Installation, Startup, Operation and Maintenance Manual

JBFX/HDFX Series
Forced Draft Burners

Manual Part No. 950088
www.webster-engineering.com
May, 2016
SAFETY PRECAUTIONS

Good safety practices must be used when working on burner equipment. The potential energy in the electrical supply, fuel and related equipment must be handled with extreme care to prevent equipment failures, injuries and potential death.

Throughout this manual, the following symbols are used to identify potential problems.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>This indicates a potential hazardous situation, which if not avoided, could result in personal injury or death.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>This indicates a potentially hazardous situation, which if not avoided, could result in damage to the equipment.</td>
</tr>
</tbody>
</table>

The following general safety precautions apply to all equipment work.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>IF YOU SMELL GAS, OPEN WINDOW, EXTINGUISH ANY OPEN FLAMES, STAY AWAY FROM ELECTRICAL SWITCHES, EVACUATE THE BUILDING AND IMMEDIATELY CALL THE GAS COMPANY.</td>
</tr>
</tbody>
</table>

IN ACCORDANCE WITH OSHA STANDARDS, ALL EQUIPMENT, MACHINES AND PROCESSES SHALL BE LOCKED OUT PRIOR TO SERVICING.

IF THIS EQUIPMENT IS NOT INSTALLED, OPERATED AND MAINTAINED IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS, THIS PRODUCT COULD EXPOSE YOU TO SUBSTANCES IN FUEL OR FROM FUEL COMBUSTION WHICH CAN CAUSE DEATH OR SERIOUS ILLNESS AND WHICH ARE KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

IMPROPER SERVICING OF THIS EQUIPMENT MAY CREATE A POTENTIAL HAZARD TO EQUIPMENT AND OPERATORS.

SERVICING MUST BE DONE BY FULLY TRAINED AND QUALIFIED PERSONNEL.

BEFORE DISCONNECTING OR OPENING UP A FUEL LINE AND BEFORE CLEANING OR REPLACING PARTS OF ANY KIND,
• TURN OFF THE MAIN MANUAL FUEL SHUTOFF VALVES INCLUDING THE PILOT COCK, IF APPLICABLE. IF A MULTIPLE FUEL BURNER, SHUT OFF ALL FUELS.
• TURN OFF ALL ELECTRICAL DISCONNECTS TO THE BURNER AND ANY OTHER EQUIPMENT OR SYSTEMS ELECTRICALLY INTERLOCKED WITH THE BURNER.

Service Organization Information:

Company Name ________________________________
Address ______________________________________
Phone Number _________________________________

Date of Startup ____________________________
Lead Technician _____________________________
A. INTRODUCTION

This manual covers the Models JBFX and HDFX burners offered by Webster Combustion Technology, LLC. These burners can be used in a wide variety of Cast Iron, Firebox, Firetube, Flextube and other applications. They can fire natural gas or propane with several different operating systems.

READ AND SAVE THESE INSTRUCTIONS FOR REFERENCE.

WARNING
DO NOT ATTEMPT TO START, ADJUST OR MAINTAIN THIS BURNER WITHOUT PROPER TRAINING OR EXPERIENCE. FAILURE TO USE KNOWLEDGEABLE TECHNICIANS CAN RESULT IN EQUIPMENT DAMAGE, PERSONAL INJURY OR DEATH.

The startup and maintenance of the JBFX and HDFX burners requires the skill of an experienced and properly trained burner technician. Inexperienced individuals should not attempt to start or adjust this burner.

Every attempt has been made to accurately reflect the burner construction, however, product upgrades and special order requirements may result in differences between the content of this manual and the actual equipment. These special components will be described in the information provided with the burner and should be used as the controlling document.

NOTE: This manual must be readily available to all operators and maintained in legible condition.

1. Nameplate Information

Each burner has a nameplate with important job details, similar to the nameplates shown in Figure A-1. The “X” in the model number refers to a low NOx burner.

![Figure A-1 Nameplate](image)

The serial number represents the unique number for that burner and is a critical number that will be needed for any communications with Webster Engineering.

The input rates define the maximum and minimum inputs for that burner, given in MBH for gas.

The electrical ratings of the burner are given, with the voltage, current load, frequency and phase (this will either be single or 3-phase). For motors, the motor HP is listed.
2. Ratings
The ratings for each specific burner are given on the nameplate. The general burner ratings are given in Specification Sheets that follow this section. The maximum inputs are given based on the type of fuel. Other conditions, like the supply gas pressure or the combination of fuels, emission requirements and control systems, may prevent the burner from reaching the lowest firing rate.

3. Product Offering
The JBFX/HDFX burner can fire natural gas, propane and digester gas.

This burner is a low emmision burner capable of firing sub 20ppm NOx or sub 9ppm NOx, depending on the requirements of the particular burner application.

Figure A-2 lists the common variations and options available on this product. The minimum furnace conditions are given in Section C.

4. Your Complete Manual
In addition to this manual, there are several other documents that should be considered as part of the complete manual for the burner.

All of these documents are needed to support the installation and startup of the unit. These additional items include:

a. The wiring diagram, which shows the limits and interconnection of the burner and vessel controls.
b. The gas piping schematics, which show the components and their relative positions in the piping train.
c. The unit material list which provides an overview of the burner requirements and a complete bill of material, including the part numbers and description for each item.
d. The flame safeguard manual provides the operating sequence for the burner management system. This will be a critical document for trouble-shooting any future problems.
e. Catalog cuts of the major components. These provide details on the installation, adjustment and maintenance of the components used on the burner.

