•JEOL JSM 6610LV

OPERATING INSTRUCTIONS

VERSION 1.2

HOW CAN I AVOID DAMAGING THIS SEM?

1. Close the specimen chamber door slowly.

2. Measure and enter the sample height correctly.

3. When tilting, observe the tilt limits in the section Tilting.

4. Use the IR camera when changing Z distance or when tilting.

5. Make sure the stage is in the exchange position and use the exchange tool when changing samples.

**Extensive and costly damage (>$10,000) can be done to**

**the SEM if the above five items are not followed.**

6. Wear gloves when touching the stubs and samples.

7. Use the hourglass timer.

8. Never store images on the hard drive. This protects the operating system and your data.

Log On

1. Fill in the logbook.

2. Insert a flash drive into the USB port.

3. Select SEM main menu and wait for it to load.

Sample Insertion and Navigation

* *Gloves must be worn at all times when touching the stubs, samples, and sample holders. This includes sample mounting and any subsequent touching of the samples, stubs, or holders.*

1. Place the sample in one of the specimen holders (the normal options are 32, 51, and 76 mm).

**If the top of any sample is not even with the top of the holder, be sure**

**to measure the distance above the top using the millimeter ruler.**

2. Verify that the stage coordinates read: X=1.5, Y= -48.259, R=0, T=0, and Z= 80. If not, select the Stage button, then Position File, then select Sample Exchange, then the Move button.

3. Select the Vent button, select OK, thenunlatch the door immediately.

4. Wait until VENT button stops blinking, then open the door.

5. Mount the sample holder using gloves and the sample insertion device.

**6. Close the door slowly and latch the door.**

7. In the Sample height setting menu, double click the proper holder (32, 51, or 76), along with the proper insert and click the Select button

8. In the same menu, enter the Sample Offset. **The number to enter is the sum of 2 mm and the measured distance that your samples project above the top of the holder.** Then select the Close button.

9. Select the EVAC button, then select OK, then wait until the EVAC button stops blinking.

10. After the EVAC button stops blinking, set the Hourglass Timer. While waiting for the hourglass, proceed with step 11.

11. Color Camera Navigation. Select the Sample Setting button, then the Navigation button. Select Holder Size \_ Small for the 32 mm holder or \_ Big for all other holders. Then select the Capture button and wait for image acquisition.

Next select the Stage button, then the SNS Switch button, then double click on the color image to indicate where you want to go on your sample, and wait for the stage to move. This step may be repeated at any time during operation of the SEM to find a new area on your sample.

12. When the Hourglass has run out, you may proceed with Startup.

Startup

1. Select the accelerating voltage by selecting the value on the drag down menu and double clicking.

2. Activate the IR camera by selecting the Windows logo at the top left and selecting the JEOL IR Camera.

3. Next, select the Z number. This number displayed represents the top of the sample holder. The smallest Z you can enter is the sum of your Sample Offset plus 8 mm.

*For instance, assume your sample projects 5 mm above the top of the holder. Your Sample Offset is then 7 mm (5 mm + 2 mm). The closest Z is then 7 mm + 8 mm= 15 mm.*

To enter the Z number, select grab the green Z and enter the value, then select the Move button. Watch the movement on the IR camera.

Select the Stop button if a collision appears to be

about to happen.

Small movements of the Z may also be done selecting the Stage button and using the Δ and ∇ Z arrows; left mouse button is slow, right mouse button is fast.

4. Select the HT button. It will change from OFF to ON. Wait a few seconds for the filament to saturate and align automatically.

5. Select the Spot Size. A good number for routine imaging is 30. If magnifications above 20,000X are needed, select a spot size as small as 10.

6. Select the ACB (automatic contrast and brightness button) at the top.

Routine Operation

1. Focus by one of three methods:

(1). Use the Focus knob. There is a Coarse/Fine button.

(2). Use the AF (AutoFocus) button.

(3). Use the Focus button and drag the mouse.

*The WD displayed on the image indicates where the objective lens is currently focused*

2. Change Contrast and Brightness by one of three methods:

(1). Use the Contrast and Brightness knobs.

(2). Use the ACB (Auto Contrast and Brighness) button.

(3). Use the Contrast and Brightness buttons and drag the mouse.

3. Sample movements X and Y can be done by one of seven different methods:

(1). Use the Joystick. The range is limited.

(2). Dragging the image with the mouse.

(3). Double clicking to where you want to go on the image.

(4). Using the Stage Button then the SNS Switch and double clicking on the color image.

(5). Using the arrows at the top, bottom, left, and right of the screen.

(6). Grabbing the green X and Y, entering the stage coordinates, then selecting Move.

(7). Select the Stage button, then use the X and Y arrows; left mouse button is slow, right mouse button is fast.

4. Scan Speed. Select the Scan Speed by selecting one of the four Scan buttons.

Photos

**Never save images on the hard drive or to the desktop; always save them to Drive E:\**

1. To select the pixel format and photo time, go to Setup, then select the options to the right of Photo.

(1) If you want a 2560 x 1920 pixel format, select this and one of the three time selections (40, 80, or 160 seconds).

(2) If you want of 5120 x 3840 pixel format, select this and one of the two time selections (80 or 160 seconds).

2. To Auto Save do the following:

(1). Select the box 🞏 to Auto Save

(2). In Directory, enter E:\.

(3). Enter a file name.

