



Standard Operating Procedure: Inspection Microscopy

Olympus MX63

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1. Lab Safety Information

- ✓ All GMU NFF users are required to complete the Lab Safety Orientation (LSO) before performing any lab work.
- ✓ Proper Personal Protective Equipment (PPE) should always be worn before entering the clean room: safety glasses, hair net, shoe covers, gloves, and lab coat. Additional PPE is available for specialized chemical work as needed.
- ✓ No shorts, sandals, tank tops, or spaghetti-strap shirts are allowed in the clean room!
- ✓ Material Safety Data Sheets (MSDS) are available in a binder in the gowning room.
- ✓ Read the SDS for any chemicals you plan to use before proceeding with your work. Any materials used in the clean room for the first time should be brought in after the approval of NFF staff.
- ✓ A safety buddy is required in the clean room with you when doing chemical work. The safety buddy should be fully trained and qualified to work with the chemical you are using. They must remain in the clean room the entire time you are handling the chemical. Feel free to ask NFF staff if no one qualified is available!
- ✓ Prohibited clean room items: cardboard, pencils, cloth, hats/coats, and contact lenses.
- ✓ Accepted clean room items: plastic, pens, synthetic fabrics, clean room paper.

2. Inspection Microscopy Safety Information

- ✓ Any irregular system behavior should be reported to NFF staff promptly. Never attempt to fix the system yourself! We are here to help.
- ✓ Fluids should not be spilled onto the microscope.
- ✓ The lamp should always be first-on and last-off.
- ✓ Do not rotate the revolving nosepiece directly with hand. Rotating by hand may damage the gear heads or cause other malfunctions.
- ✓ Make sure that you do not move the stage too far upwards while focusing. In such cases, the sample will press against the objective tip, and it may cause an expensive breakage of glass.
- ✓ Failure to use the system safely and properly may result in your access to the system being reviewed and/or revoked.

3. Principles of Optical Microscopy

Microscopes are instruments that magnify specimens too small to see with the naked eye, ranging from simple single-lens tools to complex systems. The key component is the microscope objective, which forms the primary image. Modern microscopes use a dual-stage magnification system, combining an objective lens with an eyepiece. Magnification is achieved by multiplying their values, while resolution and contrast depend on various optical strategies and specimen preparation.

The Olympus MX63 Inspection Microscope in our characterization laboratory is used for the inspection and analysis of micro/nanofabricated structures. It provides ergonomic, user-friendly, and high-quality observations of large samples, such as wafers up to 300 mm, flat panel displays, and circuit boards. It features advanced imaging technology and a modular design, allowing customization for specific applications, while adhering to international standards like SEMI S2/S8, CE, and UL. The setup has a 6" X 6" XY stage, color camera, image analysis software. The microscope offers magnifications of 25X, 50X, 100X, 200X, 500X, and 1000X. The setup and components of the Olympus MX63 Inspection Microscope are shown in Figure 1 and 2.



