Nikon

MICROPHOT-FXA

Instructions

NIKON CORPORATION

Thank you for your purchase of Nikon's MICROPHOT-FXA microscope system. Please read this instruction manual thoroughly in order to become acquainted with the complete system. We hope the MICROPHOT-FXA will be of lasting service.

1. CAUTIONS

① Handle the microscope gently, taking care to avoid sharp impacts.

② Remove the lamphouse before carrying the microscope, and grip only the indicated handholds of the microscope base. (Fig. 1)

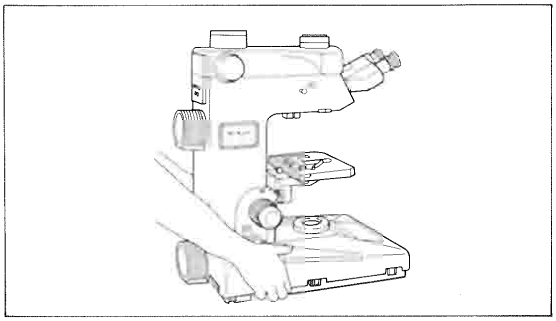


Fig. 1

③ Select a location with limited exposure to dust, vibration, high temperatures, humidity, and direct sunlight.

④ Be certain the line voltage indication on the power supply unit corresponds to the available line voltage. (Fig. 2)

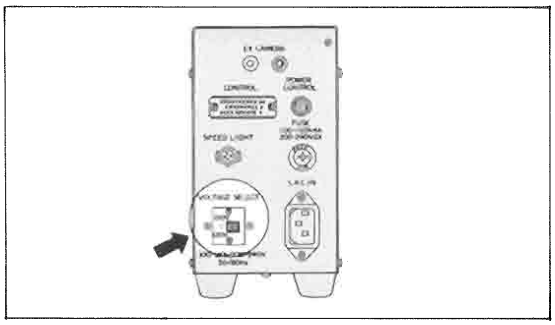


Fig. 2

⑤ Never leave any inflammable substances (such as gasoline, thinner, alcohol, etc.) near the lamphouse, which becomes extremely hot during use.

⑥ Do not leave the microscope displaying the "OVER" overexposure warning indicator, or set for high film sensitivity, as extremely strong light may cause deterioration of the photomultiplier (light detector), which is extremely sensitive to light.
Likewise, for the same reason, do not use any exposure correction under 0 at film sensitivity setting below ISO 6.

2. CARE AND MAINTENANCE

① 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 (methanol or ethanol). Use xylene to clean immersion oil off objective lens surfaces.

② 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 attempt to dismantle the instrument, thereby avoiding the possibility of impaired operational efficiency and accuracy.

④ When not in use, cover the instrument with its vinyl cover, and store in a place free from moisture and fungus.

CONTENTS

I. ASSEMBLY

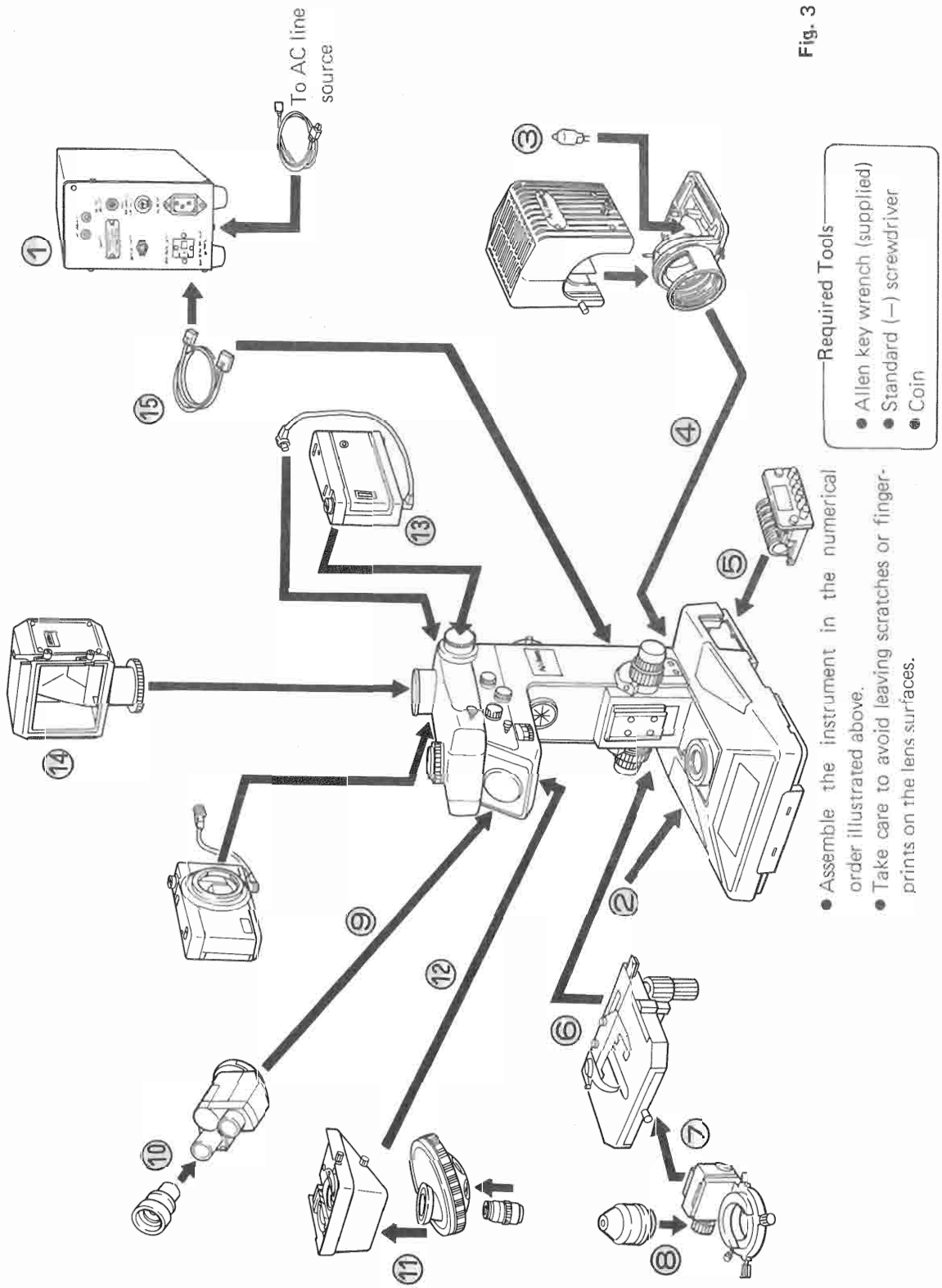


Fig. 3

① Line voltage check

- Check the line voltage indication on the rear panel of the power supply to be sure it corresponds to the available line voltage.
  If not, contact your dealer or nearest Nikon representative.

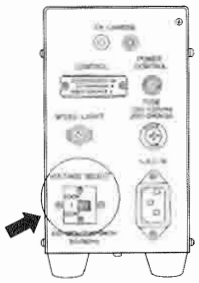


Fig. 4-1

② Base leveling adjustment

- To stabilize the microscope base on the desk, adjust the spring-loaded leveling foot at the left rear corner of the base with the supplied tool.

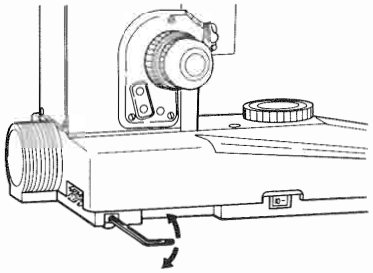


Fig. 4-2

③ Lamp installation

- Use a coin to loosen the clamp screw located on the right side of the lamphouse cover [1], then remove the cover [2].
- While depressing the clamp lever [3], fully insert the lamp leads into the socket pinholes [4].
- Raise the clamp lever to its original position [5].
- Replace the lamphouse cover [6], and tighten the clamp screw [7].

Note

Do not touch the lamp bulb with bare hands. Handle instead within its plastic cover, or while using clean gloves. Wipe off any fingerprints or smudges with a clean cloth moistened in pure alcohol.

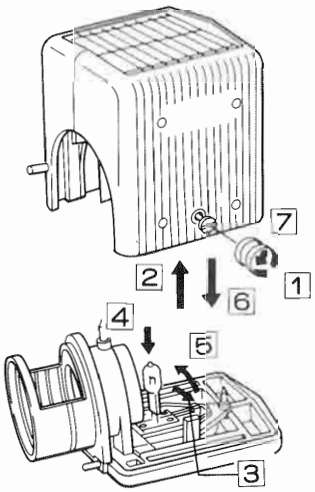


Fig. 4-3

④ Lamphouse installation

- Loosen the lamphouse mount clamp screw [1], and remove the protective cap [2].
- Aligning the lamphouse's mounting groove with the corresponding pin in the lamphouse mount, install the lamphouse [3], and retighten the clamp screw [4].

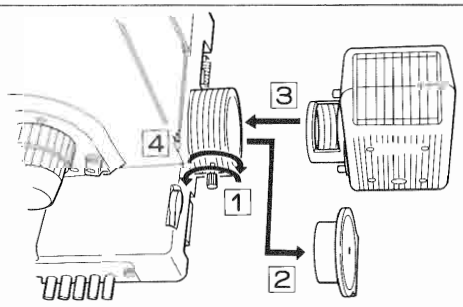


Fig. 4-4

⑤ Filter cassette installation

- Slide the filter cassette into the port in the right side of the microscope base, and secure with its two mounting screws.

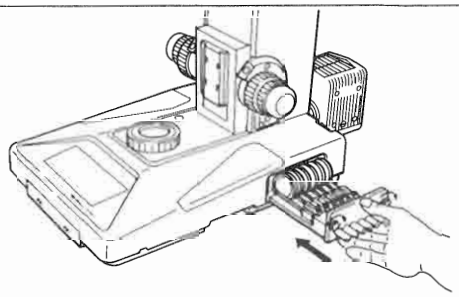


Fig. 4-5

⑥ Stage mounting

- Slide the stage mount down onto the dovetail of the vertical stage carrier [1], and clamp it in place [2] when the upper surfaces of the dovetail and groove are flush.

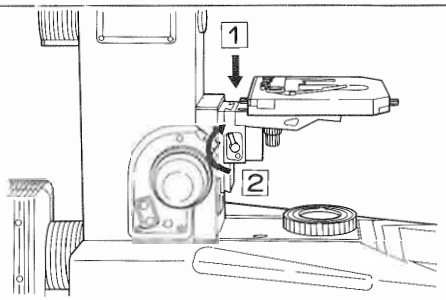


Fig. 4-6

⑦ Substage condenser holder mounting

- Lower the substage to its lowest position with the condenser focus knob.
- Tilting the substage condenser holder as illustrated, press it into position [1] and clamp [2].

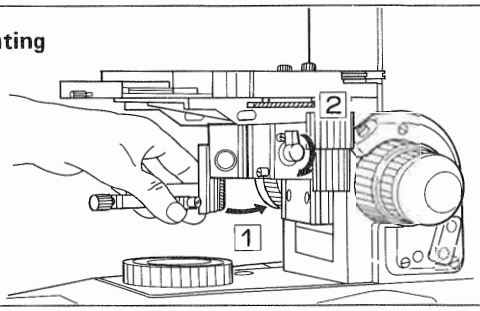


Fig. 4-7

⑧ Condenser installation

- Install the condenser with its label facing forward [1] and clamp [2], then raise the substage to its uppermost limit.

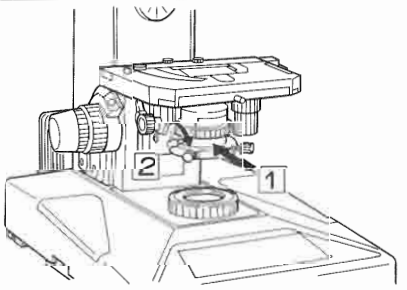


Fig. 4-8

⑨ Binocular eyepiece tube installation

- Unfasten the eyepiece tube clamp screw with the supplied tool.
- Grasp the binocular eyepiece tube with both hands and settle the notch over the top of the clamp screw, aligning the two indicator marks (▼ and ▲) by turning the unit slightly [1], [2]. Position correctly, and tighten the clamp screw with the supplied tool [3].

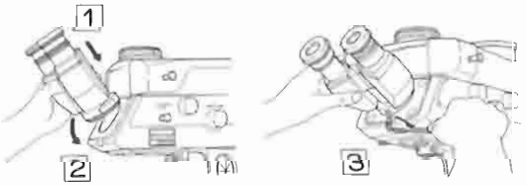


Fig. 4-9

⑩ Eyepiece attachment

- Align the positioning pin of the eyepiece with the groove of the binocular eyepiece tube, and insert to its full limit.

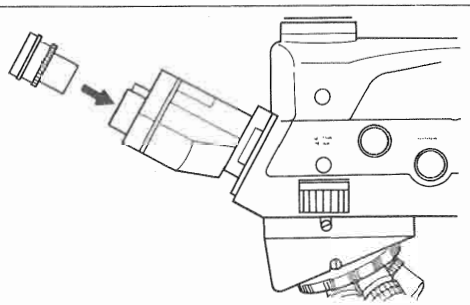


Fig. 4-10

⑪ Objective mounting

- Install the objectives in the revolving nosepiece holes in a clockwise fashion from the lowest magnification to the highest.
- MG and motorized nosepieces feature numbered objective positions, therefore install the objectives in the indicated order.

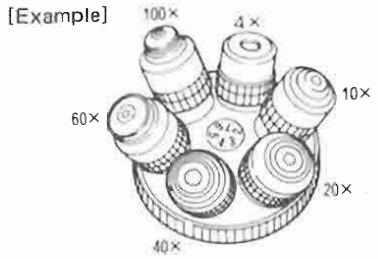


Fig. 4-11

⑫ Nosepiece installation

- Mount the nosepiece onto the intermediate nosepiece mount [1] and tighten the intermediate mount's lower clamp screw with the screwdriver [2].
- Lower the stage with the coarse focus knob.
- Mount the nosepiece assembly onto the microscope's dovetail nosepiece mount, sliding it all the way back to its limit [3]. Then tighten the intermediate mount's upper clamp screw with the screwdriver [4].

Fig. 4-12

⑬ Dark box installation (Side optical path mounts)

- Aligning the mounting marks on the dark box and the microscope's side camera mount, attach the dark box [1] and rotate it in the indicated direction [2] to its full limit.
- When using a dark box applicable to DX code film speed selection, use the DX cable to connect the dark box to the corresponding DX connector on the back panel of the microscope (either DX-R or DX-L).

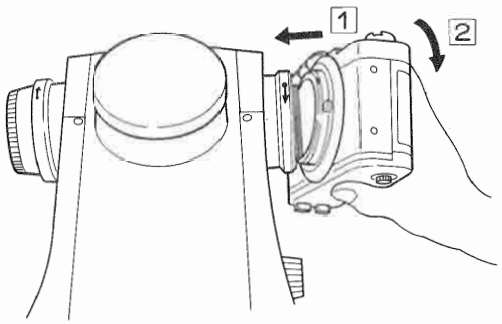


Fig. 4-13

⑭ Large format adapter installation (Upper optical path mount)

- Aligning the adapter's mounting pin with the camera mount's positioning slot [1], mount the adapter and fasten by rotating the mounting ring in the indicated direction [2].

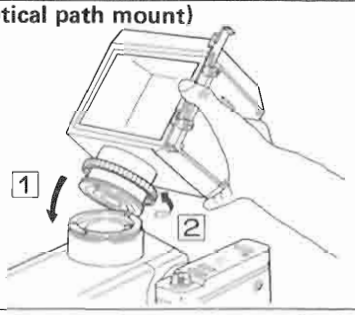


Fig. 4-14

⑮ Cord connections

- Connect the power supply to the microscope base with the supplied control cable [1].
- Connect the power cord to the AC IN receptacle and connect the other end to the line source [2].

