

Operation Procedure for DLD Axis Ultra



Contents	Page
Start Up Procedure	2
Sample Loading	3
Optimizing Sample Height	6
Performing Scans in Manager	7
Sputter Cleaning	9
Sample Unloading	10
Returning System to Proper State for Next User	11
Data Processing	11
Imaging	12
Small Area and Multipoint Spectroscopy	15
Start up procedure for when computer or software has been shut down	16
Acquisition Conditions Reference Sheet	18

Startup Procedure (typical)

1. **Verify that the SAC pressure is $< 1 \times 10^{-8}$ and STC pressure is $< 5 \times 10^{-7}$ on the vacuum control unit display. If vacuum levels are higher than these values, notify instrument staff and do not proceed.**



2. **Verify that XPS software is still open on the computer and that the controller processor unit below the vacuum control unit displays “d.3”.**
3. **The manual control window should be displayed on the screen. If it is not, click on the “Manual” zone in the top task bar.**

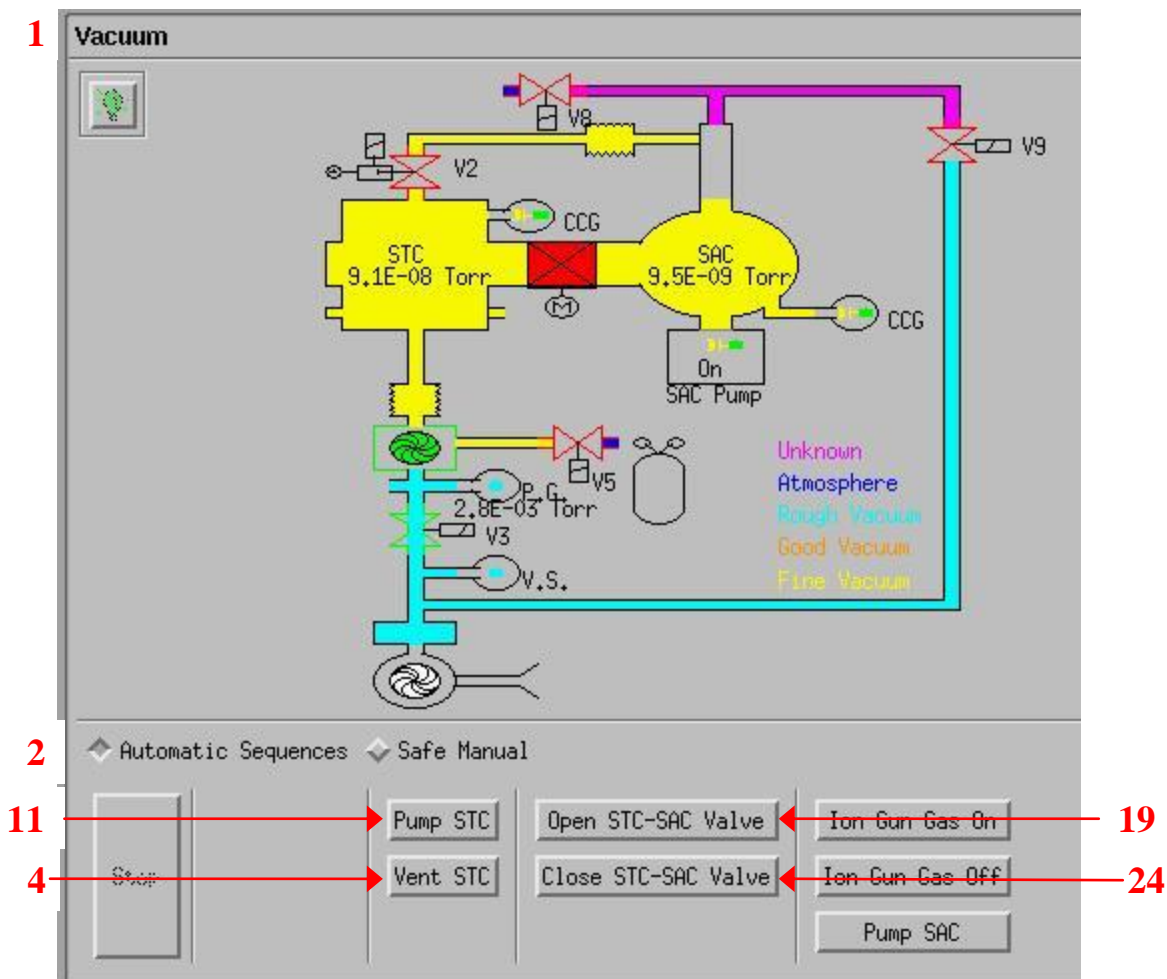
If the software is not open, the controller processor unit will not display “d.3”. You will need to re-start the software and possibly re-calibrate the stage. The procedure for doing this is found in the section “Start up procedure for when computer or software has been shut down” at the end of this document.

Never close any windows, as this will shut down the program and require you to restart the software and re-calibrate the stage.

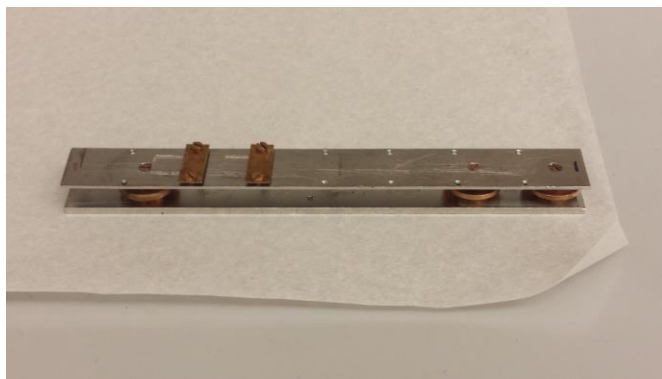
Sample Loading

***Always wear gloves when handling samples and sample holders.
Failure to do so will compromise the chamber vacuum
and produce bad measurement results.***

1. **Scroll down to Vacuum Control section in the Manual Control Window**
2. **Choose Automatic Sequence box**



- 3. Make sure the door between the STC and the SAC is closed** (Displayed as a red box with an “X” through it)
- 4. Click on “Vent STC”.** This will vent the Sample Transfer Chamber to allow sample loading.
- 5. Partially loosen the three brass screws on the end of the STC chamber and wait for chamber to completely vent. It’s important that the top screw is just barely loose. You don’t want to undo this screw until the chamber has vented.** When the chamber is completely vented, the seal behind the screws will open slightly due to the N₂ gas purge pressure, and the top screw will become tight.
- 6. Completely loosen the three brass screws on the end of the STC chamber and rotate the chamber door open.**
- 7. Rotate the translation knob to move the transfer arm forward for sample loading**
- 8. Attach the sample holder to the end of the transfer arm.** Make sure the transfer arm is attached to the top notch of the sample holder. If using the sample bar, make sure that the side of the bar with a *single* copper disk is securely held by the “hook” of the transfer rod.



