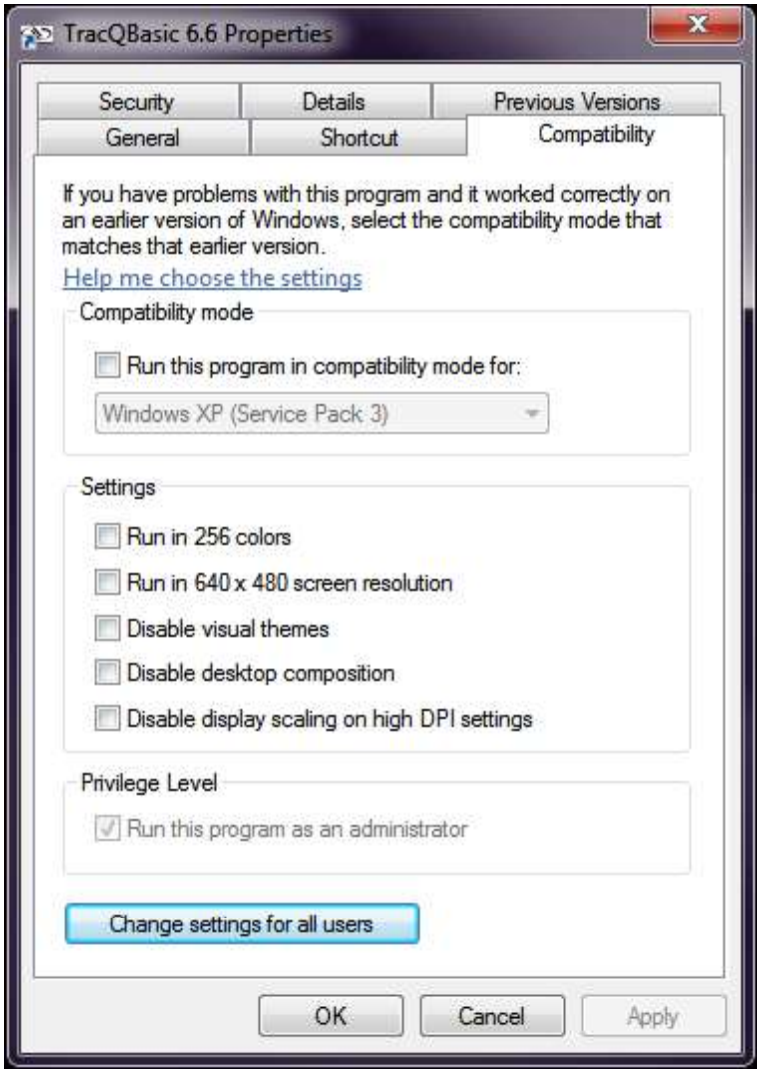
This document covers the legacy QEPVSI-B system, which is no longer available for ordering. Contact Newport if you would be interested in a modified variant of this system, utilizing our CS260B series of monochromators.

#1 Software install

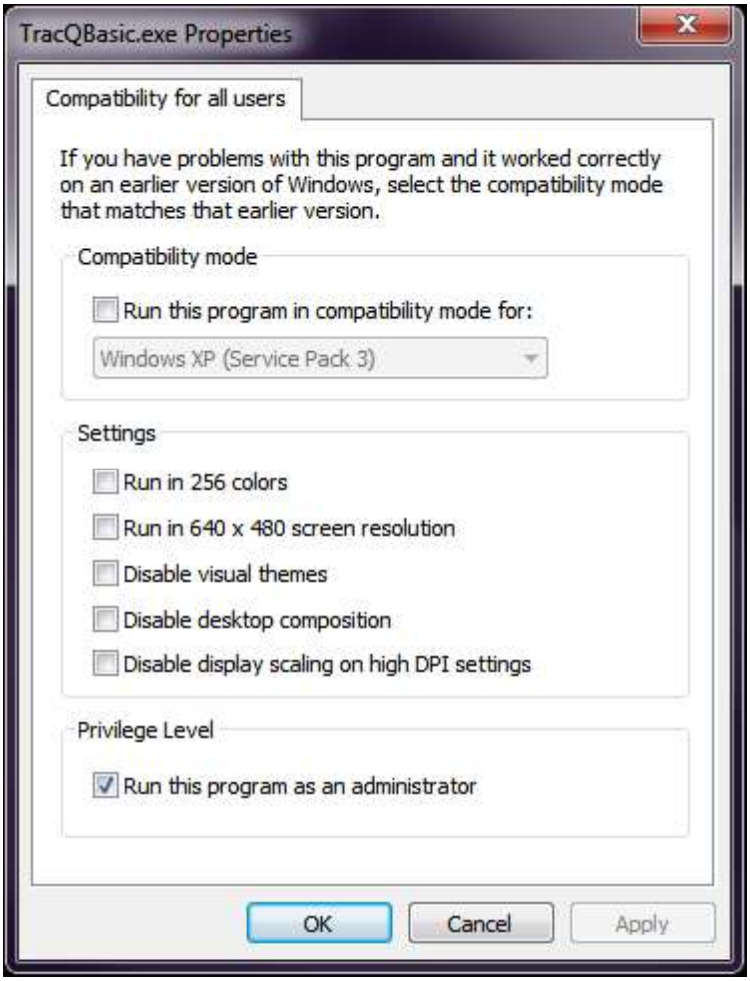
1.1 Software install of thumb drive

1.2 Run setup.exe

- **This will install TracQ Basic V 6.6 and all of its libraries**
- **After installation is complete restart your computer**
- **Right click once on the TracQ Basic icon and click "Properties". In the Compatibility tab of the Properties window, click on "Change settings for all users".**



- **Check the box "Run this program as administrator", then click "OK".**



- **Run as Administrator for All Users**
- **If you have trouble installing your drivers for the monochromator See Appendix # 2**

#2 Lamp Installation

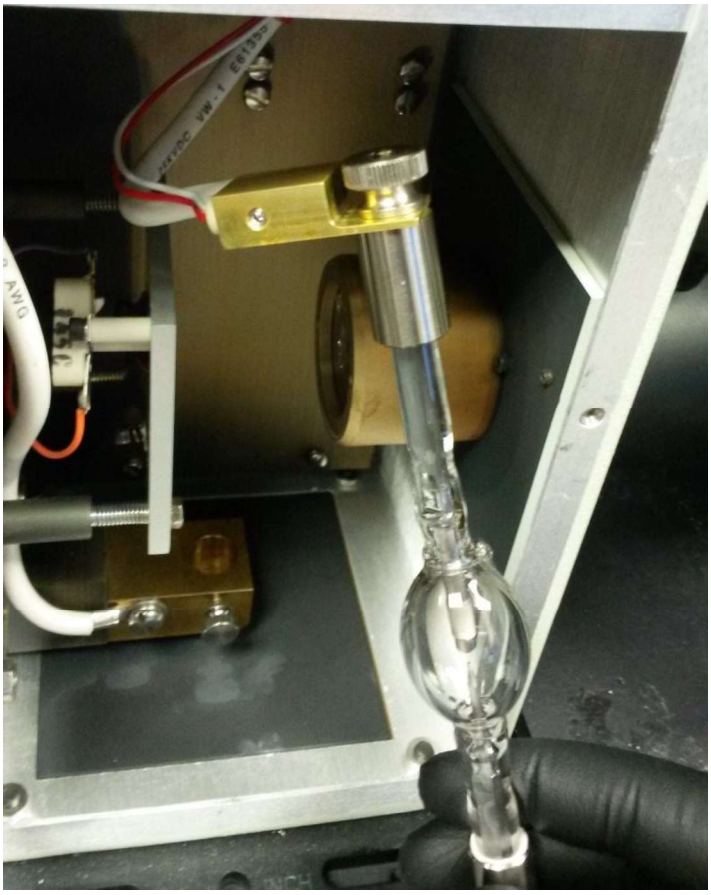
2.1 Wear proper protective equipment when handling the lamp

- **Safety glasses,**
- **Gloves**

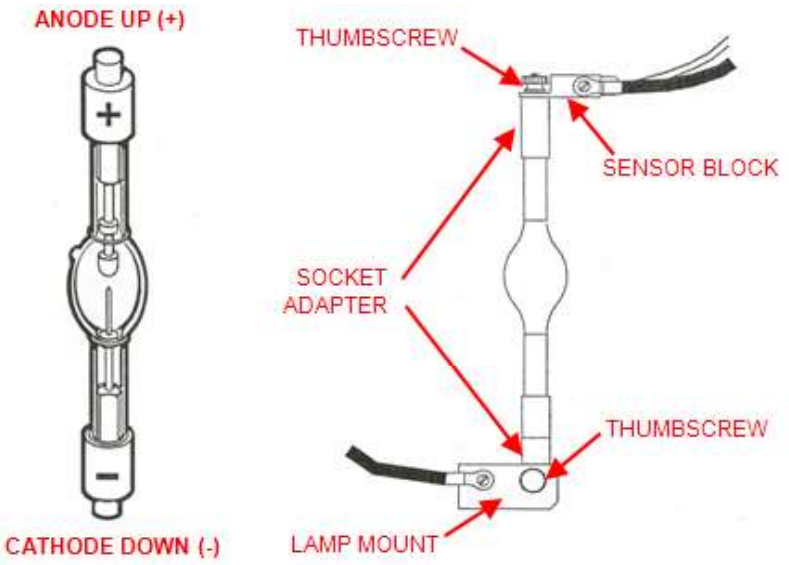
2.1 Securely attach the brass adaptor to the negative end of the lamp

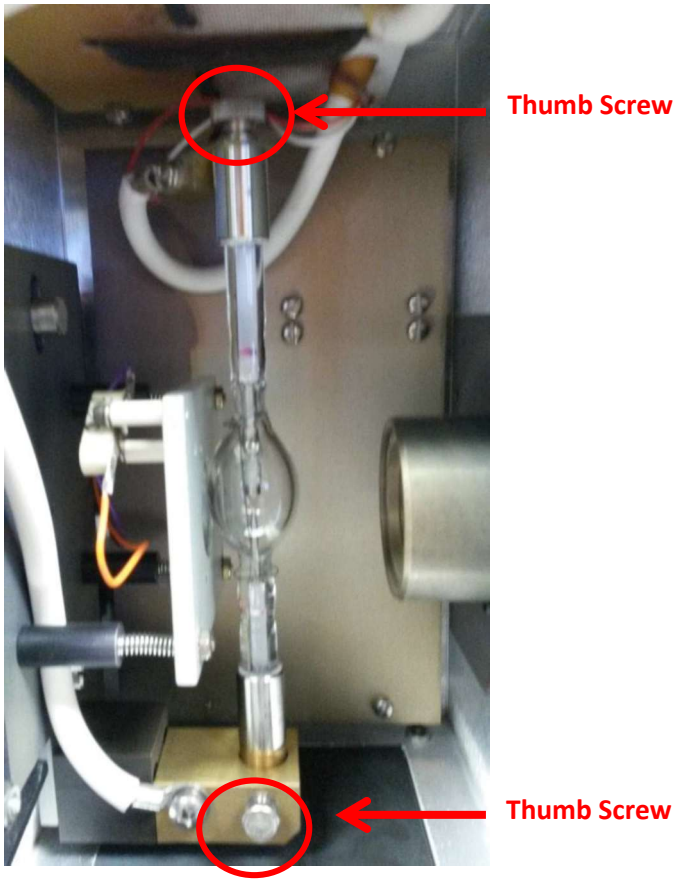
2.2 Install the lamp in to the lamp housing with the positive side up

- **Attach the brass adaptor that holds the thermistor on the top of the lamp with thumb screw**



- **Place bottom of lamp in to the lamp mount**
- **Tighten thumb nuts to secure the lamp to the lamp housing**





- **If the lamp includes a starter wire, rotate the lamp so that the wire is facing towards the back of the lamp housing. The back of the lamp housing is where the baffle covers the fan, directly opposite of the door opening.**
- **See Appendix 3 for more information about lamp alignment**

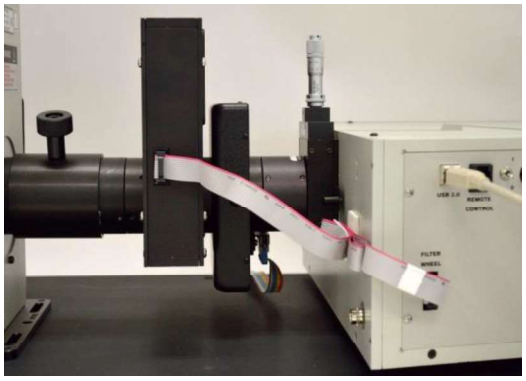
#3 Cable Connections

3.1 Lamp housing to power supply

- **Using cable 70050 only attach one way**
- **Power supply to wall power**

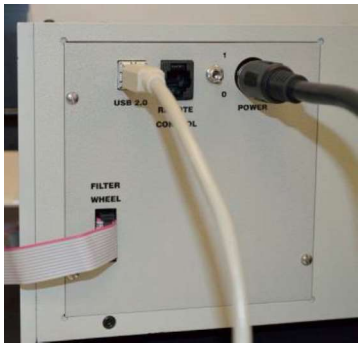
3.2 Filter wheel to monochromator with ribbon cable

