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D00023: Cell Cleaning Instructions

Document Description:

This document will assist the end user in the removal and cleaning of an AMACxx-LW cell from a MINI type spectroscopy instrument.

List of referenced documents:

List of superseded documents:

Doc. Rev.	Revision Notes	Revision Date	Author	Reviewer
1.0	Initial Publishing	2013-12-30	J.Northrup	

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Tools

- 3/32” Hex head driver (Allen driver)
- 7/64” Hex head driver (Allen driver)
- 9/64” Hex head driver (Allen driver)
- 3/16” Hex head driver (Allen driver)
- Cross Tip (Phillips) screwdriver
- 8” Adjustable Wrench
- Small cutting dikes
- Dry air source (canned air)
- Small Zip-tie
- Ethanol in Safety Labeled Chemical Wash Bottle
- Glass beaker
- Vinyl gloves
- Eye protection

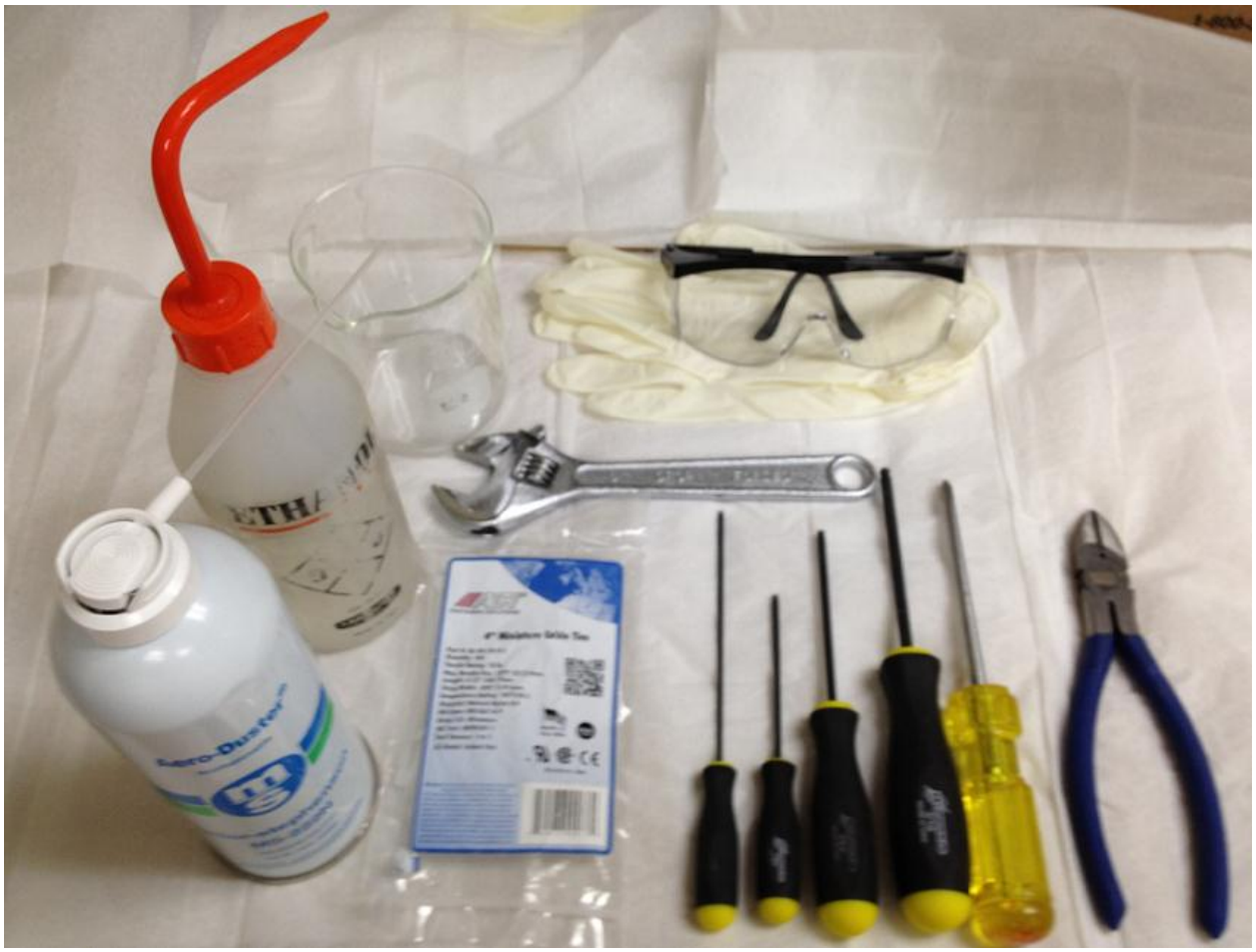

Figure 1: Required tools

Accessing the AMACxx-LW cell

Removal of outer enclosure lid

Remove the 6 black Cross/Phillips tip screws that hold the lid of the outer enclosure using a Cross/Phillips screwdriver. Figure 2 and figure 3 show the location of these 6 screws.

