Nikon

C-CU UNIVERSAL SYSTEM CONDENSER

DIFFERENTIAL INTERFERENCE CONTRAST ATTACHMENT
PHASE CONTRAST ATTACHMENT

Instructions

WARNING

1. Intended product use

The system should only be used for microscopic observation. Do not use the system for any other purpose.

2. Do not disassemble

Attempting to disassemble the microscope or the system could result in electric shock or damage to the equipment. Never attempt to disassemble any portion of the equipment unless the procedure is described in this manual. If you have any problems with the equipment, contact your nearest Nikon representative.

3. Read the instruction manuals carefully

For your safety, carefully read this manual and the manuals provided with the other products used with the system. Make certain to heed the warnings and cautions at the beginning of each manual in particular.

Furthermore, when using the system in conjunction with the Epi-fl (Episcopic-fluorescence) attachment, be certain to carefully read the manual provided with the Epi-fl attachment. The mercury lamp that is used as the light source in the Epi-fl attachment requires careful handling.

- Cautions regarding the power supply: Read the manuals for the power supply and the microscope.
- Cautions regarding fuses: Read the manuals for the power supply and the microscope.
- Cautions regarding lamp heat: Read the manual for the microscope.
- Cautions regarding the lamp specification: Read the manuals for the microscope and the power supply.

CAUTION

1. Turn off the power when assembling the equipment, 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 microscope and the power supply off and unplug the power cord before assembling the equipment, connecting or disconnecting cables or replacing a lamp.

2. Do not spill liquid on the equipment

If the microscope, the system 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 off 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.

3. Caution concerning assembly

Be careful not to pinch your hands or fingers when assembling the equipment.

Thank you for purchasing the Nikon products. This instruction manual is written for the users of the Nikon C-CU universal system condenser. 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 you nearest Nikon representative.
- Also be sure to read the manuals for any other products that you are using with this unit (the microscope, power supply, etc.).
- In this manual, the differential interference contrast will be abbreviated as "DIC", and the phase contrast will be abbreviated as "Ph".

Warning/Caution Symbols Used 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.

Notes on Handling the System

1. Handle the system gently

The system is a precision optical instrument. Handle the system gently, avoiding any physical shocks.
In particular, the optical system used on DIC method must be kept strain-free; handle the objective and condenser carefully so that they are not deformed.

2. Dirty lenses

Do not get dust, fingerprints, etc., on the lenses. Dirt on the lenses, mirrors, etc., will adversely affect the image. If any of the lenses get dirty, clean them as described in chapter "6. Care and Maintenance."

3. Installation location

In order to avoid degraded performance and to prevent malfunctions, take the following requirements into consideration when selecting a location to install the equipment:

- Install the equipment in a location with little vibration.
- Avoid installing the equipment in a location exposed to direct sunlight.
- Avoid installing the equipment in a dusty location.
- Avoid installing the equipment in a location subject to high temperatures (40°C or higher) or high humidity (60% or higher). (Such conditions could allow mold or condensation to form on the lenses and filters.)

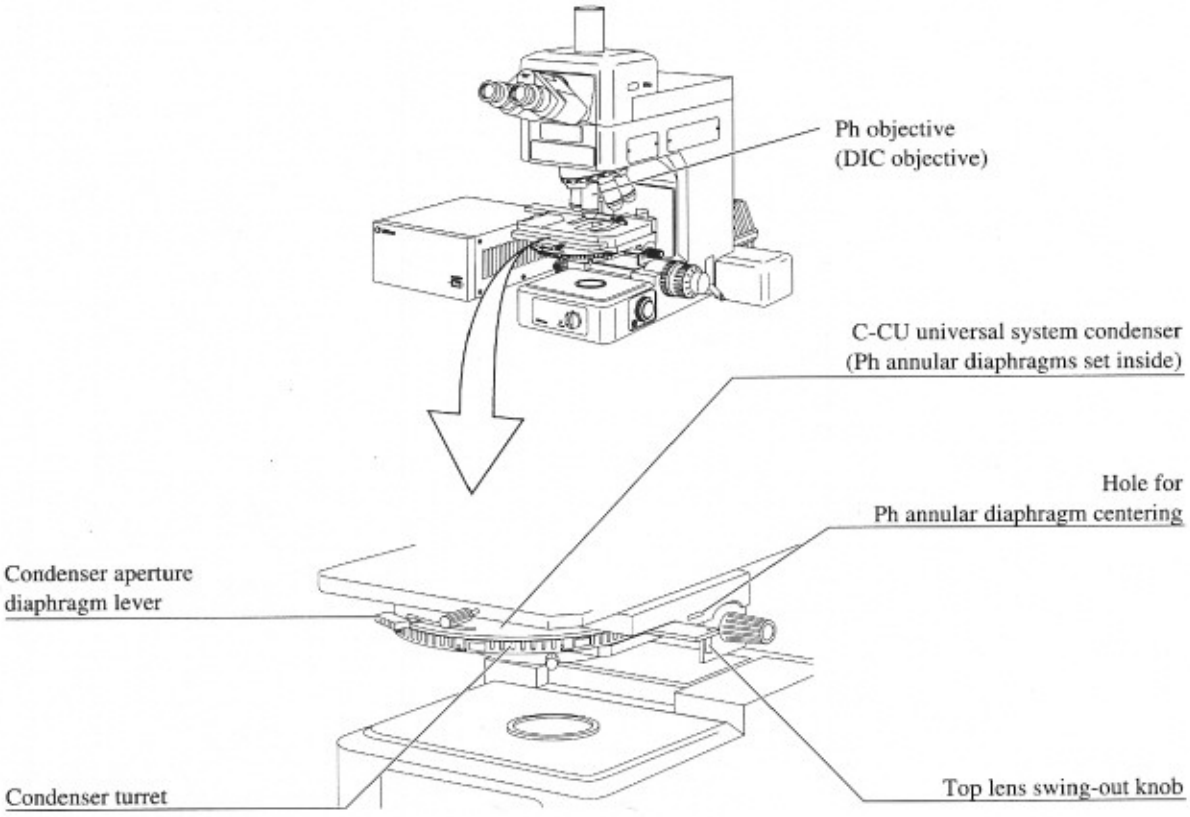
Contents

1 Names of Structural Components and Operational Parts

Attaching the C-CU universal condenser and other necessary components to the microscope makes DIC and Ph observation possible with your microscope.
If the system is not yet assembled, see chapter "4. Assembly," first.
For details on the assembly and handling of the microscope, power supply, etc., see their respective manuals.

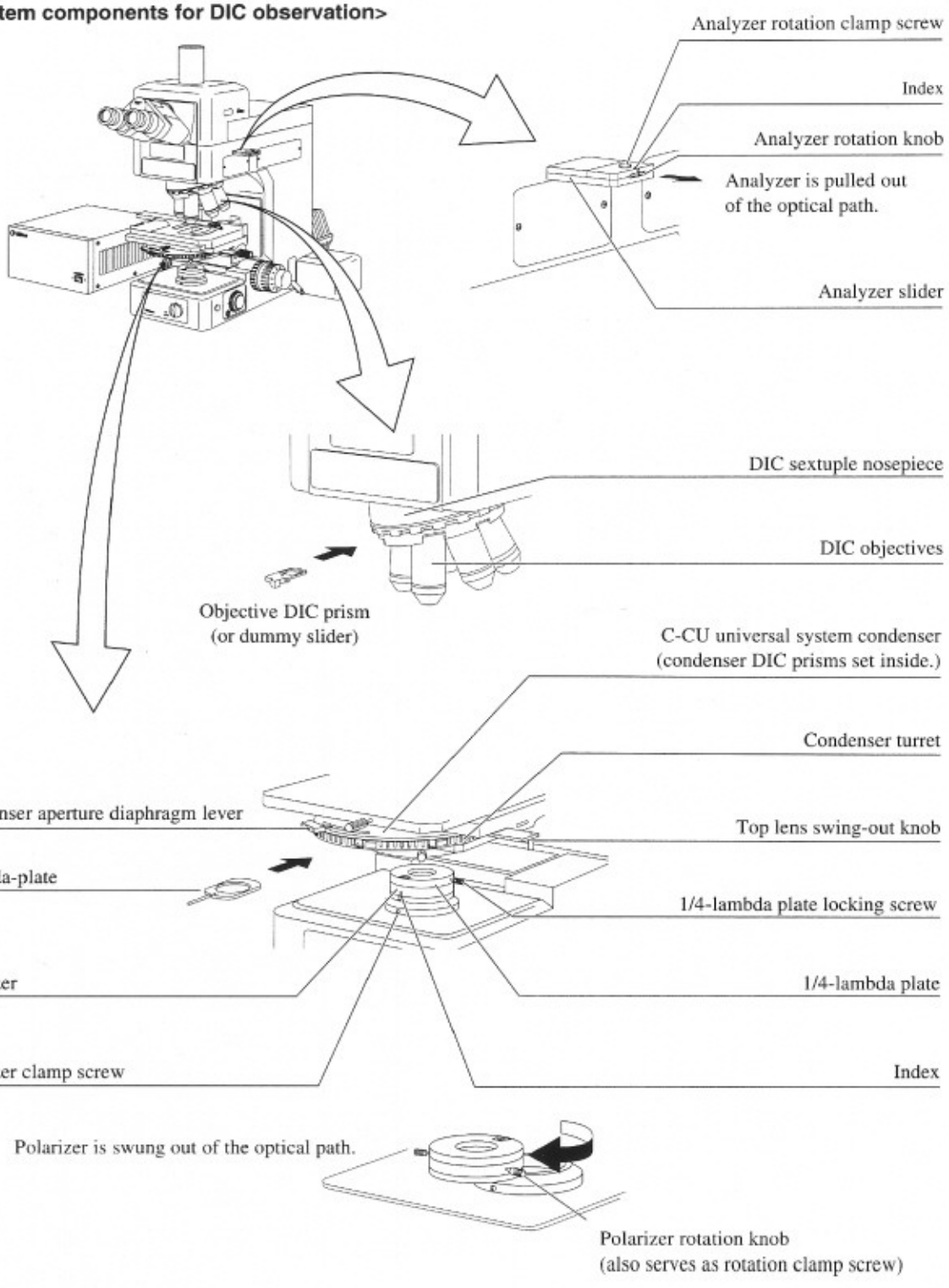
(The Nikon ECLIPSE E800 microscope with the C-CU universal condenser and other components needed for DIC or Ph observation mounted is shown below. Some components may not be included in the set that you purchased.)

