



QHT Manual for: SU-2A Gas Burner

50,000 BTU/H to 250,000 BTU/H

The burner shall be used only with NATURAL GAS or LP GAS.

Warning: If the following instructions are 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 any appliance.
- Do not touch any electrical appliance.
- Do not use any phone in your building.
- Immediately call your gas supplier from an outside phone.
- Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

- A qualified installer, service agency or the gas supplier must perform installation and service.
- All installations must be made in accordance with all state and local codes, which may differ from instructions in this manual.
- The installer should inform and demonstrate to the user the correct operation and maintenance of the appliance.
- The installer shall also inform the user of hazards of flammable liquids and vapors and shall remove such liquids and vapors from the vicinity of the burner.
- The installation adjustment data trap, or label supplied, shall be filled in and affixed to the burner or the covered appliance.
- A combustion analyzer must be used to commission or adjust the burner.

These instructions should be affixed to the burner or adjacent to the heating appliance

Massachusetts Plumbing Board # G3-0904-16



New York City Dept. of Buildings MEA # 382-03-E

**Manufactured by Heat Wise, Inc.
28 Industrial Blvd. Unit I, Medford NY 11763**

Chart 1: Natural Gas and LP								
Burner Model	Length of Flame Tube	Firing Rate		Primary Electric Input	Secondary Electric Input	Total Watts	Total Amps	Gas Conn.
		Min BTU/H	Max BTU/H					
SU-2A	4 ¼"	50,000	250,000	120 Volt 60 Hz 1 Ph	24 Volts	150 Max	3 or less	½"

- Control System: Honeywell S89F with 34 second Pre-Purge.
- The system uses a remote ignition system with a separate Ignition Transformer.
- Gas Valve: Honeywell VR8205

BURNER DESCRIPTION

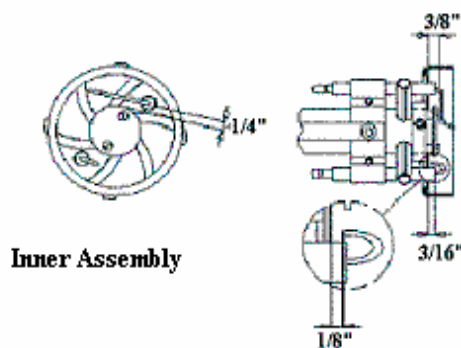
The SU-2A Gas Burner is a fully automatic, flame retention burner and is suitable for combustion of natural gas or LP (propane). Changing orifices alters the firing rate. The gas pressure may be adjusted on the gas valve and can be used to convert a natural gas unit to LP (or vice versa). NOTE: **The same gas valve is used for both natural gas and propane without any conversion kit.**

The combustion air can be adjusted for proper O₂ or CO₂ by the dial located at the rear of the burner housing, which allows the air to flow more or flow less within the burner.

Two electrodes act as a sparker and a flame rod (See Fig. 1). Flame rectification by this flame rod monitors the continued presence of the burner flame.

Warning: Should overheating occur, 1) shut off the manual gas shut off valve to control the appliance; 2) DO NOT shut off the control switch to the pump or blower

Fig. 1 Electrode and Flame Sensor Dimensions



AIR FOR COMBUSTION

If the boiler or furnace room is unusually tight, or if the house has a ventilation fan, it is recommended that the combustion air be supplied to the furnace room through intakes from the outside of the building. The intakes must terminate facing down in order to avoid obstruction from rain, snow, leaves, etc. Openings must have **one square inch of free area per 10,000 BTU input** rate (see Example 1). Refer to the QHT boiler manual for instructions and recommendations for installing direct vent kits, installing louvers, etc.

