JEOL IT 800 Manual (this is a short guideline, it is not complete and you have to do your notes separately)

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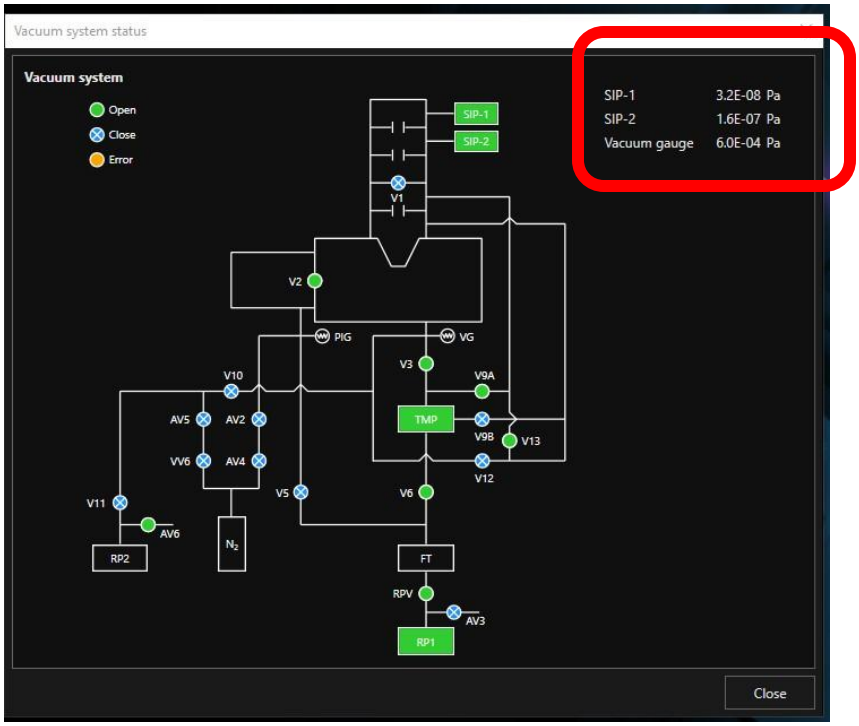
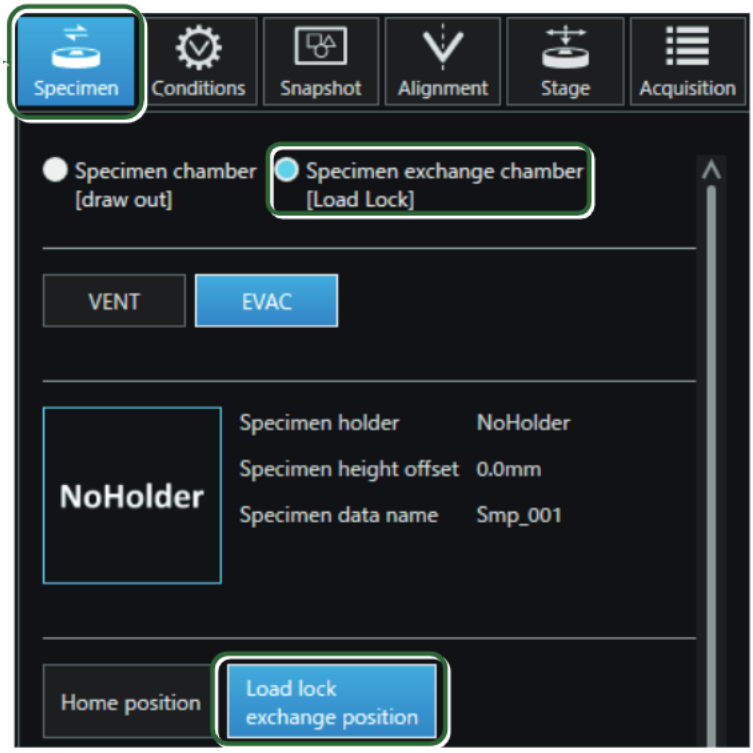
General procedure

