TECHNICAL INSTRUCTIONS

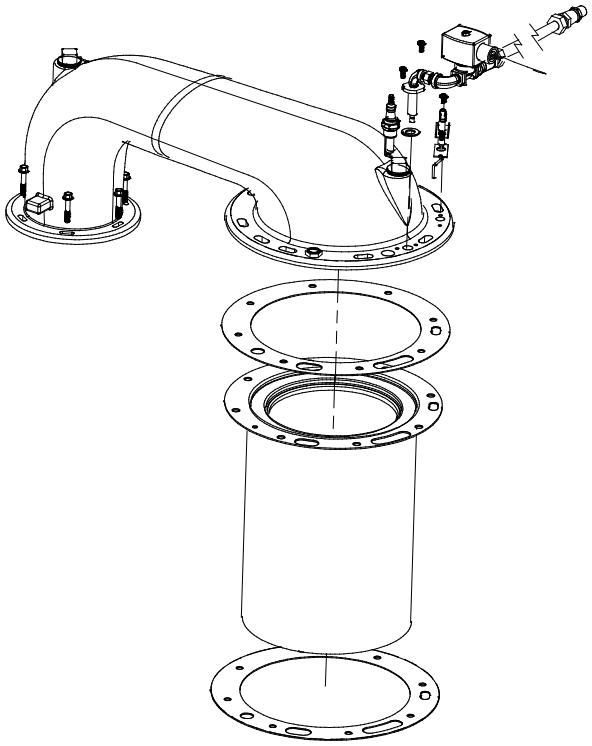
24-Month Maintenance Kit P/N 58015-03

For BMK2.0LN (Venturi Design)

Description of Document:

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

- Benchmark 2.0LN (Venturi Design)



BMK 2.0LN (Venturi Design)
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 2.0LN Venturi Design boilers equipped with an Spark Igniter.

The replacement parts required to perform the waterside and fireside inspections on the Benchmark 2.0LN (Venturi Design) Boilers are provided in the 24-Month Maintenance Kit (P/N 58015-03) listed and described in section 2.

2. CONTENTS OF 24-MONTH MAINTENANCE KIT, P/N 58015-03

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

Table 1: Benchmark 2.0LN 24-Month Maintenance Kit, Part No. 58015-03

ITEM	QTY	PART NO.	DESCRIPTION
1	1	GP-122435-S	SPARK IGNITER
2	1	66034	FLAME DETECTOR
3	1	81048	FLAME DETECTOR GASKET
4	1	81047	GAS INJECTOR GASKET
5	1	123612	EXHAUST MANIFOLD SEAL
6	2	81030	BURNER GASKETS
7	1	84017	CONDENSATE TRAP O-RING
8	1	81092	CONDENSATE TRAP ORIFICE GASKET (.25" I.D.)
9	1	81019	BURNER HOUSING GASKET
10	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:

- 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-110LN.

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
- Loctite 246

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.

Preliminary Inspection Instructions

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 2.0LN 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.

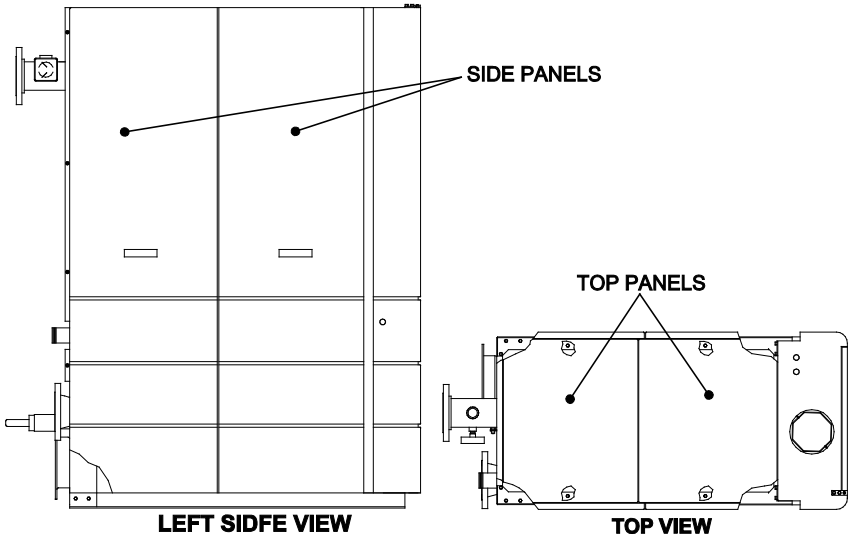

Figure 1: Benchmark 2.0LN (Venturi Design) Boiler Cover Locations

5. WATERSIDE INSPECTION OF THE HEAT EXCHANGER

Benchmark 2.0LN (Venturi Design) 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 2) 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.

