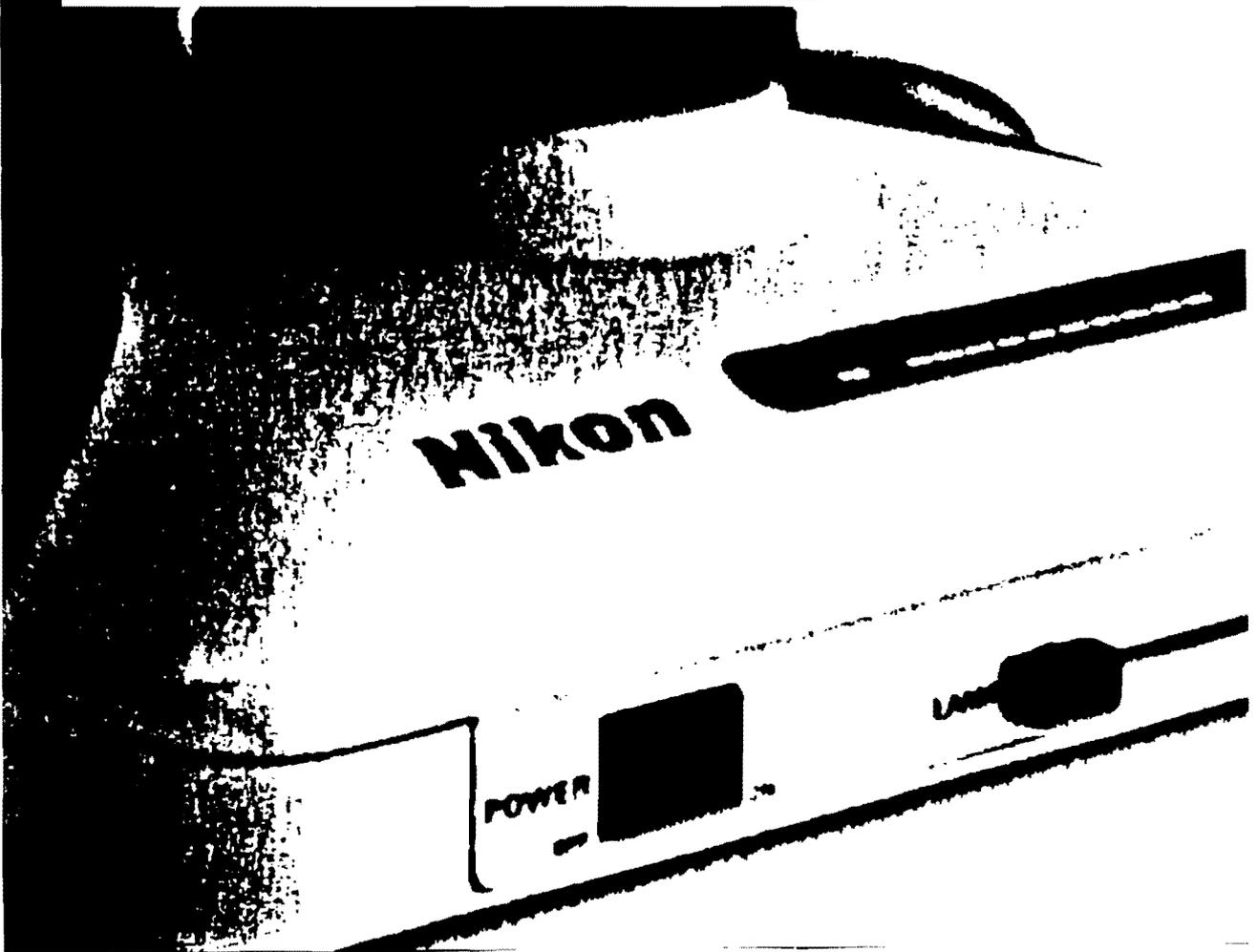
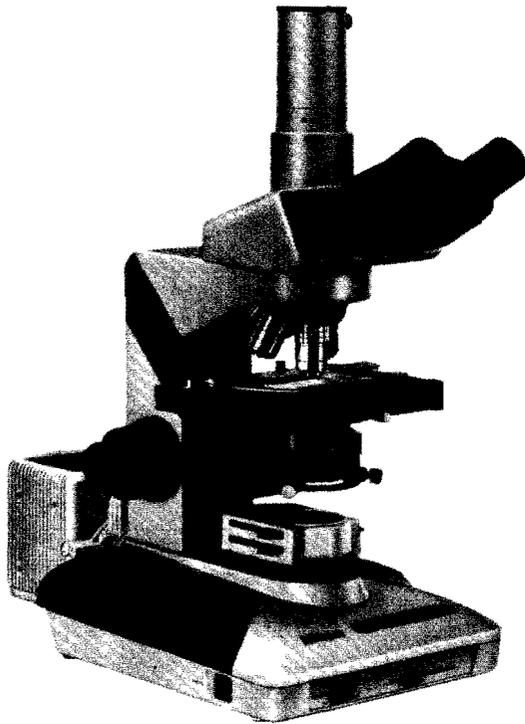


Nikon

INSTRUCTIONS

OPTIPHOT-2





Thank you very much for purchasing a Nikon Microscope. This microscope is a high precision instrument with a very delicate structure and varied functions. Please thoroughly read this manual first to use the microscope correctly.

CAUTIONS

1 Avoid Strong Shocks!

Handle the microscope gently, taking care to avoid strong shocks.

2 When Carrying the Microscope

When carrying the microscope, support the bottom of the microscope base. The instrument weighs about 11.5 kg. Do not hold the overhanging portion of the base.

3 Place of Use

Avoid the use of the microscope in a dusty place, or where it may be subject to vibrations, or exposed to high temperatures, moisture, or direct sunlight.

4 Power Source Voltage and Fuse

Check the power source voltage and fuse following the procedure on p.6.

5 Light Source

The halogen bulb to be used is 12V-100W. Do not use bulbs other than the one specified in p.31 (electrical specifications).

If a bulb of more than the suggested wattage is used, the light adjusting circuit may be damaged.

6 Turning on the Lamp

Take care not to touch the lamp housing when it is lit, and don't bring inflammable substances such as gasoline, thinner and alcohol near it, as some parts of the lamp housing may become very hot while the lamp is on.

7 Changing the Bulb and Fuse

Before replacing the bulb or fuse, turn OFF the main switch and disconnect the power source plug. Replace the halogen lamp (12V-100W), making sure that it is cool enough. Do not touch the glass part with your bare hands.

8 Dirt on the Lens

Do not leave dust, dirt, or finger marks on the lens or bulb surfaces.

They will prevent you from clearly observing the specimen.

9 Focus Knobs

Never attempt to adjust the tightness of the right- and left-hand focus knobs by turning one, while holding the other. It may cause problems. Do not turn the coarse focus knobs past the limit. Avoid turning it forcibly, because it may cause problems.

CARE AND MAINTENANCE

1 Cleaning the Lenses

To clean the lens surfaces, remove dust using a soft brush or gauze. Only when removing finger marks or grease, use a soft cotton cloth, lens tissue, or gauze lightly moistened with **pure alcohol** (methyl alcohol or ethyl alcohol). **For cleaning the objectives of immersion oil use only xylene.** Do not use xylene for cleaning the surface of the entrance lens of the eyepiece tube or the prism surface of the Ultra-Wide Eyepiece Tube "UW". Observe sufficient caution in handling alcohol and xylene, (they are in flammable), and the ON-OFF of the power source switch.

2 Cleaning the Painted Surfaces

Avoid the use of any organic solvent (for example, thinner, ether, alcohol) for cleaning the painted surfaces and plastic parts of the instrument. We recommend you use the attached silicon cloth.

3 Never Attempt to Dismantle!

Never attempt to dismantle the instrument because you may impair the functions.

4 When Not in Use

When not in use, cover the instrument with the accessory vinyl cover, and **store it in a place free from moisture and fungus.** It is especially recommended that the objectives and eyepieces be kept in an airtight container containing desiccant.

5 Periodic Checking

To maintain the best performance of the instrument, we recommend that the instrument be periodically checked. (For details of this check, contact your authorized Nikon distributor.)

★Please note per your Nikon warranty, "Any defects or damage directly or indirectly caused by the use of unauthorized replacement parts and/or performed by unauthorized personnel" will void the warranty.