- **This ribbon should come installed on the system**
- **NOTE: Do not remove the ribbon cable with the monochromator powered on damage will occur**



3.3 Monochromator

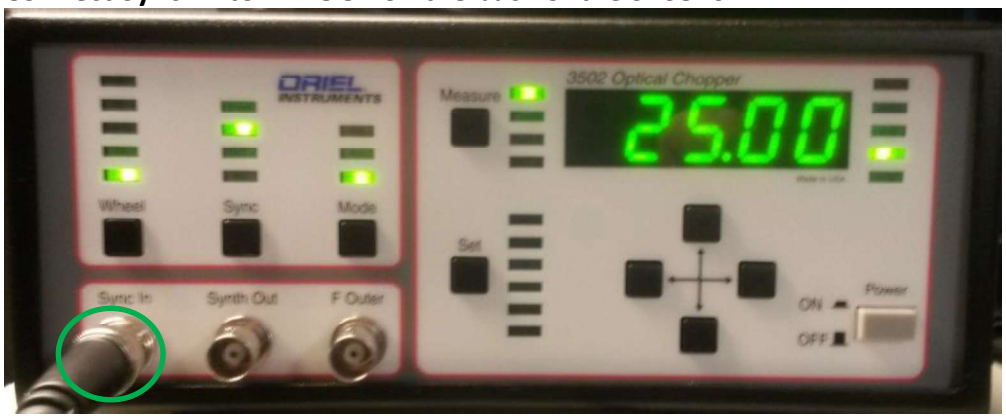
- **Power cable attaches to wall power**
- **USB connects to computer**
- **NOTE: Do not connect the USB cable to the computer until the TracQ Basic software is installed.**



3.4 Optical Chopper

- **Attach Chopper Controller cable to Chopper wheel Connection (9-pin DSub) to the motor connection on chopper controller**

- **Connect Sync in to TTL OUT on the back of the SRS810**



3.5 SRS810 Connections

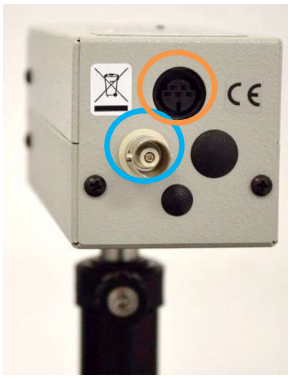
A1 BnC to detector or pre amp for sample cell

- **Connect A1 BnC cable to BnC on detector / pre amp**

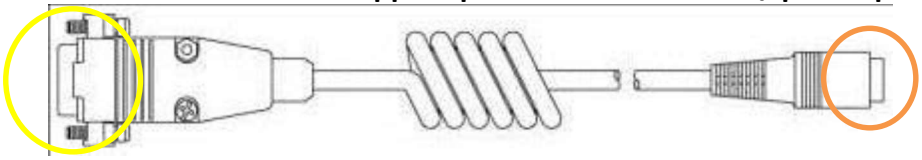
Mini grabbers connect from the sample cell and attach to the Bnc connection at the top of the pre amp

- **Reference detector**

Preamplifier



- **CBL-70054-LIDA cable supplies power to the detector / pre amp**

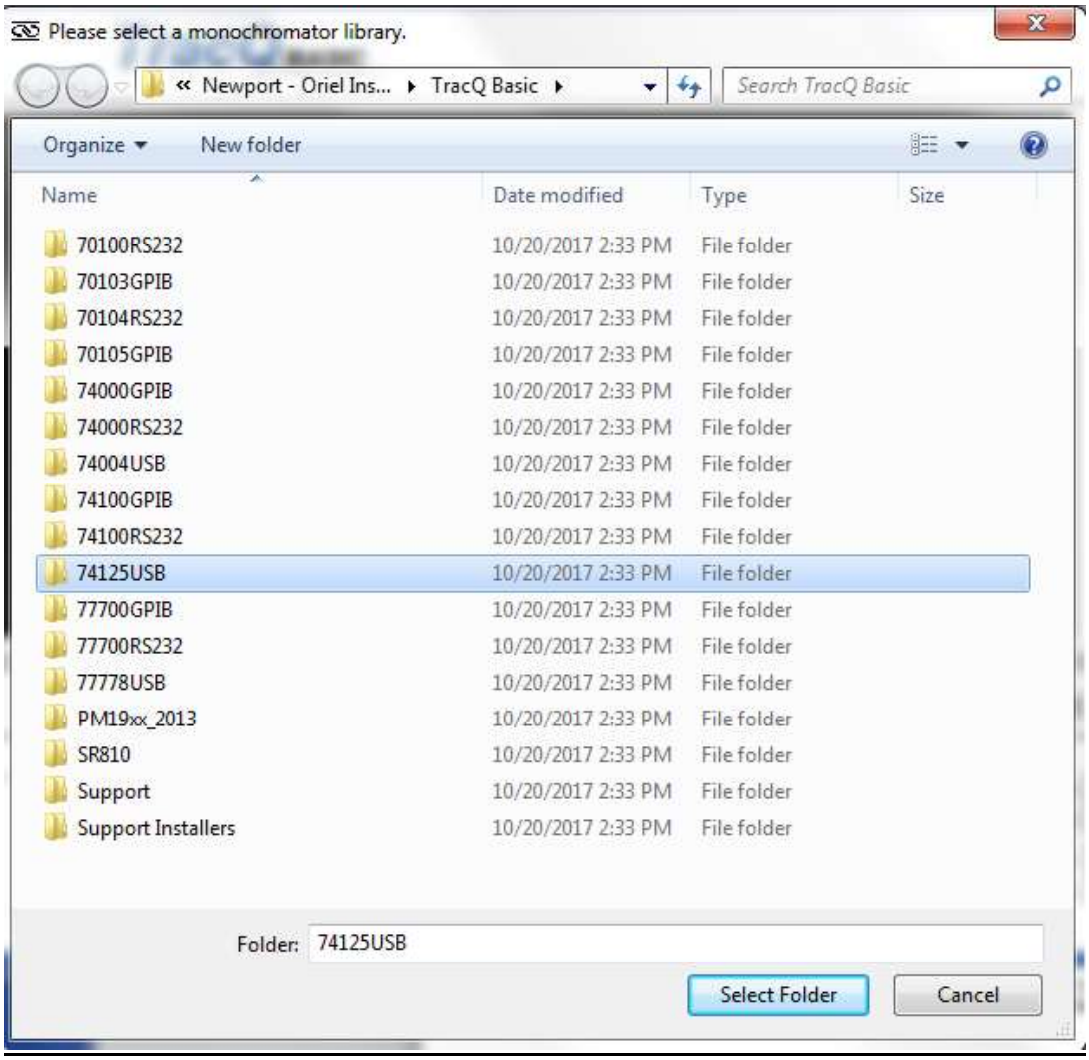


- **GPIB-USB cable connects SRS810 from port IEEE-488 STD Port to USB on computer**

#4 TracQ Set Up

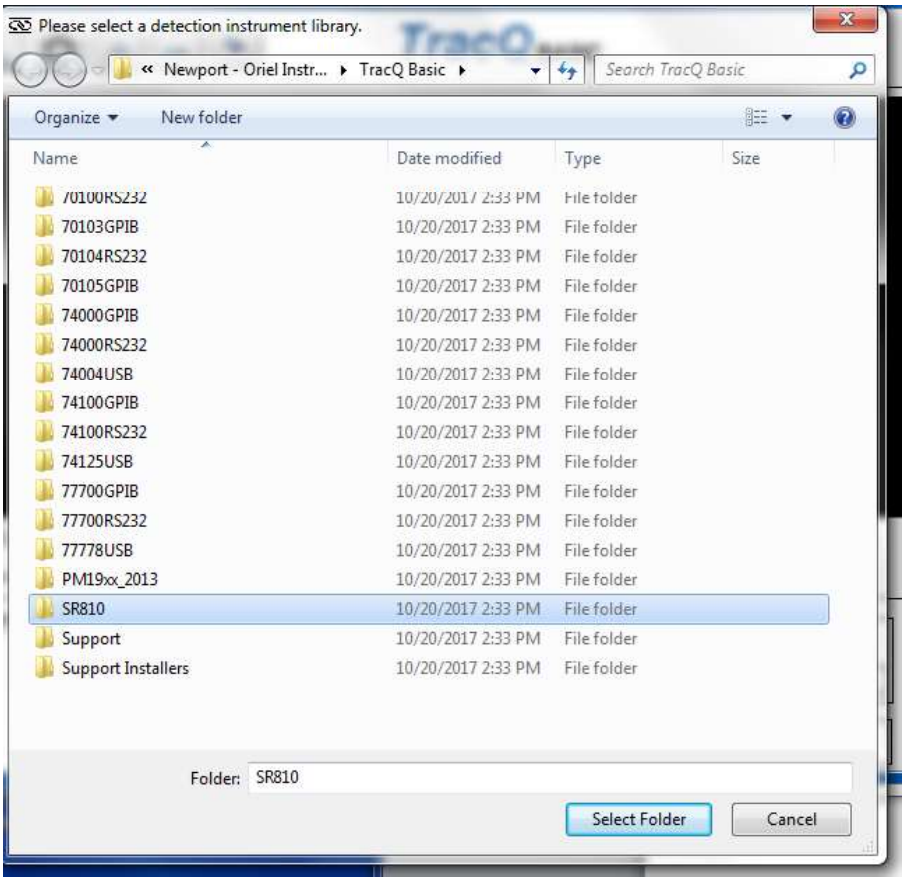
4.1 Establish mono communication select com port

- **Monochromator/Mono library path /74125 USB**



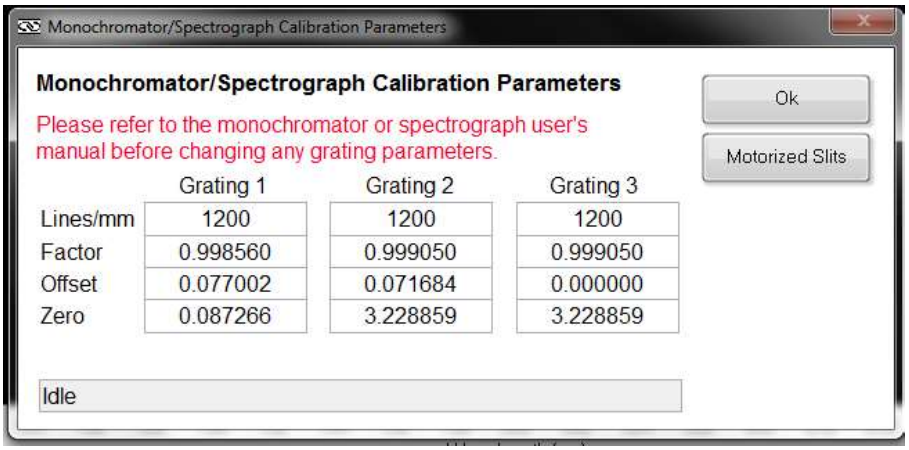
4.2 Establish detector communication

- **Detection Instrument/Detector library path/ SR810**



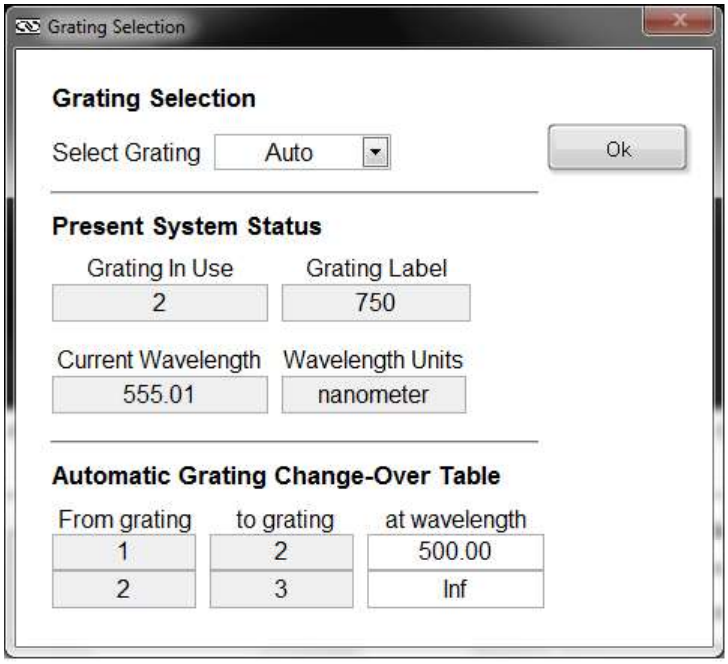
4.3 Verify the grading calibrations parameters with the certifications that ship with mono

- **Monochromator/ calibration parameters**
- **Example (values may be different)**



