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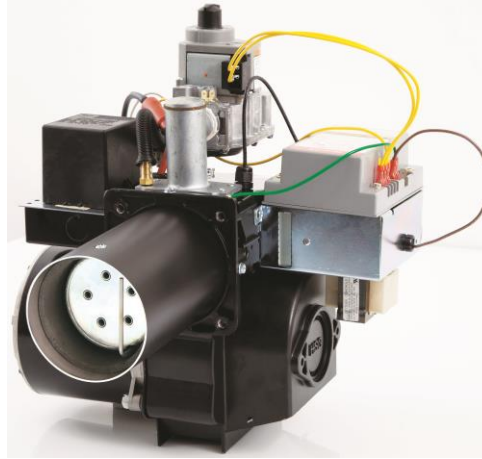


HSG200
HSG400

Gas Burners

Manual 62484 | Revision D | Publication Date: 8/17/2018

Note: Dimensions in parentheses () are informational only. English values take priority.



CSA CERTIFICATION:
 189810-1154925

ANSI Z21.17
 MASS G3-0903-67

SPECIFICATIONS

BURNER MODELS	MINIMUM INPUT	MAXIMUM INPUT	Air Tube Standard Lengths
HSG200	60,000 Btu/hr (18 kW)	200,000 Btu/hr (59 kW)	6, 9, 12 in. (153, 229, 305 mm)
HSG400	200,000 Btu/hr (59 kW)	400,000 Btu/hr (117 kW)	6, 9, 12 in. (159, 229, 305 mm)

FUELS: Natural Gas and LP Gas **FLAME SAFETY:** 24 Vac Electronic **IGNITION:** 7300 Vac Direct Spark

AVAILABLE VOLTAGES: 120 Vac 60 Hz, 230 Vac 50/60 Hz 1 Phase

AIR TUBE DIAMETER: 4 in (101.6 mm) **MOUNTING:** Adjustable Flange is standard; Pedestal Mount is Optional



READ THIS MANUAL BEFORE USING THIS PRODUCT. FAILURE TO FOLLOW THE INSTRUCTIONS AND SAFETY PRECAUTIONS IN THIS MANUAL CAN RESULT IN SERIOUS INJURY OR DEATH. KEEP THIS MANUAL FOR FUTURE REFERENCE.



INSTALLTION OF THE BURNER MUST BE DONE BY A QUALIFIED INSTALLER IN ACCORDANCE WITH REGULATIONS OF THE NATIONAL FUEL GAS CODE ANSI Z223.1/NFPA54, AND IN COMPLETE ACCORDANCE WITH ALL LOCAL CODES AND AUTHORITIES HAVING JURISDICTION.

A QUALIFIED INSTALLER IS THE PERSON WHO IS RESPONSIBLE FOR THE INSTALLATION AND ADJUSTMENT OF THE EQUIPMENT AND WHO IS LICENSED TO INSTALL GAS-BURNING EQUIPMENT IN ACCORDANCE WITH ALL CODES AND ORDINANCES.

Overview of Safety Warning System and Your Responsibilities

The safety of you and others depends upon you thoroughly reading and understanding this manual. If you have questions or do not understand the information presented in this manual, **please call Wayne Combustion System or see www.waynecombustion.com.**



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. The meaning of this safety alert symbol is as follows: **Attention! Become alert! Your safety may be at risk. The message that appears next to the warning which can be either written or pictorially presented. NEVER remove or tamper with the warning labels, safety devices or guards fitted on the unit.**

Wayne Combustion System is **NOT** responsible for any bodily injury and/or property damage that may result from operation outside of the stated operating conditions for which this unit was intended.

Hazard Definitions:



Indicates a hazardous situation, which, if not avoided, will result in **death or serious bodily injury.**










Indicates a hazardous situation, which, if not avoided, could result in **death or serious bodily injury.**




Indicates a hazardous situation, which, if not avoided may result in **minor or moderate bodily injury.**



Indicates a situation that may result in equipment-related damage.

Hazard Level	Pictogram	Type	Hazard Explanation
 WARNING		Fire or Explosion	<p>Failure to follow safety warnings exactly could result in serious injury, death or property damage. Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.</p> <p>WHAT TO DO IF YOU SMELL GAS:</p> <ul style="list-style-type: none"> • Open windows. • Do not try to light any appliances. • Do not touch electrical switches; do not use any phone in your building. • Extinguish any open flame. • Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. • If you cannot reach your gas supplier, call the fire department.
 WARNING		Electric shock or burn	<p>High voltages are present in this equipment. Follow these rules to avoid electric shock:</p> <ul style="list-style-type: none"> • Use only a properly grounded circuit. A ground fault interrupter is recommended. • Do not spray water directly on burner. • Turn off power before servicing. • Read the owner's manual before using.
 WARNING		Overheating	<p>Should overheating occur:</p> <ul style="list-style-type: none"> • Shut off the manual gas control to the appliance. • DO NOT shut off power to the equipment, allow blower to continue running.
 WARNING		Carbon Monoxide Poisoning	<p>Carbon monoxide is a colorless, odorless gas that can kill. Follow these rules to control carbon monoxide:</p> <ul style="list-style-type: none"> • Do not use this burner if in an unvented, enclosed area. Carbon monoxide may accumulate. • Do not adjust the pressure regulator. High pressures produce carbon monoxide. • Check flue gases for carbon monoxide. This check requires specialized equipment. • Allow only qualified burner service persons to adjust the burner. Special instruments and training are required. • Read the burner manual before using. <p>CARBON MONOXIDE POISONING: Early signs of carbon monoxide poisoning are similar to the flu with headaches, dizziness, weakness, nausea, vomiting, sleepiness, and confusion. If you suspect carbon monoxide poisoning, get outside to fresh air immediately, and then call 911. Some people are more affected by carbon monoxide than others. These include pregnant women, people with heart or lung disease or anemia, those under the influence of alcohol, and those at high altitudes. Propane/LP gas and natural gas are both odorless. An odor-making agent is added to each of these gases. The odor helps you detect a gas leak. However, the odor added to these gases can fade. Gas may be present even though no odor exists.</p>

Hazard Level	Pictogram	Type	Hazard Explanation
 WARNING		Proposition 65 material	This product can expose you to chemicals, including lead, nickel, carbon monoxide and sulfur dioxide, which are known to the State of California to cause cancer or birth defects or other reproductive harm. For more information, go to www.p65Warnings.ca.gov .
NOTICE		Special Requirements	When contacting Wayne Combustion Systems for service information, please have the burner specification number and model number when calling or writing. Specification number is at the bottom of the "T" shape on the back of the burner and model number is at the top of the "T" shape on the back of the burner.

If any instructions in the manual are not clear, contact Wayne Combustion Systems at 1-260-425-9200 for assistance.

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SECTION I: INSTALLATION AND SETUP

These instructions were prepared for the guidance of those installing this particular gas conversion burner. While they apply 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 ANSI Z21.8 Installation of Domestic Gas Conversion Burners and ANSI Z223.1 the National Fuel Gas Code, latest version.

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.

- 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.
- When the heating appliance is installed in a tightly closed 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/hr (0.2931 kW) input but not less than 100 square inches. (See Figure 1).
- When the house is of unusually tight construction, has a (kitchen) ventilating fan which may be used for exhausting air from 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.

Ventilating Air Opening
1 Sq. in. (645.2 mm²)
for each 1,000 Btu
(.29 kW) per hour
Input, 100 Sq. in. minimum.

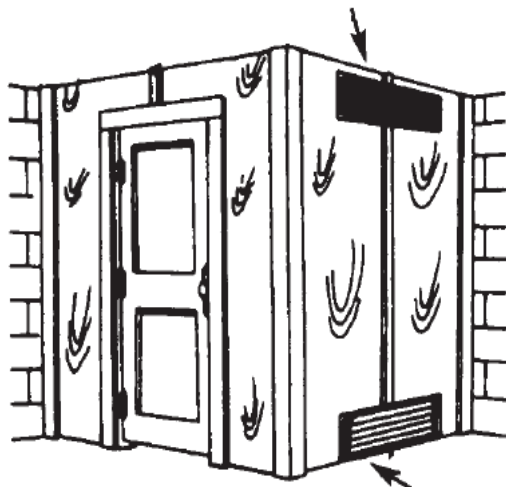


Illustration above shows air opening necessary to supply air for combustion when heating appliance is installed in an enclosed room.

Figure 1

Air Inlet Opening 1 Sq. in. (645.2 mm²) for each 1,000 Btu (.29 kW) per hour input, 100 Sq. in. minimum.

Application below located in confined spaces. Ventilation air from inside building – combustion and draft hood dilution air from outside with ventilated attic or ventilated crawl space.

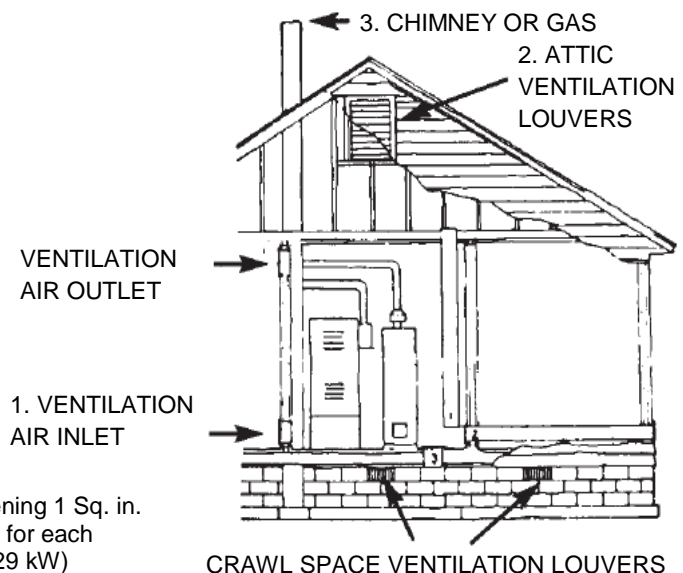


Figure 2

NOTE ON FIGURE 2: 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/hr (1.465 kW) 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 per hour (1.465 kW) of the total input rating of all appliances in the enclosure.

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 installing 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 closed system, the feed and pressure relief valves shall be in proper operating condition. If there is an expansion tank on a closed 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 I=B=R 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.

*Copies may be obtained from the <http://www.ashrae.org>

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

INSPECTION OF FLUE PIPE AND CHIMNEY

- The flue pipe should be carefully inspected and replaced if necessary in connection with installation of a draft hood. A barometric damper may be used per Flue Pipe, Draft Hood, and Barometric Damper section of manual. 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 (0.610m) 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 will freely conduct the flue gases to the outside.
- Flue pipe should extend through the chimney wall to the inner face of the 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 to a flue of an open fireplace.

INSPECTION OF HEATING APPLIANCE

Clean the appliance heat exchanger interior, combustion chamber and flue connections. Remove all adhering tars, scale, dirt, and soot. Inspect the heat exchanger for obvious and potential flue gas leaks. Cement all joints around the appliance base and access openings to prevent air and/or flue gas leakage into or out of the combustion chamber.

Warm Air Furnaces* - Make certain the electrical characteristics of the fan and limit switch correspond to those required by this burner and that they are in proper working order.

Hot Water Boilers* - Make certain water temperature and altitude gauges, pressure relief valves are in proper working order.

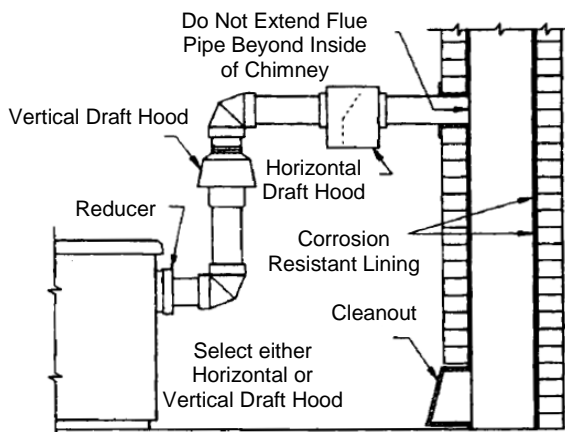
Steam Boilers* - Make certain the system is pressure tight and that the pressure gage and pop off safety valve are in proper working order. Verify existing water sight glass permits clear observation of boiler water level.

*Where applicable, existing temperature of pressure limit switch or low water cut-off switch operation and electrical characteristics shall be checked to determine their compatibility to the gas control circuitry of this burner.

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

FLUE PIPE, DRAFT HOOD, AND BAROMETRIC DAMPER

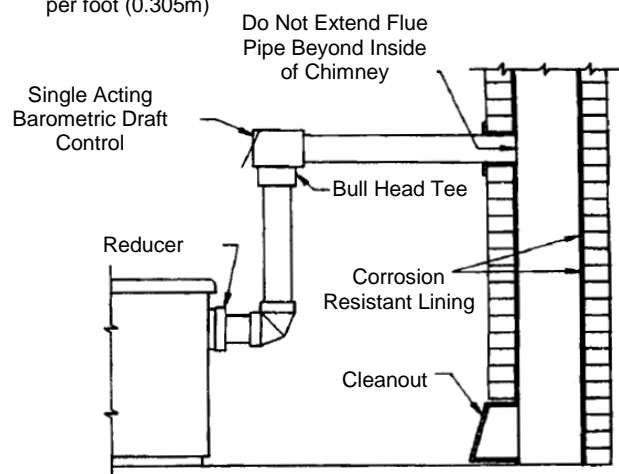
Pitch Horizontal Run
1/4" (6.35mm) MIN.
per foot (0.305m)



Draft Hood Positions

Figure 3

Pitch Horizontal Run
1/4" (6.35mm) MIN.
per foot (0.305m)



Barometric Draft Control Position

Figure 4

Strict compliance to appropriate codes should be made regarding flue pipe clearances from combustible materials. A CSA type draft hood or its equivalent shall be placed in and made part of the flue pipe from the appliance. A barometric damper may be used in place of the draft hood where permitted by local building codes. If an oil barometric damper has been previously installed this may be used if it is in good condition and any and all weights and/or stops are removed. The flapper on a gas barometric damper must be free swinging in both directions. Check with local building codes and building inspectors. 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.

Pitch the horizontal run of the flue pipe upward 1/4 inch (6.35 mm) per foot (0.305 m) or more. Run directly to the chimney, fasten joints securely and support horizontal runs to prevent snagging. If the flue pipe must be extra-long, it's size should be increased. The horizontal length of the flue pipe should not exceed the height of the chimney above the flue connection.

The draft control should be hood type per Figure 3 or, IF APPROVED BY LOCAL AUTHORITIES, a single barometric damper suitable for gas firing per Figure 4. The draft control should be sized the same as the flue pipe per Figure 5. Refer to the barometric draft regulator manufacturer's instructions for complete detail.

NOTICE: Should the flue pass through a partition the draft control must be located in the same room as the heating appliance.

DRAFT HOOD & FLUE PIPE SIZES FOR GAS CONVERSION BURNERS IN FURNACES AND BOILERS

Input Btu/hr (kW)	Drafthood Flue Pipe Size
Up to 120,000 Btu/hr (35 kW)	5 Inch (127 mm) Diameter
120,000 Btu/hr (35 kW) – 180,000 Btu/hr (53 kW)	6 Inch (152 mm) Diameter
180,000 Btu/hr (53 kW) – 250,000 Btu/hr (73 kW)	7 Inch (178 mm) Diameter
250,000 Btu/hr (73 kW) – 320,000 Btu/hr (94 kW)	8 Inch (203 mm) Diameter
320,000 Btu/hr (94 kW) – 410,000 Btu/hr (120 kW)	9 Inch (229 mm) Diameter

Figure 5

- NOTE: If the flue pipe exceeds 10 ft. (3 m) in length, or contains more than two elbows, use next size larger pipe and draft hood.
- NOTE: All installations must operate with negative draft over fire. Refer to your local gas company and codes for assistance.

When installing the burner in revertible flue (down draft or diving flue 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. 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

Clean the 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 appliance will be impaired. Plugged or restricted flue passages will prevent burner from operating properly.

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

When converting oil designed boilers and furnaces, it is recommended that the existing combustion chamber be used with the gas burner, provided it is in good condition. If the blast tube opening into the combustion chamber is larger than the 4" (102 mm) diameter, high temperature cement should be used to reduce the opening to 4" (102 mm) diameter.

IN NO CASE SHOULD THE TUBE BE ALLOWED TO EXTEND INTO THE CHAMBER PROPER. IT MUST BE AT LEAST 1/8" (3.2mm) SHORT OF THE INSIDE SURFACE OF THE COMBUSTION CHAMBER. (SEE FIGURES 6, 7, 8)

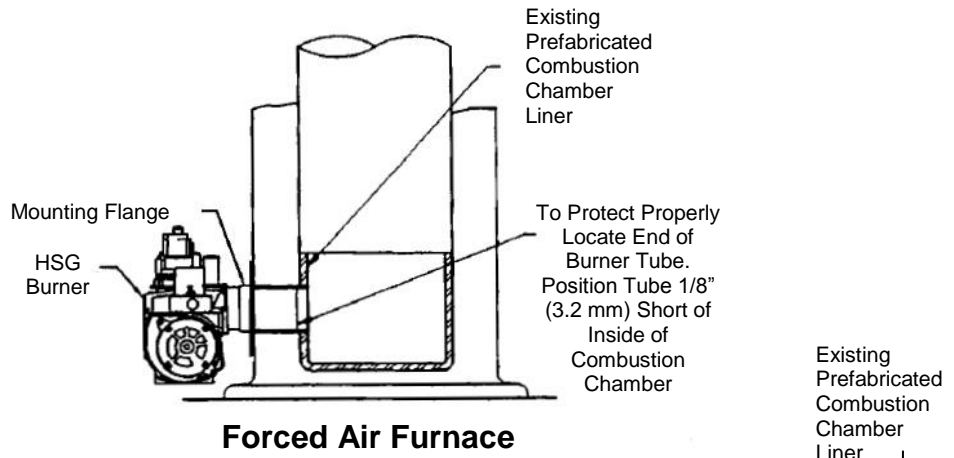
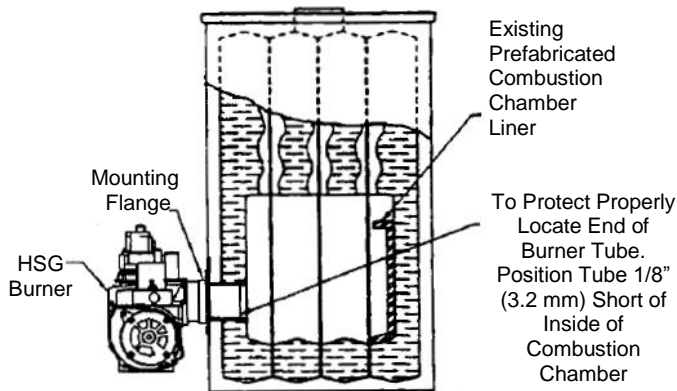
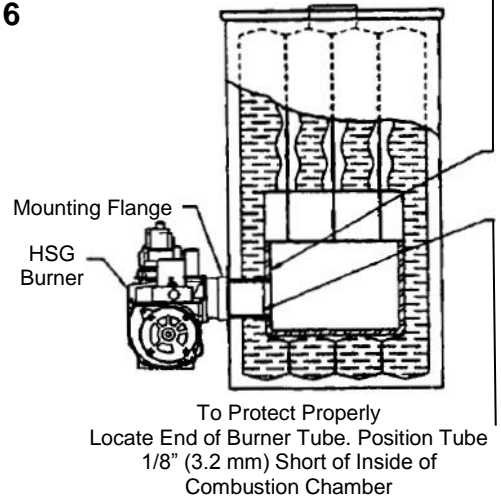


Figure 6



**Hot Water or Steam Boiler
with Combustion Chamber
Target**

Figure 7



**Hot Water or Steam Boiler
with Combustion Chamber
Liner**

Figure 8

SIZING OF COMBUSTION CHAMBER

The following table is provided as a guideline for determining combustion chamber size and corresponding firing rate when appliance rates are not available.