Figure 1. Olympus MX63 Inspection Microscope

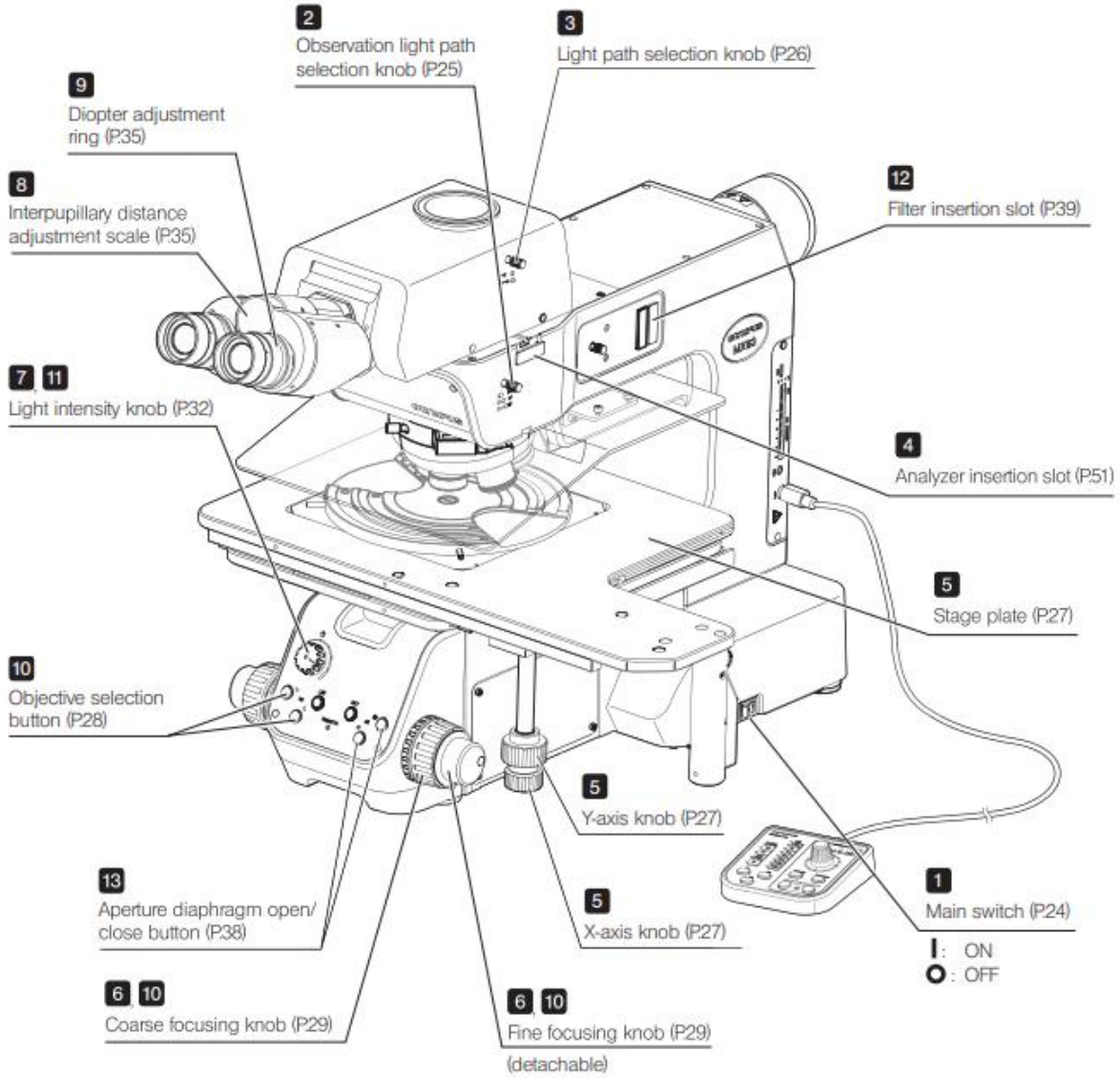


Figure 2. Components of Olympus MX63 Inspection Microscope

4. Operation Manual

4.1. Turning on the Microscope and Starting with the Software

1. Rotate the light intensity knob (Figure 3, #1) fully counterclockwise.



Figure 3. Light Intensity Knob (#1) and Objective Selection Buttons (#2)

2. Turn on the main switch.

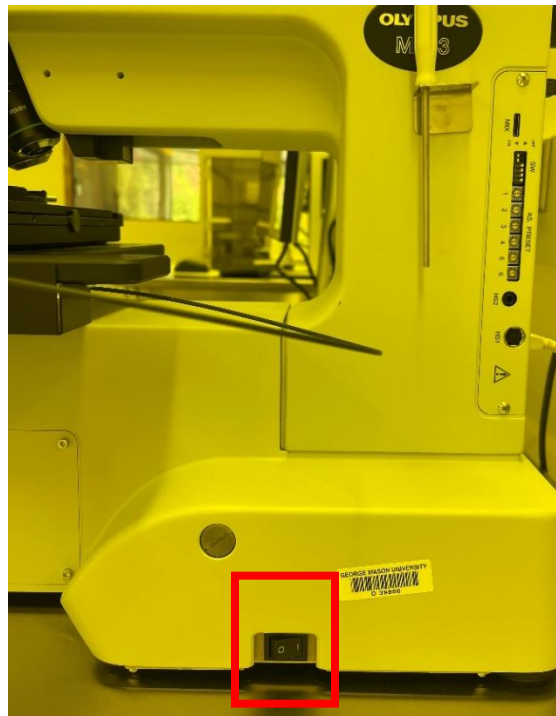


Figure 4. Main Switch

3. Gradually rotate the light intensity knob clockwise to increase the brightness of the illumination.
4. Open the PRECiV Capture software. The software interface is shown in Figure 5.

