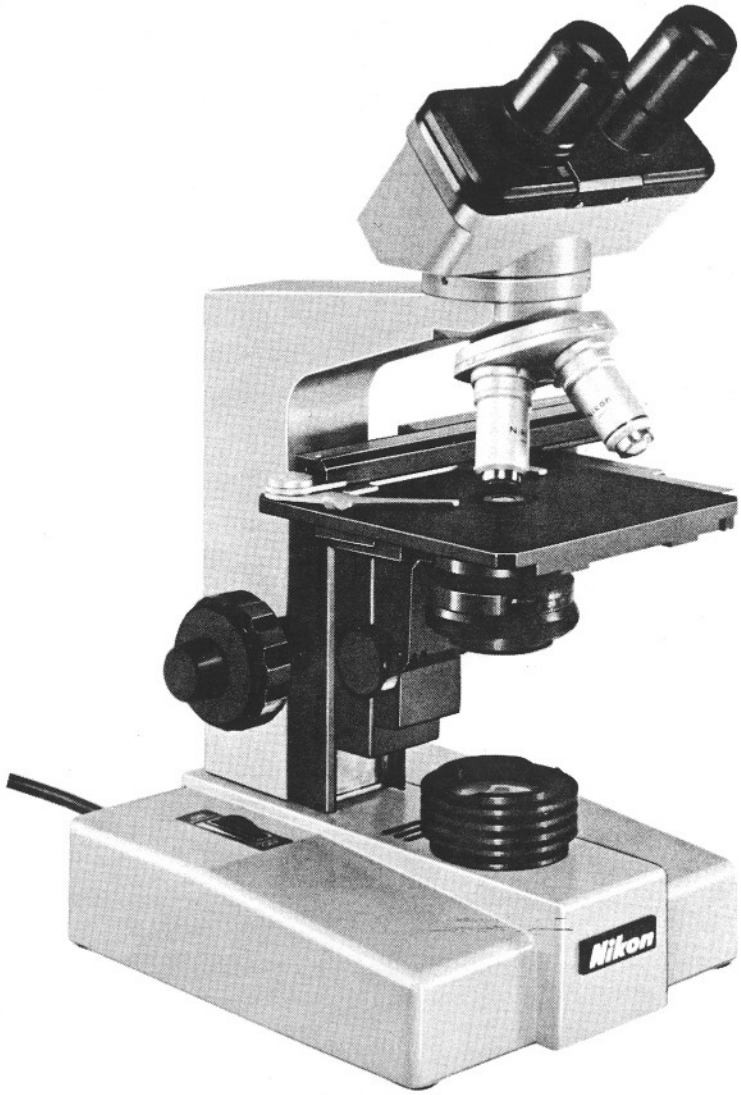
Nikon

MICROSCOPE
MODEL SC

Instructions



NIPPON KOGAKU K.K.

CAUTIONS IN HANDLING

❶ Red-colored lock screw

Before handling the microscope, be sure to **remove the red-colored lock screw.**

❷ Exchanging the lamp bulb and fuse

Before replacing the lamp bulb or fuse, be sure to **turn the power switch to OFF and pull out the power source cord** from the socket.

❸ Place for using

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

❹ Dirt on the lens

Do not leave **dust, dirt or finger marks** on the lens surfaces.
They will prevent you from clear observation of the specimen image.

❺ Avoid sharp knocks!

Handle the microscope gently, taking care to **avoid sharp knocks.**

❻ Use SC type objectives & eyepieces

For the SC microscope, use no other objectives and eyepieces that of **SC type.**

CARE AND MAINTENANCE

❶ Cleaning the lenses

To clean the lens surfaces, remove dust using a soft hair brush or gauze. Only for removing finger marks or grease, should soft cotton cloth, lens tissue or gauze lightly moistened with **absolute alcohol** (ethanol or methanol) be used.
For cleaning the objectives and immersion oil only use xylene.
Observe sufficient caution in handling alcohol and xylene.

❷ Cleaning the painted surfaces

Avoid the use of any organic solvent (For example; thinner, xylene, ether, alcohol etc.) for cleaning the painted surfaces and plastic parts of the instrument.

❸ Never attempt to dismantle!