5. Service, Parts and other Information
Service and parts are available from your local Webster Representative. For a list of Webster Representatives, please call 620-221-7464, or visit the Webster web site:

[www.webster-engineering.com](http://www.webster-engineering.com)
MODEL JBFX BURNER MODEL CONFIGURATION

FIGURE A-2

JBFX1G-40-07-RM7800L-M.25-M-UL/CSD-1

**BURNER SERIES**
- JBF
- HDF
- “X” denotes Low NOx

**FUELS**
- G  Nat. Gas
- LP Propane
- SG Digester

**BLOWER HOUSING SIZE**

<table>
<thead>
<tr>
<th>Boiler Horsepower</th>
</tr>
</thead>
<tbody>
<tr>
<td>03   1/3</td>
</tr>
<tr>
<td>05   1/2</td>
</tr>
<tr>
<td>07   3/4</td>
</tr>
<tr>
<td>10   1</td>
</tr>
<tr>
<td>15   1.5</td>
</tr>
<tr>
<td>20   2</td>
</tr>
<tr>
<td>30   3</td>
</tr>
<tr>
<td>50   5</td>
</tr>
</tbody>
</table>

**BLOWER MOTOR HORSEPOWER**

| 03   1/3          |
| 05   1/2          |
| 07   3/4          |
| 10   1            |
| 15   1.5          |
| 20   2            |
| 30   3            |
| 50   5            |

**FLAME SAFEGUARD VENDOR DESIGNATION**
- RM7800L Honeywell
- M Mark AutoFlame - mini mark
- E110/EP170 Fireye
- Nexus Fireye
- LMV3 Siemens
- LMV5 Siemens

**CODES AND LISTINGS**
- UL
- ULc
- CSD-1
- FM
- IRI
- NFPA-85

**GAS TRAIN VENDOR**
- VGD Siemens
- VGG Siemens
- M Maxon
- Blank All Others (ASCO) - (std)

**GAS TRAIN SIZE**

| .15   1 1/2 inches |
| .20   2 inches     |
| .25   2 1/2 inches |
| .30   3 inches     |
| .40   4 inches     |

**GAS SYSTEM**
- M Modulation

The above represents the common model designations. Contact the factory for other options and special applications.
### Model JBFX Series Typical Dimensions (Inches)

<table>
<thead>
<tr>
<th>Burner Model Number</th>
<th>Input (MBH)</th>
<th>Motor HP</th>
<th>Std. Gas Train Size</th>
<th>Min. Req’d Gas Pres.</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>JBFX1-G10-03</td>
<td>420</td>
<td>1/3</td>
<td>1”</td>
<td>1 PSIG Min.</td>
<td>4</td>
</tr>
<tr>
<td>JBFX1-G15-03</td>
<td>640</td>
<td>1/3</td>
<td>1”</td>
<td>Req’d Supply Pressure</td>
<td>4</td>
</tr>
<tr>
<td>JBFX1-G20-05</td>
<td>850</td>
<td>1/2</td>
<td>1”</td>
<td></td>
<td>5.3</td>
</tr>
<tr>
<td>JBFX1-G25-05</td>
<td>1060</td>
<td>1/2</td>
<td>1”</td>
<td></td>
<td>7.6</td>
</tr>
<tr>
<td>JBFX1-G30-07</td>
<td>1280</td>
<td>3/4</td>
<td>1 1/4”</td>
<td></td>
<td>7.6</td>
</tr>
<tr>
<td>JBFX1-G35-07</td>
<td>1490</td>
<td>3/4</td>
<td>1 1/4”</td>
<td></td>
<td>7.6</td>
</tr>
<tr>
<td>JBFX1-G40-07</td>
<td>1700</td>
<td>3/4</td>
<td>1 1/4”</td>
<td></td>
<td>7.6</td>
</tr>
<tr>
<td>JBFX1-G42-10</td>
<td>1790</td>
<td>1</td>
<td>1 1/4”</td>
<td></td>
<td>7.6</td>
</tr>
<tr>
<td>JBFX1-G47-10</td>
<td>2000</td>
<td>1</td>
<td>1 1/2”</td>
<td></td>
<td>7.6</td>
</tr>
<tr>
<td>JBFX2-G50-15</td>
<td>2130</td>
<td>1 1/2</td>
<td>1 1/2”</td>
<td></td>
<td>7.6</td>
</tr>
<tr>
<td>JBFX2-G60-15</td>
<td>2560</td>
<td>1 1/2</td>
<td>1 1/2”</td>
<td></td>
<td>7.6</td>
</tr>
<tr>
<td>JBFX2-G75-20</td>
<td>3200</td>
<td>2</td>
<td>2”</td>
<td></td>
<td>7.6</td>
</tr>
<tr>
<td>JBFX2-G90-30</td>
<td>3840</td>
<td>3</td>
<td>2”</td>
<td></td>
<td>9.5</td>
</tr>
<tr>
<td>JBFX3-G100-50</td>
<td>4260</td>
<td>5</td>
<td>2”</td>
<td></td>
<td>9.5</td>
</tr>
<tr>
<td>JBFX3-G125-50</td>
<td>5330</td>
<td>5</td>
<td>2 1/2”</td>
<td></td>
<td>9.5</td>
</tr>
<tr>
<td>JBFX3-G150-100</td>
<td>6400</td>
<td>10</td>
<td>2 1/2”</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>JBFX3-G200-100</td>
<td>8530</td>
<td>10</td>
<td>3”</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>HDFX5-G250-150</td>
<td>10,500</td>
<td>15</td>
<td>3”</td>
<td>2 PSIG</td>
<td>13</td>
</tr>
<tr>
<td>HDFX5-G400-150</td>
<td>15,000</td>
<td>15</td>
<td>3”</td>
<td>2 PSIG</td>
<td>15</td>
</tr>
<tr>
<td>HDFX7-G500-300</td>
<td>20,900</td>
<td>30</td>
<td>3”</td>
<td>4 PSIG</td>
<td>20</td>
</tr>
</tbody>
</table>

Note: HDFX burners are not currently U.L. listed.

**HDFX Side View**

**HDFX Back View**
Fuels Burned and Control Systems

- Natural Gas, Propane, Digester or Mixed Gases
- Modulating
- Control Circuit Requires 120 vac, 60 Hz, Single Phase Voltage Supply

Model JBFX burners are listed by Underwriters Laboratories, Inc. (UL / ULC) and can be packaged to meet specific requirements of IRI, FM, GE GAP, NFPA, MIL spec. or other special insurance or local code requirements.

Model HDFX burners are not listed by Underwriters Laboratories Inc (UL/ULC) but can be packaged to meet specific requirements of IRI, FM, GE GAP, NFPA, MIL spec. or other special insurance or local code requirements.
B. COMPONENT IDENTIFICATION

This section shows the different common components used in the JB burner line and should be helpful to identify parts described elsewhere in this manual.

