

Nikon

Microscope
ECLIPSE E800
Instructions

Thank you for purchasing this Nikon product. This instruction manual is written for users of the Nikon Microscope ECLIPSE E800. To ensure correct usage read this manual carefully before operating the instrument.

- It is prohibited to alter this manual in part or whole without expressed permission.
- The contents of this manual are subject to change without any notice.
- Although every effort has been made to ensure the accuracy of this manual, if you note any points that are unclear or incorrect, contact your nearest Nikon representative.
- Also be sure to read the instruction manual for the power supply that you are using, either the V-PS100DU, or the V-PS100E.

Warning/Caution Symbols in This Manual

Though Nikon products are designed to provide you utmost safety during use, incorrect usage or disregard of the instructions can cause personal injury or property damage. For your safety, read the instruction manual carefully and thoroughly before usage. Do not discard this manual but 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



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.



CAUTION

1. Check the light source

The power supplies V-PS100DU and V-PS100E provide the power for the halogen lamp that serves as the microscope light source. Although these power supplies can power a halogen lamp of up to 12 V/100 W, the specified lamp and lamphouse must be used. The equipment could be damaged if a non-specified combination of components is used.

Specified lamphouse : Nikon halogen lamphouse Model C-LP HALOGEN 12V100W
Specified lamp : Halogen lamp, 12 V-100 W LONGLIFE
OSRAM HLX 64623 or PHILIPS 7724

2. Turn off the power when connecting or disconnecting cables or when replacing the lamp

In order to prevent electric shock and damage to the equipment, always turn the power switch on the power supply off (flip it to the " " side) and unplug the power cord before connecting or disconnecting cables or replacing the lamp.

3. Cautions when replacing the lamp

In order to prevent burns, allow the lamp to cool (for at least thirty minutes after turning off the power) before replacing the lamp. Furthermore, in order to prevent electric shock and damage to the equipment, always turn the power switch on the power supply off (flip it to the " " side) and unplug the power cord before replacing the lamp.

After replacing the lamp, make sure that the lamphouse cover is securely closed.
Never use the lamphouse while its cover is open.

4. Do not wet

If the microscope or the power supply becomes wet, a short circuit may result and the equipment could be damaged or could become extremely hot. If you accidentally spill a liquid on the equipment, immediately turn the power switch on the power supply off (flip it to the " " side) and unplug the power cord. Then use a dry cloth to wipe away the moisture. If any liquid gets inside of the equipment, do not attempt to use it; instead, contact your nearest Nikon representative.

5. Weak electromagnetic waves

This microscope emits weak electromagnetic waves. The accuracy of any precision electronic equipment may be adversely affected if positioned near this microscope. If this microscope affects TV or radio reception, move the radio or TV away from the microscope.

6. Cautions concerning installation

Be careful not to pinch your hands or fingers when installing the microscope.

This microscope is a precision optical instrument, and using or storing it under unsuitable conditions may damage it or may have an adverse affect on its precision. See "Installation Location" on P.27, and use this microscope in a suitable environment.

7. Notes on transport

Because this microscope is a precision optical device, handle it carefully and do not subject it to strong physical shocks. (The precision of the objective in particular may be adversely affected by even weak physical shocks.)

When moving the microscope, first detach the lamphouse. Then have at least two people carry the microscope, at least one on each side, using the carrying handles.

Be sure to screw the carrying handles in as far as they will go and make sure that they are secure. If the carrying handles are not attached securely, they could come out or break while the microscope is being carried, creating a hazardous situation. Screw the carrying handles into the upper holes on the rear of the microscope. If you use the lower holes, your hands will be caught between the handles and the table when you place the microscope down. (P.27)

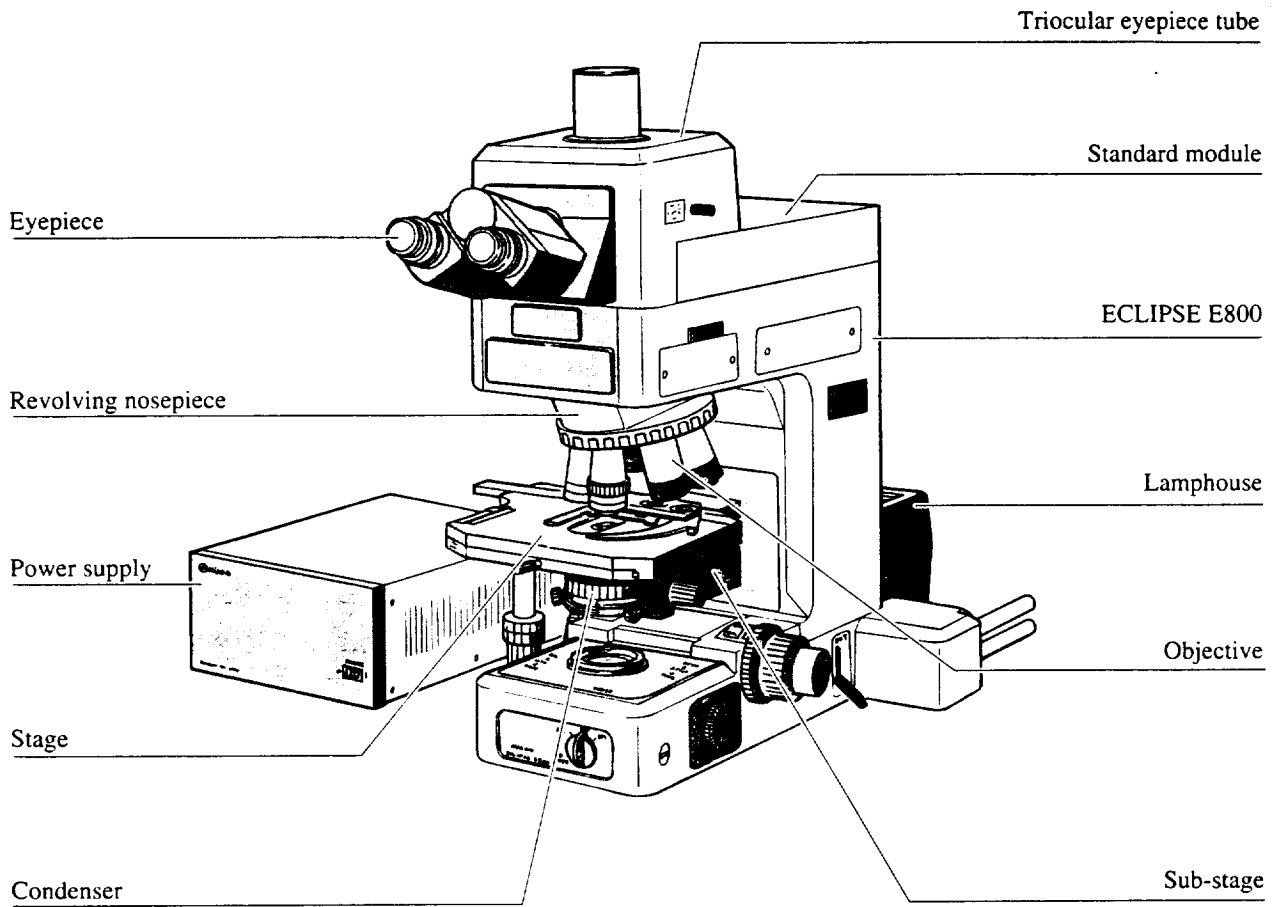
In addition, do not grasp the coarse focus knob, the fine focus knob, the eyepiece tube, the stage, etc., when carrying the microscope; there is a chance that the part could come off, and the equipment could be damaged.

