

Electrical Power Supply - 115V/60HZ 1 Ph.

MOUNTING: Fixed Flange or Adjustable Flange

These instructions were prepared for the guidance of those installing this particular gas conversion burner. While this applies in principle to all installations, they should not be interpreted as meaning the only safe and economical way to install a conversion burner. It may be necessary to deviate from these instructions in some instances in order to comply with local gas company rules or codes in effect in the area in which the installation is made. It is recommended that the installer confer with the local gas company and with the proper municipal officials regarding any specific code or regulation governing the installation of gas conversion burners, the installation must conform with local codes or, in the absence of local codes, with the American National Standard Installation of Domestic Gas Conversion Burners, Z21.8 latest edition, and the National Fuel Gas Code, ANSI Z223.1-latest edition.

Safe and Economical operation of the burner throughout its service life is dependent to a large extent upon its proper installation in the heating appliance. Therefore, we may impress upon the installer that good clean workmanlike installations mean satisfied customers.

VISUAL INSPECTION OF THE HEATING SYSTEM

A conversion burner shall not be installed in an appliance located in a room or basement where facilities for normal air circulation or infiltration are so limited so as to interfere with ready obtainment of all air necessary for proper combustion and draft hood dilution, unless at the time of burner installation special provisions are made for combustion and draft hood dilution air.

- a. In open basements of homes of normal construction (without basement storm windows or tight stair doors) infiltration of combustion air is usually sufficient to replace that drawn up the flue, so special provisions are seldom necessary.
- b. When the heating appliance is installed in a tightly close room without ventilating openings to outdoors or other rooms, provisions shall be made for supplying air for combustion through special openings, one near the floor line and the other near the ceiling, each to be sized on the basis of one square inch or more of free area for each 1,000 BTU (.2931 kW) input per hour. See Figure 1.
- c. When the house is of unusually tight construction, has a (kitchen) ventilating fan which may be used for exhausting air to indoors, or has a vented fireplace, it is recommended that combustion air be supplied to the furnace room through intakes extending to the outside of the building and terminating in down turned fittings, suitably arranged to prevent obstruction from snow or rain, and including a protecting screen not smaller than 1/4-inch (6.35 mm) mesh.

The heating system (both the heat exchanger and distribution system) shall be of a size to properly heat the building. Through inquiry it shall be determined that all rooms have been heated adequately without wide variations in temperature, without objectionable drafts, and without excessive fuel costs in the past. If the heating system is deficient with respect to any of the above determinations, provisions shall be made to correct the deficiency, replace obsolete parts, or (by storm windows, insulation, etc.) to reduce the heat loss to a point where the existing system will provide the proper amount of heat.

a. Gravity Warm Air System

The supply and return ducts and registers should be sized and arranged so that the house can be heated without excessive furnace temperatures. Reference may be made to the American Society of Heating, Refrigerating and Air-Conditioning Engineers Guide and Data Book series and Handbook of Fundamentals.*

b. Forced Warm Air Systems

Inspection should also show whether the electrical characteristics of the fan and limit switch are satisfactory and whether the air filters and fan are in condition for continued proper service with the gas burner, reference may be made to the American Society of Heating, Refrigerating and Air-Conditioning Engineers Guide and Data Book series and Handbook of Fundamentals.*

c. Hot Water Systems

The boiler thermometer and altitude gauge should be in good order. On a closer system, the feed and pressure relief valves shall be in proper operating condition. If there is an expansion tank on a closer system, inspection should show it to be substantially empty of water. When there is an existing water temperature limiting switch, its operating and electrical characteristics shall be checked to determine its suitability to the gas control circuit. For common piping systems reference can be made to the American Society of Heating, Refrigerating and Air-Conditioning Engineers Guide and Data Book series* and to the Hydronic Institute Guides.**

d. Steam or Vapor System

The system shall be pressure tight, with pressure gauge and pop safety valve in good condition and with an existing water glass which permits clear observation of boiler water level. When there is a pressure limit switch or low-water cut-off, inspection shall determine whether either device can be utilized in the gas burner control circuit, reference should be made to the American Society of Heating, Refrigerating and Air-Conditioning Engineers and Institute of Boiler and Radiator Manufacturers guides. Traps and air vents shall be of adequate capacity, in good condition, and correctly placed in the system. (Coal firing tends to maintain a slight but continuous steam pressure which prevents air from being drawn back into the steam system. Intermittent gas burner operation and resultant intermittent steam supply usually introduces the need for repurging the system of air each time the boiler is steamed if satisfactory heat distribution is to be achieved.)

*copies may be obtained from the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 345 East 47th Street, New York, NY 10017.

^{**} Copies may be obtained from the Hydronic Institute, 35 Russo Place, Berkeley, NJ 07922.

FLUE PIPE AND CHIMNEY

The flue pipe should be carefully inspected and replaced if necessary in connection with installation of a draft hood. All installations must operate with a negative draft overfire. Refer to your local gas company or codes for assistance or to the furnace and/or boiler manufacturer for recommendations.