<System components for Ph observation>



(Ph microscopy cannot be performed when using an oil-type top lens.)

<System components for DIC observation>



2 Microscopy

The general flow of the microscopy procedure is described below.
For details on each step, see the corresponding section in chapter "3. Operation of Each Part."
If the equipment is not yet assembled, see chapter "4. Assembly," first.
For details on the assembly, handling and operation of the microscope, power supply, etc., see their respective manuals.

WARNING Before using the system, be sure to read the ⚠**WARNING** and ⚠**CAUTION** at the beginning of this manual, and also the section entitled, "Notes on Handling the System." Be certain to heed all of the warnings and cautions.
Also be sure to read the manuals for any other products that you are using with the system (the microscope, power supply, etc.), and heed all of the warnings and cautions in those manuals.

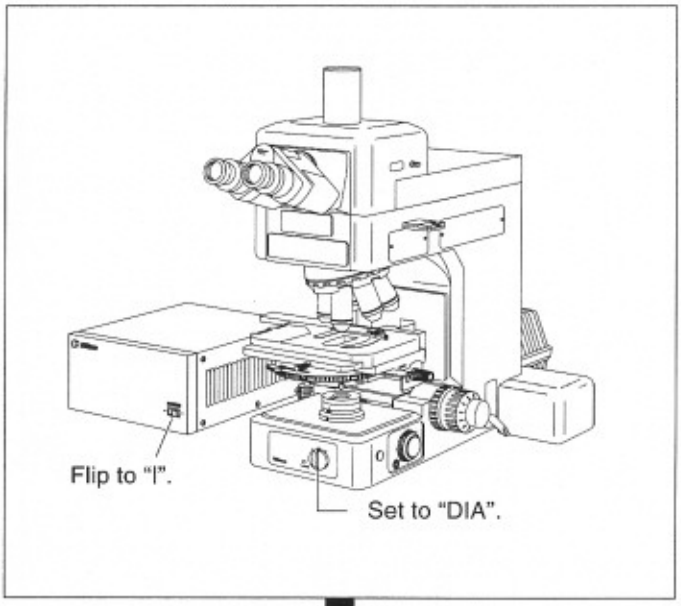
1 Differential interference contrast microscopy

Key points of microscopy

1. Use slide and cover glasses that are not deformed and that are free of dust or dirt. Use a slide glass that is between 0.8 and 1.2 mm thick, and a cover glass that is 0.17 mm thick.
2. When using the system with an oil-type top lens mounted on the system condenser, apply immersion oil between the top lens and the slide glass. With the oil, the N.A. of the condenser lens becomes 1.4, making it possible to get optimum performance from the lens. In addition, contrast is further improved in DIC microscopy.
3. For the DIC method, the adjustments made in steps 6 and 7 below are especially important. If these adjustments are not made properly, viewing will be poor.
4. If the VFM epi-fluorescence attachment is also mounted on the microscope, see section "3. Microscopy in combination with Epi-fl attachment".

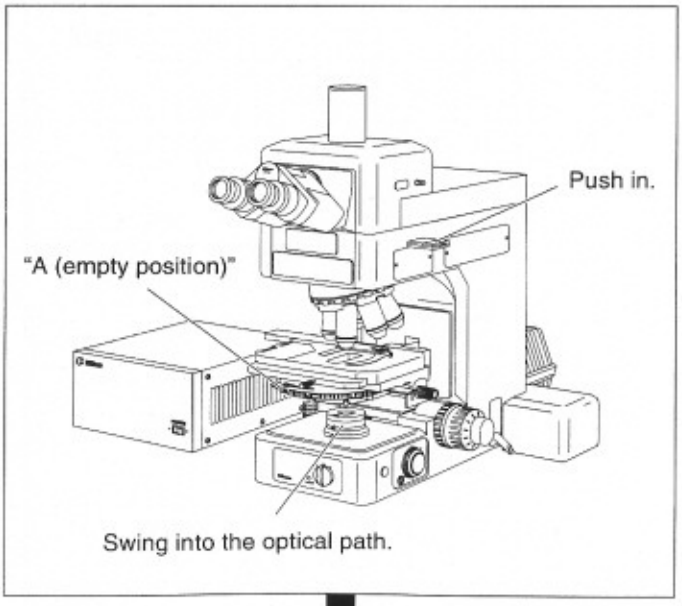
When using an oil-immertion type 10× DIC objective for DIC observation, there may be some unevenness in the viewfield.

1 Turn on the lamp that provides diascopic illumination.

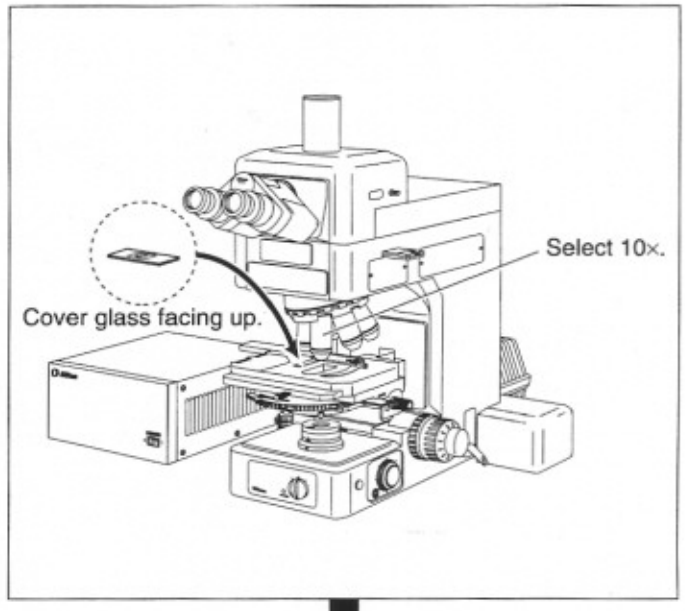


2 Insert the polarizer and the analyzer into the optical path. (p. 21)

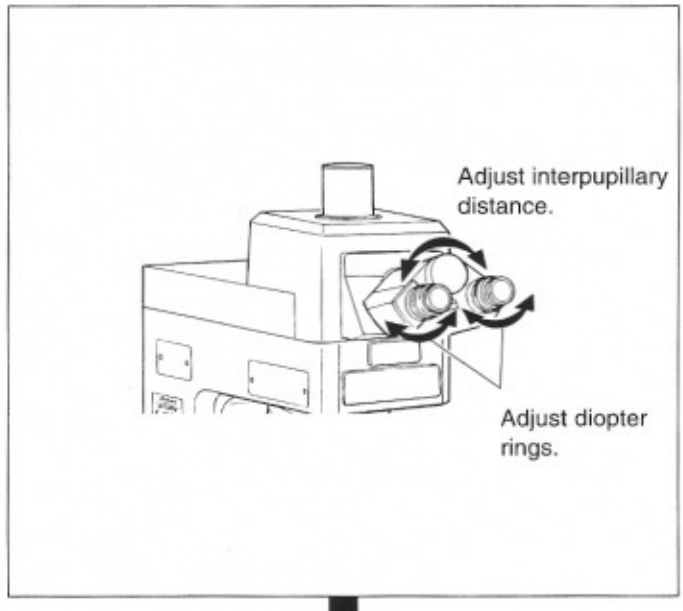
3 Rotate the condenser turret so that the "A" (empty position) indication is at the front.



