TECHNICAL INSTRUCTIONS

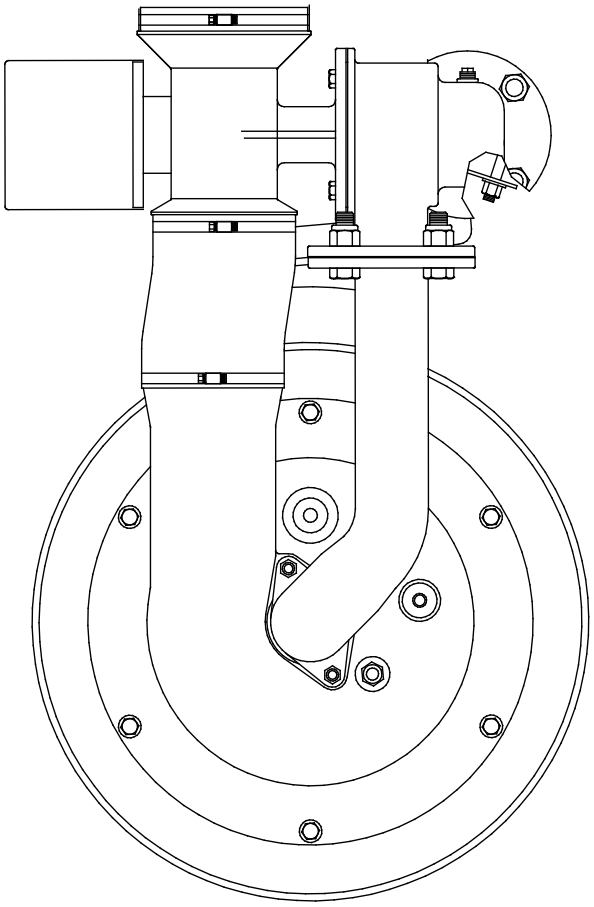
24-Month Maintenance Kit P/N 58015-02

For BMK2.0 (Nozzle Mix)

Description of Document:

This TID provides the procedures to perform recommended 24-Month maintenance on the following Benchmark Low NOx Boiler Models:

- Benchmark 2.0 (Nozzle Mix)



BMK 2.0 (Nozzle Mix)
Burner Assembly

Latest Update: 07/25/2014

Disclaimer

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Technical Support:
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1. INTRODUCTION

This Technical Instruction Document (TID) provides the procedures to perform waterside and fireside inspections of the heat exchanger contained in Benchmark 2.0 boilers equipped with a Nozzle Mix burner.

The replacement parts required to perform the waterside and fireside inspections on the Benchmark 2.0 (Nozzle Mix) Boilers are provided in the 24-Month Maintenance Kit (P/N 58015-02) listed and described in section 2.

2. CONTENTS OF 24-MONTH MAINTENANCE KIT (P/N 58015-02)

The items included in the 24-Month Maintenance Kit are listed in Table 1.

Table 1: Benchmark 2.0 (Nozzle Mix) 24-Month Maintenance Kit, P/N 58015-02

ITEM	QTY	PART NO.	DESCRIPTION
1	1	GP-122435-S	SPARK IGNITER
2	1	123970	FLAME DETECTOR
3	1	123612	EXHAUST MANIFOLD SEAL
4	1	161432	BURNER GASKETS
5	1	161433	BERNER RELEASE GASKET
6	1	84017	CONDENSATE TRAP O-RING
7	1	81092	CONDENSATE TRAP ORIFICE GASKET (.25" I.D.)
8	1	123545	AIR FUEL VALVE O-RING
9	1	69126	LWCO/CAPACTIOR ASSEMBLY

3. TOOLS, TEST EQUIPMENT AND MATERIALS REQUIRED

The items required to perform the inspections, replacements and tests specified in these instructions are listed in paragraph 3.1, 3.2 and 3.3 which follow.

3.1 Tools

Common hand tools, plus the items listed below are required:

- Igniter Removal Tool
- Small Wire Brush
- Flashlight
- Spark Gap Feeler Gauge

3.2 Test Equipment

No test equipment is required to perform the 24-month inspections and maintenance included in these instructions. However, following completion of these inspections, the Benchmark Boiler should be tested using the combustion calibration procedures provided in O & M Manual GF-110 or GF-110T (Texas only).

3.3 Materials

Expendable materials required to perform the procedures described in this bulletin are not included in the 24-Month Inspection Kits. These materials may include such items as:

- Pipe joint compound
- Teflon tape
- Cleaning solvents and materials
- Anti-Seize Compound (EZ-Lock or equivalent)

4. PRELIMINARY INSPECTION PROCEDURES

The detailed procedures required to perform the waterside and fireside inspections included in these instructions are provided in sections 5 and 6. However, prior to performing the procedures in section 5 and 6, perform the preliminary safety, set-up and disassembly procedures described in the following steps:

WARNING!
FAILURE TO FOLLOW SAFETY INSTRUCTIONS REGARDING PREPARATION OF THE UNIT, AS DESCRIBED BELOW, MAY RESULT IN INJURY, DEATH, OR DAMAGE TO EQUIPMENT.

1. At the front panel of the unit, set the **ON/OFF** switch on the C-More Control Panel to the **OFF** position.
2. Disconnect electrical power to the unit by turning off the external circuit breaker.
3. Turn off the external gas supply shutoff valve.
4. Close the water supply and return valves to the unit.
5. Refer to Figure 1 and remove the top and side panels of the unit.
6. With the top and side panels removed, the Benchmark 2.0 Burner, heat exchanger and Exhaust Manifold can be accessed to prepare the boiler for the required waterside and fireside inspections described in sections 5 and 6.

