HRSEM User's Guide

THE CENTER FOR NANOSCIENCE AND NANOTECHNOLOGY
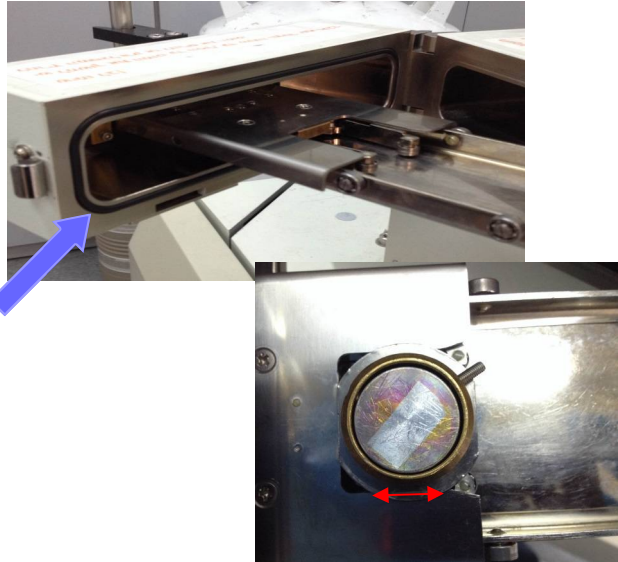
HRSEM

Initial steps

1	Log in to HRSEM	
2.	Check lights on the side of the exchange chamber, in front of the microscope: EXCH POSN—light on HLDR—light off (if it is on there is a specimen in the chamber)	
3.	If EXCH POSN is not ON : Set height to 08.0mm Set tilt to 99.9 In software: Click Stage Specimen holder Exchange and press Exchange	
4.	Check lights in front of the microscope: GUN VALVE CLOSE—light on	
5.	Loosen the clip on the side of the exchange chamber	

Inserting Samples

6.	To vent the chamber: Press and hold the VENT button until it is flashing. Wait until it stops flashing.	
7.	Swing the door back and mount the specimen holder. Note direction of dovetail parallel to loading ↕ direction on the stage **Check that the** O-RING is in it's place.	
8.	Close the door and shut the clip . Press and hold the EVAC button until flashing. **WAIT** until the EVAC button stops flashing. Loosen the clip on the side of the exchange chamber	

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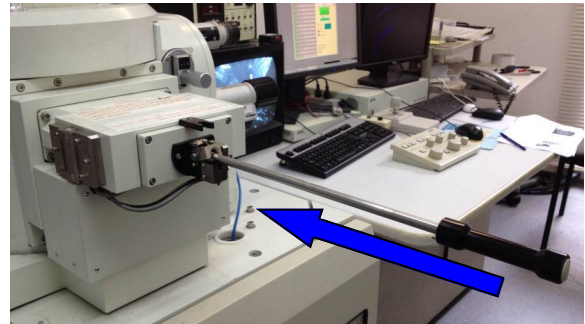
Inserting Samples

