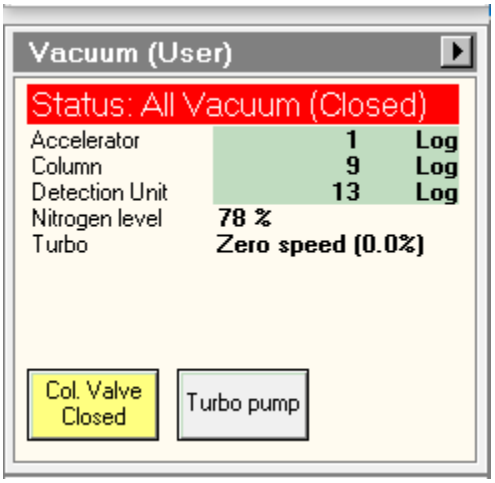
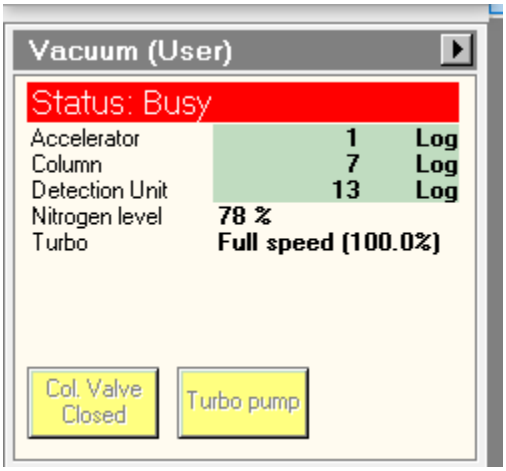
FEI Talos L120C Operation Manual

Before and after starting a session, check:

Good column vacuum (< 20 log)
Good nitrogen level (> 10%)
Make sure the column valve is closed before sample holder insertion/removal!
Turn on the **Turbo** in the Vacuum ocx and wait till it reaches 100%



Turbo Off



Turbo On

Vacuum ocx

Sample Holder

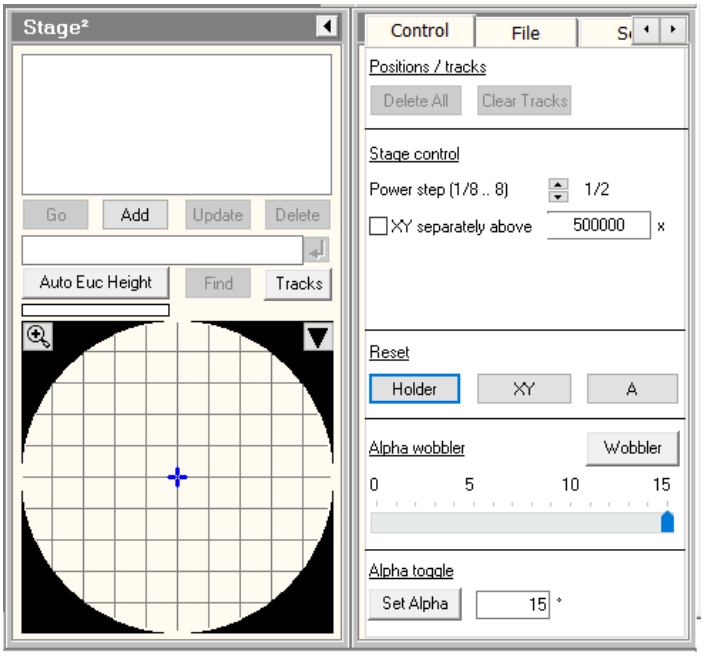
There are many types of sample holder available for different application.
Single tilt, Double Tilt, Cryo, Tomography, Gas cell, Fluid cell, and Vacuum transfer holders.

See Fig.1 for sample placement in Single Tilt Holder.

Holder Insertion/Removal *See fig 2 for Sample Holder insertion into stage.

1. Align pin on holder to the mark on stage at 5 o'clock position and insert the holder straight into the stage. Insert holder till you feel pressure from the holder o-ring making contact. Insert slightly more to seat o-ring
2. Select Holder type in the User Interface

3. Wait for the load lock to pump down and finish (RED LED will turn off on stage).
4. SLOWLY Rotate the holder CCW and SLOWLY fully insert it to the microscope column area. Have a good grip on the end of the specimen holder.
5. **SAMPLE HOLDER REMOVAL:** *In the STAGE ocx, expand out to the CONTROL tab and press the HOLDER reset which will reset the stage positions to 0. Reverse the above steps to remove the holder. Remember when removing holder from stage, there is still a vacuum in the closed airlock. Hold fingers around rod to stabilize it when removing to prevent hand from jerking.