Input Btu/hr (kW)	Preferred	
	Width Inches (mm) x Length Inches (mm)	Diameter Inches (mm)
50,000 (14.7)	7 (177.8) x 7 (177.8)	8 (203)
75,000 (22.0)	7.5 (190.5) x 7.5 (190.5)	9 (229)
100,000 (29.3)	12 (304.8) x 12 (304.8)	13 (330)
150,000 (44.0)	12 (304.8) x 15 (381)	14 (356)
200,000 (58.6)	13 (330.2) x 17 (431.8)	15 (381)
250,000 (73.3)	13 (330.2) x 18 (457.2)	16 (406)
300,000 (88.0)	13 (330.2) x 20 (508)	18 (457)
350,000 (102.6)	14 (355.6) x 21 (533.4)	20 (508)
400,000 (117.2)	15 (381) x 22 (558.8)	21 (533)

Recommended Combustion Chamber Sizes

Figure 9

BURNER INSTALLATION

The HSG200 and HSG400 power gas burners were designed for converting oil fired 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 all controls will be readily accessible for inspection, cleaning, adjustment and repairs.

INSTALLATION OF MOUNTING FLANGE

Position the mounting flange on the furnace wall, adjusting orientation as necessary until the bolt pattern of the furnace allows the flange to sit flush. (See Figure 10 for flange dimensions.)

Note the orientation of the flange and remove it so that the flange gasket may be placed between the furnace wall and the flange. Tighten the flange to the furnace wall.

Insert the burner tube into the flange and position it per Figures 6, 7, 8. Tighten the flange onto the burner tube.

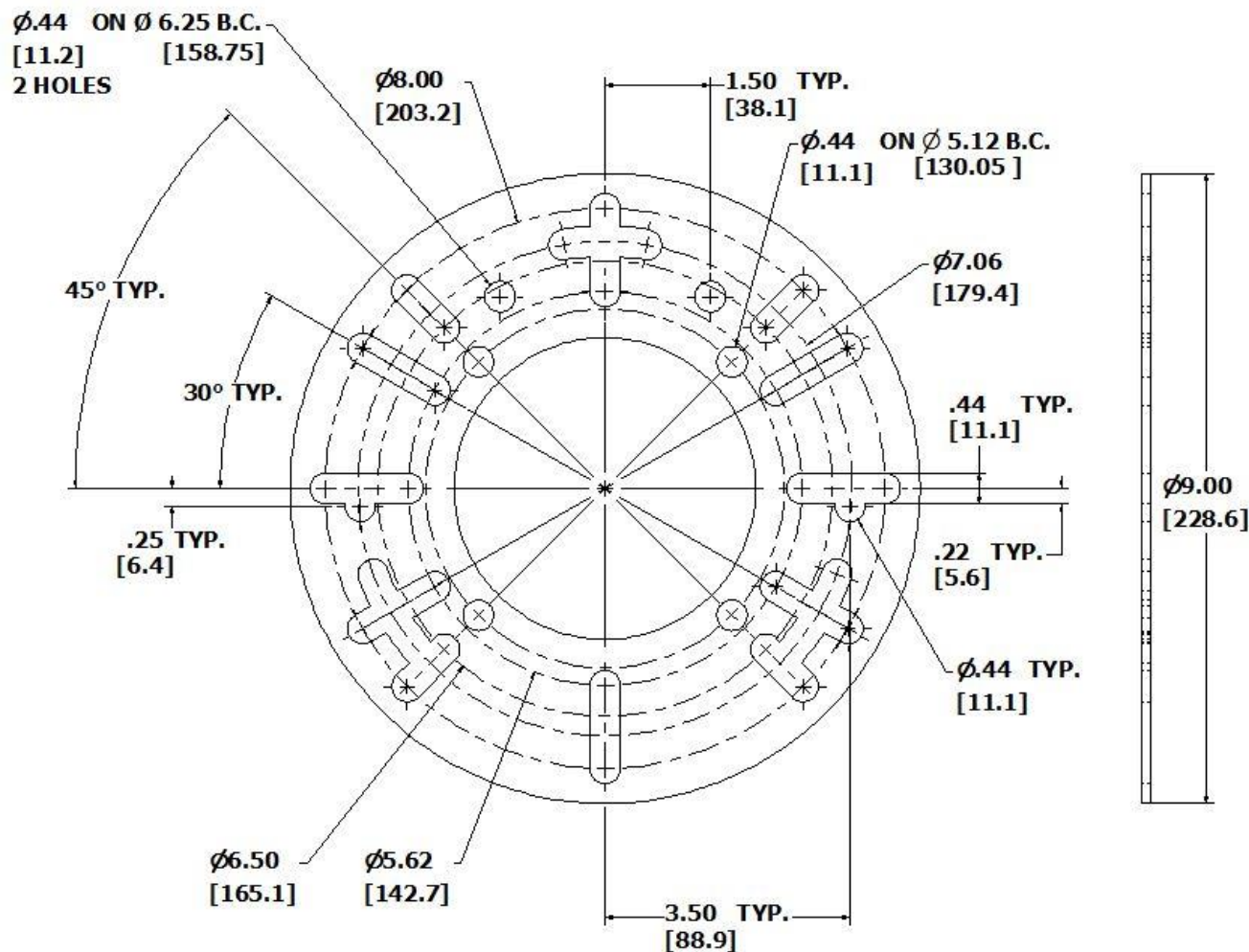


FIGURE 10: Adjustable Mounting Flange Dimensions

DETERMINE ORIFICE SIZE AND RATE

The gas conversion burner needs to be set to deliver the same amount of heat to the appliance as the oil burner it is replacing. Determine the Btu/hr heat input rate for the appliance by locating the rating plate of the appliance and determine the firing rate of the oil burner. Typically the nozzle in the oil burner is stamped with the gallon per hour rate. Use the lesser of these two rates as the firing rate of the gas burner.

For calculating from gallon/hour of oil to Btu/hour of gas, one gallon of oil produces 140,000 Btu/gal (147700 kJ/L) of heat. For example: A furnace rating of 0.60 G.P.H. would be $0.60 \times 140,000 = 84,000$ Btu/hr. This is the input rate needed from the gas burner.

Once the desired heat output of the burner has been determined, the gas orifice must be properly sized. The HSG200 and HSG400 power gas conversion burners are approved for use with natural and LP gas only. The HSG200 and HSG400 burner models are shipped labeled and orificed for natural gas. To convert to LP gas and/or increase Btu/hr (kW) input on natural or LP gas, an orifice kit is supplied with each burner with the orifices shown in Figure 11. Use Figure 11 to select orifice size and manifold pressure to achieve desired rate on burner. If the desired input rating cannot be obtained within the Figure 11 manifold orifice pressure adjustment range, the next size larger or smaller orifice should be used (Refer to orifice chart Figure 11).

HSG200 is shipped from factory with a #8 - 0.199" orifice installed and HSG400 is shipped from the factory with a T - 0.358" orifice. The combination gas valve pressure regulator, which has an outlet pressure setting range of approximately 2.0" w.c. (498.2 Pa) to 4.0" w.c (996.4 Pa) and is factory set at 3.5" w.c. (872 Pa).

**WARNING****GAS LEAK HAZARD**

Liquefied petroleum gas is heavier than air. All connections should be checked for leaks using a soapy solution applied to gas connections. Leaking gas will settle in low lying areas such as basements and trenches. This can lead to asphyxiation and explosion.

HSG SERIES POWER GAS CONVERSION BURNER ORIFICE CHART

Orifice Size and Drill	Manifold Pressure		
	2.0" (498 Pa)	3.0" (747 Pa)	4.0" (996 Pa)
HSG200 Natural Gas			
#29 - .136 (3.5 mm)	50,000 (15)	64,000 (19)	76,500 (22)
#8 - .199 (5.1mm)	74,000 (22)	95,000 (28)	116,000 (34)
J - .277 (7.0 mm)	112,000 (33)	138,000 (40)	164,000 (48)
Q - .332 (8.4 mm)	160,000 (47)	206,000 (60)	-
HSG200 LP Gas			
#30 - .128 (3.3 mm)	49,000 (14)	58,500 (17)	68,200 (20)
#27 - .144 (3.7 mm)	66,000 (19)	78,000 (23)	92,000 (27)
#15 - .180 (4.6 mm)	82,000 (24)	112,500 (33)	136,000 (40)
D - .246 (6.2 mm)	131,000 (38)	187,500 (55)	243,000 (71)
HSG400 Natural Gas			
T - .358 (9.1 mm)	200,000 (59)	248,000 (73)	285,000 (84)
15/32 - .468 (11.9 mm)	265,000 (78)	343,000 (101)	400,000 (117)
HSG400 LP Gas			
K - .281 (7.1 mm)	190,000 (56)	242,500 (71)	295,000 (86)
Q - .332 (8.4 mm)	242,500 (71)	332,500 (97)	400,000 (117)

Figure 11: Orifice Selection Guide

NOTE: For 50 cycle application de-rate input by 15%

NOTE: The Btu/hr input values in Figure 11 show the approximate hourly input of the burner for the various orifice sizes. To determine the actual input of the burner by using the gas meter, follow these steps:

- 1) Turn off all other gas appliances.
- 2) The hand on the dial with the lowest cubic feet value (fastest revolving dial) should be clocked for one complete revolution.
- 3) Divide 3,600 by the time in seconds for one complete revolution and multiply by the dial value (1, 2, or 5 cubic feet depending on size of meter.)
- 4) Multiply this by the heating value of the gas to obtain the input to the burner in Btu per hour.

EXAMPLE: Time in seconds for one complete revolution of dial is 72. 3,600 divided by 72 is 50, 2 cubic foot was timed therefore 50 x 2 is 100. Multiply 100 by heating value of gas which is 1,075 for natural gas; and this will give you an input of 107,500 Btu/hr (31.51 kW). Use a heating value of 2500 for LP gas.

Running Pressure Required: Natural or LP 5.5" w.c. (1400 Pa) Minimum, 14" w.c. (3500 Pa) Maximum.
De-rate input for altitude over 2000 ft. (609.6 m) by 4% each 1000 ft. (304.8 m) above sea level.

IMPORTANT: MANIFOLD PRESSURE ADJUSTMENTS CAN ONLY BE MADE WITH THE BURNER RUNNING AND THE GAS ON.



Valve is rated for 0.5 PSI or 14 inch w.c. Over pressurizing valve may cause damage to the valve.

CHANGING THE ORIFICE

Before replacing the orifice, the gas supply and power must be shut off. The HSG200 is shipped from factory with a #8 - 0.199" orifice installed and HSG400 is shipped from the factory with a T - 0.358" orifice installed. The combination gas valve pressure regulator, which has an outlet pressure setting range of approximately 2.0" w.c. (498.2 Pa) to 4.0" w.c (996.4 Pa) is factory set at 3.5" w.c. (871.85 Pa). The HSG Series burners come with an orifice kit that contains all the size orifices listed in Figure 11.

To remove the orifice, locate the HSG manifold (Figure 12).

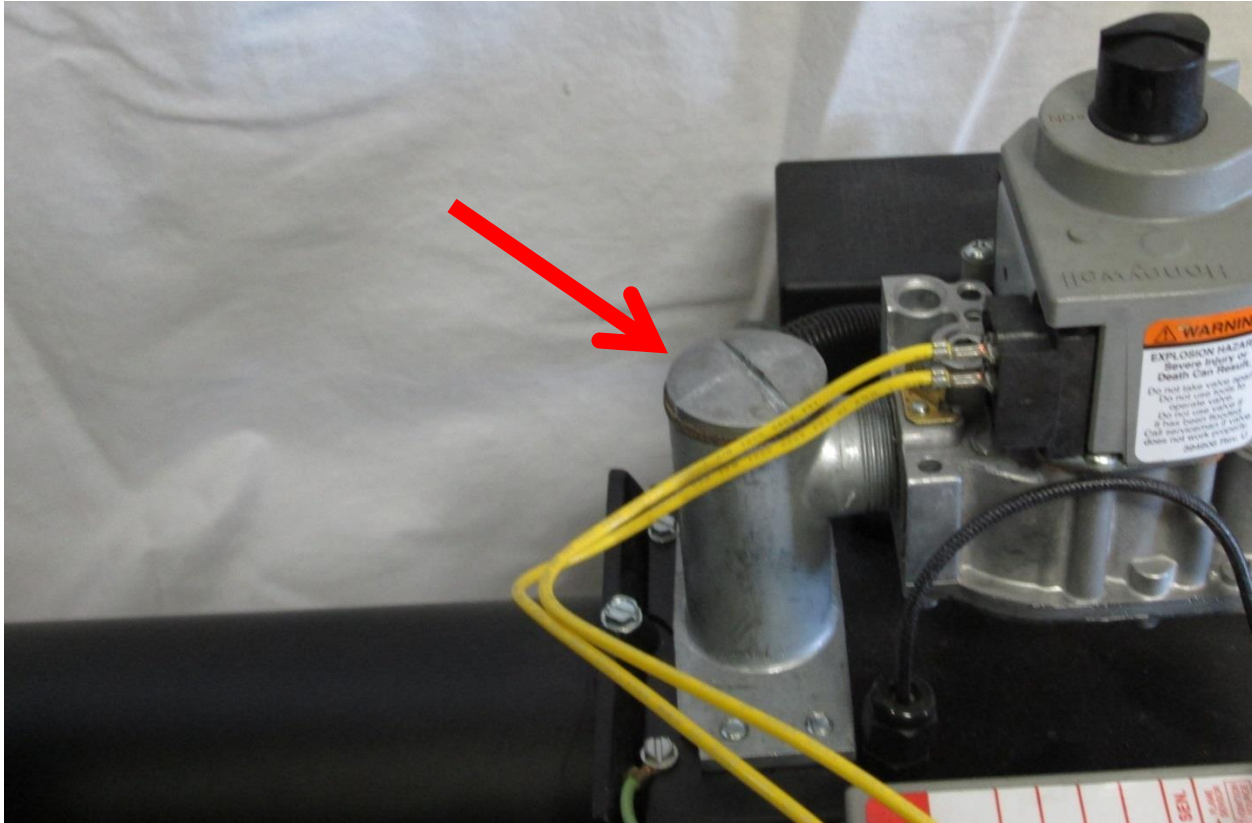


Figure 12: HSG Manifold

Once the HSG manifold is located, remove the slotted orifice cap, making sure the orifice cap gasket stays attached to the orifice cap and is not damaged (Figure 13).

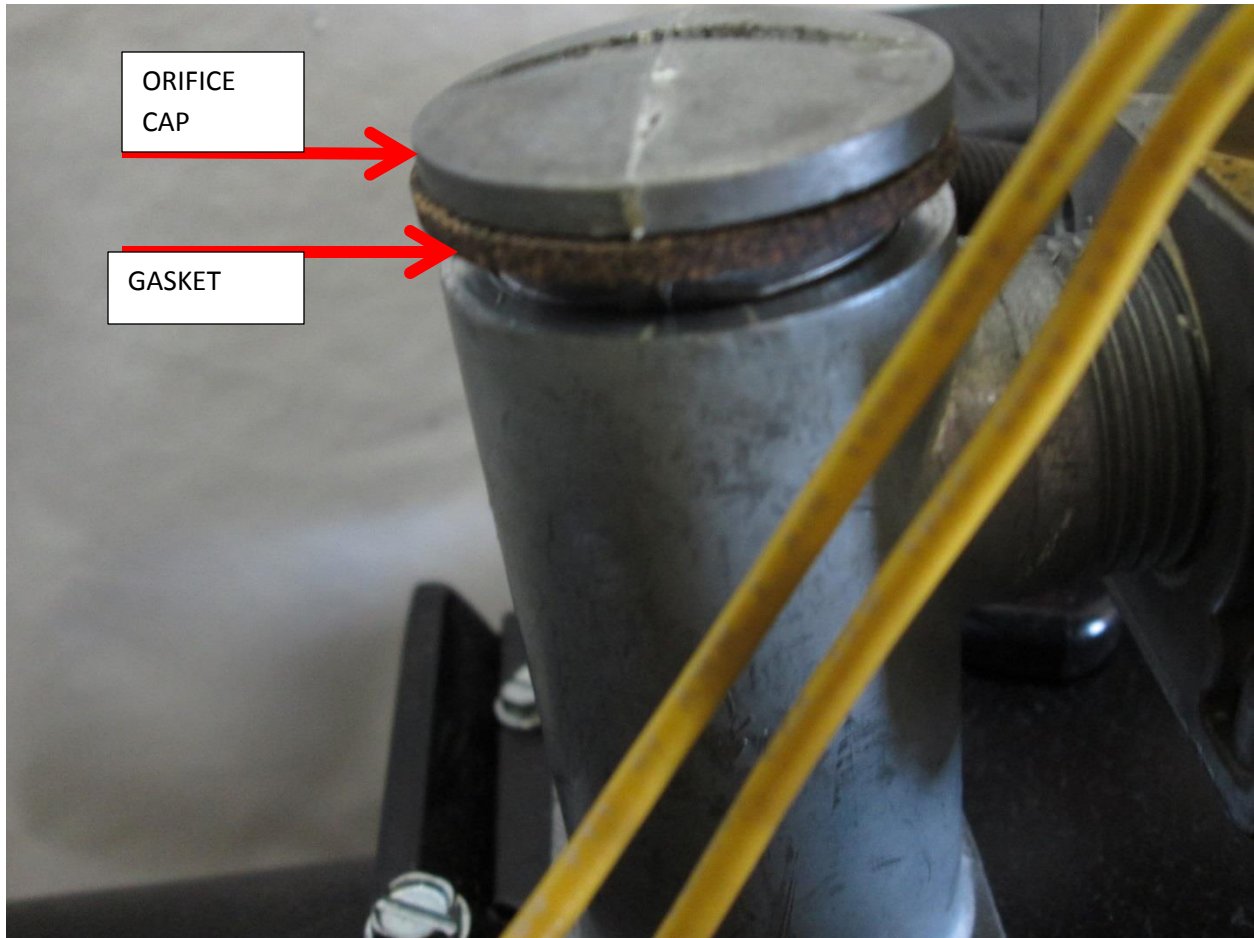


Figure 13: HSG Cap with Gasket on Manifold

Remove orifice spring to access and remove orifice (Figure 14). Orifice will be stamped with its size (Figure 15).

