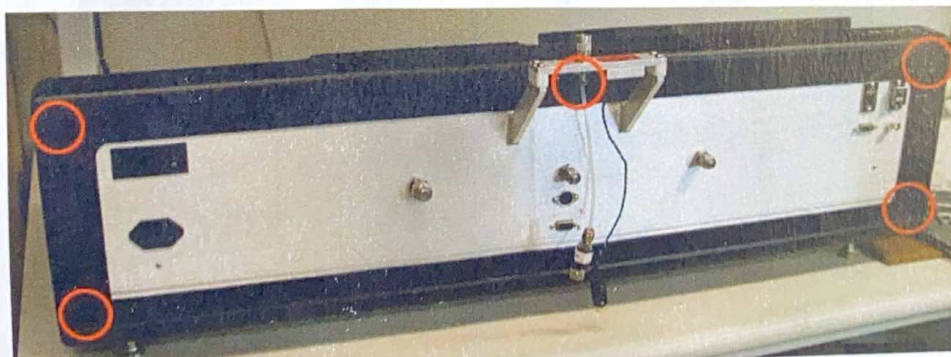
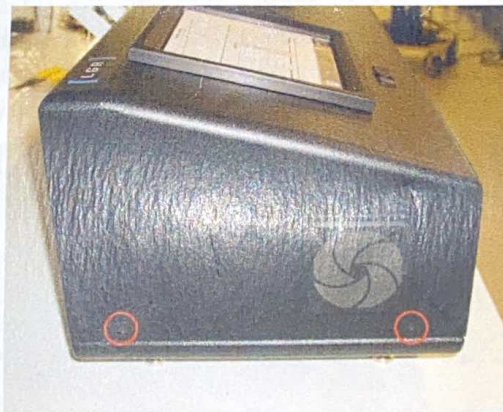


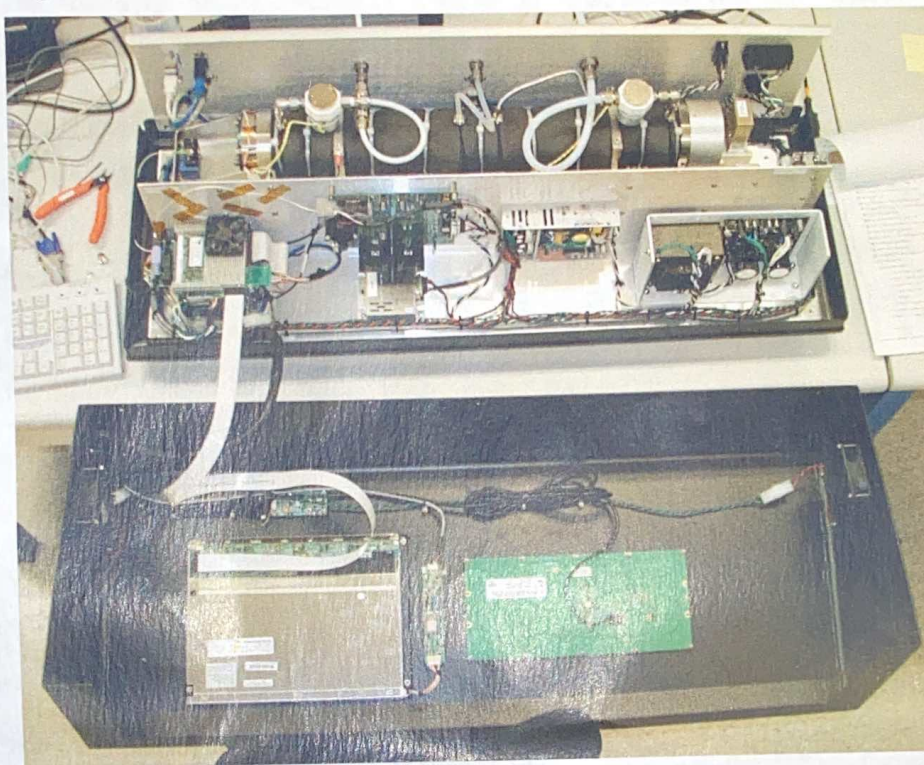
DLT-100 Mirror Cleaning Instructions

NOTE: You should perform this procedure only in a relatively clean, non-carpeted room. Airborne particles, particularly carpet fibers, are quickly attracted to freshly cleaned mirrors and can easily re-contaminate them before the mirrors are reattached to the cell.