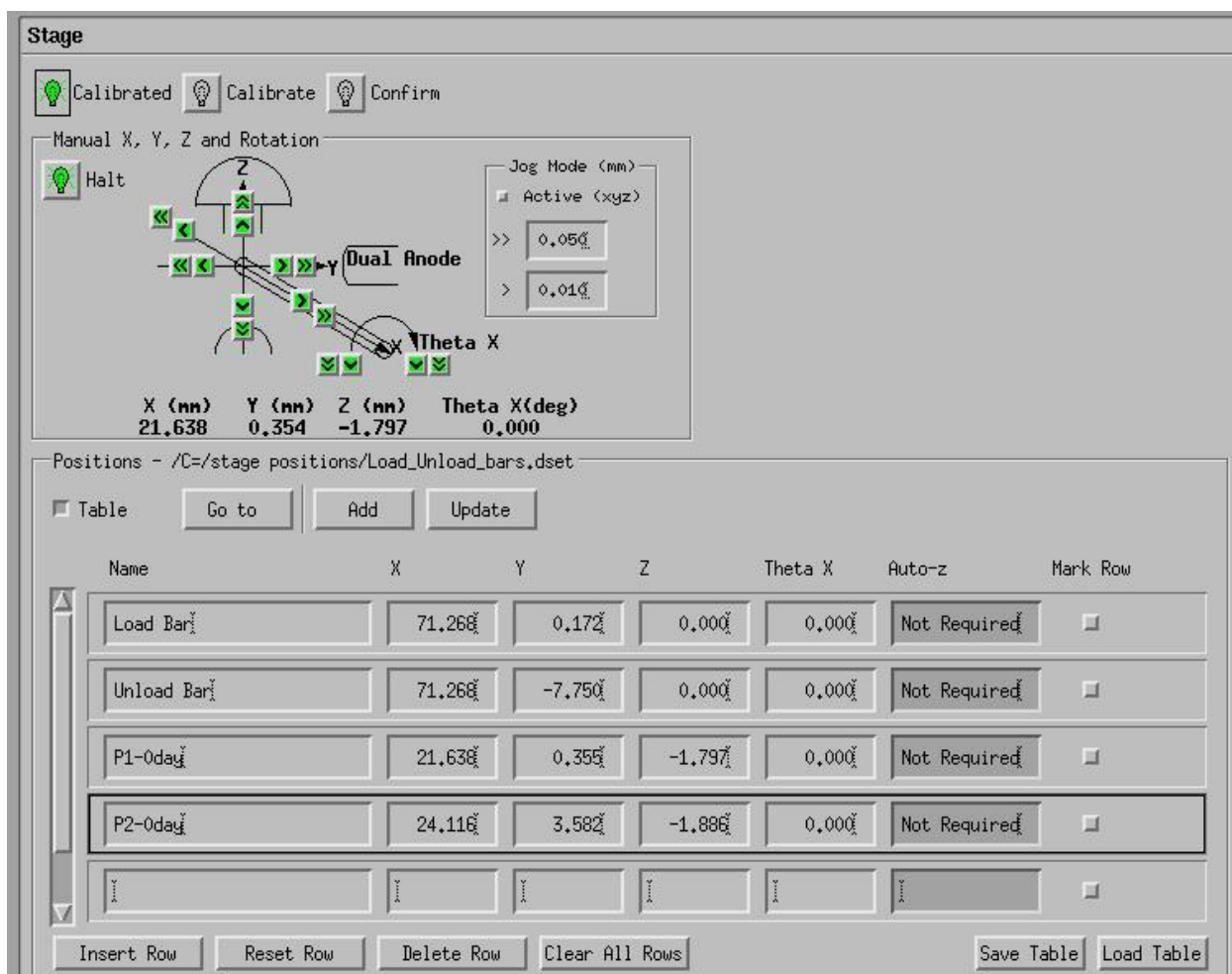
9. Rotate the translation knob to move the transfer arm backward so that the sample holder does not collide with the chamber opening when closing the chamber door
10. Close the chamber door and tighten the three brass screws
11. Click on “Pump STC” and make sure the pump down sequence initiates. The top screw should now be loose.
12. After pump-down is initiated, make sure that the turbo pump starts and turns green in the software display.
13. When completed, “Automatic Sequence Successfully Completed” will be displayed in the Vacuum Control Section
14. Verify that the SEC pressure is $< 5 \times 10^{-7}$ torr. It will take ~1 hour to reach this pressure. Ideally samples will pump down overnight or at least 2 hours before moving them into the SAC.

***DO NOT open the STC-SAC valve and transfer the sample
if the SEC pressure is greater than 5×10^{-7} torr!!***

15. Scroll to Stage section in the Manual Control Window
16. If the “Load bar” position is not displayed in the position table rows, then perform the following:
 - a. Click on “Load Table”
 - b. Go to C directory and double click on file: /C=/Stage Positions
 - c. Select Load_Unload_bars.dset

Note: This file contains load and unload positions for both the single circular sample holder and the bar sample holder.

17. Highlight the position table row labeled “Load bar”, and click on “Go To”. This will move the stage to the proper position for transferring the sample holder.



18. **Verify that the Dual Anode x-ray source is backed out from the sample area.** When used, it is very close to the sample, and you may hit it with your samples. If in doubt, ask Carrie!
19. Click on “Open STC-SAC Valve” and wait to see valve open in the vacuum diagram.
20. **While looking through the viewing windows, rotate the translation knob to move the sample holder into the SAC chamber until it interlinks with the stage and stops.** Make sure that you move any samples in storage out of the way as you move through the STC.
21. **Use the joystick to move the stage away from the transfer arm, releasing the sample holder from the transfer arm:**
 - a. While jiggling the translator knob, press the LEFT button on the joystick to move the stage away from the transfer arm.
 - b. Holding down the RIGHT button after pressing and holding the LEFT button will speed up the stage movement.



22. When the sample holder has cleared the transfer arm, rotate the translation knob to move the transfer arm completely out of the SAC chamber -until the green light at the end of the transfer arm barrel is illuminated.
23. Scroll to the Vacuum Control Section, and click on “Close STC-SAC Valve”
24. Position sample using the joystick while watching Video Monitor. Use the LEFT, RIGHT, IN, and OUT buttons to position sample area of interest under the “X” on the video monitor.

