



A SCOTT FETZER COMPANY
801 GLASGOW AVE.
FORT WAYNE, IN 46803

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MODELS

HSG200

HSG400

GAS BURNERS

120V/50-60 HZ

220V/50 HZ

PART NO. 62484-001

WARNING: If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- WHAT TO DO IF YOU SMELL GAS
 - Do not try to light the appliance.
 - Do not touch any electrical switch; do not use any phone in your building.
 - 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.
- Installation and service must be performed by a qualified, licensed installer, service agency or the gas supplier. **WARRANTY IS VOIDED IF NOT INSTALLED BY QUALIFIED SERVICE PERSON.**



MEA
MASS.
ANSI Z21.17

APPROVED
FOR USE CITY
OF NEW YORK
MEA 49-83-E

NOTICE

THESE INSTRUCTIONS SHOULD BE AFFIXED TO THE BURNER OR ADJACENT TO THE HEATING APPLIANCE. FOR FURTHER INSTRUCTIONS AND WARNINGS, SEE PAGE 21 OF THIS MANUAL.

SPECIFICATIONS

[SEE PAGE #1]

**SPECIFICATIONS MODELS
HSG200, HSG400
NATURAL OR PROPANE GAS**

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

HSG200

Maximum Input Capacity - 200 MBtu/HR (211000 kJ)
Minimum Input Capacity - 60 MBtu/HR (63300 kJ)

HSG400

Maximum Input Capacity - 400 MBtu/HR (422000 kJ)
Minimum Input Capacity - 200 MBtu/HR (211000 kJ)

SUPPLY LINE PRESSURE REQUIRED: Natural or Propane 5.5 W.C. (1370 Pa) Minimum, 14.0 W.C. (3487 Pa) Maximum

AIR TUBE DIAMETER: 4 inches (101.6 mm)

AIR TUBE LENGTHS:	HSG200	6 inches	(152.4 mm)
(See Fig. 12C for	HSG400	6.25 inches	(158.75 mm)
Overall Dimensions)	HSG200/400	9.00 inches	(228.6 mm)
	HSG200/400	12.00 inches	(304.8 mm)

MOUNTING: Adjustable flange standard (deduct 1 1/8 inch (28.575 mm) from above air tube lengths when using flange). Optional pedestal mounting.

STANDARD VOLTAGE: 120 VAC / 60 HZ/ 1 Phase
120 VAC / 50 HZ/ 1 Phase (Special motor installed with max capacity reduced 20%)
220 VAC / 50 HZ/ 1 Phase

FLAME SAFETY: 24 VAC Electronic

IGNITION: 7300 VAC Direct Spark

GAS VALVE: 3/4 x 3/4 (19.05 mm x 19.05 mm) NPT 3 Function Redundant 24 VAC

*200 MBtu/HR (211000 kJ) (200,000 BTU [58.62 kW] / HR) or 400 MBtu/HR (42200 kJ) (400,000 BTU [117.24 kW] / HR) at sea level. Derate input for altitude over 2000 ft. (609.6 m) by 4% each 1000 ft. (304.8 m) above sea level. (one gallon (3.79 L) fuel oil = 140 MBtu/HR (14770 kJ)).

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SECTION I INSTALLATION

A. GENERAL

The Wayne HSG200 and HSG400 power gas conversion burners are adaptable to most types of central heating plants previously fired by power oil burners. Typical heating plants are gravity and forced air circulation furnaces, hot water, steam or vapor boilers. Power burner design makes the HSG200 and HSG400 well suited for "negative draft" fired appliances where an oil burner is being replaced.

Installation of these power gas conversion burner models must conform to local codes, or in their absence, the American National Standard for the Installation of Domestic Gas Conversion Burners, ANSIZ21.8 - and the National Flue Gas Code, ANSIZ223.1 or current standard year.

NOTICE: ANSI or local installation code compliance is the sole responsibility of the qualified installer.

B. VENTILATION

The HSG conversion burner models covered by this manual shall not be installed in an appliance located where normal air circulation or infiltration is limited in providing all the air necessary for proper 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 ventilation 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 is to be sized on the basis of one square inch (645.2mm²) or more of free area each 1,000 BTU (.29kW) input per hour.

When the building is of unusually tight construction, has kitchen and/or bathroom ventilation fans which may be used for exhausting air to outdoors, 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 (6.35mm) mesh.

C. HEATING APPLIANCE INSPECTION

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. 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.

D. CHIMNEY, FLUE PIPE AND DRAFT CONTROL

The chimney should be inspected for unsafe conditions such as excessive soot accumulation, deteriorated masonry, blockage or potential blockage.

NOTICE: No manually adjustable flue pipe damper is permitted on any gas burner installation.

The chimney should be lined with a corrosion resistant material. If the chimney is unlined, consult your local gas utility for recommendations.

WARNING: Under no circumstances should the flue pipe be connected to the chimney of an open fireplace.

The flue pipe should be sized to carry of the flue gases as outlined in Figure 1.

INPUT BTU/HR (kW/HR)	DRAFTHOOD FLUE PIPE SIZE
UP to -120 MBH (35.172kW)	5 INCH (127mm) DIAMETER
120 MBtu/HR (35.172kW) - 180 MBH (52.758kW)	6 INCH (152.4mm) DIAMETER
180 MBtu/HR (52.758kW) - 250 MBH (73.275kW)	7 INCH (177.8mm) DIAMETER
250 MBtu/HR (73.275kW) - 320 MBH (93.792kW)	8 INCH (203.2mm) DIAMETER
320 MBtu/HR (93.792kW) - 410 MBH (120.171kW)	9 INCH (228.6mm) DIAMETER

Figure 1

Strict compliance to appropriate codes should be made regarding flue pipe clearances from combustibile materials.

Pitch the horizontal run of the flue pipe upward 1/4 inch (6.35mm) per foot (.305m) or more. Run directly to the chimney, fasten joints securely and support horizontal runs to prevent sagging.

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 2 or, IF APPROVED BY LOCAL AUTHORITIES, a single barometric damper suitable for gas firing per Figure 3. The draft control should be sized the same as the flue pipe per Figure 1, and should be located higher than the highest part on the appliance flue passage. 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.

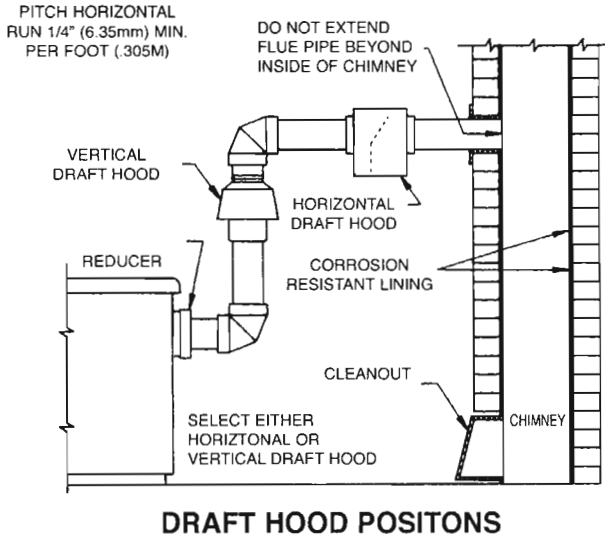


Figure 2

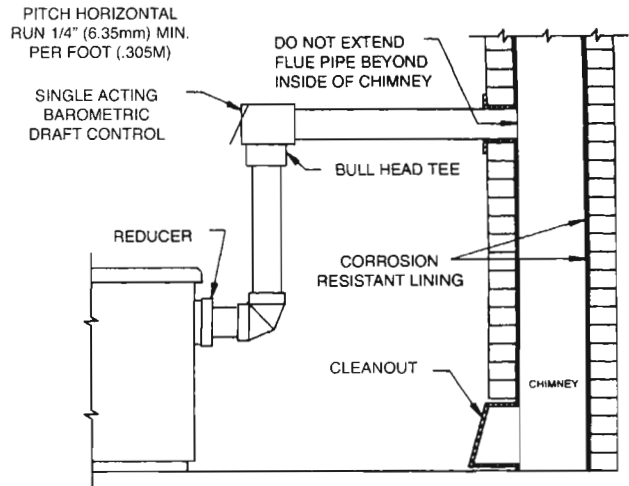


Figure 3

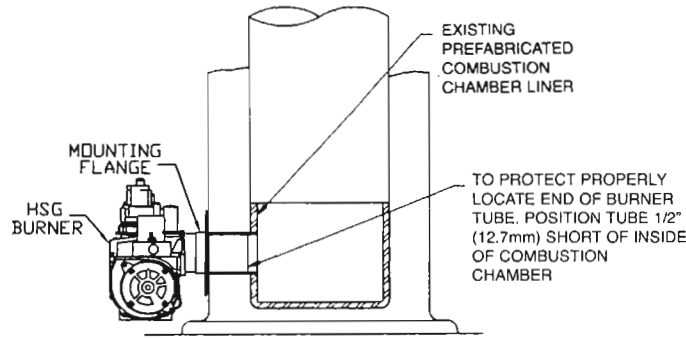


Figure 4

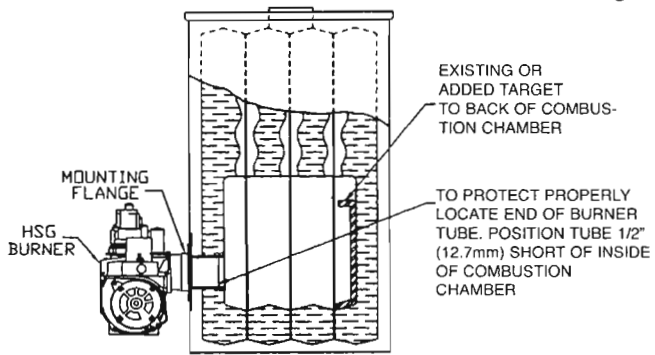


Figure 5

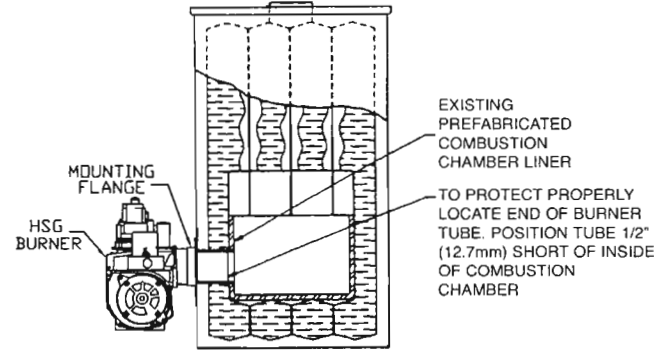


Figure 6

E. COMBUSTION CHAMBER

A combustion chamber is normally required to protect non-heat transfer surfaces, and to provide a radiant bed for rapid heat transfer to the primary surfaces of the heat exchanger. If in good condition, the existing combustion chamber can be used.

