

Vaporizer Cleaning Procedure

Overview

This procedure was developed to clean vaporizers which have been exposed to water soluble compounds such as salts. This procedure can be performed by any user with common tools found in the laboratory and does not require disassembly of the vaporizer.

Time requirements

Elapsed time 15 hours

Vaporizer cool down- 2 hours

Actual cleaning time- 1 hour

Purge out cycle -12 hours

Picarro recommends starting this procedure at approximately 1pm so that the instrument will be ready for operation the following morning.

Required Materials

Vaporizer connections:

2' x 1/4" OD PTFE tubing, quantity two

Stainless steel female Swagelok fitting assembly (nut, ferrule and backing) for 1/4" tubing, quantity two

1/16" to 1/4" male-male Swagelok adapter, quantity 1

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7/16" 20-NF coupling nut (18-8 steel), quantity 1

Number 13 o-ring (Viton), quantity 1

Silicone sealant (optional)

Solvent source

Funnel with 1/4" ID spout, maximum funnel diameter recommended

Electrical tape for sealing tubing to funnel

Notes:

The above set up is for gravity feed. Alternatively a low, higher pressure flow pump can be used. A good low cost choice for water would be a pump for small indoor fountain, pump needs to have a head of 20" or more. The 1/16" outlet tubing of the vaporizer will restrict flow and cause backpressure.

Solvent (Customer Supplied)

1.5 liters Deionized water or very low mineral content water

Notes:

Solvent should be chosen based on the solubility of the residue in the analyzer in that solvent. Any possible chemical transformations of the original analyte, when subject to 140 C, should be considered. Remember the valve plungers are made of Viton and EPR which have limited compatibility with organic solvents. Picarro assumes no responsibility if solvents other than water are used for this cleaning procedure.

Other:

Vaporizer vertical stand (VVS)

Vaporizer cable extension

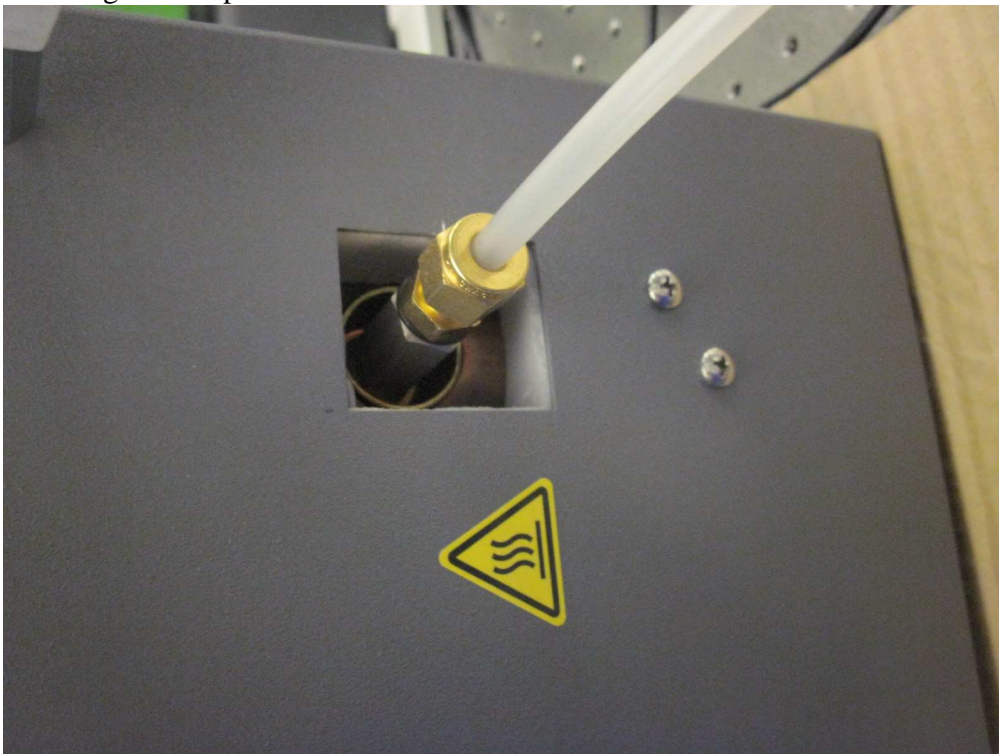
Paper towels (customer supplied)

1-2 liter container for capturing excess solvent (customer supplied)