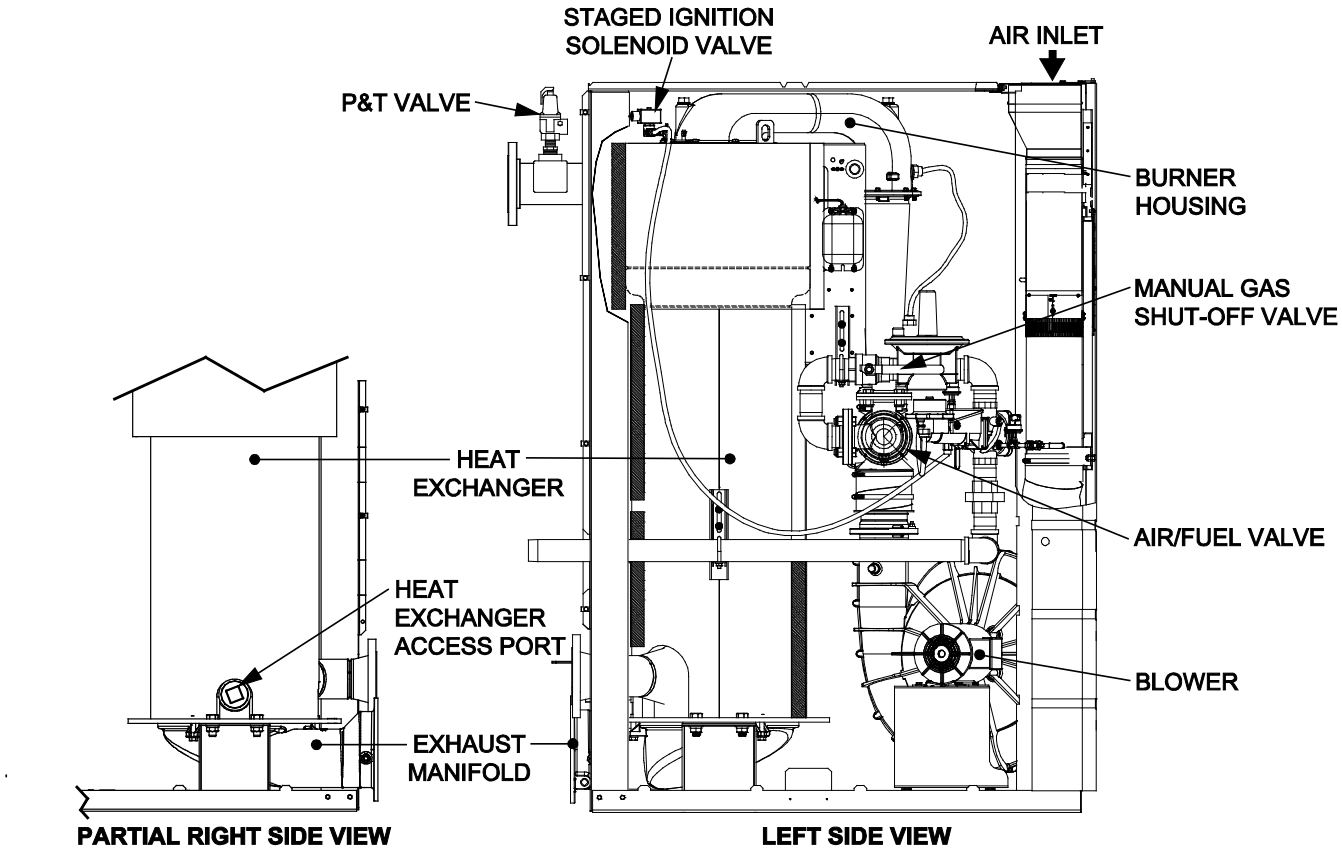

Figure 2: BMK 2.0LN (Venturi Design) - (Partial Right Side and Left Side Views)

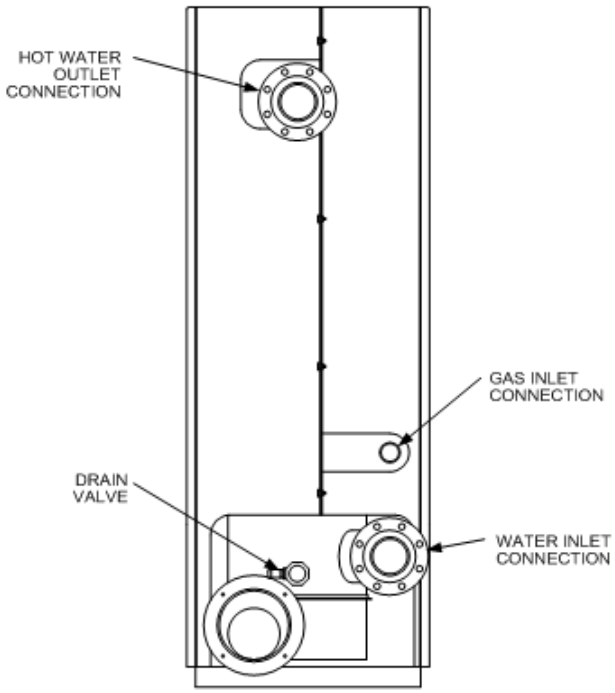

Figure 3: Benchmark 2.0LN (Venturi Design) - (Rear View)

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
- Preliminary Burner Reassembly
- Burner Component Replacement
- Final Burner Reassembly

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 and Figure 5 shows an exploded diagram of the complete Burner Assembly removed from the unit.