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I . NOMENCLATURE

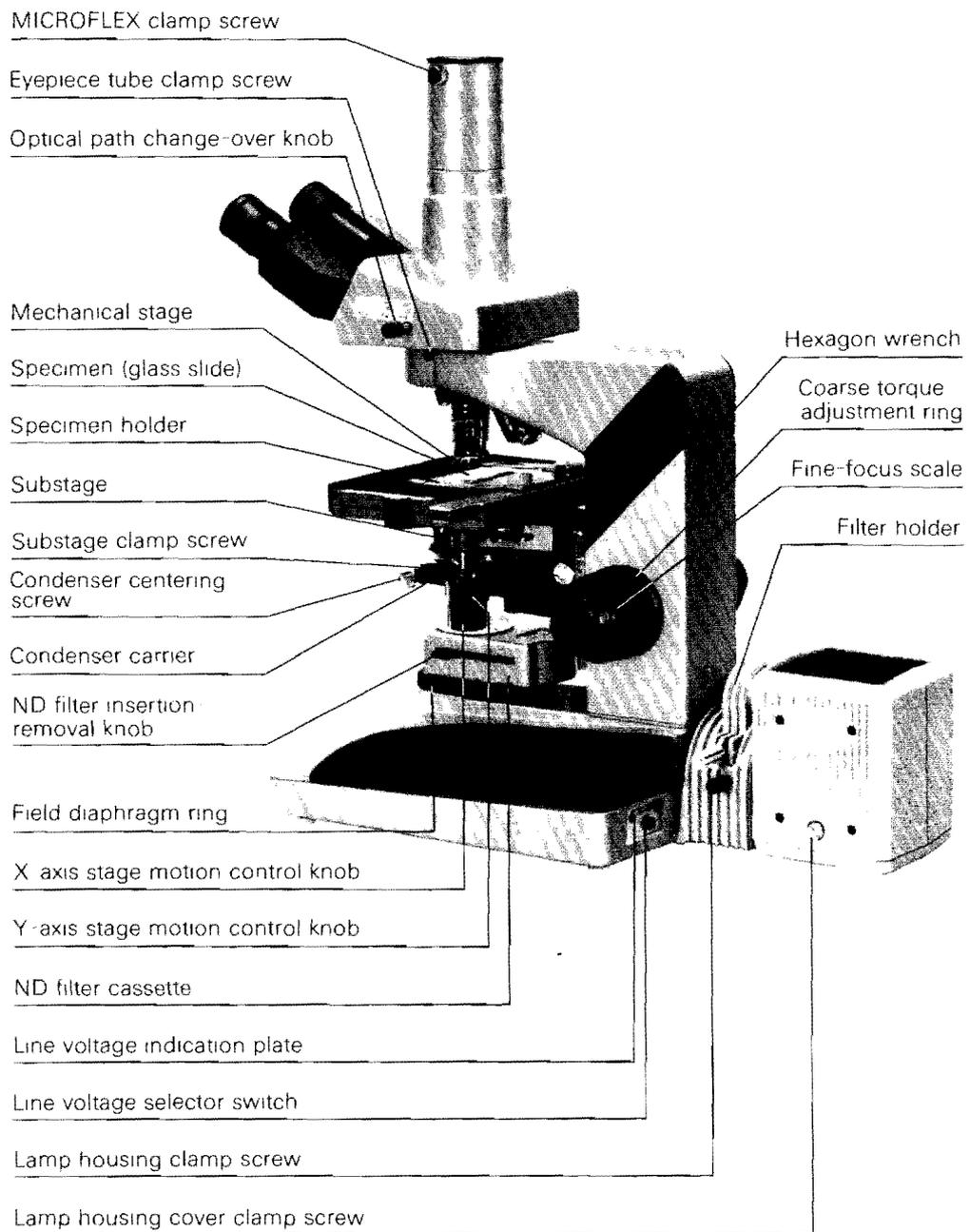


Fig.1-1

I . NOMENCLATURE

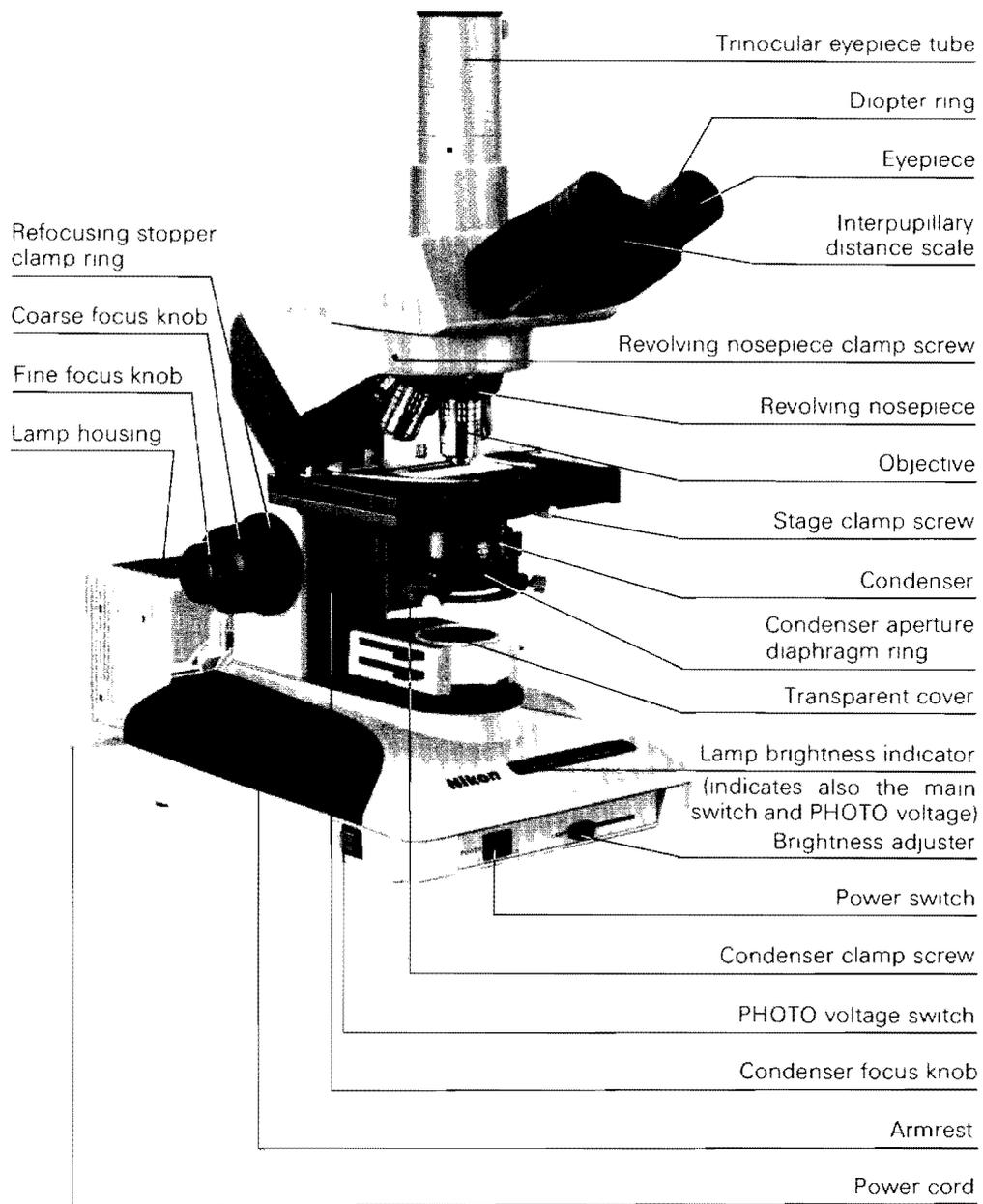
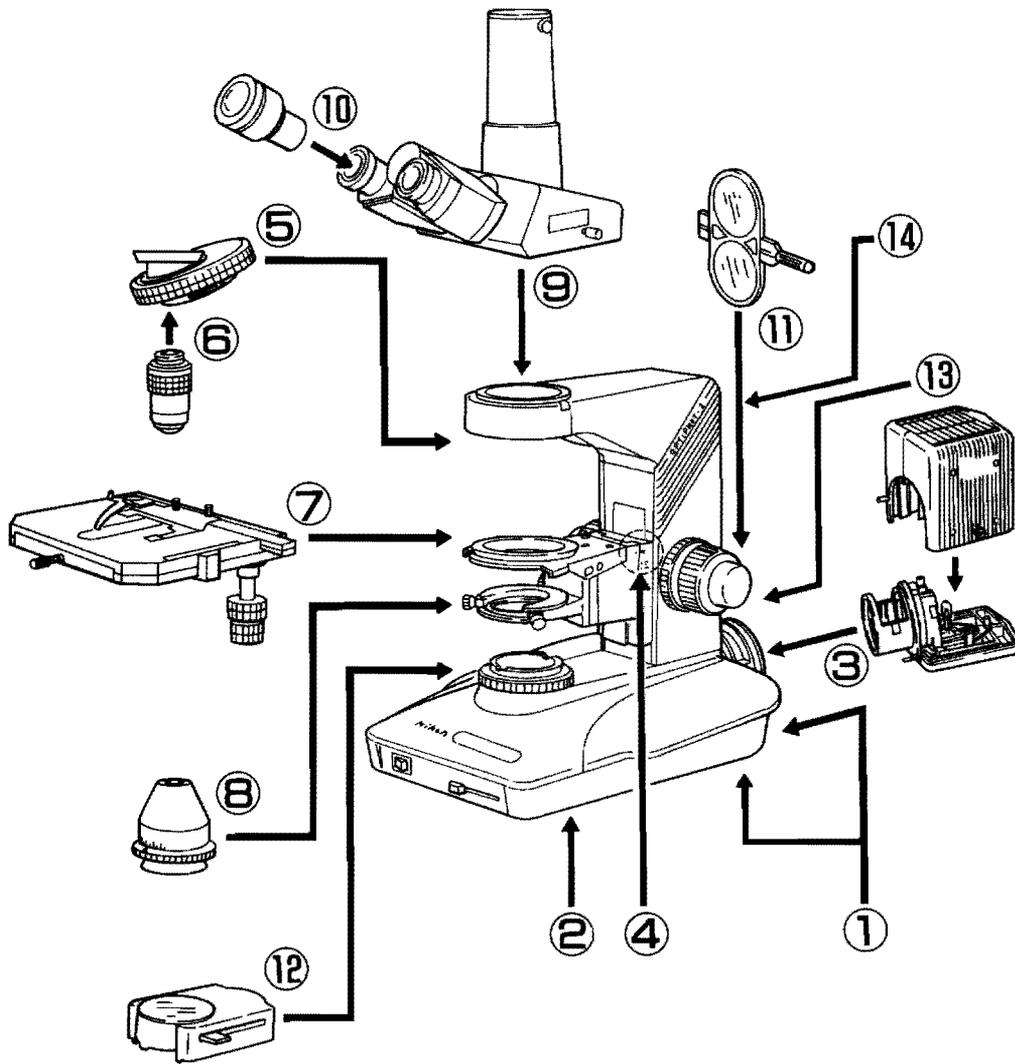


Fig. 1-2

II . ASSEMBLY (mounting and dismantling)

To assemble the microscope, follow the procedures given from ① to ⑭.
For details, read p.6 to p.13.