A full combustion chamber liner is recommended for warm air furnaces, (see Figure 4), and a target wall or full combustion chamber liner is recommended for wet leg cast iron or steel boilers. (See Figures 5 and 6). If a built-up chamber is necessary, use 2300° F (1260°C) minimum insulating fire-brick or fiberfrax.

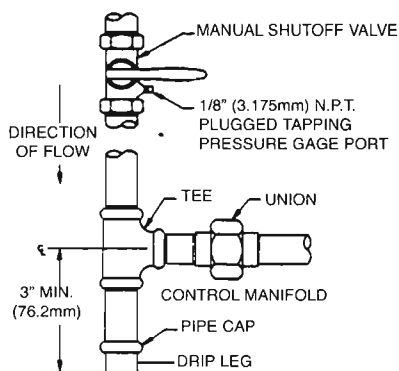
THE BURNER AIR TUBE MUST NOT BE ALLOWED TO EXTEND INTO THE CHAMBER PROPER; IT MUST BE SET 1/2 INCH (12.7mm) SHORT OF THE INSIDE SURFACE.

Before permanently securing the burner to the heating appliance with either the adjustable mounting flange or pedestal or cementing around the air tube in the combustion chamber opening, check that the burner head assembly is free of foreign materials and that the sensor and electrode probes have not been damaged or repositioned, see Figure 13.

INPUT BTU/HR kW/HR	PREFERRED	
	WIDTH"(mm) X LENGTH"(mm)	DIAM." (mm)
50 MBtu/HR (14.655kW)	7 (177.8) X 7 (177.8)	8 (203.2)
75 MBtu/HR (219.825kW)	7 1/2 (190.5) X 7 1/2 (190.5)	9 (228.6)
100 MBtu/HR (293.1kW)	12 (304.8) X 12 (304.8)	13 (330.2)
150 MBtu/HR (439.65kW)	12 (304.8) X 15 (381)	14 (355.6)
200 MBtu/HR (586.2kW)	13 (330.2) X 17 (431.8)	15 (381)
250 MBtu/HR (732.75kW)	13 (330.2) X 18 (457.2)	16 (406.4)
300 MBtu/HR (879.3kW)	13 (330.2) X 20 (508)	18 (457.2)
350 MBtu/HR (1025.85kW)	14 (355.6) X 21 (533.4)	20 (508)
400 MBtu/HR (1172.4kW)	15 (381) X 22 (558.8)	21 (533.4)

RECOMMENDED COMBUSTION CHAMBER SIZES

Figure 7



SUPPLY LINE CONNECTION TO BURNER

Figure 8

F. GAS PIPING

NOTICE: All piping must comply with state and/or local codes. The available gas supply pressure should be within minimum and maximum pressures shown in the burner specifications. If the gas supply pressure exceeds the 14" W.C. (3.5 k Pa) maximum, an intermediate main gas regulator must be installed ahead of the main gas manual shut off valve shown in Figure 8.

WARNING: Failure to install the intermediate gas regulator will result in gas leakage from burner gas valve.

A drip leg or sediment trap must be installed in the supply line to the burner. See Figure 8.

A pipe union shall be installed in the gas line adjacent to, and upstream from, the main gas manual shutoff valve. See Figure 8.

The gas supply piping to the burner should branch off from the main gas supply line as close to the gas meter as possible. Do not connect to the bottom of a horizontal section. See Figure 9 for gas supply pipe sizes.

Use new black iron pipe and malleable fittings free of burrs and defects. Use pipe joint compound resistant to liquefied petroleum gases.

A 1/8" (3.175mm) NPT plugged tapping accessible for test gauge connection shall be provided immediately upstream of the gas supply connection for determining gas supply pressure to the burner.

Test new supply piping for leaks. **CAUTION: DURING PRESSURE TEST FOR LEAKS IN GAS SUPPLY PIPING, THE BURNER MUST BE DISCONNECTED TO PREVENT EXPOSING THE COMBINATION GAS VALVE TO PRESSURES OVER 1/2" (3447 PaG) PSIG. POSSIBLY DAMAGING THE VALVE AND VOIDING THE BURNER WARRANTY.**

PIPE SIZE	TYPE OF GAS	CAPACITY - MBtu/HR (kJ)			
		LENGTH OF PIPE			
		15 (381mm)	30 (762mm)	45 (1143mm)	90 (2286mm)
3/4 (19.05mm)	Propane	400 (422000kJ)	250 (263750kJ)	200 (211000kJ)	
1 (25.4mm)	Natural	400 (422000kJ)	250 (263750kJ)	200 (211000kJ)	
	Propane		400 (422000kJ)	350 (369250kJ)	250 (263750kJ)
1 1/4 (31.75mm)	Natural		400 (422000kJ)	400 (422000kJ)	300 (316500kJ)
	Propane			400 (422000kJ)	400 (422000kJ)
1 1/2 (38.1mm)	Natural				400 (422000kJ)

CAPACITIES SHOWN ARE FOR A TOTAL PRESSURE DROP OF 0.3" W.C. (74.73Pa) FOR 0.5" W.C. (124.55Pa) PRESSURE DROP, MULTIPLY CAPACITY SHOWN BY 1.3. FOR HIGHER PERMISSIBLE PRESSURE DROPS, CONSULT YOUR UTILITY.

SUPPLY PIPE CAPACITIES IN MBtu/HR (kW)

Figure 9

G. ELECTRICAL

The installation must be wired and GROUNDED in accordance with local codes or in their absence, with the National Electric Code ANSI/NFPA No. 70-1987 or latest edition.

For the 120 VAC 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.

CAUTION: Each installation must include suitable limit controls. Existing oil burner combination limit and operating controls are normally not suitable for gas burner use.

CAUTION: The burner is equipped with it's own 24 VAC transformer. Do not add any 24 VAC power consuming device in the 24 VAC control circuit of the burner, as it could overload 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.

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

Section 3- Operation and Troubleshooting for applicable burner wiring diagrams.

H. MAIN BURNER ORIFICE SIZING AND INSTALLATION

The HSG200 and HSG400 power gas conversion burners are approved for use with natural and propane gas only.

The HSG200 and HSG400 burner models are shipped labeled and orificed for natural gas. To convert to propane gas and/or increase BTU/HR (kcal/Hr) input on natural or propane gas, an orifice kit is supplied with each burner with the orifices shown in Figure 10.

When selecting a desired BTU/HR (kcal/Hr) input, figure 140,000 BTU's per gallon of oil input. For example: furnace or boiler rating of 0.75gph at 100 psig. The $0.75 \times 140,000 = 105,000$ BTU's input rate. It may be possible to reduce the firing rate on natural or propane gas 15% to 20%, as most older appliances are oversized for the heating load.

($2.83875L \times 9356 \text{ kcal} = 26559.35 \text{ kcal}$)

To remove or interchange main orifice discs refer to Figure 15 (Page 16).

1. Remove slotted orifice cap, Item #40, making sure orifice cap gasket, #39, stays attached to orifice cap and is not damaged.
2. Remove orifice spring, Item #38, to access and remove orifice disc, Item #42.
3. Install desired orifice from Figure 10, making sure it is seated flat in the orifice holder, Item #37.
4. Replace orifice spring and securely tighten orifice cap against orifice cap gasket in orifice holder.

