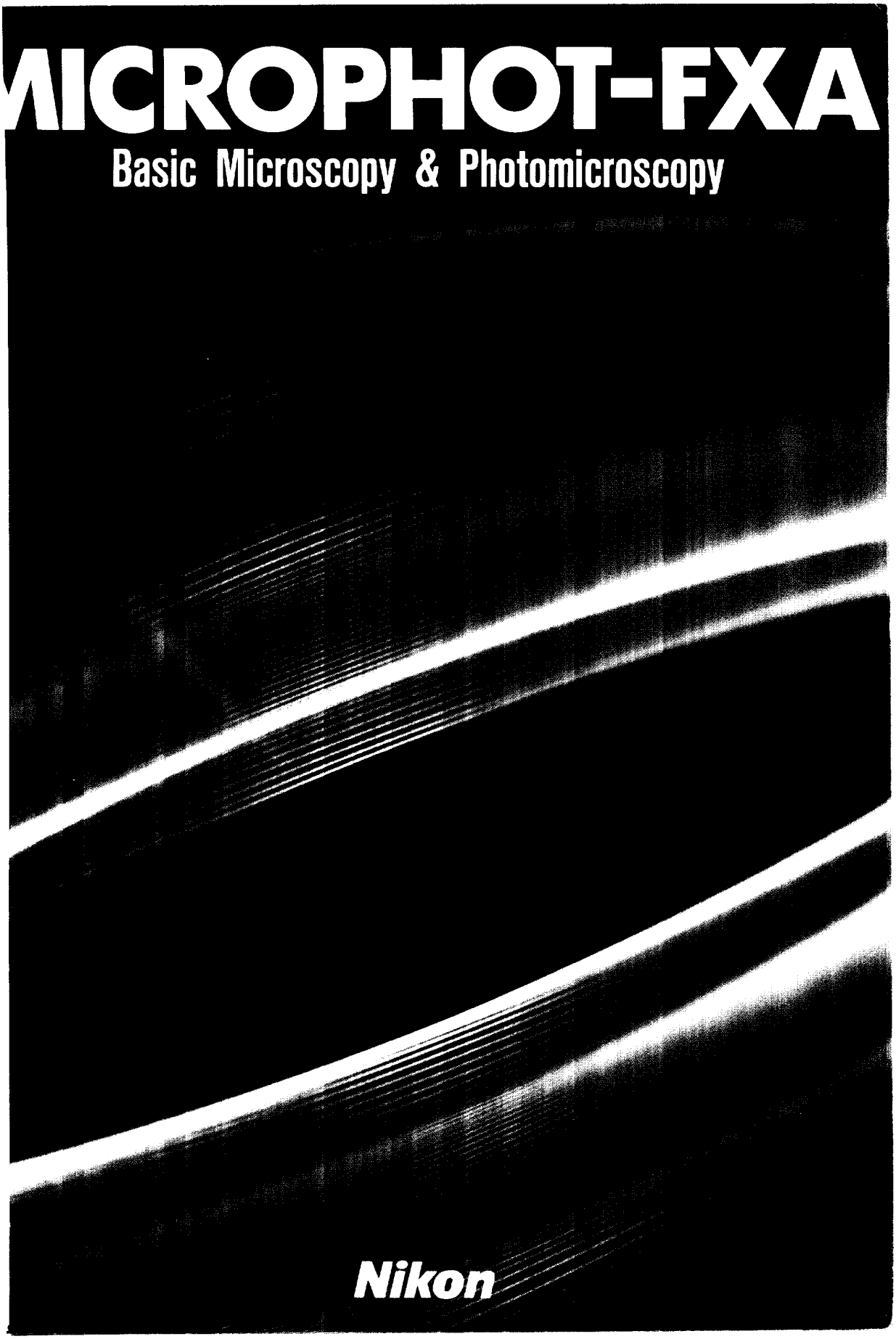
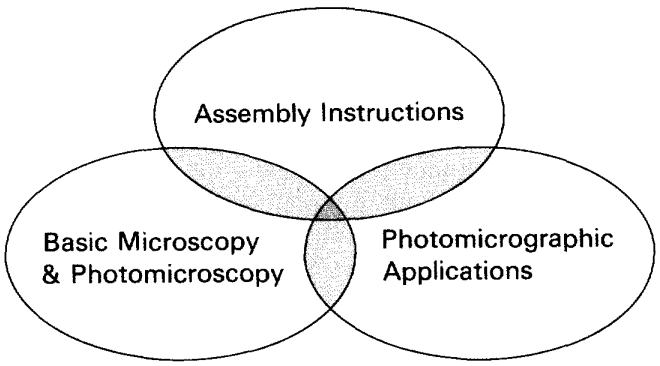
MICROPHOT-FXA

Basic Microscopy & Photomicroscopy



Nikon

Thank you for your purchase of Nikon's MICROPHOT-FXA microscope system. The MICROPHOT-FXA operation manual is divided into three parts:
This part, the Basic Microscopy & Photomicroscopy Manual, explains the procedures for camera attachment, film installation, microscopy, and photomicroscopy.
Part I., the Assembly Instructions, contains a detailed explanation of the microscope's assembly and adjustment procedures.
Part III., the Photomicrographic Applications Manual provides procedures for specialized photomicrographic applications.
Please read these instruction manuals thoroughly in order to become acquainted with the complete system and its operation. We hope the MICROPHOT-FXA will be of lasting service.

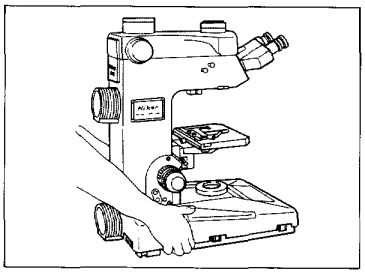


Handling Precautions

1. Handle Carefully!

Handle the microscope gently, taking care to avoid sharp impacts.

2. Carrying the Microscope

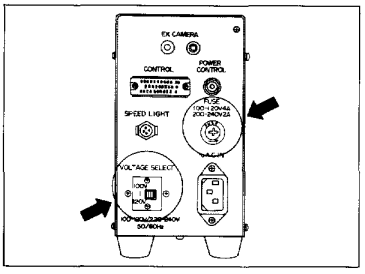


Remove the lamphouse(s) before carrying the microscope, and grip only the indicated handholds of the microscope base.

3. Microscope Location

Select a location with limited exposure to dust, vibration, high temperatures and humidity, and direct sunlight.

4. Line Voltage and Fuse



Confirm that the "VOLTAGE SELECT" on the rear panel of the power supply unit corresponds to the available line voltage, and that the correct rating of fuse (4A for 90-132V area, 2A for 198-264V area) is installed in the fuse holder.

5. Lamphouse

Never leave any volatile substances (such as gasoline, thinner, benzoline, etc.) near the lamphouse, as the lamphouse becomes extremely hot during use and such exposure can be dangerous.

6. High-Sensitivity Photomultiplier※1

Never leave the microscope displaying the "OVER" overexposure warning ihdicator on the LCD, or exposed to strong light for extended periods of time, as damage to the system's extra-sensitive photomultiplier (light detector) may result.

7. Film Sensitivity Settings

For the same reason as the preceding item 6, never set the film sensitivity to ISO 6※2 or lower. If set to ISO 6, be sure to set the exposure correction to under −1/3.

※1 Photomultiplier: An extremely sensitive detector of light and of other radiation, consisting of a tube in which the electrons released by radiation striking a photocathode are accelerated to successive dynodes that release several electrons for each incident electron, greatly amplifying the signal obtainable from small quantities of radiation.

※2 ISO: The international standard or film sensitivity.

Care and Maintenance

1. Lens Cleaning

Dust is best removed with a soft brush or gauze. More persistent dirt, such as fingerprints, grease and oil, may be removed with soft cotton, lens tissue, or gauze lightly moistened with absolute alcohol (methyl alcohol or ethyl alcohol). Use xylene to clean immersion oil off objective surfaces.

2. Cleaning Painted or Plastic Surfaces

Avoid the use of any organic solvents (such as thinner, alcohol, ether, etc.) to clean the painted or plastic surfaces of the instrument, using instead a mild solution of soap and water, or a neutral detergent.
Take extra care when cleaning the lettering on plastic parts, only wiping lightly with a damp towel.

3. Never Dismantle

Never attempt to dismantle the instrument, thereby avoiding the possibility of impaired operational efficiency and accuracy.

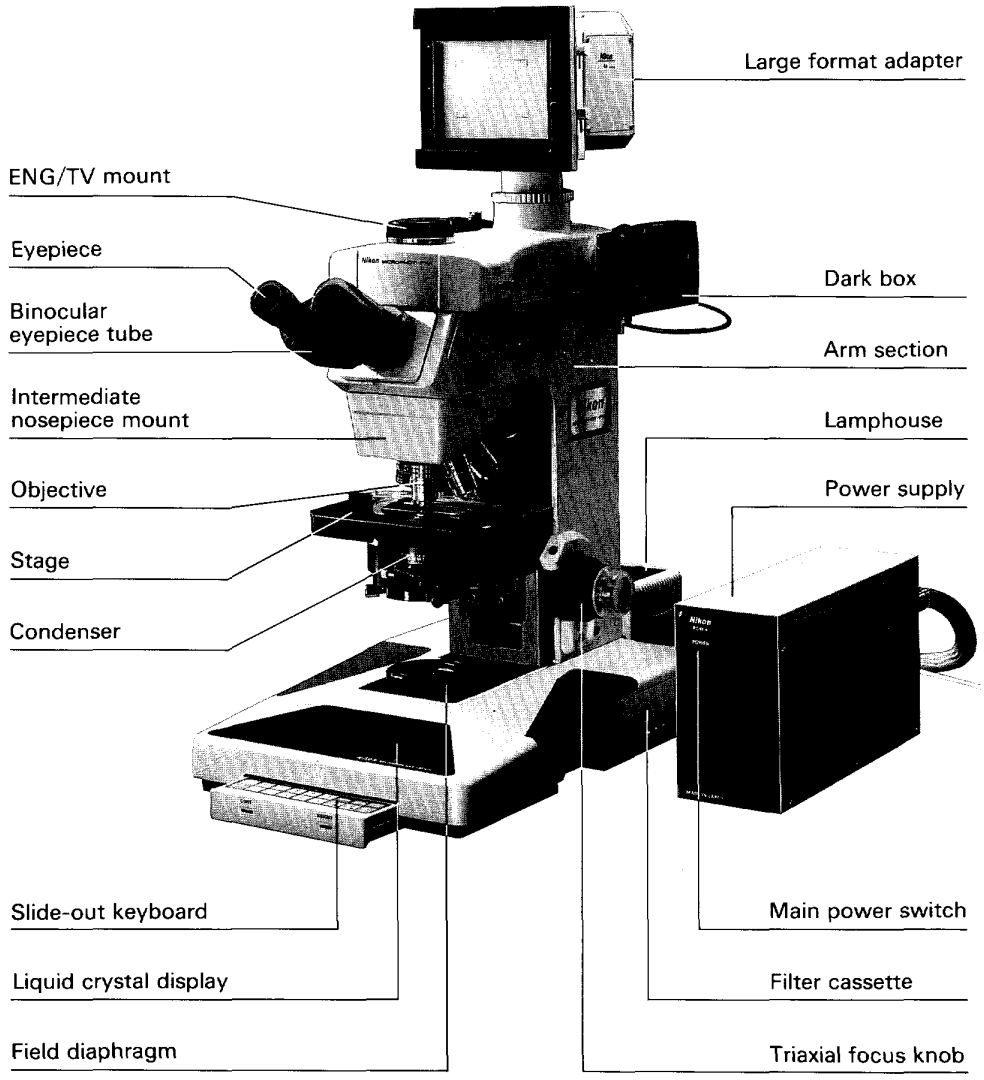
4. When Not in Use

When not in use, cover the instrument with the plastic cover, and store in a place free from moisture and fungus.

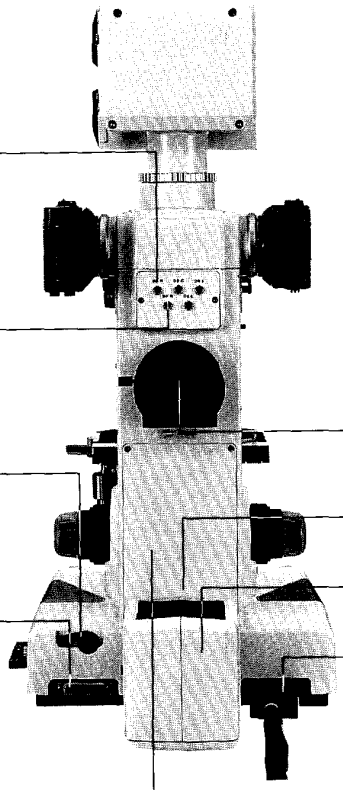
CONTENTS

I. NOMENCLATURE

1. System Components



2. Rear



Data back connector

DB-R: Right optical path
DB-C: Center optical path
DB-L: Left optical path

DX code readout connector

DX-R: Right optical path
DX-L: Left optical path

Diffuser lever

Rotate down to full limit to move diffuser into optical path.

Communication connector

DIP switch cover

Remove to perform DIP switch settings.
Turn power OFF and ON again after changing settings.
Refer to Part I., Assembly Instruction, p.20, Chapter II.-7. for details.

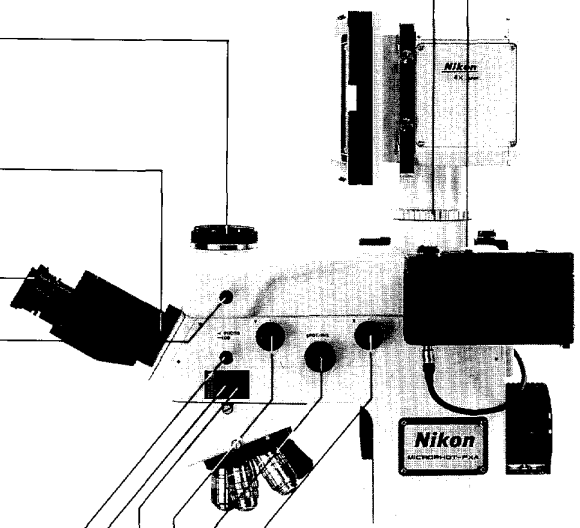
Lamphouse mount (for episcopic illumination)

Lamphouse mount (for diascopic illumination)

Lamphouse

Control cable

3. Upper Right Side



Right camera mount (F mount)

Mounts FX-35X or FX-35W dark boxes.

Center camera mount (A mount)

Mounts large format adapter. Mounts also 35mm dark box, or motor-driven F3 with optional A mount or CL2X conversion lens.

TV mount (ENG mount)

Mounts various TV cameras, as well as optional auto-focus system or microphotometry system.

Shutter/Bertrand lens slider

Holds optional eyepiece shutter or Bertrand lens.