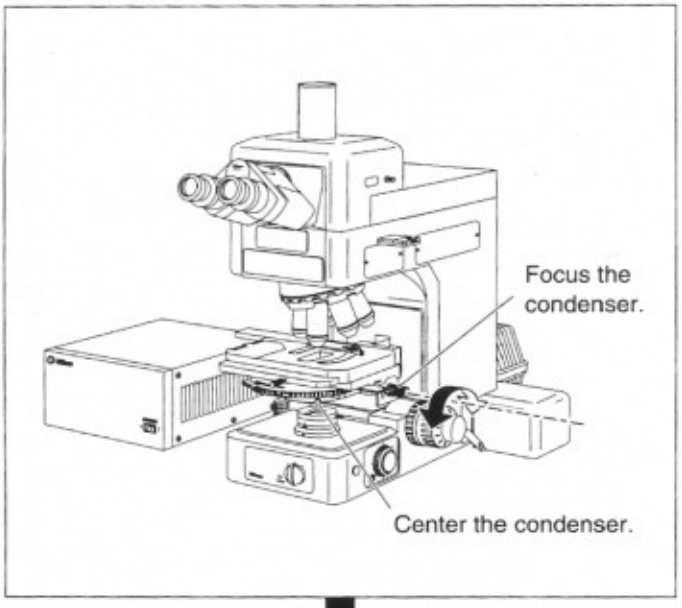
4 Place the specimen on the stage, and focus on the specimen with the 10× objective. (See the manual provided with the microscope.)



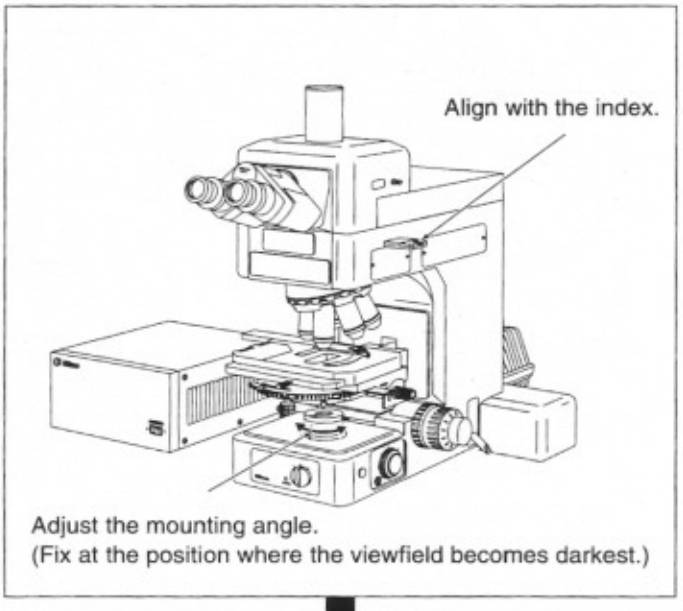
5 Adjust the diopter and the interpupillary distance.
(See the manual provided with the microscope.)



6 Center and focus the system condenser.
These adjustments are very important. Do not skip this step. (p. 20)



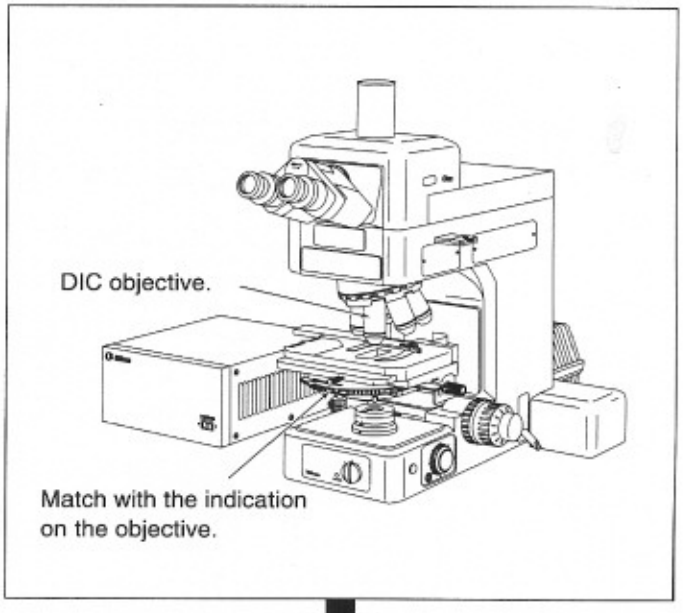
7 Adjust the orientation (direction of vibration) of the optical system.
This adjustment is very important. Do not skip this step. (p. 21)



8 Move the stage and center the portion of the specimen to be viewed in the view field.

9 Insert a DIC objective into the optical path.

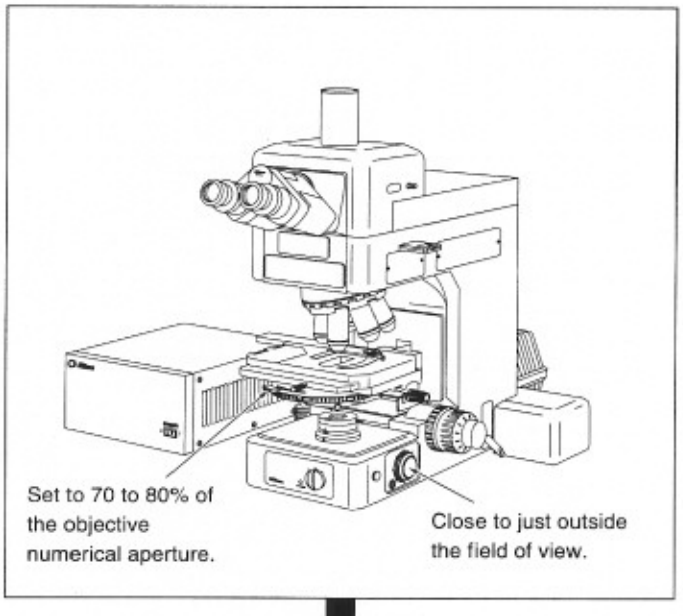
10 Rotate the condenser turret so that the indication that matches the indication ([L], [M] or [H]) on the objective is at the front. (p. 27)



11 If an oil-type top lens is mounted on the system condenser, apply immersion oil between the specimen and the top lens. (p. 26)

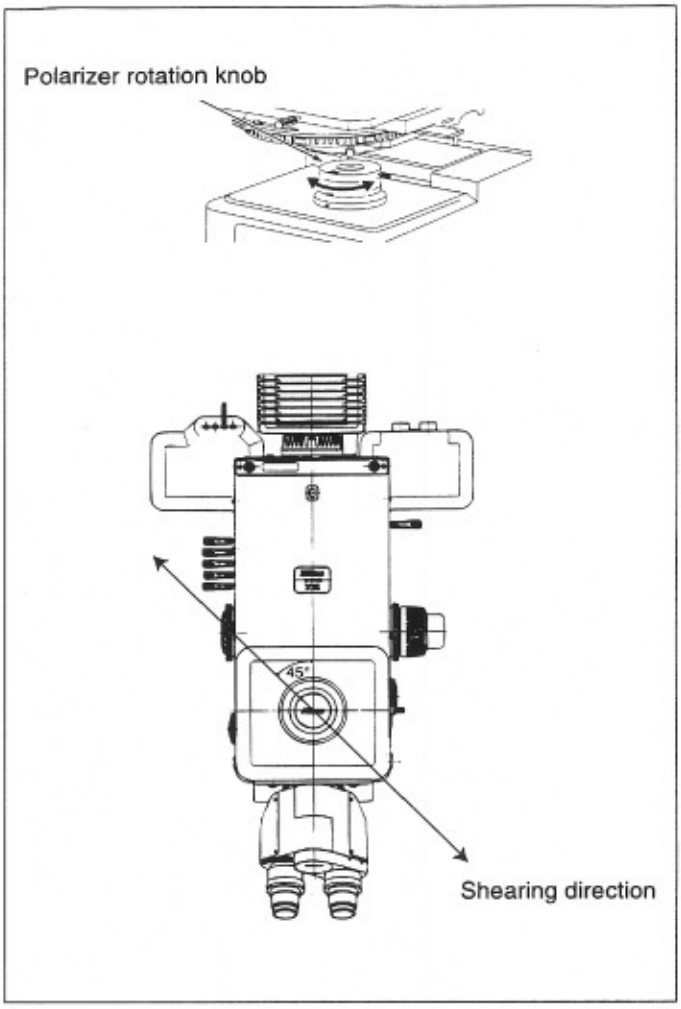
12 When using an oil immersion type objective, apply immersion oil between the specimen and the objective.
(See the manual provided with the microscope.)

