Olympus DSX2000 Training SOP

Standard Operating Procedure

> **We welcome your feedback.** This SOP is a living document. If you find a mistake, an inconsistency, a step that is unclear, or anything that was hard to follow, please leave a comment directly on this file in Google Drive. All suggestions are welcome and will help us make this document more useful for everyone.

Prepared for instrument training and routine lab use.

Table of Contents

1 Critical Rules

Read before your first session. These protect the instrument and your samples.

> **Wait for the automatic startup move to finish before loading a sample.** When the microscope and PRECiV DSX start, the stage and zoom head move to their default positions automatically. Keep the stage area clear until all motion stops.
>
> **Do not attempts to use the XY stage knobs manually.** Move the sample with the joystick or the software stage controls only. The stage-height knob is allowed for coarse Z setup; the manual XY knobs are not.
>
> **Never switch objective slides while the objective is close to the sample.** Create safe clearance before releasing the slide carrier. The objective can contact the sample if a slide is changed at close range.
>
> **Only switch between prepared objective slides.** Do not remove lenses from their slides or attempt to install bare objectives yourself during routine use.
>
> **Press [EUCENTRIC] before tilting.** Tilting the zoom head without first pressing the Eucentric button risks bringing the objective too close to the sample. Always press [EUCENTRIC], wait for the head to reposition, and then release the tilting lock lever.

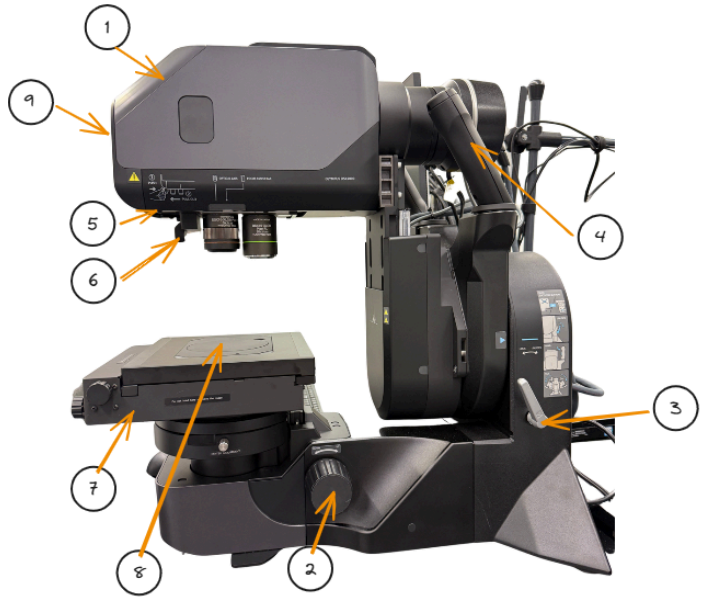
Pre-Session Checklist

Before touching any controls, confirm:

- Space between stage and objective is **clear of any samples or obstructions**
- Tilt lock lever is **engaged** (zoom head is vertical)