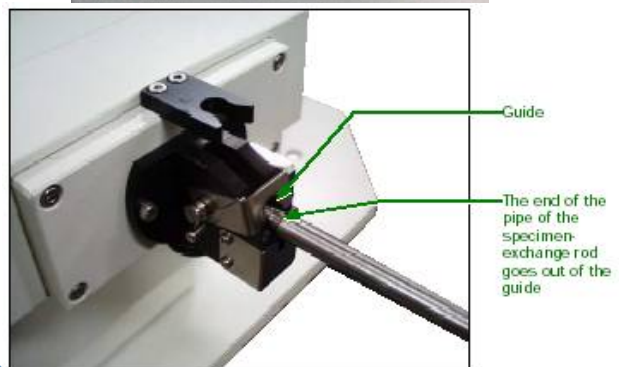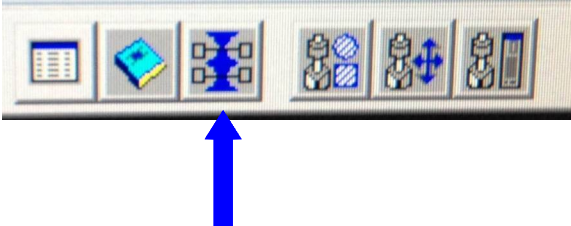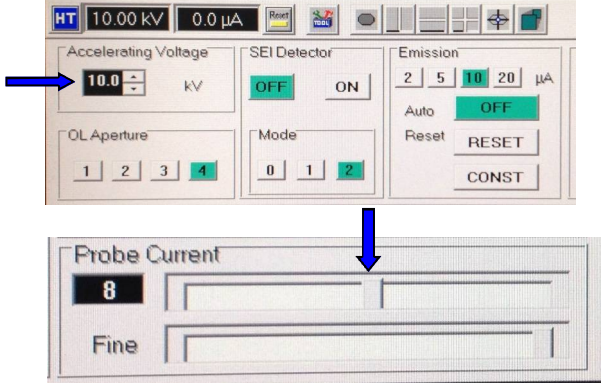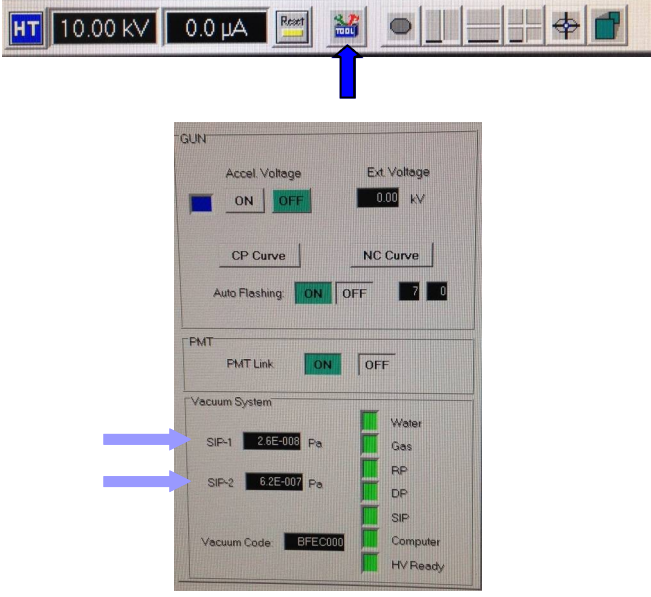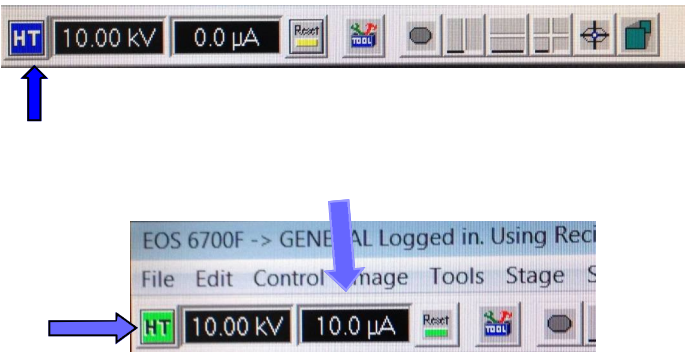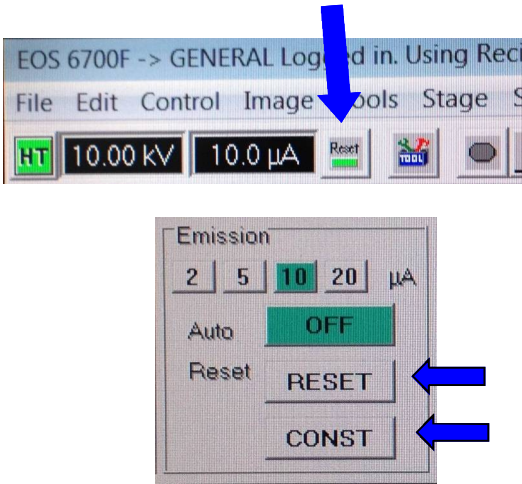|		
9.	Switch on TV screen and IR camera	
10.	Pull the rod down and slide it in completely (look on TV screen to see that the sample holder reaches the right place) Please hold the rod with the handle ONLY! If you hear a long beep— STOP!—something is wrong, most likely the stage is not in the exchange position!	
11.	Check HLDR light is on. Withdraw the rod, PULL IT OUT COMPLETELY!!!! until the end of the pipe of the rod goes out of the guide and tilt up the rod until clipped.	

12.	Press the Instrument Control window.	
13.	Set accelerating voltage to desired value and probe current to 8.	
14.	Open the Maintenance menu. Check: SIP1 $2x10^{-8}$ -$3x10^{-8}$ Pa SIP2 is not higher than $1x10^{-6}$ Pa.	
15.	WAIT for $5.0x10^{-6}$ mbar (black line) or lower on the external vacuum meter AGD	

