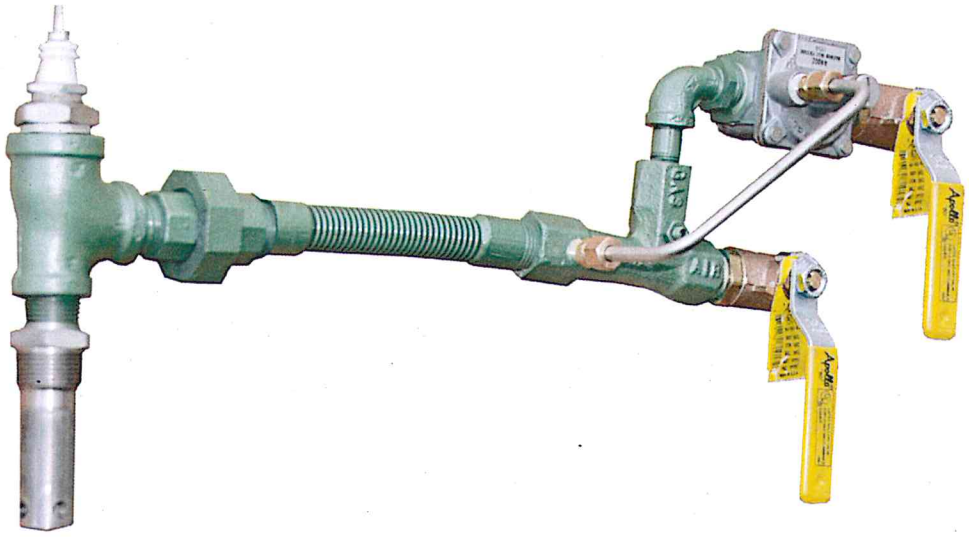
IPG GAS PILOT BURNERS



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

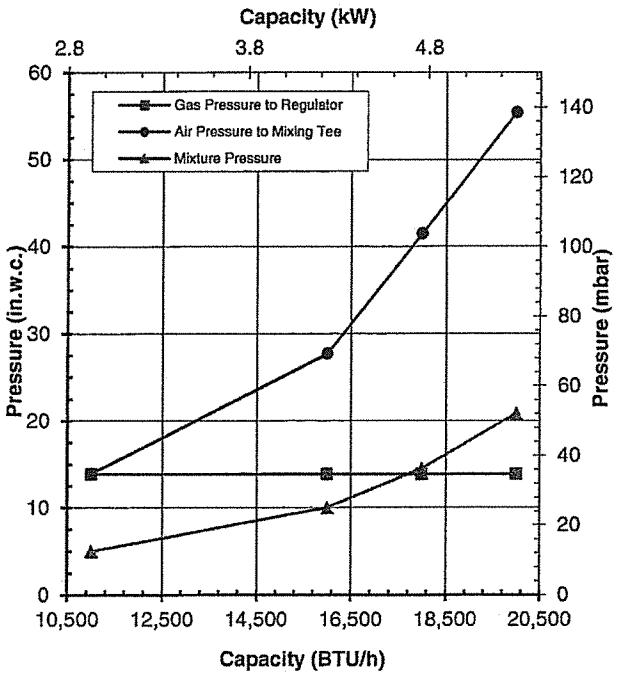
NATURAL GAS, AMBIENT COMBUSTION AIR OPERATION

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^3/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^3 (Standard), and LHV of 10.21 kWh/nm3 (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