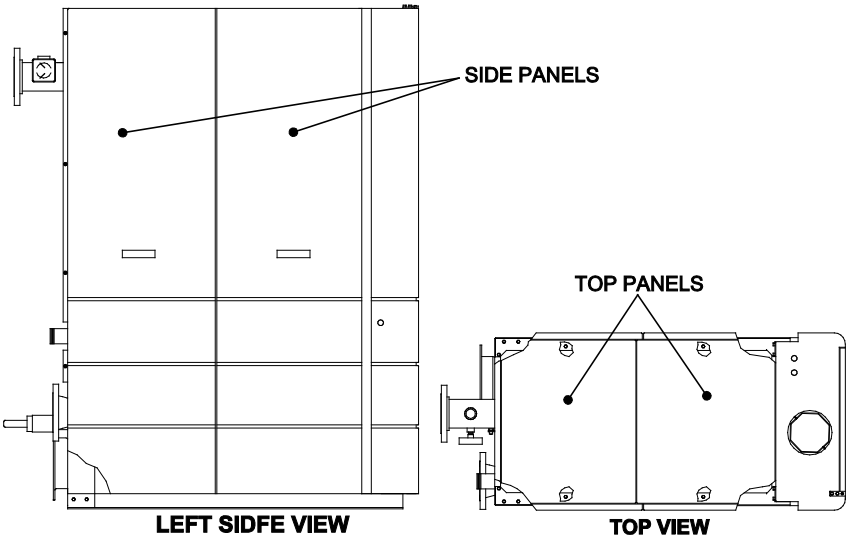

Figure 1: Benchmark 2.0 (Nozzle Mix) Boiler Cover Locations

5. WATERSIDE INSPECTION OF THE HEAT EXCHANGER

Benchmark 2.0 (Nozzle Mix) models contain a heat exchanger as shown in Figure 2. Perform the waterside inspection as follows:

Burner Preliminary Disassembly and Inspection Instructions

1. Ensure that the preliminary safety, set-up, and disassembly procedures in section 4 have been performed to provide access to the heat exchanger of the unit.
2. Allow the unit to cool prior to proceeding.
3. At the rear of the unit (Figure 3), slowly open the drain valve and drain the boiler water from the heat exchanger.
4. Open the P&T relief valve (Figure 4) on top of the hot water outlet, at the rear of the boiler, to allow air to enter the heat exchanger during draining.
5. After the heat exchanger has been drained, remove the 2-1/2 inch access port plug on the right side of the heat exchanger as shown in Figure 2.
6. If waterside inspection is required by your local inspector, follow the inspector's instructions. Upon satisfactory completion of the inspection, proceed to step 7.
7. Apply pipe compound to the threads of the access port plugs and replace them using a pipe wrench.
8. Close the drain valve at the rear of the boiler.
9. Close the P&T relief valve.
10. Open the water supply and return valves to the unit and refill the heat exchanger. This completes the waterside inspection for the unit.

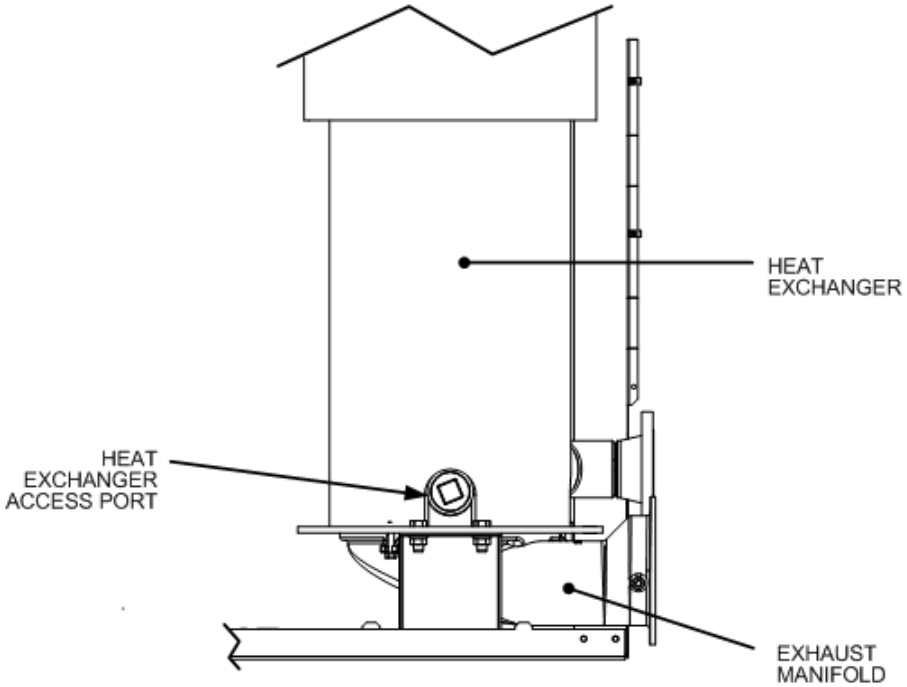

Figure 2: BMK 2.0 (Nozzle Mix) - (Partial Right Side Views)

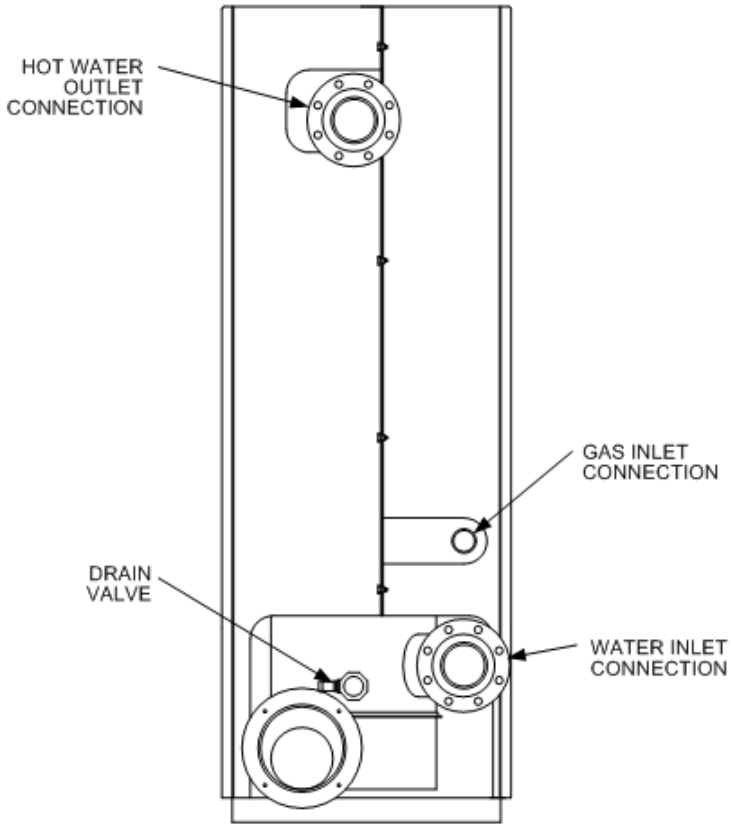

Figure 3: Benchmark 2.0 (Nozzle Mix) - (Rear View)

6. FIRESIDE INSPECTIONS & COMPONENT REPLACEMENT

The heat exchanger fireside inspection includes removal of the Burner and recommended replacement of Burner components and inspection of the Exhaust Manifold assembly and replacement of Condensate Trap components. The 24-Month Maintenance Kit includes the recommended replacement parts for annual maintenance, which should also be performed at this time. Therefore, the procedures in this section are organized as follows:

Burner Maintenance:

- Burner Disassembly and Inspection
- Burner Reassembly
- Burner Component Replacement

Exhaust Manifold & Condensate Trap Maintenance:

- Exhaust Manifold Disassembly and Inspection
- Exhaust Manifold Reassembly
- Condensate Trap Component Replacement

The procedures for the listed maintenance actions are provided in the following paragraphs.