Initial setup in Software
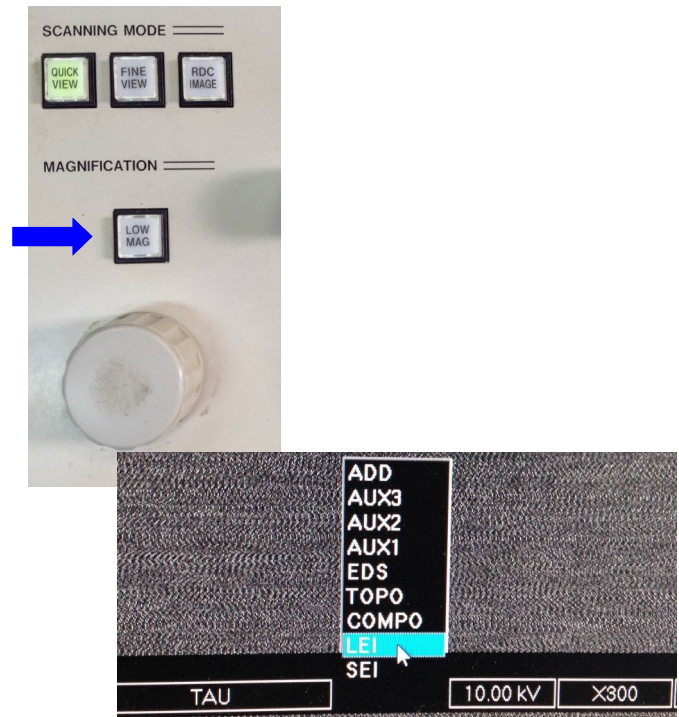
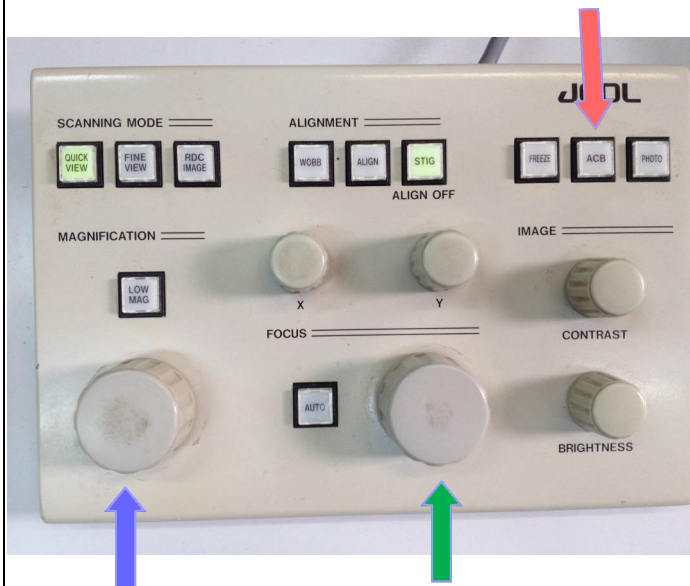|		
16.	Check that the **HT** button is blue and then press HT. **HT** will turn green. Wait for the emission current to reach 10 µA.	
17.	Check GUN VALVE CLOSE – light off	
18.	Note: the current may fall off during your session, press reset button (if it turns yellow) or use CONSTANT / RESET in the emission current menu.	

Imaging

19.	Press LOW MAG on operation panel, and then change to LEI detector	
20.	Reduce magnification to minimum Adjust contrast and brightness (ACB) so you can see something & focus.	
21.	Move stage to find an area of interest on specimen, using joystick and mouse (right click)	

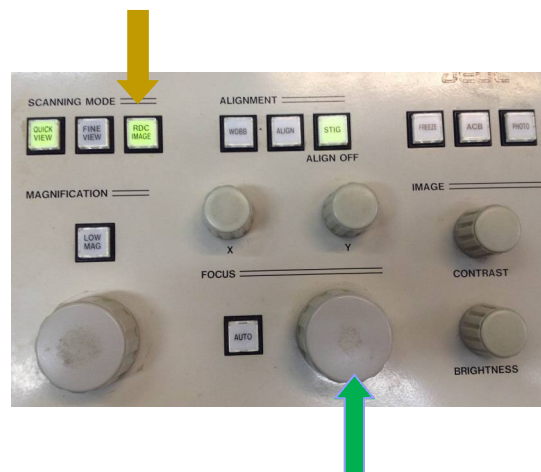|		
22.	Turn off LOW MAG	
23.	Switch to SEI detector (for working distances of 8mm or less)	
24.	Use reduced view (RDC IMAGE) & focus, if needed	