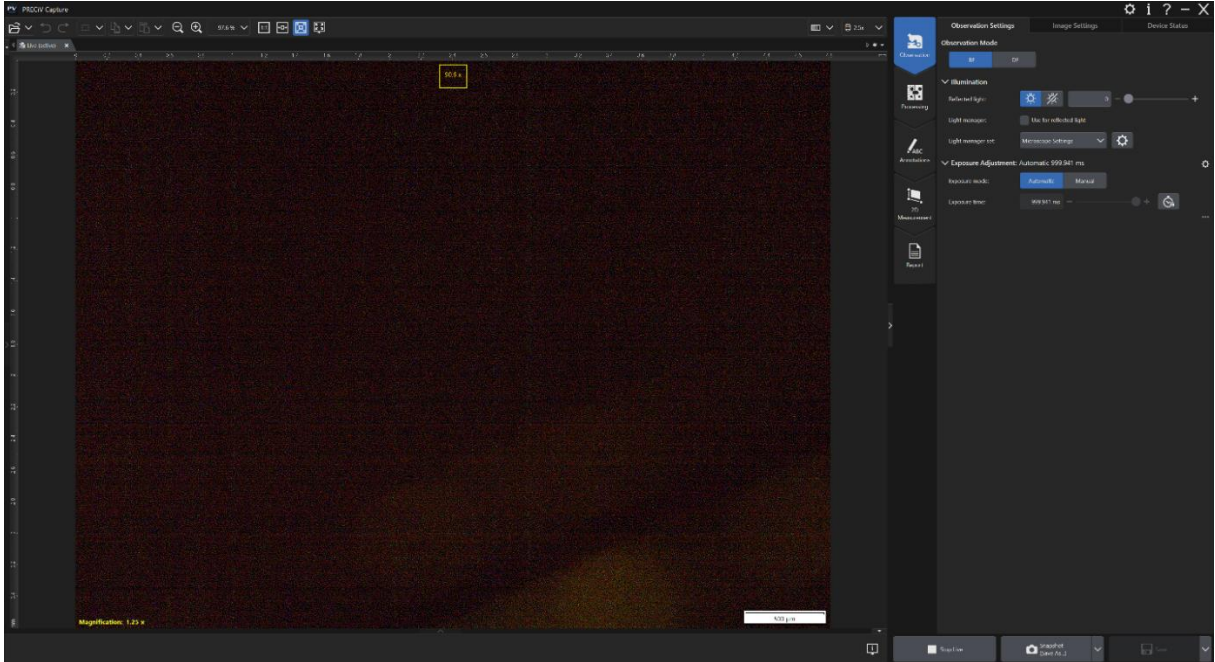
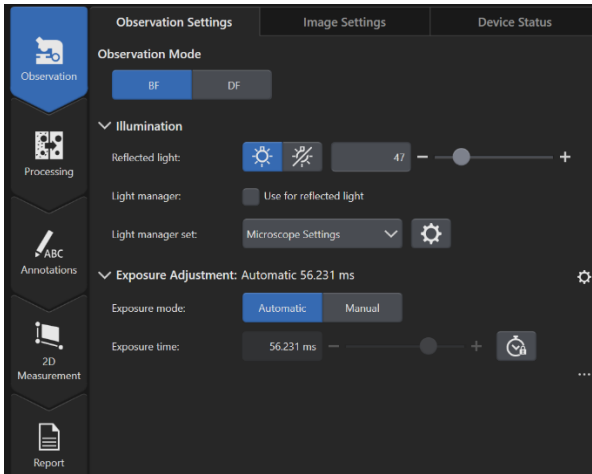
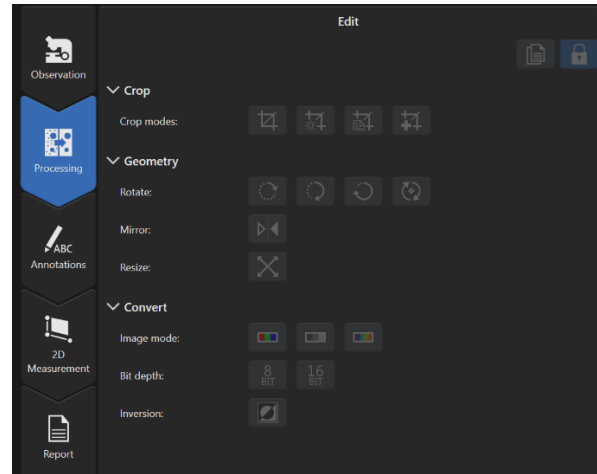