13 Adjust the aperture diaphragm and the field diaphragm.
- Generally, stop down the aperture diaphragm to 70 to 80% of the N.A. of the objective.
- Stop down the field diaphragm so that it is just inside or just outside the viewfield.
(See the manual provided with the microscope.)



14 Loosening the polarizer rotation knob and rotating the polarizer changes the image contrast.

- In order to obtain the high contrast, make the background color for the view field a gray sensitive color.
- The highest contrast is obtained in the shearing direction (refer to the diagram); therefore, rotate the stage to adjust the orientation of the specimen, and align the portion of the specimen for which contrast is desired with the shearing direction.



Color contrast microscopy

1. Perform steps 1 to 14 of the DIC microscopy procedure.
2. Insert an NCB filter into the optical path.
3. Remove the GIF (green interference) filter from the optical path to allow illumination by white light.
4. Insert the lambda-plate (sold separately) in the bottom of the system condenser.
5. The above procedure makes the background color of the view field sensitive, enabling observation with high contrast. (If there are variations in the refractive index or thickness of the specimen, interference colors will appear according to the gradient of those variations.)

2 Phase contrast microscopy

Key points of microscopy

The appearance of a Ph image depends on the phase difference and shape of the specimen, the characteristics of the objective, etc. Keep the following points in mind when preparing a specimen and when selecting the Ph objective.
If the DIC system or Epi-fl system is also mounted on the microscope, see section "3 Microscopy in combination with Epi-fl attachment."
Please note that with the combination of components described in this manual, you cannot perform Ph microscopy with the oil-type top lens attached to the system condenser.

1 Select a specimen that will not adversely affect the centering of the Ph annular diaphragm.

Specimens that scatter light or produce a prism or lens effect adversely affect the centering of the Ph annular diaphragm. Especially when viewing a thick, live specimen, a large, coarse specimen, or a specimen prepared with a microplate, care must be taken as the centering of the Ph ring diaphragm is shifted by a lens or prism effect, resulting in poor viewing.

2 Select a specimen suited for the latitude and contrast of the objective.

When using a dark contrast Ph objective, make sure that the phase difference of the specimen does not exceed the latitude (phase difference tolerance) of the objective. If the phase difference of the specimen exceeds the latitude, the image will appear brighter than the background, making observation impossible.
When preparing a phase contrast specimen, the phase difference can be adjusted through the thickness of the specimen and the refractive index of the filling agent, the culture solution, etc.
If the contrast of a specimen observed with a DLL objective is low, better results may be obtained with a DM objective.

3 Stained specimens

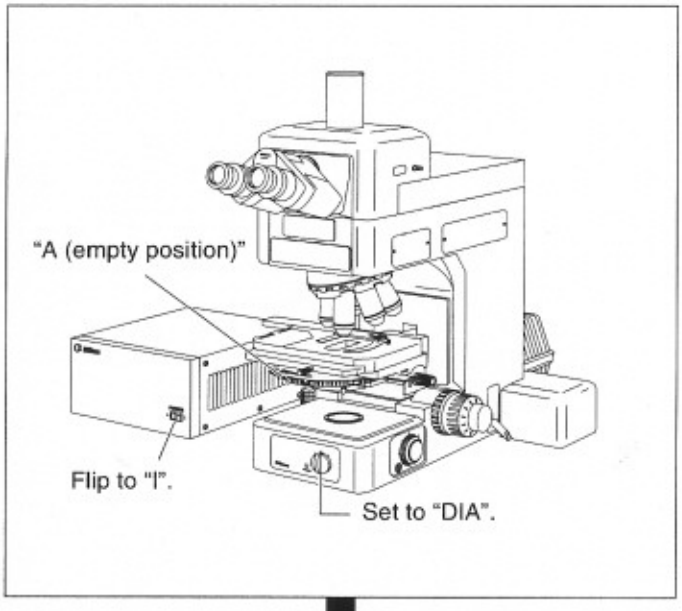
Specimens with a high contrast or stained too dark are not suitable for Ph microscopy. Ph microscopy is suited for lightly stained specimens, decolored specimens, or ultra-thin specimens for electron microscopes.

4 Ph annular diaphragm centering

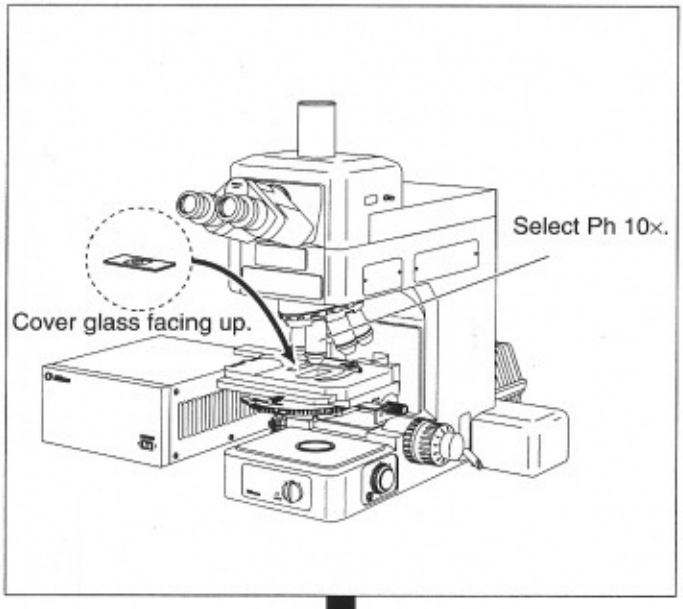
In Ph microscopy, the exact alignment of the objective phase plate and the image of the Ph annular diaphragm in the system condenser is extremely important in order to maintain the phase contrast effect. Re-check this alignment before starting microscopy.

1 Turn on the lamp that provides diascopic illumination.

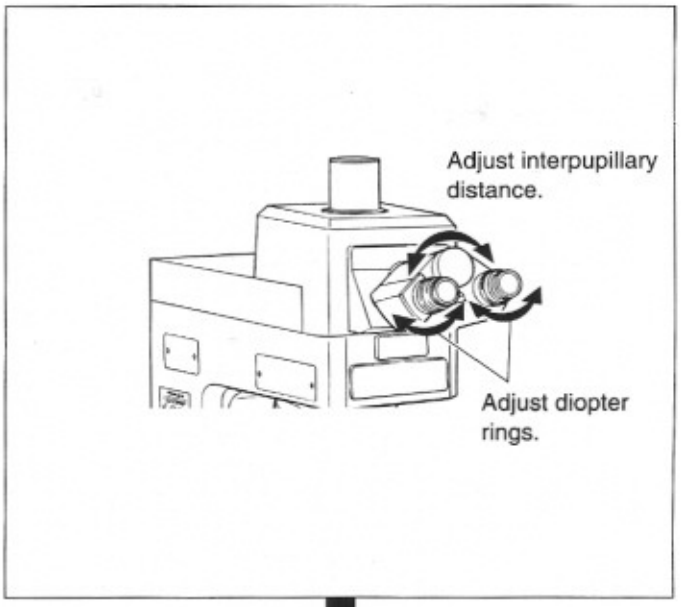
2 Rotate the condenser turret so that the "A" (empty position) indication is at the front.



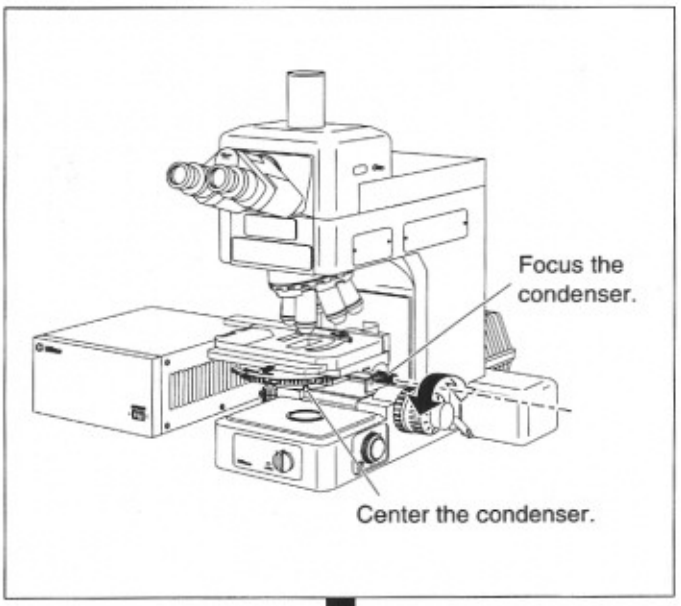
3 Place the specimen on the stage, and focus on the specimen with the 10× Ph objective (Ph1). (See the manual provided with the microscope.)