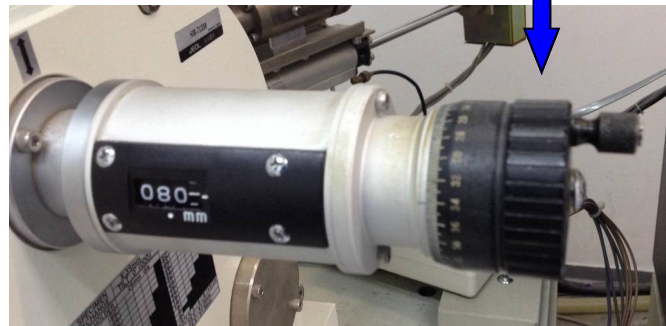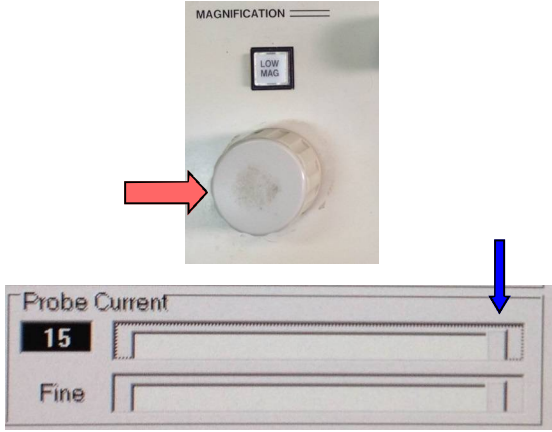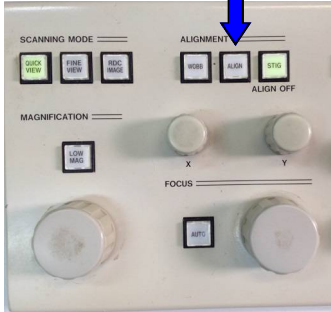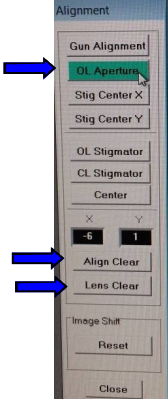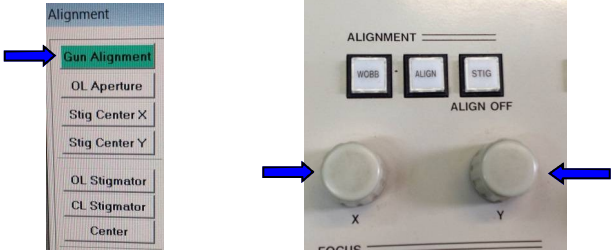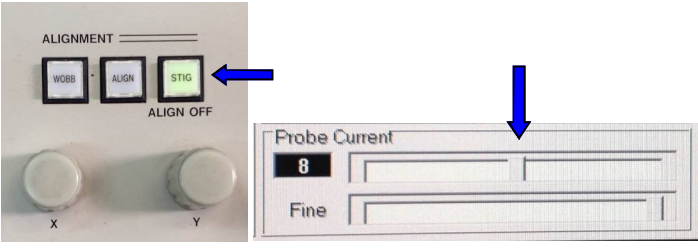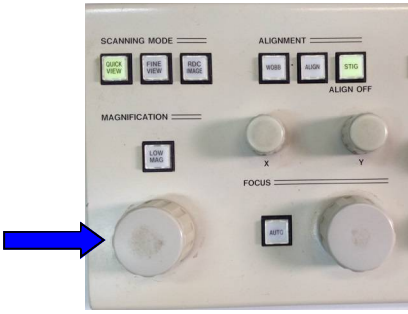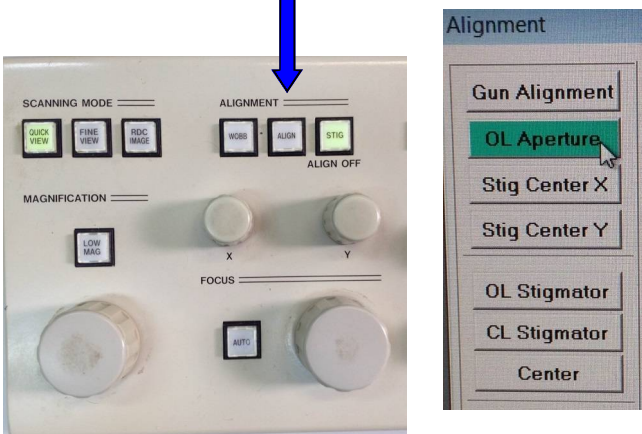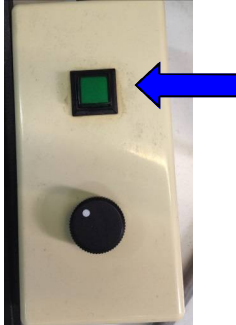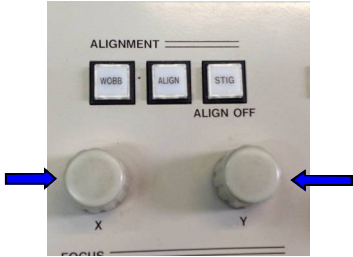|		
25.	If you wish to work on a different working distance (WD) than 8mm: Choose WD from menu. Change height using the WD control on the console. If you hear a long beep—STOP!—something is wrong, most probably you are too close to the end of column.	

