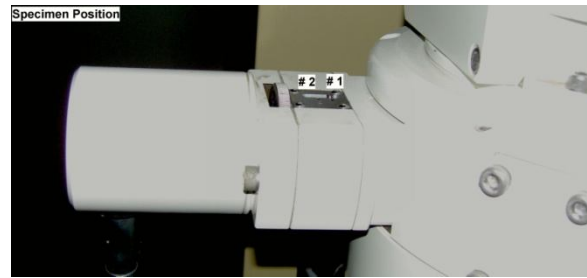


TEM: JEOL 100CX-II: Operation Instructions: For Imaging:

Abbreviation: RHTP: Right Hand Top Panel RHBP: Right Hand Bottom Panel....

Initial Diagnostics:

1. **DP (Diffusion Pump)** light is green, **HIGH VACUUM** light is green.(LHTP)
2. **Ready** indicator light is green. (LHTP)
3. **HT button** is off. **Filament Emission knob** is off.(LHTP)
4. **Imaging Mode:** Should be on **Mag.** (RHTP)
5. **Specimen:** Should be at #1 (Top Left Side of the column)
6. **Objective Aperture:** Out (Lower Right Side of the column)
7. **Condenser Aperture:** #2 (Upper Right Side of the column)
8. **Spot Size:** # 2 (LHTP)



Acceleration Voltage: Press **HT** (LHTP), and then sequentially increase the accelerating voltage. Make sure the **dark current** (LHTP) stabilizes at each accelerating voltage before you increase the accelerating voltage, i.e. press 20kV button, wait for the dark current to stabilize, then press 40kV, wait for the dark current to stabilize. Move periodically till the desired accelerating voltage.

Loading Sample:

1. TEM holder will be in the black case.
2. Load your 3mm TEM grids. The sample closest to the end of the sample holder is #1. After loading the sample, tap the holder gently to make sure the sample is secure in its position.
3. Since in the initial diagnostics (# 9, above) the Specimen is at # 1, the sample under the beam will be Sample # 1.

- Insert sample holder in the Goniometer with the pin of the holder at 9 o'clock position. The pin exactly fits in its notch on the Goniometer; apply slight pressure which initiates the vacuum process indicated by the red light (Right Side of the Goniometer). Wait till the red light turns off and you hear two valves close. With a firm grasp, turn the holder clockwise and guide it as the vacuum pulls the sample holder in, slightly to the left and into position.



Caution: There is no need of applying any pressure while loading the sample holder. Hold the sample holder while inserting it, since the vacuum pulls the sample holder.

Filament Emission: At this stage, the accelerating voltage is on and should be stable. Turn the filament emission knob gently with constant speed till it reaches saturation (metal stop). You should see the beam on the florescent screen. If not, you are on the metallic part of the grid or on different specimen. Move to Low Mag mode (Right Side Panel) to find the electron beam.

Routine Alignment (only in Mag mode):

Gun Alignment: Magnification ~10 kX, Spot Size #1, bring **Condenser (LHTP)** to crossover (smallest illumination spot). Undersaturate the Filament (LHTP), focus the filament image with the **Condenser** and center the filament image (dark halo) with the Gun Align Tilt knobs (RHLP). Saturate Filament till the metal stop (LHTP).



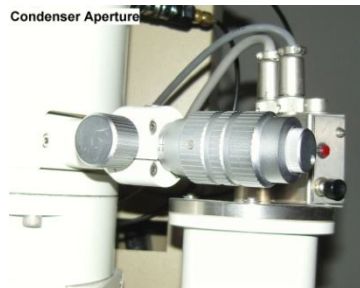
Condenser Alignment: Magnification ~10 kX, Spot Size at 3, bring Condenser to cross-over. Center beam with Alignment Trans knobs (left and right TP). Switch Spot Size to 1, bring Condenser to cross-over, center beam with Gun Align Trans knobs (RHBP). Repeat until spots 1 and 3 coincide.



Condenser Aperture Stigmatism: Magnification ~ 10 kX, with **Condenser Aperture at #2**. Bring Condenser to cross-over and center beam with Alignment Trans knobs. With Condenser, spread beam clockwise and center beam with **Condenser Stigmator x and y controls** (RHLP). Repeat until beam spreads out and converges in a circular form (Right Image Below).



Condenser Alignment: Using the condenser knobs spread and converge the beam through crossover several time, the beam should move in and out and not in any direction. If it does move in any other direction, adjust the condenser lens, so that the beam moves in and out as you go through crossover.



Z Axis (height) Correction: Magnification ~ 10 kX, focus a recognizable specimen object. Unlock the **Goniometer** and tilt it 20° towards you. The object should remain in its position, if not, bring it back to its position using the **z-adjust knob on the bottom of the Goniometer**. Refocus and bring it back to 0° and refocus. Repeat till the object remains in its position.

Current Center Alignment: Magnification ~ 20 kX, focus an object at the center of the screen, turn medium focus knob 4 clicks to the left, if the object has moved, bring it back to its position using **Alignment: Tilts knobs (RHLP)**. Focus and re-center using the stage drives. Repeat the procedure till the object remains in the center during medium focusing.



