

BAM-1020 LEAK CHECK ADDENDUM

BAM-1020-9804 LEAK CHECK REV A



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1 INTRODUCTION

1.1 About This Addendum

This addendum has been written to address the minor disparity seen when performing leak checks with different types of filter tapes with the BAM-1020 monitor. A future revision of the product manual will incorporate the tests and troubleshooting located within this document.

1.2 Technical Service

Should support still be required after consulting the printed documentation, contact one of the expert Met One Instruments, Inc. Technical Service representatives during normal business hours of 7:00 a.m. to 4:00 p.m. Pacific Standard Time, Monday through Friday. In addition, technical information and service bulletins are often posted on our website. Please contact us and obtain a Return Authorization (RA) number before sending any equipment back to the factory. This allows us to track and schedule service work and to expedite customer service.

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Please have the instrument serial number available when contacting the manufacturer. On most models manufactured by Met One Instruments, it will be located on a silver product label on the unit, and also printed on the calibration certificate. The serial number will begin with a letter and be followed by a unique five-digit number such as U15915.

2 Leak Checks

The BAM-1020 requires periodic leak checks to ensure that the sample flow is not being diluted. Most leaks will occur at the nozzle - tape interface. A leak may also be caused by degraded O-rings, or an improper inlet tube to receiver connection.

NOTE: Only Met One Instruments, Inc. factory authorized tape should be used with the BAM-1020 monitor. Tape supplied by other vendors has not been tested or approved for use and any data collected using third party filter tape will not be considered valid.

Required Tools: Leak Check Valve (Part No. BX-305 or included as part of the BX-302)

Minimum Suggested Interval: Monthly and whenever the filter tape is changed.

2.1 Basic Leak Check

Use the following steps to perform the basic leak check:

1. Go to the TEST>PUMP menu. This will stop the current sample, if one is in progress.
2. Remove the PM10 size selective inlet from the sample tube and install the BX-305 leak check valve (or BX-302 zero filter). If a PM2.5 cyclone is being used, it should be left in place and included in the leak check. Verify that the leak valve is in the open position,
3. Press the PUMP button. The BAM-1020 will automatically lower the nozzle (if needed) and start the pump.
4. Allow sufficient time for the flow to stabilize at 16.7 LPM on the BAM-1020 display and then press the LEAK button. Verify the status changes to indicate LEAK ON.
5. Turn the BX-305 leak valve on the inlet to the closed position as shown in Figure 2-1.



Figure 2-1 BX-305 Leak Check Valve Installed on Inlet Tube

6. The pump flow rate should drop below 1.5 LPM.
 - a. If the flow rate is 1.5 LPM or less, the leak check is satisfactory. Proceed to step 7.
 - b. If the flow rate is greater than 1.5 LPM, the leak check fails. Proceed to step 7 and then repeat the leak test after completing step 11. If it fails a second time, go to section 2.2.
7. Slowly open the BX-305 valve to restore normal flow through the BAM-1020.
8. Press the PUMP button to turn off the pump and then go to the TEST > TAPE menu.

9. Advance the tape forward seven windows by pressing the UP arrow to set the WINDOWS field to 7 and then pressing the FWD button. The nozzle should raise automatically and then advance the tape. If the last sample spot is not clearly visible, advance the tape one window at a time until it is.
10. Inspect the last sample spot on the tape roll. Examine it closely for any abnormal deformation or holes. The presence of abnormalities indicates debris build up at that location of the nozzle / vane interface. These indicate areas of the interface that may require additional cleaning. Note that in low concentrations the sample spot may not be easily located.
11. Remove the tape and thoroughly clean the nozzle / vane interface as instructed in the MAINTENANCE, DIAGNOSTICS and TROUBLESHOOTING section of the BAM-1020 Operation Manual. Pay particular attention to areas shown to have build up in step 10 above.
12. Reinstall the filter tape as directed in the Filter Tape Loading section of the BAM-1020 Operation Manual. If step 6 failed, repeat the above leak check procedure now. If step 6 passed, continue on to step 13.
13. Exit to the Main Menu
14. Remove the BX-305 and replace the PM₁₀ size selective inlet.
15. Resume normal sampling operations.

