

<b>Date: 12/4/09</b>	<b>Number: 2009-15</b>
<b>Subject: BENCHMARK 3.0 LOW NOx BOILER 24 MONTH INSPECTION KIT, PART NUMBER 58015-04</b>	
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## **1. INTRODUCTION**

This Technical Service Bulletin provides the procedures to perform waterside and fireside inspections of the heat exchangers contained in Benchmark 3.0LN and 3.0LN Dual-Fuel Boilers.

The replacement parts required to perform the waterside and fireside inspections on the Benchmark 3.0LN and Dual-Fuel Boilers are provided in the 24 - Month Inspection Kit (part no. 58015-04) listed and described in section 2.

## **2. CONTENTS OF 24 - MONTH INSPECTION KIT, PART NO. 58015-04**

The items included in the 24 Month Inspection Kit required for Benchmark 3.0LN and 3.0LN Dual-Fuel Boilers are listed in Table 1.

**Table 1. Benchmark 3.0LN: 24 Month Inspection Kit, Part No. 58015-04**

<b>ITEM</b>	<b>QTY</b>	<b>PART NO.</b>	<b>DESCRIPTION</b>
1	1	GP-122435-S	IGNITER
2	1	66006	FLAME DETECTOR
3	1	81048	FLAME DETECTOR GASKET
4	1	81047	GAS INJECTOR GASKET
5	1	49102	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	81098	CONDENSATE TRAP ORIFICE GASKET (.75" I.D.)

### 3. TOOLS, TEST EQUIPMENT & MATERIALS REQUIRED

The items required to perform the inspections, replacements and tests specified in this Bulletin 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
- Spark Gap Feeler Gauge

#### 3.2 Test Equipment

No test equipment is required to perform the 24 - month inspections include in this Technical Service Bulletin. However, following completion of these inspections, the Benchmark Boiler should be tested using the combustion calibration procedures provided in O & M Manual GF-116, GF-116M or GF-117. See paragraph 7.2

#### 3.3 Materials

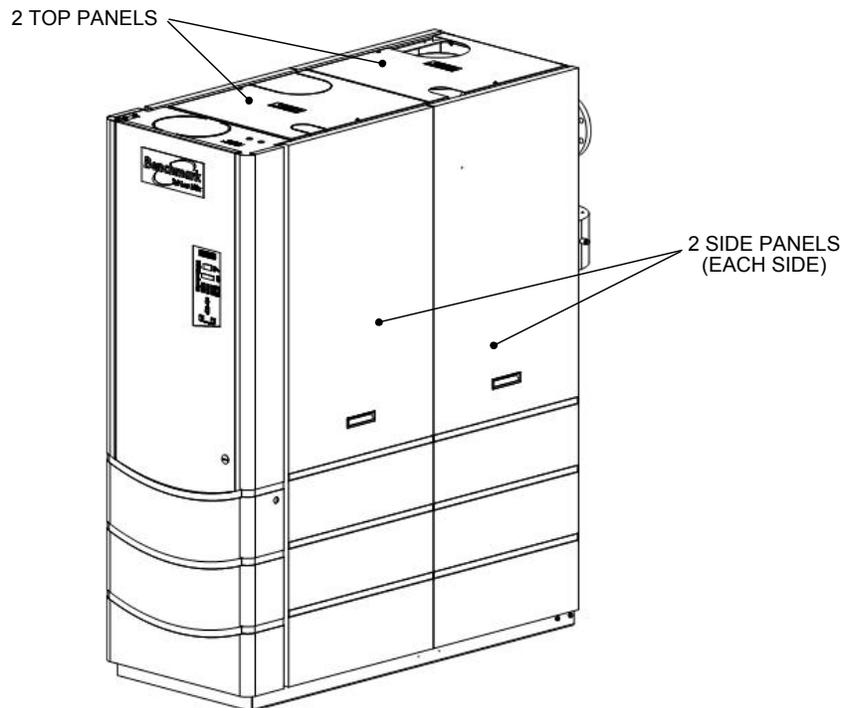
Expendable materials required to perform the procedures described in this bulletin are not included in the 24 -Month Inspection Kits. These materials may include such items as:

- Pipe joint compound
- Teflon tape
- Cleaning solvents and materials

### 4. PRELIMINARY INSPECTION PROCEDURES

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

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 3.0LN burner, heat exchangers and exhaust manifold can be accessed to prepare the boiler for the required waterside and fireside inspections described in sections 5 and 6.