Never attempt to dismantle the instrument so as to avoid the possibility of impairing the operational efficiency and accuracy.

❹ When not in use

When not in use cover the instrument with the accessory vinyl cover or put in the case (available on order) and **store it in a place free from moisture and fungus.**

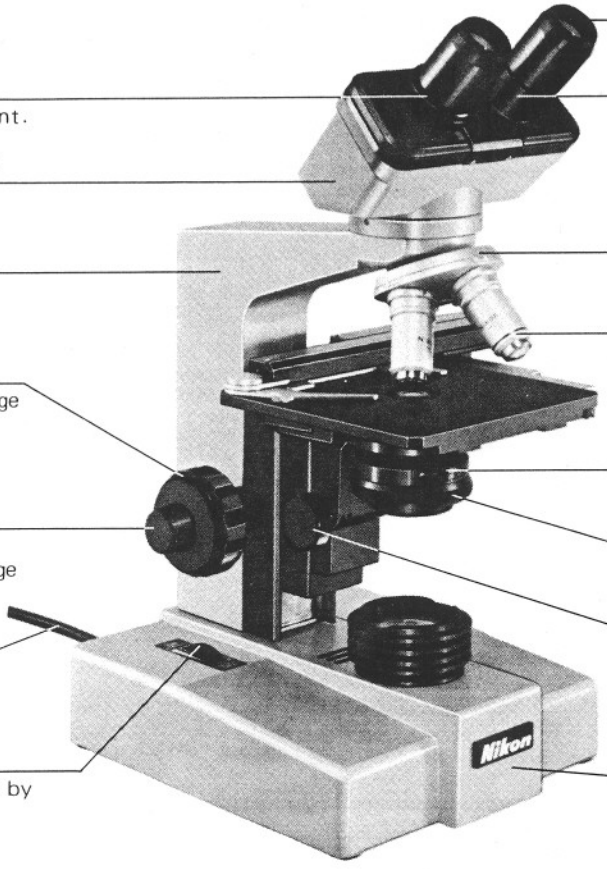
❺ Periodical checking

To maintain the performance of the instrument, we recommend the customers to check the instrument periodically. For details, contact our dealers.

CONTENTS

I . NOMENCLATURE AND FUNCTION

The descriptions in this instruction manual, for the most part, cover the use of the binocular eyepiece tube microscope. They are applicable, except where not specified, to the monocular eyepiece type as well.



SC eyepiece

Diopter ring
Used for eyesight adjustment.

Eyepiece sleeve
Hold the sleeves, when adjusting interpupillary distance.

Binocular eyepiece tube

Revolving nosepiece
Accepts 4 objectives.

Arm

SC objective

Coarse focus knob
One rotation moves the stage about 24mm.

Condenser

Fine focus knob
Range: 2.2mm
One rotation moves the stage about 0.2mm.

Diaphragm control ring

Condenser focus knob

Power cord

Power switch and brightness control dial
More brightness is obtained by turning toward the thicker end of the arrow.