5

Tools: hexagon wrench (accessory), plus screwdriver, minus screwdriver

II. ASSEMBLY

① Check the Power Source Voltage and Fuse

- Disconnect the power cord from the AC input connector. (Make sure that it is disconnected.)
- Make sure that the line voltage indication plate at the rear of the base indicates the correct line voltage to be used (100-120V or 220-240V) (Fig. 2-1).
When it indicates incorrect voltage, remove the line voltage indication plate by unscrewing the two screws using a plus screwdriver.
- Mount the line voltage indication plate after switching the input voltage change-over switch to indicate correct voltage.

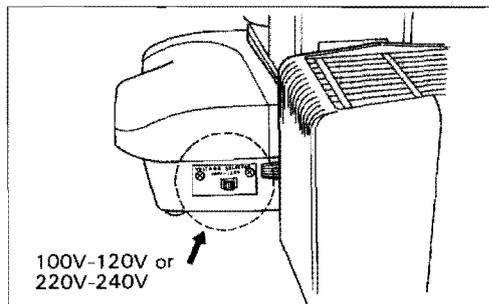


Fig. 2-1

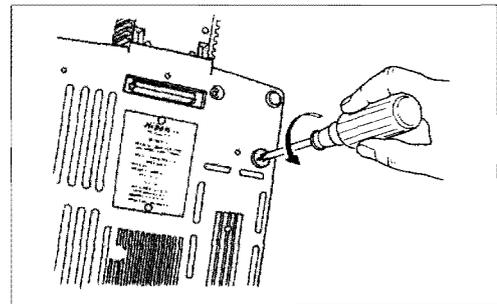


Fig. 2-2

- Remove the fuse holder at the bottom of the base using a plus screwdriver (Fig. 2-2) and make sure that the metal part of the fuse indicates "125V 3.15A" for 100-120V or "250V T2A" for 220-240V.
When incorrect fuse type is to be inserted, please contact your authorized Nikon distributor.
- Insert the fuse into the fuse holder and tightly screw it into the original position using a plus screwdriver.

② Leveling Foot Screw

- For stable installation of the microscope, manipulate the adjustment screw at the rear-left of the base (Fig. 2-3).

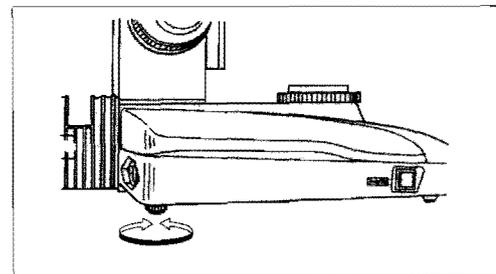


Fig. 2-3

③ Mounting Lamp and Lamp Housing

Keep the cover on or use gloves when mounting the lamp bulb so as not to touch the surface directly with your fingers.

If finger marks or dirt on the bulb surface, wipe them off with lens tissue. Make sure to remove the cover after mounting the lamp.

- Release the housing cover clamp screw using a coin **1** to remove the cover **2**.
- While pulling down the lamp clamp lever **3**, firmly insert the lamp into the socket pin holes until it reaches the limit **4** (Fig. 2-4).

Caution:

Be careful not to tilt the lamp when mounting. If tilted, try again.

- Return the lamp clamp lever to the original position.
- Close the cover and fasten it with the lamp housing cover clamp screw.
- Insert the lamp housing into the lamp housing mount of the microscope base fitting the groove of the lamp housing to the turning limit pin of the lamp housing mount **5** and fasten it firmly with the clamp screw of the lamp housing **6** (Fig. 2-5).

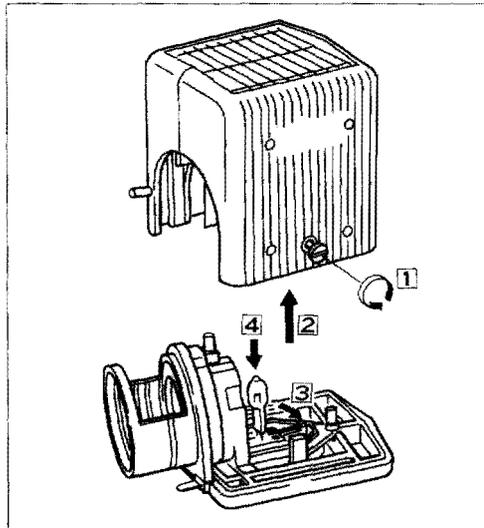


Fig. 2-4

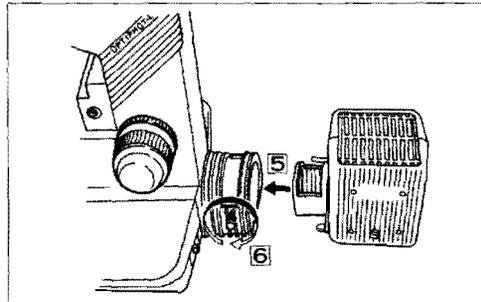


Fig. 2-5

Cautions when dismantling

- Turn off the main switch. (Make sure that it is off.) **Do not touch the bulb immediately after turning it off** because it is very hot. Make sure that the bulb has cooled enough when replacing it.
- To remove the lamp housing, remove the filter holder, release the lamp housing clamp screw and pull out the lamp housing from the base.

II.ASSEMBLY

④ Make Sure of the Position of the Substage

- Make sure that the white ● mark on the substage side lines up with the white ◀ mark on the microscope stand side (Fig. 2-6).
- If they don't meet, release the substage clamp screw using a minus screwdriver. Support the substage by hand so it doesn't drop. Move the substage vertically to adjust the marks and then fasten it.

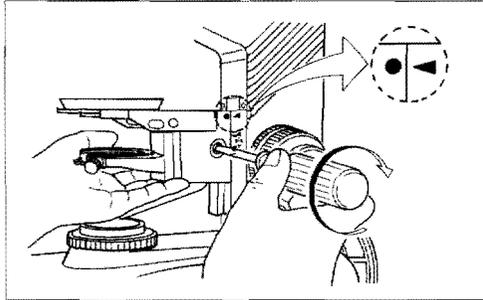


Fig. 2-6

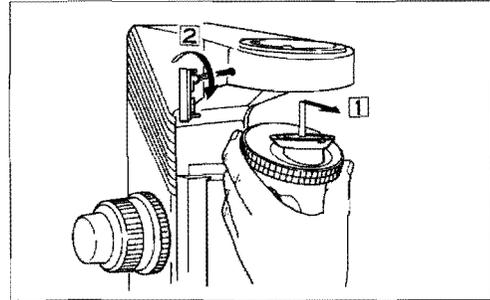


Fig. 2-7

⑤ Mounting and Dismantling the Revolving Nosepiece

- Lower the substage by turning the coarse focus knob.
- Loosen the revolving nosepiece clamp screw sufficiently using the hexagon wrench. (See ④.)
- To mount the revolving nosepiece push it in so the groove of the revolving nosepiece engages with the pin of the circular dovetail 1. Fasten it with the revolving nosepiece clamp screw 2 (Fig. 2-7).

Cautions when dismantling

- Remove the ND filter cassette when it is attached and lower the stage by turning the coarse focus knob.
- Remove the objective if attached.
- To remove the revolving nosepiece, sufficiently loosen the revolving nosepiece clamp screw using the hexagon wrench. Support the revolving nosepiece so it doesn't drop.

★ Reversed revolving nosepiece and forward revolving nosepiece

Though the standard mounting method of the revolving nosepiece of this microscope is backward (reversed), it can also be mounted facing forward.

Use the following procedures to mount forwardly.

- Loosen the three bolts, with hexagon holes, on the cover of the nosepiece mount using the hexagon wrench 1 (see ④) to remove the cover 2.

Keep the three bolts, however, screwed in (Fig. 2-8).

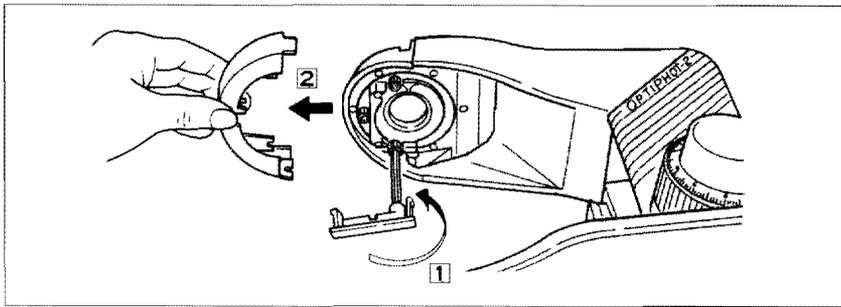


Fig. 2-8

- Loosen the three bolts with hexagon holes on the circular dovetail for mounting the eyepiece tube (integrated with the circular dovetail for mounting the revolving nosepiece) by using the hexagon wrench ③. Remove the circular dovetail ④. Mount and turn it 180°, ⑤ and ⑥, then fasten it with the three bolts with hexagon holes firmly and equally ⑦ (Fig. 2-9).
(When removing the circular dovetail, keep the revolving nosepiece clamp screw fastened.)