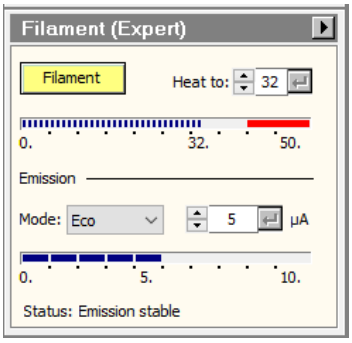
Microscope User Interface

The microscope operation interface consists of these programs:

1. TEM User Interface: general microscope operation
2. Display of live TEM image (Flucam)
3. TEM Imaging & Analysis (TIA): image acquisition

Starting Procedure:

Once holder is in the scope and the vacuum is good to start (< 20).
Turn Filament on (Takes about 10 minutes) and make sure it is set to ECO Mode.



Check the "Blanker Shutter Monitor" window to see where the beam is and the screen position.
In the Settings Tab of the UI, under the Vacuum ocx, Open Column valves
Find the beam and sample. You may need to lower magnification to do so.
Center beam with trackball and center feature of interest with joystick. You will need to keep adjusting these as you increase magnification. Bring magnification to about 3kx.

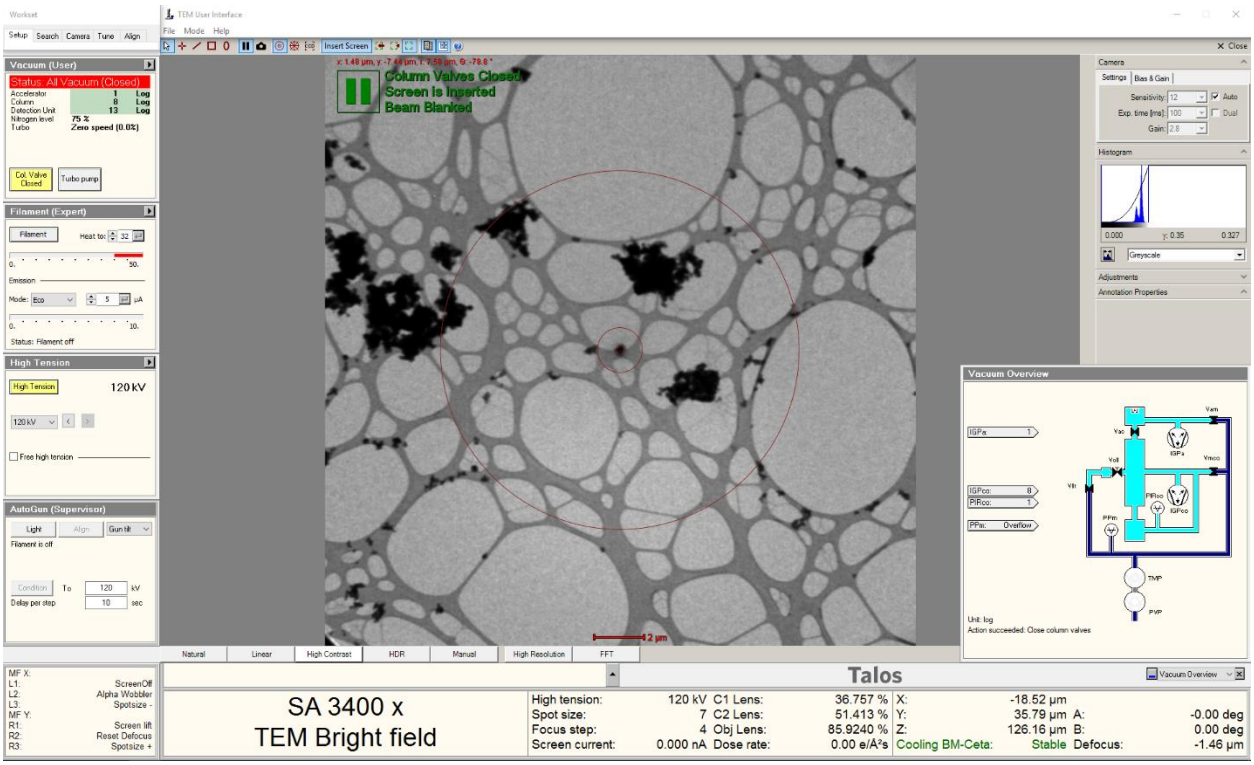
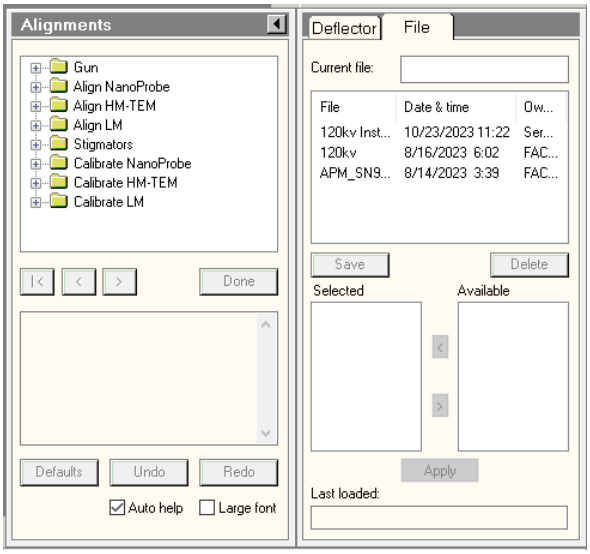