2.2 Advanced Leak Checks

If the basic leak check detailed in section 2.1 fails, the following procedures will isolate the problem.

Required Tools: Leak Check Valve (Met One Instruments Part No. BX-305 or BX-302)
Nozzle Seal Tool (Part No. 7440)

2.2.1 Total System Leak Test

This procedure will create a positive seal at the nozzle / vane interface. With this seal in place, the rest of the flow system can be tested for leaks.

The following procedure assumes steps 1 through 6 in section 2.1 have just been completed and a flow rate of greater than 1.5 LPM was found.

1. If running, press the PUMP button to turn off the pump. Slowly open the BX-305 valve and then press the NOZZLE button to raise the nozzle.
2. Remove the filter tape from beneath the nozzle and insert the Nozzle Seal Tool with the hole positioned beneath the nozzle. See Figure 2-2.

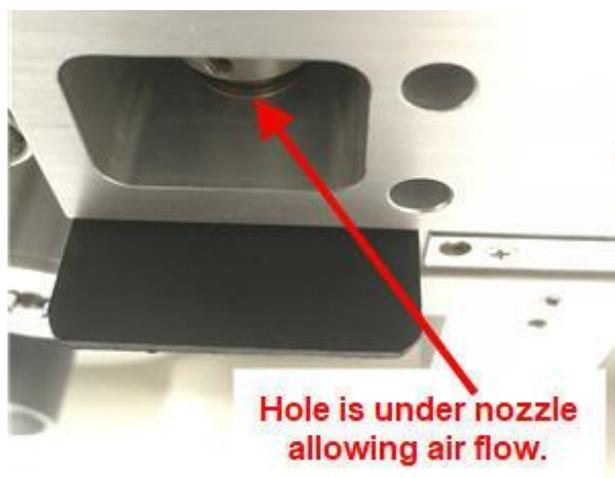


Figure 2-2 Nozzle Seal Tool with Hole Under the Nozzle

3. Verify the BX-305 valve is still mounted on the inlet and is in the open position.
4. In the TEST>PUMP menu. Press the PUMP button. The BAM-1020 will automatically lower the nozzle and start the pump.
5. Allow sufficient time for the flow to stabilize at 16.7 LPM on the BAM-1020 display and then press the LEAK button. Verify the status changes to indicate LEAK ON.
6. Turn the BX-305 leak valve on the inlet to the closed position as shown in Figure 2-1.
7. The pump flow rate should drop below 0.3 LPM.
 - a. If the flow rate is 0.3 LPM or less, the leak check is satisfactory. The high flow rate observed during the basic leak test is located at the nozzle / tape interface. Proceed to section 2.2.3
 - b. If the flow rate is greater than 0.3 LPM, then there is a leak somewhere in the system. Go to section 2.2.2 to locate the leak.

2.2.2 Lower Leak Test

This procedure will split the flow system at the nozzle / vane interface. With this seal in place, only the portion of the flow system downstream of this location will be placed under vacuum and tested for leaks.

The following procedure assumes the steps listed in section 2.2.1 were performed and a leak of greater than 0.3 LPM was found.

1. If running, press the PUMP button to turn off the pump. Then, press the NOZZLE button to raise the nozzle.
2. Rotate the Nozzle Seal Tool so that the solid portion of the tool is positioned beneath the nozzle. See Figure 2-3.