The flue pipe entrance into the chimney should be at least two feet (.610m) above the clean-out opening in the chimney.

The chimney should extend high enough above the dwelling or other neighboring obstructions so that wind from any direction will not strike the chimney from any angle above horizontal. Unless the obstruction is of greater magnitude, it is the usual experience that a chimney extending two feet above flat roofs or above fire wall parapets, and peaked roofs within 30 feet (9.144m) will be reasonably free of downdraft.

Where the chimney is unlined or where local experience indicates that flue gas condensate might be a problem, the local gas company should be consulted.

The chimney should be examined and thoroughly cleaned, if necessary, before installation is made to make sure it freely conduct the flue gases to the outside.

Flue pipe should extend through the chimney wall to inner face of chimney liner but not beyond, and should be firmly cemented to masonry. A thimble may be used to facilitate removal of flue pipe for cleaning, in which event the thimble should be permanently cemented in place with mortar or other fireproof material that will not crack or check the flue pipe or thimble, whichever is used, should be sealed into the chimney liner.

Flue connections from two or more appliances should not enter opposing or adjacent sides of the chimney at the same level.

Under no circumstances should the flue pipe be connected it to a flue of an open fireplace.

INSPECTION OF HEATING APPLIANCE

A careful inspection of furnace or boiler should be made. If cracked heating sections, leaking soft plugs or any other condition which might make the unit unsatisfactory for gas conversion is found, proper arrangements should be made for replacement or repair before proceeding with the burner installation. Cracked heating sections should be replaced.

A neutral pressure point adjuster, similar to the one shown in figure 2 may be installed in the flue pipe between the furnace and a conventional type CSA draft hood. The neutral pressure point adjustment should be left in the fully open position until after the burner rating has been established. The material used for flue pipe should be resistant to corrosion.

The necessity for installing a neutral pressure point adjuster as outlined above, may be eliminated by reducing the flue pipe and draft hood to the sizes shown in the table.

NOTE: For oil fired conversions consult boiler or furnace manufacturer. Appliance must maintain negative draft overfire.



Ventilating Air Opening 1 Sq. in. for each 1000 Btu per hour input



Application located in confined spaces. Ventilation air from inside building - combustion and draft hood dilution air from outside. Ventilated attic or ventilated craw space. NOTE: Ducts used for make-up air may be connected to the cold air return of the heating system only if they connect directly to outdoor air.

Attic Ventilation Louvers are required at each end of attic with alternate air inlet No. 1.

1, 2, and 3 mark alternate locations for air from outdoors. Free area shall be not less than 1 Sq. in. (645.2 mm2) per 5,000 Btu (.1455 kW) per hour of the total per hour of the total input rating of all appliances in the enclosure.

Crawl-space Ventilation Louvers for unheated crawl space are required with alternate air inlet No. 3.

Each Ventilation Air Opening from inside the building shall have a free area of not less than 1 Sq. in. (645.2 mm2) per 5,000 Btu (.1.465 kW) per hour of the total per hour of the total input rating of all appliances in the enclosure.

Illustration showing air opening necessary to supply air for combustion when heating appliance is installed in an enclosed room.



Suggested form of neutral pressure point adjuster. Insert in slot cut in flue pipe

When adjustment is completed, scribe a line on adjuster so it can be relocated.

Remove adjuster, trim of excess, slit remainder vertically and bend segments in alternative directions.

Replace in flue pipe, recheck adjustment to ascertain unchanged conditions, and fasten adjuster in place with sheet motal screws.

Suggested Construction of a Neutral Pressure Point Adjuster.

FIGURE 2

If there is a by-pass as indicated in Fig. 1, crack bypass and lock. Otherwise install pipe as suggested in Fig. 2.





Suggested method for installing by-pass connection.

FIGURE 3





Recommended Locations for a Horizontal Type Draftbood.



VERTICAL TYPE DRAFT HOOD (Always install in a vertical position)





Recommended Location for Draft Hoods in Flue Pipes for Updraft Type Appliances.

FIGURE 4

PREPARATION OF FURNACE OR BOILER

Clean combustion chamber thoroughly. Scrape and brush all heating surfaces and flue ways. Soot and fly ash are excellent insulators and unless removed the efficiency of the heating plant will be impaired. Plugged or restricted flue passages will prevent burner from operating properly.

Be sure water column and gauge on boiler is clean and water level is visible. In all cases make sure the pigtail to limit control is clear. Safety pop valves on team boilers and automatic relief valves on closed water systems should be thoroughly checked to make sure they are in good working condition.

FLUE PIPE AND DRAFT HOOD

A CSA type draft hood or its equivalent shall be placed in and made part of the flue pipe from the appliance. At no time should the draft hood be located at a point lower than the highest flue passage in the appliance. The draft hood should be installed in the position for which it was designed and in no case installed in a false ceiling, separate room from the heating appliance, or in any other manner that will permit a difference in pressure between the draft hood relief opening and the combustion air supply. On sealed type appliances where all combustion air is taken from the outside, a cap should be installed on end of flue pipe to prevent back drafts. In such cases no draft hood or diverter should be installed inside. See Figure 4.

