

1. General Installation Information (to be completed by technician)

Date installed: _____

Location (city & state): _____

Cleaner's name: _____

National Board number (boiler): _____

Installed by (company): _____

Installed by (technician): _____

2. Clearances and Boiler Room

2.1. Boiler placement

- 2.1.1. Lattner recommends a minimum of 36" clearance from the all sides of the boiler to any combustible surface.

2.2. Combustion air

- 2.2.1. Boiler room must be vented with a 13" x 13" opening (minimum). If other combustion equipment is present, vent may need to be larger.

3. Connections

3.1. Feedwater inlet 1"

- 3.1.1. Install two (2) 1" spring-loaded check valves for use with steam boilers.

3.2. Blowdown outlet 1"

- 3.2.1. Install one (1) 1" slow-opening y-type valve and one (1) 1" quick-opening ball valve for use with steam boilers rated at 200 psi design pressure. Lattner recommends using schedule 80 pipe for blowdown piping. Never reduce blowdown piping.

3.3. Steam outlet 1-1/2"

- 3.3.1. Install one (1) 1-1/2" rising stem main steam stop valve. Lattner recommends installing a 2" x 6' steam header (pipe) as close to the boiler as possible for reserve and surge steam storage. Steam line should be pitched downward, away from the boiler toward the first steam trap.

3.4. Stack connection 8"

- 3.4.1. Install double wall stack per ANSI Z2231.1, appliance category III for positive pressure boilers. Boiler must be vented separately from all other equipment. Limit stack connection to two (2) 45 degree elbows. Avoid any horizontal runs of stack.

3.5. Gas train/connection 1"

- 3.5.1. Lattner recommends a gas supply line the same size or larger than the gas train. Do not reduce the gas line at any point to less than 1".



3.6. Grounding

- 3.6.1. Verify that green ground wires are securely attached to grounding screw in boiler panel box. In addition to the grounding wire provided, Lattner recommends grounding the boiler/burner package with a grounding rod. Grounding rods are available at most hardware stores. Follow the instructions included with the grounding rod.

3.7. Electrical connection 120/1/60

- 3.7.1. All wiring must be done in strict accordance with the National Electrical Code. The boiler requires a 120 volt single phase connection with a separate fused disconnect (supplied by installer or contractor) and a 20 amp circuit breaker (supplied by installer or contractor).
- 3.7.2. Wire the boiler feed pump/motor to pump contactors in panel box (see Lattner wiring diagram supplied with boiler).
- 3.7.3. Connect the power supply to the terminals in the panel box (see Lattner wiring diagram supplied with boiler).

4. Burner Start-Up

4.1. Required equipment for burner start-Up

- 4.1.1. Combustion Analyzer
- 4.1.2. "U" tube manometer or aneroid gas pressure gauge
- 4.1.3. Honeywell digital display module with 30 second pre-purge

4.2. Procedure¹

- 4.2.1. Before attempting start up, thoroughly study and familiarize yourself with the exact sequence of operation and all other details on the specific flame safeguard control system being used. This information will be found in bulletins supplied with the burner, as well as technical bulletins covering other components. All of these should be used as reference material in burner start up and service.
- 4.2.2. Check boiler water level.
- 4.2.3. Attach gas pressure gauge or manometer to upstream side of main gas cock (0" to 35" w.c.) and to burner side orifice tee (0" to 10" w.c.) as well as to pilot gas pressure test tee tapping (0" to 10" w.c.).
- 4.2.4. Ensure that the FGR switch is in the OFF position (switch located on the exterior of the panel box).
- 4.2.5. Make certain that all dampers in flue or stack are in wide open position, or as appropriate for start up.
- 4.2.6. Insert combustion analyzer probe in stack. Drill a 1/2" hole in double wall stack 6" above boiler.
- 4.2.7. Connect Honeywell digital display module to burner control.
- 4.2.8. With the main and leak test cocks and pilot cocks in OFF position, turn on gas cock at meter. Check to make certain that pressure upstream of main and pilot cocks does not exceed 14" w.c. If pressure is acceptable, proceed to next step.
- 4.2.9. Next, check the operation of the gas pilot system. This is a very important part of the start-up procedure.