Deflector Compensation Alignment: Magnification ~ 10 kX, bring Condenser to cross-over. Switch **Wobbler up to X** (LHBP), converge the 2 spots with **X Compensator and X Corrector knobs**. Repeat procedure for Y, using the Y Compensator and Y Corrector knobs. Bring the Wobbler position back to the center. (**Caution: Y Corrector Knob is very sensitive**)



Image Wobbler Alignment: Focus Image, bring **Condenser** to cross-over. Turn the **Image Wobbler** (LHTP) on, converge the 2 spots with the **Image Wobbler A and B knobs** (RHLP).

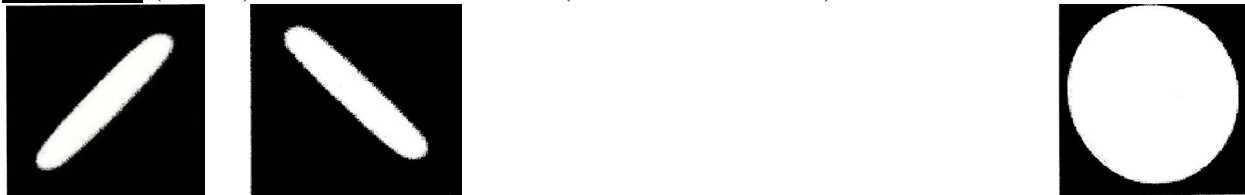


Objective Lens Alignment (Voltage Centering): Magnification ~ 50 kX, center an object. Turn **HV Wobbler on** (LHTP). Minimize image movement with the **Align Tilt knobs** (left and right TP). Center beam with Alignment Trans knobs (left and right top panel).

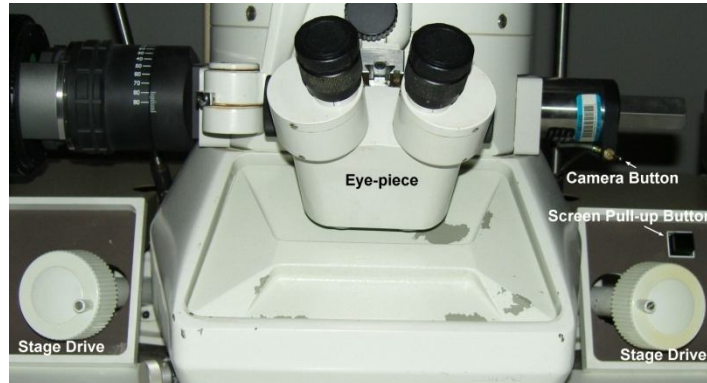


Obtain Images Using Gatan DigitalMicrograph: Focus on the grid (away from sample). Spread the beam uniformly on the florescent screen. **Insert the Camera.** Open the **Gatan DigitalMicrograph Software.** Select **Get Diffraction** under the Video menu in the toolbar. The image will be displayed on the TV monitor. Adjust the brightness-contrast of the image and focus the image using the fine and ultra-fine focus knobs (RHTP). **Start View** of the DigitalMicrograph Software. Adjust brightness-contrast.

Objective Lens Stigmation: Select the **dotted RectangleROI from the toolbar.** Press **ALT and click and drag to form a square on the image.** Open **Process-Live FFT (Fourier Transfer) from the toolbar.** Another display window opens up, converting the image into a digital signal. On a amorphous substrate i.e. the grid, a polymer layer, the FFT should be a nice circle (image to the right). If the FFT looks oblique (images below) use the **objective Stigmation fine knobs** (LHBP). Use one axis at a time (either X or Y knobs).



Alignment should be completed at this stage. Proceed with imaging your sample. Retract camera to view the sample on the fluorescent screen. Make use of the **eye-piece and the pull up screen** (RHTP) to locate and focus your sample. Always recenter beam with align: trans knobs after any magnification change. **Adjust brightness contrast of the field of view on the TV monitor before viewing on DigitalMicrograph**. To capture images, click acquire image, the software prompts you to **enter the magnification** which can be read from the RHTP. Use File: **Save Display As** to save images to your designated folder or on your flash drive. Please do not store images on the hard drive



Changing Specimens: To change from grid #1 to grid #2, lower the magnification and turn the thumbwheel on the column from 1 to 2. The new grid should be visible on the view screen.

Unloading Sample: Bring specimen position to #1. Slowly turn the Filament Current knob down but do not turn off the HV. Remove the specimen holder by gently pulling the rod out to a stop (about 3 inches), then rotating the rod counter clockwise to a stop. Pull the holder completely out of the column. Remove your grids and put the sample holder back in its case.

Shut Down Procedure:

1. Slowly turn the filament emission back to zero.
2. Press any kV button half way till you see that no light is lit on the kV.
3. Press HT button to turn the kV off.
4. Make sure the camera is retracted.
5. Turn off the TV monitor and Computer monitor.
6. Login and log time usage.