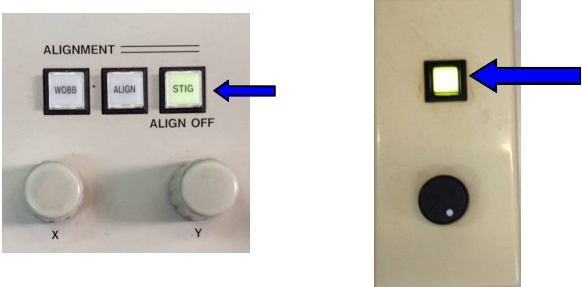|		
26.	At lower magnification, increase Probe Current to max (15) (if you can't see anything—adjust contrast and brightness)	
27.	Press ALIGN on the OPERATION panel.	
28.	In the Alignment window go to the OL Aperture. Press Align Clear. Press Lens Clear.	
29.	Press Gun Alignment. Adjust X and Y to maximize signal of brightness. Correction should be less than 10 for each	
30.	Press STIG on the OPERATION panel to turn off alignment. Return probe current to 8.	

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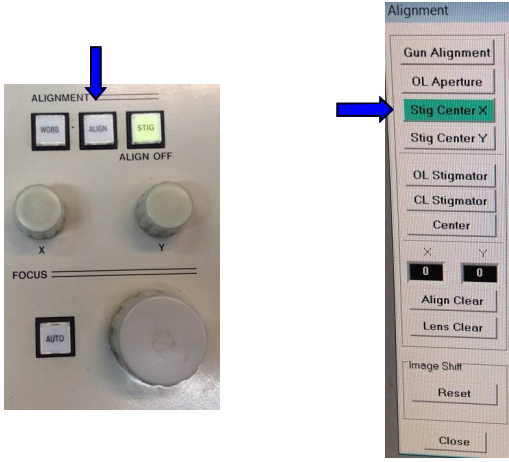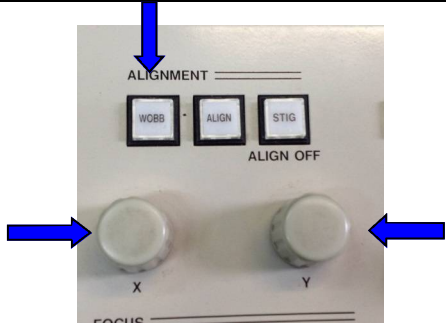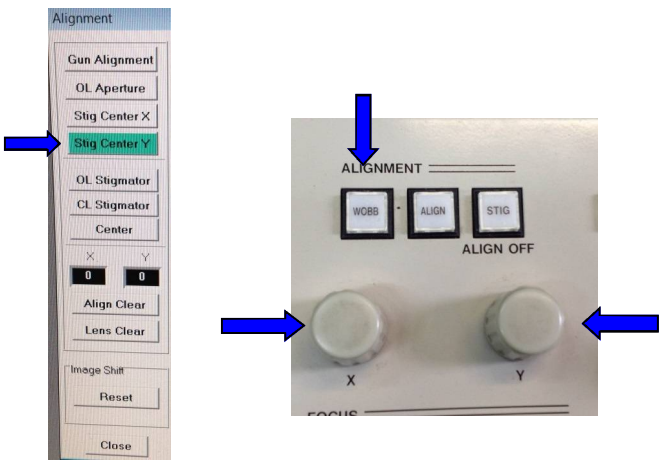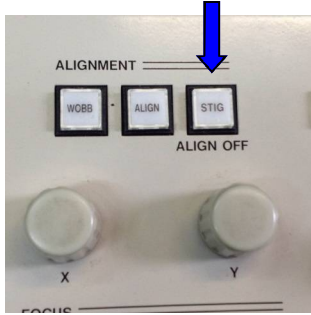|		
31.	Find feature at about 5,000X or more - If you need to work on a higher magnification, find a feature at about 50,000X	
32.	Press ALIGN on the OPERATION panel. Go to OL Aperture.	
33.	Press HT Wobb green button - **NOT** in software! Use the black knob to adjust wobble amplitude.	
34.	Adjust X and Y to minimize motion of image. (Keep feature in field of view by moving stage) Work up to higher or lower magnifications as needed.	
35.	When done: Press STIG button and focus. Press HT Wobb to turn off wobbler.	

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Imaging - Astigmatism correction

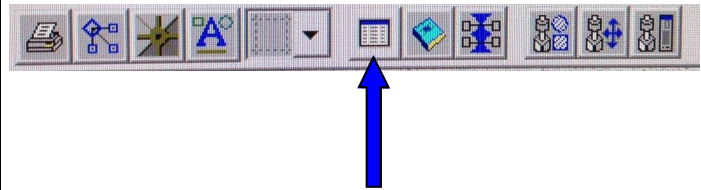|		
36.	Find feature at mag of 20,000X or more (more is better) Press ALIGN on the OPERATION panel. Go to OL Stigmator. Press Align Clear.	
37.	Press STIG on operation panel. Roll focus and look for stretching of image. It will switch from one direction to another. Get the best focus you can.	
38.	Adjust X and Y to get sharpest image Work up to higher mags as needed.	