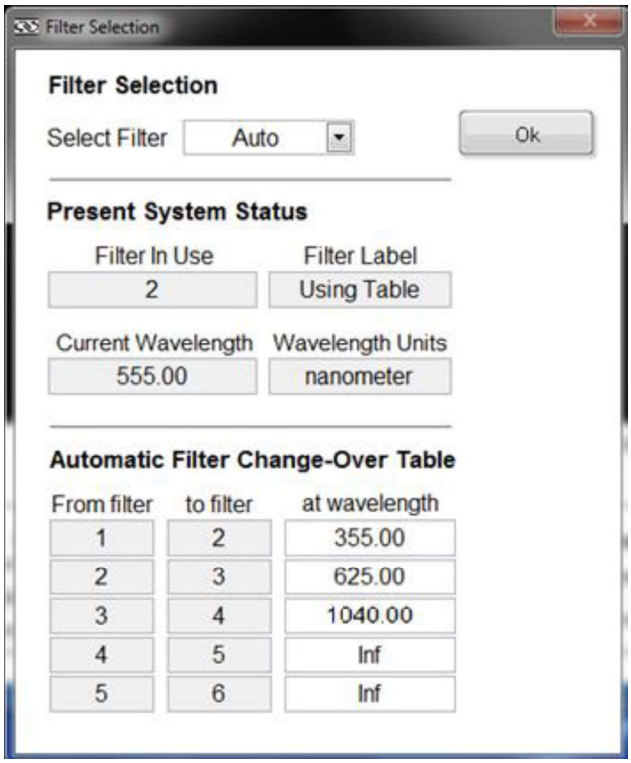
4.4 Grating switch over parameters

- **Monochromator / gratings**
- **Grading selection to AUTO**
- **Grating switch over @ (500nm)**



4.5 Filter change over parameters

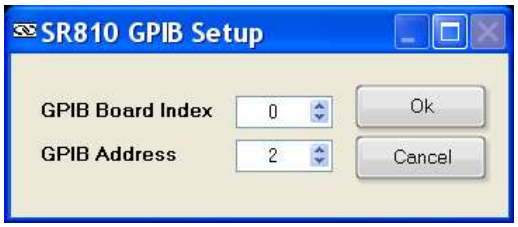
- **Set filter wheel selection to AUTO**



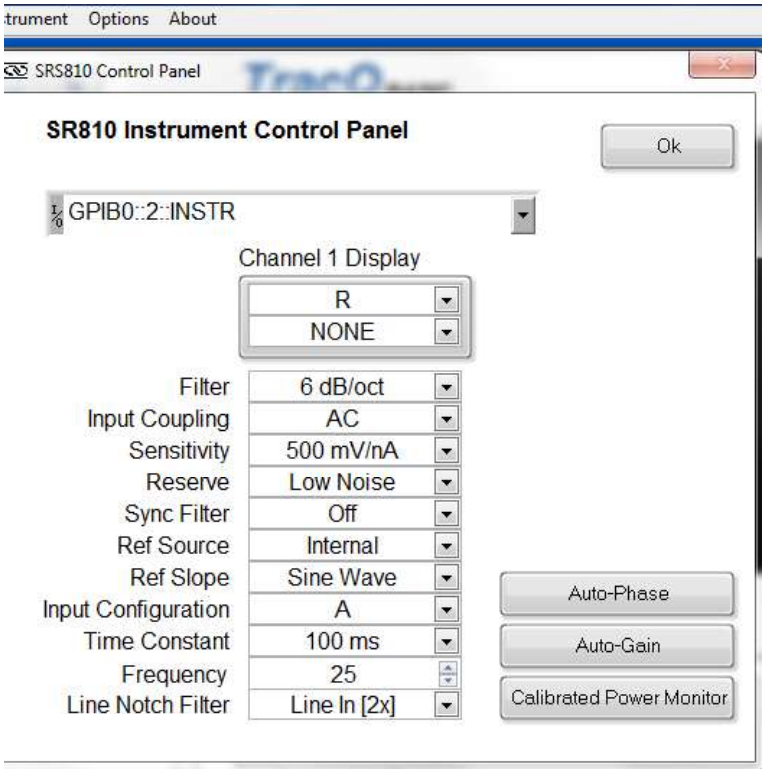
4.6 SRS parameter set up

- **1 Interface section**
  - **GPIP/RS232 = GPIB**
  - **ADDRESS = 2**
  - **BAUD = 9600**
  - **PARITY = NONE**
  - **QUEUE = 444E 3F0A**
- **2 Time Constant**
  - **Set the parameters**
  - **Time Constant=100ms**
  - **Slope/Oct= 12db**
  - **Sync <200Hz= ON**
- **3 Signal Input**
  - **Input=A**
  - **Coupling=AC**
  - **Ground=FLOAT**
- **4 Sensitivity**
  - **Set equal to 5 X 100 mV**
- **5 Reserve**
  - **Set equal to LOW NOISE**
- **6 Filters**
  - **Set equal to 2 X line**

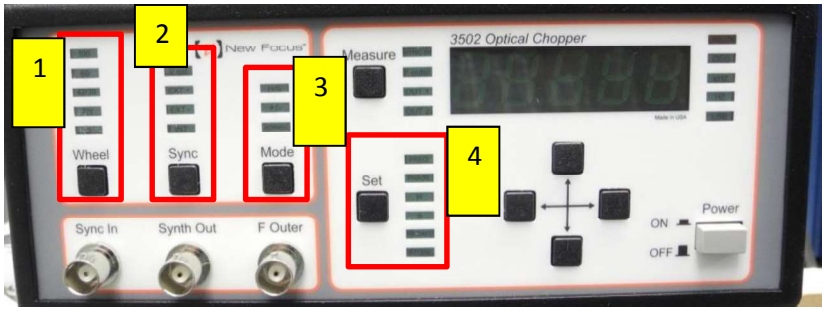
4.7 In TracQ software go to the pull-down menu Detection Instrument / Setup Communication. Set up as shown



- **In TracQ software go to Detection Instrument/ setup parameters**
  - **Verify that Channel 1 Display is set to R**
  - **Verify Ref Source is set to Internal**



4.8 Chopper set up



- **Wheel (1) = 2**

- **Sync (2) = EXT+**
- **Mode (3) = Normal**
- **The 'Set' button (4) cycles through parameters indicated by the adjacent LEDs. These should be:**
    - **FREQ = 25.0 Hz**
    - **PHRASE = 0 DEG**
    - **H = 6**
    - **S = 1**

#5 Optical Alignment

5.1 Power supply settings (OPS-A500)

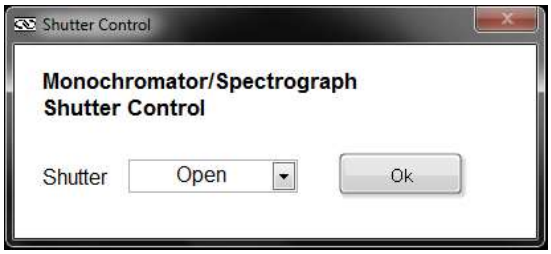
- **Verify I Set is 16A and I Max is17.5**

- **Verify P Set is 300W and P Max is 330W**

- **Verify the power supply is operating in power mode**
- **Once the values are set you can now ignite the lamp by pressing the lamp button on the front panel of the power supply**

5.2 Use TracQ to open/close shutter

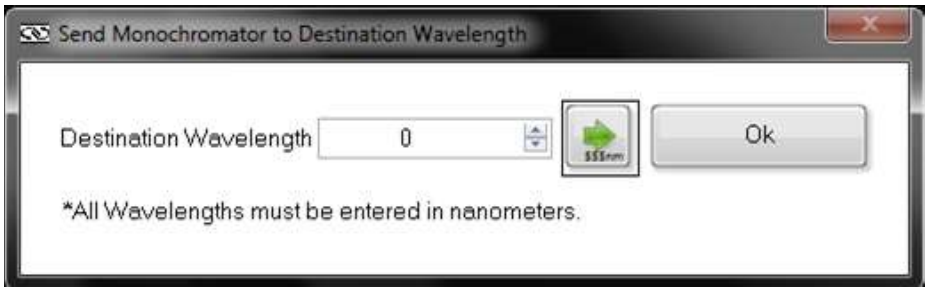
- **Monochromator / shutter**



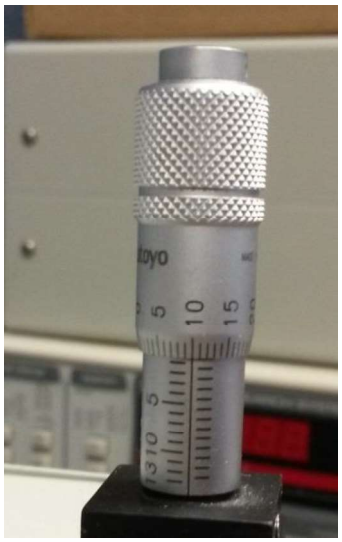
- **Verify shutter is in correct position**

5.3 Use TracQ go to wavelength and enter "0"

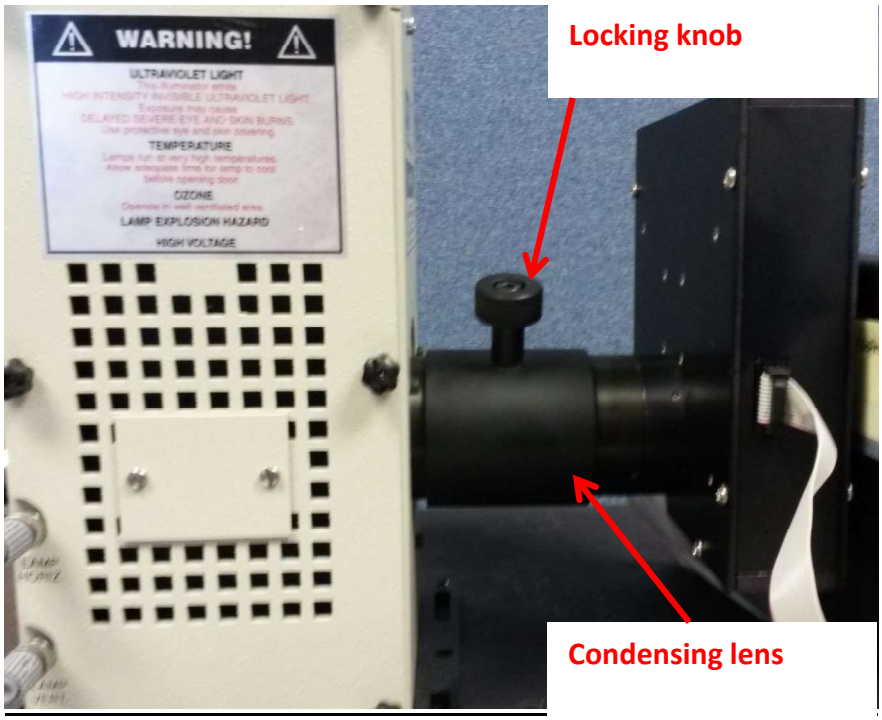
- **Monochromator/ go to wavelength**



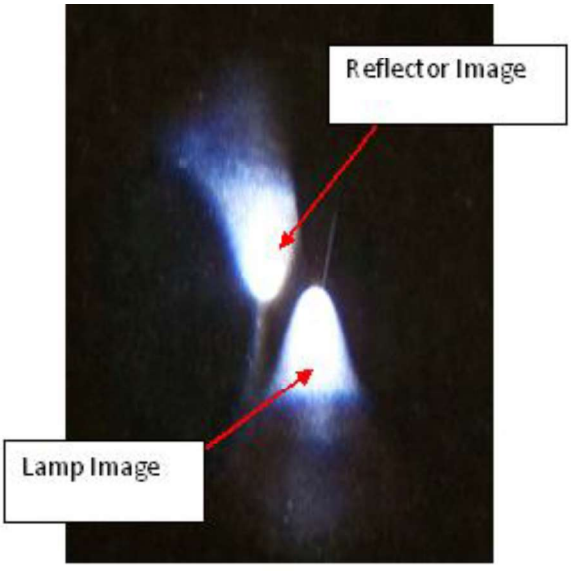
5.4 Increase slit widths on both micrometers to 600 microns (for optical alignment only)



5.5 Use condensing lens to focus on the arc



- **Focus image with knob on condenser lenses**



- **Focus Reflector Image to look similar to Lamp image as shown below. Use the three knobs for Rear Reflector Adjustment on the Lamp Housing.**
- **Overlay the two images of the arc**

- **Lock condenser in place using locking knob**
  - **(You Tube video https://www.youtube.com/watch?v=cwhYITvA8EI)**

5.6 Minimum slit height to center beam (tab adjustment)

5.7 Center lamp using adjustment gray knobs for horizontal and vertical adjustments.

- **Defocus condenser lens to make beam uniform.**
- **Uniform beam** **Focused beam**

5.8 Set both micrometers to 375 um

5.10 Set wavelength to 555nm

- **Monochromator/go to wavelength (see step 5.3)**

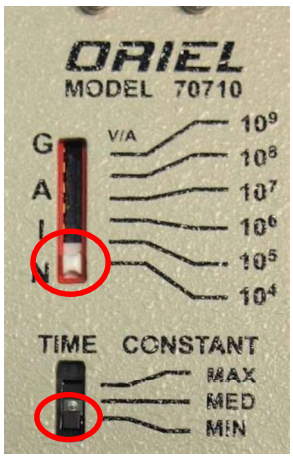
5.11 Attach 77330 Focusing Lens assembly