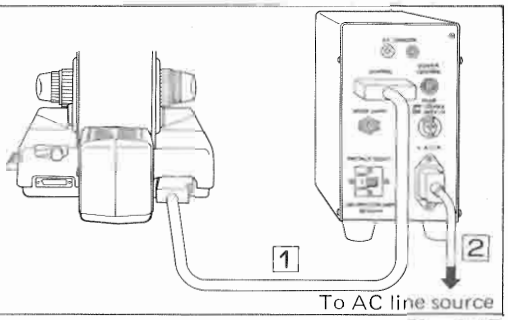


Fig. 4-15

Ⅱ. NOMENCLATURE

1. System Components

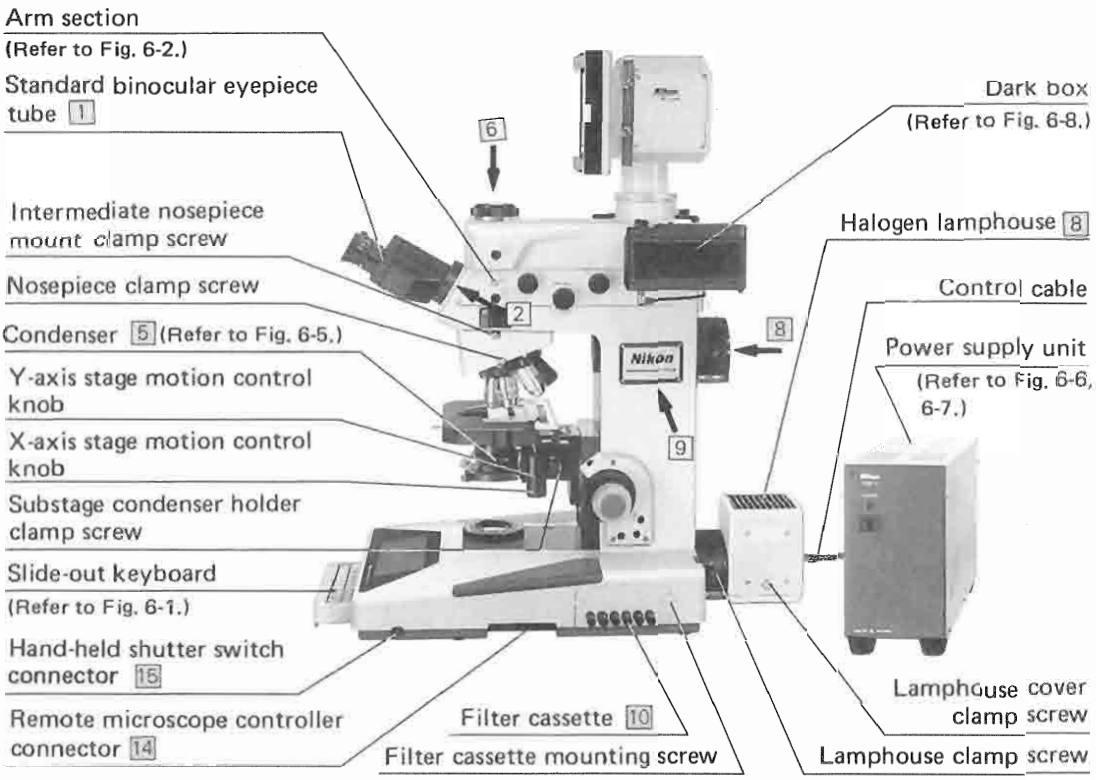


Fig. 5-1

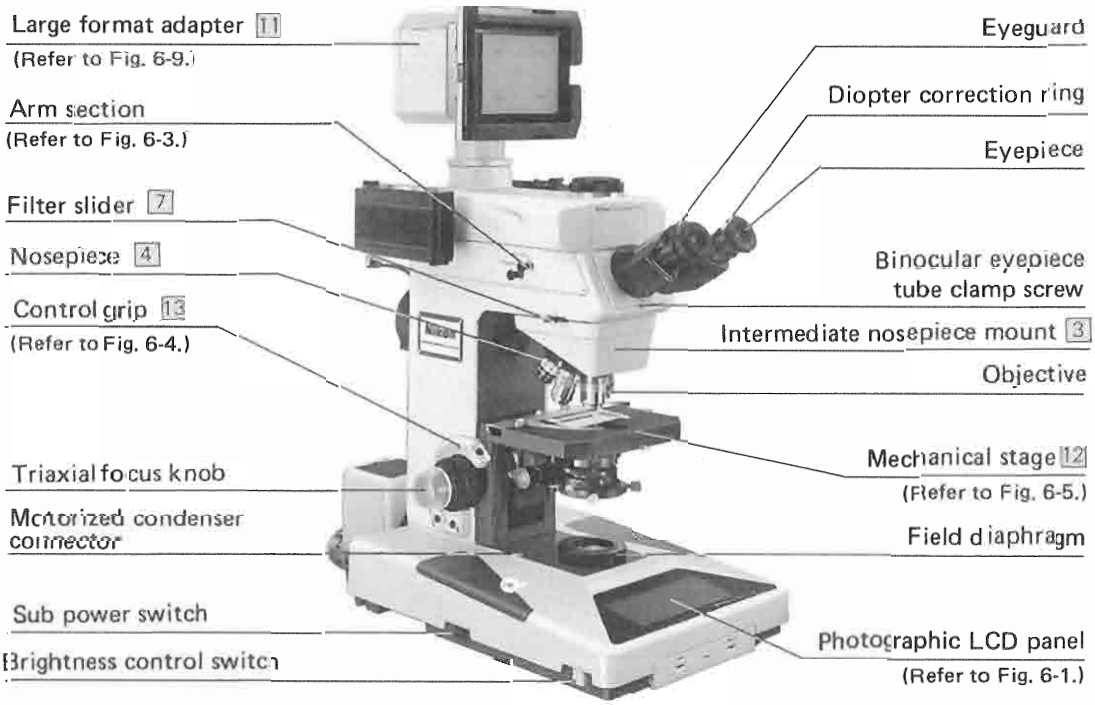


Fig 5-2

2. Main Unit Rear Panel

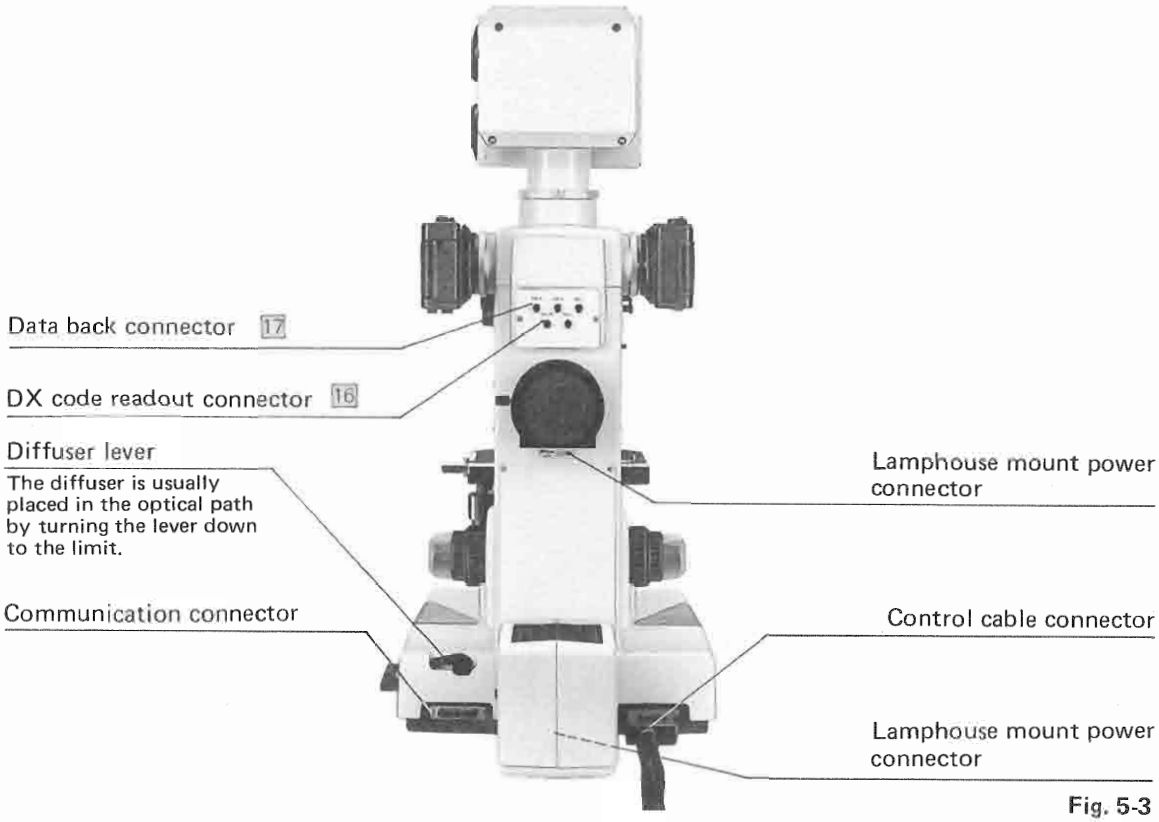


Fig. 5-3

★ Mounts and Interchangeable Accessories

(Refer to 1 ~ 17 on the Fig. 5-1 ~ 5-3.)

1. Ultra-wide-field binocular eyepiece tube
2. Shutter and Bertrand lens slider
3. Motorized nosepiece, Intermediate tubes for Nomarski differential interference contrast attachment, Dia-polarization attachment, Epi-fluorescence attachment, and Universal epi-illuminator
4. Sextuple, Quintuple, Brightfield/darkfield, BD · DIC, Centering, and MG nosepieces
5. Achromat/Aplanat, Swing-out, Motorized, Phase contrast turret, and Universal condensers
6. Auto-focus system (light detector unit), CCTV, and ENG straight tube.
7. Simple polarization analyzer, Dia-fluorescence absorption filter, and Epi-depolorizer
8. Hg 100W high-intensity lamphouse
9. Epi-illumination filter cassette
10. Dia-fluorescence excitation filter cassette
11. 2× conversion lens, Speedlight light detector, and F3 camera (w/ MD-4)
12. Rotating stage, Scanning stage, and 4″ × 4″ substage
13. Auto-focus system (drive unit)
14. Remote microscope controller
15. Hand-held shutter switch
16. DX cable
17. Data back cable

1) Photomicrographic LCD panel and slide-out keyboard

Shutter speed mode display
(AUTO, MANUAL, TIME, BULB, MEMORY, FLASH)

Left side camera display
(Refer to ★Camera display.)

Shutter speed display

Magnification display

LCD (Liquid Crystal Display) contrast adjustment dial

Backlight brightness adjustment dial
For adjusting the panel's backlight brightness when used in a dark room.

Center camera display
(Refer to ★Camera display.)

SPOT/AVE light measurement display

Right side camera display
(Refer to ★Camera display.)

Lamp voltage display

Frame count/Film length display

Film sensitivity (ISO) display

Exposure compensation value display

Photographic LCD panel

Slide-out keyboard
Drawer type—Accessible by lightly pressing the front center part of the control keyboard.

Fig. 6-1

★ Camera display

: Large format adapter

: External camera

: 35 mm dark box

Darkened image indicates selected optical path.

- The photo above shows the regular display with the keyboard retracted into the microscope base. For more details, please refer to the separate Operations Manual included with the MICROPHOT-FXA.

6	7	8	9	0
1	2	3	4	5

: Numerical input and function control keys

: Numerical input clearance & function cancellation key
[Exposure or interval cancellation key]

: Shutter speed memory & data selection key
[Lamp ON/OFF key]

: Film advance key
[Film start designation key (Used when film cartridge has no DX code.)]

: Camera optical path selection key

: Shift key.
Bracketed functions selected when depressed with other key.

: Cursor (Function selection) key
[Cursor (Function selection) key]

: Cursor (Function selection) key
[Cursor (Function selection) key]

: Input, function designation, & display selection key
[Preceding display recall key]

Note • Continuous cursor movement possible when cursor key is held down.

2) Arm section and intermediate magnification selector

Photo/TV select knob

3-position switching with light ratios as shown in the chart below.

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

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

Y-axis measurement area positioning dial

Rotate the dial to move the measurement area in the Y-axis direction (applicable for both 1% spot and 30% average measurement).

Measurement area selection dial

Rotate the dial to select either 1% spot or 30% average measurement. SPOT or AVE indicators will be visible on the display.

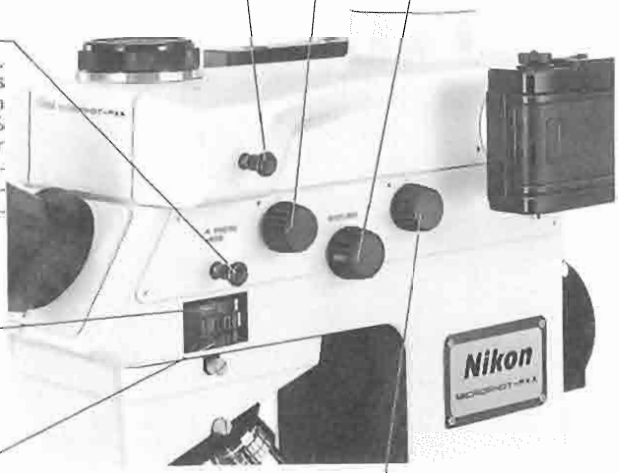
Light path selector knob

When the knob is pulled out, 100% of the light directly enters the binocular eyepiece tube. When the knob is pushed in, 100% of the light enters the binocular eyepiece tube through the photomicrographic optical system permitting the exposure measurement area to be identified.

Intermediate magnification selector

1×, 1.25×, 1.5×, 2×, and focusable Bertrand lens are built into the turret system.

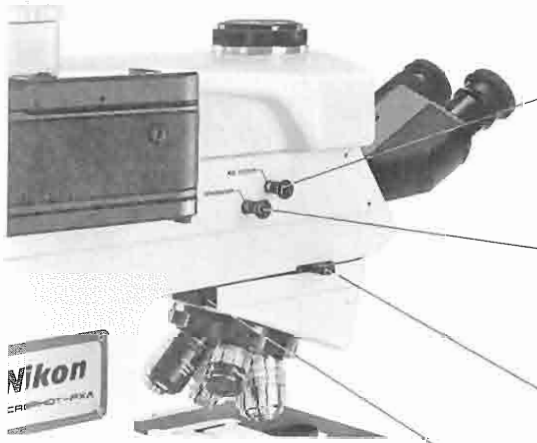
Bertrand lens focus knob



X-axis measurement area positioning dial

Rotate the dial to move the measurement area in the X-axis direction (applicable for both 1% spot and 30% average measurement).

Fig. 6-2



ND filter knob

The relative brightness between the binocular eyepiece tube and TV/Photo side can be equalized by placing the ND filter in the optical path. Pull the ND filter knob out if the brightness difference is too great.

Focusing magnifier knob

Use the 4× focusing magnifier to precisely focus lower power objectives. Pull the knob out to position the magnifier in the optical path.

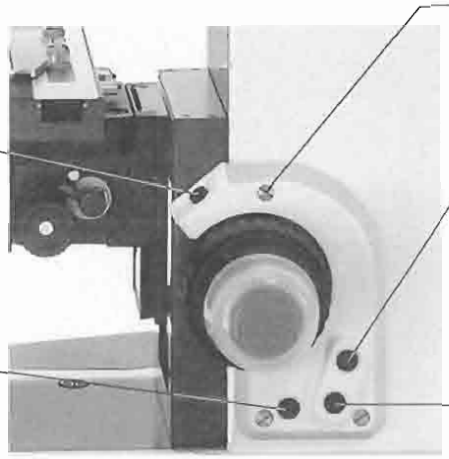
Filter slider

Magnification readout/motorized nosepiece connector

Fig. 6-3

3) Control grip

(Located on right and left sides.)



Control grip mounting screw

Shutter key

Motorized nosepiece clockwise rotation key

Continuous operation possible when key is held down.

Reticle illumination key

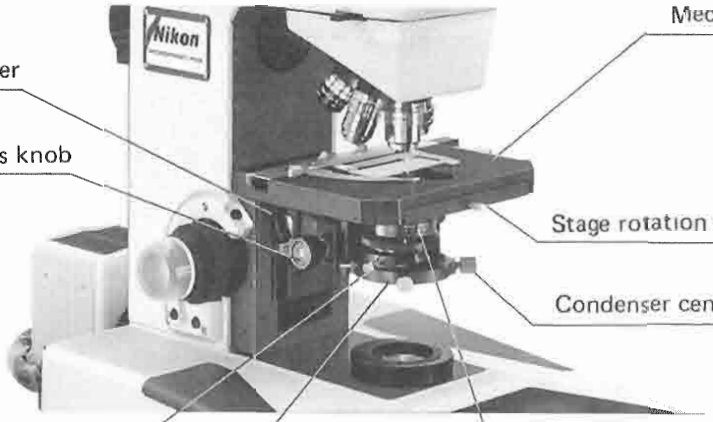
Switches ON/OFF with repeated depressions. Red and green reticle colors selectable. (Refer to separate Operations Manual, III-6, -6).)

Motorized nosepiece counterclockwise rotation key

Continuous operation possible when key is held down.

Fig. 6-4

4) Mechanical stage



Mechanical stage

Stage clamp lever

Condenser focus knob

Stage rotation clamp screw

Condenser centering screw

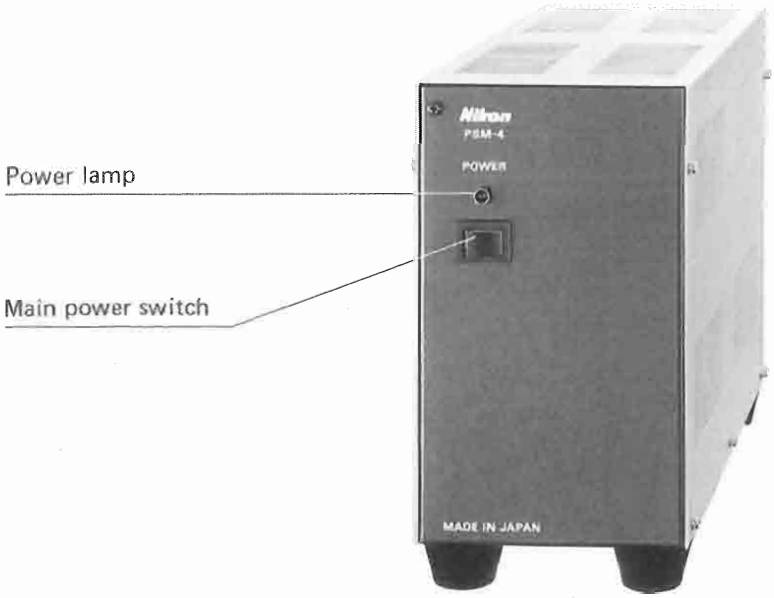
Condenser clamp screw

Substage condenser holder

Condenser

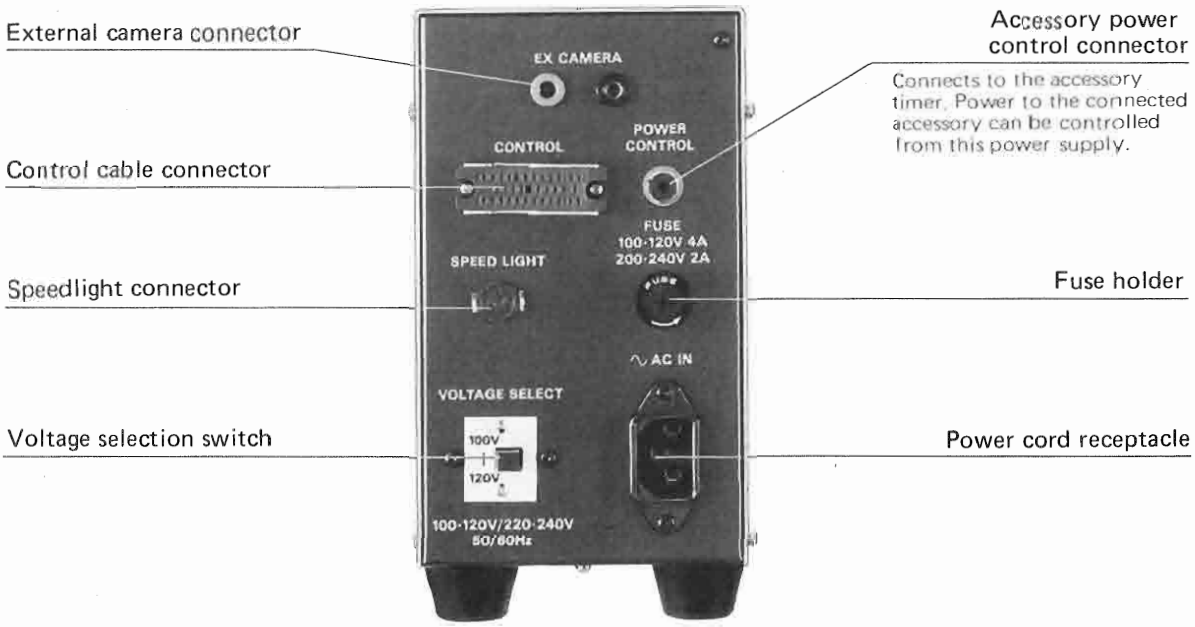
Fig. 6-5

5) Power supply unit



Front panel

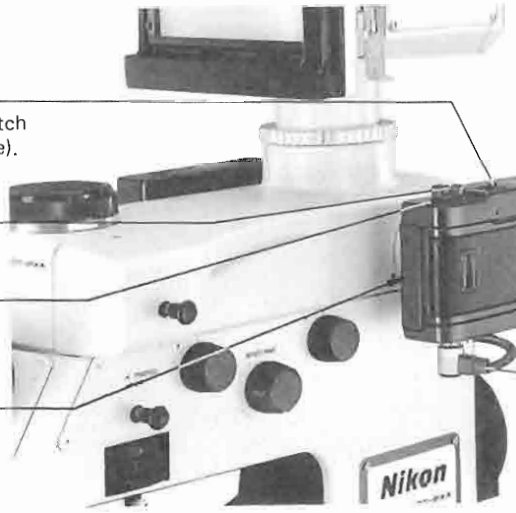
Fig. 6-6



Rear panel

Fig. 6-7

6) Dark box (FX-35DX)



Advance mode selection switch

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

Rewind crank

Rewind knob

Camera mounting lock release button

Film advance button

Film rewind button

Film advance indicator

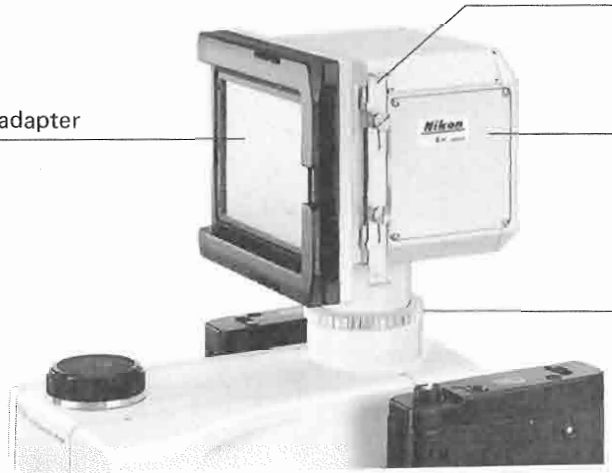
DX cable connector

With the DX cable, connect to the DX readout connector located on the rear panel of the microscope.

- The right-side mounted dark box to the DX-R connector.
- The left-side mounted dark box to the DX-L connector.

Fig. 6-8

7) Large format adapter



Film holder mounting bracket

Slide down to fasten; up to release.

4" × 5" film adapter

Large format adapter

Accepts 4" × 5" film adapter or Polaroid film holder to permit large format photomicrography.

Large format adapter mounting ring

Fig. 6-9

Ⅲ. PREPARATION

1. Switch ON

(1) Turn ON the system power switches in the following order: The power supply main switch and then the microscope base sub-switch.

(2) Confirm the setting of illumination method. Change over the illumination system to diascopic or episcopic, if necessary. Refer to p. 34 for changing procedures.

(3) Adjust the lamp voltage to an indicated value of approx. 6.0 using the brightness control switch.

Note
- **The lamphouse utilizes a pre-centered design, therefore lamp centering is unnecessary.**
- **Only the sub-switch need be used when temporarily switching OFF the microscope. The power supply will consume no more than 2W of power if its main switch is left ON indefinitely.**

2. Interpupillary Distance Adjustment

(1) Place the ND 32 and NCB 11 filters in the optical path.

(2) Place the specimen on the stage and bring it into focus.
Move the eyepiece tubes together or apart until the full viewfield is clearly visible through both eyepieces as a single image.

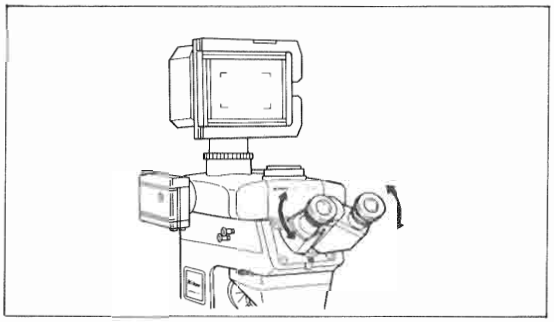


Fig. 7

3. Eyepiece Diopter Adjustment

Adjust the eyepiece diopter for both left and right eyepieces.

(1) Be certain the light path selector knob is pushed in.

(2) Rotate the diopter correction rings on both eyepieces so that the double crosshairs in the center of the viewfield can be seen as clearly separated lines. (Fig. 8).

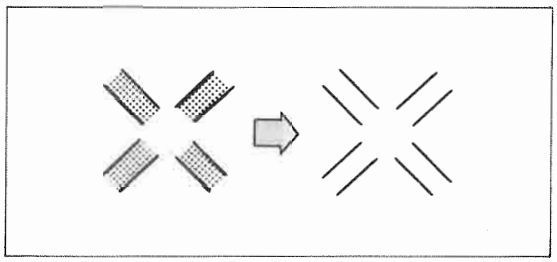


Fig. 8

(3) CF eyepieces feature high eyepoint, which provides comfortable observation for even those who wear eyeglasses. The rubber eyeguards may be folded down when wearing eyeglasses. (Fig. 9).

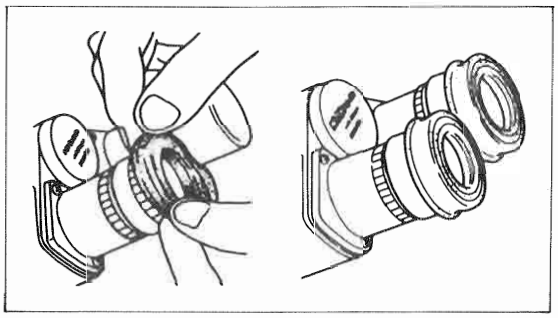


Fig. 9

4. Condenser Centering

(1) Close down the field diaphragm to its smallest aperture with the field diaphragm control ring. Turn the condenser focus knob to bring field diaphragm image into focus. The images of both the specimen and field diaphragm can then be seen through the binocular eyepiece tube.