Example 1: 150,000 BTU/hr firing rate

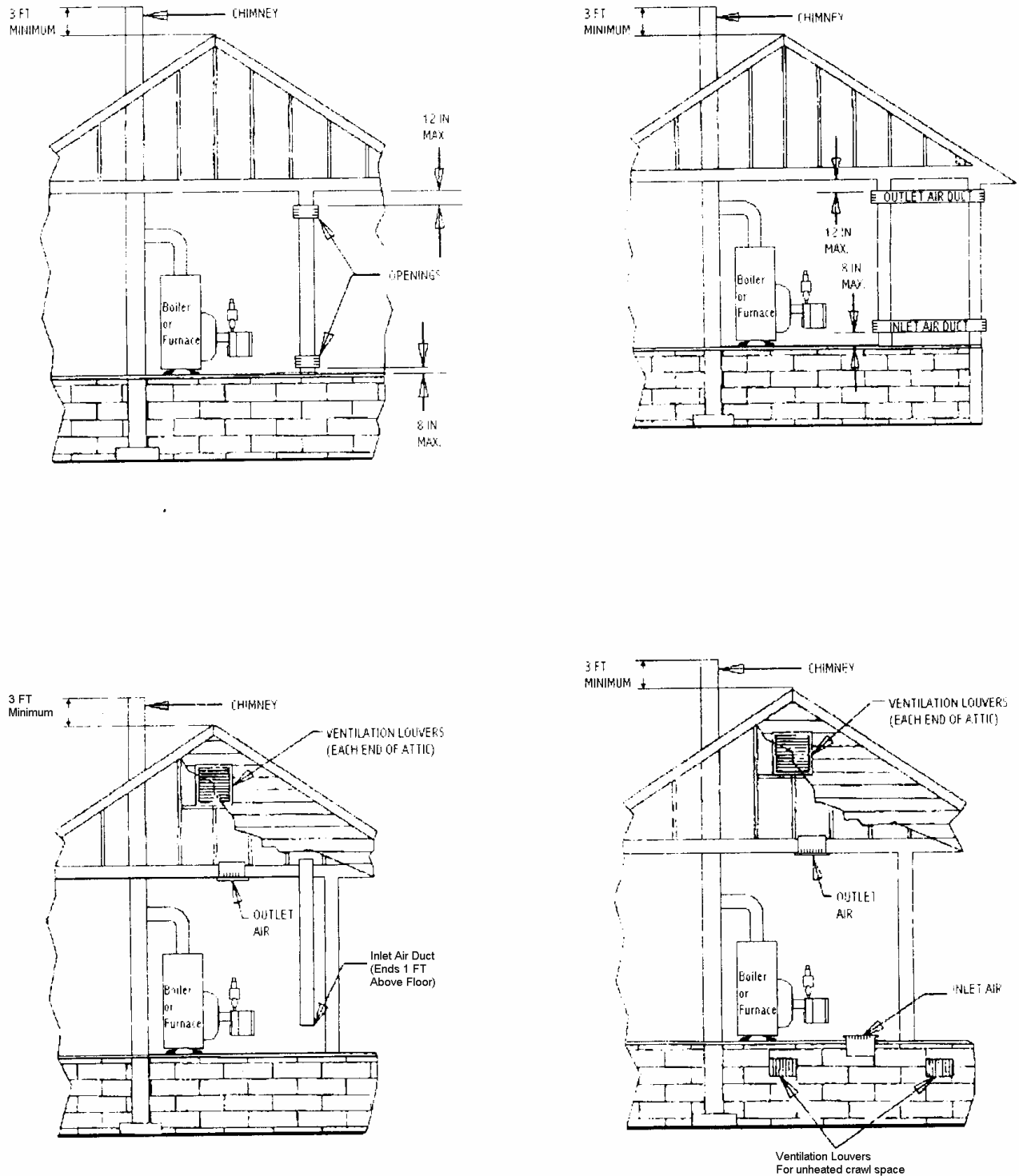
$$(150,000 \text{ BTU} / \text{hr}) * \frac{(1 \text{ in}^2)}{10,000 \text{ BTU} / \text{hr}} = 15 \text{ in}^2$$

CHIMNEY REQUIREMENTS

The chimney should extend **at least 3'** above a flat roof or the highest roof ridge (see Fig. 2) and be free in a **radius of 30'** of objects such as tree limbs, other buildings, etc, which may cause a down draft. The chimney should be lined as required by the local Gas Company or local codes.

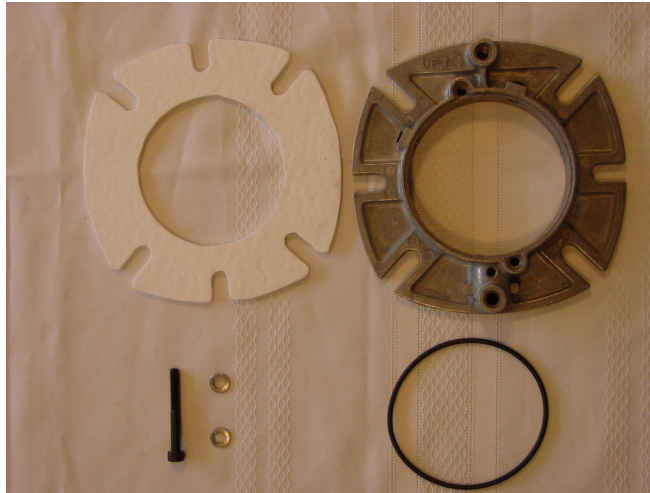
Some utilities require new chimney liners for all gas installations. Use a corrosion resistant chimney liner (approved for gas service) of the same size as the vent pipe.

