG 1000D	1 NPT	26	24	19 1/4	38 1/2	18 7/16	22 1/8	18 1/16	17 1/4	5 1/8	14	15 7/8	3 1/2	8	9 1/8	3 3/4	5-9/16	—	—	—
PBG 2000B/3000B	1 1/2 NPT	30	28	21	41 7/8	22 5/8	22 1/32	17 5/16	23	5 3/8	20	18 9/16	4 1/2	10	10	6 1/4	8 1/4	—	—	—
PBG 5000C	2 NPT	30	28	21	44 15/16	25 9/16	22 3/4	17 9/16	24 3/8	5 5/8	20	22 11/16	4 1/2	10	15 7/16	6 1/4	8 3/4	—	—	—
											17	16-1/4				24-7/8	18	20	23 1/4	
											19	16-1/4								

Y6848
(NOT TO SCALE)

METRIC NFPA MANIFOLD OPTIONS PBG 300-5000



MODEL	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"J"	"K"	"L"	"M"	"N"	"P"	"Q"	"R"	"S"	"T"	"U"	"V"
PBG 300C	3/4 NPT	660	610	489	924	468	575	473	459	130	254	403	73	203	232	95	95	—	—	—
											432	400	403	314	305	314	305	254	445	152
PBG 500C	3/4 NPT	660	610	489	924	468	575	473	459	130	305	403	73	203	232	95	114	—	—	—
											483	400	403	203	232	365	305	305	445	152
PBG 750C	1 NPT	660	610	489	978	468	562	459	438	130	356	403	89	203	232	416	330	356	451	—
											610	413	89	203	232	416	330	356	451	229
PBG 1000D	1 NPT	660	610	489	978	468	562	459	438	130	356	403	89	203	232	416	330	356	451	—
											610	413	89	203	232	416	330	356	451	248
PBG 2000B/3000B	1 1/2 NPT	762	711	533	1064	575	560	440	584	137	508	471	114	254	254	159	210	—	—	—
											826	413	114	254	254	159	210	—	—	292
PBG 5000C	2 NPT	762	711	533	1141	649	578	446	619	143	508	576	114	254	392	159	222	—	—	—
											826	413	114	254	392	159	222	—	—	292
											463	413	114	254	392	632	457	508	591	—

Y6848 METRIC
(NOT TO SCALE)

E. INSTALLATION

1. The Hauck PBG burner can fire in any position. Therefore, they can be installed to fire through side-walls, roofs or the bottoms of ovens, dryers, or furnaces. It may be necessary to rotate the gas ratio regulator so that the stem (adjusting spring) housing is pointing downward. Also, the installation instructions for the UV scanner, control motors and combustion air pressure switches should be reviewed to insure that the mounting arrangement is in accordance with the manufacturer's recommendations.
2. The PBG burners will bolt to the oven or furnace wall. Prepare the oven wall appropriately to support the weight of the burner and any other associated components. Install the burner combustor tube/tile so that it projects past the interior of the oven or furnace wall. Wall thickness should not exceed 6 inches (150mm). For walls thicker than 6 inches (150mm), consult Hauck for recommendations. The optional refractory combustor tile should be installed flush with the interior wall for applications above 1500°F (816°C).
3. For air heating installations where the burner will fire into a chamber under negative pressure, spacers may be installed between the burner mounting bracket and the oven/furnace wall to draw secondary air past the firing tube.
4. On installations where there is a positive pressure within the combustion chamber, the opening in the oven or furnace wall should be at least 1 inch (25mm) larger than the burner combustor tube/tile. Pack the space around the tube with ceramic fiber suitable for the temperatures involved. Ceramic fiber packing should not extend past the 6 inch (150mm) maximum wall thickness. Installation of the high temperature gasket between the burner mounting plate/flange and the oven or furnace wall is recommended for all positive pressure ovens or furnaces.
5. If the burner will be located outdoors, protection should be provided to prevent rain and/or snow from being drawn into the blower. Properly select all accessory items for outdoor operation. A rain hood or other suitable protection is recommended for burners installed in areas of direct rain or snow exposure; contact Hauck for recommendations.
6. If the Hauck PBG burner is to be operated within an enclosed area, verify that an adequate fresh air supply is available to supply combustion air to the burner.