Diopter correction ring

TV/PHOTO select knob

3-stage light ratio selection as shown in the chart below

	TV	PHOTO
IN	0%	100%
CENTER	80%	20%
OUT	100%	0%

Note: These ratios represent the light values as divided at the prism. Optical system reflection and absorption may cause slight variations in the actual values.

OB/PHOTO light path selector knob

OB (Pulled OUT): All light passes directly to the binocular eyepieces.
PHOTO (Pushed IN): All light passes through the photomicrographic optical system then on to the binocular eyepieces. (Exposure measurement area can be seen through the eyepieces.)

Intermediate magnification selector

5-position turret holds 1×, 1.25×, 1.5×, and 2× magnifiers and focusable Bertrand lens.

Bertrand lens focusing ring

Appears only when the intermediate magnification selector is set to B (Bertrand lens).

X-axis measurement area positioning dial

Rotate to position measurement area in horizontal axis.
(For both 1% spot and 30% average measurements.)

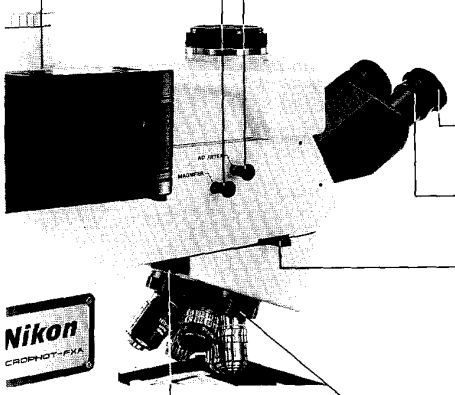
SPOT/AVE measurement area selection dial

Rotate to select either 1% spot or 30% average measurement area.
Corresponding SPOT or AVE indicator displayed on LCD.

Y-axis measurement area positioning dial

Rotate to position measurement area in vertical axis.
(For both 1% spot and 30% average measurements.)

4. Upper Left Side



Left camera mount (F mount)

Mounts FX-35X or FX-35W dark boxes.

Magnifier knob

Pull out to position 4 × magnifier in optical path for greater focusing accuracy when using lower power objectives.

ND filter knob

Pull out to position ND filter in binocular section optical path. Reduces viewing brightness without affecting photomicrographic illumination.

Eyeguard

Diopter correction ring

Filter slider

Leave in place during normal observation. Replace slider to perform simultaneous observation with optional epi-fluorescence and differential interference attachments.

Nosepiece

Magnification readout connector

Enables magnification readout of the objective on the optical path when used with MG or optional motorized nosepiece.

5. Lower Right Side

Motorized nosepiece clockwise rotation key

Hold down key for continuous operation. Functions as COUNT-UP button when counter function is ON.

Motorized nosepiece counter-clockwise rotation key

Hold down key for continuous operation.
Functions as COUNT-DOWN button when counter function is ON.

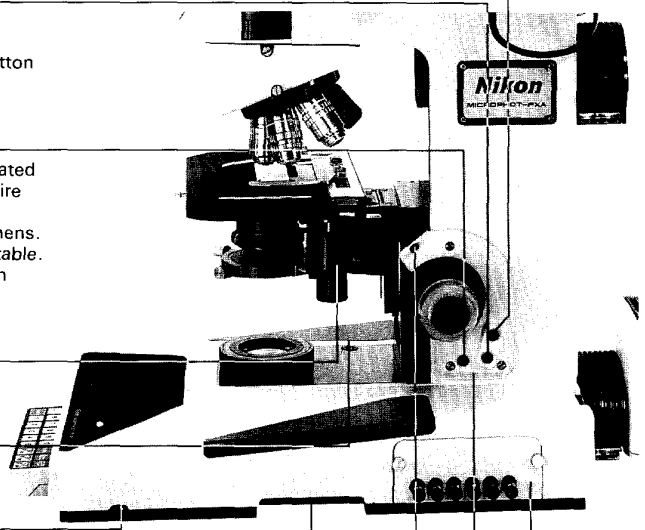
Reticle illumination key

Switches ON and OFF with repeated depressions, brightly lighting entire photomask to facilitate frame composition of even dark specimens. Red or green reticle colors selectable. Functions as RESET button when counter function is ON.

Condenser focus knob

Motorized condenser connector

Hand-held shutter switch connector



Remote controller connector

Shutter key (EXP key)

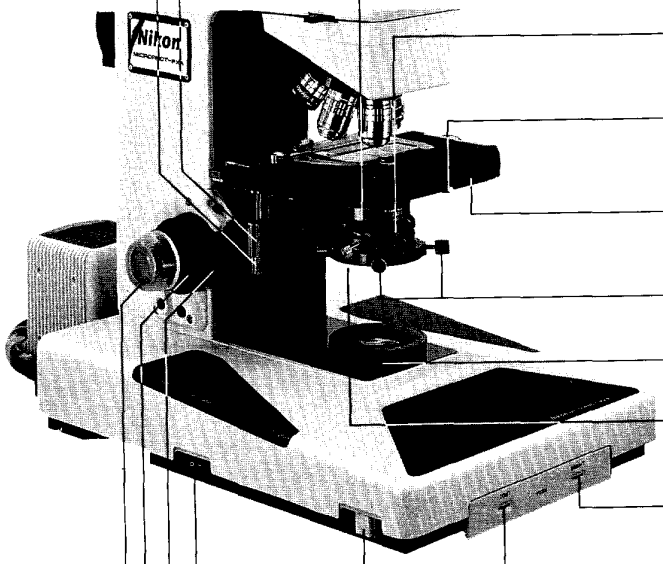
Control grip

Filter cassette

Press in buttons to position filter in optical path.

ND2	Brightness control filter (50% light transmission)
ND8	Brightness control filter (12.5% light transmission)
ND32	Brightness control filter (3% light transmission)
HE	Didimium filter (Not for ordinary use. Use only with HE hematoxylin and eosin stains.)
GIF	Green interference filter (Not for ordinary use. Use only for phase-contrast, differential interference, and contrast adjustment)
NCB11	Color temperature compensation filter

6. Lower Left Side



X-axis stage motion control knob

Y-axis stage motion control knob

Condenser

Condenser aperture diaphragm ring

Stage rotation clamp screw

(Also located on opposite side)

Mechanical stage

Condenser centering screws

Field diaphragm

Condenser holder

LCD Backlight brightness adjustment dial

Turn right for more bright background illumination. Turn left to the limit to turn off the illumination.

LCD (Liquid Crystal Display) contrast adjustment dial

Brightness control switch

Press the front half of the switch to decrease lamp voltage. Press the back half to increase lamp voltage.

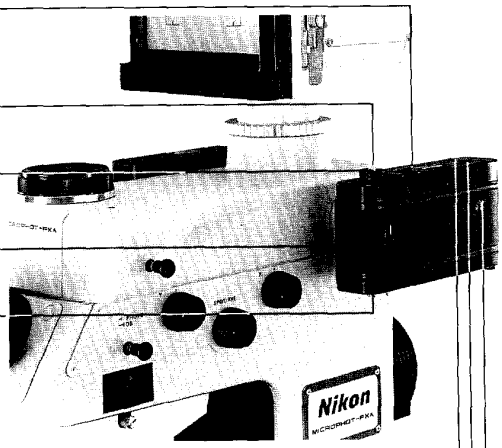
Sub-power switch

Coarse focus knob

Medium focus knob

Fine focus knob

7. Dark Box (FX-35DX)



Advance mode selection switch

Be sure switch is set to "A" (AUTO mode).

Rewind crank

Rewind knob

Camera mounting lock release button

DX cable connector

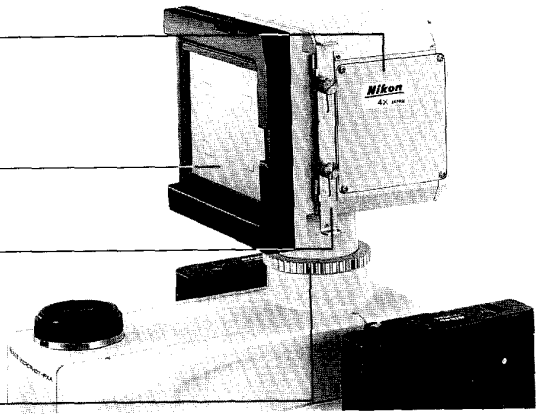
Connect to DX readout connector on rear panel of microscope using DX cable.
- Right-side dark box: DX-R
- Left-side dark box: DX-L

Film advance button

Film rewind button

Film advance indicator

8. Large Format Adapter



Large format adapter

Mounts 4"×5" film adapter or Polaroid film holder.

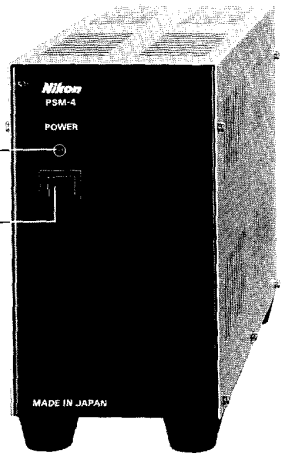
4"×5" film adapter

Film holder mounting bracket

Slide down to fix, and up to remove the film holder.

Large format adapter mounting ring

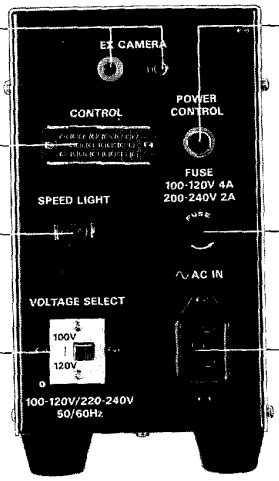
9. Power Supply Unit



Power lamp

Main power switch

Front Panel



External camera connector

Accessory power control connector

(Under development)

Control cable connector

Speedlight connector

Fuse holder

Power cord receptacle

Voltage selection switch

Before turning on the power, check to confirm that the panel indication corresponds to the available line voltage. If not correct, take off the cover using screw driver and reset the switch.

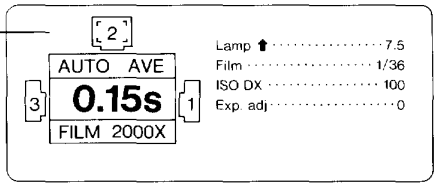
Rear Panel

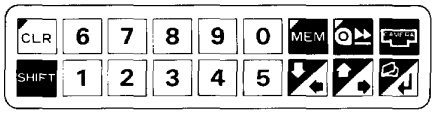
10. Slide-Out Keyboard

Press lightly on the front center of the keyboard drawer to open.

Liquid Crystal Display (LCD)
(English/Japanese)

Display is set for English at the factory, but can be changed to Japanese with a DIP switch setting. (Refer to Part I., the Assembly Instructions, Chapter II.-7. "DIP Switch Settings.")





Numerical input keys

Numerical input clearance/
function cancellation key

Exposure time memory key

Film advance key

Camera optical path
selection key

Return key

Arrow keys (for right and left cursor movement)

Keep pressing for continuous movement.

Shift key

The following functions are enabled when the SHIFT key is depressed together with the keyboard function keys.

SHIFT + CLR : Exposure or interval cancellation

SHIFT + MEM : Lamp ON/OFF

SHIFT + : Film initialization
(Used when film cartridge has no DX code)

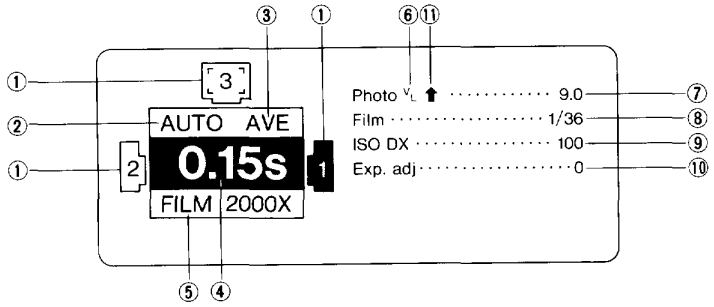
SHIFT + : Cursor down (Function selection)

SHIFT + : Cursor up (Function selection)

SHIFT + : Previous screen

11. LCD Display

● Main Screen



①Camera Displays

System recognizes 35mm dark box, large format camera, and external camera, and displays appropriate icon when camera is attached to any of the system's three mounts.

Camera Display

: Large format camera

: External camera (center)

: External camera (left side)

: 35mm dark box

Darkened image (reverse display) indicates selected optical path.

②Photomicrographic mode display

Displays "AUTO," "MANUAL," "MEMORY," "TIME," "BULB," or "FLASH".

③Measurement area display

Displays selected measurement area for photomicrography.
SPOT: 1% spot measurement area
AVE: 30% average measurement area

④Exposure time (shutter speed) display

⑤Magnification display

Magnification automatically displayed when using the motorized or MG nosepiece. Any of three display variations may be selected:

- Objective magnification × Intermediate magnification
- Total photomicrographic surface magnification
- Total observation surface magnification

⑥Voltage Lock (V-Lock) display

Appears when lamp voltage is fixed at 9 for optimal photomicrographic results.

⑦Lamp voltage display

⑧Film frame number display

⑨ISO film sensitivity value display

⑩Exposure compensation value display

Compensation adjustment can be performed in 1/3EV steps from −3 to +3EV.

⑪Illumination display

↑: Diascopic illumination
↓: Episcopic illumination

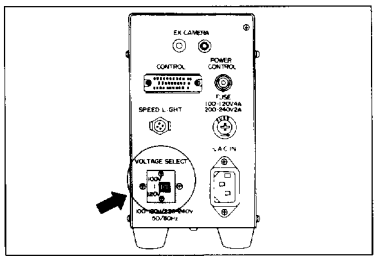
NOTE: For more details on the LCD, please refer to Part III., the "Photomicrographic Applications Manual."

II. BASIC MICROSCOPY

1. Turn on the power.

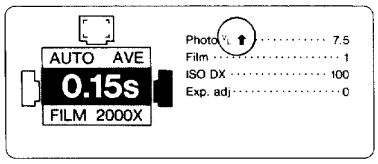
After confirming that the power supply is set for the correct line voltage, turn on the main power switch followed by the microscope base sub-power switch.

(Use the sub-switch to turn off the microscope for relatively short periods of time. The power supply consumes less than 2W when its main switch is left on.)



2. Check the illumination optical path.

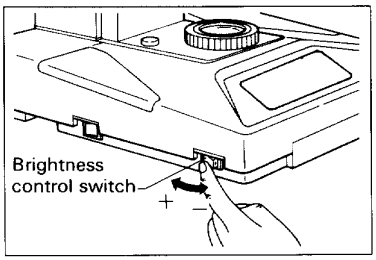
Confirm that the diascopic (⬆) indicator is displayed.
(If not, see p.34.)