Fig. 2 Overview of the microscope user interface, TEM User Interface

HINT: if having beam and image issues. Try reloading the Column alignments (120kv) on the Alignment File window.



Select the latest alignment file by highlighting it and the press the Apply button.

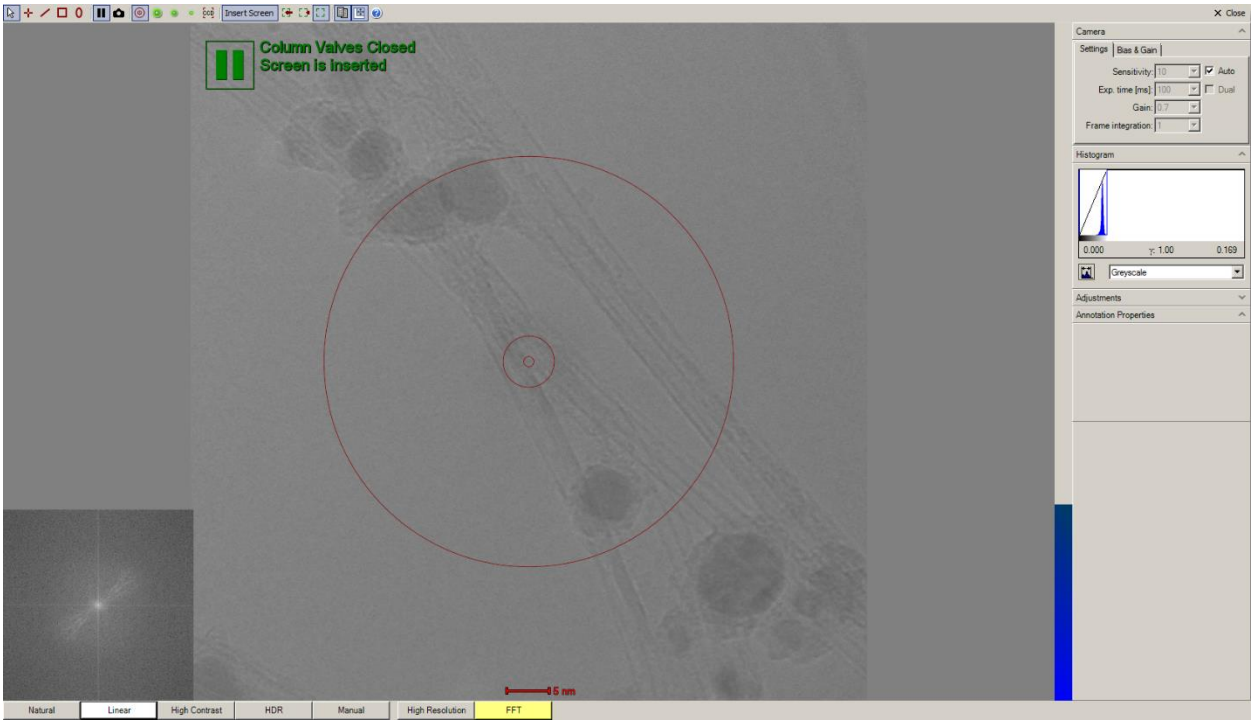


Fig. 3 Flucam displays the live image projected on the phosphor screen. Buttons below image controls contrast levels. Select which works best for your sample signal.

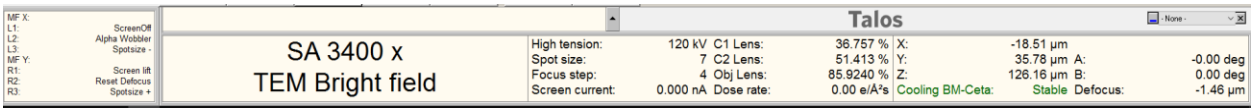


Fig. 4 Microscope status panel displays info of the scope condition.
Hand Panel function buttons to the left of the display shows what is assigned to those buttons.

