

***Nikon***

Polarizing Microscope  
**ECLIPSE E600 POL**  
Instructions

Thank you for purchasing the Nikon products.

This instruction manual is written for the users of the Nikon Polarizing Microscope ECLIPSE E600 POL.

To ensure correct usage, read this manual carefully before operating the instrument.

- It is prohibited to reproduce or transmit this manual in part or whole without Nikon's expressed permission.
- The contents of this manual are subject to change without notice.
- Some of the products described in this manual may not be included in the set you have purchased.
- 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.

### Warning/Caution Symbols Used in This Manual

Although Nikon products are designed to provide you with the 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 using the instrument. Do not discard this manual but keep it near the product for easy reference.

In this manual, safety instructions are indicated with the symbols shown below. Be sure to follow the instructions indicated with these symbols to ensure correct and safe operation.

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

### Meaning of Symbols Used on the Equipment

Symbol	Meaning
	Caution for heat. This marking near the lamphouse calls your attention on the following: <ul style="list-style-type: none"><li>• Lamphouse becomes very hot during and immediately after the illumination.</li><li>• Risk of burns. Do not touch the lamphouse during and immediately after the illumination.</li><li>• Make sure that the lamphouse is sufficiently cool before the lamp replacement.</li></ul>



## WARNING

### 1. Intended product use

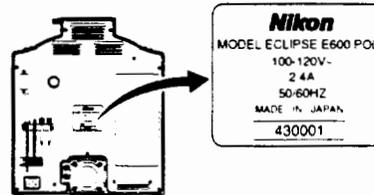
This microscope should only be used for microscopic observation. Do not use it for any other purpose.

### 2. Do not disassemble

Disassembling may cause malfunction and/or electrical shock. Do not disassemble any parts other than those mentioned in this manual. If you notice any malfunction, notify your nearest Nikon representative.

### 3. Input voltage

Make sure that the input voltage indicated on the back panel of the microscope is the same as your regional voltage. If not the same, do not use the microscope; instead, notify your nearest Nikon representative immediately. If the microscope is used with the wrong input voltage, a short circuit or fire may result, causing the damage of the microscope.



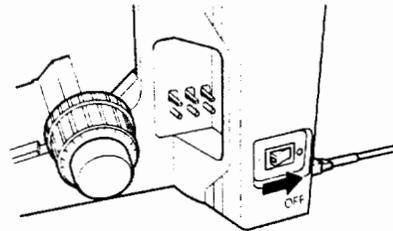
### 4. Power cord

To prevent electrical shock, always turn off the power switch (flip it to the "○" side) before connecting or disconnecting the power cord. Use only the following power supply cord set. Using the wrong power cord could result in damage or fire.

- For 100–120V area  
UL Listed, detachable cord set, 3 conductor grounding type SVT, No. 18 AWG rated at 125V, 7A minimum.

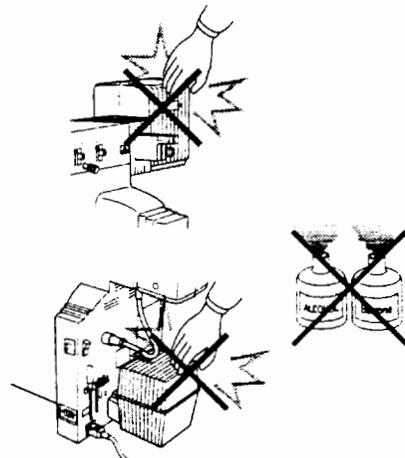
In case of using the extension cord, use only the power supply cord with the PE (protective earth) wire.

- For 220–240V area  
3 pole power supply cord set, which must be approved according to EU/EN standards. - Class I equipment should be connected to PE (protective earth) terminal.  
In case of using the extension cord, use only the power supply cord with the PE (protective earth) wire.



### 5. Heat from the light source

The lamp and the lamphouse become extremely hot. To avoid burns, do not touch the lamphouse while the lamp is lit or for thirty minutes after it has been turned off. Furthermore, in order to avoid the risk of fire, do not place fabric, paper or highly flammable materials such as gasoline, petroleum benzine, paint thinner or alcohol near the lamphouse while it is lit or for about thirty minutes after it has been turned off. The back of the microscope also becomes hot during use. Although this is not a malfunction, be careful not to touch the back of the microscope when it is hot.





## CAUTION

### 1. Only use the specified halogen lamp

The power supply unit in the microscope provides the power for the halogen lamp that serves as the microscope light source. This unit can supply power for a halogen lamp of up to 12V-100W. The specified lamp and lamphouse must be used, otherwise, the microscope could be damaged.

Specified lamphouse (for diascope use):

Nikon C-LP HALOGEN 12V100W model

Specified lamphouse (for episcopic use):

Nikon LHS-H100P-2 HALOGEN 12V100W model

Specified lamp (for both diascope and episcopic uses):

12V-100W LONGLIFE halogen lamp (OSRAM HLX64623 or PHILIPS 7724)

### 2. Precautions for replacing the lamp

To prevent burns, allow the lamp to cool for at least thirty minutes after turning off the power switch before replacing it. Furthermore, to prevent electrical shock and damage to the microscope, always turn off the power switch (flip it to the "○" side) and unplug the power cord before connecting or disconnecting the lamphouse.

After replacing the lamp, be sure to attach the lamphouse cover securely. Never use the lamphouse without its cover.

### 3. Do not wet the microscope

If the microscope gets wet, a short circuit may result that could damage it or make it extremely hot. If you accidentally spill a liquid on the microscope, immediately turn off the power switch (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 the microscope, do not use it; instead, notify your nearest Nikon representative.

### 4. Weak electromagnetic waves

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

### 5. Precautions for 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 effect on its accuracy. See "Installation location" on p. 32 and always use the microscope in a suitable environment.

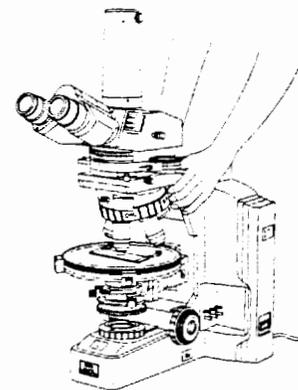
### 6. Precautions for moving the microscope

First detach the lamphouse, and then securely hold the microscope by the base of the arm from the back.

Do not grasp the focus knobs, eyepiece tube, stage, etc. when carrying the microscope.

This could cause the part to come off, resulting in damage to the microscope.

This microscope is a precision optical instrument, so handle it carefully and do not subject it to a strong physical shock. (The accuracy of the objective in particular may be adversely affected by even a weak physical shock.)



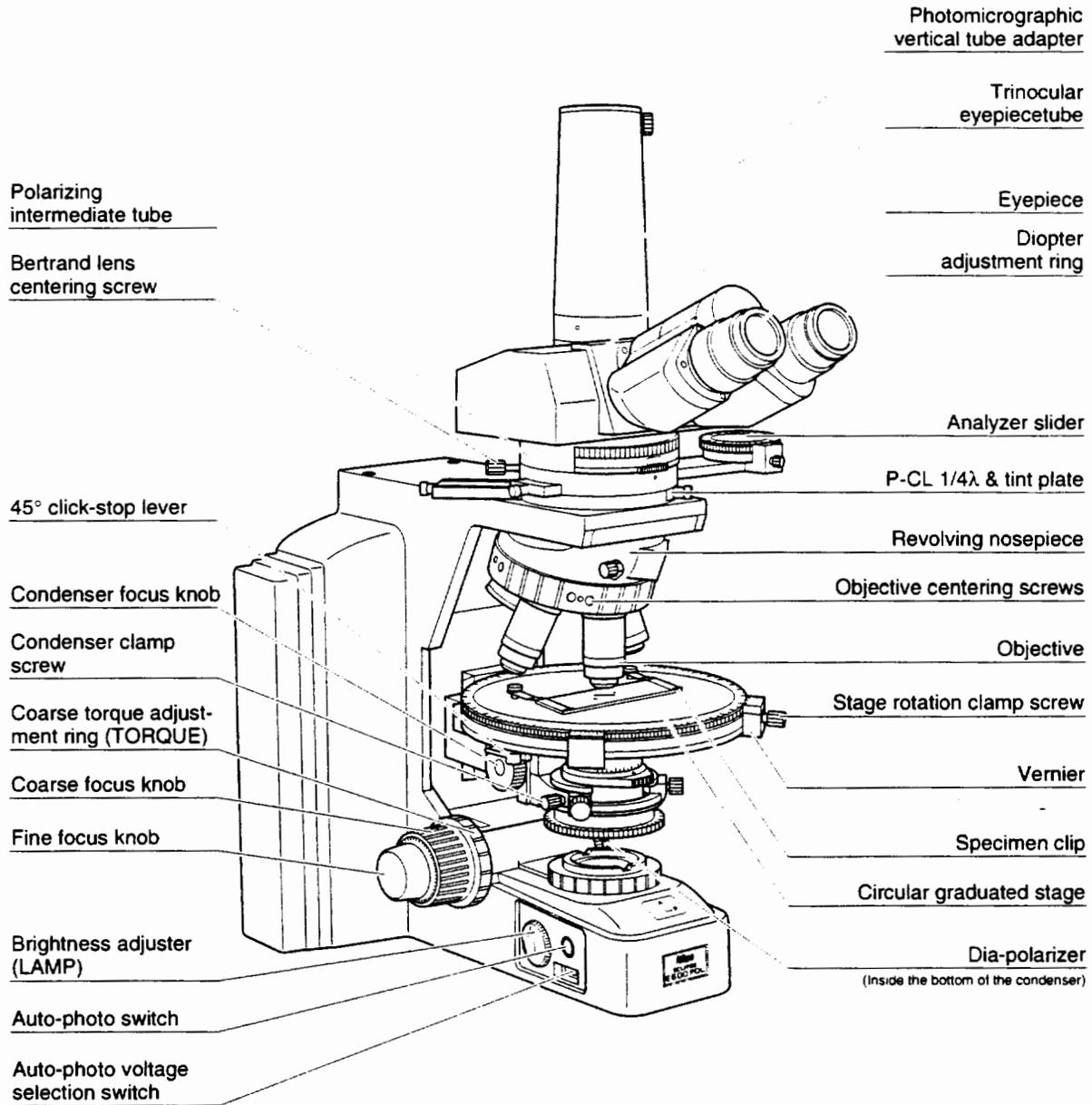
# CONTENTS

Warning/Caution Symbols Used in This Manual .....	1
⚠ WARNING .....	2
⚠ CAUTION .....	3
<b>1</b> Names of Component Parts and Operational Parts .....	6
<b>2</b> Microscopic Procedure .....	8
<b>1</b> Diascopic Illumination Microscopy .....	8
<b>2</b> Episcopic Illumination Microscopy .....	13
<b>3</b> Orthoscopic Observation/Conoscopic Observation .....	17
<b>3</b> Operation of Each Part .....	18
<b>1</b> Coarse and fine focus knobs .....	18
1. Rotation of the coarse and fine focus knobs and vertical movement of the stage ....	18
2. Adjusting the torque of the coarse focus knob .....	18
3. Coarse focus stopper .....	19
<b>2</b> Trinocular eyepiece tube .....	20
1. Optical path selection .....	20
2. Vertical tube adapter .....	20
3. Optical path selection lever clicking .....	20
<b>3</b> Diopter adjustment .....	21
<b>4</b> Interpupillary distance adjustment .....	21
<b>5</b> Condenser .....	22
1. Focusing and centering .....	22
2. Condenser aperture diaphragm .....	23
3. Swing-out the top lens of the condenser .....	24
<b>6</b> Field diaphragm .....	24
<b>7</b> Filters .....	24
<b>8</b> Auto-photo switch (for photomicrography) .....	25
<b>9</b> Oil-immersion operation (using an oil-immersion type of objective and condenser) ....	25
<b>10</b> Orientation of polarizing plates (Polarizer and Analyzer) .....	26
<b>11</b> Focusing and centering the Bertrand lens .....	28
<b>12</b> P-CL $1/4\lambda$ & tint plate .....	28
<b>13</b> Centering the objectives .....	28
<b>14</b> Circular graduated stage for polarizing microscope .....	29
<b>15</b> Use of optional accessories (Sold Separately) .....	29
1. P-CS Senarmont Compensator .....	29
2. P-CQ Quartz wedge .....	30
3. Attachable Mechanical Stage .....	31
<b>4</b> Assembly .....	32
<b>5</b> Troubleshooting Tables .....	41
<b>6</b> Care and Maintenance .....	45
<b>?</b> Specifications and Standards .....	46