3. Set the lamp voltage to 7.0.

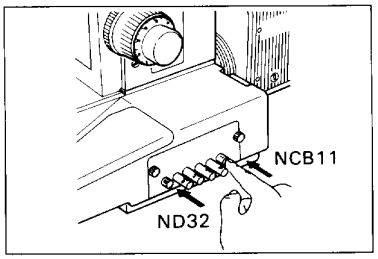
While watching the lamp voltage display, set the lamp voltage to approximately 7.0 with the brightness control switch. (If the display is set to "Photo$^{V}_{L}$", preventing voltage adjustment, see p.35.)

(Lamp centering is unnecessary.)



4. Select the ND32 and NCB11 filters.

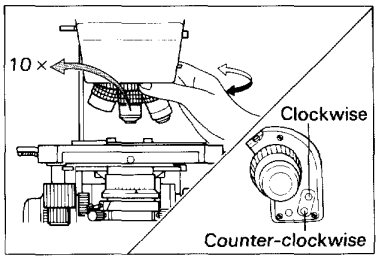
Depress the filter cassette buttons to move the ND32※7 and NCB11※8 filters into the optical path.



※7 ND filter : Brightness control filter. Higher number indicates darker filter (lower light transmission).
※8 NCB filter: Color balance filter. Refer to p.36.

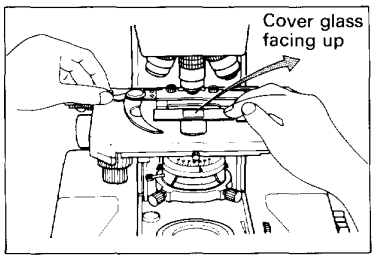
5. Move the 10× objective into the optical path

Move the 10× objective into the optical path by rotating the nosepiece securely into the click-stop. If using a motorized nosepiece, press either the clockwise or counter-clockwise rotation keys on the control grip.



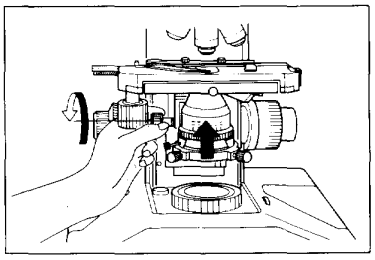
6. Place the specimen on the stage.

Be sure to mount the specimen with its cover glass facing up.



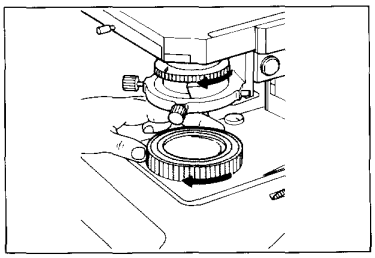
7. Raise the condenser.

Turn the condenser focus knob to raise the condenser to its full limit.



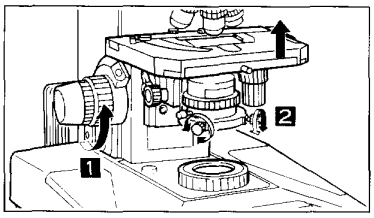
8. Fully open the field aperture and condenser aperture diaphragm.

(This step is unnecessary if using the motorized nosepiece, as the aperture diaphragm is set automatically.)



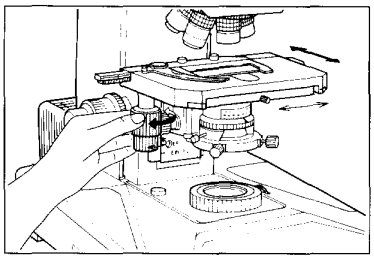
9. Raise the stage

Rotate the coarse focus knob 1 to raise the stage to its highest position without touching the objective. Adjust the condenser centering screws 2 to position the condenser directly under the objective.



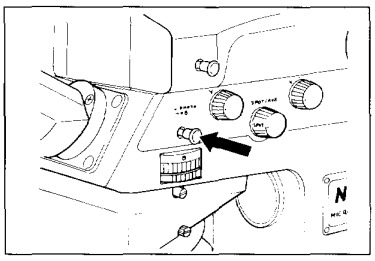
10. Position the specimen.

Move the stage to position the desired section of the specimen in the viewfield.



11. Push in the OB/PHOTO light path selector knob.

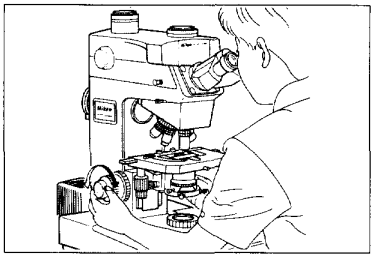
Push in the light selector knob to position the photomask※9 in the optical path.



※9 Photomask: A reticle slide on which are printed a double crosshair pattern for diopter adjustment and photo frame lines to facilitate positioning of the specimen viewfield for various film formats.

12. Focus

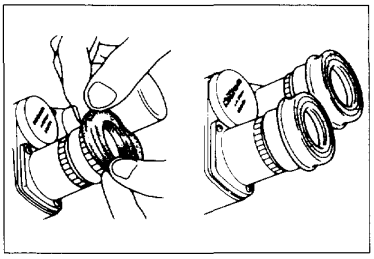
Rotate the triaxial focus knob to focus the specimen.
(Refer to p.38, "Using the triaxial focus knob.")



NOTE

Never turn the left and right-hand knobs in opposite directions at the same time, as damage may result.

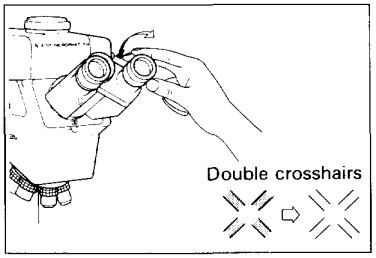
The CF eyepiece lenses are of a high-eyepoint type. If wearing glasses, fold down the rubber eyeguards.



13. Adjust the eyepiece diopter

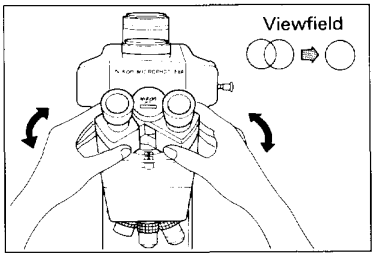
This adjustment corrects for the observer's eyesight.
Rotate the diopter adjustment ring on each eyepiece to bring the reticle's double crosshairs into sharp focus.

(Be sure to perform this step for each eye, as correct focus for each eye is usually different.)



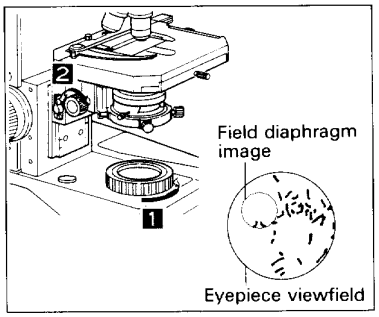
14. Adjust the interpupillary distance

Adjust the interpupillary distance by moving the eyepiece tubes together or apart until the full viewfield is clearly visible through both eyepieces as a single image.

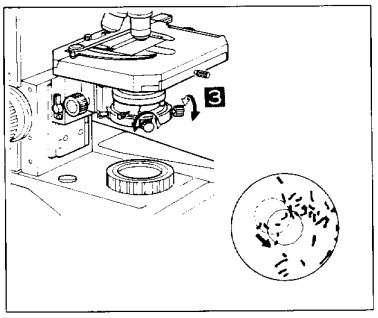


15. Center the condenser

Close down the field diaphragm to its smallest aperture 1 and rotate the condenser focus knob to focus the field diaphragm image on the specimen surface 2.
(If the field diaphragm image is out of the viewfield, adjust the condenser centering screws to move it into the viewfield.)

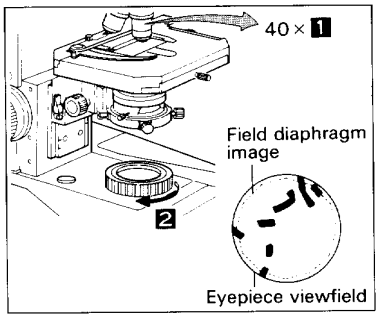


Adjust the condenser centering screws 3 to move the field diaphragm image to the center of the viewfield, so that the center of the double crosshairs and the center of the diaphragm image coincide.

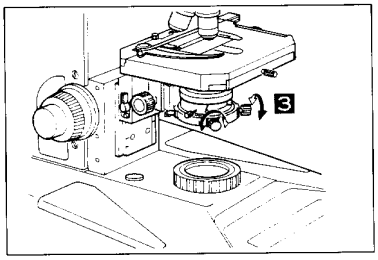


16. Switch to the 40× objective and re-center the condenser

Switch to the 40× objective 1, and open the field diaphragm 2 to the same size as the viewfield image.

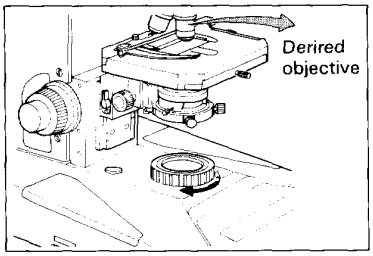


If the field diaphragm is off-center, readjust with the centering screws 3.



17. Switch to the desired objective

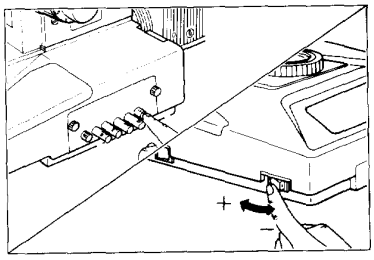
Switch to the desired objective. Adjust the field diaphragm to the size of the viewfield and focus.



- When using the MG or motorized nosepiece, magnification can be calculated automatically and displayed on the LCD. (Refer to p.47 "Selecting magnification displays".)

18. Adjust the brightness

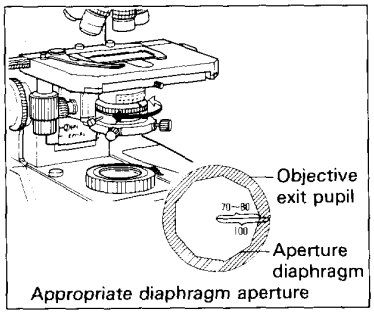
Use either the ND filters or the brightness control switch. (Be sure to maintain lamp voltage between 6-12.)



19. Adjust the condenser diaphragm

Set to 70%-80% of the objective's numerical aperture (N.A.). (The scale on the condenser indicates N.A. Set the ▲ mark to equal: "Objective N.A. ×0.7".)

(This step is unnecessary if using the motorized condenser, as the N.A. is automatically adjusted.)



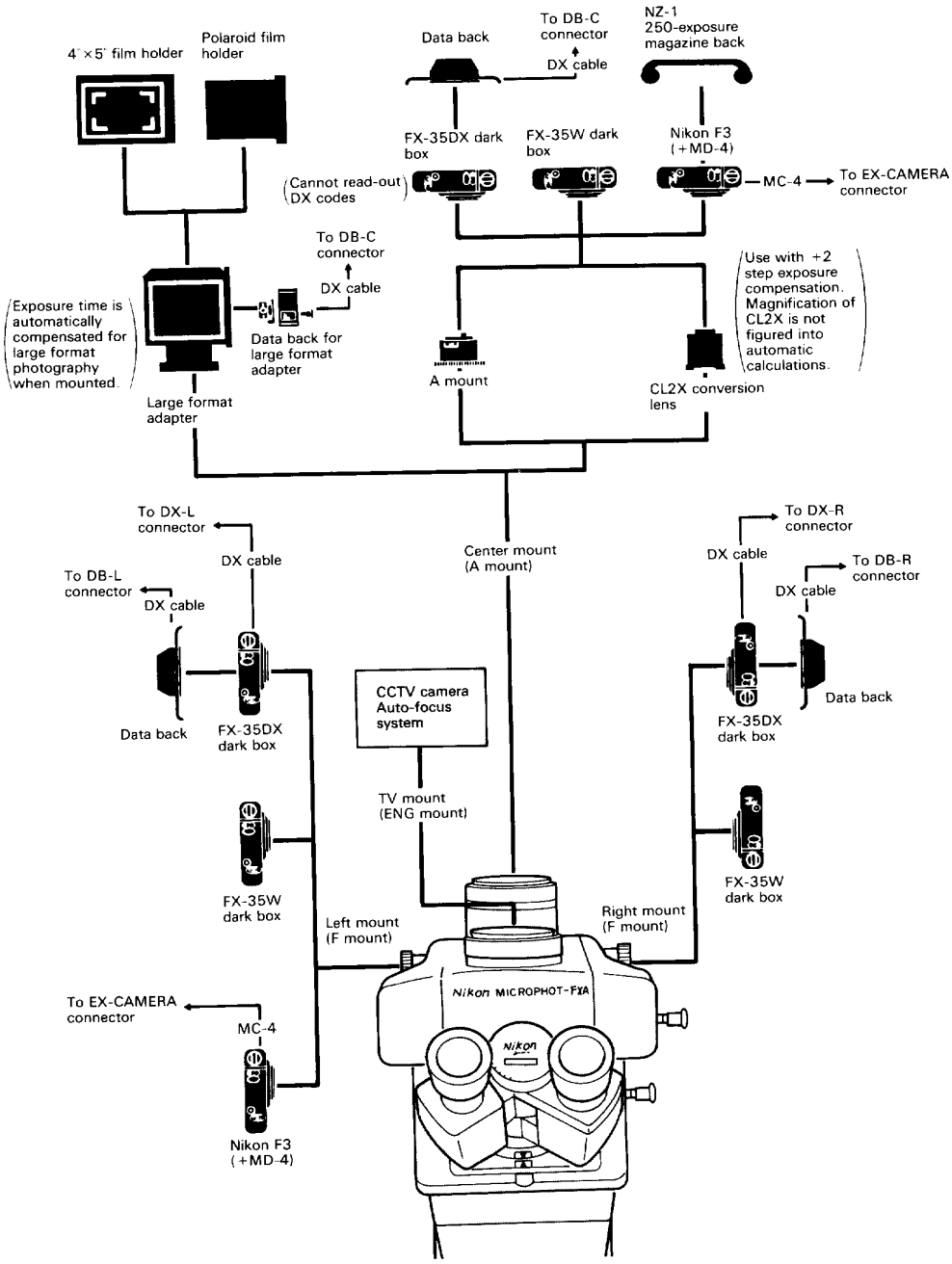
Appropriate diaphragm aperture

- With this step, the basic microscopic operation is completed.
- Improved image quality may be achieved by opening or closing the condenser aperture diaphragm slightly. (Refer to p.41.)

III. CAMERA MOUNTING AND FILM LOADING

1. System Composition

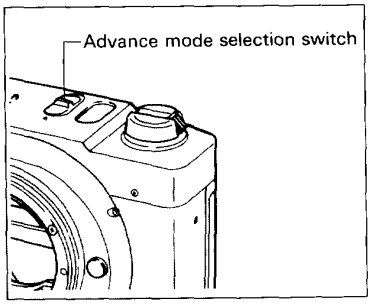
The following cameras can be mounted to the MICROPHOT-FXA.