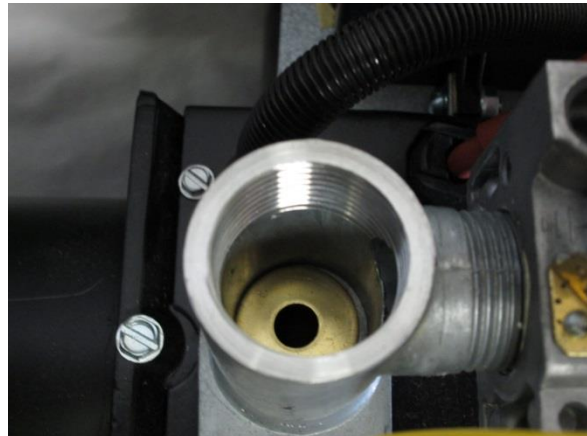
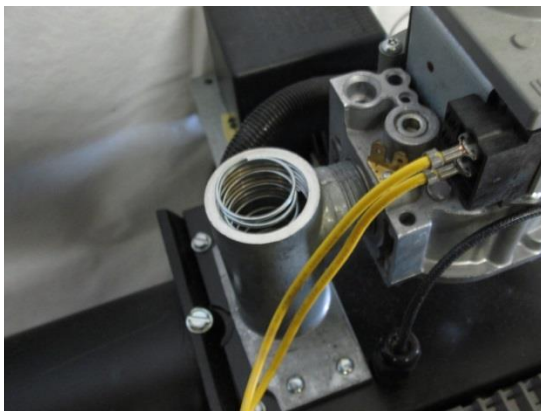


Figure 14: HSG Cap with Gasket Removed and Spring Removed



Figure 15: HSG Orifice

Install the new orifice in manifold, reinstall spring and cap with gasket in the manifold. The orifice kit included with conversion burners also contains gas identification labels. When changing from one gas to another, locate the gas identification label on the burner and if necessary, place the proper label from the kit over the label on the burner. The burner is now ready to be connected to the gas supply piping; see instructions in next section.

INSPECTION AND SIZING OF GAS PIPING

NOTICE

All piping must comply with local codes and ordinances or the National Fuel Gas Code ANSI Z223.1/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 upstream from the control manifold and downstream from the sediment trap or drip leg (See Figure 16). A 1/8" NPT plugged tapping port accessible for 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 16). If the gas supply pressure exceeds the 14" w.c. (3.5 kPa) maximum, an **intermediate main gas regulator** must be installed ahead of the main gas manual shutoff valve shown in Figure 16.

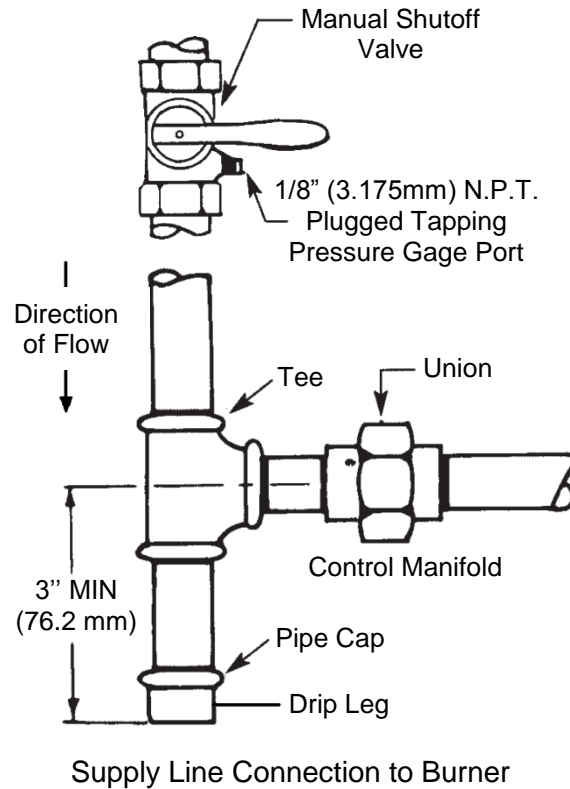


Figure 16

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 burrs and defects in structure or threading. Aluminum tubing should not be used for the main gas supply. Joint compounds (pipe dope) should be used sparingly on male threads only and be approved for all gases.

It is recommended that tables 1, 2, and 3 be used to determine the size pipe to use from the meter to the burner. The building structure should not be weakened 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. **Note: Each elbow, union, and tee adds approximately 2.5 feet of pipe.**

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 psig (3447 PaG). 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 psig (3447 PaG).

Table 1: Pipe Sizing Chart for Natural Gas (0-0.5 psi) with Straight Schedule 40 Metal Pipe

The following chart is based on **0-0.5 psi** inlet pressure, specific gravity of **0.6**, and a pressure loss of **0.5" w.c.**

Maximum Capacity of Pipe Size in Btu/hr

Length of Pipe (ft)	1/2"	3/4"	1"	1 1/4"	1 1/2"
10	175,000	360,000	680,000	1,400,000	2,100,000
20	120,000	250,000	465,000	950,000	1,460,000
30	97,000	200,000	375,000	770,000	1,180,000
40	82,000	170,000	320,000	660,000	990,000
50	73,000	151,000	285,000	580,000	900,000
60	66,000	138,000	260,000	530,000	810,000
70	61,000	125,000	240,000	490,000	750,000
80	57,000	118,000	220,000	460,000	690,000
90	53,000	110,000	205,000	430,000	650,000
100	50,000	103,000	195,000	400,000	620,000
150	40,000	84,000	160,000	325,000	500,000
200	35,000	72,000	135,000	280,000	430,000

Table 2: Pipe Sizing Chart for LP (11" w.c.) with Straight Schedule 40 Metal Pipe

The following chart is based on **11" w.c.** inlet pressure and a pressure drop of **0.5" w.c.**

Special use: Piping sizing between single or second stage (low pressure regulator) and appliance.

Maximum Capacity of Pipe Size in Btu/hr

Pipe Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	3"
Actual ID	0.622	0.824	1.049	1.38	1.61	2.067	3.068
Length of Pipe (feet)	Maximum Capacity in Btu/hr						
10	291,000	608,000	1,145,000	2,352,000	3,523,000	6,786,000	19,119,000
20	200,000	418,000	787,000	1,616,000	2,422,000	4,664,000	13,141,000
30	160,000	336,000	632,000	1,298,000	1,945,000	3,745,000	10,552,000
40	137,000	287,000	541,000	1,111,000	1,664,000	3,205,000	9,031,000
50	122,000	255,000	480,000	984,000	1,475,000	2,841,000	8,004,000
60	110,000	231,000	434,000	892,000	1,337,000	2,574,000	7,253,000
80	94,000	197,000	372,000	763,000	1,144,000	2,203,000	6,207,000
100	84,000	175,000	330,000	677,000	1,014,000	1,952,000	5,501,000
125	74,000	155,000	292,000	600,000	899,000	1,730,000	4,876,000
150	67,000	140,000	265,000	543,000	814,000	1,568,000	4,418,000
200	58,000	120,000	227,000	465,000	697,000	1,342,000	3,781,000
250	51,000	107,000	201,000	412,000	618,000	1,189,000	3,351,000
300	46,000	97,000	182,000	373,000	560,000	1,078,000	3,036,000
350	42,000	89,000	167,000	344,000	515,000	991,000	2,793,000
400	40,000	83,000	136,000	320,000	479,000	922,000	2,599,000

Table 3: Pipe Sizing Chart for LP (11" w.c.) with Copper Tubing

The following chart is based on 11" w.c. inlet pressure and a pressure drop of 0.5" w.c..

Maximum Capacity of Tube Size in Btu/hr				
Pipe Size	1/2"	5/8"	3/4"	7/8"
Length (feet)	Maximum Capacity in Btu/hr			
10	110,000	206,000	348,000	536,000
20	76,000	141,000	239,000	368,000
30	61,000	114,000	192,000	296,000
40	52,000	97,000	164,000	253,000
50	46,000	86,000	146,000	224,000
60	42,000	78,000	132,000	203,000
70	38,000	71,000	120,000	185,000
80	36,000	67,000	113,000	174,000
90	33,000	62,000	105,000	161,000
100	32,000	59,000	100,000	154,000

NOTE: Copper tubing shall comply with standard type K or L of ASTM B 88 or ASTM B 280.

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 test dial and allowing 5 minutes to show any movement, or by soaping 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. **Never use a flame** or fire 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 into the appliance. Be sure to relight all the gas pilots on other appliances.

ELECTRICAL WIRING OF BURNER

The conversion burner is shipped completely wired. It is only necessary to supply the line voltage 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 latest edition of the National Electrical Code, ANSI/NFPA No. 70. See wiring diagrams in Figure 25, 26, 27, and 28 for reference on wiring, thermostat connection, and limit circuit. 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 latest edition of the National Electrical Code ANSI/NFPA No. 70.

For line voltage wiring to the burner, use solid copper conductor wire not lighter than #14 AWG. **If a fused disconnect is used, it should be fused for a minimum of 15 amps.**

The burner ships with a jumper wire on the thermostat (T-T) terminals. Jumper needs to be removed for remote thermostat control and the thermostat needs to be connected per wiring diagrams. T-T terminal is an open/close switch for the burner and no voltage should be connected to it. For boilers it may be necessary to leave the T-T terminal jumped as the aquastat may be providing the voltage to the burner

and controlling when voltage is sent to the burner. Make sure the jumper wire or the thermostat wires if used do not come in contact with any metal. This may cause the burner to ground out. The burner is controlled by the appliance. Once wiring is complete between burner and appliance, verify appliance is controlling the burner's on/off operation. When connecting the burner to the line voltage electrical supply, utilize the knockout provided on the burner's junction box.

NOTICE

The burner is equipped with its own 24 Vac transformer. Do not add any 24 Vac power consuming device to the 24 Vac control circuit of the burner, as it could overload the transformer. Overloading the transformer will damage the transformer.
Set the room thermostat "heat anticipator" for the total current draw of the 24 Vac burner operation circuit (HSG200 0.55 amps, HSG400 0.7 amps).

CAUTION



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

NOTICE

If any of the original burner wiring must be replaced, it must be replaced with #18 AWG 105° C wire or equivalent.

INSPECTION OF 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 should be provided with means to guard against firing a dry boiler or one in which the water is dangerously low.

NOTICE

On installations where an oil burner is being 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 ensure 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.

INSTALLATION OF 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.

SECTION II: INITIAL START UP

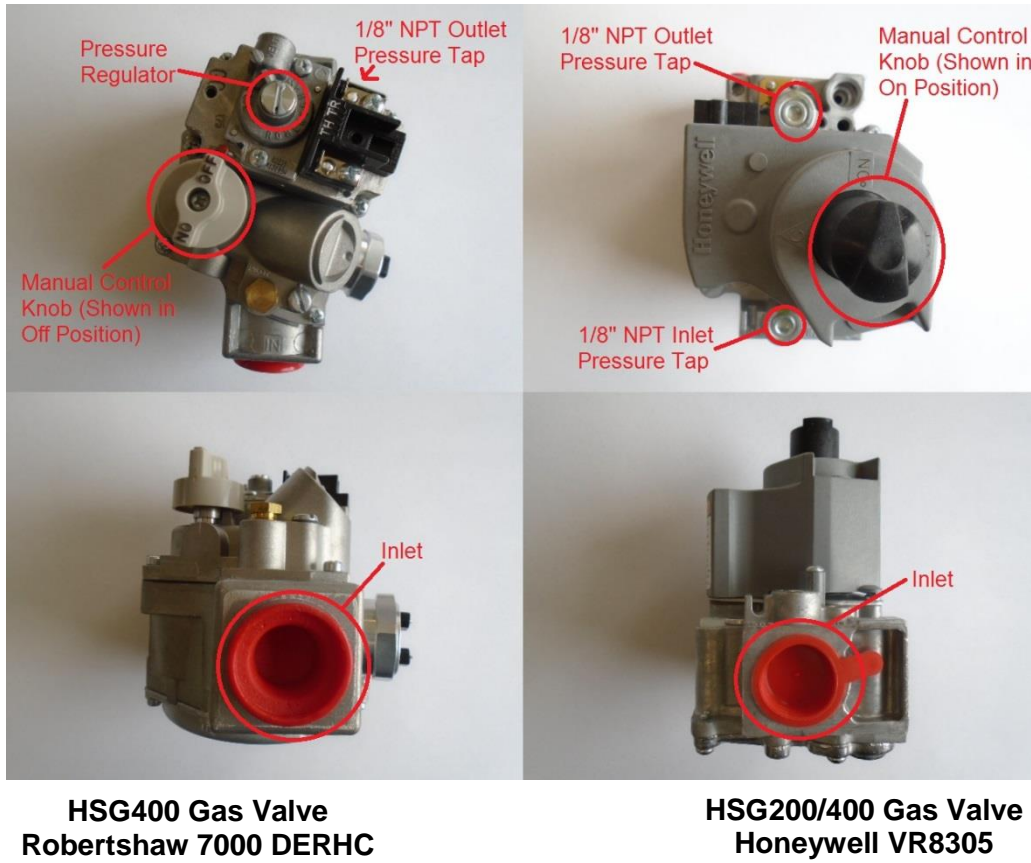


Figure 17: Gas Valves for HSG Series Burner

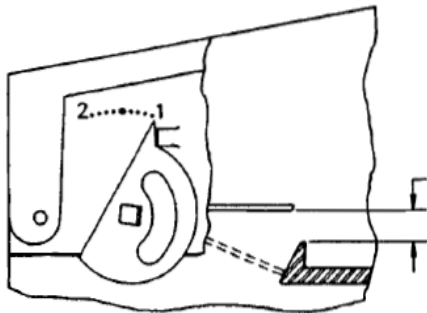
INITIAL BURNER START UP PROCEDURE

NOTICE

READ THE APPLICABLE SEQUENCE OF BURNER/PRIMARY GAS CONTROL OPERATION IN SECTION V SERVICE AND TROUBLESHOOTING BEFORE PROCEEDING.

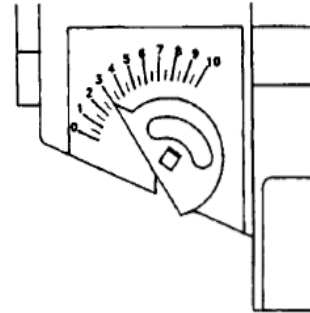
1. Depress the combination gas valve manual control knob and turn to "OFF" position. (For location of the manual control knob, refer to Figure 17). Remove the 1/8" NPT pressure tap plug from the gas valve and install a hose barb fitting. Connect a manometer to the hose barb fitting.
2. Adjust the primary air and off-cycle damper to the start-up settings shown in Figure 18.

IMPORTANT
THESE SETTINGS ARE FOR INITIAL STARTUP ONLY, AND MUST BE
READJUSTED FOR COMBUSTION EFFICIENCY.



HSG200 SET AT NO. 1
HSG400 SET AT NO. 2

OFF CYCLE DAMPER
SETTING



HSG200 SET AT NO. 2
HSG400 SET AT NO. 4

PRIMARY AIR
SETTING

Figure 18: Air Settings for Initial Start Up



Primary Air Location



Off Cycle Damper Location

Figure 19: Primary Air and Off Cycle Damper Locations

3. 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.
4. Set the thermostat or operating control below room temperature, shutting the burner "OFF" for 1 minute. This will reset the primary control.
5. Depress the combination gas valve manual control now and turn to "ON" position.
6. 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.
7. 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. If the burner goes into lockout, it may be reset by adjusting the thermostat or operating control below room temperature for a few seconds, then readjusting to call for heat.
8. Once burner is running set the manifold pressure by adjusting the gas valve's pressure regulator while measuring the gas pressure using a manometer. The correct operating manifold orifice pressure range for both natural and LP gas is 2.0" w.c. (498 Pa) minimum to 4.0" w.c. (996 Pa) maximum. By adjusting the pressure regulator between 2.0" w.c. (498 Pa) minimum to 4.0" w.c. (996 Pa) on either natural or LP gas, a wide input range can be achieved with a single orifice size. If the desired input rating cannot be obtained within the above manifold orifice pressure adjustment range, the next size larger or smaller orifice should be used (Refer to orifice chart Figure 11).
9. A more accurate Btu/hr (kW) input can be determined by using the natural gas service meter with only the burner 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 formula listed below where one complete revolution on the gas meter is equal to one cubic foot of gas.

$$\frac{3600 \times \text{ft}^3 \text{ per rev.} \times \text{Btu value/ft}^3}{\text{Seconds per revolution}} = \text{Btu/hr (kW)}$$

EXAMPLE:

$$\frac{3600 \times 1 \times 1000}{12} = 300,000 \text{ Btu/hr (87.9 kW)}$$

COMBUSTION ADJUSTMENT OF BURNER

All adjustments below must be made with the following equipment:

- | | |
|---|-----------------------|
| 1. Draft Gauge | 3. CO Tester |
| 2. O ₂ or CO ₂ Analyzer | 4. Water Column Gauge |

NOTICE

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

1. After the burner has been in operation for at least 10 minutes and the off cycle damper and primary air shutter were set per Figure 18, 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. See step 2 for recommended values.
2. **For natural gas applications**, best performance will be achieved with a CO₂ setting of 8% to 10% (3% to 6.5% O₂) and CO should be minimized with a goal of 100 ppm or less. **In no case should CO be above 400 ppm Air Free.**

For LP gas applications, best performance will be achieved with a CO₂ setting of 9.5% to 11.8% (3% to 6.5% O₂) and CO should be minimized with a goal of 100 ppm or less. **In no case should CO be above 400 ppm Air Free.**

If an O₂ analyzer is used:

$$\text{CO}_{\text{AIRFREE}} = \frac{20.9}{(20.9 - \% \text{O}_2)} \times \text{CO}_{\text{PPM}}$$

If a CO₂ analyzer is used:

$$\text{For Natural Gas: } \text{CO}_{\text{AIRFREE}} = \frac{11.7}{\% \text{CO}_2} \times \text{CO}_{\text{PPM}}$$

$$\text{For LP Gas: } \text{CO}_{\text{AIRFREE}} = \frac{13.8}{\% \text{CO}_2} \times \text{CO}_{\text{PPM}}$$

Stack temperatures for furnaces and boilers are recommended to be between 350 and 400 degrees Fahrenheit.

NOTE: Check overfire draft and adjust to NEGATIVE -0.01 (2.491 Pa) to -0.02 (4.982 Pa) inches w.c. during burner operation.

If these values are not achieved with the initial settings listed in Figure 18, adjust the primary air shutter to achieve these values. For the HSG400, if these values are not able to be achieved and the burner is set to the low end of the firing range, adjust the off cycle damper to a lower setting to adjust burner. For the HSG200, if these values are not able to be achieved, the off cycle damper setting may need to be increased to adjust the burner.