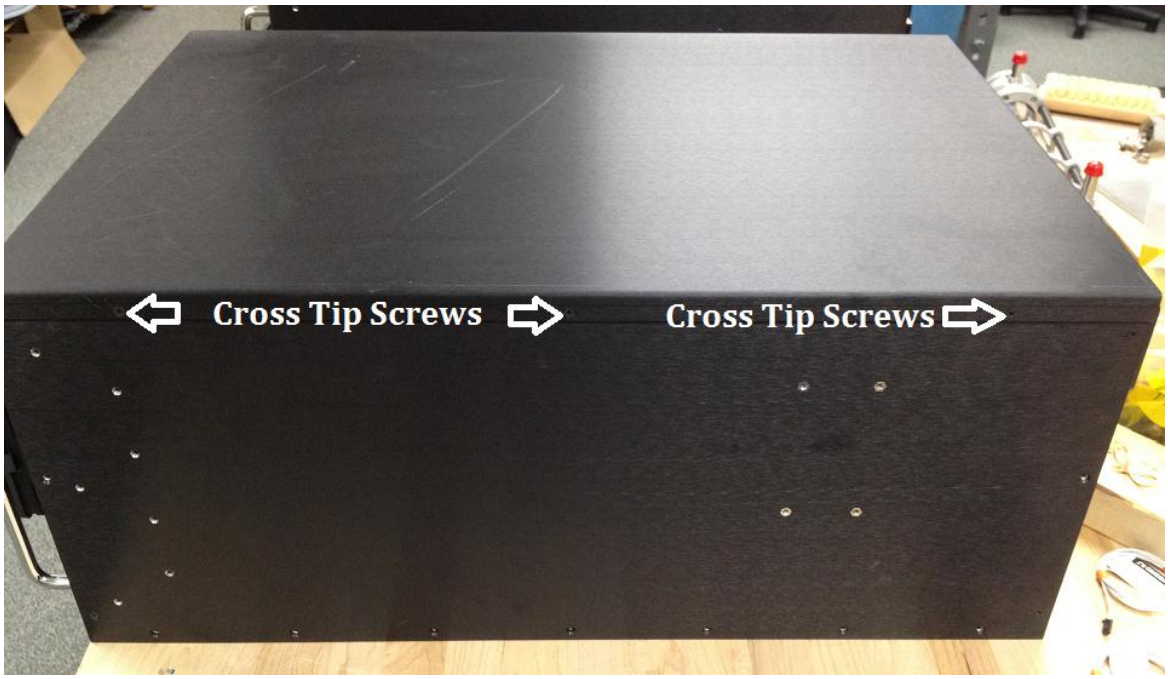

Figure 2: Right side outer lid screws

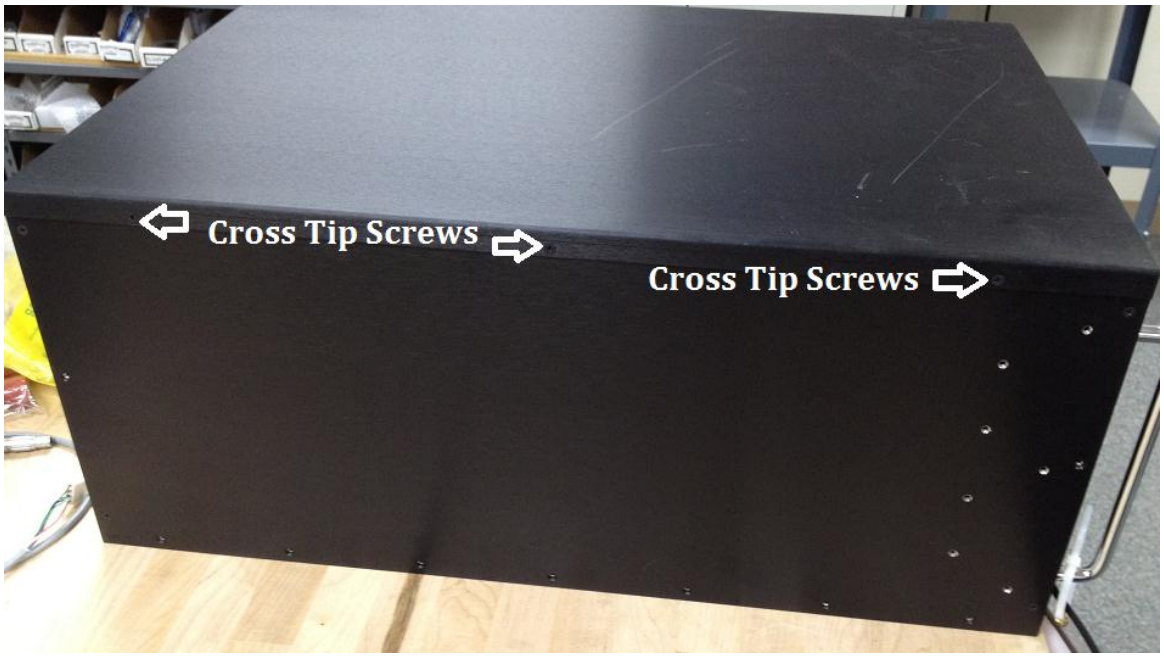

Figure 3: Left side outer lid screws

Removal of refrigerator lid

Turn spring lock Cross/Phillips tip screws counter-clockwise to loosen using your fingers. There is no need to use a screw driver for this removal and installation. Note the example of a properly closed and properly open spring lock screw given Figure 4 below. Also note the correct orientation of the refrigerator lid in Figure 5. This will be helpful when reassembling the refrigerator lid.