2. 35mm Dark Box (FX-35DX/FX-35W)

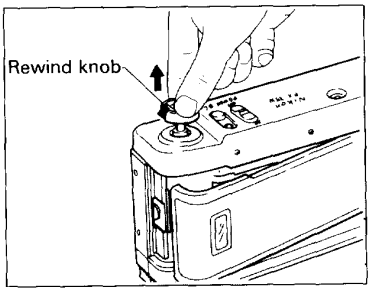
1) Film Loading and Camera Attachment

①If using the FX-35DX dark box, set the advance mode selection switch to "A" (AUTO mode). If the switch is set to "M" (MANUAL mode), operation errors, such as film advance failure or non-stop advance to the end of the roll may result.

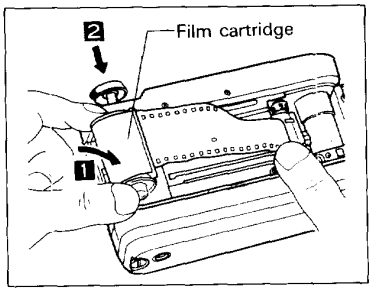


- If using the manual-advance dark box FX-35W, this step may be ignored.
- If using an optional data back※10, mount it on the dark box in advance, referring to its instruction manual.

②Open the back cover by pulling out the rewind knob.



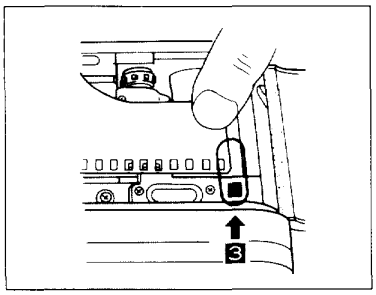
③Insert the film cartridge into the film receptacle ❶, and press in the rewind knob.



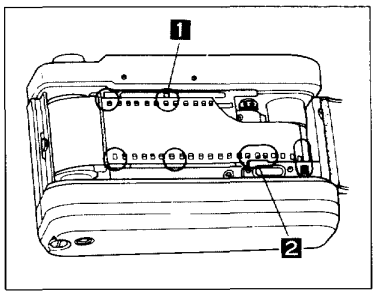
※10 Data back: *Equipment used to print data directly on the film. Install it instead of the back cover of the camera or dark box.*

④Align the end of the film with the red mark.

- If the film leader protruding from the cartridge is too long, manually rewind the film a bit to fit.
- Ensure that the film tip is not excessively bent.



⑤Check the film position, ensuring the film is properly seated between the two film guide rails 1 and that the drive sprocket teeth protrude through the film perforations 2.



NOTE

Ensure all film slack is taken up.

⑥Press the rear cover closed until it clicks into place.

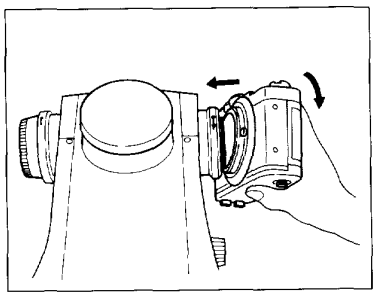
NOTE

Do not take up the film slack with the rewind knob before film initialization, as the film tip might pull away from the red mark, possibly disrupting the correct advance of the film.

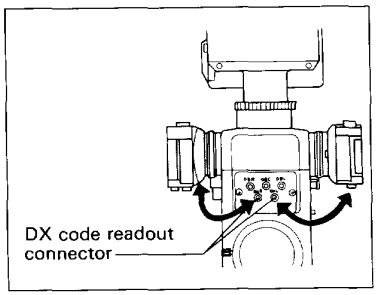
⑦If using the FX-35DX, connect the optional DX cable to the dark box. If using the data back, connect another DX cable to the data back.

⑧Mount on the microscope

- Left or right mounts:
  Align the small black dot on the dark box's mount with the (↓) mark on the microscope mount, then attach and rotate in the indicated direction to a full stop.
- Center mount:
  Use the optional CL2X conversion lens or the A mount.



⑨If using the FX-35DX, connect the other end of the DX cable attached in Step ⑦ to the DX code※11 readout connector on the rear panel of the microscope.
Right camera: DX-R
Left camera : DX-L



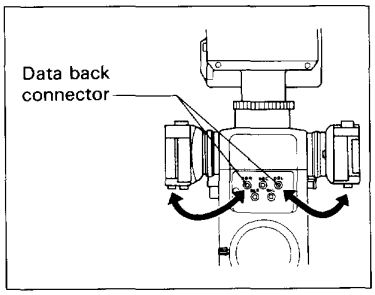
NOTE

- If the FX-35DX is mounted in the center position, the ISO film speed cannot be read-out because the mount has no connector.
- The FX-35W has no DX-code detector.
- If the DX cable is disconnected or misconnected, the ISO value and frame count may not read-out correctly.
- Always be sure mount caps are installed on any mounts not carrying a camera or dark box.

※11 DX code: The code printed on 35mm film cartridges which indicates the film sensitivity (ISO value).

⑩If using the data back, connect the data back DX cable attached in Step ⑦ to the appropriate Data back connector on the rear panel of the microscope.

Right camera data back : DB-R
Center camera data back: DB-C
Left camera data back : DB-L

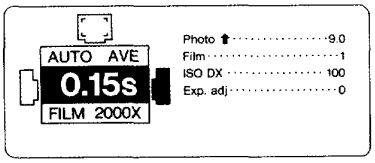


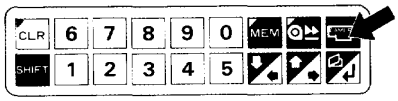
NOTE

Data backs cannot be installed on the FX-35W dark box.

2) Film Initialization

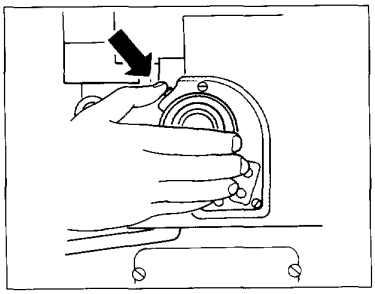
①Slide out the keyboard and depress the key to switch the optical path to the loaded camera. (The optical path is set at the position indicated by the reverse indication of camera icon.)





②Initialize the film.

- For FX-35DX
  Depress the shutter key. The film will automatically advance to the first frame.
  (If using DX-encoded film, the ISO value is automatically set, though it can be changed later.)
- For FX-35W
  Depress the SHIFT + keys.



NOTE

Confirm that the film advance indicator on the rear cover rotates during film advance. If the indicator does not rotate, the film will have to be reloaded.

③Enter the film frame No. and total number of frames.
Depress the [2] key to select "2. Film". Enter the frame No. with the numerical keys ([0] - [9]) and confirm with the [↵] key. Then enter the total number of frames with the numerical keys ([0] - [9]) and confirm with the [↵] key. (To change the input value, depress the [CLR] key.)

Example: If using a 36-frame roll film from its first frame, input as:

[2] [1] [↵] [3] [6] [↵]
└First frame └Number of frames in roll

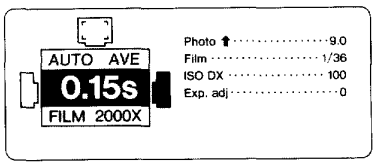
- To continue using the previously set value, press the [↵] key only.
- Input range for both frame No. and total number of frames: 0-999

④Input the ISO value.
If the ISO value cannot be set automatically by the DX code (such as when using the FX-35W, a non-DX-coded film cartridge, or when purposely designating a different value from the DX code), manually input the ISO value.
Depress the [3] key to select "3. ISO", then input the desired ISO value with the numerical keys ([0] - [9]) and confirm with the [↵] key. (To change the input value, depress the [CLR] key.)
By depressing [MEM] key instead of numerical keys on above step, the FXA reverts to the automatic DX code readout mode.
Example: To set the ISO value to 300, input as:

[3] [1] [0] [0] [↵]

- To continue using the previously set value, press the [↵] key only.
- ISO value input range: 1-25,000

⑤Confirm that the displayed ISO value and Film frame No./ Total number of frames are correct. With this step, basic preparation for photomicrography is completed.

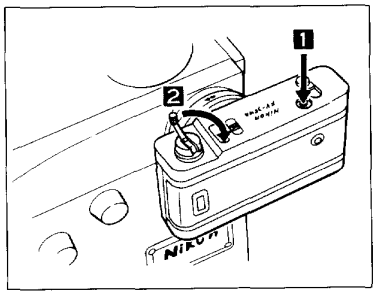


3) Film Rewind and Replacement

When the last frame is exposed, the warning buzzer sounds to indicate film roll completion.

①Depress the film rewind button **1**. It is not necessary to hold it down.

- Do not press the film rewind button until photomicrography is completed. If depressed during operation, a double exposure will result.



②To rewind the film, flip out the rewind crank and turn in the indicated direction **2**.

- The film advance indicator rotates backwards while rewinding the film.
- Although rewind tension grows stronger towards the end of the roll, continue turning the crank until the film advance indicator stops rotating.

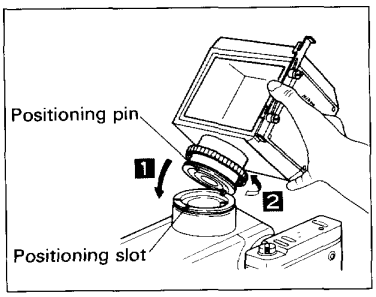
③Pull out the rewind knob to open the rear cover and remove the film cartridge.

- Avoid opening the dark box/camera body or leaving the exposed film in a bright room or direct sunlight. Send the film to the developer as soon as possible.
- Do not open the dark box/camera body until the film is completely rewound.

3. Large Format Camera System

1) Large Format Adapter Mounting

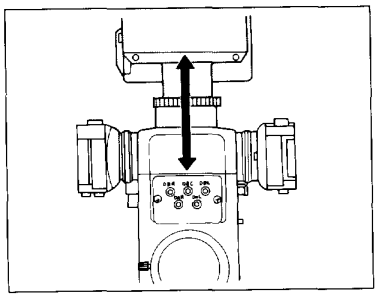
①Align the large format adapter's positioning pin with the center camera mount's positioning slot and mount 1, securing with the mounting ring 2.



NOTE

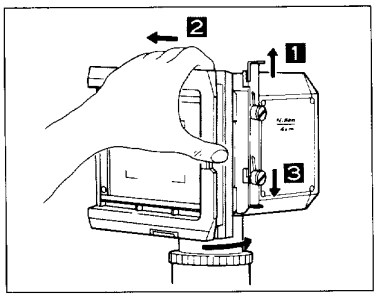
- Never touch the large format adapter's internal mirror.
- When the large format adapter is mounted, exposure times are automatically corrected for large format photography.

②When using the data back for large format adapter, connect the data back's DX cable to the data back connector DB-C on the rear panel of the microscope.



2) 4″×5″ Film Format Photomicrography

①Slide up the film holder mounting bracket **1**, and tilt the 4″×5″ film adapter slightly to fit it securely into the left-side bracket **2**. Pressing the film adapter flush against the mounting surface, slide the metal bracket down again to lock it into place **3**.



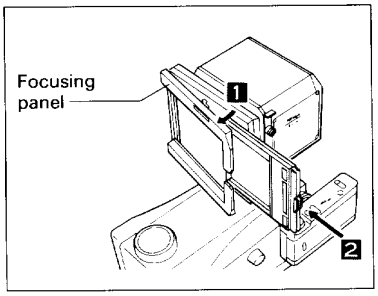
NOTE

Check the figures for left and right of the 4″×5″ film adapter.

②Raise the right side of the focusing panel **1**, and slide the film holder into left till its full limit **2**.
The following 4″×5″ film holders may be used with this system:

- Polaroid M545
- Polaroid M550
- Fuji PA-45
- Most other commercially available sheet film holders

Select the appropriate film for each holder and consult the film and holder's operations manuals for instructions on correct preparation and use.

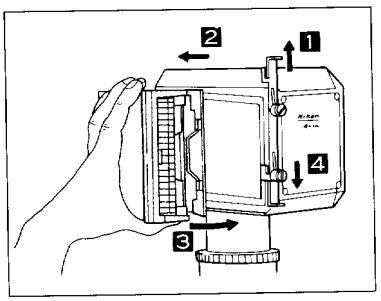


NOTE

- When handling the large format adapter with 4″×5″ film holder attached, always hold the main body of the adapter.
- When not performing large format photomicrography, leave the 4″×5″ film holder attached to prevent dust from entering the system.

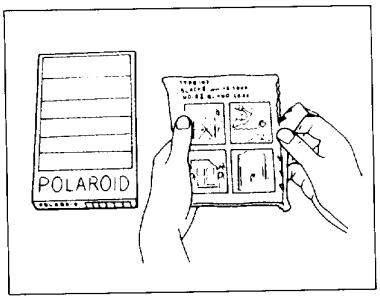
3) Polaroid Photomicrography

①Slide up the film holder mounting bracket 1, and tilt the Polaroid film holder slightly to fit it securely into the left-side bracket 2. Pressing the hoder flush against the mounting surface 3, slide the metal bracket down again to lock it into place 4.

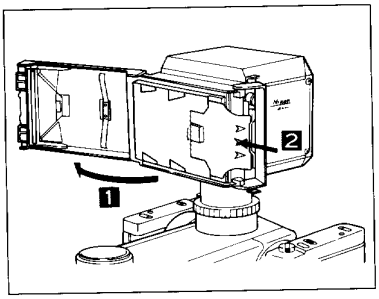


- Confirm which direction, left or right, the film will be pulled out, as the film holder can be installed in either direction.

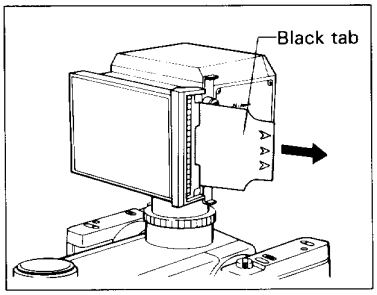
②To unpack the film magazine, tear off one end of the package and carefully pull out, holding on to the edge of the magazine.



③Open the film holder 1 and load the magazine 2, pressing it in to its full limit.



④Close the holder back and pull out the black tab before exposure.



NOTE

- Before exposure, be sure to draw out the light shield and wait for all vibration to stop.
- The following $3^1/_4" \times 4^1/_4"$ (8.5×10.8cm) pack films may also be used with this system:
  Fuji FP-100 FP-3000B FP-400B
  Polaroid Type 107 Type 108 Type 611 Type 612
  Type 665 Type 667 Type 668 Type 669
  Please read the film instructions carefully before use.
- When handling the large format adapter with Polaroid film holder attached, always hold the main body of the adapter.
- When not performing large format photomicrography, leave the Polaroid film holder attached to prevent dust from entering the system.