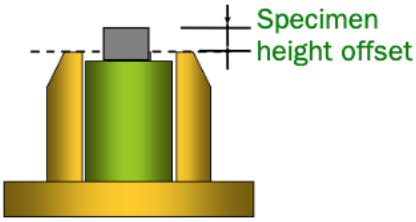
1. If PC is off-Start **JEOL PC**, switch on the mouse and the keyboard,
2. Login: account **SEMUser**, password **SEMUser**
3. Start data transfer PC, login **User**, password: **User0.1#**
4. Open SEM Center software, use login **User** (you do not need a password, **or login of your group**)
5. Check the vacuum, SIP1 should be ~3*10-8 Pa, SIP2 ~1.3*10-7 Pa. (go to maintenance/Vacuum system)
6. Write down the pressures, filament current, extraction voltage, acceleration voltage and emission current in the electronic log on the transfer PC.



7. Check that the stage is in the **load lock exchange** position and that specimen exchange chamber (Load Lock) option is active:



8. Make sure that observation button (ON) **is off**, i.e. valve between electron gun and main chamber is closed.
9. Always use gloves when handle the sample holder. Do not touch the o-ring in the loadlock chamber
10. If there is a sample in the main chamber, move it to the load lock chamber. Check that it shows that the exchange position is active.
11. **Prepare your sample: Air blow the sample to remove the debris etc.**
12. **Measure the height of your sample in mm. Max sample 10cm in length and 4cm in height**



13. Then open the clamp and VENT the load lock and place your sample on a holder in the specimen position (check arrows directions).
14. Close the load lock using the latch and press EVAC on the microscope to pump the load lock. Wait for the pressure, EVAC button stops blinking when evacuation is finished.
15. Check that stage is in the **load lock exchange** position and load the sample inside the main SEM chamber using specimen exchange rod.
16. The sample overview image is taken when loading and you can use this image for the sample navigation.
17. Specimen holder setting window will appear. Choose the right holder type and the sample height offset (**you measured it before loading**).
18. Give a project and a sample name. And press OK. These will be a folder and a subfolder

19. Set location and the file name in the AUTOSAVE: choose a folder and file name in Setting/Image&analysis data

20. Wait for the vacuum in the **vacuum gauge to be <5*10-4 Pa**

21. Press HOME POSITION, the sample will get up to 10mm.

22. Check if the depth of focus is set to 0.

23. Current settings, as an example start with standard 50%, acceleration voltage: 15kV standard (for biological samples and polymers 1-3kV and high-definition current 50%), adjust as needed.

24. Choose an imaging mode (STD-standard, SHL-super lens mode, BD-beam deceleration, LDF-long distance focus) and a detector. (For SHL mode use voltage <5kV, UHD, short WD).

25. Choose WD (working distance). 10mm for EDX, 4mm for height resolution imaging. Home position is WD 10mm. **Check that the sample does not hit the pole piece when WD changes.**

26. When vacuum is good, press ON.

27. With the track ball adjust Z height to get image in better focus. If the z-change is big, then in the specimen holder menu adjust the sample height too (**Z-height- WD in mm**). CHECK THAT THE SAMPLE DOES NOT HIT ANYTHING

28. Use RCD-reduced scanning window for faster alignment.

29. **Focus and stigmation:** focus and adjust astigmatism OL stig using Stig/Align for X and Y.

30. **Beam alignment**: in Alignment menu choose Beam Align and wobbler and make sure that image position does not change along with periodical changes using Stig/Align for X and Y..

