JEOL 6500 User Manual

LOG IN to your session on the computer to the left of the microscope.

Starting Conditions

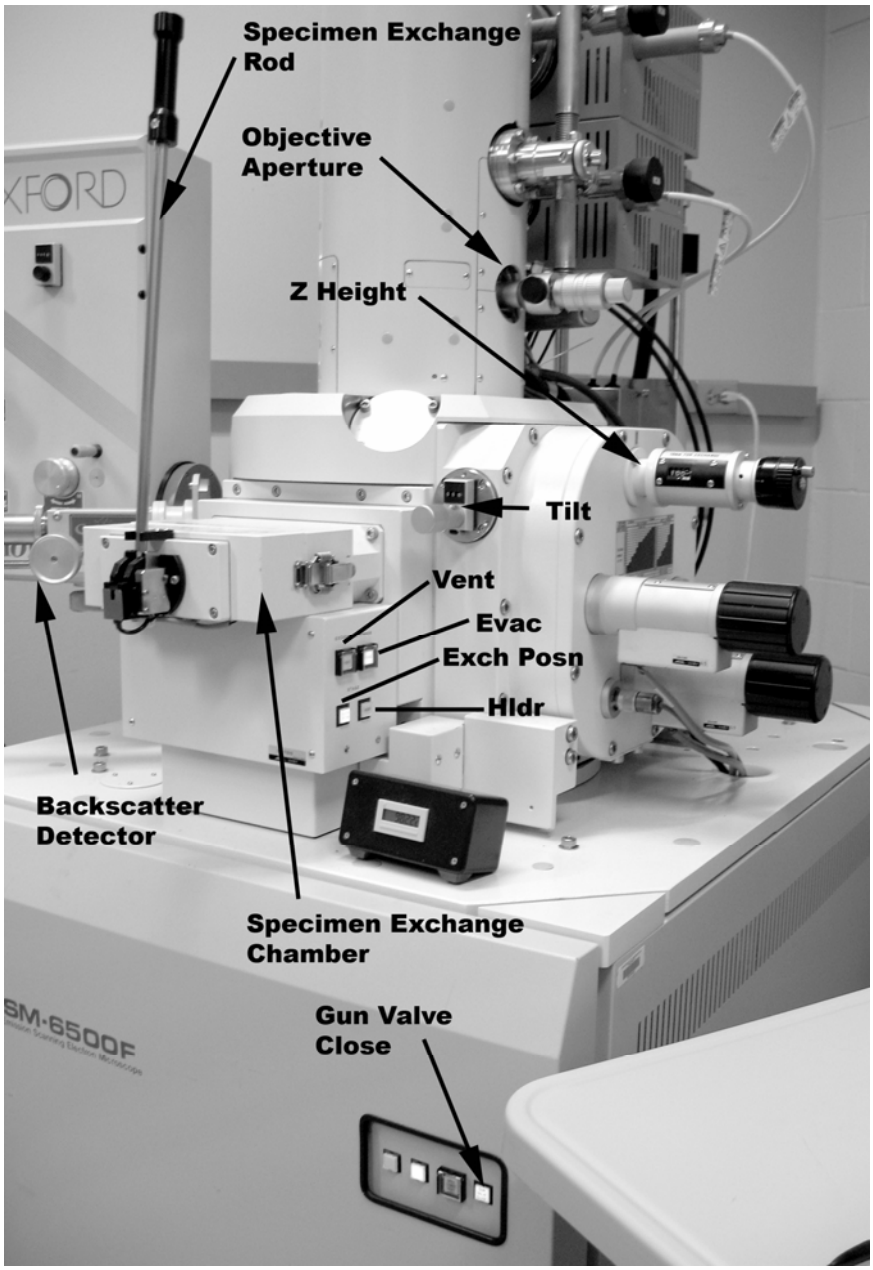
1. Press Ctrl-Alt-Del and log on to the microscope computer. Click on JEOL PC SEM 6500 icon. Click yes if message on screen about stage appears.