- 4.2.9.1. Pilot assembly, orifice size, and spark gap are factory set. On UV pilots the spark is to arc against the pilot head.
- 4.2.9.2. Flame safeguard programming controls supplied can be of several different models (with varying sequences), depending upon the code requirements. Before attempting burner start up make certain that you are familiar with the operation of the Honeywell RM7895A flame safeguard control being used on this specific application. A Honeywell flame safeguard manual is included in your burner operating manual.
- 4.2.9.3. In order to prepare the pilot for proper operation, it is essential that appropriate adjustments be made to the burner air inlet damper and the pilot gas pressure. It is necessary that the air damper remain in one fixed position at least ½" open until it is determined that the pilot test will ignite instantly and stabilize with a good flame signal. Typical pilot test tee pressures for all Webster burners are 2-1/2" to 3" w.c. for natural gas. Pilot test tee pressures will vary. Job specific pressure to be determined by the technician performing the on site start up.
- 4.2.9.4. Frequently the cause for pilot problems relates to gas pressures that are too high and/or air dampers that are closed too far. Both conditions can cause a fuel rich mixture in the pilot box which can substantially delay or totally prevent pilot ignition. Read the following start up procedure thoroughly before proceeding.
- 4.2.9.5. Perform an initial spark pickup test. With the pilot gas cock closed, the burner will go through a blower pre-purge period, after which the gas pilot ignition transformer will be energized, although no pilot will be established. At no time should there be any flame signal reading, nor should the main gas valve attempt to open. At the end of the pilot trial for ignition and blower purge period, the flame safeguard control should shut the system down in a safety lock-out mode, requiring manual reset of the flame safeguard control to restart burner. If a flame signal is detected, verify the flame retention tab and ignition electrode are properly positioned.
- 4.2.10. With the Main and Leak gas cocks closed, the pilot gas cock open: Turn the burner switch ON. The blower motor will purge the heat exchanger of any accumulated combustibles. At the end of the purge cycle, which may be as short as 30 seconds or as long as 90 seconds, the pilot solenoid valve and ignition transformer will energize.
- 4.2.11. Pilot adjustment and main flame light off procedure for burners with automatic dampers
- 4.2.11.1. If the burner has automatic air dampers (operated by linkage from the main automatic fuel valve, or by a 2 position or modulating firing rate motor) ensure that the air dampers are held (fixed) in the pilot lighting (low) air flow position until all pilot adjustments are completed.
- 4.2.11.2. Set the air flow and pilot gas pressure to provide instant ignition, good flame stability, and flame signal readings. This can be accomplished as follows:
- 4.2.11.3. Observe pilot signal with Honeywell digital display module and reduce pilot gas pressure to a point where the signal is erratic or reduced substantially from initial readings. Signal value range from 1.25 to 5 DC volts on digital display module. Raise the pilot gas pressure to the point where the signal is again stable. View pilot through viewing port. Be sure that you are getting full coverage of scanner pipe by pilot flame. If pilot is slow in lighting, it may be due to air in the pilot line. Eliminate air and/or adjust pilot gas pressure regulator flow rate.
- 4.2.11.4. After attaining the proper pilot flame signal values, cycle the pilot off and on several times in order to ensure its reliability (with the main and leak gas cocks still closed). Turn the burner switch OFF.