Microscope base

Fig. 1

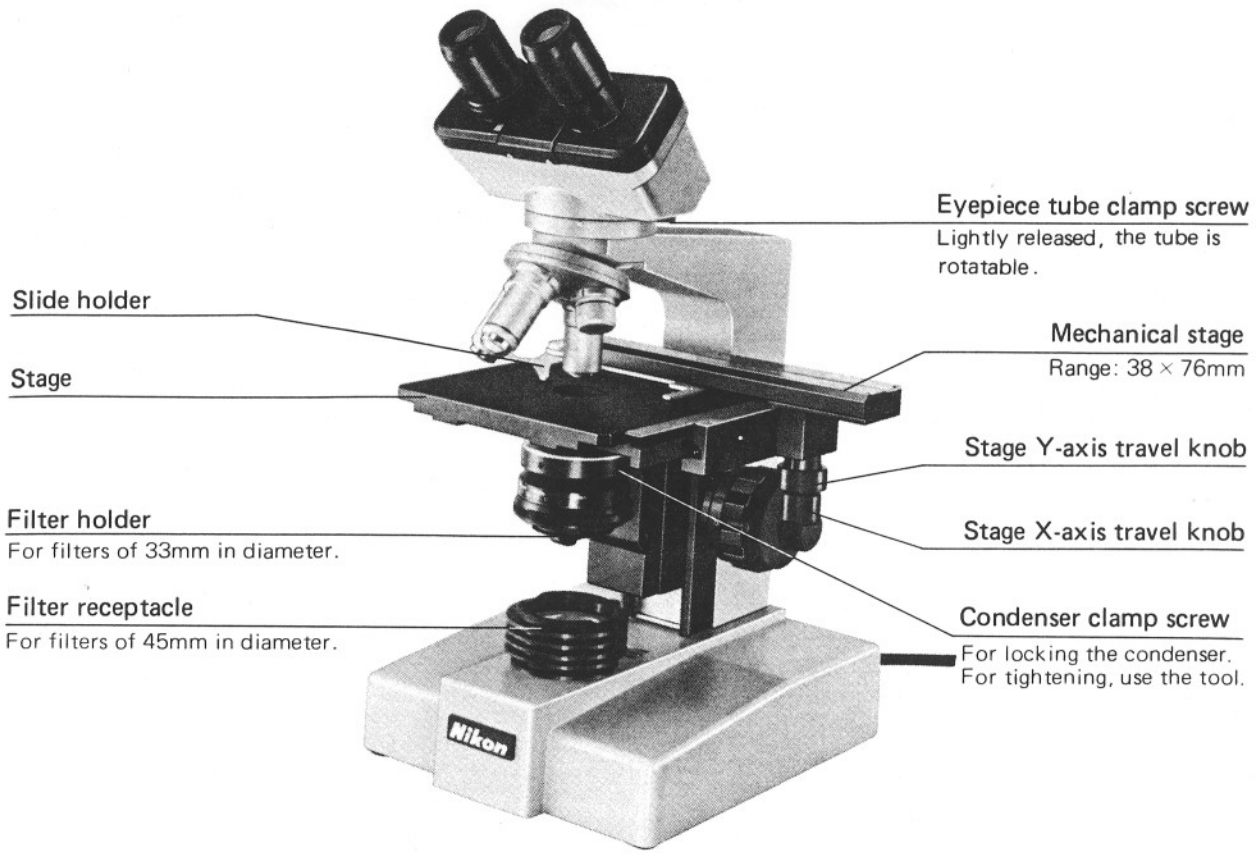

Eyepiece tube clamp screw
Lightly released, the tube is rotatable.
Slide holder
Mechanical stage
Range: 38 × 76mm
Stage
Stage Y-axis travel knob
Filter holder
For filters of 33mm in diameter.
Stage X-axis travel knob
Filter receptacle
For filters of 45mm in diameter.
Condenser clamp screw
For locking the condenser. For tightening, use the tool.
Nikon

Fig. 2

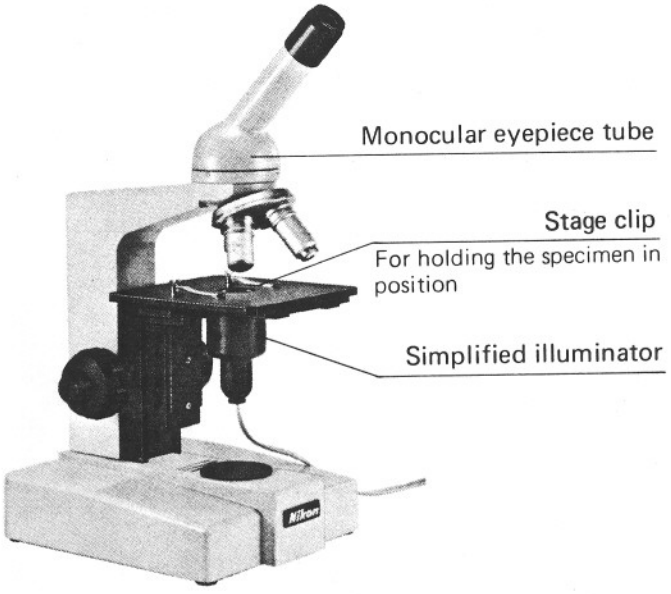

Monocular eyepiece tube
Stage clip
For holding the specimen in position
Simplified illuminator
Nikon

Fig. 3

II. ASSEMBLY

Before handling the microscope, remove the red-colored lock screw. (Fig. 4)

1. Attaching the eyepiece tube (Fig. 5)
   1) Slacken the eyepiece tube clamp screw sufficiently.
   2) Tilting the eyepiece tube as shown in Fig. 5, seat it in a horizontal position.
   3) Fasten up the clamp screw securely.

