TECHNICAL INSTRUCTIONS

Benchmark 1.5LN 24-Month Maintenance Kit# 58015-05

Technical Instruction Document

Maintenance Kit 58015-05 Contents

ITEM 1
Igniter
P/N **GP-122435-S**

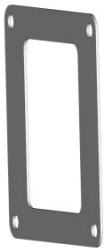
ITEM 2
Flame
Detector
P/N **66034**

ITEM 3
Flame Detector
Gasket
P/N **81048**

ITEM 4
Gas Injector
Gasket
P/N **81047**

ITEM 5
Exhaust
Manifold Seal
P/N **84020**

ITEM 6
Burner Gasket
P/N **81063**

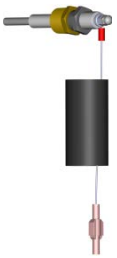


ITEM 7
Blower
Gasket
P/N **81064**

ITEM 8
Condensate
Trap O-Ring
P/N **84017**

ITEM 9
Condensate Trap
Orifice Gasket
P/N **81092**

ITEM 10
O-Ring
P/N **88003**



ITEM 11
LWCO Kit
P/N **69126**

Initial Release: 12/08/2014 (Replaces TSB-2009-16)

Table of Contents

1. INTRODUCTION

This Technical Instruction Document provides the procedures to perform waterside and fireside inspections of the heat exchangers in Benchmark 1.5LN and 1.5LN Dual-Fuel Boilers.

The replacement parts required to perform the waterside and fireside inspections on the Benchmark 1.5LN and 1.5LN Dual-Fuel Boilers are provided in the 24 - Month Inspection Kit (part no. 58015-05) listed and described in section 2.

2. CONTENTS OF KIT 58015-05

The items included in the 24 Month Inspection Kit required for Benchmark 1.5LN and 1.5LN Dual-Fuel Boilers are listed in Table 1.

Table 1. Benchmark 1.5LN: 24 Month Inspection Kit, Part No. 58015-05

ITEM	QTY	PART NO.	DESCRIPTION
1	1	GP-122435-S	IGNITER
2	1	66034	FLAME DETECTOR
3	1	81048	FLAME DETECTOR GASKET
4	1	81047	GAS INJECTOR GASKET
5	1	84020	EXHAUST MANIFOLD SEAL
6	2	81063	BURNER GASKET
7	1	81064	BLOWER GASKET
8	1	84017	CONDENSATE TRAP O-RING
9	1	81092	CONDENSATE TRAP ORIFICE GASKET (.25" I.D.)
10	1	88003	O-RING
11	1	69126	LWCO / CAPACITOR ASSEMBLY KIT

3. TOOLS, TEST EQUIPMENT & MATERIALS REQUIRED

The items required to perform the inspections, replacements and tests specified in this document are listed in section 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 document. However, following completion of these inspections, the Benchmark Boiler should be tested using the combustion calibration procedures provided in O & M Manual GF-120, GF-120M, or GF-121 (Dual-Fuel). See section 7.2 for instructions.

3.3 Materials

Expendable materials required to perform the procedures described in this document 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
- High-temperature anti-seize compound

4. PRELIMINARY INSPECTION PROCEDURES

Perform the preliminary set-up and disassembly procedures in this section before performing the waterside and fireside inspections included in this document.

WARNING!

High voltages are used to power these boilers and so it is required that all power applied to these boilers is removed first before performing any of the procedures described in this document. Serious personal injury or death may occur if this warning is not observed.

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 1.5LN 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.

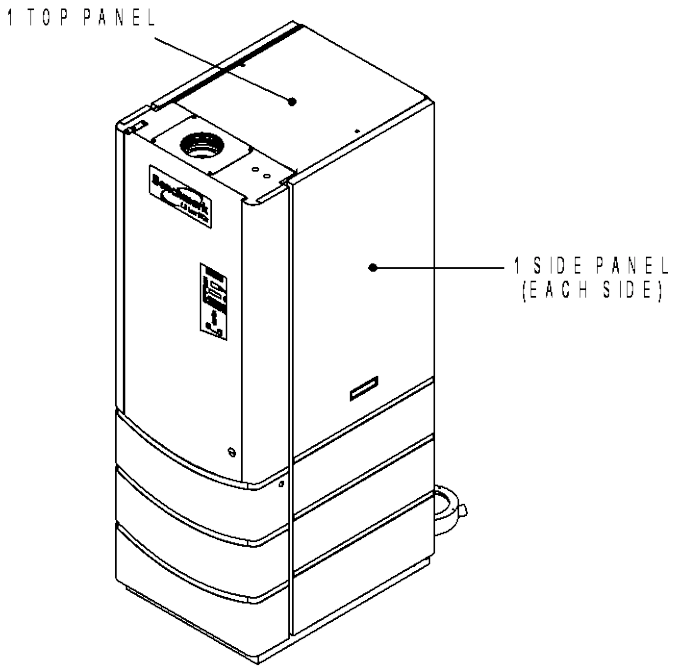


Figure 1. Benchmark 1.5 Low NOx (LN) Boiler

5. WATERSIDE INSPECTION OF BENCHMARK 1.5 HEAT EXCHANGER

Benchmark 1.5LN units contain a single 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 unit's heat exchanger.
2. Allow the unit to cool prior before 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, or loosen/remove the shell sensor 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 left 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 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.

