

- b. Input for NATURAL GAS is approximately at rating when manifold pressure is 3-1/2" water column, but should be checked on the gas meter:

$$\text{Btuh Input} = \text{Btu/cu. ft.} \times \text{cu. ft. metered in 3 minutes} \times 20$$

Example #1:

For 1000 Btu/cu.ft. gas, this becomes:

$$\text{Btuh Input} = \text{cu. ft. metered in 3 minutes} \times 1000 \text{ Btu/cu.ft.} \times 20$$

Example #2:

For 1050 Btu/cu.ft. gas, this becomes:

$$\text{Btuh Input} = \text{cu. ft. metered in 3 minutes} \times 1050 \text{ Btu/cu.ft.} \times 20$$

4. The higher heating value* of gas varies substantially for different localities. Consult with Slant/Fin's Technical Service Dept. for re-orificing procedures if any of the following apply:
- Boiler (burner) is overfiring. CAUTION! National Fuel Gas Code ANSI Z223.1-latest edition, does NOT permit firing at a higher input rate than the input rate indicated on the boiler rating plate in order to avoid hazardous conditions such as explosion or carbon monoxide poisoning.
 - Poor higher heating value* of gas is causing the actual input to be substantially lower than the rating plate indication.

* "Higher heating value" of gas is commonly known as a "heating value."

Boiler rated input in cu. ft./hr. of 1000 Btu/cu.ft. Natural Gas	Cubic Feet Gas Consumption 1000 Btu/cu. ft. gas, in 3 min- utes, at rated output
75	3.75
100	5.00
120	6.00
125	6.25
150	7.50
160	8.00
175	8.75
200	10.00
225	11.25
250	12.50
275	13.75
300	15.00
325	16.25
350	17.50
375	18.75
399	19.95

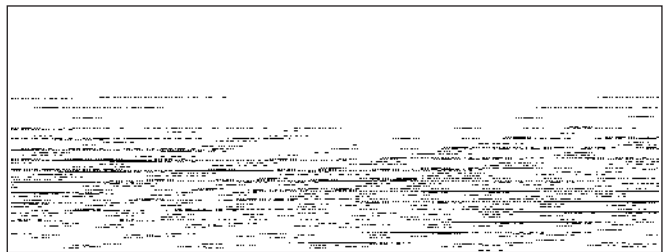
Gas rate table: The gas metered in 3 minutes to obtain rated input for each boiler model, using 1000 Btu/cu. ft. gas, is tabulated in gas rate table.

B. Main Burners

- Fire the boiler continuously for at least 15 minutes, to reach burner operating temperature.
- Observe the flames, all burners. The base of all flame jets should be blue. The tips should be blue shading to orange. NOTE: Dust, disturbed by any movement, will cause bright orange flames. Wait for dust to settle.
- For one burner, close the air shutter until some of its flame jet tips turn yellow-white, indicating insufficient primary air. Then open shutter until whitish tips disappear completely. Set all burner shutters to the same opening. Observe to make sure that no yellow-white tips appear over any portion of the flame. Small yellow tips at the pilot location are permitted.
NOTE: This adjustment method gives MINIMUM primary air setting for safe combustion. DO NOT attempt to make this adjustment unless burners are at operating temperature. Adjustment should be made with burner access panel in final operating position. Use of a mirror may be helpful to observe flames. Note that burner ports are on top of main burner tube.

C. Main Burner Ignition Checkout and Pilot Adjustment.

- The pilot flame must not smother or snuff out when tested as follows:
 - Main burner ignition from cold start-repeat.
 - Continued operation of main burner.
 - Main burner ignition with appliance at maximum operating temperature after prolonged operation.
 NOTE: Observe operation of the pilot burner with appliance doors in the final operating position. Use of a mirror may be helpful.
- Safety Shutdown Checkout
 - For proper operation the pilot should engulf the thermocouple or flame sensor as shown below.
 - To adjust pilot, turn pilot flow adjustment screw on valve clockwise or counterclockwise to give a steady flame enveloping 3/8 to 1/2 inch of the tip of the thermocouple or flame sensor. Note that turning the pilot adjust screw clockwise will decrease the pilot flame.
 - Check safety shutdown of gas valve by following procedure outlined "CARE" and "MAINTENANCE" section.



CARE AND MAINTENANCE

WARNING: THE FLOW OF COMBUSTION AND VENTILATING AIR TO THE BOILER SHOULD NOT BE OBSTRUCTED. This section must be brought to the attention of the owner by the installer so that the owner can make the necessary arrangements with a qualified service agency for the periodic care and maintenance of this boiler. The installer must inform the owner that the gas supplier can recommend a number of qualified service agencies. The installer must also inform the owner that the lack of proper care and maintenance of this boiler and any fuel burning equipment may result in a hazardous condition.