Remove and inspect the Burner Assembly as follows:

Burner Preliminary 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). Remove the two (2) screws (#10-32 & #8-32) securing the flame detector to the burner housing. Remove the Flame Detector and underlying gasket. The Flame Detector and gasket will be replaced with new ones from the kit at reassembly.

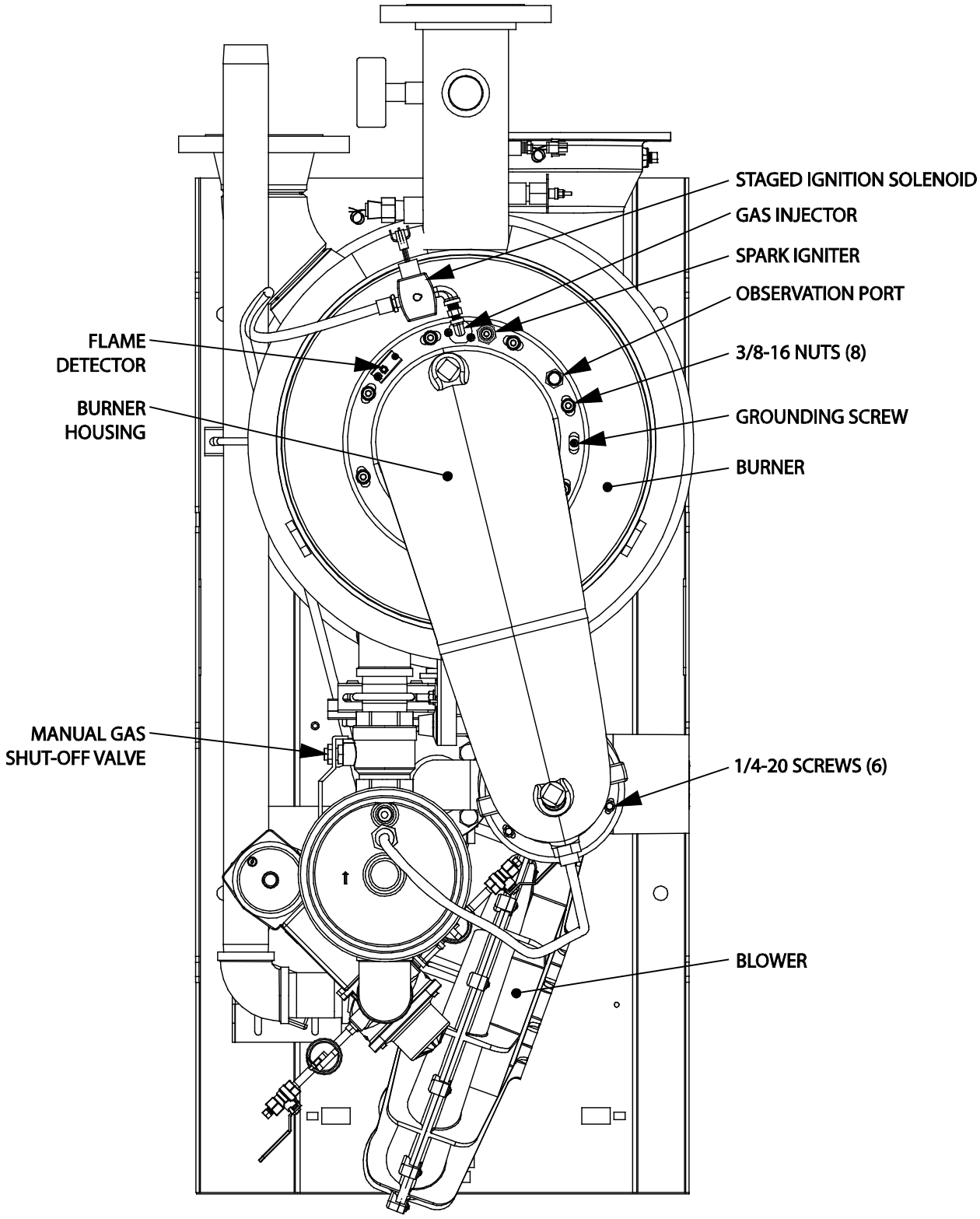