(2) Adjust the condenser centering screws to center the field diaphragm image over the double crosshairs. (Fig. 10-[1])

(3) Switch to the 40× objective. Open the field diaphragm to an aperture slightly larger than that of the viewfield, as shown in Fig. 10-[2]. Should the field diaphragm be off-center, readjust the centering of the condenser.

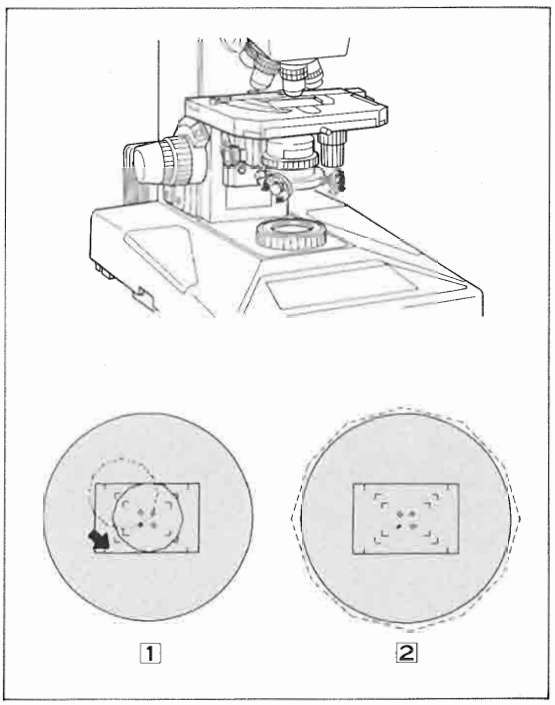


Fig. 10

5. Stage Motion Control Knob Adjustment

The height and torque of the stage motion control knob are adjustable.

1) **Torque adjustment**
Slide the X- and Y-axis stage motion control knobs apart and adjust the torque by turning the exposed torque adjustment ring. (Fig. 11)

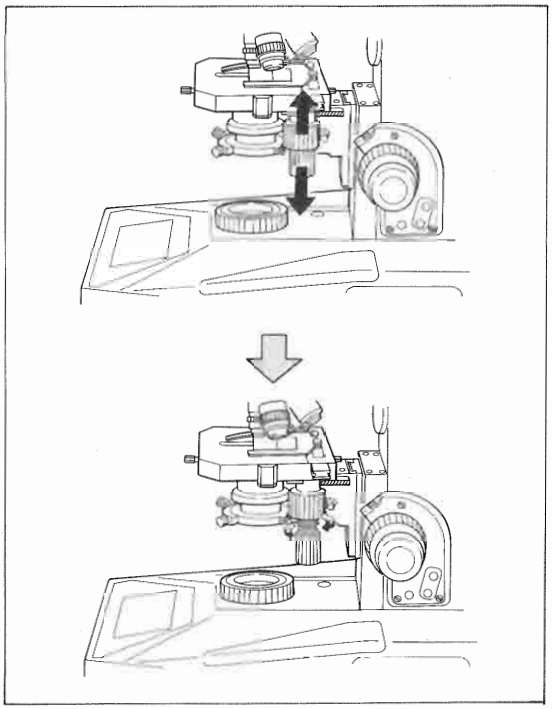


Fig. 11

2) **Height adjustment**
Both the X- and Y-axis knob heights are adjustable. Position the knobs at the desired height by sliding them up or down.

6. Coarse Tension Adjustment

The rotational torque of the triaxial coarse focus knob has been pre-adjusted at the factory for the most suitable torque. However, if further adjustment is deemed necessary the following procedure may be used:

(1) Remove the three mounting screws holding the left-side control grip.

(2) After loosening the two adjustment ring set screws using the supplied tool, rotate the ring to adjust the torque, then retighten the set screws. (Fig. 12)

Note ●Please keep in mind that if the torque adjustment ring is too loose the stage will fall under its own weight.

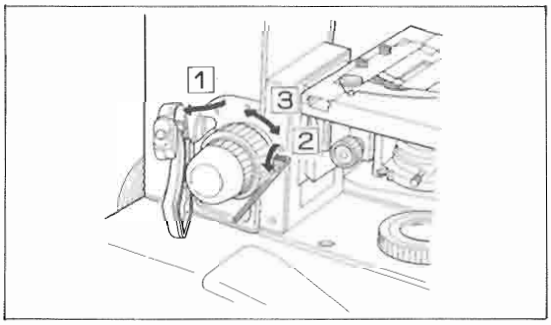


Fig. 12

3) Reinstall the control grip.

Note ●Follow the same procedure if the Auto-Focus system is installed in place of the control grip.

7. Lamp Replacement

Please refer to the following procedure if the lamphouse bulb should fail.

(1) Assure the microscope base sub-switch is turned OFF.

(2) Loosen the lamphouse mount clamp screw [1], and remove the lamphouse from the mount [2]. (Fig. 13)

Note ●The lamphouse and lamp are extremely hot immediately after the lamp has been turned off. Therefore, wait a few minutes for the lamp to cool down before attempting replacement.

(3) Lamp installation. (Refer to p. 4.)

(4) Lamphouse installation. (Refer to p. 4.)

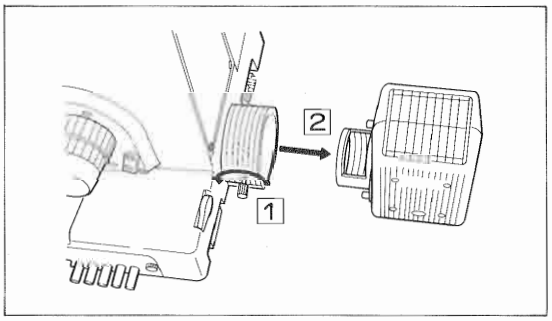


Fig. 13

Ⅳ. MICROSCOPY

1. Basic Operating Procedure

(1) Switch ON the main power switch and the microscope base sub-switch. Set the lamp voltage to approx. 7.0 with the brightness control switch.

(2) Position the necessary filter(s) in the optical path.
The NCB 11 and ND 32 filters may be suitable for general microscopy.

(3) Place the specimen on the center of the stage. Move the 10× objective into the working position and focus on the specimen.

(4) Adjust the interpupillary distance and eyepiece diopter.
(Refer to p. 16.)

(5) Center the condenser. (Refer to p. 17.)

(6) Move the desired objective into the working position and focus on the specimen.

(7) Adjust the condenser. (Refer to Table 1.)

Table 1 Condenser usage

Type / Object distance / Objective	Swing-out condenser N. A. 0.9 (dry-type)	Achromat/Aplanat condenser N. A. 1.4 (oil immersion-type)
	1.8mm	1.6mm
1×	Remove condenser	Remove condenser
*2× & *4×	Swing out top lens	
10× 20× 40× 100×	Swing in top lens	Applicable

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

*
- Fully open the aperture diaphragm when using 2× or 4× objectives with the swing-out condenser.
- Table 1 is also applicable to UW (ultra wide) field observation for all but the 1× objective.
- An ultra-low power condenser is recommended for use with the 1× and 2× objectives.

(8) Adjust the brightness with either the ND filter(s) or the brightness control switch. Use a lamp voltage of between 6 and 12.

(9) Adjust the aperture and field diaphragms. (Refer to p. 20.)

2. Manipulation of Each Element

1) Filter cassette

Table 2 shows the usage of each filter in the filter cassette. Depress the appropriate filter cassette button(s) to move its corresponding filter(s) into the optical path. Press again to remove. (The filter cassette can be removed from the microscope base to accept any ϕ33mm filters besides the standard filters.)

Table 2 Filters usage

Type of filter	Usage
ND2 (T=50%)	For general microscopy and brightness adjustment in photomicrography
ND8 (T=12.5%)	
ND32 (T=3%)	
HE (didymium filter)	For color photomicrography of HE-stained specimens with tungsten-type film
GIF (green interference filter)	For phase contrast, DIC, and contrast adjustment with black and white film
NCB 11 (color balance filter)	For general microscopy and color photomicrography

T: Light transmission

2) Intermediate magnification selector

(Fig. 14)

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 observation, photomicrography, and TV images.

The focusable Bertrand lens may be conveniently used for aligning the phase annulus and photographing or televising polarized conoscopic images.

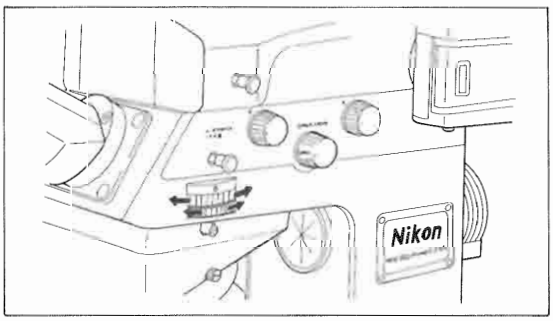


Fig. 14

3) Aperture diaphragm

The aperture diaphragm affects resolution, contrast, and depth of focus as the result of adjusting the numerical aperture (N.A.) of the illumination system. Generally, aperture settings of 70 ~ 80% of the objective N.A. yield appropriate contrast. (Fig. 15)

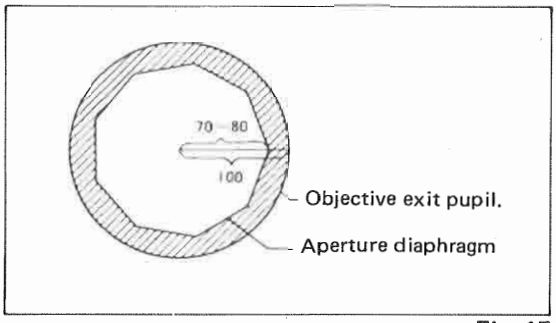


Fig. 15

Move the Bertrand lens into the optical path. Turning the focus ring, focus on the exit pupil of the objective. Adjust the aperture diaphragm as shown in **Fig. 15**, observing the diaphragm image visible on the exit pupil of the objective. Or, roughly adjust the aperture diaphragm referring to the N.A. scale on the condenser.

It is not recommended that the aperture diaphragm be stopped down to less than 60% of the objective N.A., as the resolution deteriorates, except when observing almost transparent specimens.

4) Field diaphragm

The field diaphragm determines the illuminated area on the specimen. For general use, the diaphragm is set slightly larger than the viewfield. Too wide an illuminated area may give off stray light, which causes flare and ghosts, 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.

5) Focusing system

Fig. 16 shows the relationship between the rotational direction of the focus knob and the vertical movement of the stage.

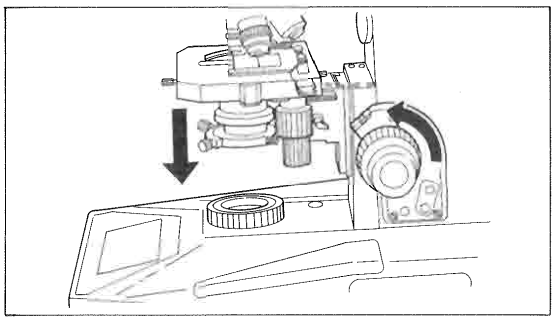


Fig. 16

Vertical stage movement

Fine focus knob (1μm increments)	: 0.1mm/revolution
Medium focus knob	: 1.7mm/revolution
Coarse focus knob	: 36.8mm/revolution

The triaxial focusing range is 55mm; 2mm up and 53mm down from the standard position.

The triaxial focus knob gives the following advantages: When changing specimens or focusing with low power objectives (1× ~ 4×), the coarse focus control may be the best choice. For medium power objectives (10× ~ 20×), sight the specimen with the medium focus control and focus precisely with the fine focus control.

Never twist the knobs, as damage to the mechanism may result.

6) Stage rotation

For easy picture composition, the stage can be rotated by loosening the stage rotation clamp screw. (Fig. 17) (The stage center is aligned.) In addition to the triaxial focus range, the stage can be lowered by loosening the stage clamp lever.

Take care that the stage does not hit the microscope stand when being rotated.

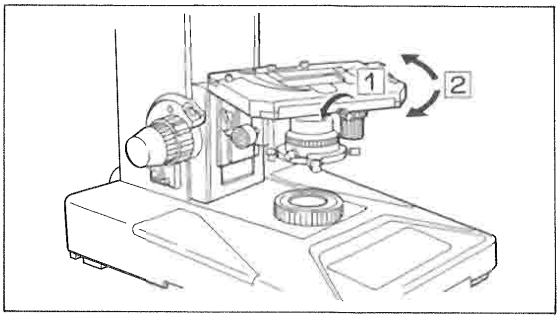


Fig. 17

7) Control grip

With the hand in position to operate the fine motion focusing knob, the control grips permit camera shutter operation, reticle illumination, and nosepiece rotation (when the motorized nosepiece is used) to all be conveniently performed without looking away from the binocular eyepieces.

Finger positioning is as follows: (Fig. 18)

- Thumb : Shutter key
- Forefinger : Fine focus knob
- Middle finger : Nosepiece rotation (Clockwise)
- Ring finger : Nosepiece rotation (Counterclockwise)
- Little finger : Reticle illumination

Although control grips are mounted on both sides of the microscope stand, key operation would generally be performed using the hand not manipulating the stage motion control knobs.

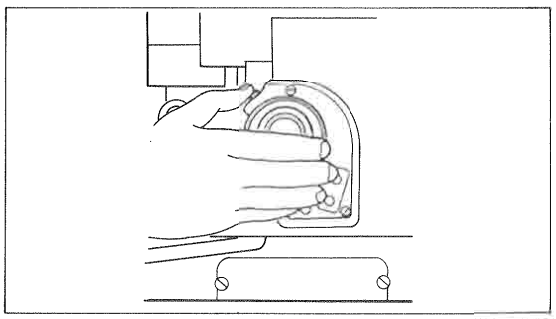


Fig. 18

Control grip is also operated for a Counter Function other than those described here. For details, refer to the separate Operations Manual.

8) ND filter

The appropriate brightness for TV camera viewing may be too bright for observation through the binocular eyepiece tube. In this case, pull the ND filter knob to position the ND filter in the optical path. As the ND filter reduces the brightness to the binocular eyepiece tube, more light can be transferrred to photomicrography, resulting in the shortest possible shutter speeds. (Fig. 19)

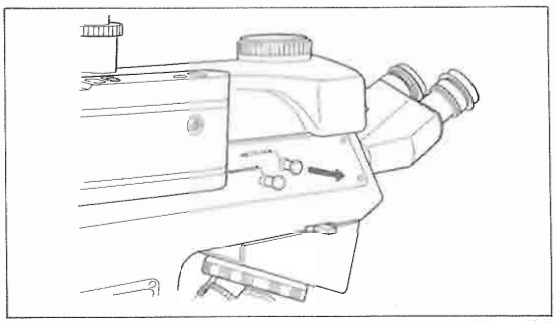


Fig. 19

V. PHOTOMICROGRAPHY

The basic photomicrographic procedures for the MICROPHOT-FXA are covered in the following section.

1. Preparation

Preparation 1 (FX-35DX)

Note ●Always check to be sure that the advance mode switch is set to the "A" position (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.

1) Film loading

(1) Pull up the film rewind knob until the camera back pops open. (Fig. 20)

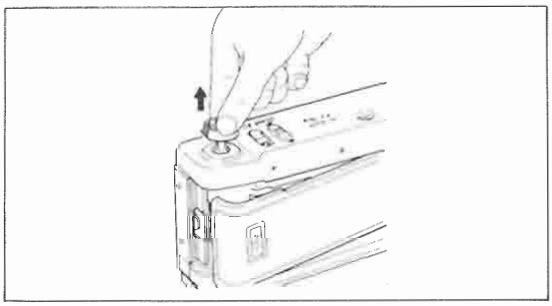


Fig. 20

(2) Install the film cartridge (Fig. 21-[1]), then push the rewind knob back down [2] to secure the cartridge in place.

(3) Align the tip of the film leader with the red film installation mark [3]

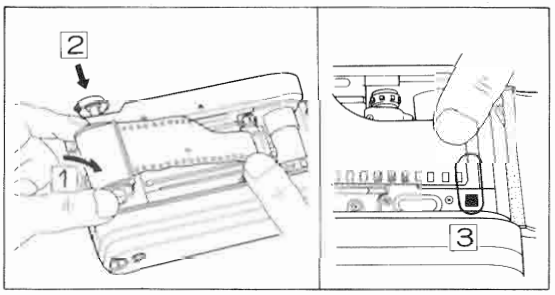


Fig. 21

●If too much film leader has been pulled out of the cartridge, align the film tip by re-winding the film slightly to take up the slack.

●Assure that the tip of the film leader is not badly bent.

(4) Confirm film position, assuring that the film is properly seated between the two film guide rails, and that the film perforations are aligned with the film sprocket teeth. (Fig. 22)

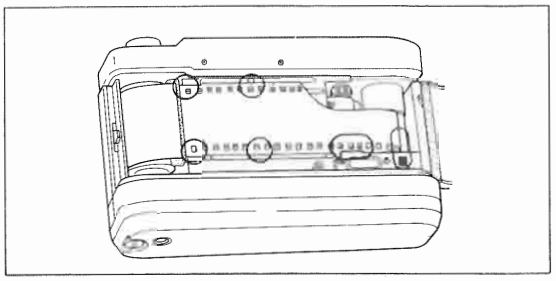
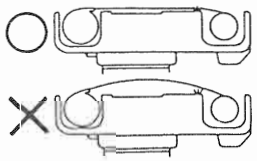


Fig. 22

Note ●Please be sure that all film slack is taken up, and that the film doesn't ride up over the guide rails.



(5) Close the dark box back, making sure it clicks securely into place.

Note ●Take care not to move the rewind knob before advancing the film, lest the film tip lose its alignment with the film installation mark, possibly disrupting the correct advance of the film.

2) Dark box mounting

(1) Aligning the mounting marks on the dark box and microscope mount, install the camera box, rotating it in the indicated direction to its full stop. (Fig. 23)

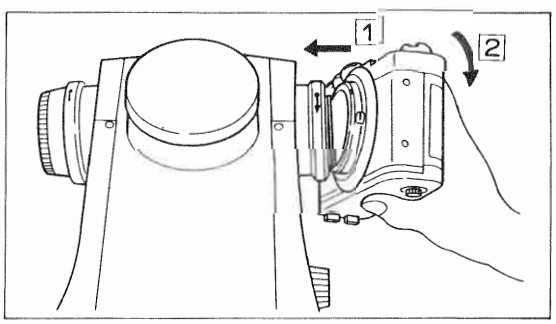


Fig. 23

(2) With the DX cable, connect the dark box and the DX readout connector located on the rear panel of the microscope.
Be sure to connect (Fig. 24):
- The right-side mounted dark box to the DX-R connector.
- The left-side mounted dark box to the DX-L connector.

Note
- **If the DX cable is not properly connected, film data (such as ISO value and frame count) will not be transmitted. Therefore, assure correct connection.**
- **Be certain any camera mount not fitted with a dark box always has its plastic cap securely installed.**

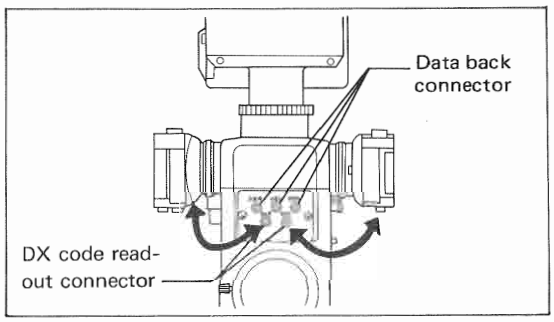


Fig. 24

(3) When using the Data Back attachment, connect the data back cable to the corresponding data back connector on the microscope rear panel (DB-R, -C, or -L).
(Fig. 24)

3) Optical path confirmation

(1) Confirm that the light path selection knob is pushed in, and that the PHOTO/TV knob is either pushed in or in its center position. The setting is correct if the photo mask can be clearly seen through the binocular eyepieces.
(2) Checking the photographic function display, confirm that the camera optical path corresponds to the dark box position being mounted. If not correctly set, or it several cameras are being mounted, set the optical path to the camera position to be used.

<Optical Path Selection Procedure>

① Pull out the microscope base slide-out keyboard.
② Depress the camera optical path selection key (CAMERA) to select the desired optical path, indicated by the darkened camera silhouette on the display.

4) Film initialization

(1) Depress the shutter key. The film will automatically advance to the first frame, ready for photography.

Note
- The film advance indicator on the rear cover of the dark box rolls to show that the film is being correctly advanced, therefore it should be checked for correct operation. If the indicator does not roll correctly, reinstall the film.
- **Depress the film advance key slowly and steadily** for each picture frame advance. Should the advance key be depressed before finishing the previous winding, the first and second pictures taken thereafter might overlap each other.

(2) Refer to the display to confirm ISO value and frame count.

5) Illumination confirmation

(1) Uneven illumination can have disastrous effects on photomicrographic results. Therefore, confirm that the condenser is correctly adjusted.
(2) Confirm that the illumination system is correctly set for diascopic or episcopic illumination.

6) Lamp voltage and filter selection

Light source color temperatures vary with lamp voltage setting, therefore voltage and filter selections play critical roles in the results achieved in color photomicrography. When the lamp voltage is set to an indicated 8.9 ~ 9.1, the "Photo" display will appear, indicating the recommended illumination range for photomicrography.
For the PHOTO Function, that is the lamp voltage is automatically set to 9V in photomicrography, refer to p. 34.