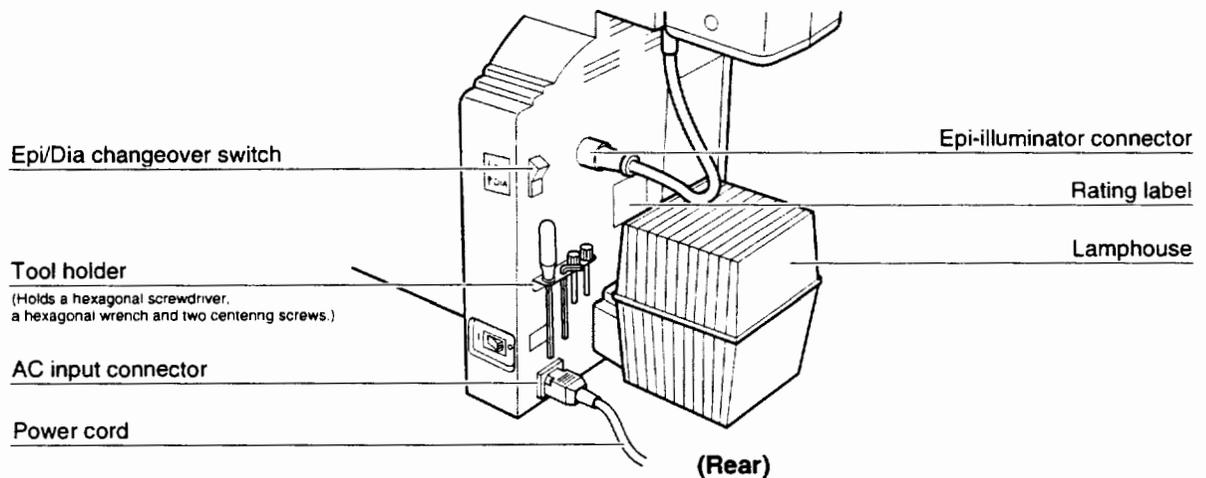
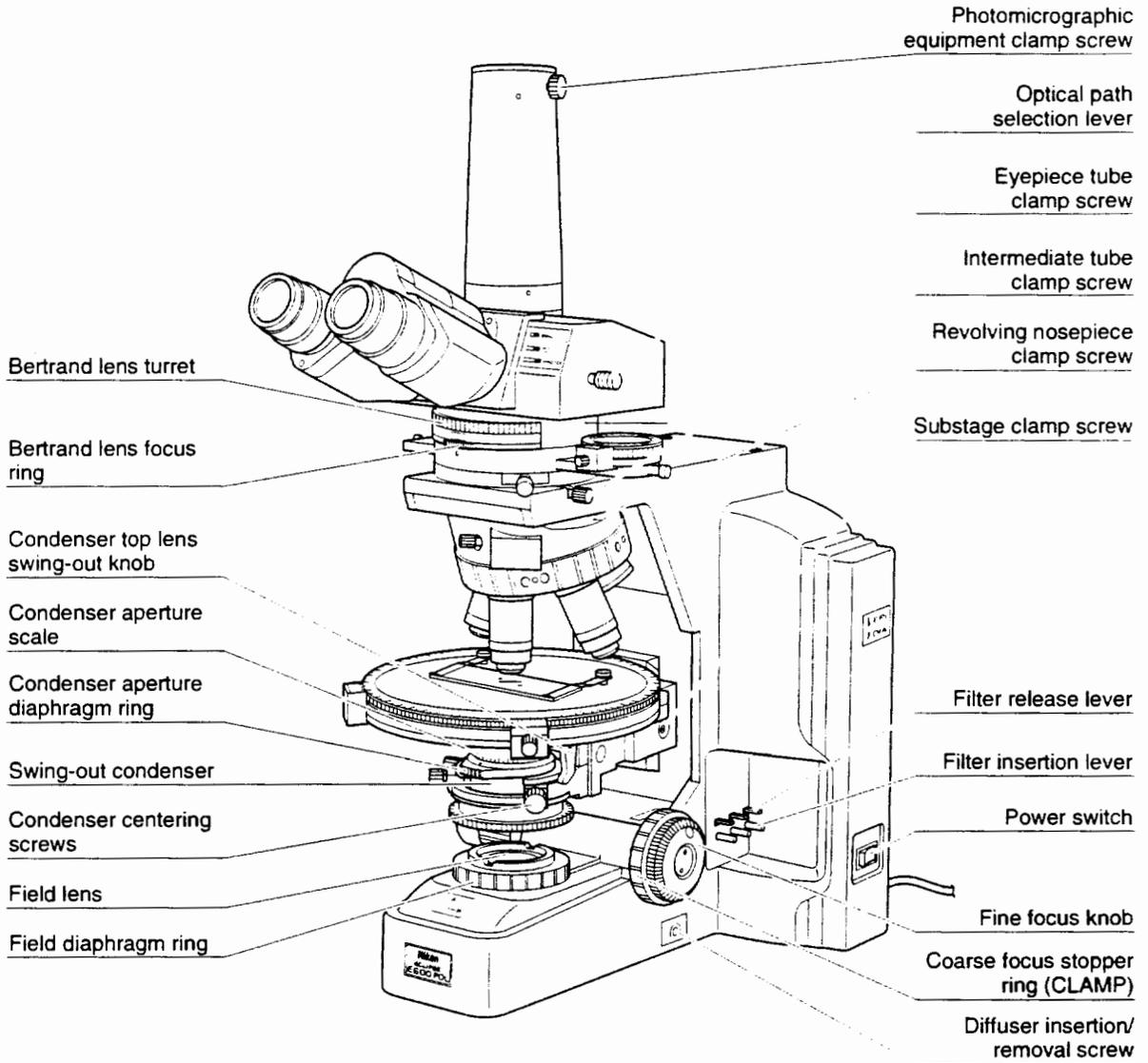
# 1

## Names of Component Parts and Operational Parts

If the microscope has not yet been assembled, see chapter "4. Assembly" first.



# 1. Names of Component Parts and Operational Parts



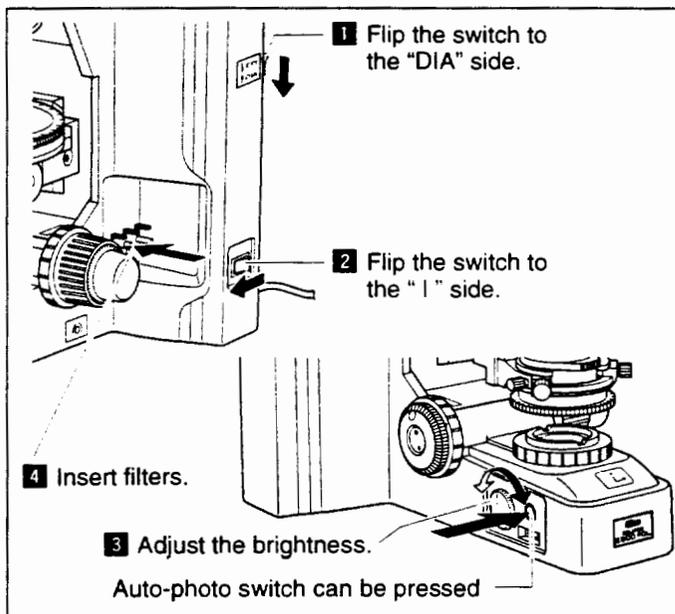
The general procedure for microscopy is described below.

For details on each step, refer to the corresponding item in chapter "3. Operation of Each Part."

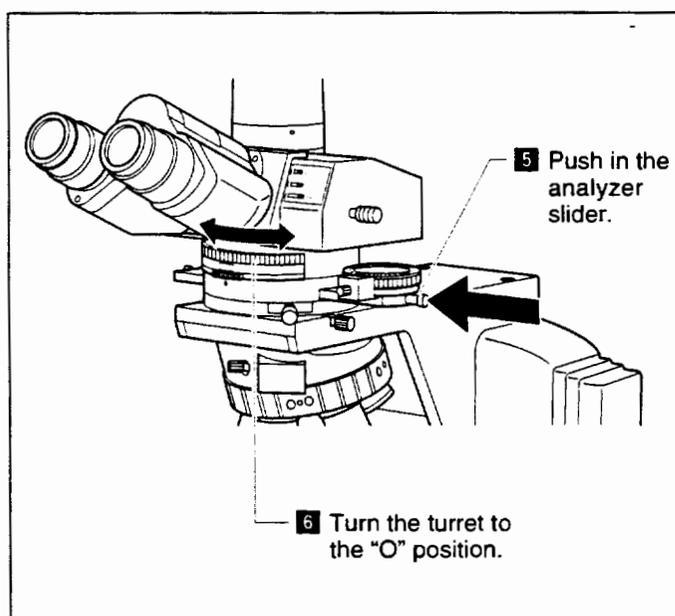
If the microscope has not yet been assembled, see chapter "4. Assembly" first.

## 1 Diascopic Illumination Microscopy

- 1** Turn the Epi/Dia chageover switch on the back of the microscope stand to the DIA position.
- 2** Turn on the power.  
(Flip the switch to the "I" side.)  
As soon as the power comes on, the switch lights.
- 3** Set the brightness adjuster to give the desired brightness.  
Pressing the auto-photo switch will set the voltage for the brightness that provides the best color reproduction. (p.25)
- 4** Insert filters ND32 or 8 and NCB11 into the optical path.  
ND32 or 8 reduces glare in the binocular eyepiece. NCB11 improves color reproduction. (p.24)

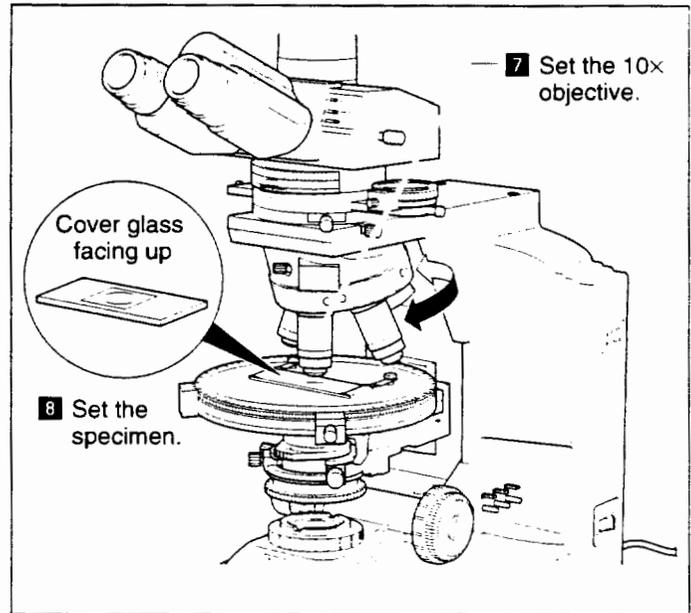


- 5** Push in the analyzer slider of the intermediate tube to remove the analyzer from the optical path.
- 6** Put the Bertrand lens turret in the "O" position to remove the Bertrand lens from the optical path.



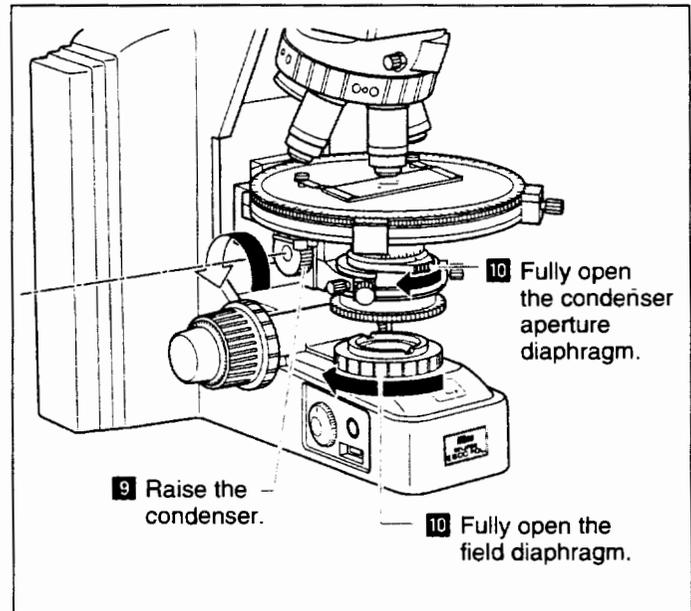
**7** Move the 10× objective into the optical path. Rotate the revolving nosepiece until the 10× objective clicks into place.

**8** Set the specimen in place with the cover glass facing up.

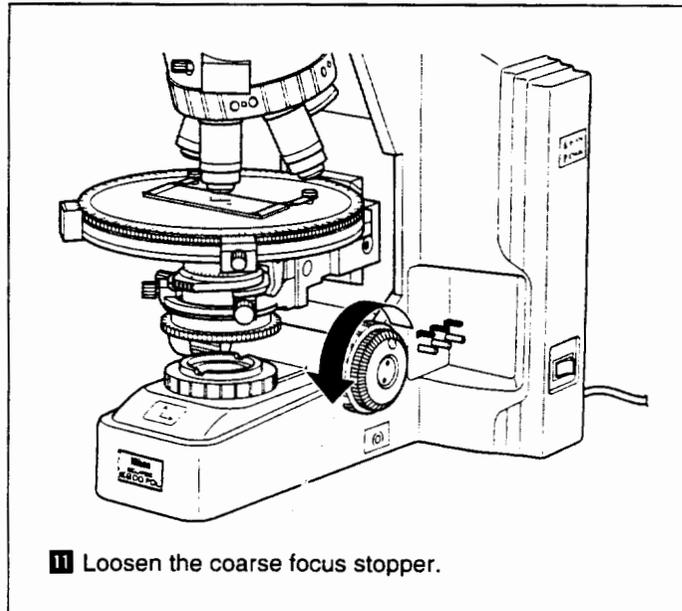


**9** Raise the condenser as high as it will go.

**10** Fully open the field diaphragm and condenser aperture diaphragm.



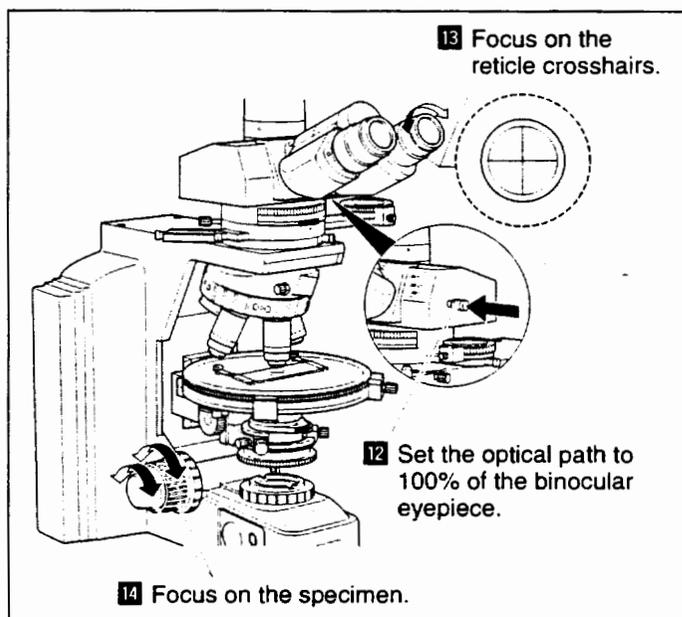
- 11** Loosen the coarse focus stopper ring. Rotate it in the direction opposite the arrow on the base as far as it will go. (p.19)



- 12** Set the optical path to 100% of the binocular eyepiece when using the trinocular eyepiece tube. (p.20)

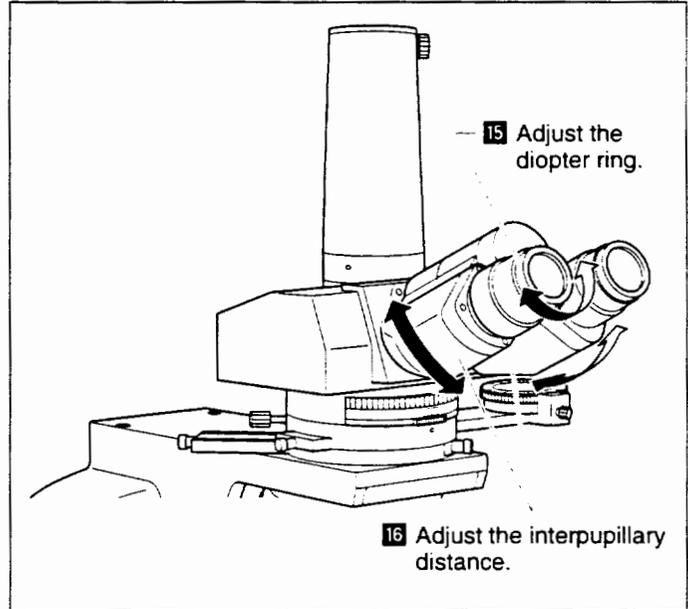
- 13** Turn the diopter adjustment ring of the right eyepiece (containing the crosshairs) and focus on the crosshairs.