When converting oil fire appliances the flue pipe and draft hood or diverter used should be the same size as the furnace flue collar. It is recommended that a rise as great as possible or at least 1/4 inch (6.35mm) to the foot (.305m) (horizontal length) be maintained in the flue pipe from the appliance to the chimney. The flue pipe should be relocated where possible to avoid sharp turns.

Not more than 6,500 BTU (1.905 kW) per ir	nch (645.2 mm2) of the flue area
Input - BTU (kW) Per Hour	Draft Hood and Flue Pipe Size
Up to 84,000 (24.62)	5 inch (127mm)

DRAFT HOOD & FLUE PIPE SIZES FOR GAS CONVERSION BURNERS IN UP-DRAFT COAL FURNACES ND BOILERS

NOTE: If the flue pipe exceeds 10 ft. (3.048m) in length, or contains more than two elbows, use next size larger pipe and draft hood.

NO MOVEABLE FLUE PIPE DAMPER SHOULD BE USED ON ANY INSTALLATION.

NOTE: All installations must operate with negative draft overfire. Refer to your local gas company and codes for assistance.

REVERTIBLE FLUE (DOWN DRAFT OR DIVING FLUE TYPE) FURNACES OR BOILERS

When installing the burner in the above type furnaces or boilers, the draft hood (or draft diverter) should be located at least one foot higher than the top of the highest point of the appliance flue passage or combustion chamber. It is also recommended that a vent pipe, not less than one inch in diameter, be provided from the highest point in the flue passage, directly to the flue pipe. This is not necessary on the appliances with built in up draft bypass. (See Figure 3.) The gas company serving the area should be consulted in regards to their recommendations for converting this type of furnace or boiler.

The flue pipe should be securely supported and the joints fastened with sheet metal screws or riveted to prevent sagging, and in no case should be located in a manner that will present a hazard to combustible building material. (Refer to local building code.)

PREPARATION OF COMBUSTION CHAMBER

THE POWER GAS BURNER IS DESIGNED FOR "INSHOT" FIRING INTO A REFACTORY LINED COMBUSTION CHAMBER CONSTRUCTED IN THE ASH PIT OF ANY BOILER OR FURNACE ORIGINALLY DESIGNED FOR COAL OR OIL FIRING. THE SIZE, SHAPE AND CONSTRUCTION OF THE CHAMBER SHOULD BE GIVEN SUCH CONSIDERATION AS WILL RESULT IN THE MAXIMUM EFFICIENCY OF EACH INSTALLATION.

On smaller inputs precast chambers may be used if the firing door and ash pit are large enough to insert the chambers and assemble.

When converting oil designed boilers and furnaces, it is recommended that the same combustion chamber be used with the gas burner. If the blast tube opening into the combustion chamber is larger than the 4" (101.6mm) diameter, high temperature cement should be used to reduce the opening to 4" (101.6mm) diameter.

IN NO CASE SHOULD THE TUBE BE ALLOWED TO EXTEND INTO THE CHAMBER PROPER. IT MUST BE AT LEAST 1/8" (3.175mm) SHORT OF THE INSIDE SURFACE OF THE COMBUSTION CHAMBER.

COMBUSTION CHAMBERS

The combustion chamber sizes given in Figure 5 are based on the maximum rated BTU capacity. If the input is to be permanently set at a reduced rate, the combustion chamber floor area can be reduced proportionately to the proposed input, allowing 200,000 BTU (211000kJ) per square foot (.093m² combustion chamber floor area and proportioning the length about 70% greater than the width.

The height of the walls of the combustion chamber is generally determined by the grate line. The side and front walls should be built about 2" (50.8mm) above the grate line, covering the grate lugs and covering the bases of the water legs of boilers about 3" (76.2mm) or 4" (101.6mm) to avoid heating sections that may be filled with sediment. The back wall should be carried one or two courses higher and overhung to deflect hot gases from direct impingement on the rear heat exchanger surfaces. Hard firebrick should be used for the overhung section to prevent erosion of the brick at this point by the high velocity gases moving over it.

The remaining open spaces between the combustion chamber and ash pit walls should be filled with loose insulation. Since this insulation may not stand combustion chamber temperatures, the top course of the combustion chamber walls be laid flat, extending to, and fitting the contour of the firebox and covering the loose insulation.

Always use cement furnished by the brick manufacturer for cementing insulating firebrick. It should be thinned to the consistency of a very thick cream so that the brick can be dipped into it and set in place. The use of other cement or mortar may impair the insulating and radiating gualities of the brick.

Magnesia block insulation, common brick, hard fire brick, dry sand and/or expanded mica products such a "Vermiculite" or "Zonolite" can be used to back up the insulating firebrick. High temperature furnace cement can be used to seal the openings around the burner and furnace.

Approved insulating bricks are: Babcock & Wilcox No. K-23 and No. K-26, A. P. Grenn No. G-23 and No. G-26, Armstrong Cork No. A-23 and No. A-26 an Johns Manville No. JM-23 and No. JM-26.