6.1 Burner Maintenance

Perform the fireside inspections of the low NOx Burner and replacement of Burner component parts using the procedures in the following paragraphs, 6.1.1 and 6.1.2.

6.1.1 Burner Disassembly and Inspection

The Burner Assembly is located at the top of the heat exchanger as shown in Figure 4. Figure 4 shows the Burner Assembly mounting details looking down onto the top of the boiler.

Remove and inspect the Burner Assembly as follows:

Burner Disassembly and Inspection Instructions

1. Ensure that the preliminary set-up and disassembly procedures in section 4 have been completed.

WARNING

THE BURNER ASSEMBLY MAY BE EXTREMELY HOT. TO AVOID BURNS, ALLOW IT TO COOL SUFFICIENTLY BEFORE ATTEMPTING TO REMOVE IT FOR INSPECTION.

2. Disconnect the lead wire from the Flame Detector (Figure 6).
3. Disconnect the igniter cable from the igniter contactor (Figure 6).
4. Disconnect the combustion air hose from the burner by loosening the hose clamp shown in Figures 4 and 6.

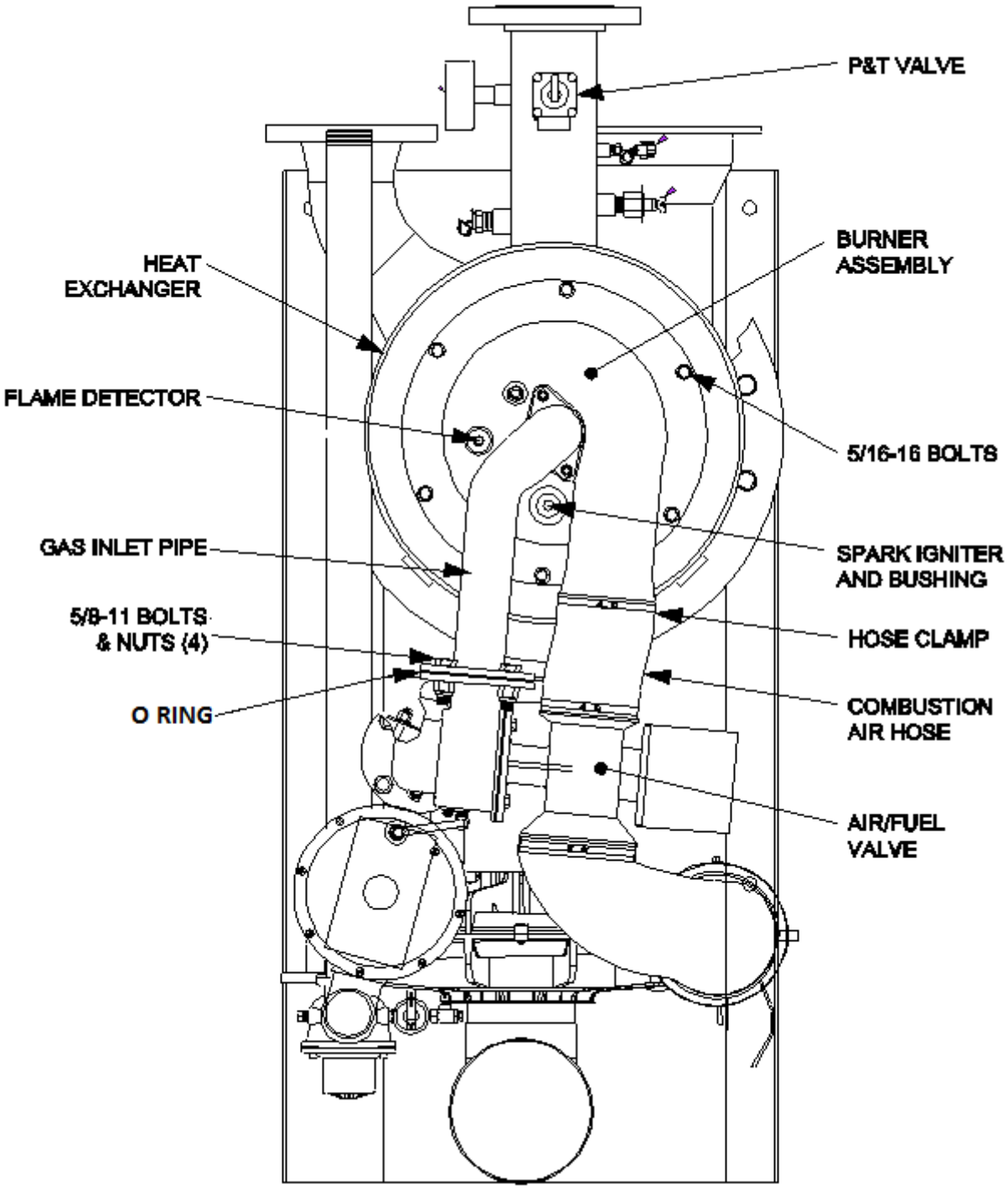

Figure 4: Benchmark 2.0 (Nozzle Mix) - Top View

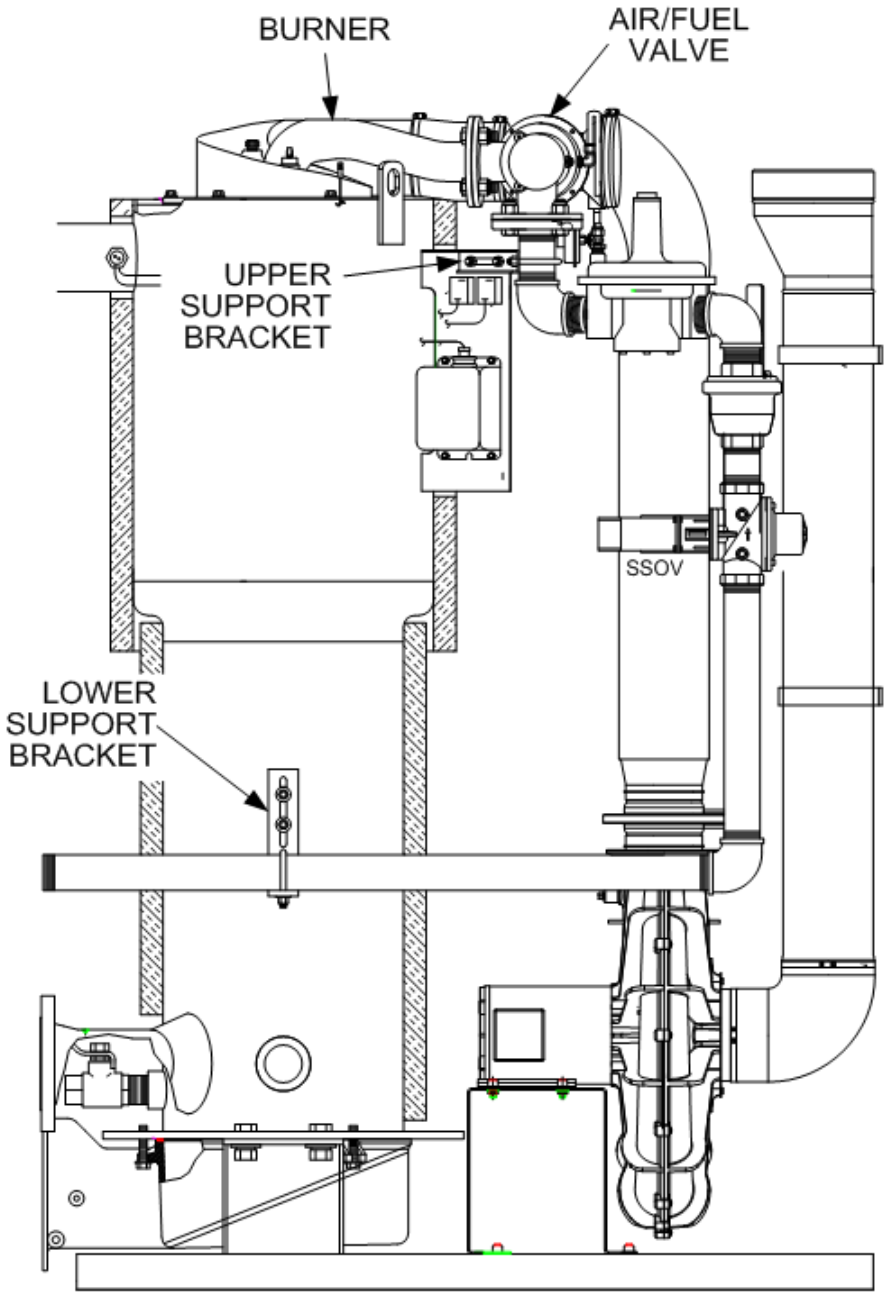

Figure 5: BMK2.0 (Nozzle Mix) Gas Train Support Bracket Locations