NOTICE

IF THE BURNER Btu/hr (kW) INPUT IS CHANGED REPEAT COMBUSTION ADJUSTMENT OF BURNER.

3. After the air is adjusted, combustion meets the recommendations in step 2 and the burner is running properly, be sure to record all set up information and leave it with the burner. With the burner shut off and the manual control knob in the "OFF" position, remove the hose barb and replace the 1/8" NPT pressure tap plug. Apply a small amount of thread sealant to the plug before replacing.

SECTION III: GAS CONVERSION

The HSG200 and HSG400 can operate on either natural gas or LP gas. To convert an HSG burner from one gas to another requires changing the orifice, setting of the manifold pressure, and adjusting the air shutter(s). The HSG200 and HSG400 conversion burners are shipped from the factory with a natural gas orifice installed and a label on the burner which indicates the burner has a natural gas orifice installed. In order to convert the burner to fire LP gas, refer to the chart in Figure 11 for selection of the proper orifice for the desired firing rate. An orifice kit is provided with each burner. The kit also includes a gas identification label that is designed to be placed over the gas identification label located on the burner. Place the label for the new gas, natural or LP over the existing label when converting from one gas to another. Follow the procedure outlined in CHANGING THE ORIFICE and SECTION II: INITIAL START UP for making the necessary adjustments to the manifold pressure. Follow the procedure in COMBUSTION ADJUSTMENT OF BURNER for any initial installation, after a change in rate, or a conversion from one gas to another.

Orifice kits for the HSG200 and HSG400 burners are available from Wayne Combustion Systems.

NOTICE

Some HSG burner models are sold to Original Equipment Manufacturers and are pre-set with the proper orifice for the firing rate and gas utilization for the specific equipment. Before attempting to convert this equipment from one gas to another, consult the equipment manual or contact the equipment manufacturer for the procedure on gas conversion.

SECTION IV: CONSUMER INSTRUCTIONS

GENERAL INSTRUCTIONS FOR SERVICING BURNER



PROFESSIONAL SERVICE REQUIRED

Gas burners require the services of an experienced technician for proper setting and adjustment. If the burner does not appear to be operating properly, **DO NOT ATTEMPT TO ADJUST THE BURNER YOURSELF**, but call in a competent serviceman.

A homeowner should be able to check several possible causes of shutdown before calling in a serviceman. The following check list may eliminate the need for a service call or at least provide information for the serviceman.

1. Check thermostat. Make sure that it is set at the desired room temperature. If the thermostat is damaged or loose on the wall, have it replaced or repaired.
2. Check fuses in service box for the burner circuit. Replaceable type fuses should not be loose in the socket. If a fuse is blown out or if in doubt, replace with the same size and type. If circuit breaker is in the service box, check position of indicator. If tripped, reset.
3. Check on-off switch for the burner circuit, it may have been accidentally turned off.

It is advisable, periodically, to visually inspect the burner. Check air inlet blower to make sure it is not clogged or blocked. Check air shutter to make sure that it has not been tampered with, make sure that it is in the same position as when final adjustments were made. Check blower wheel to see if it is dirty or full of lint. The areas around the conversion burner should be kept clear and free of combustible materials, gasoline and other flammable vapors and liquids. The flow of combustion and ventilating air to the burner must not be blocked or obstructed in any manner.

CLEANING OF BURNERS (BY SERVICEMAN ONLY): Remove the burner from the appliance and visually inspect the blast tube for any deterioration. Check burner head, electrodes, etc. with illustrations in the owner's manual for proper locations.

SECTION V: SERVICE AND TROUBLESHOOTING

HSG SERIES BURNER UTILIZING WAYNE 64420 SERIES IGNITION CONTROLS

HSG burners with a spec number that contains a “D,” for example, 62377D, use Wayne ignition controls. Older burners that have a spec number containing a “C” use a Honeywell control. See next sections for information on these controls. Spec numbers can be found on HSG burners on a small label located below the T-shaped label on the back of the burner.

WIRING BURNERS USING WAYNE IGNITION CONTROLS

These burners ship with black, white, and green wires exiting the junction box via its conduit connection point. The black and white wires are used for testing at the factory and should be removed and discarded. After that, connect incoming L1 to the connector where the black wire was and L2 where the white wire was. Use a wire nut to connect earth ground to the green wire. **Failure to connect earth ground to the green ground wire will cause the ignition control to lock out with a “LINE Voltage Error” fault.**

NUMBER OF FLASHES	ERROR
GREEN	NORMAL OPERATION
1	NO FLAME DURING TRIAL
3	GAS VALVE RELAY FAIL
4	LINE VOLTAGE ERROR
5	INTERNAL CONTROL ERROR

Table 4: Error Codes for Wayne Control

SEQUENCE OF OPERATION – HSG SERIES POWER GAS CONVERSION BURNER UTILIZING WAYNE 64420-001 IGNITION CONTROL WITH EXTERNAL 30 SECOND PRE-PURGE TIMER P/N 62388-001 AND RESISTOR P/N 62530-001

On a call for heat, 120 Vac goes to the motor, and 24Vac goes to the air switch. Once the motor reaches operating rpm, combustion air pressure closes the air proving switch, energizing the external 30 second pre-purge timer. After the 30 second pre-purge timing, the ignition control is energized.

After the initial 30 second pre-purge provided by the external timer, the Wayne control is energized, and it will activate the gas valve allowing gas to flow to the burner head. Simultaneously, the ignition control energizes the ignition transformer, producing a spark at the electrode, establishing main burner flame.

This trial for ignition period lasts four (4) seconds and occurs at the beginning of every heat cycle. Normally, burner flame will be established before the end of this period. Once the flame is established and the trial for ignition ends, sparking will cease and the flame rod will provide flame monitoring to the ignition control for the remainder of the heat cycle.

When utilizing the Wayne 64420-001 control with the external 30 second pre-purge timer, a 10K ohm resistor is wired in parallel between the output terminals of the 30 second pre-purge timer and the input terminal to the ignition control. The function of this resistor is to keep a load on the output terminal of the external 30 second pre-purge timer, after the initial call for heat and 30 second start pre-purge.

This promotes immediate re-ignition of the main burner flame after initial 30 second pre-purge provided by the external timer, overriding the need for a separate pre-purge for each heat cycle. This control scheme is used in oven or similar applications where process temperatures must remain constant.

If the flame is extinguished during the heat cycle, the ignition control will attempt to re-establish the main burner flame. If this does not occur within the trial for ignition period, the ignition control will go into lockout, de-energizing the gas valve and ignition transformer. Then, the LED on the ignition control will flash an error code. These error codes are listed on the ignition control’s label near the LED and in Table 4 above.

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 and closing the gas valve.

See Figure 25 for the wiring diagram for burners with the Wayne 64420-001 control.

SEQUENCE OF OPERATION – HSG SERIES POWER GAS CONVERSION BURNER
UTILIZING WAYNE P/N 64420-002 IGNITION CONTROL W/BUILT IN 30 SECOND PRE-PURGE

On a call for heat, 24V goes to the motor start relay and air switch. Once the motor reaches operating rpm, combustion air pressure closes the air proving switch, energizing the ignition control.

This Wayne ignition control has an internal 30 second pre-purge timer. After the initial 30 second pre-purge, the control simultaneously energizes the gas valve and ignition transformer. Gas flows to the burner head and the transformer produces a spark at the electrode 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 and the trial for ignition ends, sparking will cease and the flame rod will provide flame monitoring to the ignition control for the remainder of the heat cycle. If the flame should be extinguished during the heat cycle, the ignition control will attempt to establish the main burner flame. If this does not occur within the trial for ignition period, the ignition control will go into lockout de-energizing the gas valve and ignition transformer. The LED on the ignition control will flash an error code in this case. These error codes are listed on the ignition control's label near the LED and in Table 4 above.

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.

See Figure 26 for the wiring diagram for burners with the Wayne 64420-002 control.

HSG SERIES BURNER UTILIZING HONEYWELL IGNITION CONTROLS

SEQUENCE OF OPERATION – HSG SERIES POWER GAS CONVERSION BURNER
UTILIZING HONEYWELL S89E GAS PRIMARY P/N 62758-002 WITH EXTERNAL
30 SECOND PRE-PURGE TIMER P/N 62388-001 AND RESISTOR P/N 62530-001

On a call for heat, voltage (24V) is applied to the motor start relay and air switch. Once the blower motor reaches operating rpm, combustion air pressure causes the air proving switch to close, the contacts energize the external 30 second pre-purge timer. After the 30 second pre-purge timing, the S89E is energized.

The S89E gas primary control has an internal 8 second safe start check. After the initial 30 second pre-purge provided by the external timer, the S89E gas primary control is energized, the 8 second safe start check will commence. Once this is accomplished, the S89E activates the gas valve allowing gas to flow to the burner head. Simultaneously, the S89E control energizes the ignition transformer, producing a spark at the electrode, 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 flame sensor will provide flame monitoring to the S89E gas primary control for the remainder of the heat cycle.

When utilizing the S89E gas primary control with the external 30 second pre-purge timer, a 10K ohm resistor is wired in parallel between the output terminals of the 30 second pre-purge timer and the input terminal to the S89E gas primary control. The function of this resistor is to keep a load on the output terminal of the external 30 second pre-purge timer, after the initial call for heat and 30 second start pre-purge and 8 second safe start check.

This promotes simultaneous re-ignition of the main burner flame after the S89E's 8 second safe start check, overriding the 30 second pre-purge. This control scheme is used in oven or similar applications where process temperatures must remain constant.

Should the flame be extinguished during the heat cycle, the S89E primary ignition control will go into the 8 second safe start check after which time it will re-energize the gas valve and ignition transformer in an

attempt to re-establish the main burner. If this does not occur within the 4 second trial for ignition period, S89E gas primary control will go into lockout de-energizing 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 insufficient supply of combustion air to the burner, the air switch contacts will open, putting the system into lockout closing gas valve.

See Figure 27 for wiring diagram of HSG Series Burner utilizing the Honeywell S89E control.

SEQUENCE OF OPERATION – HSG SERIES POWER GAS CONVERSION BURNER UTILIZING HONEYWELL S89F P/N 62759-002 IGNITION CONTROL W/BUILT IN 30 SECOND PRE- PURGE

On a call for heat, voltage (24V) is applied to the motor start relay and air switch. Once the fan motor reaches operating rpm, combustion air pressure causes the air proving switch to close, and the contacts energize the ignition control.

The ignition control has an internal 30 second pre-purge timer. After the initial 30 second pre-purge, the ignition control simultaneously energizes the gas valve and ignition transformer. Gas flows to the burner head and the transformer produces a spark at the electrode 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 and sparking ceases, the flame sensor will provide flame monitoring to the ignition control for the remainder of the heat cycle. If the flame should be extinguished during the heat cycle, the S89F ignition control will go into the 30 second pre-purge and 8 second safe start check, then re-energize the gas valve and ignition transformer in an attempt to establish the main burner flame. If reignition does not occur within the trial for ignition period, the ignition control will go into lockout de-energizing 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.

See Figure 28 for the wiring diagram for HSG Series burners using the Honeywell S89F control

FLAME SENSING ON HSG SERIES BURNERS

The ignition control utilizes the flame current rectification principal for main burner flame sensing.

The flame rectification phenomenon occurs as follows: The ignited gas flame causes the immediate atmosphere around the flame to become ionized (gas atoms become electrically charged). The ionization causes the atmosphere around the flame to become electrically conductive. An ac voltage output from the ignition control sensing circuit is routed through the flame sensor probe. When the flame sensor probe and burner head are both in contact with a properly adjusted flame, the burner head with its larger surface attracts more free electrons, thus becoming negatively charged. The flame sensor probe with its small surface area gives up free electrons, thus becoming positively charged. The free electrons from the ac voltage in the flame sensor probe flow through the ionized gas flame to the grounded burner head. As the ac current passes through the gas flame, it is rectified into a dc current flowing back to the grounded side of the sensing circuit. The flame in actuality is a switch. When the flame is present the switch is closed allowing current to flow through the sensing circuit of the control. When no flame is present, the switch is open with no current flowing through the sensing circuit of the control.

The dc current flow is measured in units called dc microamperes. This current can be measured by disconnecting the wire from the Sense terminal and connecting the probes of a meter that can measure microamps between that wire and the sense terminal. A steady dc microampere current of 0.2 minimum (.8 microamps for Honeywell controls) or higher through the sensing circuit of the primary ignition control is sufficient to keep the burner running without a safety lockout. See Figure 20 for flame current measurement.

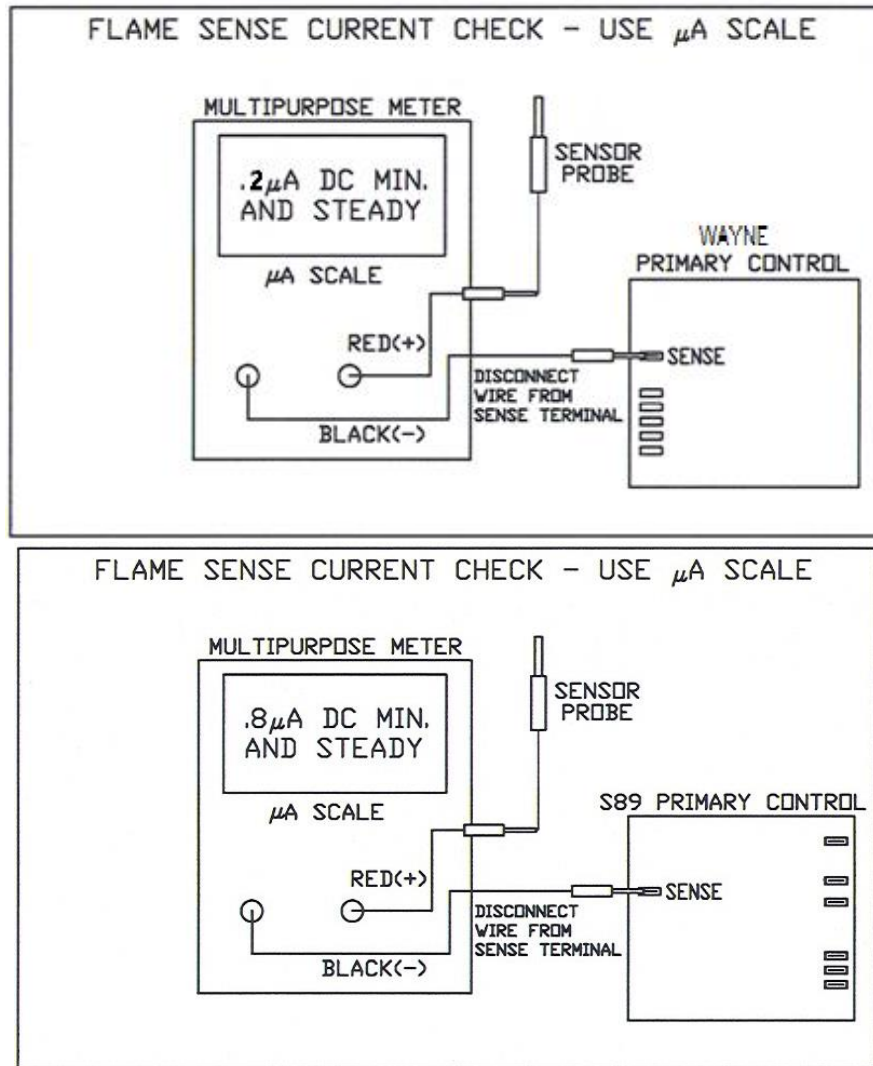
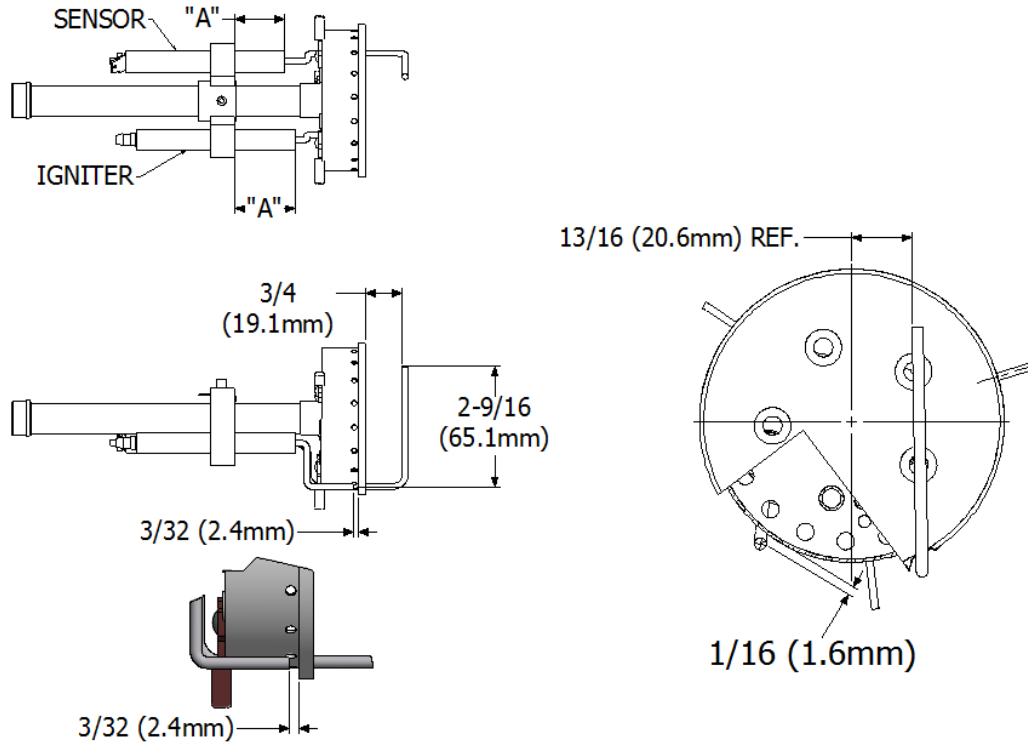


Figure 20: Flame Current Measurement, Top: Wayne control; Bottom: Honeywell control



PROBE	DIM "A" REF
IGNITER	1 5/8 in (41.3mm)
FLAME SENSOR	1 1/4 in (31.8mm)