Optimizing Sample Height

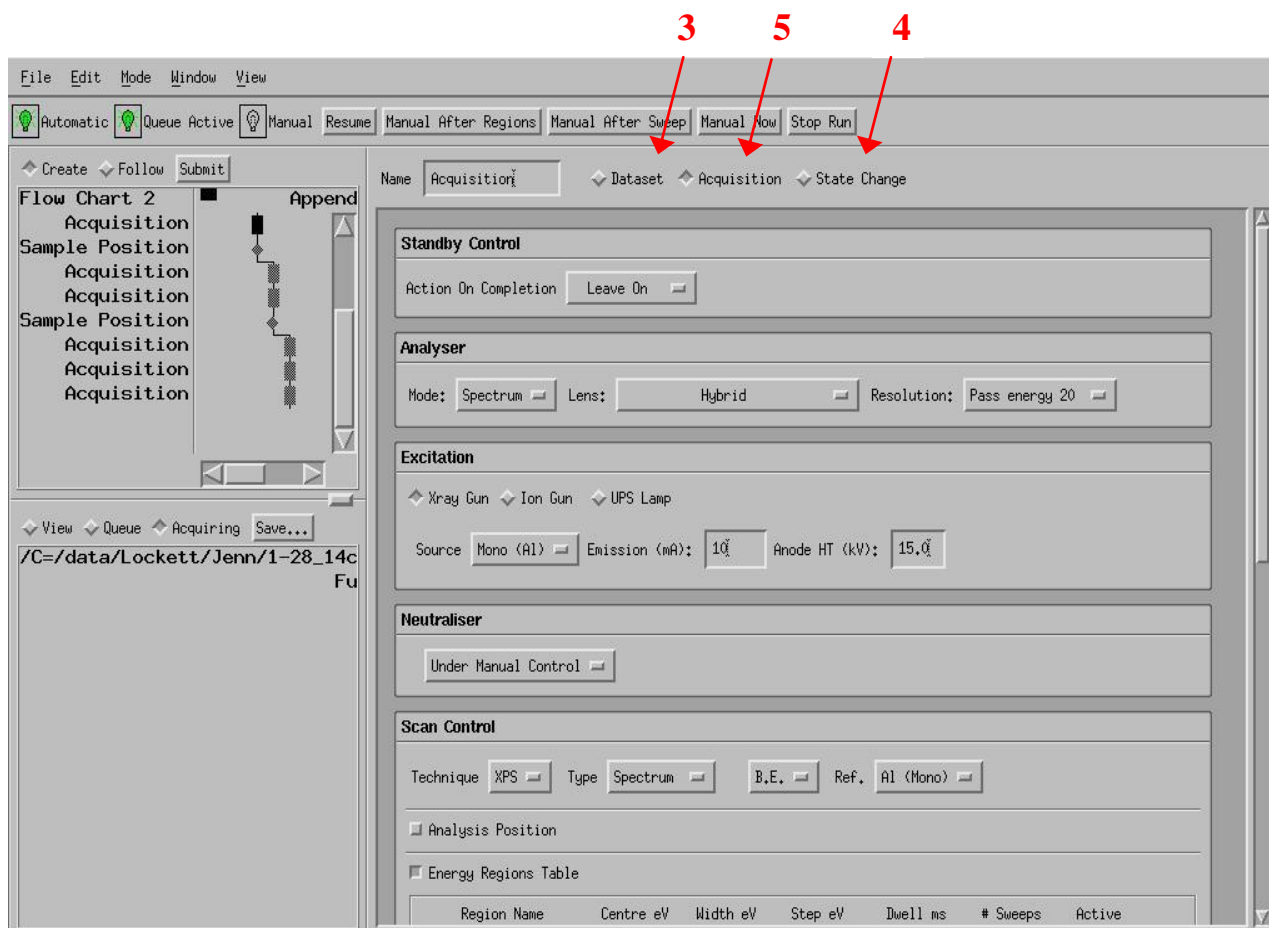
1. Click on the “Manual” zone in the top task bar to open the manual control window.
2. Turn on the charge neutralizer (if necessary).
3. Turn on the x-ray gun
 - a. Select a filament (usually Mono (Al))
 - b. Starting with Emission = 1 mA and Anode HT = 6 kV, press “Standby”. Once the standby light is green, press “On”.

- c. Once the On light is green, slowly ramp up the emission current and voltage until Emission = 10 mA and Anode HT = 15 kV.
4. **Set up the parameters for data acquisition:**
 - a. Analyzer
 - i. **Mode:** Spectrum
 - ii. **Lens:** Hybrid
 - iii. **Resolution:** Pass Energy 20 eV
 - b. Acquisition
 - i. **Type:** Spectrum
 - ii. **B.E.** (instead of K.E.)
 - iii. **Ref:** Al (Mono)
 - iv. Enter region name or energy value based on element or chemical state energy peak value of interest (for example O 1s; refer to Kratos mousepad for the most intense line for each element). If the sample is a true unknown, start by running a survey scan to identify the elements in the sample.
 - v. **Dwell:** 200 (or longer if a low intensity peak)
 - vi. **# Sweeps:** 1
 - c. Press “On” to start Acquisition
5. **Watch the collection of data in the Real Time Display.**
6. **Left click on the center of the peak to center that position in the energy window before acquisition is complete.**
7. **Change the Acquisition Type to “Snapshot”, change the dwell time to 500 ms, the pass energy to 80, and then press “Restart Technique”.** This will allow you to scan the peak of interest more quickly.
8. **Adjust the height of the sample stage using the joystick with the “down” and “up” buttons to maximize the area in the Real Time Display.**
9. **Save the x, y, z coordinates in the table in the Stage section of the Manual window.** Click on the row in which you want your coordinates displayed and press the “Update” button. Change the name of the sample in this table to something that describes this sample.
10. **Use the joystick to move to the next sample on the bar and repeat steps 8 and 9.**
11. **Turn Acquisition Control “Off” and Press “Restart Technique”** to turn the scan off right away instead of at the end of the next scan.

Performing Scans in Manager

1. **Click on the “Manager” zone in the top task bar to open the Vision Instrument Manager work area**
2. **Delete any old programs in the flow chart section of the Manager window (upper left corner).**
3. **Choose the “Dataset” button at the top of the Manager window.**
 - a. Click on “Browse...”
 - b. Find your folder and then enter a Dataset name (file name) for your data in the selection field.

- c. Click on both mouse buttons to paste the “Dataset” sequence in the flow chart section of the Manager window.