1

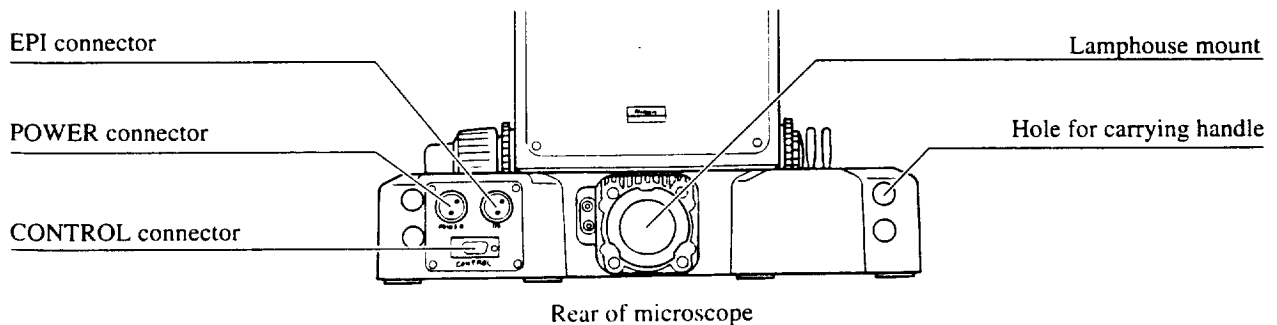
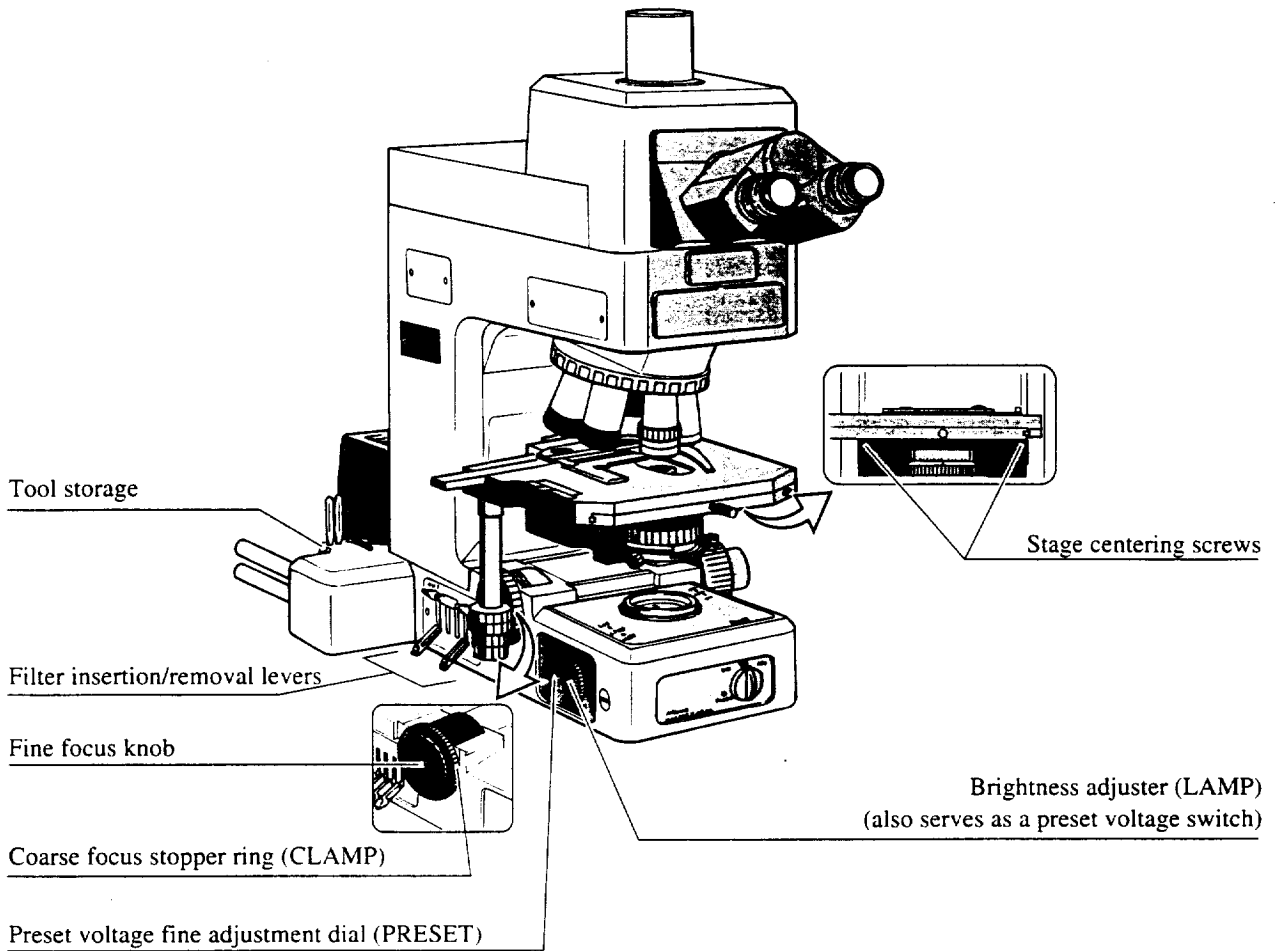
Names of Component Parts

