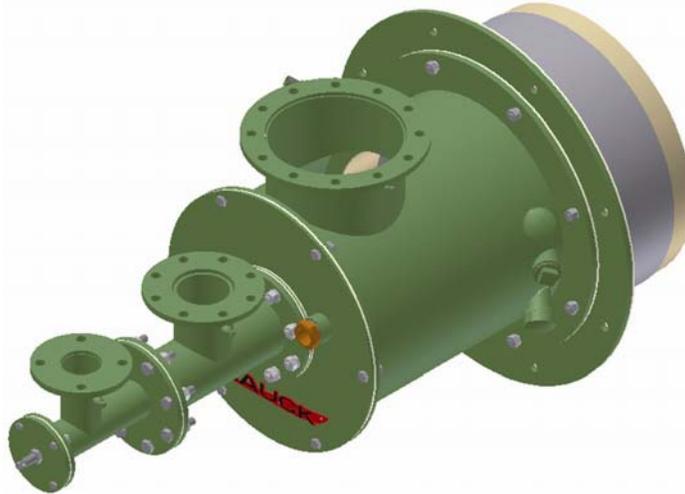




HEAVY OIL FIRED BBC BETA BURNERS



NOTE

These instructions are intended for BBC burners firing heavy oil. Refer to BBC-9 for additional information.



WARNING

These instructions are intended for use only by experienced, qualified combustion start-up personnel. Adjustment of this equipment and its components by unqualified personnel can result in fire, explosion, severe personal injury, or even death.

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These instructions are intended to serve as guidelines covering the installation, operation, and maintenance of Hauck equipment. While every attempt has been made to ensure completeness, unforeseen or unspecified applications, details, and variations may preclude covering every possible contingency. **WARNING: TO PREVENT THE POSSIBILITY OF SERIOUS BODILY INJURY, DO NOT USE OR OPERATE ANY EQUIPMENT OR COMPONENT WITH ANY PARTS REMOVED OR ANY PARTS NOT APPROVED BY THE MANUFACTURER.** Should further information be required or desired or should particular problems arise which are not covered sufficiently for the purchaser's purpose, contact Hauck Mfg. Co.



WARNING

This equipment is potentially dangerous with the possibility of serious personal injury and property damage. Hauck Manufacturing Company recommends the use of flame supervisory equipment and fuel safety shutoff valves. Furthermore, Hauck urges rigid adherence to National Fire Protection Association (NFPA) standards and insurance underwriter's requirements. Operation and regular preventative maintenance of this equipment should be performed only by properly trained and qualified personnel. Annual review and upgrading of safety equipment is recommended.

A. GENERAL INFORMATION

Heavy Oil Beta burners are baffle type burners designed for high-pressure air atomization. They are suitable for operation in furnaces up to 2700°F. Preheated air versions are available.

The BBC burners fire any clean industrial fuel gas or No. 1, No. 2, No. 4 or No. 6 fuel oil, as appropriate for the model selected. Fuel oils must be adequately filtered before delivery to the burner nozzle.

No. 4 and No. 6 fuel oils must be delivered to the burner nozzle at 90 SSU or less. Hauck recommends, in addition to appropriate fuel pre-heating, oil line tracing and insulation. Self-regulating heat trace of 12-w/ft and 2" insulation for all piping up to the burner oil inlet connection. Note that valves and other large oil manifold components will absorb the heat from the oil.

Capacities range from 2.5 million to 72.7 million Btu/Hr. All burners are cataloged at 20% excess air. Higher capacity models are available upon request. The Beta Burner flame shapes are well-defined throughout the burner's operating range. Two tile options are available. The diverging tile produces a slow mixing, long, wide flame. The converging tile produces a shorter, narrower more well-defined flame. Turndown is approximately 8:1 on gas and 5:1 on oil. If operating with excess air, thermal turndown is greater.