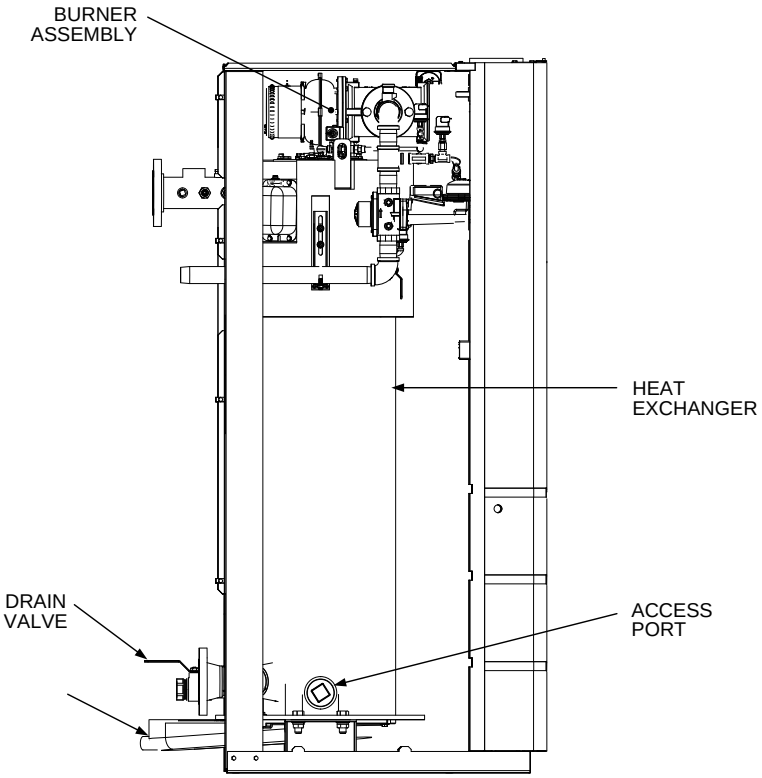


Figure 2. Benchmark 1.5LN - (Right Side View)

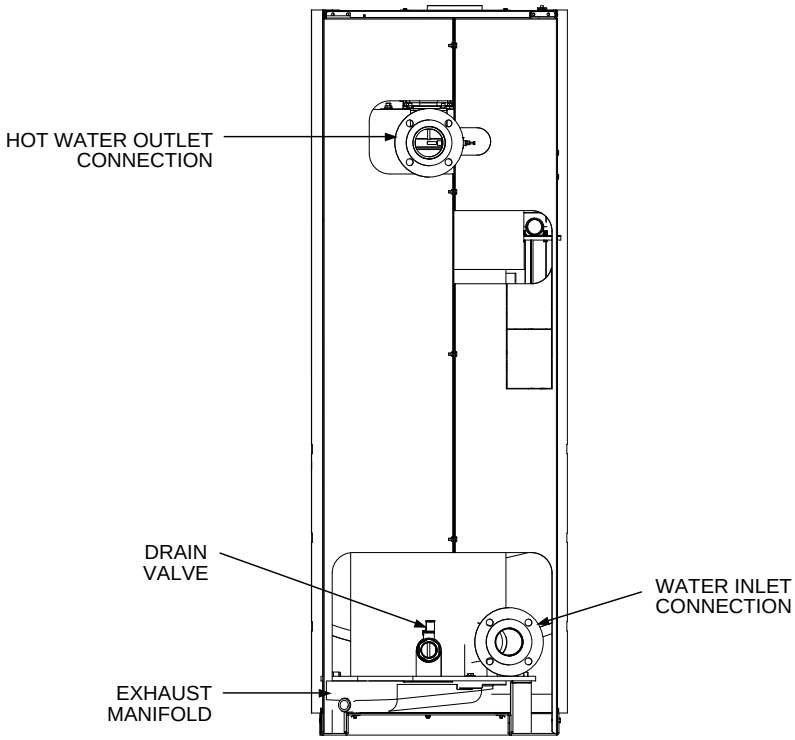


Figure 3. Benchmark 1.5LN - (Rear View)

6. FIRESIDE INSPECTIONS & COMPONENT REPLACEMENTS

Benchmark 1.5LN heat exchanger fireside inspections include removal of the burner and exhaust manifold assembly from 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 sections.

6.1 Fireside Inspection of Benchmark 1.5 Heat Exchangers

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

6.1.1 Benchmark 1.5LN Burner Inspection

The burner assembly is located at the top of the heat exchanger, as shown in Figure 4. As this illustration shows, the complete burner assembly also includes the unit's blower and air/fuel valve assemblies. Figure 5 shows the burner assembly mounting details and Figure 6 shows the complete burner assembly removed from the unit.

Remove and inspect the burner assembly 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, below.
3. Remove the two (2) screws securing the flame detector to the burner plate and then remove the flame detector and gasket.
4. Disconnect the igniter cable from the igniter (Figure 5), then unscrew and remove the igniter.
5. Remove the two screws securing the staged ignition assembly to the burner and then separate the staged ignition assembly from the burner. Remove the gas injector gasket from the burner plate; it will be replaced with a new gasket (81047) in the kit.
6. Disconnect the unit wiring harness connectors from the air/fuel valve and blower motor.

7. Disconnect the Fast-On wire leads connected to the blower proof switch and blocked inlet switch (Figure 5).
8. Remove the grounding screw.
9. Disconnect the gas train from the air/fuel valve flange by removing the four (4) 1/2" bolts and nuts (Figure 5). Discard the O-ring, as it will be replaced by a new one included with the kit (part no. 88003).
10. Disconnect the inlet air flex hose from the air/fuel valve by loosening the hose clamp (Figure 5).
11. Remove the four (4) 5/16-18 hex head screws securing the blower to the burner plate (Figure 6).
12. Remove the blower and air/fuel valve from the burner plate by lifting straight up. Also, remove the blower gasket, which will be replaced with the new gasket provided in the kit.
13. Next, remove the eight (8) 3/8-16 nuts from the burner flange using a 9/16” wrench.

NOTE

The burner assembly weighs approximately 30 pounds.