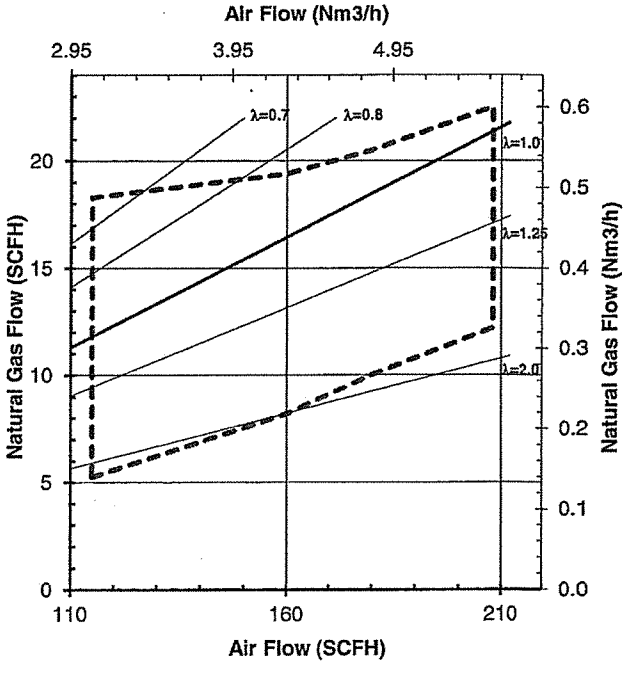


Table 1. IPG_411 Pilot

C. CAPACITIES (Continued)

IPG_412 Pilot

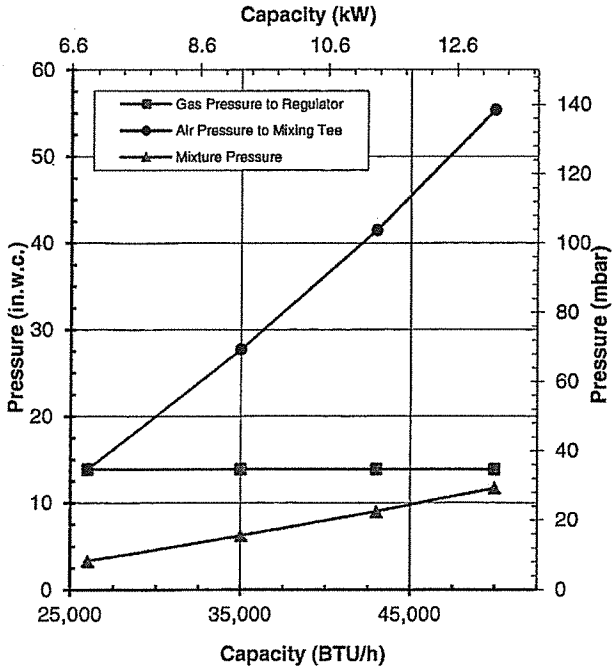
NATURAL GAS, AMBIENT COMBUSTION AIR OPERATION

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^3/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^3 (Standard), and LHV of 10.21 kWh/nm3 (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

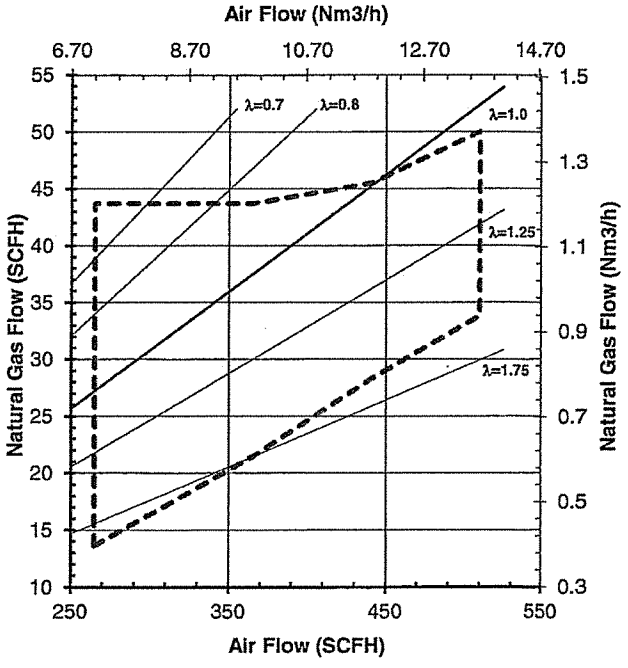


Table 2. IPG_412 Pilot

C. CAPACITIES (Continued)

IPG_413 Pilot

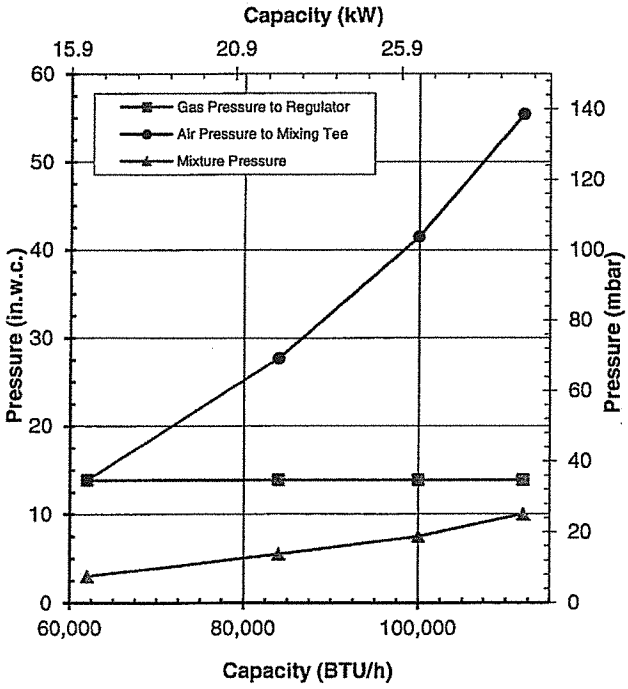
NATURAL GAS, AMBIENT COMBUSTION AIR OPERATION