2. Attaching the eyepiece (Fig. 6)
   1) Remove the dust caps from the tubes.
   2) Screw in the eyepieces.
   3) To avoid accidental release, screw the eyepiece in firmly, using a rubber sheet or the like to hold the eyepiece.

3. Attaching the mechanical stage (Fig. 7)
   1) Place the mechanical stage on the stage mount so that the travel knobs are on the right side of an operator facing the stage.
   2) Fasten the stage from the bottom with the two 4mm hexagonal hole bolts, using tool A.

4. Attaching the objectives (Fig. 8)
   1) Screw the objectives into the revolving nosepiece in such order that, as the nosepiece is rotated clockwise, an objective of higher magnifying power enters the optical path.
   2) For avoiding accidental release, it is possible to lock them tightly using tool C.

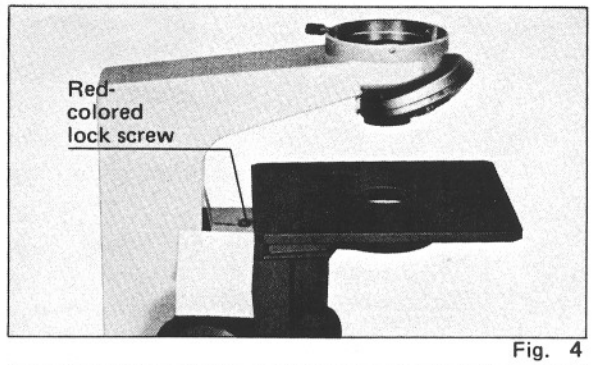


Fig. 4

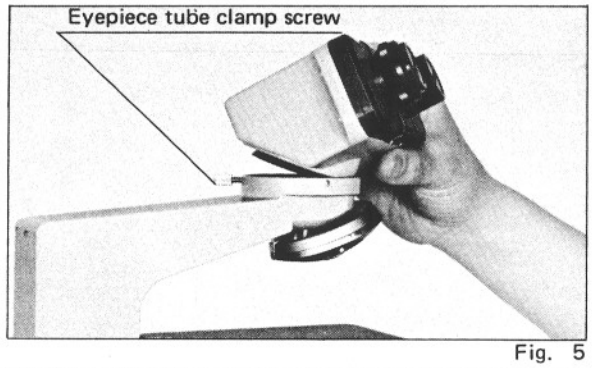


Fig. 5

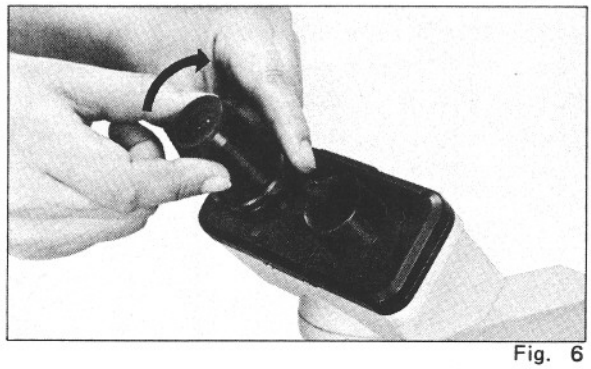


Fig. 6

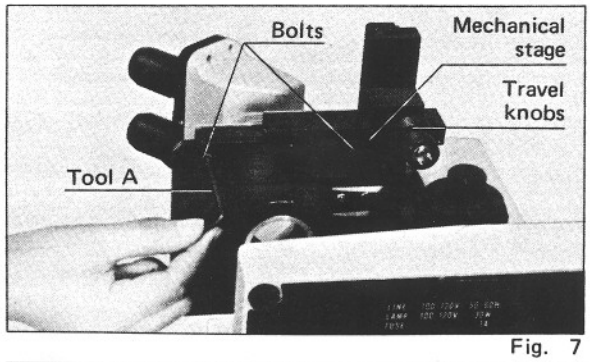


Fig. 7

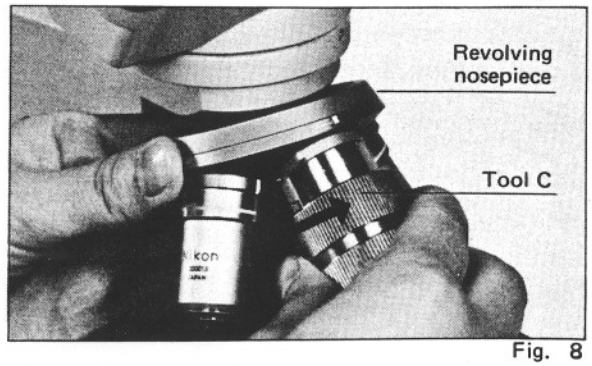


Fig. 8

5. Attaching the condenser

1) Place the blue filter into the filter holder. (Fig. 9)
2) Slide the condenser into its mount as far as it will go in position where the aperture number plate turns toward the operator.
3) Tighten the condenser clamp screw, using the tool B. **(Fig. 10)**