ORIFICE SIZE & DRILL	MANIFOLD PRESSURE		
	2.0" (498.2Pa)	3.0" (747.3Pa)	4.0" (996.4Pa)
HSG200 NATURAL GAS			
#29 - .136 (3.4544mm)	50,000 BTU (52750kJ)	64,000 BTU (67520kJ)	76,500 BTU (80707.5kJ)
#8 - .199 (5.0546mm)	74,000 BTU (78070kJ)	95,000 BTU (100225kJ)	116,000 BTU (122380kJ)
J - .277 (7.0358mm)	112,000 BTU (118160kJ)	138,000 BTU (145590kJ)	164,000 BTU (173020kJ)
Q - .332 (8.4328mm)	160,000 BTU (168800kJ)	206,000 BTU (217330kJ)	
HSG200 L.P. GAS			
#30 - .128 (3.2512mm)	49,000 BTU (51695kJ)	58,500 BTU (61717.5kJ)	68,200 BTU (71951kJ)
#27 - .144 (3.6576mm)	66,000 BTU (69630kJ)	78,000 BTU (82290kJ)	92,000 BTU (97060kJ)
#15 - .180 (4.572mm)	82,000 BTU (86510kJ)	112,500 BTU (118687.5kJ)	136,000 BTU (143480kJ)
D - .246 (6.2484mm)	131,000 BTU (138205kJ)	187,500 BTU (197812.5kJ)	243,000 BTU (256365kJ)
HSG400 NATURAL GAS			
T - .358 (9.0932mm)	200,000 BTU (211000kJ)	248,000 BTU (261640kJ)	285000 BTU (300675kJ)
15/32 - .468 (11.8872mm)	265,000 BTU (279575kJ)	343,000 BTU (361865kJ)	400,000 BTU (422000kJ)
HSG400 L.P. GAS			
K - .281 (7.1374mm)	190,000 BTU (200450kJ)	242,500 BTU (255837.5kJ)	295,000 BTU (311225kJ)
Q - .332 (8.4328mm)	242,500 BTU (255837kJ)	332,500 BTU (350787.5kJ)	400,000 BTU (422000kJ)

NOTE: For 50 cycle application derate input by 15%

HSG SERIES POWER GAS CONVERSION BURNERS
ORIFICE CHART

Figure 10

I. COMBINATION GAS VALVE

The 24 VAC combination gas valve serves three (3) functions: (1) manual gas shut-off, (2) main gas flame pressure regulator, (3) automatic electric redundant (double seated) gas shut off. (See Figure 11)

The correct operating manifold orifice pressure range for both natural and propane gas is 2.0" W.C. (498.2Pa) minimum to 4.0" W.C. (996.4Pa) maximum. By adjusting the pressure regulator between 2.0" W.C. (498.2Pa) and 4.0" W.C. (996.4Pa) on either natural or propane 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 Fig. 10.)

J. PRESSURE REGULATOR ADJUSTMENT

The combination gas valve pressure regulator, which has an outlet pressure setting range of

approximately 2.0" W.C. (498.2Pa) to 4.0" W.C. (996.4Pa) is factory set at 3.5" W.C. (871.85Pa). When pressure adjustment is required for setting input capacity with a selected orifice from Figure 10, remove the regulator cap for access to the slotted adjustment screw. Turning the screw counter clockwise reduces manifold orifice pressure, clockwise increases the pressure.

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

The 1/8" (3.175mm) NPT pressure tap for orifice manifold pressure measurement is located on the outlet side of the combination gas valve. Use a "u" tube manometer or dial type pressure gauge, scaled from "0" zero to 15.0" W.C. (3736.5Pa) to read pressure (See Figure 11).

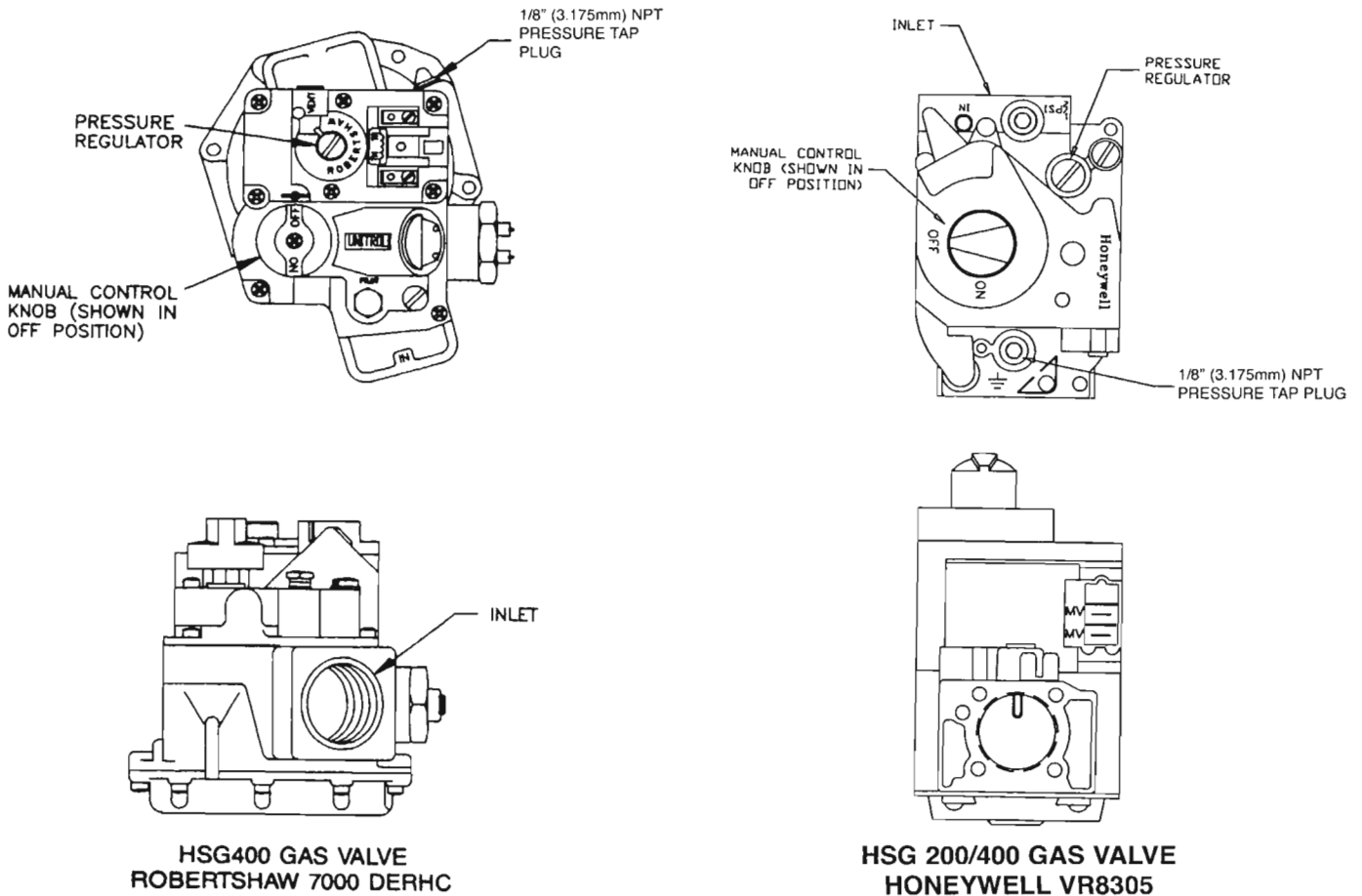


Figure 11

SECTION II INITIAL START UP

1. **NOTE:** Read the applicable sequence of burner/primary gas control operation in Section 3 Operation and Troubleshooting before proceeding.
2. Depress the combination gas valve manual control knob and turn to "OFF" position.
3. Adjust the primary air and off-cycle damper to the start up settings shown in Figure 12A and 12B.
4. 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.
5. 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.
6. Set the thermostat or operating control below room temperature, shutting the burner "OFF" 1 minute to RESET the primary control.
7. Depress the combination gas valve manual control now and turn to "ON" position.
8. 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.
9. Once burner is running adjust the orifice manifold pressure regulator as described in paragraph J - Pressure Regulator Adjustment.
10. 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.

$$\frac{3600 \times \text{cubic ft. (m}^3\text{)pre revolution} \times \text{btu (kW) valve/cubic ft (m}^3\text{)}}{\text{seconds per revolution}} = \text{BTU/HR (kW/HR)}$$

$$\text{EXAMPLE: } \frac{3600 \times 1 \times 1000 (.2931\text{kW})}{12} = 300,000 \text{ BTU/HR (87.93 kW/HR)}$$

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

the primary air damper open or closed to visually obtain a blue flame with well defined orange or yellow tips for natural gas, or well defined yellow tips for propane gas.

12. 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 THEIR DATA IS NECESSARY FOR SAFE, RELIABLE AND EFFICIENT BURNER OPERATION.

13. Perform the following combustion analysis. All adjustments below must be made with the following instruments: draft gauge, O₂ 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 (O₂) or CARBON DIOXIDE (CO₂) PERCENTAGES 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. CARBON MONOXIDE - Should be checked for its presence in the flue gas. This percentage should not exceed .04% (or 400 PPM).
 - C. NOTE: Check overfire draft and adjust to NEGATIVE -.01 (2.491Pa) to -.02 (4.982Pa) inches w/c during burner operation.

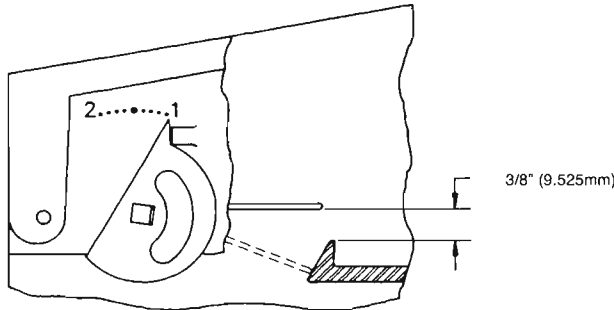
D. The flue gas temperature should be between 325°F (162.78°C) and 550°F (287.78°C) for domestic gas conversion burners. Higher flue gas temperatures indicate overfiring or excessive draft through the appliance. Lower flue gas temperatures may cause excessive condensation and indicate underfiring. Consult your local utility or the appliance manufacturer for acceptable flue gas temperatures.

CAUTION: IF THE BURNER BTU/HR (kW/Hr) INPUT IS CHANGED, REPEAT STEP 13

14. FILL OUT THE INSTALLATION COMBUSTION DATA TAG AND AFFIX IT TO THE BURNER OR CONVERTED APPLIANCE.

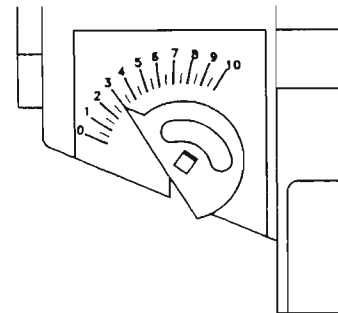
SUGGESTION: All new installations should be reinspected for proper combustion and burner operation after one or two weeks of normal operation.