14. Remove the burner assembly from burner flange by pulling straight up.
15. Remove and replace the two (2) burner gaskets with new gaskets (part no. 81063) included in the kit.
16. Beginning with the burner assembly removed in step 13, reinstall all the components in the reverse order in which they were removed, replacing the following items with new items included in the kit:
    - Blower gasket (part no. 81064)
    - Gas injector gasket (part no. 81047)
    - Igniter (part no. GP-122435-S, see section 6.2.1.1)
    - O-Ring (part no. 88003)
    - Flame detector (part no. 66034) and gasket (part no. 81048, see section 6.2.1.2)
17. Make sure to align the staged ignition assembly, igniter and flame detector holes in the burner plate with the heat exchanger top head.
18. Check to ensure that the grounding screw is reinstalled.
19. Next, refer to section 6.2 and replace the igniter, flame detector and flame detector gasket using new items included in the kit.
20. Following replacement of the igniter and flame detector, proceed to the exhaust manifold inspection procedure in section 6.1.2.

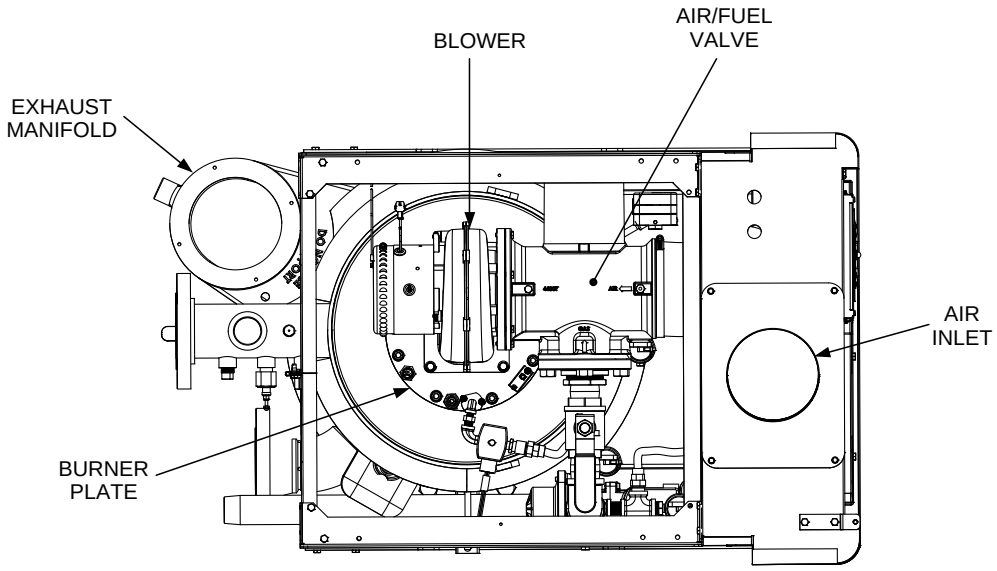


Figure 4. Benchmark 1.5LN - Top View

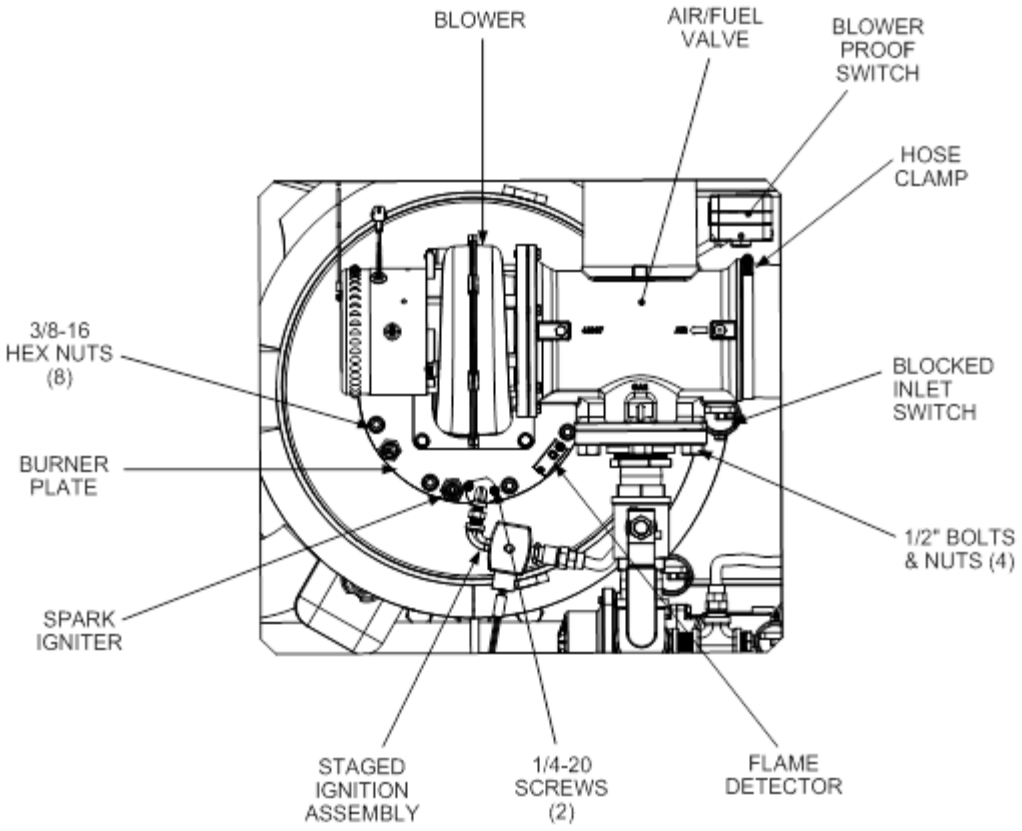


Figure 5. Benchmark 1.5LN Burner Assembly Removal

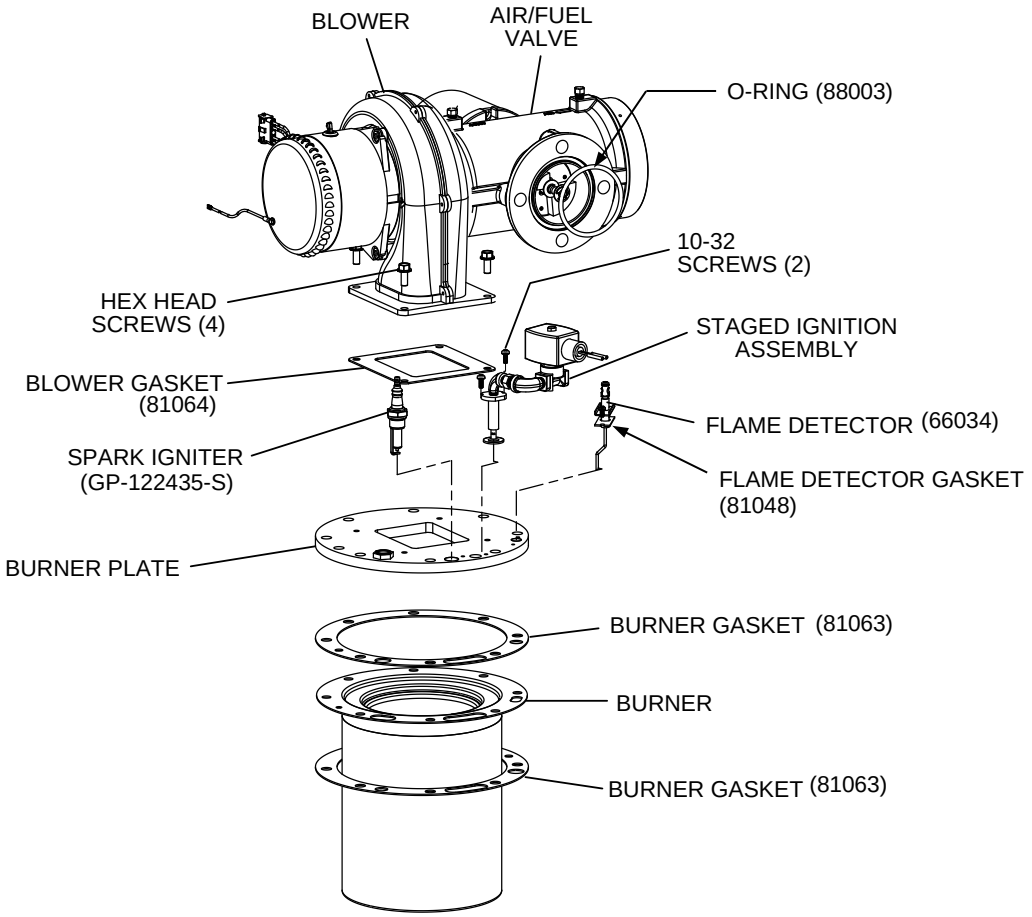


Figure 6. Benchmark 1.5LN Burner Assembly Exploded View

6.1.2 Benchmark 1.5LN Exhaust Manifold Inspection

The exhaust manifold of the Benchmark 1.5LN is installed at the rear of the unit, as shown in Figure 7. Perform the following steps 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 exhaust manifold.
4. Using a 3/4" socket wrench, remove the three bolts securing the exhaust manifold to the heat exchanger (Figure 7).
5. Remove the exhaust manifold and seal from the rear of the unit.
6. 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.
7. Inspect and clean the exhaust manifold as necessary.

8. Refer to Figure 8 and replace the existing exhaust manifold seal with the new seal (part no. 84020) included in the kit. Install the adhesive-backed seal in the recess of the exhaust manifold flange (adhesive side down).
9. Align the exhaust manifold with the lower heat exchanger flange and secure it in place using the three (3) bolts removed in step 4. Alternately tighten the bolts to obtain a uniform seal.
10. Reconnect the flue starter section to the exhaust manifold.
11. Prior to reconnecting the condensate trap, perform the procedures described in section 6.2.2.
12. Upon completion of the procedures in section 6.2.2, reconnect the condensate trap to the 1-1/2" O.D. pipe on the exhaust manifold.