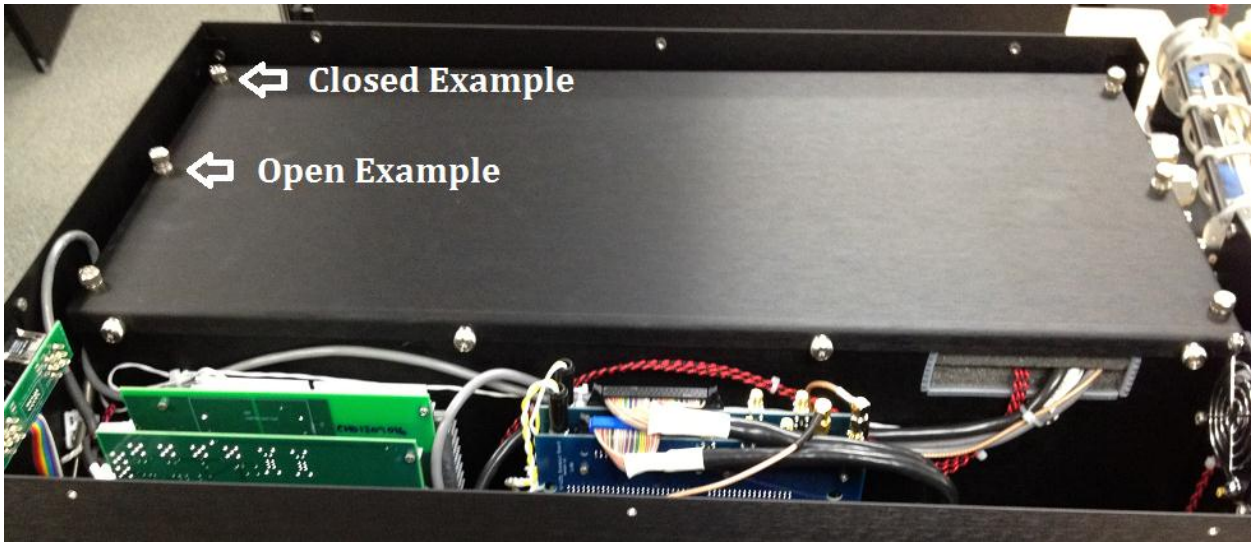

Figure 4: 10 Spring lock cross tip screws

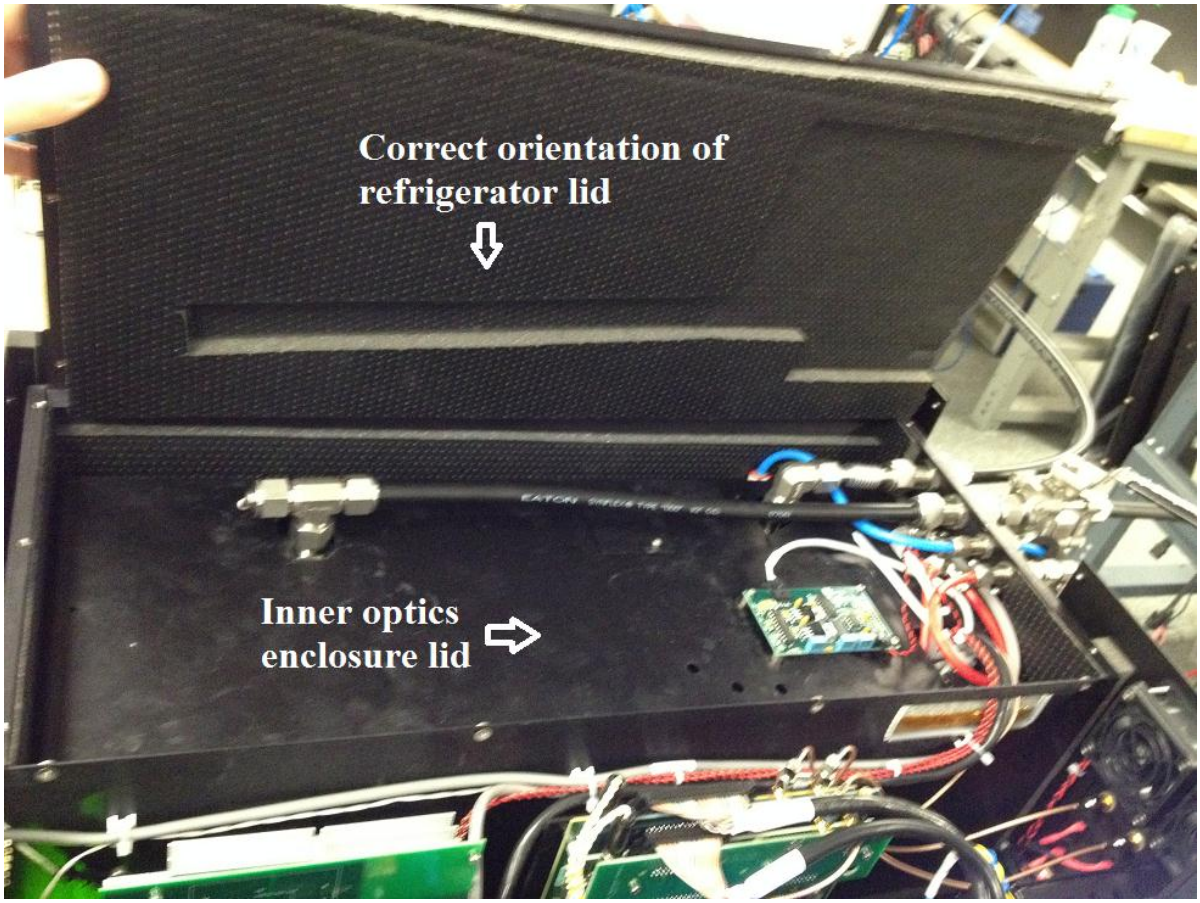

Figure 5: Refrigerator lid orientation

Removal of inner optics enclosure lid

Remove the seven (6-32 x 1/4") screws from the inner optics lid using a 7/64” hex head driver. Note that the screws have already been removed from the lid in Figure 6 and Figure 7 above. Once the three screws have been removed from the stiffener plate seen in Figure 6, this plate can be removed by rotating it clockwise around the Swagelok elbow that is attached to the cell inlet. Replacing the stiffener plate after reinstalling the cell can be accomplished easily by rotating the plate counterclockwise into position.