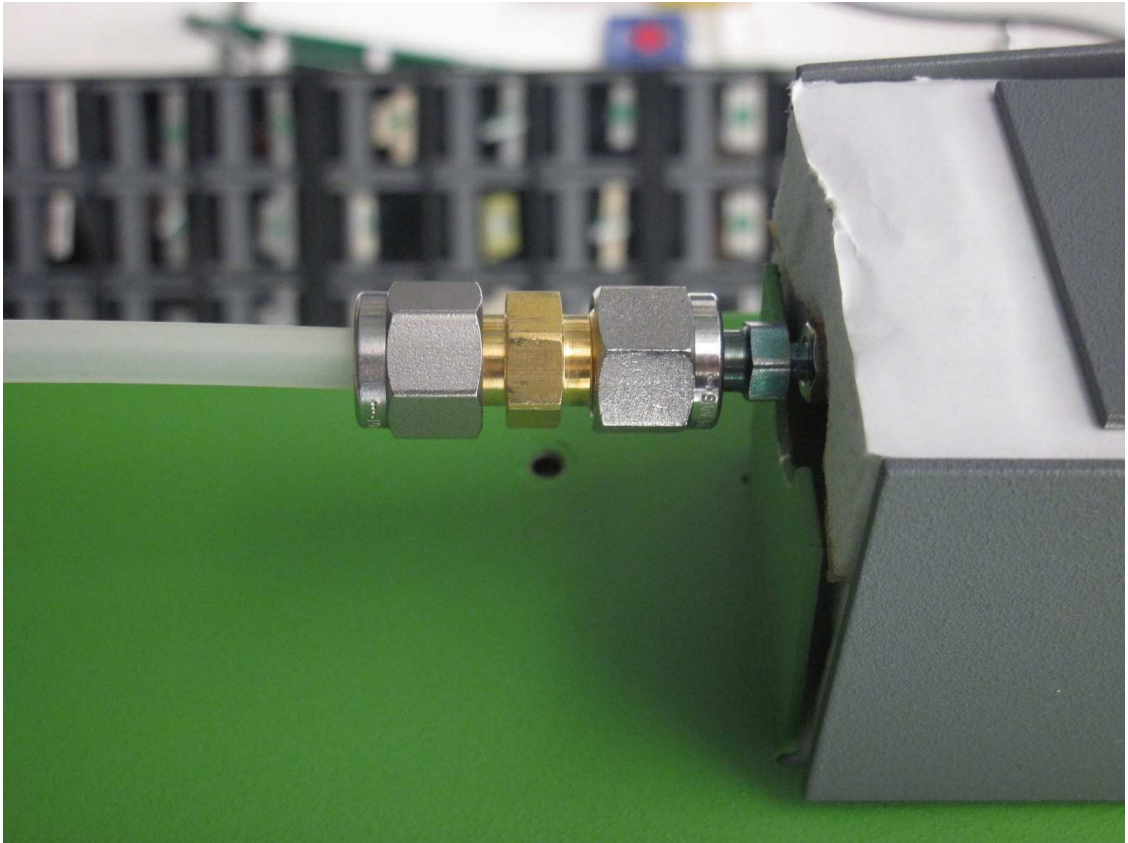
Stand or shelf approximately 24" high (customer supplied)

Procedure

1. Unplug and disconnect vaporizer from analyzer. The main connection to the purge and sample ports on the vaporizer, the vacuum line, and the connection between the vaporizer outlet and analyzer should be disconnected.
2. Remove vaporizer from autosampler mounting.
3. Allow to cool 2 hours. If the vaporizer is too hot then the tubing may melt and the thermal shock of adding liquid water at high temperature may damage the vaporizer.
4. Remove injector port and septa, any visible solid material seen in the port should be left in place. Carefully check port is not hot to the touch.
5. Connect ¼" tubing with funnel to injector port using coupling nut and male-male Swagelok adapter.



6. Connect ¼" to vaporizer outlet using 1/16" to ¼" adapter. Place container at the outlet of the tubing, this will capture the rinse waste.