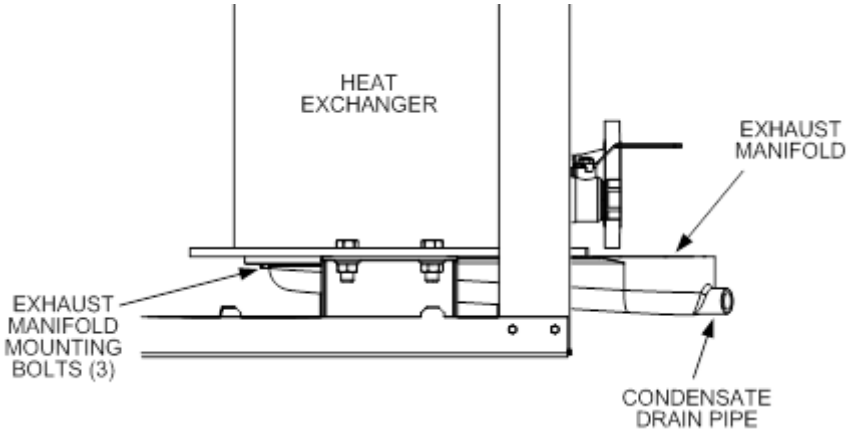


Figure 7. Benchmark 1.5LN Exhaust Manifold Location

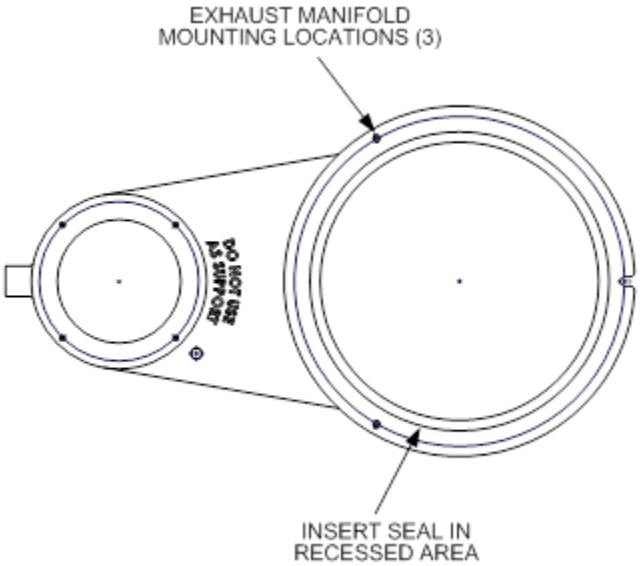


Figure 8. Benchmark 1.5LN Exhaust Manifold - Top View

6.2 Annual Maintenance Item Replacements

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

6.2.1 Burner Assembly Component Replacements

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

6.2.1.1 Igniter Replacement

Benchmark 1.5 LN units use igniter part number GP-122435-S. Complete the instructions below to replace this part.

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

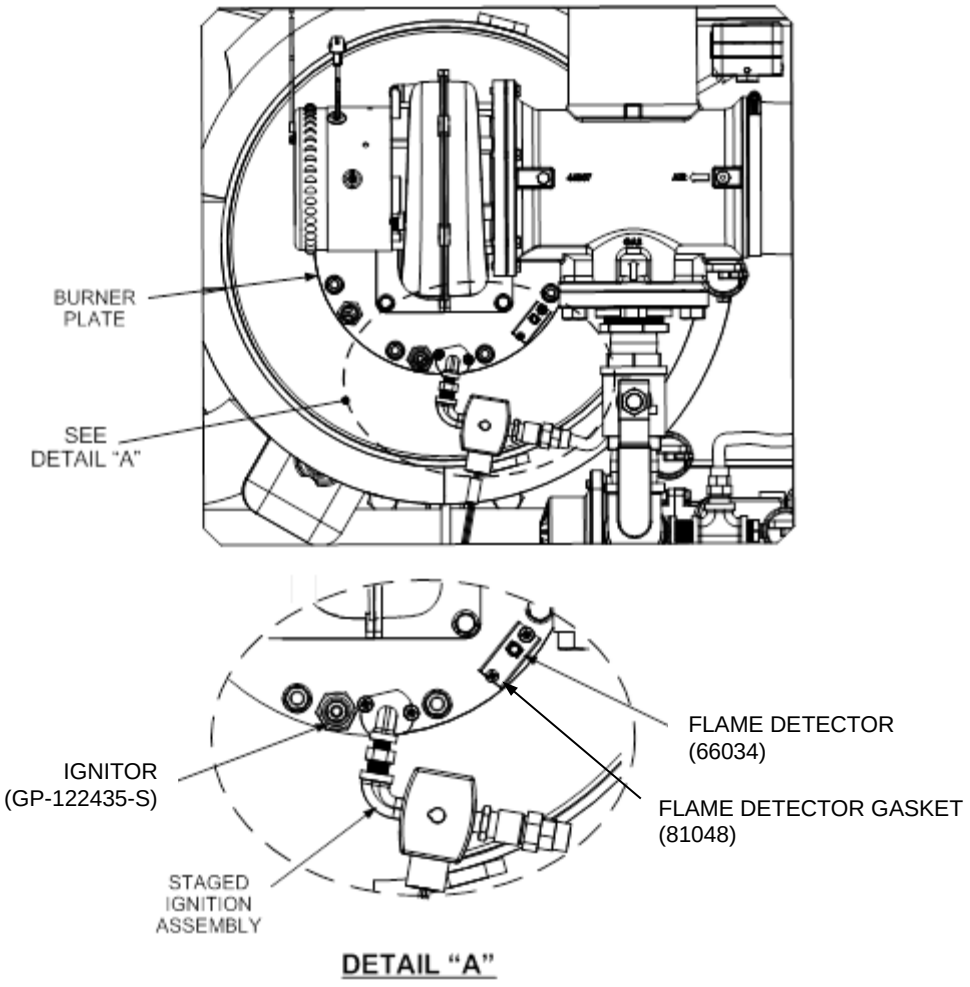


Figure 9. Burner Assembly Igniter & Flame Detector Locations

6.2.1.2 Flame Detector Replacement

Flame detector (part no. 66034) and gasket (part no. 81048) are used on Benchmark 1.5 Low NOx units. Complete the instructions below to replace these parts.

1. Refer to Figure 9, above, to locate the flame detector installation location.
2. Install the replacement flame detector (part no. 66034) and gasket (part no. 81048) in the location shown. Secure the flame detector to the burner plate using the two screws removed in section 6.1.1, step 3.
3. Reconnect the flame detector lead wire.

6.2.2 Condensate Trap Maintenance

An external condensate trap is used on all Benchmark Models. The trap should be inspected, cleaned and reassembled as follows:

NOTE

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

NOTE

There are two slightly different types of condensate traps (part no. 24060) that may be used at your site; an older style without an inlet adapter, or a newer style with a built-in inlet adapter (see Figure 10). Maintenance is the same, except that the newer style does not need an orifice gasket (Step 5).