For subsequent normal starting and shut off procedure, refer to the "Consumer Instructions" in the back of this manual or the instruction plate attached to the burner.



HSG200 SET AT NO. 1
HSG400 SET AT NO. 1 1/2
OFF CYCLE DAMPER
SETTING

Figure 12A



HSG200 SET AT NO. 2
HSG400 SET AT NO. 4
PRIMARY AIR
SETTING

Figure 12B

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

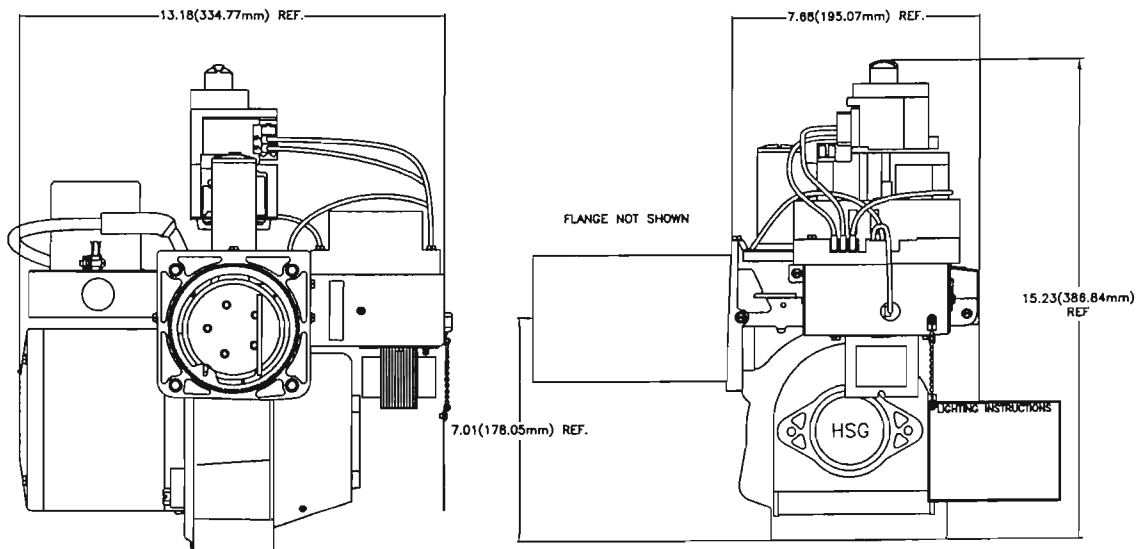


Figure 12C

SECTION III OPERATION AND TROUBLESHOOTING

SEQUENCE OF OPERATION - HSG SERIES POWER GAS CONVERSION BURNER UTILIZING HONEYWELL S89F GAS PRIMARY P/N 62759-002 W/BUILT IN 30 SECOND PREPURGE

On a call for heat, voltage (24V) is applied to motor start relay and air switch. Once the fan motor reaches operating rpm combustion air pressure is sensed by the air proving switch and closes the switch contacts energizing the S89F gas primary control.

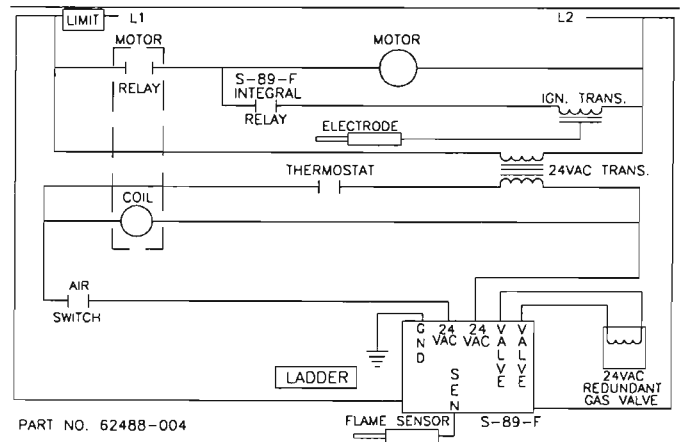
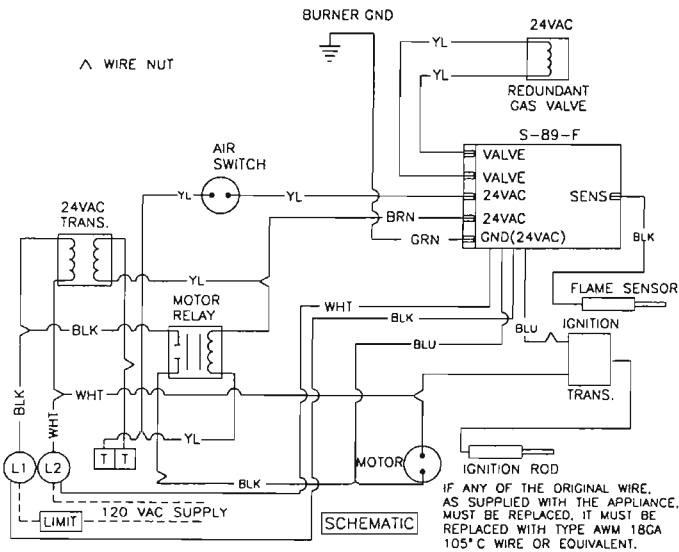
THE S89F gas primary control has an internal 30 second prepurge timer. After the initial 30 second prepurge, an internal 8 second safe start check of the S89F will commence. Once this is successfully completed, the S89F simultaneously energizes the gas valve and ignition transformer. Gas flows and the 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 S89F gas control primary for the remainder of the heat cycle. If the flame should be extinguished during the heat cycle, the S89F gas control primary will go into the 30 second prepurge 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 this does not occur within the 4 second trial for ignition period, the S89F 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 an insufficient supply of combustion air to the burner, the air switch will open, putting the system into lockout closing the gas valve.

HSG POWER GAS BURNER WITH HONEYWELL S89F GAS PRIMARY



FLAME SENSING

The Honeywell S89 series primary ignition controls utilize 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 control sensing circuit is routed through the flame sensor probe. When the sensor probe and the 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 sensor probe with its small surface area gives up free electrons, thus becoming positively charged. The free electrons from the AC voltage in the 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 microamperers. A steady DC microamp current of .8 minimum (and steady) or higher through the sensing circuit of the primary ignition control is sufficient to keep the burner running without a safety lockout. See Figure 13 for sensor probe and electrode dimensional settings, Figure 14 for flame current measurement.

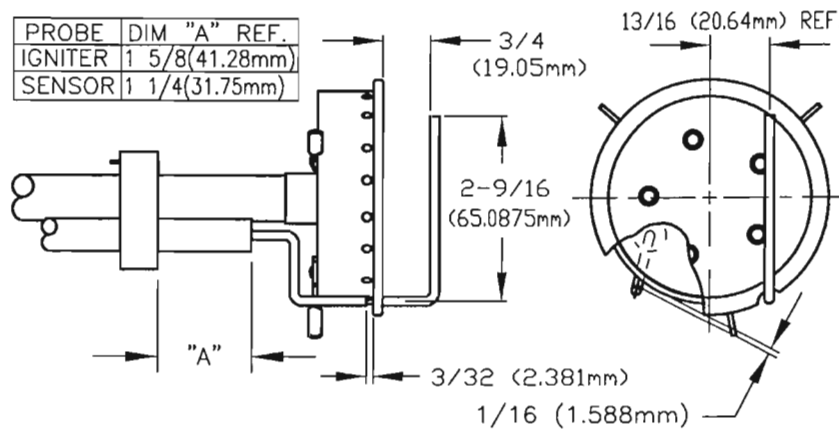
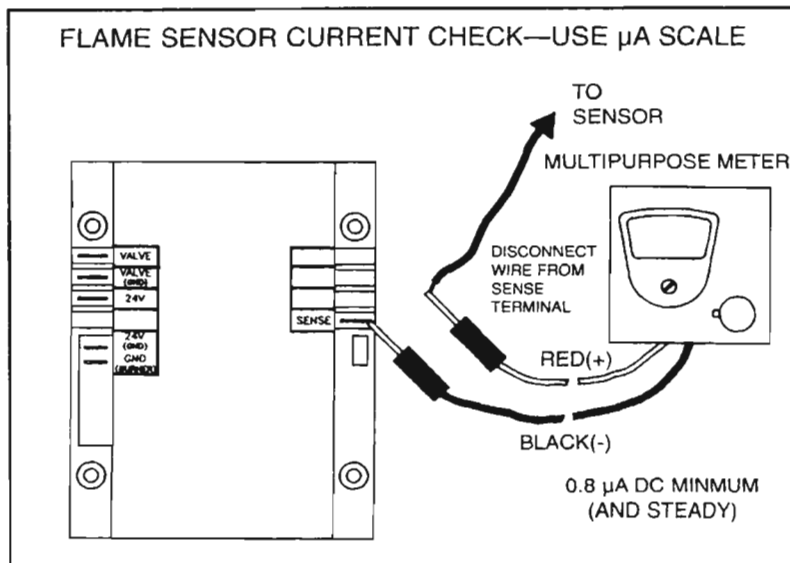