Note: The tools A, B and C **(Fig. 11)** are not included in the microscope set. If necessary, purchase them independently.

6. Attaching the lamp bulb

The microscope is delivered with its lamp bulb (100V, 115/125 or 220/240V−30W) attached. If it is necessary to replace the bulb at a later time, proceed as below:

Be sure to remove the power cord from the socket, beforehand.

1) Lay the instrument down carefully to permit unscrewing the set screw found on the bottom lid of the microscope. A screw driver or coin may be used.
2) Sliding the bottom lid to the side of the set screw, remove it. The lamp bulb will then be accessible. **(Fig. 12)**
3) To attach the bulb, pushing the lamp bulb with its silver surface turned to the side of the bottom lid insert the bulb into the socket. **(Fig. 13)**

Note: Finger marks left on the lamp bulb surface will decrease the brightness of image. In handling the bulb, use a cloth or wear gloves.

4) Replace the bottom lid.

7. Attaching the lamp bulb for simplified illumination (Fig. 14)

This lamp bulb (110/120V−10W or 220/240V −12W) is to be used exclusively for the monocular eyepiece tube type of microscope.

1) Be sure to remove the power cord from the socket.
2) Remove the lamp socket from the instrument by turning.
3) Screw the lamp bulb into the socket as far as it will go.
4) Reattach the socket.