4. Nikon F3

The motor-driven Nikon F3 camera body can be used in place of the dark box, but in one position only. Continuous exposures of up to 250 frames can be accomplished with the addition of the NZ-1 magazine back.
The F3 cannot be mounted on the right-side mount. To mount on the center mount, use the optional A mount or the CL2X conversion lens.

①Set the F3 shutter mode to "B" (Bulb), the mirror up position, and attach the MD-4 motor drive

②Following the procedure given on p.18, mount the camera on either the left-side or center microscope mount.

③Connect the the MD-4 motor drive to the "EX-CAMERA" connector with the optional MC-4 cable.

④Slide out the keyboard and set the optical path to "F3" with the key. Depress the key to select the Menu screen. Move the cursor to "Camera Position" with the arrow keys and depress the key twice, causing the "Ex" display to appear on the LCD. Push the keyboard back into place.

⑤Refer to the F3 owner's manual for the film loading procedure.

IV. PHOTOMICROGRAPHIC PROCEDURE

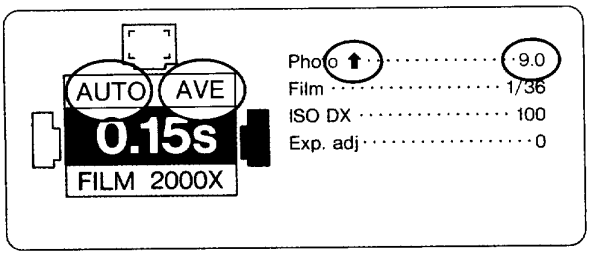
The basic photomicrographic procedure is described below.
Ensure that the following conditions are met before commencing.

- Microscope ready for standard microscopy.
  (See p.11, II. PREPARATION)
- Camera system ready for photomicrography (camera installed, film loaded and initialized, ISO value, film frame No. and total number of frames set).
  (See p.17, III. CAMERA MOUNTING AND FILM LOADING.)

1. Set AUTO, AVE, ↑, and 9.0

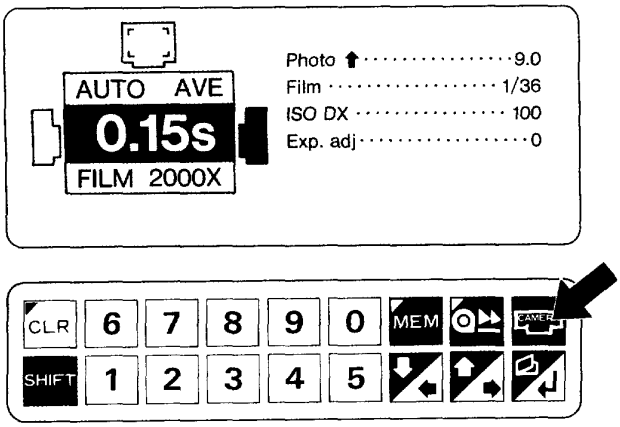
While observing the LCD, set as shown below:

- Set the photomicrographic mode to "AUTO".
  Select the menu screen with the ↵ key, move the cursor to the second line on the right and depress the ↵ then [1] keys. (p.45)
- Set the measurement range to "AVE".
  Select with the SPOT/AVE measurement area selection dial on the right side of the microscope arm. (p.52)
- Set the illumination to "↑ (Diascopic)".
  At the main screen, depress Keys [1] and [2] in order. (p.34)
- Set the lamp voltage to "9.0".
  Adjust with the brightness control switch located at the front left side of the microscope base. (p.11 & 35)



2. Select Camera

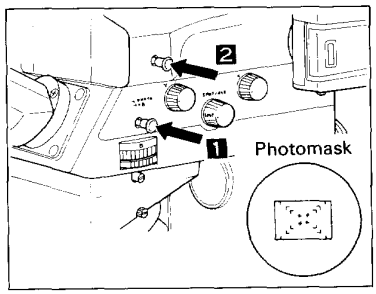
Slide out the keyboard and depress the [camera] key to set the optical path for the camera position to be used.



- If more than one cameras are used, be sure to switch over the optical paths to each camera each time the shutter is pressed.
- If the photomicrographic sequence is designated in advance, the optical path can be automatically switched to the selected camera with each succeeding frame. (For details, refer to Part III. Photomicrographic Applications Manual, III.-3. Photomicrographic Sequence Designation.)
- If dark surroundings make the display difficult to see, move the LCD backlight brightness adjustment dial on the front of the keyboard to the right to illuminate the display.

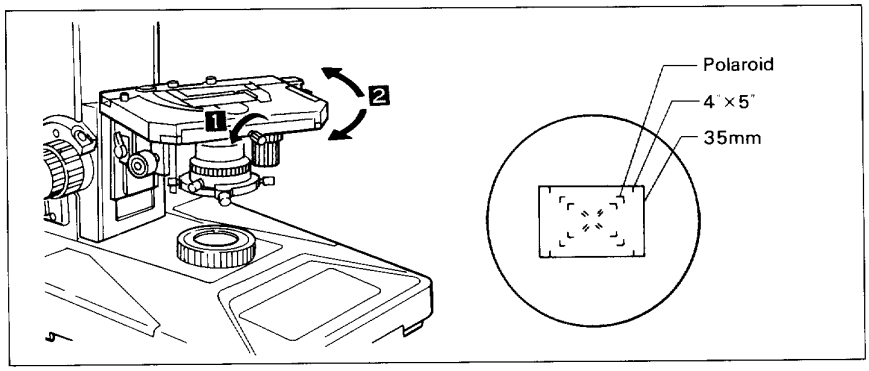
3. Select Optical Path

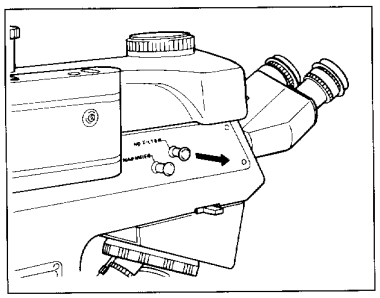
- Push in the OB/PHOTO light path selector knob 1.
- Press in the TV/PHOTO select knob 2.
- Check to confirm that the photomask can be seen through the binocular eyepieces.



4. Compose the Frame

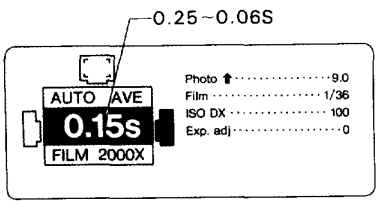
- Move the stage in the X- and Y-axes or loosen the stage rotation clamp screw 1 to permit rotation of the stage 2 for the desired specimen positioning within the corresponding photomask.
- Check the focus. (p.39)





- If the image in the binocular eyepieces is too bright, pull the ND filter knob out to move the arm section ND filter into the optical path. This will darken the observed image without affecting the photomicrographic optical path.
- If using the MG or motorized nosepiece, three kinds of objective magnification information can be seen on the LCD. (p.47)
- If using the standard nosepiece, total magnification can be calculated by referring to the chart on p.51.
- If the photomask is difficult to see because of the dark specimen, it can be illuminated in either red or green. (p.53)

5. Check Exposure Time

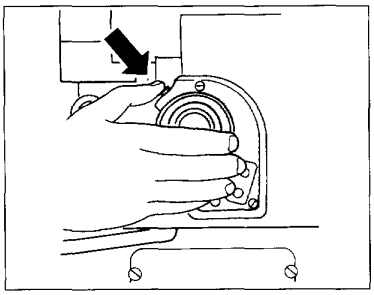


In the AUTO photomicrographic mode, the microscope automatically calculates the correct exposure time (shutter speed) from the specimen brightness.
While observing the LCD, adjust the ND filters and/or lamp voltage to set the exposure time between 0.25 and 0.06 seconds.

- Set the lamp voltage to between 8.9 and 9.1.
- If the display reads "OVER" (too bright) or "UNDER" (too dark), adjust the brightness with the ND filters at the filter cassette.
- Leave the NCB11 filter in the optical path.
- With the SPOT/AVE measurement area selection dial, select the desired measurement area range. (SPOT: 1% spot measurement or AVE: 30% average measurement). (p.52)

6. Depress Shutter Key

- If using the large format system, pull out the light shield and wait for all vibration to stop before pressing the shutter key.
- To interrupt an exposure, depress the SHIFT and CLR keys simultaneously. The film will advance one frame and all information will remain the same as existed before the shutter key was depressed.



7. Advance the Film One Frame

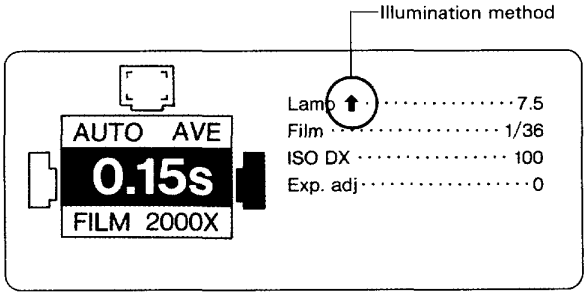
- FX-35DX: Advances automatically.
- FX-35W: Depress the key on the keyboard.
- Large Format Adapter: Replace the light shield and change film.
- The warning buzzer sounds upon reaching the end of the 35mm film roll. (p.23)

V. COMPONENT OPERATION

1. Changing Illumination Optical Paths

(Diascopic/Episcopic illumination switching)

The arrow (↑ or ↓) visible in the first line of the LCD (main screen) indicates the selected illumination method.
(↑ : Diascopic illumination; ↓ : Episcopic illumination)



NOTE

If the lamp voltage is set to 8.9-9.1, the display will read "Photo" instead of "Lamp". The display "Photo $^{V}_{L}$" indicates that the voltage lock function is on. To turn it off, refer to p.35, "Enabling and Disabling the Voltage Lock."

Optical Path Switching Procedure

①Slide out the keyboard. Each item on the display is numbered and can be selected by depressing the corresponding number on the keyboard.
②Depress the [1] key and select "Lamp" (or "Photo").
③The operation message "Select V-Lock ↵=ON CLR=OFF 1=EPI 2=DIA" appears on the display.

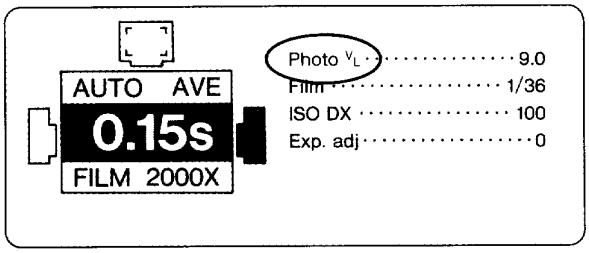
For episcopic (EPI) illumination, depress the [1] key.

For diascopic (DIA) illumination, depress the [2] key.

④Push in the keyboard and check the arrow display.

2. Fixing the Optimum Voltage for Photomicrography
(Voltage Lock Function)

For optimum color balance when performing photomicrography with color film, the lamp voltage must be set to between 8.9 and 9.1 owing to the film's sensitivity to differences in light source color temperature. The Voltage Lock (V-Lock) function holds the lamp voltage stably at 9V, the most suitable voltage for color photomicrography. When this function is set on, the "Photo $^{V}_{L}$" display appears on the LCD.



NOTE

The V-Lock function cannot be used when the photomicrographic mode is set to "MEMORY" or "FLASH". (p.44)

Enabling and Disabling the Voltage Lock

①Slide out the keyboard. Each item on the display is numbered and can be selected by depressing the corresponding number on the keyboard.

②Depress the [1] key and select "Lamp" (or "Photo").

③The operation message "Select V-Lock ↵=ON CLR=OFF 1=EPI 2=DIA" appears on the display.

To enable the voltage lock, depress the [↵] key.

To disable the voltage lock, depress the [CLR] key.

④Push in the keyboard and check the display.

3. Improving Color Tone

(Lamp voltage and color temperature compensation filter)

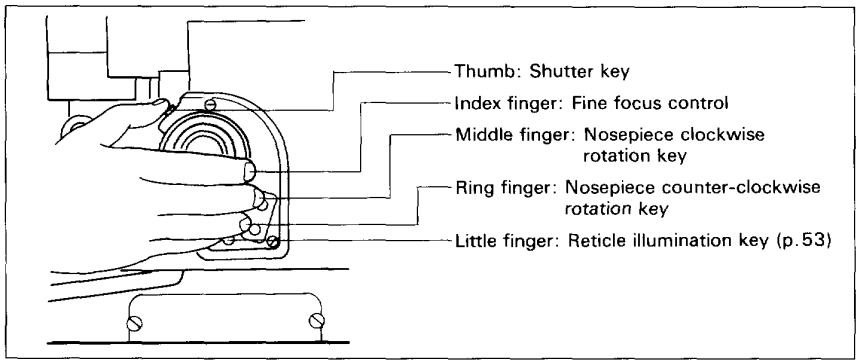
When performing color photomicrography, colors can vary depending on light source type and voltage setting. These variations are caused by differences in light source color temperature, which results in blueish hues if the color temperature is too high and reddish hues if too low. The MICROPHOT-FXA uses a long-life halogen lamp and NCB11 filter combination designed for optimal color reproduction when used at the specified lamp voltage of 9V. To maintain optimal color tones, please keep the following points in mind:

Set the lamp voltage to between 8.9 and 9.1.
Position the NCB11 filter in the optical path.
Use in conjunction with suitable color adjustment filters

- Refer to Part I., the Assembly Instructions, p.19, Chapter II.-5. "About the Halogen Lamp."
- When the lamp voltage is set to between 8.9 and 9.1, the "Lamp" display on the LCD changes to "Photo".
- The Voltage Lock (V-Lock) function maintains the lamp voltage at 9V, the most suitable voltage setting for photomicrography. (p.37)
- If the "OVER" or "UNDER" displays appear on the LCD notifying the inappropriate brightness for the photomicrography, the brightness must be adjusted using the ND filters. If brightness is adjusted at the brightness control switch, the color balance will be adversely affected.
  ND2 : 50% light transmission
  ND8 : 12.5% light transmission
  ND32: 3% light transmission
- Remove the NCB11 filter from the optical path if using tungsten-type color film or black/white film. (p.55)
- Set the lamp voltage to 8.0 when using tungsten-type color film.

4. Easier Operation (Using the control grip)

Shutter operation, nosepiece rotation (if using the motorized nosepiece), and reticle※12 illumination can all be performed while observing the specimen, without moving one's eye from the eyepiece. For easy operation, place a hand on the base armrest and position the fingers as shown in the figure below.



