



Nikon

Microscope
ECLIPSE E100

Instructions

Thank you for purchasing this Nikon product. This instruction manual is for the users of the Nikon Microscope ECLIPSE E100 describing basic operation of the microscope. To ensure correct usage, please read this manual thoroughly before using the microscope.

- It is prohibited to reproduce or transmit this manual in any form without the prior consent of Nikon.
- The instructions and specifications in this manual are subject to change without notice.
- Although every effort has been made to ensure the accuracy of this manual, if you find that any part of this manual is unclear or incorrect, contact your nearest Nikon representative.
- Some ECLIPSE E100 microscope sets may come with different components and accessories from those shown in this manual.
- Also read the manuals for the products used with the microscope, for example, the Nikon photomicrographic equipment.

Warning and Caution Symbols Used in This Manual

Though Nikon products are designed to provide you with utmost safety during use, incorrect usage or disregard of the instructions may cause personal injury or property damage. For your own safety, read the instruction manual carefully and thoroughly before using the product. Do not discard this manual. Always keep it near the product for easy reference.

Inside this instruction manual, safety instructions are indicated with the symbols shown below. Be sure to follow the instructions marked with these symbols for your safety.

Symbol	Meaning
 WARNING	Disregarding instructions marked with this symbol may lead to death or serious injury.
 CAUTION	Disregarding instructions marked with this symbol may lead to injury or property damage.

Symbols Labeled on the Product

Symbol	Meaning
	<p>Caution! Hot surface</p> <p>This symbol label attached near the field lens unit (the lamp is set underneath the field lens unit) and on the bottom surface of the base plate (the lamp is set above this place) reminds you of the following.</p> <p>WARNING: Risk of burn injury. The lamp and its surroundings (including the field lens unit) become hot during use. Do not touch them while the lamp is on and for thirty minutes after the lamp is turned off.</p> <p>CAUTION: The lamp and its surroundings remain hot even after the lamp is turned off. Make sure that they are sufficiently cool before replacing the lamp.</p>
	<p>Caution!</p> <p>This symbol label attached near the AC inlet reminds you of the following.</p> <p>CAUTION: Make sure that the input voltage set by the voltage selector matches the voltage provided in your region. The voltage selector on the microscope sent to the United States is set to "120V" at the factory.</p>

Common Sense Safety Instructions

1. Purpose



Use this microscope only for microscopic observation.

Do not use this microscope for any other purpose because the protection provided by the equipment may be impaired.

2. Never Disassemble the Microscope



There are no user serviceable parts inside the microscope. Disassembly will void the warranty, and could degrade the performance, cause electrical shock or personal injury, or damage the instrument. If you have a service problem, contact your nearest Nikon representative.

3. Check the Input Voltage



The input voltage is indicated in two places at the rear of the microscope: on the nameplate and above the AC-IN socket. Confirm that these input voltage indications correspond to the voltage provided in your region. If not, follow one of the instructions below. The use of microscopes with the different input voltage indications will cause overcurrent and overheating, which may result in fire or severe damage to the microscope.

- **If the voltage indication on the nameplate differs:**

Do not plug in the microscope. Contact your nearest Nikon representative.

- **If the voltage indication above the AC-IN socket differs:**

Refer to p. 26 and change the input voltage setting before turning on the power switch.

- For the microscope with the nameplate showing

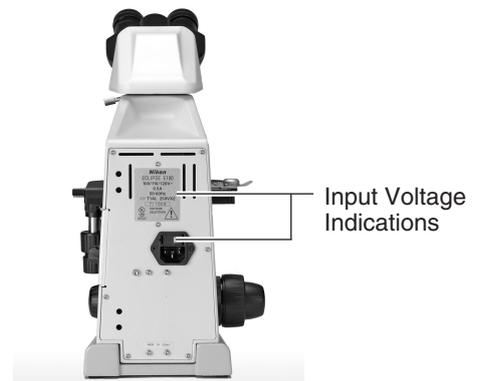
[100/110/120 V ~]:

The voltage can be set to: AC 100 V, 110 V or 120 V.

- For the microscope with the nameplate showing

[220/230/240 V ~]:

The voltage can be set to: AC 220 V, 230 V or 240 V.



4. Use the Specified Lamp, Fuse, and Power Cord



Use the specified lamp and fuse. For the microscope with the nameplate showing [100/110/120 V], use the power cord provided. For the microscope with the nameplate showing [220/230/240 V], use the specified power cord. Using an incorrect lamp, fuse, or power cord may damage the instrument or cause a fire. (Also see p. 41-42 on power cord.)

- **Specified Lamp**

Halogen lamp 6V-20W (PHILIPS 7388 or OSRAM HLX64250)

- **Specified Fuse**

- For the microscope with the nameplate showing [100/110/120 V ~]:

250 V, 1 A, time-lag low-breaking type, 5X20 miniature fuses (two pieces)

- For the microscope with the nameplate showing [220/230/240 V ~]:

250 V, 0.5 A, time-lag low-breaking type, 5X20 miniature fuses (two pieces)

5. Turn Off Power Switch before Assembling the Microscope, Replacing the Lamp or Fuse, and Plugging in or Unplugging the Power Cord



Turn off the power switch before you plug or unplug the power cord to prevent electrical shock or fire. Also turn off the power switch and then unplug the power cord before assembling the microscope, and before changing the lamp or fuse. To turn off the power, turn the power switch to ○.

6. Keep the Microscope Free of Moisture and Foreign Matter



Keep the microscope free of moisture to prevent short circuiting that could result in overheating or other malfunctions. If water splashes on the microscope, immediately turn off the power switch (turn the switch to ○) and unplug the power cord. Then, wipe off the water with a dry cloth. Short circuiting can also result when foreign matter is trapped inside the microscope. If foreign matter or water has entered the microscope, do not use the microscope and contact your nearest Nikon representative.

7. Heat at the Light Source



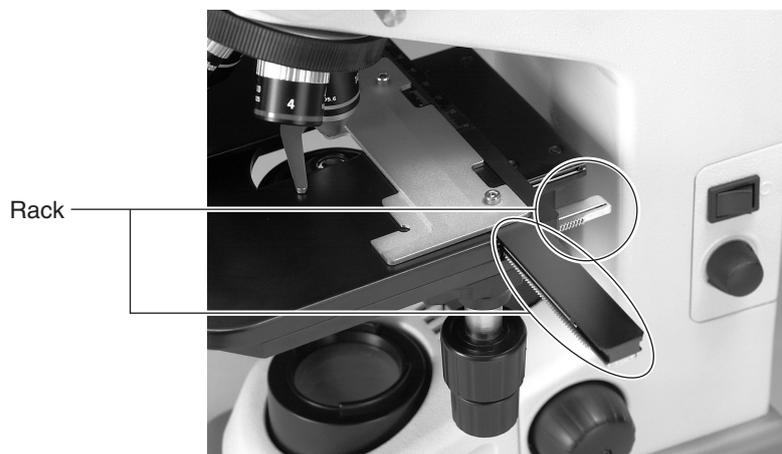
The lamp becomes hot during use. Do not remove the field lens unit while the lamp is on, and be sure the lamp has been off for 30 minutes before touching it.

- When changing the lamp bulb, make sure that the lamp is cool enough to touch (the light should be off at least 30 minutes).
- Do not touch the lamp while it is on or until the lamp has been off for 30 minutes, as doing so could result in burns.
- Never bring cloth, paper or flammable volatile substances such as gasoline, petroleum benzine, acetone, thinner, or alcohol near a hot lamp, as a fire could result.

8. Stage Rack



The rack for the stage protrudes during use. Be careful not to hit the rack with your hand or other parts of your body when handling the microscope as you may get hurt by an edge of the rack.



9. Installation

This microscope is a precision instrument. Using the microscope in an unfavorable environment could result in malfunctions or degraded performance. Consider the following conditions when choosing the installation location.

- Observation conditions are better if light from windows and bright room light can be avoided.
- Install the microscope in a location with a room temperature of 0° to 40° C and with a maximum relative humidity of 85%. High temperature and humidity are to be avoided because they promote mold growth and condensation, which may damage the microscope.
- Dirt and dust degrade optical performance and are to be avoided.
- Vibrations in the environment will degrade the image. Install the microscope in a location free of vibrations.
- Install the microscope on a solid table and keep the microscope level.
- This microscope emits a feeble electromagnetic wave. Do not place a precision electronic device near the microscope as precision could be degraded. Also, avoid placing a radio or TV near the microscope as reception of sound and images may be hampered.
- Install the microscope in the location of 10 cm or more away from the surrounding walls.
- Install the microscope in the place that allows easy detachment of the power cord from the AC inlet in the event of emergency.

10. Carrying the Microscope

This microscope is a precision instrument. Handle it gently. Strong shocks and forcible operation will damage the instrument. Shocks to the objectives, especially, could degrade image precision.

- When carrying the microscope, hold it at its arm with both hands.
- Do not hold the focus knobs, the eyepiece tube, or the stage. These parts could easily come off and could result in malfunctions.



11. Handling the Lamp

Do not touch the glass part of the lamp with bare hands. Wear gloves or use a cloth when handling the lamp so as not to leave fingerprints on the surface. Wipe off any fingerprints or stains using a clean cloth moistened with alcohol. Fingerprints will etch into the hot surface of the lamp and reduce the brightness, damage the lamp or reduce its service life.