The burner operates with three air connections:

1. High pressure atomizing air (40-60 psig nominal)
2. Low pressure primary air (.25" wc to 7" wc nominal)
3. Low pressure secondary air (secondary air 20.8" wc at high fire)

Note: All air pressure taps are static measurements at their respective pressure tap.

B. RECEIVING AND INSPECTION

Upon receipt check each item on the bill of lading and/or invoice to determine that all equipment has been received. A careful examination of all parts should be made to ascertain if there has been any damage in shipment. Please review all drawings and instruction materials to become familiar with burner components, piping schematics, installation and operating procedures and safety precautions.

IMPORTANT

If the installation is delayed and the equipment is stored outside, provide adequate protection as dictated by climate and period of exposure. Special care should be given to all motors, bearings, refractory material and control panels, if applicable, to protect them from rain or excessive moisture.

C. BURNER CAPACITY TABLES

HIGH PRESSURE OIL OPERATION									
		Model Number							
Specifications - HIGH FIRE		_04	_06	_08	_10	_12	_14	_18	_24
Max Input @ 20% Excess Air	(MMBtu/hr)	3.0	5.2	10.1	16.5	20.8	27.0	40.0	72.7
Max Excess Air	(%)	70	160	120	400	400	600	350	750
Flame Length @ Max Input	(ft)	5	6	10	11	11	12	14	16
LOW FIRE									
Input @ 20% Excess Air	(MMBtu/hr)	0.5	1.7	3.0	4.9	6.1	6.5	7.3	14.1
Max Excess Air	(%)	90	55	100	100	100	150	220	500

Notes:

1. All burners equipped with converging tile and refractory baffle plate.
2. Btu input based on HHV's of natural gas with 1034 Btu/ft³, and 9.74:1 air/fuel ratio No. 2 oil with 138,000 Btu/gallon, and 1380:1 air/fuel ratio and No. 6 oil with 151,000 Btu/gallon, 1510:1 air/fuel ratio.
3. Flame lengths measured from the end of converging tile; for a diverging tile (available from size __06 to __18), add 18% to the converging tile flame length.

Table 1. BBC Heavy Oil Capacities

HIGH PRESSURE OIL OPERATION									
		Model Number							
Specifications - HIGH FIRE		_04	_06	_08	_10	_12	_14	_18	_24
Max Input @ 20% Excess Air	(MW)	0.8	1.4	2.7	4.4	5.5	7.1	10.6	19.2
Max Excess Air	(%)	70	160	120	400	400	600	350	750
Flame Length @ Max Input	(m)	1.4	1.8	3.0	3.4	3.4	3.7	4.3	4.9
LOW FIRE									
Input @ 20% Excess Air	(MW)	0.1	0.4	0.8	1.3	1.6	1.7	1.9	3.7
Max Excess Air	(%)	90	55	100	100	100	150	220	500

Notes:

1. All burners equipped with converging tile and refractory baffle plate.
2. Btu input based on LHV's of natural gas with 36.74MJ/nm³, No. 2 oil with 37MJ/L, and No. 6 oil with 41.3 MJ/L
3. Flame lengths measured from the end of converging tile; for a diverging tile (available from size __06 to __18), add 18% to the tile flame length.