4 Adjust the diopter and the interpupillary distance.
(See the manual provided with the microscope.)



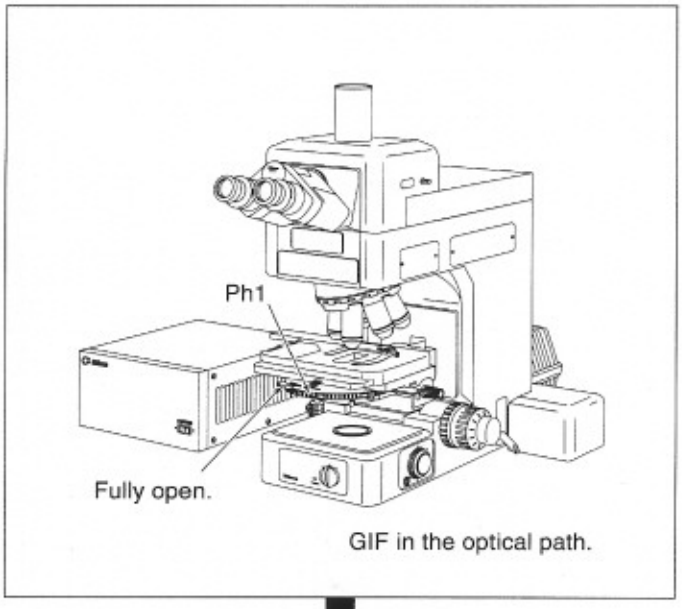
5 Center and focus the system condenser.
These adjustments are very important. Do not skip this step.
(p. 20)



6 Rotate the condenser turret so that the "Ph1" indication is at the front. (p. 22)

7 Open the condenser aperture diaphragm all of the way.
(Always leave the condenser aperture diaphragm fully open during Ph microscopy.)

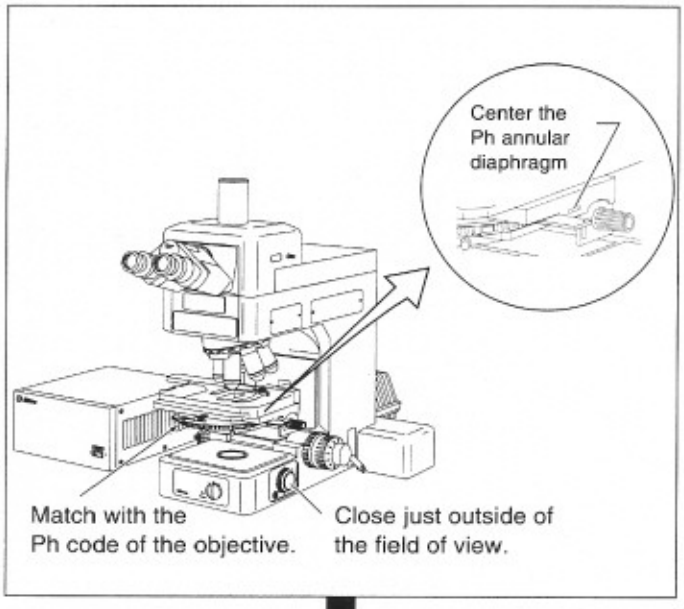
8 Insert a GIF (green interference) filter in the optical path



9 Center the Ph annular diaphragm. This adjustment is very important. Do not skip this step. (p. 23)

10 Adjust the field diaphragm so that it is just inside or outside of the view field. (See the manual provided with the microscope.)

11 If the objective has been switched, also switch the condenser turret in accordance with the Ph code of the objective. After doing so, always center the Ph annular diaphragm. (p.23) Also readjust the size of the field diaphragm.



12 When using an oil immersion type objective, apply immersion oil between the specimen and the objective.
(See the manual provided with the microscope.)

3 Microscopy in combination with Epi-fl attachment

It is possible to combine DIC microscopy (or Ph microscopy) with Epi-fl microscopy by mounting both the components for the DIC microscopy (or the Ph microscopy) and Epi-fl attachment on the microscope. For example, use the DIC method (or the Ph method) instead of the Epi-fl method (which causes colors to fade) to search for the target portion of the specimen. It is also possible to use both methods simultaneously in order to compensate for their individual shortcomings.
For details on the microscopy procedure when using the Epi-fl method, see the manual provided with the Epi-fl attachment; for details on the microscopy procedure when using the DIC method or the Ph method, see pages 7 and 13, respectively.

1. Switching the methods

Perform the following steps when switching between the different microscopy methods.

When switching to DIC microscopy

- Move the shutter on the Epi-fl attachment into the optical path to block off the light source for epi-fl microscopy.
- Move the diascopic filter block (DIA ILL) into the optical path.
- Insert the analyzer into the optical path.
- Swing the polarizer into the optical path.
- Bring a DIC objective into the optical path.
- Insert the objective DIC prism into the optical path.
- Rotate the condenser turret so that the indication that is the same as the indication on the objective is at the front.
- Adjust the size of the aperture diaphragm (normally, to about 70 to 80% of the N.A. of the objective).

When switching to Ph microscopy

- Move the shutter on the Epi-fl attachment into the optical path to block off the light source for epi-fl microscopy.
- Move the diascopic filter block (DIA ILL) into the optical path.
- Remove the analyzer from the optical path.
- Swing the polarizer out of the optical path.
- Bring a Ph objective into the optical path.
- Rotate the condenser turret so that the indication that is the same as the Ph code of the objective is at the front.
- Open the aperture diaphragm completely.

When switching to Epi-fl microscopy

- Turn off the microscope's diascopic illumination lamp. (Viewing is difficult if the lamp is left on.)
- Remove the shutter on the Epi-fl attachment from the optical path.
- Bring the desired filter block into the optical path.
- Remove the analyzer from the optical path.
- Remove the objective DIC prism from the optical path. (Only when using a DIC objective.)
- Adjust the size of the aperture diaphragm (normally, to about 70 to 80% of the N.A. of the objective).

2. Simultaneous microscopy

When using both the DIC method (or the Ph method) and the Epi-fl method simultaneously, follow the procedure described below.

1. Use the DIC method (or the Ph method) to find the portion of the specimen to be observed.
2. If there is a green interference (GIF) filter in the optical path for diascopic illumination, remove the filter from the optical path.
3. Bring the desired excitation filter block into the optical path.
4. Open the shutter on the Epi-fl attachment and recheck the focus.
5. Use the ND filters of the Epi-fl attachment to adjust the brightness of the fluorescent image.
6. Use the microscope's ND filters to adjust the brightness of the DIC image (or the Ph image).

4 Bright field microscopy

For bright field microscopy, perform the steps described below. For details on the microscopy procedure, see the manual provided with the microscope.

- Rotate the condenser turret so that the "A" (empty position) indication is at the front.
- If the polarizer, analyzer, or objective DIC prism is in the optical path, remove it. Since removing any of these will increase the illumination, adjust the brightness by inserting ND filters into the optical path.
- When using a 2× or 4× objective, swing out the top lens and fully open the field and aperture diaphragm during observation.

Operation of Each Part

1 System condenser

1. When using a 2× or 4× objective

When using a 2× or 4× objective, hold the top lens swing-out knob and quietly push the slider to the left, to swing out the top lens. (Do not move the swing-out slider quickly. Fully open the field and aperture diaphragm when the top lens is out of the optical path.) Doing so expands the illuminated area so that observation using a 2× or 4× objective is possible.
(Do not swing out an oil-type top lens, since doing so will not only spill the immersion oil but may damage the specimen by pushing it up from the bottom since the distance between the top lens and the specimen is very short.)

2. Focusing and centering the system condenser

Focus and center the system condenser, referring to the section on focusing and centering the condenser in the manual provided with the microscope. When doing so, keep the following points in mind.

- Keep the top lens in the optical path; do not swing it out of the optical path. If the top lens is swung out of the optical path, the field diaphragm image will not be focused on the specimen surface.
- Rotate the condenser turret so that the "A" (empty position) indication is at the front.
- If the polarizer, analyzer, or objective DIC prism is in the optical path, remove it. Since removing any of these will increase the illumination, adjust the brightness by inserting ND filters into the optical path.