See chapter "2. Names of Operational Parts" for the names of the parts that are used to operate the microscope.

If the microscope is not assembled yet, see chapter "5. Assembly" first.



2. Names of Operational Parts

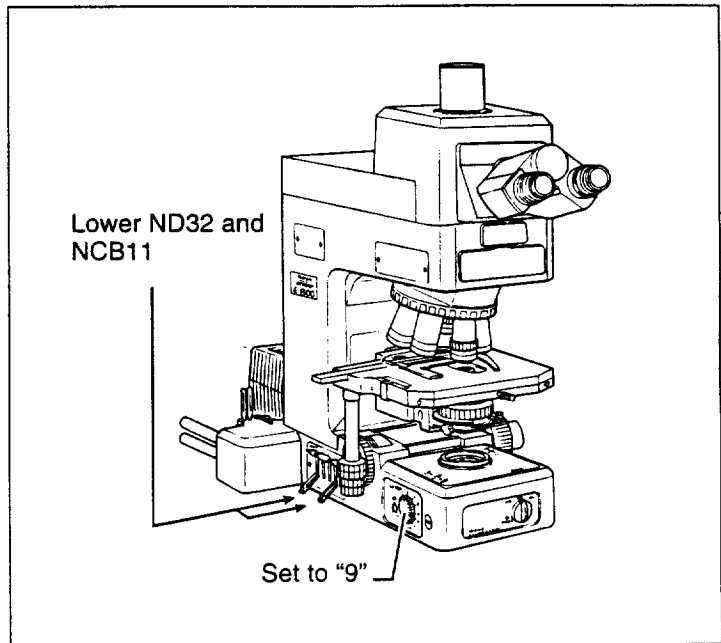


3 Set the brightness adjuster to "9".

This brightness provides the best color reproduction. (p. 23)

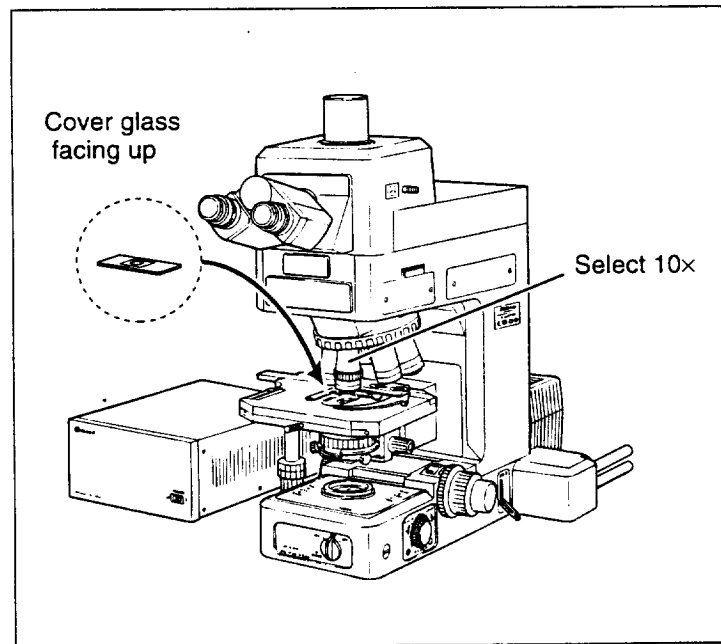
4 Insert filters ND32 and NCB11 into the optical path.

ND32: Reduces glare in the binocular eyepiece.
NCB11: Improves color reproduction. (p. 21)

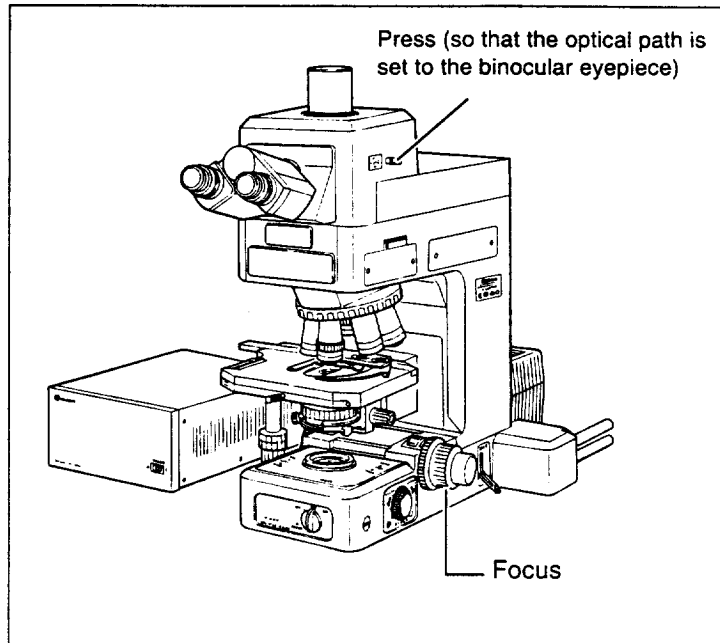


5 Move the 10× objective into the optical path. Rotate the revolving nosepiece until the 10× objective clicks into place.