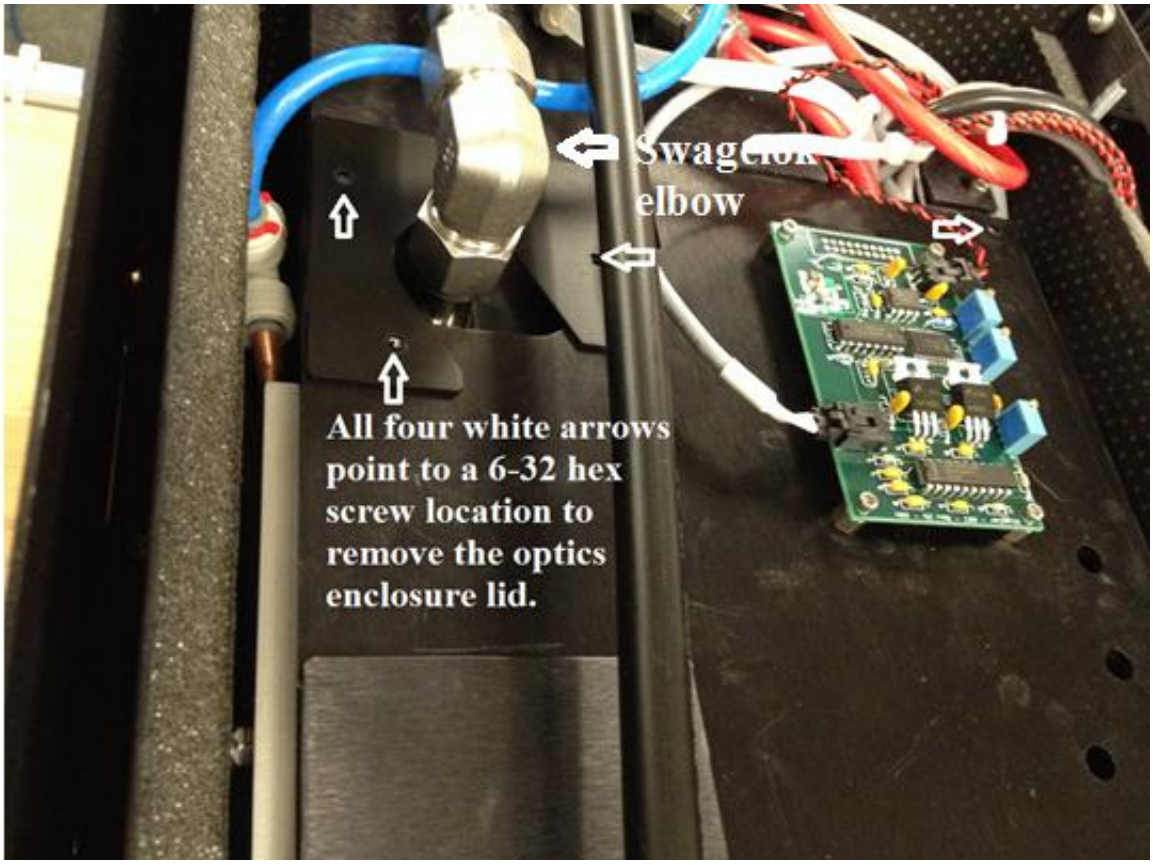

Figure 6: First four screw locations to remove optics enclosure lid

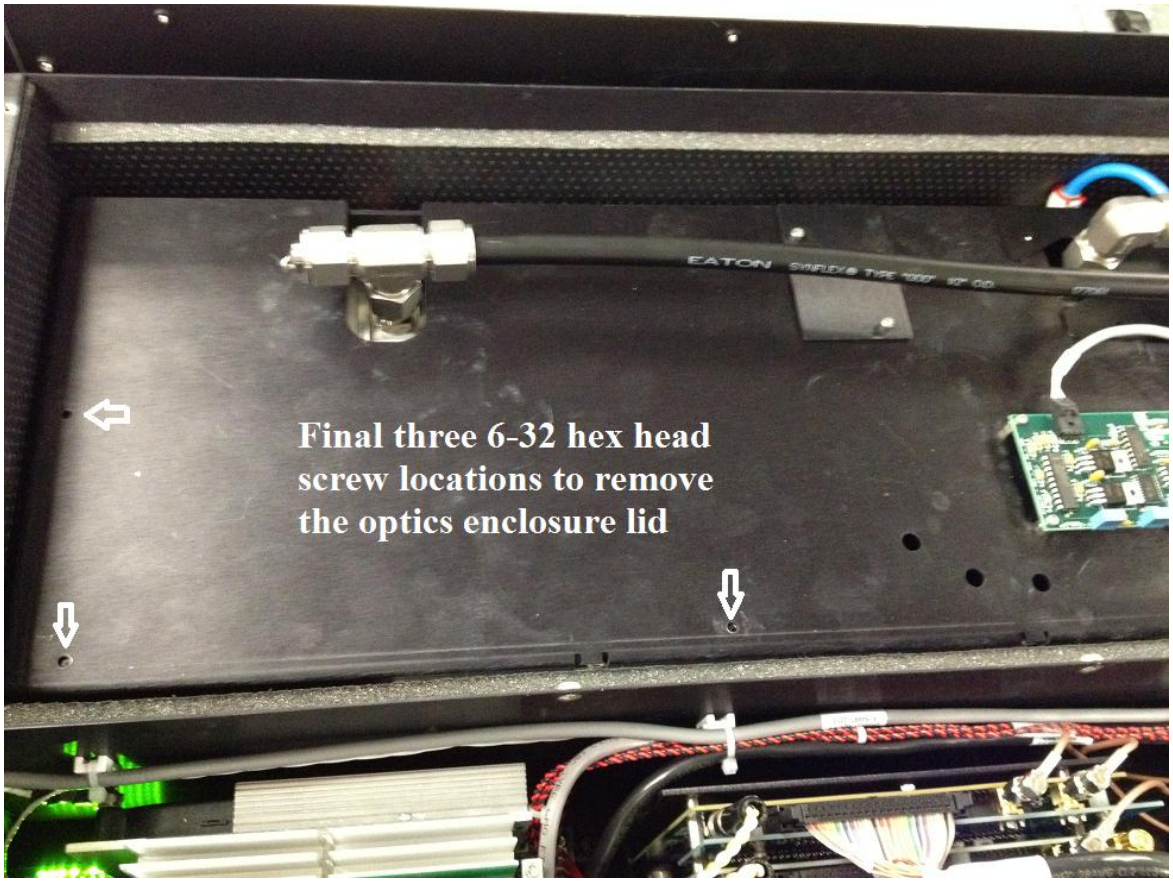

Figure 7: Final three screw locations to remove optics enclosure lid

Removal of AMACxx-LW cell

Note that the Blue Laser housing is not depicted in all the Figures of this manual. The presence of the blue laser housing should not complicate the steps described in any manner and should not be removed. The blue laser housing was left out of the images in order to more clearly indicate screw locations and points of interest.

Removing the cell plumbing

Loosen 4 (7/8") Swagelok fittings indicated in the Figure 8 above using either a 7/8" open end wrench or an 8" adjustable wrench. Then remove the Synflex tubing and place it to the side. Be careful not to pull on the thermistor cabling which may be Zip-tied to the longer Synflex tube of the plumbing. The thermistor cable being attached to the Synflex tubing is seen in older generations of the MINI machine and is not depicted in the image below.

Also be careful not to bend the Synflex tubing excessively. When reattaching the tubing, be careful when tightening the Swagelok ends with Teflon ferrules (white in color). These ferrules should not be over tightened to prevent damage to them and also the tubes should not be tightened in such a way that causes the cell to be pulled on by the tube connections. All Teflon ferrule connections should be hand tight, do not use a wrench on these connections. Steel ferrule connections will require a wrench to tighten.

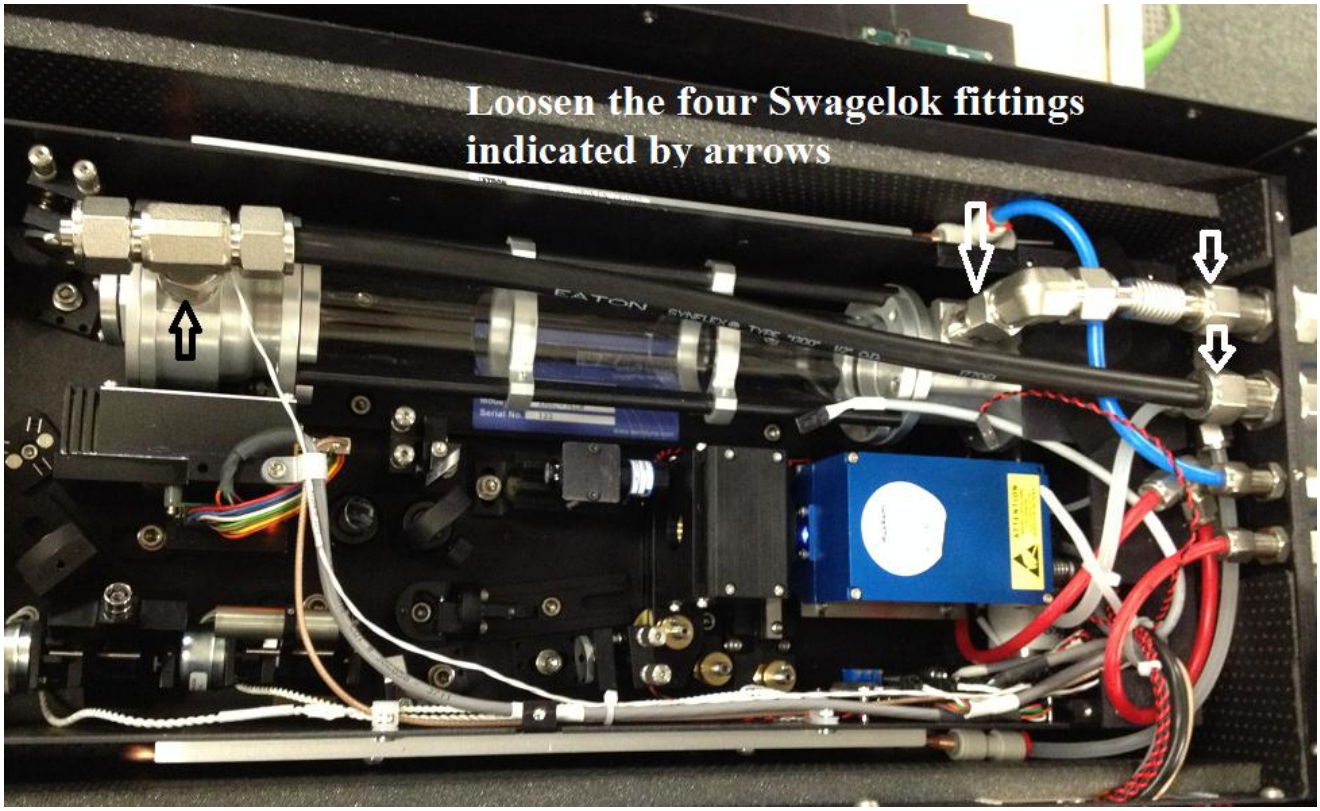

Figure 8: Swagelok fitting connection locations

Removal of the AMACxx-LW cell

Clip the Zip-tie that is indicated by the white arrow in Figure 9 below. This will need to be refastened by an equivalent Zip-tie once the cell has been cleaned and replaced. If this Zip-tie is present, this step can be disregarded. This also was a legacy methodology that has been removed from new builds of the MINI instrument. Figure 9 shows an example of the Zip-tie location as a reference for older generation MINI machines.