Figure 4: Benchmark 2.0LN - Top View

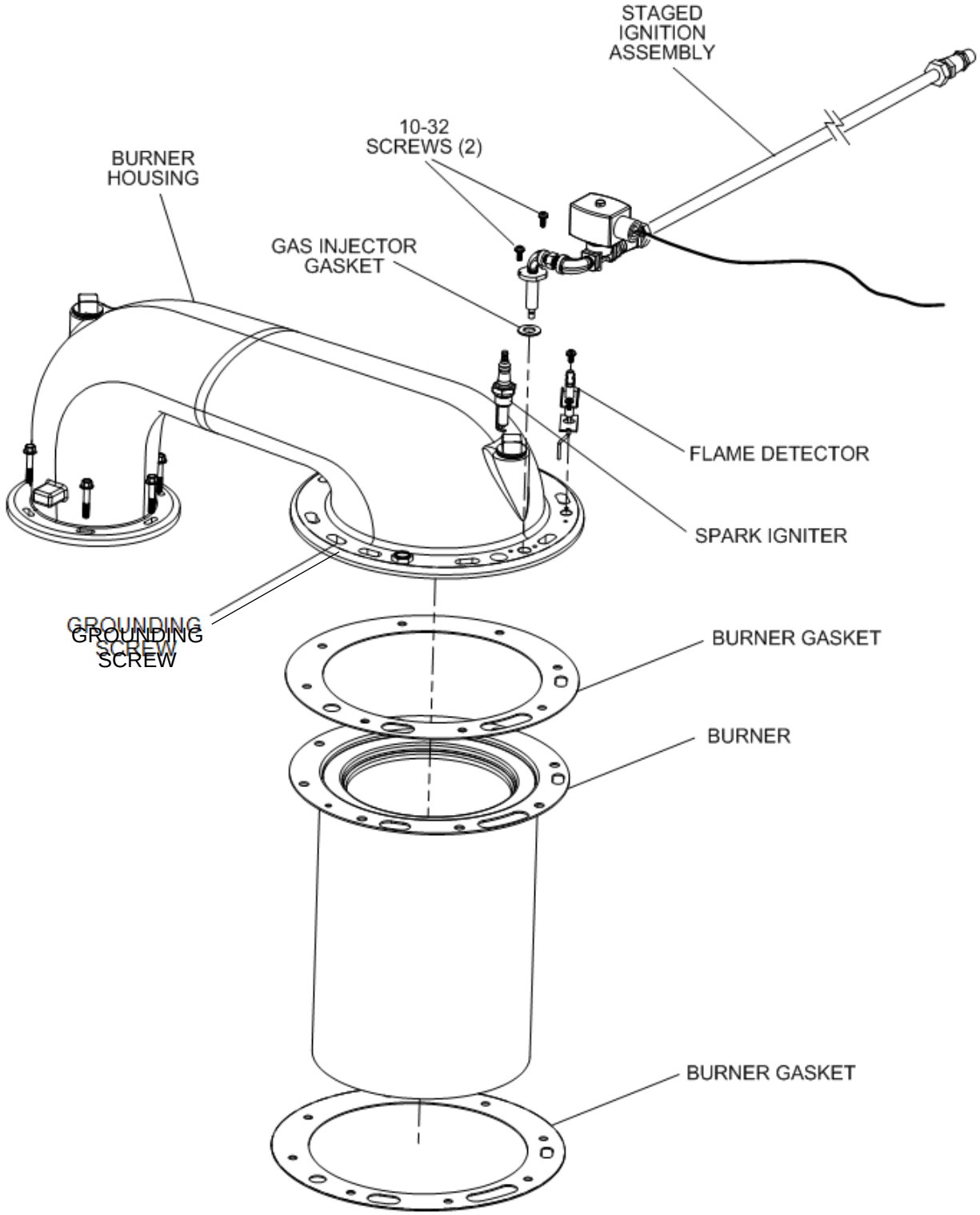

Figure 5: BMK2.0LN (Venturi Design) Burner Assembly - Exploded View

3. Remove the Spark Igniter cable from the Spark Igniter, then remove the Spark Igniter from the Burner Plate using a 1" open-end wrench. The Spark Igniter will be replaced at reassembly with a new one from the kit.