Figure 21: Igniter and Flame Sensor Probe Settings

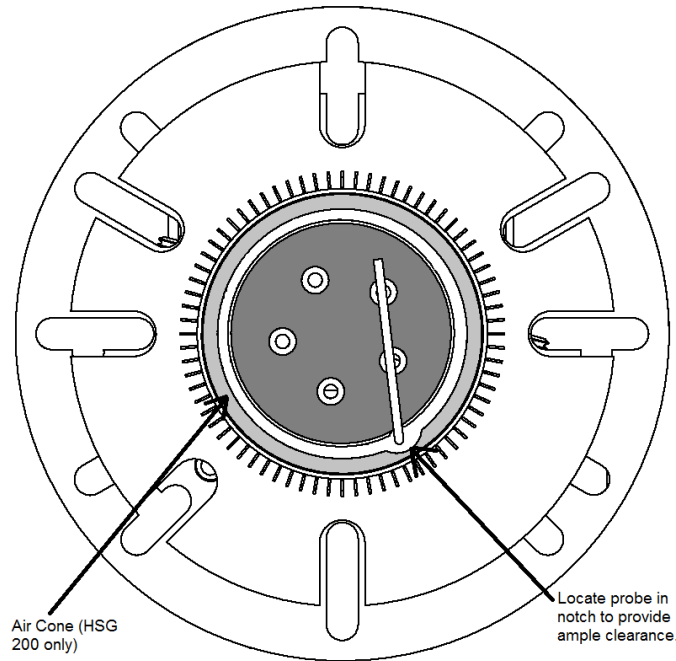
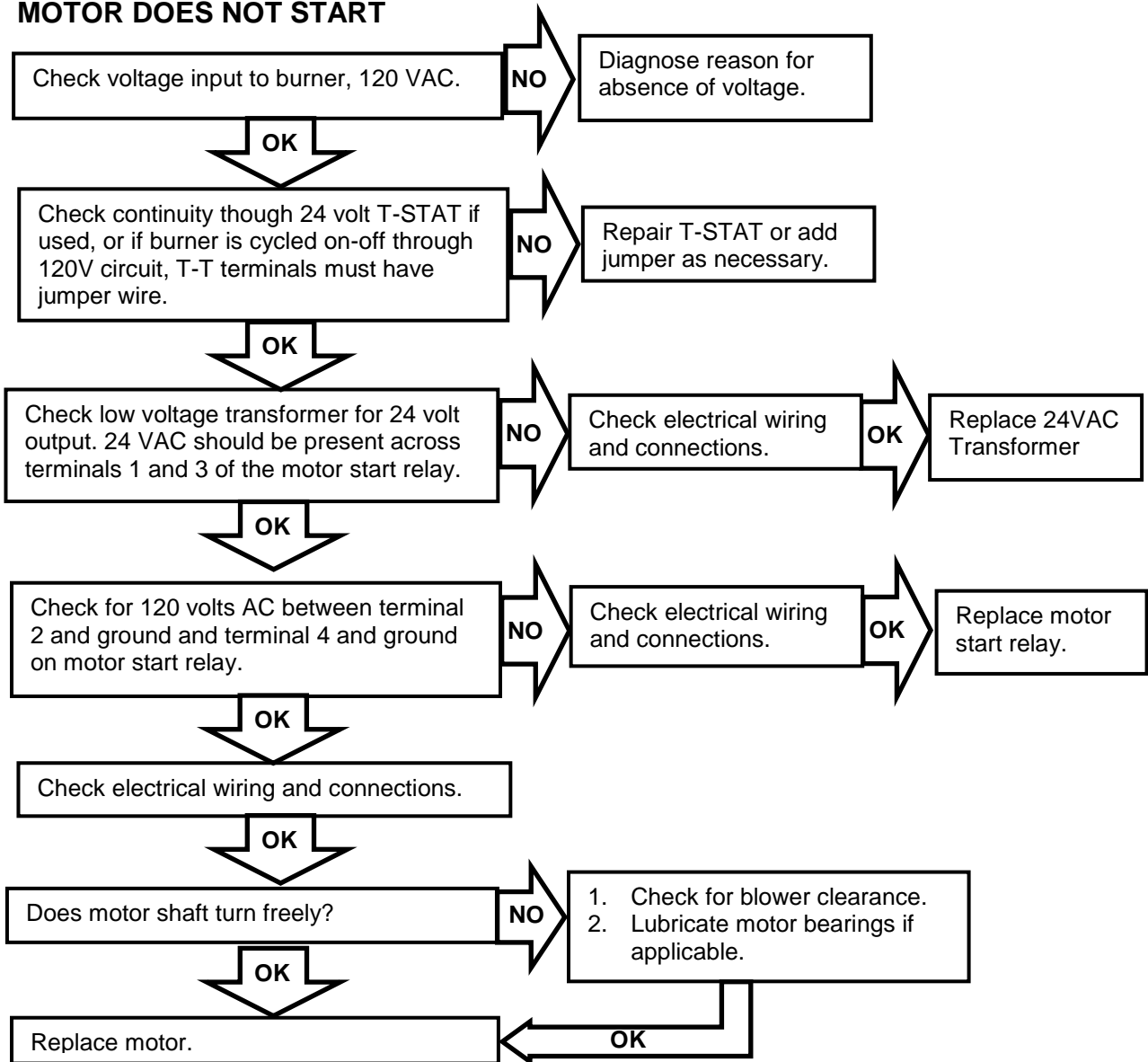


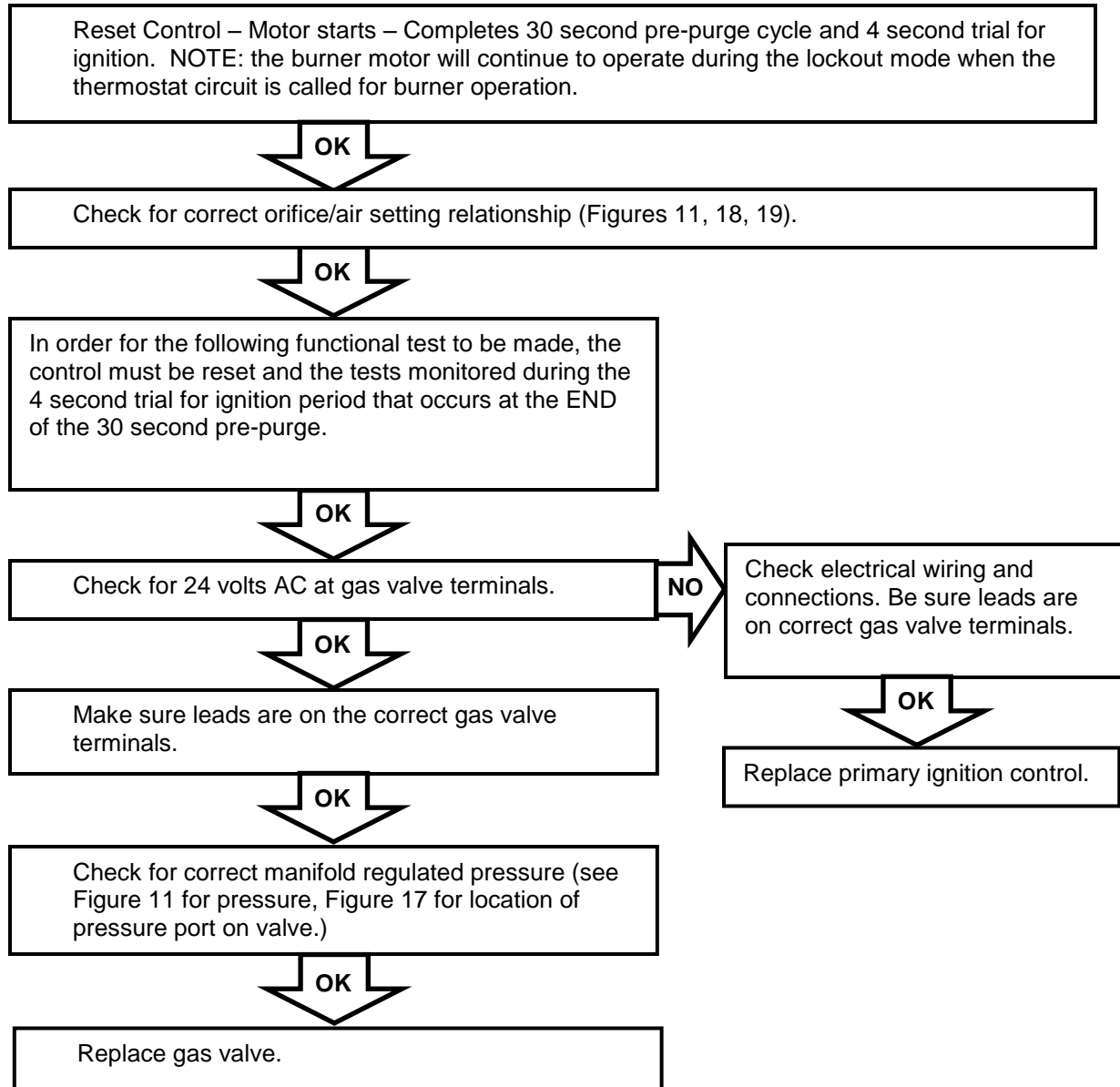
Figure 22: Burner Face and Flame Sensor Probe Location