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^3/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^3 (Standard), and LHV of 10.21 kWh/nm3 (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

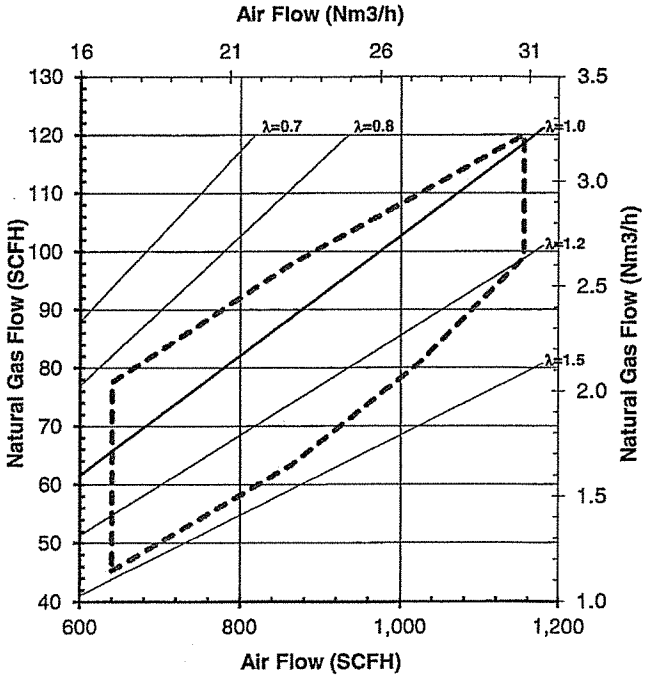


Table 3. IPG_413 Pilot

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 in.w.c. (3.5 - 13.7 kPa) 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 in.w.c. (3.5 kPa) at the inlet of the regulator. The regulator is designed to operate from 13.9 - 27.7 in.w.c. (3.4 - 6.9 kPa); maximum allowable inlet pressure is 27.7 in.w.c. (6.9 kPa).
   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)