- 14** Focus on the specimen. (p.18)



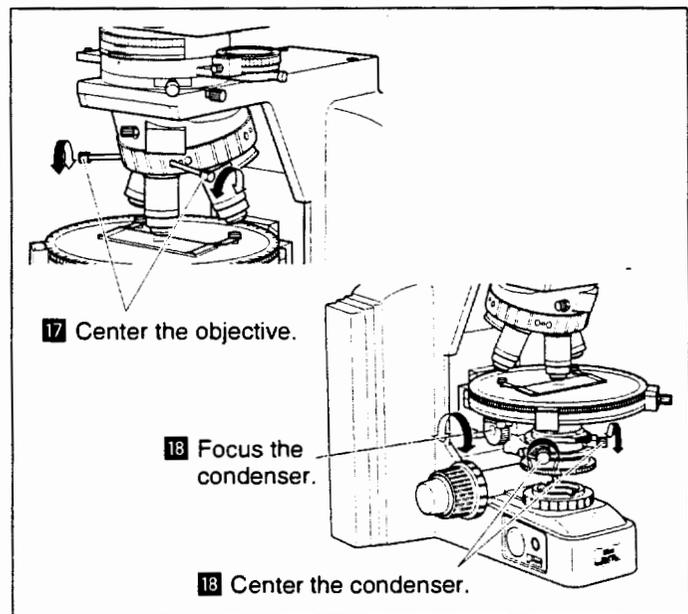
**15** Adjust the diopter of the left eyepiece. (p.21)

**16** Adjust the interpupillary distance. (p.21)



**17** Center the objective. (p.28)

**18** Focus and center the condenser. (p.22)



**19**

Switch to any desired objective and view the specimen.

Rotate the revolving nosepiece to its click-stop position.

In the case of using an oil-immersion objective, apply oil while being careful that air bubbles do not form between the end of the objective and the specimen.

**20**

Manipulate the coarse focus knob or fine focus knob to re-focus on the specimen.

**21**

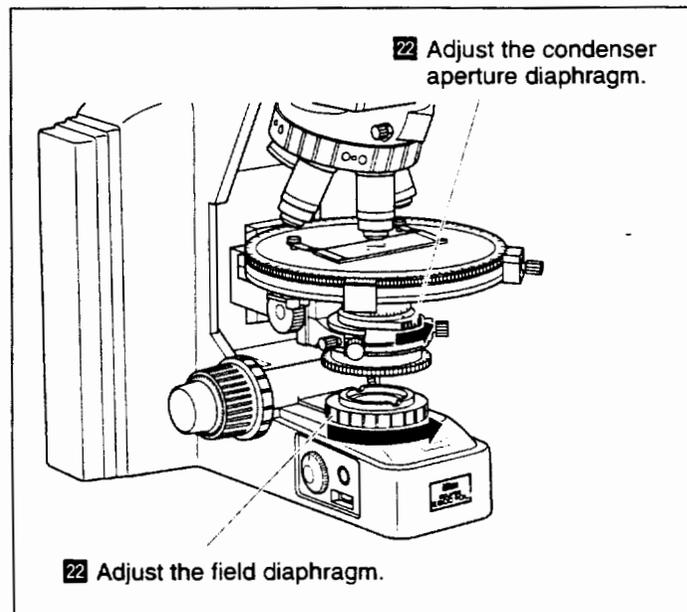
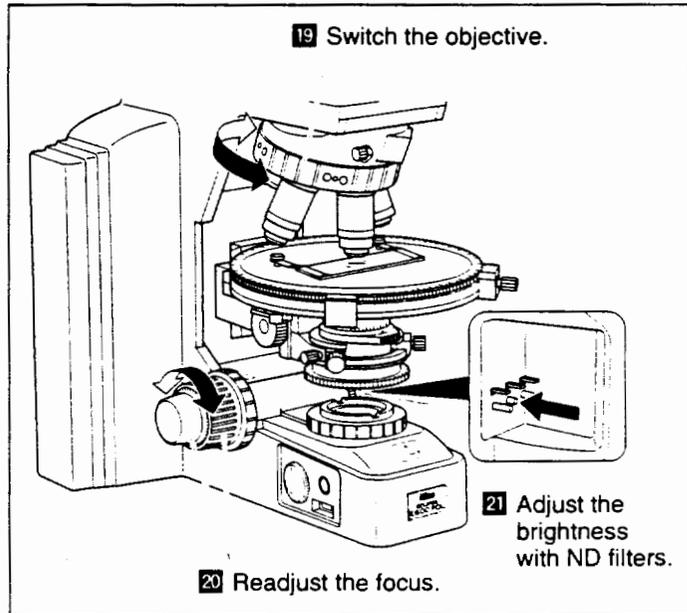
Manipulate the ND filter insertion lever to adjust the brightness.

(When adjusting the lamp brightness, turn off the auto-photo switch and manipulate the brightness adjuster.)

**22**

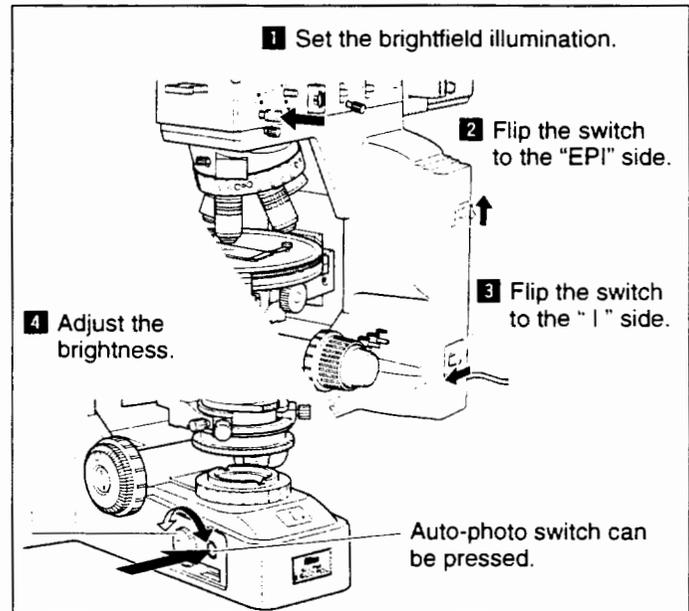
Close the field diaphragm so that it is just outside the field of view. (p.24)

Close the condenser aperture diaphragm to about 70 – 80% of the numerical aperture of the objective. (p.23)

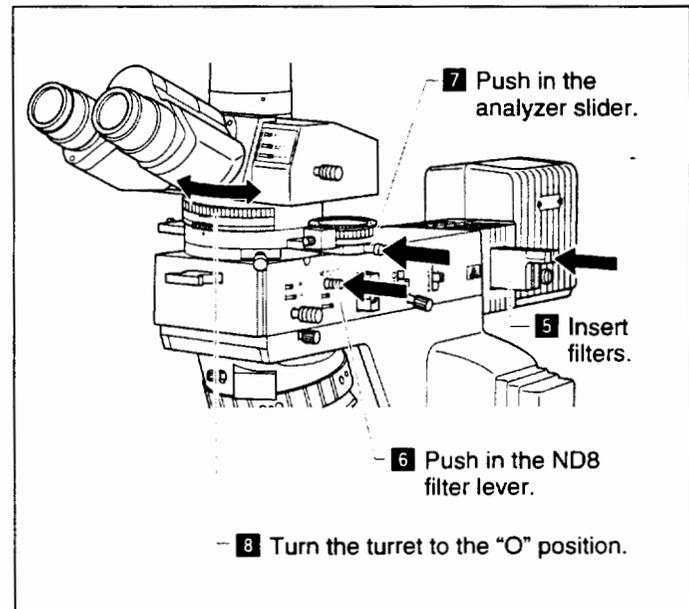


## 2 Episcopic Illumination Microscopy

- 1** Push in the illumination changeover lever of the Epi-illuminator to the limit (indication: B.F) to set the brightfield illumination.
- 2** Turn the Epi/Dia changeover switch on the back of the microscope stand to the EPI position.
- 3** Turn on the power. (Flip the switch to the "I" side.) As soon as the power comes on, the switch lights.
- 4** Set the brightness adjuster to give the desired brightness. Pressing the auto-photo switch will set the voltage for the brightness that provides the best color reproduction.

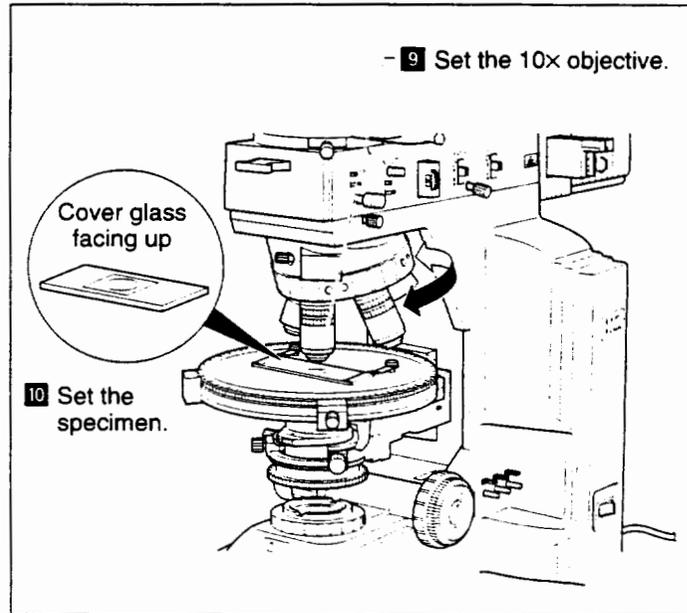


- 5** Insert filters ND2 or 4 and NCB11 of the Epi-illuminator into the optical path. ND2 or 4 reduces glare in the binocular eyepiece. NCB11 improves color reproduction.
- 6** Confirm that the ND8 anti-glare filter lever is pushed in.
- 7** Push in the analyzer slider of the intermediate tube to remove the analyzer from the optical path.
- 8** Put the Bertrand lens turret in the "O" position to remove the Bertrand lens from the optical path.



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

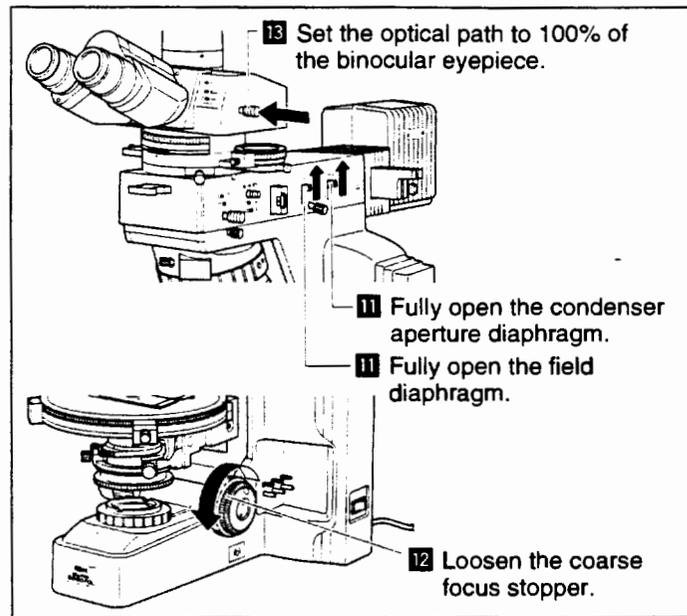
**10** Set the specimen in place with the cover glass facing up.



**11** Fully open the field diaphragm and aperture diaphragm of the Epi-illuminator.

**12** Loosen the coarse focus stopper ring.  
Rotate it in the direction opposite the arrow on the base as far as it will go.