Figure B-1
JBFX Burner

Figure B-2
JBFX Burner Side View
Figure B-5
Control Panel

- Terminal Strip
- Control Relays
- Control Transformer
- Transformer Fuses
- Burner Motor Starter
- Flame Safeguard
- On-Off Switch
- Manual Potentiometer
- Rate Control
- Power On Light
- Fuel On Light
- Alarm Silencing Switch (Optional)
- Manual-Auto Selector Switch
- Control Transformer
- Call for Heat Light
- Low Boiler Water Level
  Light (Optional)
- Alarm Buzzer
- Alarm Light
- Power On Light
- Fuel On Light
- Switches
- Relays
- Lights
- Motors
C. INSTALLATION

Prior to installing the burner, the site conditions and utilities need to be evaluated. This section provides some general questions that can help the review process. Inspect the burner for any undetected damage that may have occurred during shipment or by jobsite handling. Special attention should be given to the control panel and protruding parts such as linkages. Check linkages, air louver stops, wiring connections and fasteners for tightness. Also check head to ensure no damage has occurred to the metal fiber surface during shipment.

Verify that all ship loose (or separately shipped) items are on hand. This normally will be gas train components, mounting lugs and insulating rope. Also, front mounting plate with attached combustion head. The burner material list included with the instruction manual serves as a good checklist for this purpose.

1. Is there adequate outside ventilation to supply the needed air for safe combustion as required by your local regulatory agency?
2. If a burner mounting plate is required, is it available and does it meet specifications? (See Section E.)
3. Is 120-60-1 voltage available for the control circuit and is the correct voltage available for the blower motor?
4. Will the burner properly fit the boiler or heater with ample clearance on top, bottom and sides?
5. Will there be adequate gas pressure to assure the specified firing rate?
6. Is there adequate flue provisions to assure SAFE and proper venting of the burner?
7. All manuals should be reviewed and understood and stored in a convenient place.
8. Teflon tape should not be used on any field piping.

9. Rope gaskets should be used between vessel and mounting plate.
10. Gas piping should be flushed (cleaned) prior to use.
11. Check minimum straight lengths for gas pressure regulator and/or sensing line.
12. If multiple vessels connect to a single stack, are they sized and designed to maintain +/- 0.1” draft at the vessel outlet under all operating conditions.
13. Is stack designed to maintain +/- 0.1 at outlet during all operating conditions.
14. Is the burner mounting plate and burner head sealed with rope gasket? (See Figure B-2.)
15. Is there a drop leg in the gas supply to capture foreign material? (See Figure C-1.)
16. Is the piping between the gas train and burner done in a manner that will minimize the pressure drop?
17. Has all of the piping been pressure checked for leaks?
18. Is the combustion chamber of proper size? Metal fiber burners must have at least 5” clearance between metal fiber head and furnace walls or tubes.
19. Inspect head carefully for damage to metal fiber surface prior to installation. If any damage is found, contact Webster before proceeding with installation.
20. Smaller JBFX units are generally shipped as a complete assembly with head, frontplate and burner housing. Larger HDFX burners are shipped with head and refractory assembled as a single unit separate from the main burner housing.
21. Great care must be used when installing the head into the furnace opening. If the metal fiber surface of the head is damaged during installation, that can have adverse effects on the performance of the burner. If damage occurs, contact Webster.
22. Support burner adequately using coupling support points on the burner housing.

WARNING
DO NOT USE TEFILON TAPE OR COMPOUNDS CONTAINING TEFILON. THIS COULD DAMAGE THE VALVES CREATING AN UNSAFE OPERATION
D. SPECIAL INSTRUCTIONS FOR CANADIAN INSTALLATIONS

1. The installation of a burner shall be in accordance with the regulations of the provincial installation requirements, or in their absence, the following shall govern:

   Gas Burners--CGAB149.1 and CGAB149.2

 Authorities having jurisdiction should be consulted before installations are made.

2. All electrical wiring shall be done in accordance with the Canadian Electrical Code, Part I.

3. The installer shall identify (label) the main electrical power disconnect and the manual shut-off valve on the gas supply drop-line to the burner.

4. Gas burning equipment shall be connected to flues having sufficient draft at all times, to assure safe and proper operation of the burner.
E. BURNER MOUNTING CRITERIA

It is of vital importance that the burner be properly mounted to the boiler or appliance being fired. Improper mounting can cause leakage of the hot gases back around the burner head resulting in warpage and deterioration. The following illustrations show the proper way the burner must be installed to validate warranty conditions.

TYPICAL METAL FIBER BURNER REFRACTORY FRONTPLATE

Figure E-1
Refractory Dimension

Figure E-2
Burner Mounting Instruction
The JBFX and HDFX burner can be equipped with a wide range of fuel and operating systems to control the fuel, air, modulation and pilots. This section describes how these systems operate. Burner start-up is expected to be done by service personnel who are qualified in the basics of mechanical know-how. The following illustrations and information are supplied to identify the various fuels, air and ignition devices that have Adjustment Features. All adjustments can be done with common tools normally carried by burner and boiler service personnel.

**NOTE:** Refer to the bulletins included in the manufacturer’s data section of the Burner Instruction Manual for items shown below.

**Gas Systems – Illustrated Gas Trains by Capacity and Code:** The following illustrations show the Webster configuration for UL, FM and IRI as grouped by UL capacity ratings. Refer to the legend below for component part identification. These illustrations are not to be used for field erection and/or system design purposes.

<table>
<thead>
<tr>
<th>UL Capacity Range BTU/Hr.</th>
<th>Operation Mode</th>
<th>Webster Designation</th>
<th>Code</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>To 2,500,000</td>
<td>Modulating</td>
<td>M</td>
<td>X X</td>
<td>722003</td>
</tr>
<tr>
<td>2,500,001 to 5,000,000</td>
<td>Modulating</td>
<td>M</td>
<td>X X</td>
<td>722004</td>
</tr>
<tr>
<td></td>
<td>Modulating</td>
<td>M</td>
<td>X X</td>
<td>722010</td>
</tr>
<tr>
<td>5,000,001 to 12,500,000</td>
<td>Modulating</td>
<td>M</td>
<td>X X</td>
<td>722005</td>
</tr>
<tr>
<td>12,500,001 and Up</td>
<td>Modulating</td>
<td>M</td>
<td>X X</td>
<td>722011</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>722082</td>
</tr>
</tbody>
</table>

**NOTE:** Pressure Drops – Pressure drop through a given gas train will vary somewhat in relation to the individual items used, the specific gravity of the gas to be burned and the overall length.
UL Modulation Gas Piping Diagram - 2,501 to 5,000 MBH Firing Rate

FM Modulation Gas Piping Diagram - 2,501 to 5,000 MBH Firing Rate

UL Modulation Gas Piping Diagram - 5,001 to 12,500 MBH Firing Rate
G. INITIAL SETTINGS

1. The burner will be set at the factory for normal initial settings. These are only rough settings that must be adjusted at startup to match the furnace, fuel pressure and environment of the specific application. These general settings are covered in this chapter as a means of checking the burner (linkage and settings can move in shipment) or readjusting the burner if the settings are lost.