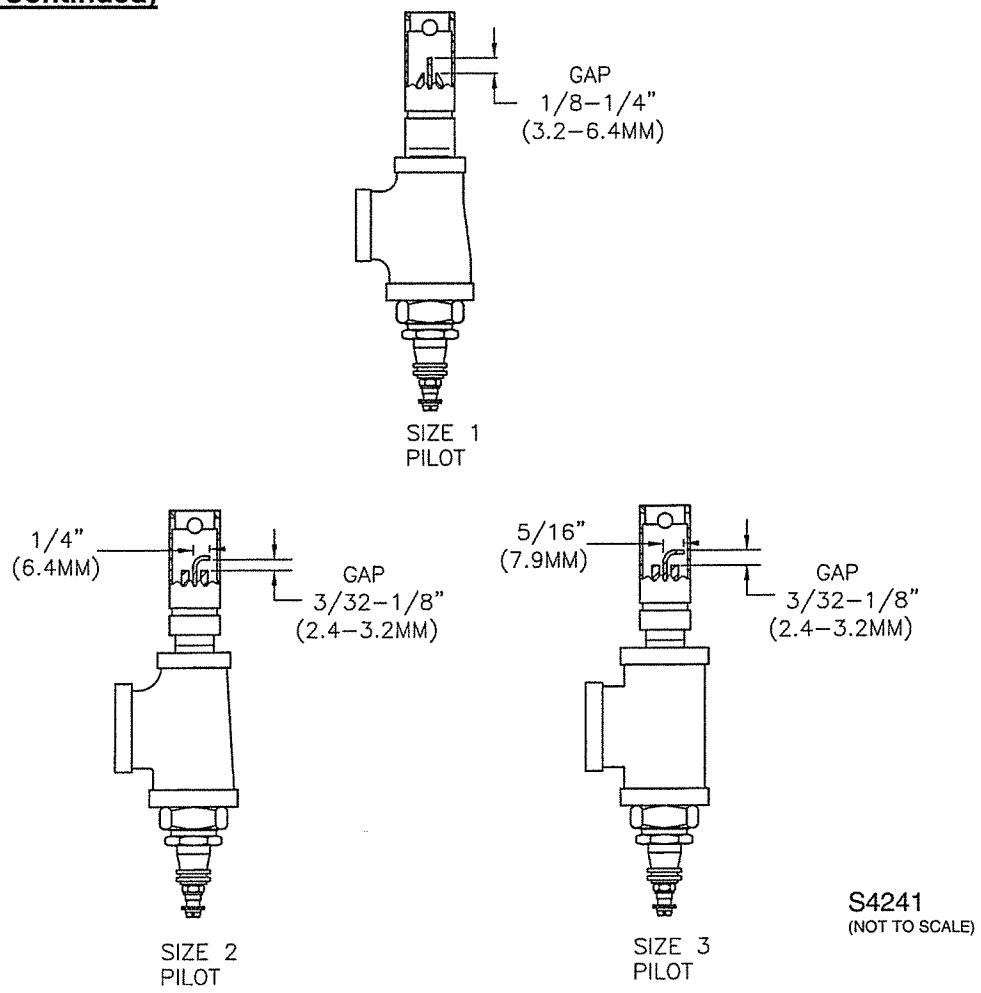


Figure 1. Spark Gap Setting and Electrode Positioning

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.

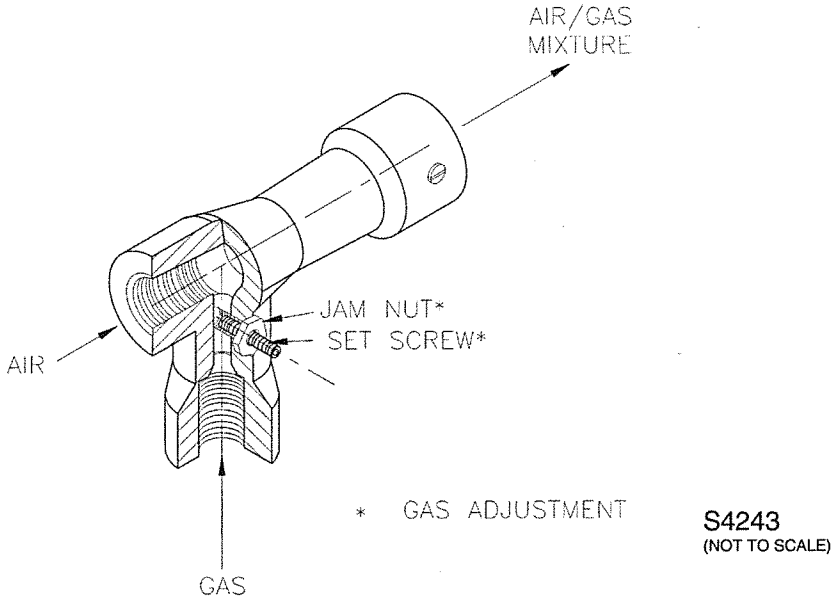


Figure 2. Pilot Mixer Adjustment

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).

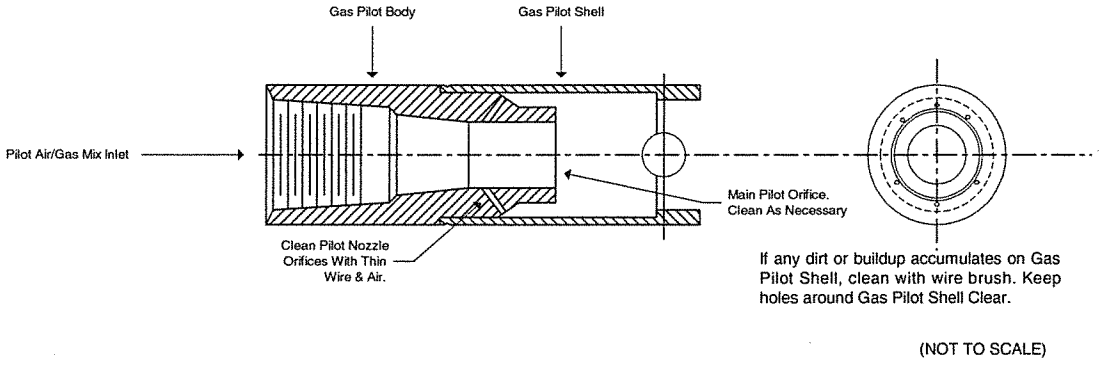


Figure 3. Cleaning Pilot Nozzle and Piloting Holes