**13** Set the optical path to 100% of the binocular eyepiece when using the trinocular eyepiece tube.

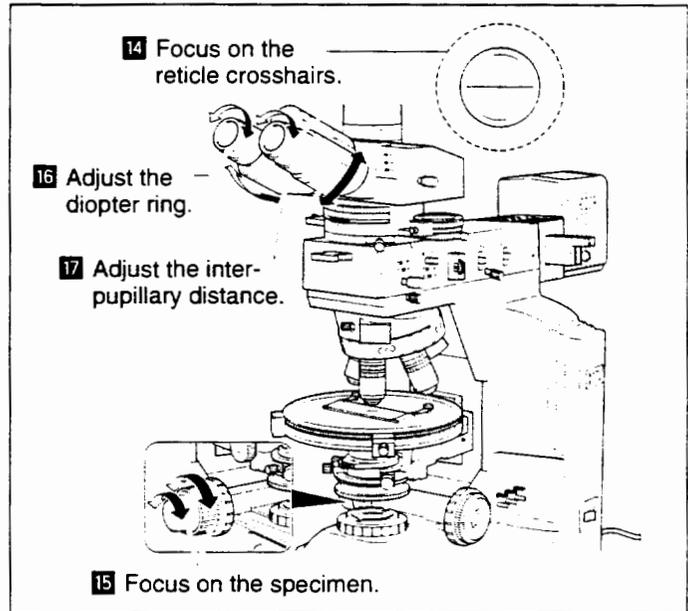


**14** Turn the diopter adjustment ring of the right eyepiece (containing the crosshairs) and focus on the crosshairs.

**15** Focus on the specimen.

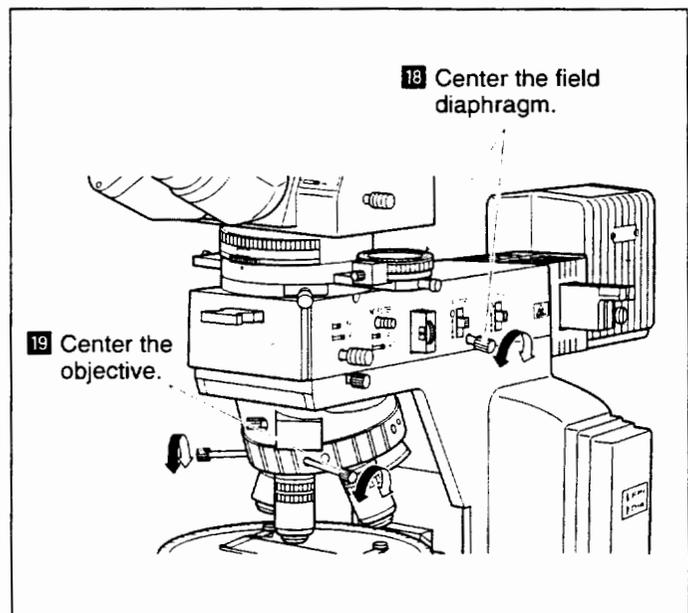
**16** Adjust the diopter of the left eyepiece.

**17** Adjust the interpupillary distance.



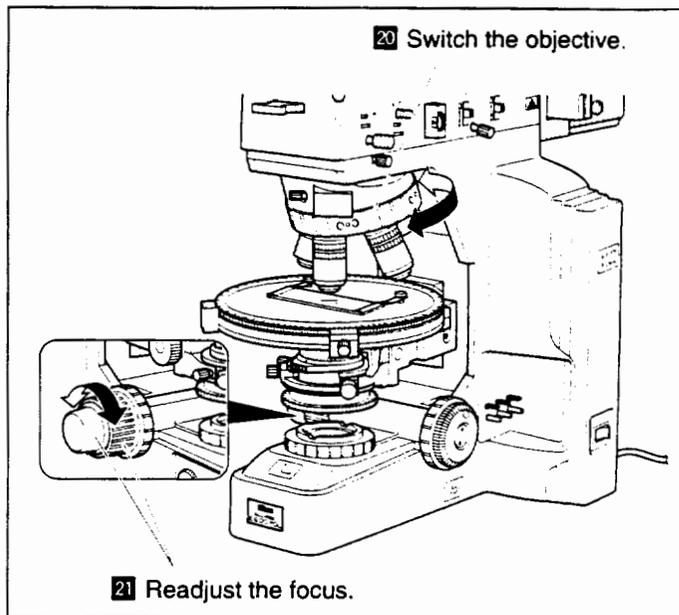
**18** Center the field diaphragm of the Epi-illuminator.

**19** Center the objective.



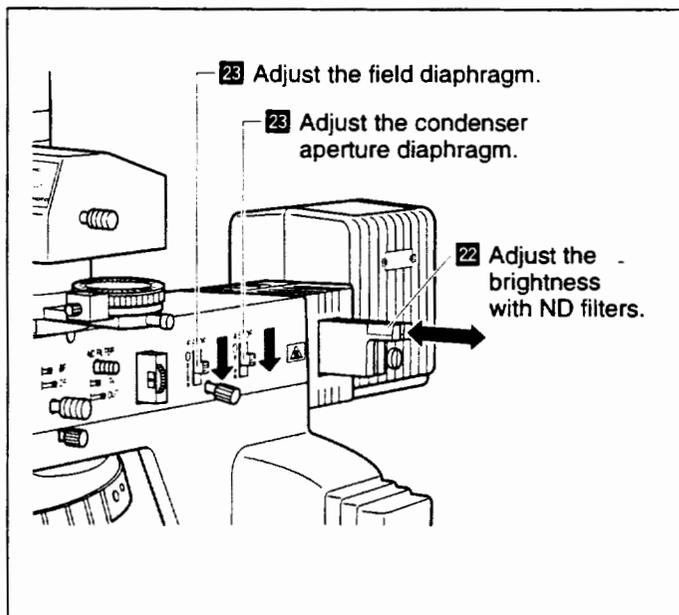
**20** Switch to any desired objective and view the specimen. Rotate the revolving nosepiece to its click-stop position. In the case of using an oil-immersion objective, apply oil while being careful that air bubbles do not form between the end of the objective and the specimen.

**21** Manipulate the coarse focus knob or fine focus knob to re-focus on the specimen.



**22** Adjust the brightness using the ND filter of the Epi-illuminator. (When adjusting the lamp brightness, turn off the auto-photo switch and manipulate the brightness adjuster.)

**23** Adjust the field and aperture diaphragms of the Epi-illuminator.  
**Field diaphragm:**  
 Close it to the size just outside the field of view.  
**Aperture diaphragm:**  
 Close it to the size about 70 – 80% of the numerical aperture of the objective.



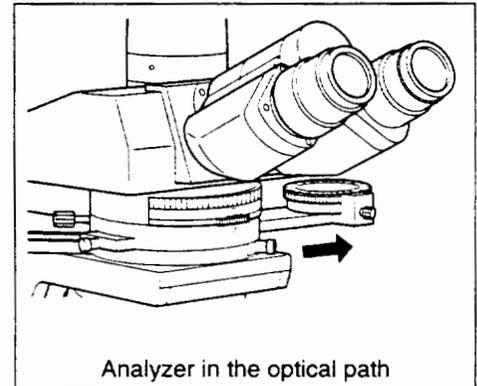
This completes the procedure for microscopy for normal observation. Refer to the following section 3 for details regarding the microscopy procedures for "Orthoscopic Observation" and "Conoscopic Observation".

### 3 Orthoscopic Observation/Conoscopic Observation

The following provides an explanation of the characteristic observation method of polarizing microscopes along with the microscopy procedure. If normal microscopy has not yet been completed, refer to the previous section 1 or 2 and complete normal microscopy.

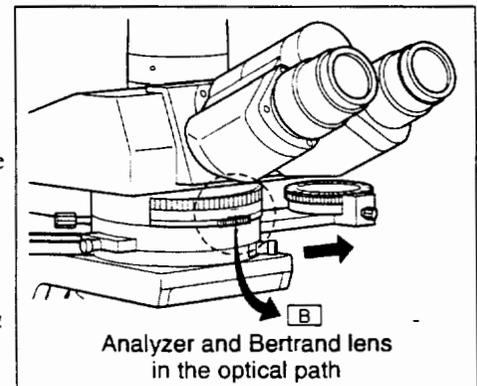
#### Orthoscopic Observation

- In this method, the specimen is observed with the polarizer and analyzer placed in the optical path.
- Operation  
Pull out the analyzer slider and move the analyzer into the optical path.
- In this case, the shape of the specimen is visible (direction of optical axis) and the optical properties relative to the direction of the thickness of the specimen can be observed.



#### Conoscopic Observation

- In this method, in addition to the polarizer and analyzer, the Bertrand lens is also moved into the optical path when observing a specimen.
- Operation  
Move the analyzer into the optical path, and place the Bertrand lens turret of the intermediate tube in position "B" to move the Bertrand lens into the optical path. (Refer to p.28 for details regarding the focusing procedure.) Place the P-CL  $1/4\lambda$  & tint plate in the hollow position. Use an objective having a large numerical aperture (high magnification: normally 40 or higher).
- Specimens can be observed from various angles with diasopic light in the form of a single image. Differing from orthoscopic observation, however, the shape of the specimen itself is not visible with this observation.



The settings of each part in orthoscopic microscopy and conoscopic microscopy are summarized below.

	Orthoscopic Observation		Conoscopic Observation
Purpose of observation	To investigate the vibration direction and birefringence of observation light by observing the extinction and interference color due to the specimen.		To distinguish between uniaxial and biaxial properties and observe the optic-axial angle and optical characteristics in minerals.
Top lens of the condenser	10× or higher	IN	IN
	4× or lower	OUT	
Bertrand lens	OUT (Turret position: O)		IN (Turret position: B)
Aperture diaphragm	10× or higher	70 – 80% of the numerical aperture of the objective	Circumscribed the circumference of the conoscopic field of view (or fully opened)
	4× or lower	Fully opened	
Field diaphragm	10× or higher	Circumscribed the circumference of the eyepiece field of view	Circumscribed the circumference of the orthoscopic field of view
	4× or lower	Fully opened	

## 1 Coarse and fine focus knobs

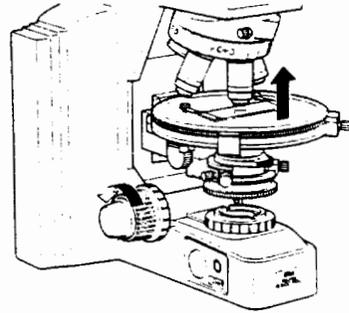
### 1. Rotation of the coarse and fine focus knobs and vertical movement of the stage

Rotating the fine focus knob one step moves the stage 1  $\mu\text{m}$ .

Rotating the fine focus knob one complete turn moves the stage 0.1 mm.

Rotating the coarse focus knob one complete turn moves the stage 12 mm.

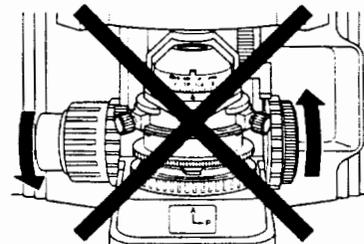
The coarse/fine focus stroke (range of vertical motion) for the stage is 2 mm up and 23 mm down from the reference (focused) position.



Direction of coarse/fine focus knobs and stage vertical motion

Never attempt either of the following actions. These actions will damage the microscope.

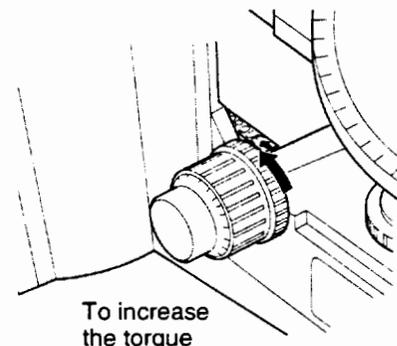
- Rotating the left and right knobs in opposite directions at the same time.
- Continuing to rotate the coarse focus knob after the stage has reached the limit of its motion.



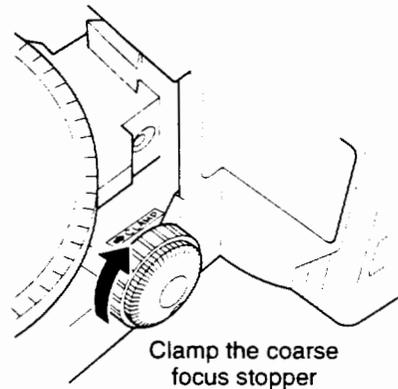
### 2. Adjusting the torque of the coarse focus knob

It is possible to adjust the torque of the coarse focus knob.

To increase the torque, turn the torque adjustment ring (TORQUE) located behind the coarse focus knob in the direction of the arrow on the microscope base (i.e., the counter-clockwise direction). To reduce the torque, turn the ring in the direction opposite to the arrow (i.e., the clockwise direction).



### 3. Coarse focus stopper



#### **Purpose of the 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 has been clamped in position, the coarse focus knob cannot be used to move the stage any higher. In effect, once the coarse focus knob has been 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.

#### **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 of the arrow on the base of the microscope (about  $3/4$  revolution). The coarse focus stopper is now clamped in position.

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.

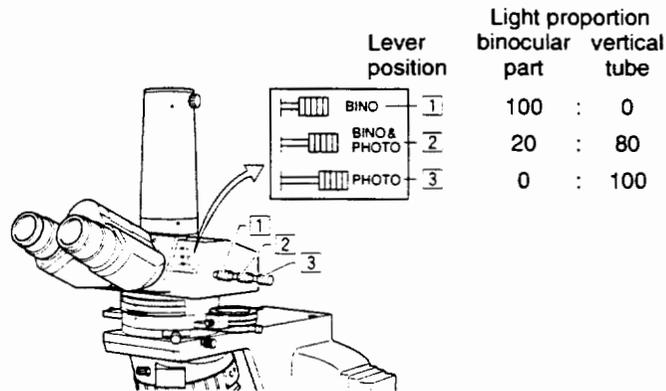
The specimen should be roughly in focus when the stage has been raised as far as it will go; use the fine focus knob to bring the specimen into perfect focus.

If the coarse focus stopper is not being used, be sure to turn the coarse focus stopper ring in the direction opposite to the arrow on the microscope base as far as it will go.

## 2 Trinocular eyepiece tube

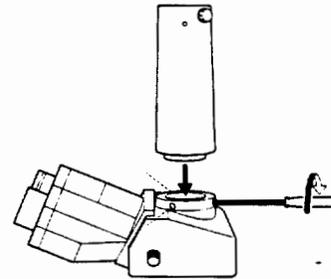
### 1. Optical path selection

The optical path selection lever can be used to select the way to divide the amount of light between the binocular part and the vertical tube.



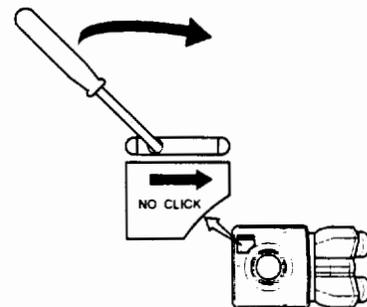
### 2. Vertical tube adapter

A photomicrographic vertical tube adapter is provided as standard equipment that allows a photomicrographic equipment to be installed. To install the adapter, insert it into the vertical tube and clamp three screws with the provided screwdriver. Replace this adapter with the optional TV vertical tube adapter when using a TV camera.