TROUBLESHOOTING GUIDE PRIMARY IGNITION CONTROLS

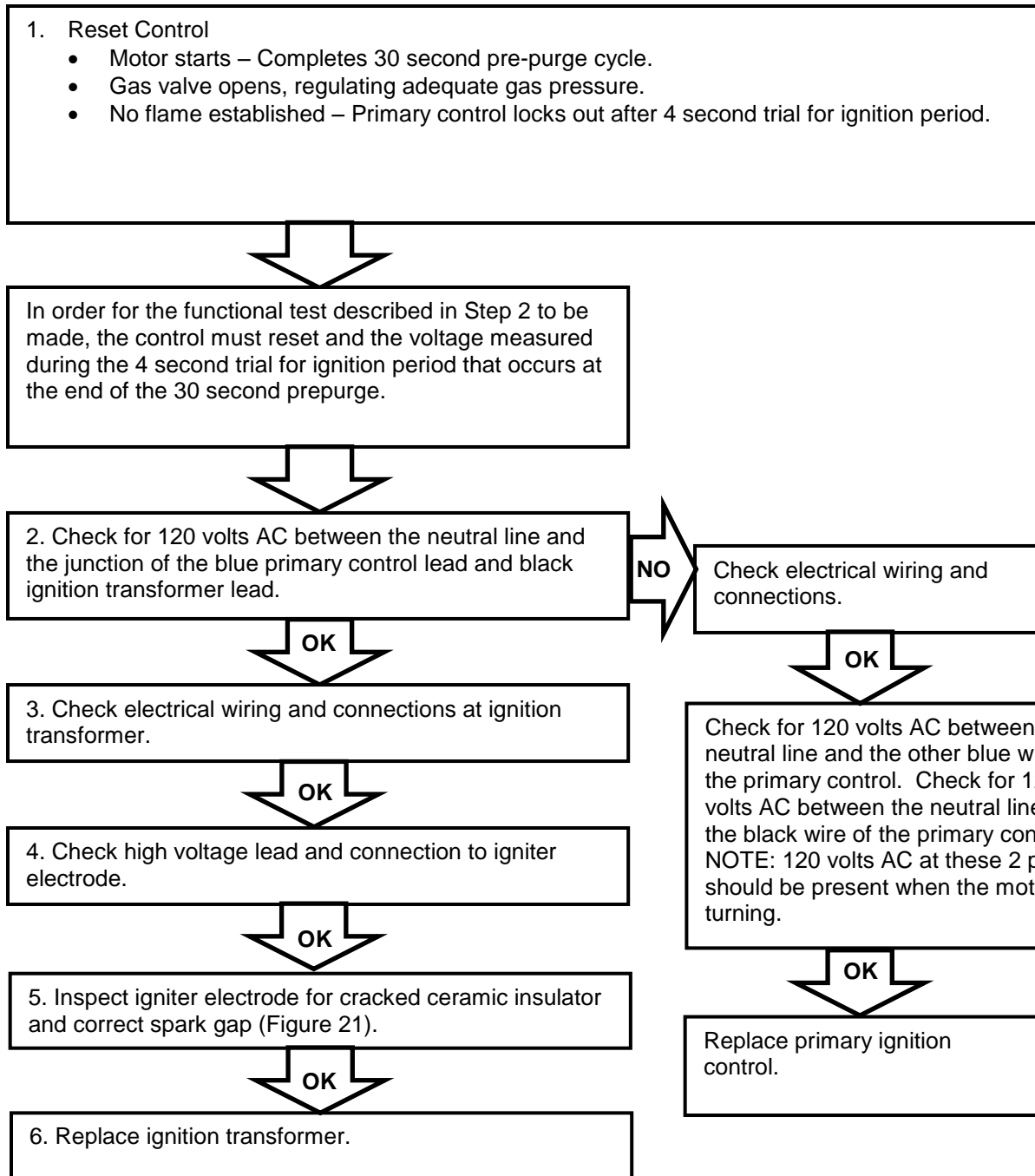
MOTOR DOES NOT START



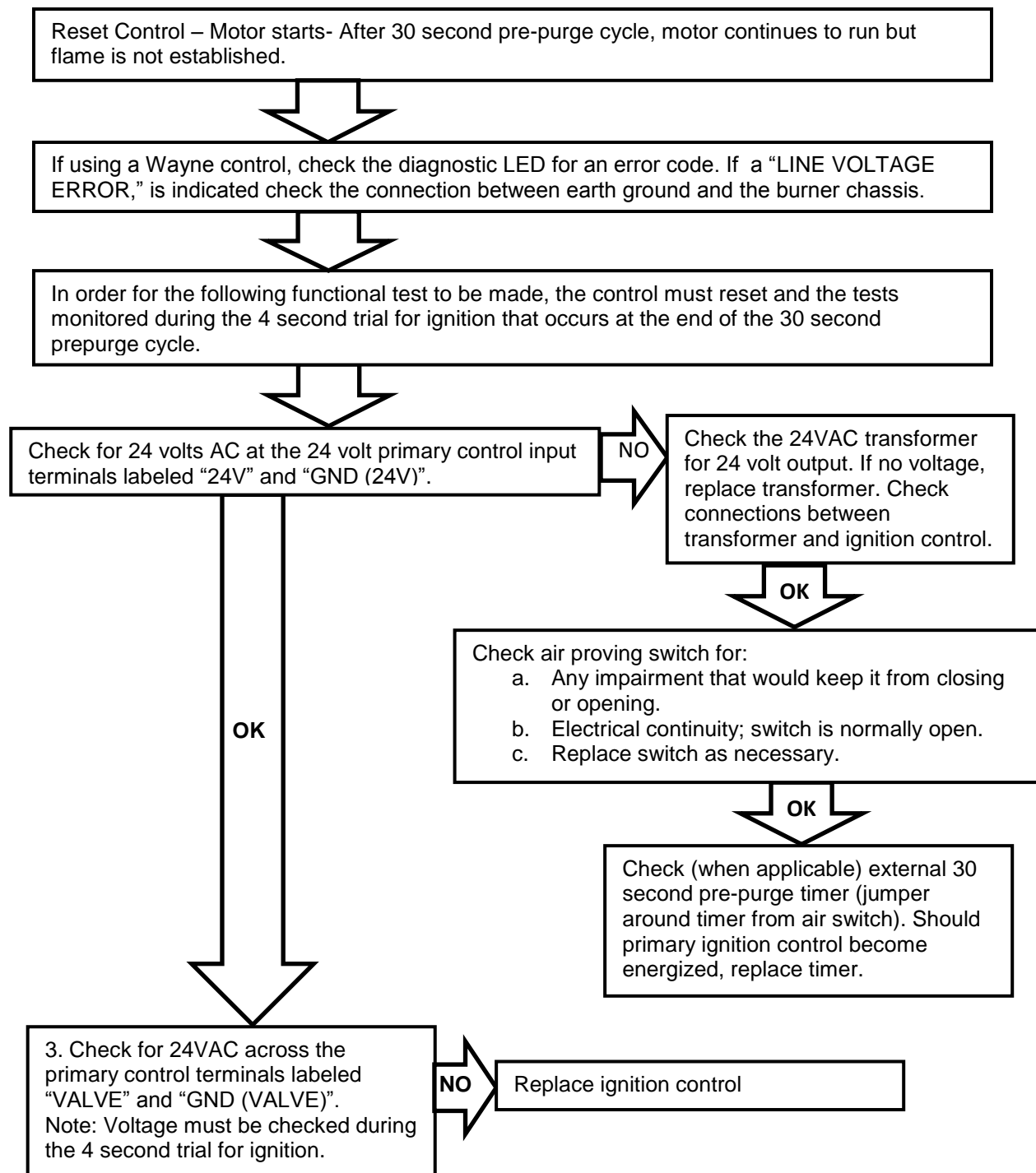
IGNITION ARC ESTABLISHED – NO FLAME



NO IGNITION ARC ESTABLISHED



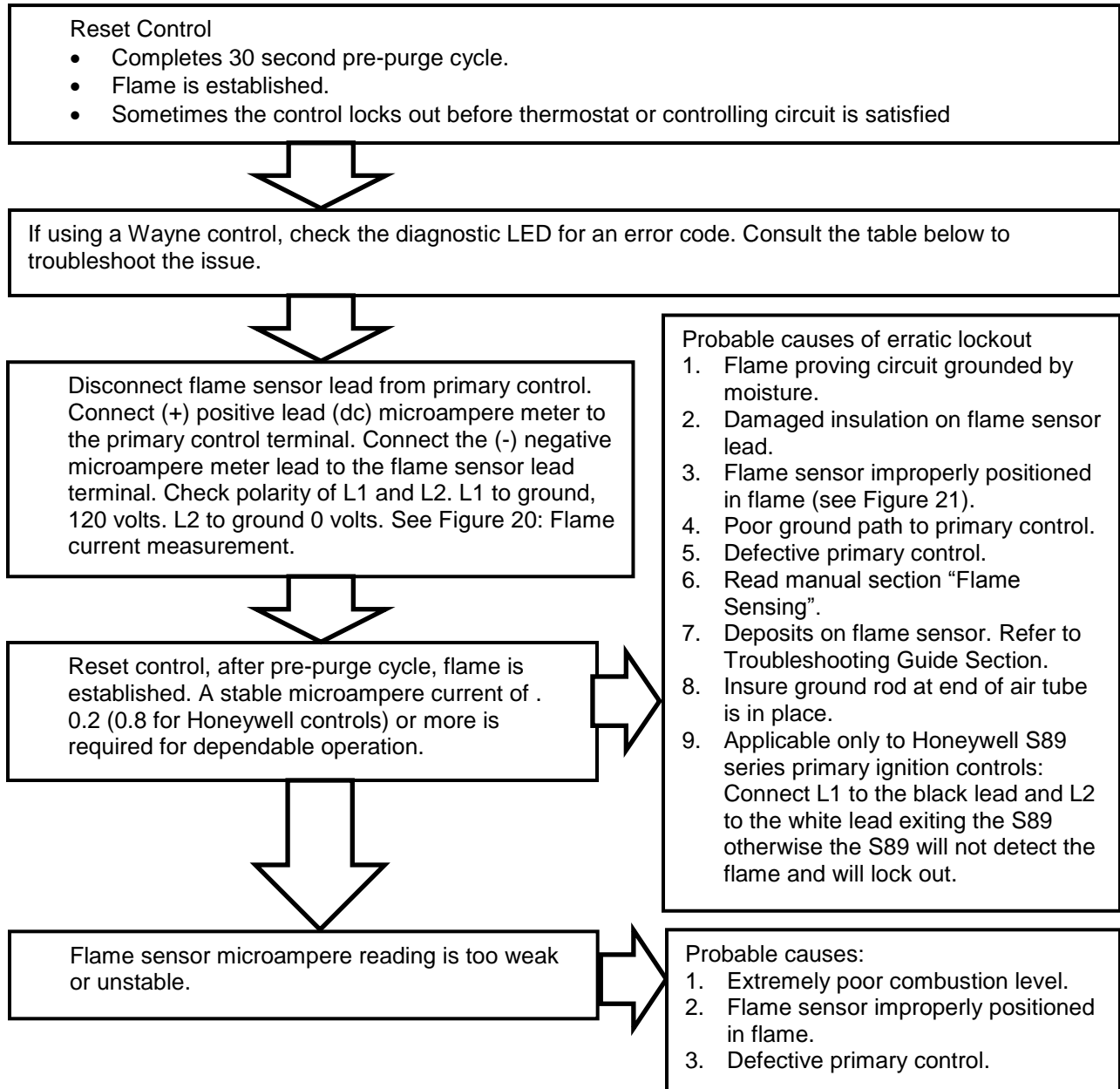
NO IGNITION – NO GAS FLOW



Wayne Control Error Codes

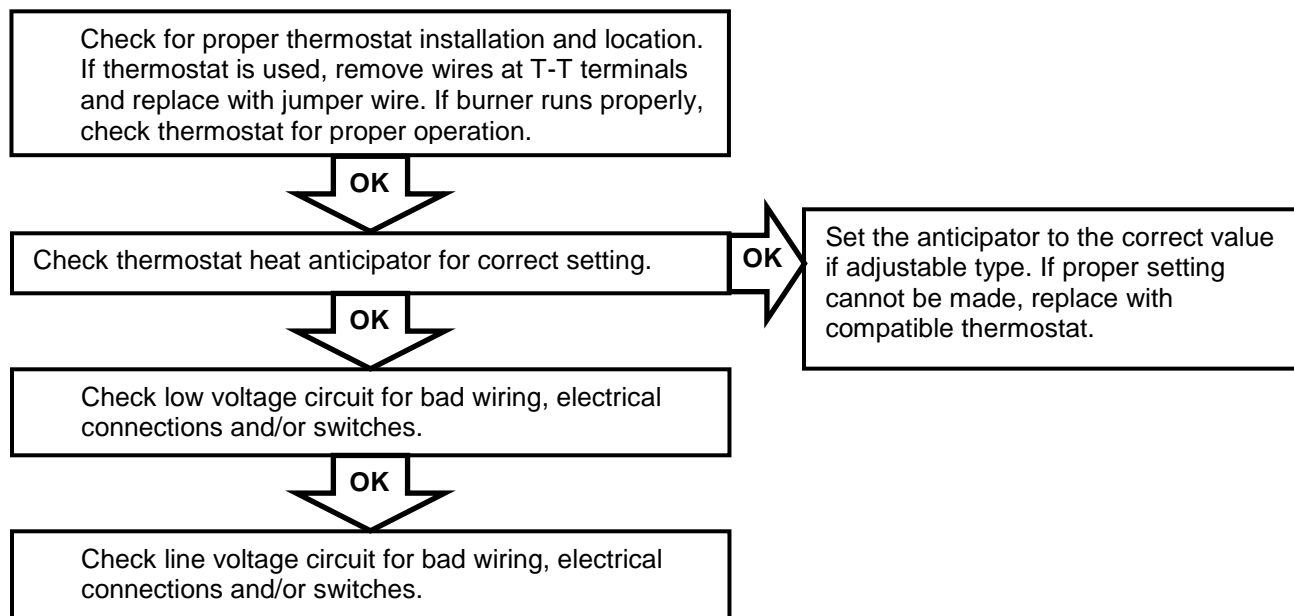
NUMBER OF FLASHES	ERROR
GREEN	NORMAL OPERATION
1	NO FLAME DURING TRIAL
3	GAS VALVE RELAY FAIL
4	LINE VOLTAGE ERROR
5	INTERNAL CONTROL ERROR

LOSES FLAME DURING CYCLE – CONTROL LOCKS OUT ON SAFETY



NUMBER OF FLASHES	ERROR
GREEN	NORMAL OPERATION
1	NO FLAME DURING TRIAL
3	GAS VALVE RELAY FAIL
4	LINE VOLTAGE ERROR
5	INTERNAL CONTROL ERROR

BURNER CYCLES ERRATICALLY



NOTE: When the thermostat wires terminate on the HSG primary control box "T" terminals, the heat anticipator setting value for the HSG burner is determined by adding the primary control current to the gas valve current. The result is the anticipator setting. (Example: $0.2 + 0.6 = 0.8$ amps).

If the thermostat wires ARE NOT terminated on the burner control box "T" terminals and these terminals are JUMPED, you must then determine what the correct anticipator setting is by inspecting the controlling device at the point where 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: $0.4 + 0.2 = 0.6$ amps). When the current draw cannot be determined accurately by the above method, measure the current with an ampere meter using 1 AMP scale. Connect the meter leads in series with one of the thermostat leads for the accurate reading.

SERVICING HSG SERIES BURNER
(SERVICE TECHNICIAN ONLY)



ELECTRICAL SHOCK HAZARD

Make sure the main manual gas valve, manual control knob on the combination valve and electrical supply are turned off before opening burner or removing any parts for service.



BURN HAZARD, HOT SURFACE

Burner flange and air tube are hot when burner is in operation. Do not service this area during or immediately after operation. Allow area to cool.

A. BURNER HEAD AND ELECTRODE/SENSOR ASSEMBLY

The burner head, electrode, sensor probe, combination valve, orifice housing and housing cover are part of the gas train assembly which can be removed as one unit (see Figure 23).

1. Disconnect the gas supply line from the combustion gas valve inlet; disconnect flame sensor lead wire from gas primary, gas valve lead wires from gas valve operator and (orange) ignition lead wire from ignition transformer ignition lead wire.
2. Remove the two 1/4" hex slotted screws on the top front of the housing cover and the two 5/16" hex slotted screws on the left and right side back of the housing cover.
3. To remove gas train assembly, gently lift up rear of housing cover pulling rearward slightly on the drawer assembly gradually positioning the rear of the drawer assembly upward 90 degrees. Gently extract burner head and electrode/sensor assembly out of opening in housing taking extreme care to not dislocate or damage igniter electrode or flame sensor.
4. When servicing, clean burner head ports, igniter electrode and flame sensor. Inspect the flame sensor and electrode wires and porcelain insulators carefully for hairline cracks which will degrade performance. Replace as necessary.
5. Examine the igniter electrode and flame sensor for any serious corrosion or deterioration of metal at the tips. Check for proper dimensional settings of the flame sensor and electrode (See Figure 21). Adjust and/or replace these assemblies as necessary. Make sure that the ignition and sensor probe wires go to the correct electrodes and the ignition wire boot is in place over the electrode porcelain.
6. Make sure that the burner tube end is properly positioned in the combustion chamber entry. It must be set 1/8" (3.2 mm) short of the inside face of the combustion chamber as shown in Figures 6, 7, 8.

B. AIR PROVING SWITCH

The air proving switch is mounted to the housing cover with (2) #6 self-tapping screws under the gas valve. A clear plastic tube, protected by a spring cover, is connected to the barbed fitting on the pressure switch while the other end is connected to a brass barbed fitting. The plastic tube allows pressurized air from the blower housing to travel to the pressure switch causing diaphragm contacts to close thus completing the circuit.

The function of the air proving switch is to ensure combustion air is being developed by the blower motor and blower wheel. Should the blower motor fail or the blower wheel malfunction, the burner gas valve will shut off.

1. The air proving switch should never require maintenance. However, should nuisance lockouts occur, the pressure switch can be checked. This is done by disconnecting the yellow and white leads from the Air Proving switch and jumpering the leads together. If the burner functions correctly, the switch needs to be replaced.

WARNING**Electrical Hazard**

If a jumper is used to check the pressure switch it must be removed or an unsafe operating condition can occur resulting in personal injury or death.

2. As mentioned above, the switch should never require maintenance. However a pinched tube will shut off the flow of pressurized air to the diaphragm creating a failure made similar to bad air proving switch. Always check to ensure that the clear tubing is not pinched. Make sure the spring cover is reinstalled over the tube.
3. Switch is mounted in the horizontal position with terminals up from factory. Final burner mounting should maintain horizontal switch position.

NOTICE

Damage to internal components of burner may result, if air proving switch is mounted in another position other than horizontal.

C. COMBUSTION AIR BLOWER AND MOTOR

1. Cleaning of the combustion air blower is indicated if the blades show an accumulation of dust and lint, or if the character of the flame indicates a deficiency of combustion air.
2. The side plate, motor and blower wheel are removed as one assembly. Disconnect the motor wire inside the junction box beneath the ignition transformers. Remove the four 5/16" hex slotted screws securing side plate to fan housing.

NOTICE

Do not remove blower wheel from motor shaft during periodic cleaning.

3. Should removal of the blower wheel be necessary for cleaning or replacement of it or the motor, the blower wheel must be positioned correctly on the motor shaft (Figure 24).

HSG200 blower wheel part number 21664 is positioned 2 1/16" (52.4mm) measured from the blower wheel inlet ring face to the side plate face.

HSG400 blower wheel part number 21642 is positioned 2 3/16" (55.6 mm) measured from the blower wheel inlet ring face to the side plate face.

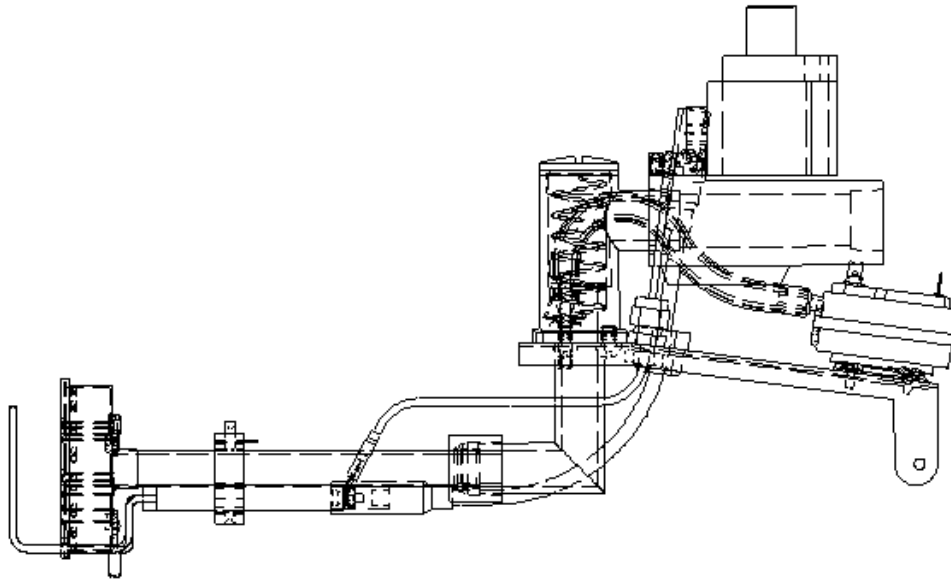


Figure 23: HSG Gas Train Assembly (INDIVIDUAL PARTS ONLY SOLD SEPARATELY. REFERENCE SECTION VI FOR PART NUMBERS)

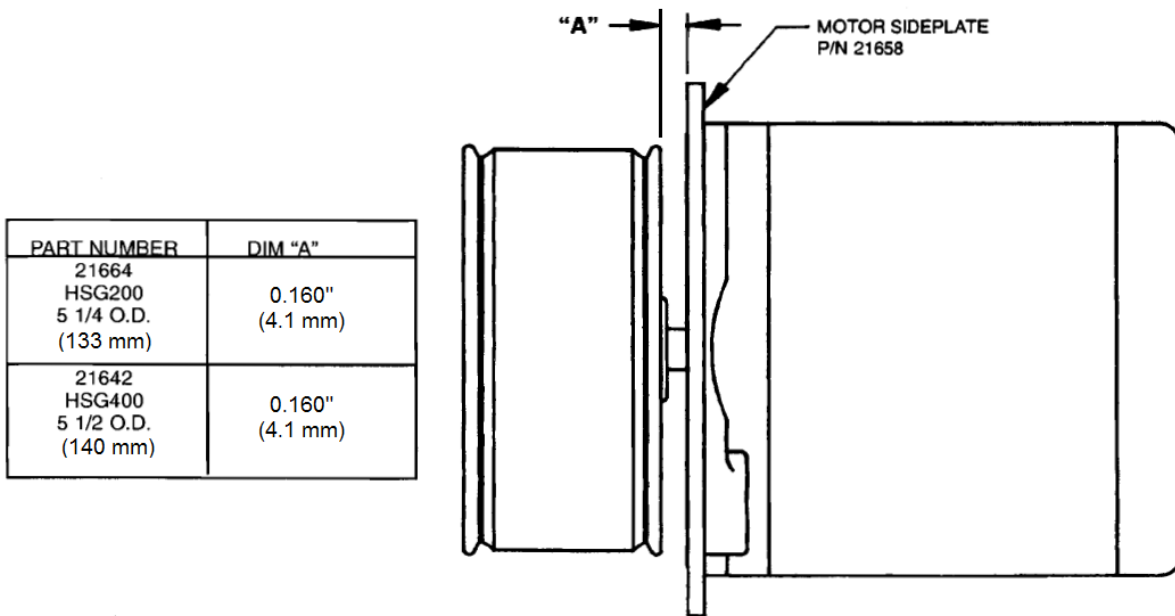


Figure 24: MOTOR/BLOWER ASSEMBLY

TROUBLESHOOTING GUIDE

Nuisance Lockouts/Flame Sensing Problems –HSG200 & HSG400 Gas Burners

Wayne’s HSG series direct spark ignition (DSI) gas burners prove flame through the process of flame rectification. Flame rectification is achieved by the ignition control as it places a small voltage on the flame sensor. When the flame sensor is surrounded by flame, the voltage on the flame sensor “leaks” to ground through the flame, resulting in an electrical current. This current is interpreted by the ignition control as the presence of flame.

One of the most common problems with gas appliances utilizing this type of electronic flame sensing system is the “nuisance lockout”. Lockouts are not generally due to the burner failing to ignite, but rather

simply the failure of the system to sense the establishment of the flame. Should this situation exist for a period of time longer than the ignition control's stated lockout timing, the control will shut down or go into permanent lockout. The only way to get the burner to recycle is to break, and then reinstate power to the burner.

The following situations can lead to flame sensing problems and can be checked without disassembling the burner:

- The burner is not properly grounded to "earth ground" of the supply voltage.
- The ignition control is not properly grounded to the burner itself. Using an ohm meter, check the wire attached to both parts for good contact and continuity.
- The burner ignition control is polarity sensitive. The polarity of the incoming line voltage may be reversed. Verify that black and white wires are hot and neutral respectively, and that they are connected to the corresponding black and white wires on the burner.

The remaining checks and/or adjustments require removal of the gas train:

- The connections from the "SENSE" terminal of the ignition control to the end of the flame sensor may be broken at some point. Check all quick connect terminations and connections. Check the continuity with an ohmmeter while flexing wires to assure no hidden conductor breakage exists. If replaced, wiring must be of equal or heavier gauge and equal or better temperature rating.
- The flame sensor probe may be grounded out. Assure that the flame sensor probe is not touching the burner head. The flame sensor should be positioned in the center of the clearance groove on the outer edge of the burner head with approximately 1/16" (1.5875mm) clearance from the head. The flame sensor must not be positioned too far away from the head as this may result in grounding out of the flame sensor against the inside surface of the air tube.
- The flame sensor probe should be free of soot and creosote. Deposits may insulate the probe, leading it not to pass the electrical charge to the flame. The probe can be cleaned with steel wool, emery paper or extra fine sandpaper.

NOTICE

Deposits on the flame sensor probe are the leading cause of nuisance lockouts in dual-fuel wood/gas fired appliances.

- The flame sensor probe may be burned away. Check it against dimensions on the IGNITER AND FLAME SENSOR PROBE SETTINGS drawing (Figure 21).
- The dimensional location of the flame sensor probe may be incorrect, or the probe may be bent out of shape. Check it against dimensions on the IGNITER AND FLAME SENSOR PROBE SETTINGS drawing and adjust if necessary.
- The spark electrode gap may be incorrect, resulting in no spark or an inadequate spark that will not ignite the gas properly. Check the electrode gap against the IGNITER AND FLAME SENSOR PROBE SETTINGS drawing and adjust if necessary.
- The high tension lead conductor from the ignition transformer to the tip of the spark electrode may be broken, preventing the high voltage current from getting to the electrode tip. Check all connections thoroughly and/or check to continuity of the lead wire assembly with an ohmmeter.

Once all of the items listed previously have been carefully checked and corrected as necessary, re-insert the gas train assembly into the burner. NOTE: be careful not to bend the air proving switch sail arm (if so equipped) or accidentally reposition with the flame sensor probe or igniter electrode during reinstallation of the gas train assembly.

If, after all of the above listed items have been carefully checked, the burner still fails to work, it is due one of or more of the following problems:

1. Unit sparks and fires but will not stay lit. Ignition control module is malfunctioning and must be replaced.
2. Unit does not spark. Ignition transformer is bad and must be replaced.