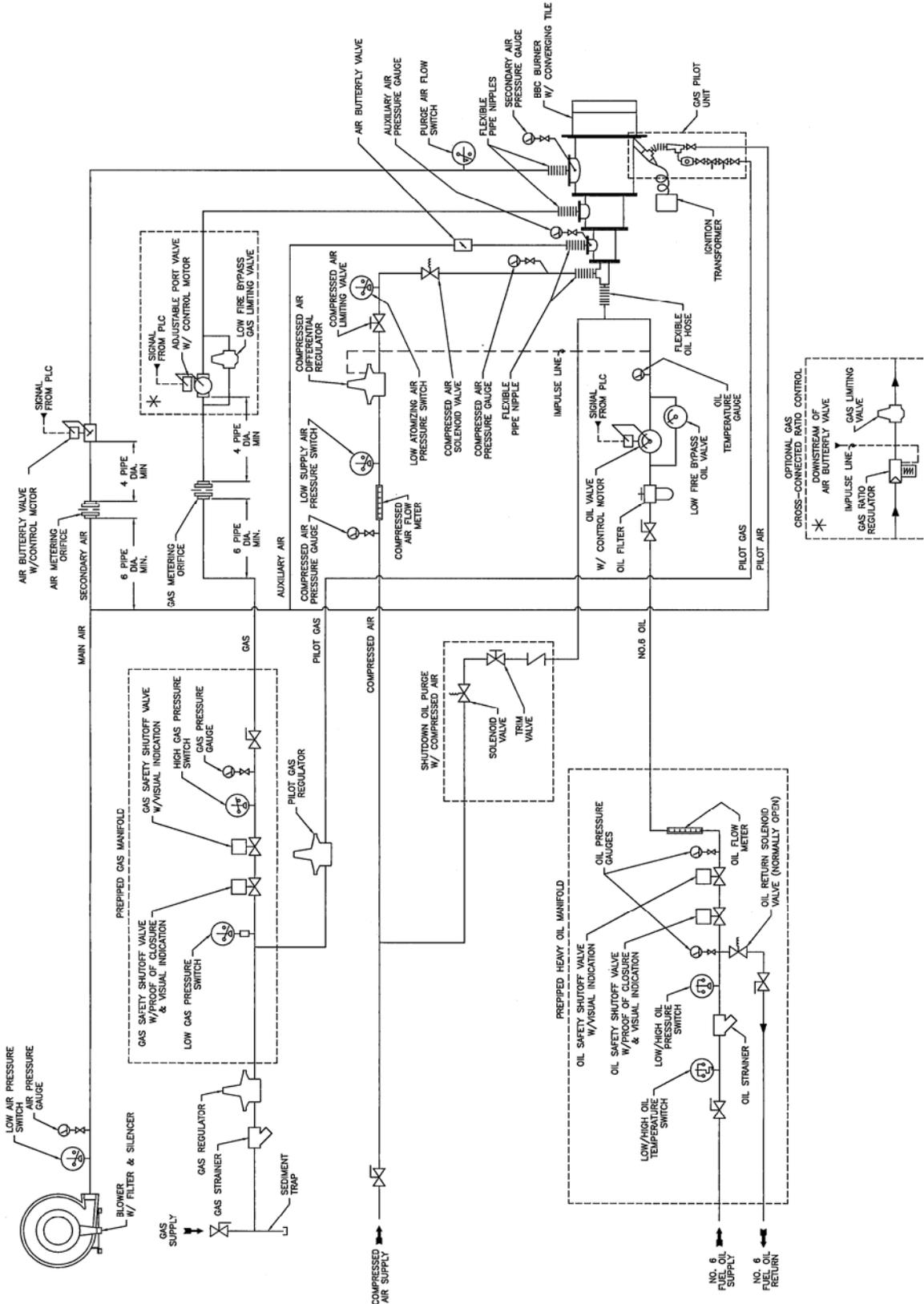
Table 2. BBC Heavy Oil Metric Capacities

D. DIMENSIONS

See appropriate Dimension sheet for detailed dimensional information.

E. RECOMMENDED CONTROL SCHEME

Hauck recommends a link-valve control system. A basic schematic is shown below.



Y6845
(NOT TO SCALE)

3. FOR ALL HEAVY OIL APPLICATIONS, OIL PIPING MUST BE HEAT TRACED (ELECTRIC OR STEAM) AND INSULATED. SELF-REGULATING HEAT TRACING IS RECOMMENDED TO MAINTAIN THE DESIRED TEMPERATURE OF A GIVEN FUEL OIL TO ACHIEVE 90 SSU (1.8 X 10⁻⁵ M²/SEC) OR LESS AT THE BURNER. ELECTRICAL HEAT TRACING WITH A NOMINAL RATING OF 12 W/FT (35W/M) COVERED WITH A NOMINAL 2" (50MM) FIBERGLASS TYPE INSULATION IS SUFFICIENT FOR MOST APPLICATIONS.
4. AUXILIARY AIR IS REQUIRED FOR FLAME SHAPING AND SHOULD NOT EXCEED 7"WC [1.7KPA] AS MEASURED AT THE AUXILIARY AIR PRESSURE GAUGE.