3. System condenser aperture diaphragm adjustment

Adjust the size of the aperture diaphragm, referring to the section on the aperture diaphragm in the manual provided with the microscope. Normally, the diaphragm should be closed to 70 to 80% of the N.A. of the objective. When doing so, keep the following points in mind.

- Keep the top lens in the optical path; do not swing it out of the optical path. If the top lens is swung out of the optical path, the aperture diaphragm will not function.
- For Ph microscopy, open the aperture diaphragm all of the way. If the aperture diaphragm is closed at all, the Ph annular diaphragm may be blocked, making Ph microscopy impossible.

2 Components for DIC microscopy

1. Polarizer

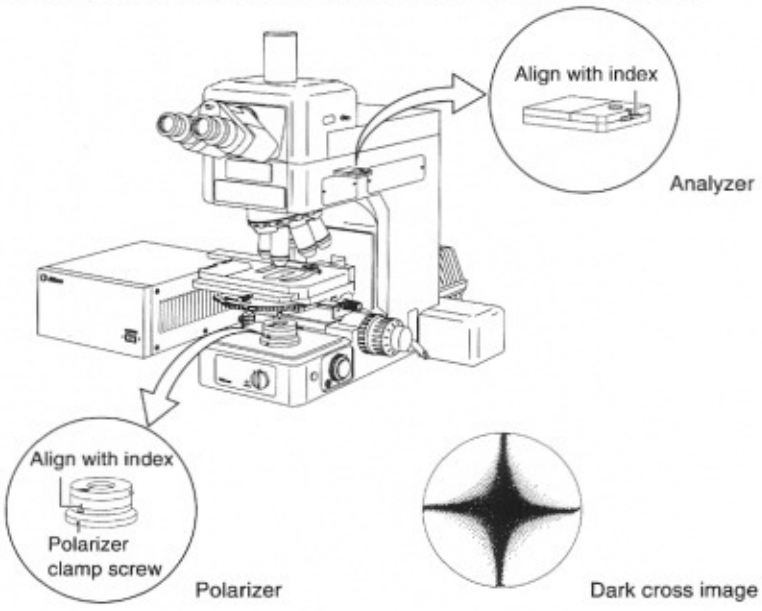
- To remove the polarizer from the optical path, swing the upper part of the polarizer out of the optical path.
- The polarizer can be rotated by loosening the polarizer rotation knob; the background color can be changed by rotating the polarizer.

2. Analyzer

- Insert the analyzer into the optical path by pushing it into the second click position. To remove the analyzer from the optical path, pull it out.
- The analyzer can be rotated by loosening the analyzer rotation clamp screw and moving the rotation knob; normally, the analyzer is clamped in position at the index.

3. Optical system orientation adjustment (adjustment of direction of vibration)

Adjust the orientation of the polarizer and the analyzer so that they are perpendicular. Perform this adjustment carefully, since it determines the basic performance of the DIC method.



1 Focus and center the system condenser. (P. 20)
2 Focus on the specimen. (See the manual provided with the microscope.)
3 Insert a 40× objective into the optical path, and rotate the condenser turret so that the "A" (empty position) indication is at the front.
4 Remove the objective DIC prism, located above the 40× objective, from the optical path.
5 Insert the analyzer into the optical path.
6 Loosen the analyzer rotation clamp screw and move the rotation knob to align the analyzer with the index, and clamp it in place.
7 Swing the polarizer into the optical path.
8 Loosen the polarizer rotation knob, align the upper part of the polarizer with the index, and clamp it in place.
9 Remove the specimen from the view field.
10 Adjust the angle at which the polarizer is mounted on the microscope.
Method 1: Use a hexagonal screwdriver to loosen the polarizer clamp screw. Next, while looking through the eyepieces, rotate the entire polarizer and then fix it in place at the position where the view field is darkest.
Method 2: Remove an eyepiece, and then use an adapter (sold separately) to mount a centering telescope (sold separately). Close the aperture diaphragm to a minimal opening, and then turn the eyepiece of the centering telescope so that the aperture diaphragm is brought into focus.
Open the aperture diaphragm as far as it will go.
Loosen the polarizer clamp screw with a hexagonal screwdriver. Next, rotate the entire polarizer and then fix it in place at the position at which the dark cross image become visible.
11 Install an objective DIC prism (one for a 40× objective) in the revolving nosepiece.

3 Components for Ph microscopy

1. Ph annular diaphragm

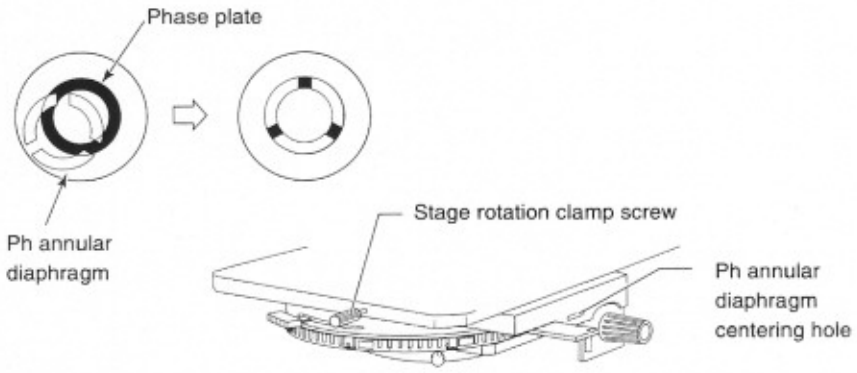
Ph microscopy is performed by matching the system condenser Ph annular diaphragm with the objective phase plate.

Ph code

One of the phase codes (Ph1, Ph2, or Ph3) is displayed on a Ph objective, depending on the size of the phase plate. (The Ph code has no bearing on the magnifying power of the objective.) Rotate the system condenser so that the Ph annular diaphragm with the same code is in the optical path. Ph microscopy is not possible if different codes are used in combination.

Centering the Ph annular diaphragm

1 If the aperture diaphragm is closed at all, open it fully.
2 Remove an eyepiece, and then use an adapter (sold separately) to mount a centering telescope (sold separately).
3 Turn the eyepiece of the centering telescope so that the images of the objective phase plate and the system condenser Ph annular diaphragm image are brought into focus.
4 If the images of the phase plate and the Ph annular diaphragm are not in alignment, use two hexagonal screwdrivers to adjust the Ph ring diaphragm centering screws on the condenser turret so that the centers of the two images are aligned. (Insert the screwdrivers in the screw holes at the rear side of the stage.)
Note that if the image of the Ph annular diaphragm extends beyond the phase plate, the phase image contrast deteriorates.
If the stage handle is in the way, loosen the stage rotation clamp screw and rotate the stage slightly.



2. Ph objective

The Plan Fluor Ph objective can be used for bright field microscopy, DIC microscopy, and Epi-fl microscopy. The Plan Apochromat Ph objective can be used for bright field microscopy, DIC microscopy, and Epi-fl microscopy, excluding UV excitation. However, because both have a phase plate inside, the "view" may differ from an objective intended specifically for the microscopy method in question.
For the absolute best results, use an objective intended specifically for the microscopy method in question.