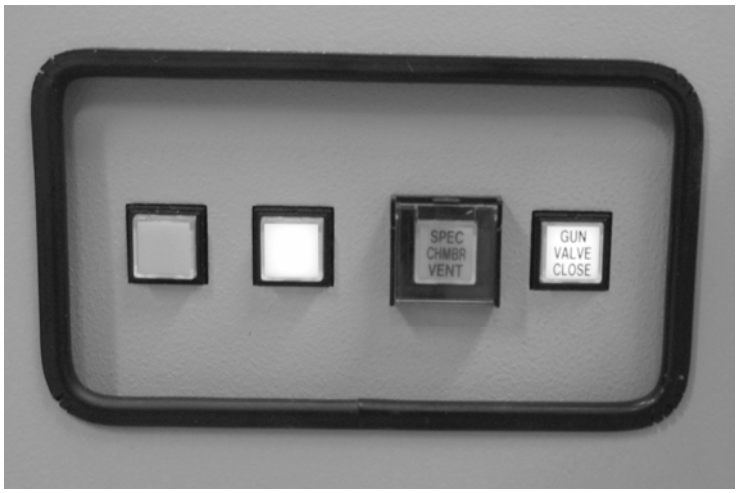
2. Click the 

button and read the Penning Gauge to ensure that the microscope is at appropriate vacuum (10^{-4} -- 10^{-5} Pa). If not, consult with staff.

3. Click the Stage Specimen Holder Exchange  button; select the holder you are using; and click the "Exchange" button. Ensure that the "Z Position" dial on the side of the chamber is at the 10.0 mm position and that "Tilt" is at 0.00. Close the "Specimen Exchange" window.

4. Check that the lights on side of exchange chamber and front of microscope are as follows:
   "EXCH POSN" — ON
   "HLDR" — OFF (if it is ON there is a specimen in the chamber)
   "GUN VALVE CLOSE" (front of microscope) — **light ON**.





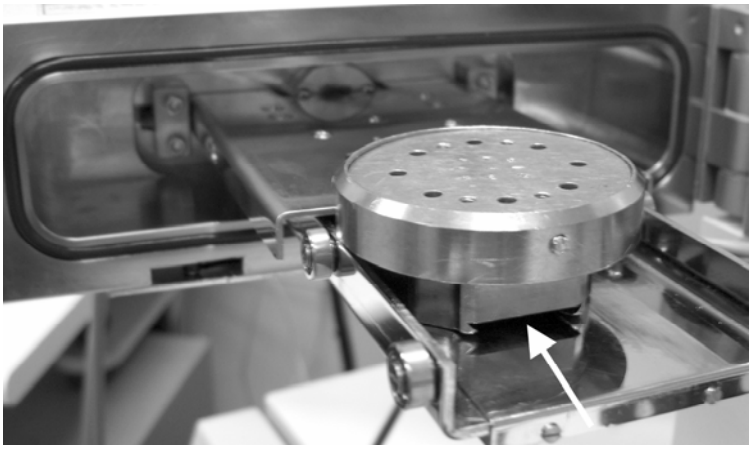
Specimen Loading

1. Loosen clip on side of chamber. Press and hold "Vent" button until it starts to flash.

2. Swing back the door when the chamber vents. Check to see that the O-ring is properly fitted into its groove.

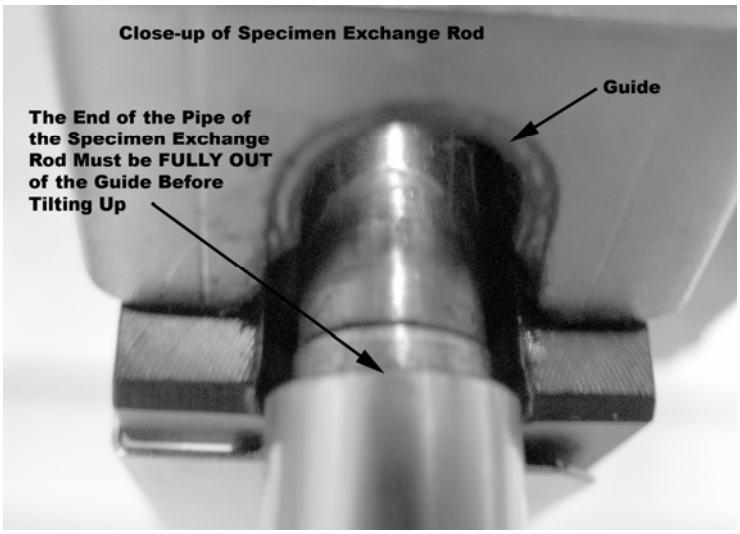
3. Mount specimen holder so that the **bottom groove is parallel to the loading direction.**

   The specimen should be flush with the top surface of the specimen holder. Close door, and clip shut.



4. Press and hold "EVAC" button until it starts to flash. **WAIT** until "EVAC" button stops flashing.

5. **With two fingers, gently bring the rod down and let it self position—then slide it in completely.** Watch the chamber camera as you do this to ensure a secure connection. If you hear a long beep—STOP!—something is wrong, most likely stage not in exchange position.