- NOTES: 1. PIPING SCHEMATIC SHOWN FOR SINGLE BURNER FIRING GAS AND NO. 6 (HEAVY) FUEL OIL USING CHARACTERIZED VALVE FLOW CONTROL.
2. HEAVY FUEL OIL SUPPLY SYSTEM (NOT SHOWN) IS AN INTEGRAL PART OF ANY HEAVY OIL BURNER SYSTEM. TYPICAL COMPONENTS INCLUDE SUCTION HEATER, SUPPLY PUMPING UNIT, LINE HEATER, AND OIL PRESSURE REGULATOR OR PRESSURE RELIEF VALVE. HOWEVER, REQUIREMENTS ARE DEPENDENT UPON THE SPECIFIC BURNER SYSTEM (CONSULT HAUCK).

To maximize control flexibility and turndown, a compressed air modulating regulator is recommended (as indicated in previous schematic). This regulator modulates the compressed air as oil flow is modulated. It promotes better turndown and reduces compressed air consumption.

F. INSTALLATION

For a list of pre-installation recommendations and installation instructions see BBC-9.

NOTE

All heavy fuel oil piping **must be** heat traced (electric or steam) and insulated. Self regulating heat tracing is recommended to maintain the desired temperature of a given fuel (No. 4 fuel oil @ 160°F, No. 6 fuel oil @ 250°F). Electrical heat tracing with a nominal rating of 12 watts/ft covered with a nominal 2" fiberglass type insulation is sufficient for most applications.

G. INITIAL BURNER SETUP

CAUTION

All cast refractory burner components are porous and therefore subject to moisture absorption. Refractory components should not be stored or exposed to damp conditions potentially reducing their normal expected life. Care **must** be taken at initial startups and after extended idle times to assure refractory components have been sufficiently dried prior to normal firing conditions. It is highly recommended that **low fire drying for at least 6-8 hours at 50 to 100% excess air** occur at initial startups prior to exposing refractory components to normal firing operation. Thereafter, if the refractory components are exposed to excessive moisture, condensation, or high humidity for extended periods, **allow at least 30 minutes of low fire drying** before beginning normal operation. Failure to do so may cause any moisture present to expand rapidly resulting in refractory spalling and/or premature failure.

CAUTION

Initial adjustment and burner start-up should be undertaken only by trained and experienced personnel familiar with combustion systems, control and safety circuitry and overall installation procedures.

Compressed air must be supplied to the compressed air modulating regulator at 90 psig. The downstream compressed air pressure should be set at 40 psig when the burner is at high fire. If the control system **does not** use a compressed air modulating regulator, set the compressed air at the nozzle pressure (psi) listed in capacity tables on pages 3 through 5.

Compressed air pressure to the compressed air flow meter **must** remain constant.

Oil should be properly filtered and supplied to the burner inlet at a viscosity of **90 SSU or less**. If the oil is not properly heated, carbon formation will result and burner operation will diminish.