31. **Repeat steps Focus/stig and beam alignement steps iteratively until you get good results**

32. **Extra Beam alignment (not always necessary)**: check STIG center and make sure image position does not change along

with periodical changes of the focus using Stig/Align. Should be stable

33. When finished with beam align-leave setting in OL-stig mode.
34. Use FREEZE button when you do not inspect your sample. If you leave the room, close the valve (ON off).
35. When changing imaging mode: do the lens clear twice. Right click on the image and choose lens clear.
36. Detectors: SED-ET (SE), UHD (SE), SBED (BSE), TED (STEM), LVSED (low vacuum SE), LVBED (low vacuum BSE), CL detector and EDX detector. SE detectors are good for topography, BSE for material contrast. For SBED and LVBED switch off the camera.
37. Depending on the view mode-you can see up to 4 detectors simultaneously.
38. For taking photos check the parameters in the photo menu (right click and set it how you need). Integrated (averaging) imaging includes beam drift correction. Or CF-charge free scanning
39. Save images in TIFF

Finishing your session

1. Switch off the beam
2. Retract any detectors if you inserted it.
3. If you changed depth of focus- set it back to zero in settings
4. Check the specimen in the load lock position.
5. Extract the sample to the load lock chamber.
6. Open the clam and vent the load lock chamber and remove the sample.
7. **EVAC** the load lock chamber again
8. Transfer your data to the data server via transfer PC
9. Switch off the mouse and the keyboard

EDX (can be used in LV mode up to 70 Pa)

1. Set WD to 10mm, check the sample height
2. 10kV minimum voltage. (check with the periodic table)
3. Set analytical current
4. Check "Signal depth Window" to see at which depth you excite your sample at the set voltage
5. **Switch off the camera**
6. Switch EDX menu (on the left panel) **SWITCH**
7. Death time should be about 35-40%, can be set in the current menu. Adjust the current accordingly.
8. Choose measurement time T2 or T3, dwell time 0.1ms, resolution 512x384 or higher.
9. Use probe tracking if needed for drift correction.
10. Choose option you need: map, line, point
11. To start measurements press START button: 

, stop when finished.
12. Save the data. You can create a report of your measurements

Low Vacuum mode (Use WD 4mm or bigger, never use 2mm)

1. In specimen menu choose LV and LV BED-C detector, use scan 2 or higher
2. Set the pressure between 10 and 300 Pa (wait for the pressure). LV orifice will be inserted.
3. Switch off the side camera
4. Use 10kV and standard current 75%

5. Check the stigmation and beam alignment again
6. You can also use LV SED detector.
7. When finished, retract the detectors, go back to HV mode