INSTALLATION OF BURNER AND CONTROLS

The inshot power gas burner was designed especially for converting gun fired oil designed furnaces and boilers. Due consideration was given to making it as simple and easy to install and service as possible without weakening its durability or efficiency. The burner is supplied as a completely assembled package unit.

NOTE: The burner must be installed in such a manner that they unit and all controls will be readily accessible for inspection, cleaning, adjustment and repairs.

SIZING OF INPUT IN RELATION TO FURNACE

FIGURE 140,000 BTUs (147700KJ) per gal. of oil input. For example: Furnace rating 0.60 G.P.H. then 0.60 x 140,000 = 72,000 BTUs input rate

The orifice spud supplied with all burners is the size for the minimum BTU input of the burner for the type gas shown on the rating plate. On page 17, under parts lists, shows the correct drill size for various inputs.

The correct manifold pressure for natural and LP gas is 3.5" w.c(871.8 Pa). Only minor adjustments in the input rate should be made by adjusting the pressure regulator. The minimum manifold pressure should be 3.0" w.c. (747.2Pa) and the maximum pressure should be 3.5 w.c. (871.8 Pa) the next size larger or smaller orifice size should be used if the desired input rating cannot be obtained within the above manifold pressure adjustment range.

Input	Floor Area	Preferred
BTU/Hr.	Sq. Inches	Width and
	(mm=)	
Up to 30,000 (14.65)	49 (51610)	7 (177.8) X 7 (177.8)
up to 84,000 (24.91)	56 1/4 (36290)	7 1/2 (190.5) X 7 1/2 (190.5)

Recommended Min. Wall Thk.: 2 1/2" (63.5mm) insulating firebrick plus back up of 1 1/2" (38.1mm) or more losse insulation. Recommended Min. Floor Construction: 2 1/2" (63.5mm) insulating firebrick plus back up of 1 1/2" (38.1mm) magnesis block.

FIGURE 5

HONEYWELL S87KDI SYSTEM







ELECTRICAL WIRING

The power burner is shipped completely wired. It is only necessary to supply the 115 volt circuit, thermostat and limit circuit. All wiring must conform with the National electric Code or the code legally authorized in the locality where the installation is being made. The burner, when installed, must be electrically grounded in accordance with local codes or, in the absence of local codes, with the National Electrical Code, ANSI/NFPA No. 70-latest edition. See wiring diagrams, Figure 6, page 6.

If an external electrical source is utilized, the conversion burner, when installed, must be electrically grounded in accordance with local codes or, in the absence of local codes, with the National Electrical Code ANSI/NFPA No. 70-latest edition.

CAUTION: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

LIMIT CONTROL SWITCHES

Warm air furnaces (gravity and forced air) should be equipped with an automatic temperature limit control switch. Hot water boilers (forced or gravity) should be equipped with an automatic temperature limit control switch.

Steam or vapor boilers be provided with means to guard against firing a dry boiler or one in which the water is dangerously low.

IMPORTANT: On installations where an oil burner replaced with a gas burner, the controls on the boiler or furnace will have to be checked for compatibility with the gas burner. All controls should be checked to insure that they operate properly and that they are in good condition. In no case should any limit or safety control be bypassed or wired in such a manner that it will result in unsafe operation of the burner or appliance. If the controls on the appliance are not compatible with the burner operation they should be replaced with the proper controls.

THERMOSTAT

The thermostat should be installed on an inside wall and should be located in the natural circulating path of room air. Locations which would expose the thermostat to cold air, or drafts from windows, door, or openings leading to the outside, or to air currents from cold or warm air registers, or where the natural circulation of air is shut off such as behind doors, above or below mantels, shelves or in corners, should be avoided. The thermostat should not be exposed to heat from nearby radiators, lamps, rays of the sun or mounted on a wall near pipes, warm air ducts or chimney flue. Any hole in the plaster or panel through which the thermostat wires pass should be sealed to prevent drafts.

The maximum comfort to be obtained from any automatic heating installation is dependent to a great extent upon the proper installation and adjustment of the room thermostat.

GAS PIPING

All piping must comply with local codes and ordinances or the National Fuel Gas Code ANSI Z223. 1-latest edition and NFPA No. 54. A sediment trap or drip leg must be installed in the supply line to the burner.

A union shall be installed in the gas line adjacent to the upstream from the control manifold and downstream from the manual main shutoff trap or drip leg must be installed in the supply line to the burner.

A 1/8" N.P.T. (3.175mm) plugged tapping accessible from test gauge connection shall be installed immediately upstream of the gas supply connection for the purpose of determining the gas supply pressure to the burner.

A manual shutoff valve shall be installed in the gas supply line external to the appliance, see Figure 7.

The gas line should be a separate supply direct from the meter to the burner. It is recommended that new pipe; be used and located so that a minimum amount of work will be required in future servicing. The piping should be so installed as to be durable, substantial and gas tight. It should be clear and free from cutting burns and defects in structure or threading. Cast iron fittings or aluminum tubing should not be used for the main gas circuit. Joint compounds (pipe dope) should be used sparingly on male threads only and be approved for all gases.