- 4.2.11.5. Make certain that linkage from the automatic fuel valve to the air damper is in place. Air damper opening should be set to pilot air flow ignition position.
 - 4.2.11.6. Open gas leak test cock (with main cock still closed) and start burner.
 - 4.2.11.7. After burner has pre-purged and established good pilot flame signal readings the main automatic fuel valve will be energized. As this valve begins to open, slowly open the main gas cock to light off the main flame. The main flame should light immediately. If not, it is possible that you will have to eliminate air from the main gas line and/or adjust main gas pressure regulator flow rates or adjust bleed valve on main burner valve if supplied.
 - 4.2.11.8. Adjust burner as necessary to provide smooth ignition of main flame. If flame signal drops significantly when main automatic gas valve opens, slightly increase pilot gas pressure to attain stable flame signal value.
 - 4.2.11.9. Because the burner operates on a Low/High/Low principle, take action necessary to hold burner at low fire position for initial low fire position adjustments. When low fire adjustments are complete, advance the unit to the high fire position. Under certain circumstances it is acceptable procedure to disconnect and lock into position one of the air dampers. The other damper then being adjusted for automatic operation.
 - 4.2.11.10. Make certain that the air flow settings provide correct O₂, CO₂, NO_x, and other combustion values throughout the range of firing input rates (see Table 1 in section 4.4). Check also with local utility and any other authorities having jurisdiction before final burner adjustment.
 - 4.2.12. Conduct all applicable test procedures shown in control manufacturer's bulletins included with burners. Set and check operation of low and high gas pressure switches (if applicable), all burner and heat exchanger controls, and operating devices. Check blower air flow switch by first closing main gas cock and disconnecting motor lead wire.
- 4.3. Flue gas recirculation piping (FGR) & low-NO_x operation
- The FGR piping allows the boiler to operate at less than 30 ppm NO_x as required by SCAQMD for Los Angeles, Orange, Irvine, San Bernardino, Ventura, and Riverside counties. For the FGR piping to operate correctly, the boiler and burner package must be installed and set-up as described above. After completion initial installation and set-up, perform the following procedures:
- 4.3.1. Before turning the FGR switch to ON, allow the boiler to operate for one (1) hour or until boiler is operating at full pressure.
 - 4.3.2. Open the drip leg valve on the FGR piping.
 - 4.3.3. Allow water/condensation to drain from drip leg valve.
 - 4.3.4. Close drip leg valve half way.
 - 4.3.5. Turn the FGR switch to ON.
 - 4.3.6. Allow burner to operate for 10 minutes without making air/gas mixture (burner linkage) adjustments. Note that the pilot flame may become unstable as water/condensation from the FGR line is pushed through the burner. If the pilot flame is extinguished, reset it and wait for pre-purge cycle to complete. You may be required to cycle the burner several times before obtaining a stable pilot flame.
 - 4.3.7. If the pilot flame is stable, slowly close the drip lag valve until it's fully closed.



- 4.3.8. Repeating the procedures outlined in sections and subsections of 4.2.11, adjust the air/gas mixture (burner linkage) until your combustion analyzer measurements are within the ranges listed in Table 1 (section 4.4).

4.4. Critical Data & Combustion Analysis Objectives

Constituent	Value
Fuel	Natural Gas
Supply Voltage	120/1/60
Operating Principle	Low/High/Low
BTU Rating	690 MBH
Minimum Gas Inlet Pressure	7" w.c.
Maximum Gas Inlet Pressure	14" w.c.
Manifold Pressure	3" to 4" w.c.
Oxygen (O ₂)	5% to 6%
Carbon Dioxide (CO ₂)	0% to 10%
Carbon Monoxide (CO)	Less than 400 ppm
Nitrogen Oxides (NO _x)	Less than 25 ppm (uncorrected for 3% O ₂)
Stack Temperature	375° F to 450° F
Efficiency	80% to 82.5%

4.5. Pressure Control Settings

The Low/High/Low power burner has the capability to reduce the firing rate of the boiler when the demand for steam has been reduced. Reducing the firing rate of the boiler increases the efficiency of the boiler and eliminates the resultant drop in steam pressure during the time the burner goes through its pre-purge cycle.

- 4.5.1. The controls operate as follows:
 - 4.5.1.1. High fire control - This control allows the burner to fire at its maximum rate.
 - 4.5.1.2. Low fire control - This control causes the burner to fire at a reduced firing rate and stops the burner from firing when the desired pressure is attained.
 - 4.5.1.3. Pressure limit control - This control stops the burner from firing when a pre-set maximum pressure has been reached.

4.5.2. The controls should be set as follows:

- 4.5.2.1. Adjust the pressure limit control to a pressure not greater than 85% of the safety valve setting as indicated on the nameplate attached to the safety valve.
- 4.5.2.2. Adjust the low fire control to the maximum operating pressure desired. Adjust the differential setting to 8 or 10 psi.
- 4.5.2.3. Adjust the high fire control to a lower pressure than the low fire control, possibly 5 to 10 psi. below the setting of the low fire control. Adjust the differential setting to 8 or 10 psi.

4.5.3. Example:

The boiler is equipped with a safety valve set to relieve pressure at 150 psi. The intended boiler operating pressure is 115 psi. This is the pressure desired to stop the burner from firing. The burner should fire at its maximum rate up to about 108 psi. and the steam pressure should not be allowed to drop below 100 psi.

Set the controls as follows:

- 4.5.3.1. Set the pressure limit control to 130 or 135 psi.
- 4.5.3.2. Set the low fire control to 115 psi and the differential to 10 psi.
- 4.5.3.3. Set the high fire control to 108 psi and the differential to 8 psi.