Loosen the 4 (1/4-20 x 3/8") hex head screws indicated by the red arrows in Figure 9 using a 3/16" hex head driver. The screws should be able to be completely loosened from the optics table and left in the baseplate of

the cell for easy removal. This will detach the cell's baseplate from the optical table and allow the AMACxx-LW cell to be lifted up and off the optics table. DO NOT remove the cell from the optics table yet. First follow the remaining steps in order to safely remove the cell.

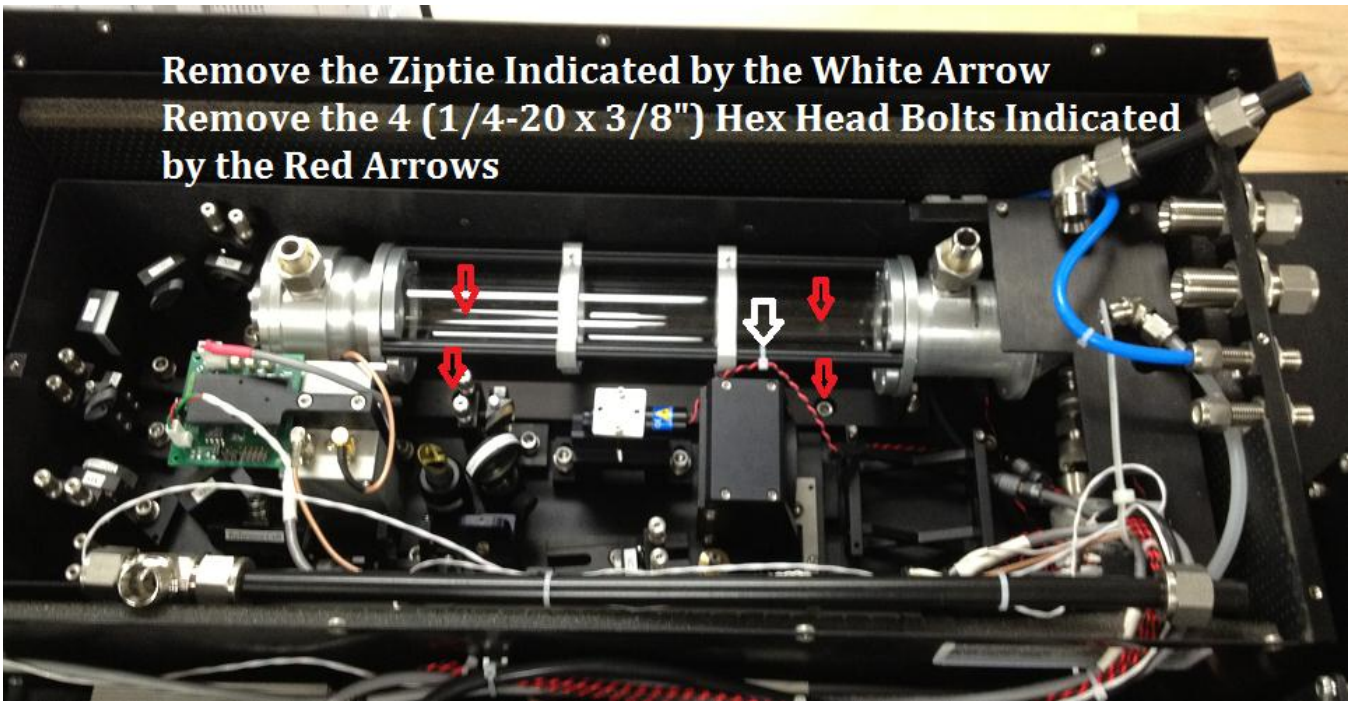

Figure 9: Cell baseplate bolt locations and Zip-tie location

Locate the optics card which is mounted to the side of the optics enclosure and disconnect the Wiggler power cable from it. Figure 10 shows the location of the optics card and Figure 11 shows a close up image of the wiggler connection. Be very careful removing the 2 pin connector from the optics card and freeing the cable from the cable harness area. Never pull excessively on the wiggler cable or the Baratron tubing while removing the cell. Once the wiggler's 2 pin connector is disconnected you should be able to remove the cell.