5. Remove the four (4) 5/8-11 nuts and bolts from the gas outlet side of the Air/Fuel Valve (Figure 6), and remove the Air/Fuel Valve O-ring from the junction. DO NOT remove the gas inlet pipe from the burner assembly.
6. Remove the six (6) 5/16-16 bolts from the burner flange (Figure 6).

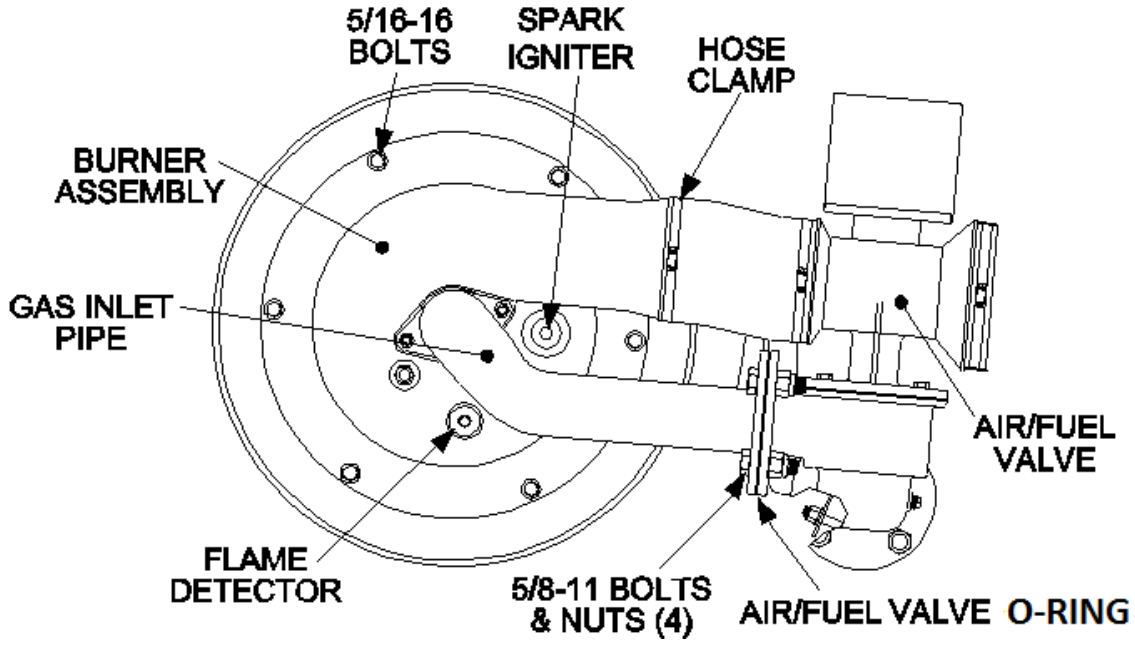

Figure 6: Partial Top View Showing Flame Detector, Spark Igniter, and Other Details on the Burner Assembly

NOTE

The Burner Plate is heavy, weighing approximately 20 pounds.

7. Remove the burner assembly from the burner flange by lifting it straight up.
8. Inspect the removed Burner for damage, warping or discoloration. If the Burner is damaged, especially in the Observation Port or Staged Ignition Assembly area of the flange, it must be replaced with a new assembly. Inspect the Burner Mesh with a flashlight inside for evidence of clogging or sagging.
9. Inspect lower Burner Gasket for leak paths, gouges, or damage. An undamaged lower gasket may be left in place without causing any adverse issues.

IMPORTANT!

Follow appropriate local and state regulations as pertains to inspection of critical boiler parts.