5. Troubleshooting²

5.1. Burner fails to start

- 5.1.1. Bad fuse or switch open on incoming power source, or motor overload out.
- 5.1.2. Control circuit has an open control such as operating, limit or low water cut-off.
- 5.1.3. Reset button on motor or flame safeguard programming control open. Push reset button.
- 5.1.4. Loose or faulty wiring. Tighten all terminal screws. Check wiring against wiring diagram furnished with burner.

5.2. Burner motor runs but pilot does not light

- 5.2.1. Be sure gas is turned on at meter and pilot cock is open.
- 5.2.2. Place hand on pilot valve to feel it open. Check gauge at tee in pilot line for gas pressure and prompt opening of pilot valve.
- 5.2.3. Check visually or by sound for spark arcing.
- 5.2.4. Check air switch and be sure its circuit closes during start. Be sure timing card is inserted into flame safeguard.

5.3. Burner motor runs and pilot lights but main gas valve does not open

- 5.3.1. Check flame signal. If low, adjust pilot gas pressure and air settings for improved readings.
- 5.3.2. Check gas valve circuit, both main valve and proof of closure switch.
- 5.3.3. Main valve opening too slow, adjust bleed on diaphragm valve.
- 5.3.4. Shut-off cock or test cock not open.
- 5.3.5. Defective main valve.

5.4. Occasional lockouts for no apparent reason

- 5.4.1. Re-check D.C. voltage readings. If insufficient, check gas pressure and air damper setting. Check electrodes setting. If flame rod pilot, flame rod may have to be re-positioned.
- 5.4.2. Check ignition cable and electrode porcelain for damage or breaks which could cause short.
- 5.4.3. Check for loose or broken wires.

5.5. Burner will not start, even though burner has not failed before and/or has been running normally

- 5.5.1. Operating Control circuit open.
- 5.5.2. Starting interlock such as proven low fire switch or proof of closure switch open.
- 5.5.3. Defective control or loose wiring.
- 5.5.4. Limit circuit open.
- 5.5.5. An additional source of information relative to trouble-shooting can be found in the flame safeguard programmer manual supplied with the burner.

5.6. Boiler and pump switch are ON but pump does not run and water level in the boiler is low

- 5.6.1. Circuit breaker is tripped or fuse is blown.
- 5.6.2. McDonnell Miller float is stuck.
- 5.6.3. McDonnell Miller is wired incorrectly.
- 5.6.4. Pump is wired incorrectly.

5.7. Pump runs but does not maintain water level in boiler

- 5.7.1. Bad check valve. Always use spring-loaded check valves for use with steam boilers (see section 3.1.1).
- 5.7.2. Bad steam trap/s.
- 5.7.3. Strainer is plugged.
- 5.7.4. No water in tank.



- 5.7.5. Pump is out of adjustment.
- 5.8. Pump overfills boiler (high water alarm)
 - 5.8.1. McDonnell Miller is not operating correctly (and/or snap switch is stuck in the closed position).
 - 5.8.2. McDonnell Miller is wired incorrectly.
 - 5.8.3. Pump is wired incorrectly.
- 5.9. Boiler takes excessive time to reach pressure
 - 5.9.1. Burner is not tuned properly.
 - 5.9.2. Improper gas pressure (low gas inlet pressure; i.e. less 7" w.c.).
 - 5.9.3. Boiler flue passage requires cleaning.
 - 5.9.4. Gas valves operating incorrectly.
- 5.10. Boiler shuts down on auxiliary low water cut-off
 - 5.10.1. Pump switch is turned off.
 - 5.10.2. Warrick probe wired incorrectly.
 - 5.10.3. Probe is not seated in socket properly.
 - 5.10.4. Probe length is incorrect length.
 - 5.10.5. Boiler/burner grounding is incorrect.
 - 5.10.6. Warrick relay wired incorrectly.
 - 5.10.7. Probe has scale, dirt, or debris on it.
 - 5.10.8. Foaming in boiler (over treatment of water with chemical).
 - 5.10.9. McDonnell Miller is operating incorrectly.
 - 5.10.10. Pump is not functioning properly.
 - 5.10.11. Bad check valve. Always use spring-loaded check valves for use with steam boilers (see section 3.1.1).

¹ Burner start-up procedure and information in sections 4.1 and 4.2 (and all subsections therein) is provided by Power Flame Incorporated. This information is available in Power Flame burner manuals. Some of this information has been edited and/or modified for use with Lattner boilers, Lattner supplied equipment, and burners other than those manufactured by Power Flame.

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