1. Ignite the pilot and main burner. Ensure high pressure atomizing air flow for ignition. Refer to IPG-9 and BBC supplemental data for low fire reference points for lighting. **DO NOT ATTEMPT TO LIGHT BURNER AT HIGH FIRE.**
 2. Gradually increase the secondary air for the burner to desired high fire flow rate.
 3. With the secondary air at high fire:
 - a. Set the primary air according to the pressure/flow. Consult supplemental data for details. Primary air is used to keep the nozzle cool, prevent oil from going into the burner body, and shape the flame.
 - b. Ensure that the oil control motor is fully open. Set the desired oil flow rate by adjusting the oil supply pressure.
 - c. Set the high pressure atomizing air to the proper flow rate. Consult supplemental data for details. See Figure 1 for details on reading compressed air flow.
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1. Read the inlet pressure to the compressed air flow meter in the bottom horizontal scale.
 2. Follow inlet pressure vertically to intersection of horizontal flow indicator.
 3. Interpolate flow rate in scfm.

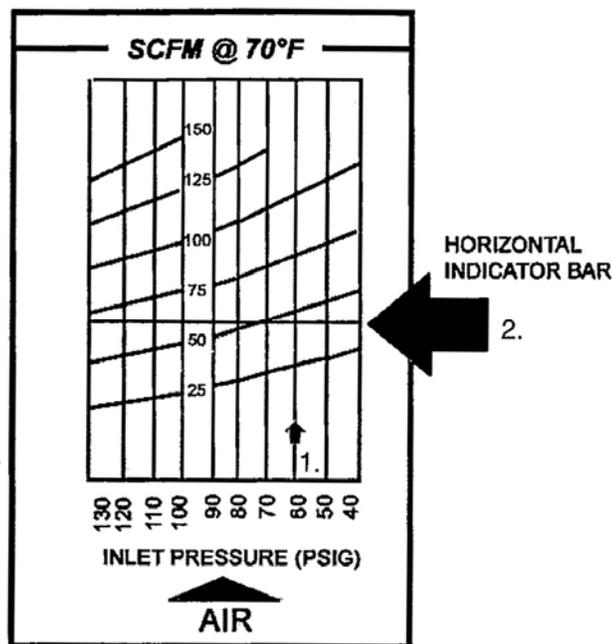


Figure 1. Compressed Air Flow Meter and Scale

NOTE: Adjustments to high fire pressure atomizing air flow should be made on the trim valve downstream of the pressure regulator, with the regulator bias in the midrange. It may be necessary to bleed the regulator to remove air from the sensing line.

NOTE: High pressure atomizing air and oil flows are dependent upon one another. As one flow is adjusted, the other flow is also affected. Flow rates may have to be adjusted multiple times to achieve the recommended flows.

4. After high fire adjustments have been completed, gradually reduce the burner output to the desired low fire secondary air setting. Consult supplemental data for details:
 - a. The primary air may not have to be adjusted from the high fire setting. Consult supplemental data for details.
 - b. Adjust the oil flow to the desired low fire flow rate. The oil control valve can then be stroked to accommodate the range of travel from high to low fire.
 - c. Adjust the high pressure atomizing air flow to the recommended setting. Consult supplemental data.

NOTE: This adjustment is made by using the bias adjustment on the high pressure atomizing air regulator.

5. After low fire adjustments have been completed, return the burner to high fire, check the high pressure atomizing air, secondary air, and oil flows. Ensure that flows agree with recommended settings in supplemental data or desired application settings.
6. After high fire adjustments have been completed, return the burner to low fire, check the high pressure atomizing air, primary air, secondary air, and oil flows. Ensure that flows agree with recommended settings in supplemental data or desired applications settings.
7. Re-ignite pilot and burner at low fire and confirm that settings are consistent with application requirements or supplemental data.

NOTE: See Figure 2 for regulator details. Bias is adjusted on top of the regulator, while the oil vent valve is located on the side of the regulator.