Fig. 2 Chimney and Fresh Air Dimensions

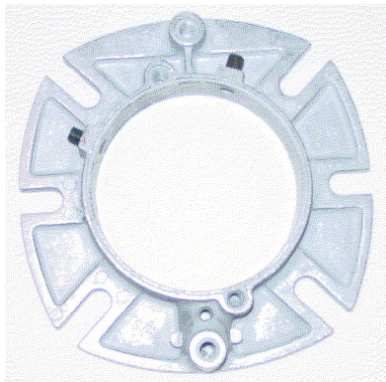


MOUNTING THE BURNER

Picture 1: Parts



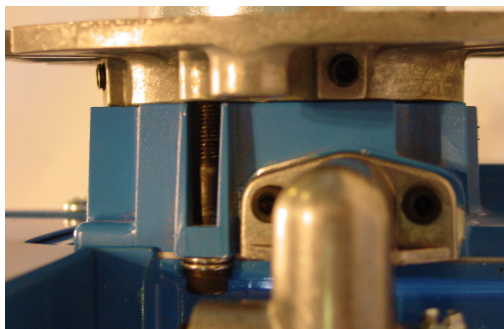
Picture 2: Flange



Picture 3: Holding Screw



Picture 4: Mounting the Burner



Mounting the SU-2A to the Boiler

- Refer to Picture 1 for all the parts required to mount the burner.
- First, install the gasket and burner flange (see Picture 2) to the boiler. The flange is marked “up”. There are two set screws; one slightly to the right of the 12 o’clock position. The second screw should be on the left (slightly above the 9 o’clock position). Tighten all the nuts equally. Make sure that the set screws on the flange are backed out, to allow enough clearance.
- Install the provided O-ring on the blast tube. Then, insert the SU-2A gas burner **completely** into the boiler. Once the burner is inserted and pushed all the way forward, insert the holding screw with the two split washers (See Picture 3) into the slot on the top of the housing and attach the burner to the flange (see Picture 4). Use a 5 mm allen key (or a 3/16 allen key) to tighten the holding screw. Make sure that both split washers are installed on the holding screw as shown in Picture 3.
- Once the holding screw is tight, tighten the two set screws on the flange. Seal off any free openings with either high temperature cement or high temperature silicone.

GAS SERVICE & PIPE CAPACITY

Before connecting the burner to the gas supply, insure that the gas pipes and service meter are large enough to permit the additional load of the gas burner (see Chart 2).

Chart 2: Pipe Capacity Table*(x 1,000 BTU's)				
Pipe Length**	Nominal diameter of pipe in inches			
	¾"	1"	1 ¼"	1 ½"
15'	172	345	750	
30'	120	241	535	850
45'	99	199	435	700
60'	86	173	380	610
75'	77	155	345	545
90'	70	141	310	490
105'	65	131	285	450
120'		120	270	380

* Using 0.6 Specific Gravity Gas and a Pressure Drop of 0.3" of Water Column

** Each 90° elbow counts as 3' for the purpose of these calculations

Example 2:

There is 75 feet of 1" pipe from the meter to the burner and there are 5 elbows.

(5 elbows X 3') + 75' pipe = 15' + 75' = 90' of effective pipe length

The maximum BTU that can be fired is 141,000 BTU (see chart 2)

It is advisable to run a separate gas line from the meter to the gas burner to avoid pressure drops. Refer to the above Pipe Capacity table for the correct sizes. ***ALL PIPING MUST CONFORM TO LOCAL CODES.*** Use black steel pipe and malleable fittings (**do not use cast iron parts**) with a suitable pipe dope that is resistant to liquefied petroleum gases. Test for gas leaks using an approved gas leak tester.

Piping should consist of:

1. A shut off valve approximately 6' away from the unit.
2. A 1/8" plugged NPT tapping for gas pressure measurement preferably on the manual shut off valve (as shown or anywhere between the gas valve and the shut off valve).