4. Choose the “State Change” button and then select “Sample Position”.
 - a. In the Stage portion of the Manual window, select the position you want to drive to.
 - b. Go back to the manager window and press “Load Position”.
 - c. Click on both mouse buttons to paste the “Sample Position” sequence in the flow chart section of the Manager window.
5. Choose the “Acquisition” button and set up the parameters for the survey scan. The following are typical values (See also Acquisition Conditions Reference Sheet):
 - a. **Standby Control:** Leave On (leaves X-rays on after scan completed)
 - b. **Analyser**
 - i. **Mode:** Spectrum
 - ii. **Lens Mode:** Hybrid
 - iii. **Resolution:** Pass Energy 80 eV
 - c. **Excitation**
 - i. Select “X-ray”

- ii. **Source:** Mono (Al)
 - iii. **Emission:** 10 mA *Never go above 20 mA, as it will degrade source life*
 - iv. **Anode HT:** 15 kV (Emission and Anode HT should match what you set in Manual)
- d. **Neutralizer:** Under Manual Control
- e. **Scan Control**
 - i. **Technique:** XPS
 - ii. **Type:** Spectrum
 - iii. **BE** (instead of KE)
 - iv. **Ref:** Al (Mono)
 - v. **Region Name:** Type in "Survey". This will enter common parameters for the Survey scan, which you can rename as something shorter (Ex: Full). You may also want to add text after the region name to indicate what sample you are looking at (e.g., Full spotA).
 - vi. **Start eV:** 1200 (right click on header to change from Centre eV to Start eV)
 - vii. **End eV:** -5
 - viii. **Dwell ms:** 200
 - ix. **# Sweeps:** 1
 - x. **Click on "Active" box**
- h. Click both mouse buttons at the same time to paste the "Acquisition" sequence in the flow chart
- 6. **Choose the "Acquisition" button and set up the parameters for the elemental scans. The following are typical values** (See also Acquisition Conditions Reference Sheet):
 - a. **Standby Control:** Leave On (leaves X-rays on after scan completed)
 - b. **Analyzer**
 - i. **Mode:** Spectrum
 - ii. **Lens Mode:** Hybrid
 - iii. **Resolution:** Pass Energy 20 eV
 - c. **Excitation**
 - i. **Select "X-ray"**
 - i. **Source:** Mono
 - ii. **Emission:** 10 mA *Never go above 20 mA, as it will degrade source life*
 - iii. **Anode HT:** 15 kV (Emission and Anode HT should match what you set in Manual)
 - d. **Charge Neutralizer:** Under Manual Control
 - e. **Scan Control**
 - i. **Technique:** XPS
 - ii. **Type:** Spectrum
 - iii. **BE** (instead of KE)
 - iv. **Source:** Al (Mono)
 - v. **Region Name:** Type in region name (e.g., O 1s) and settings will automatically load. (Note – region name must match exact spelling and case of entry contained in database.) After the settings have loaded, you may want to add text after the region name to indicate what sample you are looking at (e.g., O 1s spotA).

- vi. **Adjust automatically loaded settings (dwell time and number of sweeps) if necessary**
- vii. **Click on “Active” box for regions you want to scan**
- h. Click on both mouse buttons at the same time to paste the “Acquisition” sequence in the flow chart
- 7. **Repeat steps 4-6 for each sample in the SAC.** You may find that it’s easier to copy and paste the portion of the program you’d like to repeat, and just change sample specific settings.
- 8. **Click the “Resume” button at the top of the window to set to Automatic mode.**
- 9. **Click on “Submit” to start the flowchart job**
- 10. **Choose “Acquiring” in the view window (bottom left portion of the Manager window) to see the scan data being collected in the Real Time Window**
- 11. **When completed, the scan may be viewed in the Real Time Window by highlighting the item in the acquiring window and “pasting” (both mouse buttons) into the right-hand section of the real-time display window.**
 - a. Using mouse control menus you may zoom in on regions of the scan.
 - b. Choose element list from the Windows pull down menu to open up an element list for identifying peaks
 - i. Clicking on peaks of interest in the Real Time Window will cause associated element to display in the element list window

Sputter Cleaning

It is suggested that you acquire a spectra on peaks of interest before and after performing a sputter clean so that a comparison can be made and the effect of the clean determined. (See procedure for performing spectroscopy around peaks of interest). For example, you may want to look at the oxygen and carbon peaks before and after sputtering to verify that they have decreased sufficiently and the sample peak of interest to determine that it has increased sufficiently.

1. **Click on the “Manual” zone in the top task bar** to open the manual control window.
2. **Scroll to the Vacuum Control Section and choose Automatic Sequence**
3. **Click “Ion Gun Gas On” and look for the valves to open.** This opens the valves to allow the Argon gas in for sputtering.
4. **Make sure that the argon tank main valve is open.**
5. **Open leak valve to the Ar line.** From the fully closed position you should pass the marker line once and then stop when the marker lines match up again (after one full rotation). This should set the manual leak valve so that the pressure in the STC is $3-4 \times 10^{-7}$ torr and the SAC is $3-4 \times 10^{-8}$ torr with the gun on. The regulator takes a little time to respond once the line is opened, and the pressure is still somewhat dynamic early on in the process when the valves have just been opened.
6. **In the Ion Gun Section, choose the Table button.** The table contains pre-set setting for various ion sputtering conditions.
7. **Choose the 4 kV Large Spot row in the Table** (for depth profiling, choose the 5kV medium spot and a raster of 2 mm should normally suffice)
8. **Click “Restore Row”** to enter these settings. You may click on the “states” button to watch the sputtering parameter values

9. Choose desired Raster Size in Operation Settings
10. Click on “Standby” to ramp up voltage and currents.
11. After ramp-up complete, click on “On” to start the sputter process
12. Allow to run for desired time. (Typical time is 10 minutes for a sputter clean)
13. Click on “Standby” after desired time has elapsed
14. Perform spectra around the peaks of interest and compare post-sputter spectra with pre-sputter spectra.
 - a. If additional sputtering is desired, click on “Start” and sputter for additional desired time
15. Click on “Off” after acceptable sputter cleaning has been achieved
16. In Vacuum control section, click on “Ion Gun Gas Off” and look for valves to close
17. Close the leak valve when finished.
18. Turn off the argon at the tank