Table 3 Voltage and filter selection

Film		Lamp voltage	Filter
Color film	Daylight type	9	With NCB 11
	Tungsten type	8	Without NCB 11
Black/white film	—	6 or higher	Without NCB 11 Contrast filter (GIF etc.) may be used.

The NCB 11 filter may be the most suitable for commonly used films. Depending on the type of film used, color reproduction may differ. When the film does not reproduce the color of the specimen well, add the necessary color compensation filter(s).

When the illumination light intensity is above or below the working range of the photomultiplier, the warning signs "OVER" or "UNDER" are correspondingly displayed on the main display. Adjust the brightness with the ND filter(s), when either of these indicators are displayed.

Note • The MICROPHOT-FXA employs a long-life halogen lamp for specimen illumination, therefore the NCB 10 filter utilized in other microscope systems as a color temperature compensation filter is not applicable. However, should a standard lamp ever be used, be sure to substitute the NCB 10 filter for correct color compensation.

7) Exposure compensation

Exposure compensation may become necessary if the measured area is smaller than the 1% spot measurement area, or if **reciprocity failure*** is expected. A positive exposure compensation value indicates overexposure and a negative value indicates underexposure. Refer to p. 35 for exposure compensation procedures.

* Reciprocity failure refers to the irregularity of film sensitivity. When the shutter speed is too long, the reciprocal relation between shutter speed and brightness becomes disorderly. Refer to the instructions of the film for details.

8) Field and aperture diaphragm adjustments

The field diaphragm should be set to an aperture slightly larger than that of the viewfield to eliminate stray light.

The aperture diaphragm affects resolution, contrast, and depth of focus. Adjust the aperture diaphragm as needed. Generally setting the aperture to approx. 70 ~ 80% of the objective N.A. gives appropriate contrast.

9) Focusing

Focus on the specimen through the binocular eyepiece tube using the following procedure.

(1) Be certain the eyepiece diopter is correctly adjusted. (Refer to p. 16.)

(2) For high power objectives (40× or higher), focus with the fine focus knob until both the double crosshairs of the photo mask and the specimen are seen sharply.

(3) For medium power objectives (10× and 20×), focus with the medium focus knob. Moving your eyes from side to side, turn the fine focus knob until the relative positions of the double crosshairs and the specimen remain unchanged.

(4) For low power objectives (4× or lower), focus with the coarse focus knob first. Pull out the focusing magnifier knob to magnify the image, then turn the medium focus knob until both the double crosshairs and the specimen can be seen sharply.

10) Picture compositon

Use the stage motion control knobs to compose the picture within the photo mask corresponding to the film size in use. **(Fig. 25)**

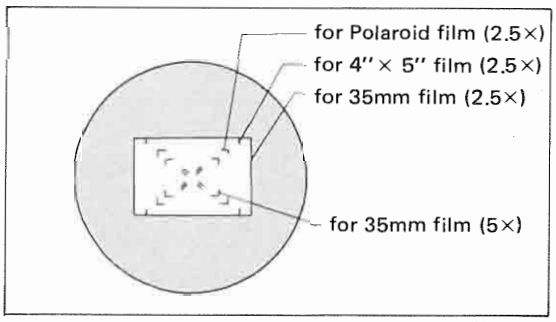


Fig. 25

11) Exposure measurement area

Select the exposure measurement area (1% spot or 30% average measurement) by turning the measurement area selection dial. ("SPOT" or "AVE" displays visible on the display.)

1% spot measurement is effective for specimens having large differences in brightness, or small measurement areas, such as in dark-field or fluorescence microscopy.

30% average measurement works well for most specimens which do not have large differences in brightness.

12) Measurement area positioning

(Fig. 26)

The main feature of the movable visible measurement area (in both 1% spot and 30% average) makes it possible to take photomicrographs without having to change picture composition. In measurement exposures using the 1% spot under a high power objective, it is not always necessary to move the specimen directly under the measurement area. The measurement area itself can be repositioned using the indicated dials, instead of moving the stage.

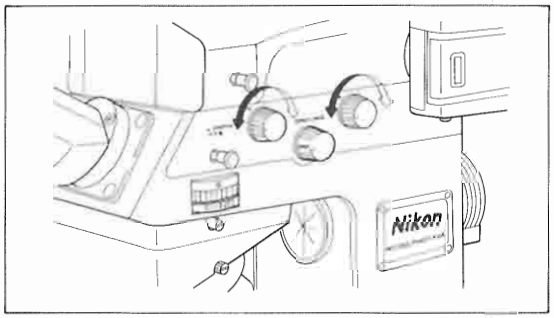


Fig. 26

13) Reticle illumination

When observing dark specimens, such as those found in epi-fluorescence microscopy, depress the reticle illumination key located on the control grip to illuminate the photo mask. Red or green reticle color may be selected at the slide-out keyboard. For the selection procedure, please refer to the Operations Manual, p. 19.

The reticle light can be turned off by depressing the key again. Likewise, if on, the reticle light will automatically be switched off when the shutter key is depressed to permit light measurement and exposure. (The reticle light turns on after the exposure is made.)

Note • Occassionally, the shutter speed displayed while the reticle is being illuminated will differ slightly from the actual shutter speed when the exposure is made. This, however, will have no effect on the automatic photomicrographic exposure.

14) Film rewinding

The message buzzer will sound when the film reaches its end.

(1) To rewind the film, depress the rewind button (Fig. 27-[1]), flip up the crank, and rotate the rewind knob in the indicated direction [2].

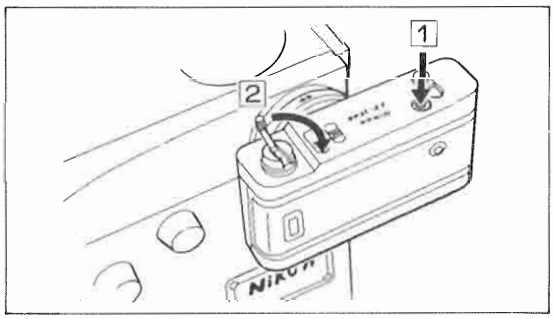


Fig. 27

(2) When the tension is released, give the crank a few more turns until it turns freely, indicating the film leader is rewound completely into the cartridge. Open the back by pulling up the rewind knob, and remove the cartridge. Do not leave the cartridge out under bright light.

15) Self-check function

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 the 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.

Error message displays

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

16) Backlight illumination

When performing photomicrography in dark surroundings, switch on the LCD panel's backlight illumination to make the display more easily visible. Brightness can be controlled with the adjustment dial on the front of the slide-out keyboard.

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.

Preparation 2 (Large Format Camera)

Note ●Take care to hold the entire large format adapter when carrying it with the Polaroid film holder or 4"×5" film adapter attached.

●When not in use, please leave the Polaroid film holder or 4"X 5" film adapter attached to protect the adapter internals from dust.

●Do not touch the large format camera adapter's internal mirror.

●Exposure time will automatically be corrected for the large format adapter when mounted. (p. 7, ⑭)

[4"X 5" film format photomicrography]

1) 4"X 5" film adapter installation (Fig. 28)

(1) Slide up the adapter mounting bracket [1].

(2) Tilt the 4"×5" film adapter and fit it into the left-side bracket [2].

Note ●Adjust the orientation of the adapter as shown in the figure.

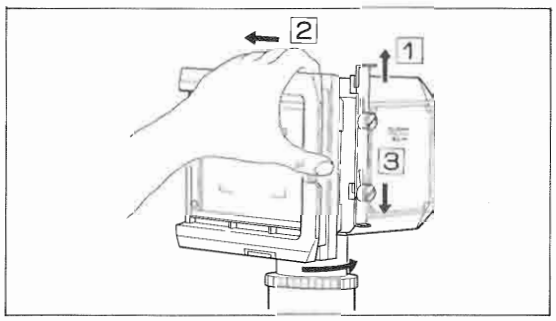


Fig. 28

(3) Press the 4"×5" film adapter flush against the mounting surface, and slide down the metal bracket to secure [3].

2) Film holder installation (Fig. 29)

Raise the right side of the focusing panel [1], and slide the film holder fully in to the left [2].

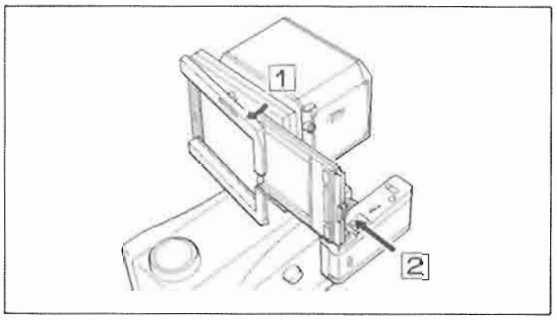


Fig. 29

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

Note ●Perform whatever preparations may be necessary for each type of film and/or holder, carefully reading their operating instructions before use.

[3¼"X4¼" Polaroid photomicrography]

1) Polaroid film holder installation (Fig. 30)

(1) Slide up the adapter mounting bracket [1].

(2) Tilt the film holder and fit it into the left-side bracket [2].

Note ●Confirm which direction the film will be pulled out, as the film pack can be installed facing in either direction.

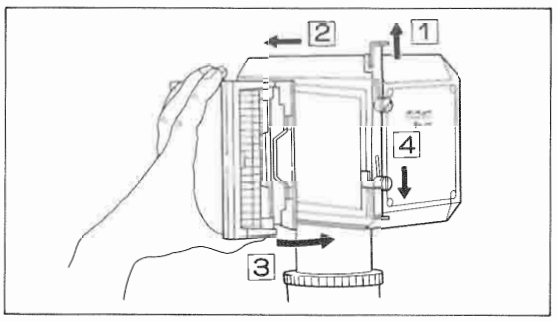


Fig. 30

(3) Press the film adapter flush against the mounting surface [3], and slide down the metal bracket to secure [4].

2) Film magazine loading

- Unpack the film magazine

  Tear off one end of package and take out the film.

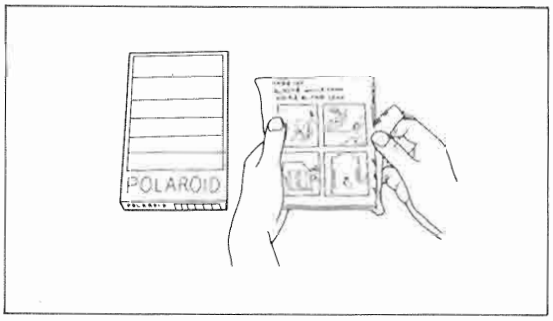


Fig. 31

- Load the film magazine

  Open the film holder (Fig. 32-[1]) and load the magazine, pressing it in to the left [2].

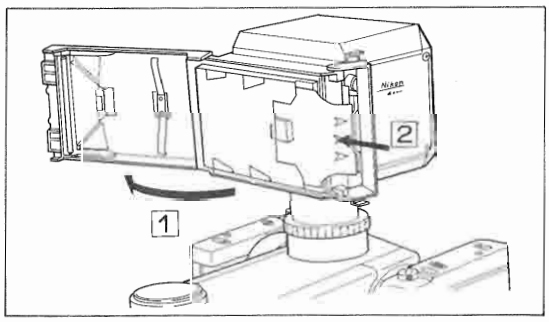


Fig. 32

- Pull out the black tab

  Close the holder back. Draw out the black *tab before* exposure.

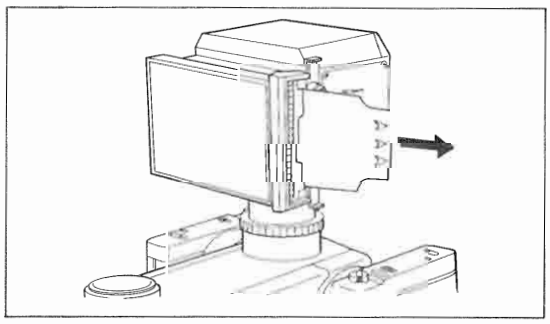


Fig. 33

- Before exposure, pull out the dark slide and wait for all vibration to stop.
- The following card-size (3¼"× 4¼") (8.5 ×10.8mm) film packs may also be used:

Fuji FP-100	Polaroid Type 107	Type 665
FP-3000B	Type 108	Type 667
FP-400B	Type 611	Type 668
	Type 612	Type 669

- Thoroughly read the film instructions before use.

▶ Preparation Completion Display Example

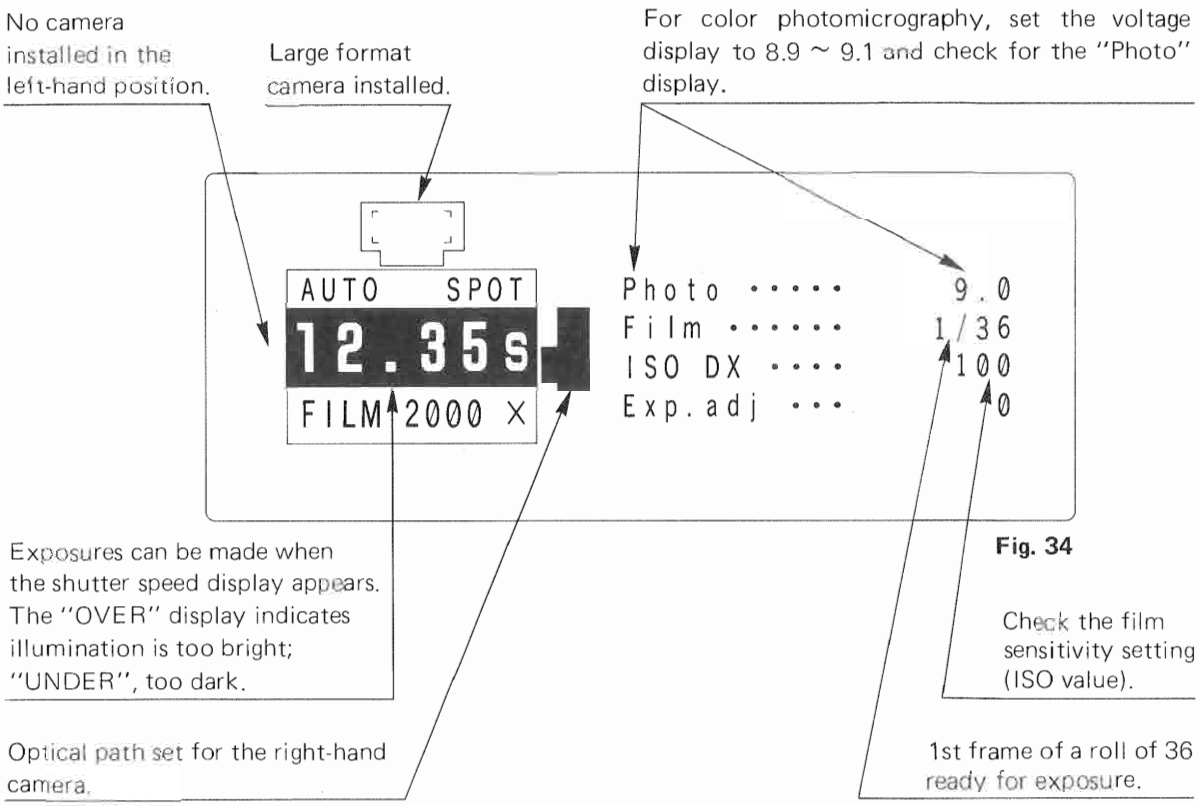


Fig. 34

▶ Magnification Calculation

The MICROPHOT-FXA can display the total magnification of the photomicrographic system on the photographic display unit. The calculation method is as shown in the figure below.

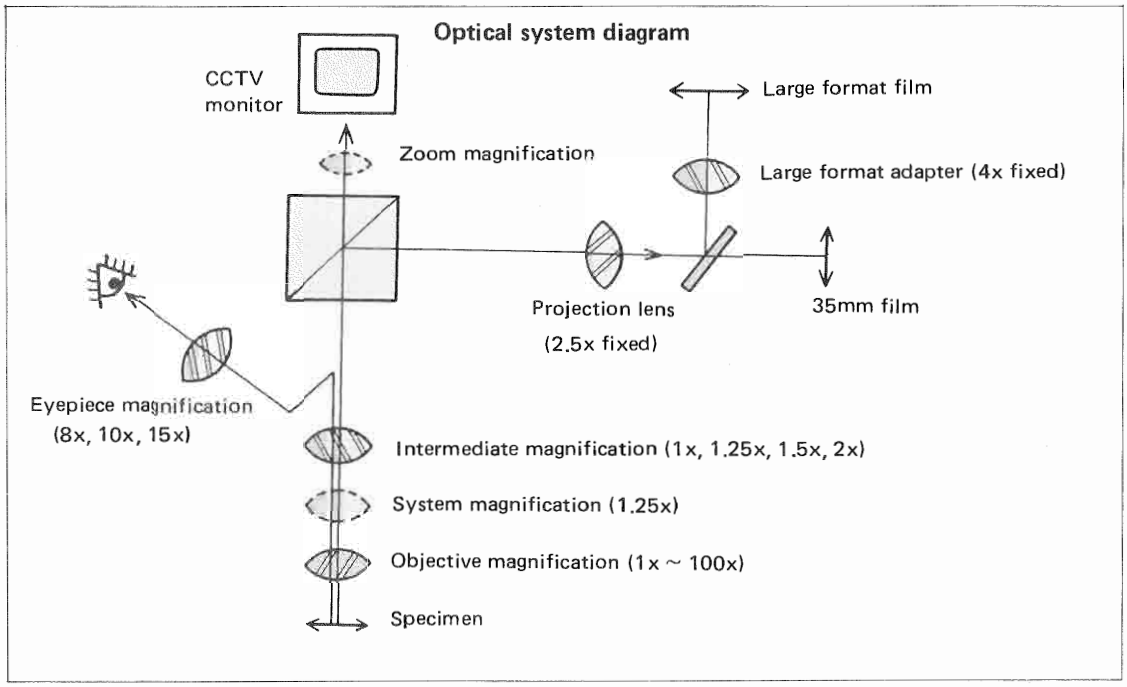


Fig. 35

Photomicrographic magnification(35mm) =
Photomicrographic magnification (large format) =
Observation =
CCTV(monitor) =

Objective × Intermediate magnification × 1.25(System magnification)* ×
- 2.5(Projection lens)
- 2.5(Projection lens) × 4(large format)
- Eyepiece
- Zoom lens × 2.3 x monitor size (in.)

* This magnification is also applicable to diascopic differential interference and epi-fluorescence systems.

▶ Optical Path Camera Options

Camera \ Position	Left	Center	Right
FX-35DX	○	○ *1 *2	○
FX-35WA	○	○ *2	○
F3 + MD4 (External camera)	○	○ *2	×
F3 + MD4 + 250 exposure magazine back NZ-1	×	○ *2	×
Large Format Adapter (Current and earlier models)	×	○	×
FX-35DB ((Combination of 35DX/WA with data back)	○	○	○
Large Format Adapter DB (Combination of current model with data back)	×	○	×
Conversion lens	×	○	×
Speedlight	×	○	×

Note
- *1: DX code readout function disabled.
- *2: FM mount A required in these applications.
- When using the conversion lens, automatic exposure compensation function disabled.
- Double camera head can't be used.
- Large Format Adapter DB available soon.

2. Operating Procedure

General Operating Procedure 1 (FX-35DX)

(1) Load film. (Refer to p. 23, 1).)

(2) Mount camera box. (Check DX cable connection.) (Refer to p. 23, 2).)

(3) Check optical path setting. (Refer to p. 24, 3).)

(4) Depress shutter key. (Set first frame, ISO. Check frame count, ISO value display.) (Refer to p. 24, 4).)

(5) Adjust lamp voltage and select filter. (Refer to p. 24, 6).)

(6) Focus on specimen. (Refer to p. 25, 9).)

(7) Select intermediate magnification.

(8) Compose picture. (Refer to p. 25, 10).)

(9) Select exposure measurement area (SPOT or AVE). (Refer to p. 26, 11).)

(10) Adjust field and aperture diaphragms. (Refer to p. 25, 8).)

(11) Recheck focus. (If low magnification, use magnifier.) (Refer to p. 25, 9).)

(12) Recheck composition.

(13) Select and position measurement area. (Refer to p. 26, 11) and 12).)

(14) Set exposure compensation. (Refer to p. 35, 5.)

(15) Check shutter speed. (Memory photographic function setting. Refer to p. 35, 6.)

(16) Depress shutter key.

(17) Shutter closed →Open.

(18) Shutter speed countdown. (When shutter is opened, shutter speed counts down in units of 1/100th sec.)

(19) Shutter open→Closed.

(20) Advance film one frame.

↓

(20) Film end warning buzzer sounds. . . . . Film finished.

(21) Rewind and remove film. (Refer to p. 26, 14).)

General Operating Procedure 2 (Large Format Camera)

(1) Ready large format adapter, filmholder, film, etc. (Refer to p. 27 and 28.)

(2) Check optical path setting. (Refer to p. 24, 3).)

(3) Set ISO/ASA film sensitivity. (Refer to p. 34, 4.)

(4) Select voltage and filter. (Refer to p. 24, 6).)

(5) Focus on specimen. (Refer to p. 25, 9).)

(6) Select intermediate magnification.

(7) Compose picture. (Refer to p. 25, 10).)

(8) Select exposure measurement area. (Refer to p. 26, 11).)

(9) Adjust field and aperture diaphragms. (Refer to p. 25, 8).)

(10) Recheck focus. (If low magnification, use magnifier.) (Refer to p. 25, 9).)

(11) Recheck composition.