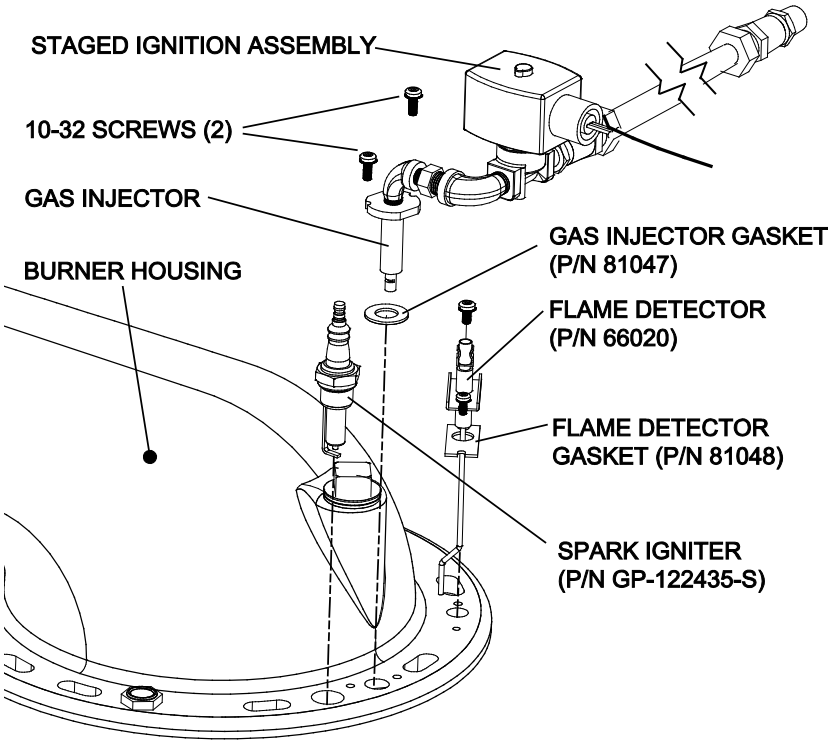

Figure 6: Partial Exploded View Showing Flame Detector, Spark Igniter, Gas Injector, and Staged Ignition Assembly on the Burner Housing Flange

4. Remove the two (2) 10-32 screws securing the Staged Ignition Assembly to the burner. Separate the Staged Ignition Assembly and gas injector gasket from the burner. The Gas Injector Gasket will be replaced at reassembly with a new one from the kit.
5. Disconnect the burner housing from the blower by removing the six (6) 1/4-20 screws using a 3/8" wrench (Figure 4).
6. Remove the eight (8) 3/8-16 nuts from the burner flange (Figure 4) using a 9/16" wrench.

NOTE

The Burner Plate is heavy, weighing approximately 20 pounds.

7. Remove the grounding screw (Figures 4 and 5).
8. Remove the burner housing and burner housing gasket from the burner flange by pulling straight up.
9. If there is an extension ring around the burner, remove it.
10. Remove the burner by pulling straight up. Be sure to remove and discard the two (2) burner gaskets. At reassembly, these gaskets will be replaced with new ones from the kit. Figure 5 shows an exploded view of the burner assembly for a BMK2.0LN Venturi Boiler.
11. 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.

12. 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 Preliminary Burner Reassembly

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

Preliminary Burner Reassembly Instructions

1. Replace the two old Burner Gaskets with the new gaskets (P/N 81063) from the kit as you place the burner back into the heat exchanger. Ensure that the gaskets and Burner are aligned with the Spark Igniter and Flame Detector slots in the heat exchanger top head.

IMPORTANT!

When installing new Burner Gaskets, it is imperative that the gaskets be properly aligned to assure that the cutouts for the Observation Port, Spark Igniter, and Flame Detector line up with those in the heat exchanger top plate, Burner flange and Burner housing. Failure to properly align these items may result in damage to the gaskets or interference with the components.

2. Replace the old Burner Housing Gasket with the new one (P/N 81019), and then place the Burner Housing back into position on the burner top and blower opening.

3. If there was an extension ring around the burner at disassembly, replace it.

4. Ensure that the Burner Housing Gasket is positioned correctly in relation to the mounting holes of the Burner Housing Flange, and then reinstall the six (6) 1/4-20 screws into the holes of the flange, but only tighten by hand at this time to ensure proper positioning.

5. To each of the eight (8) Burner mounting studs coming up through the Burner Flange, add one of the 3/8” flat washers removed during disassembly.

6. After placing the washers, apply Loctite 246 to the Burner mounting studs. While supporting the housing so it is level with the Burner flange, use a torque wrench to tighten the eight (8) 3/8-16 hex nuts on the Burner flange to 35 ± 5 ft-lbs. Use an alternating pattern when tightening the hex nuts to ensure a uniform seal.

7. Now, tighten the six 1/4-20 screws on the Burner Housing Flange with a screw driver, using an alternating pattern when tightening the screws to ensure a uniform seal.

NOTE

So far, the following items have been replaced from the kit:

- Burner Gaskets (2 x P/N 81030)
- Burner Housing Gasket (P/N 81019)

Next, the following components will need to be replaced:

- Spark Igniter (P/N GP-122435-S)
- Gas Injector Gasket (81047)
- Flame detector and gasket (P/N 66020 & 81048)

8. Proceed to section 6.1.3 for instructions to replace the Spark Igniter, Gas Injector Gasket, and Flame Detector components prior to final Burner reassembly.

6.1.3 Burner Component Replacement

The old components that need to be replaced have already been removed during the disassembly process in section 6.1.1. The following instructions show how to install the new parts during the Burner reassembly process.