1. Remove the connections on the inlet and outlet sides of the condensate trap, shown in Figure 10.
2. Refer to Figure 10 and loosen the four (4) thumbscrews securing the cover on the condensate trap and then 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. On older-style traps, remove and discard the currently installed orifice gasket from the trap. A new orifice gasket will be installed in step 8. The newer traps, with a built-in inlet adaptor, do not use an orifice gasket, so this step may be bypassed for those traps.
6. Thoroughly clean the trap and float. Also inspect the drain piping for blockage. If the trap cannot be thoroughly cleaned, replace the entire condensate trap (part no. 24060).
7. Check the condensate drain pipe on the exhaust manifold (Figure 11) to ensure it is clear of blockage.
8. On older-style traps, replace the orifice gasket with a new gasket included with the kit (part no. 81092). Ensure that the replacement gasket is lying flat in the trap.
9. Replace the cover O-ring (part no. 84017) with the new one provided in the kit.
10. Reinstall the float with float guide attached.
11. Replace the condensate trap cover and tighten the four (4) thumb screws.

12. Reassemble all piping and hose connections to the condensate trap inlet and outlet.
13. Reconnect the trap to the condensate drain connection on the connecting manifold.
14. Ensure that the trap is horizontal and level to ensure proper drainage.

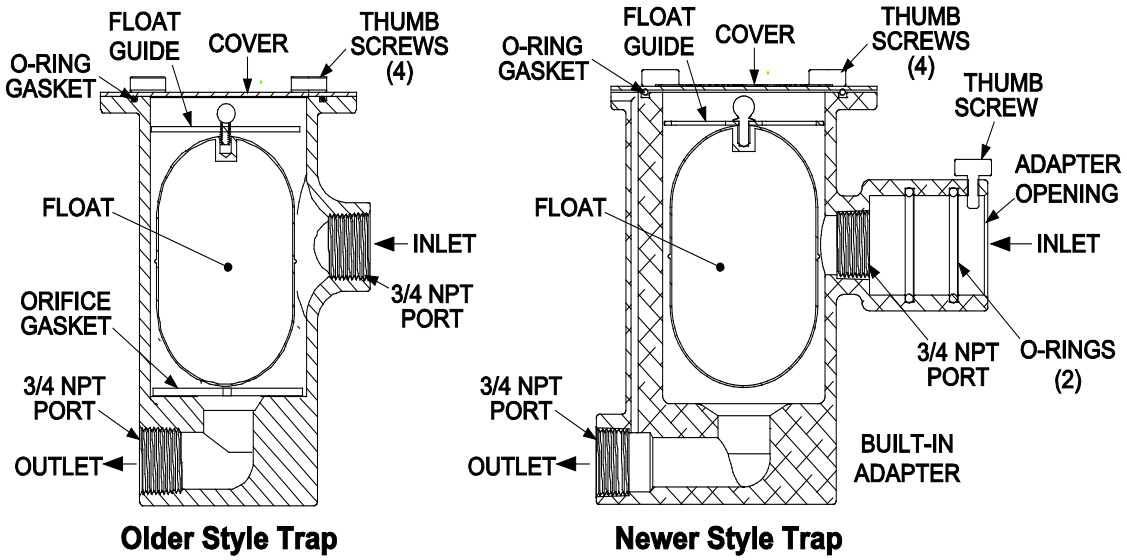


Figure 10. Condensate Trap Part No. 24060

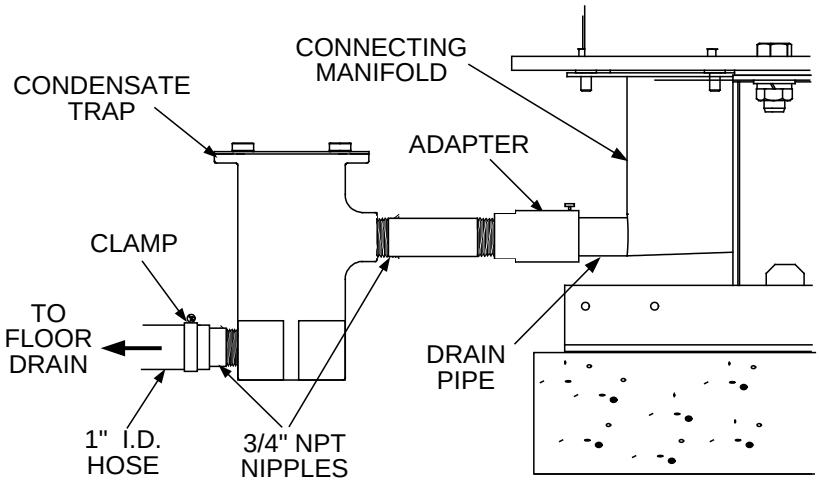


Figure 11. Connecting Manifold Condensate Drain Location

6.3 Replacing the LWCO Probe/Capacitor Assembly

The replacement LWCO probe sensor comes with a capacitor assembly attached. This procedure replaces an old probe assembly with a new probe assembly (P/N 69126).

1. Cut the shell harness wire just below the female spade connector (Figure 12). The new LWCO assembly includes a new female connector to crimp onto the shell harness wire.