Handle the lamp gently. Shocks and vibrations will damage the lamp or reduce its service life.

When changing the lamp, be sure that the contact is not damaged. If the contact is damaged, the lamp may not light up or may overheat. Insert the lamp's contact pins fully into the socket holes. If the pins are loose, the lamp could come off or result in a contact failure, which will cause overheating or smoke. Also, make sure that the field lens unit is securely attached.

12. Focus Knobs

Do not turn the right and left focus knobs simultaneously in opposite directions. Do not turn the coarse focus knob any further after the stage has been moved up or down to its limit. These operations will damage the focusing mechanism.



Do not turn the knobs in opposite directions.

13. Oil-Immersion Observation

Use only a minimum quantity of oil. If too much oil is applied, surplus oil could flow out to the stage and the condenser which could lead to degraded performance.

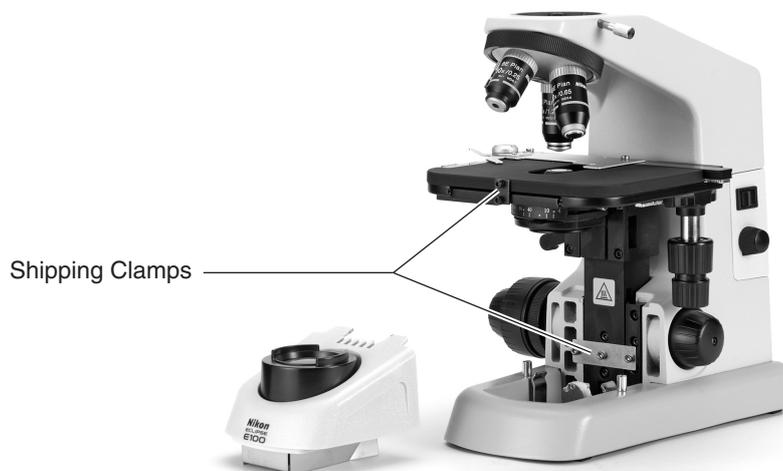


WARNING

When using petroleum benzine or absolute alcohol to wipe off immersion oil or to clean the lenses, follow the instructions provided by their manufacturers. Absolute alcohol and petroleum benzine are inflammable. Take great care when handling them.

14. Shipping Clamps

The microscope is held tightly by the clamps during shipment. Be sure to remove the clamps before use. For details, see p. 27.



Contents

Warning and Caution Symbols Used in This Manual	2
Symbols Labeled on the Product	2
Common Sense Safety Instructions	3
I. Nomenclature of Each Part	8
II. Switches and Controls	10
III. A Swift Microscopic Procedure	12
IV. Microscopy (Detailed Procedure)	14
V. Miscellaneous Operations	22
1. Oil-Immersion Observation	22
2. Adjusting the Torque of the Coarse Focus Knob	24
3. Photomicrography and TV Microscopy	24
4. Cord Hangers	24
VI. Assembly	25
1. Assembly of Standard Set	26
2. Assembly of Additional Components	28
1) Condenser	28
2) Objectives	29
3) Specimen Holder	29
4) Eyepiece and Eyepiece Pointer	29
5) Monocular eyepiece tube	29
6) Other Accessories	29
3. Replacement of Consumable Materials	30
1) Replacing the Lamp	30
2) Replacing the Fuse	31
VII. Optical Characteristics	33
VIII. Troubleshooting tables	35
IX. Care and Maintenance	40
X. Specifications	41



Nomenclature of Each Part

The microscope is made up of the following components.

① **Basic unit**

② **Eyepieces**

Screwed on to the eyepiece tube.

③ **Eyepiece tube**

This is a binocular eyepiece tube. A trinocular eyepiece tube is available for photomicrography and TV microscopy. Amonocular eyepiece tube can be used also.

④ **Objectives**

Objectives with various magnifying powers are available.

⑤ **Condenser**

Used for condensing light. The condenser should be positioned slightly lower than its upper limit.

Adjust the aperture diaphragm lever according to the objective.

⑥ **Field lens unit**

Pull the field lens unit upward when changing lamp.

⑦ **Lamp**

Halogen lamp of 6 V-20 W is used.

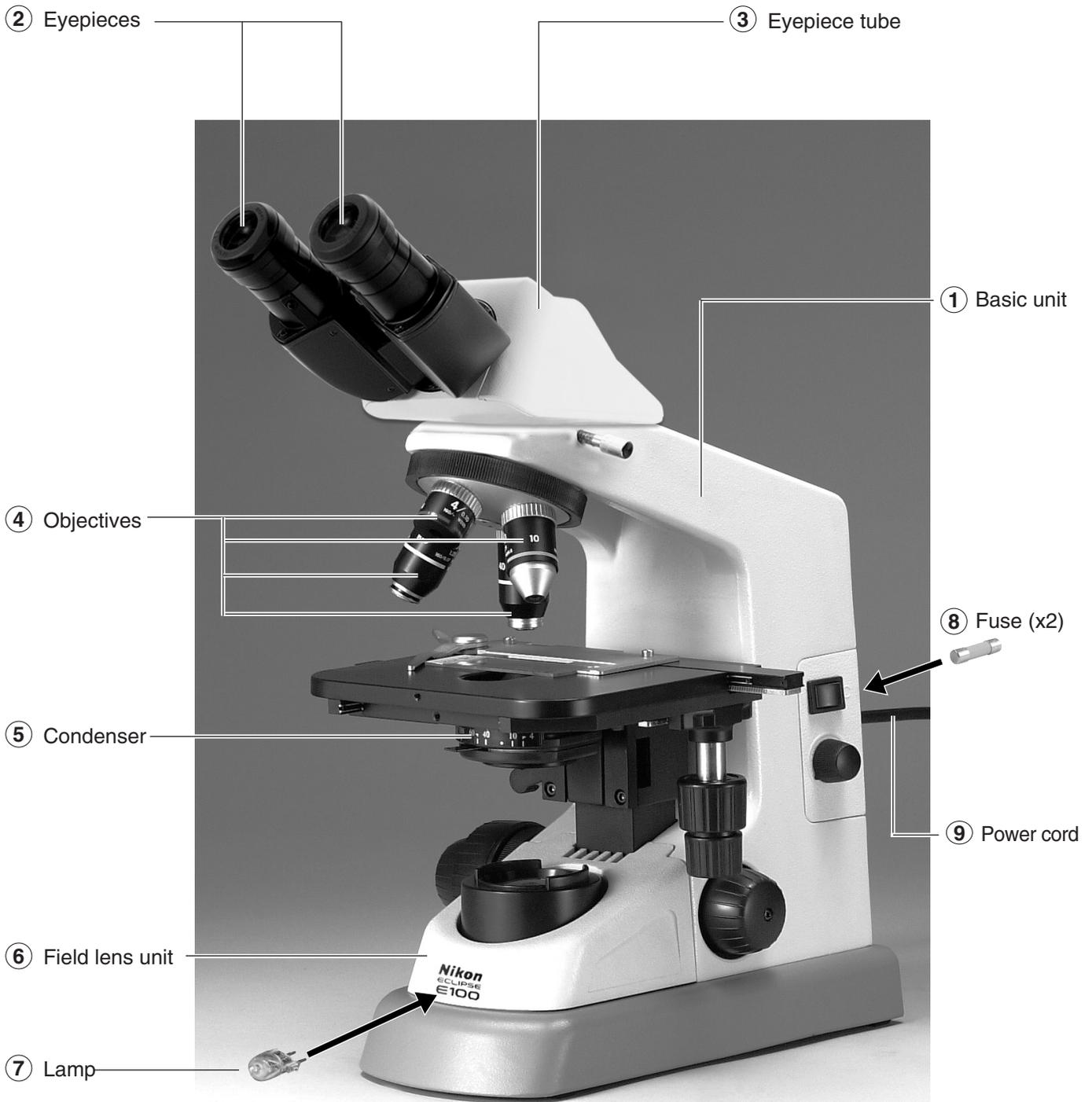
⑧ **Fuse**

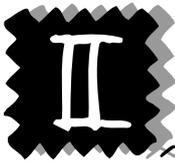
For the microscope with the nameplate showing [100/110/120 V], 250 V, 1 A, time-lag low-breaking type, 5X20 miniature fuses (two pieces) are used.

For the microscope with the nameplate showing [220/230/240 V], 250 V, 0.5 A, time-lag low-breaking type, 5X20 miniature fuses (two pieces) are used.