5.12 Place calibrated reference detector in beam path align beam under the active area of the detector

- **Focus the beam distance is around 40mm +/- 5 mm**

5.14 Detector parameters

- **Set gains to 10^4 and time to min**

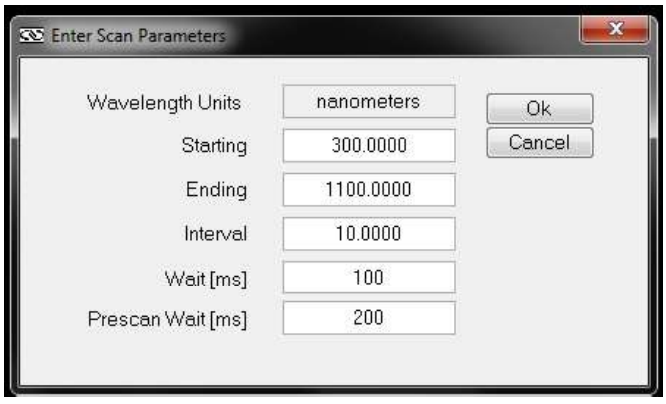


- **Check SRS to verify that you are seeing signal in mv**

#6 Reference Scan

6.1 Set up reference scan parameters

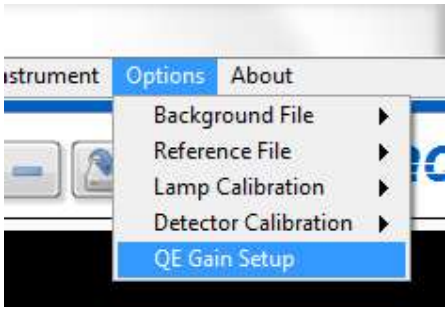
- **Scan/ Set up scan wavelength parameters**



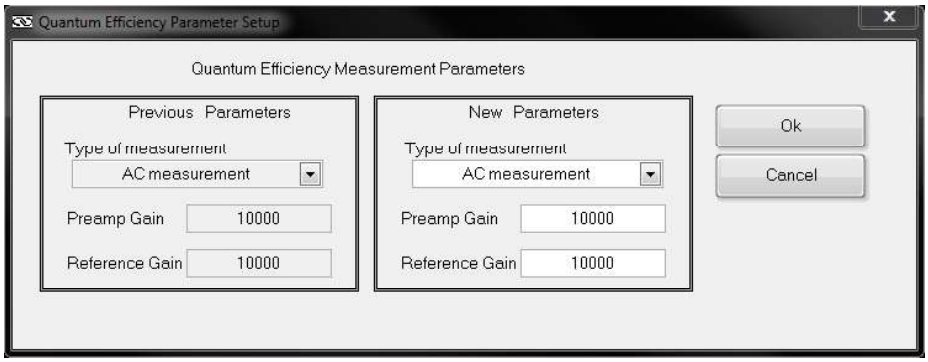
- **Starting wavelength**
- **Ending wavelength**
- **Interval- (step size)**
- **Wait (ms)- The delayed of time in-between grating positions before the detector takes a sample**

- **Pre scan wait (ms)- Allow the sample extra time to settle prior to talking the first data point**

6.2 QE gain set up



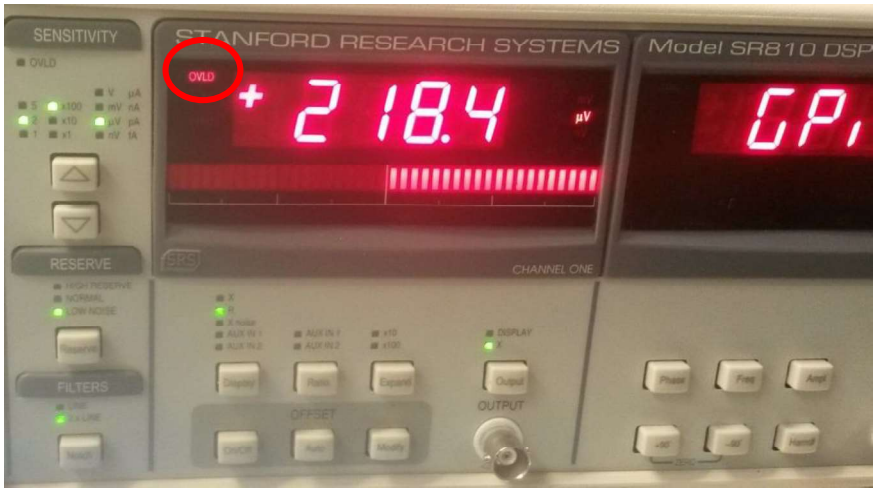
- **Set measurement type to AC**
- **Preamp Gain to 10000 (10^4)**
- **Reference Gain 10000 (10^4)**
- **These are the default values**



6.2 SRS Sensitivity Selection

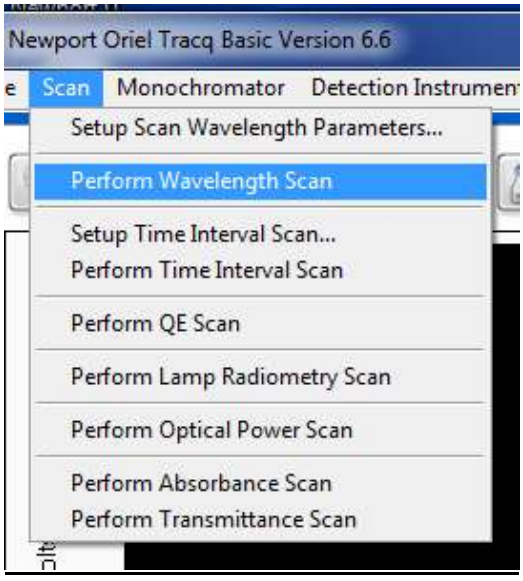
- **Set wavelength to 555nm(see step 5.3) make sure shutter is open (see step 5.2)**
- **Press auto gain on the SRS810**

- **After Auto Gain is complete, manually adjust the sensitivity from the front panel (from 1 x100 mV to 2 x 100 mV). This will keep the signal from saturating *during* a wavelength scan**



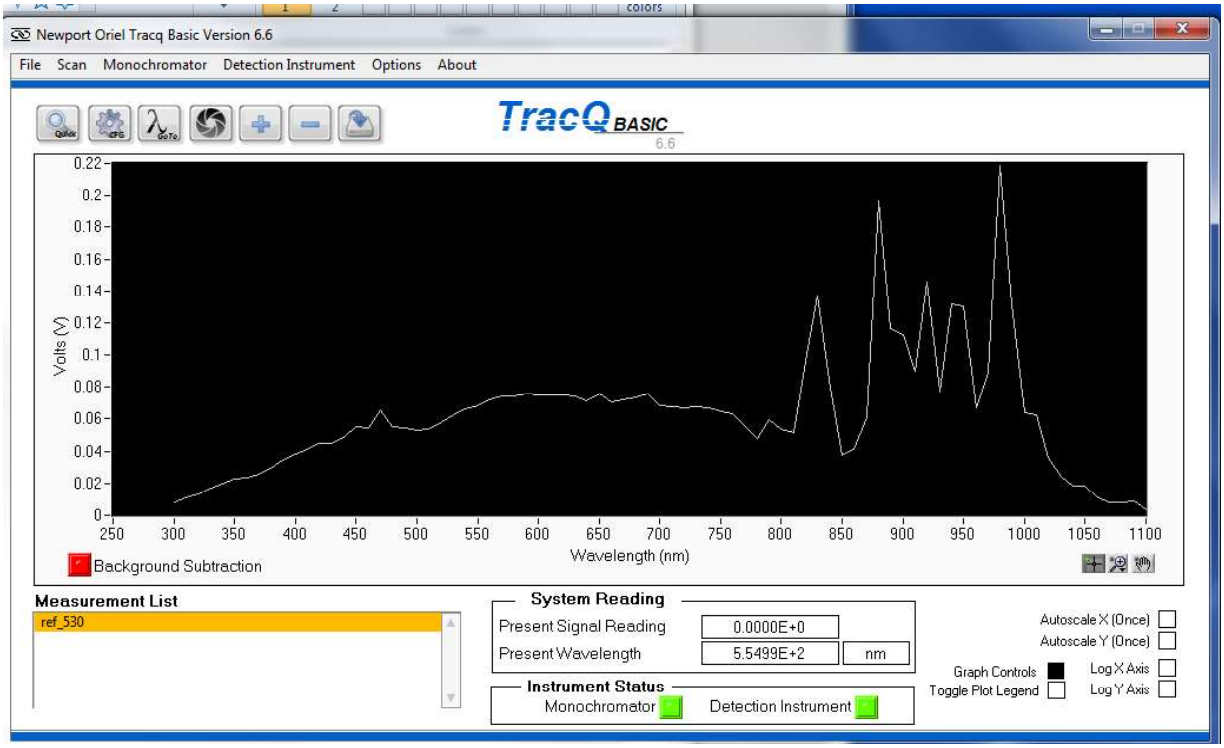
- **You know the sensitivity is too high when the red OVLD symbol appears on the display of the SR810.**
- **This will cause the detector to oversaturate and cut off data**
- **Reduce the sensitivity as needed to take the signal out of overload**

6.3 Perform Wavelength scan



- **Save file**
- **File\ save scan data as ref1_XXX where XXX is the last 3 numbers of the calibrated reference detector**
- **Below is an example of wave length scan with 10 nm steps**

- **You should see gradual increase from 350-800 and peaks at 825nm, 875nm, 930nm, 945nm, 980nm**



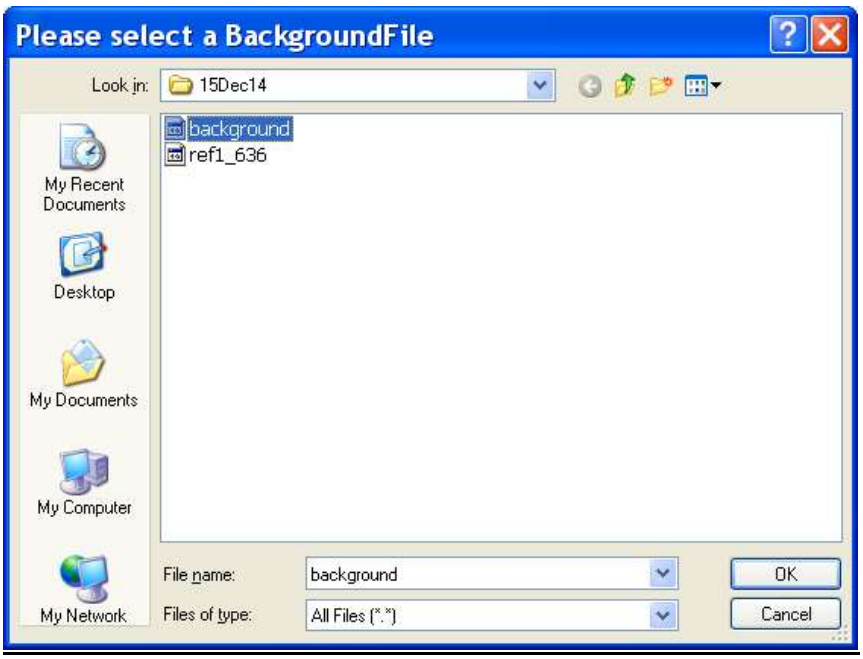
6.4 Perform Background scan of detector

- **Close shutter (see step 5.2)**
- **Press the *Auto Gain* button on the SR810 to automatically reset the instrument to increase the sensitivity to read the signal from the Reference Detector with no incident light.**

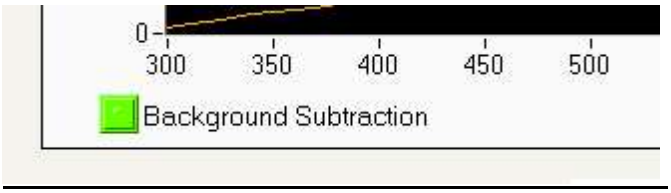
- **After Auto Gain is complete, manually adjust the sensitivity from the front panel (to 2 x1 uV). This will keep the signal from saturating *during* a wavelength scan, Auto gain can also be accessed by Detection Instrument/ setup parameters (see step 4.7)**
- **Perform Wavelength scan (See Steps 6.3) on the reference detector with no light to measure the background signal of the**
- **Save background scan File\ save scan data detector background**

6.5 Load detector background file for background subtractions

- **Once the back ground file is loaded you will have to toggle background subtraction on.**



- **Notice that *Background Subtraction* is now highlighted green indicating that the present scan has the**
- **Background data subtracted from the measured detector signal.**



6.6 Open shutter (step 5.2)

- **Set the wavelength to 555 (see steps 5.3)**
- **Press the Auto gain on the SR810**
- **Manually adjust the sensitivity of the detector signal to 5X 100 X mV.**

6.7 Perform a wavelength scan (See Step 6.3) on the reference detector a second time with background subtraction on.

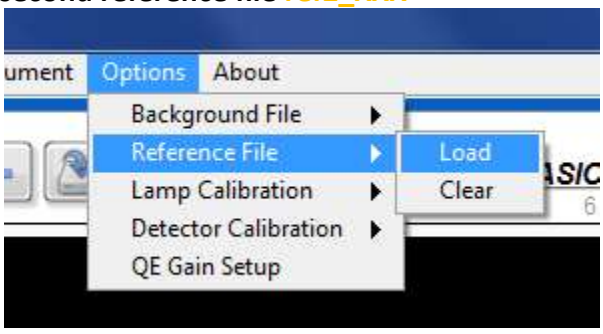
- **Save file ref2_XXX**

6.8 Load the both reference files for comparison

- **Select the scan that you want to view under Measurement list.**
- **Hold Ctrl key and select the second scan that you want to view**

6.12 If the reference scans are identical, then background noise is low and bulb is warmed up. This is a good sign the system is stable and ready to make accurate measurements of you samples.