It is recommended that the pipe diameter table on next page be used to determine the size pipe to use from the meter to the burner.

The building structure should not be weak ended by installation for the gas piping. The piping should not be supported by the other piping, but should be firmly supported with pipe hooks, straps, bands or hangers. Butt or lap welded pipe should not be bent.

The gas piping should be so installed so as to prevent an accumulation of condensation and it must be protected against freezing. A horizontal pipe should be pitched so that it grades toward the meter and is free from sags. The pipe should not be run through or in an air duct or clothes chute.

The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of the system at test pressure in excess of 1/2 (3447 PaG) psig.

The appliance must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 (3447 PaG) psig.

TESTING PIPING FOR LEAKS

Before turning gas under pressure into piping, all openings from which gas can escape should be closed. Immediately after turning on gas, the system should be checked for leaks. This can be done by watching the 1/2 cubic feet (.014m³) test dial and allowing 5 minutes to show any movement, or by scaping each pipe connection and watching for bubbles. If a leak is found, make the necessary repairs and repeat the above test.

DEFECTIVE PIPES OR FITTINGS SHOULD BE REPLACED AND NOT REPAIRED. <u>NEVER USE A FLAME OR FIRE</u> IN ANY FORM TO LOCATE GAS LEAKS, USE A SOAP SOLUTION.

After the piping and meter have been checked completely, purge the system of air. Do not bleed the air inside the furnace. Be sure to relight all the gas pilots on other appliances.

PURGING

After the piping has been checked, all piping and appliances receiving gas through the meter shall be fully purged. A suggested method for purging the gas line to the burner is to disconnect the pilot line at the outlet o the pilot valve. Under no circumstances shall the line be purged into the combustion chamber.

After the gas line to the conversion burner has been fully purged and the pilot line reconnected, the gas supply at other pilot burners located on other gas appliances which were extinguished as the result of interrupted service shall be reignited. LENGTH OF STANDARD PIPE THREADS IN INCHES(MM)

PIPE SIZE	EFFECTIVE LENGTH OF THREAD	OVERALL LENGTH OF THREAD
3/8(9.53)	3/8(9.53)	9/16(14.29)
1/2(12.7)	1/2(12.7)	3/4(12.7)
3/4(12.7)	1/2-9/16(14.29)	13/16(20.64)
1(25.4)	9/16(14.29)	1(25.4)

	Nominal Diameter of Pipe in Inches (mm)				
3/4 (19.05) 1 (25.4) 1-1/4 (31.75) 1-1/2 (38.1) 2 (50.8					2 (50.8)
Length of Pipe in Feet (Meter)	Sp. G	Capacity-0 r. Gas and Pres	Cu, Ft. (m3) Per ss. Drop of 0.3 in	Hr. with a 0.6 n. (74.72 Pa) W	ater Col.
15 (4.572)	172 (4.87)	345 (9.77)	750 (21.24)		
30 (9.144)	120 (3.4)	241 (6.82)	535 (15.15)	850 (24.07)	
45 (13.72)	99 (2.8)	199 (5.64)	435 (12.32)	700 (19.82)	
60 (18.29)	86 (2.44)	173 (4.90)	380 (10.76)	610 (17.27)	
75 (22.86)	77 (2.18)	155 (4.34)	345 (9.77)	545 (15.43)	
105 (32)	65 (1.84)	131 (3.71)	285 (8.07)	450 (12.74)	920 (26.05)
120 (36.58)		120 (3.4)	270 (7.65)	420 (11.89)	860 (24.35)
180 (54.86)		100 (2.83)	225 (6.37)	350 (10.76)	720 (20.39)

MULTIPLIER FOR VARIOUS SPECIFIC GRAVITIES

SPECIFIC GRAVITY	MULTIPLIER	SPECIFIC GRAVITY	MULTIPLIER
.35	1.31	1.00	.775
.40	1.23	1.10	.740
.45	1.16	1.20	.707
.50	1.10	1.30	.680
.55	1.04	1.40	.655
.60	1.00	1.50	.633
.65	0.962	1.60	.612
.70	0.926	1.70	.594
.75	0.895	1.80	.577
.80	0.867	1.90	.565
.90	0.817	2.10	.535

To convert the figures given to capacities for another gas of different specific gravity, multiply the tabular values by the multiplier shown in the Specific Gravities Table.





Location of Union and Drip Leg for Connecting Burner to Housing Piping

PROPER PIPING PRACTICE





LEAVE 2 END THREADS BARE-

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All adjustments below must be made with the following instructions:

1. Draft Gauge	3. (
2. O ₂ or CO ₂ Analyzer	4. \

CO Tester
Water Column Gauge

After the burner has been in operation for 10 minutes and if a neutral pressure point adjuster was installed, proceed as follows. Start from the wide open position and gradually close the neutral pressure point adjustment. Crack observation door about 1/8 inch (3.175mm). Then by holding match flame along opening, the neutral pressure point can be determined. The flame should be drawn in below the center of the door and it should be blown outward above the center. In other words, the pressure below the burner flame. The pressure should be neutral at the center. Closing the adjuster lowers the neutral pressure point and pressure below the burner flame and below atmospheric pressure point and opening the adjuster raises the neutral pressure point.