(12) Select and position measurement area. (Refer to p. 26, 11) and 12).)

(13) Set exposure compensation. (Refer to p. 35, 5.)

(14) Check shutter speed. (Memory photographic function setting. Refer to p. 35, 6.)

(15) Pull out dark slide (Polaroid or 4"× 5" film holders.)

(16) Assure all vibration/movement is stopped.

(17) Depress shutter key.

(18) Shutter closed →Open.

(19) Shutter speed countdown. (When shutter is opened, shutter speed counts down in units of 1/100th sec.)

(20) Shutter open→Closed.

(21) Replace dark slide.

(22) Process after photography. (Refer to the Instructions for film being used.)

(23) Film end.

▶ Screen 1 Function Settings

On Screen 1 are displayed seven frequently used preset functions for which the keyboard must be pulled out to perform. When the keyboard is pulled out, the functions "Lamp", "Film", "ISO", and "Exp. adj" can be selected by number designation.

1. Automatic PHOTO Function (Lamp function 1)

Automatically sets the lamp voltage to 9V when performing photomicrography. Convenient for color photomicrography.

(1) Depress Key [1]. (Selection 1: Lamp function)
(2) Depress the [↵] key. (Designates automatic PHOTO function.)

2. Illumination Optical Path Selection (Lamp function 2)

Enables selection of diascopic or episcopic illumination systems. (Only when using the halogen lamp.)

(1) Depress key [1]. (Selection 1: Lamp function)
(2) Depress key [1]. (Designates episcopic illumination.)
Depress key [2]. (Designates diascopic illumination.)

3. Film Count and Total Frame No.

(1) Depress Key [2]. (Selection 2: Film function)
(2) Use the [0] ~ [9] or [CLR] keys to input the film count value, then depress the [↵] key.
(3) Use the [0] ~ [9] or [CLR] keys to input the total frame No. value, then depress the [↵] key.

4. Manual ISO Value Input

Used to set the film sensitivity reading when using a dark box that doesn't offer DX code output. Also used to alter film sensitivity readings that have been automatically preset by DX code using the appropriate dark box.

(1) Depress Key [3]. (Selection 3: ISO function)
(2) Use the [0] ~ [9] or [CLR] keys to input the film ISO value, then depress the [↵] key.

Note ●To set an arbitrary ISO value when using DX film, first depress the shutter key to initialize the camera for Frame 1, then perform the above procedure.

5. Exposure Compensation

Used to set the exposure compensation value or designate the bracket exposure function when more than two points are selected.

(1) Depress Key [4]. (Selection 4: Exposure compensation function)

(2) The present exposure compensation value(s) is (are) indicated by the bar over the position(s) on the "Bracket" display. To clear, use the ◀ or ▶ key to move the cursor to the indicated position, then depress the CLR key.

(3) To set a new exposure compensation value, move the cursor to the desired value, then depress the MEM key.

- Input of more than two bar positions automatically enables the Auto-bracket function. This function permits a continuous series of exposures to be made with a single depression of the shutter key, the compensation value shifting one designated step per exposure.

(4) Confirm the setting and depress the ↵ key.

6. Photomicrographic Memory Function

When photographing photomontages or kaleidoscopic brightness variations, the constant exposures can be set by depressing the MEM key. Depress the MEM key again to return to auto-exposure operation.

(1) Depress the MEM key.

Note •Memory photomicrography is only effective when the shutter speed mode is set to AUTO. To cancel, depress the MEM key again.

7. Camera Optical Path Selection (Left, Center, Right)

(1) Depress the ⌐ key.

(With the MICROPHOT-FXA, both single camera photomicrography and multi-camera combination photomicrographic functions can be performed. For procedure examples of such operations as data transfer and interval photomicrography, please refer to the separate Operations Manual included with the MICROPHOT-FXA.)

Ⅵ. ACCESSORY USAGE

1. High Intensity Lamphouse

The optionally available high intensity lamphouse may be installed if greater brightness than that available in general observation is required.

1) Nomenclature

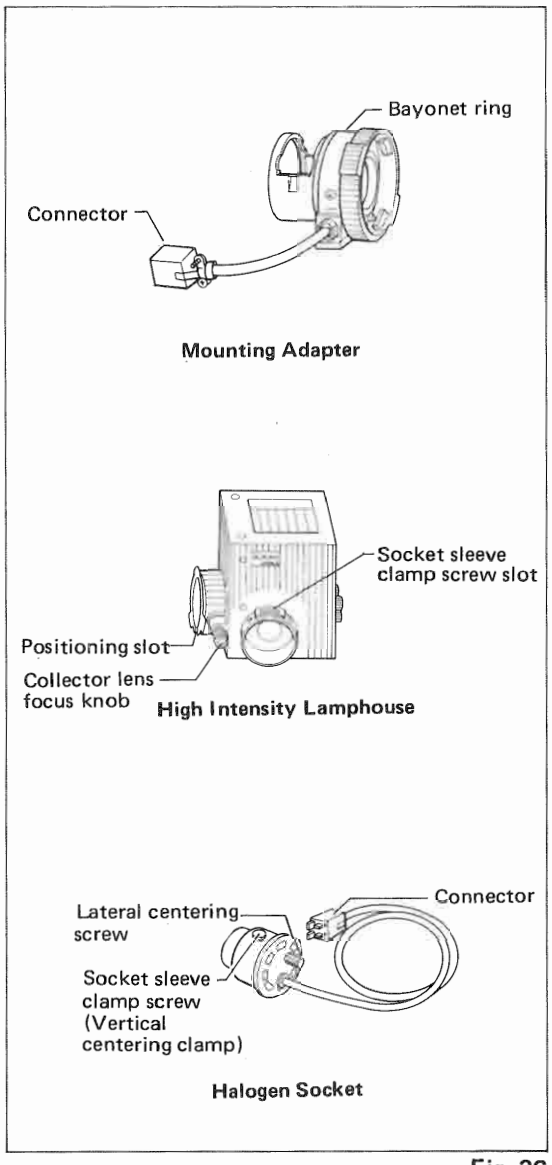


Fig. 36

2) Assembly

Note ●Before assembly, insert the correct collector lens into the lamphouse, referring to the "Assembly Instructions" included with the high intensity lamphouse.

(1) Lamphouse and adapter assembly

Turn the bayonet ring in the indicated direction [1], and attach the adapter to the lamphouse [2], aligning the adapter's positioning pin with its corresponding slot in the lamphouse. Secure by turning the bayonet ring in the indicated direction to its full stop [3]. (Fig. 37)

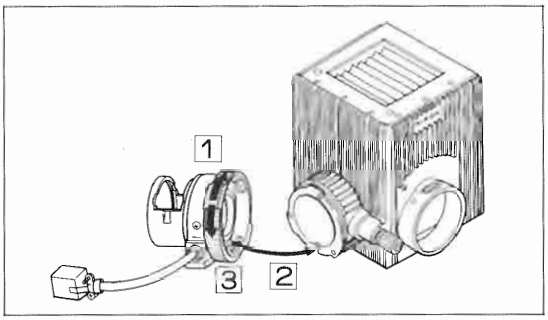


Fig. 37

(2) Lamphouse installation

Loosen the lamphouse mount clamp screw [1], and remove either the protective cap or the standard lamphouse, whichever is attached [2]. Mount the lamphouse assembly [3], aligning the lamphouse mount positioning pin with the adapter's positioning groove, then secure with the clamp screw [4]. (Fig. 38)

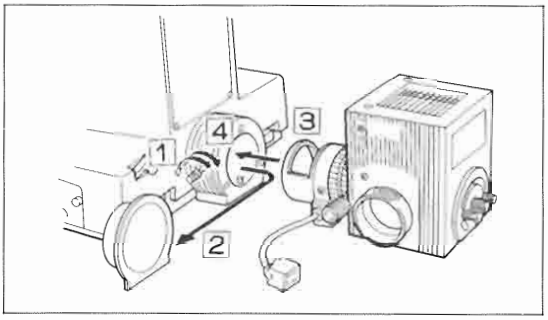


Fig. 38

(3) Lamp installation

Insert the halogen lamp securely into the lamp socket. Be careful not to touch the lamp with the fingers. Leave the plastic cover on the lamp for protection until the lamp is in its proper position, then remove the cover and discard. (Fig. 39)

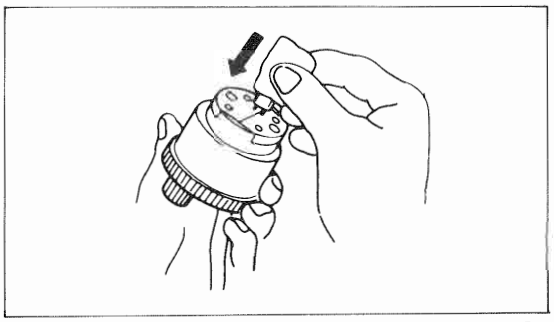


Fig. 39

(4) Lamp socket installation

Insert the lamp socket into the lamp-house socket port [1], and fasten with the clamp screw [2]. (Fig. 40)

Note • Insert the clamp screw through the vertical centering screw slot at the top of the socket sleeve.

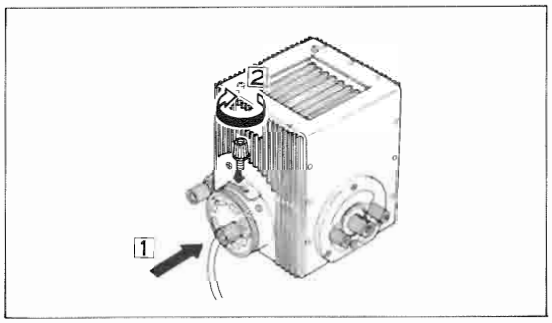


Fig. 40

(5) Cord connection

Connect the socket and mounting adapter connectors. (Fig. 41)

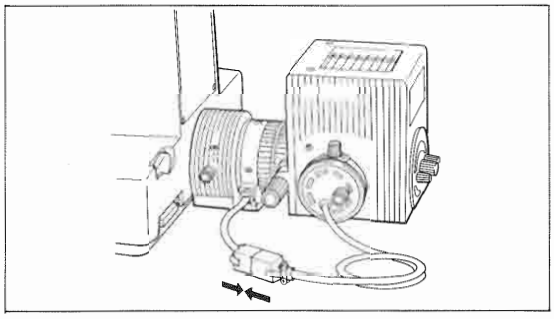


Fig. 41

3) Lamp centering

(1) Switch ON the microscope base sub-switch. Set the lamp voltage to 6.0 with the brightness control switch.

(2) Place a slide on the stage. Move the 10× objective into the working position and focus on the specimen with the aperture and field diaphragms fully opened.

(3) Roughly center the condenser with 10× objective, as described on p. 17. (Adjustment need not be precise.)

(4) Place the lamp centering tool on the field lens. (Fig. 42)

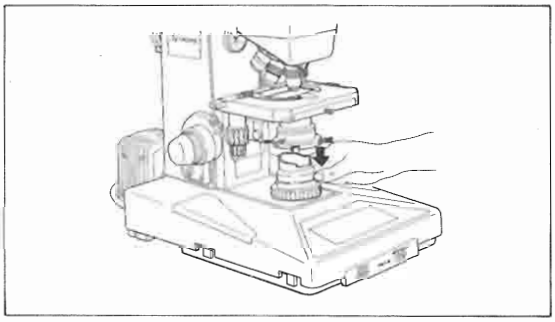


Fig. 42

(5) Stop down the aperture diaphragm, and remove the built-in diffuser from the optical path by lifting the diffuser lever. Adjust the collector lens focus knob to focus the image of the lamp filament on the aperture diaphragm, as visible in reflection on the ND filter of centering tool.

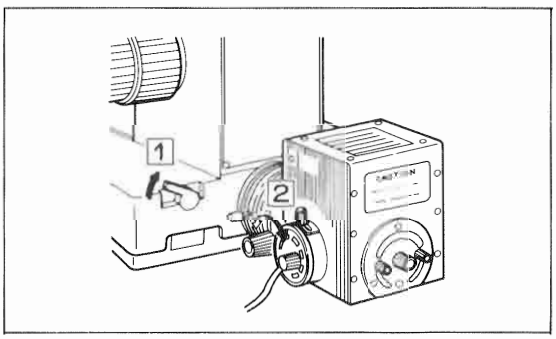


Fig. 43

(6) Loosen the lamp socket clamp screw [1]. Center the filament image by manipulating the vertical and lateral centering screws [2], as shown in Fig. 44.

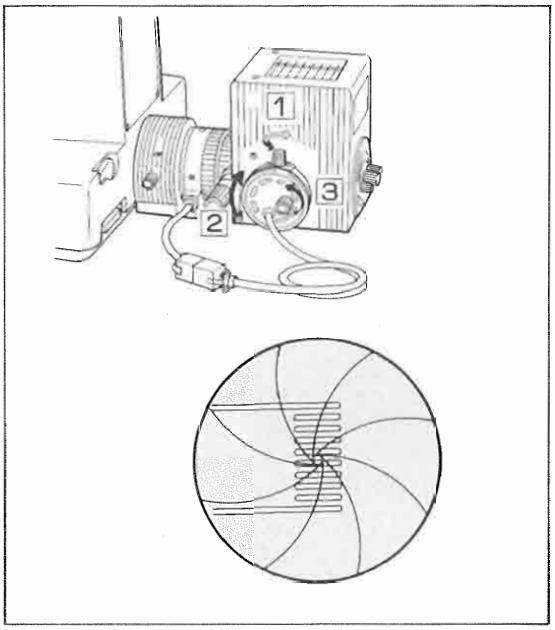


Fig. 44

(7) Turn the rear mirror focusing screw (Fig. 45-[1]) to focus the reflected filament image on the aperture diaphragm.

(8) Adjust the two rear mirror centering screws (Fig. 45-[2]) to superimpose the reflected filament image on the direct filament image, as shown in Fig. 45.

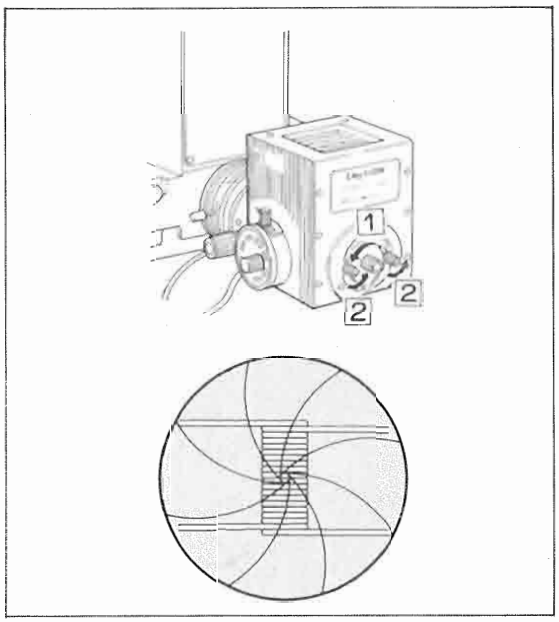


Fig. 45

(9) Position the diffuser in the optical path.

(10) Remove the lamp centering tool.

This completes the lamphouse preparation procedure. All functions, such as illumination brightness and photomicrographic operations, can be controlled from the main unit. The preparation procedure for episcopic illumination is the same.

2. Nikon F3

Besides using its specially designed dark box for photomicrography, the MICROPHOT-FXA can also be used with the motor-driven NIKON F3 camera. Simply connect the camera's MD-4 motor drive to the power supply's external camera connector using the optionally available MC-4 connection cable, then set the NIKON F3 shutter speed to B (Bulb) and its mirror to the up position. Continuous exposures of up to 250 frames can be accomplished using the F3 system's accessory, 250-exposure magazine back NZ-1.

Note
- The external camera position must be designated on the slide-out keyboard whenever the Nikon F3 is used. For more details, please refer to the separate Operations Manual included with the MICROPHOT-FXA.
- Camera optical path installation positions are limited, so please be careful. (Refer to p. 31.)

3. Microscopic Speedlight SBM-1

Speedlight SBM-1 can be connected to the power supply's Speedlight connector, and will automatically synchronize the camera's shutter speed (at 1/100 sec.) when it is switched ON. When used, the Speedlight can make possible stop-motion exposures of up to 1/5000 of a second. For more details, please refer to the Speedlight SBM-1 operation manual.

VII. 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).	● Incorrect beam splitter positioning. →	Pull or push light path selector knob to full limit. (Refer to p. 12.)
	● Incorrect nosepiece positioning (objective off-center). →	Rotate to click-stop position.
	● Condenser off-center. →	Adjust condenser after focusing on closed field diaphragm. (Refer to p.17.)
	● 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. 19.)
	● Unapplicable or incorrectly positioned diffuser. →	Correctly reposition diffuser. (Refer to p.9 and p. 37- 3).)
	● Incorrectly positioned revolving nosepiece. →	Correctly reposition revolving nosepiece. (Refer to p. 6.)
Dirt or dust in the viewfield.	● Dirt or dust on the lens (condenser, objective, field lens). →	Cleaning.
	● Dirt or dust on the slide glass. →	Cleaning.
	● Condenser too low. →	Adjust condenser position. (Refer to p. 17.)
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.
	● 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. 17 and 37.)
	● Dirt or dust on entrance lens of binocular eyepiece tube. →	Cleaning.

Symptoms	Causes →	Countermeasures
Inferior image quality (resolution or contrast).	●Improper setting of objective's cover glass thickness correction ring (where applicable).	→ Adjust ring to match cover glass thickness.
	●Improper setting of objective's iris diaphragm (where applicable).	→ Adjust ring (Fully open for brightfield and close for darkfield.)
Poor image quality.	●Apeture diaphragm too small.	→ Open to 70 ~ 80% of objective N.A.(Refer to p. 20.)
	●Condenser too low.	→ Raise condenser to bring closed field diaphragm into focus. (Refer to p. 17.)
	●No diffuser.	→ Position diffuser into optical path. (Refer to p. 9.)
Uneven focus.	●Nosepiece not in click-stop position.	→ Rotate to click-stop position. position.
	●Incorrect nosepiece mounting.	→ Slide nosepiece into full limit and fasten clamp screw securely.
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.	→ Slide nosepiece in to full limit and fasten clamp screw securely
	●Condenser off-center.	→ Recenter condenser after focusing on closed field diaphragm. (Refer to p. 17.)
	●Beam splitter incorrectly positioned.	→ Pull or push the light path selector knob to its full limit. (Refer to p. 12.)
	●Intermediate magnification selector not in click-stop position.	→ Turn to click-stop position.
Yellowish image.	●No NCB 11 filter.	→ 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 low power objectives).	→ Readjust eyepiece diopter ring. (Refer to p. 16.)
Insufficient objective parfocality when switched.	●Incorrect diopter adjustment.	→ Readjust eyepiece diopter ring. (Refer to p. 16.)

Symptoms	Causes →	Countermeasures
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 next set of holes.
Binocular images not coincident.	● Incorrect interpupillary distance adjustment. →	Adjust interpupillary distance. (Refer to p. 16.)
Eye fatigue experienced during observation.	● Incorrect eyepiece diopter adjustment. →	Adjust eyepiece diopter. (Refer to p. 16.)
	● 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.
Instantaneous lamp failure.	● Unspecified lamp used. →	Use only 12V-100W halogen lamp (OSRAM 64623 or PHILIPS 7724)
	● Line voltage too high. →	Use step-down transformer to supply adequate voltage.
Insufficient illumination brightness.	● Condenser off-center. →	Center condenser after focusing on closed field diaphragm. (Refer to p. 17.)
	● Aperture diaphragm set too small. →	Open to 70 ~ 80% of objective N.A. (Refer to p. 20.)
	● Condenser too low. →	Raise condenser to bring closed field diaphragm into focus. (Refer to p. 17.)
	● 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. →	Adjust voltage to at least 6.0.
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, utilize focusing magnifier.
	● 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.
	● Momentary vibration. →	● Use ND filters to lengthen shutter speed (for color film, 1/4 ~ 1/15 sec.) ● Reduce voltage to lengthen shutter speed (for black/white film).
	● 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. (Refer to p. 24, 17.)
Insufficient contrast.	● Aperture opened too wide. →	● Close down aperture to 70 ~ 80% of objective N.A. (Refer to p. 25.)
	● Wrong filter selection. →	● Use GIF filter in metallurgical, interference, polarization, or phase contrast microscopies. ● To increase contrast of particular stain, apply filter of complementary color (black/white photos).
	● Incorrect field diaphragm setting. →	● Adjust slightly larger than viewfield. (Refer to p.25.)
	● Low contrast specimen. →	● Perform phase contrast, darkfield, or DIC microscopy. ● 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.

Symptoms	Causes ——→	Countermeasures
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 eyepiece 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. (Refer to p. 24, Table 3.)
	● Inadequate exposure time setting. ——→	● Inadequate exposure time results in color reproduction failure due to reciprocity failure. Adjust shutter speed to within specified range with ND filter(s), or adjust this failure using CC filter.
	● Film development process faulty. ——→	● Consult development laboratory, especially for color print photos.
	● Film expired. ——→	● Use new film.
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. ——→	● Reinsert keyboard.
	● Quick-return mirror failure. (Error message displayed.) ——→	● Contact dealer or nearest NIKON representative.
LCD difficult to see.	● Poor contrast. ——→	● Adjust LCD contrast control dial.
	● Insufficient illumination. ——→	● Adjust backlight brightness control dial.