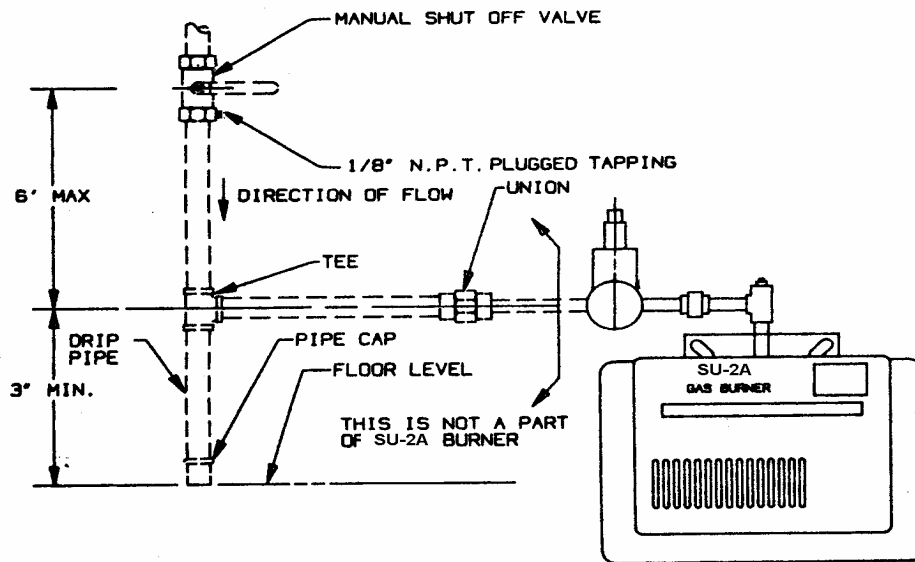
Note: The manual shut-off valve and tapping are NOT part of the SU-2A Gas Burner.

Please make sure you conform to local and state codes.

3. A gas union.
4. A drip pipe.

Caution: The gas valve should not be subjected to more than ½ PSIG. Therefore, the burner should be isolated during high-pressure gas leak tests. The appliance and its individual shut off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of ½ psig. The appliance must be isolated from the gas supply piping by closing its individual manual shut off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than ½ psig.

Fig. 3 Gas Burner Piping*



*The dotted lines represent field installation.

ORIFICE INSTALLATION

All burners are equipped with an orifice set at the appropriate firing rate. It sometimes may be necessary to drill the orifice. Drilling the orifice increases the firing rate. To drill the orifice, first open the stainless steel union and then unscrew the orifice from inside the union. Determine the proper orifice size for the desired firing rate and drill the orifice (see Chart 3 and Chart 4). Replace the orifice in the union and tighten the union so that it is gas tight. Once installed, a higher or lower firing rate can be achieved by raising or lowering the manifold pressure by ± 0.3 ". Pressure changes can only be made when the burner is running. A manometer must be used to check and adjust the pressure. The typical working manifold pressure for natural gas is **3.5" W.C.** (2.3" W.C. for LP). The maximum inlet pressure at the gas valve is **11" W.C.**; the minimum is **5" W.C.** (for the purpose of input adjustment). Note: the minimum running input pressure is 5" W.C. NOTE: The static pressure of the system may be within norm, but the pressure drop when the system is running can reduce this greatly. Check the running pressure to make sure there are no fluctuations in the pressure.

INSTALLING THE CHIMNEY LINER, DRAFT REGULATOR AND VENT PIPE

Some utilities require new chimney liners for all gas installations. Use a corrosion resistant chimney liner (approved for gas service) of the same size as the vent pipe. Use a double swing draft regulator, listed by CSA or U.L. The vent pipe should extend only to (but not beyond) the inside wall of the chimney. The draft over fire should always be positive.

BURNER SETTINGS

Refer to the below charts for the proper settings for the SU-2A burner and QHT boiler. Note: a pressure change at the valve, and, in some cases, an orifice change, is all that is required to convert a natural gas burner to a LP (propane) unit and vice-versa.