Figure 5. PRECiV Capture Software Interface

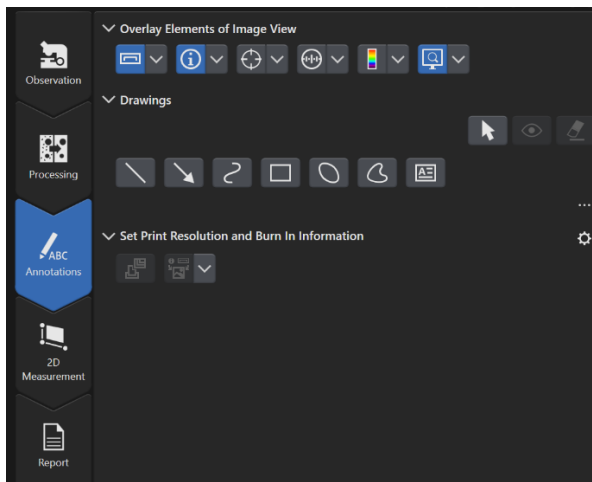
5. The Olympus MX63 Inspection Microscope offers several modes, including observation, processing, annotations, and 2D measurement (Figure 6). To capture an image, begin with observation mode. Adjustments for bright-field, dark-field, illumination, and exposure can also be made in observation mode. Use the 2D measurement mode to calculate distance, area, diameter, angle, coordinates, and counts of any structures after acquiring the image.



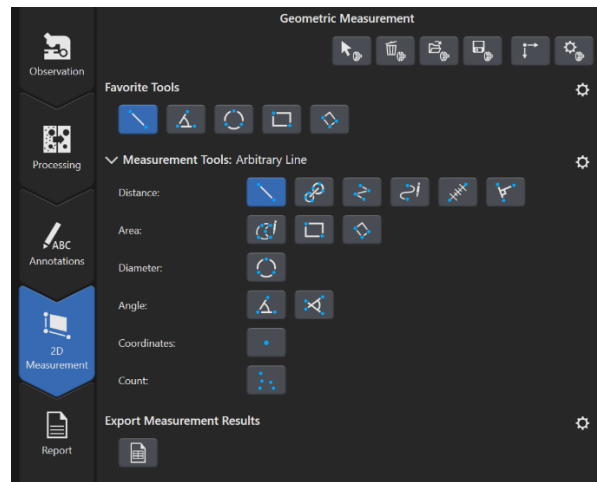
(a) Observation



(b) Processing



(c) Annotations



(d) 2D Measurement

Figure 6. Inspection Modes

4.2. Placing the Sample

6. Ensure the microscope is set to the lowest magnification.
7. Use the X- and Y-axis knobs (Figure 2) to move the stage closer to you by adjusting it in the X and Y directions.
8. Carefully place your sample on the stage plate.
9. Using the X- and Y-axis knobs, position the stage plate so the sample is directly under the objective lens. Ensure there is sufficient space between the stage and the objective lenses.

4.3. Adjusting the Parameters and Image Acquisition

10. Adjust the light path selection knob (Figure 7, #1) to choose whether to observe through the eyepiece or via the camera display.
11. Adjust the observation light path selection knob (Figure 7, #2) to choose between bright-field or dark-field imaging, depending on your analysis. The differences between bright-field and dark-field imaging are illustrated in Figure 8.