Once the neutral pressure point has been adjusted, the combination air shutter should be adjusted so that the percent CO2 test must be made at the inlet side of the draft hood. If the CO2 reading is not within the recommended limits, then the combustion air shutter should be re-adjusted and then the neutral pressure point be rechecked and reset if necessary.

IT IS ESSENTIAL TO MAKE CERTAIN THAT THE PRODUCTS OF COMBUSTION DO NOT CONTAIN CARBON MONOXIDE, CO. It is possible to have flame impingement on cold surfaces with resultant CO even if CO2 and O2 are within acceptable limits. The flue gas sample is taken through the same hole used for the CO2 test. CO test instrument must be used for this test.

The most common causes of CO are flame impingement on cool surface and insufficient primary air, both of which could be caused by over firing. The only answer is to reduce the firing rate or increase the primary air.

Combustion efficiency is determined by the percent CO2 and the temperature of the flue gases. These two measurements are taken on the inlet side of the draft hood. Combustion efficiency and stack loss calculators provide slide rule convenience for correlating CO2 and stack temperature readings. These calculators are available from several manufactures of combustion test equipment.

IMPORTANT

DRAFT - When installing Wayne power gas burners in oil fired boilers a minimum negative draft of .02" (4.982 Pa) w.c. over fire must be maintained.

Refer to your local gas company and codes for assistance.

For gas fired equipment requiring a double acting barometric the preferred location of the barometric draft control is part of the bullhead tee shown in figures A, B OR C. During normal operation, flue gases make a right angle turn behind the control, but do not infringe upon it. Should a downdraft occur, air flowing n the opposite direction strikes the control directly, causing it to open outwardly and vents the air into the room with a minimum of resistance. Entrained products of combustion are thus provided greater relief.





FIGURE 8

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FIGURE 8

- 1.NOTE: Read the applicable sequence of burner/primary gas control operation in the Operation and Troubleshooting section before proceeding
- On new gas line installations, air may be trapped in the line, the burner may experience several lockouts until all the air is purged from the lines.
- 2. Turn on the main electrical power and set the thermostat or operation control to call for heat. Allow the burner to run a MINIMUM of 5 minutes to purge combustion chamber and appliance heat exchanger.
- Set the thermostat or operating control below room temperature, shutting the burner "OFF" 1 minute to RESET the primary control.
- 4. Set the thermostat or operating control to call for heat. The burner will start and go through the applicable sequence of burner/primary gas control operation, refer to step 1.
- 5. Once burner is running adjust the orifice manifold pressure regulator.
- 6. A more accurate BTU (kW) input can be determined by using the NATURAL gas service meter with the burner only on (all other gas appliances should be off). The hand on the gas meter dial with the lowest cubic feet valve (fastest revolving dial), should be clocked for one complete revolution and use the following formula.

3600 x cubic ft. (m³)pre revolution x blu (kW) valve/cub ic ft (m³) = BTUIHR (kWIHr) seconds per revolution

EXAMPLE: <u>3600 x 1 x 1000 (.2931kWI)</u>= 300,000 BTUIHR 12 (87.93 kWIHR)

Nat 1000 BTU CUBIC FT. LP 2500 BTU CUBIC FT.

7. After the desired input has been obtained, re-adjust

the primary air damper with test equipment.

8. After the burner has been in operation for at least 10 minutes, assuring combustion chamber and heat exchanger are fully warmed, take combustion analysis flue gas samples just ahead of the draft control in the flue pipe.

NOTE: ALWAYS USE RELIABLE COMBUSTION TEST INSTRUMENTS. BEING PROFICIENT IN THE USE OF THESE INSTRUMENTS AND INTERPRETING THE DATA IS NECESSARY FOR SAFE, RELIAE AND EFFICIENT BURNER OPERATION.

- **9.** Perform the following combustion analysis. All adjustments below must be made with the following instruments: draft gauge, 0₂ or CO₂ analyze and CO tester.
 - A. Adjust the primary air damper to provide about 25% excess combustion air. Confirm this by checking the flue gas for its FREE OXYGEN(0₂) or CARBON DIOXIDE (CO₂) PERCEN-TAGES with a test instrument. Free oxygen should be about 4.5%, or carbon dioxide should be about 9.5% for natural gas, 12.1 % for propane gas.

B. NOTE: Check overfire draft and adjust to NEGATIVE -.01 (2.491 pa) to -.02 (4.982Pa) inches W.C. during burner operation.

OPERATION AND TROUBLESHOOTING

SEQUENCE OF OPERATION — SC80 GAS BURNER UTILIZING HONEYWELL S87K GAS PRIMARY WITH BUILT IN 30 SECOND PREPURGE

On a call for heat, voltage (24V) is applied to motor start relay. Once the fan motor reaches operating rpm combustion air pressure is sensed by the end switch and closes the switch contacts energizing the S89K gas primary control.