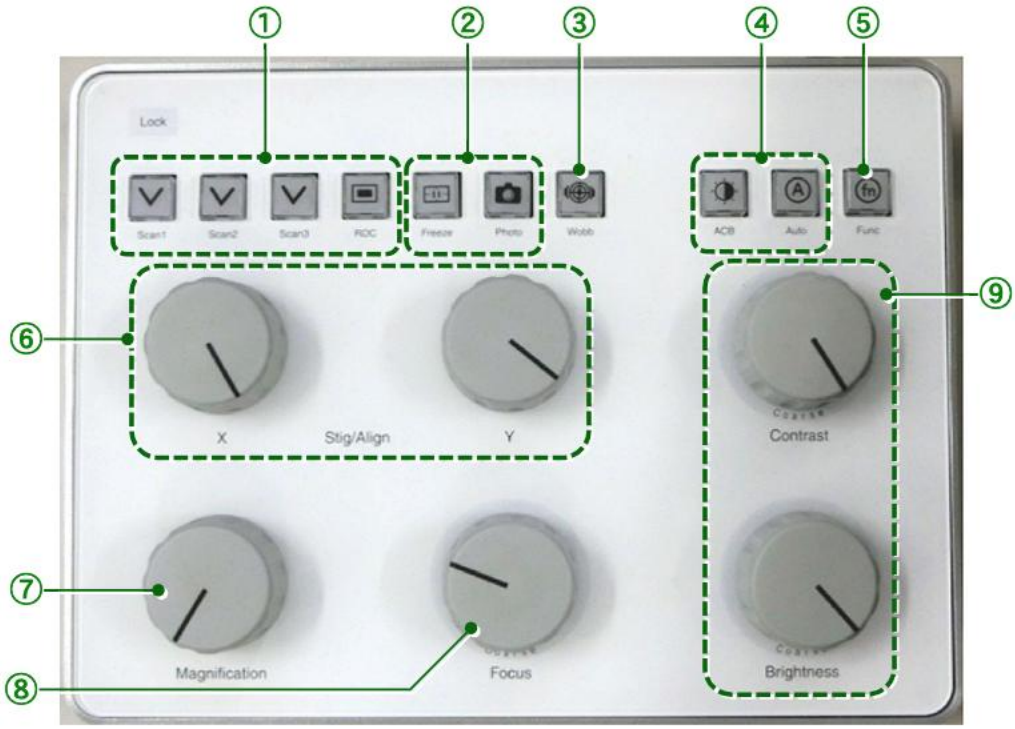
Beam deceleration

1. In Observation mode choose BD, start with 6mm
2. WD 2mm or 4mm. Check the z-height.
3. Do beam alignment and stigmation correction.
4. Check Stig center
5. Use low acceleration voltages. Start with 1kV and HD current 75% or lower. Adjust the specimen voltage to get better signal (can go up to 5kV), look at the camera and check if you see sparks, if you see them-**stop increasing the voltage!**

STEM

1. Choose the special TEM grid holder, load it and choose it in the specimen holder setting
2. Set voltage to 30kV, 4mm, high probe current ON.
3. Get an image in using SED detector, do beam alignment. **DO not use small screen in STEM mode!**
4. Beam off, then insert STEM detector (called TED). Check vacuum. Beam ON.
5. Check astigmatism
6. Do imaging using either bright field or darkfield mode. Use CF mode if charging.
7. High probe current OFF
8. Beam OFF
9. When finished, RETRACT the detectors.
10. Then remove the sample as usual

Panel controls



③ Wobb (Wobbler)

Wobb: Used for alignment works of the electron column (Source align, Beam align, Stigma-center X, and Stigma-center Y). When this button is pressed, the button lamp starts blinking, and then the focus of the image changes periodically. When this button is pressed again, the WOBB mode is canceled, and the button lamp turns off.

④ ACB/Auto (Automatic function)

ACB: Performs automatic brightness adjustment.

Auto: Executes the auto function specified in SEM Center.

⑤ Func (Function assignment)

Func: Executes the function set in SEM Center

In the case of JIB-PS500i, this button changes the observation mode between SEM and FIB.

⑥ Stig/Align (Stigmator/Axis alignment)

Stig/Align knob: Used for the astigmatism correction or various axis alignment operations. The operation varies depending on the condition of SEM Center.

⑦ Magnification

Magnification knob: Used to select the image magnification. The selected magnification is displayed on the observation screen.

⑧ Focus

Focus knob: Used to set the focus.
Pressing this knob switches its mode between Coarse and Fine, which changes the shift amount of the focus for turning the knob. During the Coarse operation, the Coarse lamp under the knob lights, and the shift amount of the focus increases.

⑨ Contrast/Brightness

Contrast knob: Adjusts the contrast of the observation image.
Pressing this knob switches its mode between Coarse and Fine, which changes the shift amount of the contrast for turning the knob. During the Coarse operation, the Coarse lamp under the knob lights, and the shift amount of the contrast increases.

Brightness knob: Adjusts the brightness of the observation image.
Pressing this knob switches its mode between Coarse and Fine, which changes the shift amount of the brightness for turning the knob. During the Coarse operation, the Coarse lamp under the knob lights, and the shift amount of the brightness increases.

① Scan settings

Scan1 to 3:	Sets the scan speed of the SEM to one of Scan1 to 3 defined in SEM Center.
RDC:	Limits the scanning range to 1/4. Limiting the scanning range of the electron beam can improve image quality under a fast scanning speed. This function is mainly used to adjust the axis.

② Freeze/Photo (image acquisition/photography)

Freeze:	Stops the image update in the observation image display section. Scanning stops after the current scanning is complete that has already started before this button is pressed.
Photo:	Executes image capture. When this button is pressed, scanning starts from the uppermost part of the image.

Electron interaction with a sample