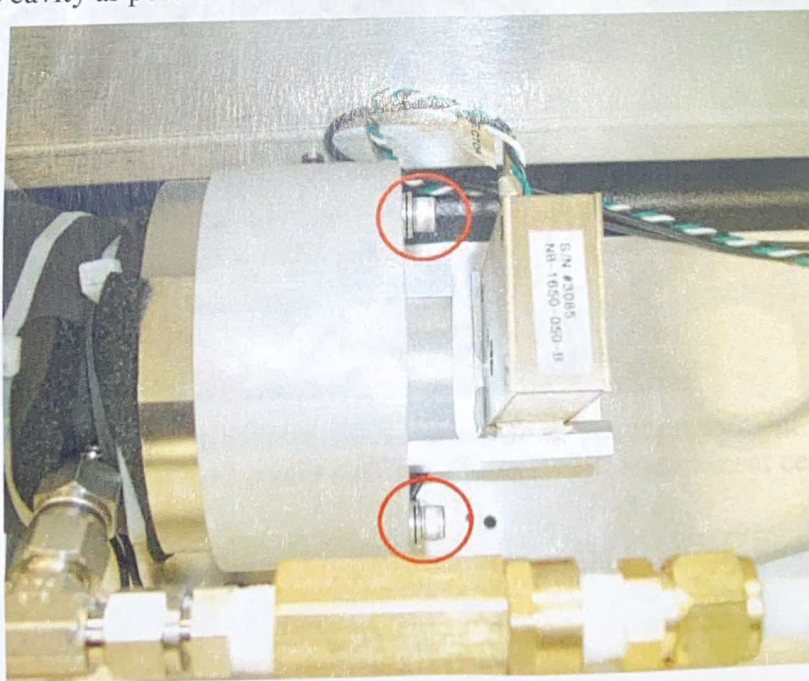
1. Power off the analyzer and remove the power plug.
2. Wait ~10 minutes to allow the gas pressure in the measurement cell to reach ambient level.
3. Detach the DLT case top by removing the 12 screws indicated in the Figure below (3 in the front, 2 on each side, and 5 on the back). Do NOT detach the screws along the bottom of the back panel.



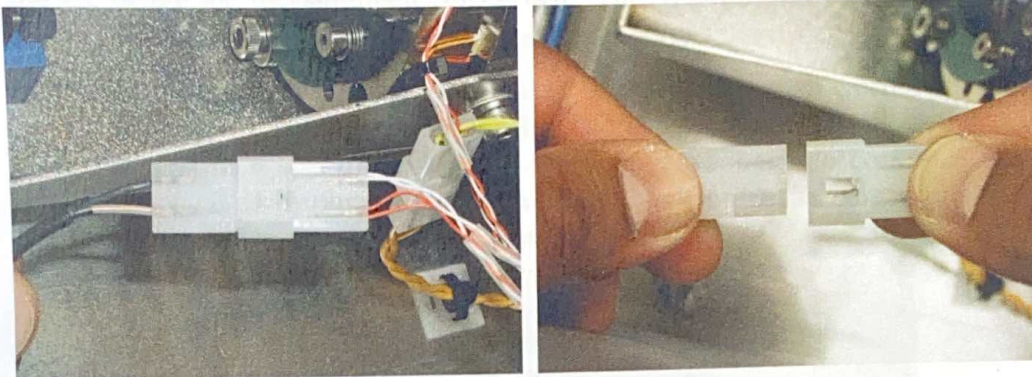
4. Remove the case top and place in front of the instrument, leaving the cables connected (see Figure below).



5. Detach the detector assembly by removing the two 1/4-20 screws holding it onto the cell as shown in the Figure below. After the screws are removed, the detector bracket will slide off the cavity. Without removing any wires from the detector, place the assembly as far from the cavity as possible.

