

# OPERATION OF JEOL JSM-840A

(September 2005 - Version 2.0)

## STARTUP

1. Cooling water on
2. POWER switch on
3. CURRENT meter illuminated

## 👉 SIGN IN TO LOG BOOK 👈

## SPECIMEN EXCHANGE VIA AIR LOCK

1. **FILAMENT** control fully CCW
2. **ACCELERATING VOLTAGE OFF** (Button **OUT** and dark)
3. WD set to 39mm, X to 25.0mm, Y to 35.0mm and Z adjust to mark. Tilt, and rotation 0.0
4. Load sample in stage, and adjust z-height (Sample rod in Hole **B** for large stage)
5. Pull sample insertion rod all the way back until it clicks.
6. Place insertion rod in airlock, trigger vacuum control switch. Hold sample rod in place until vacuum starts.
7. When light goes out. Turn airlock handle CCW until stop, pull open airlock door, turn handle CW 90° ( pin pointing up)
8. Push sample rod into column. Align and push sample holder on to stage dovetail. Unscrew sample rod CCW, and pull rod back until it clicks.
9. Set **WD** to desired setting (i.e. 15 or 39mm)
10. Turn airlock handle 90° CCW until stop, push airlock door closed, turn air lock handle 90° CW until stop.
11. **HOLD** sample rod, trigger airlock vacuum control switch to vent, return rod to holder.

## IMAGE OBSERVATION

1. Initial settings:
  - a) **DISPLAY MODE**
    - **CHARACTER** switches set to **MAG & WHITE**
    - **CONT** to ~12:00 and **BRIGHT** fully CW
    - **NORM & D-MAG** buttons pressed and lit others off.
  - b) **AFD** switch to **OFF**
  - c) **IMAGE SELECTOR**
    - **POLARITY -INV** button Off
    - Both **L** and **R SEI** buttons depressed
  - d) **SCAN MODE** to **LSP** and **SCAN SPEED** to **TV**
  - e) **IMAGE SHIFT** knobs to 12:00
  - f) **MAGNIFICATION** to 100x
  - g) **VIDEO CONTROL GAMMA** adjust to **OFF**
  - h) **SE IMAGE CONT** to ~600 Set **BRIGHT** so line is ~1/3 from CRT bottom
  - i) **EOS MODE** only **SEM** button depressed and lit
  - j) **DFC** and **WOBB** out and unlit
  - k) **COURSE FOCUS** set to match WD position
  - l) **PROBE CURRENT** to  $1 \times 10^{-10}$  amp
  - m) **GUN BIAS** switch set to **AUTO**
  - n) **SEI DETECTOR:**
    - REF/SEI** switch/to **SEI**

**PMT LINK** switch to **OFF**

**COLLECTOR** to ON

o) Set panel and room lights as desired

2. **FILAMENT** control fully CCW
3. **ACCELERATING VOLTAGE** to desired kV (5 - 40 by 1 kV steps & 0.2 - 4.9 by 0.1 kV steps)
4. **ACCELERATING VOLTAGE** on
5. **CURRENT** switch to **EMISSION**. While watching **CURRENT** meter, increase **FILAMENT** control until initial rise on meter.
6. Continue increasing **FILAMENT** control until waveform plateaus.
7. Adjust Gun Alignment Tilt X & Y to maximize waveform height.
8. Depress **PIC** to view an image on the monitor
9. Release **D-MAG** for full screen view

## PHOTOGRAPHY

1. Set **DISPLAY CONT & BRIGHT** to 12:00.
2. Focus and correct astigmatism at a magnification at least 2 to 4 times the magnification you want (Depress and release the **CLEAR OL & CL** switches before final focus)
3. Decrease magnification to the magnification you want

## FILM

4. **DISPLAY MODE WFM** depressed (increase **DISPLAY BRIGHT** fully CW)
5. Adjust **CONTRAST** and **BRIGHTNESS** controls
6. Insert film. Set **FILM COUNTER**.
7. Depress **PHOT** button
8. When exposure finished, remove film, and process

## Digital Imaging Instructions for the Orion Imaging System

1. **DISPLAY MODE:**
  - Ensure **CHARACTER** switches set to **Mag & White**
  - Blue **WFM** pressed and lit
  - **BRIGHT** fully CW
2. Adjust wave form using the **SE IMAGE Cont** and **Bright** knobs until wave form falls between the top and bottom lines on the imaging monitor
3. Press **D-MAG** and **NORM** buttons - in and lit
4. Set **Photo** Control to 22
5. Open Orion software from the desktop



Orion32.Ink

a) from Menu bar

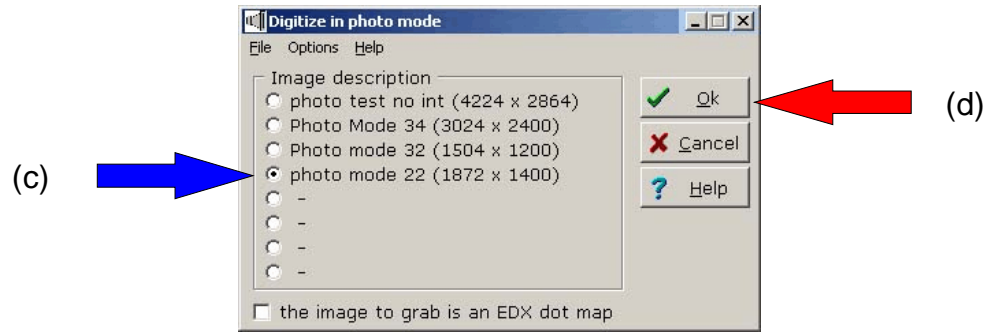


b) click **SEM > Digitize in Photo Mode**

**OR** click the Photo Mode Icon



- c) In the **Digitize in Photo Mode** Window  
 - IMAGE DESCRIPTION  
 select **photo mode 22 (1872x1400)** - **blue arrow**



- d) Press the Photo button on the scope and **immediately** (you have about 3 seconds) press **OK** in the software - **red arrow**
- After the image has finished scanning click File > Save in the menu bar, navigate to your folder and save your image. If you click the “Save when finished” box in Photo Assistant, the save file dialog box will open automatically.
  - When you are done grabbing images close the software and click “yes” in the confirmation box.