2 Instrument Overview

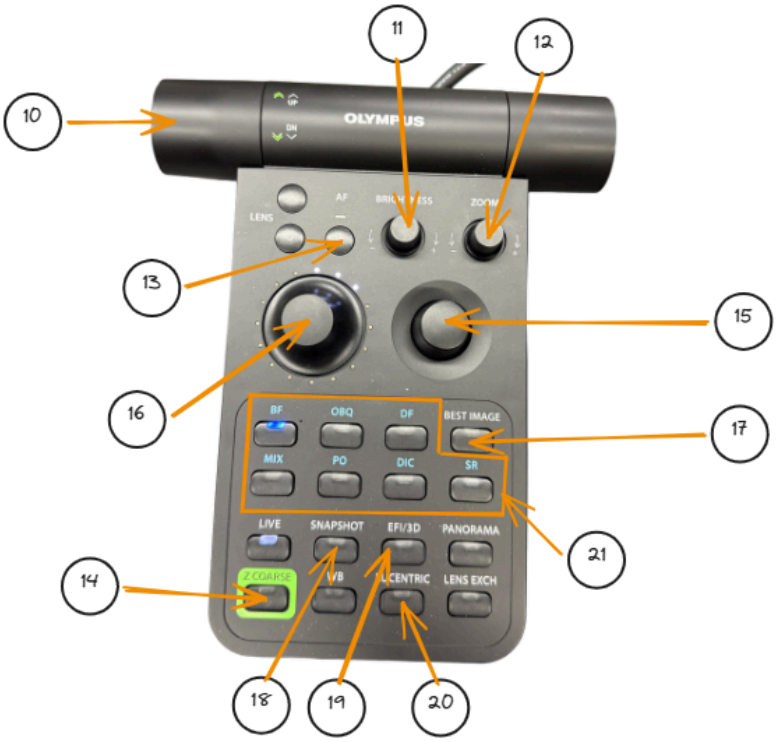
2.1 Instrument Diagram — Main Body



No.	Component	Description
1	Zoom head	Optical unit containing the camera; moves up/down on the arm during focusing and tilt operations
2	Stage-height knob	Manual coarse Z control used to raise or lower the stage during setup and large focus adjustments
3	Tilting lock lever	Locks zoom head at current tilt angle; rotate to release before tilting the head
4	Rotation-releas e knob	Hold while physically tilting the head to the desired angle; release to lock at new position
5	Objective-slide carrier	Holds the prepared objective slides and releases them when the lens exchange control is used
6	Objective slide	Slide/cartridge containing an installed objective; users switch between prepared slides during routine operation
7	Motorized XY stage	Sample platform; X and Y motion is controlled by the joystick or software. Do not use the manual XY knobs during routine use
8	Stage aperture cover	Round cover over the transmitted-light opening; the default opaque cover can be replaced with the transparent transmitted-light cover when needed

No.	Component	Description
9	Status indicator LED	Blue light on the zoom head; glows when the system is powered on

2.2 Instrument Diagram — Hardware Console



No.	Component	Description
10	Focus dial	Main console focus control; moves the zoom head up or down for routine focusing
11	Brightness dial	Adjusts reflected illumination brightness
12	Zoom dial	Continuously changes optical zoom magnification
13	AF button	One-press auto-focus; hold to activate continuous AF mode
14	Z Coarse button	Enables larger Z steps from the console focus control during big focus changes
15	XY-Stage joystick	Moves motorized stage in X and Y; tilt in any direction to move, push down to stop
16	Multi-dial	Context-sensitive knob; rotate to adjust the current setting, press to confirm or cycle options
17	Best Image button	Captures the image in all observation modes simultaneously; select the best result from the comparison grid
18	Snapshot button	Captures and saves a 2D image immediately

No.	Component	Description
19	EFI/3D button	Runs automated depth scan; produces an all-in-focus image or 3D surface map (if feature is licensed)
20	EUCENTRIC button	Moves zoom head to the correct pivot height before tilting; press before releasing the tilting lock lever
21	Observation mode buttons	Row of quick-select buttons: BF · OBQ · DF · MIX · PO · DIC · SR

3 Flow of Operation

Steps 3.1–3.2 apply to every session. At step 3.3 you choose your light path; both branches then converge at the Best Image step (3.4). Tilt observation (3.5) and objective-slide changes (3.6) are optional and can be done at any point after finding initial focus.

3.1 Startup

1. Turn on the DSX2000 (power switch on the rear of the base).
2. Turn on the monitor and the PC if not already on.
3. Open **PRECiV DSX**. When prompted, confirm for stage and z-focus to move to default positions.
4. Wait for all automatic stage and zoom-head movement to finish before placing anything on the stage.
5. Confirm the blue status LED on the zoom head is on.

> **Ready to proceed when:** Live image is visible on screen, the software is in the **Observation** step (left workflow bar), and all automatic startup motion has stopped.

3.2 Load Sample and Find Focus

> **Keep clearance between the objective and the sample while loading.** If the working distance looks tight, use the stage-height knob (label 2) and the console focus control (label 10) to create more space before moving the sample under the objective.

1. Place your sample flat on the stage.
2. Use the **XY-Stage joystick** (label 15) to move the region of interest under the objective.
3. Use the **stage-height knob** (label 2) for coarse Z setup until the sample is close to focus.

4. Use the **focus dial** (label 10) to move the zoom head and sharpen the live image.
5. Press the **AF button** (label 13) if you want a one-press auto-focus after the sample is already near focus.

> **Ready to proceed when:** Sample is visible on screen and focus is close enough for fine adjustment.

3.3 Select Your Light Path

Before running Best Image, choose which light source you need. The choice depends on your sample type, not the mode — that will be selected in the next step.

Your sample	Go to
Opaque surface (metals, ceramics, coatings, circuit boards, solid polymers)	**Section 3.3A** — Reflected light
Semi-transparent or thin (thin sections, some polymers, transparent films, biological slides)	**Section 3.3B** — Transmitted light
Not sure?	Try reflected light first; if the image is featureless, try transmitted

3.3.1 Branch A — Reflected Light

> Reflected light is the default. The DSX2000 starts in reflected brightfield mode. If the live image already looks good, you may be ready to proceed directly to step 3.4.