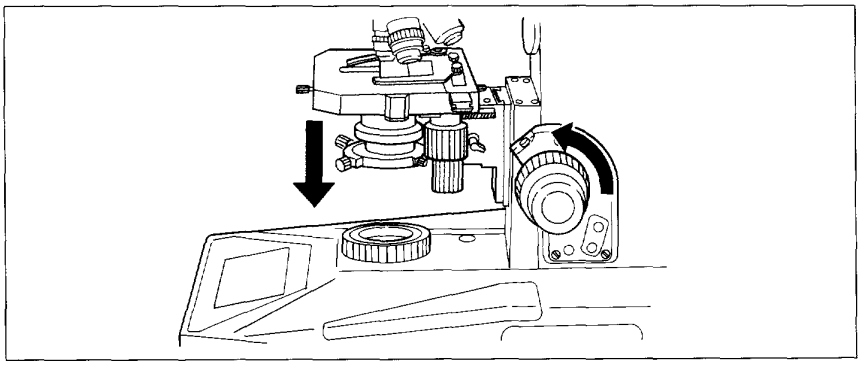
Control grips are located on both sides of the microscope, and can be used as preferred. Besides the functions described here, this unit also features a counter function. For details, refer to Part III., the Photomicrographic Applications Manual, Chapter III.-10.

※12 Reticle: The transparent glass plate on which the photomask is printed.

5. Accurate Focusing

——Using the triaxial focus knob——

Rotate the focus knob to move the stage vertically and focus the specimen. The relationship of knob rotation to stage movement is shown in the figure below.



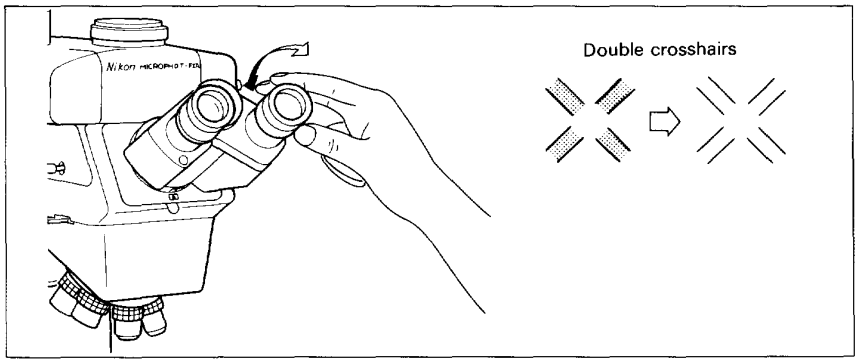
Scaled in 1μm increments, the fine focus knob moves the stage 0.1mm per rotation.
The medium focus knob moves the stage 1.7mm per rotation.
The coarse focus knob moves the stage 36.8mm per rotation.
Stage stroke extends 2mm above and 25mm below the reference position.
The coarse focus knob is recommended for use when changing specimens, since it moves down the stage fast. When focusing on low-power objectives (1-4×), use coarse and medium focus knobs. For intermediate magnifications (10-20×), sight with the medium focus knob and focus precisely with the fine focus knob.

NOTE

Never turn the left and right-hand knobs in opposite directions at the same time, as damage may result.

——Focusing on photomicrography——

First use the diopter correction ring to sharply focus the double crosshairs on photomask. Perform on both left and right eyepieces. (Push in the OB/PHOTO light path selector knob to bring the photomask into the viewfield.)

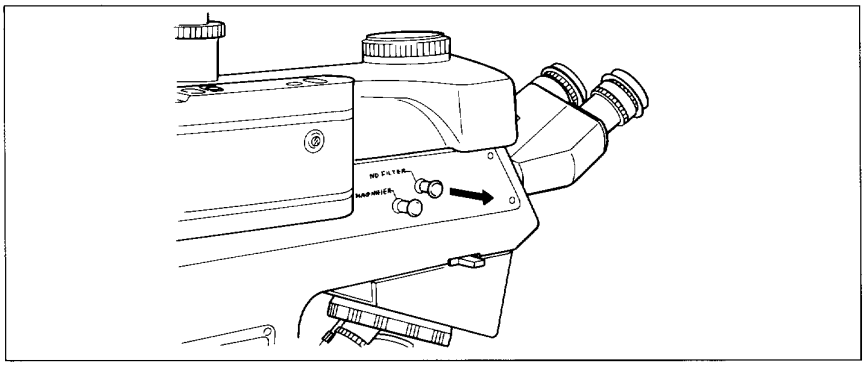


If the photomask is difficult to see because of the dark specimen, it can be illuminated in either red or green. (p.53)

- For 40× or higher power objectives
  Use the fine focus knob to bring both the double crosshairs and specimen into sharp focus.

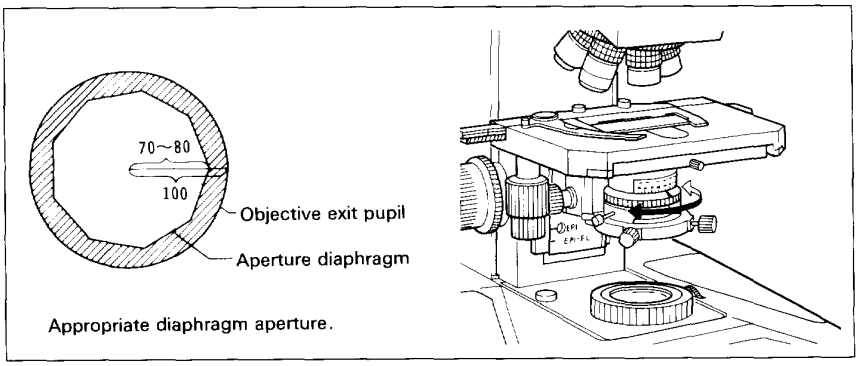
- For 10-20× objectives
  Perform initial focusing with the medium focus knob, then, while moving the eyes from side to side, adjust the fine focus knob until the relative positions of the crosshairs and specimen image remain unchanged.

- For 4× or lower power objectives
  Perform initial focusing with the coarse focus knob, then pull out the magnifier knob to magnify the observing image and use the medium focus knob to bring both the double crosshairs and specimen into sharp focus.
  (The magnifier has no effect on the photomicrographic image.)



6. View Adjustment (Condenser aperture diaphragm operation)

The aperture diaphragm adjusts the illumination system's numerical aperture (N.A.), affecting optical resolution※13, contrast and depth of focus※14. While closing the aperture diaphragm increases contrast and depth of focus, it also reduces resolution and brightness. Because these characteristics are interrelated, and cannot be controled one by one, the aperture must be adjusted for each specimen and application.
Generally, aperture settings of 70%-80% of the objective N.A. yield appropriate contrast.



Appropriate diaphragm aperture.

Rotate the intermediate magnification selector to position the Bertrand lens※16 in the optical path, and focus on the objective's exit pupil with its focusing ring. Adjust the aperture diaphragm while observing its image superimposed over the exit pupil of the objective. Or, perform a rough adjustment by referring to the condenser's N.A. scale.
Unless observing nearly transparent specimens, it is recommended that the aperture diaphragm not be stopped down to less than 60% of the objective N.A., as resolution will be adversely affected.

※13 Resolution: The ability to distinguish between two points in close proximity to each other
※14 Depth of Focus: The vertical range simultaneously in focus when observing an object.
※16 Bertrand Lens: A convex lens used in combination with the objective to permit observation of the objective's exit pupil.

Objective Magnifications and Condenser Usage

Type		Swing-out Achromat Condenser	Achromat/ Aplanat Condenser	Motorized Condenser (Achromat)	Low Power Condenser
N.A.		0.9 Dry type	1.4 Oil immersion type	0.85 Dry type	0.15 Dry type
Object Distance		1.8mm	1.6mm	3.1mm	9.2mm
Objective Magnifications	1×				
	2×	● Swing out top lens ● Fully open the aperture diaphragm			
	4×				
	10×	● Swing in top lens			
	20×				
	40×				
	60×				
	100×				

□ Applicable to UW (ultra wide) field observation
▨ Applicable to standard field observation only
□ Unapplicable

NOTE

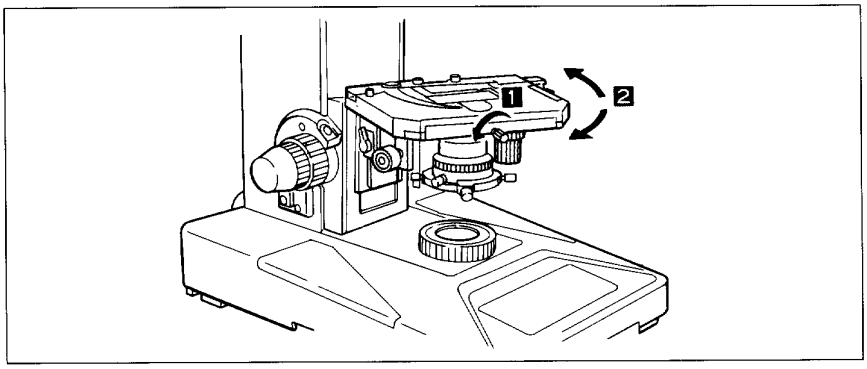
Object distance (from top of condenser to specimen) includes a slide glass thickness of 1.2mm.

7. Eliminating Flares (Field aperture operation)

The field diaphragm determines the illuminated area on the specimen. For general use, the diaphragm is set slightly larger (or smaller) than the viewfield. Too wide an illuminated area may give off stray light, which causes flares※17, resulting in reduced image contrast. Therefore correctly adjust the field diaphragm, especially in photomicrography. In general, it may be better to stop down the diaphragm for an illuminated area that just covers the film format.

8. Optimal Photo Composition (Stage rotation)

For more convenient photo composition, loosen the stage rotation clamp screw 1 and rotate the center-aligned stage 2.



NOTE

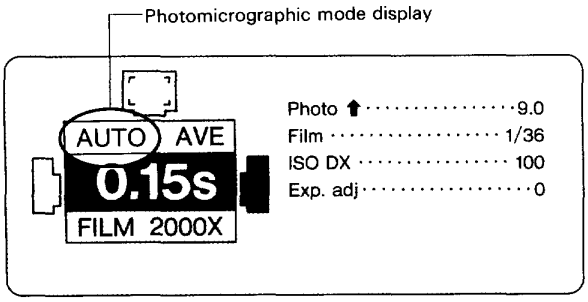
When rotating the stage, take care not to hit the main pillar or condenser.

※17 Flare: Stray light that spreads out over the image surface.

9. Setting Exposure Time (Photomicrographic modes)

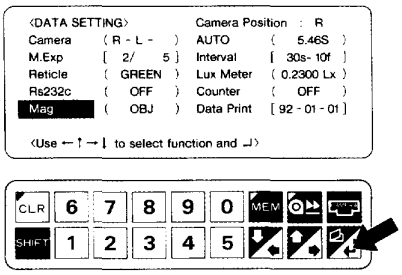
This system can be operated under six different photomicrographic modes. Select the one most appropriate for each frame's photo or specimen characteristics.

- AUTO mode ——— Automatically calculates appropriate exposure time (shutter speed) relative to specimen brightness.
- MANUAL mode ——— Permits numerical input setting of exposure time.
- TIME mode ——— Opens, then closes shutter with each succeeding depression of the shutter key.
- BULB mode ——— Opens shutter while shutter key is depressed.
- MEMORY mode ——— Locks exposure time during AUTO mode exposures.
- FLASH mode ——— Automatically sets the exposure time to 0.01 seconds when a speedlight is designated for use.

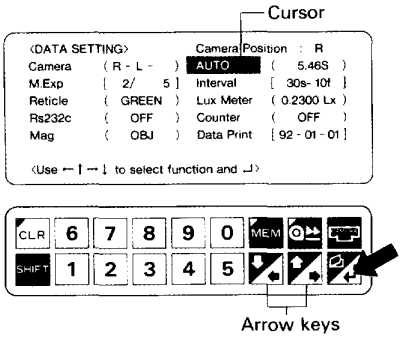


—— Setting photomicrographic mode to AUTO mode——

①Slide out the keyboard and depress the ↵ key to call up the menu display.



②Move the cursor with the arrow keys to the second line on the right row where photomicrographic mode is indicated. Depress ↵ key.



③The operation message "Select 1=AUTO 2=MANUAL 3=TIME 4=BULB" appears on the display. Press the 1 key to select "AUTO".

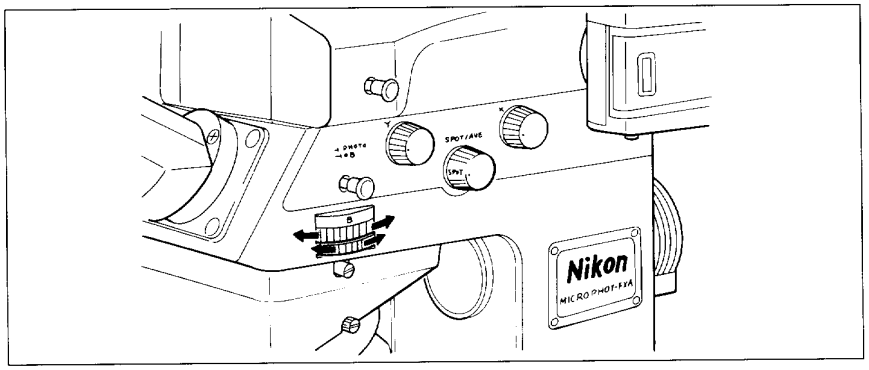
④Slide the keyboard back in and check the LCD display.

- For more details regarding the other photomicrographic modes, refer to Part III., the Photomicrographic Applications Manual.

10. Increasing Magnification

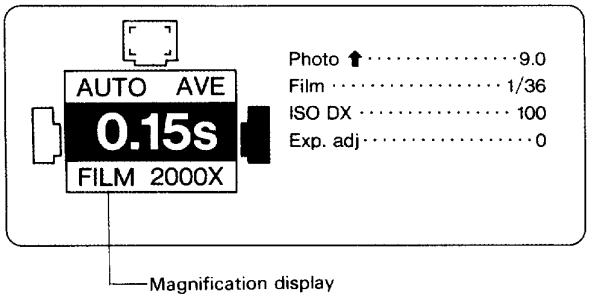
(Intermediate magnification selector usage)

1×, 1.25×, 1.5×, 2×, and focusable Bertrand lenses are built into the turret-type magnification selector. The desired magnification can be selected by simply rotating the turret, and will have an effect on all images (observation, photomicrography, and TV images). The focusable Bertrand lens may be conveniently used for aligning the phase annulus and photomicrographing or televising polarized conoscopiic images.



11. Selecting Magnification Displays

When using the MG or motorized nosepiece, magnification can be automatically calculated and displayed on the LCD.

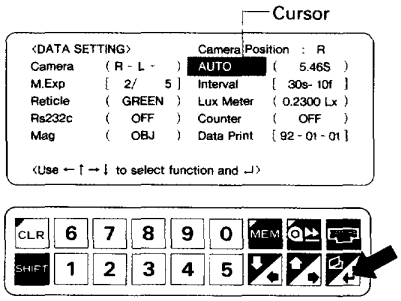


The following three types of displays can be selected.