⑨ **Power cord**

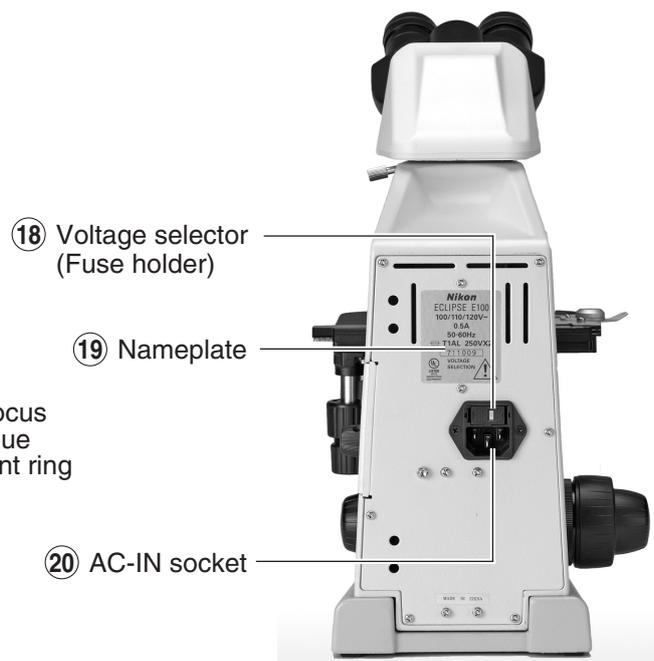
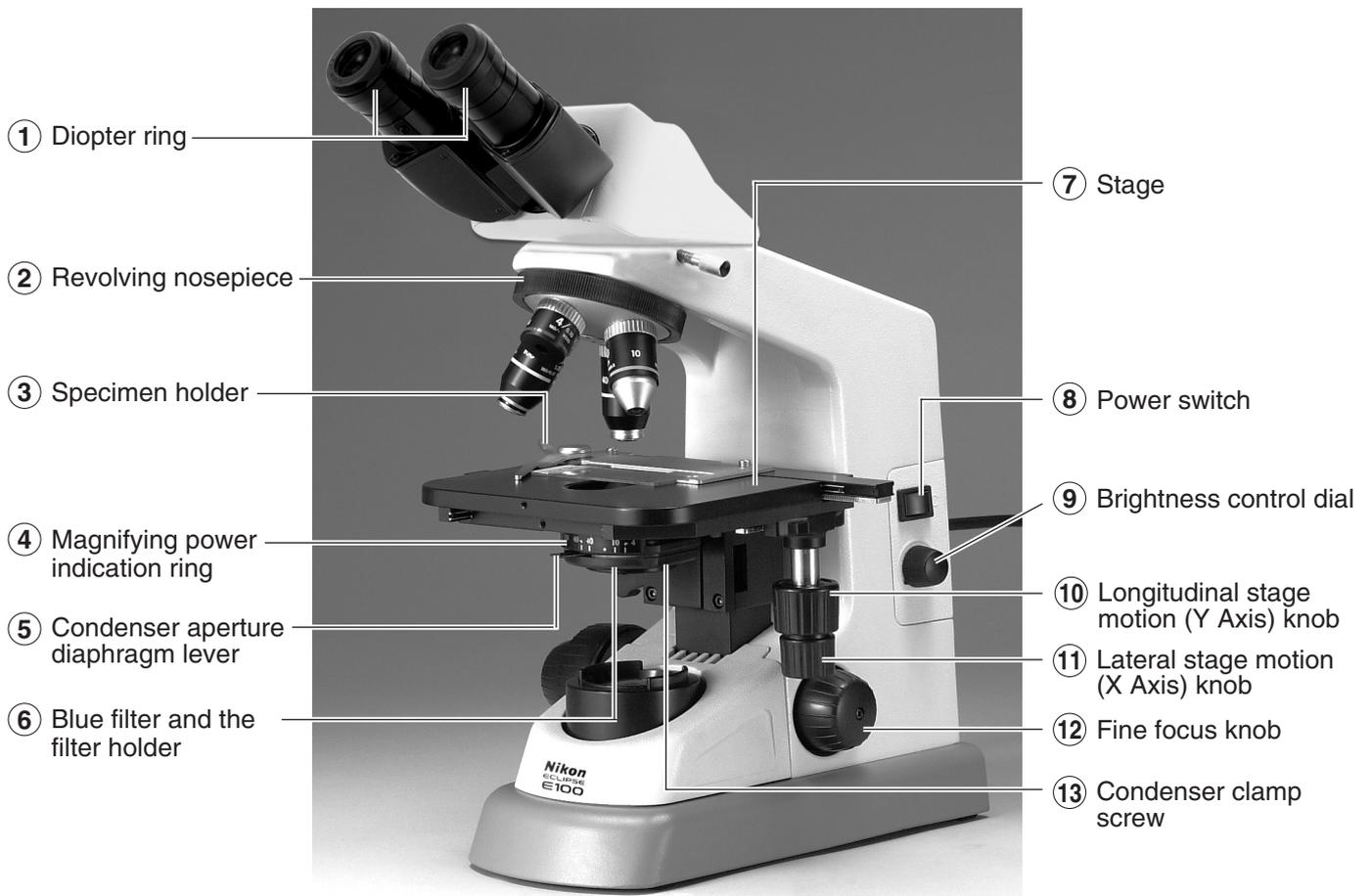
Use the power cord provided.





Switches and Controls

- ① **Diopter ring**
Adjust the diopter ring to compensate for the difference between your right and left eyesight. (p. 18)
- ② **Revolving nosepiece**
Can hold up to four objectives.
- ③ **Specimen holder**
Put your finger at the root tilt of the claw to open the claw. (p. 15, 29)
- ④ **Magnifying power indication ring**
- ⑤ **Condenser aperture diaphragm lever**
Set the lever to match the magnifying power of the objective. (p. 20)
- ⑥ **Blue filter and the filter holder**
- ⑦ **Stage**
- ⑧ **Power switch**
When turned to |, power is turned on and the lamp lights.
When turned to ○, power is turned off and the lamp goes off.
- ⑨ **Brightness control dial**
When turned clockwise, the lamp voltage increases and the viewfield becomes brighter.
When turned counterclockwise, the lamp voltage decreases and the viewfield becomes darker.
- ⑩ **Longitudinal stage motion (Y Axis) knob**
These knobs are located either to the right or the left of the stage.
- ⑪ **Lateral stage motion (X Axis) knob**
ditto
- ⑫ **Fine focus knob**
- ⑬ **Condenser clamp screw**
- ⑭ **Condenser vertical motion lever**
Use this lever to adjust the vertical position of the condenser. (p. 19)
This lever is located either on the right or the left side of the stage.
- ⑮ **Coarse focus knob torque adjustment ring**
Used to adjust the tension (torque) of the coarse focus knob. (p. 24)
- ⑯ **Coarse focus knob**
There are both coarse and fine focus knobs on the opposite side of the stage motion knobs.
- ⑰ **Fine focus knob**
Used for focusing. There is no coarse focus knob on the side with the stage motion knobs.
- ⑱ **Voltage selector (Fuse holder)**
Use this selector to match the input voltage of the microscope to the voltage provided in your region. (p. 26)
- ⑲ **Nameplate**
Indicates the input voltage.
- ⑳ **AC-IN socket**
Plug the power cord into this inlet. Make sure that the power switch is off (turned to ○) before plugging the cord in.



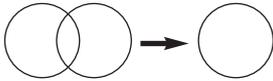
III

A Swift Microscopic Procedure

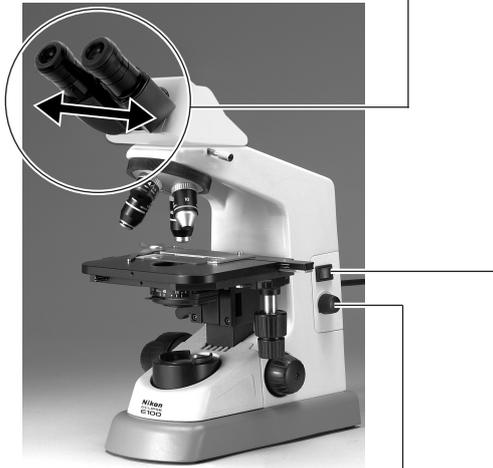
Turn on the lamp and adjust interpupillary distance.

1 Turn on the power switch.

2 Widen or narrow to merge the viewfields into one.



Viewfields



3 Adjust brightness too.

Focus with 10x objective.

1 Match the bottom edge of the diopter ring with the engraved base line.



2 Place specimen slide on the stage. (Coverglass up.)

3 Swing the 10x in the optical path.

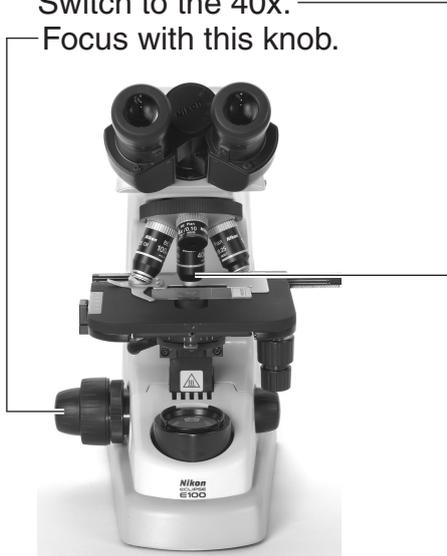


Use this knob for focusing.

Adjust the diopter.

Repeat the steps **1** to **3** twice.

- 1** Switch to the 40x.
Focus with this knob.



- 2** Switch back to the 10x.
Use your right eye.



And focus with this ring.

- 3** Hold the 10x. Use your left eye.



Then focus with this ring.

Repeat the steps 1 to 3.

Magnify the image and observe!

- 1** Check the magnifying power.



- 2** Move the lever to the magnifying power of the objective.

- 3** Observe.

Turn off the power.

Wait till the microscope cools down before storing.