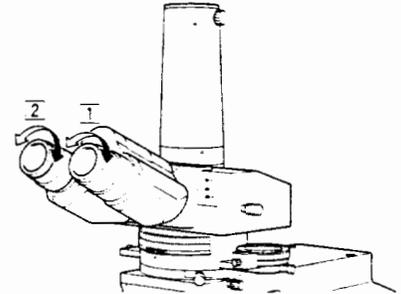
### 3. Optical path selection lever clicking

There is a switch identified by "NO CLICK" on the bottom surface of the eyepiece tube. Turn the switch in the direction of the arrow with the hexagonal screwdriver provided to disengage the clicking action of the optical path selection lever. Disengaging the clicking action minimizes small vibrations produced by operating the lever.



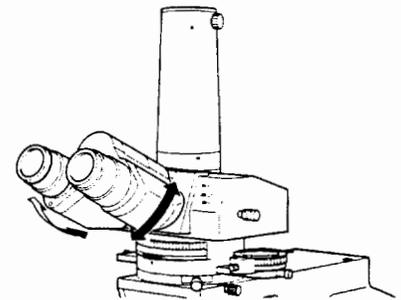
### 3 Diopter adjustment

The diopter difference between both eyes is adjusted by adjusting the diopter. In the case of a polarizing microscope, since an eyepiece containing crosshairs is used for the right eye, the procedure for adjusting the diopter differs from that of an ordinary microscope. To begin with, turn the diopter adjustment ring on the right eyepiece to bring the crosshairs in the eyepiece into focus **1**. Next, focus on a specimen on the stage while viewing with the right eye, and then turn the diopter adjustment ring on the left eyepiece **2** and bring the specimen into focus.



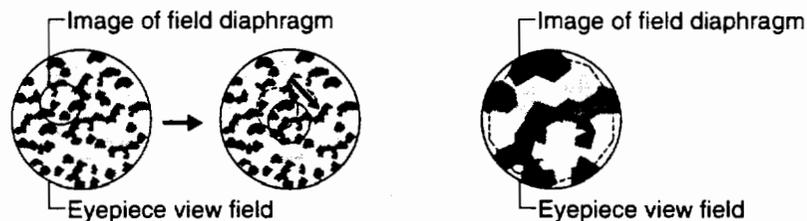
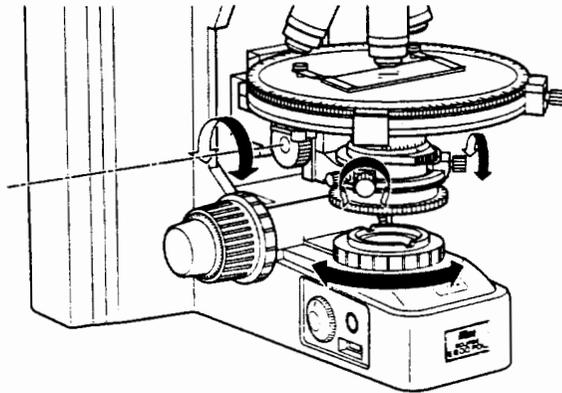
### 4 Interpupillary distance adjustment

Before adjusting the interpupillary distance, perform steps **1** to **15** in chapter "2-1. Diascopic Illumination Microscopy" so that the specimen is in focus with the 10× objective. (Perform steps **1** to **16** in "2-2. Episcopic Illumination Microscopy".) Adjust the interpupillary distance so that the view field for each eye is at the same position on the specimen. Doing so will make observation through the binocular eyepiece with both eyes easier.



## 5 Condenser

### 1. Focusing and centering

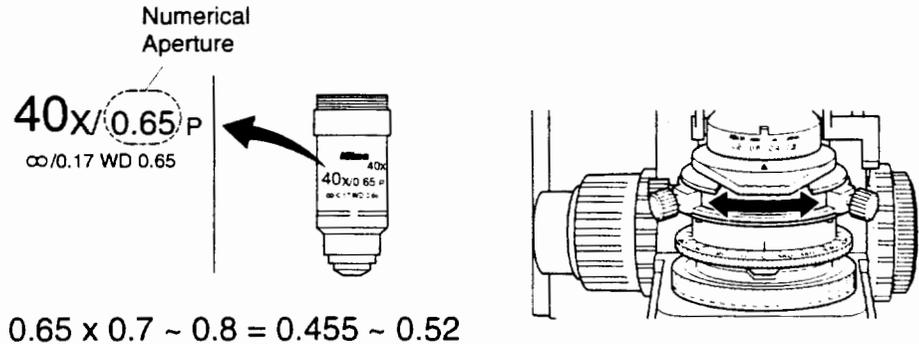


Focus and center the condenser so that the light passing through the condenser forms the image at the correct position on the specimen (i.e., at the center of the optical path).

Before focusing and centering the condenser, perform steps **1** to **16** in chapter "2-1. Diascopic Illumination Microscopy" so that the specimen is in focus with the 10 $\times$  objective.

- 1 Close the field diaphragm to its minimum setting.
- 2 Turn the condenser focus knob so that the image of the field diaphragm is formed on the specimen.
- 3 Make rough adjustments with the condenser centering screws so that the image of the field diaphragm appears at the center of the eyepiece view field.
- 4 Move the 40 $\times$  objective into the optical path. Turn the fine focus knob to focus on the specimen.
- 5 Turn the condenser focus knob so that the image of the field diaphragm is formed on the specimen.
- 6 Adjust the condenser centering screws so that the image of the field diaphragm appears at the center of the eyepiece view field. This adjustment is easier to make if you adjust the size of the field diaphragm to be slightly smaller than the eyepiece view field.

## 2. Condenser aperture diaphragm



### Orthoscopic Microscopy

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 numerical aperture of the objective. The numerical aperture is indicated on the barrel of each objective.

**An indication of 40×/0.65 means that the magnification is 40× and the numerical aperture is 0.65.**

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

Since 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 using the Bertrand lens

Insert the Bertrand lens into the optical path (by placing in position "B"). Turn the diaphragm control ring to stop down the aperture diaphragm to its minimum setting. Turn the Bertrand lens focus ring to focus on the aperture diaphragm. Turn the diaphragm control ring to adjust the aperture diaphragm. (This is normally adjusted to 70-80% of the field of view.)

### Conoscopic Microscopy

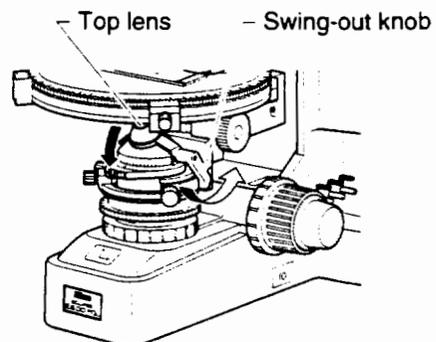
In the case of conoscopic microscopy, the condenser aperture diaphragm functions as a field diaphragm on the conoscopic image surface. Stop down the diaphragm until it circumscribes the circumference of the field of view of the conoscopic image (pupil of the objective).

### 3. Swing-out the top lens of the condenser

The top lens of the swing-out condenser can be moved outside the optical path with the swing-out knob.

During normal orthoscopic microscopy or conoscopic microscopy, the top lens is used while positioned in the optical path. During orthoscopic microscopy using a low-power objective of 4X or lower, swing out the top lens.

During measurement of retardation or evaluation by interference color, swing out the top lens (the condenser aperture diaphragm may be stopped down) and illuminate with light that is as parallel to the optical axis as possible.



## 6 Field diaphragm

The field diaphragm restricts illumination to the area on the specimen being viewed. Turning the field diaphragm ring changes the size of the field diaphragm. For normal observation, the size of the diaphragm should be slightly larger than the boundary of the view field. If a broader area than necessary is illuminated, stray light will enter the view field, creating flaring and reducing the contrast of the optical image. The correct setting of the field diaphragm is especially important in photomicrography; generally, good results are obtained by stopping down the field diaphragm to just slightly larger than the area that will be reproduced on the film, i.e., the size of the photo frame.

## 7 Filters

Three filters are housed in the base of the microscope.

A filter is inserted into the optical path by pressing in the filter insertion lever on the right side of the microscope. The filter is removed from the optical path by pressing the release lever down.

NCB11 (color balancing filter)	For color balance adjustment and color photomicrography
ND32 (transmission rate: 3%)	For brightness adjustment
ND8 (transmission rate: 12.5%)	For brightness adjustment
GIF (Optional)	For retardation measurement and contrast adjustment (Place on the field lens.)

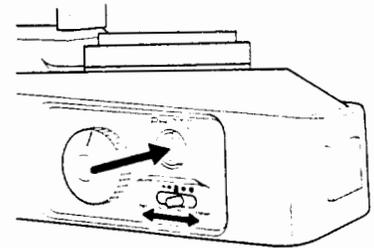
A diffuser is contained in the microscope. When removing the diffuser from the optical path, turn the diffuser insertion/removal screw as far as it will go (about 90°) in the counter-clockwise direction with a hexagonal screwdriver. When returning the diffuser to the optical path, turn the screw as far as it will go in the clockwise direction.

## 8 Auto-photo 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, 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 auto-photo switch is used to automatically set the standard lamp voltage (9 V). If the images on color film shot with the auto-photo switch on are reddish or bluish, finely adjust the voltage with the auto-photo voltage selection switch. The center position of the 5-level slide switch is roughly 9 V. Sliding the switch forward increases the bluish tint of the light, while sliding the switch towards the back increases the reddish tint of the light.

Use commercially available color compensation filters (CC filters) if this adjustment does not resolve the problem.



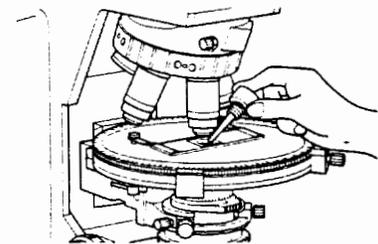
## 9 Oil-immersion operation (using an oil-immersion type of objective and condenser)

An objective marked "Oil" is an oil-immersion type. These objectives are used with the immersion oil applied between the specimen and the tip of the objective. The immersion oil is provided for the microscope.

Bubbles in the oil will adversely affect the viewing of the image, so be careful to prevent the formation of air bubbles. To check for air bubbles, remove the eyepieces, fully open the field and aperture diaphragms, and look at the exit pupil of the objective within the eyepiece tube. (The exit pupil will appear as a bright circle.) When it is difficult to see if there are any bubbles, mount a centering telescope (sold separately) on the eyepiece sleeve with an adapter (sold separately). Then, while turning the eyepiece on the centering telescope to change the focus, look through the centering telescope for air bubbles. If there are bubbles in the oil, remove them by one of the following methods:

- Turn the revolving nosepiece slightly, moving the oil-immersed objective back and forth once or twice.
- Add more oil.
- Remove the oil and replace it with new oil.

Use as little oil as possible (just enough to fill the space between the tip of the objective and the specimen). If too much oil is applied, the excess will flow onto the stage.



Any oil remaining on an oil-immersion type of objective or staining on the tip of a dry type of objective has a negative effect on viewing. After using oil, wipe all of it away and make sure that there is no oil on the tips of the other objectives.

Use petroleum benzene to wipe away immersion oil. Removing the oil and wiping with absolute alcohol (ethyl alcohol or methyl alcohol) will complete cleaning.

If you cannot obtain petroleum benzene, use methyl alcohol. Note that methyl alcohol does not clean as well as petroleum benzene and it will be necessary to repeatedly wipe the surfaces (three or four times is usually sufficient to clean the lenses.)



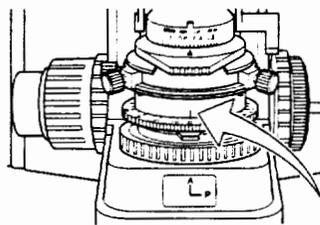
**WARNING** When using petroleum benzene or absolute alcohol, always follow the instructions provided by the manufacturer. Keep these flammable liquids away from fire or sparks.

## 10 Orientation of polarizing plates (Polarizer and Analyzer)

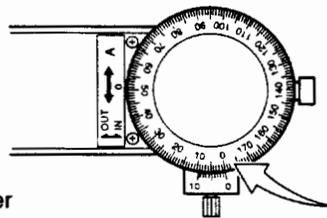
### Diascopic Observation

The dia-polarizer and analyzer coincide with the directions of the orientation plate on the top of the microscope base when the protractor scale is at "0" (the polarizer is in the X direction: P and the analyzer is in the Y direction: A), and are in the crossed Nicols position. The dark cross image as shown in the diagram can be observed at this time in the conoscopic observation.

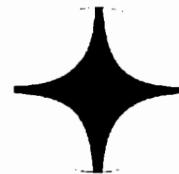
It should be noted that the X direction is explained as that of the analyzer and Y direction as that of the polarizer in some commercially available technical manuals and reference books.



Polarizer scale: 0

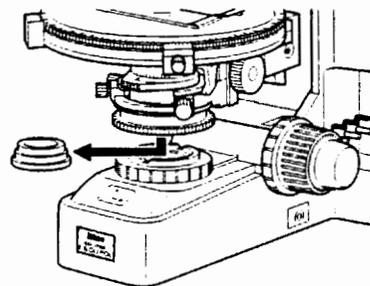


Analyzer scale: 0



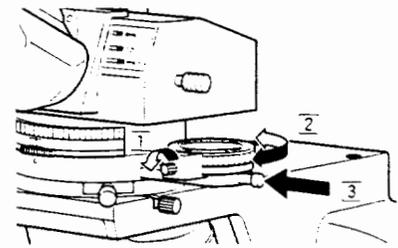
Dark cross image

The dia-polarizer is attached to the bottom of the substage and can be rotated 360°. It can be removed from the bottom of the substage by pulling down as necessary. When re-attaching, align the positioning pin on the top of the polarizer with the groove in the bottom of the substage. Since the groove in the bottom of the substage is not visible when the condenser is attached to the substage, attach the polarizer after temporarily removing the condenser.



The analyzer can be rotated by first loosening the analyzer clamp screw **1** and then turning the rotation dial **2**. The angle of rotation can be read to 0.1 degrees over a range of 0-360 degrees with the vernier.