Eucentric Position

In order to get the optimal microscope performance and reliable diffraction results one needs to set the sample at the eucentric height. To set the eucentric Z height:

1. Go to some low magnification (~3,000x) and find a recognizable feature and center it.
2. Select Alpha Wobbler (Function Button on Hand Panels). Observe image movement.
3. Using **Z** (Right Hand Panel button), move either up or down button to minimize the lateral movement of recognizable feature. When corrected, feature should tilt on itself.
4. Iteration steps 1 – 3 at higher magnification (~50,000x) to fine tune the z position, if necessary.

TEM Operation

Users need to go through a few alignment procedures to optimize the performance while the microscope is routinely maintained by IAC staff. Follow the items on "Direct Alignment" panel:

1. Make sure the sample eucentric height has been set and click on "Eucentric Focus" button on the Right Hand Panel. Confirm that image is in focus to perform the next alignments.
2. Beam tilt pp X and Y
   - Set the microscope at some moderate magnification (around 50,000x) and make sample is in focus.
   - Focus the beam, Press alignment, and use MF-X and -Y knobs to make the two beams overlap
3. Rotation Center
   - Set the microscope at some moderate magnification (around 50,000x) with focused image.

- Expand the beam to illuminate the entire screen area
- Minimize the image lateral movement by turning MF-X and -Y knob

4. Fine tune Obj Stig and Focus as needed.

CCD:

Once image looks good on the Flucam, you can switch over to the CCD. In the CCD window, Insert the CCD camera with the “Insert Button”. Lift the Screen in the Flucam window, so the beam can be exposed on the CCD. In CCD window-Select “Search” to adjust image magnification, focus, and stigmatism. You can use the “PreView” to get a better image for fine focus and stigmation. Once things look good, select the “Acquire” button to capture an image. If needed, adjust Integration time, Sampling, and Readout to the desired image resolution.
Adjusting stigmation can be done more easily by using the FFT function. De-focus image so that you see a few rings in the FFT, shape of rings are an indication of residual astigmatism. Make rings round using the Objective stigmation.

Data Saving and Exporting

- The data is saved locally on the support PC (network link \ Transfer\ Z: drive) located on the desktop.
- Each image will need to be saved individually. Or you could use the ”Auto Save” function.
- It is recommended to save the images in FEI’s raw format (.emi/sri) as the format contains information about the experimental condition (magnification, camera length, voltage, etc.)
- Use TIA Folder Export function to batch convert the files to .jpg, .tif, etc.
  - Use “Settings” to set up the export parameters (Source and Target folder path, image type, scale bar, etc)
  - Click “Export” to execute