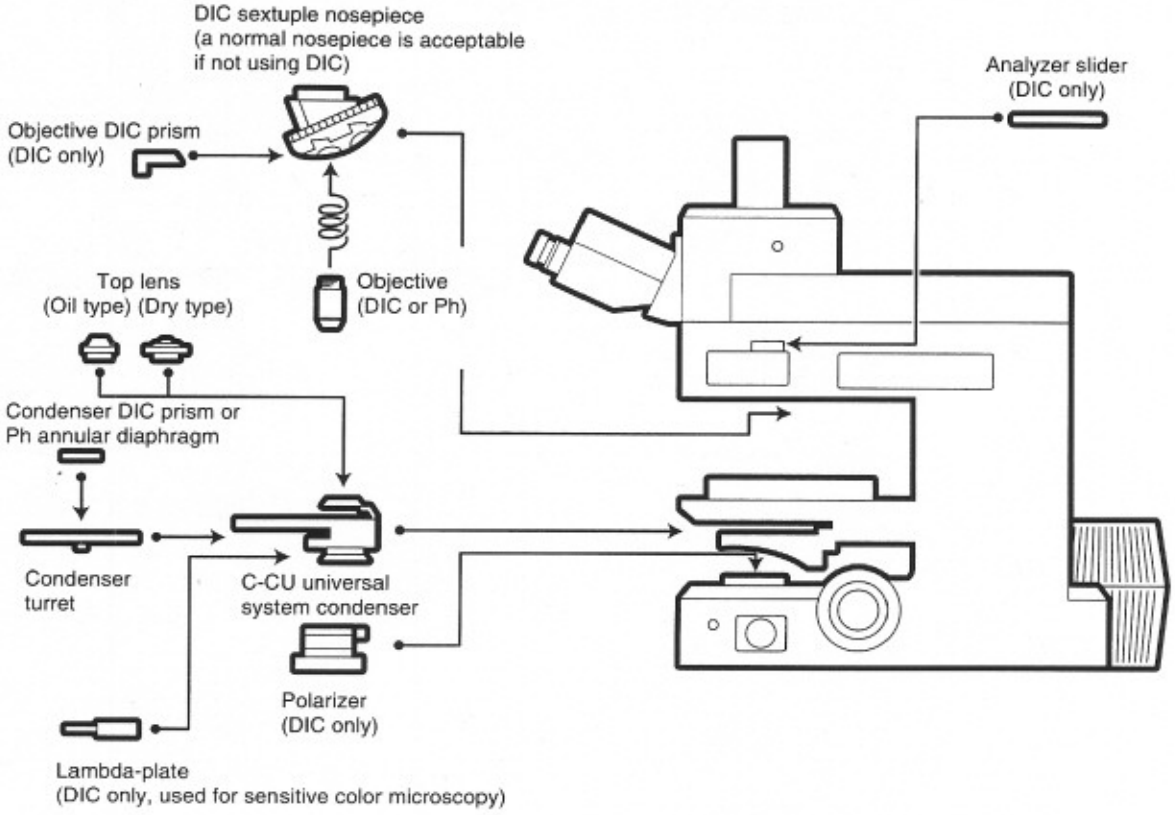
4 Assembly

WARNING Before assembling the system, be sure to read the ⚠**WARNING** and ⚠**CAUTION** at the beginning of this manual, and also the section entitled, "Notes on Handling the System." Be certain to heed all of the warnings and cautions.
Also be sure to read the manuals for any other products that you are using with the system (the microscope, power supply, Epi-fl attachment, etc.), and heed all of the warnings and cautions in those manuals.
In order to prevent accidents, burns, and injuries caused by electric shock, fire, or ultraviolet light, turn off the power switches for the microscope and power supply during assembly.

Refer to the illustrations while assembling the equipment.
For details on the assembly, handling, and operation of the microscope, power supply, Epi-fl attachment, etc., see their respective instruction manuals.
Scratches or fingerprints on the lenses and prisms will adversely affect the image. Handle these components carefully during assembly in order to keep them free from scratches and fingerprints.

Required tools

- Hexagonal screwdriver: 1
  (Use the tool provided with the microscope.)



DIC only : Components needed only when performing DIC microscopy.
Attach the polarizer after the system condenser.

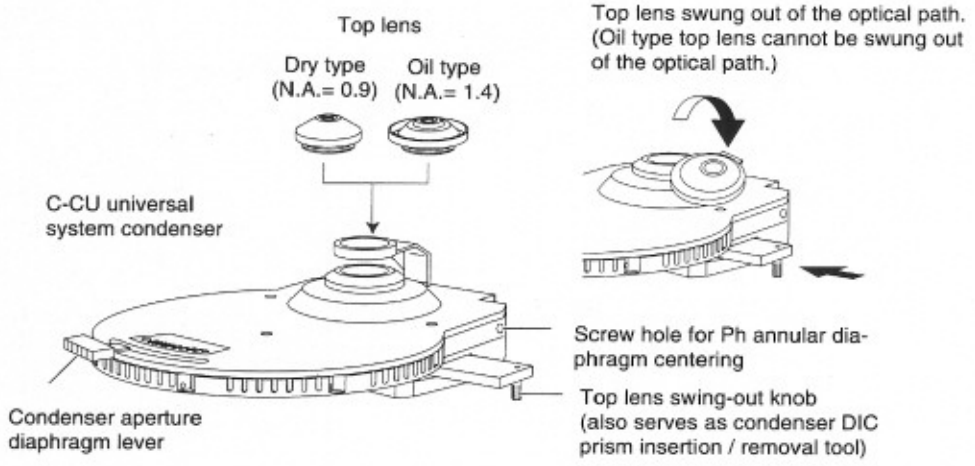
1. Microscope assembly

Assemble the microscope as described in the microscope manual.
However, do not mount the revolving nosepiece, the objectives or the condenser.
(If not performing DIC microscopy, mount the revolving nosepiece.)

2. Mounting the Epi-fl attachment

If Epi-fl attachment is also to be used, mount the Epi-fl attachment on the microscope as described in the manual provided with the Epi-fl attachment.
However, do not mount the shielding plate until after mounting the components for DIC microscopy (or the Ph microscopy). In addition, do not mount the shielding tube, since it is not used.

3. System condenser assembly



When performing DIC microscopy, install the condenser DIC prisms inside the system condenser; when performing Ph microscopy, install the Ph annular diaphragms inside the system condenser. Three of each type can be installed.

1 Select the condenser DIC prisms and Ph annular diaphragms to be installed in the system condenser.

Selecting a condenser DIC prism

Which DIC prisms should be installed is determined according to the top lens type and the N.A. (numerical aperture) of the objective.

Top lens	Condenser DIC prism		Objective lens N.A.	(Indication on objective)	Objective DIC prism	Indication color
Oil type	Oil 1.4	DIC L	N.A. < 0.5	(L)	L	Yellow
		DIC M	0.5 ≤ N.A. < 1.0	(M)	M	
		DIC H	1.0 ≤ N.A	(H)	H	
		DIC SS (Note 1)	1.0 ≤ N.A	(H)	SS	
Dry type	Dry 0.9	DIC L	N.A. < 0.5	(L)	L	Green
		DIC M	0.5 ≤ N.A. < 1.0	(M)	M	
		DIC H	1.0 ≤ N.A	(H)	H	

(Note 1) The DIC prism with the indication [SS] has smaller shearing amount than the prism with the indication [H]. [DIC SS] condenser prism should be used together with the [SS] objective DIC prism and [H] objective.

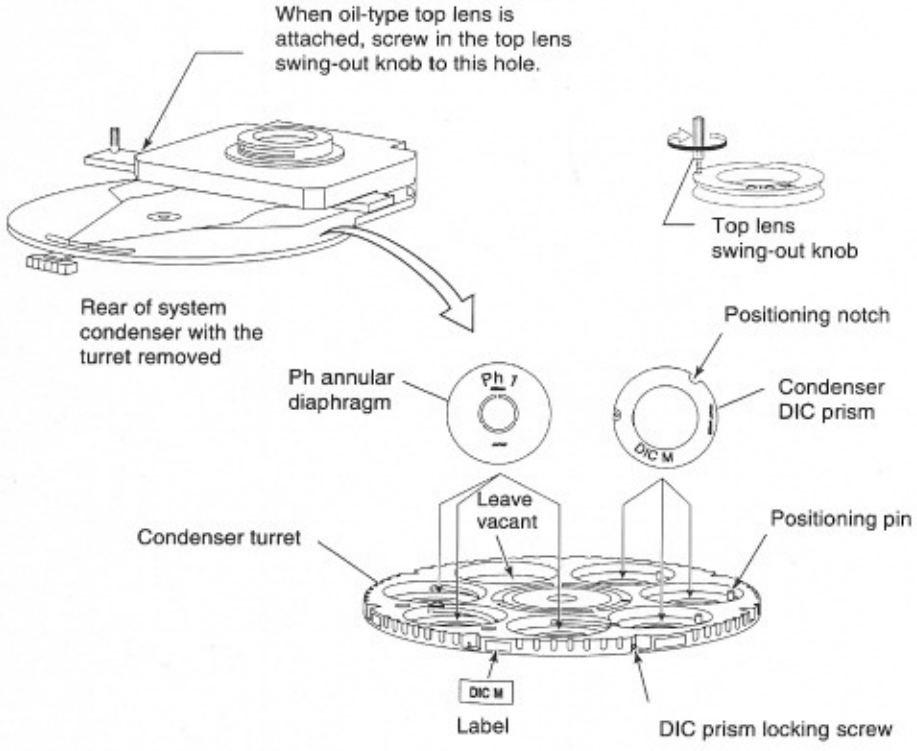
Selecting a Ph annular diaphragm

Install Ph annular diaphragms labelled with the same Ph codes indicated on the Ph objectives.

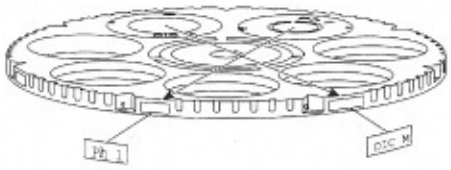
2 Loosen the screw located in the center of the back of the system condenser, and then remove the turret from the system condenser. There are a total of seven holes in the turret. Leave the smallest hole vacant. (That hole is used for system condenser centering and bright field observation.)