Chart 3: B10 Series							
Boiler Model	Rate BTU/H	Fuel	Orifice	Head	Air	Manifold " W.C.	Burner Model
B10 3 section	80,000	Nat. Gas	3/16"	18	Closed	3.5"	SU-2A
		LP		22		2.0"	
B10 4 section	115,000	Nat. Gas	7/32"	12	3	3.5"	SU-2A
		LP				2.3"	
B10 5 section	140,000	Nat. Gas	9/32"	15	8.3	3.2"	SU-2A
		LP			7.75	1.8"	
B10 6 section	175,000	Nat. Gas	21/64"	10	13.5	3.5"	SU-2A
		LP				2.3"	
B10 7 Section	215,000	Nat. Gas	27/64"	3	15	3.3"	SU-2A
		LP				2.0"	

Chart 4: SG Series							
Boiler Model	Rate BTU/H	Fuel	Orifice	Head	Air	Manifold " W.C.	Burner Model
SG 2 section	91,000	Nat. Gas	7/32"	20	Closed	3.5"	SU-2A
SG 3 section	140,000	Nat. Gas	9/32"	15	8.5	3.5"	SU-2A
		LP				2.3"	
SG 4 section	182,000	Nat. Gas	21/64"	9	14	3.5"	SU-2A
		LP				2.3"	
SG 5 section	224,000	Nat. Gas	27/64"	3	15	3.5"	SU-2A
		LP				2.3"	

1. Limits close.
2. Blower motor starts as the 24 Volt transformer powers the airflow switch.
3. Power from the airflow switch to the S89F control initiates 34 second pre-purge.
4. At the end of the pre-purge, the spark is energized for 4 seconds. At the same time, the 24 Volt transformer powers the gas valve, allowing the fuel to flow.
5. Within 4 seconds, the flame should be established and proved. The spark will shut off and the control will hold power to the gas valve until the limits open and the burner stops firing.
6. If the flame is not established, the blower motor continuously runs.
7. To restart, power should be interrupted for five minutes. Turn on the power to start this sequence again.

LIGHTING INSTRUCTIONS

To light the SU-2A Gas Burner

1. Set the thermostat to the lowest temperature
2. The control knob on the gas valve should be in the “OFF” position for at least five minutes.
3. Rotate the control knob counter-clockwise to the “ON” position and set the thermostat to the desired temperature settings

Reset, if Flame Lockout Occurs

1. Turn the thermostat off, or turn the main power off
2. Wait five minutes
3. Turn the main power on

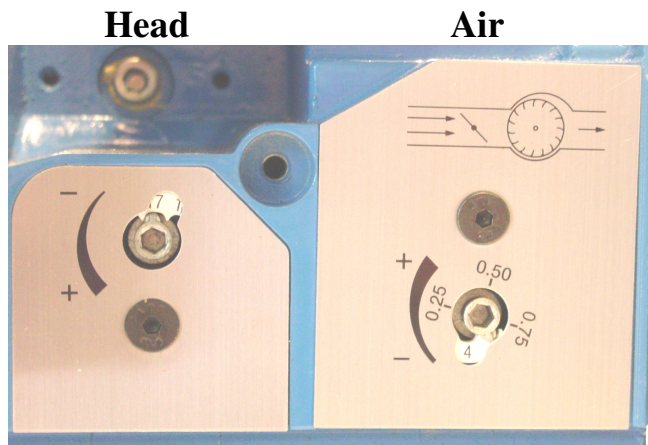
To shut the burner off

1. Rotate the control knob on the gas valve to the “OFF” position
2. Set the thermostat to the lowest temperature
3. Turn Main Power Off.

BURNER OPERATION

Before turning the burner on, make sure the proper orifice is installed. Check for gas supply leaks. Check the wiring diagrams. Install manometers before and after the gas valve; **make sure that the manifold pressure corresponds with the proper orifice and fuel (refer to the charts 3 and 4 on page 7)**. Keep the observation port of the boiler open. Follow the instructions on the nameplate of the burner to turn it on. Follow the sequence of operations for the control (see page 8).

HEAD AND AIR ADJUSTMENT



To access the head and air adjustment, remove the **black plastic cover** from the rear of the housing, using the supplied 4 mm allen key. The left dial is the head adjustment dial; the right dial is the air adjustment dial. These dials can spin 360°; 22 times for the head and 32 times for the air.