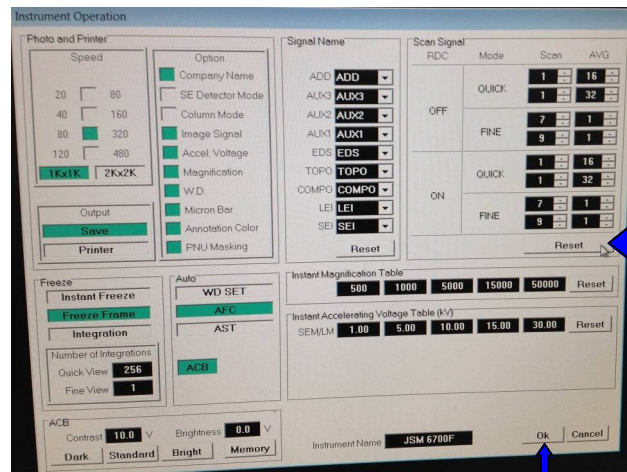|		
39.	Press ALIGN on the OPER-ATION panel. Press Stig Center X .	
40.	Press WOBB button on the OPERATION panel. Adjust X and Y to minimize motion of image.	
41.	Press Stig Center Y Press WOBB button on the OPERATION panel. Adjust X and Y to minimize motion of image.	
42.	Press STIG to exit the Alignment menu.	