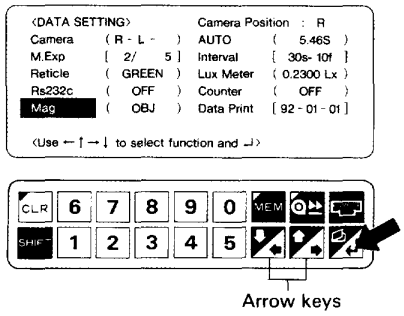
- OBJ ——— Objective × Intermediate magnification
- FILM ——— Total photomicrographic surface magnification
- EYE ——— Observation surface magnification

Magnification of the eyepiece and objectives, and numerical aperture of the objectives must all be registered in advance, regardless of which magnification display is selected.
Refer to the following section for more information on display selection and lens data registration.

①Slide out the keyboard and depress the ↵ key to call up the menu display.



②Move the cursor to "Mag" at the bottom line of the left row and depress the ↵ key to select.



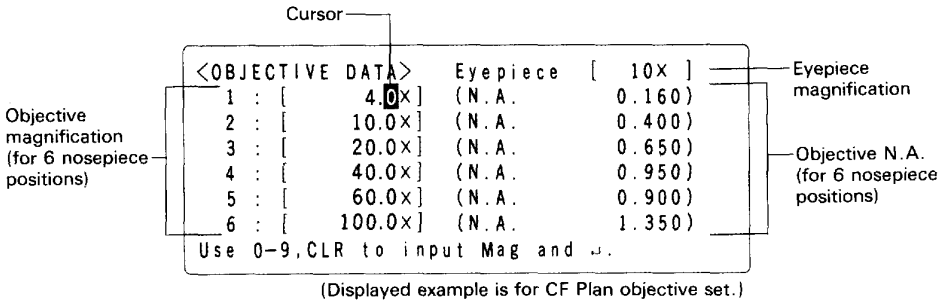
③The operation message "Select Mag
1 = OBJ
2 = FILM
3 = EYE or ↵"
appears on the display. Press:

- 1 for objective × intermediate magnification
- 2 for total photomicrographic surface magnification
- 3 for observation surface magnification
- ↵ for registration of eyepiece and objective magnification and objective N.A.

If the 1 , 2 or 3 key is depressed, check the display and slide in the keyboard. If the ↵ key is depressed, the display will change to the "Optics Data Input" Screen shown on the following page.

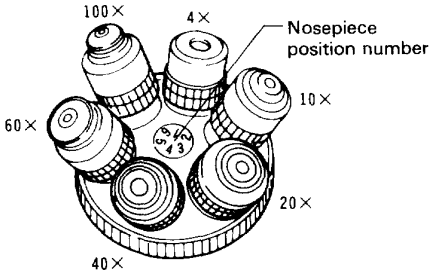
④Eyepiece and objective magnification and objective N.A. registration

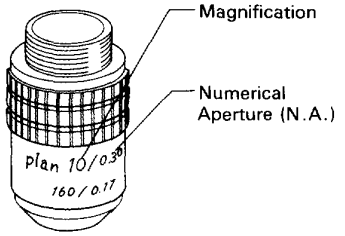
Optics Data Input Screen



(Displayed example is for CF Plan objective set.)

The numbers 1-6 visible on the left side of the display indicate nosepiece positions. Input the magnification and N.A. for the objective installed in each position in ascending order. (Each objective's magnification and N.A. are engraved on its outer surface.) (Entry is made at selected cursor position.)





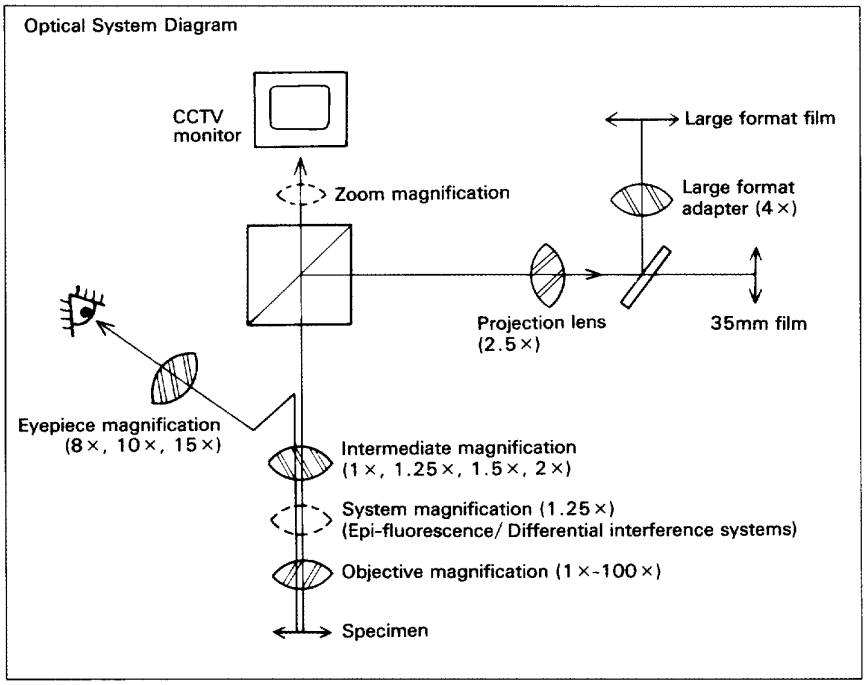
⑤Input the objective magnification (1-200×) with the numerical keys and set with the ↵ key. Then input the objective N.A. (0.010-1.500) and enter with the ↵ key. The cursor automatically advances to the next objective position. Input the remaining objective data in the same way.

- In case of error input, delete with the CLR key and re-input.
- If no input is desired, depress the ↵ key to move the cursor to the next entry position.
- To return to the menu screen, depress the SHIFT and ↵ keys.
- Sliding in the keyboard at any time signals entry completion and returns the display to the main screen.

⑥When objective data input is complete, the cursor moves to the "Eyepiece" position at the upper right corner of the display. Input the eyepiece magnification (1-20×) with the numerical keys and set with the ↵ key.

⑦Slide in the keyboard to return to the main screen.

12. Calculating Total Magnification



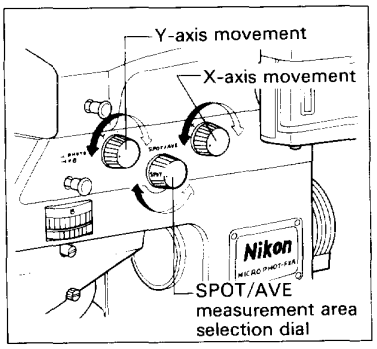
◎Total Photomicrographic (Film) Surface Magnification
Large Format: Objective × Intermediate magnification × Projection lens (2.5×) × Large format adapter (4×)
35mm: Objective × Intermediate magnification × Projection lens (2.5×)

◎Observation Surface Magnification (From binocular eyepieces)
Objective × Intermediate magnification × Eyepiece

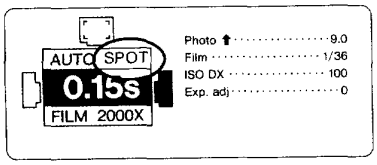
◎Total CCTV Magnification (at the monitor)
Objective × Intermediate magnification × Zoom lens × (2.3 × Monitor inch size)

- When using optional epi-fluorescence or differential interference systems, include the additional system magnification (1.25×) in the calculation.
- If the optional CL2X conversion lens is installed on the center camera mount, include the additional magnification (2×) in the calculation.
- If the MG or Motorized nosepiece is installed, either of the following 3 magnification formats can be automatically calculated and displayed on the LCD. (p.47)
  OBJ : Objective × Intermediate magnification
  FILM: Total photomicrographic surface magnification
  EYE : Observation surface magnification

13. Achieving the Best Exposure (Measurement area settings)

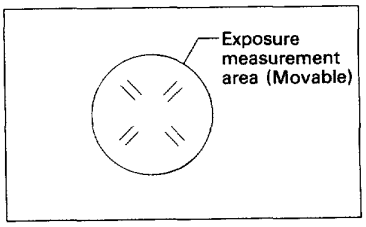


When the photomicrographic mode is set to "AUTO", the microscope automatically measures specimen brightness and calculates the shutter speed (exposure time). Two types of exposure measurement can be selected with the SPOT/AVE measurement area selection dial, with the selection appearing on the display. The two measurement area positioning dials allow the measurement area to be freely moved to achieve optimal exposures of desired sections of the specimen viewfield, without having to move the stage.

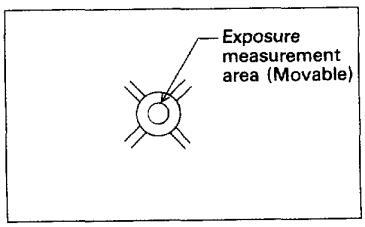


30% Average Measurement (AVE)
This method measures the average illumination over 30% of the photomicrographic viewfield area. Suitable for most specimens which do not have large variations in brightness.

1% Spot Measurement (SPOT)
This method measures a narrow 1% spot in the viewfield area. Primarily effective for specimens exhibiting large variations in brightness, or small measurement areas, as found in darkfield or fluorescence microscopy, and also effective to get precise measurement of one specific object.



AVE: 30% average measurement
- Average contrast with no major variations in brightness

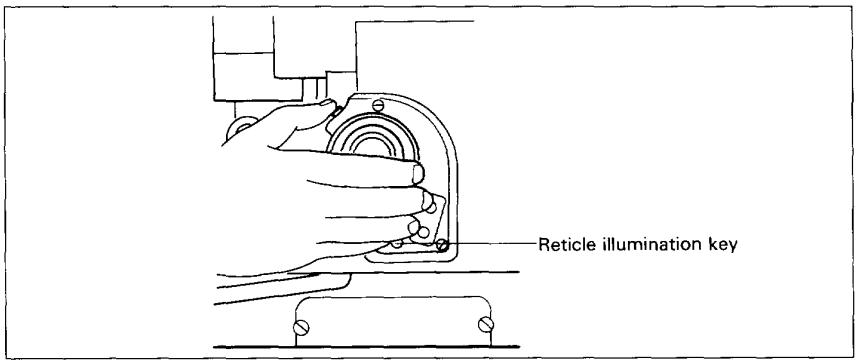


SPOT: 1% spot measurement
- Large variations in specimen and background brightness
- Small specimen spots spread across viewfield
- Accurate measurement of specific areas
- Fluorescent specimens

- Exposure measurement (photometric) values can be shown on the display. For details, refer to Part III., the Photomicrographic Applications Manual, Chapter III.-6.

14. Easier Photomask Viewing (Reticle illumination)

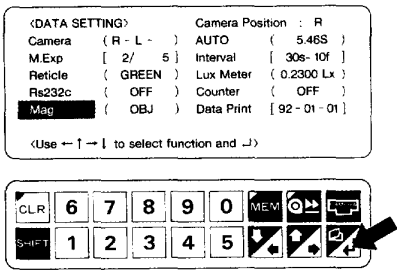
If the specimen is so dark that the photomask is difficult to see, as during epi-fluorescence microscopy, depress the reticle illumination key located on the control grip to illuminate the photomask. Either of two colors (red or green) can be selected at the keyboard. To turn off the reticle illuminator, press the key again.
If the shutter key is depressed while the reticle is illuminated, the illuminator will be switched off for the duration of the light measurement and exposure.
The selection of reticle illumination function and its color is made from the keyboad.



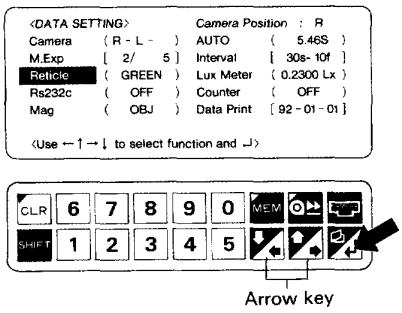
NOTE

- Occasionally, reticle illumination may cause the exposure time reading to differ slightly from the actual exposure time. However, as the illuminator is shut off during photomicrographic operation, it will have no effect on the final automatic exposures.
- If the reticle illuminator is disabled at the keyboard, it cannot be turned on by depressing the reticle illumination key.
- The reticle illuminator cannot be turned on or off while the counter function is enabled. (Refer to Part III., the Photomicrographic Applications Manual, Chapter III.-10.)

①Slide out the keyboard and depress the ↵ key to call up the menu screen.



②Move the cursor to "Reticle" on the left row and depress the ↵ key to select.



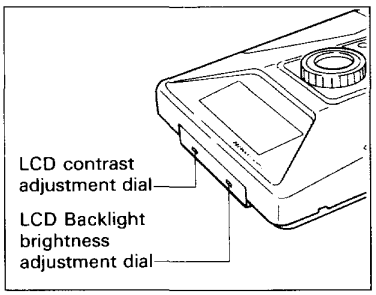
③The operation message "Select Reticle function ↵=ON CLR=OFF" appears on the display. Press the ↵ key to enable the illuminator, or the CLR key to disable it.

④If the illuminator is enabled, the message "Select Color 1=GREEN 2=RED" appears next. Press the 1 key for a green reticle photomask display or the 2 key for red.

⑤After completing the setting, slide in the keyboard.

15. Easier Display Viewing (LCD backlight illumination)

When performing photomicrography in dark surroundings, turn on the LCD panel's backlight illumination to make the display more easily visible. Turn the dial to the right to increase LCD brightness, and to the left to turn the backlight illumination off.



NOTE

- **To extend the life of the electroluminescence for the backlight, be sure to turn it off whenever the microscope is being used in a well-lit location.**

16. Black/White Film Photomicrography

As differences in color temperature have not much effect on black/white film, please note the following points when performing black/white photomicrography.

Lamp voltage should be set to over 6.0.
Remove the NCB11 color temperature compensation filter from the optical path.

- The filter cassette's GIF filter can be used to improve color contrast for many types of specimens, and should be tried.
- To increase the contrast of a particular stain, use a filter of a complementary color.
- A "B/W" indicator can be displayed on the LCD by sliding out the keyboard and depressing the [2] key, then the MEM key. (Depress the MEM key once again at this point to remove the "B/W" indicator.)
- For more information on the relationship of lamp voltage to color temperature, refer to p.36.
- Spectral characteristics will change slightly as lamp voltage and its corresponding color temperature are reduced.

17. Other Functions (Warning and self-check functions)

——Warning Functions——

At the detection of an input error or other abnormality, one of the following warning buzzers sounds, accompanied by a message display.

- Normal key input : Short beep
- Invalid key input : Long beep
- Abnormality detected: 3 short beeps

The warning buzzer can be switched on or off at the DIP switch located under the rear cover. For details, refer to Part I., the Assembly Instructions, Chapter II.-7.