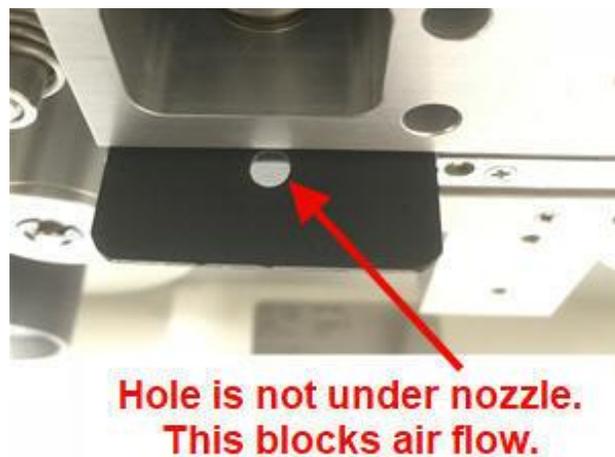


Figure 2-3 Nozzle Seal Tool with Solid Side Under the Nozzle

3. Verify the LEAK status still indicates LEAK ON. If not, press the LEAK button to turn it on and then press the PUMP button. The BAM-1020 should automatically lower the nozzle and start the pump.
4. The pump flow rate should drop below 0.3 LPM.
 - a. If the flow rate is 0.3 LPM or less, the leak check is satisfactory. This confirms that the leak is above the nozzle. Investigate all mating connections and O-rings in the flow path before the nozzle / vane interface to locate and correct the leak.
 - b. If the flow rate is greater than 0.3 LPM, then there is a leak downstream of the nozzle. Investigate all mating connections and O-rings in the flow path after the nozzle / vane interface to locate and correct the leak.
 - c. Once resolved, repeat the steps listed in section 2.1 to verify the flow system integrity.

2.2.3 Filter Tape Leak Test

Use this procedure to assess the actual leak rate at the nozzle / tape interface. It is assumed that the Basic Leak Check and the Total System Leak Test have both already been performed and a high flow rate (greater than 1.5 LPM) at the nozzle / tape interface was found. It is also assumed that the filter tape is still not installed.

Required Tools: Certified Calibration Transfer Standard (CTS) such as the BX-307
Nozzle Seal Tool (Part No. 7440)
Filter Tape (Part No. 460180)

1. Remove the BX-305 from the sample tube and install the calibration transfer standard (CTS).
2. Navigate to the TEST>PUMP menu.
3. The Nozzle Seal tool may already be installed with the hole positioned beneath the nozzle (see Figure 2-2). If this is not the case, press the NOZZLE button to raise the nozzle (if needed), position the sealing tool in this configuration, and then lower the nozzle.
4. If the LEAK status is set to LEAK ON, press the LEAK button to set the status to LEAK OFF.
5. Press the PUMP button to start the pump.
6. Allow at least 2-3 minutes for the flow to fully stabilize. When the flow rate stabilizes, write down the CTS flow rate value. This is the “Without Tape” value.

NOTE: *If after 5 minutes, the flow still has minor fluctuations, estimate the average flow rate and use that for the “Without Tape” value.*

7. Stop the pump and raise the nozzle.
8. Remove the Nozzle Seal Tool.
9. Place a three-inch-long piece of filter tape directly below the nozzle.
10. Press the PUMP button. The BAM-1020 should automatically lower the nozzle onto the strip of tape and start the pump.
11. When the flow rate stabilizes, write down the CTS flow rate value. This is the “With Tape” value.
12. Stop the pump and raise the nozzle.
13. Remove the strip of filter tape.
14. Subtract the “With Tape” value from the “Without Tape” value using the following equation:

$$\text{WithoutTape} - \text{WithTape} = \text{LeakRate}$$

The result should be a positive value of 0.3 LPM or less. A typical example might look like this: 16.71 LPM – 16.58 LPM = 0.13 LPM

- a. If the difference is 0.3 LPM, or less, the leak test passes. Record the results (as needed), remove all test equipment, and resume normal sampling operations.
- b. If the difference is greater than 0.3 LPM, an out of tolerance leak exists at the nozzle / tape interface. Thoroughly clean the nozzle and vane area and then perform this test again. Repeat this test. If after a couple of attempts this test still fails, contact the Met One Instruments, Inc. service department (see section 1.2) for assistance.