2B Technologies, Inc.

An InDevR Company

Technical Note No. 019

Cleaning Procedure for Model 205 Ozone Monitor

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Summary:

It is recommended that Ozone Monitors be returned to 2B Tech at least once annually for calibration. This includes cleaning of the entire flow path and installation of a new internal ozone scrubber. If the flow path becomes contaminated, as evidenced by large positive or negative offset (Z) and/or low slope (S) calibration parameters, it may be necessary to clean the flow path and replace the analytical ozone scrubber. This can be done by the user if desired. The procedure involves the following steps:

1. Remove the top and bottom covers.
2. Bypass of the analytical ozone scrubber.
3. Bypass the DewLines™ (Nafion tubes).
4. Connect a drain tube at the exit of the innermost detection cell.
5. Squirt methanol through the flow path while the instrument is running.
6. Blow dry with clean compressed air or nitrogen.
7. Check the DewLines™ for contamination.
8. Replace the analytical ozone scrubber.
9. Reconnect plumbing.

Tools needed:

-Philips head screw driver
-Teflon®-lined Tygon® or other clean, inert tubing such as PTFE, PFA or PVDF
-Methanol (methyl alcohol)
-Squirt bottle
-New ozone scrubber

Warning: This procedure makes use of the toxic and flammable solvent methanol, and appropriate care should be taken. Although a relatively safe solvent to work with, as with all solvents appropriate care should be taken. Remove any clothing contaminated with methanol. If methanol contacts your skin, wash the affected areas with soap and water for at least 15 minutes. If methanol gets in your eyes, wash your eyes with water for at least 15 minutes, occasionally lifting and lowering the upper and lower eyelids and seek medical help.

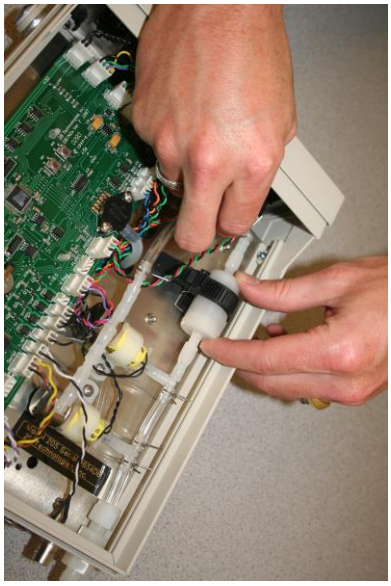
Procedure:

1. Remove the top and bottom covers:

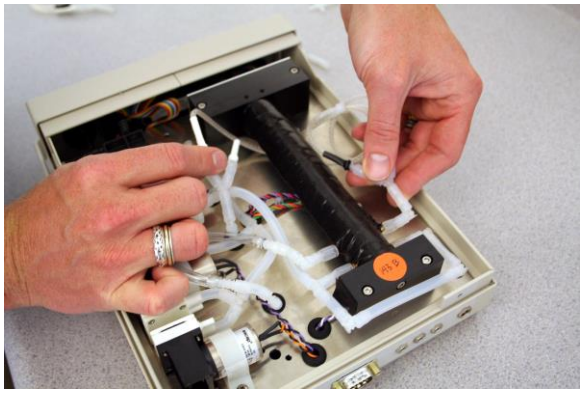
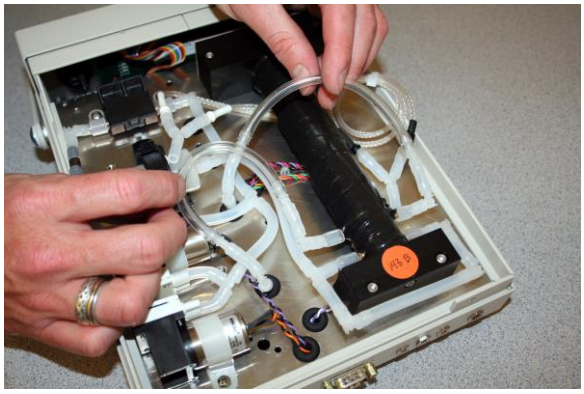
   a. Remove 4 screws on back of instrument.

   b. Remove top and bottom covers by lifting at rear and sliding toward the back of the instrument.

2. Bypass the analytical ozone scrubber by disconnecting both ends of the scrubber and replacing it with a short piece of clean, inert tubing such as Teflon-lined Tygon®, PTFE, PFA or PVDF. **Do not use Tygon!** A cleaning loop for this purpose was provided with the instrument, but other tubing may be used.




3. Remove the DewLines™ at both ends and replace with clean, inert bypass tubing. Note that each DewLine™ consists of two sections of Nafion® tubing connected in parallel.

4. Disconnect the tubing from outlet of the innermost detection cell and replace it with a drain tube. This can be any kind of tubing; silicone tubing is shown here. You can, for example, disconnect the section of tubing connected to the pump and use it as the drain.


5. **Put on goggles and plastic or rubber gloves. Carry out the cleaning procedure in a hood or well ventilated area. Make sure there are no sparks or flames nearby. Collect the waste solvent and dispose of properly. Don't pour methanol down a drain.** Use a squirt bottle to force methanol through the flow path while the instrument is running. You should pass at least 50 cc of methanol through the instrument. The purpose of having the instrument running is to clean both sides of the two 3-way solenoid valves. These valves switch states every 2 seconds.

6. Dry the flow path with clean, compressed air or nitrogen while the instrument is running. Be careful during this step and use low pressure to begin with as large quantities of methanol will spew out initially.

7. If the DewLine™ has become contaminated (as noted by discoloration), it should be replaced, or returned to 2B Technologies for cleaning.

8. It is recommended that you replace the analytical ozone scrubber (the one you bypassed) during this step. If the flow path was dirty, then the scrubber will be dirty as well. A contaminated scrubber will typically cause a large offset in the measurement and may re-contaminate the flow path. The ozone scrubber on the opposite side of the instrument that protects the air pump may be changed at this time as well, although that ozone scrubber has no effect on the measurement.

9. Reconnect the plumbing and replace the instrument covers. Photos of the top and bottom of the instrument are shown on the next page as a guide.

Additional Cleaning: When calibrated, the Ozone Monitor should have an offset (Z) in the range ±10 ppb and preferably ±5 ppb. The slope calibration parameter should be in the range 0.90-1.10 and preferably 0.94-1.06. Offsets and slopes outside this range are most often due to a contaminated flow path. Sometimes it requires more than one cleaning to correct a highly contaminated instrument. If methanol alone is not adequate, it is helpful to do a first cleaning with hexane and a second cleaning with methanol. All of the cautions concerning the use of methanol apply to hexane as well. If cleaning of the flow path in combination with replacing the ozone scrubber does not correct the problem, please return the instrument to 2B Technologies. We will provide you with an estimate of any required repairs before doing the work.

If you have an ozone source, it is helpful to 1) clean the instrument with methanol, 2) expose the instrument to high ozone levels (ppm and above) for several minutes to

hours, and 3) clean the instrument again with methanol. The ozone will oxidize contaminants to form polar oxygen-containing compounds that are more soluble in methanol.

Note: You can check the zero of the instrument by running it with an external ozone scrubber attached. Keep in mind that the external ozone scrubber must be clean; otherwise, it will desorb UV-absorbing compounds and cause an apparent offset that is not real.