(4). Provide a starting file number. It will start saving at this number and keep numbering the images automatically as collected.

(5). In Format, make sure .tif is selected.

(6). Select 🞏 Paste Text if you want the image information as part of your image.

(7). Select the Photo button at the top of the screen and wait. It will take a photo and auto save it.

(8). When finished, select the Freeze button to take it off Freeze.

4. To manually collect and save a photo, do not select the 🞏 Auto Save box in step 3.

(1). Select the Photo button and wait.

(2). Next to the blue text Freeze, select 🞏 Text paste if you want the information as part of your image.

(3). Select the Save button, then specify Removable Disk E:\, enter a File Name, **save as type Tiff**, then select the Save button.

(4). When finished, select the Freeze button to take it off Freeze.

Rotation

1. Rotation can be done by grabbing the green R and entering a value, then selecting Move.

2. Rotation can also be done by selecting the Stage button, then selecting the R arrows at the top left and right; left mouse button is slow, right mouse button is fast.

Tilting

1. Activate the IR camera by selecting the Windows logo at the top left and selecting the JEOL IR Camera.

2. Note the maximum tilt range from the following table.

|  |  |
| --- | --- |
| Z working distance, mm | MaximumTilt |
| 10 | -10 to +35° |
| 15 | -10 to +50° |
| 20 | -10 to +55° |
| 25 | -10 to +59° |
| 30 | -10 to +60°\* |
| 40 | -10 to +60°\* |
| 48 | -10 to +60°\* |

\*Tilts from -10 to 90° are possible at the center of the sample holder only, with limited X and Y movement. **Consult with CAM staff before attempting tilts outside the range of the table.**

3. While watching the IR camera, grab the green T and enter the tilt value and selecting Move, or select the Stage Button and use the right tilt arrow to do negative tilts to -10° or the left tilt arrow to do positive tilts to the limit on the above table; left mouse button is slow, right mouse button is fast.

Select the Stop button if a collision appears to be

about to happen.

Sample Removal

1. Select the HT button. It should change from ON to OFF.

2. Set the Hourglass Timer.

3. Select the Stage Button, then Position File, then select Sample Exchange, then the Move button. Wait until the Moving Stage note goes away.

4. Close the IR camera.

5. When the Hourglass Timer has run out, select the VENT button, then select OK then **unlatch the door immediately.**

6. Wait until VENT button stops blinking, then open the door.

7. Remove the sample holder using gloves and the sample insertion device.

8. Close and latch the door, select the Close button in Sample Height Setting, select the EVAC button, then select OK, then wait until the EVAC button stops blinking.

Shutdown after Sample Removal

1. Select File then select Exit JEOL Scanning Electron Microscope, then select OK and wait until the program stops.

3. Select Windows, then Computer, right click Removable Disk E:\, then select Eject, then remove your flash drive.

4. Select Start, then select Log Off.

4. Fill in the logbook.

Low Vacuum Mode

**Important: You must consult with Center for Advanced Microscopy personnel before operating the 6610LV in the low vacuum mode. First, it is necessary to determine if your sample is compatible with the low vacuum mode. Second, the differential aperture is essential for low vacuum operation. CAM personnel must insert this aperture before low vacuum operation can be done.**

**All samples containing volatile materials should be examined in the low vacuum mode only. Start in the Low Vacuum Mode and do not switch to the High Vacuum Mode.**

1. Go through the normal Log On section.

2. Select the Low Vacuum button, then select OK.

3. Note the vacuum reading on the display.

4. Adjust the vacuum to the desired value. 50 Pa is a good starting point. Then select the Start button. The range is 10 to 270 Pa.

5. Wait for the vacuum to reach the selected value.

6. Follow the instructions in the section Sample Insertion and Navigation.

7. After the Hourglass has run out, wait for the vacuum to reach 50 Pa, then go to the section Startup. Do not activate the IR camera.

8. In the Low Vacuum mode, the BEIC detector will be selected and the scan speeds will be different.

9. Experiment with the BEIC detector and the LVSI detector to determine which provides the best image on your sample.

10. If sample charging is a problem, try increasing the vacuum from 50 Pa to 80 Pa.

Printing

Method 1 - Printing in JEOL SEM main menu. The sample name and other information will be printed on the image even if you did not select 🞏 Paste Text when you saved the image.

1. Select File>Report

2. For a 1 image report, select:



Then select:



 Then go to drive E:, In Files of Type: change to Tiff files> select your file> Open. You can enter a title on the image if needed.

3. For a 2 image report, select:



 Then select:



 Then go to drive E:\., In Files of Type: change to Tiff files> select your first file> Open. You can enter a title on the image if needed.

Then select:



Then go to drive E:\., In Files of Type: change to Tiff files> select your second file> Open. You can enter a title on the image if needed.

4. When finished with either step 2 or 3, select File> Print.

Method 2 - Printing in Windows. The sample name will not be printed on the image. Other information will be printed on the printed image if you selected 🞏 Paste Text when you saved the image.

1. Select the Windows logo, then go to Computer, then to Drive E:\.

2. Select the file you wish to print. Windows Photo Viewer will open it.

3. Then select Print. You will obtain a high quality full page laser jet print.

4. To printing two images on a page, first select two images using the Ctrl key, then select Print.

5. Then select the two 5 x 7 print option on the right side and deselect 🞏 Fit picture to frame.