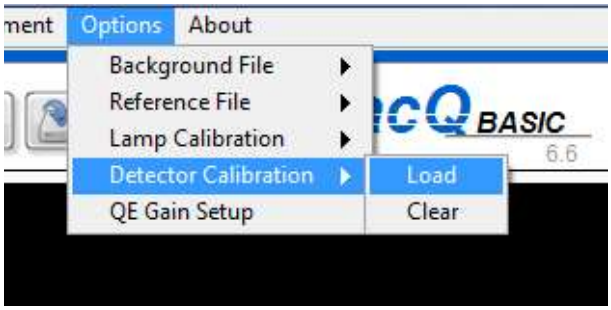
6.13 Load the second reference file ref2_XXX



6.14 *LOAD CALIBRATED REFERENCE DETECTOR CAL FILE*

- **Load the calibration file for your specific Reference Detector. Options/ Detector Calibration / Load/ "70356_70316N_636_tabs.txt" (example file**

name). This calibration file for *your specific reference detector* is included on your USB thumb drive

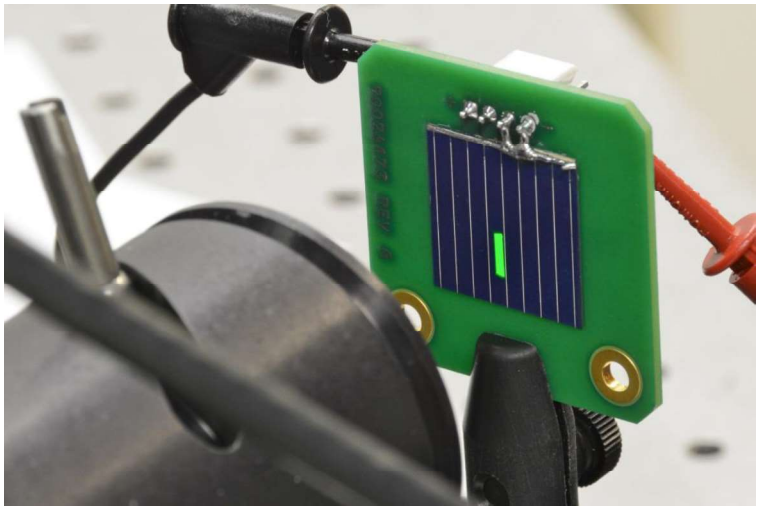


6.15 Now you have calibrated your QEPVSI-B for following wavelength scans of your solar samples or filter transmission. It is very important at this point that you resist modifying the QEPVSI-B instrument in any way from its current configuration before completing your test scans. Do not turn off/on the lamp; adjust the collimation of the lamp, the input/output slits on the monochromator, the output lens position or the horizontal slider that controls beam height. If changes are made or you return to your system after a long period of time (many hours) in which the lab environment has changed, please repeat these calibration steps.

#7 Sample test

7.1 Place sample in beam path

- **Keep same working distance as (see step 5.12)**
- **Set the wavelength to 555 (see step 5.4)**
- **Be careful to place the beam in between the bus bars**



7.2 Connect the sample cell to the pre amplifier (see steps 3.5)

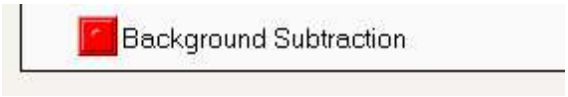
- **Check gain settings. Same as detector settings gain on the pre amp 10^4 time min**

7.3 Press the Auto Phase to allow the SR810 to lock to the phase difference between the chopper sync signal and the pulse light signal from the sample cell. The auto phase can be pushed a few times to verify the lock-in phase is consistent. The phase will likely be different from what it was previously when using the reference detector. This is normal.

7.4 Take a background scan of you sample cell

- **Clear the old back ground file**

- **Verify Background Subtraction is off by noticing the green indicator has become read**



- **Close shutter (see step 5.2)**

7.5 Press the *Auto Gain* button on the SR810 (see step 6.4)

- **Manually adjust the sensitivity to keep the SR810 from over saturating**
- **Example: 5 X 1 X uV**

7.6 Minimize light entering the sample cell by covering the sample from room lights and equipment lights

7.7 Perform Wavelength scan on the sample cell with no light to measure the background signal of the system (see steps 6.3)

- **Save file as background_sample cell**

7.8 Load background_sample cell file (see step 6.5)

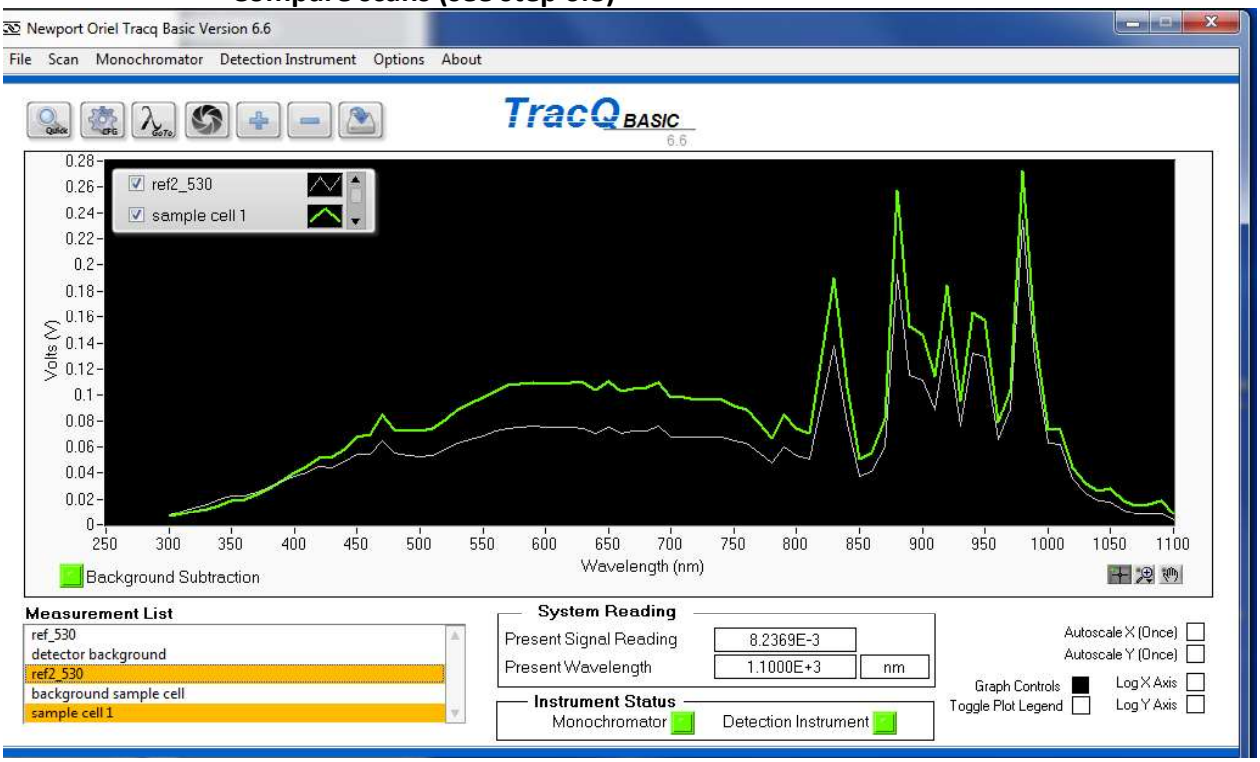
- **Now the background noise of sample amplifier can be subtracted from all future wavelength scans performed with your sample cell.**
- **Verify background is active**

7.9 Wavelength scan of sample cell

- **Open shutter (see step 5.2)**
- **Set mono to 555 (see step 5.3)**
- **Press Auto gain then manually adjust the sensitivity of the detector signal to 5X 100 X mV.**
- **Perform a wavelength scan on the sample cell with back ground subtraction on (see step 6.3)**
- **Save scan as sample cell 1**

7.10 Compare ref2_XXX and sample01 (see step 4.12)

- **It is common for the sample cell (green curve) to have a slightly higher response than the reference detector (gray curve) as shown.**
- **Compare scans (see step 6.8)**

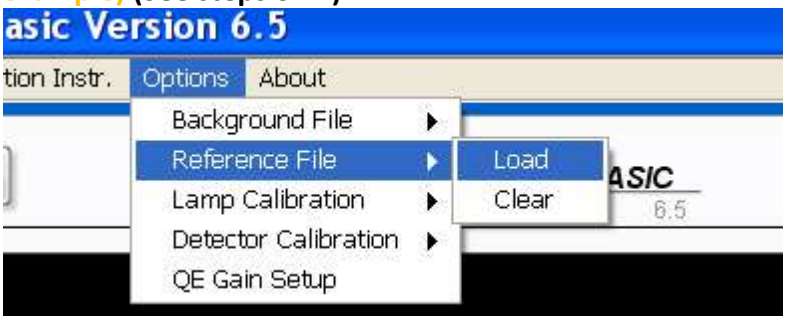


#8. QE scan sample cell

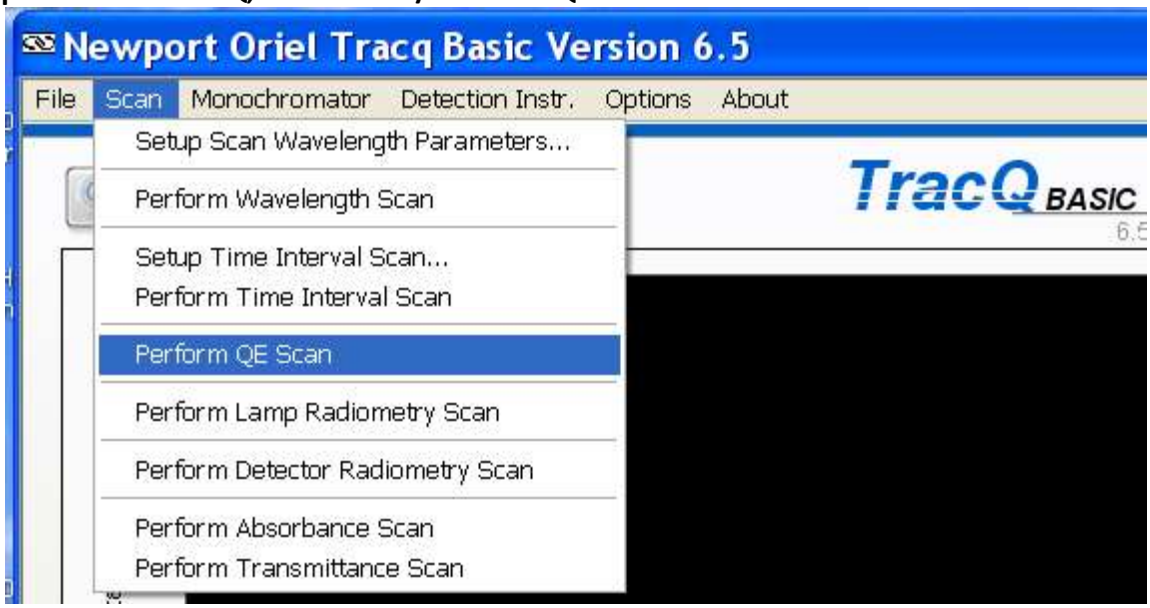
At this point it is critical that no changes be made to the wavelength scan parameters, slit widths, working distances.