Sample Unloading

Always wear gloves when handling samples and sample holders

1. Click on the “Manual” zone in the top task bar to open the manual control window.
2. Turn off the Charge Neutralizer and the x-ray power supply if still on.
3. Scroll to Stage section in the Manual Control Window
4. Highlight the position table row labeled “Unload Bar” and click on “Go to”. This will move the stage to the proper position for transferring the sample holder.
5. Scroll down to Vacuum Control section in the Manual Control Window
6. Choose the Automatic Sequence box
7. Click on “Open STC-SAC Valve” and wait to see valve open in the vacuum diagram
8. While looking through the viewing window, rotate the translation knob to move the sample holder into the SAC chamber until it interlinks with the stage and stops.
9. Use the joystick to move the stage toward the transfer arm, so that the sample is on both the transfer arm and the stage:
 - a. Press the right button on the autostage manual controller to move the stage toward the transfer arm.
 - a. Holding down the left button after pressing and holding the right button will speed up the stage movement
 - b. Drive stage towards the back of the chamber while jiggling the translation knob until sample holder hooks onto the transfer arm.
10. When the sample holder has transferred, rotate the translation knob to move the transfer arm completely out of the SAC chamber – until the green light at the end of the transfer arm barrel is illuminated.
11. Scroll to the Vacuum Control Section, and click on “Close STC-SAC Valve” and watch display for valve to close
12. Click on “Vent STC”. This will vent the Sample Transfer Chamber to allow sample loading.

13. **Partially loosen the three brass screws on the end of the STC chamber and wait for chamber to completely vent.** When the chamber is completely vented, the seal behind the screws will open slightly due to the N₂ gas purge pressure.
14. **Completely loosen the three brass screws on the end of the STC chamber and rotate the chamber door open**
15. **Rotate the translation knob to move the transfer arm forward for sample unloading**
16. **Remove the sample holder from the end of the transfer arm**
17. **Rotate the translation knob to move the transfer arm backward so that the transfer arm does not collide with the chamber opening when closing the chamber door**
18. **Close the chamber door and tighten the three brass screws**
19. **Click on “Pump” STC and make sure the pump down sequence initiates.** The top screw should now be loose.
20. **After pump-down is initiated, make sure that the turbo pump starts and turns green in the software display.**
21. **When completed, “Automatic Sequence Successfully Completed” will be displayed in the Vacuum Control Section**

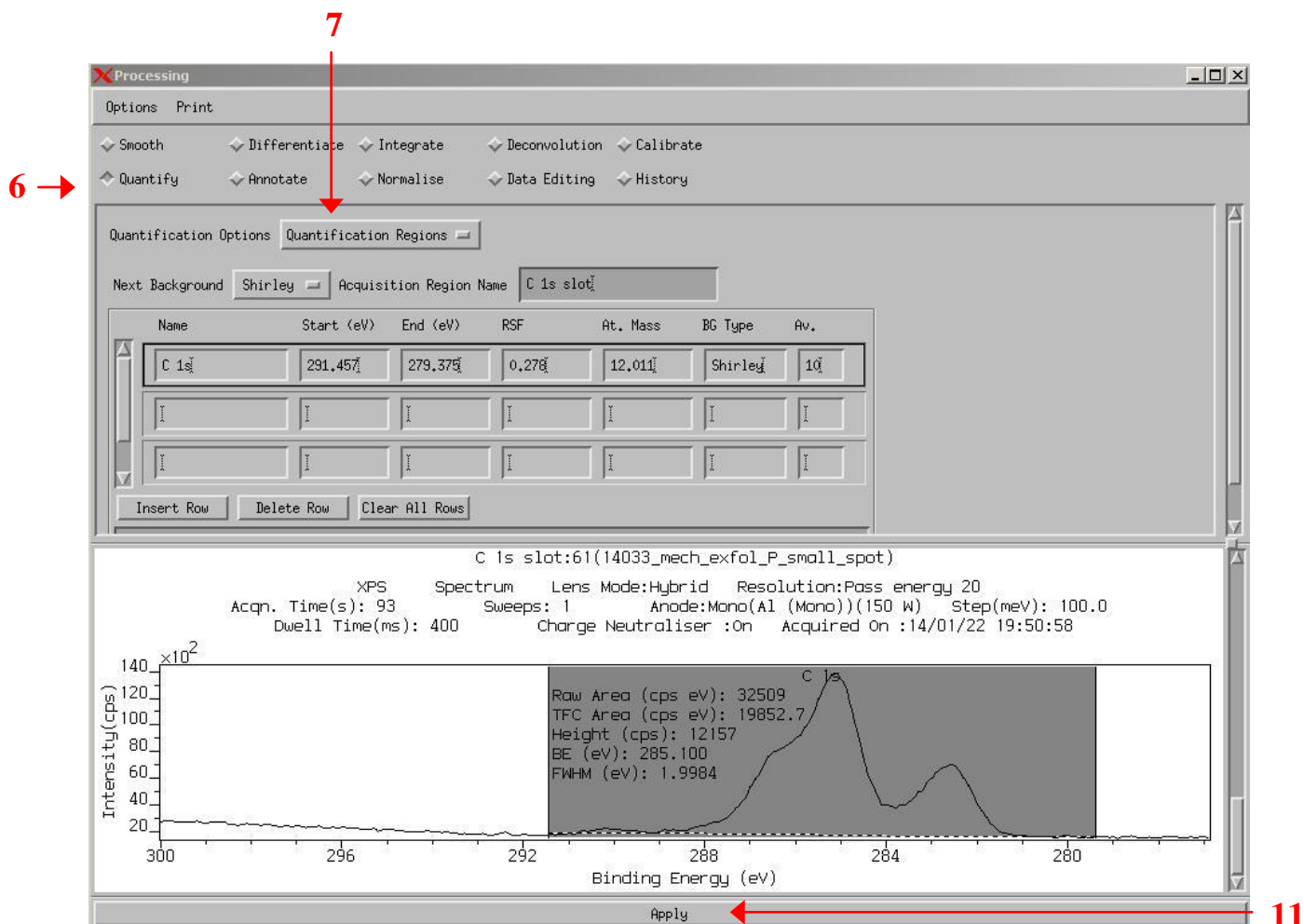
Returning System to Proper State for Next User

1. **DO NOT CLOSE ANY WINDOWS OR EXIT THE SOFTWARE**
2. **Ensure that the Charge Neutralizer and the x-ray power supply are off.**
3. **Turn off the TV monitor and chamber light**
4. **Make sure to log your time online.**

Data Processing

The data processing software allows you to change the way in which data is viewed (including overlaying of multiple spectrum scans or images), and also allows you to quantify the results (e.g., weight or atomic percent of elements)

1. **Click on the “Processing” zone in the top task bar to open the data processing work area**
2. **From the “File” pull down menu in the Main Vision Processing page, choose “Open Dataset for Processing”**
3. **Click on the “Update” button to load recent datasets**
4. **Choose the dataset filename(s) for which you want to process the data.**
5. **Highlight the scans you wish to process, and paste them into the processing window.**
6. **Click on “Quantify” at the top of the window.**
7. **Select “Quantification Regions” from the Quantification Options pull down menu.**
8. **Select the type of background correction you want to apply (Shirley, Tougaard, and Linear are commonly used).**
9. **Type in the name of the spectral line that you are trying to background correct.**
10. **Modify the start and end positions if necessary.**
11. **Click Apply at the bottom of the page to save this to your dataset. (VERY IMPORTANT)**



12. For peak fitting, select “Components” from the Quantification Options pull down menu.

13. Type in the name of the spectral line that you are trying to fit. The software will automatically place this peak where it thinks it is appropriate. Repeat this process of adding additional components as many times as you can justify.