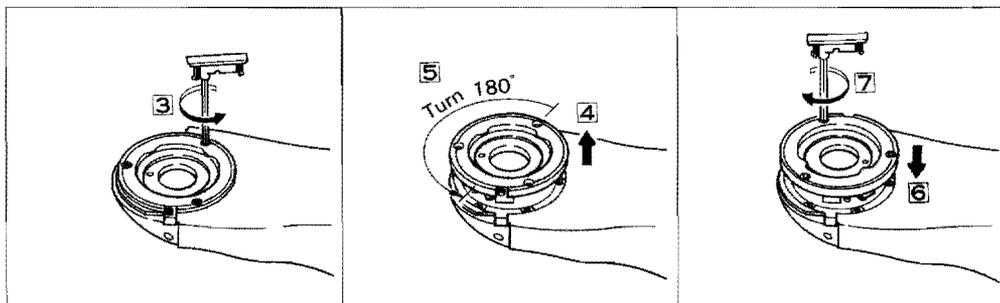


Fig. 2-9

- Sufficiently loosen the revolving nosepiece clamp screw using the hexagon wrench. To mount the revolving nosepiece push it so the groove of the revolving nosepiece engages with the pin of the circular dovetail ⑧. Fasten it with the revolving nosepiece clamp screw ⑨ (Fig. 2-10).
When mounting forwardly, the clamp screw is on the right side of the arm.

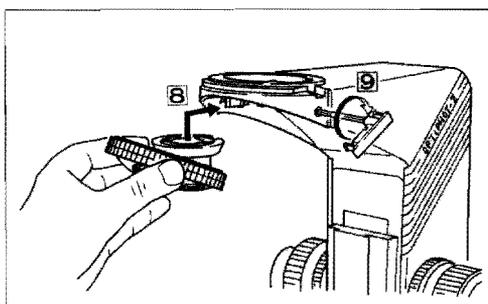


Fig. 2-10

⑥ Mounting and Dismantling the Objectives

- Mount the objectives into the holes of the revolving nosepiece in such positions that, when viewed from above, their magnifying power increases as the nosepiece is revolved clockwise (Fig. 2-11).

Cautions when dismantling

- Remove the ND filter cassette if attached and lower the stage by turning the coarse focus knob.
- Remove any specimen if it is on the stage.
- Hold the objective with both hands so as not to drop it when removing it from the revolving nosepiece.

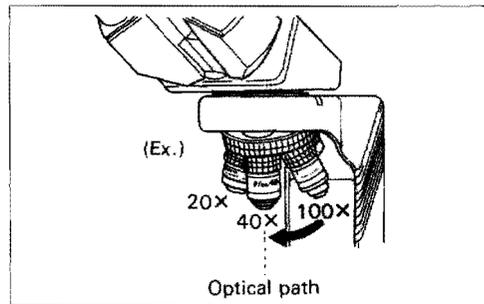


Fig.2-11

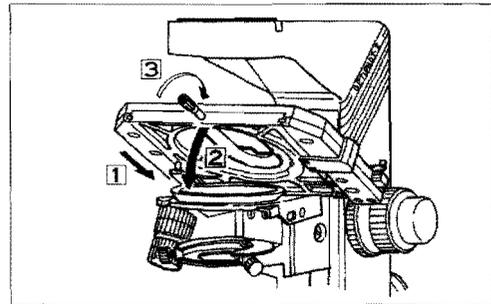


Fig.2-12

⑦ Mounting the Stage

- Lower the substage by turning the coarse focus knob.
- Loosen the stage clamp screw sufficiently.
- Insert the stage into the circular dovetail of the stage mount of the substage, ① and ②. Fasten the stage with the stage clamp screw ③ (Fig. 2-12).

Specimen Holder

- The specimen holder should be fastened to the mounting hole on the right side for a left-knob stage and on the left side for a right-knob stage. Remove the specimen holder when observing a large specimen.

⑧ Mounting and Dismantling the Condenser Lens

- Raise the substage by turning the coarse focus knob.
- Lower the condenser carrier to its limit by turning the condenser focus knob.
- Insert the condenser lens into the condenser carrier ① with the aperture number plate facing toward the user. Fasten it with the condenser clamp screw ② (Fig. 2-13).
- Raise the condenser carrier to its limit by turning the condenser focus knob.

Cautions when Dismantling

- Remove the ND filter cassette if attached.
- Lower the condenser carrier to its limit by turning the condenser focus knob. Remove the condenser lens by releasing the condenser clamp screw.

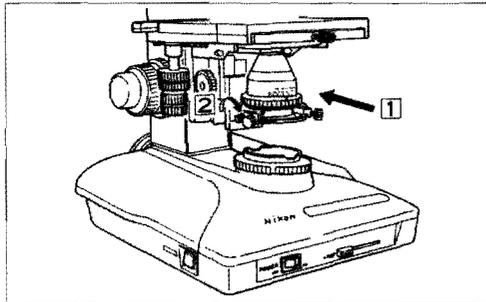


Fig. 2-13

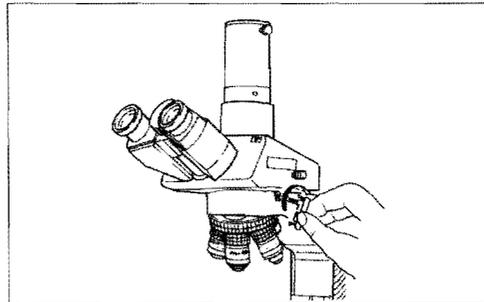


Fig. 2-14

⑨ Mounting the Trinocular Eyepiece Tube

- Loosen the eyepiece tube clamp screw sufficiently using the hexagon wrench. (See ⑭.)
- Insert the circular dovetail of the trinocular eyepiece tube into the circular dovetail of the eyepiece tube mount. Fasten it with the eyepiece tube clamp screw (Fig. 2-14).

⑩ Mounting the Eyepiece

- Use the same magnification eyepieces for both the right and left eyes.
- Insert the eyepieces into the sleeves of the trinocular eyepiece tube by engaging the three grooves of the eyepiece with the three protrusions of the sleeve (Fig. 2-15).
- When using eyeguard rubbers, insert them into the eyepieces (Fig. 2-16).

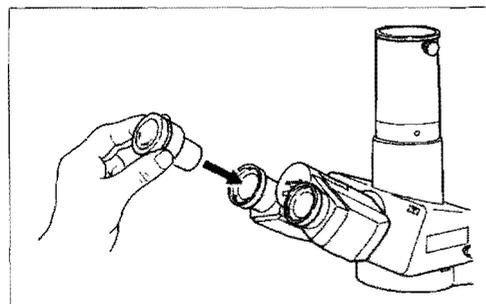


Fig.2-15

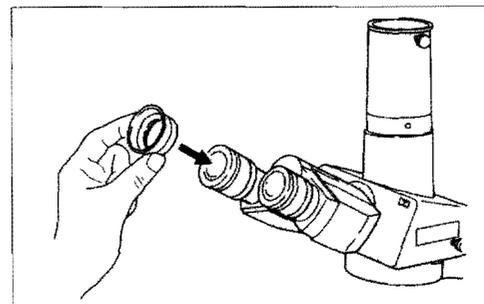


Fig.2-16

⑪ Mounting and Dismantling the Filter

When mounting/dismantling the filter to/from the filter holder, use gloves or gauze so as not to touch the filter directly with your bare hands.

- Mount the filter to be used as shown in Fig. 2-17- ①. NCB11, GIF, and ND filters should be mounted to match their respective indications. The HE filter can be mounted using the position for either the NCB11 or GIF filter, or to a filter holder with an ND indication.
- Push the filter holder down into the filter holder mount (Fig. 2-18). Keep the three filter holders mounted to give protection from dust even when the filters are not mounted.
- When removing the filter, push the filter as shown in Fig. 2-17- ②.

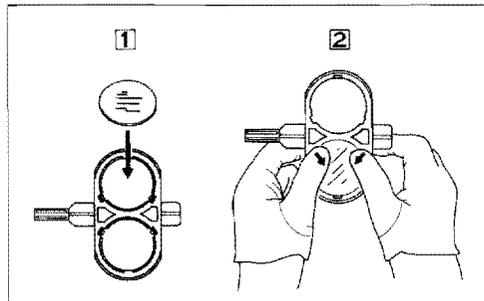


Fig. 2-17

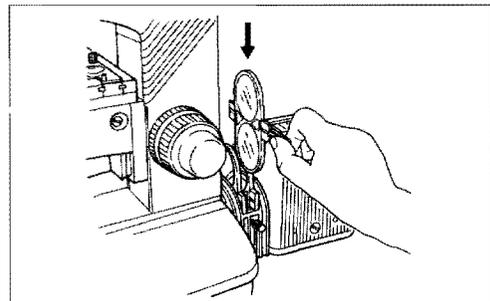


Fig. 2-18

⑫ Mounting and Dismantling the ND Filter Cassette

- Push down the ND filter cassette from the top so the two protrusions of the lower part of the ND filter cassette fit with the two mounting grooves on the rim of the field lens of the microscope base (Fig. 2-19).
- When frequently lowering the microscope stage, mount the ND filter cassette in the direction as shown in Fig. 2-20.
- When dismantling, push the cassette either to the left or right and raise the opposite side.