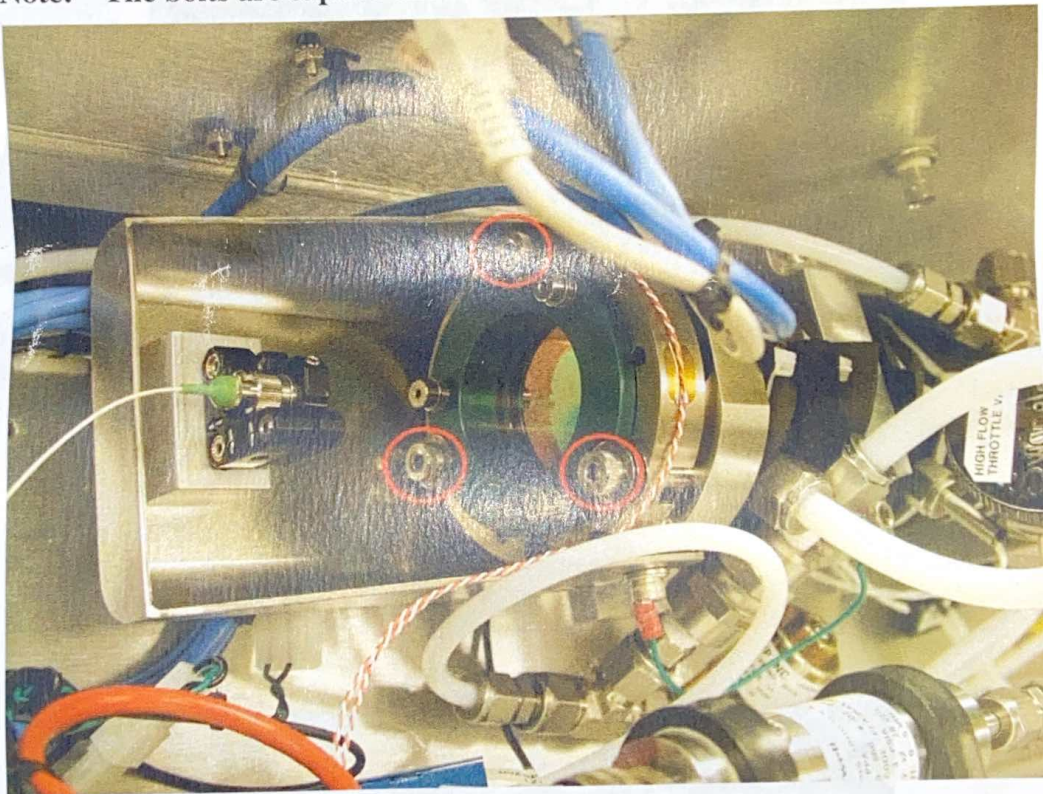


6. Unplug the wires connecting the front flange (in front of the optical fiber launch) to the instrument by separating the mated large plastic connectors break (see Figure below).



7. Remove both cavity mirror flanges by unscrewing the large flange bolts (circled in red in the Figure below) as far as possible.

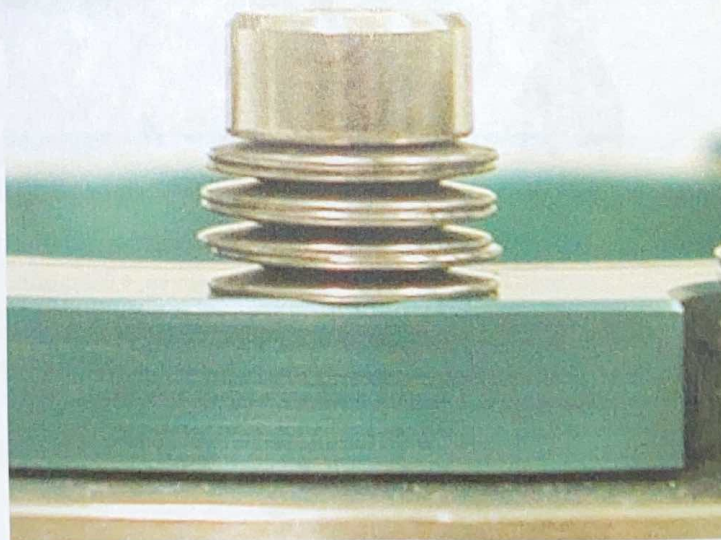
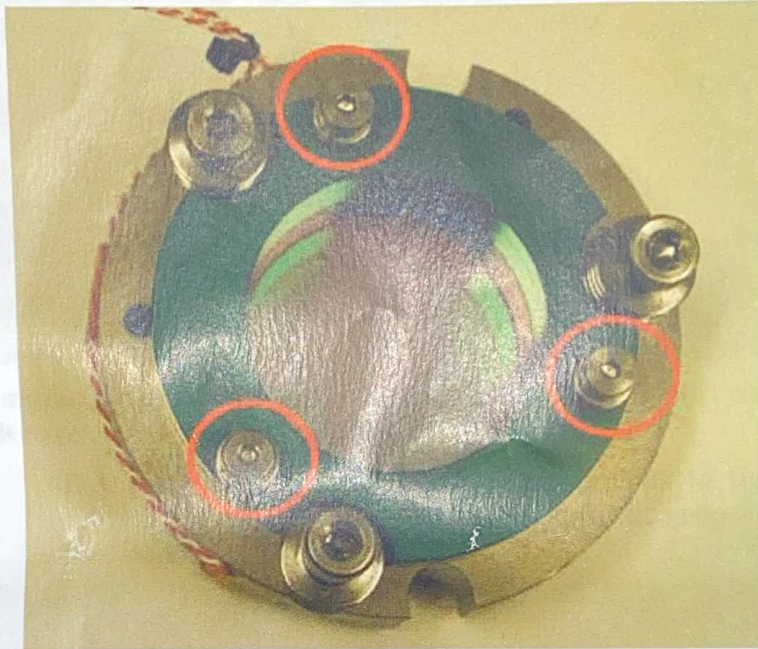
Note: The bolts are captive and do not detach from the flange.