The analyzer can be moved out of the optical path by pushing in the analyzer slider **3**. Although the analyzer is designed, as standard, to be inserted from the right relative to the intermediate tube, it can also be inserted from the left. In this case, it may be somewhat difficult to read the angle of rotation since the readings on the scale, etc. are backward.



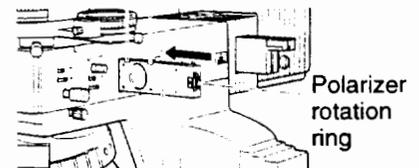
Since the intermediate tube contains a built-in depolarizer, it is not necessary to be concerned about the relationship between the orientation of the polarizing plate and photomicrographic devices.

### Episcopic Observation

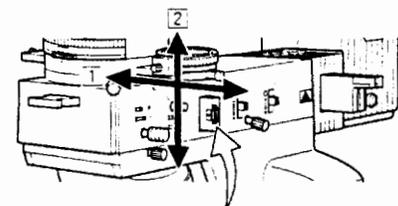
In the case of performing episcopic polarizing microscopy, an episcopic polarizer is used in combination with the analyzer of the intermediate tube. Place a mirror or other isotropic specimen having a high reflectance on the stage and focus on that specimen. Set the analyzer scale to "0" and replace the hollow slider of the epi-illuminator with the polarizer slider and insert the polarizer slider into the epi-illuminator. The empty hole will enter the optical path when the polarizer slider is pushed in until it clicks once.

The polarizer will enter the optical path when the polarizer slider is push in until it clicks twice. Turn the polarizer rotation ring of the polarizer slider until it reaches the crossed Nicols position in the same manner as during diasopic observation.

- First click position
- Second click position



- Polarizer slider



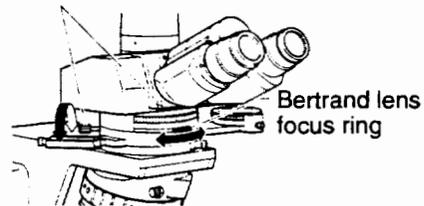
- 1** Lateral direction
  - 2** Vertical direction
- Direction of polarizer

Be careful not to touch the polarizer rotation ring and change the orientation during observation. If this happens, the orientation must be reset.

## 11 Focusing and centering the Bertrand lens

When changing the objectives, turn the Bertrand lens focus ring under the Bertrand lens turret of the intermediate tube and focus the Bertrand lens. Centering the Bertrand lens is performed with two centering screws. The centering procedure is the same as that for the condenser except that the condenser aperture diaphragm image is used instead of the field diaphragm image.

Bertrand lens centering screws



## 12 P-CL $1/4\lambda$ & tint plate

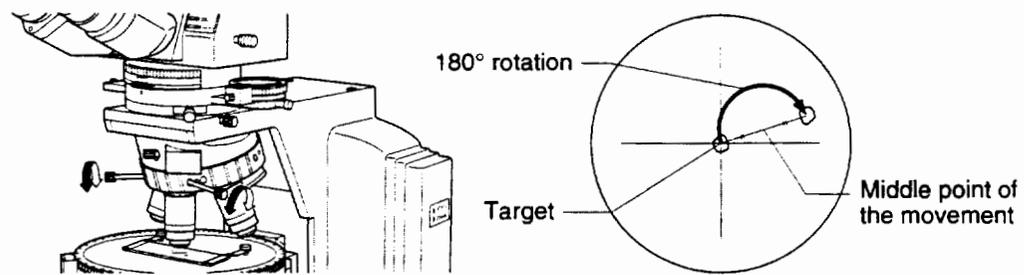
The P-CL  $1/4\lambda$  & tint plate has a hole in the center. By pushing it into the slot, the sensitive tint plate (530 nm) is brought into the optical path. Pulling it out brings the  $1/4\lambda$  plate into the optical path. This plate is used for recognition of very weak birefringence and the determination of X' and Y' of the specimen.

## 13 Centering the objectives

Before centering the objectives, focus on a specimen using the 10X objective.

**Tools Used:** Centering tools  $\times 2$  (provided) (when not in use, place them in the tool holder in the back of the microscope stand).

- 1 Bring an appropriate target such as granules that can be easily used as a marker in the specimen to the center of the crosshairs of the eyepiece.
- 2 Insert the centering tools into the centering screws on the nosepiece.
- 3 Rotate the stage about  $180^\circ$ . Move the objective using the centering tools so that the center of the crosshairs moves by one-half the amount of movement of the target.
- 4 Next, move the specimen and bring the target to the center of the crosshairs.
- 5 Repeat this procedure several times. Carry out this centering procedure for each objective.



The centering nosepiece has a DIN standard slot. This allows the use of a  $1/4\lambda$  & tint plate compatible with DIN standards.

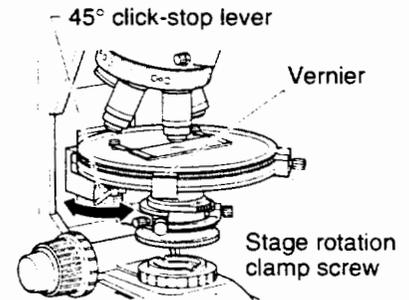
## 14 Circular graduated stage for polarizing microscope

### ■ Stage rotation

Loosening the stage rotation clamp screw can rotate the stage. The angle of rotation can be read to 0.1 degrees from the two vernier scales.

### ■ 45° click-stop

Turning the 45° click-stop lever towards the front until it stops causes the click-stop to move in 45° increments from the position where the lever was rotated. This makes it possible to move easily and accurately from the extinction position to the diagonal position. Turning the lever towards the back until it stops releases the click-stop device.



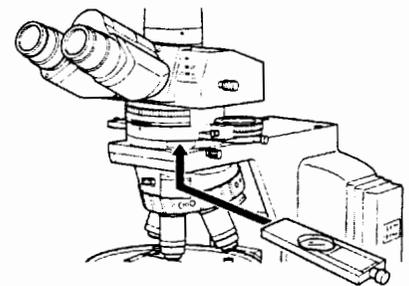
Release the click-stop device where the stage has dropped into a click position. If the click-stop device is released where the stage is not at this position, the first 45° increment will not be accurate the next time the click-stop device is operated.

## 15 Use of optional accessories (Sold Separately)

### ■ 1. P-CS Sénarmont Compensator

The P-CS Sénarmont compensator is used by inserting into the slot of the intermediate tube in place of the P-CL 1/4λ & tint plate.

It can be used to measure retardation up to 1λ according to the following procedure.



It is normal to bring the top lens of the condenser into the optical path when observing at a magnification of 10× or greater. Measuring the retardation or evaluating by interference color, however, stop down the condenser aperture diaphragm or swing out the top lens even for a magnification of 10× or higher (with the aperture diaphragm fully opened), and illuminate with light that is as parallel to the optical axis as possible.

### 1 Determination of Extinction Position

Rotate the stage with the specimen under the crossed Nicols to find the direction where the part of the specimen to be measured appears darkest.

### 2 Determination of Subtraction Position

Rotate the stage 45° from the extinction position to the diagonal position. Insert the P-CL 1/4λ & tint plate into the optical path and confirm that the interference color of the section of the specimen to be measured changes toward the lower order side. If the interference color changes toward the higher order side, rotate the stage another 90°.

### 3 Measurement

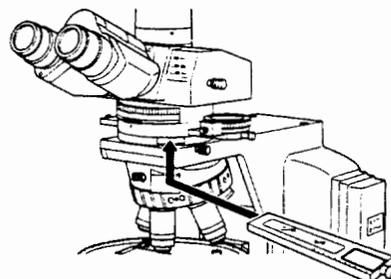
Place the GIF filter on the field lens and replace the P-CL 1/4λ & tint plate with the P-CS Sénarmont compensator. Rotate the analyzer so that the section of the specimen to be measured becomes darkest. When the rotation angle of the analyzer at that time is taken to be theta (θ) degrees, then retardation (R) (nm) is determined with the following formula:

$$R = \frac{\theta}{180} \lambda \quad (\lambda: \text{wavelength used})$$

The value of λ when using the GIF filter is 546 nm.

## 2. P-CQ Quartz wedge

The P-CQ quartz wedge is used by inserting it into the slot of the intermediate tube in place of the P-CL 1/4λ & tint plate. The quartz wedge is engraved with a scale and can be used for rough measurement of retardation in the range of 1λ-6λ.



It is normal to bring the top lens of the condenser into the optical path when observing at a magnification of 10× or greater. Measuring the retardation or evaluating by interference color, however, stop down the condenser aperture diaphragm or swing out the top lens even for a magnification of 10× or higher (with the aperture diaphragm fully opened), and illuminate with light that is as parallel to the optical axis as possible.

### 1 Determination of Extinction Position

Rotate the stage with the specimen under the crossed Nicols to find the direction where the part of the specimen to be measured appears darkest.

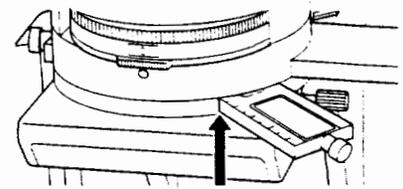
### 2 Determination of Subtraction Position

Rotate the stage 45° from the extinction position to the diagonal position (direction where the specimen appears brightest). Insert the P-CQ quartz wedge into the slot of the intermediate tube and confirm that the interference color of the section of the specimen to be measured changes toward the lower order side. If the interference color changes toward the higher order side, rotate the stage another 90°.

### 3 Measurement

Move the section of the specimen to be measured to the center of the crosshairs of the eyepiece. Next, slide the P-CQ quartz wedge along the slot and observe that the interference color sequentially changes. Stop sliding the quartz wedge where the dark stripe covers the section of the specimen to be measured. Reading the value from the quartz wedge scale at that time can make a rough measurement of retardation.

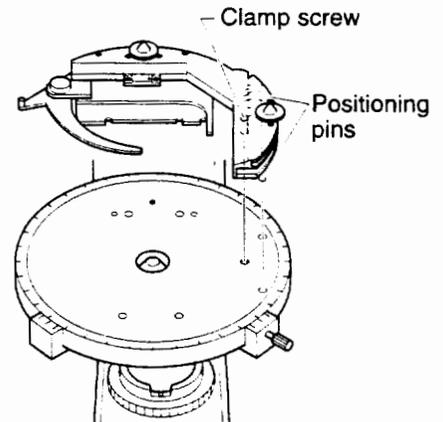
Retardation can be measured even more accurately by using the P-CS Sénarmont compensator in combination with the P-CQ quartz wedge.



Read the scale

### 3. Attachable Mechanical Stage

The attachable mechanical stage is installed by inserting the two pins on the bottom into the two pinholes on the stage surface. Tighten the clamp screw using the supplied hexagonal wrench.





**WARNING** To prevent electrical shock or fire, turn off the power switch (flip it to the “○” side) during assembly.



**CAUTION**

- Be careful not to pinch your hands or fingers when setting up the microscope.
- Viewing will be adversely affected if any of the lenses is scratched or has fingerprints on it. Handle the lenses carefully during assembly.
- This microscope is a precision optical instrument. Handle it carefully and do not subject it to a strong physical shock. (The accuracy of the objectives in particular may be adversely affected by even a weak physical shock.)

Assemble each part in sequence as numbered in the diagram. (For details, refer to pages 33 to 40.)

### Tools needed

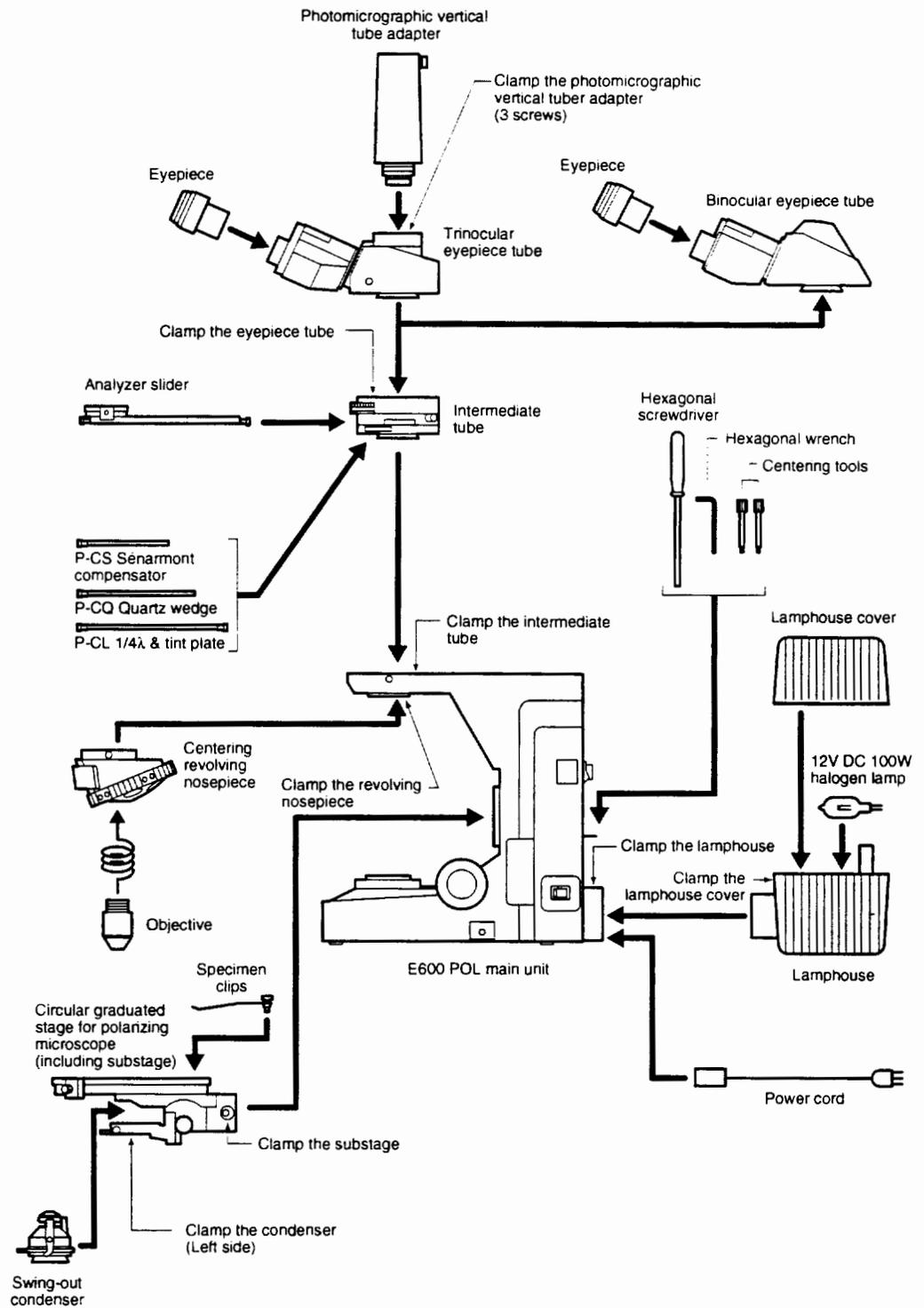
- A hexagonal screwdriver (provided) with the microscope  1.3 mm
- A hexagonal wrench (provided with the microscope)  3 mm

When not using, place these in the tool holder in the back of the microscope.