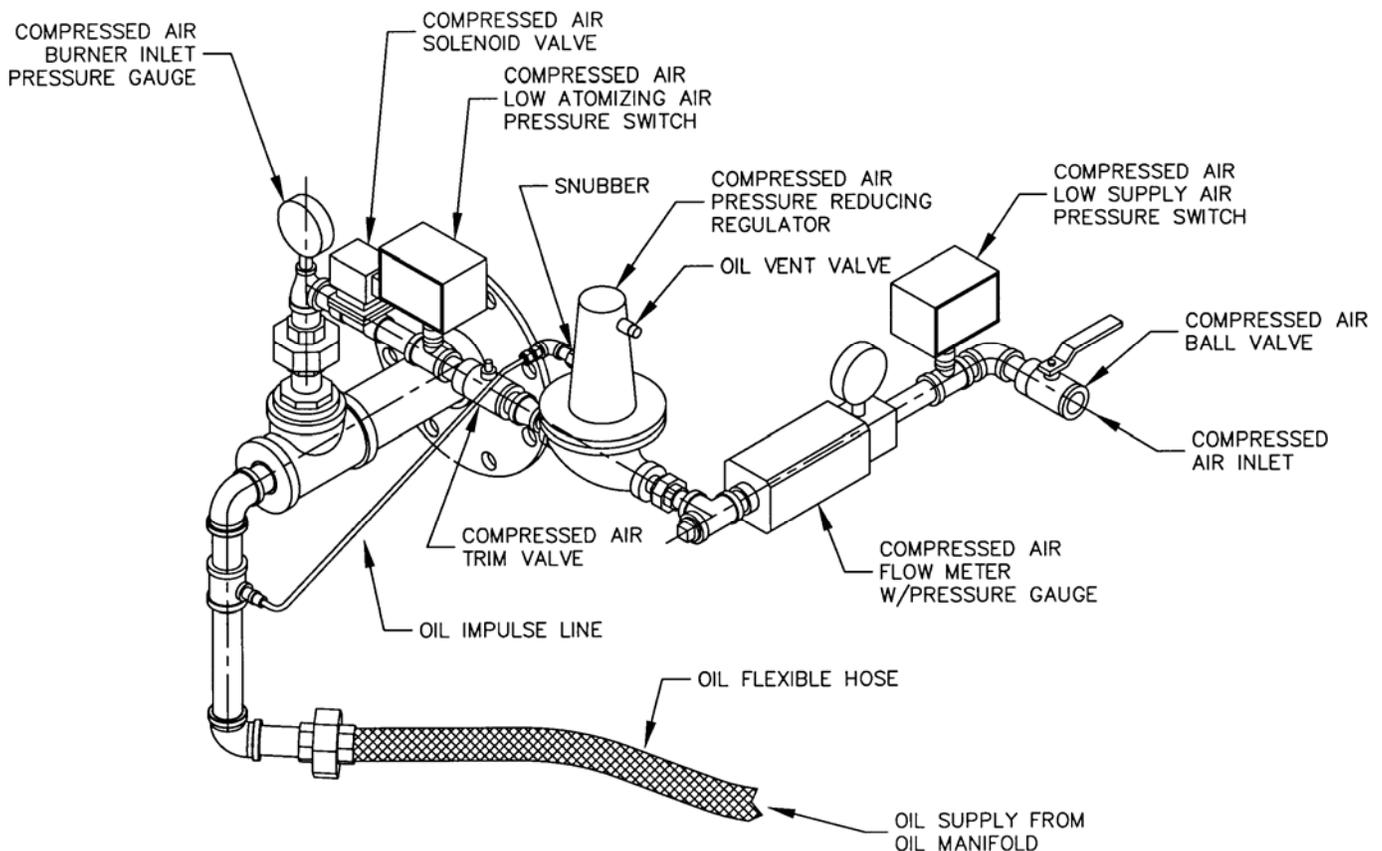


Figure 2. Compressed Air Manifold Detail

H. MAINTENANCE

The atomizer tip should be cleaned frequently depending on fuel quality and filtering.

Observe the burner tile and baffle from the burner observation ports and baffle clean-out ports. If carbon or debris is present, shut the burner down and clean out the burner tile and baffle. Be sure to keep baffle holes clear. If baffle holes clog, burner operation will become erratic. Baffle clean-out ports are located on the burner backplate.