## BACKSCATTERED IMAGING

→ Due to decreased S/N ratio of BEI signal you may need to:

- increase **ACCELERATING VOLTAGE**
- Increase **PROBE CURRENT**

☞ Switch SEI Collector to Off or Suppress if Probe Current is over  $1 \times 10^{-8}$

Decrease **WD**

Use **Orion software capture** window for better viewing

- Locate area of interest in **SEI** mode, focus and stigmat
  - BE IMAGE CONTROL**
    - **SUPPRESS** fully CCW then turn CW 1 full turn to arrow
    - **GAIN COARSE** fully CW to 4
    - **GAIN FINE** fully CW
  - SCAN SPEED** to **SLOW 1**
  - IMAGE SELECTOR**
    - **INV** button pressed and lit
    - **Left TOPO** button pressed and lit
  - DISPLAY MODE:**
    - Blue **WFM** pressed and lit
    - **BRIGHT** fully CW
  - Adjust wave form using the **BE IMAGE Gain** and **Bright** knobs until wave form falls between the top and bottom lines on the imaging monitor
- ☞ Note: On this scope the **BE IMAGE** controls are reversed. IE. Rotating the **Bright** knob CW increases the **black level** not the brightness. If the desired brightness cannot be achieved adjust the **Suppress** knob slightly
- Press the **Norm** button

# CAPTURING BACKSCATTER IMAGES

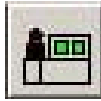
1. Open Orion software from the desktop

- from Menu bar



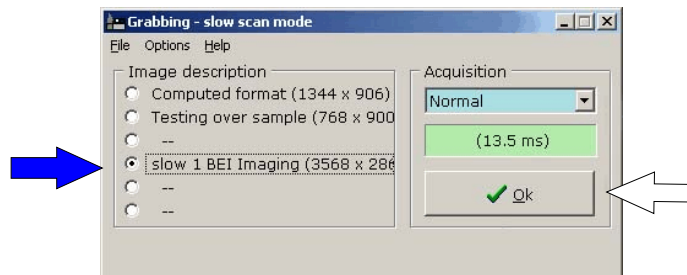
b) click **SEM > Grabbing - Slow Scan Mode**

OR click the Slow scan mode Icon



c) In the **Grabbing - Slow Scan Mode** Window

-IMAGE DESCRIPTION select **Slow 1 BEI Imaging** - blue arrow



d) Press the OK button in the Grabbing - Slow Scan Mode window -red arrow

6. You can adjust image brightness and contrast in this mode. Image will continue to scan until you tell it to stop. After the image has scanned several cycles and you are satisfied with the brightness and contrast click **Stop at EOS** (end of scan) in Visual Modes Window

7. Click File > Save in the menu bar, navigate to your folder and save your image.

8. When finished capturing BEI Images return scope to SEI mode

- **IMAGE SELECTOR**

- **INV** button out and dark
- **Left and Right SEI** buttons pressed and lit

## **NORMAL SHUT DOWN**

1. **FILAMENT** fully CCW
2. **ACCELERATING VOLTAGE OFF** (Button **OUT** and dark)
3. Specimen out. Sample rod and sample stage on holder.
4. Exit **Orion** capture program. Turn Off Monitor
5. Normal operating settings are returned to.
6. **DISPLAY MODE:**
  - CHARACTER MAG & WHITE/MASK** to **OFF**
  - CONT** and **BRIGHT** fully CCW
  - NORM** button pressed and lit others off.
7. **MAGNIFICATION** to **300,000X**
8. **SEI DETECTOR** to **OFF** and **COLLECTOR** to **OFF**
9. **CURRENT** meter display (middle-right control panel) will be illuminated
- 10 **SIGN OUT OF LOG BOOK**
11. Lights off

## **FULL SHUT DOWN**

- ☞ Full shut down is to be done **ONLY** in case of:
  - a. Interruption of building utility services (Electrical or Water)
  - b. Vacuum system failure
  - c. Instruction of EMF Staff

1. Complete **NORMAL SHUT DOWN**.
2. Turn **POWER** key (bottom right corner of control panel) CW to **OFF** - Lights on right panel will go out and scope will go quiet
2. Switch breaker box to **OFF**
3. Wait 20mins for pumps to cool.
4. After 20mins turn cooling water recirculator manual switch to **OFF**

## **TURNING SCOPE ON AFTER FULL SHUT DOWN**

- ☞ To be done ONLY after correction of the reason for the full shut down

1. Breaker box to **ON**
2. Cooling water recirculator manual switch to **ON**
3. Turn **POWER** key (bottom right corner of control panel) CW to **START** hold until rotary pump starts, and release, some lights will come on, wait until high vacuum is established.

- ☞ After 30-45 mins, the **CURRENT** meter display (middle-right control panel) will be illuminated indicating the scope is functioning.