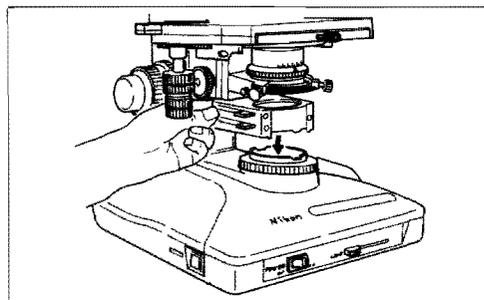


Fig. 2-19

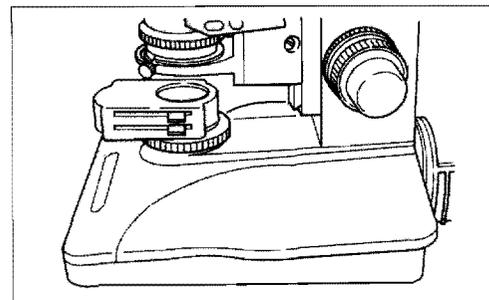


Fig. 2-20

⑬ Connecting the Power Cord

- Insert the socket of the power cord to the AC input connector and plug it into a AC line receptacle (Fig. 2-21).
- When the receptacle is not a double-pole ground type, use a plug converting adapter (Fig. 2-22).

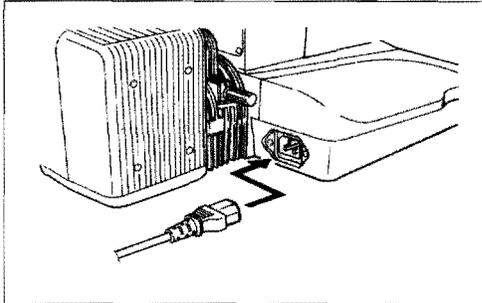


Fig. 2-21

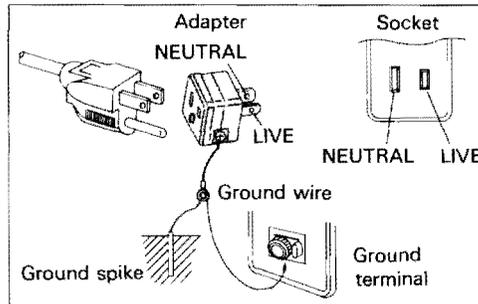


Fig. 2-22

⑭ Hexagon Wrench

- The hexagon wrench is stored in the back of the microscope stand. Take it out as shown in Fig. 2-23.

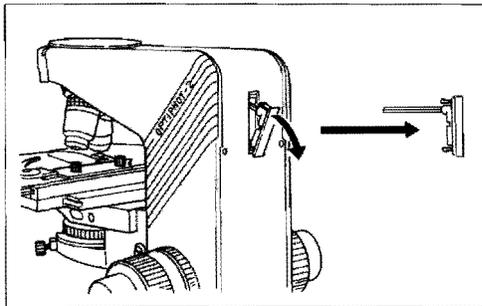


Fig. 2-23

III. MICROSCOPY

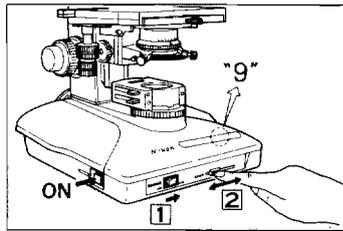


Fig.3-1

- 1) Turn the lamp on by setting the main switch to ON. Set the lamp brightness indicator to "9" using the brightness adjuster or by turning the PHOTO voltage switch to ON (Fig. 3-1).

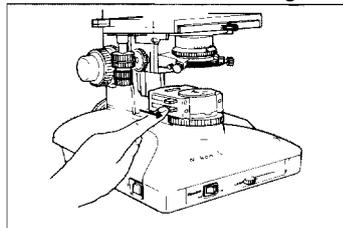


Fig.3-2

- 2) Slide the filter insertion / removal knobs of the ND filter cassette to the limit to place the entire ND filter in the optical path (Fig. 3-2).

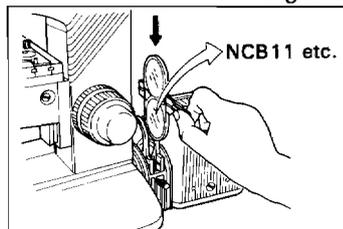


Fig.3-3

- 3) Put the NCB 11 filter (or necessary filter) into the optical path (Fig. 3-3).

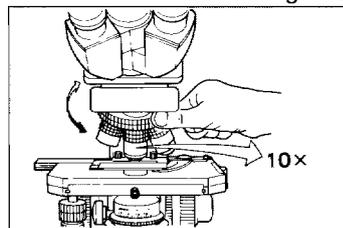


Fig.3-4

- 4) Revolve the revolving nosepiece to put the 10X objective into the optical path. Properly turn the revolving nosepiece so it fits into position (Fig. 3-4).

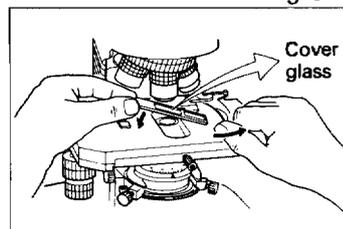


Fig.3-5

- 5) Place the specimen (glass slide) on the stage with its cover glass facing up and fasten it with the specimen holder (Fig. 3-5).

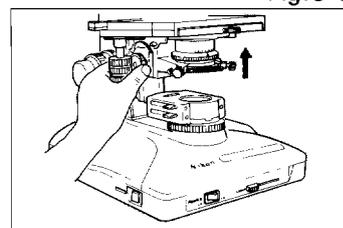
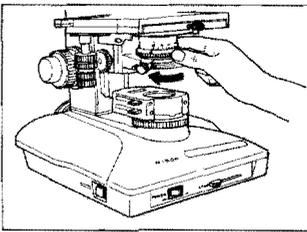
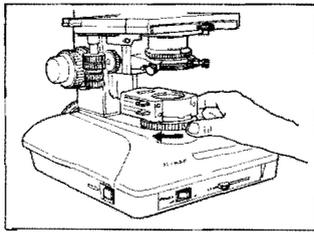


Fig.3-6

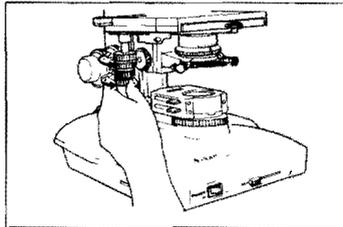
- 6) Raise the condenser lens using the condenser focus knob until it hits the limit (Fig. 3-6). When using an achromatic aplanat condenser, add oil taking care not to allow bubbles to exist between the top of the condenser lens and the specimen. (See p. 25, Manipulation of Each Element-11.)

III. MICROSCOPY



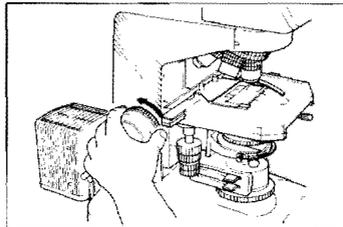
7) Fully open the field diaphragm and the aperture diaphragm (Fig. 3-7).

Fig. 3-7



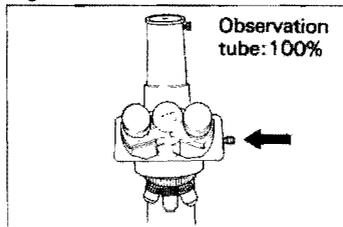
8) Manipulate the Y-axis and X-axis stage motion control knobs to put the specimen into the optical path. (Place the specimen immediately above the condenser lens) (Fig. 3-8).

Fig. 3-8



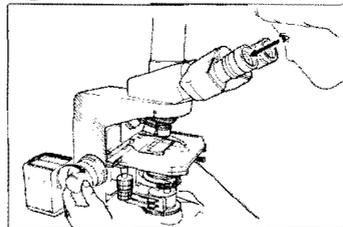
9) Loosen the refocusing stopper clamp ring until it reaches the limit (Fig. 3-9). (See p. 18, Manipulation of Each Element-2.)

Fig. 3-9



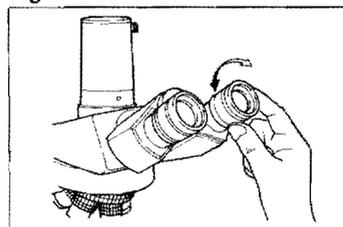
10) Change the optical path of the eyepiece tube to enter 100% of the light into the binocular part (Fig. 3-10). (See p. 19, Manipulation of Each Element-3.)

Fig. 3-10



11) Manipulate the coarse/fine focus knob and focus on the specimen while looking in the eyepiece (Fig. 3-11).

Fig. 3-11



12) Adjust the diopter (Fig. 3-12). (See p. 20, Manipulation of Each Element-4.)

Fig. 3-12

III. MICROSCOPY

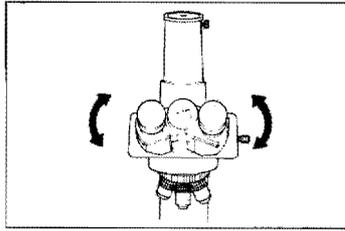


Fig.3-13

- 13) Adjust the interpupillary distance (Fig. 3-13). (See p. 20, Manipulation of Each Element-5).)

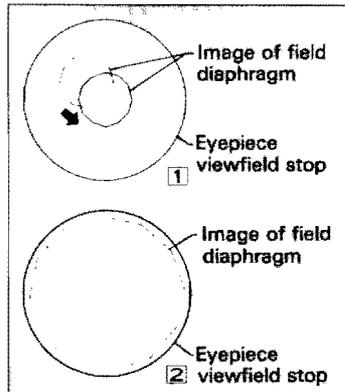


Fig.3-14

- 14) Focus and center the condenser lens (Fig. 3-14). (See p 21, Manipulation of Each Element-6).)