2. Air Proving Switch
The air proving switch has been adjusted at the factory for an initial setting. If the switch trips during initial start-up, first inspect the air sensing line tubing for kinks or burrs on the ends to make sure there are no obstructions. Also check to ensure the tubing connections going to the switch housing are tight, and double check the wiring going to the switch. If the tubing for the air sensing lines looks good and the wiring checks out, turn the adjustment screw CCW two full turns to reduce the trip pressure setting.

3. Air Filter Switch
The air filter switch has been adjusted at the factory for an initial setting. If the switch trips during initial startup, perform the same checks to the tubing & wiring as described for the Air Proving Switch. Also check to make sure there are no obstructions blocking airflow going into the filter element. If the tubing, wiring and filter element looks good, turn the adjusting screw on the switch CW in ¼ turn increments.

If the switch trips during normal burner operation the air filter element should be removed, inspected, cleaned and re-installed on burner. The filter element may be cleaned by using lukewarm water and mild detergent. Blow dry using compressed air from the inside out. Do not attempt to run burner without having the filter element in place as this may damage burner head.

4. Parallel Positioning Servos
JBFX and HDFX burners are equipped with a parallel positioning system (linkageless). The control valves can be positioned and operated using the fuel/air ratio controller. Refer to the burner controller system manual for specific details on how to adjust the servo position and set up fuel and air curves for your specific application. Fuel & Air curves are not put in at the factory unless customers specifically request a full factory firetest. Please be mindful that in the event curves were installed at the factory for the gas and air servos they will almost certainly require adjustment in the field as on site conditions cannot be perfectly duplicated at the factory. Refer to the instruction manual for details.

CAUTION

ACTUATOR MOUNTINGS CAN BE BENT OR MOVED DURING SHIPMENT AND INSTALLATION. THEY MUST BE CHECKED PRIOR TO OPERATION AND ANY FAULTS CORRECTED. FAILURE TO CORRECT A MISALIGNED CONTROL WILL RESULT IN PREMATURE FAILURE.

Metal Fiber burners are premix-type burners which require more excess air than conventional burners. For sub 9ppm NOx levels, this means the O₂ levels in the stack should be between 8-8.5% (about 55-60% excess air).
1. Gas Pilot Assembly
A crucial part of reliable burner operation is a dependable pilot, which must be properly adjusted and kept clean. A gas pilot is standard on all models of JBFX & HDFX burners. The pilot mounting tube is integral to the refractory frontplate. This tube is situated next to the pilot scanner and is angled in slightly toward the centerline of the burner head. The gas pilot assembly is secured to the pilot mounting tube on the refractory frontplate with (4) 10-32 screws. A gasket is used between the pilot & pilot mounting flange for a gas-tight seal.

There are 2 tubing connections to the pilot. A larger 5/8" aluminum tube is used to supply combustion air from the blower housing to the pilot. A smaller 3/8" aluminum tube is used to supply gas to the pilot from the pilot train. A small orifice is provided just inside the gas connection to limit the gas flow into the pilot. Air and gas tubing should have as few bends as possible with generous bend radii and the connection points should be tight and leak-free. Check for leaks at all tubing connection points during burner commissioning.

Pilot ignition is accomplished via a center electrode which travels through the center of the pilot to the end. The square electrode at the end must be kept centered in the pilot tube for proper operation. If the electrode shorts out against the inner wall at the end of the pilot tube, the pilot will not light. Ignition energy is supplied via a high tension lead coming from the ignition transformer.

Pilot gas pressure should be measured at the 1/8" port located on the downstream side of the last pilot solenoid valve.
I. STARTUP AND OPERATING ADJUSTMENTS

1. Pre-start Check List
2. Gas Setup
3. Operating Control Adjustments
4. Limit Tests
5. Pilot Test
6. Burner Shutdown

This section covers the startup and operating adjustments of the Webster Models JBFX and HDFX burners.

WARNING

BURNER STARTUP, COMBUSTION ADJUSTMENTS AND LIMIT CONTROLS ADJUSTMENTS SHOULD ONLY BE PERFORMED BY EXPERIENCED SERVICE TECHNICIANS. ATTEMPTING TO PERFORM THESE FUNCTIONS WITHOUT THE PROPER TRAINING AND EXPERIENCE CAN RESULT IN EQUIPMENT DAMAGE, PERSONAL INJURY OR DEATH.

Before proceeding with the startup and adjustment, be sure that the overall installation is complete. Review the boiler operating and installation manual, as well as all control manuals to verify that all equipment is ready for operation. These manuals must be read and understood prior to starting the equipment.

If you are not qualified to service this equipment, DO NOT TAMPER WITH THE UNIT OR CONTROLS. CALL YOUR SERVICEMAN.

At the conclusion of the startup, document valve and linkage positions, pressures and settings for future reference.

READ AND SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE.

1. Pre-Start Check List

Before starting the burner, a complete review of the installation, wiring and piping of the burner, boiler and all supporting equipment must be complete and all of these items must be ready for operation prior to starting. The following is a general review:

- All wiring is connected. Test pulls on wire show them to be tight.
- All fuel lines are connected and tight.
- Pilot gas is connected.
- Burner is mounted to vessel and floor, with all bolts secured.
- The stack is connected and routed to the outside. Draft controls are installed and operational, if needed.
- Gas vent lines are connected and routed to the outside, if required per code.
- Do not start the unit unless all cleanout doors are in place and secured.
- The vessel is completely installed, filled with water and operating controls checked.
- Support equipment is in place and ready (feed pumps, draft controls, steam/hot water systems, boiler limits and controls and feedwater systems).
- A load must be available for the burner startup and adjustment process. The burner must be operated at high rates for extended periods of time and the load must be capable of using this energy.
- A combustion analyzer with O2, CO (for gas), and NOx must be available to tune combustion. All of these analyzers must be recently calibrated and able to provide accurate readings.
- Other test equipment, including manometers, gauges and volt meter shall be available.
- Manometer or gauge on the gas manifold.
- Manometer or gauge before and after gas pressure regulator.
- Draft gauge or manometer (at stack outlet).
- Draft gauge or manometer for furnace pressure.