Figure 13

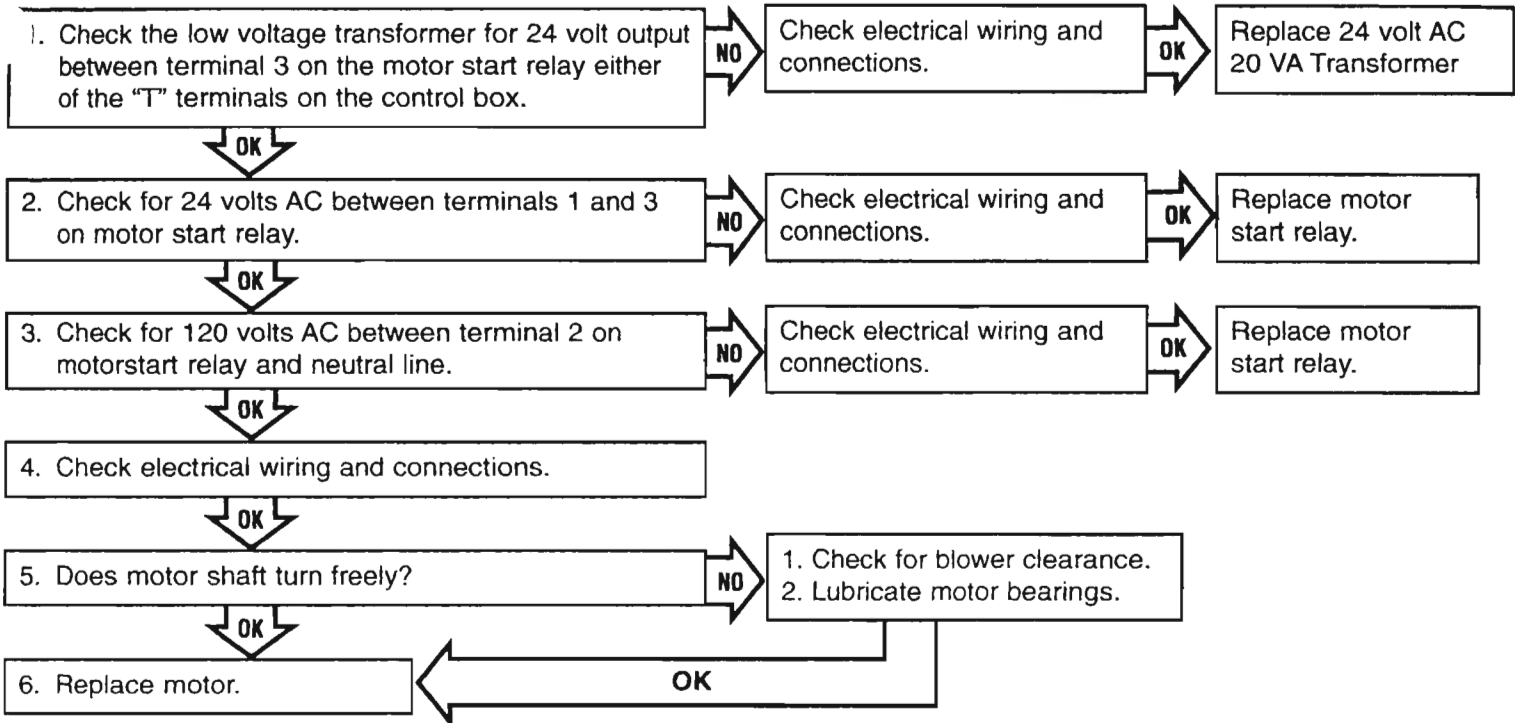


S89 FLAME CURRENT MEASUREMENT

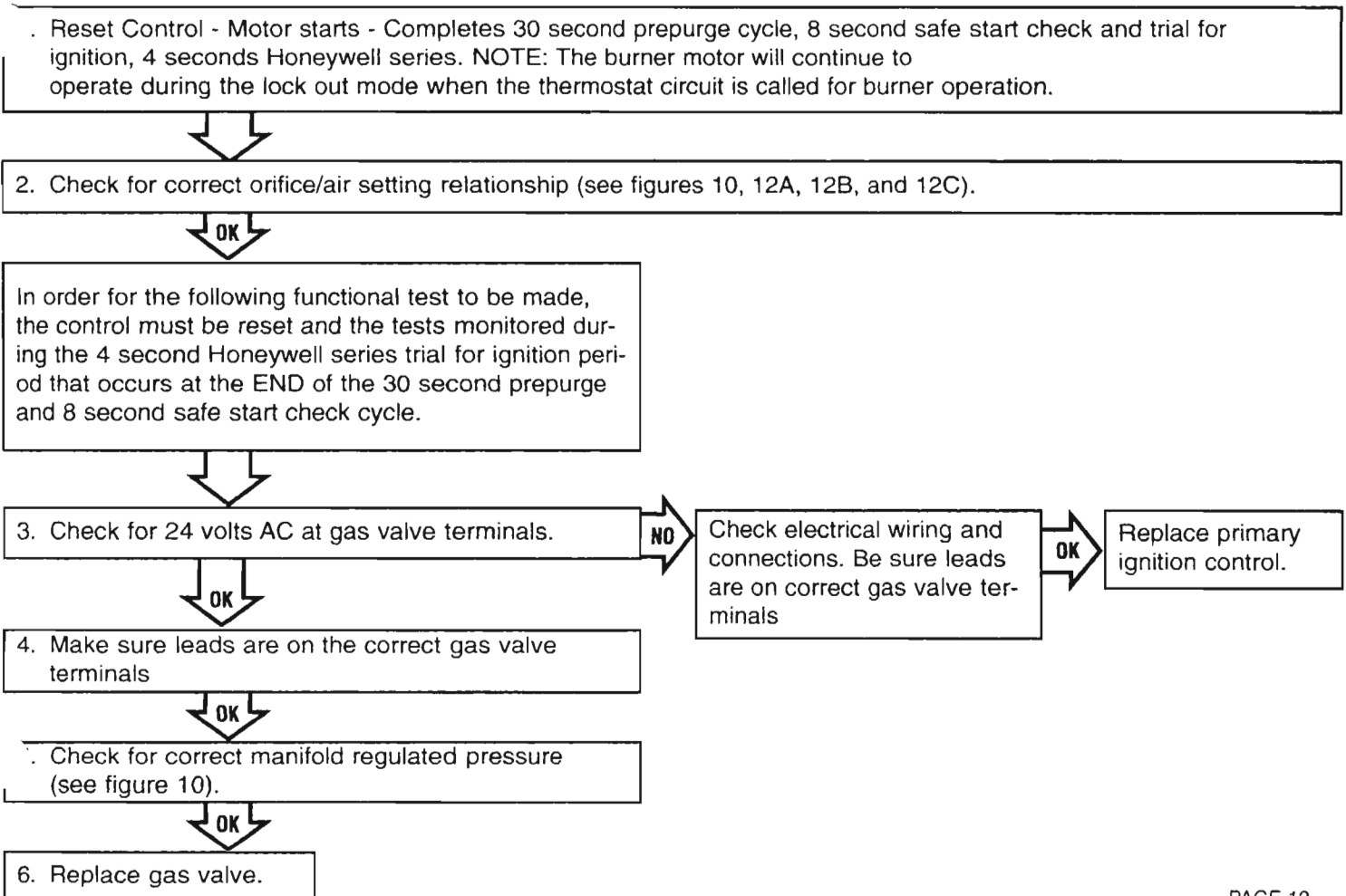
Figure 14

HSG SERIES WITH A HONEYWELL S89E, S89F PRIMARY IGNITION CONTROLS
TROUBLE SHOOTING GUIDE

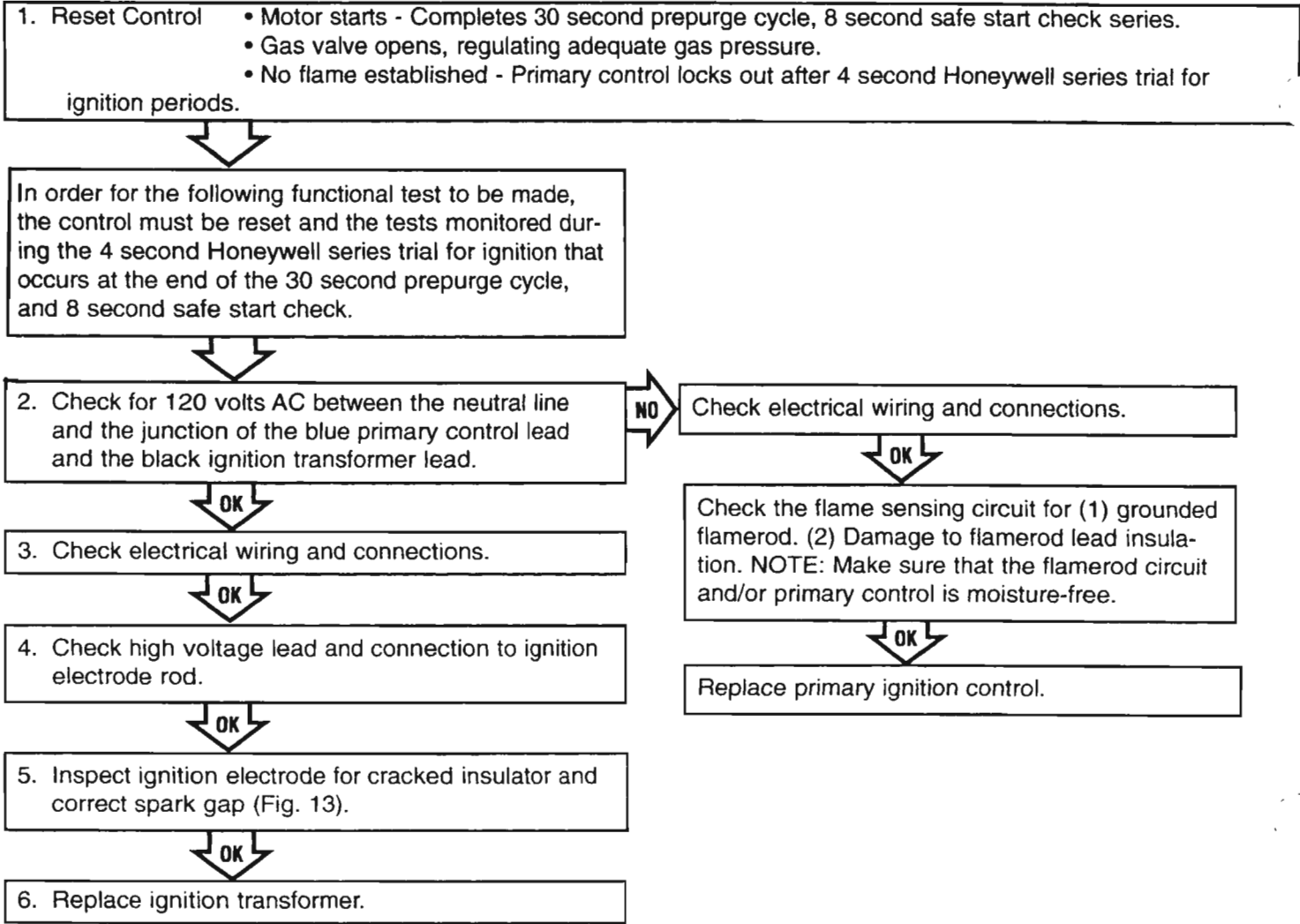
MOTOR DOES NOT START



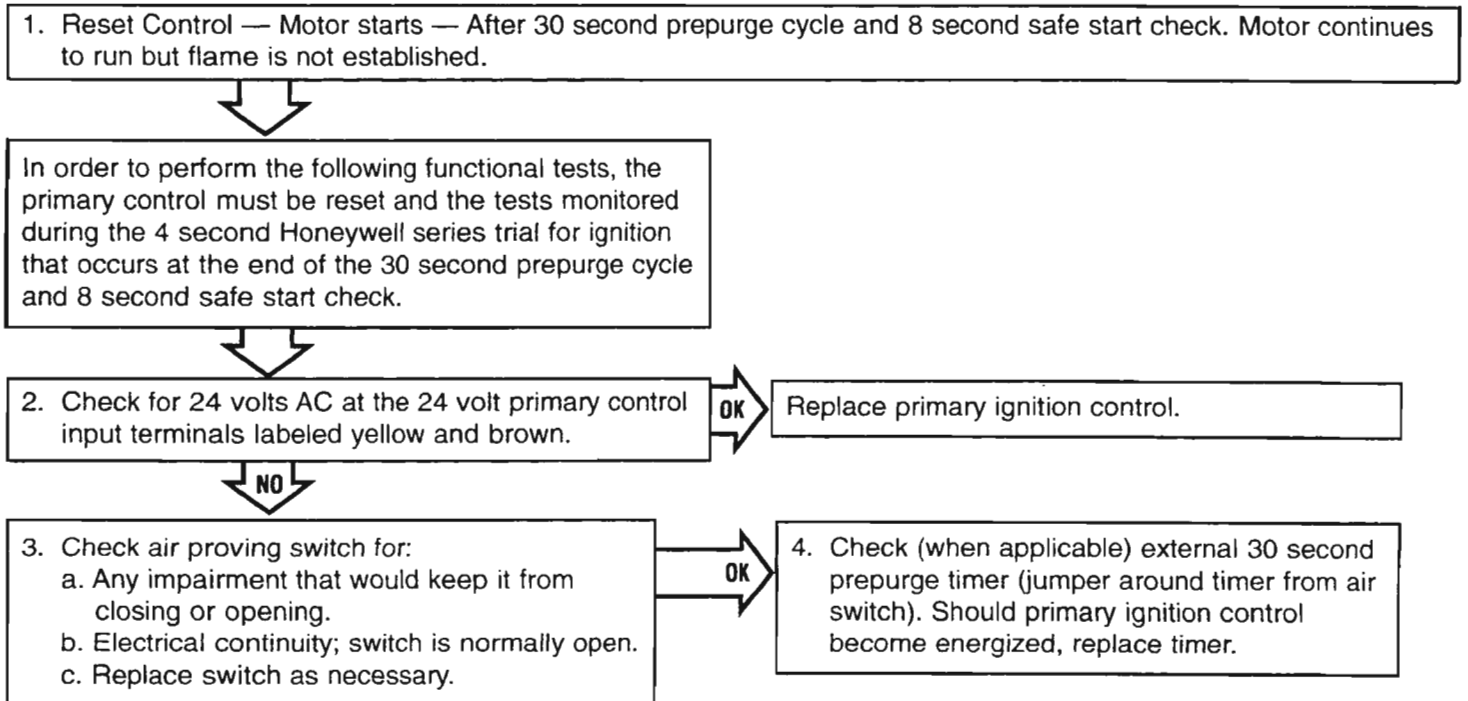
IGNITION ARC ESTABLISHED — NO FLAME