THE S87K gas primary control has an internal 30 second prepurge timer. After the initial 30 second prepurge, an internal 8 second safe start check of the S89K will commence. Once this is successfully completed, the S87K simultaneously energizes the gas valve and ignition transformer. Gas flows and the transformer produces an approximate 7300 volt spark end point grounded at the burner head establishing main burner flame.

At the start of each heat cycle, there is a trial for ignition period of four (4) seconds duration. Normally, burner flame will be established before the end of this period. Once the flame is established, sparking will cease and the flame rod will provide flame monitoring to the S87K gas control primary for the remainder of the heat cycle. If the flame should be extinguished during the heat cycle, the S87K gas control primary will go into the 30 second prepurge and 8 second safe start check, then reenergize the gas valve and ignition transformer in an attempt to establish the main burner flame. If this does not occur within the 4 second trial for ignition period, the S87K gas primary control will go into lockout deenergizing the gas valve and ignition transformer.

To restart the system, the main power or thermostat must be de-energized momentarily, then re-energized. If at any time during the heat cycle, there is an insufficient supply of combustion air to the burner, the air switch will open, putting the system into lockout closing the gas valve.

HONEYWELL S87K PRIMARY IGNITION CONTROL **TROUBLESHOOTING GUIDE**

MOTOR DOES NOT RUN



6. REPLACE GAS VALVE.

NO IGNITION ARC ESTABLISHED



NO IGNITION - NO GAS VALVE



LOSES FLAME DURING CYCLE – CONTROL LOCKS OUT ON SAFETY



NOTE: YOU MUST DETERMINE WHAT THE CORRECT ANTICIPATOR SETTING IS BY INSPECTING THE CONTROLLING DEVICE AT THE POINT WHERE THE THERMOSTAT WIRES TERMINATE. TYPICALLY, THIS INFORMATION CAN BE FOUND ON THE BODY OR COVER OF THE CONTROLLING DEVICE. WHEN DETERMINING THE CURRENT DRAW OF THE DUAL HEAD GAS VALVE, BE SURE TO CONSIDER THE SEPARATE AMPERE VALUES FOR EACH VALVE. THESE USUALLY ARE STENCILED ON THE VALVE BODY, AND MUST BE ADDED TOGETHER TO OBTAIN THE CORRECT SUM. (EXAMPLE .4 + .2 = .6). WHEN THE CURRENT DRAW CANNOT BE DETERMINED ACCURATELY BY THE ABOVE METHOD, MEASURE THE CURRENT WITH AN AMPERE METER USING THE 1 AMP SCALE. CONNECT THE METER LEADS IN SERIES WITH ONE OF THE THERMOSTAT LEADS FOR THE ACCURATE READING



EXPOLDED ASSEMBLY VIEW

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37	63913-001	MANIFOLD-SC80 SPECIAL	1	Р
36	15731	SCREW, 6 32 X .312 HEXSLT	4	P
35	16635-002	WASHER, FLAT #8	1	P
34	60177	BUSHING, SNAP INSULATING .50"	1	Р
33	62815-096	ORIFICE, .096" (#41) DRILL	1	p
32	63640 001	DECAL, RATING SC80	1	P
31	63705-001	WIRE, HARNESS-SC80	1	P
30	62047	CLAMP, CABLE .44"ID	1	P
29	63637-001	VALVE, WHITE RODGERS 25M72-703	1	P
28	15766	PLUG. PIPE-1/8 NPT	1	P
27	61684	POP RIVET .12 X .28	2	p
26	62406-002	RELAY. 24V 50/60 Hz	1	P
25	60178-002	T-T TERMINAL	1	Р
24	60186 004	TRANSFORMER, 120V/24V 50/60 H2	1	p
23	62903-001	BOX.CONTROL W/STRAP	1	P
22	550017	NIPPLE CLOSE-3/8 NPT	. 1	P
21	62411-017	WIRE, ASSEMBY WHITE 3"	1	P
20	63673 001	COUPLING.REDUCER-3/4 TO 3/8	1	P
19	63641-001	BRACKET, CONTROL MOUNT-SCBO	1	р
18	101243-001	CONTROL, IGN-H S87K1008 DI	1	Р
17	62899	LID, CONTROL BOX PLATED	1	р
16	61755	SCREW, RDPLMC 10-32 X 1.25"	1	P
15	60054	NUT, HEX 10-32	2	P
14	60226	BUSHING, METAL 7/8 HOLE ADAPTER	2	Р
13	13026	BUSHING STRAIN RELIEF .562 HOLE	1	P
12	61624 002	NIPPLE-3/4" X 4" TBE BLK	1	P
11	60001-002	ELBOW, PIPE-3/4NPT 90* FEMALE	1	Р
10	63646-001	A5SEMBLY, VENTURI	1	M
8	63566-001	SHUTTER, AIR-CROWN	1	Ρ
7	60172 002	MOTOR/BLOWER ASM 115V/50-60 HZ	1	P
6	63620-001	GASKET, END CAP	1	P
5	63716-001	TUBE/FLANGE WELDMENT-PAINTED	1	M
4	100603-008	SCREW, HXSLT 8-18 X 1.25	2	Р
3	12697 002	SCREW, HXSLT 23 10 24 X .375	4	Р
2	12697	SCREW, HXSLT 23 10-24 X .5	7	Р
1	100603-001	SCREW, 6-20 X .375	4	P
ITEM	I PART NO.	DESCRIPTION	QTY	TYPE
		Parts List		

*-NOT SHOWN

Natural Gas Orifice chart for SC80 @ 3.5" w.c.