6. Withdraw rod, **PULL OUT COMPLETELY** and tilt up until clipped ("HLDR" light should be ON).

7. **WAIT** for 5.00E-004 Pa (or lower)

Specimen Unloading

1. Set stage  to exchange position. ("Exch Posn" is ON). Ensure that the "Z Position" dial on the side of the chamber is at the 10.0 mm position and that "Tilt" is at 0.00.

2. Turn the **"SEI detector" Off** and close the "Gun Valve" (**"GUN VALVE CLOSE"** (front of microscope) — **light ON**.)

3. **With two fingers, gently bring the rod down and let it self position—then slide it in completely.** Withdraw rod, **PULL OUT COMPLETELY** and tilt up until clipped ("HLDR" light should be ON).

4. Loosen clip on side of chamber. Press and hold "Vent" button until it starts to flash.

5. Open chamber, check O-ring and remove specimen holder.

6. **C**lose door, and clip shut. Press and hold "EVAC" button until it starts to flash.

Software Setup / Obtaining an Image

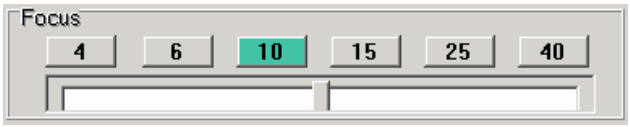
1. Set imaging parameters by clicking on the:

   "Recipe Setup"  button to choose from a list of predefined recipes; or

   "Column"  button to manually set parameters such as accelerating voltage, emission current, etc.

2. When the vacuum level has reached 5.00E-004 Pa (or lower), turn the **"SEI detector" On** and open the "Gun Valve" (**"GUN VALVE CLOSE" — light OFF**.)

3. Set Working Distance to 10mm with the "Focus" slider bar (that's approximately where the specimen is).



   The working distance will be shown in the bottom right corner of the computer screen.

4. Adjust brightness and contrast ("ACB" button or manual knobs) so you can see something & initially focus with the **Z position dial** on the side of the chamber. [If you have little signal: do gun alignment (see below); if you see nothing, the "Freeze" button on the console may be lit].

5. Moving to an area of interest on the specimen can be done with the joystick or by right-clicking the mouse. At higher magnifications, "moving to adjacent areas on your specimen" is actually accomplished by moving the beam. This is done by left-clicking, holding and dragging the mouse. If you exceed the range of this function, select the "Image Shift—Reset" button in the "Alignment" window below.

6. Set the working distance to the desired value and coarse focus **manually** using the **Z position dial** on the side of the chamber. Fine focusing can subsequently be done with the "Focus" knob on console using reduced area view ("RDC Image")

Alignment

Press "Align" on the control panel and the window to the right will appear.

A good starting strategy is to sequentially highlight "Gun Alignment" through "CL Stigmator" and at each selection press the "Align Clear" button so that both "X" and "Y" read "0".

1. Align gun to maximize signal.
   - At the lowest magnification increase the "Probe Current" to its maximum setting. Adjust contrast so you can see something.
   - Press "Align" on console; ensure "Gun Align" is selected; and adjust X and Y knobs on control panel to maximize signal (brightness of image).
   - Press "STIG" on console to turn off alignment and return "Probe current" to previous value (7 or 8 or whatever you want).

2. Align aperture. Alignment of the objective aperture is necessary when you observe image movement while focusing

- Find feature at about 5,000X or more.
- Turn "HT Wobbler" ON and adjust its amplitude.
- Press "Align" on console and select "OL Aperture" in the "Alignment" window. Adjust X and Y knobs to minimize X and Y motion of image. You may need to move the stage to keep the specimen in view.
- Work up to higher magnifications as needed.
- When done, press "STIG" button, turn off "HT Wobbler" and focus.

Note: if you find that you can not correct for the wobble after significant adjustment of the X and Y knobs, consult staff – the objective aperture may need to be manually centered.

3. Astigmatism correction.

- Roll focus and look for stretching of the image as you go up in magnification. The stretching will switch from one direction to another as you go between under and over focus. Set focus where stretching switches.
- Ensure that the "Stig" button on the control panel is lit.
- Adjust X and Y to get sharpest image.
- Work up to higher magnifications as needed. Even if stretching isn't apparent in the image, you will still need to correct for astigmatism to get well focused images
- If the image moves while you're adjusting the stigmators, then the stigmators themselves will have to be aligned. Select "Stig Center X" in the "Alignment" window, press "Wobble" on the console and adjust X and Y to minimize movement. Do the same for "Stig Center Y".