2. Gas Setup

a. Place the burner switch in the “OFF” position.
b. Place the “Auto-Manual” switch (if used) in the manual position, for modulation.
c. Place the manual flame control potentiometer in the MIN (low fire) position on modulating units (if used).
d. Close the downstream manual shutoff valve (closest to the burner head) on the gas train.
e. Turn the electrical power on for the burner, boiler and related components.
f. Verify that the gas metering valve is nearly closed, the vent valve (if equipped) is operating and the gas pilot valve is not open (the solenoid will hum and feel warm).
g. Turn the burner switch on. This will start the blower motor and initiate the prepurge cycle.
h. When the prepurge sequence is complete and the low fire start switch (if used) is made, the pilot valve will open and the pilot flame should be visible through the sight port.
i. When the pilot flame is established, the flame safeguard will energize the main gas valve (indicated with the Fuel Valve Light). This operation of the main fuel valves must be visually checked by observing the valve stem operation.
j. After the timer has completed the trial for main flame, the burner will go out on alarm (the closed manual gas valve prevented the burner from lighting). At this time, the gas valves must be visually checked to verify that they have closed. This test sequence proves the proper operation of the primary control.
k. Press the reset button and restart the burner. When the pilot has started, open the manual gas valve to allow the main flame to start.

l. If the burner is not operating as indicated, follow the troubleshooting guide steps to determine the problem and corrections required.

m. After a few seconds, the combustion analyzer should have an accurate reading of the O\textsubscript{2} in the stack. O\textsubscript{2} range should be between 7% - 9.5%. Rough settings for low and mid fire combustion settings are adequate at this time. Once the high fire is set, the other settings can be fine tuned.

n. Operate the burner until the boiler is warmed up, and near the operating pressure or temperature. Increase the firing rate using the manual potentiometer, or use parallel positioning control, while monitoring and adjusting the O\textsubscript{2} level. Adjust the gas pressure regulator as needed to reach the high fire input.

o. Adjust the high fire input to match the maximum input listed on the rating label. At high fire, the gas butterfly valve should be at least 75 degrees open (more if available gas pressure is low), and the gas pressure regulator adjusted to obtain the rating. The input should be measured using the following equation:

Calculating Natural Gas Input

\[
\text{HHV} \times \left[\frac{\text{P}_{\text{atm}} + \text{P}_{\text{gas}}}{29.92}\text{in} \times \left\{\frac{520}{(\text{T}_{\text{gas}} + 460)}\right\} \times \left[\frac{\text{measured ft}^3/\text{sec}}{\text{3600 sec/hr}}\right]\right]
\]

Where:

MBH = 1000's of BTU/M input
HHV = Higher heating value of gas, BTU/cubic feet
P\text{atm} = Atmospheric pressure in inches Hg
P_{\text{gas}} = Gas pressure before gas meter in inches Hg
(\text{inches Hg} = \text{PSIG} \times 2.04)
T_{\text{gas}} = Gas temperature at the flow meter, in degrees F
Measured ft\textsuperscript{3} = Volume of gas measured by meter
Sec = Time for measured ft\textsuperscript{3} to flow through meter

Note: Some gas meters require a 7 inch wc correction to \text{P}_{\text{gas}}. Consult your meter calibration data.

\textbf{NOTE:} The listed manifold pressure is only an approximate value and can vary with operating conditions and normal tolerances. The fuel flow rate must be measured to obtain an accurate input value.

p. Adjust the air damper to obtain the correct O\textsubscript{2} level.

q. Modulate the burner to low fire, adjusting the O\textsubscript{2} level as the burner modulates.

r. Adjust the low fire input, using the air damper adjustments.

s. Readjust the midfire points for the correct O\textsubscript{2} level.

t. Adjust the low gas pressure switch to be 10% below the lowest expected gas pressure.
  - With a gauge or manometer at the same location as the low gas pressure switch, modulate the burner to determine the firing rate with the lowest gas pressure.
  - At the lowest gas pressure, adjust the low gas pressure setting up until the switch breaks and causes the burner to shutdown.
  - From the scale reading of the switch, adjust the setting to a pressure that is 10% lower than the shutdown pressure. For example, if the switch opened at 10 inches as indicated on the low gas pressure switch, the switch should be adjusted to a reading of 9 inches.
  - Remove the gauge or manometer and plug the opening.
  - Cycle the burner on and off to determine if the limit works properly.
  - If the limit causes nuisance shutdowns because of small pressure drops during startup, reduce the pressure setting an additional 5%.

u. Adjust the high gas pressure switch to be 10% above the highest expected gas pressure.
  - With a gauge or manometer at the same location as the high gas pressure switch, modulate the burner to determine the firing rate with the highest gas pressure.
  - At the highest gas pressure, adjust the high gas pressure setting down until the switch opens and causes the burner to shutdown.
  - From the scale reading of the switch, adjust the setting to a pressure that is 10% higher than the shutdown pressure. For example, if the switch opened at 10 inches as indicated on the high gas pressure switch, the switch should be adjusted to a reading of 11 inches.
  - Remove the gauge or manometer and plug the opening.
  - Cycle the burner on and off to determine if the limit works properly.
  - If the limit causes nuisance shutdowns because of small pressure changes during startup, increase the pressure setting an additional 5%.

v. The burner should be operating at low fire to adjust the air proving switch. Turn the adjusting screw cw (in) until the burner trips out (shutdown caused by the air flow switch). Turn the adjustment screw ccw (out) 1 1/2 turns from the point of shutdown. Check the operation at higher rates.

3. Operating Control Adjustments

The operating controls must be adjusted to properly cycle the burner “ON and OFF” and provide modulation. The controls should not force the burner into rapid “ON-OFF” cycles, as this will cause premature failure of the motor and operating equipment. The operating control must be adjusted to provide the “ON” pressure or temperature desired. It must allow the burner to come on and start before the temperature or pressure drops into the modulating range.
The “OFF” pressure or temperature must be sufficiently above the “ON” point to allow a reasonable run time. The modulating control must be adjusted to start modulation at some reasonable point below the “ON” temperature or pressure and provide modulation to high fire at the lowest temperature or pressure.

4. Limit Tests
Once the burner has been started and the operating pressures and temperatures have been set, the limit switches need to be adjusted so that they will trip if the pressure or temperature exceeds the operating value, but will not trip with normal variations. The switch should be checked for proper operation by allowing the temperature or pressure to vary below or above the recommended level to insure that they provide safe shutdown before the burner operation is affected. In high pressure or temperature switches where the temperature or pressure cannot be set high enough to trip the switch, the switch can be checked by lowering the set point to prove that the switch will provide a safe shutdown.