IV

Microscopy (Detailed Procedure)

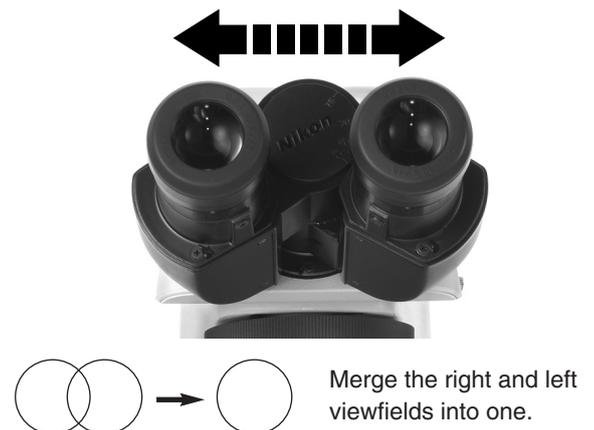
1) Lamp Illumination

Turn on the power switch (turn to |) and the lamp will come on. Turn the brightness control dial to adjust the brightness of the viewfield. (Turning the dial clockwise increases the brightness; turning the dial counterclockwise decreases it.)



2) Interpupillary Distance Adjustment

Adjust the distance between the eyepieces to merge the right and left viewfields into one. (This is an adjustment to match the distance between eyepieces with the distance between your eyes).



3) Align the Diopter Ring with the Engraved Base Line

Turn the diopter ring on the right eyepiece to align its bottom edge with the engraved base line. Turn and align the diopter ring on the left eyepiece in the same way.

Match the bottom edge of the diopter ring with the engraved base line.



4) Specimen Mounting

Place specimen slide on the stage with the coverglass facing upward. Open the claw of the specimen holder with your finger at the root tilt and fix the specimen slide with the claw.



5) Focus with the 10x Objective

Rotate the revolving nosepiece to bring the 10x objective into the optical path. (The objective will click into place when rotated into position.) Bring the specimen image into focus by turning the coarse focus and then fine focus knob.

- Direction of stage movement relative to focus knob rotation is shown in the figure.
- There is no coarse focus knob on the side with the stage motion knobs. There are both coarse and fine focus knobs on the opposite side of the stage motion knobs.
- Do not turn the right and left focus knobs simultaneously in the opposite directions. Do not turn the coarse focus knob further after the stage has reached its lower or upper limit. These operations could result in a malfunction.



Turn the focus knob as shown to move the stage down.

Try!!

Focusing

Turning the focus knobs recklessly is a long and hard way to focus on the image. If you are using a high power objective, you may even damage the specimen by pressing it against the objective. Before breaking the coverglasses or damaging the objectives, read the following and find the correct way to focus on the specimen.

- (1) Put the 10x (or 4x) objective in the optical path.
- (2) Turn the coarse focus knob to raise the stage to its upper limit. *1
- (3) Looking into the eyepieces, slowly rotate the coarse focus knob to lower the stage. When the specimen image appears, stop rotating the knob.
- (4) Rotate the fine focus knob and precisely focus on the image.

When you want to observe the image with a high power objective, first focus on the image using a 10x (or 4x) objective. Then change to a high power objective and rotate the fine focus knob for precise focusing.



First raise the stage to the most extent not to hit against the objective,

then look into the eyepieces and lower the stage.

1. When rotating the coarse focus knob while looking into the eyepieces, be sure to turn it only in the direction that lowers the stage.
2. When raising the stage using the coarse focus knob, take your eyes off the eyepieces and look at the gap between the upper surface of the specimen and the front of the objective from the side.
3. First focus with a low power objective. Then change to a high power objective.

*1: Since the working distances of 10x and 4x objectives are large (p. 33), these objectives do not touch the specimen even when the stage is raised to its upper limit provided that the slide and coverglasses of a standard thickness are used. (The standard thickness for slides is 1.2 mm and that for coverglass is 0.17 mm.)



Using the Working Distance for Focusing

Each objective has its working distance indicated on its side. The working distance is the distance between the front of the objective and the specimen when the specimen image is in focus. If you have difficulties in focusing with the standard procedure described on p. 16, try one of the following methods using the working distance for focusing.

Method 1:

While looking at the microscope from the side, rotate the coarse focus knob to bring the specimen close to the objective. When the distance between the specimen and the front of the objective becomes slightly smaller than the working distance, take your hands off the coarse focus knob. The specimen is now almost in focus. Look into the eyepieces and rotate the fine focus knob in the direction that lowers the stage.



Raise the stage until this distance is slightly smaller than the working distance.



Lower the stage with the fine focus knob to find the focal point.

Method 2:

Swing the 40x objective into the optical path. While looking at the microscope from the side, rotate the coarse focus knob until the specimen almost touches the objective (about 0.5 mm apart from the front of the objective). The specimen is now almost in focus. Switch to the 10x objective, look into the eyepieces, and rotate the fine focus knob slightly to find the focal point. Be careful not to hit the objective with the specimen.

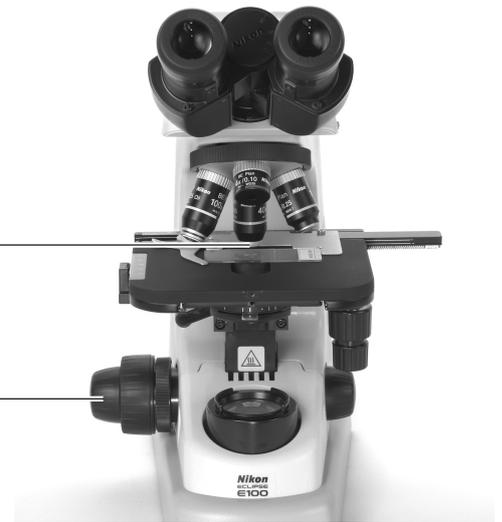
6) Eyepiece Diopter Adjustments

Adjust the diopter ring on the eyepiece tube according to the difference between your left and right eyesight. This adjustment enables the user to take full advantage of the high-quality objectives, including their parfocality.

- (1) Swing the 40x objective in the optical path. Rotate the coarse and then fine focus knobs to bring the specimen in focus.**

Switch to the 40x.

Focus with this knob.



- (2) Switch back to the 10x (or 4x) objective. While looking into the right eyepiece with your right eye, focus on the specimen by rotating the right diopter ring and not using the focus knob.**

Use your right eye. Switch back to the 10x.

And focus with this ring.



- (3) While looking into the left eyepiece with your left eye, focus on the specimen by rotating the left diopter ring and not using the focus knob.**

Use your left eye. Hold the 10x.

Then focus with this ring



- (4) Repeat the steps (1) to (3).**

7) Condenser Vertical Position Adjustment

Use the condenser vertical motion lever to move up the condenser till it touches the limit. Then, slightly lower the condenser. If you should see the diffuser image on the viewfield background, slightly move up or down the condenser till the diffuser image disappears.

Condenser vertical motion lever



8) Objective Selection

Rotate the revolving nosepiece to the desired objective magnification. (The objective will click into place when rotated into position.)

Adjust the aperture diaphragm lever according to the selected objective (see the procedure 9)).

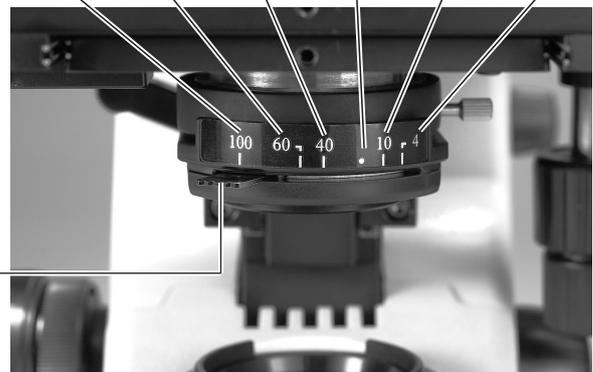
9) Aperture Diaphragm Adjustment

Set the condenser aperture diaphragm lever to the same figure as the magnification of the objective in the optical path.

Corresponding objective magnification

100× 60× 40× 20× 10× 4×

Aperture diaphragm lever



Try!!

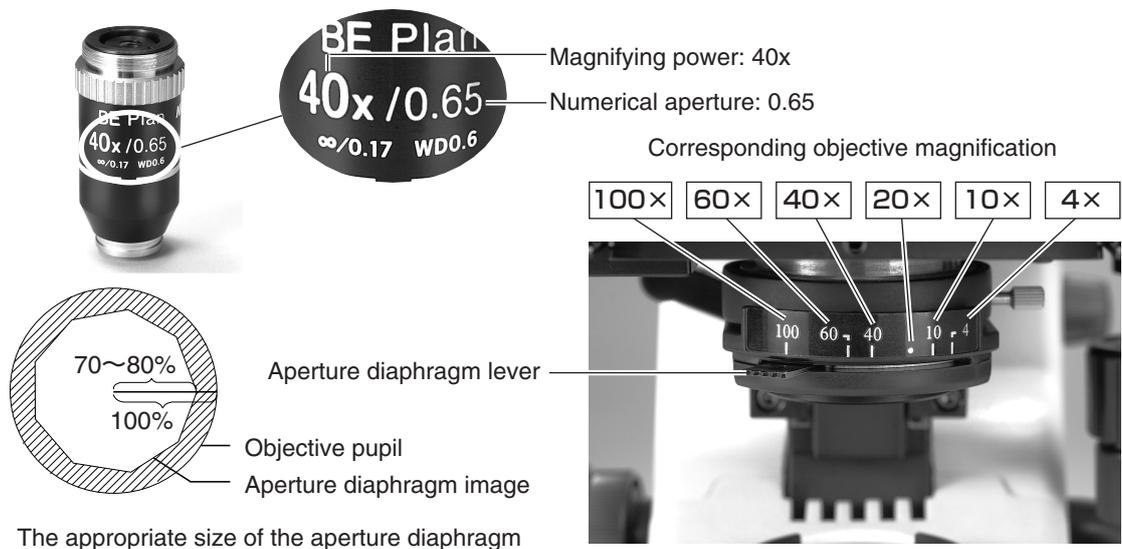
Adjusting the Aperture Diaphragm

The aperture size is increased or decreased by rotating the condenser aperture diaphragm lever. If the aperture diaphragm is closed, the brightness and resolution are decreased but the contrast and range of focus are increased. If the aperture diaphragm is opened, the brightness and resolution are increased but the contrast and range of focus are decreased.

