

JEM 2100F TEM Daily Operation Guide

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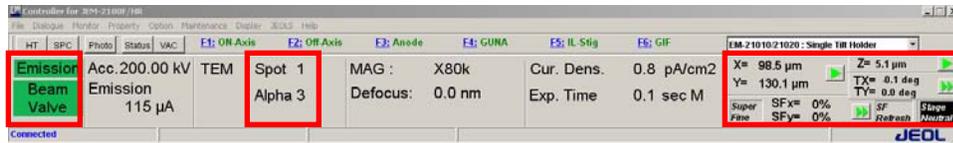
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In emergency, close gun valve by pressing the "Beam" button at the upper-left corner of left control panel.

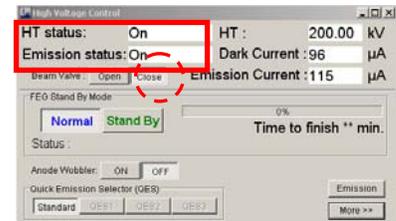
I. Preparation

Before you start

- Check conditions of JEM-2100F.
 - ION PUMP: Vacuum meter $<2.5 \times 10^{-5}$ Pa with blue scale
 - JEOL PC: Vacuum System:
 - PIG1, PIG3, PIG5, and PIG6 read **Evac Ready**
 - PIG4 reads **Evac Ready** if the plug holder is in. (may be over 200 if plug holder is not in.)
 - JEOL PC:



- HT Status: ON, Emission Status: ON
- TEM Spot=1, Alpha=3
- X=Y=Z=0, TX=0, TY=0 (double click **Stage Neutral** to return all coordinates to 0)
- BEAM VALVE: **closed**



Start-up

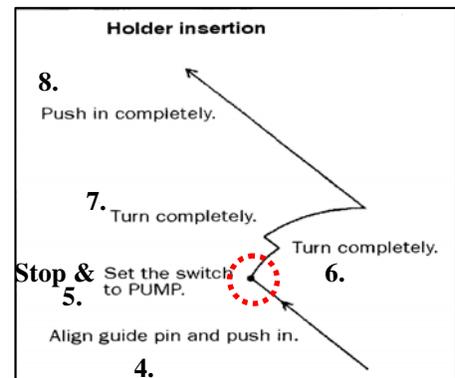
1. If you are the first user of the day, take out ACD heater, fill the Anticontamination device (ACD) with LN₂, and wait for 20 min. and then top off LN₂ again.
2. If you are not the first user of the day, top off the ACD again with LN₂.

Remove the plug holder from goniometer if it is inserted.

1. Pull the lock pin back to unlock the plug holder.
2. Pull the plug holder until it stops (~3mm).
3. Turn **15° counterclockwise** and then **STOP**.
4. Wait until V21 turns green, and amber LED light stops blinking.
5. Pull the **PUMP/AIR** switch on the goniometer and turn it down to **AIR**.
6. Wait until the PIG4 reads 245μA.
7. Remove the plug holder from the Goniometer.

Load specimen

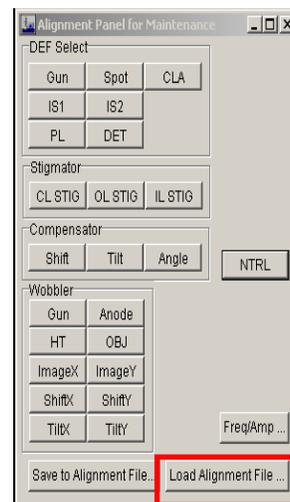
1. Put holder on sample loading station, with appropriate holder support lying underneath the hold tip.
2. For single tilt holder, loosen two screws TWO turns, rotate the cover plate away and mount specimen with film side UP.
 - ** For double tilt holder, loosen the screw TWO turns, rotate the plate-clamping finger and mount sample facing DOWN.
3. Check O-ring and clean with duster if necessary.
4. Align holder guide pin with the guide groove on the goniometer, push till it stops.
5. Keep pushing the holder in position, wait for the specimen chamber LED V21 and then V34 turn green
6. Pull **PUMP/AIR** switch on goniometer and turn it up to **PUMP**. Do not release your hand until the blinking yellow LED light on the goniometer stays steady/PIG4 goes below 200.
7. Wait till PIG4 reads **EVAC Ready** /green LED light on the goniometer should be on.
8. Turn holder clockwise and **SLOWLY** insert specimen holder into the goniometer. Try to insert smoothly and



- gently. *Never use force side ways!*
- Wait till column pressure is below 1.5×10^{-5} Pa and PIG4 reads *EVAC Ready*.
 - JEOL PC: TEMCON – upper right corner – select “EM-21010/21020” for *single tilt holder* or **31630** for *double tilt holder*.

II. TEM Alignment

- Press **Beam** button (left panel) to open the gun valve.
- Load alignment file (JEOL PC: *Maintenance* menu – *Alignment Panel for Maintenance*– load alignment file: *C:\Daily_Operation\Daily_operation.jal*)
- Press **STD focus** (right panel).
- Insert and center condenser aperture
 - MAG 1 = 40,000x – 100,00x
 - Spot size = 1, alpha = 3
 - Adjust **BRIGHTNESS** knob to crossover and center with **Shift X** and **Y** knobs
 - Insert the largest aperture by pressing **CL** control and **1** (top on left panel)
 - Turn **BRIGHTNESS** knob *clockwise* to spread beam to periphery of screen and center with aperture X, Y controls
- Condenser lens stigmatism correction
 - Mag. >100,000x
 - Spot size = 1, alpha = 3
 - Press **COND STIG**
 - Turn **BRIGHTNESS** knob back and forth through the focus position and check the shape of the electron beam
 - Adjust **DEF/STIG** knobs to make the spot round immediately before and after focusing
- Find sample.
 - Note: Move sample **SLOWLY** when trying to find sample in low-mag mode! You may turn on **PIEZO** when you want to move sample under very high magnification. Remember to turn it off after use!
- Z axis correction - Align sample eucentric height using Z up/down buttons (right panel).
 - mag. = 40,000x - 100,000x
 - Push **WOBLER X** or **Y** button
 - Push **Z** up or down buttons until image becomes stationary
 - Switch **WOBLER X** or **Y** off