3 Set a condenser DIC prism (with the label indication facing up) in the hole with the pin. Sufficiently loosen the DIC prism locking screw. Remove the top lens swing-out knob, which also works as a DIC prism insertion/removal tool, from the system condenser slider and screw it into the threaded hole. Set the prism in the hole so that the notch on the prism is aligned with the position of the pin in the hole. Using a hexagonal screwdriver, tighten the DIC prism locking screw to lock the prism in place. Remove the top lens swing-out knob, and replace it in its original position on the slider.

4 When performing Ph microscopy, set a Ph annular diaphragm (with the Ph code indication facing up) in the hole with the spring. Using a hexagonal screwdriver, sufficiently loosen the Ph annular diaphragm centering screws. Use the side of the diaphragm to push the spring and set the diaphragm in place. (Tighten both screws an equivalent amount.)



5 Apply labels to the side of the turret in accordance with the DIC prisms and Ph annular diaphragms that were installed. Apply each label in the position that appears in the front when the system condenser is mounted on the microscope and the DIC prism or Ph annular diaphragm in question is inserted into the optical path. (The label will be on the diagonal from the DIC prism or Ph annular diaphragm in question.) Place the label "A" on spaces for vacant holes.



Apply labels diagonal from the DIC prism or Ph annular diaphragm.

6 Mount the turret on the system condenser.
Insert the turret into the system condenser so that the round cutout at the rear of the turret comes just under the top lens. You can feel a slight click spring at this moment. Lightly press in the turret and tighten the screw at the rear of the turret.

7 Mount the top lens on the system condenser.
- When performing DIC microscopy, mount a top lens that is suited to the types of DIC prisms that were installed.
- When performing Ph microscopy, mount a dry-type top lens. (This system does not permit Ph microscopy when using an oil-type top lens.)

8 Adjust the position of the swing-out knob according to the top lens type.
- When a dry-type top lens is mounted, screw in the swing-out knob to the hole at the end of the swing-out slider.
- When an oil-type top lens is mounted, screw in the swing-out knob to the hole at the center of the swing-out slider.

4. Mounting the system condenser

Using the condenser focus knob, lower the condenser carrier (the bottom portion of the substage) as far as it will go. (If mounting another condenser, loosen the condenser clamp screw and remove the condenser.)
Slide the system condenser in horizontally so that the limit pin on the circular dovetail of the system condenser fits in the notch on the condenser carrier. Tighten the condenser clamp screw to lock the condenser in place. (Tighten it so that it does not loosen even when the turret is rotated.)

5. Mounting the DIC sextuple nosepiece (only when performing DIC microscopy)

Use a hexagonal screwdriver to adequately loosen the microscope's revolving nosepiece clamp screw. Align the revolving nosepiece with the notch on the revolving nosepiece mount on the microscope and slide the revolving nosepiece in from beneath, pushing it toward the rear as far as it will go. Tighten the revolving nosepiece clamp screw to fix the revolving nosepiece in place.

Note when removing the revolving nosepiece

Lower the stage and remove any objectives in the nosepiece.
Be sure to hold the revolving nosepiece while removing it so that it does not fall.

6. Mounting the objectives

Lower the stage. Screw the objectives into the revolving nosepiece so that the objectives are in order of increasing power when the revolving nosepiece is rotated clockwise (when viewed from above).

Note when removing the objectives

Lower the stage, and if there is a specimen on the stage, remove it.
Use both hands when removing the objectives so that they do not fall.

7. Mounting the objective DIC prism (only when performing DIC microscopy)

Remove the dummy slider located directly above the DIC objective. Replace the dummy slider with a DIC prism slider that corresponds with the DIC objective.

8. Mounting the analyzer slider (only when performing DIC microscopy)

Remove the cover on the right side of the microscope arm and insert the analyzer slider. (The analyzer enters the optical path at the second click position. Pulling the slider out removes it from the optical path.)

9. Installing the polarizer (only when performing DIC microscopy)

Loosen the polarizer clamp screw, rotate the polarizer so that the index lines match, and then lock it in place.
Place the polarizer over the field lens in the microscope base, and then tighten the clamp screw to lock the polarizer in position where the index line is in front. (Be sure to make adjustments of the direction of vibration before performing microscopy.)

10. Mounting the lambda-plate (only when performing DIC microscopy)

With the λ symbol facing up, insert the lambda-plate in the bottom portion of the system condenser.

Assembly is now complete.

5 Troubleshooting Tables

Improper use of the microscope may adversely affect performance even if the microscope does not suffer damage. If any of the problems listed in the table below arise, take the countermeasures indicated. If a problem not covered in the tables below arises, or if the countermeasures indicated in the tables below do not resolve the problem, see the manual provided with the microscope.

1 DIC microscopy

Problem	Cause	Countermeasure
The view field is vignetting	The system condenser turret is in an intermediate position.	Turn the turret until it clicks into place.
	The objective DIC prism is in an intermediate position.	Mount the prism correctly.
	The revolving nosepiece is not mounted properly.	Mount the revolving nosepiece correctly.
	The polarizer/analyzer is in an intermediate position.	Insert in, or move out from the optical path correctly.
	The lambda-plate is in an intermediate position.	Insert the plate as far as it will go.
Contrast not obtained when using the DIC method	The polarizer is not in the optical path.	Insert the polarizer into the optical path.
	Analyzer is not in the optical path.	Insert the analyzer into the optical path.
	The condenser DIC prism is not selected correctly.	Insert the DIC prism corresponding to the objective and top lens to be used into the optical path.
	The objective DIC prism is not in the optical path.	Mount the prism correctly.
	The combination of the objective and the objective DIC prism is not correct.	Use the DIC prism that corresponds to the objective.
Poor contrast obtained when using the DIC method	The polarizer orientation is incorrect.	Correctly adjust the orientation of the optical system.
	The condenser DIC prism is not selected correctly.	Insert the DIC prism corresponding to the objective and top lens to be used into the optical path.
	The combination of the objective and the objective DIC prism is not correct.	Use the DIC prism that corresponds to the objective.
	There is dirt on the objective, condenser, or specimen.	Gently wipe away the dirt. (Because this is a polarized interference microscope, dirt poses more of a problem than usual.)
	The field diaphragm image is not focused on the specimen surface.	Move the condenser up or down to focus the image on the specimen surface.

2 Ph microscopy

Problem	Cause	Countermeasure
Poor phase contrast is obtained.	The system condenser Ph annular diaphragm and the objective phase plate do not match.	Adjust the Ph annular diaphragm so that it matches with the objective phase plate.
	The system condenser Ph annular diaphragm and the objective Ph code do not match.	Insert the Ph annular diaphragm with the same Ph code as the objective into the optical path.
	The field diaphragm image is not focused on the specimen surface.	Move the condenser up or down to focus the image on the specimen surface.

6 Care and Maintenance

1 Filter and lens cleaning

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

- Use an air blower to blow away dust. If that does not suffice, brush away the dust with a soft brush, or else wipe it away gently with gauze.
- Only if there are fingerprints or grease on a lens or filter, dampen a piece of soft, clean cotton cloth, lens tissue, or gauze with absolute alcohol (ethyl alcohol or methyl alcohol) and wipe. However, do not use the same area of the cloth, etc., to wipe more than once.
- Use petroleum benzine to clean off immersion oil. Wiping with absolute alcohol (ethyl alcohol or methyl alcohol) after the oil has been removed finishes the clean up process.
  If you cannot obtain petroleum benzine, use methyl alcohol. However, because methyl alcohol does not clean as well as petroleum benzine, it will be necessary to wipe the surfaces repeatedly. (Usually, three or four times is sufficient to clean lenses or filters.)
- Use petroleum benzine only to remove immersion oil from objectives; do not use petroleum benzine for cleaning the entrance lens on the eyepiece tube, filters, etc.
- Because absolute alcohol and petroleum benzine are both highly flammable, be careful when handling, when around open flames, when turning the power switches on and off, etc.
- Use absolute alcohol and petroleum benzine according to the instructions given by their manufacturers.

2 Cleaning of 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 the peeling of printed characters. Use of a silicon cloth is recommended.

3 Storage

Store the equipment under conditions of low humidity where mold is not likely to form.
Store the objectives, eyepieces, filter blocks, etc., in a desiccator or similar container with a drying agent.
Put the vinyl cover over the equipment to protect it from dust.
Before putting on the vinyl cover, turn off the power switches for the microscope and the Epi-fl attachment light source, and wait until the lamphouse is cool.

4 Regular inspections

Regular inspections of this equipment are recommended in order to maintain peak performance. Contact your nearest Nikon representative for details about regular inspections.

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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