6.1.3.1 Spark Igniter Installation

The Spark Igniter (P/N 66026) installation is accomplished as follows:

Spark Igniter Installation Instructions

1. Burner and Burner Housing must first be completely reassembled to the Burner.
2. Using a spark gap feeler gauge, check to ensure that the spark igniter is gapped at 1/8".
3. Prior to installing the replacement Spark Igniter, high temperature, conductive, anti-seize lubricant must be applied to the Spark Igniter threads. A small tube of this lubricant is included in the igniter replacement kit (P/N 58023).
4. Reinstall the Spark Igniter using a 1" open-end wrench. Torque the Spark Igniter to 15 ft-lbs. Do not over tighten.

6.1.3.2 Gas Injector Gasket Installation

The Gas Injector Gasket (P/N 81047) installation is accomplished as follows:

Gas Injector Gasket Installation Instructions

1. Retrieve the new Gas Injector Gasket (P/N 81047) from the kit and position where Gas Injector enters the burner flange (Figure 6).
2. Secure the Gas Injector to the burner flange on top of the gasket using the two (2) 10-32 screws removed at disassembly.

6.1.3.3 Flame Detector Installation

Flame detector (P/N 66006) and gasket (P/N 81047) installation is accomplished as follows:

Flame Detector Installation Instructions

1. Refer to Figures 4, 5, and 6 to locate the Flame Detector installation location.
2. Install the replacement Flame Detector and gasket in the location shown. Secure the Flame Detector to the Burner housing flange using the two screws removed previously.

6.1.4 Final Burner Reassembly

After Burner component replacement (Section 6.1.3), continue Burner reassembly as follows:

Final Burner Reassembly Instructions

1. Reinstall the grounding screw to the Burner Housing (Figure 4).
2. Connect lead wire to the Flame Detector (Figure 6).
3. Attach igniter cable to the Spark Igniter assembly (Figure 6).
4. During the Burner maintenance process, the following items (included in the maintenance kit) should have been replaced:
   - Burner Gaskets (2 x P/N 81030)
   - Burner Housing Gasket (P/N 81019)
   - Spark Igniter (P/N GP-122435-S)
   - Gas Injector Gasket (81047)
   - Flame detector and gasket (P/N 66020 & 81048)
5. This completes the Burner Maintenance for the BMK2.0LN (Venturi Design) boiler. Proceed to section 6.2 for Exhaust Manifold maintenance instructions.

6.2 Exhaust Manifold and Condensate Trap Maintenance

The Exhaust Manifold (Figure 7) must be inspected and cleaned, and the Condensate Trap (P/N 24060) (Figure 9), 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 exhaust manifold.
3. Using a 3/4" socket wrench, remove the three bolts securing the exhaust manifold to the heat exchanger (Figure 7).
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). See Figure 8.