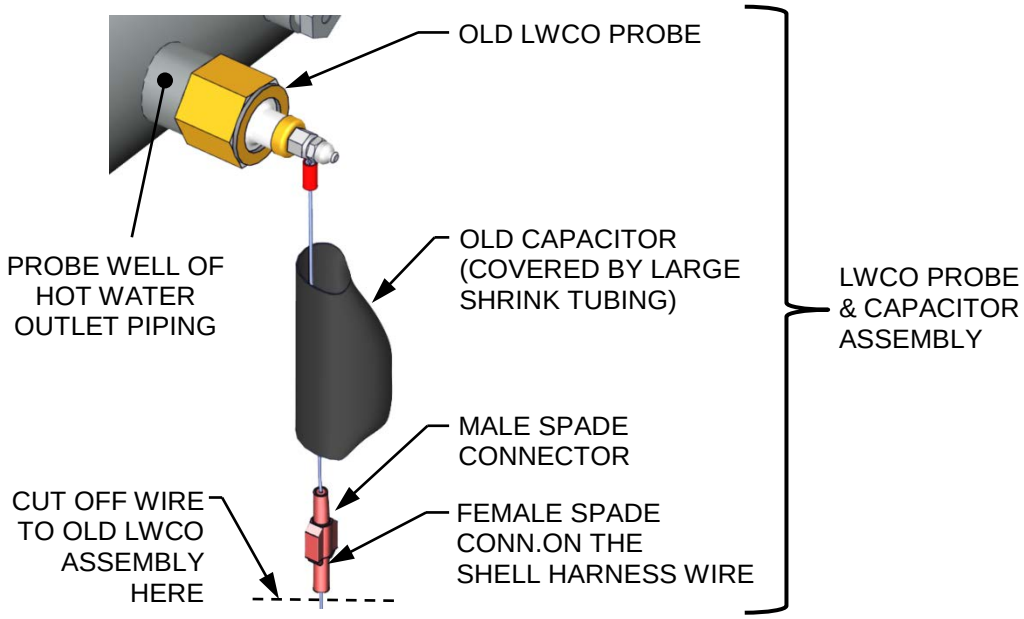


Figure 12: Removing Old LWCO Probe/Capacitor Assembly

2. Remove the LWCO probe from the recess well on the hot water outlet piping by unscrewing the brass coupling to which it is attached.
3. Retrieve the new LWCO probe from the kit and sparingly apply an NSF approved pipe dope to the threads of the brass coupling (Do NOT use Teflon tape) and install into the probe well vacated by the old LWCO probe.
4. The new LWCO assembly comes with a spare female connector already inserted into the male connector, and this should be crimped onto the stripped end of the shell harness wire.

6.4 Low Water Cutoff (LWCO) Capacitor Integrity Test

The LWCO capacitor should be tested for electrical shorts after it has been replaced. The LWCO capacitor integrity test consists of two parts as described in the next two sections. The first procedure explains how to test for electrical shorting of the LWCO probe capacitor, while the second procedure instructs how to perform the standard Low Water Cutoff test using the C-More controls.

Refer to Figure 13 for an illustration of the LWCO probe assembly and its typical installation.

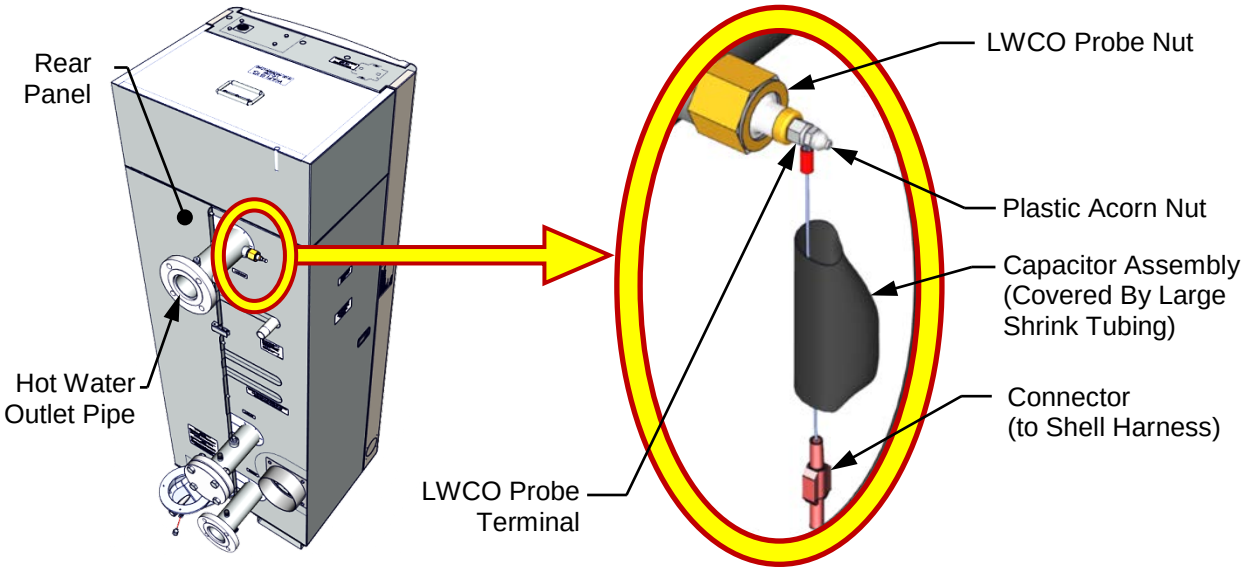


Figure 13: LWCO Probe Location (BMK750 Shown)

6.4.1 Low Water Cutoff (LWCO) - Capacitor Electrical Short Test

This test determines if there is an electrical short between the LWCO capacitor and the heat exchanger. Perform the capacitor electrical short test as described below.

1. Turn OFF AC power to the unit.

WARNING!

High voltages are used to power these units and so it is required that power applied to these units is removed first before performing the procedure described in this instruction. Serious personal injury or death may occur if this warning is not observed.

2. Remove the Shell Harness Cable (male) connector from the P-5 (female) connector on the rear panel of the C-More controller (see Figure 14).