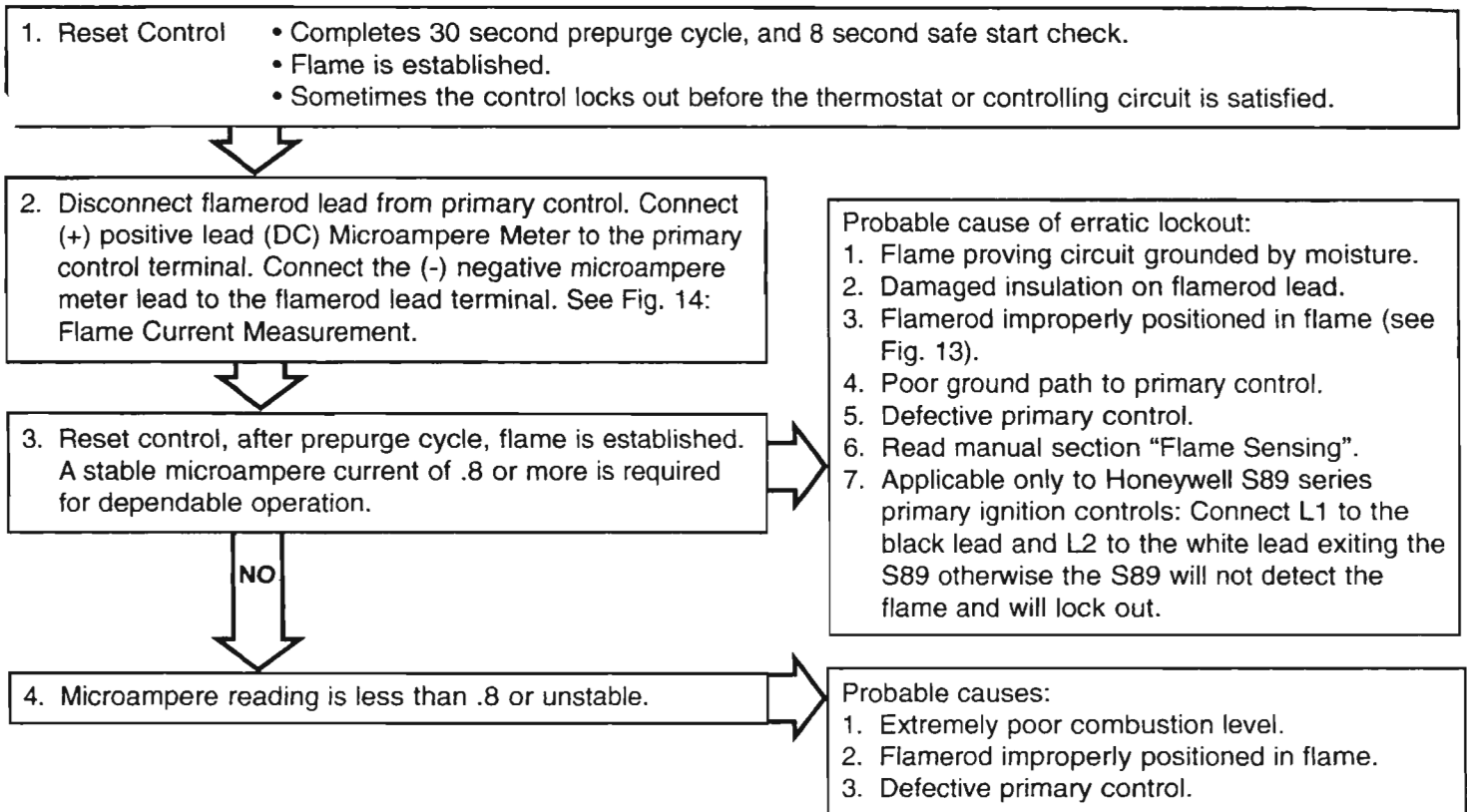
NO IGNITION ARC ESTABLISHED



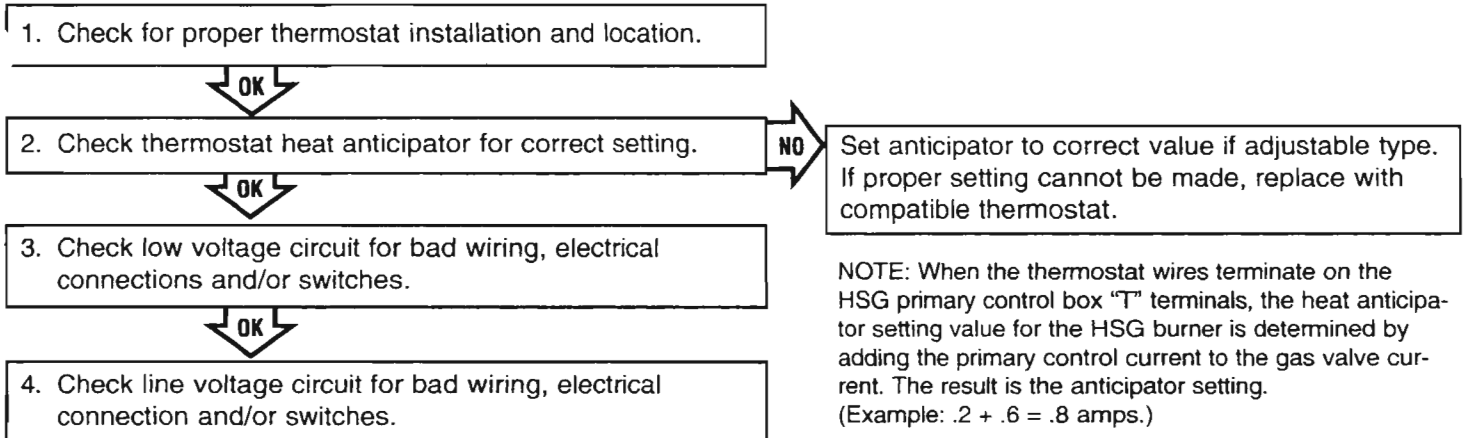
NO IGNITION — NO GAS VALVE



LOSES FLAME DURING CYCLE — CONTROL LOCKS OUT ON SAFETY



BURNER CYCLES ERRATICALLY



SECTION IV SERVICE

Caution: Make sure the main manual, combination valves and main power switch are turned off before opening burner or removing any parts for service.