1. GENERAL MAINTENANCE (Refer also to Owner's Information Manual)

These operations are recommended to be performed at regular intervals:

- BOILER HEATING SURFACES:** clean off all coatings found.
- BOILER CONTROLS:** check contacts, settings, correct functioning.
- PIPING:** check piping and accessories for leaks.
- CHIMNEY VENTING SYSTEM:** check for obstructions and leaks.

E. BOILER ROOM AIR SUPPLY: check air vents for continued POSITIVE supply of air as required. Air needs are greatest in cold weather. Air vents must be open and free of obstruction.

F. WATER SYSTEM CHECK:

1. System to be full of water, and pressure to remain stable at correct setting on gauge.
2. Air control system: noise and air binding in radiation should not occur.
3. Water lines: slightest leaks should be corrected.
4. Low water cutoff, for operation (see instructions furnished with unit).

2. WATER LEVEL CHECK DURING HEATING SEASON

- A. Check water pressure regularly and add water slowly to system when needed. If much water is added, venting may be necessary.
- B. Regular loss of water from water boiler system may indicate either a system leak, or a faulty air control system, or a faulty automatic fill valve.

3. ANNUAL INSPECTION AND CLEANING

- A. It is important that this boiler be inspected by a competent serviceperson to help insure safe and reliable operation.
- B. Check for gas leaks from valve and gas piping to burners and pilot. If leaks are found, repair or replace as required.
- C. This inspection should include:
 1. Controls check. See "Safety Check for Control System" (No.4) below.
 2. Recheck of input gas rate to burners. See "Initial Start" paragraph in "Operating instructions" section.
 3. Re-adjusting for best flame characteristics of main flame and pilot(s).
See "Initial Start" paragraph in "Operating Instructions" section and see "Burner Adjustment" section.
 4. Burner and boiler flue passage cleanliness: BURNER AND FLUE CLEANING (see figure 13). It is suggested that paper be placed on burners to collect any foreign material when cleaning flues.
 5. Remove jacket top and flue cover.
 6. Use wire brush to clean flueways.
 7. Replace flue cover and re-seal with furnace cement. Replace jacket top. Remove and dispose of paper and accumulated material.
 8. If burner surfaces are not clean, or if uneven flame indicates plugged burner ports, remove and clean burners.

NOTE-TO REMOVE BURNERS:

1. Disconnect pilot at pilot mount, or disconnect pilot gas line at gas valve, before removing burners next to pilot.
2. Lift burner and remove burner from orifice.
3. Clean and replace burners* and pilot. Adjust burners as described on page 9.

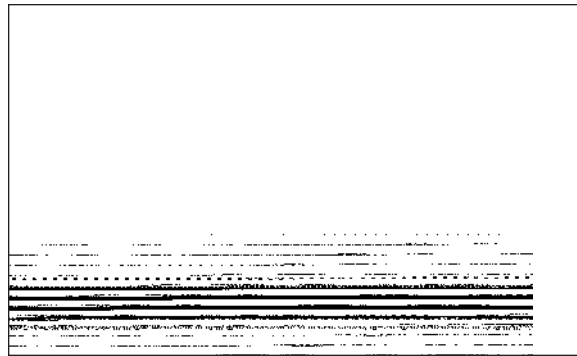
*To clean burners run a clean flue brush up the tube until all foreign matter is removed.

WARNING:

The ceramic combustion chamber in the burner box contains crystalline silica. Wear proper dust mask and gloves when servicing combustion chamber or burners. Crystalline Silica has been identified as a carcinogen or possibly carcinogenic to humans.

4. SAFETY CHECK FOR CONTROL SYSTEM

- A. High limit control test: Set thermostat high enough for boiler water temperature to reach high limit control



setting. When this temperature is reached, the high limit switch should open, and the main gas valve should close automatically. If the high limit does not operate to close the main gas valve, the valve, the high limit or the wiring is faulty. Repair or replace immediately.

B. Gas valve safety shutdown test:

For boilers equipped with Honeywell S8600 intermittent pilot system, with main burners firing, disconnect the ignition cable from the S8600 IGNITOR BOX. The gas valve should shut off the main burners.

If the gas valve fails to shut down main burners when test is performed, replace the gas valve.

- C. Check for gas leaks from valve and gas piping to burners and pilot. If leaks are found, repair or replace as required.

5. PROVIDING PROTECTION FROM FREEZING

- A. Anti-freeze is sometimes used in hydronic heating systems to protect against freeze-up in the event of power failure or control shutdown when the building is unoccupied. It should be recognized that unless the building is kept above freezing temperature by some means, the plumbing system is not protected.