Generally, a good image of sufficient contrast can be achieved with the aperture diaphragm closed to approximately 70% - 80% of the objective's numerical aperture. Since the image resolution will be degraded when the aperture diaphragm is closed too much, do not close the aperture diaphragm to less than 60% of the objective's numerical aperture except when observing a specimen with low contrast, such as a near-transparent specimen.

The aperture diaphragm controls the numerical aperture of the illumination. Do not use it to control brightness. Use the brightness control dial to control the brightness.

- The objective's numerical aperture is indicated on the side of the objective.
40x / 0.65 = magnifying power 40x, numerical aperture 0.65
- To observe the diaphragm image, remove the eyepiece and look down the open tube. (The eyepiece is fastened to the eyepiece tube. Loosen the screw before removing the eyepiece.)
- The figures on the condenser show the approximate positions of the aperture diaphragm lever corresponding to each objective magnification. (When the aperture diaphragm lever is moved to that position, the size of the aperture diaphragm will be 70% - 80% of the objective's numerical aperture.) Each time you switch the objective, align the aperture diaphragm lever to the same figure as the magnifying power of the objective to get a good image with sufficient contrast.



10) Turning Off the Lamp

Turning off the power switch (turn to ○) switches off the lamp.

When storing the microscope:

- Unplug the power cord.
- Wait until the field lens unit is cool enough to touch.
- Cover the microscope with the vinyl dust cover. (Before covering the microscope, make sure that the field lens unit is cool enough to touch.)
- When carrying the microscope, hold it at its arm and the bottom of its base.



Miscellaneous Operations

1

Oil-Immersion Observation

The “Oil” mark on the side of an objective indicates that it is an oil-immersion type objective. (The oil-immersion objective also has a black band around the barrel end.) An oil-immersion objective is used with the immersion oil applied between the front of the objective and the coverglass. For an oil-immersion objective with a numerical aperture of 1.0 or more, use of an oil-immersion type condenser is required to take full advantage of its performance. An oil-immersion type condenser, like an oil-immersion type objective, needs immersion oil to be applied between the front of the condenser and the coverglass.

The abbe condenser included in the bright viewfield set can be used for oil immersion observation.

● Example of Oil-Immersion

Condenser:

Move the specimen toward the back and lower the condenser slightly. Add a drop of oil on the front of the condenser from the long hole on the stage. Bring the specimen back over the condenser and slowly raise the condenser.

Objective:

Rotate the revolving nosepiece to move the objective out of position. Add a drop of oil to the specimen. Slowly rotate the revolving nosepiece to bring the objective back into position.



● Eliminate Air Bubbles

Make sure that air bubbles are not trapped during oil application. Air bubbles degrade the image. To see if any air bubbles are trapped in the oil, remove one eyepiece and fully open the aperture diaphragm. Look into the eyepiece tube and check the objective pupil (a bright round part). If you cannot see it well, replace one of the eyepieces with the centering telescope (optional) and look through the eyepieces of the centering telescope while rotating the eyepiece part of the centering telescope.

Do any of the following to eliminate air bubbles:

- Rotate the revolving nosepiece to move the objective back and forth.
- Gently move the condenser vertical motion lever to move the condenser up and down.
- Add another drop of oil.
- Wipe off the oil and apply again.

● Handling of the Immersion Oil

Use a minimum quantity of oil. If too much oil is applied, surplus oil could flow out onto the stage and the condenser and degrade performance.

After completing oil-immersion observation, be sure to clean the objective, condenser, and any other parts that may be stained by oil. Any oil residue left on the lenses of oil-immersion type objectives or adhesion of oils on the front lens of dry type objectives will degrade image quality. Use petroleum benzine to wipe off oil and finish with absolute alcohol (ethyl or methyl alcohol). If petroleum benzine is not available, use methyl alcohol instead. In that case, wipe off the oil several times (generally 3 or 4 times) as the detergency of methyl alcohol is weaker than petroleum benzine.



WARNING

When handling petroleum benzine and absolute alcohol, be sure to follow the instructions provided by the manufacturers. Since they are highly inflammable take great care when handling them.

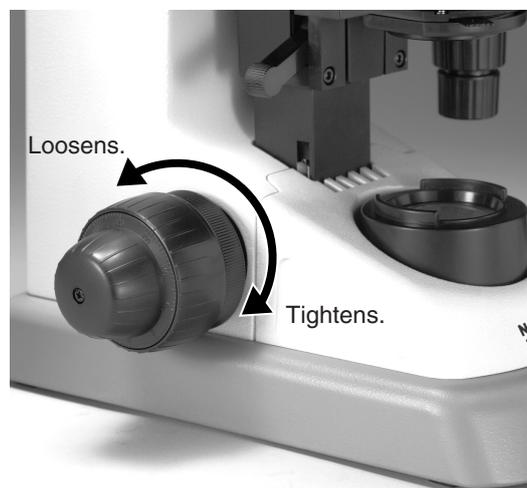
● Cautions on Handling the Immersion Oil

- Close the container cap tightly after use. Make sure that the cap is closed tight after refilling the container. Check the cap periodically to make sure it has not come loose, allowing oil to leak out.
- Do not press the container hard. Oil could splash out.
- If you find an oil drips around the container, wipe them off.
- Avoid contact of immersion oil with eyes or skin. In the event of contact with eyes or skin, take one of the following measures although Nikon immersion oil does not contain any toxic ingredients.
 - ◇ **Contact with skin: Rinse your skin thoroughly with soap and water.**
 - ◇ **Contact with eye: Rinse your eye thoroughly with water (more than 15 minutes) and see a doctor.**
- Do not leave immersion oil in the sun (ultraviolet rays can damage it).

2

Adjusting the Torque of the Coarse Focus Knob

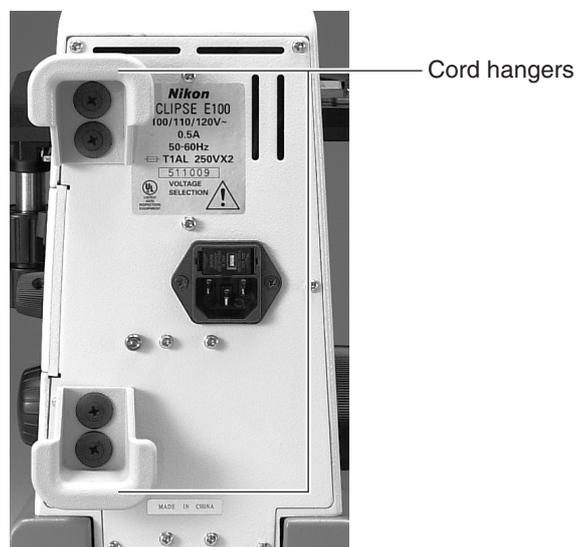
The tension (torque) of the coarse focus knob rotation can be adjusted. To increase the tension, turn the coarse focus knob torque adjustment ring counterclockwise. The torque adjustment ring is located at the back of the coarse focus knob. To decrease the tension, turn the ring clockwise. Do not decrease the tension too much. If it is too loose, the stage will fall under its own weight.

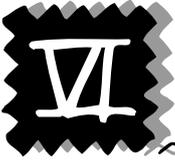


3

Cord Hangers

Push the cord hangers (optional) into the holes on the rear of the microscope. The hangers can be used for winding the power cord around when the microscope is not in use. To remove the hangers, use a screwdriver.





Assembly

Read the “Common Sense Safety Instructions” in this manual before assembling the microscope. Be sure to follow the instructions written therein. Also, make sure that the power switch is off (turned to ○) before assembly to prevent electrical shock.

Tools Required for Assembly

Hexagonal wrench (one hexagonal wrench is provided with the microscope and the eyepiece tube), flatblade precision screwdriver

Assembly of Standard Set

1) Input Voltage Check

The input voltage is indicated in two places at the rear of the microscope: on the nameplate and above the AC-IN socket. Confirm that these input voltage indications correspond to the voltage provided in your region. If not, follow one of the instructions below. The use of microscopes with the different input voltage indications will cause overcurrent and overheating, which may result in fire or severe damage to the microscope.