F. ELECTRICAL POWER SUPPLY

Local and national codes and/or standards should be adhered to. Voltage, phase and frequency must be compatible with the motor and electrical accessory nameplate ratings. All wiring to the burner blower, air control motor, and control accessories must be completed before the burner is ignited.

NOTE

If the PBG burner will be subjected to backpressure from the chamber or furnace into which it is firing, a large blower motor may be required to achieve the desired heat input; consult Hauck.

G. GAS SUPPLY

SPECIAL NOTE

Hauck recommends the use of gas manifolds conforming to National Fire Protection Association (NFPA) standards. NFPA requires two safety shutoff valves wired in series, equipment isolation valve, sediment trap and strainer upstream of the first shutoff valve, manual shutoff valve downstream of the second (blocking) shutoff valve, and high and low gas pressure switches interlocked to the burner's safety shutoff valves. Additionally, each burner above 150,000 Btu/hr must have visual position indication on each shutoff valve. Burners above 400,000 Btu/hr must have visual position indication in each safety shutoff valve **and** at least one proof of closure switch. The Hauck PBG with NFPA options contains all of these features.

The Hauck PBG Burners are designed to operate with a regulated gas supply pressure to the inlet of the manifold of 14 to 21"wc (3.5 to 5.2kPa) for natural gas at a nominal HHV of 1034 Btu/ft³ (LHV of 36.74 MJ/Nm³) or propane at a nominal HHV of 2499 Btu/ft³ (LHV of 91.2 MJ/Nm³). **The exact specification of either natural gas or propane should be specified when the burner is ordered. If adequate gas pressure is not available, high fire capacity will be reduced, and low fire ignition may be erratic.**

For multiple burner installations that use a common prepiped gas manifold, insure that the gas supply pressures to the individual burners are within the 14 to 21"wc (3.5 to 5.2kPa) range. To simplify piping and assure accurate burner control, it is strongly suggested that control of the combustion air and gas be accomplished via the valves/regulators packaged with the burners and not with central or common air and gas valves/regulators.

The Hauck PBG Burners have been assembled and adjusted for the gas specified on the purchase order. The burner should require only minimal field adjustment. If it is desired to change the gas specifications, please contact Hauck for recommendations on replacing the fixed high fire gas orifice and adjusting the low fire bypass.

H. INITIAL SET-UP



WARNING

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

The PBG is factory adjusted to conform to capacity and ignition limits. Although the burner should require no adjustment upon initial set-up, several adjustments can be made in situations where the burner needs to be fine tuned to the application.

1. Combustion Air Valve

The combustion air valve travels 90° from closed to the fully open position. A flexible coupling attaches the control motor to the air damper. The air valve must be in the closed position for ignition.

2. PBG 300, 500, 750 & 1000

The above sizes incorporate a low fire air adjustment screw. The screw will affect the low fire appearance of the flame. The screw is factory set to achieve 0.2"wc (50Pa) at the air pressure tap on the burner body. To adjust low fire air, loosen the locknut, then turn the screw. Clockwise rotation will reduce low fire air flow and result in a more luminous flame, while counter clockwise rotation will result in a less luminous flame. Tighten the locknut when the adjustment is complete.

3. Gas Ratio Regulator

The gas ratio regulator proportions gas flow through the burner relative to the burner air pressure. Adjusting the bias of the regulator can increase or decrease the ratio of gas to the burner air. The bias adjustment is located under the cap on the regulator stem. Clockwise adjustment of the bias screw will increase gas flow, while counter clockwise adjustment will decrease gas flow. **An adjustment of the bias will affect the high and low fire performance of the burner. Be sure to check both high and low fire after adjusting the bias. Be sure the burner will ignite after a bias adjustment.** A maximum ¼ turn at each adjustment is recommend, then re-check burner ignition and firing performance. The bias has been factory set for operation at a zero backpressure condition.