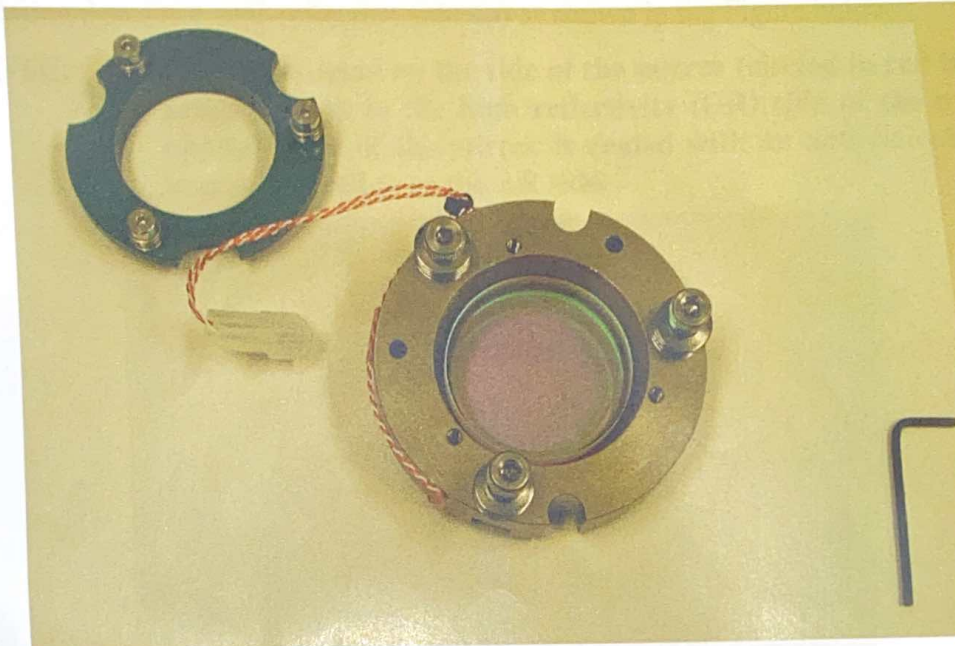
8. Remove any dust or particulates from the inside of the measurement cell by using the compressed gas canister to gently puff gas through the measurement cell from a distance of 6 to 8 inches.

9. Take one mirror flange and place it on a clean, dust-free surface with the reflective side (facing inside the measurement cell) down. Unscrew the three small screws (circled in red in the Figure below) that hold the green mirror backing ring.

Note: These screws are NOT attached to the ring and extra caution should be taken to avoid losing the spring washers underneath each bolt, as the washers are placed in a specific order. If the spring washers do come off the shoulder screw, it is important to place them back onto the screw in the formation shown in the second Figure below.



10. Gently remove the mirror backing ring to expose the mirror (see figure below).



11. Place the mirror flange on top of the short Teflon tube (provided) and push the flange downwards to release the mirror as shown in the Figure below.

NOTE: If the small diameter face-seal o-ring sticks to the mirror, gently remove it, and place the o-ring back into the groove at the bottom of the flange.



12. Place the mirror onto the mirror cleaning block with the arrow head on the mirror edge pointing down (i.e. anti-reflection side up) as shown in the Figure below.

NOTE: The arrow head on the side of the mirror (circled in red in the Figure below) points to the high reflectivity (HR) side of the mirror. The opposite side of the mirror is coated with an anti-reflection coating, and is referred to as the AR side.



