

# **BX-302 ZERO FILTER CALIBRATION KIT MANUAL**



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## Overview:

This manual describes the procedure for using the BX-302 Zero Filter Calibration Kit to audit or adjust the Background value on the BAM-1020 particulate monitor. These instructions must be followed carefully to obtain the best accuracy from the unit. Refer to the BAM-1020 operation manual for more information.



**BX-302 Zero Filter Kit Installed on a BAM-1020 Inlet**

## About the Background:

The BACKGROUND value is the factory-set zero correction (slope offset) for the BAM-1020 concentration data. This is determined by running the unit for a couple of days with a HEPA zero filter on the inlet. The concentration values over this time are averaged, and the BKGD is the negative of this average. All of the stored and displayed concentration data contains this correction. The BKGD value varies from unit to unit, and is typically a number between +0.001 and -0.003 mg/m<sup>3</sup>. **Warning:** This is a unit-specific calibration value which may significantly affect the accuracy of the unit.

The BKGD value is factory calibrated for each BAM-1020 under laboratory conditions, and is typically never changed on units set up for PM<sub>10</sub> monitoring. Units configured to monitor PM<sub>2.5</sub> should have this value field verified during initial unit deployment and at a recommended interval of every six to twelve months afterward using the BX-302 Zero Filter Kit. The test corrects the BKGD value to compensate for minor variations caused by local conditions such as grounding and shelter characteristics.

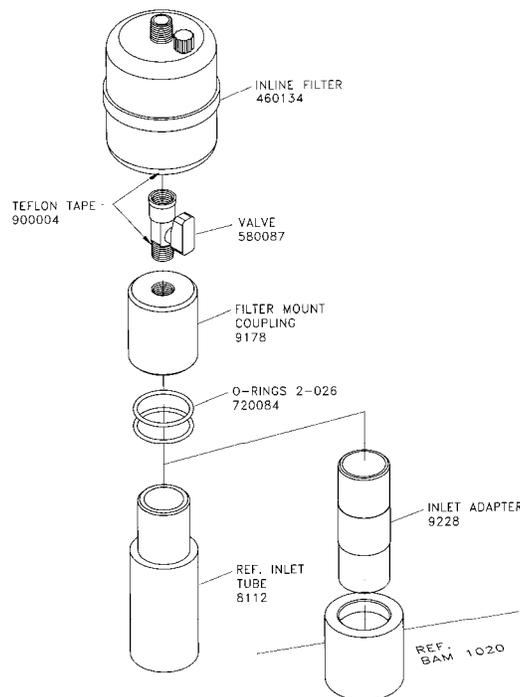
The test should not be performed during a period of rapidly changing weather. The room air temperature also must not change rapidly during the course of any one hour. This prevents noise caused by changes in air density between the beta source and detector being measured as mass. Temperature changes of less than 2 degrees between the beginning and the end of each sample hour are okay. The exact temperature is not important, as long as it remains fairly constant. Large equipment and radio towers in close proximity can also cause noise.

## Equipment Required:

- BX-302 Zero Filter Calibration Kit
- BAM-1020 Fully installed and operational per the operation manual.
- Computer with HyperTerminal or similar communications software.
- BAM-1020 serial cable
- Spreadsheet program, such as Microsoft Excel®

## Setup:

- The BAM-1020 should be installed in its normal shelter at the site where sampling is to be performed. The unit must be configured for normal operation in its usual environment. The BAM-1020 must be powered up for about 24 hours before starting the test, but does not necessarily need to be sampling during warm-up.
- The Smart Heater (if used) must be installed and operating normally. It must be set for the normal RH setpoint, typically 35%.
- Remove the PM<sub>10</sub> and PM<sub>2.5</sub> inlet heads, and install the BX-302 zero filter assembly onto the top of the inlet tube as shown in the diagram below. Make sure the assembly is fully seated. Use O-ring lubricant if needed.
- If there is any chance of precipitation, install the included 90° Nylon fitting and length of Tygon tubing to keep rain out of the filter.
- The BKGD (Background) value is located in the SETUP > CALIBRATE menu. **Record the previous value**, then change it to **0.000**. Exit back to the main menu.