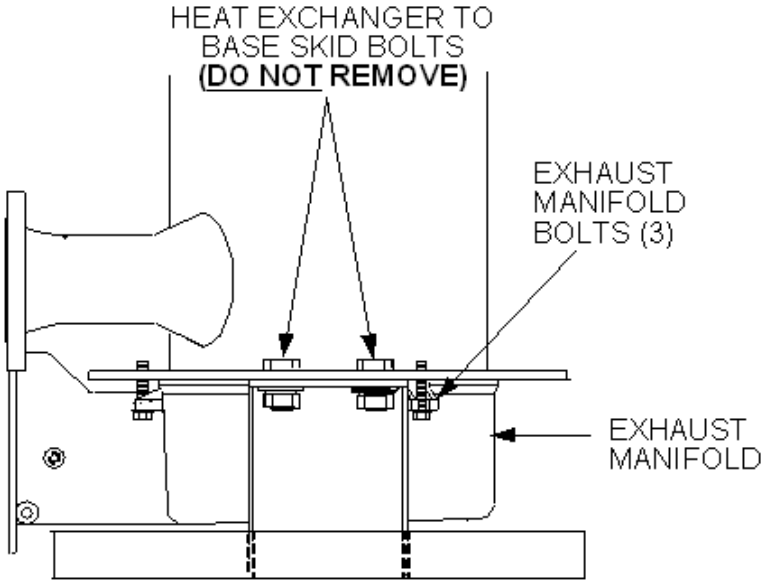

Figure 7: Benchmark .0LN (Venturi Design) Exhaust Manifold Location

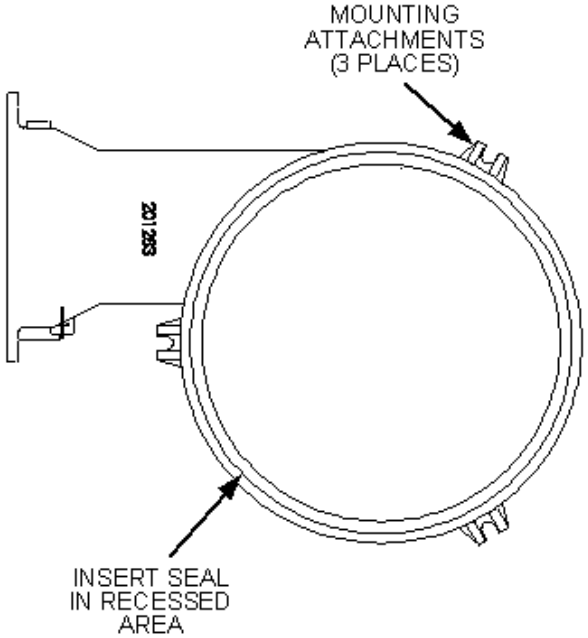

Figure 8: Benchmark 2.0LN (Venturi Design) Exhaust Manifold – Top View

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) bolts removed in step 3. Alternately tighten the bolts to obtain a uniform seal.
2. Reconnect the flue starter section to the exhaust manifold.
3. Now, perform the Condensate Trap inspection and component replacement procedures described in paragraph 6.2.2.
4. After performing the procedures as described in section 6.2.2, reconnect the condensate trap to the 1/2" NPT port on the exhaust manifold.

6.2.3 Condensate Trap Component Replacement

For Benchmark 3.0 boilers, the external Condensate Trap (P/N 24060) is attached to the connecting manifold drain pipe using a special adapter (Figure 10).

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 10). 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 10.
2. Refer to Figure 9 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 9). 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 10) 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.

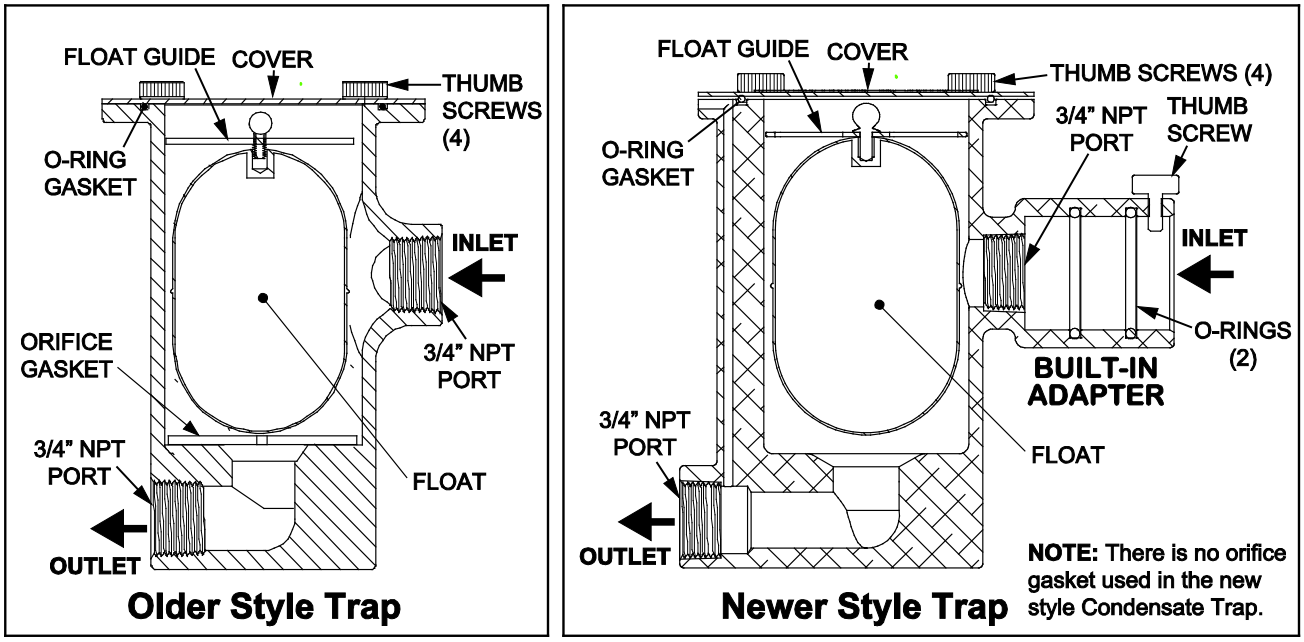

Figure 9: Condensate Trap P/N 24060 (Old and New Styles)