ELECTRICAL SPECIFICATIONS

Electrical Source	90-132V/ 198-264V AC, 45-66Hz
Light Source	12V-100W Halogen lamp (OSRAM 64623 or PHILIPS 7724)
Fuse	90-132V : 4A 198-264V : 2A
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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Printed in Japan

(88.6.c)H·E-1N

Nikon

MICROPHOT-FXA

OPERATIONS MANUAL

NIKON CORPORATION

This manual provides operating procedure examples of all the possible photomicrographic operations that can be performed with the MICROPHOT-FXA microscope system excluding the general operating instructions, which can be found in the MICROPHOT-FXA Instruction Manual. Please read this Operations Manual thoroughly, and familiarize yourself with the operating procedures for any desired functions.

CONTENTS

I. FUNCTIONS

This section provides brief explanations of all the functions of the system. For quick reference, consult the displayed message for each selected operation procedure.

1. Illumination Functions

1) **PHOTO Function**
   If the shutter speed mode is set to "AUTO", "MANUAL", "TIME", or "BULB" when the PHOTO function is enabled, the lamp voltage is automatically set to 9V if not already preset to a suitable voltage for photomicrography, (within the range of 8.9 – 9.1V).
2) **Illumination Switching Function**
   "Episcopic" and "Diascopic" illumination systems can be switch-selected at the keyboard.

2. Film Functions

1) **Film Frame Number Preset Function**
   Enables selection of the number of frames for exposure.
2) **Film Count Preset Function**
   Enables selection of the frame count number.
3) **Film Count-Up Function**
   Advances the frame number each time the film is advanced, counting up to the last designated frame number, when preset.
4) **Film Speed (ISO Value) Preset Function**
   Enables the film speed to be preset within an ISO range of 1-25,000.
5) **DX Code Film Speed (ISO Value) Preset Function**
   Permits the film speed to be automatically set by the film's DX code.
6) **Film Initialization Function**
   (1) (When using film with a DX code)
   Depression of the [EXP] key automatically advances the film to its initialized position. (The film speed is also automatically set to correspond to the film's DX code.)
   (2) (When using any other film types)
   The film is advanced to its first frame via manual operation of the keyboard.

3. Exposure Compensation

1) **Exposure Compensation Value Preset Function**
   Permits the exposure compensation value to be preset in 1/3EV steps within the range of –3 to +3EV.
2) **Auto-Bracket Function (Applicable when shutter speed mode is set to "AUTO".)**
   Permits the exposure compensation value to be preset in 1/3EV steps from –3 to +3EV for a total of 19 steps. When this function is selected, a single depression of the [EXP] key enables continuous film exposures with the compensation value shifting up from the lowest designated EV step at one step per exposure. (The auto-bracket function is rendered inoperative when only one step is bracketed.) Exposure compensation information is displayed when the keyboard is stored.

4. Camera Functions

1) **Photomicrographic Sequence Designation Function**
When the photomicrographic sequence is set, the camera optical path automatically shifts to the selected camera position.
2) **External Camera Designation Function**
A single external camera can be attached in either the center or left-hand camera positions.

5. Shutter Speed Mode

1) **AUTO Mode Function**
Automatically calculates the correct shutter speed.
Shutter speed range : 0.01 – 999.9 sec. (16 min. 39 sec.)
(Display)
Within shutter speed range
Over 60 sec. : Minutes (M), Seconds (S) displayed (w/o digits below decimal point).
Under 60 sec. : Seconds (S) displayed (w/ two digits below decimal point).
Outside shutter speed range
"UNDER" or "OVER" display visible.
2) **MANUAL Mode Function**
The shutter speed can be set from 0.01 to 999.9 seconds (16 min. 39 sec.) Second units are used for input. If the input value exceeds 60 seconds, the display automatically converts into minutes and seconds after input, although the digits below the decimal point are not displayed.
3) **TIME Mode Function**
The shutter is opened with the first depression of the [EXP] key, and closed with the next. The elapsed time is displayed in 0.1 second intervals while the shutter is open.
4) **BULB Mode Function**
The shutter is opened for the duration the [EXP] key is depressed. The elapsed time is displayed in 0.1 second intervals while the shutter is open. The shutter automatically closes if the exposure exceeds 999.9 seconds (16 min. 39 sec.).
5) **MEMORY Mode Function**
Used only with the "AUTO" exposure mode, this function permits the shutter speed to be stored in the memory for succeeding exposures.
6) **FLASH Mode Function**
This function automatically sets the shutter speed to 0.01 seconds when a speedlight unit is designated for use.

★ **Shutter Speed Display During Exposure**
The shutter speed is displayed during count-down in "AUTO", "MANUAL", "MEMORY", and "FLASH" exposure modes. In "TIME" and "BULB" modes, the shutter speed is displayed during count-up.

6. Multiple Exposure

This function permits preset of 2 – 999 multiple exposure frames. The film automatically rewinds after the designated number of frames have been exposed.

7. Interval Function

(Interval time preset)

This function permits the interval time between exposures to be preset, with inputs of numerals 1 – 59 for the selectable units of hours (H), minutes (M), and/or seconds (S). The lamp is automatically turned OFF if the preset interval exceeds 2 minutes, turning ON again when one minute remains in the interval.

Only the lamp and reticle illumination (when interval exceeds 1 min.) can be switched ON and OFF during interval operation. AVE/SPOT setting, objective selection, and camera mount selection are all disabled. The lamp is turned OFF after the entire interval is completed.

(Interval frame number preset)

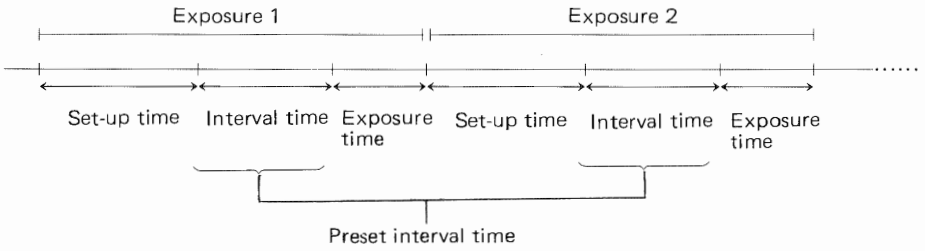
Up to 999 frames can be preset for continuous exposure at a single depression of the [EXP] key.

(Interval display)

During interval operation, the "*" mark on the display flashes once a second. The remaining time is displayed in descending units of (H) → (M) → (S).

(Example)	Remaining Time		Display
	2 hr 38 min 45 sec.	→	2H
	36 min 22 sec.	→	36M
	1 min 10 sec.	→	1M
	24 sec.	→	24S

Note **1. Interval exposures are divided into the three segments illustrated below, therefore the total time required for photography is not equal to the calculation of (Interval Time) x (Interval Frame No.).**



Set-up time refers to the time required for quick-return mirror operation and photometric measurement (Approx. 2 sec.).

2. When the interval function is used simultaneously with the auto-bracket function, the total No. of photomicrographic frames is equal to (Interval frame No.) × (Auto-bracket step No.)

8. Reticle Illumination

"Red" or "Green" reticle illumination colors can be keyboard-selected.

9. Photometric Value Display

The following three photometric modes can be keyboard-selected.

1) **Simple Photometry**

Converts photometric values to film surface brightness (0.0001 –65.0 lux), and displays result.

2) **Subtracted Photometry**
Measures background, calculates (Photometric value) – (Background value), and displays result.

3) **Relative Photometry**
Sets standard value, calculates (Photometric value)/(Standard value), and displays result.

Note **The photometric value is only displayed when the shutter speed mode is set to "AUTO", and is automatically switched OFF when another mode is selected.**

10. Communication with External Equipment

1) **RS232C Baud Rate Preset**
Rates of 300, 600, 1200, 2400, 4800, and 9600 baud can be selected and preset.

2) **Host Computer Control**
The MICROPHOT-FXA system can be controlled by commands received from a host computer.

3) **Data Output to Printer**
The following parameters can be designated at the keyboard for printer output.

(Subject)

1. Shutter speed
2. Film count
3. Lamp voltage
4. ISO value
5. Exposure compensation value
6. Multi-exposure number
7. Interval time
8. Data print
9. Photometric value
10. Magnification
11. Counter value

11. Counter Calculation

Using the revolving nosepiece clockwise and counterclockwise rotation keys and the reticle illumination key, count-up, count-down, and count reset (0 clear) functions can be performed within the range of 0 – 99,999 (no negative values possible).
Even with the motorized nosepiece installed, if the counter function is enabled, both nosepiece and reticle operations are rendered inoperative.

Nosepiece clockwise rotation key : Count-up
Nosepiece counterclockwise rotation key : Count-down
Reticle illumination key : Count reset

12. Magnification Display

When either the motorized or MG nosepiece is mounted, one of the following three displays can be selected at the keyboard:

1. Total photomicrographic magnification
2. Total observation magnification
3. Objective X intermediate magnification

13. Data Print

(Printable data)

1. Film ISO (ASA) value
2. Exposure compensation value
3. Film count and Frame number
4. Shutter speed
5. Photometric value*
6. Total photomicrographic magnification
7. Scale length
8. Arbitrary data

* The photometric value can only be selected for imprint on film when the shutter speed mode is set to "AUTO". Should another shutter speed mode be selected, it is automatically disabled.

(Arbitrary data)

Using alphanumeric letters, numbers, and special characters in strings of a maximum length of 8 characters, as many as 6 labels of arbitrary data can be assigned to each camera. The Count-Up/Down function affects only those numbers positioned in the last three digits of the string (the "0"s in "XXXXX000").

14. Warning Function

Whenever an invalid key is depressed, or an input error or some other malfunction is detected, a warning beep sounds in conjunction with the display of a warning message.

(Warning beep)

1. Normal key entry	Short beep
2. Invalid key entry	Long beep
3. Malfunction detected	Three short beeps

A DIP switch selection permits the warning beep to be switched ON or OFF.

15. Data Storage Function

The following types of data can be stored in memory, where they remain even after the power to the main unit is turned OFF.

(Stored data)

1. Film data for 3 cameras
   [ISO value, film count, frame number, DX data, film type (Color / B/W)]
2. Exposure compensation data for 3 cameras
3. PHOTO function data for 3 cameras
4. Data print for 3 cameras
5. Arbitrary data for 3 cameras
6. Multi-exposure number data for 3 cameras
7. Interval data for 3 cameras
8. RS232C baud rate
9. Objective magnification/Numerical aperture data (Display mode)
10. Eyepiece magnification
11. Lamp voltage
12. Illumination (Epi/Dia)
13. Reticle color
14. Printer output subject

16. Interval/Exposure Pause

1) Interval Pause
Freezes interval operation, and restores all data to the condition existent before [EXP] key depression.

2) Exposure Pause
Freezes photomicrographic operation, restores all data to the condition existent before [EXP] key depression, then advances film.

17. Special Photomicrographic Function Combination Tables

1) Relation of Special Functions to Shutter Speed Mode

	PHOTO	BRACKET	M.Exp	INTERVAL	D.B.	EX. CAMERA
AUTO	O	O	O	O	O	O
MANUAL	O	X	O	O	O	O
TIME	O	X	X	X	O	O
BULB	O	X	X	X	O	O
MEMORY	X	X	O	O	O	O
FLASH	X	X	X	O	O	O

O: Valid X : Invalid

Table 1

2) Combination Photography

	M.Exp	D.B.	INTERVAL	BRACKET	PHOTO	EX.CAMERA
M. Exp	–	O	O	X	O	O
Data Back	O	–	O	O	O	O
INTERVAL	O	O	–	O	O	O
BRACKET	X	O	O	–	O	O
PHOTO	O	O	O	O	–	O
EX. CAMERA	O	O	O	O	O	–

O: Valid X : Invalid

Table 2

3) Relation of Special Functions to Camera Position

	Left-hand	Center	Right-hand
AUTO	O	O	O
MANUAL	O	O	O
TIME	O	O	O
BULB	O	O	O
MEMORY	O	O	O
FLASH	X	O	X
M.Exp	O	O	O
Data Back (35mm)	O	O	O
Data Back (Large format)	X	O	X
INTERVAL	O	O	O
BRACKET	O	O	O
PHOTO	O	O	O
EX. CAMERA	O	O	X
DX	O	X	O

O: Valid X : Invalid

Table 3

Ⅱ. DISPLAY SCREENS

This section provides descriptions of the contents of each display screen shown during regular operation.

1. Screen-1

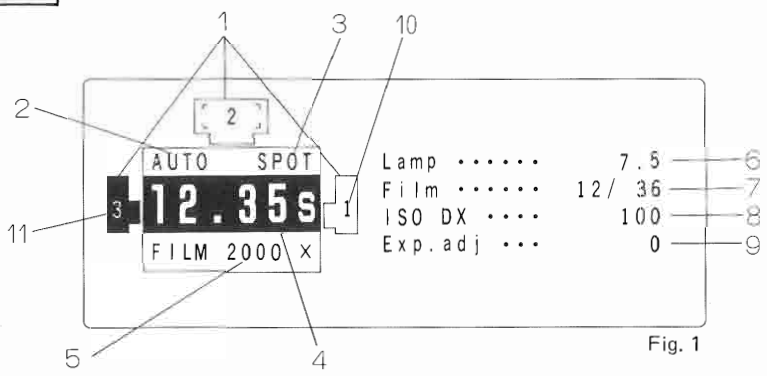


Fig. 1

(Display Contents)

1. Camera displays; Right-hand (1), Center (2), Left-hand (3)
2. Shutter speed mode display
3. Photometric method ("SPOT"/"AVE") display
4. Shutter speed display
5. Magnification display
6. Lamp voltage (PHOTO function display)
7. Film count/Frame number display (film type display)
8. Film sensitivity (ISO) display (with or w/o DX-coded film)
9. Exposure compensation value display
10. Photomicrographic sequence number display
11. Selected camera optical path display (darkened camera display)

Additional display subjects shown when setting functions.

(Refer to Fig. 2 below.)

1. Interval display
2. Data print display
3. Photometric value display
4. Counter value display

   These subjects are automatically displayed when set. Although any three of the four can be simultaneously displayed, if all four subjects are designated, the photometric value is not displayed.
5. Multiple exposure designation display
6. Auto-bracket designation display

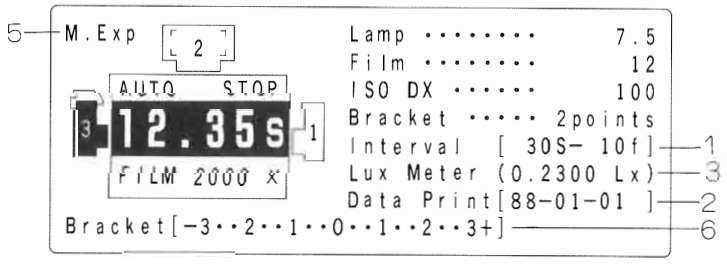


Fig. 2

Note The display 3 shown for Camera [3] indicates that it is an external camera.

2. Screen-2

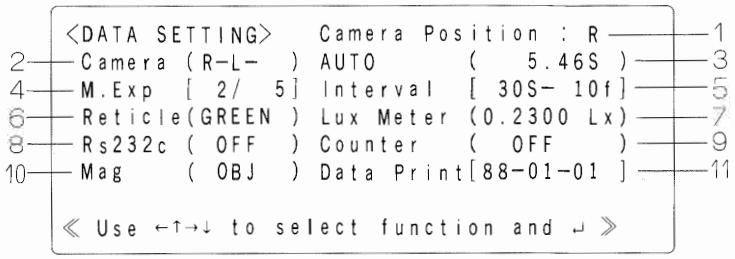


Fig. 3

Note **Data in "[ ]" brackets for selected camera.**
Data in "( )" parentheses for general system.

(Display Contents)

1. Camera optical path position (Displayed whether external camera is mounted or not.)
2. Photomicrographic sequence
3. Shutter speed mode; ( ) = Shutter speed
4. Multi-exposure mode; [ ] = Status & Parameters
   (Example)
   Display [2/ 5] indicates the 2nd frame of a multi-exposure sequence of 5.
5. Interval mode; [ ] = Status & Parameters
   (Example)
   Display [30S — 10f] indicates an interval time of 30 seconds with 10 frames remaining for exposure.
6. Reticle color
7. Photometric value display mode; ( ) = Status & Photometric value
8. External communication mode; ( ) = Status
9. Counter mode; ( ) = Status & Value
10. Magnification display mode; ( ) = Type
11. Data print mode; [ ] = Status & Data for imprint

3. Screen-3

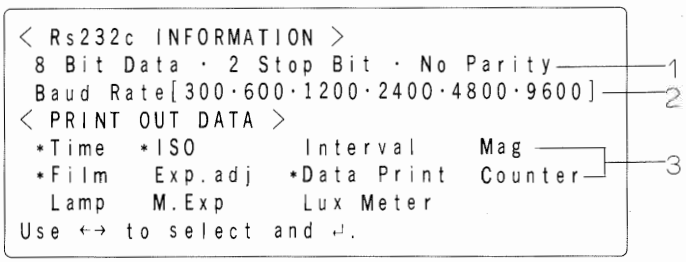
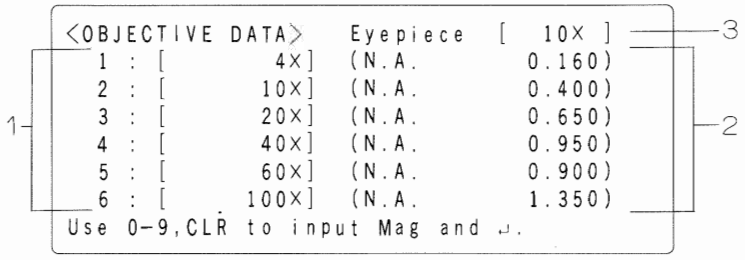


Fig. 4

(Display Contents)

1. RS232C communications protocol
2. RS232C baud rate
3. Printer output subject ("*" indicates selected data.)

4. Screen-4



(Above numerical apertures are of CF Plan objectives.)

Fig. 5

(Display Contents)

1. Objective magnification (6 data selections)
2. Objective numerical aperture (6 data selections)
3. Eyepiece magnification

5. Screen-5

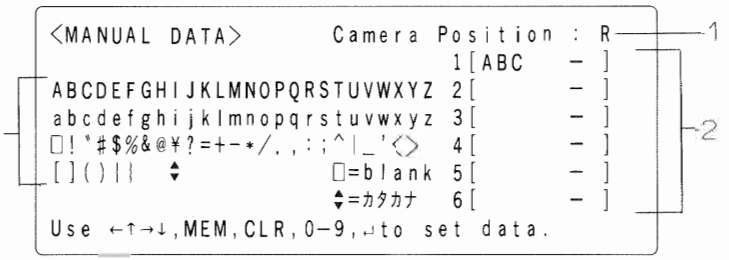


Fig. 6

(Display Contents)

1. Camera optical position (Displayed whether external camera is mounted or not.)
2. Stored arbitrary data (6 labels)
3. Transcript characters (Alphanumeric and special)

Ⅲ. OPERATING PROCEDURES

1. PHOTO Function Selection Procedure

PHOTO function setting

1. Pull out the keyboard to display the operation message and subject numbers on Screen-1.
2. Depress Key [1] .
3. The operation message, **"Select Photo ↵= ON CLR = OFF 1 = EPI 2 = DIA."** appears on the display.

PHOTO function enable

4. Depress the [/↵] key to designate this function.

PHOTO function disable

Depress the [CLR] key to disable.

2. Illumination Method (Episcopic/Diascopic) Selection Procedure

Illumination switch-selection

1. Pull out the keyboard to display the operation message and subject numbers on Screen-1.
2. Depress Key [1] .
3. The operation message, **"Select Photo ↵ = ON CLR = OFF 1 = EPI 2 = IDA."** appears on the display.

Episcopic illumination selection

4. Depress Key [1] for Episcopic illumination.

Diascopic illumination selection

Depress Key [2] for Diascopic illumination.

3. Film Count and Frame Number Setting Procedure

Film count & exposure frame No. setting

1. Pull out the keyboard to display the operation message and subject numbers on Screen-1.
2. Depress Key [2].
3. The operation message, **"Use 0-9, CLR to input count and ↵ or MEM"** appears on the display.

Film count setting

4. Use Keys [0] ~ [9] to set an film count value of 0-999.

   Depress the [CLR] key to change the input value or clear to 0.
5. Depress the [/↵] key to signify input completion.

   The operation message **"Use 0-9, CLR to input frame and ↵ or MEM"** then appears on the display.

Exposure frame number setting

6. Use Keys [0] ~ [9] to set a frame number of 0-999. Depress the [CLR] key to change the input value or clear to 0.
7. Depress the [/↵] key to signify input completion.

Film type setting

8. Depressing the [MEM] key in Steps 4 and 6 permits switch-selection of color and B/W film settings.

Film selection	Display
Monochrome film :	Film B/W .....
Color film :	Film .....

Note

- **Depress only the [/↵] key in Steps 4 & 6 if their previously set values are to be used again without modification.**

4. Film Speed (ISO) Setting Procedure

Film sensitivity setting

1. Pull out the keyboard to display the operation message and subject numbers on Screen-1.
2. Depress Key [3].
3. The operation message, **"Use 0-9, CLR to input and ↵ or MEM=DX."** appears on the display.

ISO setting

4. Use Keys [0] ~ [9] to set the film sensitivity for a value of 1-25,000. Depress the [CLR] key to change the input value or clear to 0.
5. Depress the [/↵] key to signify input completion.