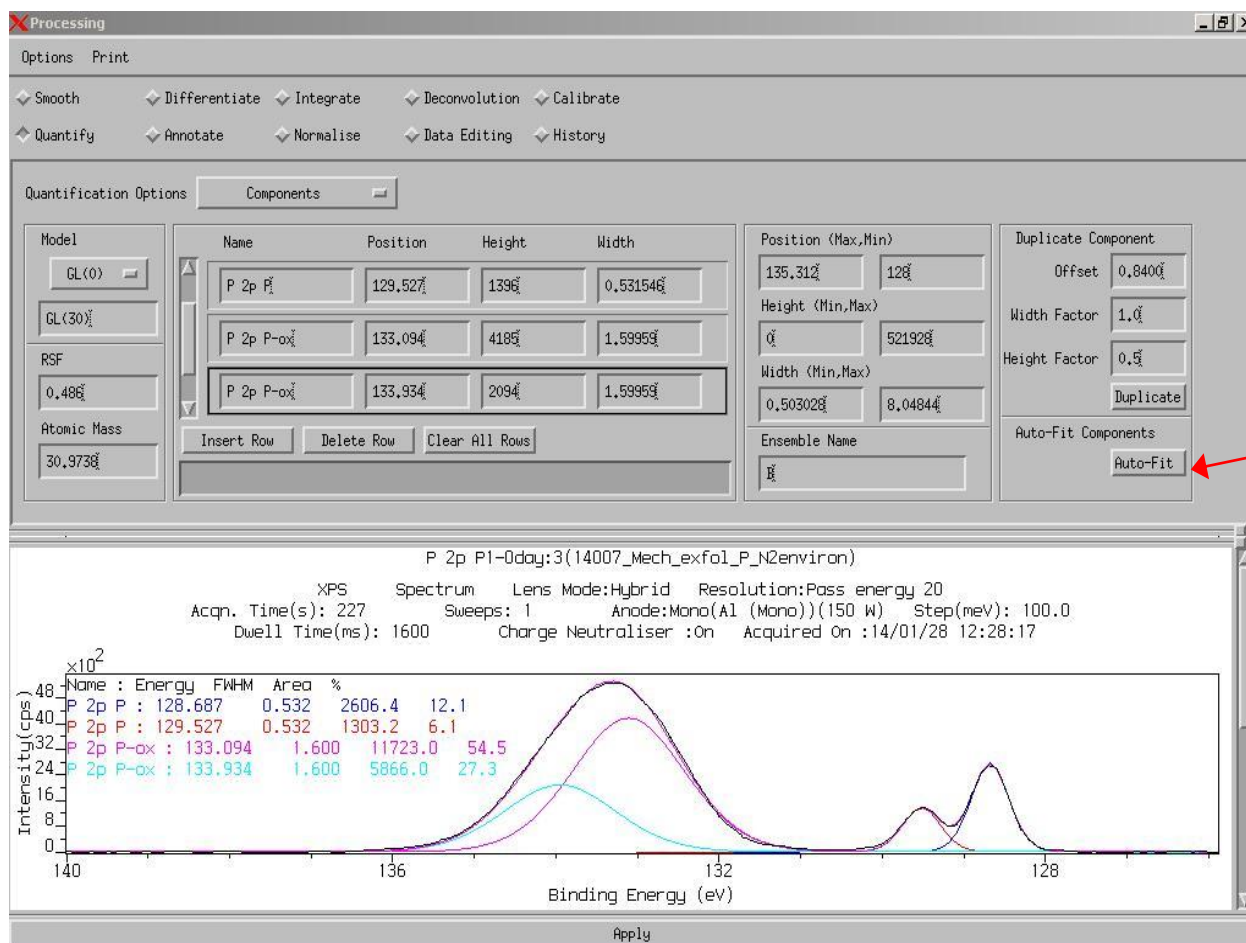
14. Adjust the peak position, height, and width min and max limits if necessary.

15. Link components if necessary

- Select “Linked Components” from the Quantification Options pull down menu
- Type the name of a new ensemble in the row just below the “Unlinked” row (e.g., Link A).
- Adjust which ensemble and component parameters are free to vary. (Height, position, width)
- Select “Components” from the Quantification Options pull down menu
- Select each component of the new ensemble and ensure that the “Ensemble Name” exactly matches the name of the ensemble you created.(e.g. Link A)

16. Press Auto Fit until the peak parameters stop changing.

17. Adjust parameters if necessary and repeat the Auto Fit.
18. Make sure to press the Apply button at the bottom of the page in both the Components and Linked Components windows in order to save your work.
19. When you're finished fitting your data, select the line scans you want to compare/quantify in the Main Vision Processing window.
20. From the Main Vision Processing window select Options → Browser Actions. Select "Profile Spectra" from the top menu.
21. Select the parameters to describe the quantification you would like to carry out, and then press "Display in Window" to display the results.
22. Click Apply at the bottom of the page to save this to your dataset. (Again, VERY IMPORTANT)



Imaging

The imaging mode allows you to pick specific peak energies and make a spatial map of their locations on your sample. You will typically follow these steps to perform imaging:

1. Pick one element or chemical state energy peak value of interest (e.g., from your survey scan)
2. Optimize the sample height to bring the image map of this energy value into best resolution