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 15)

1. Disconnect gas line from combustion gas valve inlet, 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" (6.35mm) hex slotted screws on the top front of the housing cover and the two 5/16" (7.9375mm) 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 (1.57RAD). Gently extract burner head and electrode/sensor assembly out opening in housing taking extreme care to not dislocate or damage electrode or sensor probe.
4. When servicing, clean burner head ports, electrodes and sensor probe. Inspect the sensor probe and electrode wires and porcelain insulators carefully for hairline cracks which might provide an electrical leak path that could short out the ignition spark, or flame signal.
5. Examine the electrode and sensor probe for any serious corrosion or deterioration of metal at the tips. Check for proper dimensional settings of the sensor probe and electrode (see Figure 13). 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 1/2" (12.7mm) short of the inside face of the combustion chamber as shown in figures 4, 5 or 6.

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 the diaphragm contacts to close thus completing the circuit.

The function of the air proving switch is to ensure sufficient 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: If a jumper is used to check the switch it must be removed or an unsafe condition can occur resulting in death or property damage.

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 tube.
3. Switch is mounted in the horizontal position with terminals up from factory. Final burner mounting should maintain horizontal switch position.

WARNING: Damage to internal components of burner may result, if burner is mounted in other than horizontal position.

C. COMBUSTION AIR BLOWER AND MOTOR

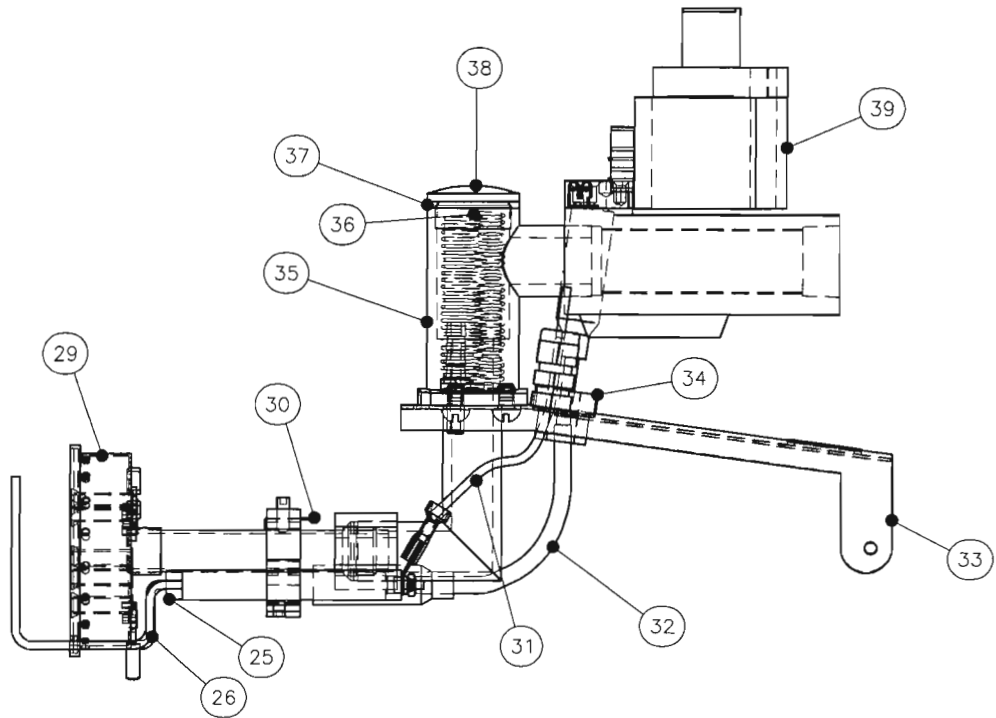
1. Cleaning of the combustion air blower is indicated if the blades show an accumulation of dust and lint, or if the character of the flame indicates a deficiency of combustion air.
2. The side plate, motor and blower wheel are removed as one assembly. Disconnect the motor wire inside the junction box beneath the ignition transformer. Remove the four (4) 5/16" (7.9375mm) hex slotted screws securing sideplate to fan housing.

CAUTION: 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 16)

HSG200 blower wheel p/n 21664 is positioned 2 1/16" (52.3875mm) measured from the blower wheel inlet ring face to the side plate face.

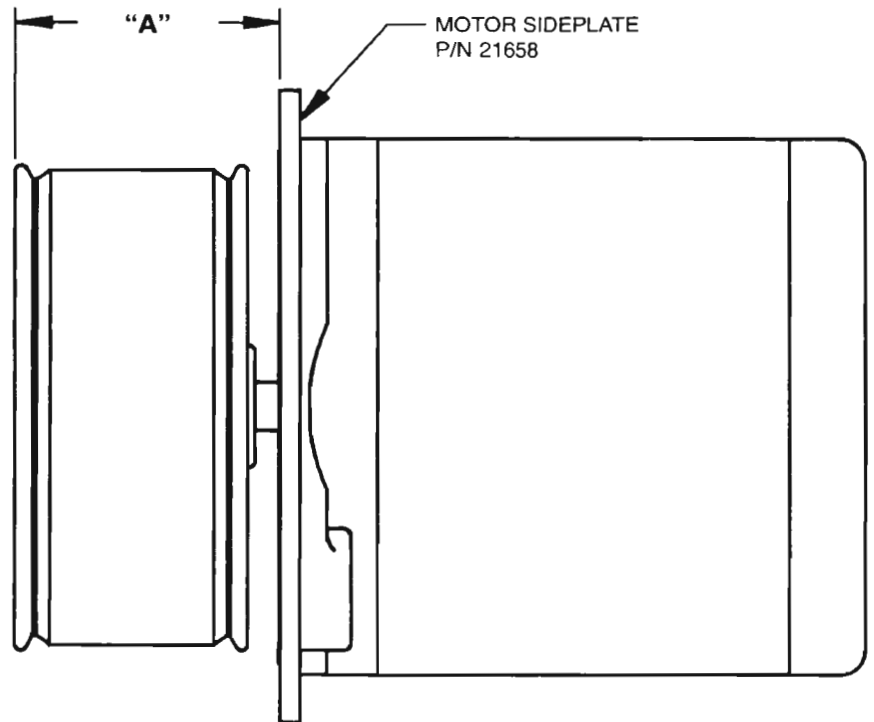
HSG400 blower wheel p/n 21642 is positioned 2 3/16" (55.5625mm) measured from the blower wheel inlet ring face to the side plate face.



DRAWER ASSEMBLY

Figure 15

PART NUMBER	DIM "A"
21664 HSG200 5 1/4 O.D. (133.35mm)	2 1/16" (52.3875mm)
21642 HSG400 5 1/2 O.D. (139.7mm)	2 3/16" (55.5625mm)