The limit switches would include the air proving switch on the burner. Limits for gas operation could include the high and low gas pressure switches. If in doubt about which limits are on a burner, refer to the wiring diagram that will show each item.

Limit switches need to be checked at regular intervals to ensure they are operating properly. See the maintenance section for details.

5. Pilot Tests
Once the burner as been set for the firing rates intended for the burner, the pilot must be checked for proper operation and safety. The minimum pilot test is done to insure that a pilot which can be seen by the scanner will light the main flame.

a. During a startup sequence, measure the time required to light the main flame after the fuel valves have been energized. This will be used to monitor the test with reduced pilot.
b. Lock the flame safeguard into the pilot position (refer to the manual for the flame safeguard for this setting)
c. Adjust the gas pressure regulator to the pilot for a minimum value while still holding the minimum signal strength for the scanner.
d. Release the flame safeguard from the pilot position. Allow it to cycle though the main flame proving sequence.
e. This reduced pilot must reliably light the main flame. Monitor the time from the main fuel valve opening and do not allow the burner to continue if the time is more than an additional two to three seconds from the initial time measured above.
f. Run through two or three cycles.
g. If this is a combination fuel burner, repeat the test on the other fuel.
h. Failures due to reduced scanner signal are acceptable.

WARNING
THE MINIMUM PILOT TEST REQUIRES CLOSE SUPERVISION OF THE COMBUSTION PROCESS. FAILURE TO CLOSELY MONITOR THE MAIN FLAME TEST TIME COULD RESULT IN DAMAGE, INJURY OR DEATH.

i. If the pilot does not light the main flame under these test conditions, check and adjust the pilot as shown in Sec. H.
j. The infrared detector must be tested for hot refractory pickup. This test is performed to make sure that the scanner does not see hot refractory that could be mistaken for a flame.
k. After the burner has been operating for some time at high input levels and the refractory in the vessel is hot, the burner should be cycled off while monitoring the scanner signal.
l. The flame signal should drop off quickly as the flame goes out and should be well below the minimum level (indicating a flame) at the end of the post purge cycle.
m. The UV detector must be tested for spark pick-up. Turn the burner on, with the pilot shut off, during the ignition cycle the flame signal should be well below the minimum level (indicating a flame).
n. If the flame signal does not drop out as required, check the location of the pilot and scanner, as shown in section “H”. This may also indicate a faulty scanner or amplifier.

6. Burner Shutdown
Normal operation of the burner will allow the operating controls to shut the burner down when the load demand is satisfied. If the burner needs to be shut down for any reason, the “ON-OFF” switch can be used to quickly turn the burner off. This will instantly cause the fuel valves to close and start a post purge cycle to remove any unburned fuel from the vessel.

In an emergency shutdown, all fuel and electrical power should be de-energized or turned off to secure the burner. This would include the main power disconnect and the manual gas shutoff valve at the drop down line.

It is recommended that the burner be manually driven to low fire before turning the burner off, as this reduces the dynamic and thermal stress. If the burner will remain off for some time, the manual fuel valves and power supply should be turned off.

CAUTION
ALWAYS KEEP THE FUEL SUPPLY VALVE SHUT OFF WHEN THE BURNER IS SHUT DOWN FOR AN EXTENDED PERIOD OF TIME.