3. Set up an image mapping flowchart in the manager to collect image maps of all energy peak values of interest

Optimizing Sample Height for Imaging

1. Click on the “Manual” zone in the top task bar to open the manual control window.
2. Scroll to Stage section in the Manual Control Window and click on “Position” box if the position table rows are not displayed
3. Insert increments of Z positions in the table by inputting increment parameters in the section below the position table
4. Click on the “Manager” zone in the top task bar to open the Vision Instrument Manager work area
5. Choose the “Dataset” button
6. Enter a filename for storing your data in the filename field
7. Enter a name for this flow chart item in the name field. (e.g., Filename)
8. Click on the middle mouse button to paste the “Filename” sequence in the flow chart
9. Choose the “State Change” button and enter a name for this flow chart item in the name field (e.g., Position)
10. Choose the Sample Position button and load the position table. This will load all the rows in the position table that was created in the manual control window.
11. Click on the middle mouse button to paste the “Position” sequence in the flow chart
12. Choose the “Acquisition” button and enter a name for this flow chart item in the name field (e.g., Map)
13. Set up the parameters for general alignment imaging (see Acquisition Conditions Reference Sheet):
 - a. Analyzer
 - iv. Analyzer mode: Imaging
 - v. Lens Mode: FOV1
 - vi. Resolution: 160
 - vii. Aperture: Low Res
 - b. Scan Control
 - vii. Choose Map
 - viii. Enter region name or energy value based on element or chemical state energy peak value of interest
 - ix. Dwell: 20 (or longer if a low intensity peak)
 - x. # Sweeps: 1
14. Click on the middle mouse button to paste the “Map” sequence in the flow chart
15. Choose the “State Change” button and enter a name for the counting flow chart item in the name field (e.g., Count)
16. Choose the Counter button and enter the # of cycles. This should be the same as the number of Z increments that were entered in the position table
17. Click on the middle mouse button and paste the “Count” sequence in the flow chart
18. In the flowchart area, highlight the “Position”, “Map” and “Count” items. Then right click and choose “Loop Back”

19. Click on “Submit” to start the flowchart job. An image map will be taken and a file created for each Z height setting that was entered.
20. If desired, choose “Acquiring” in the view window to see the image data being collected in the Real Time Window
21. When run is completed, highlight the files in the viewing window and paste into the Real Time Display window to view all maps. (You may also use the functions in the Process zone to view all maps simultaneously).
22. Choose the optimum image and note which Z position produced that image
23. Click on the “Manual” zone in the top task bar to open the manual control window.
24. Scroll to Manipulator section in the Manual Control Window and highlight the row in the position table which contains the optimum Z value
25. Click on “Go to Position”. This will move the stage to the optimum Z height

Setting up an image mapping flowchart

1. Click on the “Manager” zone in the top task bar to open the Vision Instrument Manager work area
2. Clear all flowchart items from the Z optimization flowchart
3. Choose the “Dataset” button
4. Enter a filename for storing your data in the filename field
5. Enter a name for this flow chart item in the name field. (e.g., Filename)
6. Click on the middle mouse button to paste the “Filename” sequence in the flow chart
7. Choose the “Acquisition” button and enter a name for this flow chart item in the name field (e.g., Map)
8. Set up the parameters for elemental or chemical state imaging (see Acquisition Conditions Reference Sheet):
9. Analyzer
 - i. **Analyzer mode:** Imaging
 - ii. **Lens Mode:** Typically FOV2

Note: FOV2 is the only field of view that is referenced to the various apertures to give the spot size shown in the Acquisition Conditions Reference Sheet.

- iii. **Resolution:** 160 for elemental imaging, 40 or 80 for chemical state imaging
 - iv. **Aperture:**
 1. FOV2: Medium Res or High Res
 2. FOV3: High Res
12. Scan Control
 - i. Choose Map

- ii. Enter region names or energy values based on element or chemical state energy peak values of interest (Multiple energy values can be entered on separate rows to map multiple elements or chemical states)
 - iii. **Dwell:** 20 (or even much longer for a low intensity signal or at lower pass energy)
 - iv. **# Sweeps:** 1 (or more if desired)
- 13. Click on the middle mouse button to paste the “Map” sequence in the flow chart**
- 14. Click on “Submit” to start the flowchart job.** An image map will be taken and a file created for each energy value that was entered.
- 15. If desired, choose “Acquiring” in the view window to see the image data being collected in the Real Time Window**
- 16. When run is completed, highlight the files in the viewing window and paste into the Real Time Display window to view all maps.** (You may also use the functions in the Process zone to view all maps simultaneously or overlap maps, etc.)

Small Area and Multipoint Spectroscopy

After an image map is taken, it is often desired to collect spectroscopic scans in smaller areas of interest on the sample. This procedure explains how to take spectroscopic scans in small regions that have been identified from an image map.

Multipoint Small Area Scans

- 1. Click on the “Manager” zone in the top task bar to open the Vision Instrument Manager work area**
- 2. Choose the “Dataset” button**
 - a. Enter a filename for storing your data in the filename field
 - b. Enter a name for this flow chart item in the name field. (e.g., Filename)
- 4. Click on the middle mouse button to paste the “Filename” sequence in the flow chart**
- 5. Choose the “Acquisition” button and enter a name for this flow chart item in the name field (e.g., Small Spot)**
- 6. Set up the parameters for a small area scan.**
 - a. See the Acquisition Conditions Reference Sheet to set values for desired spot size.

Note that FOV2 is the only field of view that is referenced to the various apertures to give the spot size shown in the Acquisition Conditions Reference Sheet.

- b. Analyzer mode should be “Spectrum”
- c. Enter Scan Control parameters for desired energy and spectra settings.
Typical parameters are:
 - a. **Energy width** = 15eV around the energy value of interest
 - b. **Step size** = 0.1