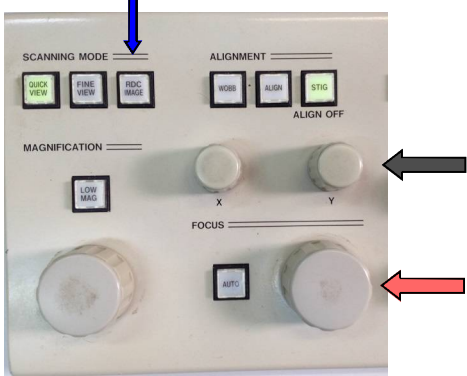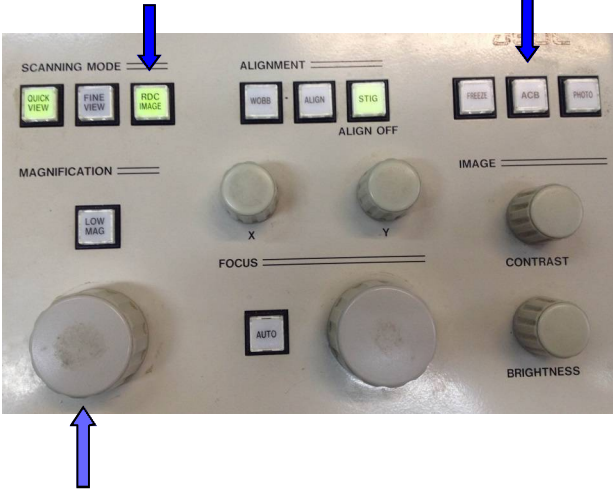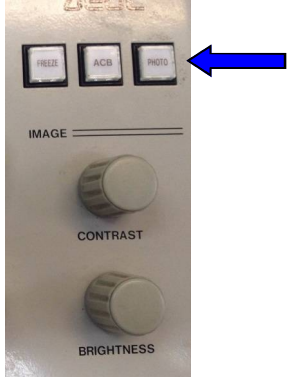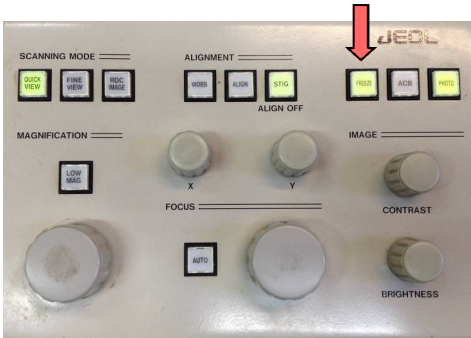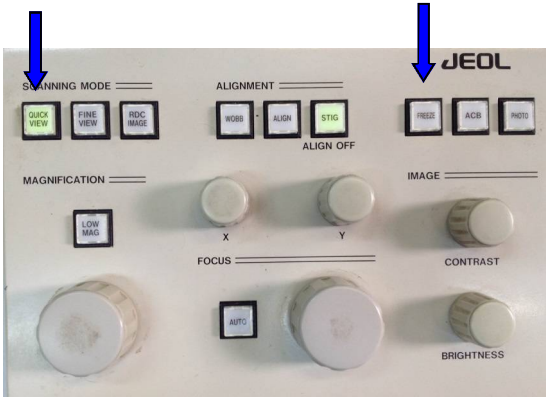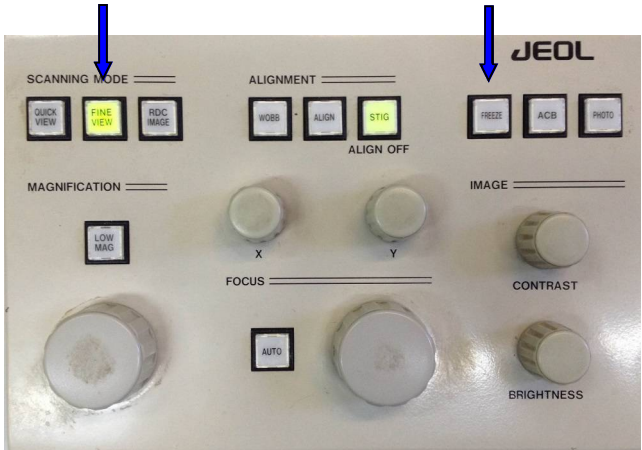|		
43.	Choose your scan mode: Press Setup Instrument Operation	
44.	Click reset then OK	
45.	You can change the number of scan or average of **Quick view** or **Fine view** if needed. Higher Scan value means a slower scan with less noise, but charging effects may become problematic.	
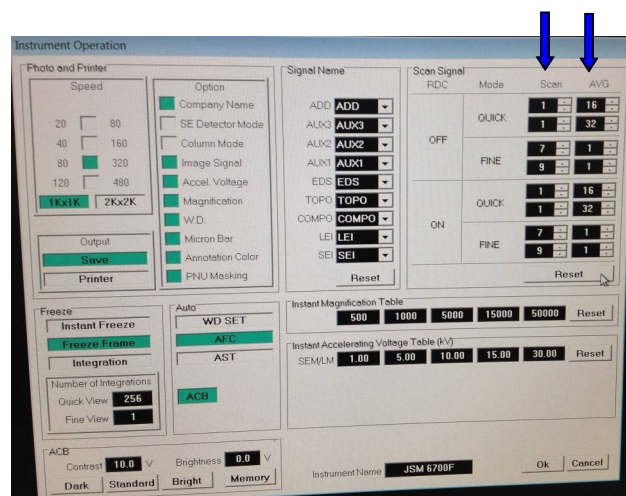
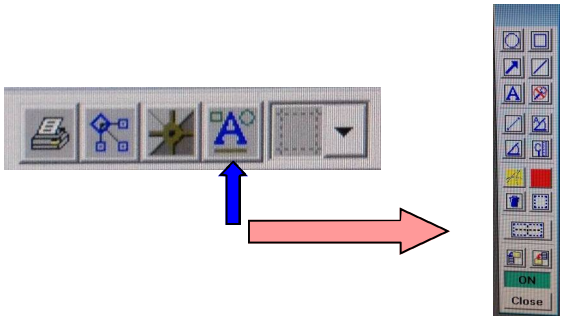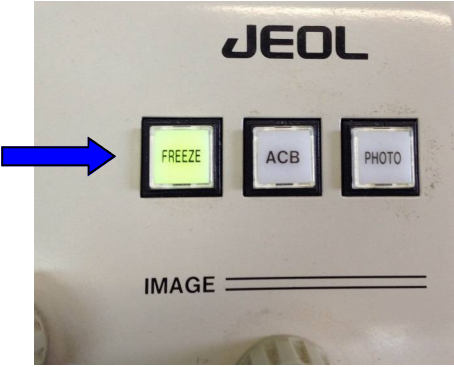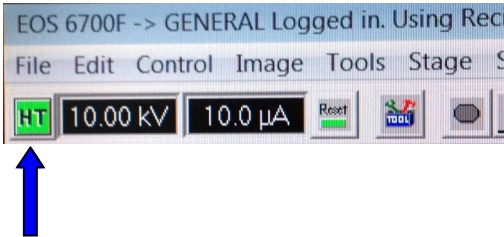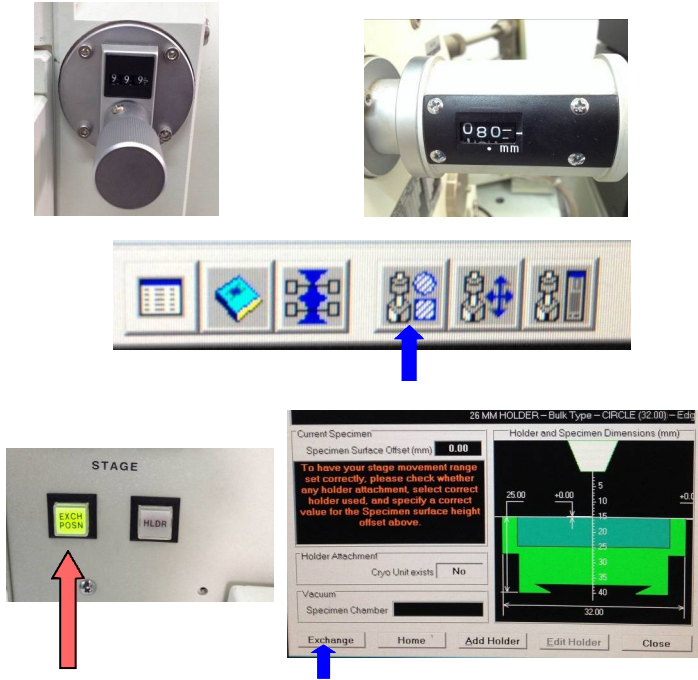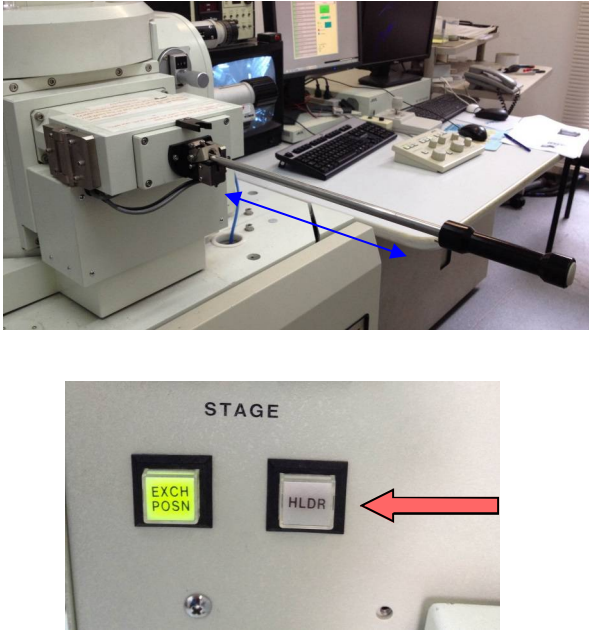|		
46.	Press RDC image and zoom to higher mag. than desired. Focus and fix Stigmation if needed.	
47.	Turn off RDC image and reduce Mag to desired level. Press ACB on the OPERATION panel.	
48.	3 options to take a picture: 1. Press PHOTO on the OPERATION panel Wait for the scan.	
49.	FREEZE button will turn ON and Frame will be frozen when it finishes.	
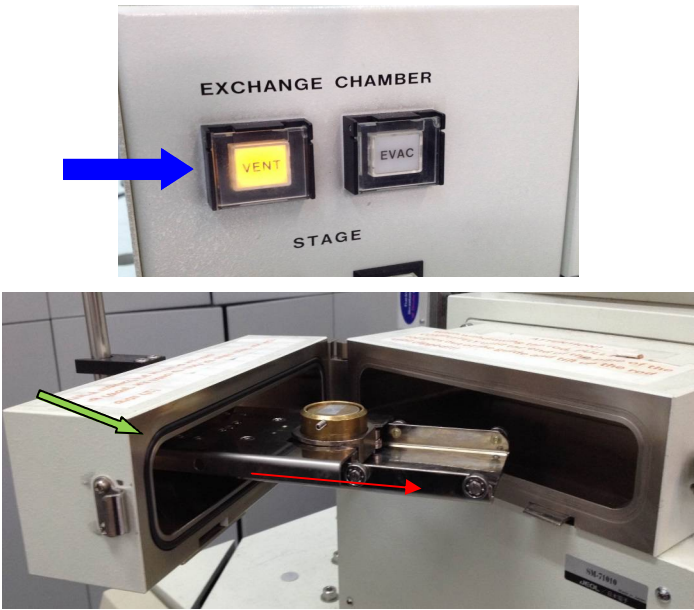
50.	**2.** For materials with charging problems: press quick view. When the image gets clearer press FREEZE. (set scan and average time if needed)	