6 Set the specimen in place with the cover glass facing up.



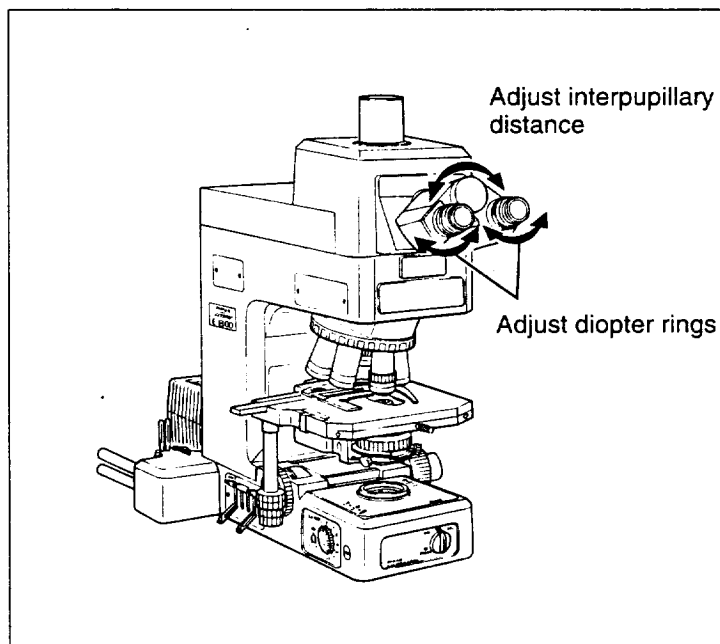
- 11** Set the optical path 100% to the binocular eyepiece. (p. 16)



- 12** Focus on the specimen. (p. 14)

- 13** Adjust the diopter rings for both eyepieces. (p. 16)

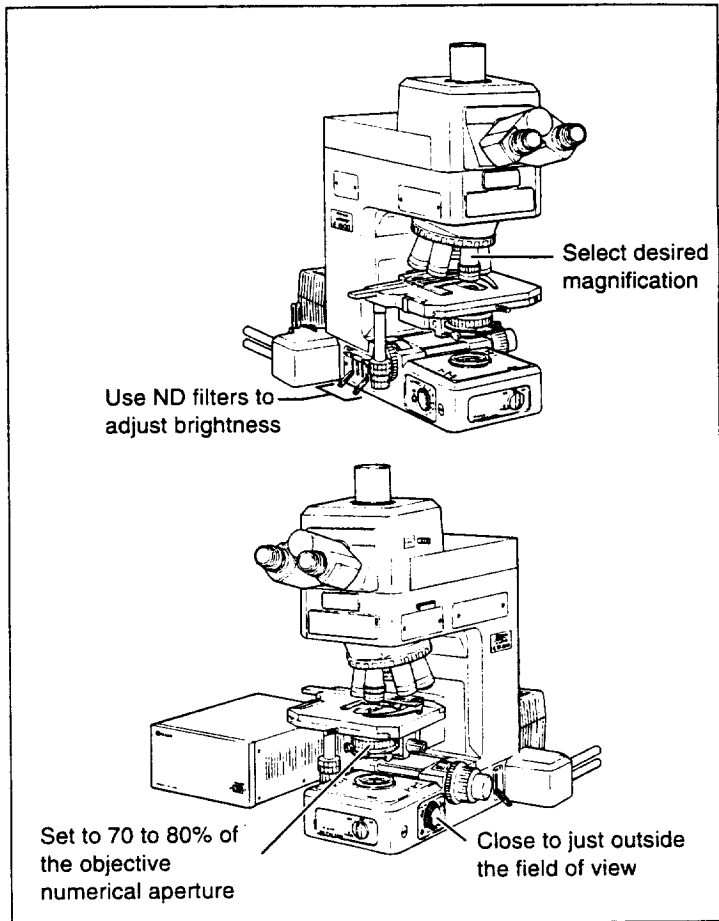
- 14** Adjust the interpupillary distance. (p. 17)



16

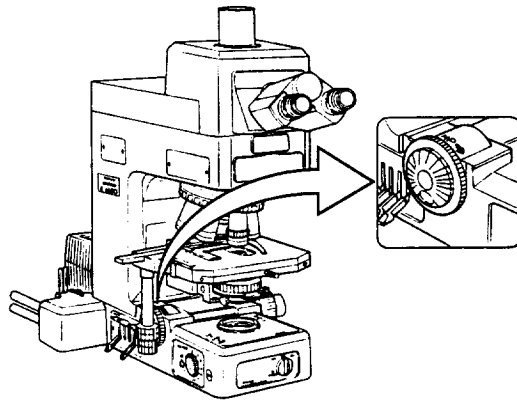
Switch to any desired objective and view the specimen.