HSG WIRING DIAGRAMS
HSG SERIES BURNER WITH WAYNE 64420-001 IGNITION CONTROL

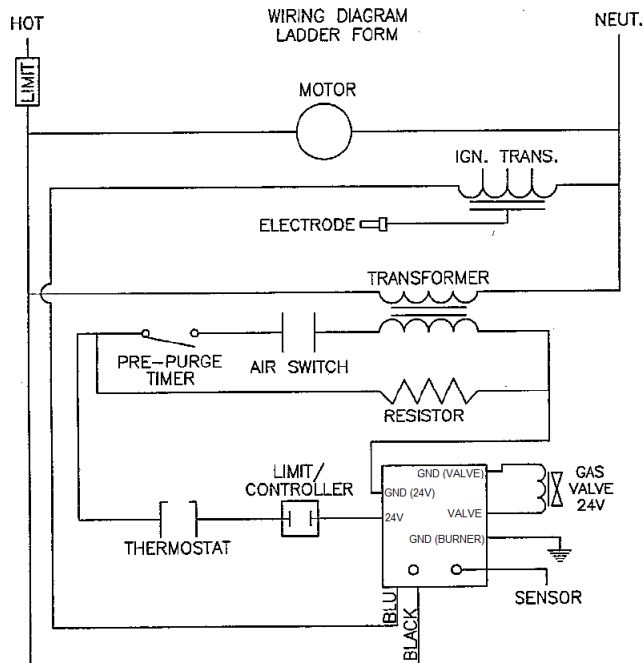
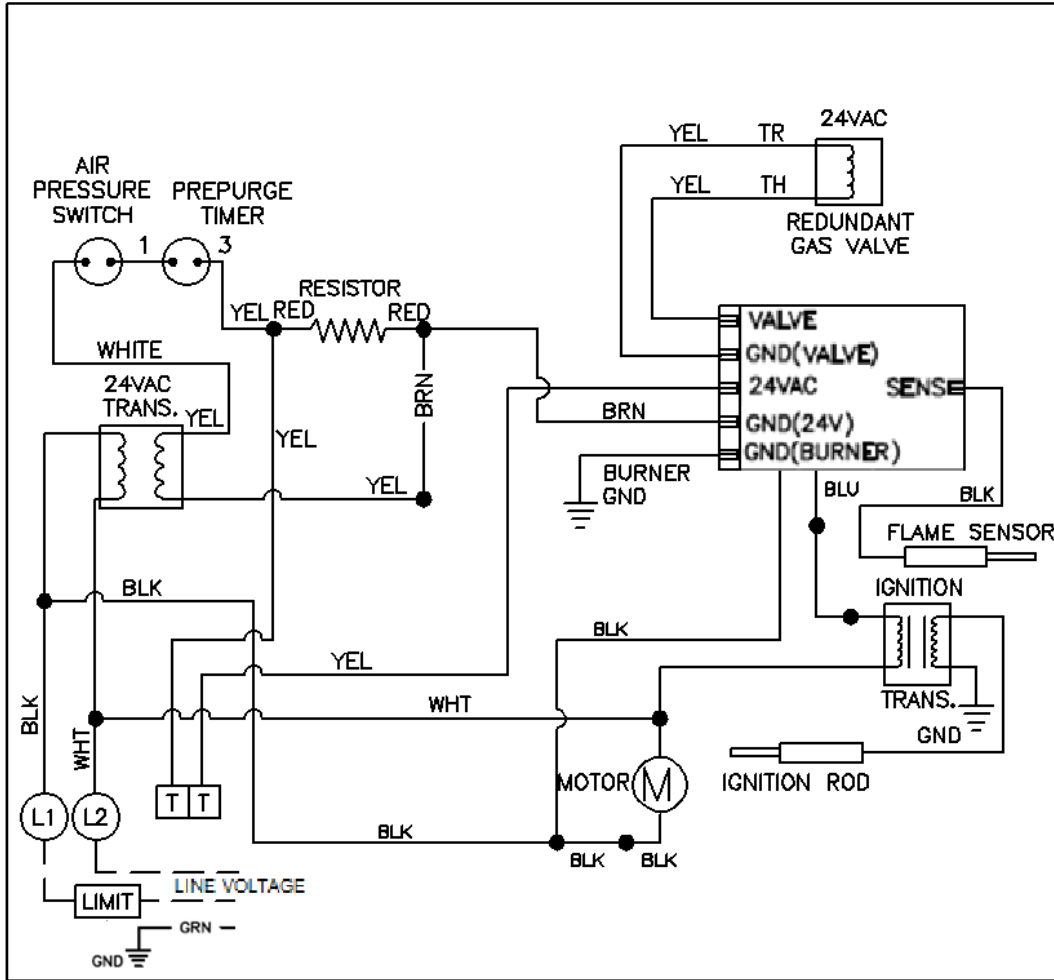


Figure 25: Wiring Diagram for Burners with Wayne 64420-001 Control

HSG SERIES BURNER WITH WAYNE 64420-002 IGNITION CONTROL

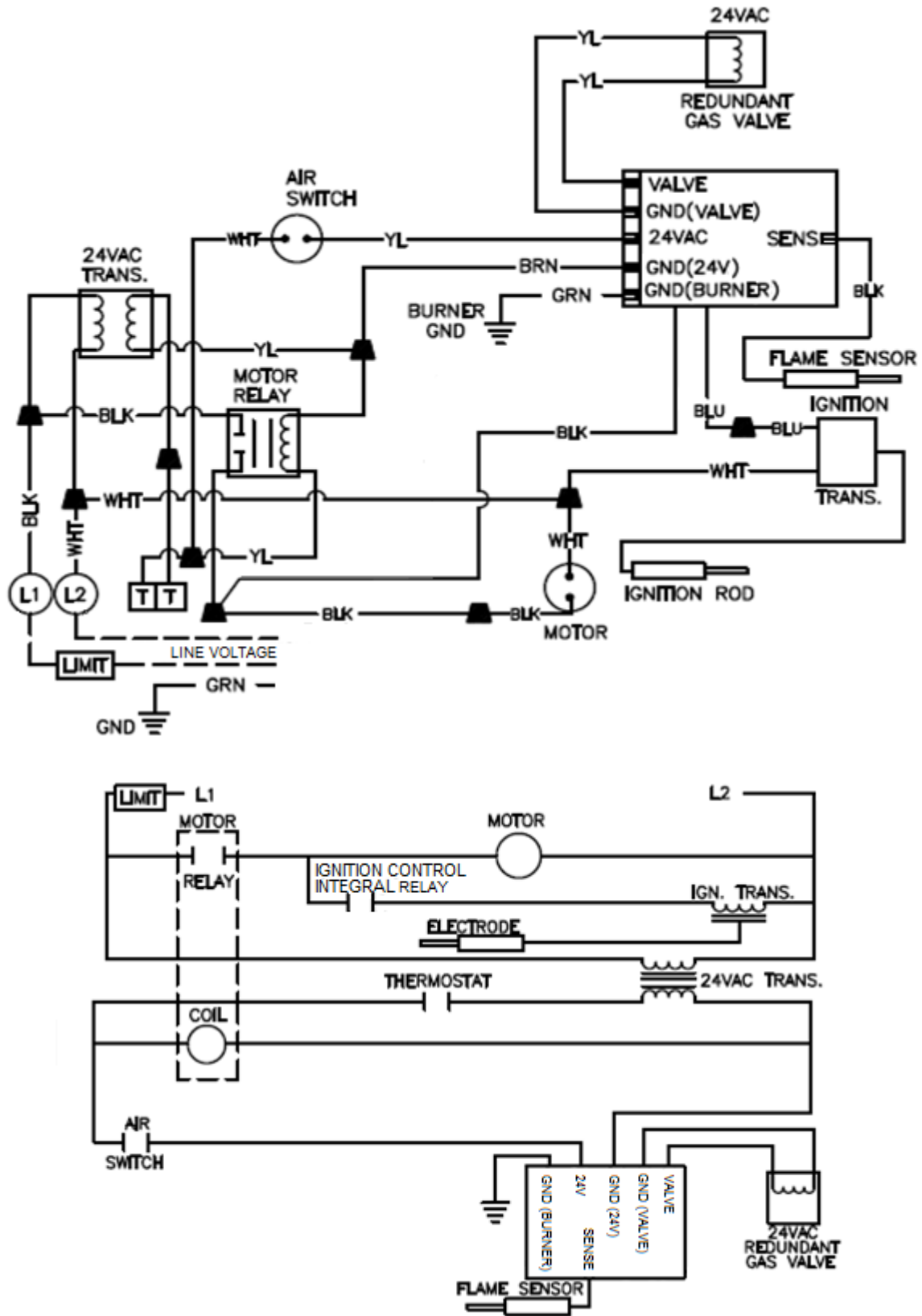


Figure 26: Wiring Diagram for Burners with Wayne 64420-002 Control

HSG SERIES BURNER WITH HONEYWELL S89E GAS PRIMARY CONTROL

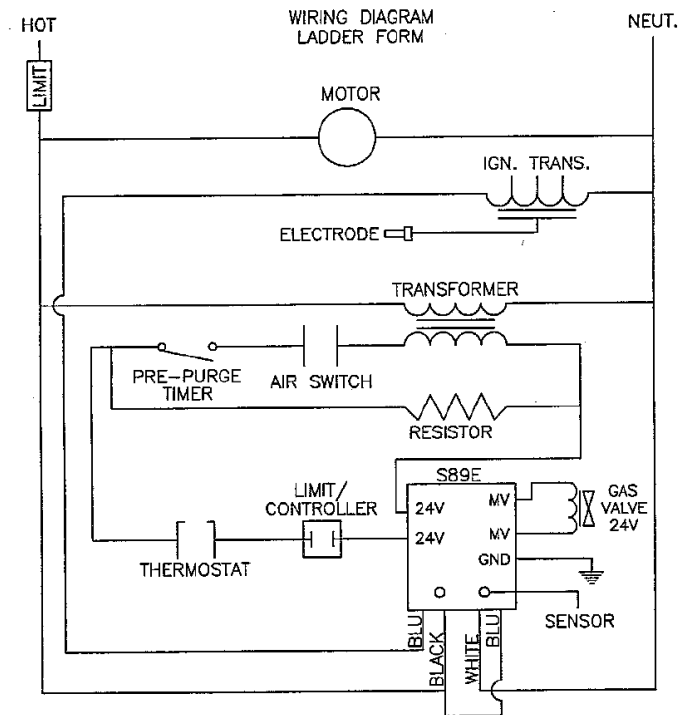
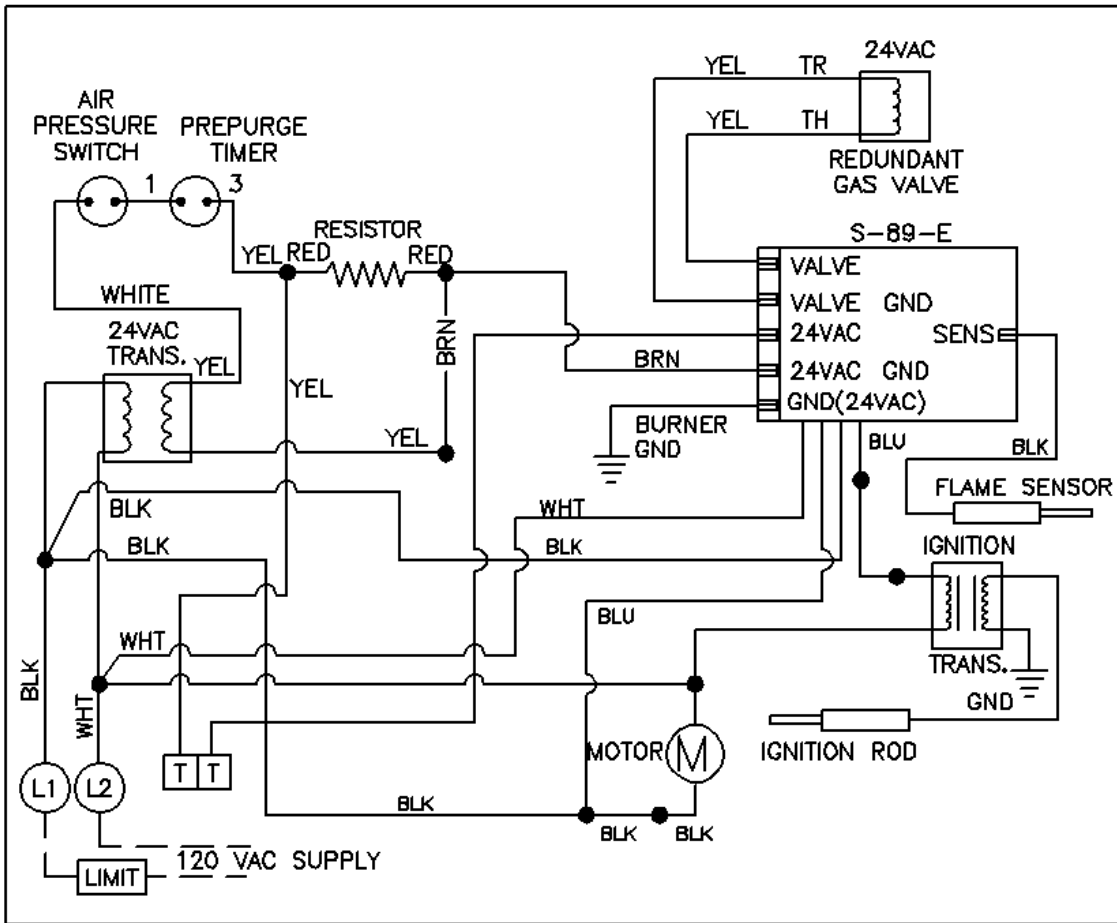


Figure 27: Wiring Diagram for Burners with Honeywell S89E Control

HSG SERIES BURNER WITH HONEYWELL S89F GAS PRIMARY CONTROL

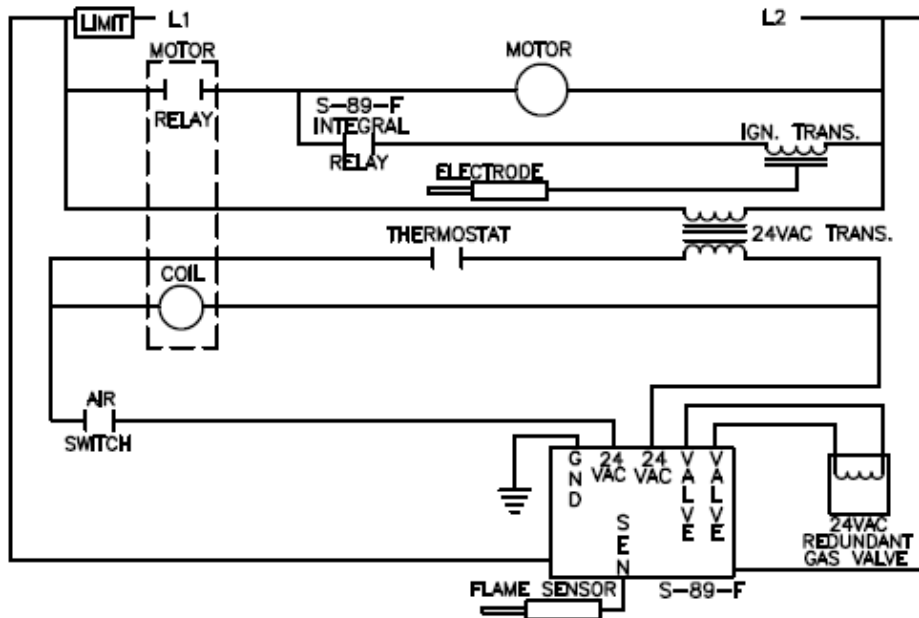
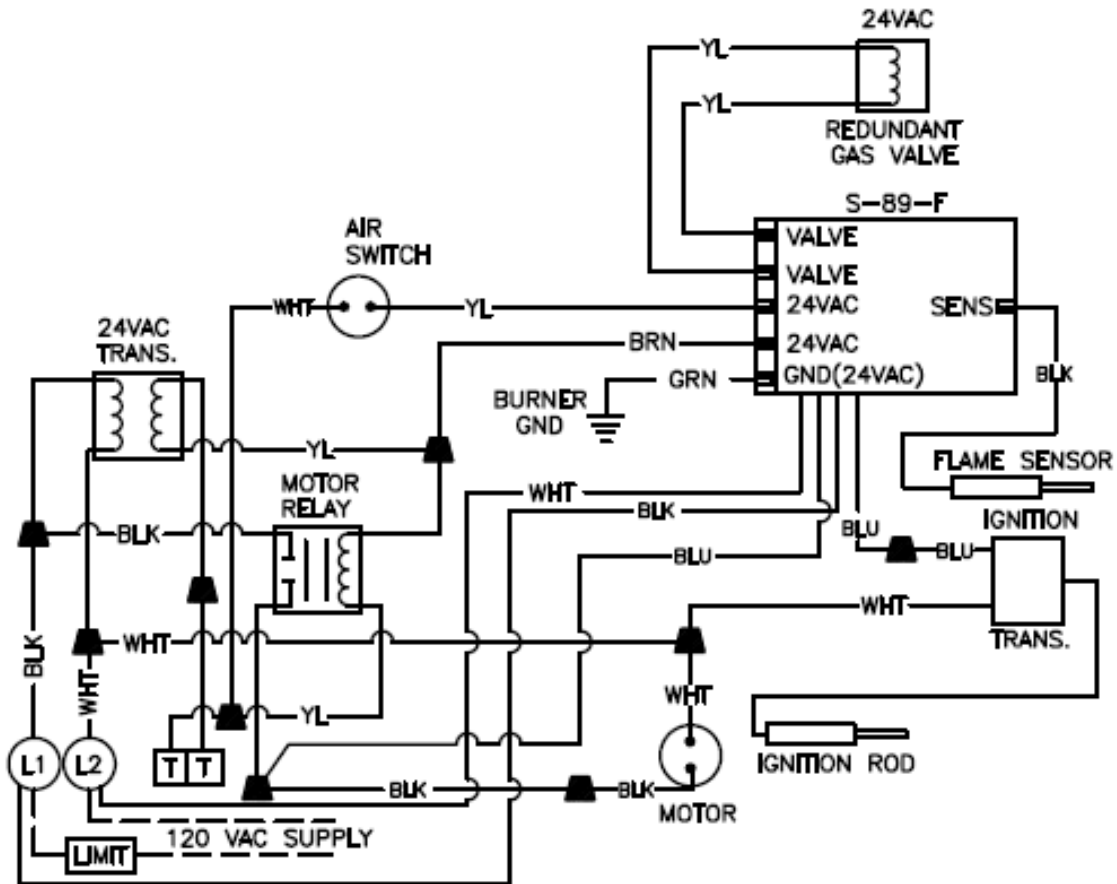


Figure 28: Wiring Diagram for Burners with Honeywell S89F Control

SECTION VI: PARTS LIST AND EXPLODED VIEWS

HSG200/400 PARTS LIST		
Item	Part No.	Description
1	100934-001	Burner Housing
2	62576-SER6	Air Tube - HSG200 6" (152.4mm)
	63270-004	Air Tube - HSG400 6 1/4" (158.75mm)
	62576-SER9	Air Tube - HSG200 9" (228.6mm)
	63270-015	Air Tube - HSG400 9" (228.6mm)
	62576-SER12	Air Tube - HSG200 12" (304.8mm)
	63270-027	Air Tube - HSG400 12" (304.8mm)
	63270-028	Air Tube - HSG400 15" (381mm)
3	62393-SER	Air Cone - (HSG200 only) (not shown)
4	21724-011	Adjustable Flange Assembly (includes gasket, not shown)
5	100428-002	Flange Gasket (not shown)
6	21664	Blower Wheel 5 1/4" OD (133.35mm) (HSG200)
	21642	Blower Wheel 5 1/2" OD (139.7mm) (HSG400)
7	21658	Side Plate
8	20627	Motor, split phase 1/7 HP (0.107 kW) 3450 RPM 120V/60
	24001-001	Motor, 1/7 HP (0.107 kW) 2850 RPM 230V 50/60 Hz
9	100373-002	Combustion Air Inlet damper
10	62408-001	Control Box (S89E & S89F)
11	62388-001	30 second Pre-purge Timer (Used with P/N 62758-002) (Special Limit Applications Only)
	62530-001	Resistor Wire Assembly
12	60186-004	24 Volt Transformer 120V
	64404-001	24 Volt Transformer 230V 50/60 Hz
	100450-001	Bushing
13	62406-002	Motor Relay
14	62759-002	Ignition Control Honeywell S89F with 30 sec. Pre-purge
	62758-002	Ignition Control Honeywell S89E with 0 sec. Pre-purge (Special Limit Applications Only)
	64420-002	Ignition Control, Wayne with 30 sec. Pre-purge
15	100377-002	Damper Indicator Pointer
16	100429	Damper Decal
15-16	100373-KIT	Includes 100373-002, 100429, 100377-002 and 100410
17	63263-005	Pressure Switch
	63272-005	Pressure Switch Conversion Kit
	63935-001	Pressure Switch (230V/50Hz)
18	60178-002	Thermostat Terminal Strip
19	100372	Adjustment Arm Off-Cycle Damper
20-21	100371-KIT	Off-cycle Damper Kit (not shown)
22	21319	Junction Box (under Ignition Transformer)
23	61843	Lighting Plate
24	62407-001	Ignition Transformer 120V, 60 Hz, France
	63873-001	Ignition Transformer 120V, 60 Hz, Allanson
	64051-001	Ignition Transformer 230V, 50/60 Hz
25	62391-002	Electrode Assembly
26	62390-002	Sensor Probe (flame sensor) Assembly
27	62387-001	Insulator Bushing (QTY 2 REQUIRED ON HSG BURNER)
28	62575-002	Chamber/Manifold - HSG200 6" (152.4mm)
	62575-001	Chamber/Manifold - HSG400 6 1/4" (158.75mm)
	62575-014	Chamber/Manifold - HSG200 9" (228.6mm)
	62575-012	Chamber/Manifold - HSG400 9" (228.6mm)
	62575-026	Chamber/Manifold - HSG200 12" (304.8mm)
	62575-024	Chamber/Manifold - HSG400 12" (304.8mm)
	62575-031	Chamber/Manifold - HSG400 15" (381mm)
29	62419-001	Clip, Electrode Bracket
30	61951-001	Igniter Support Parts Kit (INCLUDES 62419-001 and 62387-001) (not shown)
31	62411-028	11" (279.4mm) Sensor Wire - 6" (152.4mm), 6 1/4" (158.75mm) Burner
	62411-030	14" (355.6mm) Sensor Wire - 9" (228.6mm), 12" (304.8mm) Burner
	62411-068	17" (431.8mm) Sensor Wire - 15" (381mm) Burner
	64096-001	Sense Wire - 330mm Cable (230V 50/60 Hz)

PARTS LIST CONTINUED ON NEXT PAGE.