BTU/HR Rating	Orifice diame	eter In. (drill s	ize) In mm	WCS Part #
80,000	0.1695	(#18)	4.31	62815-169
70,000	0.1590	(#21)	4.04	62815-159
60,000	0.1495	(#25)	3.80	62815-149
50,000	0.1360	(#29)	3.45	62815-136
40,000	0.1200	(#31)	3.05	62815-120
30,000	0.1040	(#37)	2.64	<u>62815-1040</u>
20,000	0.0860	(#44)	2.18	62815-086
<u>LP Orifi</u>	ce Chart for "St	andard" SC8	30@3.5"w.	<u>c.</u>
80,000	0.1360	(#29)	3.45	62815-136
70,000	0.1260		3.20	62815-126
60,000	0.1180		3.00	62815-118
50,000	0.1065	(#36)	2.71	<u>62815-106</u>
40,000	0.0960	(#41)	2.44	62815-096
30,000	0.0846		2.15	62815-0846

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LIMITED WARRANTIES FOR OIL AND GAS BURNERS, MADE BY WAYNE AND USED IN RESIDENTIAL INSTALLATIONS

WAYNE COMBUSTION SYSTEMS ("WAYNE") warrants to those who purchase its Oil Burner Models for resale or for incorporation into a product of resale, that its burner is free from defects in material and workmanship under normal use and service for thirty-six (36) months from the date of manufacture. ALL GAS BURNERS manufactured by "WAYNE" will be similarly warranted for eighteen(18) months from date of manufacture except where original manufacture offers a greater warranty. (Reference #6 below) THESE LIMITED WARRANTIES DO NOT APPLY UNLESS THE BURNER COVERED BY IT IS PROPERLY INSTALLED BY A QUALIFIED, COMPETENT TECHNICIAN, WHO IS LICENSED WHERE STATE AND/OR LOCAL CODES PREVAIL, AND WHO IS EXPERIENCED IN MAKING SUCH INSTALLATIONS, IN ACCORDANCE WITH NFPA #31 OF THE NATIONAL FIRE PROTECTION ASSOCIATION AND IN ACCORDANCE WITH ALL LOCAL, STATE AND NATIONAL CODES.

Any **IN-WARRANTY** burner component which is defective in material or workmanship will be either repaired or replaced as follows:

- Fuel units, motors, transformers, gas valves, and controls should be returned to an authorized service station or distributor of WAYNE for determination of applicability of this LIMITED WARRANTY as to either repair or replacement, where said service station or distributor is reasonably available in the customer's locality. The manufacturers of burner components regularly publish and distribute listings showing the locations of their network of service stations. Where such local service is NOT available for the burner components described above or other burner parts are involved, these items should be returned, freight prepaid, to WAYNE Service Department, 801 Glasgow Ave, Fort Wayne, Indiana 46803.
- 2. Burners and/or component(s) determined to be covered under this LIMITED WARRANTY by WAYNE shall be repaired or replaced at WAYNE's sole option.
- 3. WAYNE is not responsible for any labor cost for the removal and replacement of said burner or burner components and equipment associated therewith.
- 4. A burner so repaired will then carry the LIMITED WARRANTY equal to the unexpired portion of the original burner LIMITED WARRANTY.
- If inspection by WAYNE does NOT disclose any defect covered by this LIMITED WARRANTY, the burner or burner component(s) will be either repaired or replaced at the expense of the customer and WAYNE's regular charges will apply.
- 6. If the original manufacturer of a burner component offers a warranty greater than either of our LIMITED WARRANTIES described above, then this portion will be added to our LIMITED WARRANTY.

This LIMITED WARRANTY does **NOT** cover products which have been damaged as the result of accident, abuse, misuse, neglect, improper installations, improper maintenance or failure to operate in accordance with WAYNE's written instructions.

These LIMITED WARRANTIES do not extend to anyone except the first purchaser at retail and only when the burner is in the original installation site.

IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE SHALL BE LIMITED TO THE DURATION OF THE LIMITED EXPRESS WARRANTIES CONTAINED HEREIN. WAYNE EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY NATURE FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY.

Some states do not allow limitation on how long an implied warranty lasts, so the above limitation may not apply to you. Also, some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. WAYNE neither assumes or authorizes any person to assume for WAYNE any other liability or obligation in connection with the sale of these products. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.