- Re-adjust the focus.
- Use ND filters to adjust the brightness.
- Close the field diaphragm so that it is just outside the field of view.
- Close the condenser aperture diaphragm to about 70 to 80% of the objective numerical aperture. (p. 19)



- If a portion of the field of view is dark, try adjusting the condenser centering screws. If that does not resolve the problem, check the following items:
 - Filter insertion/removal (p. 21)
 - Positioning of the revolving nosepiece (p. 35)
 - Condenser focusing (p. 18)
 - Full opening of the field and aperture diaphragms (p. 19, 20)
 - Optical path selection for the eyepiece tube (p. 16)
 - Lamp installation (p. 28)
 - Revolving nosepiece installation (p. 30)
 - Condenser installation (p. 30)
- If it is not possible to focus on the specimen, check the following items.
 - Mounting of the specimen (p. 35, 36)
 - Release of the coarse focus stopper (p. 15)
 - Thickness of the cover glass (0.17 mm is standard) (p. 35)

2 Coarse focus stopper



The coarse focus stopper marks the stage position at which the specimen is in focus by restricting the movement of the coarse focus knob. (Movement of the stage by the fine focus knob is not restricted.)

Once the coarse focus stopper is clamped in place, the coarse focus knob cannot be used to move the stage any higher. In effect, once the coarse focus knob is clamped in place at the focus position, a rough focus can be attained the next time simply by turning the coarse focus knob as far as it will go. This feature is convenient when viewing similar specimens one after another.

If the coarse focus stopper is not being used, the coarse focus stopper ring should be loosened as far as it will go (by turning it as far as it will go in the direction opposite to that indicated by the arrow on the base of the microscope.)

Using the coarse focus stopper

With the specimen in focus, turn the coarse focus stopper ring as far as it will go in the direction indicated by the arrow on the base of the microscope (about 270°). The coarse focus stopper is now clamped in place.

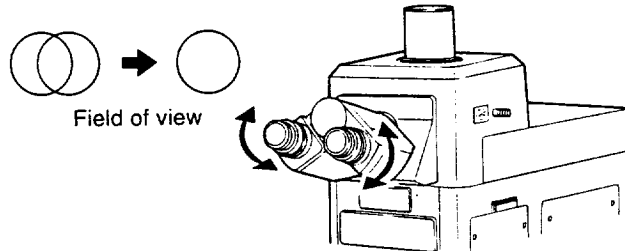
When changing the specimen, lower the stage by turning only the coarse focus knob.

After changing the specimen, gently raise the stage by turning only the coarse focus knob as far as it will go.

The specimen should be roughly in focus when the stage has been raised as far as it will go; use the fine focus knob to bring the specimen into perfect focus.

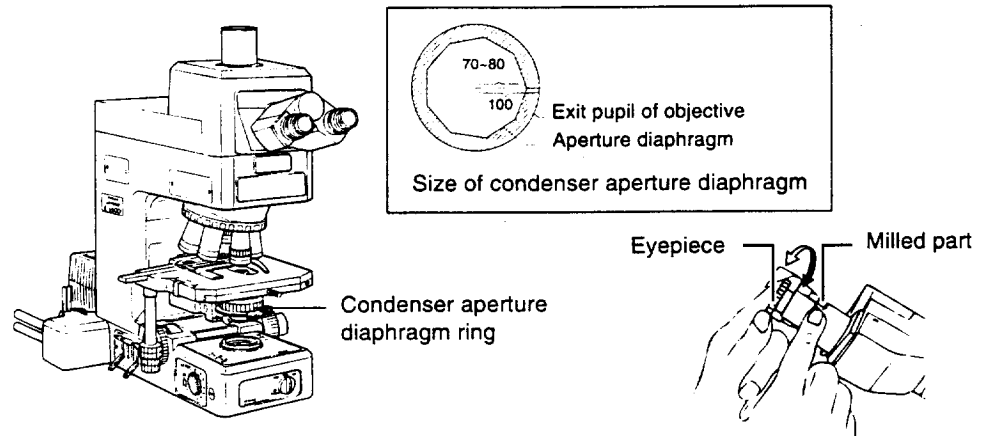
Diopter adjustment method

- 1 Perform steps **1** to **12** in chapter "3. Microscopic Procedure," so that the specimen is focused with the 10× objective.
- 2 Turn the diopter adjustment rings on the eyepieces and align the edges of the diopter adjustment rings with the engraved lines. (This is the diopter adjustment "0" position.)
- 3 Move the 40× objective into the optical path. Turn the coarse and fine focus knobs to focus on the specimen.
- 4 Move the 4× or the 10× objective into the optical path.
- 5 **Turn the diopter adjustment rings on the eyepieces**, not the coarse and fine focus knobs, and focus on the specimen. Do so while peering through the right eyepiece with your right eye and the left eyepiece with your left eye.
- 6 Repeat steps **3** to **5** twice.

5 Interpupillary distance adjustment

Before adjusting the interpupillary distance, perform steps **1** to **13** in chapter "3. Microscopic Procedure" so that the specimen is focused with the 10× objective. Adjust the interpupillary distance so that the field of view for each eye is aligned on one position. Doing so will make observation through the binocular eyepiece with both eyes easier.

Condenser aperture diaphragm



The aperture diaphragm is important because it is related to the resolution, contrast, depth of focus, and brightness of the optical image. Turning the condenser aperture diaphragm ring changes the size of the aperture diaphragm.

As the aperture diaphragm is stopped down, resolution and brightness are reduced while contrast and depth of focus are increased. Conversely, as the aperture diaphragm is opened, resolution and brightness are increased while contrast and depth of focus are reduced. It is not possible to adjust one pair of characteristics without affecting the other. Generally, a satisfactory image with appropriate contrast can be obtained with an aperture setting that is 70% to 80% of the objective numerical aperture.

If the aperture diaphragm is stopped down too far, the resolution is reduced; therefore, except when viewing a nearly transparent specimen, we do not recommend stopping down the aperture to less than 60% of the numerical aperture of the objective.

Adjusting the size of the aperture diaphragm according to the condenser scale

Because the condenser scale indicates the numerical aperture, adjust the aperture diaphragm ring according to the scale. Normally, the index on the aperture diaphragm ring should be aligned with the scale line corresponding to 70% to 80% of the numerical aperture of the objective.)