- 15) Revolve the revolving nosepiece to the objective to be used and focus on the specimen by manipulating the fine focus or coarse focus knob. (See Note: 2.) When using an oil immersion objective, add oil taking care not to allow bubbles to exist between the top of the objective and the specimen. (See p. 21, Manipulation of Each Element-11).)

- 16) Adjust the brightness by sliding the filter insertion / removal knob of the ND filter cassette. (See p. 22, Manipulation of Each Element-9).) When adjusting the brightness of the lamp, manipulate the brightness adjuster after turning the PHOTO voltage setting switch to OFF.

- 17) Adjust the viewfield diaphragm and the aperture diaphragm by manipulating their control rings. (See p. 22, Manipulation of Each Element-7) and 8).)

Note 1: Manipulate the centering screws of the condenser lens if part of the viewfield is dark. If this doesn't help, check the following items:

- Insertion / removal of the ND filter cassette III . MICROSCOPY-2)
- Turning the revolving nosepiece(click-stop position) III . MICROSCOPY-4)
- Position of the condenser lens III . MICROSCOPY-6)
- Viewfield and aperture diaphragms fully open III . MICROSCOPY-7)
- Change-over of the optical path of the eyepiece tube III . MICROSCOPY-10)
- Mounting the lamp II . ASSEMBLY-③ Mounting the lamp and the lamp housing
- Mounting the revolving nosepiece II . ASSEMBLY-⑤ Mounting the revolving nosepiece
- Mounting the condenser II . ASSEMBLY-⑧ Mounting the condenser
- Mounting the filter holder II . ASSEMBLY-⑩ Mounting the filter

Note 2: Check the following items when the specimen cannot be focused.

- Mounting the specimen III . MICROSCOPY-5)
- Releasing the refocusing stopper clamp ring III . MICROSCOPY-9)
- Position of the substage II . ASSEMBLY-④ Checking the substage position
- Thickness of the cover glass(standard=0.17mm)

IV. MANIPULATION OF EACH ELEMENT

1) Use of Focusing Device

The turning direction of the knob and the direction of vertical movement of the stage are shown in Fig. 4.

One rotation of the fine focus knob moves the stage 0.1 mm and the graduation on the fine focus knob is 1 micron. One rotation of the coarse focus knob moves the stage 12 mm. The range of coarse and fine motion is 2mm up and 28mm down from the standard position.

The coarse focus knob tightens by turning the torque adjustment ring counterclockwise.

Never turn the right or left knob while holding the other. It may cause problems.

Do not turn the coarse focus knob further than the limit.

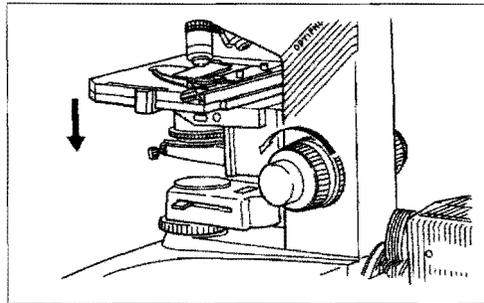


Fig. 4

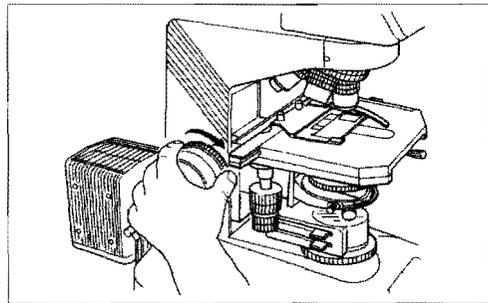


Fig. 5

2) Use of Refocusing Stopper

- Turn the refocusing stopper clamp ring and clamp it at the position where the specimen is focused. It is clamped at the position where the black delta mark (▲) on the side of the clamp ring reaches the top (Fig. 5).
- Lower the stage by using only the coarse focus knob and replace the specimens.
- Raise the stage slowly until it reaches the limit using only the coarse focus knob.

The specimen should be almost focused at the position where the stage reaches the limit. Then focus accurately by turning the fine focus knob.

When the refocusing stopper is not used, loosen the refocusing stopper clamp ring until it reaches the limit. (See Fig. 3-9.)

When the refocusing stopper clamp ring is clamped, the stage cannot be raised from that position using the coarse focus knob. However, the fine focus knob can move the stage regardless of the limit.

IV. MANIPULATION OF EACH ELEMENT

3) Optical Path Change-Over in the Trinocular Eyepiece Tube

(1) When using the trinocular eyepiece tube "F"

As shown in Fig. 6-1, when the observation tube is turned toward the user, 100% of the light enters the observation tube.

As shown in Fig 6-2, when the observation tube is revolved 60° left, 100% of the light enters the vertical photo tube. In either case, **turn the tube to the limit.**



3) Optical Path Change-Over in the Trinocular Eyepiece Tube

(1) When using the trinocular eyepiece tube "F"

As shown in Fig. 6-1, when the observation tube is turned toward the user, 100% of the light enters the observation tube.

As shown in Fig 6-2, when the observation tube is revolved 60° left, 100% of the light enters the vertical photo tube. In either case, turn the tube to the limit.

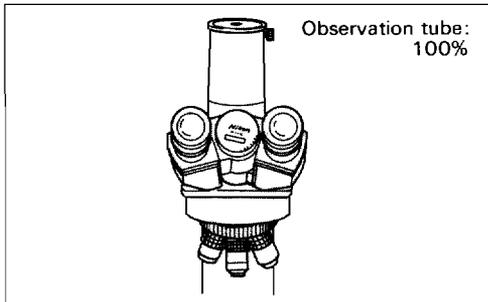


Fig. 6-1

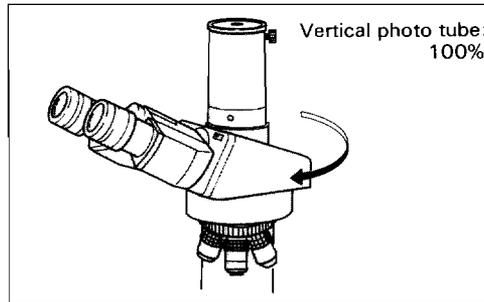


Fig. 6-2

(2) When using the trinocular eyepiece tube "T"

As shown in Fig. 7, when the change-over knob is pushed until it reaches the limit ①, 100% of the light enters the observation tube. When the change-over knob reaches the intermediate click ②, the proportion of light entering the observation tube and photo tube will be 14:86. When the change-over knob is pulled to the limit ③, 100% of the light enters the photo tube.

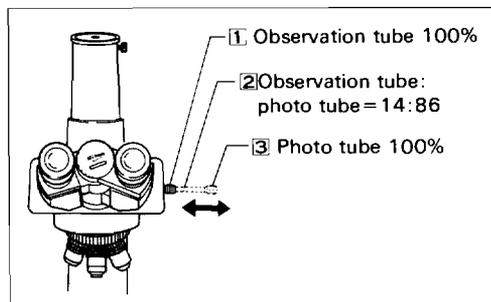


Fig. 7

IV. MANIPULATION OF EACH ELEMENT

4) Diopter Adjustment

(Before adjusting the diopter, implement MICROSCOPY procedures 1) to 11) and focus on the specimen with the 10X objective.)

Make diopter adjustments for both the right and left eyepieces.

(1) Turn the diopter compensation rings on each eyepiece until the end surface of the ring coincides with the engraved line.

(This is the position of 0 dioptic compensation.) (Fig. 8-1)

(2) Swing the 40X objective by turning the revolving nosepiece and bring the specimen image into focus by turning the fine focus knob (or the coarse focus knob).

(3) Swing the 4X or 10X objective into position. Without manipulating the fine and coarse focus knobs, turn the diopter rings on the eyepieces so that the specimen images in the right and left eyepieces are focused individually (Fig. 8-2).

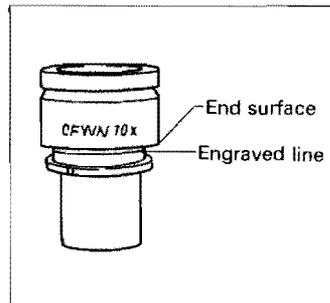


Fig.8-1

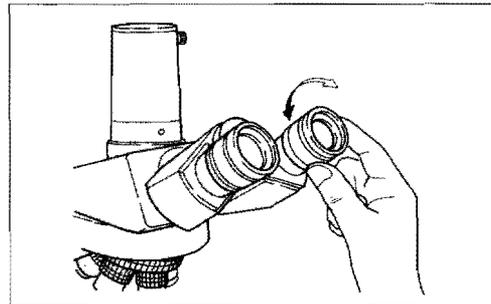


Fig.8-2

- Repeat the above procedure two times, to adjust the diopter perfectly.
- The above adjustment, compensating diopter difference between the user's right and left eyes, will keep the tube length of the microscope correct. This enables the user to take full advantage of the high-quality objectives, including their parfocality.

5) Interpupillary Distance Adjustment

(Before adjusting the interpupillary distance, implement Microscopy procedure 1) to 12) and focus on the specimen with the 10X objective.)

Adjust the interpupillary distance, so that both the right and left viewfields become one (Fig. 9).

This adjustment will enable the user to observe with both eyes.

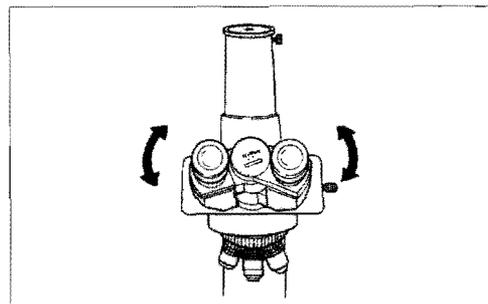


Fig.9

IV. MANIPULATION OF EACH ELEMENT

6) Centering the Condenser Lens

(Before focusing and centering the condenser lens, implement Microscopy procedure from 1) to 13) and focus on the specimen with the 10X objective.)