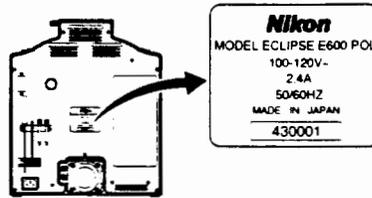
### Installation location

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 accuracy. The following conditions should be kept in mind when selecting the installation location.

- Avoid installing the microscope in a brightly lit location such as a room that receives direct sunlight, or directly under room lights. The quality of the view through the microscope deteriorates if there is excessive 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 instrument.
- Do not install the microscope in a warm, humid location (environmental temperature: 40°C or higher and relative humidity: 60% or more).



## 1. Confirming the input voltage



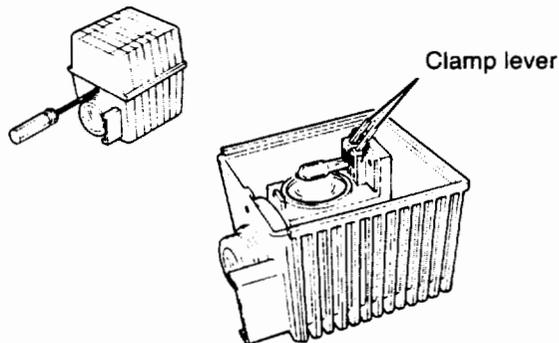
**WARNING** Make sure that the input voltage indicated on the back panel of the microscope is the same as the voltage provided in your area. If the indicated voltage is different, do not use the microscope and notify your nearest Nikon representative immediately. If the microscope is used with the wrong input voltage, a short circuit, electrical shock or fire may result, causing damage to the microscope.

## 2. Lamp and lamphouse (lamp replacement)



**CAUTION**

- To prevent electrical shock and damage to the microscope, always turn off the power switch (flip it to the “○” side) and unplug the power cord when connecting or disconnecting the lamphouse.
- To prevent burns, allow the lamp and lamphouse to cool before replacing it for at least 30 minutes after using.
- Use the Nikon C-LP HALOGEN 12V-100W model for the lamphouse.
- Use a 12 V-100 W LONGLIFE halogen lamp (OSRAM HLX 64623 or PHILIPS 7724).
- Do not touch the glass surface of the lamp with your bare hands. Doing so will cause fingerprints, grease, etc., to burn onto the lamp surface, reducing the illumination provided by the lamp. If you do get any fingerprints or dirt on the lamp, wipe it clean.
- After replacing the lamp, make sure that the lamphouse cover is attached securely. Never use the lamphouse while its cover is off.



- 1 Check that the power switch is off (i.e., that it is flipped to the "O" side).
- 2 If the lamphouse is mounted on the microscope, use a hexagonal screwdriver to loosen the lamphouse clamp screw, and then remove the lamphouse from the microscope (the screw is on the top of the lamphouse mount).
- 3 Use a hexagonal screwdriver to loosen the clamp screw on the front of the lamphouse and remove the lamphouse 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 tilted.
- 6 Attach the cover securely and tighten the clamp screw. Make sure that the cover is fixed in place and will not come off even when shaken by hand.
- 7 Connect the lamphouse to the microscope by inserting the lamphouse plug into the lamphouse socket.
- 8 Tighten the lamphouse clamp screw to secure the lamphouse in place.

### 3. Stage assembly

#### 1 Substage (including circular graduated stage)

Use a hexagonal wrench to loosen the clamp screw on the right side of the substage. Fit the substage over the substage mount on the microscope and slide it down as far as it will go. Use a hexagonal wrench to tighten the substage clamp screw and secure the substage in place.

#### 2 Specimen clip

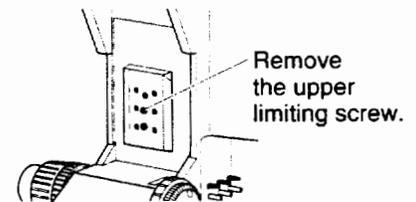
Insert the specimen clips into the holes on the stage surface.

#### 3 Condenser

Turn the condenser focus knob to lower the condenser holder as far as it will go. Insert the condenser in the condenser holder. Tighten the clamp screw on the left side with the aperture scale on the condenser facing to the front. Turn the condenser focus knob to raise the condenser as far as it will go.

#### 4 Observing a relatively thick specimen

- 1 Turn the coarse focus knob to lower the substage as far as it will go.
- 2 Loosen the substage clamp screw with a hexagonal wrench and remove the substage.
- 3 Remove the upper limiting screw with a hexagonal wrench. (Store the screw in a safe place to prevent its loss.)
- 4 Re-install the substage in the original position.



## 4. Revolving nosepiece assembly

### 1 Revolving nosepiece

Use a hexagonal screwdriver to loosen the revolving nosepiece clamp screw. Fit the revolving nosepiece into the revolving nosepiece mount on the microscope from the bottom and slide it toward the rear of the microscope as far as it will go. Tighten the clamp screw to secure the revolving nosepiece.

#### **Note on removing the revolving nosepiece**

First, remove all the objectives. Lower the stage completely, and hold the revolving nosepiece in your hand so that it does not fall when you remove it.

### 2 Objective

Lower the stage completely. Screw the objective into the revolving nosepiece so that the magnification increases when the nosepiece is rotated in the clockwise direction when looking down on the nosepiece from above.

#### **When using the objective for episcopic observation**

When using the objective for episcopic observation (Mark:  $\infty/0$ ) with the Epi-illuminator, first screw in the objective attaching screw conversion adapter (M20.32  $\rightarrow$  M2.5 and 25mm in thickness) to the revolving nosepiece and then screw in the objective to the adapter.

#### **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 they do not fall when you remove them.

## 5. Intermediate tube

Completely loosen the intermediate tube clamp screw on the microscope arm. Fit the circular dovetail of the intermediate tube into the circular dovetail groove of the microscope arm by tilting it at an angle. When fitting, insert the positioning pin on the intermediate tube in the receiving groove on the arm. Lock it in position by tightening the clamp screw.

Remove any looseness between the positioning pin and groove by pushing in the intermediate tube while rotating in the clockwise direction.

## 6. Eyepiece tube assembly

### 1 Eyepiece Tube

Completely loosen the eyepiece tube clamp screw on the intermediate tube with the hexagonal screwdriver. Fit the circular dovetail of the eyepiece tube into the circular dovetail groove of the intermediate tube by tilting it at an angle. When fitting, insert the positioning pin on the eyepiece tube in the receiving groove on the intermediate tube. Lock it in position by tightening the clamp screw.

Remove any looseness between the positioning pin and groove by pushing in the eyepiece tube while rotating in the clockwise direction.

### 2 Eyepieces

Attach eyepieces of the same magnification. Attach the eyepiece containing crosshairs on the right side so as to be viewed with the right eye. The sleeve has a positioning pins. Insert the eyepieces by aligning the grooves of the eyepiece with the positioning pins of the eyepiece tube sleeve. Insert the rubber eyeguard (sold separately) so that they fit into the grooves around the outside of the eyepieces.

## 7. Power cord



**WARNING** Use only the following power supply cord set.

- For 100–120V area  
UL Listed, detachable cord set, 3 conductor grounding type SVT, No. 18 AWG rated at 125V, 7A minimum.  
In case of using the extension cord, use only the power supply cord with the PE (protective earth) wire.
- For 220–240V area  
3 pole power supply cord set, which must be approved according to EU/EN - standards.  
Class I equipment should be connected to PE (protective earth) terminal.  
In case of using the extension cord, use only the power supply cord with the PE (protective earth) wire.

Make sure to turn off the microscope power switch (flip it to the “○” side) before connecting the power cord.

Plug the cord into the socket of the AC input connector on the back of the microscope. Securely plug the other end of the cord into an AC outlet.

## Covering the tapped holes with protective stickers

The four tapped holes on the upper surface of the microscope arm are for mounting accessories, such as Epi-fluorescence attachment, etc. When not used, cover the tapped holes with the provided protective stickers.

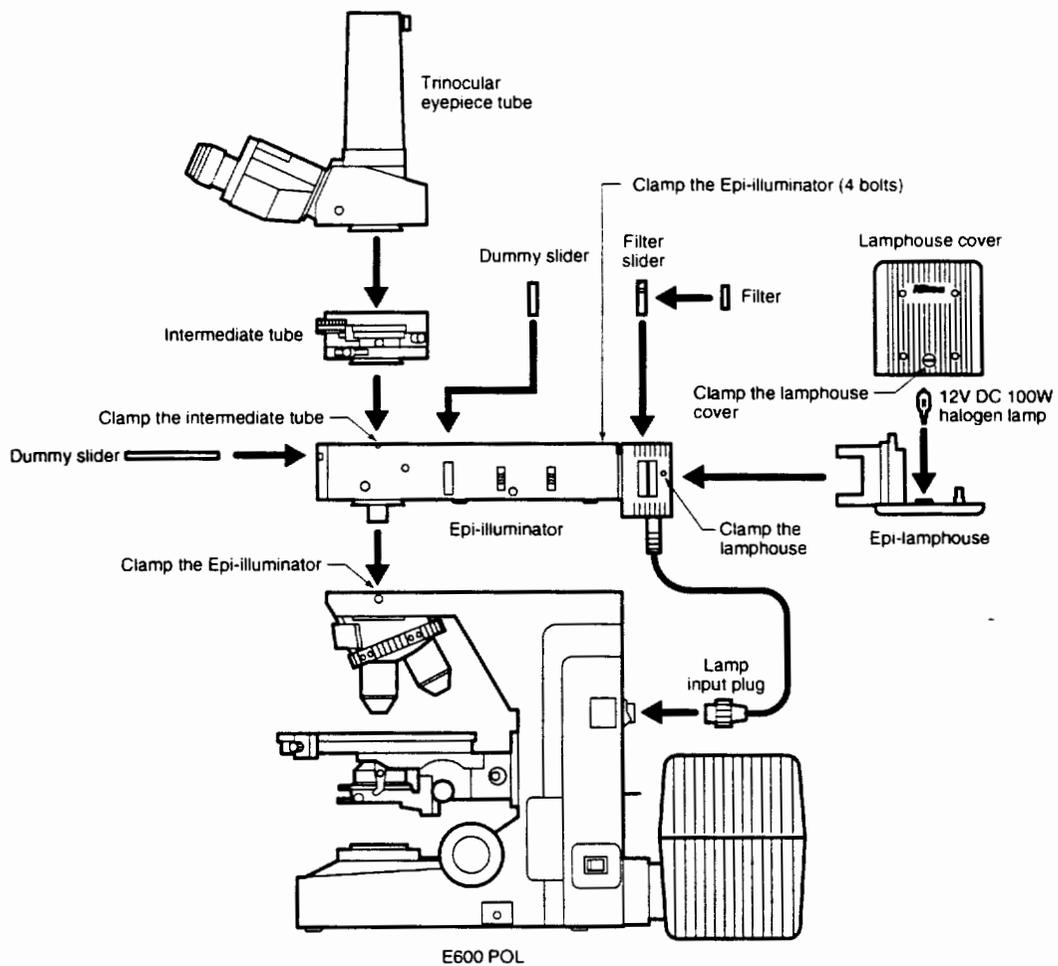
## Installing separately sold accessories

Install photomicrographic equipment and other separately sold accessories by referring to the instruction manual for each accessory.

## 8. Epi-illuminator assembly

In the case of performing episcopic polarizing microscopy, the optional accessory epi-illuminator is used by mounting between the E600 POL stand and the intermediate tube.

Assemble the epi-illuminator in the order of the numbers while referring to the diagram. Refer to the previous instructions for details concerning the assembly procedures for other parts.



- 1 Remove the eyepiece tube and the intermediate tube from the microscope stand.
- 2 Mount the epi-illuminator nearly parallel to the microscope arm.
- 3 Tighten the epi-illuminator clamp screw on the right side of the arm with the hexagonal screwdriver to lock in position.
- 4 Screw in the four hexagonal head bolts supplied with the epi-illuminator to the screw holes on the top of the epi-illuminator, and tighten the bolts using the hexagonal wrench.
- 5 Attach the lamp and lamphouse.

**CAUTION**

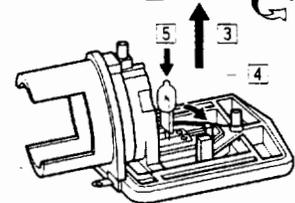
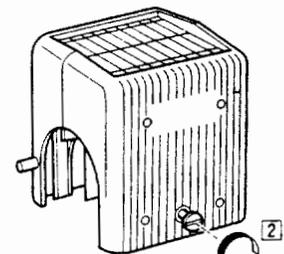
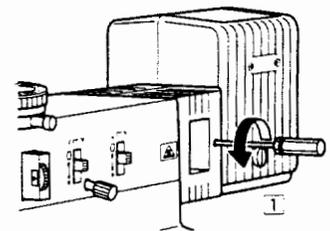
- To prevent electrical shock and damage to the microscope, always turn off the power switch (flip it to the “○” side) and unplug the power cord when connecting or disconnecting the lamphouse.
- To prevent burns, allow the lamp and lamphouse to cool before replacing it for at least 30 minutes after using.
- Use the Nikon LHS-H100P-2 HALOGEN 12V-100W model for the lamphouse.
- Use a 12 V-100 W LONGLIFE halogen lamp (OSRAM HLX 64623 or PHILIPS 7724).
- Do not touch the glass surface of the lamp with your bare hands. Doing so will cause fingerprints, grease, etc., to burn onto the lamp surface, reducing the illumination provided by the lamp. If you do get any fingerprints or dirt on the lamp, wipe it clean.
- After replacing the lamp, make sure that the lamphouse cover is attached securely. Never use the lamphouse while its cover is off.