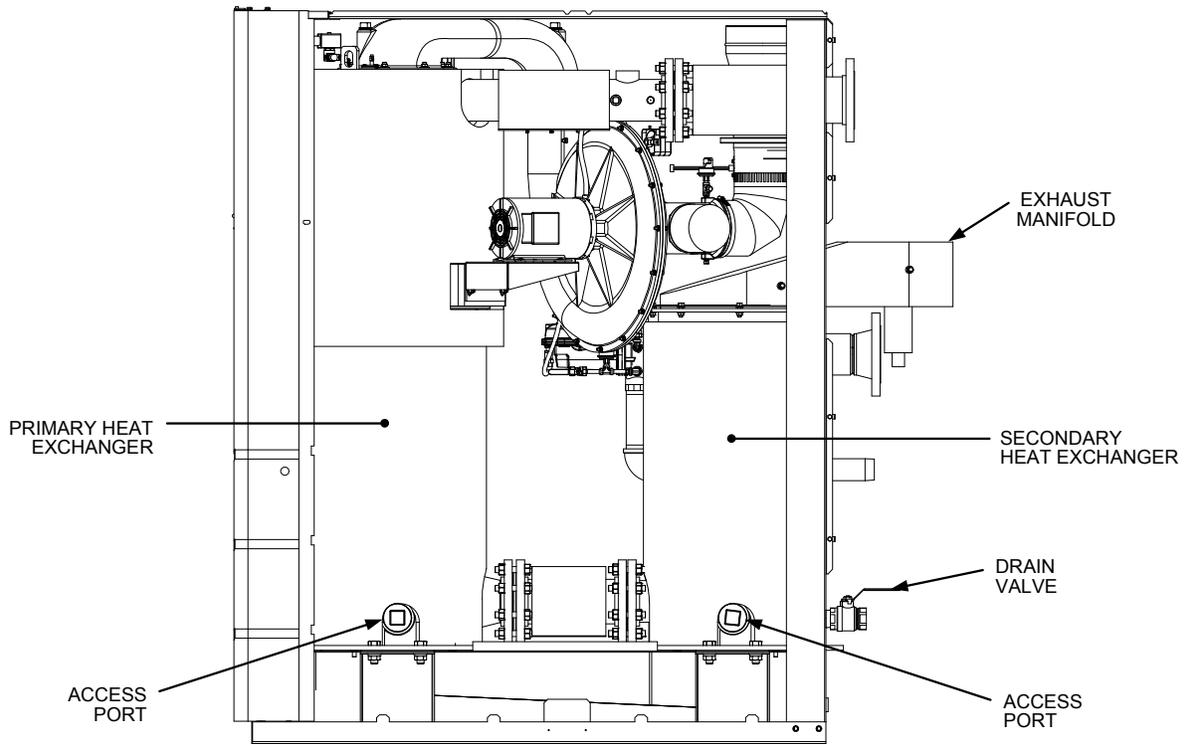


**Figure 1. Benchmark 3.0 Low NOx (LN) Boiler**

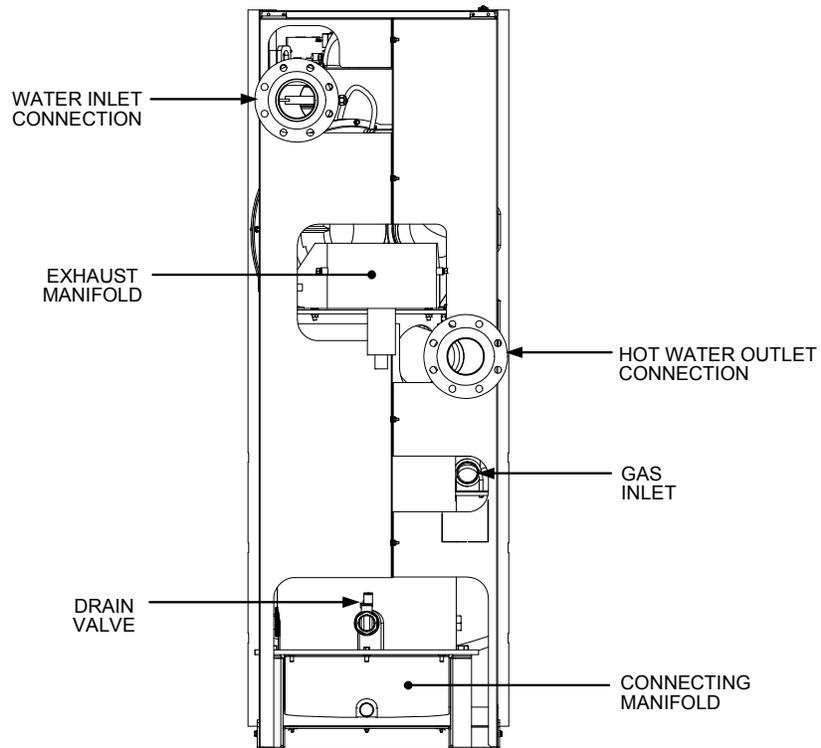
## **5. WATERSIDE INSPECTION OF BENCHMARK 2.0 HEAT EXCHANGER**

Benchmark 3.0LN Models contain both a primary heat exchanger and a secondary heat exchanger as shown in Figure 2. Perform the waterside inspection as follows:

1. Ensure that the preliminary set-up and disassembly procedures in section 4 have been performed to provide access to the heat exchangers 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 both heat exchangers.
4. Open the P&T relief valve, or loosen/remove the shell sensor to allow air to enter the heat exchanger during draining.
5. After the heat exchangers have been drained, remove the 2-1/2 inch access port plugs on the right side of the primary and secondary heat exchangers 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 or reinstall/tighten the shell sensor removed in step 4.
10. Open the water supply and return valves to the unit and refill the heat exchangers. This completes the waterside inspection for the unit.