I. IGNITION

Each PBG comes equipped with a spark igniter. Since PBG burners are preset, no adjustment to the igniter should be necessary upon initial light-off. However, if ignition problems occur or a new igniter is installed, follow the procedure in Figure 1 to replace and adjust the igniter. Spark ignition requires the burner to be properly grounded to the oven/furnace.

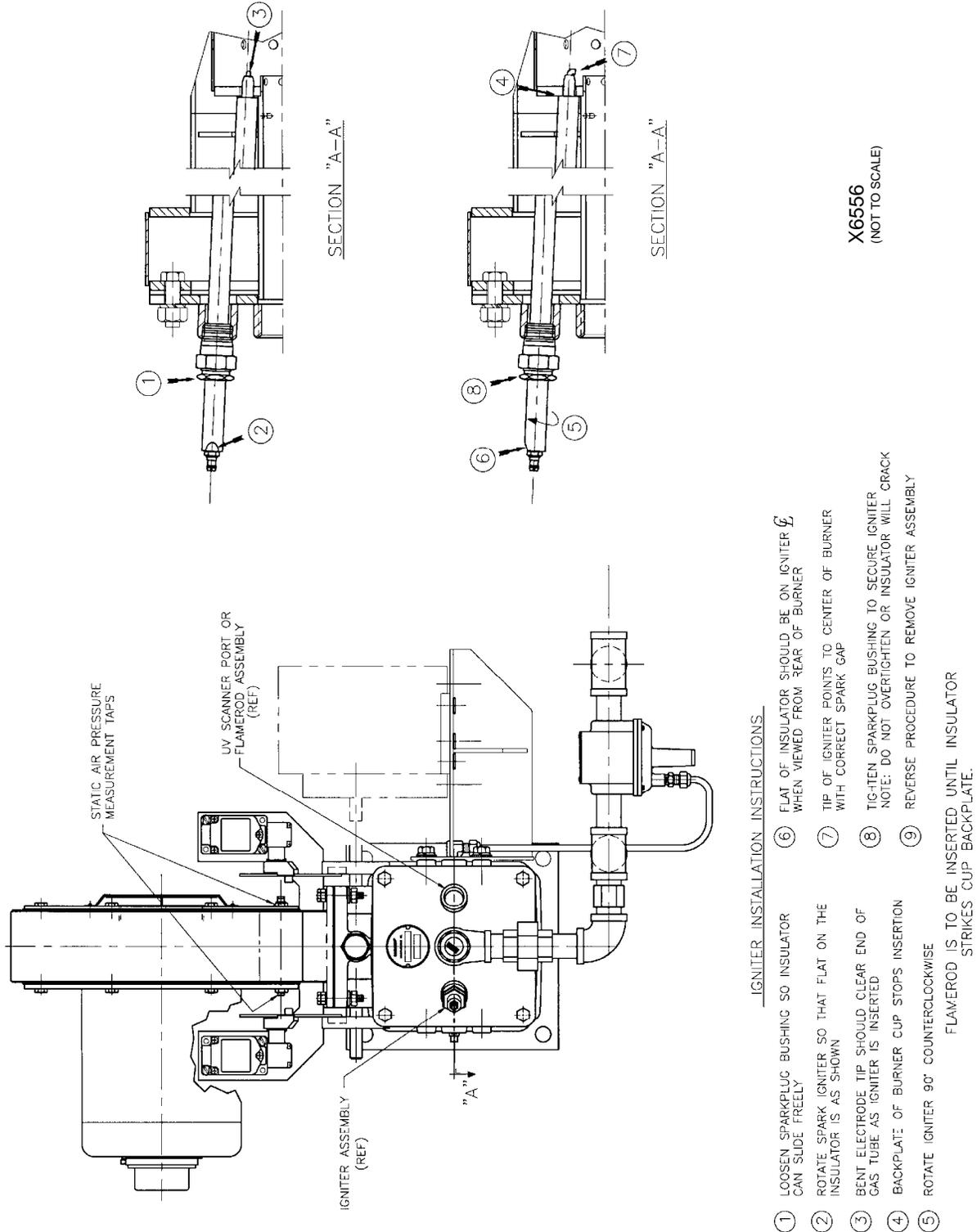


Figure 1. Spark Igniter Installation

J. OPERATION

Sequential operation of the PBG burner will depend on the control method used on the burner. Typically, the following will occur. **Consult with control system instructions specific to the installation to verify exact operation sequence.**