51.	**3.** For conductive materials: press Fine view, then press FREEZE and wait for the scan (set scan and average time if needed)	
52.	For size measurements: Use the measurement tool	
53.	In order to SAVE two images (with and without a scale bar) go to File -> Image save Export. Save on: C:\Images\User Name Press Freeze button on the OPERATION panel to restore microscope imaging.	

54.	Switch off the High Tension by pressing HT.	
55.	Set stage to exchange Position according to the following order (important!): Set tilt to 999 Set height to 08.0mm In software: click Stage Specimen holder Exchange and click Exchange Check light on side of the exchange chamber: EXCH POSN—light ON	
56.	Pull specimen out by pulling rod down, fully inserting it, pulling it SLOWLY ALL THE WAY OUT, until the end of the pipe of the rod goes out of the guide and tilt up the rod until clipped Check HLDR light is off	

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Shutdown

57.	Press and hold the VENT button until it is flashing. Wait until it stops flashing. Open chamber and remove the specimen holder. Check that the O-RING is in it's place.	
58.	Close the exchange chamber and fasten the clip.	
59.	Press and hold the EVAC button until blinking.	
60.	When EVAC button stops blinking, loosen the clip on the side of the exchange chamber.	
61.	DO NOT CLOSE THE JEOL SOFTWARE! And don't forget to logout!	