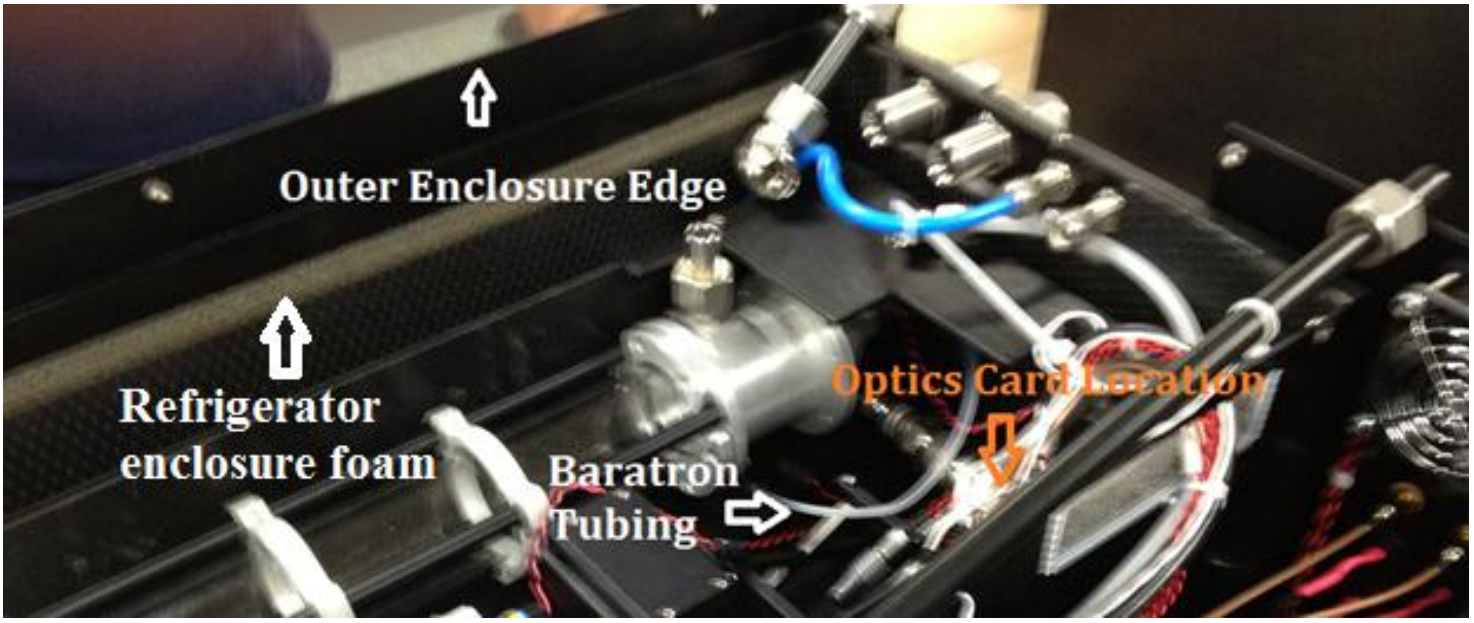

Figure 10: Location of key areas

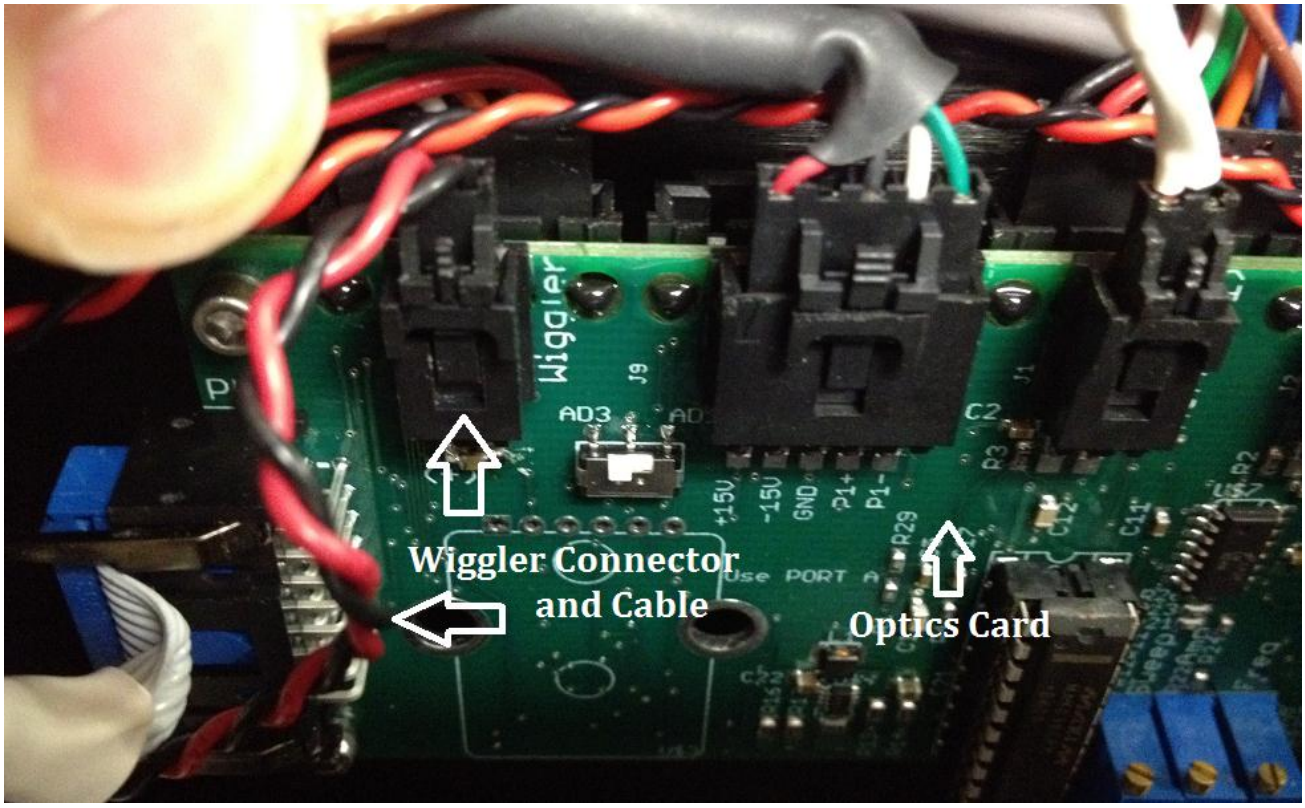

Figure 11: Close view of optics card and wiggler connection

Note the location of the Baratron's tubing prior to removing the cell from the optics table. This is the clear tubing that is attached to the rear cone of the AMACxx-LW cell. This way the Baratron tubing can be routed approximately the same way when reinstalled. It is very important to not pinch or kink the clear Baratron tubing when removing and replacing the cell.

The clear Baratron tubing should be long enough for the user to rest the cell on the top edge of the refrigerator enclosure's foam once the cell has been lifted out of the optics enclosure. Refer to Figure 10 for a visual reference of the correct location to rest the cell once it is removed from the optics table. Using the foam to help hold the cell, the user should be able to reach the hand tightened elbow on the rear cone of the cell and release the elbow and clear Baratron tubing from the cone of the cell.

Once the wiggler cable has been disconnected and cleared from the cable harness area, the four (1/4-20 x 3/8") hex head screws from the cell baseplate have been removed and the resting area for the cell on the refrigerator enclosure's foam are confirmed the AMACxx-LW cell can be removed from the machine.

Carefully start to remove the cell by lifting the front mirror housing end straight up until the bottom of the cell baseplate has cleared the top of mirror assembly M4 as seen in Figure 12.
Next pull the cell assembly slightly toward the front mirror housing end of the cell as you lift in a diagonal fashion to clear the rear mirror housing of the cell and its cone from hitting the cable mounting plate of the optics enclosure.