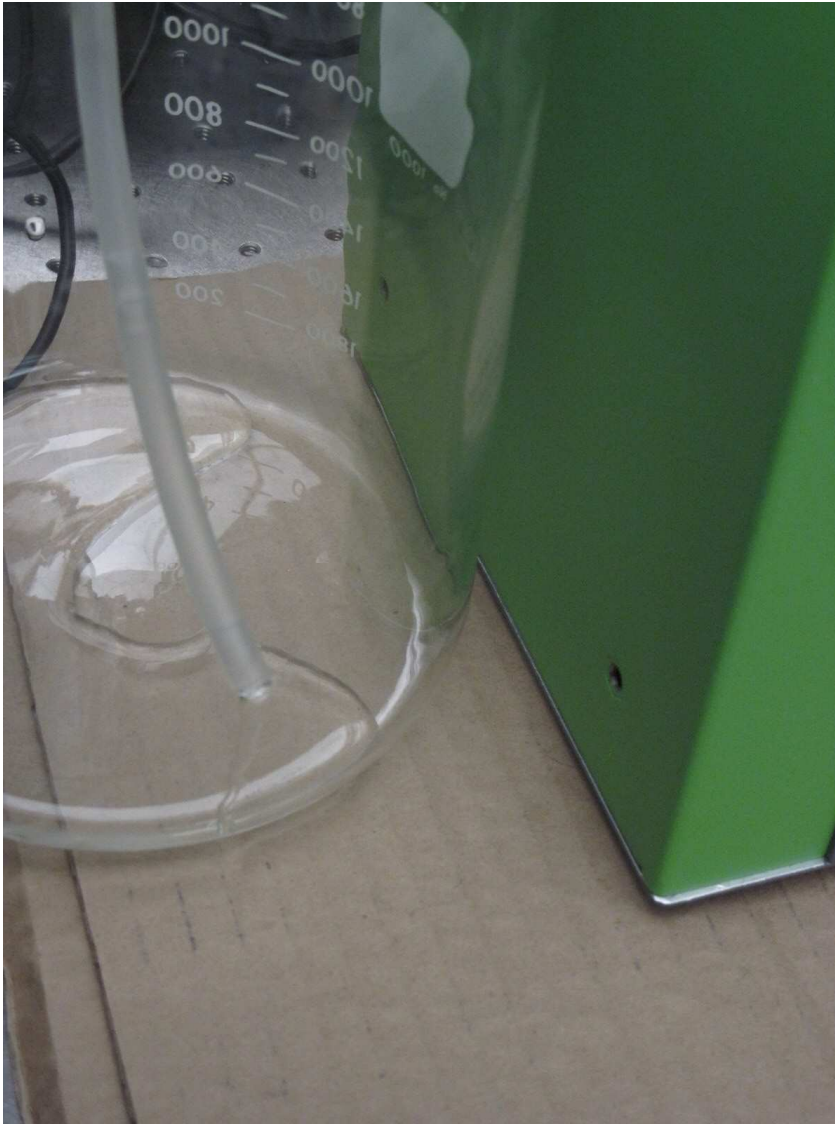
7. place vaporizer in VVS display side down, display fits into notched cutout



8. Place capture container at outlet of 1/16"-1/4" section of tubing
9. Place funnel approximately 1' above top of vapor (ideally secured to a shelf not directly above the vaporizer. This configuration will fill the vaporizer from the bottom up and allow air to escape.
10. Connect the vaporizer cable extension to the existing vaporizer cable and the back of the vaporizer. Start the vaporizer cleaning software application.
11. Place a dry paper towel underneath the connection at the injector port (Note: this will catch any small leak and indicates there is problem. If this is wet stop immediately).