**5-1** Check that the power switch is off (the switch is in the “○” position).

**5-2** If the lamphouse is already mounted on the epi-illuminator, loosen the lamphouse clamp screw with the hexagonal screwdriver and remove the lamphouse **1**. (The clamp screw is on the right side.)

**5-3** Loosen the lamphouse cover clamp screw with a coin or other tool **2** and remove the cover **3**.

**5-4** Securely insert the lamp into the pinholes of the socket **5** until it does not go in any farther while pressing down on the lamp clamp lever **4**.



Do not touch the glass portion of the lamp with your bare hands.

**5-5** Return the lamp clamp lever to its original position.

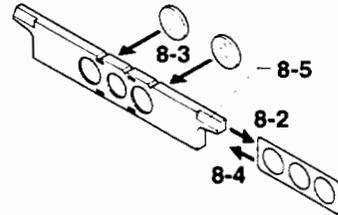
Be careful so that the lamp is not installed tilting to one side.

**5-6** Securely close the lamphouse cover and tighten the clamp screw.

**5-7** After completely loosening the lamphouse clamp screw, securely plug the lamphouse plug into the socket of the lamphouse mount and then tighten the lamphouse clamp screw.

- 6 Connect the lamphouse cord to the epi-illuminator connector on the back of the microscope.
- 7 Insert the hollow sliders all the way into the front and right sides of the epi-illuminator so that the open hole enters the optical path.
- 8 Attachment of Filter Slider (Various Filters)
  - 8-1 Remove the filter slider from the epi-illuminator.
  - 8-2 Pull out and remove the locking plate.
  - 8-3 Insert the desired filter.
 

The filter slider contains two filters.
  - 8-4 Insert and attach the locking plate.
  - 8-5 Affix the label at the same position as the filter.
  - 8-6 Attach the filter slider to the epi-illuminator.
- 9 Mount the intermediate tube on the epi-illuminator.
- 10 Mount the eyepiece tube on the intermediate tube.



The eyepiece tube, intermediate tube and epi-illuminator are provided with positioning pins, while the intermediate tube, epi-illuminator and microscope arm are provided with grooves for engaging with those pins. Remove any looseness between the pins and grooves that occurs during assembly by pushing in on the component provided with the pin while turning in the clockwise direction.



# Troubleshooting Tables

Improper use of the microscope may adversely affect the performance even if it is not damaged. If any of the problems listed in the table below occur, follow the countermeasures.

## 1 Viewing and control systems

Problem	Cause	Countermeasure
Vignetting or uneven brightness in the view field; the entire view field cannot be seen.	The optical path selection lever on the eyepiece tube is in an intermediate position.	Set the optical path selection lever to 100% of the binocular eyepiece. (p.20)
	The optical path selection lever on the eyepiece tube is not set to 100% of the binocular eyepiece.	
	The diffuser is in an intermediate position.	Insert and remove correctly. (p.24)
	The revolving nosepiece has not been installed properly.	Install the revolving nosepiece correctly. (p.36)
	The revolving nosepiece has not been rotated until it has clicked into place. (The objective is not in the optical path.)	Turn the revolving nosepiece until it clicks into place. (Place the objective in the optical path.) (p.12)
	The condenser is too low.	Position the condenser so that the image of the field diaphragm forms properly on the specimen. (p.22)
	The condenser is not centered.	Center the condenser. (p.22)
	The condenser is not installed properly.	Install the condenser correctly. (p.35)
	The filters are not switched fully into position.	Switch the filters correctly. (p.24)
	The field diaphragm is stopped down too far.	Open the diaphragm to a suitable size. (p.24)
	The lamp is not installed properly.	Install the lamp correctly. (p.34)
	The Bertrand lens is in the optical path.	Move out of the optical path.
	The top lens of the swing-out condenser is not positioned properly.	Correctly push in all the way.
	The P-CL, P-CS or P-CQ plate is not inserted correctly.	Position correctly.
Dirt or dust in the view field.	The condenser is too low.	Position the condenser so that the image of the field diaphragm forms properly on the specimen. (p.22)
	The aperture diaphragm is stopped down too far.	Open the diaphragm to a suitable size. (p.23)
	There is dirt or dust on the lens, condenser, eyepiece, filter or specimen.	Clean the components. (p.45)

Problem	Cause	Countermeasure
Viewing is poor (too much or too little contrast, poor resolution).	The aperture diaphragm is stopped down too far.	Open the diaphragm to a suitable size. (p.23)
	The condenser is too low.	Position the condenser so that the image of the field diaphragm forms properly on the specimen. (p.22)
	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 of objective.	Apply Nikon immersion oil. (p.25)
	The specified immersion oil is not being used.	
	There are bubbles in the immersion oil.	Remove the bubbles. (p.25)
	There is immersion oil on the tip of a dry type of objective.	Clean the components. (p.25)
	The compensation ring on an objective fitted with a compensation ring has not been adjusted.	Adjust the compensation ring according to the cover glass.
	There is dirt or dust on the lens, condenser, objective or specimen.	Clean the components. (p.45)
	A specimen with a cover glass is being observed with an objective for observing specimens without a cover glass.	Use an objective that allows observation of specimens with a cover glass.
	A specimen without a cover glass is being observed with an objective for observing specimens covered with a cover glass.	Use an objective for observing specimens without a cover glass. Mark on the objective ∞/0.17: For observing a specimen with a cover glass ∞/0: For observing a specimen without a cover glass ∞/-: For observing either specimen with or without a cover glass
Uneven focus.	The revolving nosepiece has not been installed properly.	Install the revolving nosepiece correctly. (p.36)
	The revolving nosepiece has not been rotated until it clicks into place.	Turn the revolving nosepiece until it clicks into place. (p.12)
	The specimen is not secured in place on the stage.	Install the specimen properly in the specimen clips on the stage.
Image flows.	The revolving nosepiece has not been installed properly.	Install the revolving nosepiece correctly. (p.36)
	The revolving nosepiece has not been rotated until it clicks into place.	Turn the revolving nosepiece until it clicks into place. (p.12)
	The specimen is not secured in place on the stage.	Install the specimen properly in the specimen clips on the stage.
	The condenser is not centered.	Center the condenser. (p.22)

## 5. Troubleshooting Tables

Problem	Cause	Countermeasure
The image is yellowish.	An NCB11 filter is not being used.	Use the NCB11 filter. (p.24)
	The lamp voltage is too low.	Push auto-photo switch and then adjust the brightness through the ND filter combination. (p.24 and 25)
The image is too bright.	The lamp voltage is too high.	
Inadequate illumination (also check the electrical system problems and countermeasures).	The lamp voltage is too low.	Open the diaphragm to a suitable size. (p.23)
	The aperture diaphragm is stopped down too far.	
	The condenser is too low.	Position the condenser so that the image of the field diaphragm forms properly on the specimen. (p.22)
Focusing is not possible with high-power objectives.	The specimen is placed upside-down.	Set the specimen on the stage with the cover glass facing up.
	The cover glass is too thick.	Use the specified type of cover glass (thickness: 0.17 mm)
The objective strikes the specimen when changing from a low-power objective to a high-power objective.	The specimen is placed upside-down.	Set the specimen on the stage with the cover glass facing up.
	The cover glass is too thick.	Use the specified type of cover glass (thickness: 0.17 mm).
	The diopter setting has not been adjusted.	Adjust the diopter setting. (p.21)
The difference in focus is large when the objective is changed.	The diopter setting has not been adjusted.	Adjust the diopter setting. (p.21)
When viewing through the binocular eyepiece, the image does not resolve into a single image.	The interpupillary distance has not been adjusted.	Adjust the interpupillary distance. (p.21)
	The diopter setting has not been adjusted.	Adjust the diopter setting. (p.21)
Eye strain develops while viewing.	The interpupillary distance has not been adjusted.	Adjust the interpupillary distance. (p.21)
	The diopter setting has not been adjusted.	Adjust the diopter setting. (p.21)
	The brightness level is not suitable.	Adjust the brightness through the ND filter combination. (p.24)

## 2 Electrical system

Problem	Cause	Countermeasure
The lamp does not light when the power switch is turned on.	The power is not being supplied.	Plug the power cord into an outlet. (p.37)
	The power cord is not connected to the microscope.	Connect the power cord. (p.37)
	The lamp has not been installed.	Install the lamp. (p.34)
	The lamp is burned out.	Replace the lamp. (p.34)
	The specified lamp is not being used.	Use the specified lamp (refer to the electrical specifications on p.46). (p.34)
The lamp flickers; the brightness is unstable.	The lamp is near the end of its life.	Replace the lamp. (p.34)
	The power cord is not connected securely.	Secure the connection. (p.37)
	The lamp is not plugged into its socket securely.	Insert the lamp securely into its socket. (p.34)
	The lamphouse is not connected to the microscope securely.	Connect the lamphouse securely. (p.34)



# Care and Maintenance

## 1 Lens cleaning

Do not let dust, fingerprints, etc. get on the lenses. Dirt on the lenses, filters, etc. will adversely affect the view of the image. If any of the lenses gets dirty, clean it as described below.

- Either brush away dust with a soft brush, or gently wipe away with gauze.
- To remove fingerprints or grease, use a piece of soft, clean cotton cloth, lens tissue, or gauze moistened with absolute alcohol (ethyl alcohol or methyl alcohol).
- Use petroleum benzine to clean off immersion oil (p. 25).
- Do not wipe the entrance lens on the eyepiece tube with petroleum benzine.
- Absolute alcohol and petroleum benzine are both highly flammable. Be careful when handling them, when around open flames, or when turning the power switch on and off.
- Follow the instructions provided by the manufacturer when using absolute alcohol and petroleum benzine.

## 2 Cleaning painted components

Do not use organic solvents such as alcohol, ether or paint thinner on painted components, plastic components or printed components. Doing so could result in discoloration or in peeling of the printed characters. For persistent dirt, dampen a piece of gauze with neutral detergent and wipe lightly.

## 3 Storage

Store the microscope in a dry place where mold is not likely to form.

Store the objectives and eyepieces in a desiccator or similar container with a drying agent.

Put the vinyl cover over the microscope after use to protect it from dust.

Before putting on the vinyl cover, turn off the microscope power (flip the switch to the " " position), and wait until the lamphouse has cooled.

## 4 Regular inspection

Regular inspection of this microscope is recommended to maintain peak performance. Contact your nearest Nikon representative for details about regular inspection.



# Specifications and Standards

- |   |   |
|---|---|
| <b>1. Model Name:</b>                         | <b>ECLIPSE E600 POL (microscope main body)</b>  |
| <b>2. Focusing Mechanism:</b>                 | <ul style="list-style-type: none"><li>• Fine focus knob scale:<br/>1 step equals 1 <math>\mu\text{m}</math></li><li>• Amount of movement of fine focus knob:<br/>One turn moves the stage up or down by 0.1 mm</li><li>• Amount of movement of coarse focus knob:<br/>One turn moves the stage up or down by about 12 mm</li><li>• Range of stage vertical motion:<br/>2 mm up and 23 mm down from the reference (focused) position</li></ul> |
| <b>3. Stage:</b>                              | <ul style="list-style-type: none"><li>• Circular graduated stage with two verniers</li><li>• Provided with a rotation mechanism with a clamp</li><li>• Provided with a 45° click-stop</li><li>• Provided with two specimen clips</li></ul>  |
| <b>4. Revolving Nosepiece:</b>                | <ul style="list-style-type: none"><li>• Quintuple</li><li>• Provided with an objective centering mechanism</li></ul>  |
| <b>5. Illumination:</b>                       | <ul style="list-style-type: none"><li>• Internal Koehler-type diascope illumination optics</li><li>• Provided with a PHOTO switch (5-level fine adjustment selector)</li><li>• Lamp rating: 12V DC, 100W halogen lamp<br/>(OSRAM HLX64623 or PHILIPS 7724)</li></ul>  |
| <b>6. Input Power Supply Voltage:</b>         | <ul style="list-style-type: none"><li>• AC 100-120V <math>\pm</math> 10% 50/60Hz<br/>Current consumption: 2.4A or less<br/>Internal fuse rating: 125V, 5A</li><li>• AC 230V <math>\pm</math> 10% 50/60Hz<br/>Current consumption: 1.2A or less<br/>Internal fuse rating: 250V, T3.15A</li></ul>   |
| <b>7. Protection Class:</b>                   | Class I   |
| <b>8. Operating Environmental Conditions:</b> | <ul style="list-style-type: none"><li>• Temperature: 0 to +40°C</li><li>• Humidity: 85% RH max., non-condensing</li><li>• Altitude: 2000 m max.</li><li>• Pollution: Degree 2</li><li>• Installation: Category II</li><li>• Indoor use only</li></ul>   |

9. Conforming Standards:

• Product with AC 100-120V

- 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.

• Product with AC 230V

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





## **NIKON CORPORATION**

9-16, Ohi 3-chome, Shinagawa-ku, Tokyo 140-8505, Japan  
Tel: +81-3-3773-8121/8122 Fax: +81-3-3773-8115

## **NIKON INC.**

Instrument Group

1300 Walt Whitman Road, Melville, NY 11747-3064, U.S.A.  
Tel: +1-516-547-8500 Fax: +1-516-547-0306

## **NIKON EUROPE B.V.**

Schipholweg 321, P.O. Box 222, 1170 AE Badhoevedorp, The Netherlands  
Tel: +31-20-44-96-222 Fax: +31-20-44-96-298