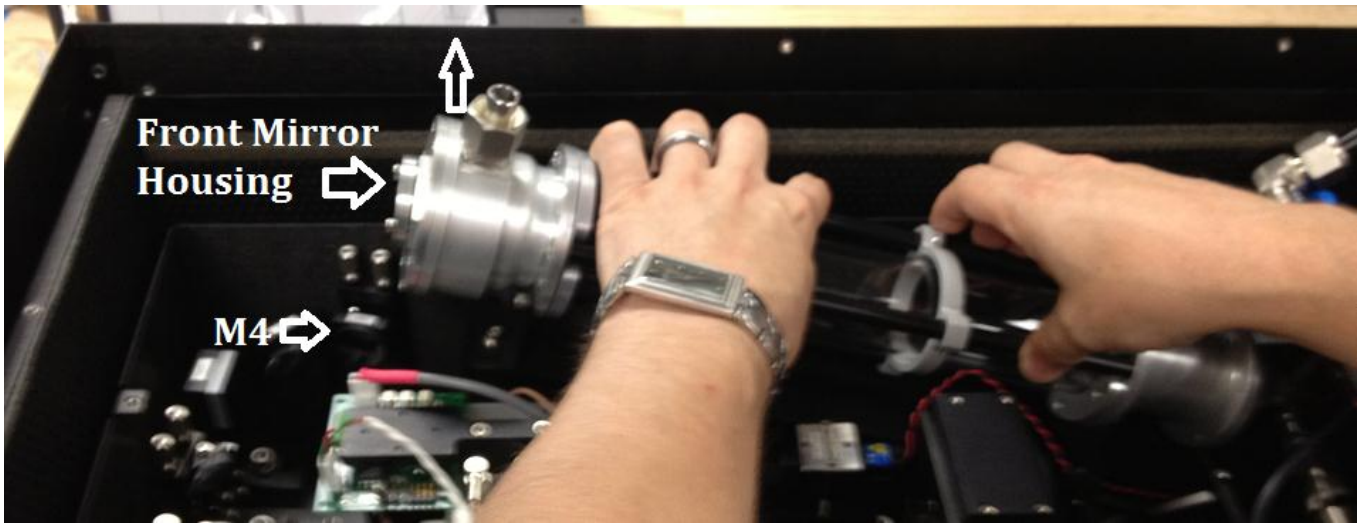

Figure 12: Lifting action, removal example

Replacement of Cell, optics lid, refrigerator lid and outer lid

Replace Cell by referencing the cell removal section (figures 8 through 12). Pay special attention to the routing of the Baratron tubing and wiggler cable connection. Make sure not to have either the Baratron tubing or wiggler cable get pinched under the base plate of the Cell when replacing the Cell back into the optics table. When re-installing the tubes for the inlet and outlet of the cell be careful not to pull on the cell when tightening the Swagelok fittings of the tubes. Reference Swagelok's website for proper torque specifications for nylon and steel ferrule connections.

Replace the seven (6-32 x 1/4") screws by loosely threading all seven screws into their perspective holes and then use the 7/64" hex driver to tighten all seven screws completely. Reference Figure 6 and Figure 7 for hole locations.
Replace the refrigerator lid by correctly orientating the lid as seen in Figure 5 of the refrigerator removal section of this document. Note that the spring lock screws can be tightened completely using only your fingers. No screw driver is required.

Replace outer lid by using a Cross/Phillips tip screw driver and referencing Figure 2 and Figure 3 in the outer lid removal section of this document.

Instructions to assemble and disassemble cell

Disassembly instructions

The 12 screws (6 per side) holding the O-ring clamps to the housings will need to be removed from both sides. These screws are depicted by the red arrows in Figure 13 below and are: 6-32 X 5/16" hex head screws; use a 7/64" hex driver to remove.

Figure 13: Retaining clamp gap note and location markers

With the list of screws indicated in Figure 14, Figure 15, and the list below removed from the cell; the tube should be able to be removed as well as the front mirror housing with the bracket still attached. This will allow for cleaning of both mirrors with ethanol. Reassemble can be completed by following the procedure listed in the following section.

Figure 14: Front mirror housing end

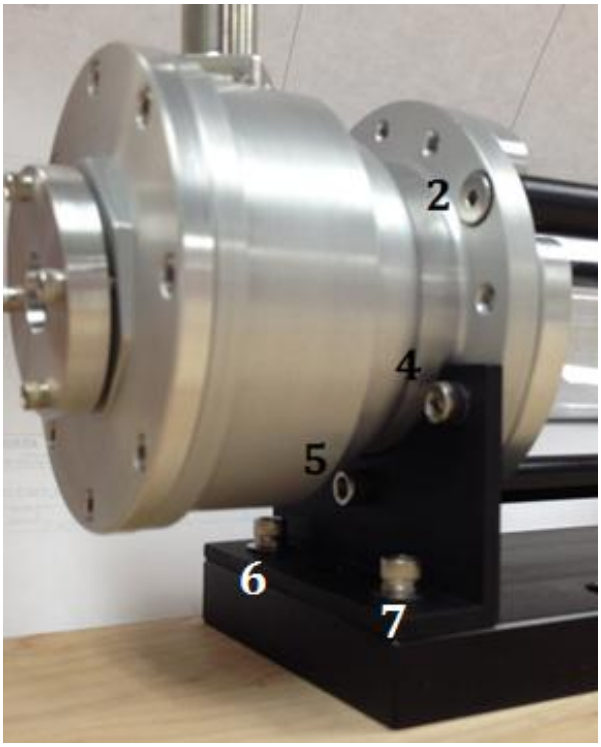

Figure 15: Front mirror housing end

Screws 1 & 2: 8-32 X 7/16” flat hex head screws; use a 3/32” hex driver to remove
Screws 3 & 4: 8-32 X 3/8” Hex head screws; can remain tightened and will not need to be removed
Screw 5: 8-32 X 5/8” Hex head screws; use a 9/64” hex driver to remove
Screw 6 & 7: 8-32 X 3/8” Hex head screws; use a 9/64” hex driver to remove

Reassembly instructions

Place the glass tube back into the rear housing adding the o-ring that was removed to slide the glass tubing out back on. Verify that the o-ring is contaminate free prior to reinstalling on to the glass tube.

Loosely screw the O-ring clamp for the rear housing back on. These 6-32 socket cap screws should be less than finger tight at this point.

Place the front mirror housing back onto the tube and loosely screw the O-ring clamp back on. These 6-32 socket cap screws should be less than finger tight at this point.

Loosely replace the remaining screws to connect the front mirror housing bracket to the cell base. These 8-32 socket cap screws should be less than finger tight at this point.

Tighten down the finger tight remaining screws using a top down method. Ie: the order should go 1, 2, 5.

Finally tighten both sides of the cell's O-ring clamps so that they have an even spacing noted in Figure 13.

When replacing screws 6 and 7 that hold the front bracket to the base plate; don't tighten these screws back up until the base plate has been tightened back down to the optical table. Then tighten the screws labeled 6 and 7 in Figure 14 and Figure 15 above.

When replacing the cell back into optics enclosure, follow the steps listed in the disassembly section in reverse order. Note that the Wiggler cable and Baratron tubing should be routed approximately the same way they were prior to removal. This general routing should have been noted prior to removing the cell from the optics enclosure.

Cleaning AMACxx-LW cell mirrors

Prior to using the Ethanol methods mentioned below, the canned air alone should be used to attempt to remove any particulate. Caned air alone serves as the least invasive way to remove particulate.