- (1) Close the field diaphragm to its smallest size by manipulating the field diaphragm control ring. Rotate the condenser focus knob to move the condenser vertically so that a sharp image of the field diaphragm is formed on the specimen surface (Fig. 10-1, 2 and 3).

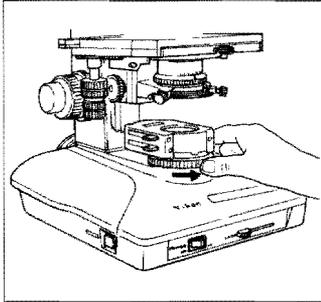


Fig. 10-1

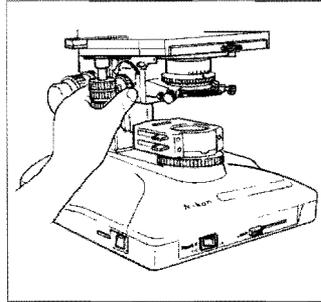


Fig. 10-2

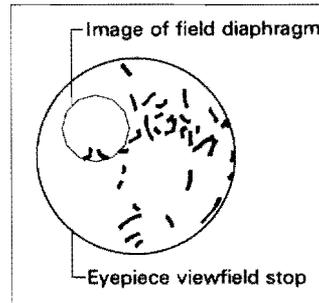


Fig. 10-3

- (2) If the image decenters from the viewfield of the eyepiece, bring it roughly to the center of the viewfield by means of the condenser centering screws (Fig. 11-1 and 2).
- (3) Change to the 40X objective. Focus on the specimen by turning the fine focus knob and form an image of the field diaphragm on the specimen surface by manipulating the condenser focus knob.
- (4) When the image decenters from the viewfield of the eyepiece, bring it to the center of the viewfield by means of the condenser centering screws. At this time, the centering will be facilitated by adjusting the size of the image of the field diaphragm to be slightly smaller than the viewfield of the eyepiece by manipulating the viewfield diaphragm control ring (Fig. 11-3).

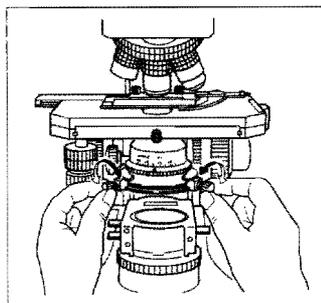


Fig. 11-1

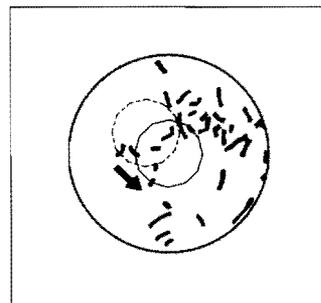


Fig. 11-2

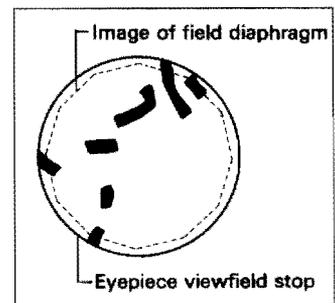


Fig. 11-3

7) Use of Field Diaphragm

The field diaphragm is used for determining the illuminated area on the specimen. The size of the diaphragm is adjusted by manipulating the field diaphragm control ring. **Stopping down the diaphragm to such an extent that the circumference of the illuminated area circumscribes or inscribes that of the eyepiece field of view is recommended for general microscopy.** If a wider area than required is illuminated, extraneous light will enter the field of view, causing flare in the image and lowering the contrast. Therefore, especially in photomicrography, the proper adjustment of the field diaphragm is very important. Generally, good results will be achieved when the diaphragm is stopped down to such an extent that the diameter of the illuminated area is slightly larger than the diagonal of the film format.

8) Use of Condenser Aperture Diaphragm

The condenser aperture diaphragm is provided for adjusting the numerical aperture (N.A.) of the illuminating system of the microscope. It is important because it determines the resolution of the image, contrast, depth of focus, and brightness. Stopping down the aperture diaphragm will lower the resolution and brightness but increase the contrast and depth of focus. In general, when **it is stopped down to 70% to 80% of the numerical aperture of the objective,** a good image of appropriate contrast will be obtained (Fig. 12).

To adjust the size of the condenser aperture diaphragm, manipulate the diaphragm control ring referring to the condenser's N.A. scale, or after removing the eyepiece from the eyepiece tube, adjust the size of the diaphragm, observing the image of the diaphragm that is visible on the bright circle of the exit pupil on the inside of the objective. Stopping down the aperture diaphragm too far will lower the resolving power. Therefore, it is recommended not to stop down the aperture to a size smaller than 60% of the N.A. of the objective in use, except when observing almost transparent specimens.

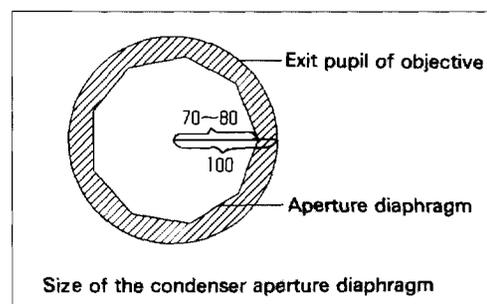


Fig. 12

9) Use of Filters

(1) ND filter cassette

Accessory filters attached to the ND filter cassette are ND2, ND4, and ND16. These are used for general microscopy and brightness control in photomicrography.

IV. MANIPULATION OF EACH ELEMENT

ND2	Reduce light to 1/2	Transmission rate=about 50%
ND4	Reduce light to 1/4	Transmission rate=about 25%
ND16	Reduce light to 1/16	Transmission rate=about 6%

- Light is reduced to 1/8 when the ND2 and ND4 filters are put into the optical path and is reduced to 1/64 when ND4 and ND16 filters are put into the optical path. Light can be reduced from 1/2 to 1/128 depending on the combination of the filters.
- Securely change the filter insertion /removal knob.

Removing and mounting the ND filters

Use gloves or gauze so as not to touch the filters with your bare hands.

To remove the ND filter, lay soft cloth such as gauze on a desk.

Place the ND filter cassette on it and spread the lever (Fig. 13).

To mount the filter, insert the filter obliquely in the opposite side of the lever and spread the lever from the lower side.

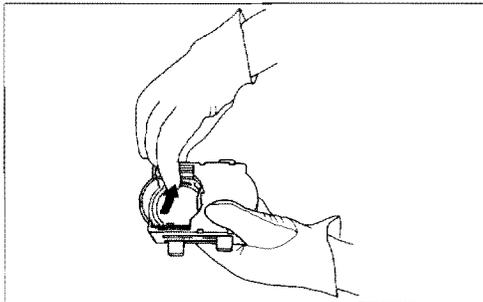


Fig. 13

Transparent Cover

Mount the transparent cover to protect the filters from dust (Fig. 14-1).

When the ND filter cassette is removed, attach the transparent cover on the field lens (Fig. 14-2).

However, remove the cover during observation or photomicrographing with the viewfield diaphragm stopped down.

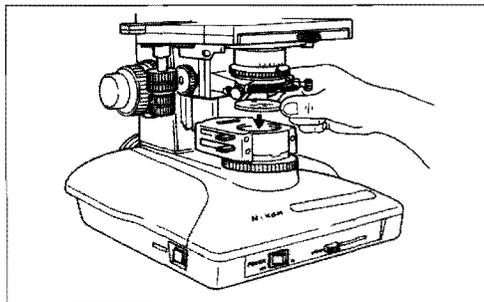


Fig. 14-1

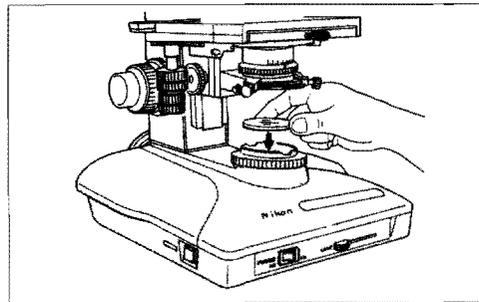


Fig. 14-2

IV. MANIPULATION OF EACH ELEMENT

(2) Filter holder part

(For the details of attaching/detaching of the filter to/from the filter holder, see II. ASSEMBLY.)

- Less frequently changed filters are mounted to the filter holder. These are used when it is too bright, using only the ND filter cassette.

NCB 11	Color balancing filter	For general microscopy and color photomicrography
GIF	Green interference filter	For microscopy of phase difference, etc. For monochrome-photomicrography
HE	HE color contrast filter	For hematoxylin-eosin staining For fuchsine staining

Filters with an outer diameter of 45mm and thickness less than 3mm can be mounted in both the ND filter cassette and the filter holder.

10) PHOTO Voltage Switch (Photomicrography)

A constant voltage should be used for color photomicrography because the color temperature of the lamp varies with the voltage being used. The color temperature balancing filter (NCB11) should be used when daylight-type color film is used. The standard is to set the voltage of the lamp to 9V.

The PHOTO voltage switch is provided to set the standard lamp voltage automatically. The lamp voltage is 9V when it is turned ON. (The position of the brightness adjuster does not matter.)

Fine adjustment of the PHOTO voltage

The PHOTO voltage of 9V can be finely adjusted by about $-0.5V$, $+0.5V$, or $+1V$. When the color film photographed at 9V is reddish, the voltage should be raised. (A higher lamp temperature gives a bluish color.) When bluish, the voltage should be reduced. (A lower lamp temperature gives a reddish color.)