III. Specimen searching, focusing, and taking digital images

1 GIF system alignment and digital TEM image recording

- Check GIF hardware (*optional, it is normally on*):
 - Gatan Power Supply (**ON**).
 - Gatan Instrument Bin (GIB) (**ON**).
 - DigiScan II (**ON**).
 - Digital Camera Controller (**ON**)
 - Shutter Control (**Auto**)
 - Temperature Control (**COOL, < -25°C**)
- GIF software preparation (*optional, it is normally on*):
 - Start **FilterControl** software from the Gatan computer.
 - Start **DigitalMicrograph** software after **FilterControl**.
 - Select **Layouts: LL TEM** from the dropdown menu of DM.
 - On **AutoFilter** window of DM, click **TEM** button  - **Search** .
- TEM preparation:
 - Change TEM MAG to **40,000x**, find a hole of a sample and move it to the center of the screen.
 - Focus the electron beam to about **2 cm** in diameter, and center it on the screen using **SHIFT X** and/or **Y**.
- GIF tuning
 - On the right control panel of the JEM 2100F, press **F6** button to raise the screen and switch to GIF mode.
 - Set the **GIF Image MAG** to **40,000x** that matches the **TEM MAG**.
 - Click **Tune GIF** . This procedure takes about 5 minutes. Monitor the progress and the results window. Adjust the beam intensity using the **BRIGHTNESS** knob if necessary.
- Objective lens astigmatism correction and Digital TEM imaging
 - Find an amorphous area or contamination edge and center it on the screen.

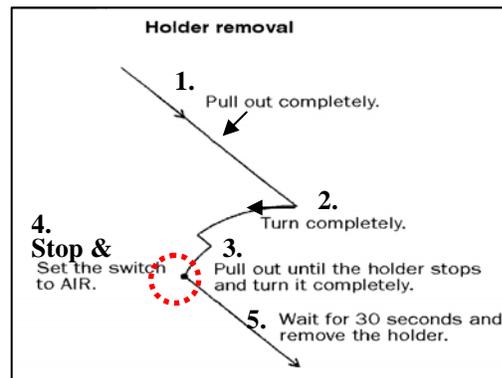
- ii) Click **Search** or **Preview**  **Idle**  to view live CCD camera image on PC screen.
- iii) From DM menu, select **Process->Live-> reduced FFT** to help correct objective lens stigmatism.
Note: CCD camera image is about 15 times larger than that seen on viewing screen. Using 40,000x TEM Mag, you may readily see lattice images.
- iv) Press **OBJ STIG** button and then turn **DEF/STIG X** and/or **Y** knobs to correct objective lens stigmatism.
- v) Click **Acquire**  to record the image.
- vi) Save the image into your own folder in the external hard disk (**Iomega HDD**)
 Note: 1). Choose right file format to save your images. The file format DM3 will keep notations and magnification information, others may not.
2). Do NOT save your images in any directories of the internal hard disk. Data in Drive C will be deleted without any notice.

IV. After imaging

1. **Idle** or **stop** live view.
2. Push **F6** to lower the phosphorous screen.

Change specimen

- 1) Remove any aperture that was used during your session except the CL aperture.
- 2) Turn off **Beam Valve**.
- 3) JEOL PC: TEMCON – **Double click** black **StageNeutral** button to neutralize sample position.
- 4) Make sure sample shifts and tilts are zero.
- 5) If you used double tilt holder, switch to holder selection option from *double tilt holder* “EM-21010/21020” to *single tilt holder*.
- 6) Remove specimen holder from the microscope following the steps below:
 - Pull the holder until it stops
 - Turn it fully counterclockwise
 - Pull it a bit until it stops
 - Turn it fully counterclockwise
 - Wait until V21 turns green, and yellow LED light stops blinking.
 - Set the **PUMP/AIR** switch to **AIR** and wait until the PIG4 reads 245uA
 - Remove the holder from the Goniometer
- 7) Take specimen out of holder and load new specimen if you want.



Complete job and leave room

- 1) If you are not the last user of the day, follow this procedure:
 - Refill LN₂
 - Insert dummy sample holder. Align holder guide pin with the guide groove on the goniometer, push till it stops.
 - Keep pushing it for about one minute. Observe on Vacuum diagram V21 and V34 open and then close.
 - Now pull PUMP/AIR switch on goniometer and turn it up to PUMP.
 - Wait till PIG4 shows **Vacuum Ready**. Then turn the dummy holder 15 degrees clockwise till it stops.
 - Make sure that V8, V26 and V21 are lit before you leave.
- 2) If you are the last user of the day, follow this procedure:
 - i. Insert dummy sample holder. Align holder guide pin with the guide groove on the goniometer, push till it stops.
 - ii. Keep pushing it for about one minute. Observe on Vacuum diagram **V21** and **V34** open and then close.
 - iii. Now pull **PUMP/AIR** switch on goniometer and turn it up to **PUMP**.
 - iv. Wait till **PIG4** shows **Vacuum Ready**. Then turn the dummy holder 15 degrees clockwise till it stops.
 - v. Insert the Heater into the ACD and plug it in the power supply
 - vi. Go to **MAINTENANCE>ACD/BAKE**
 - vii. Turn **ACD HEAT ON**
- 3) **Log off of your instrument time online!**