Adjusting the size of the aperture diaphragm by using a centering telescope (sold separately)

Remove one of the eyepieces and, using a special adapter (sold separately), mount a centering telescope in its place. Turn the aperture diaphragm ring to stop down the aperture diaphragm as far as possible. While holding down the milled part of the telescope, turn the eyepiece of the centering telescope and focus on the aperture diaphragm.

Turn the aperture diaphragm ring to adjust the size of the aperture diaphragm. (Normally, the aperture diaphragm should be adjusted so that it is about 70% to 80% of the size of the view field.)

Remove the centering telescope and the adapter, and then re-install the eyepiece.

8 Filters

In this microscope, the filters indicated below are housed in both sides of the base of the microscope. A filter is inserted into the optical path by pressing its filter insertion/removal lever down. When a lever is lifted, the filter is removed from the optical path.

NCB11 (color balancing filter)	For general microscopy and color photomicrography	Right side of microscope
ND2 (transmission rate: 50%)	For brightness adjustment in general microscopy and photomicrography	Filter cassette on left side of microscope
ND8 (transmission rate: 12.5%)		
ND32 (transmission rate: 3%)		
GIF (Green interference filter)	For phase contrast, differential interference contrast, and contrast adjustment	
D (lemon skin)	Always insert in optical path	

The filters in the filter cassette can be replaced with $\varnothing 33$ filters. For details on how to replace the filters, refer to page 32.

9 Stage

Adjustment of torque of the stage motion control knobs

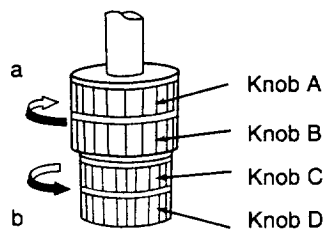
The torque of the X-axis and Y-axis stage motion control knobs can each be adjusted.

For Y-axis motion

To tighten the tension in the Y-axis, turn Knob B in the direction of arrow "a" while holding Knob A; to reduce the tension, turn Knob B in the opposite direction.

For X-axis motion

To tighten the tension in the X-axis, turn Knob C in the direction of arrow "b" while holding Knob D; to reduce the tension, turn Knob C in the opposite direction.



10 Preset voltage switch (for photomicrography)

The color temperature of the lamp varies according to the voltage. If the voltage is high, the color temperature of the lamp increases and the light becomes bluer; if the voltage is low, the color temperature of the lamp decreases and the light becomes redder. Therefore, in order to obtain the best color reproduction in color photomicrography, it is necessary for the lamp voltage to be kept constant. When using daylight-type color film, the standard setup is to use the color balancing filter (NCB11) and set the lamp voltage to 9 V.

The preset voltage switch is used to automatically set the standard lamp voltage (9 V). Because the brightness adjuster also serves as the preset voltage switch, setting the brightness adjuster to the "PRESET" position automatically sets the lamp voltage to 9 V.

Fine adjustment of the preset voltage

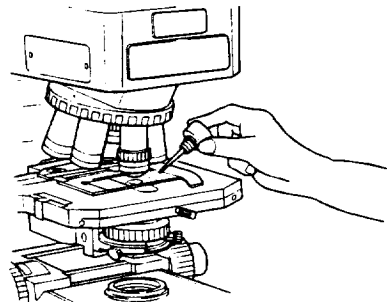
If the final images on color film shot with the brightness adjuster set to the "PRESET" position are reddish or bluish, adjust the preset voltage. Fine adjustments of up to ± 1 V can be made to the 9 V setting by using a minus (-) screwdriver to turn the rotary switch (the preset voltage fine adjustment dial) on the left side of the microscope base.

When images are reddish: Increase the voltage. (Doing so will increase the lamp color temperature, giving the light a bluish tint.)

When images are bluish: Decrease the voltage. (Doing so will decrease the lamp color temperature, giving the light a reddish tint.)

If this adjustment is not enough to resolve the problem, also use color compensation filters (CC filters), available on the market.

11 Oil-immersion operation (using an oil-immersion type objective and condenser)





Assembly



WARNING In order to prevent electric shock and fire, turn the power switch on the power supply off (flip to the “ ” side) during assembly. Also turn the microscope’s sub-power switch off.



CAUTION • When moving the microscope, first detach the lamphouse. Then have at least two people carry the microscope, at least one on each side, using the carrying handles.

- Be sure to screw the carrying handles in as far as they will go and make sure that they are secure. If the carrying handles are not attached securely, they could come out or break while the microscope is being carried, creating a hazardous situation. Screw the carrying handles into the upper holes on the rear of the microscope. If you use the lower holes, your hands will be caught between the handles and the table when you set the microscope down.
- Do not grasp the coarse focus knob, the fine foc stage, etc., when carrying the microscope; there is a chance that the part could come off, and the equipment could be damaged.
- Be careful not to pinch your hands or fingers when setting up the microscope.

Tools needed

- Two hexagonal screwdrivers (provided)
- One hexagonal wrench (provided)
- Four carrying handles (provided)
- One coin (or a minus (-) screwdriver)

Assemble each part in sequence as numbered in the diagram. (For details, refer to pages 27 to 33.) Viewing will be adversely affected if any of the lenses are scratched or if they have any fingerprints on them. Handle the lenses carefully during assembly.

Because this microscope is a precision optical device, handle it carefully and do not subject it to strong physical shocks. (The precision of the objectives in particular may be adversely affected by even weak physical shocks.)