13. Remove any loose particles of dust using the compressed gas canister by gently puffing across the mirror surface from a distance of 6 to 8 inches. Do **not** attempt to move firmly adhered particles by placing the blower tip close to the mirror surface.
14. Transfer a very small amount of fresh methanol from the capped methanol bottle to the methanol dropper bottle (just enough to rinse the dropper bottle). With the dropper top closed, shake the dropper bottle to rinse the interior of the bottle, and then discard the rinse methanol. Then fill the methanol dropper bottle approximately $\frac{1}{4}$ to $\frac{1}{3}$ full with fresh methanol from the capped methanol bottle.



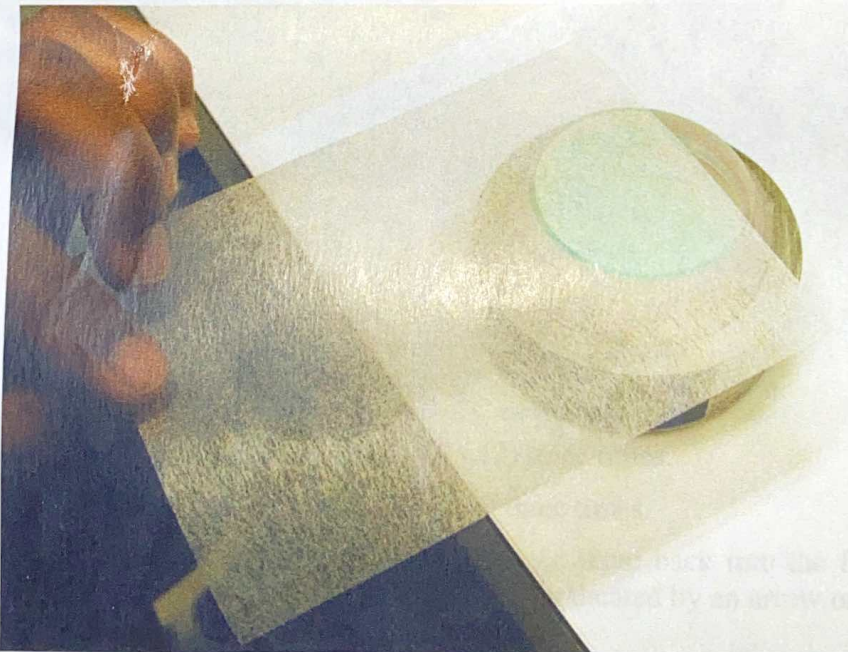
15. Separate a single sheet of lens tissue from the pack. Place this onto the mirror, with the mirror at the near edge of the sheet (leaving enough tissue overhanging the near side of the optic to allow grasping).



16. Using the methanol dropper bottle, place four drops of methanol onto the tissue above the center of the mirror as shown in the Figure below. You should see the solvent wick completely to the edge of the mirror.



17. Grasp and pull the tissue towards you with a constant but light pressure over the full length of the item (see Figures below). The tissue should be pulled at a speed which just matches the evaporation rate of the solvent from the surface. If the liquid can be seen on the surface as an area is uncovered by the tissue then the wipe speed is too fast. This procedure is called a "drag-wipe". Discard the used tissue.



18. Transfer a very small amount of fresh acetone from the capped acetone bottle to the acetone dropper bottle (just enough to rinse the dropper bottle). With the dropper top closed, shake the dropper bottle to rinse the interior of the bottle, and then discard the rinse acetone. Then fill the acetone dropper bottle approximately $\frac{1}{4}$ to $\frac{1}{3}$ full with fresh acetone from the capped acetone bottle.

19. Separate a single sheet of lens tissue from the pack. Place this onto the mirror, with the mirror at the near edge of the sheet (leaving enough tissue overhanging the near side of the optic to allow grasping).
20. Using the acetone dropper bottle, place four drops of acetone onto the tissue above the center of the mirror. You should see the solvent wick completely to the edge of the mirror. Repeat the “drag-wipe” procedure of step 17.
21. Invert the mirror in the mirror cleaning block so that the HR surface is on top (arrow head pointing up as shown in the Figure below).

