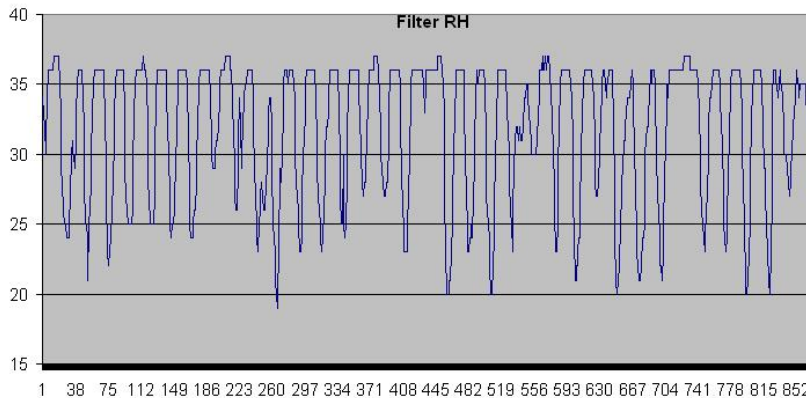




## BAM-1020 Filter RH Audit and Calibration Notes

The BAM-1020 contains a filter RH sensor located in the sample flow path, downstream of the filter tape. It measures the humidity of the sample air to control the Smart Inlet Heater system. The heater turns up or down as needed to maintain the sample near or below the default 35% RH setpoint. If the filter RH gets too high (especially above about 50%), the particulate can absorb moisture causing the unit to over-measure. The BAM-1020 is usually set to log the hourly filter RH averages on channel 4 of the data array. A typical filter RH graph is shown below:



The Smart Inlet heater should always feel warm to the touch when the BAM is operating, even if the filter RH is below 35%. Make sure the inlet heater gets hot when the sample RH is high. If not, a heater malfunction may be causing the high RH readings. There is no point in auditing the RH sensor if the heater is not working. When the filter RH exceeds the 35% setpoint by more than 1%, the BAM will turn the inlet heater up to a higher wattage to reduce the RH back below the setpoint. This method usually results in very good clipping of the filter RH at just above 35%, even if the ambient RH exceeds 90%. There may be some times when the RH goes a few percent higher than the setpoint depending on the characteristics of the ambient air and the heater cycle. If the filter RH regularly exceeds the setpoint by more than a few percent, then the Smart Heater and filter RH sensor should be audited.

The filter RH sensor is Met One part 9278, and it is a  $\pm 4\%$  device. If the sensor fails, it usually reads something impossible like -25% or 135% RH. It is difficult to effectively correlate a value from an ambient RH meter to the BAM filter RH reading, because the BAM has some self-heating caused by the Smart Heater and electronics which causes the filter sensor to always read significantly lower than ambient RH unless fully equilibrated. The RH calibration is described in section 7.19 of the BAM-1020 manual, and involves offsetting to the BAM filter RH reading to force it to match your external RH standard. **If the BAM sensor is calibrated without first being equilibrated fully to ambient, you will enter a value from your RH audit device into the BAM which is much higher than the BAM reading**, which will introduce a large positive offset so that the BAM filter RH values always look too high. We have seen some customers incorrectly adjust the BAM filter RH sensor by as much as +50% higher than the default factory calibration. If you want to calibrate the BAM filter RH sensor, then you must first fully equilibrate the sensor to ambient, or else remove the sensor from the flow path during calibration. The BAM-1020 Rev G manual does not make this completely clear.

Example: A user enters the TEST > FILTER RH screen and sees that the BAM RH sensor reads 20%, but his handheld RH audit device reads 50%. Without allowing the sensor to fully equilibrate, he enters 50% into the REFERENCE field and pressed CAL. The BAM reading changes to 50% because the BAM has now added a +30% offset to all RH readings, even though it was working correctly before. Now the BAM RH readings are always 30% too high and the RH graphs look like the BAM is not regulating the sample RH when it actually is. In addition, the Smart Heater is now almost always on full power when not needed. The solution is to hit the RESET key to remove the calibrations and restore the factory default, then equilibrate or remove the sensor and compare it to his standard in the correct way.

**To equilibrate the sensor without removing it:**

- Enter the TEST > FILTER RH screen. The BAM will raise the nozzle and turn the pump on to pull room air past the RH sensor.
- Unplug the Smart Inlet Heater and allow the BAM to cool completely to ambient. This might take an hour or more if the heater has been operating at top wattage.
- Continue to the sensor calibration steps as described below.

**To remove the sensor from the flow system for calibration:**

- Enter the TEST > FILTER RH screen.
- Unplug the Smart Heater.
- Remove the case cover from the BAM-1020.
- Remove the filter RH sensor by unplugging it from its compression fitting. Leave the harness from the sensor plugged into the circuit board so that the sensor continues to function.
- The RH sensor is sensitive to ESD (static discharge) damage and contamination from oils, so **the element on the end of the sensor should never be touched!**
- Move the sensor away from the BAM so that an accurate ambient RH value can be obtained. Allow the sensor to equilibrate for at least five minutes.
- Compare the BAM reading on the display to the reading from your reference RH device.
- Enter the reference value into the BAM display if needed and press CAL to change the BAM value to match.
- If you press the RESET key, the BAM will remove all field calibrations from the sensor and restore the default factory calibration. Don't press the CAL key after resetting the sensor, or you will load whatever meaningless value is in the REFERENCE field into the calibration!

**Both of these methods involve some time and effort. If you do not have time or the proper understanding to calibrate the BAM filter RH sensor in the field, then we recommend that you leave the factory default calibration alone as long as the readings look like reasonable RH values.**