MOTOR/BLOWER ASSEMBLY

Figure 16

PARTS LIST - MODEL HSG 200/400 SEE FIG. 15 & FIG. 17

Item	Part No.	Description
1.	100934-001	Burner Housing
2.	62576-003	Air Tube - HSG200 6" (152.4mm)
	63270-004	Air Tube - HSG400 6 1/4" (158.75 mm)
	62576-015	Air Tube - HSG200 9" (228.6mm)
	63270-015	Air Tube - HSG400 9" (228.6mm)
	62576-027	Air Tube - HSG200 12" (304.8mm)
	63270-027	Air Tube - HSG400 12" (304.8mm)
	63270-028	Air Tube - HSG400 15" (381 mm)
3.	62393-001	Air Cone - (HSG200 only)
4.	21724-011	Adjustable Flange Assembly (includes gasket)(not shown)
5.	100428-002	Flange Gasket (not shown)
6.	21664	Blower Wheel HSG200 5 1/4" OD (133.35mm)
	21642	Blower Wheel HSG400 5 1/2" OD (139.7mm)
7.	21658	Side Plate (Used with 20627 and 20627-004 Motors Only)
8.	20627	Motor, Split Phase 1/7 (.107kW) or 1/8 (.093kW) HP 3450 RPM 115V/60
	20627-004	Motor, Split Phase 1/7 (.107kW) HP 2850 RPM 230V/50Hz (220V/50Hz)
9.	100373-002	Combustion Air Inlet Damper
10.	62408-001	Control Box (S89E & S89F)
11.	62388-001	30 Sec. Prepurge Time
	62530-001	Resistor Wire Assy.
12.	60186-004	24 Volt Transformer 120V
	63005-002	24 Volt Transformer 220V
	100450-001	Bushing
13.	62406-002	Motor Relay
14.	62759-002	Primary Safety Control H'Well S89F w/30 Sec Prepurge (220V/50Hz)
	62758-002	Primary Safety Control H'Well S89E w/o 30 Sec Prepurge (Special Limit Applications Only)
15.	100377-002	Damper Indicator Pointer
16.	100429	Damper Decal
17.	63263-005	Pressure Switch
	63272-005	Pressure Switch Conversion Kit
	63935-001	Pressure Switch (220V/50Hz)
18.	60178-002	Thermostat Terminal Strip
19.	100372	Adjustment Arm Off-Cycle Damper
	20-21.	100371-KIT Off-Cycle Damper Kit
22.	21319	Junction Box (under Ignition Transformer)
23.	61843	Lighting Plate
24.	62407-001	Ignition Transformer 7500V
	64051-001	Ignition Transformer 220V/50Hz Danfoss
25.	62391-002	Electrode Assembly
26.	62390-002	Sensor Probe Assembly
27.	62387-001	Insulator Bushing (not shown)
28.	62575-002	Chamber/Manifold - HSG200 6" (152.4mm)
	62575-001	Chamber/Manifold - HSG400 6 1/4" (158.75 mm)
	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" (381 mm)
29.	62419-001	Clip, Electrode Bracket
30.	61951-001	Ignitor Support Parts Kit
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" (228.6mm) Burner
	64096-001	Sense Wire – 330mm Cable (220V/50Hz)
32.	62909-001	8" (203.2mm) Ignition Wire - 6" (152.4mm), 6 1/4" (158.75mm) Burner
	62909-003	14" (355.6mm) Ignition Wire - 9" (228.6mm), 12" (304.8mm) Burner, 15" (228.6mm) Burner
	64095-001	Ignition Wire – 500mm Cable (220V/50Hz)
33.	62404-002	Top Plate/Housing Cover
34.	62304	Strain Relief Bushing/Ignition Wire
35.	62402-001	Orifice Housing
36.	62410-001	Orifice Spring
37.	62401-001	Orifice Gasket
38.	62385-001	Orifice Cap
39.	62374-004	Gas Valve Honeywell VR8305M 4801
40.	62459-001	Orifice Package - HSG200 (not shown)
	62459-002	Orifice Package - HSG400 (not shown)
41.	21760-001	Optional Pedestal Mounting (not shown)

Used with Primary safety Control P/N 62758-002 (Special limit applications only)
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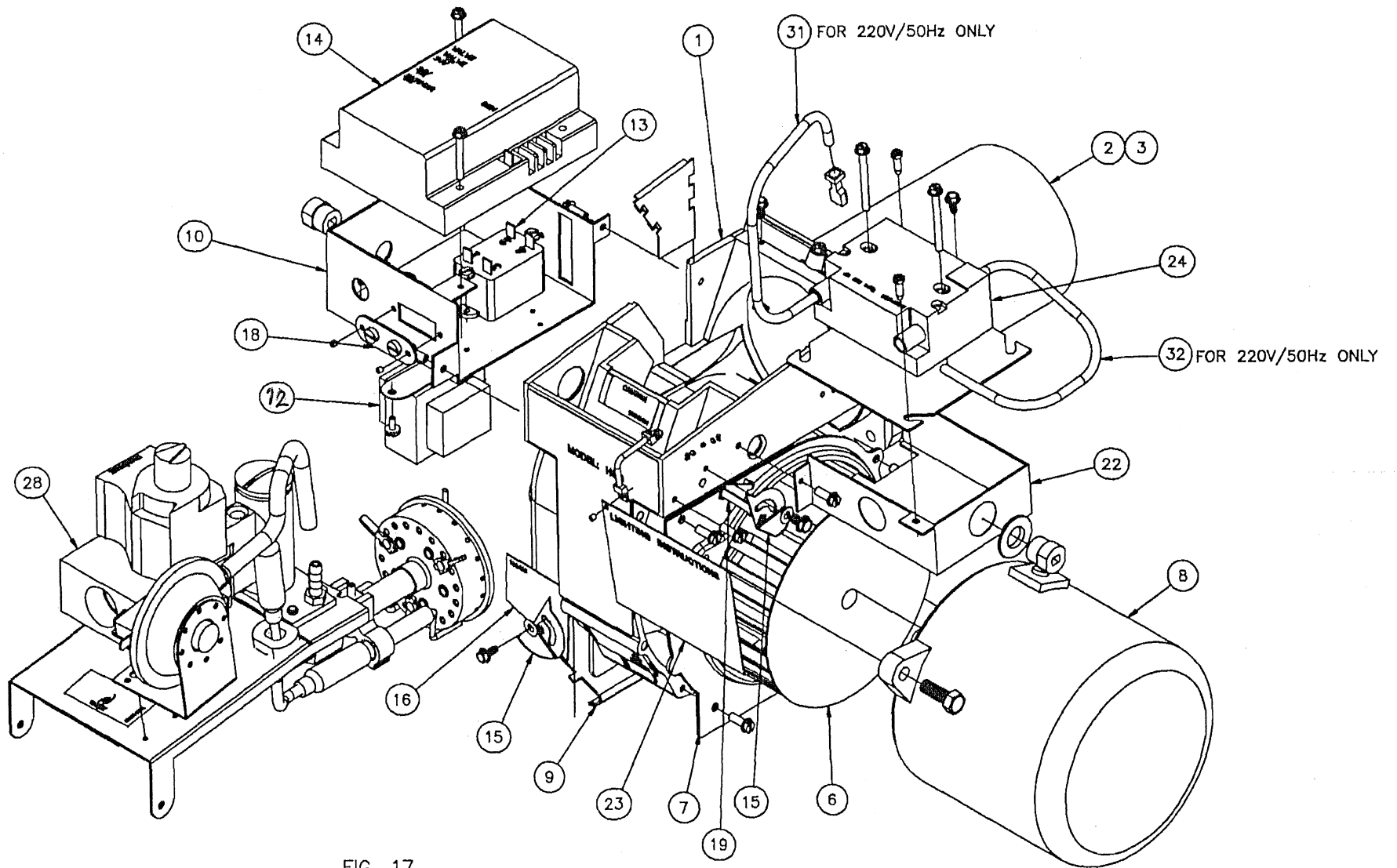


FIG. 17

TECHNICAL INFORMATION "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 placing a small voltage on the flame sensing probe. When the probe is surrounded by flame, the voltage on the probe "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 flame. Should this situation exist for a period of time longer than the ignition control's state 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" on the line voltage.
- The ignition control is not properly grounded to the burner itself. Using an ohmmeter, 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 flamerod 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 flamerod probe may be grounded out. Assure that the flamerod probe is not touching the burner head. The probe 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 probe must not be positioned too far away from the head as this may result in grounding out of the probe against the inside surface of the air tube.

- The flamerod 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 fine sandpaper. NOTE: This is the leading cause of nuisance lockouts in dual-fuel wood/gas fired appliances.
- The flamerod probe may be burned away. Check it against dimensions on the ELECTRODE AND FLAMEROD PROBE SETTINGS drawing.
- The dimensional location of the flamerod probe may be incorrect, or the probe may be bent out of shape. Check it against dimensions on the ELECTRODE AND FLAMEROD 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 ELECTRODE AND FLAMEROD PROBE SETTINGS drawing and adjust if required.
- 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 if necessary, reinsert 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 either the flamerod probe or 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 to one 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.



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 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.

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.

CONSUMER INSTRUCTIONS

MAINTENANCE:

□ Keep the area around the burner clear and free of combustible materials, gasoline or other flammable liquids or vapors. Do not obstruct burner air openings or ventilation grilles for combustion air.

CAUTION: Check the burner flame periodically. A proper NATURAL gas flame will appear blue at the burner face with orange and yellow tips. A proper PROPANE gas flame will appear blue at the burner face with yellow tips. If the flame is too rich, it will appear billowy and yellow with hazy tips, if too lean, it will appear short and all blue. Burner cleaning and/or readjustment is indicated by flames that are too rich or too lean.

WARNING: If any flame is observed when the burner is on standby, or if the ignition spark or valve operator is heard to come on before the motor reaches operating speed, immediately turn off the manual gas control and main power.

A dangerous condition has developed and must be corrected. **CONTACT A QUALIFIED SERVICE TECHNICIAN FOR CLEANING, READJUSTMENT OR REPAIR.**

LIGHTING INSTRUCTIONS:

See Section II Initial Start Up

1. TURN (DEPRESS) VALVE DIAL TO ON.
2. TURN MAIN POWER ON.
3. SET THERMOSTAT OR OPERATING CONTROL TO CALL FOR HEAT.
4. WAIT 30 SECONDS. IF BURNER HAS FAILED TO LIGHT, OR IF BURNER LIGHTS THEN GOES OUT, TURN BURNER OFF FOR 30 SECONDS AND THEN BACK ON FOR RESTART.

TO SHUT OFF:

1. TURN (DEPRESS) VALVE DIAL TO OFF.
2. TURN MAIN POWER OFF.

WARNING

EXPLOSION HAZARD

If PROPANE gas is used and the burner is located in a basement, crawlspace or confined space, contact your gas supplier about installing a "gas leak" warning device. PROPANE gas is heavier than air and can settle in low

areas or confined spaces. This would create a DANGER OF EXPLOSION OR FIRE. If you suspect a gas leak, follow instructions on front cover of this manual.



WARNING

CARBON MONOXIDE POISONING HAZARD

CARBON MONOXIDE IS A COLORLESS, ODORLESS GAS THAT CAN KILL. FOLLOW THESE RULES TO CONTROL CARBON MONOXIDE.

- ▲ 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 owner's manual before using.



WARNING

ELECTRIC SHOCK HAZARD

HIGH VOLTAGES ARE PRESENT IN THIS EQUIPMENT FOLLOW THESE RULES TO AVOID ELECTRICAL SHOCK.

- ▲ 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 HAZARD

SHOULD OVERHEATING OCCUR:

Shut off the manual gas control to the appliance

Do not shut off the control switch to the pump or blower.