- **If the voltage indication on the nameplate differs:**

Do not plug in the microscope. Contact your nearest Nikon representative.

- **If the voltage indication above the AC-IN socket differs:**

Change the input voltage setting before turning on the power switch.

- For the microscope with the nameplate showing [100/110/120 V ~]:
The voltage can be set to: AC 100 V, 110 V or 120 V.
- For the microscope with the nameplate showing [220/230/240 V ~]:
The voltage can be set to: AC 220 V, 230 V or 240 V.

- **Changing the Voltage Setting**

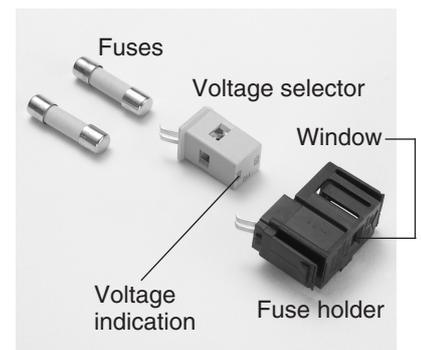
- (1) Turn off the power switch (turn to ○) and unplug the power cord.
- (2) Remove the fuse holder using the flatblade precision screwdriver. (Use the tip of the screwdriver to push the two lock plates toward the center of the fuse holder. The fuse holder pops out from the AC -IN socket.)
- (3) Wear gloves and remove two fuses and the voltage selector from the fuse holder.
- (4) Attach the voltage selector to the fuse holder so that the indication of the voltage provided in your region appears in the window of the fuse holder.
- (5) Put the fuses and the fuse holder back in place. Be sure to push both sides of the fuse holder firmly till it clicks into place.



Input Voltage Indications



Lock plate



2) Removal of Shipping Clamps

The stage top plate and focusing mechanism are clamped for protection against vibration and shocks during transportation. Remove these shipping clamps with the hexagonal wrench provided.

- **Stage Top Plate:**

The top plate of the stage is retained in the Y-axis direction by a plate fastened with two bolts. Remove the bolts and the plate.

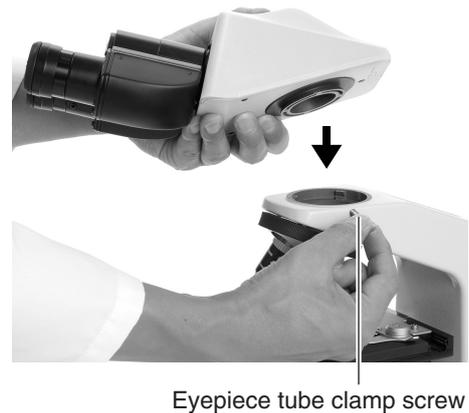
- **Focusing Mechanism:**

Remove the field lens unit to expose a plate retaining the vertical movement of the focusing mechanism. The plate is fastened with 3 bolts. Remove the bolts and the plate.



3) Installing the Eyepiece Tube

Loosen the eyepiece tube clamp screw by hand and place the eyepiece tube on the circular dovetail mount. Tighten up the eyepiece tube clamp screw by hand.

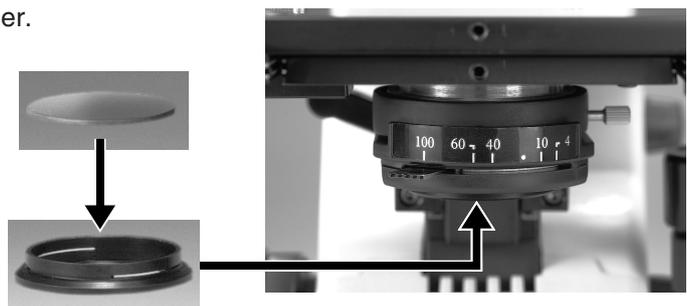


CAUTION

When detaching the eyepiece tube, hold it firmly with your hand to prevent it from falling and loosen the clamp screw.

4) Attaching the Blue Filter

Remove the filter holder from the bottom of the condenser. Put the blue filter in the holder and return the holder to the condenser.



5) Connecting the Power Cord

Turn off the power switch of the microscope (turn to ○). Connect one end (socket) of the supplied power cord to the AC-IN socket on the rear of the microscope. Connect the other end (plug) to an AC line receptacle with the ground conductor (earth conductor). Make sure that the power cord is securely connected.

- Note that the microscope should be installed near the AC line receptacle and the AC line receptacle should be placed within your reach.
- Use the power cord provided. The use of other cords may damage the instrument or cause a fire hazard.
- If using an extension cord, use only a cord that includes a protective earth (PE) wire.

This completes the assembly of the microscope standard set.

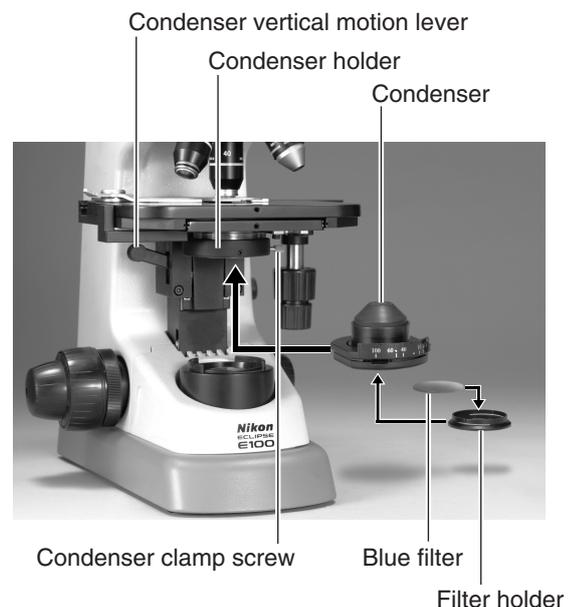
2

Assembly of Additional Components

1) Condenser

The condenser is attached to the microscope before shipment. When removing or replacing the condenser, follow the procedure below.

- (1) Lower the condenser holder a little by the condenser vertical motion lever.
- (2) Put the magnifying power indication ring on the condenser. Then, slide the condenser into the condenser holder.
- (3) Position the condenser with its nameplate facing front. Tighten the condenser clamp screw located to the right.
- (4) Raise the condenser holder to its full limit by the condenser vertical motion lever.
- (5) Place the blue filter in the filter holder and insert them into the bottom of the condenser.
- (6) Slightly lower the condenser so that light passing through the condenser focus the image on the correct position of the specimen (center of the optical path). If the diffuser image is seen on the viewfield, slightly raise or lower the condenser till the diffuser image is gone.



2) Objectives

Objectives are attached to the microscope before shipment.

When replacing an objective, remove the specimen from the stage and lower the stage. Remove the objective holding it with both hands. Be careful not to drop the objective. Screw a new objective into the revolving nosepiece. Set the objectives in such an order that the objective magnification increases as the revolving nosepiece is turned clockwise (as viewed from the top of the microscope).

3) Specimen Holder

The specimen holder is attached to the stage before shipment.

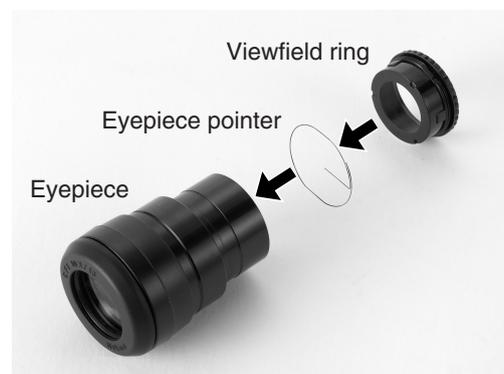
When removing the holder, loosen the two hexagonal socket head bolts furthest from the specimen using the hexagonal wrench provided.

4) Eyepiece and Eyepiece Pointer

The 10x eyepieces are attached to the eyepiece tube before shipment. When removing an eyepiece, loosen the eyepiece set screws using the hexagonal wrench provided and then remove the eyepiece. When attaching an eyepiece, push the eyepiece down to its full limit and tighten up the set screw. Be careful not to tighten too hard.

When changing to a 15x eyepiece (optional), be sure to change both the right and left eyepieces together. The right and left eyepieces should be of the same magnification.

The eyepiece pointer (optional) serves as a reference for pointing out the specimen. Attach the pointer to one of the eyepieces. Rotate and remove the viewfield ring from the eyepiece end. Attach the eyepiece pointer to the eyepiece and then put back the viewfield ring.



5) Other Accessories

For installation of other accessories such as the photomicrographic equipment, see the manual provided for each product.

3

Replacement of Consumable Materials

1) Replacing the Lamp



WARNING

- To avoid electrical shock or damage to the instrument, turn off the power switch (turn to ○) and unplug the power cord before lamp replacement.
- Use the specified lamp. Using a different kind of lamp may damage the instrument or cause a fire hazard.