**Figure 2. Benchmark 3.0LN - (Right Side View)**



**Figure 3. Benchmark 3.0LN - (Rear View)**

## **6. FIRESIDE INSPECTIONS & COMPONENT REPLACEMENTS**

Benchmark 3.0LN heat exchanger fireside inspections include removal of the burner and exhaust manifold assembly of the boiler. In addition, the 24 - Month Inspection 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:

### **Fireside Inspections:**

- Burner Inspection
- Exhaust Manifold Inspection

### **Annual Maintenance Replacements:**

- Burner Component Replacement
- Condensate Trap Component Replacements

The procedures for the above inspections and replacements are provided in the following paragraphs,

### **6.1 Fireside Inspection of Benchmark 3.0 Heat Exchangers**

Perform the fireside inspections of the low NOx burner and exhaust manifold using the procedures in paragraphs 6.1.1 and 6.1.2, respectively.

#### **6.1.1 Benchmark 3.0LN Burner Inspection**

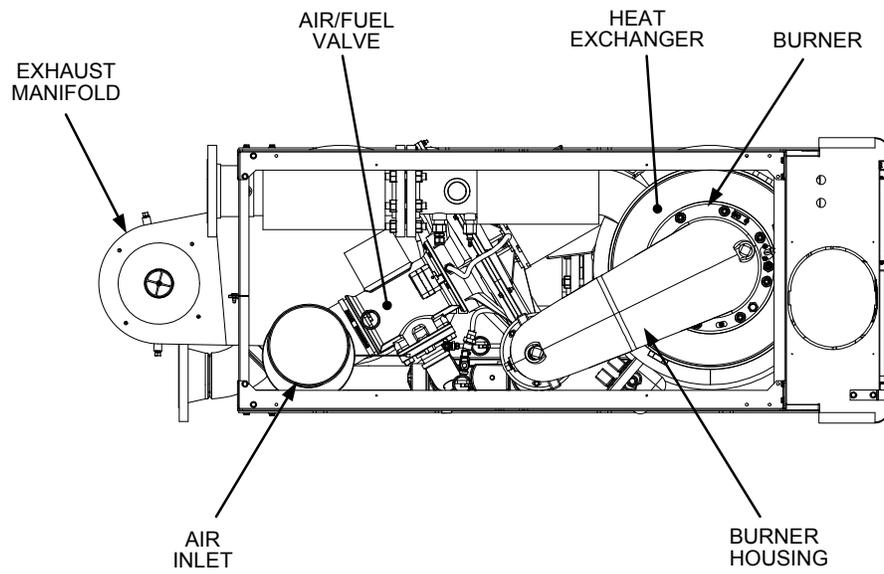
The burner assembly is located at the top of the primary heat exchanger as shown in Figure 4. Inspect the burner as follows:

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

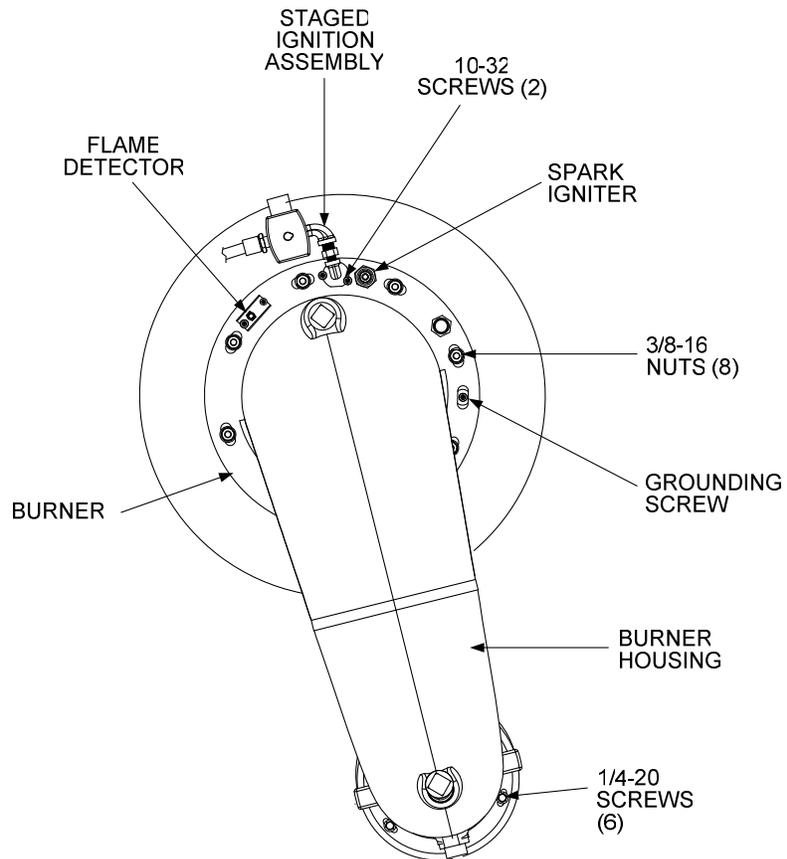
#### **WARNING**

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 shown in Figure 5. Unscrew and remove the flame detector.
3. Disconnect the igniter cable from the igniter (Figure 5). Unscrew and remove the igniter.
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.
5. Disconnect the burner housing from the blower by removing the six (6) 1/4-20 screws using a 3/8" wrench.
6. Remove the eight (8) 3/8-16 nuts from the burner flange (Figure 5) using a 9/16" wrench.