When to adjust the Air

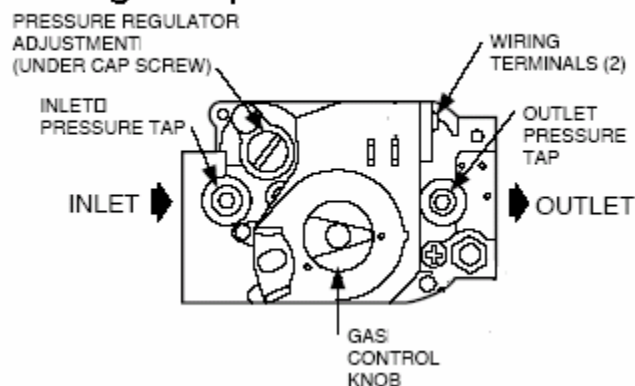
The air shutter is a mechanical shutter. Do NOT over crank the air shutter. You must use an analyzer to measure the CO₂ (Carbon Dioxide). General rule: if the CO₂ is too low, then close the air shutter. If the CO₂ is too high, then open the air shutter. ***Note: Do NOT set the CO₂ higher than 9.8% for Natural Gas or 11.5% for LP Gas.***

If the CO (Carbon Monoxide) is above 100 ppm, there is either too much air or too little air. Check the CO₂ level and adjust the burner.

When to adjust the Retention Head

The retention head is set at the factory. The retention head is 1/8” inside the tube when the marking reads ‘22’. There is a full 1/2” movement for the retention disk to move backward (to increase secondary air) or forwards (to decrease secondary air). ***NOTE: the head physically moves within the blast tube. Do not over crank the head dial.*** This movement can also be used to compensate for backpressure in the combustion area, up to 0.3” W.C.

Fig. 5 Top View Of Gas Valve



When commissioning the burner, make sure the gas control knob is in the "ON" position. Install monometers at the inlet pressure tap and outlet pressure tap. **Note: When checking manifold pressure, do not subtract burner housing pressure during valve-on delay.** Record the static incoming gas pressure. When the burner lights off, record the running incoming gas pressure; **the running incoming gas pressure should never be below 5"**. Note: this pressure drop should not be greater than 1". Check the manifold pressure from the outlet pressure tap. Refer to Charts 3 and 4 on page 7 to make sure the gas pressure is set for the appropriate fuel and pressure. If adjustments need to be made, remove the cap screw and adjust the pressure regulator. Screwing the regulator clockwise will increase the manifold pressure and counter-clockwise will decrease the manifold pressure.

Trouble shooting:

There are three factors to operate the gas burner properly:

1. Electricity {(main Power 120V/60 Hz /1 Ph)(secondary 24V)}
2. Gas flow (Incoming pressure should be 10" w.c. with proper gas line without pressure drop during burner operation).
3. Combustion air.

Check these three items properly before proceeding in detail for other problems.

Condition	Solutions
Burner motor runs and:	
No flame after pre-purge & no fuel indicator (where applicable)	Check 24V feed to airflow switch & after airflow switch to control. Fix or replace the airflow switch. If there is no secondary power, then replace the 24V transformer.
No flame, fuel indicator on (where applicable), faulty ignition transformer or spark separately	Check ignition transformer, electrode, cracked electrode or gap. Fix or replace.
Fenwal control defective after above tests.	Replace
Burner locks out after 4 seconds	
	First, check ionization electrode, ionization cable (for cracks) and boot. Fix as needed.
Polarity reversed	Check power feed for broken polarity
Bad earth grounding	Fix the ground wire
Gas pressure is too low	Check the gas pressure and adjust to proper pressure
Pulsation at start	
	First, check the burner head location with respect to the end of the flame tube. Adjust as necessary.
Gas pressure is too high.	Use manometer and readjust the pressures.
Blocked Flue	Check draft and clear flue of foreign materials.
Pulsation during operation	
Burner is not correctly adjusted.	Readjust with combustion analyzer.
The burner is dirty.	Clean the burner.
Defective chimney	Check and change if necessary with liners.
Burner locks out	
Ionization current is too low.	Check current. Minimum 0.8 micro amps. Check position of ionization electrode and the condition of the cable.
The CO content is too high	
Excess air is too high or too low.	Adjust air shutter.
The gas holes are clogged.	Clean them.
The fresh air intakes are too small.	Check and readjust.
The burner head is out of position.	Check and readjust.
Condensation in the heat exchanger	
Firing Rate is too low.	Increase the firing rate so that the stack temperature is 350° F or HIGHER. Insulate the chimney.

COMMISSIONING/TROUBLESHOOTING CHECKLIST

There are four factors that are needed to operate the gas burner:

- _____ 1. Combustion Air
- _____ 2. Electricity
- _____ 3. Gas Flow
- _____ 4. Combustion Analysis

☐ 1. Combustion Air

Check the air coming into the area where the burner is located.