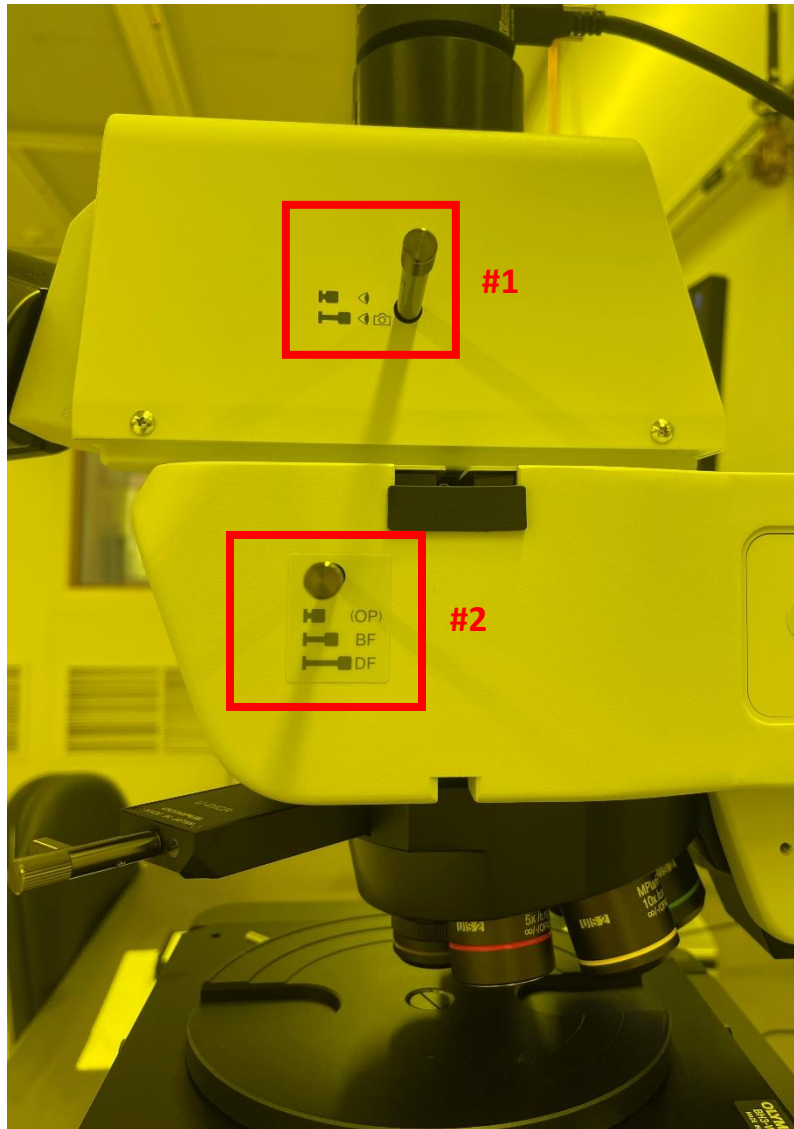


Figure 7. Light Path Selection Knob (#1) and Observation Light Path Selection Knob (#2)