**Figure 4. Benchmark 3.0LN - Top View**

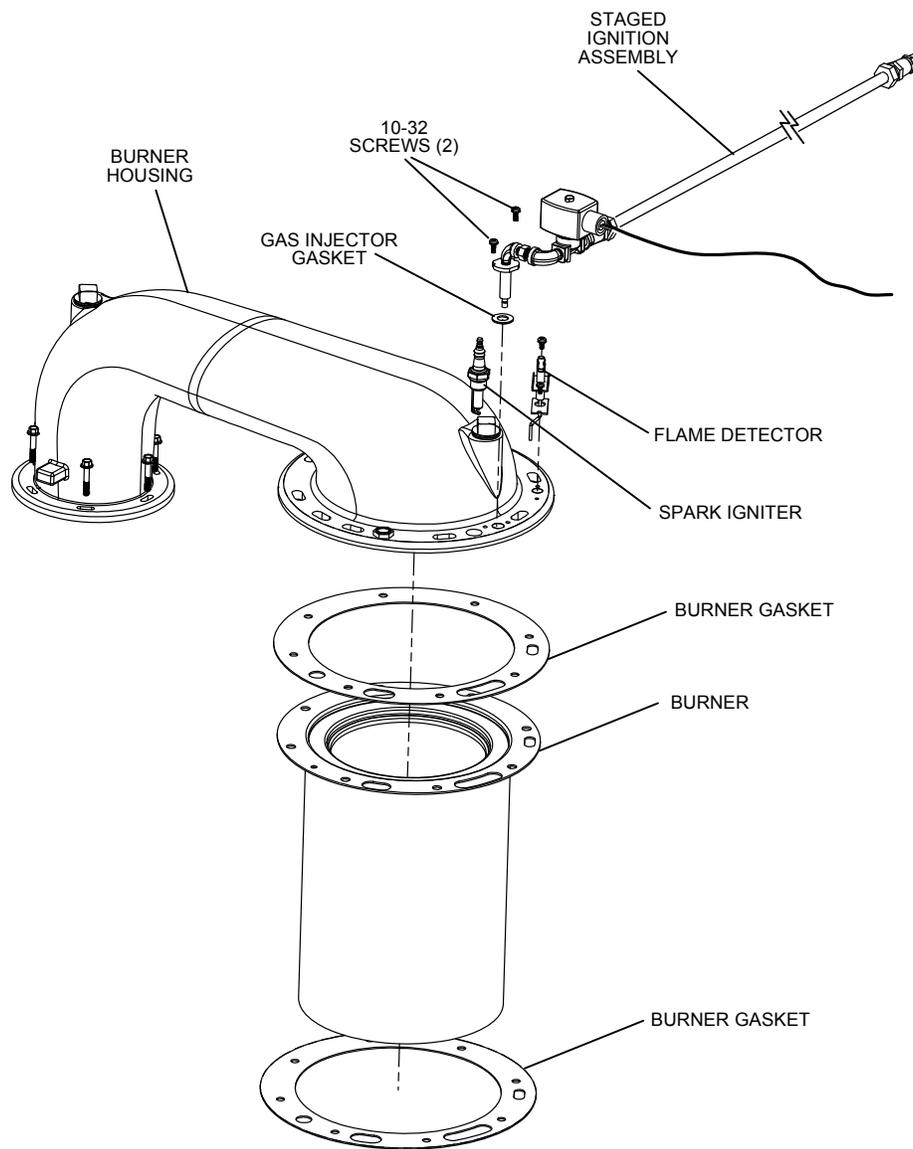


**Figure 5. Benchmark 3.0LN Burner Assembly Removal**

## NOTE

The burner housing is heavy, weighing approximately 20 pounds.

7. Remove the burner housing from the burner flange by pulling straight up.
8. Remove the grounding screw.
9. If there is an extension ring around the burner, remove it.
10. Remove the burner by pulling straight up. Figure 6 shows an exploded view of the burner assembly for a Benchmark 3.0LN Boiler.
11. Remove and replace the two (2) burner gaskets.
12. Beginning with the burner removed in step 10, reinstall all the components in the reverse order that they were removed. However, during this reassembly process, the following items (also included in the kit) should be replaced:
  - (a) Gas injector gasket (part no. 81047)
  - (b) Igniter (see paragraph 6.3.1)
  - (c) Flame detector and gasket (see paragraph 6.3.2)
13. Make sure to align the Spark Igniter (S/I) and Flame Rod (F/R) slots in the burner with the heat exchanger top head.
14. Check to ensure that the grounding screw is reinstalled.
15. Next, refer to paragraph 6.2 and replace the igniter, flame detector and gasket using the items provided in the kit.
16. Following replacement of the igniter and flame detector, proceed to the exhaust manifold inspection procedure in paragraph 6.1.2.