1. Panel is energized, and burner control motor opens to the high fire position.
2. Gas pressure, temperature and auxiliary limits close.
3. High fire limit switch closes.
4. Combustion air blower starts.
5. Combustion air pressure switch closes.
6. Purge timer starts.
7. Purge completes.
8. Burner control motor drives to low fire.
9. Low fire limit switch closes.
10. Ignition sequence starts.
 - a. Ignition transformer is energized.
 - b. Gas safety shutoff valves open.
11. Flame is detected (upon successful light-off).
12. Ten-second trial for ignition completes.
13. Burner control motor responds to temperature controller output.

NOTE

Maintain electrical power supply to the blower motor until the chamber or furnace temperature is below 200°F (93°C). If the blower is shut off with a hot chamber, hot air may exhaust through the burner and damage internal components.

K. FLAME MONITORING

The PBG burner may be ordered with either a flame rod or an ultraviolet (UV) scanner. If UV scanners are used on an oven or furnace with multiple burners, care should be exercised so that the UV scanner from one burner does not sense the flame from another burner in the oven or furnace.



WARNING

If standard full wave coil ignition transformer is used along with the UV flame scanner, provisions must be made to eliminate the possibility of the ignition transformer falsely satisfying the UV scanner. Hauck designed flame supervisory panels eliminate this potential problem by timing out the spark igniter after the trial for ignition period.

L. SHUT-OFF VALVE LEAK TESTING

In addition to leak testing the entire manifold, the automatic shutoff valves should also be leak tested. Both the main and blocking valve should be leak tested on a yearly basis at minimum. Refer to the gas piping diagram for leak testing shown in Figure 2.