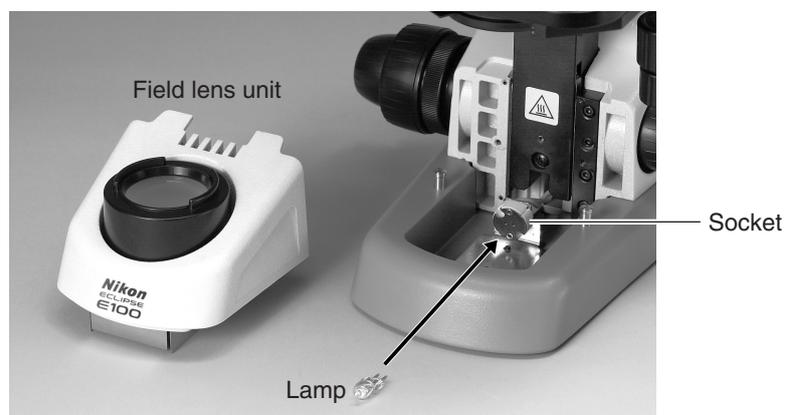
Specified Lamp: Halogen lamp 6V-20W (PHILIPS 7388 or OSRAM HLX 64250)



CAUTION

- The lamp is hot when in use. To avoid burn injury, turn off the microscope and wait at least 30 minutes (until the lamp is cool enough to touch) before attempting to change the lamp.
- Make sure that the contacts of the lamp and socket are not damaged before installing a new lamp. If the contacts are damaged, they may cause poor illumination or overheating.
- Insert the lamp's contact pins fully into the socket holes. If the pins are loose, the lamp could come loose or result in a contact failure, which will cause overheating or smoke.
- Be sure to put the field lens unit back in place after replacing the lamp. Never turn on the lamp without the field lens unit.
- Do not touch the glass part of the lamp using your bare hands. Wear gloves or use a cloth when handling the lamp to protect the surface from fingerprints. Wipe off any fingerprints or stains using a clean cloth moistened with alcohol. Fingerprints will etch into the hot surface of the lamp and reduce the brightness, damage the lamp or reduce its service life.
- Handle the lamp gently. Shocks and vibrations will damage the lamp or reduce its service life.

- (1) Turn off the power switch (turn to ○) and unplug the power cord.
- (2) Wait about 30 minutes until the lamp and its surroundings are cool enough to touch.
- (3) Hold the field lens unit at the dents on both sides and pull it upward slowly while slightly moving laterally to remove it.
- (4) Remove the old lamp.
- (5) Hold a new lamp wearing gloves or using a cloth. Insert the lamp's contact pins fully into the socket holes straight and securely.
- (6) Put the field lens unit back in place.
- (7) Plug the power cord.



2) Replacing the Fuse



WARNING

- To avoid electrical shock or damage to the instrument, turn off the power switch (turn to ○) and unplug the power cord before replacing the fuse.
- Use the specified fuse. Using a different fuse may damage the instrument or cause a fire hazard.

Specified Fuse:

- For the microscope with the nameplate showing [100/110/120 V]:
250 V, 1 A, time-lag low-breaking type, 5X20 miniature fuses (two pieces)
- For the microscope with the nameplate showing [220/230/240 V]:
250 V, 0.5 A, time-lag low-breaking type, 5X20 miniature fuses (two pieces)



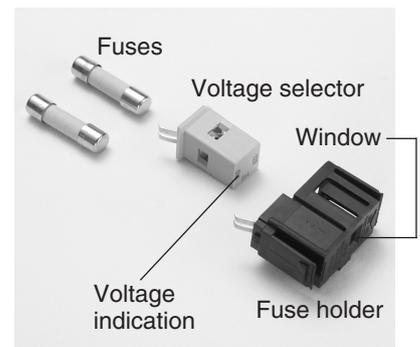
CAUTION

- Make sure that the contact of the fuse is not damaged before installing a new fuse. If the contact is damaged, a malfunction or overheating may result.
- Attach the fuse to the fuse holder securely. If not, the fuse may come loose or a contact failure may occur, resulting in overheating or smoke.
- Put back the fuse holder securely to its original position.

- (1) Turn off the power switch (turn to ○) and unplug the power cord.
- (2) Remove the fuse holder using the flatblade precision screwdriver. (Use the tip of the screwdriver to push the two lock plates toward the center of the fuse holder. The fuse folder pops out from the AC -IN socket.)
- (3) Wear gloves and remove two fuses and the voltage selector from the fuse holder.
- (4) Attach the voltage selector to the fuse holder so that the indication of the voltage provided in your region appears in the window of the fuse holder.
- (5) Put the fuses and the fuse holder back in place. Be sure to push both sides of the fuse holder firmly till it clicks into place.



Lock plate





Optical Characteristics

Combinations of 10x (Field No. 18) Eyepiece with Objectives

1

Objective Magnification	Total Magnification	Numerical Aperture	Real Viewfield	Depth of Focus	Resolving Power	Working Distance
4×	40×	0.10	4.5 mm	63.2 μm	2.8 μm	25 mm
10×	100×	0.25	1.8 mm	10.1 μm	1.1 μm	5.6 mm
40×	400×	0.65	0.45 mm	1.2 μm	0.4 μm	0.6 mm
60×	600×	0.80	0.3 mm	0.7 μm	0.3 μm	0.24 mm
100×	1000×	1.25	0.18 mm	0.4 μm	0.2 μm	0.14 mm

Microscope Terminology

2

(1) Total Magnification

The total magnification of a microscope is the individual magnifying power of the objective multiplied by that of the eyepiece.

(2) Numerical aperture (N.A.)

The numerical aperture is an important factor in determining the efficiency of the condenser and objective. It is represented by the formula:

$$\text{N.A.} = n \sin \alpha$$

where n is the refractive index of the medium (air, immersion oil, etc.) between the objective lens and the specimen or condenser, and α is half of the maximum angle at which light enters or leaves the lens from or to a focused object point on the optical axis.

The larger the numerical aperture the brighter the image and the higher the resolution.

(3) Resolving Power

The ability of an optical system to discriminate between two discrete objects separated by a minute distance. The more minute the distance, the higher the resolving power of the optical system. In relation to the numerical aperture, the resolving power is represented by the following formula:

$$\text{Resolving power} = \frac{\lambda}{2 \times \text{N.A.}}$$

where λ is the used wavelength of light. (The resolving power in the above table is indicated for $\lambda = 0.55 \mu\text{m}$.)

(4) Working Distance (W.D.)

The clearance between the front of the objective and the upper surface of the coverglass, when a specimen image is sharply focused. Generally, the higher the magnifying power of the objective, the shorter the working distance.

(5) Field Number of the Eyepiece

The diameter of the opening of the fieldstop inside the eyepiece measured in mm.

When an eyepiece has an indication of "10x / 18", it means that the magnification is 10x and the field number is 18 for that eyepiece.

(6) Real Viewfield

The diameter in mm of the field of view observable through the eyepiece.

Real viewfield = field number of eyepiece / magnification of objective

(7) Depth of Focus

The depth (thickness) of the specimen image in focus, extending above and below the focused image plane. The larger the N.A. of the objective, the shallower the depth of focus.

$$\text{Depth of focus } (\mu\text{m}) = \frac{n\lambda}{2 \times \text{N.A.}^2} + \frac{n}{7 \times M \times \text{N.A.}} \times 1000$$

Above is an approximation assuming the resolving power of an eye as 2 minutes.

λ is the wavelength of light used. (The depth of focus in the table on P. 33 is indicated for $\lambda = 0.55 \mu\text{m}$.)

n is the refractive index of a medium between the objective lens and the specimen or condenser. ($n = 1$, when the medium is air, and $n = \text{about } 1.5$ when the medium is oil.)

M is the total magnification (= the individual magnifying power of the objective x that of the eyepiece).



Troubleshooting Tables

If difficulties should be encountered in the course of operation, please recheck the symptoms, referring to the tables below, before contacting your nearest Nikon representative.

1

Optical

Troubles	Causes	Corrective Measures
Darkness at the periphery, no viewfield seen, or uneven viewfield brightness.	Revolving nosepiece not in click-stop position (objective not centered in the optical path).	Revolve to click-stop position (swing the objective correctly into the optical path).
	Condenser position too low.	Position the condenser slightly lower than the upper limit. (P. 19)
	Condenser not installed correctly.	Install correctly. (P. 28)
	Field lens unit not installed correctly.	Install correctly. (P. 31)
	Lamp not installed correctly.	Install correctly. (P. 31)
	Dirt or dust on the lens (condenser, objective, field lens, eyepiece, specimen).	Clean the lens. (P. 40)
	Optical-path selection lever in the intermediate position (on trinocular eyepiece tube).	Properly set to binocular 100%. (P. 24)
	Optical-path selection lever not set to binocular 100%.	
Dirt or dust in the viewfield.	Condenser position too low or too high.	Position the condenser slightly lower than the upper limit. (P. 19)
	Aperture diaphragm closed too far.	Open properly. (P. 20)
	Dirt or dust on the lens (condenser, objective, field lens, eyepiece, specimen).	Clean the lens. (P. 40)

Troubles	Causes	Corrective Measures
Poor image quality (low resolution, contrast too low or too high)	Condenser position too low.	Position the condenser slightly lower than the upper limit. (P. 19)
	Coverglass too thick or thin.	Use a coverglass of the specified thickness (0.17 mm).
	No coverglass attached to the slide.	
	Slide upside down.	Turn over the slide so that the coverglass faces up.
	No immersion oil used on the front lens of the oil-immersion objective.	Apply Nikon immersion oil to the objective. (P. 22)
	Nikon immersion oil is not used for oil-immersion observation.	
	Air bubbles in immersion oil.	Remove bubbles. (P. 22)
	Immersion oil found on dry type objective (especially 40x and 60x objective).	Clean the objective. (P. 40)
	Aperture diaphragm opened or closed too far.	Close or open properly. (P. 19, 20)
	Correction ring on the objective not adjusted (only for the objective with the correction ring).	Adjust the ring according to the cover glass thickness.
	Dust or dirt on the eyepieces, objective or condenser.	Clean them. (P. 40)
	No-cover-glass-objective is used for the specimen with the cover glass.	Use the ordinary objective for cover glassed specimen.
	The ordinary objective is used for the specimen without the cover glass.	Use the no-cover-glass-objective. Note: Indication on the objective. 160/0.17: For cover glassed specimen. 160/0: For no cover glassed specimen. 160/- : For both cover glassed and no cover glassed specimen.