ISO setting via DX code

6. Depress the [MEM] key if the film sensitivity is to be set by the film's DX code.

Note

- **Depress only the [/↵] key in Step 4 if the previously set value is to be used again without modification.**

5. Exposure Compensation Setting Procedure

Exposure compensation setting

1. Pull out the keyboard to display the operation message and subject numbers on Screen-1.
2. Depress Key [4].
3. The operation message, **"[-3··2··1 .. 0··1··2··3+] Use ←→, MEM, CLR, ↵ ▲▼"**, and the cursor appear on the display.
4. Using the [/←] and [/→] keys, move the cursor to the desired exposure compensation setting.

Compensation setting

5. Depress the [MEM] key to set the exposure compensation to that indicated by the position of the cursor.

Compensation clear

Depress the [CLR] key to cancel.

6. Depress the [/↵] key to signify input completion.

Note

- **Exposure compensation values1 — 19 can be selected.**
  More detailed operation messages can be displayed by depressing the [SHIFT] + [↑/] or [SHIFT] + [↓/] keys.
  (Message contents)

  "[-3··2··1··0··1··2··3+] ← → = Select ↵ = Ret ▲▼"

  "[-3··2··1··0··1··2··3+] MEM = ON CLR = OFF ▲▼"

6. Special Photomicrographic Setting Procedures

Special photomicrography

1. Pull out the keyboard to display the operation message and subject numbers on Screen-1.
2. Depress the ↵ key to select Screen-2, thus permitting data selection for special photomicrography.

1) External Camera Use Setting Procedure

External camera use designation

1. Use the ←, →, SHIFT + ↑, and SHIFT + ↓ keys to move the cursor to the "Camera Position" display on Screen-2, then depress the ↵ key.
2. The message, **"Select External Camera ↵= ON CLR = OFF."** appears on the display.

External camera enable

External camera disable

3. Depress the ↵ key if the external camera is to be used, or depress the CLR key to disable.

2) Photomicrographic Sequence Setting Procedure

Photomicrographic sequence setting

1. Use the ←, →, SHIFT + ↑, and SHIFT + ↓ keys to move the cursor to the "Camera" display on Screen-2, then depress the ↵ key.
2. The message, **"Use 1 = R 2 = C 3 = L to set CAMERA and ↵."** appears on the display.
3. Depress Key 1 to select the right-hand camera, Key 2 for the center camera, or Key 3 for the left-hand camera.
4. Depress the ↵ key to signify input completion.

Note

- **These selections can only be made if corresponding cameras are mounted. Likewise, if the selected camera body is detached, its designation will be cleared.**

3) Shutter Speed Mode Setting Procedure (AUTO/MANUAL/TIME/BULB exposure modes)

Exposure mode selection

1. Use the [←], [→], [SHIFT] + [↑], and [SHIFT] + [↓] keys to move the cursor to the "AUTO" (or "MANUAL", "TIME", or "BULB") display on Screen-2, then depress the [↵] key.
2. The message, **"Select 1=AUTO 2=MANUAL 3=TIME 4= BULB."** appears on the display.

AUTO exposure designation

3. Depress Key [1] to select AUTOmatic exposure photomicrography.

MANUAL exposure designation

Key [2] to select MANUAL exposure photomicrography,

TIME exposure designation

Key [3] to select TIME exposure photomicrography,

BULB exposure designation

or Key [4] to select BULB exposure photomicrography.

(When designating MANUAL exposure)

4. The operation message, **"Use 0-9, CLR to input and ↵."** appears on the display.

Manual time setting

5. Use Keys [0] ~ [9] to manually set the exposure time for a value of 0.01 – 999.9 sec. Depress the [CLR] key to change the input value or clear to 0.
6. Depress the [↵] key to signify input completion.

Note

- **Depress only the [↵] key in Step 5 if its previously set value is to be used again without modification.**

4) Multiple Exposure Photomicrography Setting Procedure

Multi-exposure designation

1. Use the ←, →, SHIFT + ↑, and SHIFT + ↓ keys to move the cursor to the "M. Exp" display on Screen-2, then depress the ↵ key.
2. The message, **"Select Multi-Exp function ↵= ON CLR = OFF."** appears on the display.

Multi-exposure function selection

Multi-exposure function cancellation

3. Depress the ↵ key to enable.
   Depress the CLR key to disable.

(Continue if selected.)

4. The message, **"Use 0-9, CLR to input and ↵. (2-999)"** appears on the display.

Multi-exposure number setting

5. Use Keys 0 ~ 9 to set the number of multiple exposures to 2-999. Depress the CLR key to change the input value or clear to 0.
6. Depress the ↵ key to signify input completion.

Note

- **Depress only the ↵ key in Step 5 if the previously set value is to be used again without modification.**

5) Interval Photomicrography Setting Procedure

Interval function designation

1. Use the ←, →, SHIFT + ↑, and SHIFT + ↓ keys to move the cursor to the "Interval" display on Screen-2, then depress the ↵ key.
2. The message, **"Select Interval function ↵= ON CLR = OFF."** appears on the display.

Interval function selection

Interval function cancellation

3. Depress the ↵ key to enable.
   Depress the CLR key to disable.

(Continue if selected.)

4. The message, **"Use 0-9, CLR to input time and ↵. (1-59)"** appears on the display.

Interval time setting

5. Use Keys 0 ~ 9 to set the interval time for a value of 1-59. Depress the CLR key to change the input value or clear to 0.

6. Depress the [/] key to signify input completion. The message, **"Select Unit 1=Hour 2=Min 3=Sec and ↵."** appears on the display.

Interval time (Unit) setting

7. Depress Key [1] for hours,

   Key [2] for minutes,

   or Key [3] for seconds.

   The message, **"Use 0-9, CLR to input frame and ↵."** appears on the display.

Interval frame number setting

8. Use Keys [0] ~ [9] to set the frame number to 0-999.

   Depress the [CLR] key to change the input value or clear to 0.

9. Depress the [/] key to signify input completion.

Note

- **Depress only the [/] key in Steps 5 & 8 if their previously set values are to be used again without modification.**

6) Reticle Color Selection Procedure

Reticle color selection

1. Use the [←], [→], [SHFT] + [↑], and [SHFT] + [↓] keys to move the cursor to the "Reticle" display on Screen-2, then depress the [/] key.

2. The message, **"Select Color 1 = GREEN 2 = RED."** appears on the display.

Green color selection
Red color selection

3. Depress Key [1] for a green reticle color,

   or Key [2] for a red reticle color.

Note

- **Depress only the [/] key in Step 3 if the previously selected reticle color is satisfactory.**

7) Photometric Value Setting Procedure

Photometer function designation

1. Use the [←], [→], [SHIFT] + [↑], and [SHIFT] + [↓] keys to move the cursor to the "Lux Meter" display on Screen-2, then depress the [↵] key.
2. The message, **"Select Lx Meter function ↵= ON CLR OFF."** appears on the display.

Photometer function selection

3. Depress the [↵] key to select.

Photometer function cancellation

Depress the [CLR] key to cancel.

(Continue if selected.)

4. The message, **"Select Lux Mode 1 = abs. 2 = sub. 3 = rel."** appears on the display.

Absolute photometric value display designation

5. Depress Key [1] to measure specimen brightness,

Subtracted photometric value display designation

Key [2] to compare specimen brightness to that of the background,

Relative photometric value display designation

or Key [3] to compare its brightness to the reference standard.

(Continue if options 2 or 3 are selected.)

Background setting

6. If the subtracted photometric value display is designated, the message, **"Use MEM to set BACKGROUND."** appears on the display.
7. Position the photometer over the background area, and depress the [MEM] key.

Standard setting

8. If the relative photometric value display is designated, the message, **"Use MEM to set STANDARD."** appears on the display.
9. Position the photometer over the reference (standard) area, and depress the [MEM] key.

8) External Communication Setting Procedure

External communication function designation

1. Use the  ,  , SHIFT +  , and SHIFT +  keys to move the cursor to the "Rs232c" display on Screen-2, then depress the  key.
2. The message, **"Select Rs232c CLR=OFF 1=COM 2=PRN or ↵."** appears on the display.

Host computer designation

·Printer designation

Communication function cancellation

3. Depress Key 1 for communication with a host computer, Key 2 for output to a printer, or the CLR key to cancel communication. The  key may also be depressed to designate changes in communication speed (baud rate) or printer output subject.

(Continue if designated.)

4. The display changes to Screen-3, and the message, **"Use ← → to select and ↵."** appears on the display.

Communication speed setting

5. Use the  and  keys to select the appropriate communication speed (baud rate): 300, 600, 1200, 2400, 4800, 9600.
6. Depress the  key to signify input completion. To return to Screen-2 from Screen-3, depress the SHIFT +  keys.
7. The message, **"Use ← ↑ ← ↓ to select then MEM or CLR."** appears on the display.

Printer output data selection

8. Use the  ,  , SHIFT +  , and SHIFT +  keys to select the desired printer output data.
9. Depress the MEM key to set the data for output, or the CLR key to cancel.
10. To signify input completion, or to return to Screen-2 from screen-3, depress the SHIFT +  keys.

9) Counter Function Selection Procedure

Counter function designation

1. Use the  ,  , SHIFT +  , and SHIFT +  keys to move the cursor to the "Counter" display on Screen-2, then depress the  key.
2. The message, **"Select Counter function ↵ = ON CLR = OFF."** appears on the display.

Counter function selection

3. Depress the  key to enable the Counter function.

Counter function cancellation

Depress the CLR key to disable.

10) Magnification Display Selection Procedure

Magnification display selection

1. Use the  ,  , SHIFT +  , and SHIFT +  keys to move the cursor to the "Mag" display on Screen-2, then depress the  key.
2. The message, **"Select Mag 1 = OBJ 2 = FILM 3 = EYE or ↵."** appears on the display.

Objective magnification X Intermediate magnification display designation

3. Depress Key 1 to display the objective and intermediate magnification selector magnifications.

Total photomicrographic magnification display designation

Depress Key 2 to display the total photomicrographic magnification.

Total observation magnification display designation

Depress Key 3 to display the total observation magnification.

Objective magnification/ Numerical aperture setting

Depress the  key to set the objective magnification and numerical aperture.

(Objective magnification/Numerical aperture setting)

4. The display changes to Screen-4.
5. The cursor indicates the objective magnification presently in use, and the message, **"Use 0-9, CLR to input Mag and ↵."** is displayed.

Objective magnification setting

6. Use Keys 0 ~ 9 to input an objective magnification value of 1x – 200x. Depress the CLR key when no objective is installed, when changing the input value, or when clearing to 0.
7. Depress the  key to signify input completion. The cursor then moves to the position indicating the objective's

numerical aperture, and the message, **"Use 0-9, CLR to input N.A. and ↵ ."** appears on the display. To return to Screen-2 from Screen-4. depress the SHIFT + ⏎ keys.

Objective numerical aperture setting

8. Use Keys 0 ~ 9 to input a numerical aperture value of 0.01 – 1.5. Depress the CLR key when no objective is installed, when changing the input value, or when clearing to 0.
9. Depress the ↵ key to signify input completion. The cursor then moves to the position indicating the next objective's magnification (Refer to Step 6.). Rotate the nosepiece (forward) to the next objective, or depress the SHIFT + ⏎ keys to return to Screen-2 from Screen-4.
10. Moving the cursor to the position indicating eyepiece magnification displays the message, **"Use 0-9, CLR to input Eyepiece and ↵."**

Eyepiece magnification setting

11. Use Keys 0 ~ 9 to input an eyepiece magnification value of 1x – 20x.
12. Depress the ↵ key to signify input completion, returning operation to Step 6. Or, to return to Screen-2 from Screen-4. depress the SHIFT + ⏎ keys.

Note

- **Depress only the ↵ key in Steps 6, 8, and 11 if their previously set values are to be used again without modification.**

11) Data Print Function Setting Procedure

Data print function designation

1. Use the ←, →, SHIFT + ↑, and SHIFT + ↓ keys to move the cursor to the "Data Print" display on Screen-2, then depress the ↵ key.
2. The message, **"Select Data Print function ↵= ON CLR = OFF."** appears on the display.

Data print function selection

3. Depress the ↵ key to enable.

Data print function cancellation

Depress the CLR key to disable.

(Continue if selected.)

4. The message, **"Use 1-8 to select print item. ▲▼"** appears on the display.

Printed data selection

5. Use the following key selections to designate the data to be imprinted on the film.

Arbitrary data designation

Depress Key [1] to print the arbitrary data,

Shutter speed designation

Key [2] to print the shutter speed,

ISO value designation

Key [3] to print the film sensitivity value,

Exposure compensation value designation

Key [4] to print the exposure compensation value,

Film count/Frame number designation

Key [5] to print the film count/film frame No.,

Scale length designation

Key [6] to print the scale length,

Photomicrography magnification designation

Key [7] to print the photomicrographic magnification,

Photometric value designation

or Key [8] to print the photometric (Lux) value.

Note

- Use the [SHIFT] + [↑/] and [SHIFT] + [↓/] keys to display more detailed operations messages.

  (Message Contents)

  "1=Manual-Data 2=Shutter-Time 3=ISO ▲▼"

  "4=Exp=adj 5=Film-Count/Frame 6=Scale ▲▼"

  "7=Photo-Magnification 8=Lux-Meter. ▲▼"

(If Selection 1 is designated)

6. If arbitrary data is selected for imprint, the message, **"Use ← → to select MANUAL DATA."** appears on the display.

Registered data selection

7. Use the [←/] and [→/] keys to select the desired registered arbitrary data and depress the [MEM] key.

Arbitrary data registration

Depress the [↵/] key to register arbitrary data.

(Creating Arbitrary Data)

8. The display changes to Screen-5.

Character selection/ setting

9. The cursor indicates the position of the character, and the message, **"Use ← ↑ → ↓, MEM, CLR, 0-9, ↵ to set Data."** appears on the display.

   Use the [←/], [→/], [SHIFT] + [↑/], and [SHIFT] + [↓/] keys to move the cursor to select the desired characters (large & small case alphabets and special characters) for printer output data.

   Depress the [MEM] key to register the selected characters.

Number setting

Numbers can also be selected with depression of Keys [0] ~ [9].

10. Registered characters can be deleted with a depression of the [CLR] key. Depress the [SHIFT] + [MEM] keys to load, shifting the cursor to the next character registration position.

Count function setting

11. Depress the [/↵] key to signify input completion. The cursor then moves to the position indicating the count function setting position, and the message, **"Select count 1 = UP 2 = DOWN 3 = OFF or ↵."** appears on the display.

    Or, to return to Screen-2 from Screen-5, depress the [SHIFT] + [⌂/] keys.

Count-up function designation
Count-down function designation
Count function cancellation

12. Depress Key [1] to designate the count-up function,

    Key [2] to designate the count-down function,

    or Key [3] to cancel the count function.

    The cursor then shifts to the next data registration position, returning operation to Step 8.

    Or, to return to Screen-2 from Screen-5, depress the [SHIFT] + [⌂/] keys.

Note

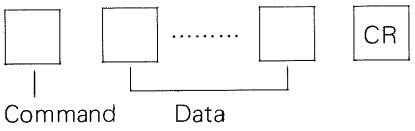
- **Depress only the [/↵] key in Steps 9 & 12 if their previously set values are to be used again without modification.**

Ⅳ. COMMUNICATION WITH HOST COMPUTER

Communication control functions using a host computer are explained in the following section.

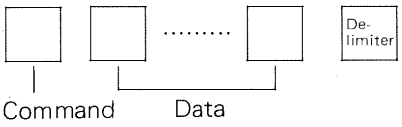
1. Communication Format

Host computer ⇒ FXA



(ASCII format)

FXA ⇒ Host computer



(ASCII format)

2. FXA Response to Host Computer Command

@	Command reception	?	Error

3. Communication Examples

Transmission from host computer to FXA

A	CR

Transmission from FXA to host computer

A	1	De-limiter

@	De-limiter

4. Command List

1) Special Commands

2) General command Group

1) Special Commands

(1) EXP Command

Exposure start order	!

(2) Lamp ON/OFF Command

Lamp ON/OFF order	,,

(3) Lamp Decrease Command

Lamp brightness reduction order	#

(4) Lamp Increase Command

Lamp brightness increase order	$

(5) Film Advance (Initialization) Command

Film advance-1 order	%
Note	• Please use the ! exposure command when using DX coded film.

(6) Film Advance (w/ Count) Command

Film advance-2 order	&

(7) MEMORY Command

MEMORY order	'

(8) Clockwise Nosepiece Rotation Command

Nosepiece clockwise rotation order | (

(9) Counterclockwise Nosepiece Rotation Command

Nosepiece counterclockwise rotation order |)

(10) Counter Count-up Command

Count-up order | *

(11) Counter Count-down Command

Count-down order | +

(12) Counter Reset Command

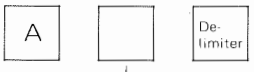
Count reset order | ,

2) General Command Group

(1) Camera Optical Path Selection Command

Present optical path status request

(FXA response)



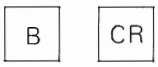
'1': Right-hand camera
'2': Center camera
'3': Left-hand camera

Optical path selection

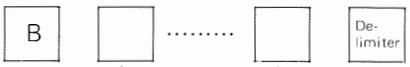
'1': Right-hand camera
'2': Center camera
'3': Left-hand camera

(2) Film ISO Value Preset Command

Film ISO value request

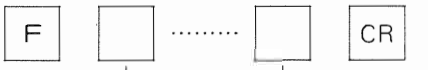


(FXA response)



ISO value data

Film ISO value setting



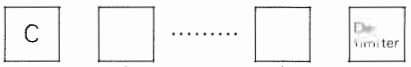
ISO value data (Range: 1~25,000)

Read-out from ISO value DX code

(3) Film Count Number Preset Command

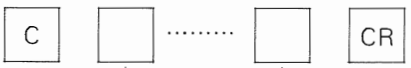
Film count No. request

(FXA response)



Film count No. data

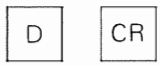
Film count No. setting



Film count No. data (Range: 0~999)

(4) Film Frame Number Preset Command

Frame No. preset value request



(FXA response)

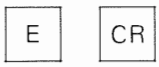
Frame No. preset value data

Frame No. setting

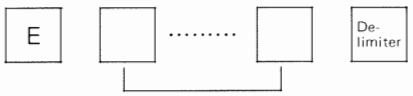
Frame No. preset value data (Range: 0~999)

(5) Exposure Compensation Value Preset Command

Exposure compensation value request



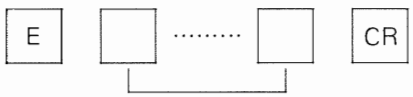
(FXA response)



Exposure compensation value data
(19 EV steps, from minus position)

'0': Reset
'1': Set

Exposure compensation value setting

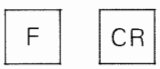


Exposure compensation value data
(MAX: 19 EV steps from minus position)

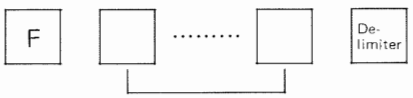
'0': Reset
'1': Set

(6) Multiple Exposure Number Preset Command

Multiple exposure No. value request

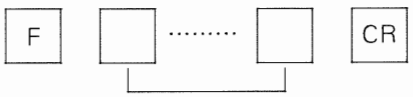


(FXA response)



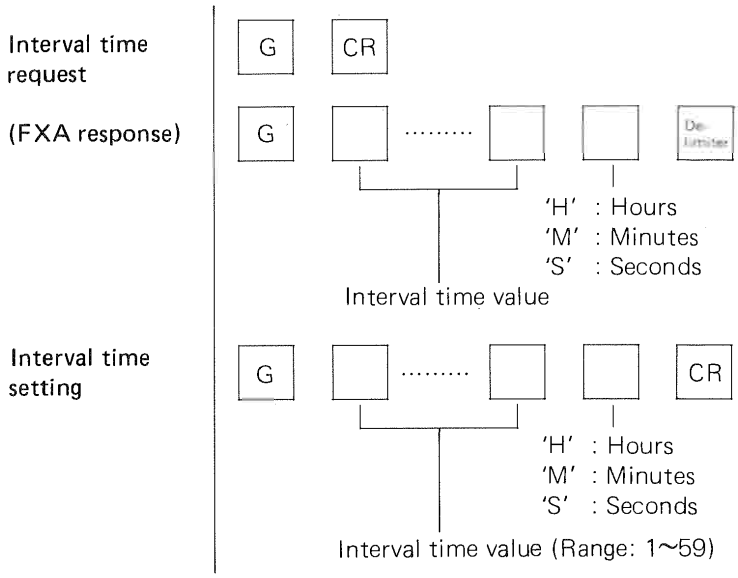
Multiple exposure No. value data

Multiple exposure No. value setting

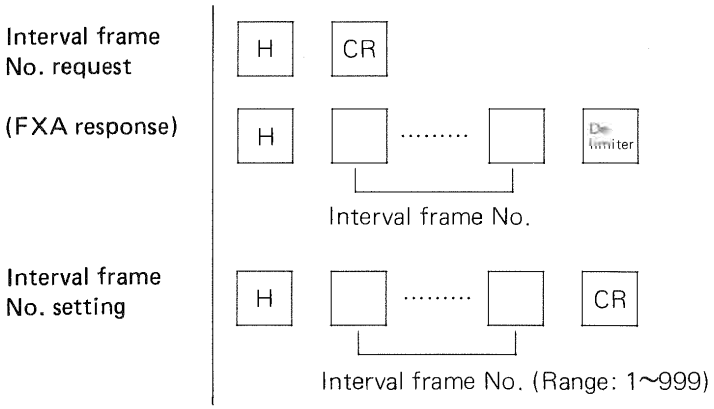


Multiple exposure No. value data
(Range: 2~999)

(7) Interval Time Preset Command

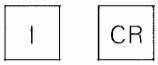


(8) Interval Frame Number Preset Command



(9) Data Print Preset Command

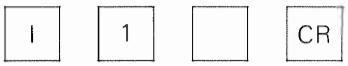
Data print request



(FXA response)

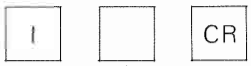
Print data (8 characters)

Arbitrary data setting



'1'~'6': Registered data No.