During inspection, if the Burner and/or mesh appear damaged, contact AERCO technical support for information regarding Burner replacement. If undamaged, proceed to section 6.1.2.

6.1.2 Burner Reassembly

Before Burner components may be replaced, the Burner must be reassembled as follows:

Burner Reassembly Instructions

1. Following burner inspection, remove and replace the burner release gasket (P/N 161433) and burner gasket (P/N 161432) provided in the kit.
2. Prior to reinstalling the burner assembly, place the new Air/Fuel Valve O-ring (P/N 123545) in the groove on the gas outlet flange of the Air/Fuel Valve and ensure it is properly positioned.

3. Replace the burner assembly and align it with the tapped holes in the burner flange. Apply anti-seize compound to the threads before securing the burner to the flange using the six 5/16-16 bolts. DO NOT fully tighten these bolts at this time.

WARNING

Use only an anti-seizing compound on the burner threaded studs. Do NOT use Loctite, or equivalent, as the threaded studs might seize on removal and damage the pem-nuts that secure them to the burner flange.

CAUTION

It is imperative that the gas inlet pipe on the burner assembly (Figure 6) be properly aligned with the four bolt holes on the gas outlet flange of the Air/Fuel Valve. Failure to observe this precaution may cause physical damage to the gas inlet pipe resulting in cracks and/or gas leaks.

4. While observing the above CAUTION, ensure that the gas inlet pipe is properly aligned with the four bolt holes on the gas outlet flange of the Air/Fuel Valve. When properly aligned, the four 5/8-11 bolts can be easily inserted in the bolt holes. If gas train realignment is required, loosen the support brackets/U-bolts at the upper and lower portions of the gas train as shown in Figure 5.
5. After the gas train is properly aligned, tighten and secure the upper and lower support brackets/U-bolts.
6. Secure the gas inlet pipe to the gas outlet flange of the Air/Fuel Valve using the four 5/8-11 bolts and hex nuts. Tighten each bolt in an alternating pattern to ensure a uniform seal between the outlet flange and Air/Fuel Valve. Fully tighten.
7. Next, fully tighten the six 5/16-16 bolts previously installed in step 3. Tighten each bolt in an alternating pattern to ensure a uniform seal.
8. Reconnect and secure the combustion air hose to the burner assembly by tightening the hose clamp (Figure 5).
9. Next, refer to paragraph 6.1.3 and replace the igniter and flame detector using the items provided in the kit.

NOTE

So far, the following items have been replaced from the kit: burner release Gasket (P/N 161433) burner gasket (P/N 161432) and O ring (P/N 123545). Next, the following components will need to be replaced:

- Spark Igniter (P/N GP-122435-S)
- Flame detector (P/N 123970)

6.1.3 Burner Component Replacement

The following instructions show how to replace the Flame Detector and Spark Igniter.

6.1.3.1 Spark Igniter Replacement

The Spark Igniter (P/N GP-122435-S) replacement is accomplished as follows:

Spark Igniter Replacement Instructions

CAUTION!

Igniter MUST be removed and installed using the igniter removal tool provided with the unit(s). Damage to burner from using a socket for igniter maintenance is not covered under warranty.

1. With the igniter cable already disconnected from the igniter, pull out the igniter bushing from the burner shell (Figure 7).
2. Insert the igniter removal tool into the burner shell, where the igniter bushing was removed. Fit the hexagonal end of the tool over the igniter (Figure 8).
3. Unscrew the igniter from the burner head. Remove the igniter from the burner shell, by grasping the contact end of the igniter.
4. Using a spark gap feeler gauge, check to ensure that the spark igniter is gapped at 1/8".
5. Prior to installation, a high-temperature anti-seize compound must be applied to the to the igniter threads.
6. Refer to Figure 8 and reinstall the igniter in the location shown. Do not over-tighten. A slight snugging up is sufficient.
7. Reconnect the spark igniter cable.

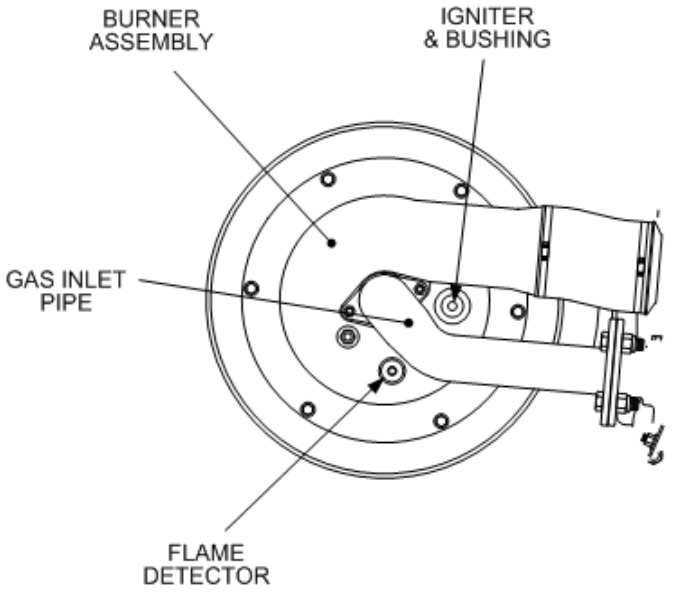

Figure 7: Benchmark 2.0 (Nozzle Mix) Igniter and Flame Detector Locations

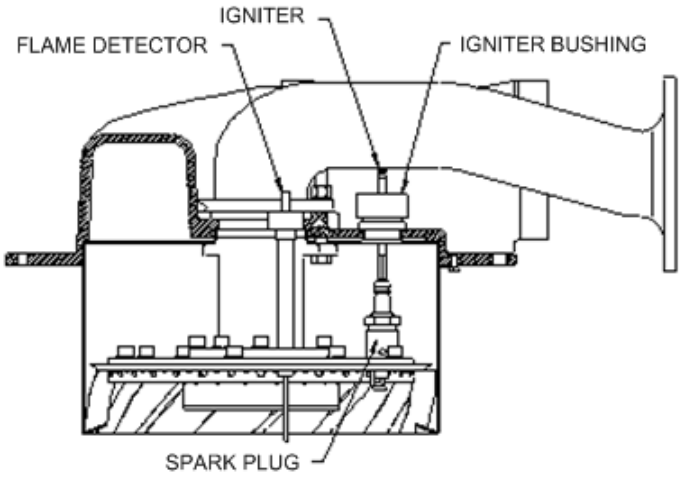

Figure 8: Benchmark 2.0 (Nozzle Mix) Burner Assembly Cutaway View

6.1.3.2 Flame Detector Replacement

Flame detector (P/N 123970) replacement is accomplished as follows:

Flame Detector Replacement Instructions

1. With the flame detector lead wire already disconnected, unscrew the flame detector and remove it. (see Figures 7 and 8)
2. Inspect the detector thoroughly. If eroded, the detector should be replaced. Otherwise clean the detector with a fine emery cloth.
3. Verify that the active length of the flame detector ceramic insulator is set to 6-1/16 inches (see Figure 9. If necessary, loosen the compression fitting and adjust the active length to this dimension.
4. Reinstall the flame detector and flame detector gasket, if removed. Hand tighten only.
5. Reconnect the flame detector lead wire.