Note: Condenser lens astigmatism correction may be necessary when using large probe currents. Select "CL Stigmator" in the "Alignment" window and correct for astigmatism with the "X" and "Y" controls. Subsequently perform objective lens astigmatism correction

Aperture alignment, astigmatism correction and fine focusing should be done well above the magnification at which your images are acquired.

Acquiring an Image

1. Press "ACB" (Auto Contrast and Brightness) on console.

2. Press PHOTO on console (it will take about 1 min to scan). Frame will be frozen when it finishes. A "Print" window will appear –select "Cancel"

3. Select the "Image File Handler"  button to save the image. Choose your directory.

4. Select "Export" (this is necessary to get a micron marker). Choose Filename and Format type.

5. Press Freeze button on console to restore microscope imaging.

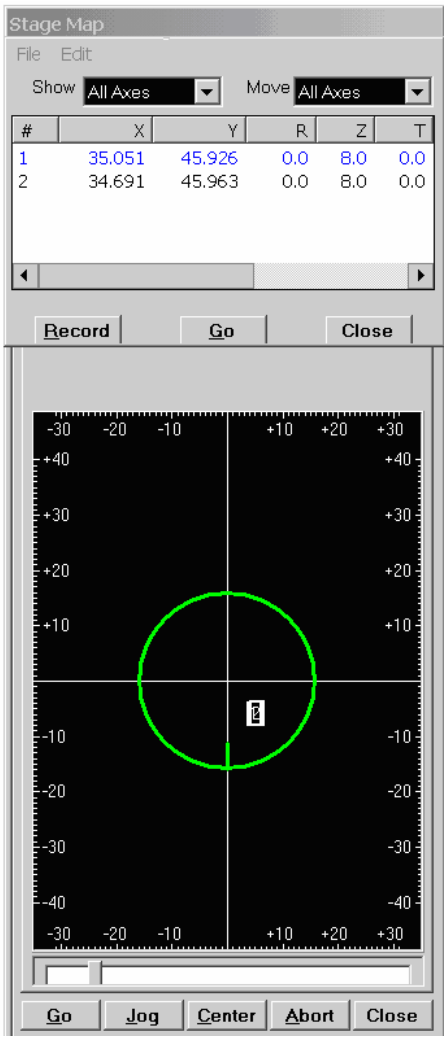
LOG OUT of your session on the microscope computer and the computer to the left of the scope. **Leave the High Tension ON**

Accessing your files:

Go to the Characterization Facility website (http://www.charfac.umn.edu/), select “Instruments” –-> “File Storage and Access” for instructions.

Recording Stage Positions:

Click the “Stage Map”  button → “Points Map” → “Points File”. You can “Record” specific positions and subsequently “Go” to them.

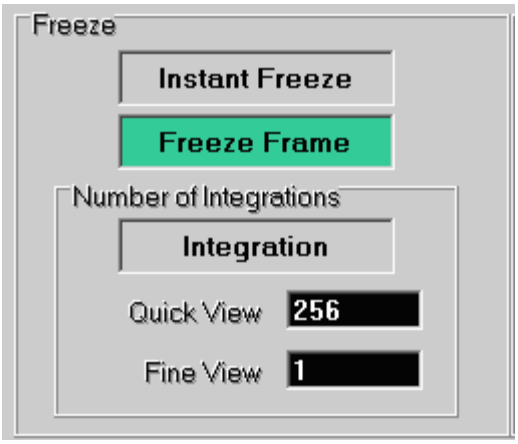


Frame Integration

Select the “Instrument Operation”  button. Highlight “Integration” and specify the number in either the “Quick View” or “Fine View” boxes.

When you press the “Freeze” button on the console the software will integrate the number of frames you specified. Select  as usual to save the image.

Make sure that “Freeze Frame is highlighted when you are through with image capture



Backscattered Electron Imaging

- Set the working distance to 10 mm and focus the specimen using the SEI detector.
- Unclip detector & crank in with knob on side—Watch out!!! If you hear a beep, you are hitting something—withdraw BS detector, reposition sample holder and try again. Position the detector so that it is centered on the computer screen.
- Align the microscope and focus upon the features of interest.
- Turn on Centaurus system (left of computer screen).
- From SEI menu (at bottom of screen) choose BSE.
- Turn “Brightness” until screen display is mid grey. Raise “Contrast” to obtain desired image. You will need to use a slow scan--too much contrast will give a poor image. If at any time red overload light comes on (screen will go blank)—turn down contrast (1/2 to 1 full turn) and hit reset button. Wait a few seconds.
- Press PHOTO on console to scan in image.
- When done: Turn off Centaurus system restore SEI imaging from menu at bottom of screen; and crank detector all the way out and pull down clip to hold it in place.