

To replace to neph zero valve and coupler assembly:



- 1) Before disassembly, note position of ball valve [1] (closed or open) and metal butterfly flange [2]. Also, check the distance between the IR reflective sensor [3] and the metal butterfly flange. You will try to duplicate these positions when finished.
- 2) Disconnect ribbon cable J17 [4].
- 3) Disconnect tube [5] from small filter to inlet block [6].
- 4) Remove large white HEPA filter [7]. This will involve loosening any of several nylon Swagelok nuts [8, 9, 10] and then turning the filter off of the threaded stem [11].
- 5) Get a 9/16" socket wrench and start to remove the 4 long threaded bolts [12] that secure the ball valve to the instrument housing. Get a feel for how tight they are screwed in. When finished, you will screw these bolts down but only so tight as to compress the o-rings and securely hold the ball valve in place. I think it is possible to torque these bolts down too hard, but unfortunately I don't have a torque wrench reading to give you.
- 6) When you remove the bolts, the inlet block will come off and the coupler assembly [13] will separate. Put the inlet block aside for now. Check the position of the coupler section that is on the shaft of the ball valve. In order to replace the old ball valve, you will have to remove this section of the coupler assembly from the old ball valve shaft. Note which groove on the valve shaft the allen screws go into (there are 3 grooves on the shaft). Get a new ball valve from the parts I sent down and put this coupler section on the new ball valve shaft exactly as it was on the old one.
- 7) Replace the shattered black plastic piece of the coupler (that goes between the two silver sections) with the new replacement piece.
- 8) Reposition the new ball valve on the instrument housing. Loosely tighten all four bolts to hold down the inlet block/ball valve assembly. When it will just hold itself, check the position of the coupler. Make sure the two ends are meeting nicely in the middle, that the shafts are more or less aligned, and that there are no big gaps lengthwise that could cause problems. Make sure the distance between the IR reflective sensor and the metal butterfly flange is about the same as it was before you started, generally < 1/8".
- 9) Tighten down the 4 threaded bolts. Make sure they are tight enough to compress the o-rings and that the ball valve will not move (even if you try to make it move by pushing it). Do not over tighten the bolts as this could cause the ball valve to deform and not turn smoothly. So, I guess I'm saying tighten the bolts pretty tight but not as tight as you could tighten them!
- 10) Replace HEPA filter. Use Teflon tape or a flexible silicone sealant on the threaded stem. Tighten all Swagelok nuts nice and tight.
- 11) Reconnect filter tube and ribbon cable.

When this is finished, please perform a couple of tests. First, make sure the zero valve turns as it is supposed to. From the data collection program, go to the neph screen. Bring up the detailed menu for the neph. On this screen you should see choices for switching the zero valve to the zero state or the sample state. Toggle this software switch and make sure the valve turns as it is supposed to. When the software thinks the valve is in the zero state, look in the inlet and verify that the valve is closed.

Next, perform a nephelometer zero. The software command can also be issued from the neph menu. This will take about 5 minutes and is all automatic. The zero values you come up with on this zero should be similar to those from the previous zero. If they are not then we may have a problem.

Next perform a neph span check. Again, this command is on the nephelometer menu. Hopefully after all this you get a good span check with average errors at the few percent level or less. We should be able to see the results of the span check when it is completed.