Two types of anti-freeze may be used: ETHYLENE GLYCOL, used in automobiles, has desirable properties, but is toxic. Its use may be prohibited when system water/glycol solution is in contact with a potable water vessel (as with a tankless heater). PROPYLENE GLYCOL is used in the quick-freeze food industry; it is practically non-toxic. Its use may be permitted when tankless heaters are used. When anti-freeze must be used, inhibited propylene glycol is recommended. Useful information on the characteristics, mixing proportions, etc. of glycol in heating systems is given in Technical Topics No. 2A, available from the Hydronics Institute 34 Russo Place, Berkeley Heights, NJ 07922. Consult glycol manufacturers for sources of propylene glycol.

B. Water Treatment:

A good water treatment program will not only extend the useful life of this boiler but it will also save much of the time and expense of repairs made necessary by preventable occurrences.

A reputable water treatment company should be consulted to evaluate and determine the best overall treatment program for your boiler equipment.

6. KEEP THE BOILER AREA CLEAR AND FREE FROM COMBUSTIBLE MATERIALS, GASOLINE, AND OTHER FLAMMABLE VAPORS AND LIQUIDS.

BURNERS FAIL TO OPERATE**CAUSE**

1. Safety pilot out, or flame too low.
2. Gas supply valve shut off.
3. Electric switch open.
4. Blown or defective line fuse.
5. Operating or limit control contacts open or dirty.
6. Defective gas valve or pressure regulator; or plugged bleed line.
7. Defective low voltage transformer.
8. Obstruction at main burner orifice.
9. Break in wiring or loose contact at control terminals.
10. Improper wiring.
11. Improper controls.
12. Rollout or blocked vent safety switch open.

REMEDY

1. Check, clean, re-light. See instructions.
2. Open gas valve(s).
3. Close switch.
4. Replace fuse.
5. Check control. Clean contacts or replace control.
6. Repair or replace.
7. Replace transformer.
8. Check, clean and reinstall.
9. Check with test-light and correct.
10. Check and correct in accordance with wiring diagrams included with appliance instructions.
11. Install proper controls.
12. Replace rollout switch (inspect flue passages prior to replacement) or reset blocked vent safety switch by depressing the reset button.

BURNERS WILL NOT SHUT OFF**CAUSE**

1. Defective operating control, gas valve, or high limit control.
2. Improper wiring or short circuit.

REMEDY

1. Check, repair or replace.
2. Check wiring and controls.

FLASH BACK - BURNING AT ORIFICES**CAUSE**

1. Manifold gas pressure too low.
2. Improper primary air adjustment.
3. Gas regulator bleed too slow.
4. Burrs on orifice.
5. Improperly drilled orifice plugs.
6. Leaking automatic gas valve.
7. Adverse draft condition in boiler room.
8. Low main gas pressure.
9. Safety pilot improperly installed.

REMEDY

1. Adjust to proper manifold pressure.
2. Adjust air to produce soft, clean flame.
3. Adjust bleed opening.
4. Remove burrs.
5. Install orifice plugs with proper drilling.
6. Repair or replace.
7. Check air supply and venting system.
8. Contact utility.
9. Correct to manufacturer's recommendations.

DELAYED IGNITION**CAUSE**

1. Pilot flame too low.
2. Pilot burner ports or pilot orifice clogged.
3. Burners or orifices out of alignment.
4. Excessive primary air.
5. Excessive burner input.
6. Adverse draft condition in boiler room.

REMEDY

1. Increase gas supply to pilot.
2. Clean ports or orifices.
3. Realign burners or manifold.
4. Adjust primary air shutters.
5. Check and reduce to input shown on rating plate.
6. Check air supply and venting system.

FUMES AND GAS ODORS**CAUSE**

1. Leaks in gas piping or accessories.
2. Gas leaks in service line or meter connections.
3. Blocked chimney.
4. Boiler flueways blocked with soot.
5. Undersized breeching or too many turns in breeching.
6. Adverse draft condition in boiler room.
7. Overfiring.

REMEDY

1. Locate leaks and repair.
2. Close service supply valve - shut down appliance and notify utility.
3. Check and repair chimney.
4. Clean flueways and adjust burners as described in the installation instructions.
5. Check manufacturer's recommendations.
6. Check air supply and venting system.
7. Adjust gas input to that shown on boiler rating plate.

CONDENSATION IN BOILER FLUES OR IN VENT SYSTEM**CAUSE**

1. Underfiring.
2. Boiler water maintained at too low a temperature level.
3. Long horizontal run of smokepipe.
4. Inadequate chimney or venting system.

REMEDY

1. Increase firing rate to that shown on rating plate.
2. Set low limit controls to maintain a higher water temperature. If boiler is not equipped with low limit replace with one which has a combination low limit/high limit aquastat.
3. Relocate boiler or insulate breeching.
4. Check chimney and venting recommendations.