1. Setting Up the Microscope



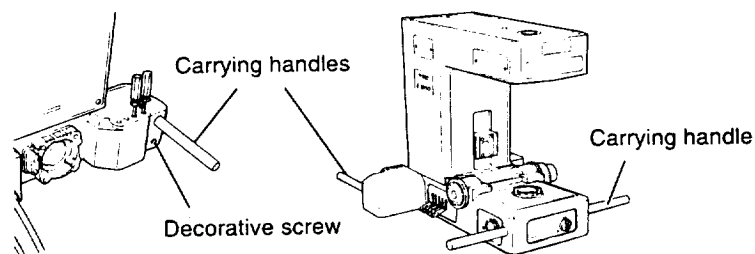
- CAUTION**
- When moving the microscope, have at least two people carry the microscope, at least one on each side, using the carrying handles.
 - Be sure to screw the carrying handles in as far as they will go and make sure that they are secure. If the carrying handles are not attached securely, they could come out or break while the microscope is being carried, creating a hazardous situation. Screw the carrying handles into the upper holes on the rear of the microscope. If you use the lower holes, your hands will be caught between the handles and the table when you set the microscope down.
 - In addition, when transporting the assembled microscope, do not grasp the coarse focus knob, the fine focus knob, the eyepiece tube, the stage, etc., when carrying the microscope; there is a chance that the part could come off, and the equipment could be damaged.
 - Be careful not to pinch your hands or fingers when installing the microscope.

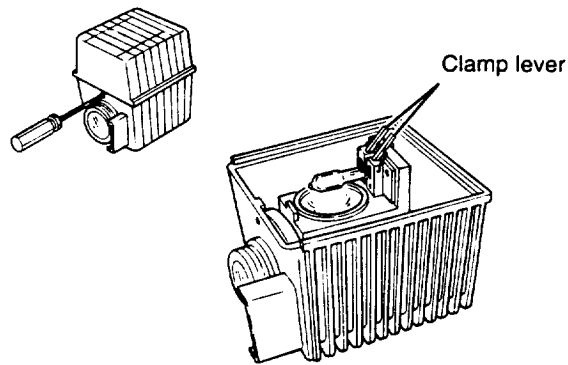
Installation location

This product is a precision optical instrument, and using or storing it under unsuitable conditions may damage it or may have an adverse effect on its precision. The following conditions should be kept in mind when selecting the installation location:

- Avoid installing the microscope in a bright location, such as in a room that receives direct sunlight, or directly under room lights. The quality of the view through the microscope deteriorates if there is a lot of ambient light.
- Install the microscope in a location that is free from dust or dirt.
- Install the microscope on a flat surface with little vibration.
- Install the microscope on a sturdy desk or table that is able to bear the weight of the microscope.
- Install the microscope in a location where the temperature will range from 0 to 40°C and where the humidity is less than 85%. If the microscope is installed in a warm, humid location, condensation or mold may form on the lenses, degrading performance or damage the equipment.

Screw the carrying handles into the holes on both sides of the front and rear (use the upper holes) of the microscope. Be sure to screw all of the handles in as far as they will go. Have at least two people, with at least one on both sides, carry the microscope to the location where it is to be installed. After placing the microscope in the desired position, use a coin (or minus (-) screwdriver) to remove the decorative screws on the rear of the microscope (in the lower holes). Remove the front pair of carrying handles from the microscope and screw them into the lower holes on the rear of the microscope. Screw the decorative screws into the open holes on the front of the microscope.





- 1 Confirm that the power supply power switch is off (i.e., that it is flipped to the "OFF" side). Also confirm that the sub-power switch on the microscope is in the OFF position.
- 2 If the lamphouse is mounted on the microscope, use a hexagonal screwdriver to loosen the lamphouse clamp screw (The screw is on the top of the lamphouse mount) and then remove the lamphouse from the microscope.
- 3 Use a hexagonal screwdriver to loosen the clamp screw on the front of the lamphouse and remove the cover.
- 4 While pressing the lamp clamp lever, push the lamp into the socket pin holes as far as it will go. (Do not touch the glass portion of the lamp with your bare hands.)
- 5 Return the clamp lever to its original position. Make sure that the lamp is not crooked.
- 6 Close the cover securely and tighten the clamp screw. Make sure that the cover is fixed in place and will not come off even when shook by hand.
- 7 Plug the lamphouse into the microscope so that the lamphouse plug fits into the lamphouse socket. Tighten the lamphouse clamp screw to secure the lamphouse in place.

4. Stage Installation

Place the stage with the bottom facing up. Place the substage on top of the stage. Align the three mounting holes on the stage and the substage, and then use a hexagonal screwdriver to tighten the three mounting bolts so that the stage is securely attached to the substage.

9. Objective Installation

Lower the stage completely.

Screw the objectives into the revolving nosepiece so that the magnification increases when the revolving nosepiece is rotated in the clockwise direction, when looking down on the revolving nosepiece from above.

Note on removing objectives

If there is a specimen on the stage, remove it first. Lower the stage completely, and hold each objective in both hands so that it does not fall when you remove it.

10. Standard Module Installation

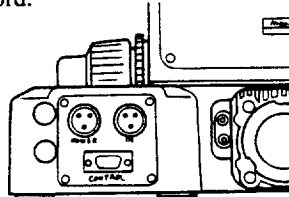
Install the standard module by aligning the two pins on the standard module with the holes on the microscope, and then use the hexagonal wrench to tighten the four bolts with hexagonal holes so that the standard module is secured in place.

11. Triocular Eyepiece Tube Installation

Use a hexagonal screwdriver to loosen the eyepiece tube clamp screw. Tilt and insert the round dovetail on the triocular eyepiece tube to the round dovetail mount on the standard module. Then tighten the eyepiece tube clamp screw so that the triocular eyepiece tube is secured in place.

15. Power Supply Connection

There are three types of cables that need to be connected: the lamp output cable, the lamp voltage control cable, and the power cord.



Lamp output cable:

Plug one end into the POWER connector on the rear of the microscope, and the other end into the LAMP OUT connector on the rear of the power supply, and then screw on the locking rings so that each connection is secure.