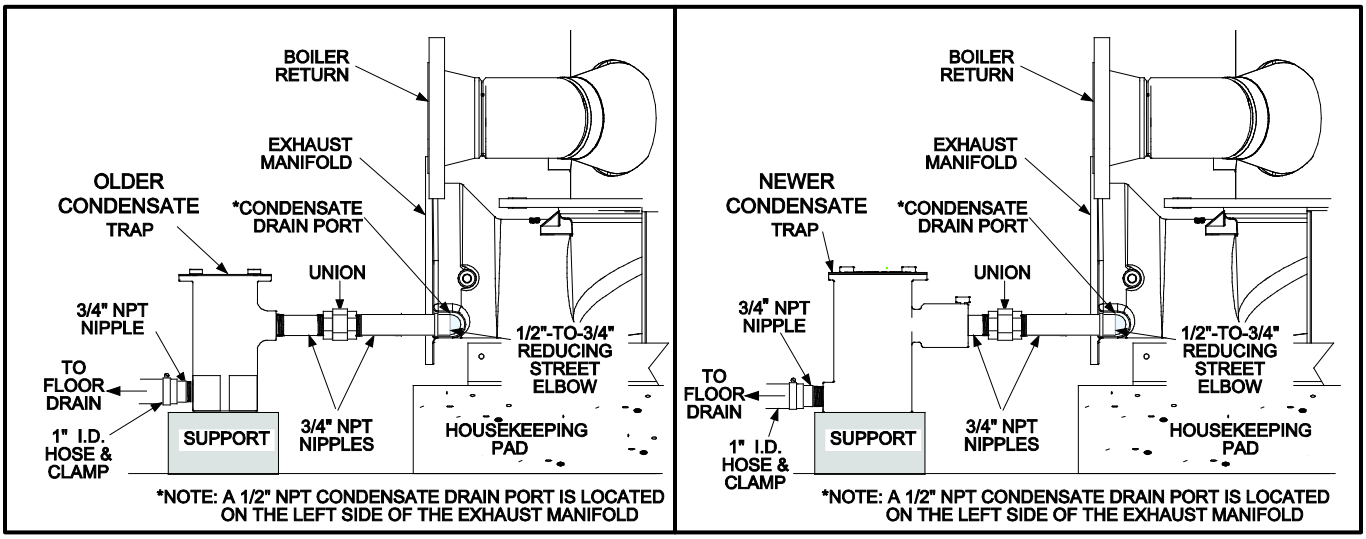

Figure 10: Exhaust Manifold Condensate Drain Connections. Old (left) and New (right) Style Trap – BMK2.0LN (Venturi Design) Partial Left Side View

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 11.

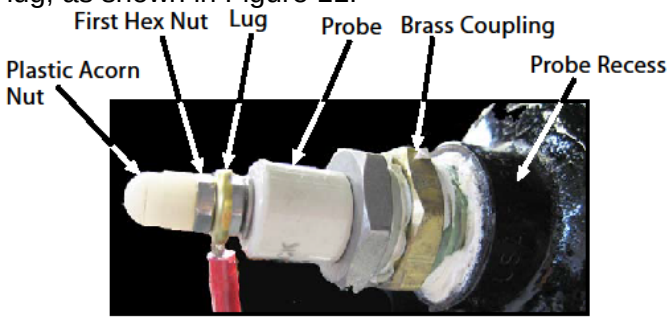

Figure 11. LWCO Capacitor Kit – Hardware Callouts on Old Probe

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 12.

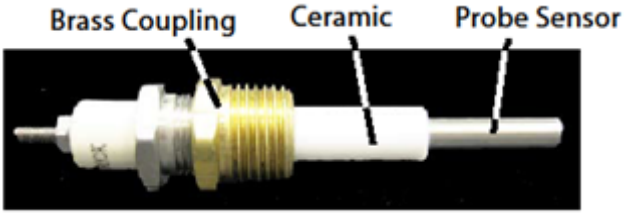

Figure 12. LWCO Capacitor

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 13.

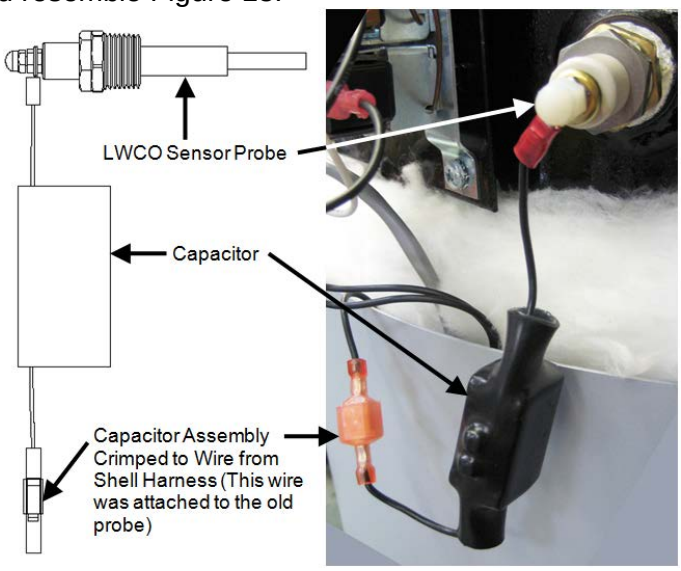

Figure 13. LWCO Capacitor Kit Connections

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-110LN.

Following successful completion of the Combustion Calibration Tests, return the Benchmark 2.0LN 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 LWCO/Capacitor Assembly Kit 69126, section 7.2.	Chris Blair