CAUTION
DO NOT START THE BURNER UNLESS ALL CLEANOUT DOORS ARE SECURED IN PLACE.
### J. TROUBLESHOOTING

<table>
<thead>
<tr>
<th>No.</th>
<th>System</th>
<th>Cause</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Ignition</td>
<td>Electrode is grounded. Porcelain is cracked.</td>
<td>Replace</td>
</tr>
<tr>
<td></td>
<td>(lack of spark)</td>
<td>Improperly positioned electrode</td>
<td>Recheck dimensions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loose ignition wire connection</td>
<td>Reconnect or tighten</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Defective ignition transformer</td>
<td>Check transformer, replace</td>
</tr>
<tr>
<td>2</td>
<td>No Ignition</td>
<td>Lack of fuel, no gas pressure, closed fuel valve</td>
<td>Check fuel supply and valves</td>
</tr>
<tr>
<td></td>
<td>(spark, no flame)</td>
<td>No voltage to pilot solenoid</td>
<td>Check electrical connections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Defective pilot solenoid valve</td>
<td>Replace</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improper raw gas tube position</td>
<td>Check location of raw gas tube</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improperly positioned electrodes</td>
<td>Recheck dimensions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Too much combustion air flow</td>
<td>Check air damper position</td>
</tr>
<tr>
<td>3</td>
<td>Pilot not detected</td>
<td>Scanner tube not positioned correctly</td>
<td>Check location of scanner tube</td>
</tr>
<tr>
<td></td>
<td>(flame present)</td>
<td>Scanner tube dirty or wet</td>
<td>Clean scanner tube / scanner</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scanner or amplifier faulty</td>
<td>Replace</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Incorrect gas pressure to pilot</td>
<td>Readjust pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Combustion air flow rate too high</td>
<td>Readjust damper</td>
</tr>
<tr>
<td>4</td>
<td>No main gas flame</td>
<td>Weak scanner signal</td>
<td>Clean scanner lens and tube</td>
</tr>
<tr>
<td></td>
<td>(pilot OK)</td>
<td>Damper or fuel control valve setting incorrect</td>
<td>Readjust</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fuel valve(s) not opening</td>
<td>Check wiring to valves</td>
</tr>
<tr>
<td>5</td>
<td>Burner stays at low fire</td>
<td>Manual pot in low fire position (low fire hold)</td>
<td>Readjust to high fire position</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Manual-auto switch in wrong position</td>
<td>Change position of switch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modulating Control</td>
<td>Check wiring or replace</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Binding or valve</td>
<td>Readjust or replace</td>
</tr>
<tr>
<td>6</td>
<td>Burner shuts down</td>
<td>Loose electrical connection</td>
<td>Check and tighten connections</td>
</tr>
<tr>
<td></td>
<td>during operation</td>
<td>Loss of fuel supply</td>
<td>Replenish fuel supply</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Limit switch breaks (opens)</td>
<td>Readjust limit switch</td>
</tr>
<tr>
<td>7</td>
<td>Burner does not start</td>
<td>Main disconnect switch is open</td>
<td>Close switch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loose electrical connection</td>
<td>Check electrical connections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operating controls are tripped</td>
<td>Check and reset operating limits</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High or low fuel pressure</td>
<td>Check fuel supply - reset switches</td>
</tr>
<tr>
<td>8</td>
<td>High CO at low fire</td>
<td>Improper excess air level</td>
<td>Readjust excess air</td>
</tr>
<tr>
<td></td>
<td>(firing gas)</td>
<td>Input too low for burner components</td>
<td>Check input, compare to rating label</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High stack draft (especially at low fire)</td>
<td>Stabilize draft</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fluxuating gas pressure (regulator not holding pressure)</td>
<td>Check regulator pressure, sensing line and supply pressure: sized properly</td>
</tr>
<tr>
<td>No.</td>
<td>System</td>
<td>Cause</td>
<td>Correction</td>
</tr>
<tr>
<td>-----</td>
<td>--------</td>
<td>-------</td>
<td>------------</td>
</tr>
<tr>
<td>9</td>
<td>Gas combustion noise (rumbling)</td>
<td>Input too low for burner components</td>
<td>Check input, compare to rating label</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improper excess air</td>
<td>Readjust excess air</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fluxuating gas pressure (regulator not holding pressure)</td>
<td>Check regulator pressure and supply</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High stack draft (especially at low fire)</td>
<td>Stabilize draft</td>
</tr>
<tr>
<td>10</td>
<td>Fuel-Air-Ratios are not consistent</td>
<td>Fuel lines plugged</td>
<td>Check and clean lines, strainers &amp; filters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fuel supply pressure changing</td>
<td>Check and/or replace pressure regulator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Combustion air temperature changed</td>
<td>Retune burner</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Draft condition changed</td>
<td>Check draft and outlet damper</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gas control valve - low fire stop not set (if used)</td>
<td>Adjust low-fire stop</td>
</tr>
<tr>
<td>11</td>
<td>Fuel-Air-Ratios have changed over time</td>
<td>Air damper seal worn</td>
<td>Replace air damper seals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fuel lines plugged</td>
<td>Check and clean lines, strainers &amp; filters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fuel control valve worn</td>
<td>Replace fuel control valve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Combustion air temperature changed</td>
<td>Retune burner</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Draft condition changed</td>
<td>Check draft and outlet damper</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vessel plugged</td>
<td>Clean vessel</td>
</tr>
<tr>
<td>12</td>
<td>Cannot obtain capacity on gas</td>
<td>Wrong spring range in regulator</td>
<td>Install higher spring range</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Too many elbows before control valve</td>
<td>Rework piping to reduce elbows</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gas line too small, high pressure drop</td>
<td>Use larger pipe size</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supply pressure lower then stated</td>
<td>Increase supply pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supply pressure drops too low at high fire</td>
<td>Use larger gas line sizes/orifice in service regulator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Regulator too small for flow and pressure</td>
<td>Change regulator</td>
</tr>
<tr>
<td>13</td>
<td>Cannot obtain NOx levels on gas</td>
<td>Insufficient excess air</td>
<td>Add more excess air</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Excessive turndown</td>
<td>3:1 max TD on MFB</td>
</tr>
<tr>
<td>14</td>
<td>Lazy/non-retaining flame</td>
<td>Too lean or too rich</td>
<td>Adjust O₂ level to recommended level</td>
</tr>
</tbody>
</table>
K. GENERAL MAINTENANCE AND CARE

1. General
This burner has been designed to provide many years of trouble free operation. The reliability can be greatly improved with some simple inspection and maintenance programs.

One of the best tools for a good maintenance program is to keep a log on the key parameters of the burner and boiler. These would include operating temperatures, pressures, inspections and preventative maintenance activities. This document can be used to detect any changes in the operating characteristics of the burner, which can be used for preventative maintenance.

The maintenance schedule can be used to help generate this log. There are also many other good references that can be used to help develop your log. Adding check points for other equipment into a common log can help. It is common to integrate the boiler and burner log, so that all components are checked at the same time.

The frequency of inspection given in the following charts is only a guideline. Initial results should be used to adjust the time intervals to be more frequent when problems or potential problems are observed.

2. Physical Inspection
Listening and looking at the burner can detect many problems. For example, leakage can usually be seen early with a small buildup of oil. Valve and linkage problems can usually be detected early on by simply watching the movement and detecting rough uneven changes. The jackshaft, linkage and valve movement should occur smoothly with no rough jerks.

The flame condition can often be a good indicator of the firing head. If the flame does not look correct, there may be a problem with the hardware. The firing head is exposed to the high temperatures of combustion and can have reduced life due to the thermal stress. In particular, the diffuser, gas orifices, gas manifold, refractory and burner mounting plate should all be inspected.

3. Fuel-Air-Ratio Controls
The fuel-air-ratio controls must be maintained in good operating condition. Over time, these items will wear and may not operate smoothly. Corrective action must be taken. Check mechanical couplings between servo & valve for tightness. There should be no slip in them.

Some louver boxes also utilize linkage to operate all the blades in unison. Check these linkage points for wear and correct as required.

There are several different types of controls and the corrective action of each could be different. Refer to the control manufacturer’s literature.

4. Gas Fuel System
The safety interlocks must be checked at regular intervals to ensure that they provide the proper safety. See the Inspection and Maintenance Schedule Chart (Figure 8) for frequencies.

The drip leg should be cleaned annually.

Monitoring the outlet gas pressure from the regulator will verify this control is working properly.

Other checks:
   a. The condensation traps must work properly and be installed to capture all of the condensation. If condensation passes through to the burner windbox, a condensate drain should be added to the bottom of the windbox.
   b. Valve movement must operate freely and smoothly.
   c. NOx emission levels.
   d. Other general items like the refractory.
   e. Stack temperature of boiler - high temperatures will increase NOx levels.
   f. Operation of safety equipment.
   g. Check safety limits, including pressure and temperature switches

7. Combustion Air Fan
If the fan and motor are ever removed, the following should be observed in re-assembly.
   a. There should be about 1/16” overlap of inlet cone and fan.
   b. Never re-use the fan to motor shaft set screws, always use new screws of the same type and style to maintain balance and fan retention.
   c. When tightening the fan hub set screws, rotate the fan to place the screws on the bottom. This way the screw is not lifting the fan.
   d. The motor shaft and fan hub must be clean and free of burrs.