Lamp voltage control cable:

Plug one end into the CONTROL connector on the rear of the microscope, and the other end into the CONTROL connector on the rear of the power supply.

Power cord:

Plug the socket onto the AC input connector on the rear of the power supply, and insert the plug into an AC outlet.

16. Installation of Photomicrographic Equipment (Sold Separately)

For details on how to assemble the photomicrographic equipment and on how to take photomicrographs, refer to the instruction manual provided with the photomicrographic equipment. Remove the cap from the vertical tube on the triocular eyepiece tube, and attach a photo tube. Drop a PL projection lens inside the photo tube (sold separately). Confirm that the projection lens is in as far as it will go.

Insert the main body of the photomicrographic equipment on to the photo tube as far as it will go. With the finder mount facing the front, secure the main body in place with the photographic equipment clamp screws. (If the photo tube on the photographic equipment has a groove around its circumference, secure the equipment in place with two small clamp screws. If there is no groove around the circumference of the photo tube, secure it in place with one clamp screw.)

Refer to the instruction manual provided with the photomicrographic equipment for details on how to mount a finder, camera box, etc.

17. Storing the Tools

When you finish using the hexagonal screwdriver and the hexagonal wrench, insert them into the tool storage compartment on the base of the microscope.

Assembly is now complete.

6. Troubleshooting Tables

Problem	Cause	Countermeasures
Viewing is poor (too much or too little contrast, poor resolution) (The details cannot be viewed clearly)	The cover glass is too thick.	Use the specified type of cover glass (thickness: 0.17 mm).
	There is no cover glass.	
	There is no oil on the tip of an oil-immersion type objective.	Apply Nikon immersion oil. (p. 23)
	The specified immersion oil is not being used.	
	There are bubbles in the immersion oil.	Remove the bubbles. (p. 24)
	There is immersion oil on the tip of a dry-type objective. (Especially in the case of a 40x objective)	Clean the objective. (p. 24)
	The compensation ring on an objective with a compensation ring has not been adjusted.	Adjust the compensation ring according to the cover glass.
Uneven focus	There is dirt or dust on the lens, condenser, objective or specimen.	Clean the components. (p. 38)
	The revolving nosepiece has not been installed properly.	Install the revolving nosepiece properly. (p. 30)
	The revolving nosepiece has not been rotated until it has clicked into place.	Turn the revolving nosepiece until it clicks into place. (p. 9)
	The specimen is not secured in place on the stage.	Install the specimen properly on the specimen holder on the stage.
Image flows	The stage has been installed on a slant.	Install the stage correctly. (p. 29)
	The revolving nosepiece has not been installed properly.	Install the revolving nosepiece properly. (p. 30)
	The revolving nosepiece has not been rotated until it has clicked into place.	Turn the revolving nosepiece until it clicks into place. (p. 9)
	The specimen is not secured in place on the stage.	Install the specimen properly on the specimen holder on the stage.
	The condenser is not centered.	Center the condenser. (p. 18)
Image is yellowish	The stage has been installed on a slant.	Install the stage correctly. (p. 29)
	An NCB11 filter is not being used.	Use the NCB11 filter. (p. 21)
	The lamp voltage is too low.	Set the brightness adjuster to "PRESET" or to position "9", and then adjust the brightness through the ND filter combination. (p. 23)

2 Electrical system

Problem	Cause	Countermeasure
The lamp does not light when the power is turned on	The power supply is not plugged in.	Plug the power cord into an outlet. (p. 32)
	The cables between the microscope and the power supply are not connected.	Connect the cables. (p. 32)
	The sub-power switch is set to "EPI."	Set the switch to "DIA." (p. 8)
	The lamp has not been installed.	Install the lamp. (p. 29)
	The lamp is burned out.	Replace the lamp. (p. 29)
The lamp blows immediately	The specified lamp is not being used.	Use the specified lamp. (Refer to the electrical standards on P.39.) (p. 28)
Inadequate brightness	The specified lamp is not being used.	Use the specified lamp. (Refer to the electrical standards on P.39.) (p. 28)
The brightness adjuster has no effect.	The lamp voltage control cable has not been connected.	Connect the cable. (p. 33)
The lamp flickers; the brightness is unstable	The lamp is near the end of its life.	Replace the lamp. (p. 29)
	The connectors are not connected securely.	Secure the connections. (p. 33)
	The lamp is not plugged into its socket securely.	Insert the lamp securely into its socket. (p. 29)



Electrical Specifications

■ ECLIPSE E800 (Main body of the microscope)

Power source:	For 100/120 V area: Power supply V-PS100DU For 230 area: Power supply V-PS100E
Input voltage:	12 V DC
Light source:	Lamp rating: 12 V DC, 100 W Lamp type: Halogen lamp (OSRAM HLX 64623 or PHILIPS 7724)
Protection class:	Class I
Operating environmental conditions:	Temperature: 0 to +40° C Humidity: 85% Rh max., noncondensing Altitude: 2000 m max. Pollution: Degree 2 Installation: Category II
Storing environmental conditions:	Temperature: -20 to +60° C Humidity: 90% Rh max., noncondensing

Conforming standards (for 100/120V area):

- UL listed product
- FCC 15B class A satisfied

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protections against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which the user will be required to correct the interference at this own expense.

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada

Conforming standards (for 230 V area):

- GS approved product
- EU Low Voltage Directive satisfied
- EU EMC Directive satisfied

■ V-PS100DU (Power supply for 100/120 V area)

■ V-PS100E (Power supply for 230 V area)

Refer to the instruction manual provided with the "Power Supply V-PS100DU, V-PS100E".

Nikon reserves the right to make such alterations in design as may be considered necessary in the light of experience. For this reason, particulars and illustrations in this handbook may not conform in every detail to models in current production.

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