HSG200/400 PARTS LIST CONT.

Item	Part No.	Description
32	62909-001	8" (203.2mm) Ignition Wire - S89E & S89F controls only; 6", 6 1/4" Burner
	62909-003	14" (355.6mm) Ignition Wire- S89E & S89F controls only; 9", 12", 15" Burner
	64095-001	Ignition Wire - 500mm Cable (230V 50/60Hz) Use with 64051-001 Ignition Transformer
	63995-001	18" Ignition Wire – Use with 63873-001 Ignition Transformer
	64460-001	8" Noise Suppression Ignition Wire, Use with Wayne controls; 6", 6 1/4" Burner
	64460-002	14" Noise Suppression Ignition Wire, Use with Wayne control; 9", 12", 15" Burner
33	62404-002	Top Plate/Housing Cover
34	62304	Strain Relief Bushing/Ignition Wire
	62402-KIT	Includes items 35 - 38
35	62402-001	Orifice Housing
36	62410-001	Orifice Spring
37	62401-001	Orifice Gasket
38	62385-001	Orifice Cap
39	-----	Orifice (Location Reference Only) See Item 41
40	62374-004	Gas Valve Honeywell VR8305M 4801
41	62459-001	Orifice Package -HSG200 (not shown)
	62459-002	Orifice Package -HSG400 (not shown)
42	21760-011	Option Pedestal Mounting (not shown)
43	64635-001	Mounting Plate, Wayne Control

HSG EXPLODED VIEWS

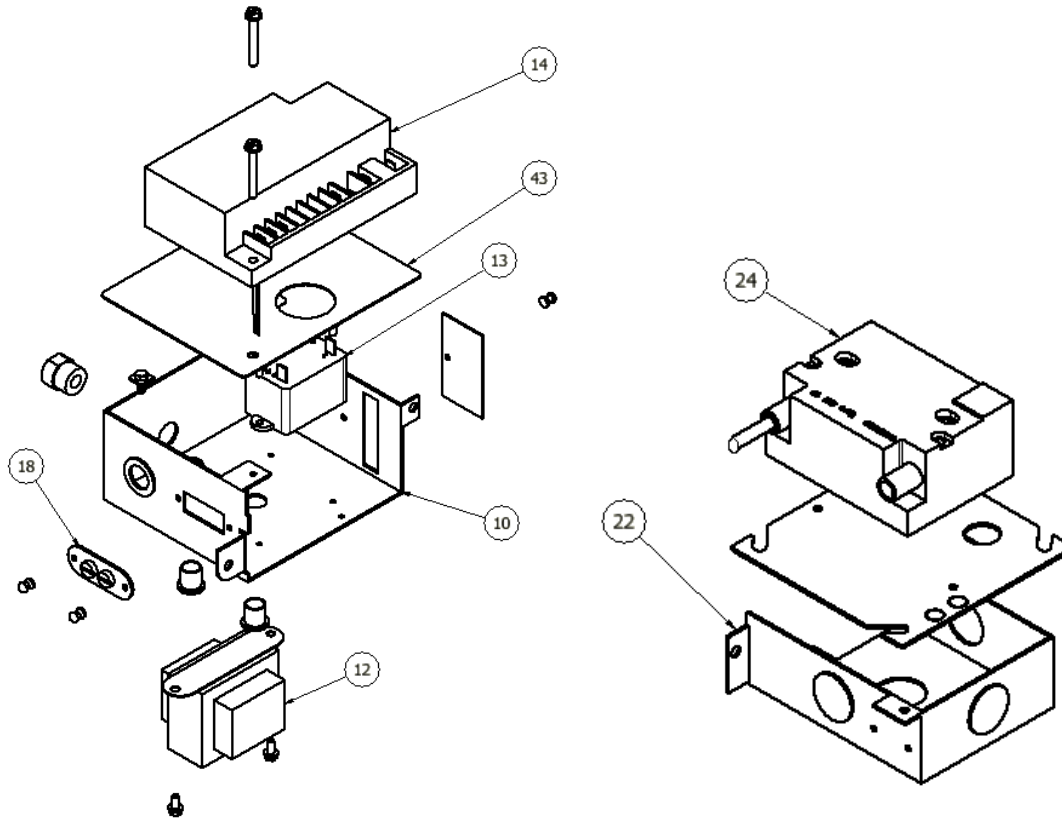


Figure 29: Junction Box Assemblies Exploded

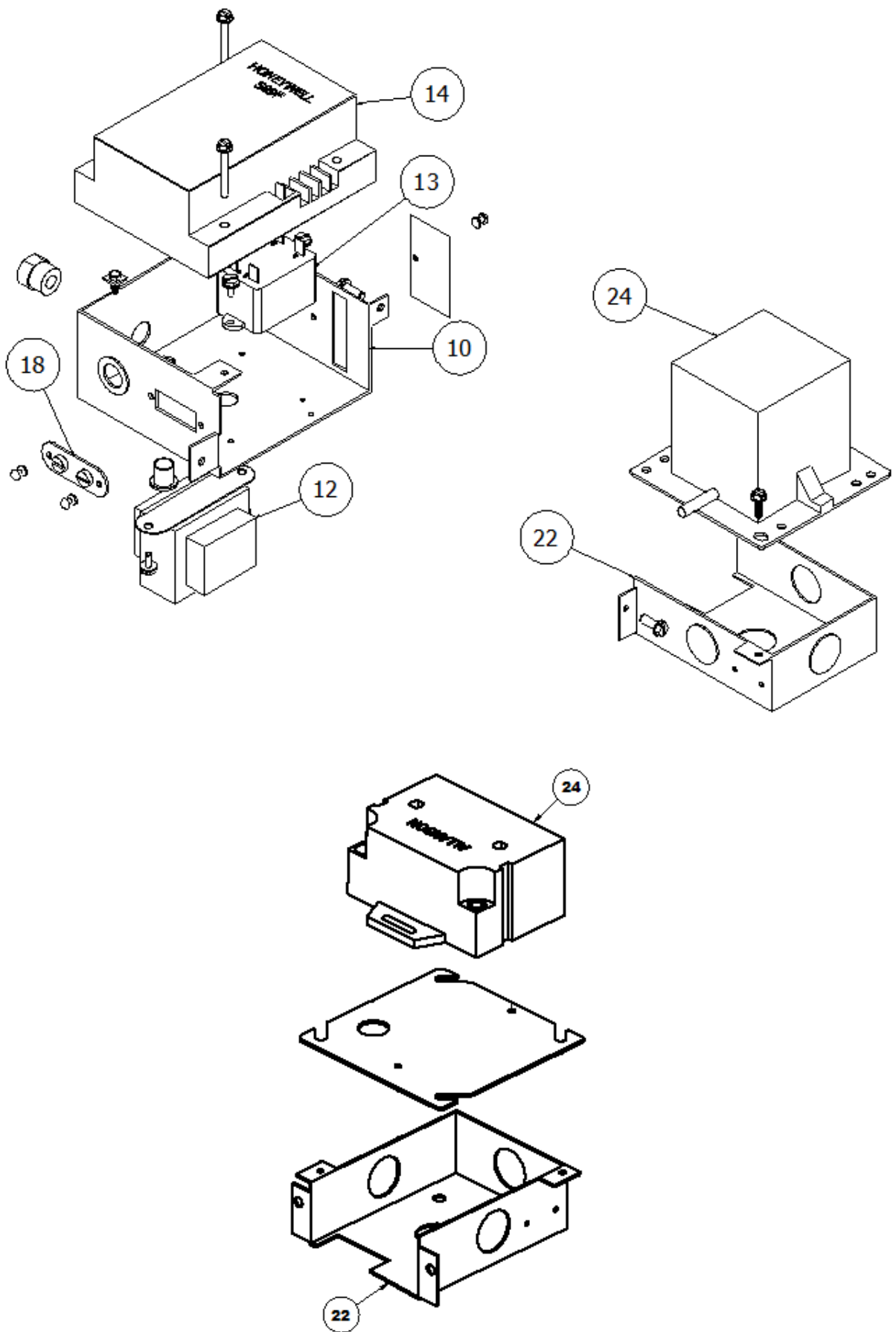


Figure 29 continued: Junction Box Assemblies Exploded

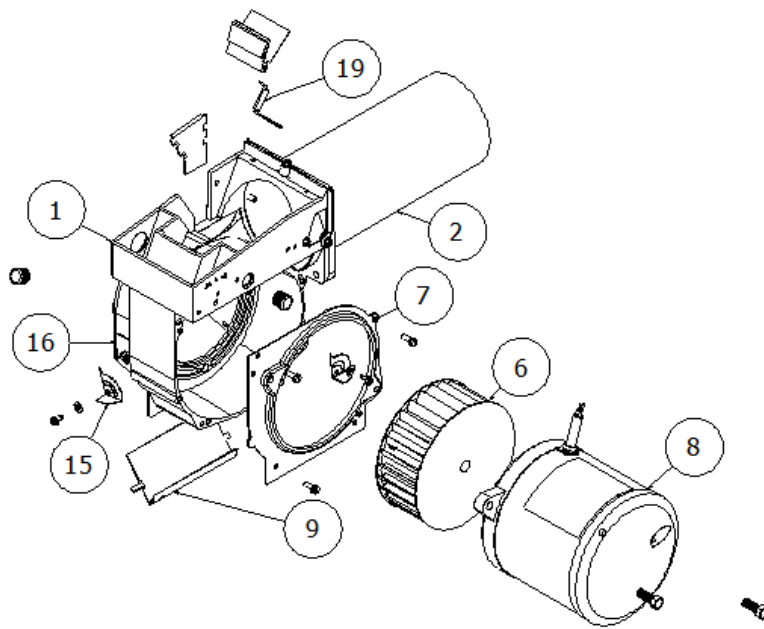


Figure 30: Motor Assembly Exploded

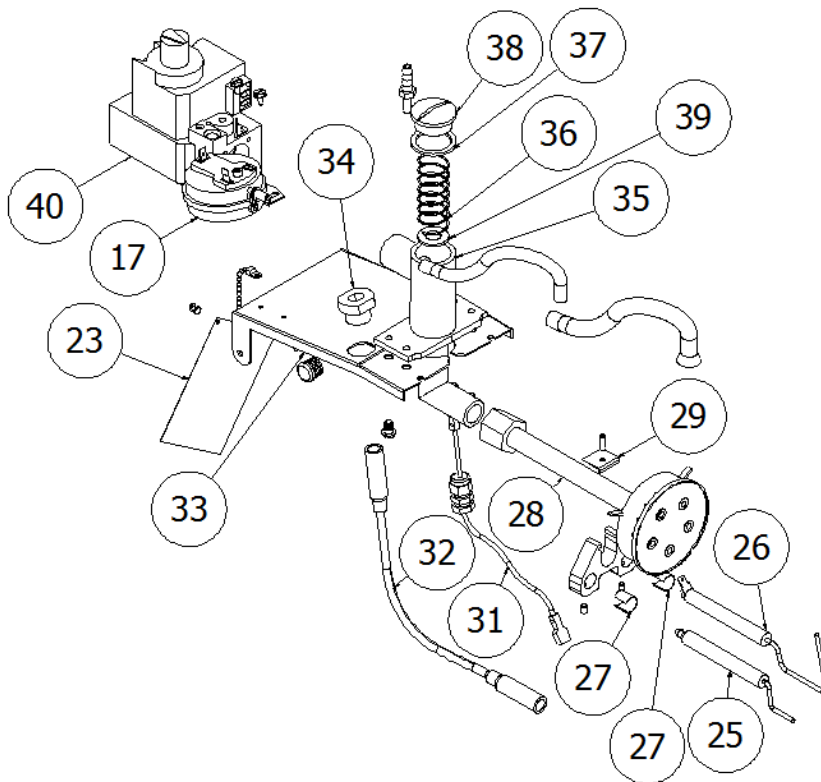


Figure 31: Gun Assembly Exploded

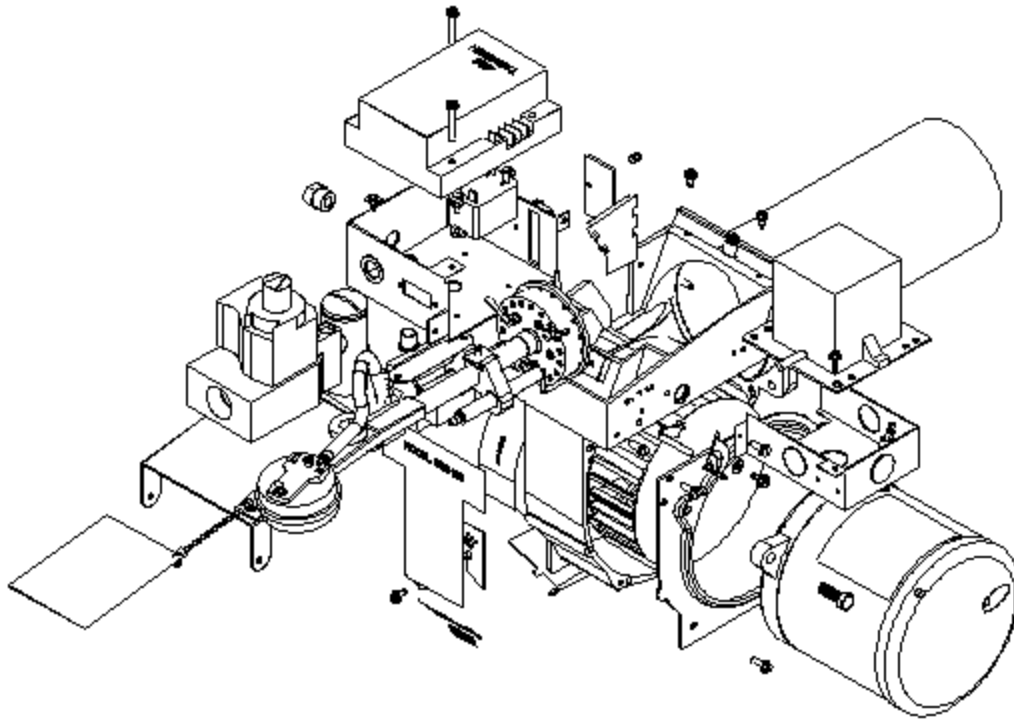


Figure 32: HSG Series Burner Exploded

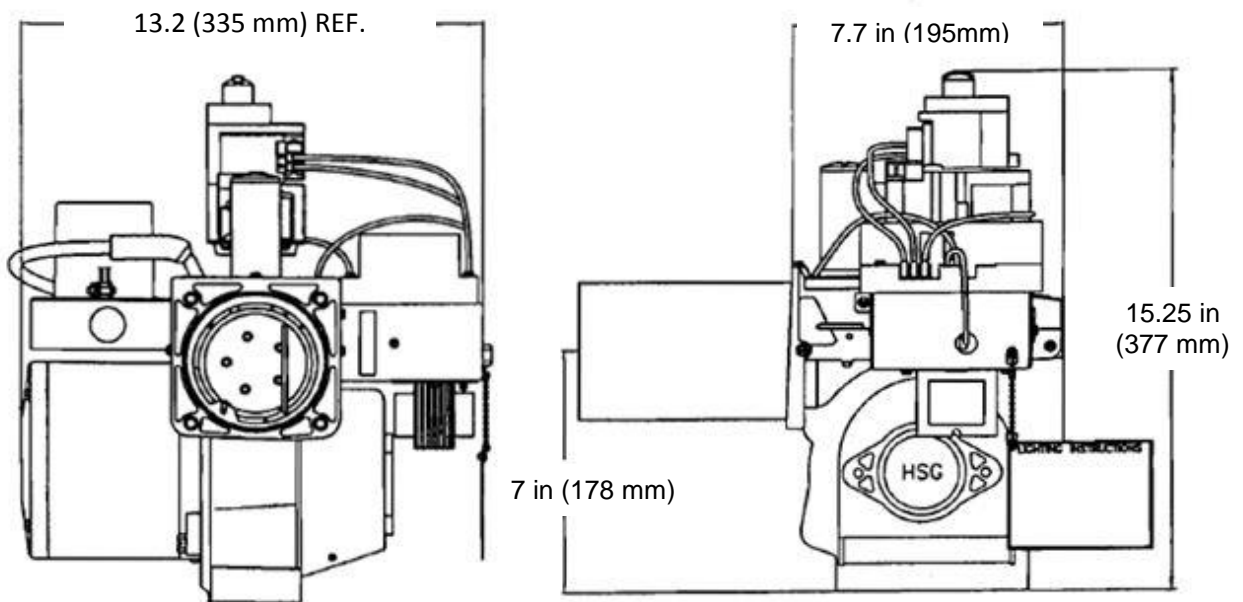


Figure 33: Outer Dimensions of HSG Series Burner



SECTION VII: WARRANTY

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:

1. Fuel pumps, 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.
5. 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.