——Self-Check Functions——

The MICROPHOT-FXA has a continuous self-check function that assures the shutter, quick-return mirror, and camera optical path selector are all functioning correctly. Should the warning buzzer sound and one of thre following messages be displayed, the shutter key will be disabled. To reset, turn the power OFF and back ON again. If the same error message appears again, contact your dealer or nearest NIKON representative.

- Shutter failure!
- Quick-Return Mirror failure!
- Light Path Switching failure!

▶FXA Function Tables

1. Photomicrographic Functions

2. Film-Related Functions

3. Illumination Functions

4. Photometric Functions

5. Microscope Functions

VI. TROUBLESHOOTING TABLES

Improper use will render the features of the microscope ineffective. Find the symptoms on the troubleshooting tables provided below, and follow the countermeasures to adjust the microscope correctly.

1. Optical

Symptoms	Causes	Countermeasures
Vignetting or uneven brightness in viewfield (viewfield not fully covered).	"OB/PHOTO" light path selector knob incorrectly positioned.	Pull or push light path selector knob to full limit. (Refer to p.13)
	Incorrect nosepiece positioning (objective off-center).	Rotate to click-stop position. (Position objective precisely in optical path.)
	Condenser off-center.	Adjust condenser after focusing on closed field diaphragm. (Refer to p.15)
	Intermediate magnification selector not in click-stop position.	Turn to click-stop position.
	Field-diaphragm aperture too small.	Open until no longer visible in viewfield.
	Dirt or dust on the lens (condenser, objective, eyepiece, slide glass).	Cleaning.
	Improper condenser usage.	Condenser adjustment. (Refer to p.41.)
	Unapplicable or incorrectly positioned diffuser.	Correctly reposition diffuser. (Refer to p.2.)
	Incorrectly positioned revolving nosepiece.	Correctly reposition revolving nosepiese.
Dirt or dust in the viewfield.	Dirt or dust on the lens (condenser, objective, eyepiece, field lens).	Cleaning.
	Dirty specimen.	Cleaning.
	Condenser too low.	Raise condenser to bring closed field diaphragm image into focus. (Refer to p.15.)
Inferior image quality (resolution or contrast).	No cover glass on slide glass, or cover glass specimen under NCG objective.	Apply cover glass or use correct objective.
	Incorrect cover glass thickness.	Use 0.17mm thick cover glass.
	Immersion oil used on dry-type objective (possible with 40×).	Cleaning.
	Dirt or dust on the lens (condenser, objective, eyepiece, slide glass).	Cleaning.

Symptoms	Causes	Countermeasures
Inferior image quality (resolution or contrast).	No immersion oil used with immersion-type objective.	Apply immersion oil.
	Air bubble in immersion oil.	Remove bubbles by swinging objective.
	Unspecified immersion oil used.	Use only Nikon immersion oil.
	Incorrect illumination.	Adjust illumination correctly. (Refer to p. 16.)
	Dirt or dust on entrance lens of binocular eyepiece tube.	Cleaning.
	Improper setting of objective's cover glass thickness correction ring (where applicable).	Adjust ring to match cover glass thickness.
	Improper setting to objective's iris diaphragm (where applicable).	Open the iris.
Poor image quality.	Apeture diaphragm too small.	Open to suitable size. (Refer to p. 41.)
	Condenser too low.	Raise condenser to bring closed field diaphragm image into focus. (Refer to p. 15.)
	No diffuser.	Position diffuser into optical path. (Refer to p. 2.)
Uneven focus.	Nosepiece not in click-stop position.	Rotate to click-stop position.
	Nosepiece incorrectly mounted or clamp screw loose.	Slide nosepiece into full limit and fasten clamp screw sucurely.
Image shift while focusing.	Vertically tilted specimen.	Correctly reposition specimen on stage.
	Revolving nosepiece not in click-stop position.	Rotate to click-stop position.
	Nosepiece incorrectly mounted or clamp screw loose.	Slide nosepiece into full limit and fasten clamp screw securely.
	Condenser off-center.	Recenter condenser. (Refer to p. 15.)
	"OB/PHOTO" light path selector knob incorrectly positioned.	Pull or push the light path selector knob to its full limit. (Refer to p. 13.)
	Intermediate magnification selector not in click-stop position.	Turn to click-stop position.

Symptoms	Causes	Countermeasures
Yellowish image.	No NCB 11 filterl.	Insert NCB 11 filter into optical path.
	Lamp voltage too low.	Adjust voltage to 6.0 or higher.
Viewfield too bright.	No ND filter.	Insert ND filter(s) into optical path.

2. Operational

Symptoms	Causes	Countermeasures
Focus impossible with high power objectives.	Slide glass upside-down.	Turn over slide glass.
	Cover glass too thick.	Use 0.17mm thick cover glass.
High power objective hits specimen when switched from low power.	Slide glass upside-down.	Turn over slide glass.
	Cover glass too thick.	Use 0.17mm thick cover glass.
	Incorrect diopter adjustment (especially for 1×, 2×, etc. low power objectives).	Readjust eyepiece diopter correction ring. (Refer to p.14.)
Insufficient objective parfocality when switched.	Incorrect diopter adjustment.	Readjust eyepiece diopter correction ring. (Refer to p.14.)
Specimen movement not smooth.	Loose slide holder.	Tighten two locking screws.
Stage travels only half of slide glass length.	Incorrect slide holder mounting holes used.	Remove slide holder and reposition in other set of holes.
Binocular images not coincident.	Incorrect interpupillary distance adjustment.	Adjust interpupillary distance. (Refer to p.14.)
Eye fatigue experienced during observation.	Incorrect eyepiece diopter adjustment.	Adjust eyepiece diopter correction ring. (Refer to p.14.)
	Inadequate illumination brightness.	Correct brightness with ND filter(s) or lamp voltage adjustment.

3. Electrical

Symptoms	Causes	Countermeasures
Lamp does not light when switch is turned ON.	Unplugged.	Connect power cord to line socket.
	No lamp.	Install lamp in lamp socket.
	Lamp failure.	Lamp replacement.
	Fuse failure.	Replace fuse.
	Power supply's main switch not turned ON.	Turn ON switch.
	Incorrect illumination method (Episcopic or Diascopic).	Check and correctly set illumination. (p.34)
Instantaneous lamp failure.	Unspecified lamp used.	Use only 12V-100W halogen lamp (OSRAM 64623 or PHILIPS 7724)
Insufficient illumination brightness.	Condenser off-center.	Recenter condenser. (Refer to p.15.)
	Aperture diaphragm set too small.	Open to suitable size. (Refer to p.16)
	Condenser too low.	Raise condenser to bring closed field diaphragm image into focus. (Refer to p.15.)
	Unspecified lamp used.	Use only 12V-100W halogen lamp (OSRAM 64623 or PHILIPS 7724).
	Dirt or dust on lens (condenser, objective, eyepiece, field lens, filters).	Cleaning.
	Lamp voltage too low.	Increase voltage.
Flickering, or unstable lamp brightness.	Impending lamp failure.	Lamp replacement.
	Incorrect lamphouse or connector connection.	Check for secure cord and lamphouse connections.
	Incorrect lamp installation.	Reinstall lamp securely.

4. Photomicrographic

Symptoms	Causes	Countermeasures
Photo not sharp.	Incorrect focus.	Looking into the eyepiece, turn diopter correction ring to bring double crosshairs into focus. Moving the eye laterally, rotate fine focus knob until no parallax between the image and double crosshairs appears.
		At low power magnification, utlilize 4× magnifier at the left side arm.
	Focusing point moves (especially at high magnification during long exposure).	To eliminate external vibration, use vibration isolation table or rigid desk.
		Select a location free of vibration.
		Coarse tension adjustment ring set too loose. (Refer to Part I., p.16.)
	Momentary vibration.	Use ND filters to lengthen exposure time (for color film, 0.25~0.06 sec.)
		Reduce voltage to lengthen exposure time (for black/white film). Note that spectral characteristics will change slightly as color temperature is reduced.
	Incorrect cover glass thickness (especially with large N.A., high power objectives).	Use 0.17mm cover glass.
		Use objective with cover glass thickness correction ring.
	Standard objectives used with uncovered specimen.	Use NCG objectives.
		Apply cover glass to slide whenever standard-type objective is used.
Image foggy.	Grease, dust or dirt on optical surface(s).	Check and clean objective lens, slide glass, condenser lens, field lens, etc.
Photos show uneven brightness.	Incorrect illumination setting (more visible on photos than during observation).	Correctly readjust illumination system. (Refer to p.15.)
Insufficient contrast	Aperture opened too wide.	Close down aperture to 70~80% of objective N.A. (Refer to p.16.)
	Wrong filter selection.	In metallurgical, interference, polarization, or phasecontrast microscopies, a use of GIF or monochromatic filter (for example, 546nm main wavelength, 30nm half-bandwidth) improves the contrast.
		To increase contrast of particular stain, apply filter of complementary color (black/white photos).

Symptoms	Causes	Countermeasures
Insufficient contrast	Incorrect field diaphragm setting.	Adjust slightly larger than viewfield. (Refer to p.15.)
	Low contrast specimen.	Perform phase contrast, darkfield, or DIC microscopy for improved contrast.
		Deeply stain specimen whenever possible.
		Red-blue stain (Mallory or Azan) gives better contrast than red-violet stain (HE) for color photomicrography.
		Fine grain, high contrast film (minicopy film) better suited for black/white photomicrography.
		For general use, wide latitude, fine grain film (such as Neopan F) may be more suitable.
Poor resolution.	Incorrect objective N.A.	Use larger N.A. objective.
		When total magnification is unchanged, increase objective magnification to attain higher resolution and sharpness, even though depth of focus is reduced.
	Excessive magnification.	500× ~ 1000× objective N.A. is the range within which adequate resolution is best obtained.
Ghosts or flare on photos.	Extraneous light entering binocular eyepeice tube.	Darken room or position standard accessory shutter slider.
	Stray light.	Avoid direct sunlight or any other intense lighting.
Poor color photograph quality.	Wrong filter selection	Select adequate filter(s).
	Film type or emulsion number differences.	Spectral sensitivities may differ among types and makes, though daylight type film is being used.
		Although the same film type is used, color reproduction may differ with emulsion number.
	Wrong lamp voltage setting.	Set to specified voltage: Daylight color film: 9.0 Tungsten color film: 8.0 Black/White film: 6.0 or higher
	Inadequate exposure time setting.	Inadequate exposure time results in color reproduction failure due to reciprocity failure. Adjust exposure time to within specified range with ND filter(s), or adjust this failure using CC filter.
	Film development prosess faulty.	Consult development laboratory, especially for color print photos.

Symptoms	Causes	Countermeasures
Shutter inoperative.	Camera not mounted.	Mount camera.
	Out of automatic exposure range. (UNDER or OVER displays visible.)	Adjust brightness with ND filter
		Adjust brightness with lamp voltage. (Possible only with black/white film.)
	Optical path selection does not correspond to mounted camera.	Reset camera optical path.
	In data setting mode.	Push in the keyboard.
	Quick-return mirror failure. (Error message displayed.)	Contact dealer or nearest NIKON representative.
LCD difficult to see.	Poor contrast.	Adjust LCD contrast adjustment dial.
	Insufficient illumination.	Adjust backlight brightness adjustment dial.

5. Error Message

Error Message	Cause	Countermeasure
"Set film count within (0-999)!"	Input value exceeds range of 0-999 during film count (Frame No.) setting	Depress CLR key to reset to 0. Then reinput film count (Frame No.) value within the range of 0-999.
"Set Film frame within (0-999)!"	Input value exceeds range of 0-999 during setting of total frame No.	Depress CLR key to reset to 0. Then reinput total frame No. value within the range of 0-999.
"Set ISO within (1-25000)!"	Input value exceeds range of 1-25000 during setting of ISO value (film sensitivity).	Depress CLR key to reset to 0. Then reinput ISO value within the range of 1-25000.
"DX code undetectable!"	Uncoded film used to set ISO value via DX code.	Set ISO value manually.
	Cable between DX camera and main unit not connected.	Check DX cable for correct connection.
"No Exp. adj registered!"	Exposure compensation value not set.	Set exposure compensation value.
"Reset CAMERA sequence!"	Same camera designated twice during photomicrographic sequence setting.	Carefully reset without designating the same camera.
"No camera in position!"	Camera not mounted in position designated during photomicrographic sequence setting.	Reset after assuring camera is correctly mounted.
"Set MANUAL time within (0.01-999.9)!"	Input value exceeds range of 0.01-999.9 during setting of MANUAL time.	Depress CLR key to reset to 0. Then reinput MANUAL time value within the range of 0.01-999.9.
"Set Multi-Exp within (2-999)!"	Input value exceeds range of 2-999 during setting of multiple exposure number.	Depress CLR key to reset to 0. Then reinput multiple exposure number within the range of 2-999.
"Set Interval time within (1-59)!"	Input value exceeds range of 1-59 during setting of interval time.	Depress CLR key to reset to 0. Then reinput interval time value within the range of 1-59.
"Set Interval frame within (1-999)!"	Input value exceeds range of 1-999 during setting of interval frame number.	Depress CLR key to reset to 0. Then reinput interval frame value within the range of 1-999.

Error Message	Cause	Countermeasure
"Set OBJECTIVE Mag within (1-200)!"	Input value exceeds range of 1-200 during setting of objective magnification.	Depress CLR key to reset to 0. Then reinput objective magnification value within the range of 1-200.
"Set Eyepiece within (1-20)!"	Input value exceeds range of 1-20 during setting of eyepiece magnification.	Depress CLR key to reset to 0. Then reinput eyepiece magnification value within the range of 1-20.
"Memorized data lost!"	Memorized data are lost.	Reinput data.
"Set shutter speed "AUTO" for Photometer!"	Attempt made to set photometric value display function when photomicrographic mode is not set to "AUTO"	Set photomicrographic mode to "AUTO" before setting.
"Film end! Change new film"	End of film roll.	Rewind and replace with new roll of film.
"Error Detected! Reset EXP Time!"	Attempt made to take exposure while out of exposure time range. ("OVER" or "UNDER" warning displayed.)	Confirm exposure time is set within allowable range before taking exposure.
	Attempt made to take exposure with no camera mounted in designated position.	Check to confirm camera is mounted.
	System in data setting mode.	Assure keyboard is securely pressed back into storage position.

Photomicrography cannot be performed if any of the following error messages are displayed. Should this situation arise, please contact your dealer or nearest Nikon representative.

"Shutter failure!"

"Light Path Switching failure!"

"Quick Return Mirror Failure!"

"Nosepiece Rotation failure!"

"Condenser Rotation Failure!"

ELECTRICAL SPECIFICATIONS

Electrical Sourse	90-132V AC; 45-66Hz 198-264V AC; 45-66Hz
Halogen lamp	12V-100W (OSRAM 64623 or PHILIPS 7724)
Fuse	90-132V; 4A (ϕ6.4×30) 198-264V; 2A (ϕ5.2×20)
Power Consumption	Less than 240W

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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