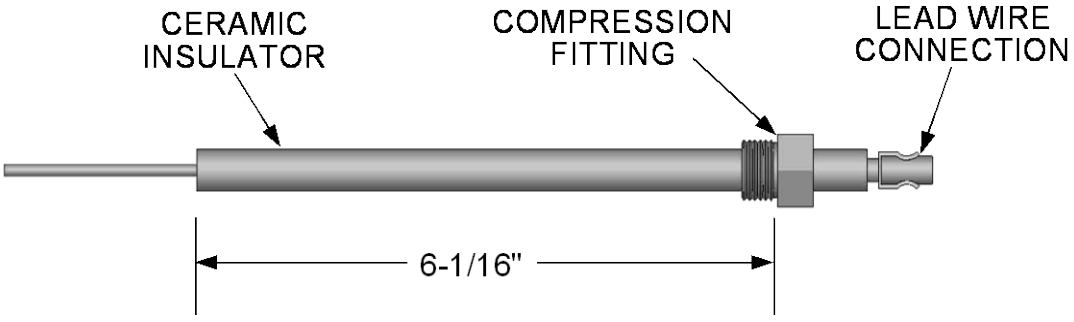

Figure 9: Benchmark 2.0 (Nozzle Mix) Flame Detector

After Flame Detector/Spark Igniter replacement, proceed to section 6.2.

6.2 Exhaust Manifold and Condensate Trap Maintenance

The Exhaust Manifold (Figure 10) must be inspected and cleaned, and the Condensate Trap (Figure 12, P/N 24060) must be inspected, cleaned, and some parts replaced from the kit.

6.2.1 Exhaust Manifold Disassembly and Inspection

To remove and inspect the Exhaust Manifold:

Exhaust Manifold Disassembly and Inspection Instructions

1. Disconnect the flue starter section from the exhaust manifold.
2. Disconnect the condensate trap from the 1/2" NPT port on the side of the manifold.
3. Using a 3/4" socket wrench, remove the three bolts securing the exhaust manifold to the heat exchanger (Figure 10).
4. Remove the exhaust manifold and seal from the rear of the unit.
5. Remove the silicone rubber seal from the recess in the flange of the exhaust manifold. Ensure that all seal residue is removed from the flanges of the exhaust manifold and heat exchanger.
6. Inspect and clean the exhaust manifold as necessary.
7. Replace the exhaust manifold seal (P/N 123612) with the new seal provided in the 24-month maintenance kit. Install the adhesive-backed seal in the recess of the exhaust manifold flange (adhesive side down) (Figure 11).

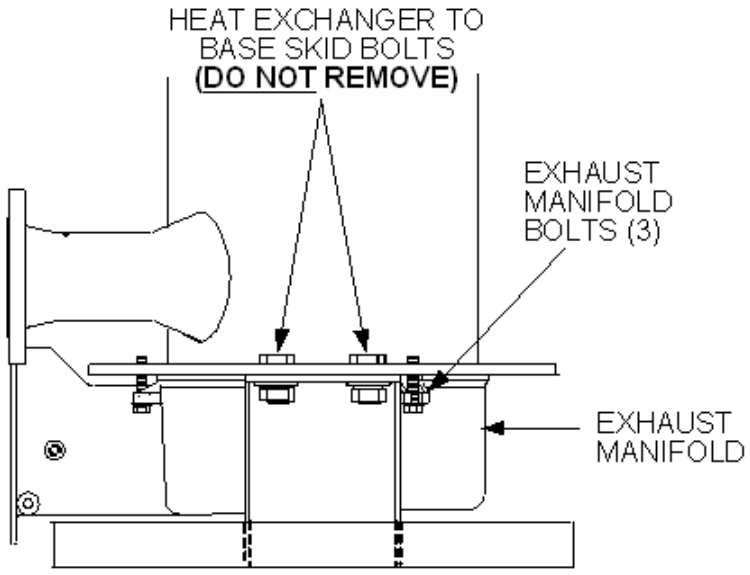

Figure 10: Benchmark .0LN (Nozzle Mix) Exhaust Manifold Location

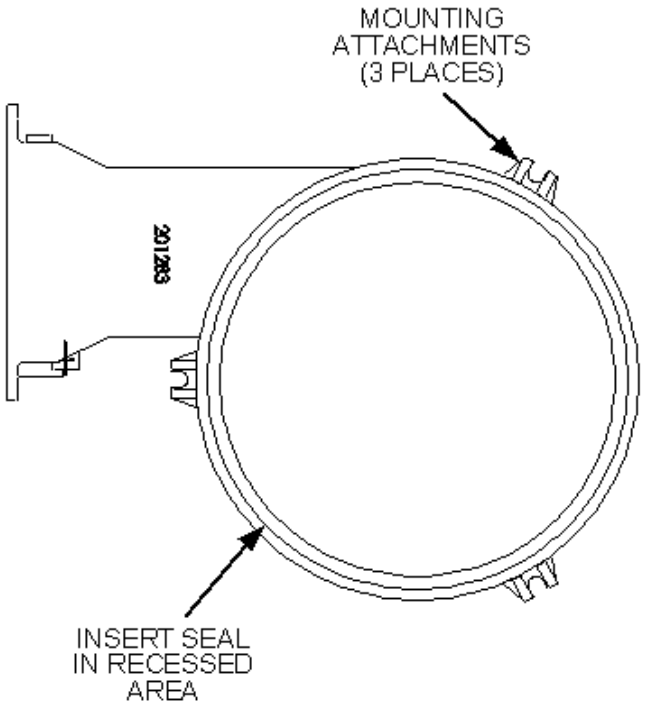

Figure 11: Benchmark 2.0 (Nozzle Mix) Exhaust Manifold – Top View

6.2.2 Exhaust Manifold Reassembly

To reassemble the Exhaust Manifold:

Exhaust Manifold Reassembly Instructions

1. Align the exhaust manifold with the lower heat exchanger flange and secure it in place using the three (3) 3/4" bolts removed in step 3 of the disassembly instructions. Alternately tighten the bolts to obtain a uniform seal.
2. Reconnect the flue starter section to the exhaust manifold.
3. Prior to reconnecting the condensate trap, perform the procedures described in paragraph 6.2.3.
4. Reconnect the condensate trap to the 1/2" NPT port on the exhaust manifold.