1. In the software **Observation Settings** panel, confirm **Reflected light** is active (the reflected light slider should be above 0%).
2. If the transmitted light slider is on, drag it to 0.
3. Adjust the **Brightness dial** (label 11) on the console to a comfortable mid-range brightness.

> **Ready to proceed when:** Sample surface is visible in reflected light on screen. Continue to step 3.4.

3.3.2 Branch B — Transmitted Light

> **Never place a sample directly on the transparent transmitted-light cover.** Replace the default opaque round cover with the transparent glass cover only for transmitted-light work, then place your sample on a separate glass slide or glass pane resting on top of that transparent cover.

1. Remove the default opaque round cover from the stage opening.
2. Install the transparent transmitted-light glass cover over the opening.

3. Place your sample on a separate glass slide or glass pane resting on top of the transparent cover.
4. Use the joystick to position the sample over the circular opening.
5. In the software **Observation Settings** panel, drag the **Transmitted light** slider up from 0 to a low starting value (around 20–30%).
6. Drag the **Reflected light** slider down to 0 (or leave it low if you intentionally want a mixed-light image).
7. Adjust the transmitted light slider until the sample structure is visible on screen.
8. Re-focus if needed using the stage-height knob (label 2) for a large correction, then the focus dial (label 10) or AF.

> In transmitted light, the sample appears bright on a uniformly lit background. Structure is visible *through* the specimen, not from its surface. If you only see a bright blank field, check that your sample is over the stage aperture, sitting on a separate glass support above the transparent cover, and thin enough for light to pass through.

> **Ready to proceed when:** Sample interior structure is visible on screen through the specimen. Continue to step 3.4.

3.4 Use Best Image to Select Observation Mode

The Best Image feature captures your sample in every available observation mode simultaneously and displays all results in a comparison grid. This is the recommended way to find the mode that shows your sample's features most clearly.

1. In the software, click the **Observation Settings** tab.
2. Click the **[All Modes]** button (in the *Find Best Image* group).
   Alternatively: press the **Best Image button** (label 17) on the console.
3. The Best Image screen appears showing thumbnail images side-by-side in each mode.
4. Click the thumbnail that shows your sample's features most clearly.
5. Click the **[Apply]** button. The live image switches to the selected mode.

> If you are not sure which thumbnail looks best, refer to Section 4 for a plain-language description of what each mode reveals. You can re-run Best Image at any time — it does not damage the sample.

> **Done when:** Live image is showing in your chosen observation mode. The mode name is displayed in the software status bar.

3.5 Tilt Observation (Optional)

Use tilt observation to view the sample at an angle, which can reveal surface texture, edge profiles, or three-dimensional structure that is not visible from directly above.

> **Press [Eucentric] first, every time.** This positions the zoom head at the correct pivot height. Skipping this step can cause the objective to crash into the sample as the head rotates.

1. Press the **Eucentric button** (label 20 on the console, or the *Eucentric Position* button in the software Z-axis panel). Wait for the zoom head to finish moving.
2. Use the **focus dial** (label 10) or AF to sharpen the image at this new height.
3. Rotate the **tilting lock lever** (label 3 on the instrument) to release the tilt lock.
4. Grip the **rotation-release knob** (label 4) on the head arm and tilt the head to the desired angle while watching the screen.
5. Release the rotation-release knob. The head locks at the current angle.
6. Re-focus using the focus dial or AF.
7. To return to vertical: grip the rotation-release knob, tilt the head back to upright, and release. You must be able to bring the lock lever back to the lock position.

> Aligning the upper edge of the sample to the horizontal crosshair in the live view helps you estimate the tilt angle quickly.

3.6 Change Objective Slide (Optional)

This instrument has multiple prepared objective slides available for routine use. You can switch to a different slide when you need a different field of view or magnification.

> **Create clearance before changing objective slides.** Make sure there is safe space between the objective and the sample before releasing the objective slide.
>
> **Switch only between prepared slides assigned for routine use.** Do not disassemble a slide or attempt to mount a bare objective yourself.
>
> **Hold the objective slide only as shown in the picture below.** Do not handle slide by gripping the objectives. Two fingers supporting the back end of the slide provides proper support without risking objective misalignment or smudging.