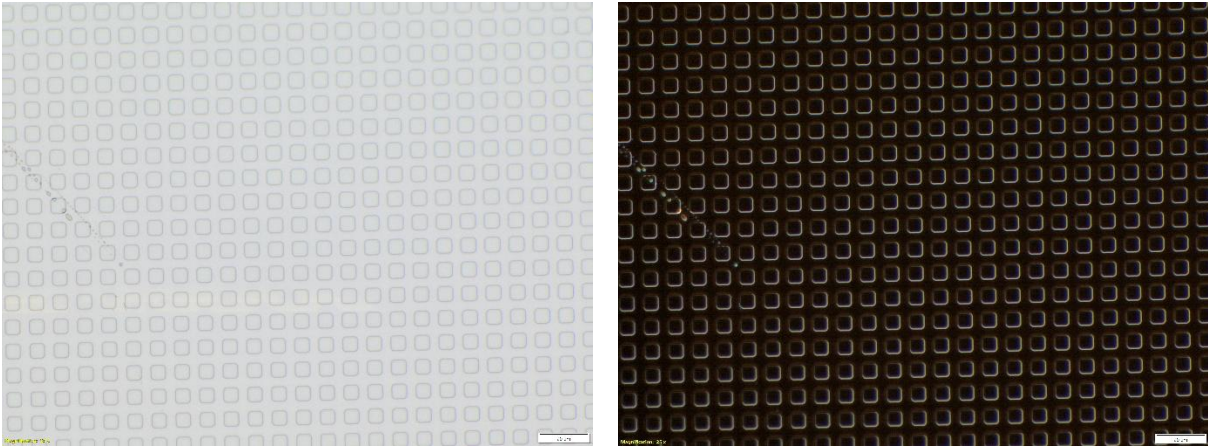


Figure 8. Bright-field (left) and Dark-field (right) Images

12. Rotate the coarse and fine focusing knobs to move the stage upward, bringing the sample closer to the objective. Be careful to avoid pressing the sample against the objective. Continue adjusting until the sample is in focus.
13. Magnification can be changed either through the software (Figure 9(a)) or by using the objective selection buttons (Figure 3, #2). After each adjustment, ensure the sample remains properly focused and there is enough space between the stage plate and the objective lenses. Figure 9 shows example images at two magnifications: (b) 2.5X and (c) 50X.

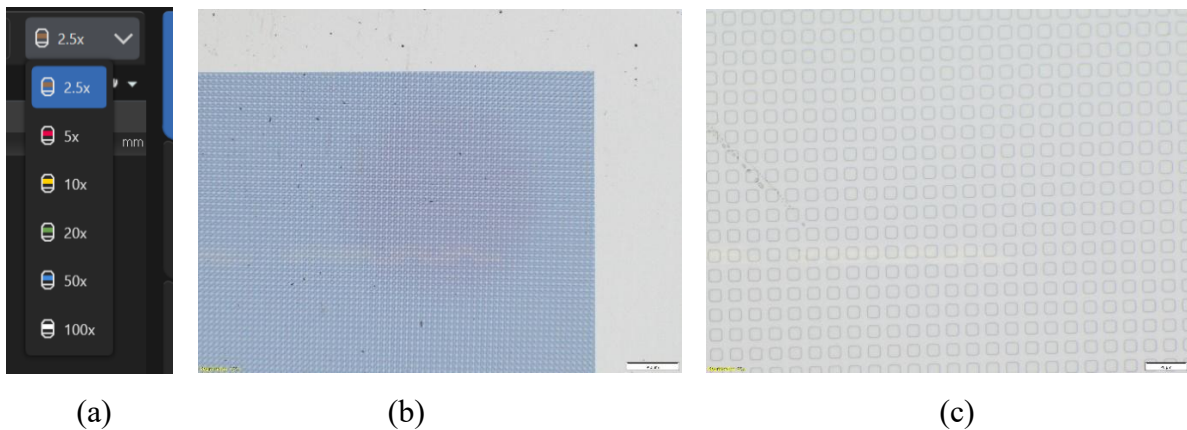


Figure 9. (a) Software Magnification Adjustment, (b) Image at 2.5X Magnification, and (c) Image at 50X Magnification

14. Once all adjustments are complete, capture the image by selecting "Snapshot" and saving it in the software, as shown in Figure 10. Click "Start Live" to return to observation mode.

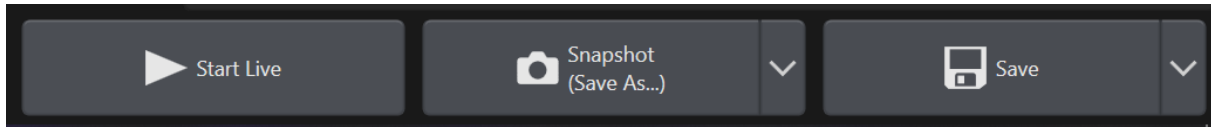


Figure 10. Capturing and Saving Image

4.4. Taking out the Sample and Turning off the Microscope

15. After completing your observations, lower the magnification to 2.5X, as done in Step 13.
16. Remove your sample by following Steps 6-9 in reverse.
17. Finally, repeat Steps 1 and 2 to fully decrease the light intensity and turn off the main switch.