Troubles	Causes	Corrective Measures
Image dark on one side.	Revolving nosepiece not in click-stop position.	Revolve to click-stop position.
	Specimen rises from stage surface.	Stabilize it using the holder.
Image shifts during focus.	Revolving nosepiece not in click-stop position.	Revolve to click-stop position.
	Specimen rises from stage surface.	Stabilize it using the holder.
	Field lens unit not installed correctly.	Install correctly. (P. 31)
Image tinged yellow.	Blue filter not used.	Use blue filter. (P. 27)
	Lamp voltage too low.	Adjust the voltage by rotating the brightness control dial. (P. 14)
Image too bright.	Lamp voltage too high.	Adjust the voltage by rotating the brightness control dial. (P. 14)
Insufficient brightness.	Lamp voltage too low.	Adjust the voltage by rotating the brightness control dial. (P. 14)
	Aperture diaphragm closed too far.	Open properly. (P. 20)
	Condenser position too low.	Position the condenser slightly lower than the upper limit. (P. 19)
	Incorrect input voltage.	Using the voltage selector, select the voltage that corresponds to the voltage provided in your region. (P. 26)

(Also see the causes and corrective measures for electrical problems.)

2

Mechanical Problems

Troubles	Causes	Corrective Measures
Image cannot be focused with high-power objectives.	Slide upside down.	Turn over the slide so that the cover glass faces up.
	Cover glass too thick.	Use a cover glass of the specified thickness (0.17 mm).
High-power objective contacts slide when changed over from low power.	Slide upside down.	Turn over the slide so that the cover glass faces up.
	Cover glass too thick.	Use a cover glass of the specified thickness (0.17 mm).
	Diopter not adjusted correctly.	Adjust. (P. 18)
	Objectives being loose. Note: Do not switch the objective directly to 60x (or 100x) from 4x. Always focus on the specimen with 10X objective before switching to high magnification objectives.	Screw onto the revolving nosepiece securely.
Difference in focal point too large when switching from one objective to another.	Diopter not adjusted correctly.	Adjust. (P. 18)
	Objectives being loose.	Screw onto the revolving nosepiece securely.
Specimen image jumps when specimen is moved by the stage.	Specimen holder not securely fastened to the stage.	Fasten securely. (P. 29)
Binocular images not integrated.	Interpupillary distance not adjusted correctly.	Adjust. (P. 14)
	Diopter not adjusted correctly.	Adjust. (P. 18)
Excessive eye fatigue.	Interpupillary distance not adjusted correctly.	Adjust. (P. 14)
	Diopter not adjusted correctly.	Adjust. (P. 18)
	Inadequate brightness or illumination.	Adjust brightness using the control dial. (P. 14)

3

Electrical Problems

Troubles	Causes	Corrective Measures
Lamp does not light when switched on.	No electrical power.	Check power cord connection. (P. 28)
	Power cord not connected to the microscope.	Connect the power cord to the AC-IN socket. (P. 28)
	Lamp bulb not inserted.	Insert correctly. (P. 30)
	Lamp bulb burnt out.	Replace bulb. (P. 30)
	Incorrect lamp used.	Use the specified lamp. (P. 30)
	Fuse blown out.	Replace fuse. (P. 31)
Flickering or unstable lamp brightness.	Lamp bulb about to fail.	Replace bulb. (P. 30)
	Power cord not correctly connected.	Connect correctly. (P. 28)
	Bulb not correctly inserted into socket.	Insert correctly. (P. 30)
Sudden lamp failure.	Incorrect lamp used.	Use the specified lamp. (P. 30)
	Incorrect input voltage.	Select the voltage that corresponds to the voltage provided in your region using the voltage selector. (P. 26)



Care and Maintenance

1

Cleaning the Lenses

- Dust is best removed using a soft brush or gauze.
- More persistent dirt, such as fingerprints, grease and oil, may be removed with lens tissue (or soft cotton, gauze) lightly moistened with absolute alcohol (anhydrous ethyl alcohol or methyl alcohol; do not use rubbing alcohol).
- To clean immersion oil off the oil-immersion type objective, use lens tissue, soft cotton or gauze lightly moistened with petroleum benzene. If petroleum benzene is not available, use methyl alcohol. In this case, you need to wipe three or four times because the detergency of the methyl alcohol is somewhat weak.
- Absolute alcohol and petroleum benzene are quite inflammable. Take great care when handling them and when turning the power switch on and off. Be very careful with fire.

2

Cleaning the Microscope

- Avoid using organic solvents (such as alcohol, ether, thinner, etc.) to clean the microscope. Doing so could result in discoloration of the painted or plastic parts or in peeling of the printed characters.
- We recommend that you use a silicon cloth to wipe down the painted or plastic parts of the microscope.
- More persistent dirt may be cleaned using gauze lightly moistened with mild detergent solution.

3

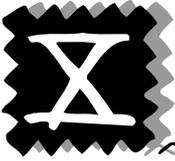
When Not in Use

- When the microscope is not in use, cover with the vinyl dust cover, and store it in a dry place where mold is not likely to form.
- Make sure that the power switch is off (turned to ○) and the lamp is cool enough to touch before covering with the vinyl dust cover.
- We especially recommend that the objectives and eyepieces be kept in a container (such as a desiccator) with desiccant in it.

4

Periodical Inspections

- To maintain the performance of the microscope, periodical inspections and maintenance are recommended.
- For details, contact your nearest Nikon representative.



Specifications

- (1) **Model Name:** ECLIPSE E100 (Microscope basic unit)
- (2) **Optical System:** CFI optical system (infinity - corrected CF optical system)
2nd objective lens focal length : $f = 200$ mm
Built-in diascope illumination system (Simplified Kohler's illumination system)
- (3) **Focusing Mechanism:** Fine focus knob graduation: $2 \mu\text{m}/\text{graduation}$
Fine focus knob travel: 0.2 mm up or down / revolution
Coarse focus knob travel: about 37.7 mm up or down / revolution
Stage vertical movable range: 2 mm upward and 20 mm downward from the focal plane.

- (4) **Stage:** Stroke: X axis: 78 mm
Y axis: 40 mm

- (5) **Revolving Nosepiece:** 4-hole fixed type

(6) Electrical Specifications

- **Lamp Rating:** Halogen lamp 6V-20W (PHILIPS 7388 or OSRAM HLX 64250)
- **Output Rating:** 6V 3.3A max.
- **Input Rating:** **Model for 100, 110, and 120 V AC Areas**
 - Input voltage: Select from 100 V, 110 V or 120 V AC by relocating the fuse holder in the AC inlet.
 - Frequency: 50 - 60 Hz
 - Voltage fluctuation: $\pm 10\%$
 - Rated current: 0.5 A
 - Fuse rating: 250 V, 1A, time-lag low-breaking type, 5 x 20 miniature fuse x 2
 - Power Cord: Use only the following power supply cord. Using the wrong power cord could result in danger or fire. The protection Class I equipment should be connected to PE (protective earth) terminal.
 - UL listed detachable power cord set. 3-conductor grounding type SVT, No.18 AWG, 3 m long maximum, rated at 125 V AC minimum.

Model for 220, 230, 240 V AC Areas

- Input voltage: Select from 220 V, 230 V or 240 V AC by relocating the fuse holder in the AC inlet.
- Frequency: 50 - 60 Hz
- Voltage fluctuation: $\pm 10\%$
- Rated current: 0.3 A
- Fuse rating: 250 V, 0.5A, time-lag low-breaking type, 5 x 20 miniature fuse x 2
- Power Cord: Use only the following power supply cord. Using the wrong power cord could result in danger or fire. The protection Class I equipment should be connected to PE (protective earth) terminal.
 - Approved according to EU/EN standards, 3 conductor grounding Type H05VV-F, 3 m long maximum, rated at 250 V AC minimum.

• **Protection Class:** Class I

(7) Operating Environment

- Room Temperature: 0° to 40°C
- Relative Humidity: 85% Max. No condensation should form.
- Altitude: 2000m Max.
- Pollution: Degree 2
- Installation Category (Overvoltage Category): Category 2
- For indoor use only.

(8) Storage Environment

- Room Temperature: -20° to 60°C
- Relative Humidity: 90% Max. No condensation should form.

(9) Conforming Standards

- The model for 100, 110, and 120 V areas is a UL-listed product.
- The model for 220, 230, and 240 V areas satisfies the EU Low-Voltage Directive.
- The model for 220, 230, and 240 V areas satisfies the EU EMC Directive.



(The model for 100, 110, and 120 V areas is not covered by the FCC.)