## Leak Check:

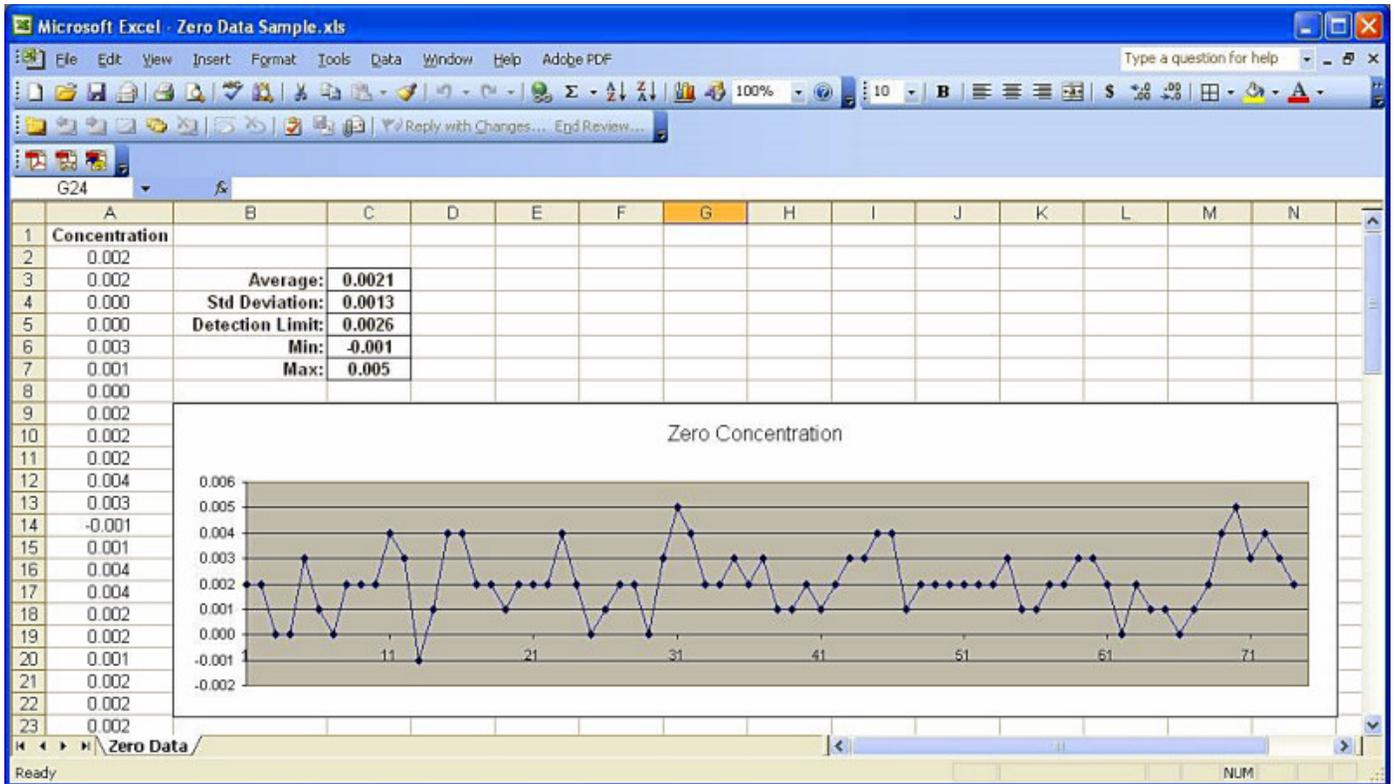
A leak check must be performed before proceeding with the Background test. Leaks at the nozzle can appear as background noise. See the BAM-1020 manual for more information on the leak check, nozzle cleaning, and fixing a leak. Perform the following steps to check for leaks:

1. Clean the nozzle and vane (under the filter tape) with isopropyl alcohol and cotton-tipped applicators as described in the BAM-1020 manual.
2. Turn the valve on the BX-302 filter to the OFF position to prevent any air from entering the inlet tube.
3. In the TEST > TAPE menu, advance the tape to a fresh, unused spot.
4. In the TEST > PUMP menu, turn on the pump. The flow rate should drop below 1.0 LPM. If the leak value is greater than 1.0 LPM, then the nozzle and vane may need cleaning, or there may be another leak in the system.
5. Resolve the leak and perform the check again. A properly functioning BAM will usually have a leak value of about 0.5 LPM with a clean nozzle and vane using this method.
6. Turn the pump off and exit to the main menu. Open the valve on the BX-302.

## Background Test:

1. After the 24 hour warm-up, start the BAM sampling for about 72 hours. (The unit should be operating just like it would for regular PM<sub>2.5</sub> sampling, only with the zero filter installed instead of the PM<sub>10</sub> head and cyclone.)
2. After 72 hours of sampling; download the hourly concentration data from the unit and import it into Excel<sup>®</sup> (or equivalent) for analysis.
3. The error log should not contain any error flags during the test period. Investigate any errors.
4. The first four hours of data may be discarded and the remaining hours used for analysis. This accounts for the tape tracking itself for the first few hours if not correctly centered when installed.
5. Graph the concentration data. The zero noise levels of the BAM-1020 from the test will be visible. The example below shows a typical low-noise data set from a new BAM-1020.
6. Calculate the standard deviation of the data (STDEV function in Excel) to four decimal places. This value varies from unit-to-unit, but should be less than 2.4 micrograms. The lower the number, the better the noise characteristics of the unit.
7. Calculate the average of the zero data to four decimal places. Calculate a new **BKGD** value for the unit by taking the negative of the average. For example, on the data below the average of the zero data was 0.0021 (2.1µg), so the new BKGD is -0.0021 (-2.1µg). Enter the new BKGD value into the BAM in the SETUP > CALIBRATE menu.
8. Compare the new BKGD to the factory BKGD value recorded before the test. The two values should be within a couple of micrograms. If the values are considerably different, check the BAM for leaks at the nozzle and verify the temperature stability of the room.

9. Make a record of the test results and any BKGD value changes and keep it with the calibration certificate for the BAM-1020 unit.
10. Remove the BX-302 filter and reinstall the PM<sub>10</sub> and PM<sub>2.5</sub> inlets.



BAM-1020 Zero Data Analysis Sample

## Technical Support

Should you still require support after consulting your printed documentation, we encourage you to contact one of our expert 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 expedite customer service.

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