As a minimum, the following replacement parts should be stocked to support uninterrupted burner operation.
   • Pilot Electrode
   • Blower Wheel
   • Pilot Ignition Transformer
   • Gas Pilot Solenoid Valve
   • Flame Scanner
Items with greater life expectancy and/or greater dollar value, such as flame safety controls, main gas valves and blower motors should be obtained from your local Webster representative when a need arises.

An illustrated parts drawing is included within the Burner Instructions Manual to aid in parts identification. The noun name of the part needed should be established from the drawing, then the part number can be obtained from the burner material list contained in the Burner Instructions and Service Manual.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Component / Item</th>
<th>Recommended Action or Test</th>
<th>Performed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>Burner Flame</td>
<td>Visual inspection of burner flame.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Air Damper</td>
<td>Visual inspection for smooth and free travel.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Fuel Metering Valves</td>
<td>Visual inspection for smooth and free travel.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Draft Controls (Stack)</td>
<td>Visual inspection for smooth and free travel.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Gas Fuel Pressure</td>
<td>Record in log book, compare trends.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Pilot</td>
<td>Visually inspect pilot flame, check and record flame signal strength if metered.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Flame SafeGuard - Pilot Test</td>
<td>Close manual fuel valve on pilot during cycle and check for safety shutdown, recording time.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Flame SafeGuard - Main Flame</td>
<td>Close manual fuel valve on pilot during cycle and check for safety shutdown, recording time.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Flame SafeGuard</td>
<td>Check flame safeguard components, including scanner.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Pilot Turndown Test</td>
<td>Conduct pilot turndown test annually or after any component change.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Hot Refractory Test</td>
<td>Conduct hot refractory hold in test. This test is required annually or after any component change.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Interlock Controls</td>
<td>Check other interlocks that may be used on the burner for smooth operation and correct action.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Firing Rate Control</td>
<td>Check firing rate control and verify settings.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Combustion Tuning</td>
<td>Conduct a combustion test, verify setting and NOx emission levels.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Pilot and Main Fuel Valves</td>
<td>Make visual and manual check for proper sequencing of valves.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Pilot and Main Fuel Valves</td>
<td>Check all coils, diaphragms, interlock switch &amp; other parts of all safety shutoff valves.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Pilot and Main Fuel Valves</td>
<td>Perform leak tests on all safety shutdown control valves.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Low Air Pressure Switch</td>
<td>Test low air pressure switch for proper operation and adjustment.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Air Filter Switch</td>
<td>Test air filter switch for proper operation and adjustment.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Air Filter</td>
<td>Inspect &amp; clean air filter. May require greater frequency depending on operating environment</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Mod Damper Switch</td>
<td>Check damper low fire proving switch per manufacturers instructions.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Combustion Air Fan</td>
<td>Clean combustion air fan and housing.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Burner Components</td>
<td>Visually check the burner components for signs of cracks, deformation, slip-page or other unusual indication</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Burner Mounting</td>
<td>Check burner mounting clamps and brackets for tightness.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Refractory and Seals</td>
<td>Check burner refractory for cracks or signs of leakage.</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>Metal Fiber Head</td>
<td>Visually inspect during periodic boiler maintenance</td>
<td>X</td>
</tr>
</tbody>
</table>

**NOTE:** Always give Webster Engineering Serial Number and/or UL Serial Number when ordering parts.
L. CARE OF THE BURNER DURING EXTENDED SHUTDOWN

Heating equipment is often located in an environment conducive to corrosion and general deterioration if not properly protected and periodically checked, especially during an extended period of shut down. The following procedures should be followed if the burner is going to be placed out of service even for a short period of time.

1. Turn the main manual fuel valve OFF.

   **CAUTION**
   Always keep the main fuel valve(s) **OFF** if the burner is shut down for an extended period of time.

2. Turn off the main electrical disconnect to the burner OFF. Follow tagout / lockout procedures.

3. Place a notification tag or label at the main manual fuel valve giving reason for shutdown. Follow tagout/lockout procedures.
4. If the burner is in an area subject to sweating and condensation, cover the control cabinet and electrical devices with plastic and secure with twine or tape.
5. Should the burner be out of service for more than thirty (30) days, a complete operational safety check must be made at the time of restart. The restart must be treated as a new burner start-up (see burner start-up section in this manual).

M. REPLACEMENT PARTS

N. WARRANTY VALIDATION & FIELD START-UP REPORT

As a final step, forward the top copy of the Warranty Validation and Field Startup Report, Form 113, to:
Webster Combustion Technology, LLC, 619 Industrial Road, Winfield, KS 67156.

WEBSTER Series JBFX and HDFX burners are listed by Underwriters Laboratories, Inc. (U.L.). Also by the State of Massachusetts Fire Marshall, City of New York Board of Standards and Appeals, State of Minnesota, and can be packaged to meet specific requirements of CSD-1, GE GAP, IRI, FM, NFPA, MIL or other special insurance or local code requirements.
WARRANTY VALIDATION FIELD START-UP REPORT

CUSTOMER: ___________________________________     W.O. _______________

BURNER MODEL: ____________________________  BOILER MODEL: ________________________________

CONTROL CIRCUIT COMPONENT OPERATIONAL TESTING (Check if Okay)

<table>
<thead>
<tr>
<th>Primary LWCO</th>
<th>High Limit</th>
<th>Firing Rate Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary LWCO</td>
<td>Operational Control</td>
<td>Low Fire Start Switch</td>
</tr>
<tr>
<td>High Gas Press. Switch</td>
<td>High Fire Purge Switch</td>
<td></td>
</tr>
<tr>
<td>Low Gas Press. Switch</td>
<td>Air Flow Switch</td>
<td>Other</td>
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</tbody>
</table>

FIELD COMBUSTION SETTINGS

<table>
<thead>
<tr>
<th>Firing Rate</th>
<th>CO₂</th>
<th>O₂</th>
<th>CO (ppm)</th>
<th>NOx (ppm)</th>
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</thead>
<tbody>
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Combustion Efficiency

Running Motor Amps & Volts  L1  L2  L3

Comments:

Having read the Manufacturer’s service manual as to the proper installation, start-up and service of the unit above, I verify that the burner has been put into operation as specified, and that the above information and checks are complete and correct.

START-UP BY ______________________________________________  Date _________________________

Company ___________________________________________  Phone No. ___________________________________

Address ___________________________________________________________________________________

NOTE: Warranty Validation - Field Start-up report must be completed, signed, dated and the top copy sent to Webster Engineering & Manufacturing Co., Winfield, KS 67156, to validate equipment warranty.