To make the adjustment, use the rotary switch at the bottom of the base with a minus screwdriver (Fig. 15).

When this adjustment is inadequate, also use color compensating filters (CC filters).

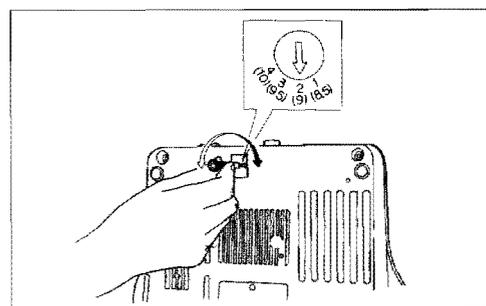


Fig. 15

11) Oil Immersion Manipulation

The objectives with the indication "oil" are to be immersed in oil between the specimen and the front lens of the objective. Use only the included oil.

When using an oil immersion objective of numerical aperture 1.0 or larger, it is recommended to use an oil immersion type achromat/aplanat condenser, to make full use of its efficiency. For this type of condenser, apply oil between the specimen and the condenser lens.

Apply the minimum amount necessary (the quantity that fills the gap between the front of the objective and the specimen, or between the front of the condenser lens and the specimen) to avoid a flow of excessive oil that will adhere to the stage and the circumference of the condenser lens.

To see if air bubbles are present in the immersion oil, which deteriorate the image quality, pull out the eyepiece from the eyepiece tube. Fully open the viewfield diaphragm and the aperture diaphragm to examine the objective exit pupil (bright circle) inside the tube.

To remove air bubbles, slightly rotate the nosepiece several times (or turn the condenser focus knob to move it slightly up and down), or apply additional oil, or replace the oil.

Any remnant of oil left on the oil immersion objective or adhesion of oil to the front of the dry system objective will deteriorate the image quality. Clean off the oil after using it and make sure that the oil did not adhere to the front of other objectives. The oil for the condenser lens should also be cleaned off after use.

To clean off the oil, wipe it with lens tissue or a soft cloth, moistened with xylene, lightly two or three times. It is essential at this time to avoid touching the lens with a part of tissue or cloth already used.

V . TROUBLESHOOTING

SEEING AND OPERATION

Failures	Causes	Actions
	Optical path in trinocular tube not fully changed.	Changeover the optical path securely to enable the binocular observation (p. 19)
	Optical path in trinocular tube not changed-over for binocular observation.	
Darkness at the periphery.	Revolving nosepiece not mounted correctly	Mount firmly. (p. 8)
Uneven brightness of viewfield.	Revolving nosepiece not in click-stop position (objective not centered in optical path)	Revolve it to click-stop position (put objective into optical path). (p. 14)
No appearance of viewfield.	Condenser is too low.	Position correctly so the viewfield diaphragm image is formed. (p. 21)
	Condenser not centered.	Centering. (p. 21)
	Condenser not mounted correctly	Mount correctly (p. 10)
	ND filter not fully changed-over.	Changeover to the limit. (p. 23)
	Filter holder not mounted correctly.	Mount firmly in correct position. (p. 12)
	Field diaphragm closed too much.	Open properly. (p. 22)
	Improper combination of objective and condenser.	Use proper combination.
	Dirt or dust on the lens (field lens, condenser, objective, eyepiece, eyepiece tube entrance lens) or specimen.	Cleaning. (p. 2)
Lamp not mounted correctly.	Mount properly. (p. 7)	

V . TROUBLESHOOTING

Faures	Causes	Actions
Dirt or dust in the viewfield.	Position of condenser too low.	Position correctly so the viewfield diaphragm image is formed. (p. 21)
	Aperture diaphragm too restricted	Open properly. (p. 22)
	Dirt or dust on the lens (field lens, condenser, objective, eyepiece, eyepiece tube entrance lens) or specimen.	Cleaning (p. 2)
Poor image obtained. (Contrast is too strong or too weak.) (Details are not clear.)	Aperture diaphragm too restricted.	Open properly. (p. 22)
	Position of condenser too low.	Position correctly so the viewfield diaphragm image is formed. (p. 21)
	Too thick or thin coverglass.	Use specified thickness (0.17 mm) coverglass.
	No coverglass attached.	
	NCG objective for observing specimen without coverglass used to observe specimen with coverglass.	Use normal objective for observing specimen with coverglass.
	Normal objective for observing specimen with coverglass used to observe specimen without coverglass.	Use NCG objective.
	No immersion oil used on the front of immersion system objective.	Use Nikon immersion oil. (p. 25)
	Immersion oil used not the type specified.	
	Air bubbles in immersion oil.	Remove bubbles. (p. 25)
	Immersion oil soils the top of dry system objective (especially 40X).	Cleaning. (p. 25)
	Compensation ring of objective not adjusted.	Adjust to match coverglass.
Dirt or dust on the lens (field lens, condenser, objective, eyepiece, eyepiece tube entrance lens) or specimen.	Cleaning (p. 2)	

V. TROUBLESHOOTING

Failures	Causes	Actions
One side of image is dim.	Revolving nosepiece not correctly attached.	Attach correctly. (p. 8)
	Revolving nosepiece not in click-stop position.	Revolve it to click-stop position. (p. 14)
	Specimen rises from stage surface.	Place it stably in specimen holder on stage. (p. 14)
	Stage tilted.	Attach correctly. (p. 10)
Image moves while being focused.	Revolving nosepiece not correctly attached.	Attach firmly (p. 8)
	Revolving nosepiece not in click-stop position.	Revolve it to click-stop position. (p. 14)
	Specimen rises from stage surface.	Place it stably in specimen holder on stage. (p. 14)
	Condenser lens not correctly centered.	Centering. (p. 21)
	Stage tilted.	Attach correctly. (p. 10)
Image tinged yellow.	NCB11 filter not used.	Use NCB11 filter. (p. 14)
	Lamp power source voltage too low.	Turn ON PHOTO voltage switch or manipulate brightness adjuster to set the lamp brightness indicator scale to "9" and adjust the brightness using a combination of ND filters in the ND filter cassette. (p. 14 and p. 23)
Image too bright.	Lamp power source voltage too high.	
Not bright enough (see also Electrical).	Lamp power source voltage too low.	Open properly. (p. 22)
	Aperture diaphragm too restricted.	
	Position of condenser too low.	Position correctly so the viewfield diaphragm image is formed (p. 21)
	Optical path change-over of trinocular tube not 100% binocular.	Changeover so that 100% of light enters binocular part. (p. 19)

V. TROUBLESHOOTING

Failures	Causes	Actions
No focused image obtained with high power-objectives.	Slide upside-down.	Attach to stage with coverglass up (when no coverglass, specimen surface should be up). (p. 14)
	Coverglass too thick.	Use coverglass of specified thickness (0.17 mm).
High-power objective touches the specimen, when changed-over from low power.	Slide upside-down.	Attach to stage with coverglass up (when no coverglass, specimen surface should be up). (p. 14)
	Coverglass too thick.	Use coverglass of specified thickness (0.17 mm).
	Eyepiece diopter not adjusted.	Diopter adjustment. (p. 20)
Insufficient parfocality of objective when changed-over.	Eyepiece diopter not adjusted.	Diopter adjustment. (p. 20)
Movement of image not smooth when moving the specimen.	Slide holder not tightly fastened to stage.	Fasten it tightly.
Travel of stage limited to one-half length of slide.	Improper attachment of slide holder	Shift the attachment position.
No cohesion of binocular image.	Interpupillary distance not adjusted.	Adjust interpupillary distance. (p. 20)
	Eyepiece diopter not adjusted.	Diopter adjustment. (p. 20)
	Magnifications of right and left eyepieces differ	Use same eyepieces. (p. 11)
Experiencing eye fatigue.	Interpupillary distance not adjusted.	Adjust interpupillary distance. (p. 20)
	Eyepiece diopter not adjusted.	Diopter adjustment. (p. 20)
	Inadequate illumination.	Adjust brightness with combination of ND filters. (p. 23)

V. TROUBLESHOOTING

ELECTRICAL

Failures	Causes	Actions
Brightness of lamp does not change even though brightness adjuster is manipulated.	PHOTO voltage switch is ON.	Turn PHOTO voltage switch OFF. (p. 24)
Lamp does not light even though switched ON.	No electricity obtained.	Connect the cord to socket.
	No bulb attached.	Attach lamp. (p. 7)
	Bulb blown	Replacement. (p. 7)
	Fuse blown.	Replacement. (p. 6)
	Lamp housing not correctly mounted.	Attach securely. (p. 7)
Flickering and unstable illumination.	Bulb about to blow.	Replacement. (p. 7)
	Connector not secure.	Connect power source cord and lamp housing securely (p. 7 and p. 13)
	Fuse holder not firmly fastened.	Fasten securely. (p. 6)
	Bulb insufficiently inserted into the socket.	Positive connection. (p. 7)
Bulb immediately blown.	Bulb used not the one specified.	Use 12V 100W halogen lamp OSRAM HLX 64623 or PHILIPS 7724
Insufficient illumination.	Input voltage change-over switch does not match the power voltage of the room.	Changeover input voltage change-over switch. (p. 6)
Fuse blown.	Fuse used not the one specified.	Use the fuse specified. (p. 6)

ELECTRICAL SPECIFICATIONS

Power source	100-120V/220-240V, 50/60Hz
Halogen lamp	12V 100W [use OSRAM HLX 64623 or PHILIPS 7724]
Fuse	100-120V:125V 3.15A 220-240V:250V T2A
Power consumption ...	less than 130W

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.