1. Use the stage-height knob (label 2) and the console focus control (label 10) to create safe clearance between the sample and the current objective.
2. Press and hold the **lens exchange button** (on the objective-slide carrier; also accessible via the **Lens button** on the console). This releases the carrier lock.
3. While holding the lens exchange button, slide the carrier to the desired prepared objective slide until it clicks into position.
4. Release the lens exchange button.
5. In PRECiV DSX, confirm the correct objective slide is selected so the software scale bar and field-of-view display match the active slide.
6. Re-establish focus using the stage-height knob for coarse adjustment, then the focus dial or AF.

> If a prepared objective slide is not available in the PRECiV DSX list, stop and ask lab staff before proceeding.

> **Ready to proceed when:** Correct objective slide is active; the software display matches the slide you selected.

3.7 Capture Image

3.7.1 2D Snapshot

1. Confirm the sample is in focus and the observation mode is set as desired.
2. Click the **Observation Settings** tab in the software.
3. Click the **[Snapshot]** button at the bottom of the screen.
   Alternatively: press the **Snapshot button** (label 18) on the console.
4. The captured image appears in the gallery panel.

5. Click the **[Save]** button to save the image. The file is assigned a default name; rename it in the *Document Name* dialog if needed.

> **Done when:** Image is saved and visible in the gallery.

3.7.2 3D / Extended-Depth-of-Focus (EFI) Acquisition

Use this when your sample has surface height variation and a single focal plane does not capture everything in sharp focus.

1. Click the **Acquisition** step icon (second icon in the left workflow bar).
2. In the *Acquisition Mode* field, click the **[EFI/3D]** button.
3. In the *Mode* field, click **[Quick Scan]**.
4. Click the **[Start]** button.
   Alternatively: press the **EFI/3D button** (label 19) on the console.
5. Wait for the scan to complete. A fully focused composite image (or 3D surface map) appears automatically.
6. Click **[Save]** to save the result.

> **Done when:** Scan is complete and result image is saved.

3.8 Shutdown

1. Use the stage-height knob and the console focus control to leave clear space above the stage before unloading.
2. Remove your sample from the stage.
3. If you used the transparent transmitted-light cover, remove it, reinstall the default opaque cover, and return the transparent cover to its designated drawer.
4. If the zoom head was tilted, return it to the vertical (upright) position and ensure tilting lever is in locked position.
5. Close PRECiV DSX.
6. Turn off the monitor.
7. Turn off the DSX2000 (power switch on the rear of the base).
8. Place the dust cover over the instrument.

> **Done when:** Instrument is off, sample removed, dust cover in place.

4 Observation Modes Reference

Use this section to understand what the Best Image thumbnails are showing. For step-by-step instructions, return to Section 3.4.

Each mode is listed with what it reveals and which sample types it works best for.

BF — Brightfield

Standard reflected-light mode. The surface is illuminated evenly from above. Features appear as variations in brightness or color. Best for most opaque samples with surface color or texture contrast: metals, ceramics, circuit boards, polished cross-sections. This is the starting mode for every session.

OBQ — Oblique Brightfield

The ring illumination rotates to illuminate the sample from a shallow angle rather than from directly above. This makes edges, steps, and surface height differences more visible by creating shadows. Useful for scratches, cracks, grain boundaries, and any sample where topography is more informative than color.

DF — Darkfield

Only light scattered or reflected at steep angles reaches the camera; direct reflected light is blocked. The background appears dark and bright features stand out. Useful for detecting fine particles, pits, scratches, and surface defects that are invisible in brightfield.

MIX — Mixed Illumination

Simultaneously combines reflected and transmitted light, or combines multiple illumination angles. Useful for samples that have both surface features and internal structure, or where a single illumination mode gives insufficient contrast on its own.

PO — Polarized Observation

Reflected polarized light. Birefringent materials (crystals, some polymers, mineral grains) rotate the polarization of light and appear with high contrast or color against a dark background. Useful for identifying crystalline phases, strain in transparent materials, and anisotropic surface films.

DIC — Differential Interference Contrast

Creates a pseudo-3D shadow-relief effect by detecting optical path differences across the surface. Reveals very subtle height variations that are invisible in brightfield — nanometer-scale steps are visible. Useful for smooth surfaces, thin films, and samples

where the topography is informative but the height variation is too small to detect with oblique illumination.

SR — Super Resolution

Computational mode that combines multiple images to produce a result with finer spatial detail than a single frame. Useful when you need the highest possible resolution from a given objective and need to see very fine surface features or grain structure. Takes slightly longer to acquire than a single snapshot.