6.2.3 Condensate Trap Component Replacement

For Benchmark 2.0 (Nozzle Mix) boilers, the external Condensate Trap (P/N 24060) is attached to the connecting manifold drain pipe using a special adapter (Figure 13).

NOTE

There are two slightly different types of Condensate Traps that may be used in your configuration; an older style with a separate inlet adapter, and a newer style with a built-in adapter (see Figure 12). Maintenance is the same, except that the newer style does not use an orifice gasket (Step 5).

This trap should be disconnected from the connecting manifold and serviced as follows:

Condensate Trap Component Replacement Instructions

1. Remove the connections on the inlet and outlet sides of the Condensate Trap shown in Figure 13.
2. Refer to Figure 12 and loosen the four (4) thumbscrews securing the cover on the Condensate Trap. Remove the cover.
3. Remove and discard the O-ring gasket currently installed in trap. It will be replaced with the new O-ring included in the Maintenance Kit during reassembly.
4. Remove the float (with float guide attached) from the Condensate Trap.
5. For ***Old Style*** Condensate Trap, remove, discard, and replace the currently installed orifice gasket from the trap with the one provided in the kit (Figure 12). The **New Style Trap** does NOT use an orifice gasket, so this step is not necessary for that type.
6. Thoroughly clean the trap and float. Also inspect the drain piping for blockage. If the trap cannot be thoroughly cleaned, replace the Condensate Trap.
7. Check the condensate drain port on the Exhaust Manifold (Figure 13) to ensure it is clear of blockage.
8. After the above items have been inspected and thoroughly cleaned, replace the orifice gasket (use new gasket) and float in the Condensate Trap. Replace the O-ring (use new O-ring) and replace the trap cover.
9. Reassemble all piping and hose connections to the Condensate Trap inlet and outlet. Reconnect trap to condensate drain connection on the connecting manifold.

IMPORTANT

When reinstalling the condensate trap, ensure that the trap inlet is level with or below the condensate outlet of the boiler. Use a suitable support to insure that the bottom surface of the trap is horizontal and level.

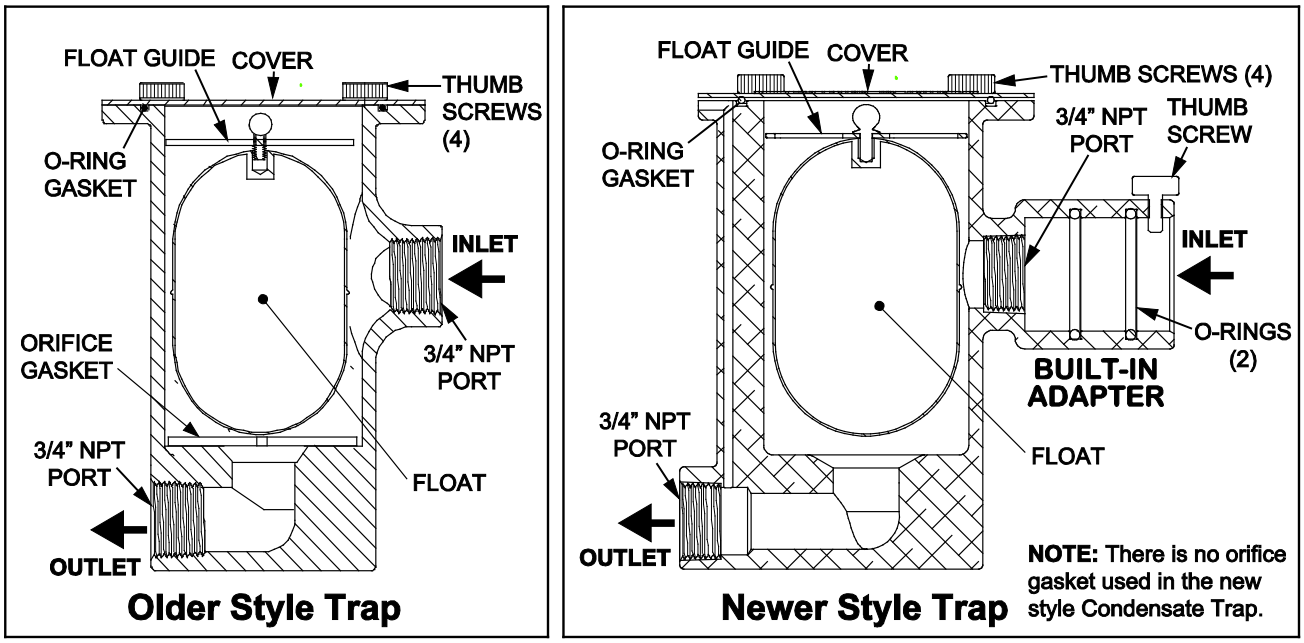

Figure 12: Condensate Trap P/N 24060 (Old and New Styles)