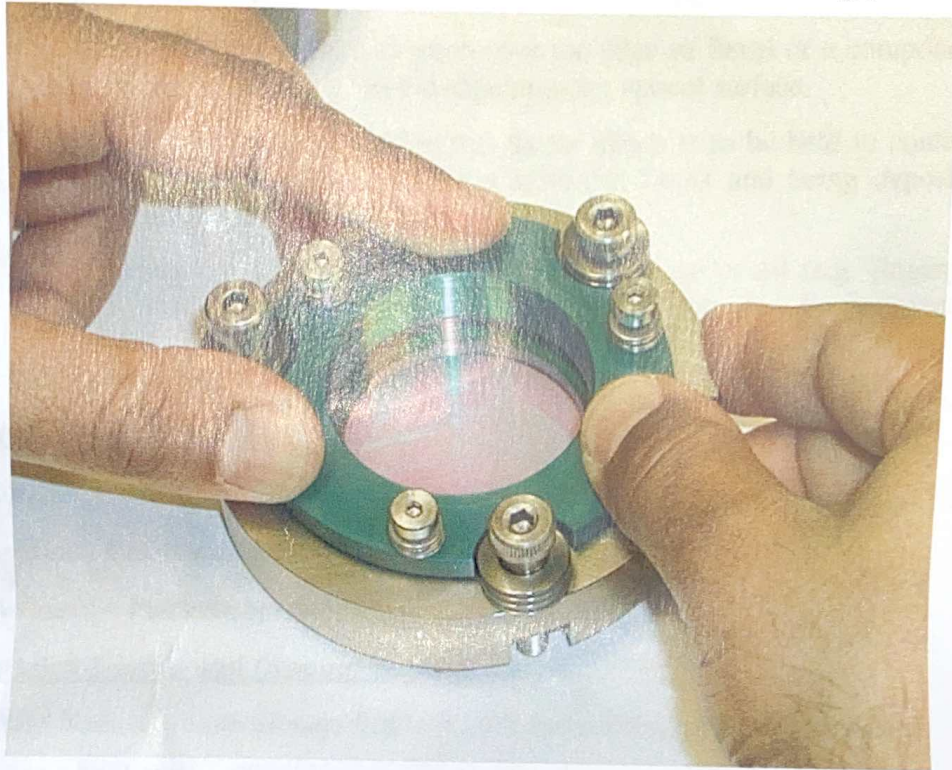


22. Perform a methanol “drag-wipe” (steps 15 - 17) three times.
23. Perform a acetone “drag-wipe” (steps 19 - 20) three times.
24. Once the mirrors have been cleaned, gently place them back into the flanges with the reflective side (HR) facing the measurement cell (indicated by an arrow on the side of the mirror).

NOTE: When placed into the flange, the mirror will sit up on the outer o-ring – this is normal.

25. Place the backing ring gently onto the mirror, and use it to press the mirror through the outer o-ring and into place (see Figure below). Tighten the screws as far as possible until they stop (until the shoulder of the shoulder screw reaches the flange).

NOTE: They do not require high torque, just turn them until they stop (until the shoulder of the shoulder screw reaches the flange).



26. Place both flanges back onto the cavity and tighten the large bolts as far as possible until they stop (until the shoulder of the shoulder screw reaches the flange).

NOTE: They do not require high torque, just turn them till they stop (until the shoulder of the shoulder screw reaches the flange).

27. Reconnect the wires (mated plastic connectors) from the front flange to the instrument.
28. Replace the detector flange and reattach it with the long $\frac{1}{4}$ -20 bolts.
29. Place the DLT case top back onto the instrument, taking especial care to ensure that all wires are safely tucked into the instrument.
30. Reattach the case top using the 12 screws removed during step #3.
31. Plug in the power cable and turn on the instrument.
32. If the procedure has been implemented correctly, the cavity ringdown time will be close to its value upon receipt.

Additional Notes:

- Cleanliness of the solvent is CRITICAL! Always use high quality solvents stored in a sealed screw-top bottles or dropper bottles (see recommendations below).
- Use a clean sheet of tissue for each wipe to avoid transferring contaminants to new areas.
- Do not allow the tissue to reach over the edge or bevel of a component to avoid dragging dirt or dust from the edge onto the optical surface.
- Do not touch any part of the wet tissue which is to be held in contact with the mirror to avoid oil being drawn from the hands and being deposited on the cleaned surface.
- If the surface has been contaminated with grease or oil (e.g. fingerprints from accidental touching of the HR or AR Surface) this may be removed with pure Acetone. Grease should be removed immediately as it can cause irreparable damage by etching the surface.

Recommended Solvents:

Sigma-Aldrich CHROMASOLV Plus solvents:

- Acetone - Part Number 650501
- Methanol – Part Number 646377

Recommended Storage and Dropper Bottles:

Nalgene 2003 Narrow Mouth Storage Bottle (LDPE body, Polypropylene screw cap)

- Part Number 2003-0001

Nalgene 2411 Drop-Dispenser Bottle (LDPE body; Polypropylene dropping closure and cap)

- Part Number 2411-0030