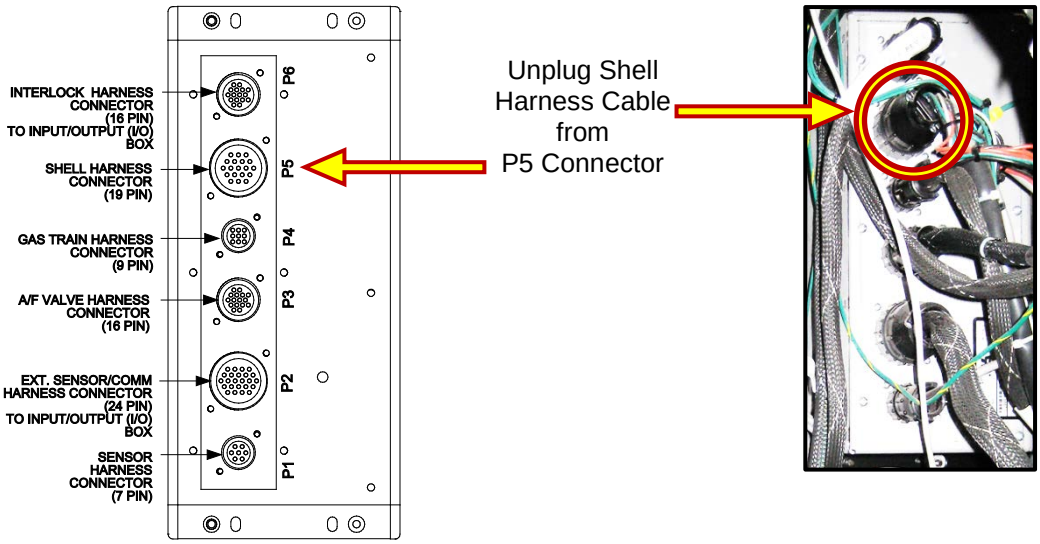


Figure 14: Removing Cable from P5 Connnector

3. Using an ohmmeter, connect one ohmmeter probe to the LWCO capacitor terminal on the unit shell as shown on left in Figure 15.
4. Connect the second ohmmeter probe to Pin #6 of Shell Harness Connector (removed from the C-More controller) as shown on right in Figure 15.

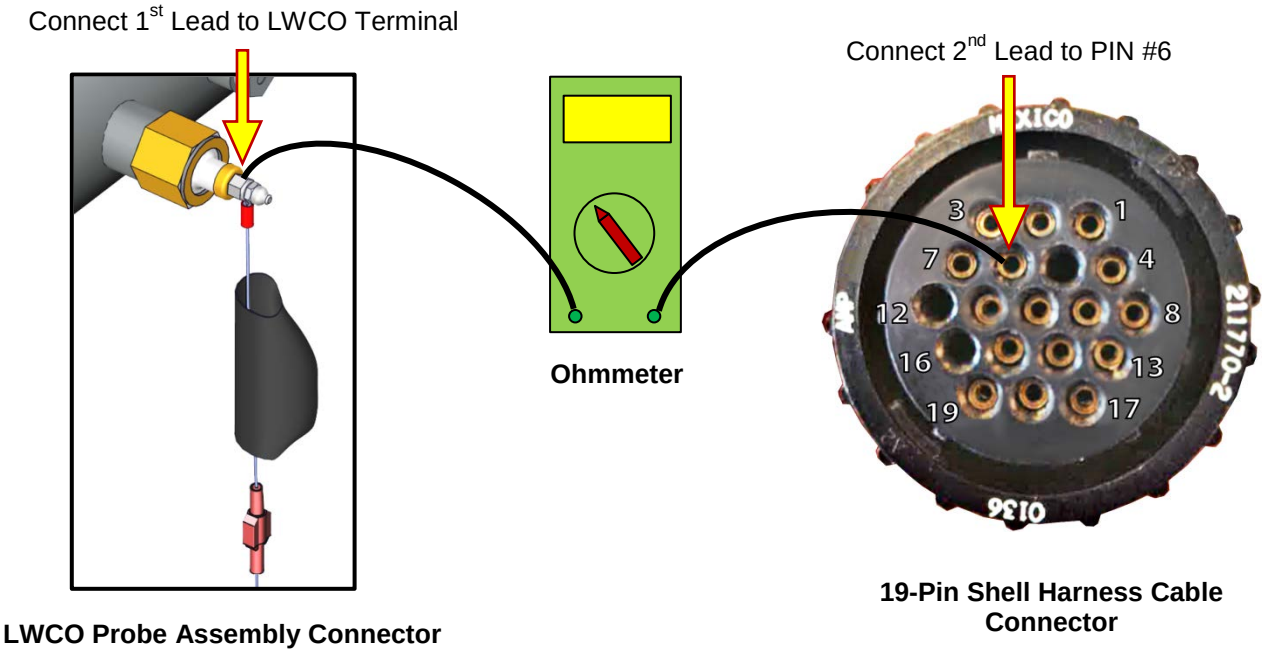


Figure 15: Connecting Ohmmeter between LWCO Probe & Shell Harness Cable

5. Confirm that the ohmmeter does NOT read a short.

NOTE

If the ohmmeter reads a short, the capacitor assembly needs to be replaced. See section 4.9 for replacement instructions or contact AERCO technical support for more information.

6. Remove both ohmmeter probes and reconnect the Shell Harness connector to the P5 connector on the rear of the C-More controller.

7. FINAL REASSEMBLY AND TESTING

Upon completion of all waterside and fireside inspections, reassemble the unit and perform the tests specified in sections 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 document, perform the Combustion Calibration Tests specified in Chapter 4 of the O & M Manual GF-116, or GF-117 (Dual-Fuel).

Following successful completion of the Combustion Calibration Tests, return the Benchmark 1.5LN Boiler to service use.

NOTES:

Change Log:

Date	Description	Changed By
12/08/2014	Rev-A: Initial release, converted from TSB- TSB-2009-15, replaced 66020 with 66034 per PIR 1028-3, added section 6.3 LWCO Replacement	Chris Blair

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