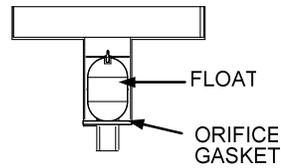
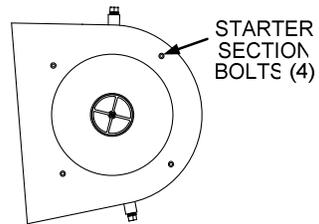
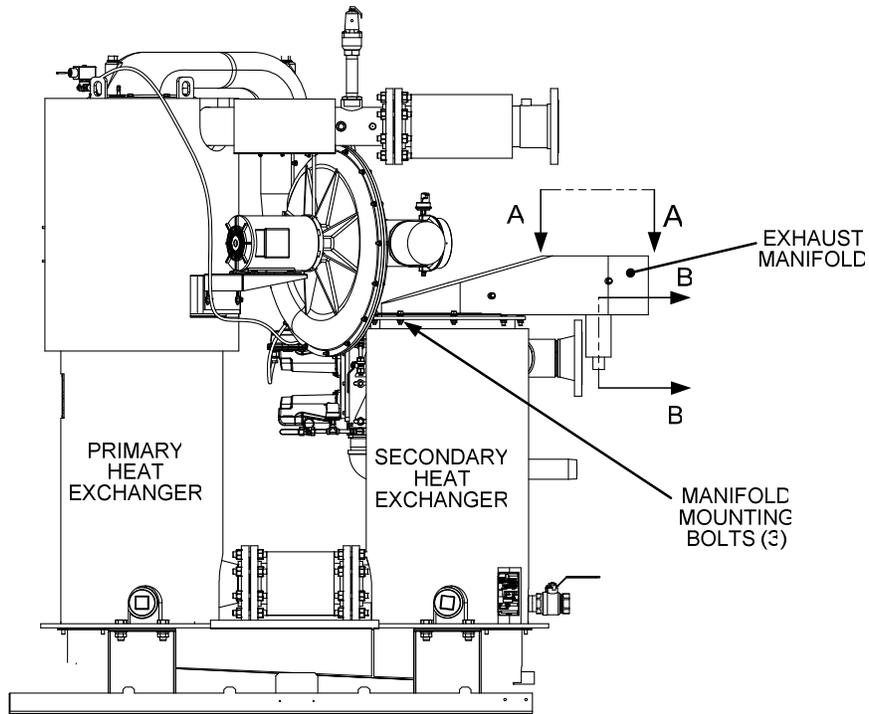


**Figure 6. Benchmark 3.0LN Burner Assembly Exploded View**

### **6.1.2 Benchmark 3.0LN Exhaust Manifold Inspection**

The exhaust manifold of the Benchmark 3.0LN is installed on the top of the secondary heat exchanger at the rear of the unit as shown in Figure 7. To remove and inspect the manifold:

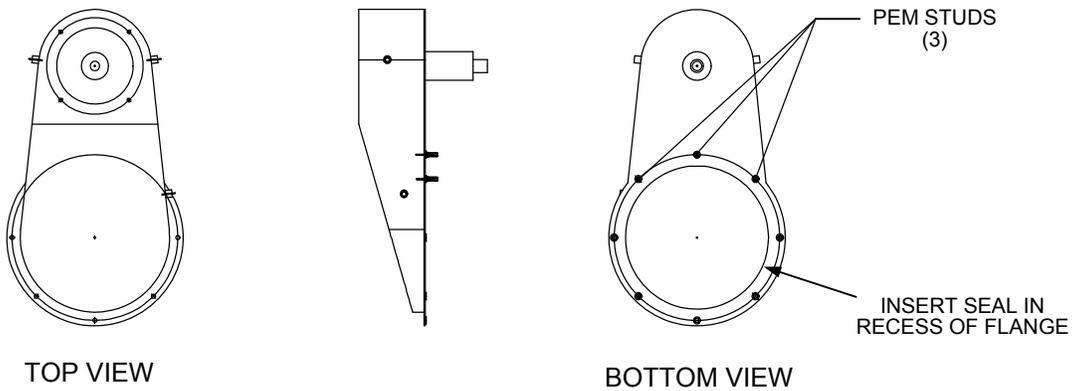
1. Remove the four (4) bolts securing the flue starter section collar to the top of the exhaust manifold.
2. Disconnect the flue starter section from the exhaust manifold.
3. Disconnect the condensate trap drain hose from the 1-1/2" O.D. pipe on the bottom of the exhaust manifold.
4. Using a 3/4" socket wrench, remove the five (5) bolts securing the exhaust manifold to the heat exchanger (Figure 8). Also, remove the three (3) hex nuts from the manifold PEM studs. Remove the complete exhaust manifold from 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 secondary heat exchanger.
6. From the opening at the top of the manifold, remove the condensate trap float (with guide attached). Also, remove the orifice gasket located beneath the float.
7. Inspect and clean the exhaust manifold as necessary.
8. Replace the exhaust manifold seal (part no. 49102) with the new seal provided in the kit. Install the adhesive-backed seal in the recess of the exhaust manifold flange (Figure 8) so that the adhesive side is in contact with the exhaust manifold.
9. Align the exhaust manifold with the upper flange of the secondary heat exchanger. Secure the manifold in place using the five (5) bolts removed in step 4. Also, replace the hex nuts on the three (3) PEM studs. Alternately tighten the bolts and nuts to obtain a uniform seal.
10. From the opening at the top of the manifold, install the new orifice gasket (0.75" I.D.) provided in the kit. Ensure that the gasket is laying flat in the bottom of the condensate trap.
11. Next, insert the condensate float (with guide attached) into the trap.
12. Reconnect the 1-1/2" I.D. drain hose to the condensate trap drain opening.
13. Reconnect the flue starter section and collar to the top of the exhaust manifold using the bolts removed in step 1.
14. The Benchmark 3.0LN also contains an additional condensate trap which is used on all Benchmark units. This trap is attached to the connecting manifold at the rear of the unit. Disconnect this trap from the manifold and perform the procedure described in paragraph 6.2.2.
15. Upon completion of the procedure described in paragraph 6.2.2, reconnect the condensate trap to the 1-1/2" pipe on the connecting manifold.



VIEW A - A

VIEW B - B

**Figure 7. Benchmark 3.0LN Exhaust Manifold Location**



TOP VIEW

BOTTOM VIEW

**Figure 8. Benchmark 3.0LN Exhaust Manifold**

## 6.2 Annual Maintenance Item Replacements

The 24-Month Inspection Kit also contains burner assembly components and condensate trap components which should be replaced every year.

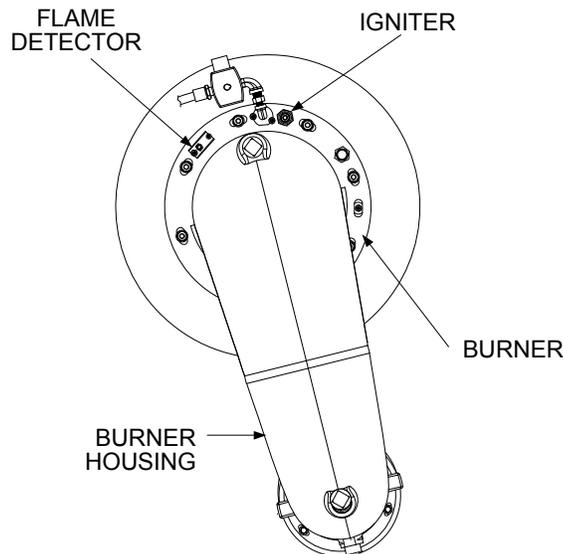
### 6.2.1 Burner Assembly Component Replacements

The burner assembly component replacements provided in the kit include a spark igniter, flame detector and flame detector gasket. These items were previously removed from the burner during the inspection procedure in paragraph 6.1.1.

#### 6.2.1.1 Igniter Replacement

Spark igniter, part no. GP-122435-S is used in all Benchmark Models. Replacement is accomplished as follows:

1. Using a spark gap feeler gauge, check to ensure that the spark igniter is gapped at 1/8".
2. Prior to installation, a high-temperature anti-seize compound must be applied to the the igniter threads.
3. Refer to Figure 9 and reinstall the igniter in the location shown. Do not over-tighten. A slight snugging up is sufficient.
4. Reconnect the spark igniter cable.