8.1 Before you can take a QE measurement load the following files

- **Options / Background File / Load / background_sample cell (see steps 4.7)**
- **Options / Reference File / Load / ref2_XXX (see steps 4.13)**
- **Options / Detector Calibration / Load / 70356_70316N_636_tabs.txt (example) (See steps 6.14)**



8.2 From front panel of the TracQ, select Scan / Perform QE Scan

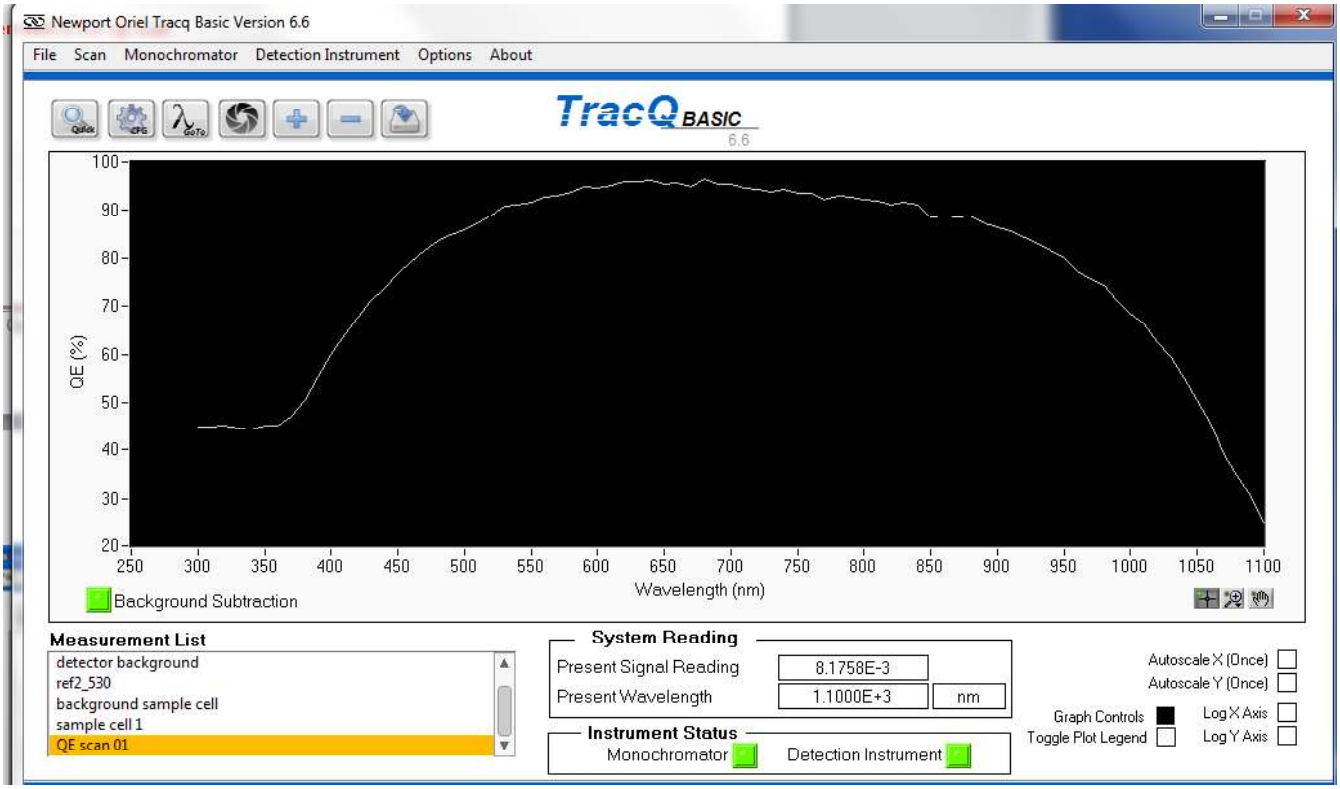


8.3 The QE scan will automatically begin. You can abort the scan at any time during the scan by clicking on clear or stop icons.

8.4 Your QE scan should look similar to the following screen shot, peaking around 90-95%.

- **This example shows wavelength 300-375 measuring around 50% QE**
- **From wavelengths 375-580 measure an increase in QE from 50%-92% efficiency**
- **From wavelength 580-850 the QE is relatively flat and measuring 90-95% QE**
- **From wavelength 850-1000 QE starts a gradual decrease in efficiency**

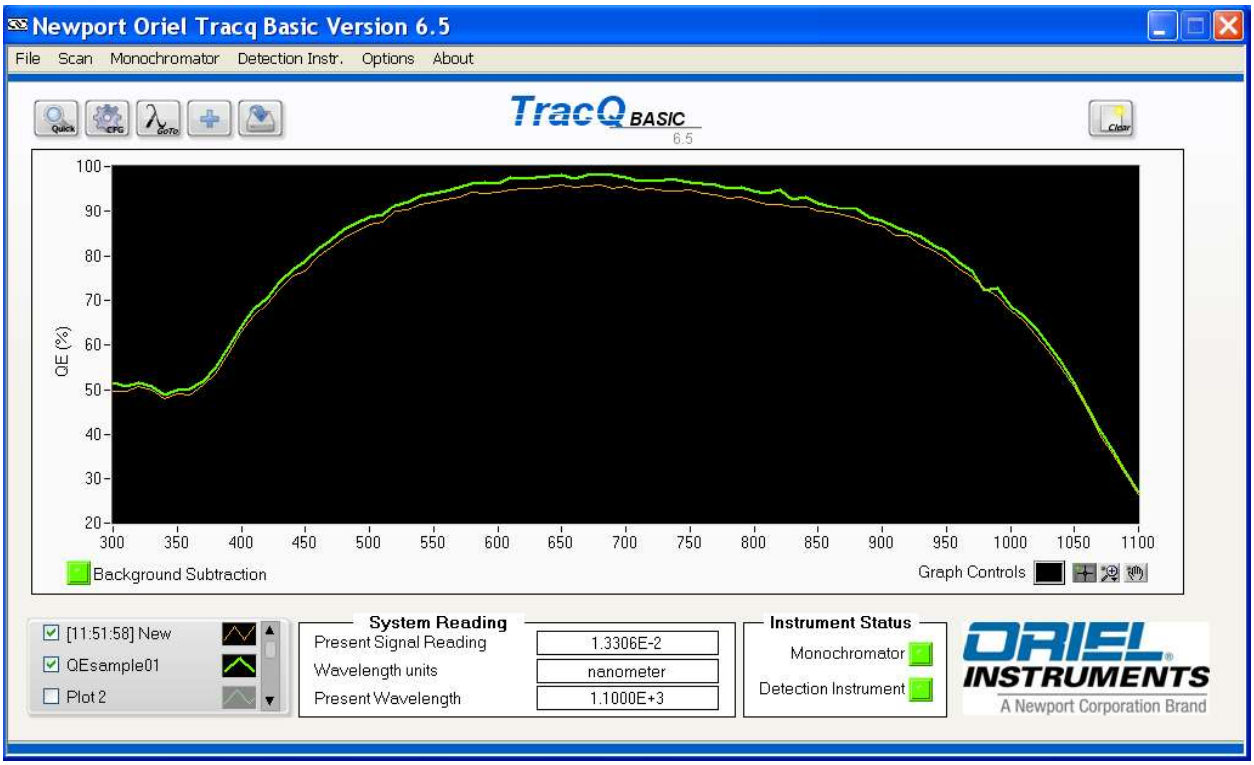
- **From wavelength 1000-1100 sharp decrease down to around 20% QE**



8.7 Save QE scan as QEsample01

8.8 To verify you QEPVSI-B is performing properly, Click on the load scan and Browse to the file "QEsample_factory" file on your USB jump drive to load the factory scan.

- **In Measurements list click on the QE scan you have just performed hold down ctrl and select the QE scan from the factory**
- **Your QE scan of your sample cell (brown curve) should be nearly identical to the factory QE scan of your sample (green curve). Slight differences may arise from exact placement of the beam on the sample and, especially, if part of the beam overlaps a bus bar on the sample surface.**



- **Once you have verified a successful sample scan, you are ready to measure other samples.**

How to change V to QE:

1. Detector collects data in Volts
2. Convert Volts in the Amps/Watt
    a. Save scan as Reference file

Customer need to

1. Perform a quick scan of the calibrated detector. Save as REF file
2. Load cal file(of calibrated detector) before performing QE scan

REFERENCE MANUALS

LIDA-SRS-KIT, Mtracqbasic 6.6, MQEPVSI-B, ORIEL CORNERSTONE 260 MANUAL (MCS130), Mtracqbasic-QSG rev A, OPS-A500 manual,

BUILD PROCEDURE- 13-APQEPVSI-B-WI001

NOTES:

- If you are getting over a 100% QE it is likely that the edge of the beam is being clipped by the detector.
- If you are getting low values .06um the cable to the SRS810 may be bad or may be incorrect cable.

Micrometer Adjustable Slits Appendix 1

Micrometer adjustable slit assemblies are continuously variable from fully closed to 3 mm width. A height adjustment slide allows variation in the height from 2 to 12 mm. Benefits of the micrometer adjustable slits are flexibility and high throughput. This type of slit is designed primarily for versatility and convenience in changing resolution and throughput, which are related to the slit width.

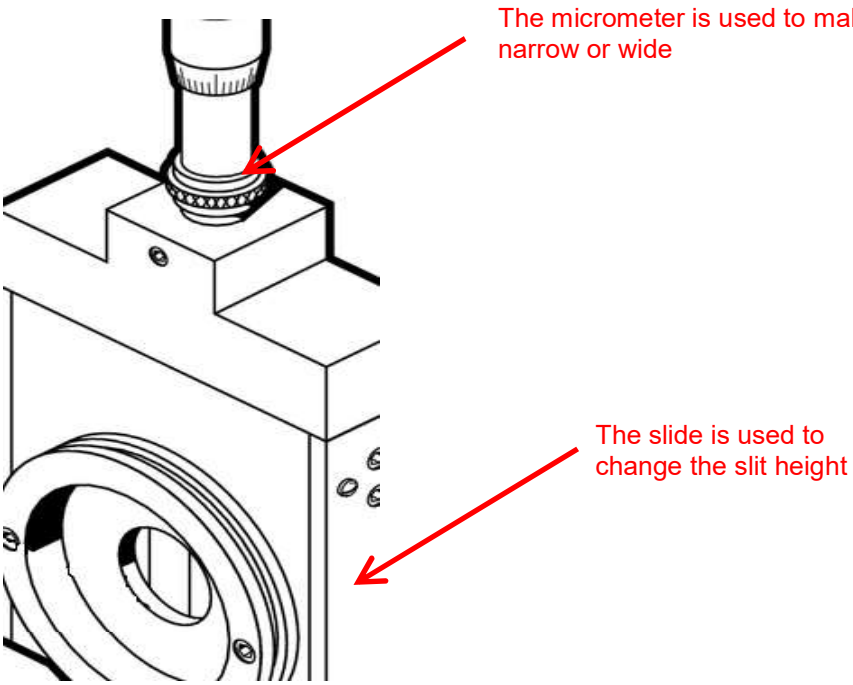


Figure 1: A Micrometer Adjustable Slit

The slit width setting is read on the micrometer. A set of numbers go around the turning dial. Another set of numbers are located on the shaft. When the zeroes in both these locations line up, the slit is fully closed. Turning the dial clockwise advances the dial position further down on the shaft, closer to the body of the micrometer. This opens the slit.

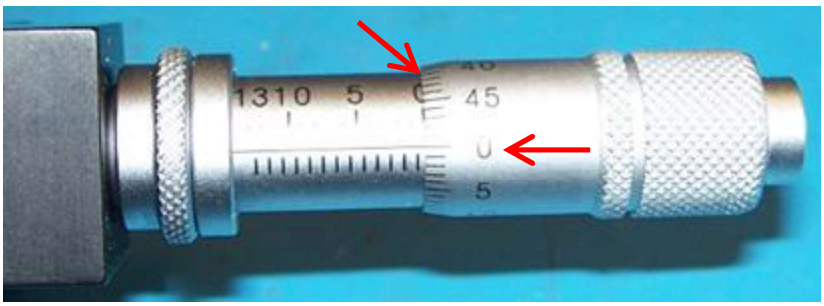


Figure 2: A Fully Closed Micrometer Adjustable Slit

The slit height is continuously adjustable. Pull the lever out for the shortest height. Push the slide in for the tallest height setting.

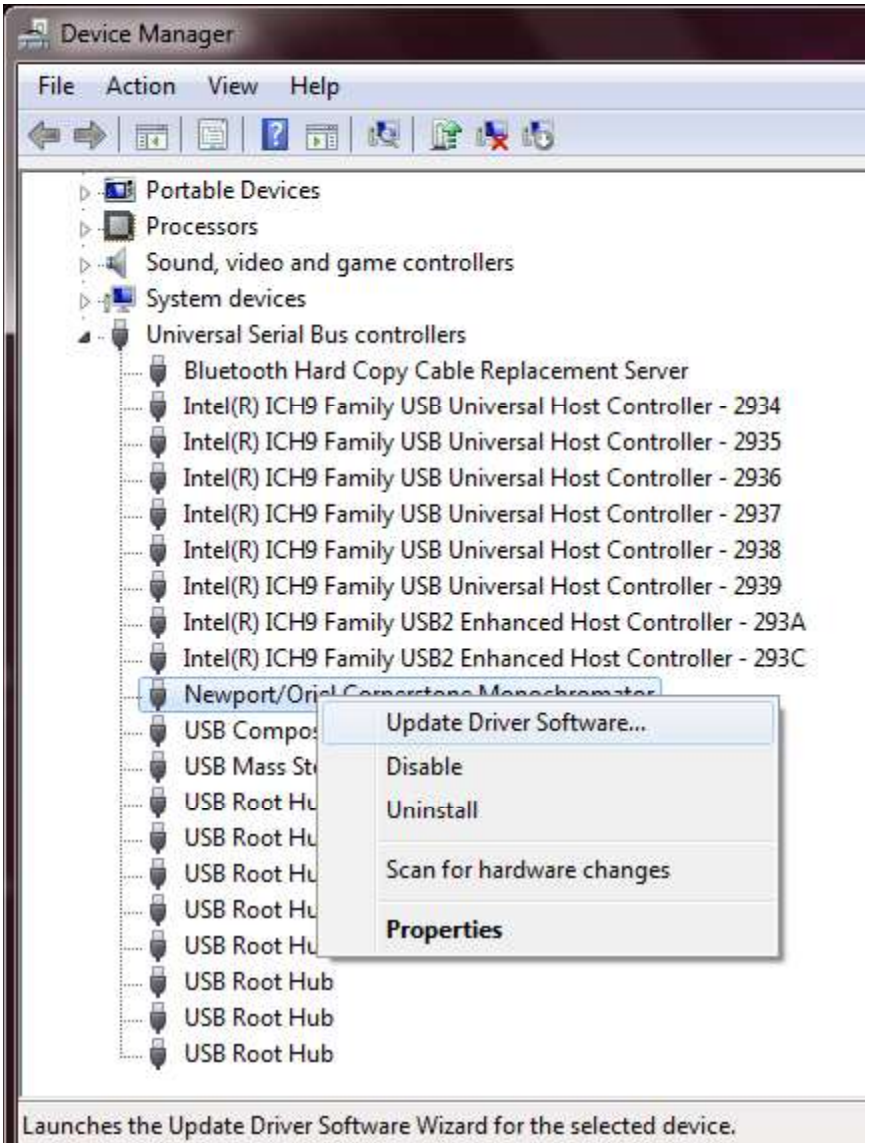
Use a 10x multiplier to convert the micrometer reading to the actual slit opening size. For example, turning the dial one full revolution starting from the fully closed position will give a reading of 50 on the micrometer. Using the multiplier, this indicates the micrometer width is set to 500 um. If unsure of the reading, begin at the fully closed position and add up each full revolution made.