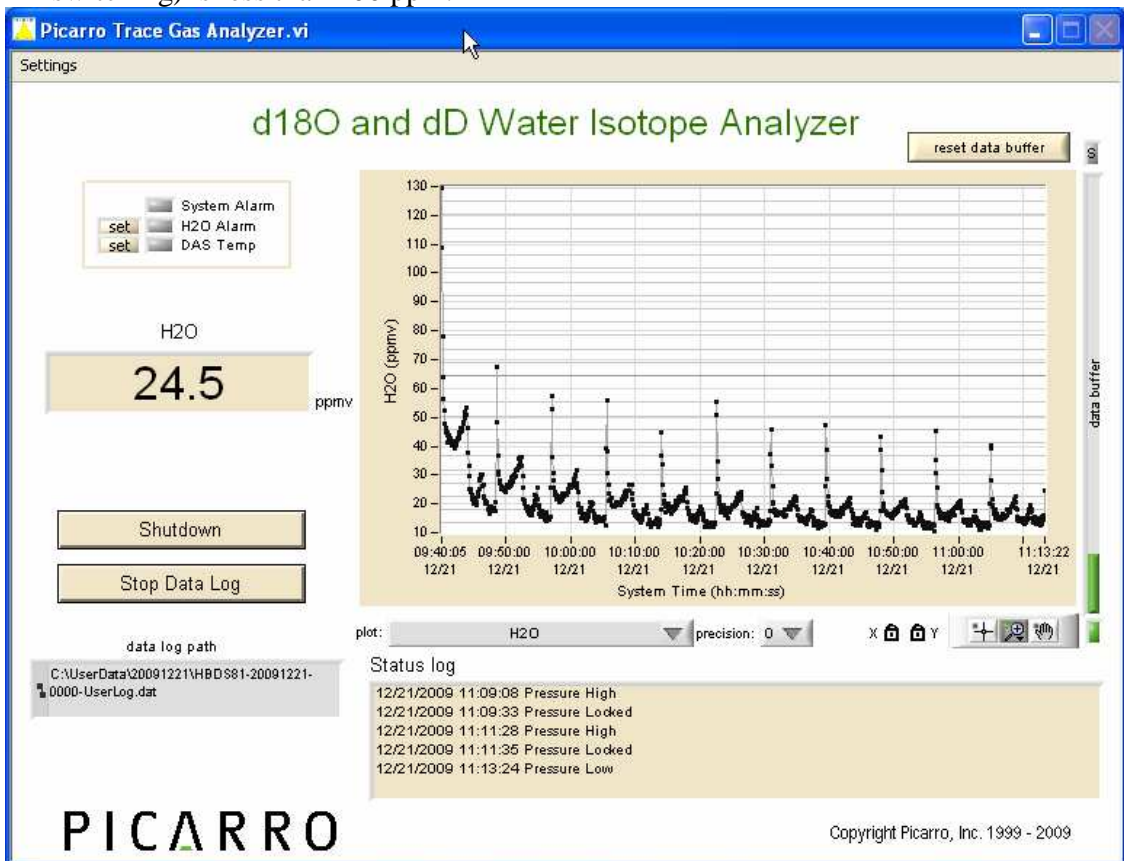


12. Prepare 500 mL of solvent, warm water (40-70 C) is recommended.
13. Verify the tubing connections are secure, the vaporizer must be unplugged from the main electrical line. If there is a leak then solvent can enter portions of the vaporizer housing which are not designed to be wetted and damage/electrical short circuit may occur.
14. In the vaporizer cleaning software select “open outlet valve”.
15. Pour the water into the funnel slowly. Verify the solvent front is moving through the tubing. Check for leaks especially at the funnel/tubing joint and the injector port. Do not overfill the funnel.
16. The vaporizer requires approximately 20mL to fill. Solvent should start dripping out a steady dropwise rate from the outlet line.



17. Set aside the rinse from the first 500mL in a separate container.
18. Repeat steps 12-15 two times more.
19. Verify the third rinsing is free of solutes, if rinsing out inorganic salts the conductivity of the solution can be checked and compared again the pure solvent (water). Use a conductivity meter or multimeter set to read Ohms to do this. For other compounds an appropriate measurement method should be used (UV-VIS, GC, etc). Perform additional rinsing if necessary.
20. Place funnel/tubing assembly into rinse container and lower both items to below the level of the injector port. This will drain the remaining liquid from the vaporizer.
21. Connect low pressure (2-3 psi) air supply (needs to be free of oil and organic contamination but not dry) to vaporizer outlet tubing. The aquarium air pump commonly used with the waste port of the autosampler can be used for this, as can the actual dry air supply. Allow to run 30-60 minutes, there will be visible condensation and droplets in the line.

22. Discard of all rinse waste appropriately.
23. Turn off the “open outlet valve” in the software and remove tubing connections
24. Inspect the injector port for visible material. If they are still there after the cleaning procedure the material is not sufficiently soluble in the solvent. If some has dissolved then repeat procedure using higher temperature solvent or more rinsing, if none has dissolved then use a different solvent.
25. Reconnect the vaporizer to the analyzer, be sure to remove the vaporizer cable extension. Plug the vaporizer into the main electrical line.
26. Select the “vaporizer pumpdown routine” in the vaporizer cleaning software and allow to run for 12 hours. The analyzer software may show a very high water reading initially but should return to a moderate value (<10000 ppm) within 5 minutes.
27. The H₂O concentration reported by the instrument will exhibit a saw tooth pattern over time. Verify the maximum value of spikes (which as associated with valve switching) is less than 200 ppm.



28. Exit the vaporizer cleaning software. The analyzer is now ready for use.