**Figure 9. Burner Assembly Igniter & Flame Detector Locations**

### **6.2.1.2 Flame Detector Replacement**

Flame detector, part no. 66006 and gasket, part no. 81047 are used only on Benchmark Low NOx models. Replacement is accomplished as follows:

1. Refer to Figure 9 to locate the flame detector installation location.
2. Install the replacement flame detector and gasket in the location shown.. Hand-tight only.
3. Reconnect the flame detector lead wire.

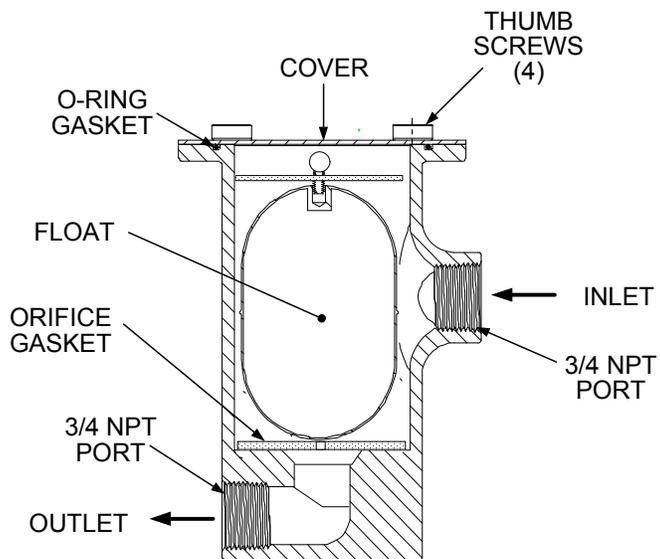
### **6.2.2 Condensate Trap Maintenance**

The condensate trap, part no. 24060 is used with all Benchmark Models. The trap should be inspected, cleaned and reassembled as follows:

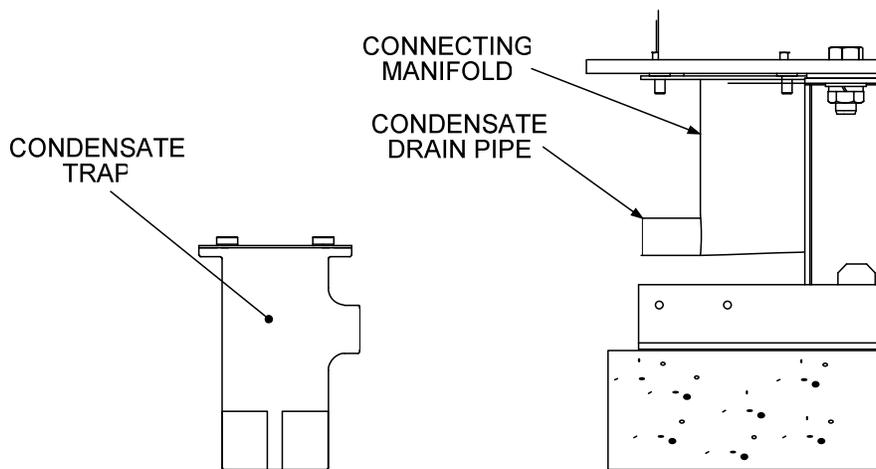
#### **NOTE**

The condensate trap should already be disconnected from the connecting manifold of the unit during the exhaust manifold inspection procedure.

1. Remove the connections on the inlet and outlet sides of the condensate trap shown in Figure 11.
2. Refer to Figure 11 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. Remove and discard the currently installed orifice gasket from the trap. The new orifice gasket from the Maintenance Kit will be installed during reassembly.
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 pipe on the connecting manifold (Figure 12) to ensure it is clear of blockage.
8. After the above items have been inspected and thoroughly cleaned, replace the 0.25" I.D. 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.



**Figure 11. Condensate Trap Part No. 24060**



**Figure 12. Connecting Manifold Condensate Drain Location**

## 7. FINAL REASSEMBLY AND TESTING

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

### 7.1 Reassembly and Set-Up Following Completion of Inspections

Following completion of the all required inspections and replacements, perform the following reassembly and setup procedures:

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 Final Testing Following Inspections

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-116, GF-116M or GF-117 (Dual-Fuel).

Following successful completion of the Combustion Calibration Tests, return the Benchmark 3.0LN Boiler to service use.