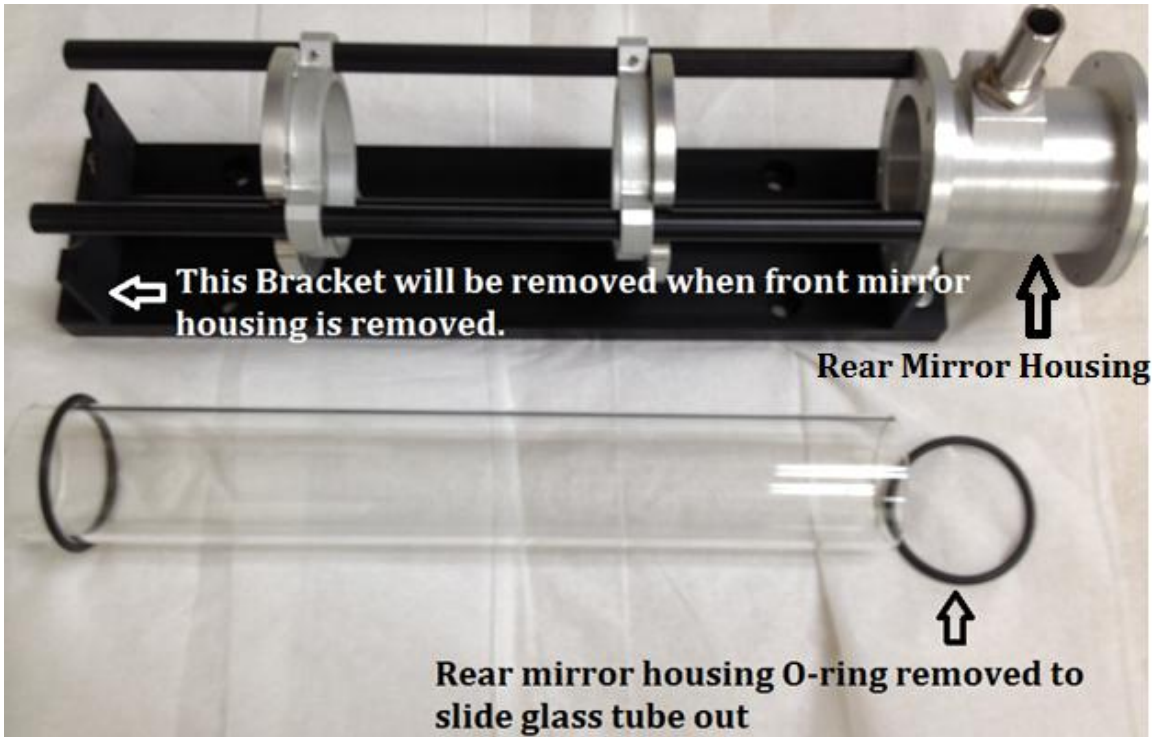

Figure 16: Removal of front mirror housing and glass tube

Note that the front mirror housing bracket is depicted in Figure 16 above to help you remember the correct orientation. This bracket will be removed when the front laser housing is removed.

Once the front mirror housing is off, remove the O-ring closest to the rear mirror housing and remove the glass tube.

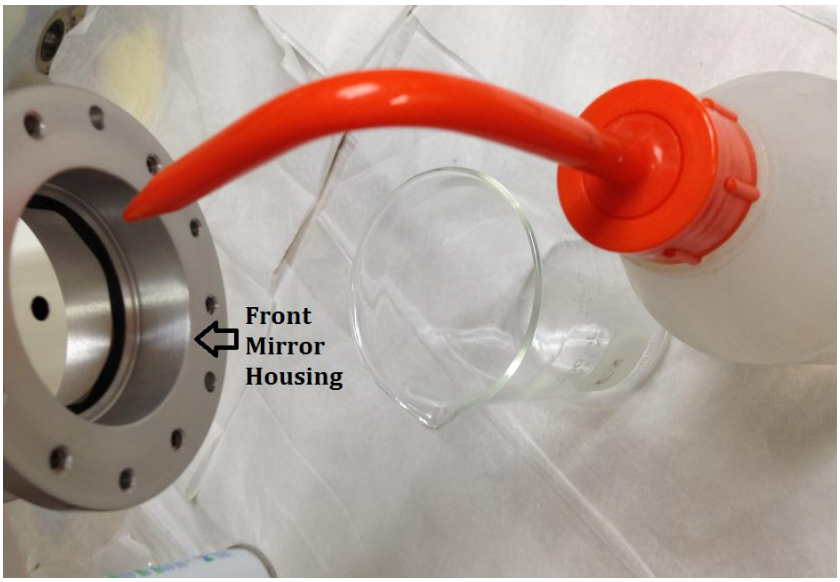

Figure 17: Front mirror cleaning set-up

Clean the front mirror housing by using the Ethanol in a Safety Labeled Chemical Wash Bottle. Spray the mirror with a steady stream of Ethanol to remove surface particulate from the mirror.

Then spray with canned air to prevent the Ethanol from leaving any residue. Repeat this two-step process until the mirror is free of particulate and unwanted residue. The beaker depicted in Figure 17, will serve to catch any Ethanol that spills out from the lip of the mirror housing.

Note that the mirror housing should be held at an angle to allow the Ethanol which comes off the mirror to spill onto the fat lip of the inner housing and then into the beaker. Once the cleaning is finished the beaker's used Ethanol should be disposed of properly.

Depending on the setting your instrument is in, this wash method may not be viable. If this is the case for your situation then apply only a few drops of Ethanol at a time instead of a stream of Ethanol to the mirror surface. Then blow the Ethanol away using the compressed can air. The Ethanol will work as a lubricant to help blow away the particulate that is sitting on the mirrors and could not be blown away with canned air only. This process may need to be repeated multiple interactions in order to get the desired effect.

Figure 18: Glass tube cleaning set-up

The glass tube can be cleaned by spraying a continuous stream of Ethanol into the O-ring side of the glass tube while rotating the tube with your other hand. An example of the angle of the tube and a general set-up of the method can be seen in Figure 18 above.

Then spray with canned air to prevent the Ethanol from leaving any residue. Repeat this two-step process until the tube is free of particulate and unwanted residue. The beaker will serve to catch the Ethanol.

Once the cleaning is finished the beaker's used Ethanol should be disposed of properly.

Figure 19: Rear mirror cleaning set-up

Clean the rear mirror housing by using the Ethanol in a Safety Labeled Chemical Wash Bottle as seen in Figure 19 above. Spray the mirror with a steady stream of Ethanol to remove surface particulate from the mirror.

Then spray with canned air to prevent the Ethanol from leaving any residue. Repeat this two-step process until the mirror is free of particulate and unwanted residue. The beaker will serve to catch any Ethanol that spills out from the lip of the mirror housing.

Note that the mirror housing should be held at an angle which allows the Ethanol which comes off the mirror to spill onto the fat lip of the inner rear housing and then into the beaker. Once the cleaning is finished the beaker's used Ethanol should be disposed of properly. This task is slightly harder to perform than the front mirror housing due to the baseplate still being mounted to the rear housing. Do not remove this rear housing from the baseplate or loosen the hex screws holding the housing to the baseplate. Either action could cause a loss of the laser beam pattern.

Depending on the setting your instrument is in, this wash method may not be viable. If this is the case for your situation then apply only a few drops of Ethanol at a time instead of a stream of Ethanol to the mirror surface. Then blow the Ethanol away using the compressed can air. The Ethanol will work as a lubricant to help blow away the particulate that is sitting on the mirrors and could not be blown away with canned air only. This process may need to be repeated multiple interactions in order to get the desired effect.