Other data setting



'2': Shutter speed
'3': Film ISO value
'4': Exposure compensation value
'5': Film count
'6': Scale length
'7': Magnification
'8': Photometric value (Lux)

Note

- "μm" scale length units converted to "microns" before output.
- The photometric value can only be designated when the shutter speed is set to AUTO.

(10) Shutter Speed Mode Preset Command

Shutter speed mode request

(FXA response)

'1': AUTO
'2': MANUAL
'3': TIME
'4': BULB
'5': MEMORY
'6': FLASH

Shutter speed mode setting

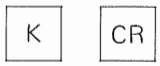
'1': AUTO
'3': TIME
'4': BULB

MANUAL mode setting

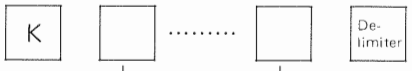
MANUAL time data (Range: 0.01~999.9)

(11) Lamp Voltage Preset Command

Lamp voltage value request



(FXA response)



Lamp voltage value data

Lamp voltage value setting

Lamp voltage value data (Range: 4.0~12.0)

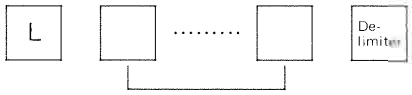
Note

- Lamp voltage setting cannot be performed if lamp is OFF. A lamp voltage value of "0.0" indicates the lamp is OFF.

(12) Objective Magnification Preset Command

Objective magnification value request

(FXA response)



Magnification value data

Magnification setting

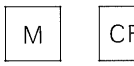
Magnification value data (Range: 1.0~200.0)

Note

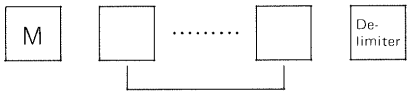
- Magnification data is output with decimal point when set for Episcopic illumination.
- Magnification data is output without decimal point when set for Diascopic illumination.

(13) Objective Numerical Aperture Preset Command

Objective numerical aperture value request

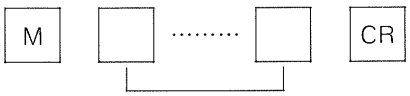


(FXA response)



Numerical aperture data

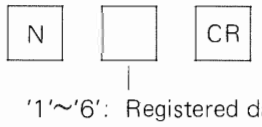
Numerical aperture setting



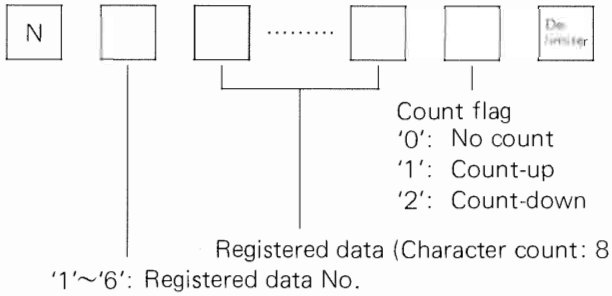
Numerical aperture data
(Range: 0.010~1.500)

(14) Arbitrary (Registered) Data Preset Command

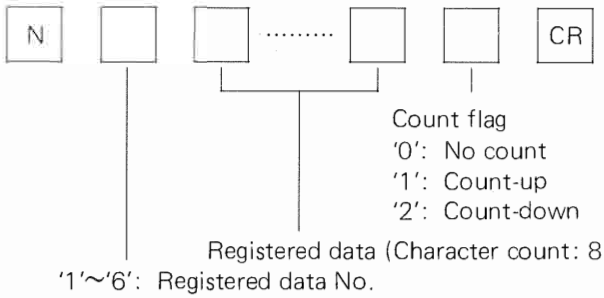
Registered data request



(FXA response)

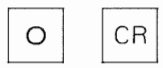


Registered data setting

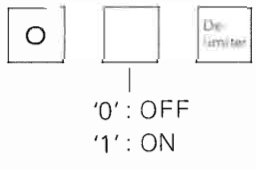


(15) Reticle ON/OFF Command

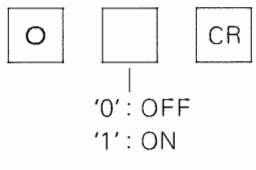
Reticle ON/OFF status request



(FXA response)



Reticle ON/OFF setting



(16) FXA Keyboard Lock/Release Command

FXA keyboard Lock/Release status request

P	CR

(FXA response)

P		De-limiter

'0': Release
'1': Lock

FXA keyboard Lock/Release setting

P		CR

'0': Release
'1': Lock

(17) Buzzer ON/OFF Command

Buzzer ON/OFF status request

Q	CR

(FXA response)

Q		De-limiter

'0': OFF
'1': ON

Buzzer ON/OFF setting

Q		CR

'0': OFF
'1': ON

(18) Film B/W / Color Preset Command

Film B/W / Color status request

R	CR

(FXA response)

R		De-limiter

'0': Color
'1': B/W

Film B/W / Color setting

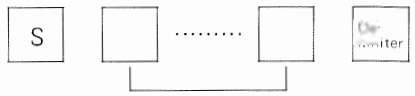
R		CR

'0': Color
'1': B/W

(19) Eyepiece Magnification Preset Command

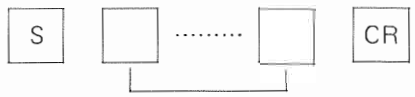
Eyepiece magnification value request

(FXA response)



Magnification data

Magnification setting



Magnification data (Range: 1~20)

(20) External Camera Designation Command

Preset position request

(FXA response)

'0': Not set
'1': Right-hand camera
'2': Center camera
'3': Left-hand camera

External camera setting

'0': Cancel
'1': Right-hand camera
'2': Center camera
'3': Left-hand camera

(21) Camera Sequence Preset Command

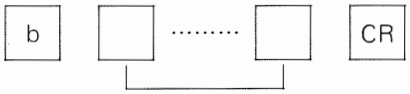
Camera sequence request

(FXA response)

Camera position data (Max.: 3)

'0': Not set
'1': Right-hand camera
'2': Center camera
'3': Left-hand camera

Camera sequence setting

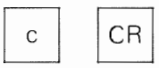


Camera position data (Max.: 3)

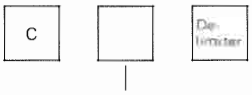
'0': Cancel
'1': Right-hand camera
'2': Center camera
'3': Left-hand camera

(22) Illumination Method Selection Command

Illumination method request

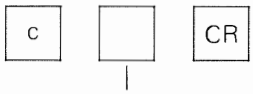


(FXA response)



'1': Episcopic illumination
'2': Diascopic illumination

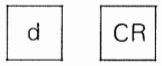
Illumination method selection



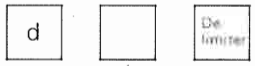
'1': Episcopic illumination
'2': Diascopic illumination

(23) PHOTO Function ON/OFF Command

PHOTO function ON/OFF status request



(FXA response)



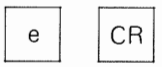
'0': PHOTO function OFF
'1': PHOTO function ON

PHOTO function ON/OFF setting

'0': PHOTO function OFF
'1': PHOTO function ON

(24) Multiple Exposure Function ON/OFF Command

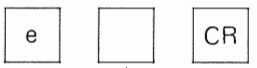
Multiple exposure function ON/OFF status request



(FXA response)

'0': Multiple exposure function OFF
'1': Multiple exposure function ON

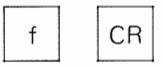
Multiple exposure function ON/OFF setting



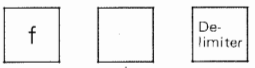
'0': Multiple exposure function OFF
'1': Multiple exposure function ON

(25) Interval Function ON/OFF Command

Interval function ON/OFF status request

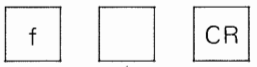


(FXA response)



'0': Interval photomicrography OFF
'1': Interval photomicrography ON

Interval function ON/OFF setting

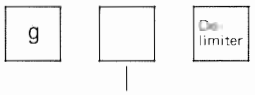


'0': Interval photomicrography OFF
'1': Interval photomicrography ON

(26) Data Print Function ON/OFF Command

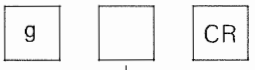
Data print function ON/OFF status request

(FXA response)



'0': Data print function OFF
'1': Data print function ON

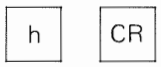
Data print function ON/OFF setting



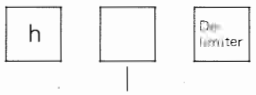
'0': Data print function OFF
'1': Data print function ON

(27) Photometer Display Function ON/OFF Command

Photometer display function ON/OFF status request



(FXA response)



'0': Photometer display function OFF
'1': Photometer display function ON

Photometer display function ON/OFF setting

'0': Photometer display function OFF
'1': Photometer display function ON

Note

- **The photometer display function can only be set while the shutter speed mode is set to AUTO.**

(28) Photometer Display Mode Selection Command

Photometer display mode request

(FXA response)

'1': Simple photometric value display mode
'2': Subtracted photometric value display mode
'3': Relative photometric value display mode

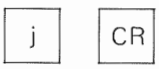
Photometer display mode setting

'1': Simple photometric value display mode
'2': Subtracted photometric value display mode
'3': Relative photometric value display mode

Background/ standard setting

(29) Counter Function ON/OFF Command

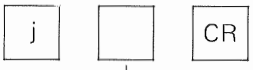
Counter function ON/OFF status request



(FXA response)

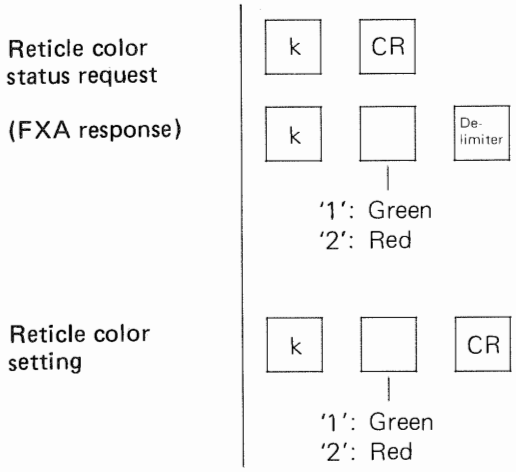
'0': Counter function OFF
'1': Counter function ON

Counter function ON/OFF setting

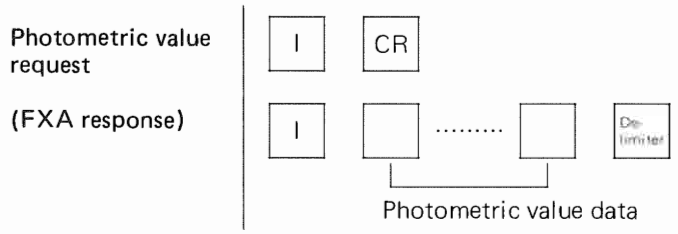


'0': Counter function OFF
'1': Counter function ON

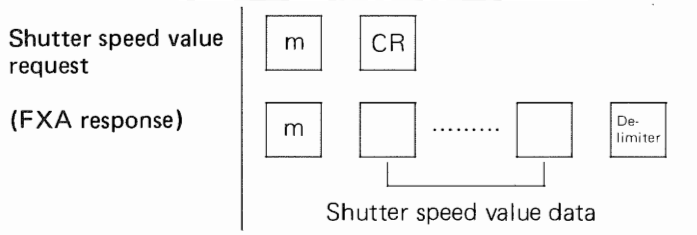
(30) Reticle Color Selection Command



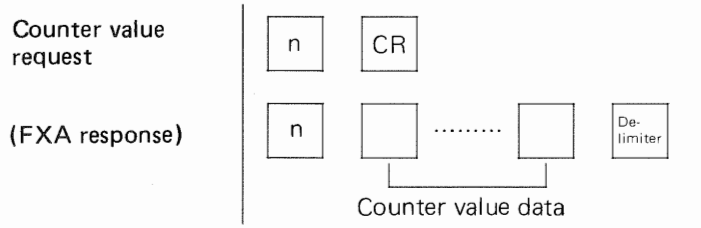
(31) Photometric Value Request Command



(32) Shutter Speed Value Request Command



(33) Counter Value Request Command



(34) Photometric Method (SPOT/AVE) Request Command

Photometric method request: o CR

(FXA response): o [ ] De-limiter

'1': SPOT
'2': AVE

(35) Camera Mounting Status Request Command

Camera mounting status request: p CR

(FXA response): p [ ] [ ] [ ] De-limiter

'0': No left-hand camera mounted
'1': Left-hand camera mounted

'0': No center camera mounted
'1': Center camera mounted

'0': No right-hand camera mounted
'1': Right-hand camera mounted

(36) Large Format/35mm Mounting Status Request Command

Large format/35mm mounting status request: q CR

(FXA response): q [ ] De-limiter

'0': 35mm camera mounted
'1': Large-format camera mounted

(37) Optional Mounting (Motorized Nosepiece, Motorized Condenser) Status Request Command

Optional mounting status request: r CR

(FXA response): r [ ] [ ] De-limiter

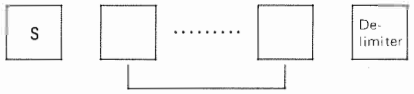
'0': No motorized condenser mounted
'1': Motorized condenser mounted

'0': No motorized nosepiece mounted
'1': Motorized nosepiece mounted

(38) Intermediate Magnification Selector Value Request Command

Intermediate magnification selector value request

(FXA response)



Intermediate magnification selector value data

(39) Nosepiece Position Request Command

Nosepiece position request

(FXA response)

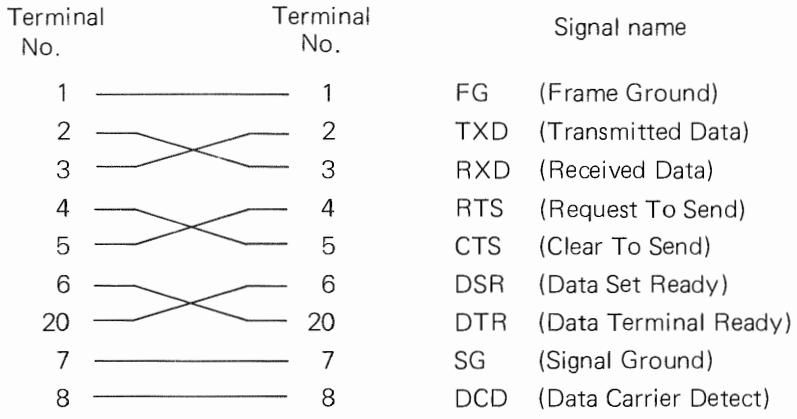
'0': Intermediate position
'1'–'6': Nosepiece position No.

Note

- **Please refer to the nosepiece unit for the nosepiece position No.**

5. RS232C Signal Cable

Please refer to the wiring diagram shown below for the RS232C signal cable specifications.



Note

1. **The EXP command is rejected when the shutter speed mode is set to "TIME" or "BULB".**
2. **The delimiter can be set at the DIP switch when transmitting data from the MICROPHOT-FXA to the host computer.**

V. PRINTER OUTPUT

Printer output functions are explained in this section.

1. Printer Output Data

The following subjects can be arbitrarily selected at the keyboard for output as data to a printer.

1) Shutter speed
2) Film count/Film frame No.
3) Lamp voltage value
4) ISO value
5) Exposure compensation value
6) Multiple exposure value
7) Interval value
8) Print data
9) Photometric value
10) Magnification
11) Counter value

2. Printer Output Format

The data output format (Heading + Data) is shown below.

1) Shutter speed

(Output format)

* Time *
12M23S

(Explanation)

The shutter speed is output following the above format.
(Shutter open time data is output when the shutter speed mode is set to "TIME" or "BULB".)

2) Film count/Film frame No.

(Output format)

* Film *
12/ 36

(Explanation)

The film count and film frame No. are output following the above format.
(Numerator: Film count; Denominator: Frame No.)

3) Lamp voltage value

(Output format)

* Lamp *
9.5

(Explanation)

The lamp voltage value is output following the above format.
(Unit of measure not output.)

4) **ISO value**

(Output format)

* ISO *

100

(Explanation)

The film sensitivity (ISO value) is output following the above format.

5) **Exposure compensation value**

(Output format)

* Exp. adj *

-3.1/3

(Explanation)

The exposure compensation value is output following the above format.

6) **Multiple exposure value**

(Output format)

* Multi. Exp *

2/ 3

(Explanation)

The multiple exposure count and repetition No. are output following the above format.

(Numerator: Multiple exposure count; Denominator: Multiple exposure No.)

(A multiple exposure count value of "0" indicates the multiple exposure function is OFF.)

7) **Interval value**

(Output format)

* Interval *

20M- 3f

(Explanation)

The interval time and frame count are output following the above format.

(A frame count value of "0" indicates the interval function is OFF.)

8) **Print data**

(Output format)

* Print Data *

87-08-18

(Explanation)

The printed data is output following the above format.

(When the scale length is selected for data print, "μm" is converted to "micron" for output.)

9) **Photometric value**

(Output format)

A. Simple photometric value mode

* Lux Meter *

23.5 Lx

B. Subtracted photometric value mode

* Lux Meter *

0.20

C. Relative photometric value mode

* Lux Meter *

@ 0.46

(Explanation)

The photometric value is output following the above format (corresponding to the preset mode: 3 selections). The photometric value can only be output when the shutter speed mode is set to "AUTO".

10) Magnification

(Output format)

A. OBJ mode

* Mag *

10x 1.25

B. FILM mode

* Mag *

FILM 2000X

C. EYE mode

* Mag *

EYE 400X

(Explanation)

The magnification is output following the above format (corresponding to the preset mode: 3 variations).

11) Counter value

(Output format)

* Counter *

345

(Explanation)

The counter value is output following the above format.

Note

1. Data is output to the printer after the shutter is closed. Therefore, when the multiple exposure function is designated, the film frame No. and the output data No. will not match.
2. Heading and data can be set for either vertical or horizontal output via the DIP switch.
3. When the photomicrographic sequence is preset, the camera position information can be output as a supplement.

Ⅵ. DIP SWITCH

The DIP switch setting options are described in the following section. (Read-out when main power is switched ON.)

OPTION-1

D8	D7	D6	D5	D4	D3	D2	D1

D1: Ever OFF
D2: English/Japanese display selection switch
OFF: English
ON: Japanese
D3: Keyboard buzzer ON/OFF select switch
OFF: Buzzer OFF
ON: Buzzer ON
D4: Epi-fluorescence/Differential interference system unit mounting switch
OFF: Not mounted
ON: Mounted
D5 – D8: Unused

OPTION-2

D8	D7	D6	D5	D4	D3	D2	D1

D1, D2: RS232C delimiter setting switch

D2	D1	
OFF	OFF	: CR+LF
OFF	ON	: LF
ON	OFF	: CR
ON	ON	: No delimiter

D3: Vertical/Horizontal printer output selection switch
OFF: Vertical
ON: Horizontal
D4 – D8: Ever OFF

Ⅶ. ERROR MESSAGE TROUBLE-SHOOTING DURING OPERATION

1. During Data Setting Operation (Input)

Error Message	Cause	Countermeasure
"Set Film count within (0-999)!"	• Input value exceeds range of 0-999 during film count setting.	• Depress [CLR] key to reset to 0. Then reinput film count value within the range of 0-999.
"Set Film frame within (0-999)!"	• Input value exceeds range of 0-999 during setting of film frame No.	• Depress [CLR] key to reset to 0. Then reinput film frame No. value within the range of 0-999.
"Set ISO within (1-25000)!"	• Input value exceeds range of 1-25000 during setting of film sensitivity (film ISO) value.	• Depress [CLR] key to reset to 0. Then reinput film sensitivity value within the range of 1-25000.
"DX code undetectable!"	• Uncoded film used to set film sensitivity via DX code. • Cable between DX camera and main unit not connected.	• Set film sensitivity manually. • Check 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.

Error Message	Cause	Countermeasure
"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.
"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 OBJECTIVE N.A. within (0.01-1.5)!"	• Input value exceeds range of 0.01-1.5 during setting of objective numerical aperture.	• Depress [CLR] key to reset to 0. Then reinput numerical aperture value within the range of 0.01-1.5.
"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.

2. Miscellaneous

Error Message	Cause	Countermeasure
"Memorized Data lost!"	• Memorized data are lost.	• Reinput data.
"Set Shutter speed "AUTO" for Photo-meter!"	• Attempt made to set photometric value display function when shutter speed mode is not set to "AUTO".	• Set shutter speed 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 shutter speed range. ("OVER" or "UNDER" warning displayed.)	• Confirm shutter speed 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.

3. 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!"	Displayed if shutter ceases to function correctly.
"Light Path Switching failure!"	Displayed if system cannot switch between camera optical paths.
"Quick Return Mirror failure!"	Displayed if quick return mirror ceases to function correctly.
"Nosepiece Rotation failure!"	Displayed if motorized nosepiece ceases to function correctly.
"Condenser Rotation failure!"	Displayed if motorized condenser ceases to function correctly.

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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Printed in Japan

(88.6.c)H·E-1N