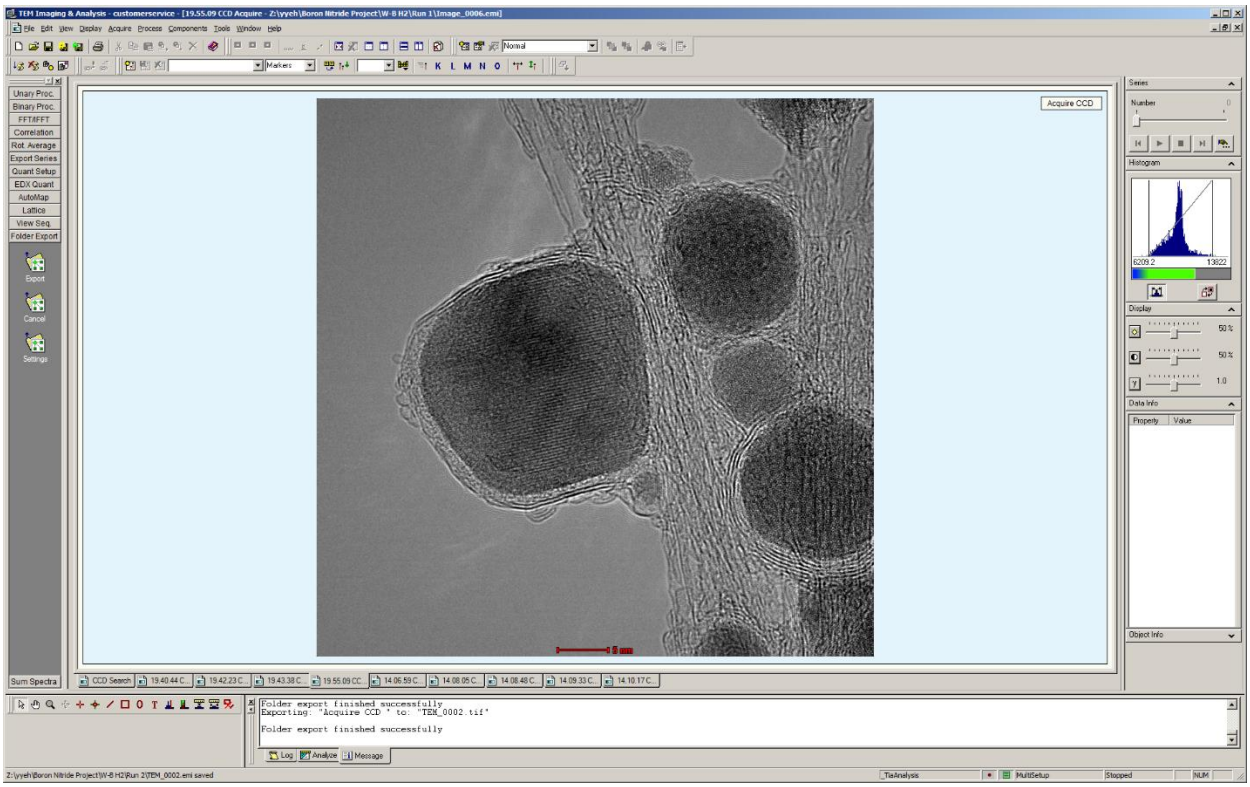


Fig. 10 TIA user interface

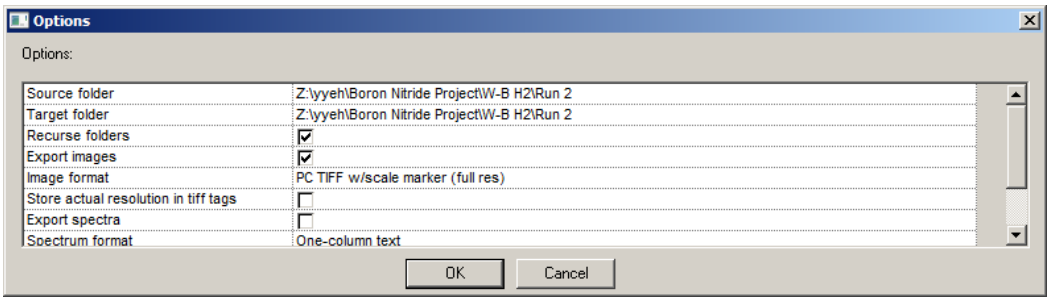


Fig. 11 Setting options under Folder Export

Converted images can be sent via email, google drive, dropbox, ect since the Support PC is connected to the internet.
If you wish to grab the images with your thumbdrive or external device, then you will need to move the images to the IAC Data Server link found on the Support PC desktop. This moves the images to the computer cluster room where you are allowed to use a thumbdrive.

ENDING SESSION:

Turn Filament off, Make sure TMP (Turbo) is off, Close column Valves.
Reset Stage positions to 0, in the Stage OCX, Flap out to Control Window and select Holder "Reset".

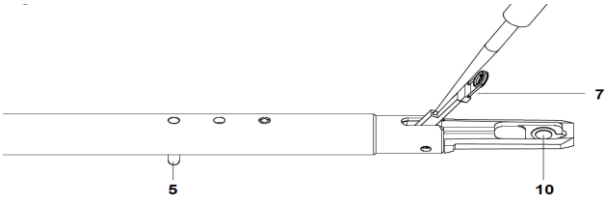


Fig.1 Sample insertion into Single Tilt Holder.

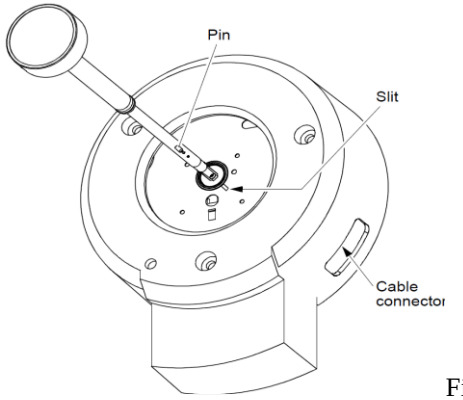


Fig. 2 Holder insertion into stage

Emergency Information:

Medical Emergencies: Contact 911 and Public Safety (609) 258-1000
Room / facility emergencies: Contact Public Safety (609) 258-1000
Issues related to the instrument:

1. Contact IAC Staff.
2. Leave system as is, Do Not disable vacuum system.
3. Close Vacuum valve.