- _____ 1. If the burner is in a large area that air can come into freely (i.e. an open basement for home heating systems), then the air supply should be sufficient for the burner.
- _____ 2. If the burner is in an enclosed area (i.e. small room or closet) then fresh air must be supplied to the burner. The intakes to the area must terminate facing down in order to avoid obstructions. The total open free area must be 1 in² per 10,000 BTU input

Example

<div style="text-align: center; margin-bottom: 10px;">150,000 Btu/hr firing Rate</div> $(150,000 \text{ BTU/hr}) * \frac{(1 \text{ in}^2)}{10,000 \text{ BTU/hr}} = 15 \text{ in}^2$
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☐ 2. Electricity

Check burner wiring

- _____ 1. Check that 120VAC is coming into the burner
- _____ 2. Check that the burner is properly grounded using a ground wire
- _____ 3. Check the polarity to the burner is correct.
(To check polarity: Set a multimeter to VAC. Touch L1 to one of the probe tips and ground to the other. If a voltage between 110 and 125 is shown then it has the correct polarity; if any other reading is shown, then check the L2 wire. If the L2 wire shows a voltage between 110 and 125 is shown then the polarity to the burner is reversed.)

☐ 3. Gas Flow

- _____ 1. Check that the capacity of the meter can meet the demand of the burner and all other appliances running off the meter.
- _____ 2. Check that the burner is on a direct pipe from the meter.
- _____ 3. Measure the total length of all the pipe and count the number of elbows (1 90° elbow=3 ft. of pipe). Compare the total feet of pipe and the BTU demand using the chart on Page 5 to determine the size of the pipe required.
- _____ 4. Check that the proper orifice is installed if needed.
- _____ 5. Check the gas pressure at the gas valve (line pressure). This pressure should be between 5" wc and 10" wc when the burner is not firing. ***Note: When checking manifold pressure, do not subtract burner pressure during valve-on delay.***
- _____ 6. With the burner firing the pressure drop on the supply side should not exceed 2" wc. If the pressure drops and then surges back up double check the piping because it means the pipes are undersized.

☐ 4. Commissioning the Burner

- _____ 1. Check the head and air settings and start the burner.
- _____ 2. **Use a combustion analyzer** to check CO₂ and CO. CO₂ should be between 9% and 9.8% and CO must be less than 400 ppm but we suggest less than 100ppm. If the CO₂ is greater than 9.8% then the air should be opened to reduce the CO₂; if the CO₂ is below 8%, then the air should be closed to increase CO₂.
- _____ 3. Check the manifold pressure to verify that it is at the specified pressure.

- ____ 4. Clock the gas meter and check that the correct firing rate is achieved. If the firing rate is low, the gas pressure should be increased slightly. If the firing rate is too high then the gas pressure should be decreased. (Usually if the stack temperature is below 300F the firing rate is too low. If the stack temperature is over 600F then the firing rate is usually too high or on rare occasions the heat exchanger is blocked up)

Gas Input to Burner in ft³/hr *

	1/2 ft ³	1 ft ³	2 ft ³	5 ft ³		2 ft ³	5 ft ³
10	180	360	720	1800	50	144	360
12	150	300	600	1500	55	131	327
14	129	257	514	1286	60	120	300
16	113	225	450	1125	65	111	277
18	100	200	400	1000	70	103	257
20		180	360	900	75		240
22		164	327	818	80		225
24		150	300	750	90		200
26		138	277	692	100		180
30		120	240	600	110		164
35		103	206	514	120		150
40			180	450	130		138
45			160	400			