Figure 3: Shortest Micrometer Adjustable Slit Height

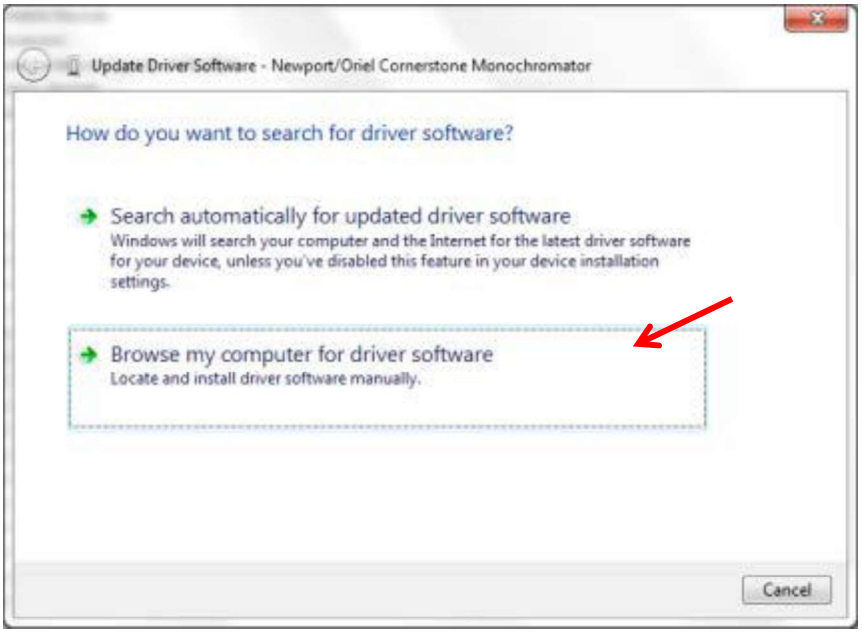
Figure 4: Tallest Micrometer Adjustable Slit Height

Monochromator driver trouble shooting Appendix 2

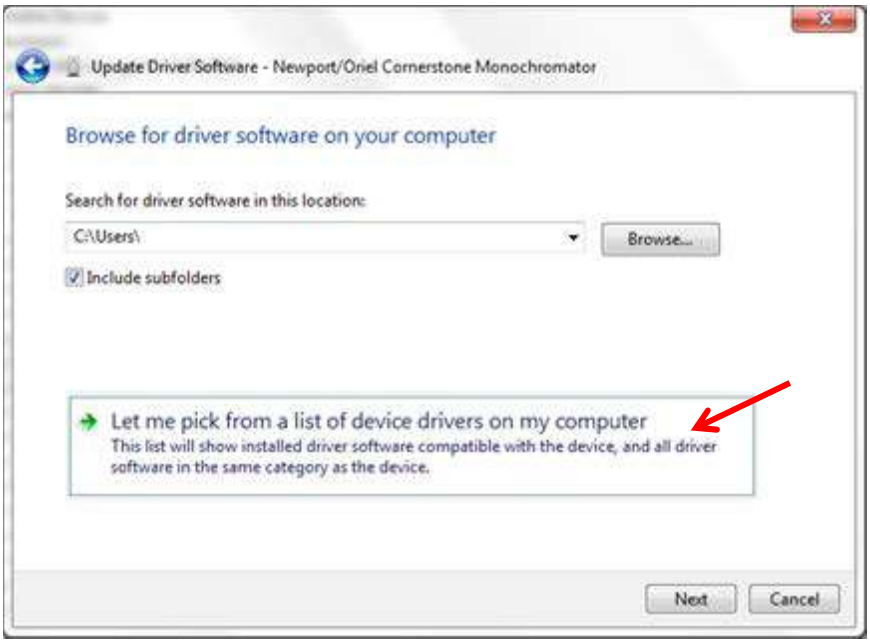
Open the Windows Device Manager and locate the instrument. Depending on the model, it may be listed as an Unknown Device or VSE Spectra. Right click on the instrument listing and select "Update Driver Software…"



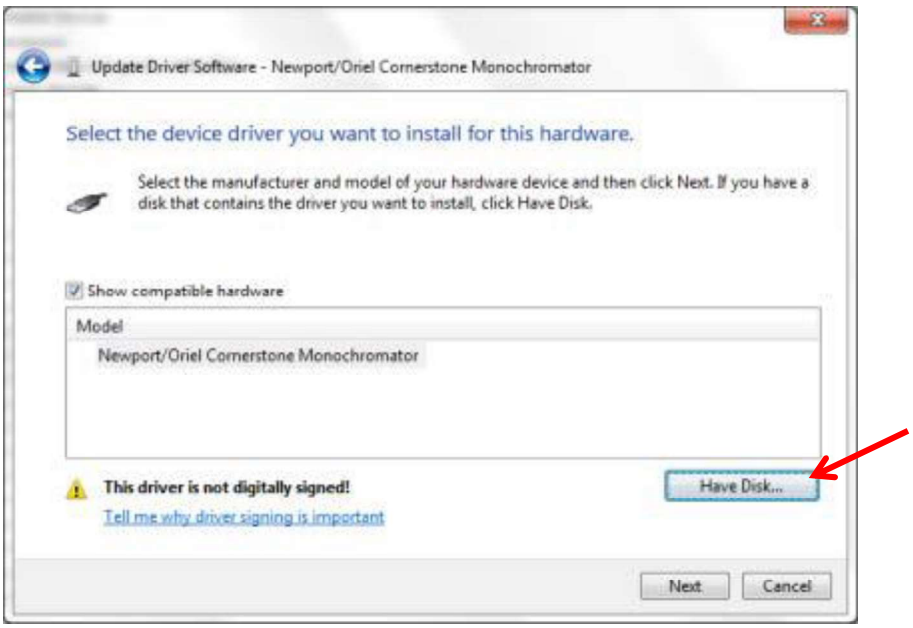
Click on “Browse my computer for driver software”.



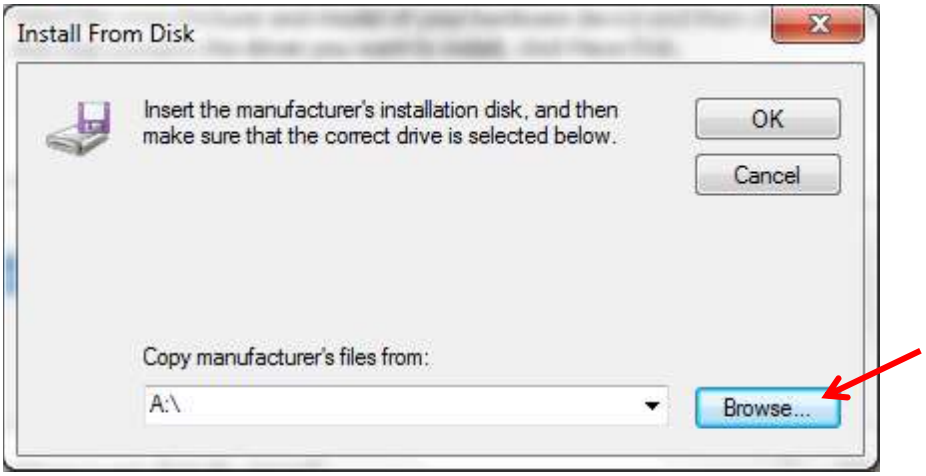
Click on "Let me pick from a list of device drivers on my computer".



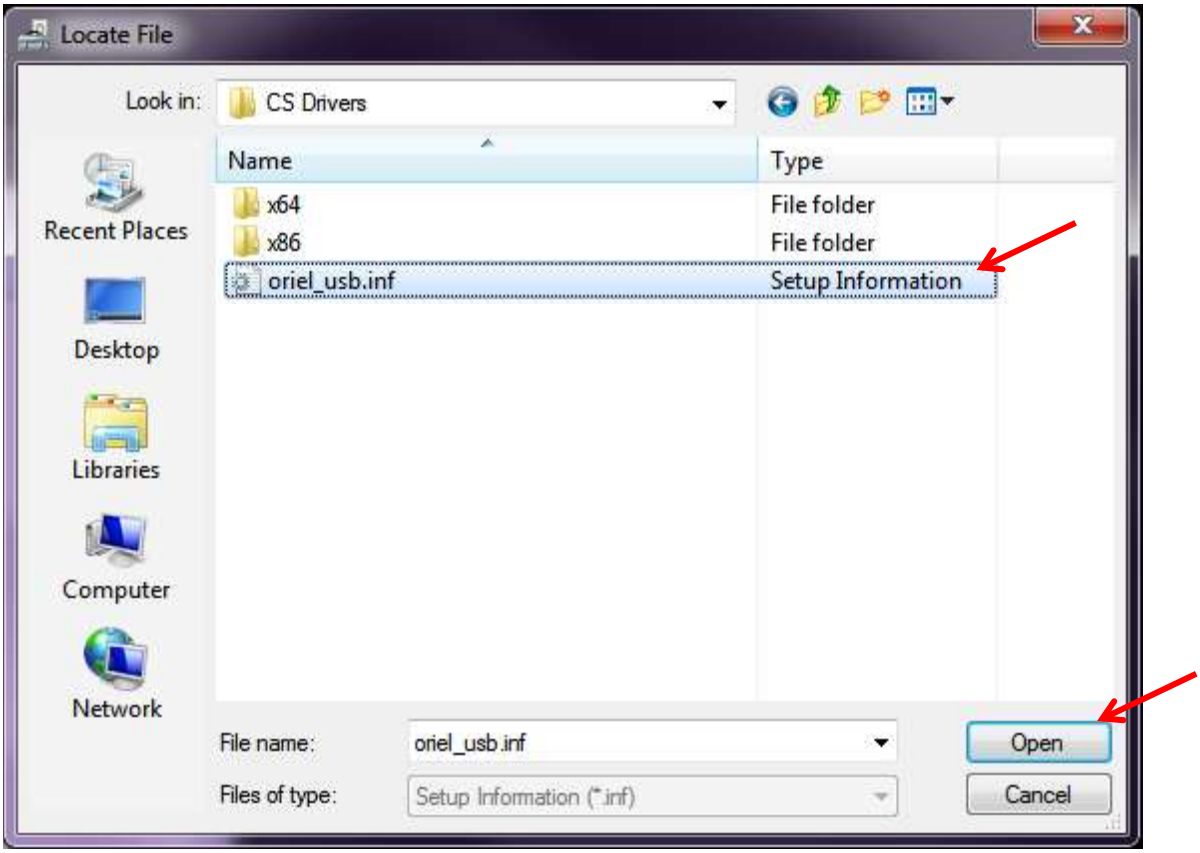
Click on "Have Disk…".



Click on "Browse…".

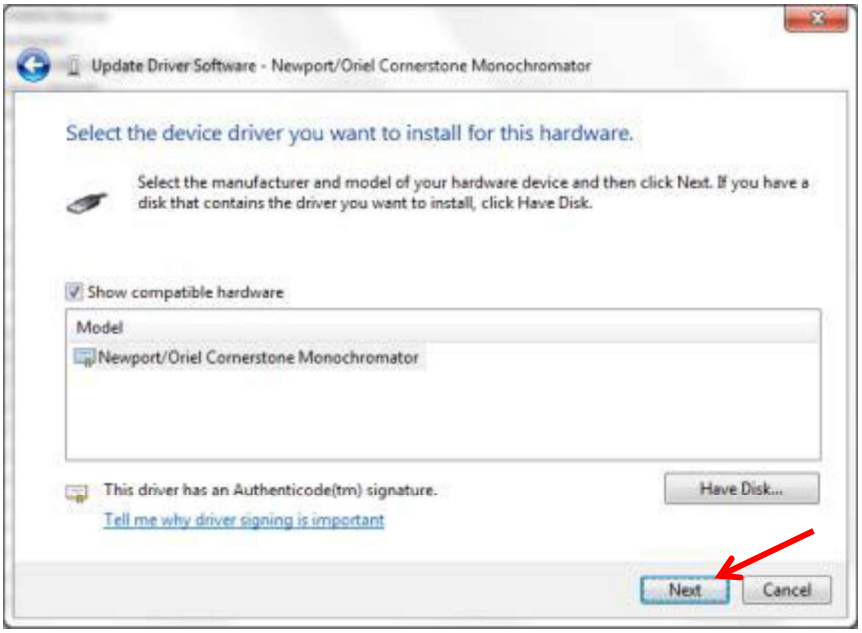


Navigate to the location of the USB driver on the computer based upon the type of monochromator. Select the .inf file as listed and click "Open".