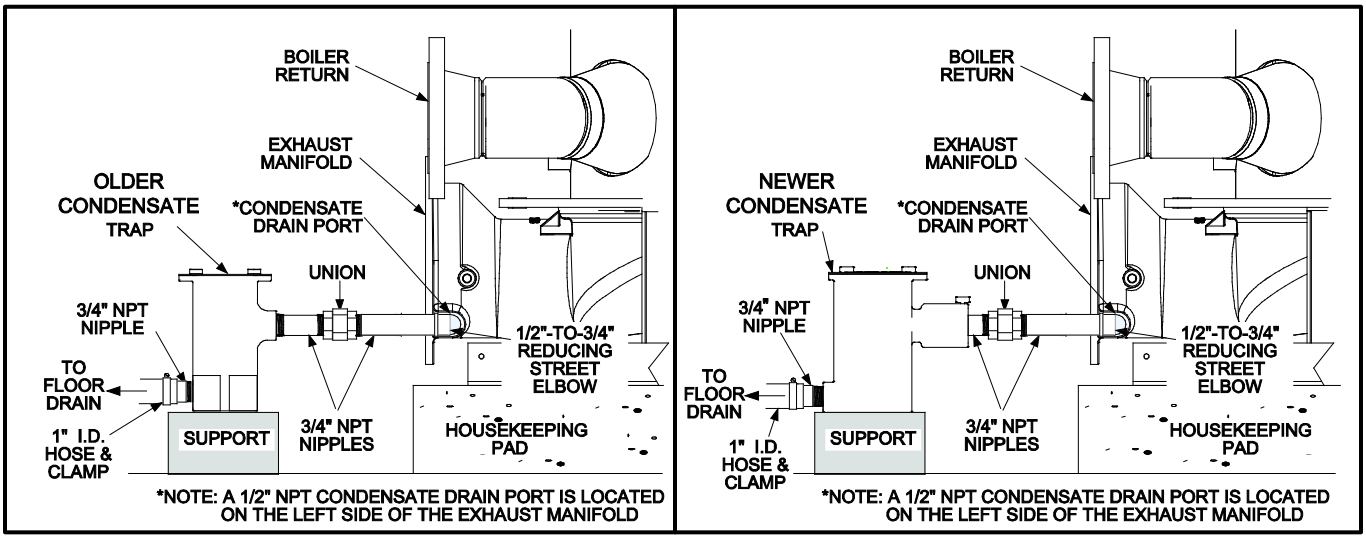

Figure 13: Exhaust Manifold Condensate Drain Connections. Old (left) and New (right) Style Trap – BMK2.0 (Nozzle Mix) Partial Left Side View

7. FINAL REASSEMBLY AND TESTING

Upon completion of all inspections and component replacement, reassemble the unit and perform the tests specified in paragraphs 7.1 and 7.2.

7.1 Set-Up and Reassembly After Maintenance

Perform the following reassembly and setup procedures:

Setup and Reassembly After Maintenance Instructions

1. Ensure that the heat exchanger has been filled and the water supply and return valves have been opened.
2. Turn ON the external circuit breaker to the unit.
3. At the front panel of the unit, set the **ON/OFF** switch on the C-More Control Panel to the **ON** position.
4. Press the **LOW WATER LEVEL RESET** button to reset the low water cutoff.
5. Press the **CLEAR** switch to reset the fault relay. This will turn off the **FAULT** LED and clear any displayed error message.
6. Replace the unit side panels and top panels.

7.2 LWCO/Capacitor Assembly Installation

This procedure replaces an old probe with a new LWCO capacitor assembly kit **(p/n 69126)**.

LWCO Installation Instructions

1. From the end of the LWCO probe, unscrew the plastic acorn nut and first hex nut, then remove the wire lug, as shown in Figure 14.

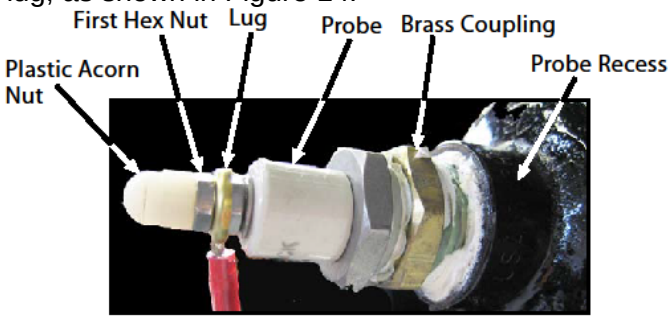

Figure 14: LWCO Capacitor Kit – Hardware Callouts on Old Probe

2. Remove the LWCO probe from the recess by unscrewing the brass coupling to which it is attached. The probe should resemble the one in Figure 15.

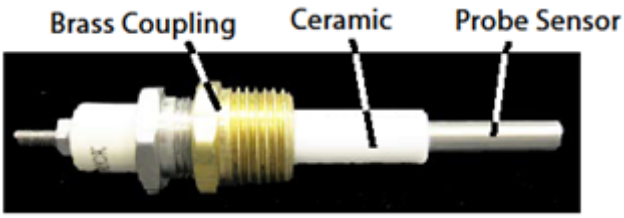

Figure 15: LWCO Capacitor

3. Sparingly apply an NSF approved pipe dope to the threads of the brass coupling to which the LWCO probe is attached (do ***NOT*** use Teflon tape) and install into the recess hole vacated by the old probe.
4. Next, cut old lug from wire (removed earlier from probe tip) and crimp onto the male crimp of capacitor assembly. If replacing a probe which already has the capacitor assembly attached, then there is already a male crimp instead of a lug and it may simply be inserted into the female crimp on the new probe/capacitor assembly. The finished capacitor assembly should resemble Figure 16.

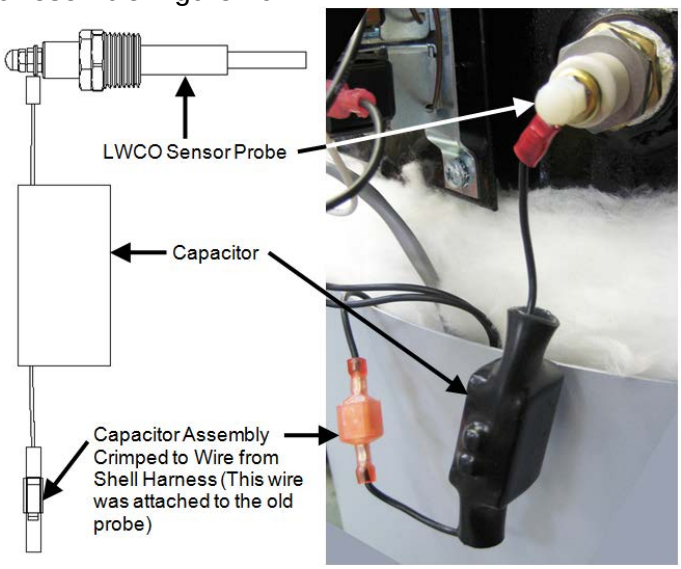

Figure 16: LWCO Capacitor Kit Connections

7.3 Final Testing After Maintenance

Upon completion of the inspections and replacements specified in this Technical Service Bulletin, perform the Combustion Calibration Tests specified in Chapter 4 of the O & M Manual GF-110 or GF-110T (Texas only).

Following successful completion of the Combustion Calibration Tests, return the Benchmark 2.0 Nozzle Mix Boiler to service use.

Change Log:

Date	Description	Changed By
07/25/2014	Rev B: PIR 279, 899: Replaced Flame Detector P/N 66020 with 66034; added O Ring P/N 123545 in sections 6-1 & 6-2; added LWCO/Capacitor Assembly Kit 69126, section 7.2.	Chris Blair