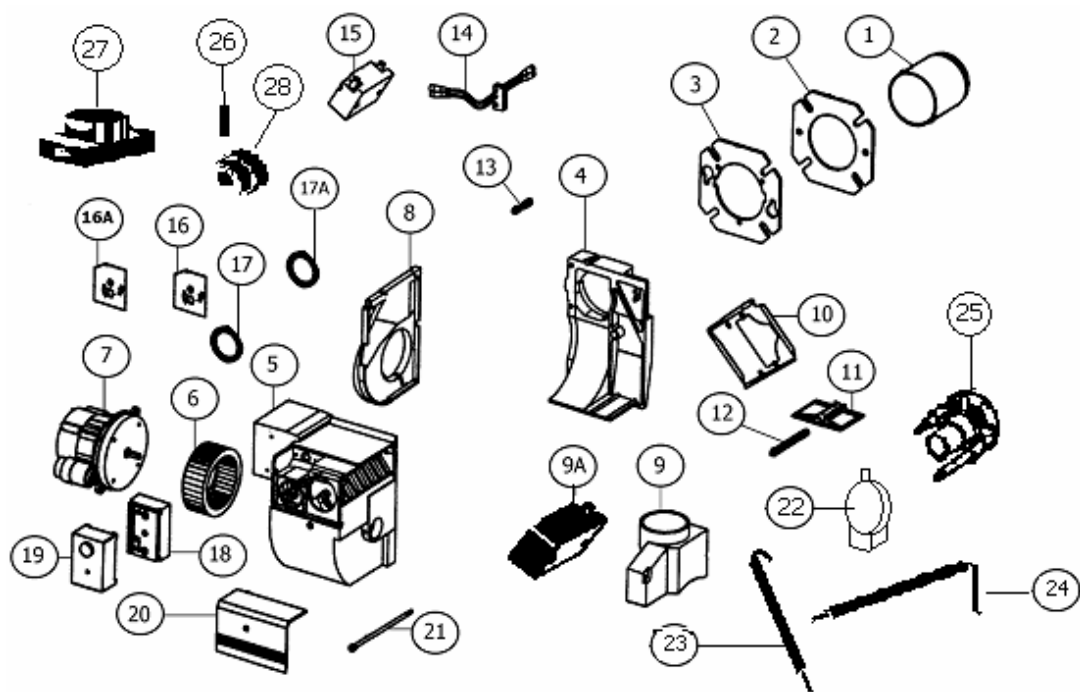
* For BTU/hr Natural gas multiply by 1000

For BTU/hr Propane multiply by 2500

- ____ 5. If the firing manifold has been readjusted, redo steps 2 and 4
- ____ 6. Check that the draft over-fire is positive

Use a combustion analyzer and record the readings below.

BURNER OPERATION: Record the Readings at Steady State	
Draft over fire at steady state (should be Positive – refer to boiler manual)	
Natural Gas CO ₂ % = (9.0% to 9.8%) or O ₂ % = (5.0% to 3.5%)	
LP Gas CO ₂ % = (10.5% to 11.5%) or O ₂ % = (5.0% to 3.5%)	
Gross Stack Temperature (350° F minimum, 450° F maximum)	
NOx (If required)	
Carbon Monoxide (CO) in PPM (less than 100 PPM ideal; should not exceed 400 PPM Oxygen free)	
Incoming Gas/LP pressure = “W.C. (minimum 5”, maximum 11”)	
Manifold Pressure = “W.C.	
Head Setting	
Air Setting	



ITEM	PART	PART #	ITEM	PART	PART #
1	Blast Tube	11728410	16	Cover Plate - Air Regulation	11887001
2	Flange Gasket	10195-1	16A	Cover Plate - Nozzle Line	11887301
3	Adjustable Flange	10195	17	Scale - Nozzle Line	11888101
4	Front piece - Housing		17A	Scale - Air Regulation	11887801
5	Rear piece – Housing		18	24 Volt Transformer	2440VA
6	Fan Wheel	11417601	19	Safety Control	2466H or S89F
7	1/6 HP PSC Blower motor	D82132	20	Plastic Cover Plate	11850001
8	Shielding Plate Housing		21	Screw (Long Special)	11750702
9	Outside Air Boot	11859107	22	Airflow Switch Honeywell	6041A
9A	Silencer	11879302	23	Ignition Electrode	115 34708
10	Air Regulation Plate	11851001	24	Flame Rod	115 34707
11	Air Damper	11852201	25	Retention head	119 39701
12	Air Regulation Adjustment screw	11848501	26	Union	1139101
13	Adjustment Screw – Nozzle Line	11912901	27	Gas Valve	VR 8205A
14	Ionization Cable	11865805	28	Brass orifice	12299
15	Ignition Transformer	2260-TWG			
	Ignition Cable for 2260-TWG	2260-GTO			

Maintenance Instructions:
TO BE FIXED/ATTACHED NEAR BURNER

Once a year, a qualified service agency needs to be contracted for other than routine maintenance.

1. The blower motor is the only moving part. It does not require lubrication, since the ball bearings have been permanently lubricated.
2. The user should do periodic visual checks of the burner and the flame.
3. Laundry lint or dog and/or cat hairs should not go inside the blower. If they are seen, they should be removed after disconnecting the power to the burner and cover parts should be installed before starting the burner.
4. Keep the area around the conversion burner clear and free from combustible materials, gasoline, and other flammable vapors and liquids.
5. No obstruction for the flow of combustion and ventilating air (ref. Page 4).

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