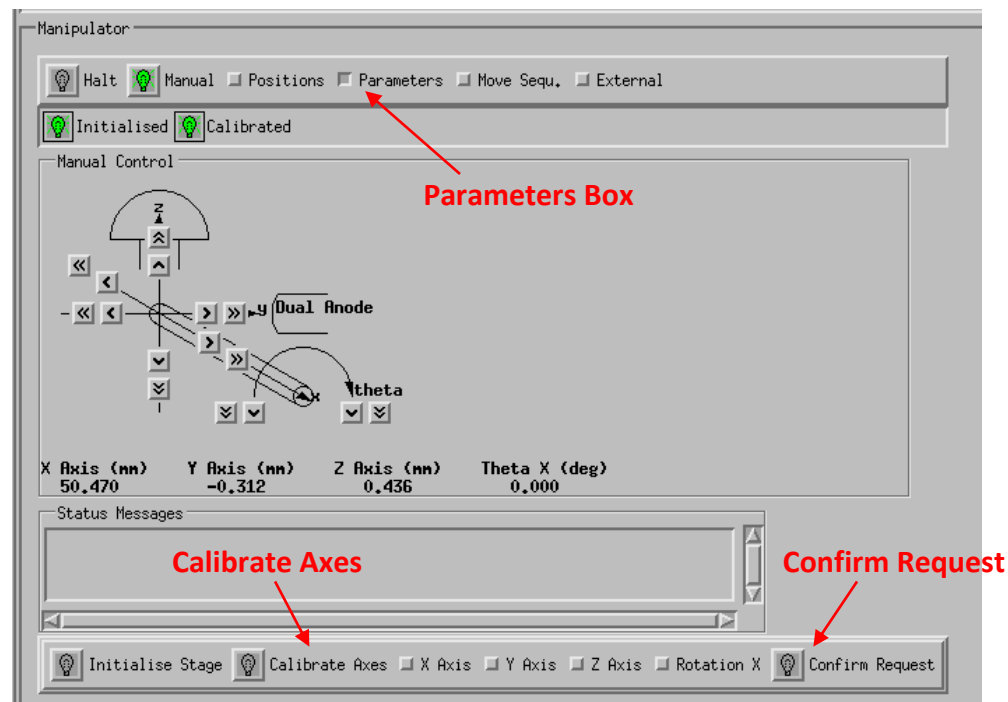
- c. **Dwell = 200**
- d. **# Sweeps = 1**
- 7. **Bring up the image map and point the mouse to the area where you want the scan to be performed, and then left click on the mouse button.**
- 8. **In the Analysis Position section of the Manager window, click on “Import Position”.**
The x,y position of the point identified in the image map will be input.
- 9. **Click on the middle mouse button to paste the “Small Spot” sequence in the flow chart**
- 10. **To perform small area spectroscopy on multiple points in an image map:**
 - a. Copy and paste the “Small Spot” sequence in the flow chart. Paste as many copies as desired points
 - b. Go into each small spot sequence, choose the position on the image map and import the position (as in Steps 6 and 7).
- 11. **Click on “Submit” to start the flowchart job**
- 12. **If desired, choose “Acquiring” in the view window to see the scan data being collected in the Real Time Window**
- 13. **When completed, the scan may be viewed in the Real Time Window** (You may also use the functions in the Process zone to view all scans simultaneously, etc.)

Line Scans

- 1. **Set up a filename and flowchart in the Manager Window** (See steps 1-3 in the Multipoint Small Scans Procedure)
- 2. **Choose the “Acquisition” button and enter a name for this flow chart item in the name field (e.g., Line Scan)**
- 3. **Set up the parameters for a small area scan.**
 - a. See the Acquisition Conditions Reference Sheet to set values for desired spot size.
 - b. Analyzer mode should be “Spectrum”
 - c. Enter “Line Scan” in the Scan Control Sections
 - d. Enter other Scan Control parameters for desired energy and spectra settings. (as in Step 5 of Multipoint Small Scans Procedure)
- 4. **Bring up the image map and click and drag the mouse to form a rectangle in the area where you want the scan to be performed. The line scan will proceed from the upper left corner of the rectangle to the lower right corner.**
- 5. **In the Analysis Position section of the Manager window, click on “Import Position”.**
The coordinates of the line identified in the image map will be input.
- 6. **Click on the middle mouse button to paste the “Line Scan” sequence in the flow chart**
- 7. **Click on “Submit” to start the flowchart job**
- 8. **If desired, choose “Acquiring” in the view window to see the scan data being collected in the Real Time Window**
- 9. **When completed, the scan may be viewed in the Real Time Window** (You may also use the functions in the Process zone to view all scans simultaneously, etc.)

Start up procedure for when computer or software has been shut down

1. **Turn on computer** (You will not need to log into Windows)
2. **Double click on the “Zones” icon on the desktop and click OK on the error message that appears.** The Zones taskbar should appear at the top of the screen.
3. **Double click on the “Shortcut to Manager” icon on the desktop** to open the manager software
4. **Click on the Window menu and:**
 - a. Open manual window
 - b. Open real time display
5. **Left click on the Zones button in the top task bar and choose “Control”**
6. **Drag the manual window into the manual zone**
7. **Drag the real time display window into the manual zone and into the manager zone**
8. **Calibrate the stage as follows:**
 - a. Go to the manipulator section in the manual window
 - b. Click on the “parameters” box
 - c. Click on “calibrate axes”
 - d. Verify that the dual anode gun located on the back of the SAC chamber is all the way out (away from the sample stage), and verify that nothing is sticking out from the sample stage
 - e. Click on “confirm request”. The stage will go through a series of motions to reach the stage limits and calibrate the stage position
 - f. When completed, the calibrated light will illuminate green



9. **Click on the position box in the manipulator section of the manual window**
10. **Click on “Read Positions”**
11. **Go to C directory and double click on file: /C=/Stage Positions**

12. Choose Load_all.dset

Acquisition Conditions Reference Sheet

Note that these parameters should only be considered as a reasonable starting point. Acquisition parameters may be optimized dependent on the instrument or overall experimental goal.

I. Charge Neutralizer Conditions – exact conditions may vary slightly between instruments.

- A. Charge balance (2.6 – 3.2 V)
- B. Filament current (1.6 – 2.1 A)
- C. Filament Bias (0.9 – 1.3 V)

II. Spectroscopy (Based on use of **monochromatic** x-ray source)

A. Large area (300um x 700um) – slot

Energy Range	Magnification	Pass Energy eV	Step Size eV	Time (min's)
Survey	hybrid	160	1	1 - 3
Region	hybrid	10 or 20	0.1	1 - 10
Valence Band	hybrid	20 or 40	0.2	5 - 20

B. Small area – small area spectroscopy must be referenced from medium magnification images for following spot sizes

** Spot size (Physical size and name in software)	Magnification	* Pass Energy	Step Size eV	Time (min's)
110 um (2mm Physical)	FOV2	10 – 40	0.1	1 - 4
55 um (1mm Physical)	FOV2	10 – 40	0.1	1– 10
27 um (0.4mm Physical)	FOV2	20 – 80	0.1	3 – 15
15 um (0.15mm Physical)	FOV2	20 – 80	0.1 – 0.2	5 – 30

* Use 160 eV for surveys

** A predetermined iris setting must be used for each spot size

III. Imaging (parallel)

A. Elemental

Goal	Magnification	PE (eV)	Acq. Time (min's)
General Alignment	FOV1	160	1
Small area spec. Position referencing	FOV2	160	1 – 5
Highest Lateral Res.	FOV3	160	2 – 8

B. Chemical State and generating spectra from images

Goal	Magnification	PE (eV)	Acq. Time (min's)
General Alignment	FOV1	40 or 80	1
Small area spectroscopy. Position referencing	FOV2	40 or 80	1 - 10
Highest Later Res.	FOV3	40 or 80	3 - 15