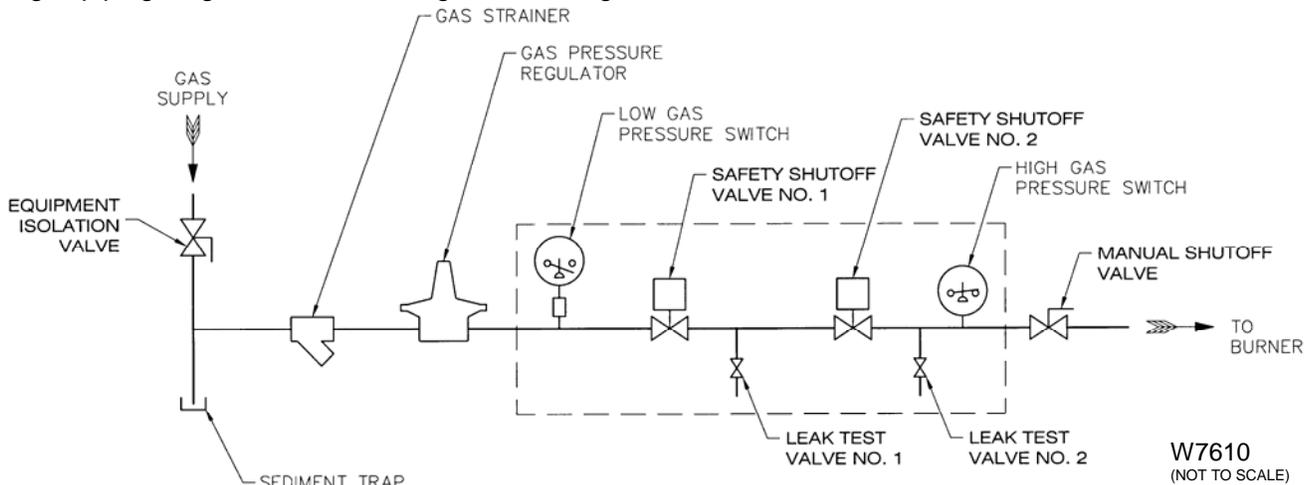


Figure 2. Gas Piping Diagram for Leak Testing

1. Shutoff the burner(s) and furnace.
2. Close the manual shutoff valve downstream of Safety Shutoff Valve No. 2.
3. Open the equipment isolation valve upstream of Safety Shutoff Valve No. 1.
4. Bleed off trapped gas by opening **both** Leak Test Valves No. 1 and No. 2.
5. Close Leak Test Valve No. 2.
6. Connect 3/16" (4.8mm) ID tubing to Leak Test Valve No. 1 and immerse the open end of the tubing in a container of water. Hold the tubing vertically 1/8 to 1/4" (3 to 6 mm) below the surface. If bubbles appear, record the leakage rate in bubbles/min and refer to the **IMPORTANT** note at the end of this section.
7. Close Leak Test Valve No. 1 and apply auxiliary power to open Safety Shutoff Valve No.1.
8. Wait several minutes so that any leakage through Safety Shutoff Valve No. 2 will have time to fill the pipe between Safety Shutoff Valve No. 2 and the manual shutoff valve.
9. Connect the tubing to Leak Test Valve No. 2 and immerse the open end in water as before. Open Test Valve No. 2. If bubbles appear, record the leakage rate in bubbles/min and refer to the **IMPORTANT** note at the end of this section.
10. When no leaks are detected, open the shutoff valve at the outlet of the PGM and return to normal operation.

IMPORTANT

The fact that bubbles are present during the leak test does not necessarily mean that a safety shutoff valve is not functioning properly in the closed position. Refer to the National Fire Protection Association's publication NFPA 86 for acceptable leakage rates for a given pipe size per UL, ANSI, CSA, FM or EN standards. **If the acceptable bubbles/min leakage rate is exceeded, the safety shutoff valve is leaking and the manufacturer's instructions should be referenced for corrective action.**



WARNING

Do not attempt to operate the combustion system until all leaks are repaired.

M. MAINTENANCE

The Hauck PBG Packaged Burner has no moving parts requiring lubrication. However, preventative maintenance can eliminate costly down time. Periodic maintenance should include the following:

1. Check all pressure switches, clean or replace if necessary. For recommended pressure settings see table below.

Switch	Pressure Settings
Low Air Pressure	4"wc (1.0 kPa)
High Gas Pressure	1 psi (6.9 kPa)
Low Gas Pressure	13"wc (3.2 kPa)

2. Check bolts and screws for tightness.
3. Check operation of flame safety equipment.
4. On a yearly basis as a minimum, the safety shutoff valve manifold should be leak tested and any leaks be repaired immediately (see Section L).
5. The PBG uses a self-cleaning fan blade which eliminates the build-up of most deposits. If an optional air filter is supplied, periodic cleaning is required to keep the burner operating at maximum efficiency.
 - a. Remove blower assembly from burner body. Be sure to remove any control components and wiring.
 - b. Remove inlet housing cover.
 - c. Using a thin, plastic bristle brush, gently remove any buildup from the fan blades.
 - d. Carefully blow out the fan housing with compressed air to remove any loosened debris.
 - e. Attach the blower to the burner body and reconnect all components.
6. Should it become necessary to remove the spark igniter for cleaning or inspection, the spark igniter must be inserted with the proper orientation to ensure ignition (see Figure 1). The flame rod, if used, inserts the same way as the spark igniter (see Figure 1), however, no particular orientation is required.

NOTE

The PBG spark igniter and flame rod are **NOT** interchangeable. However, if required for clearance or convenience, the spark igniter and flame rod or UV scanner can be installed in either port.

N. RECOMMENDED SPARE PARTS

ITEM	DESCRIPTION	QTY.	PART NO.
1	Spark Igniter Assembly (If Applicable)	1	See Parts List
2	Flame Rod Assembly	1	See Parts List
3	UV Scanner (If Applicable)	1	20579

This page left intentionally blank.