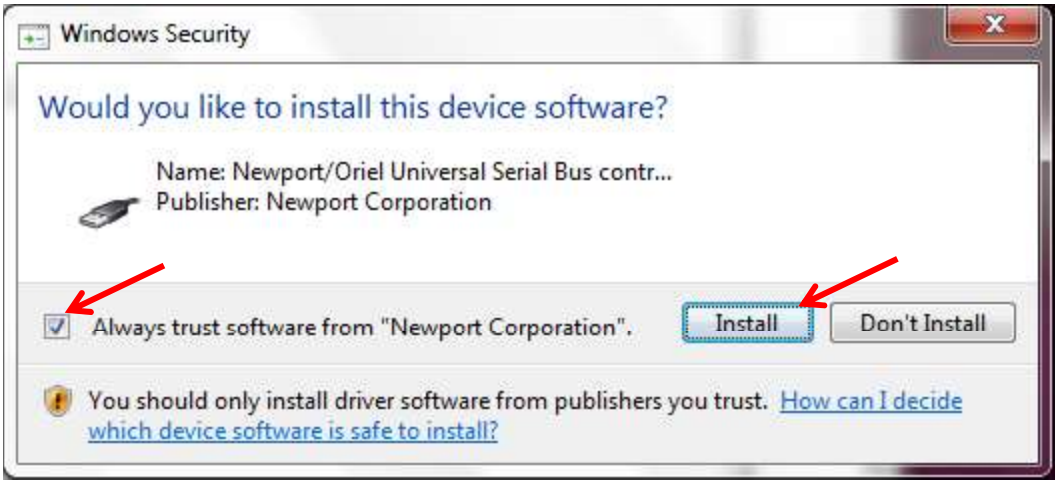


Click "OK" to continue, after verifying file path chosen.

Click "Next" to proceed with the driver software installation.



Check the box marked "Always trust software from 'Newport Corporation'. Then click "Install".



LAMP ALIGNMENT

The Newport Tunable Light Source family of products is designed to provide high-quality light output. To achieve optimal performance, proper alignment of the lamp is required. Lamp alignment consists of properly positioning the lamp, adjusting the lamp housing rear reflector position and locking the lamp housing condenser lens assembly in its correct location.

Lamp alignment must be performed when receiving the Tunable Light Source (TLS), any time the lamp is removed and reinserted (such as when transporting the unit), and when installing a replacement lamp.

Failure to align or properly align the lamp with the focusing lens of the lamp housing results in:

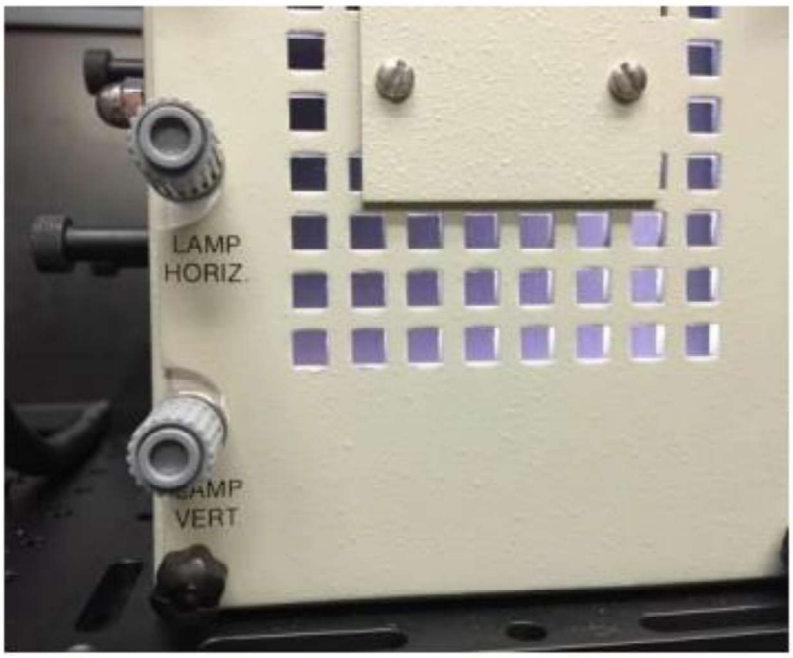
- An asymmetrical, non-uniform output beam
- Diminished output intensity

Always wear eye protection suitable for use with UV radiation during the lamp alignment process. The light output will heat up any surface or object to which it is aimed, particularly when the light is focused onto a small area. The lamp housing's condenser assembly will become hot while the lamp is on and will remain hot for some time after the lamp is turned off.

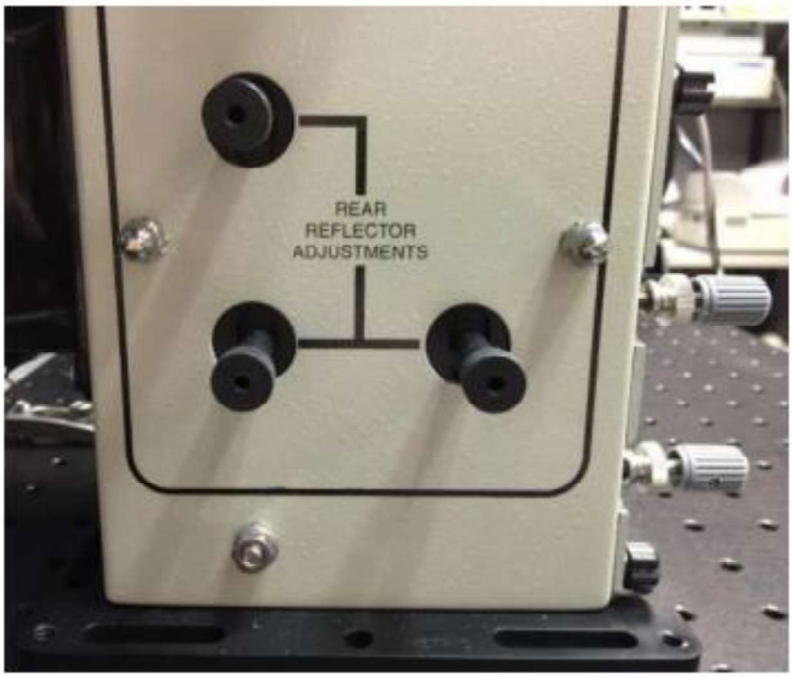
Do not leave the lamp unattended while performing this procedure. Ensure the light cannot cause injury or damage to persons or objects in the general area. A full list of precautions is available in the user manuals provided with the Tunable Light Source.

A flat, non-reflective vertical surface is required as a backdrop to image the output of the TLS when performing the alignment procedure. Ensure the surface is non-flammable and will not be damaged by the heat produced from the lamp. To view the image clearly, it may be necessary to turn off the room lighting.

Prior to turning on the TLS, the system must be inspected to confirm the lamp is installed, the lamp housing door is secured in place using all hardware provided and the lamp housing interconnection cable to the power is firmly connected to both the lamp housing and the power supply.

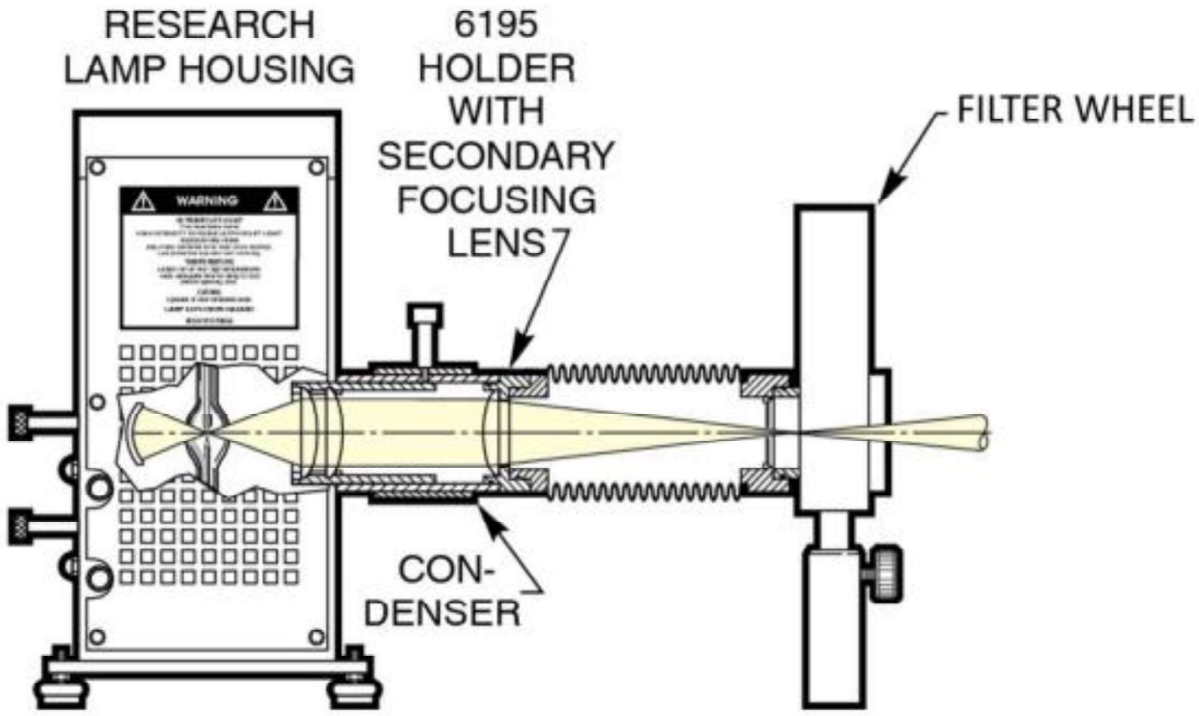


Horizontal and vertical position adjustment Knobs at the lamp housing door



Rear reflector adjustment knobs on the side of the lamp housing

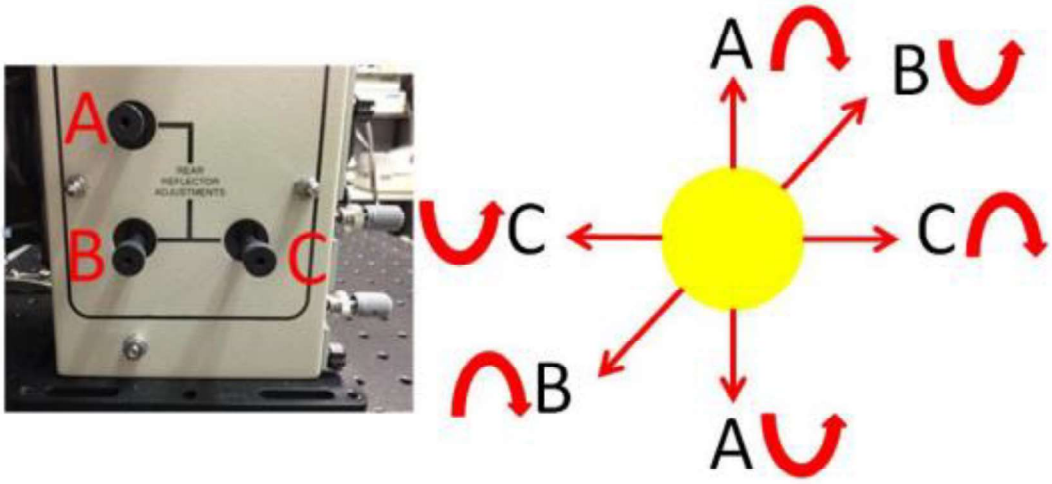
Condenser lens assembly adjustment knob and adjustment lever at output of lamp housing



The Light Path and the optics of the TLS starting from the lamp to the filter wheel

As seen in Figure 62, the lamp housing used in the TLS incorporates a collimating lens to collimate the light output of the QTH/Xe arc lamp inside. This collimated light output is then input into a secondary

focusing lens housed in the 6195 lens holder coupled to the output of the collimating lens assembly of the Research Lamp Housing. By moving the adjustment knob shown in Figure 61, the distance from the collimating lens and the focusing lens is increased or decreased, defocusing or focusing the anode and cathode (Xe arc lamp) or filament (QTH lamp) of the lamp being housed. This optical configuration is designed to allow the user to precisely focus the anode and cathode or filament of the lamp for alignment purposes, and focus the output of a properly aligned lamp into the filter wheel and thus the input aperture of the monochromator.



The yellow image at the right represents the secondary image of the QTH/arc lamp from the rear reflector of the Lamp Housing. To move this secondary image in the desired direction, rotate each Rear Reflector Adjustment knob as indicated in the image on the left (counter)clockwise to achieve the desired image displacement as indicated in the figure on the right.