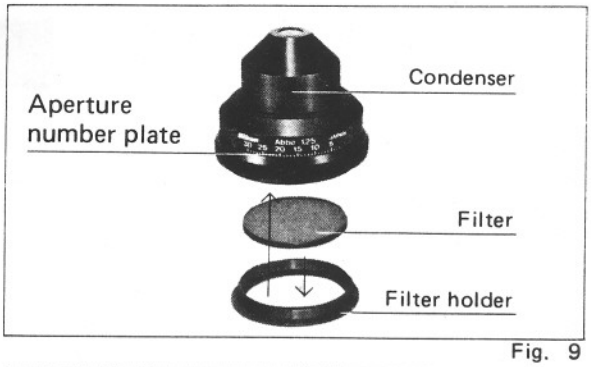


Fig. 9

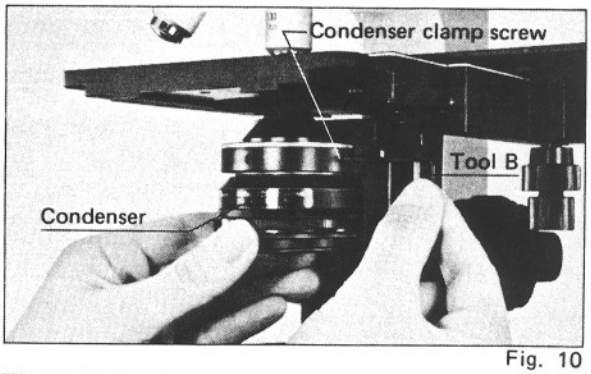


Fig. 10

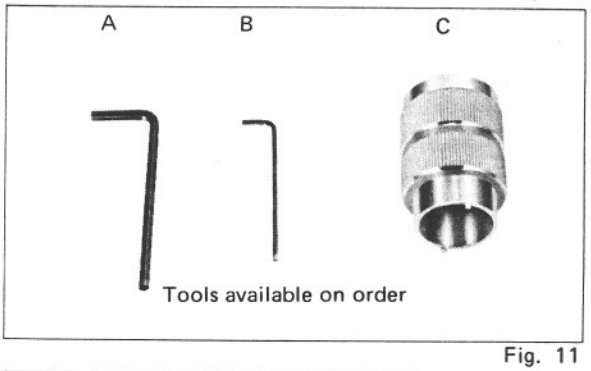


Fig. 11

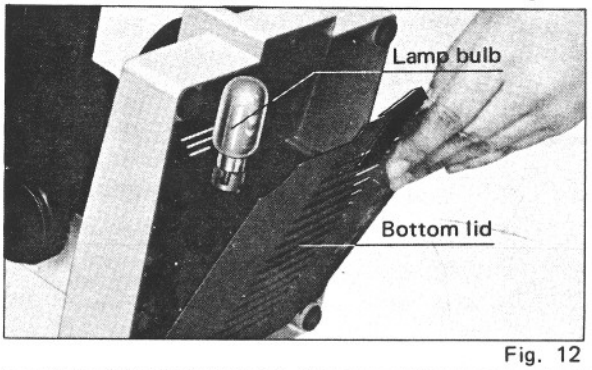


Fig. 12

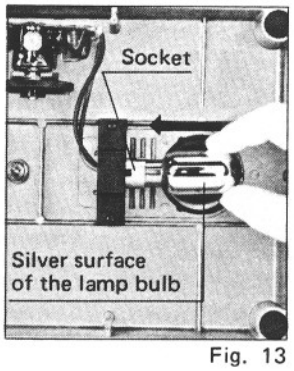


Fig. 13

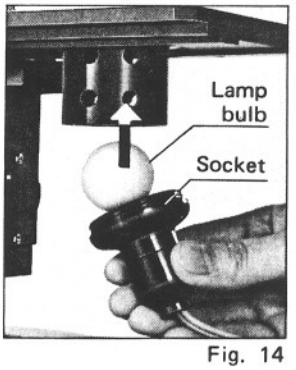


Fig. 14

III. OBSERVATION

1. **Setting the specimen in position**
   1) Place the specimen on the stage holding in position by means of the slide holder. **(Fig. 15)**
   2) When not using the mechanical stage, hold the specimen securely with the two stage clips. **(Fig. 16)**

2. **Adjusting the illumination**
   1) Insert the power cord into the socket.
   2) Raise the condenser to its upper limit, and fully open the condenser diaphragm.
   3) Turn the power switch & brightness control dial to light the lamp. **(Fig. 17)**
      Brightness is increased by turning toward the thicker end of the arrow, and decreased toward the thinner.
   4) Rotate the revolving nosepiece to swing the 4× or 10× objective into the optical path. At this time, make sure that the objective clicks properly into position.

3. **Adjusting interpupillary distance (Fig. 18)**
   When using a binocular eyepiece tube, adjust the interpupillary distance, so that both the right and left viewfields become one.

4. **Adjusting for eyesight difference (Fig. 19)**
   1) First, viewing into the right eyepiece with the 10× objective in position, manipulate the coarse and fine focus knobs to bring the specimen into focus.
   2) Then, viewing into the left eyepiece, turn the diopter ring to bring the image into sharp focus, without manipulating the focus knobs.
      0 index is put on the diopter ring.

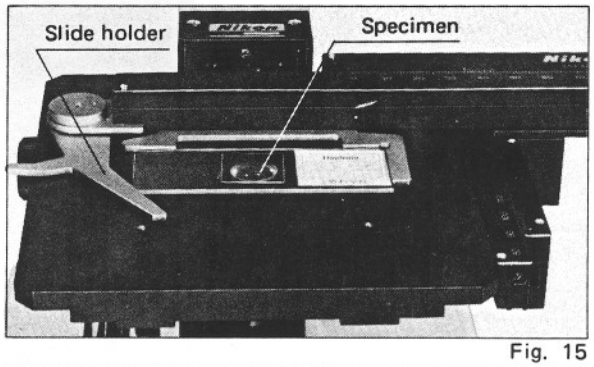


Fig. 15

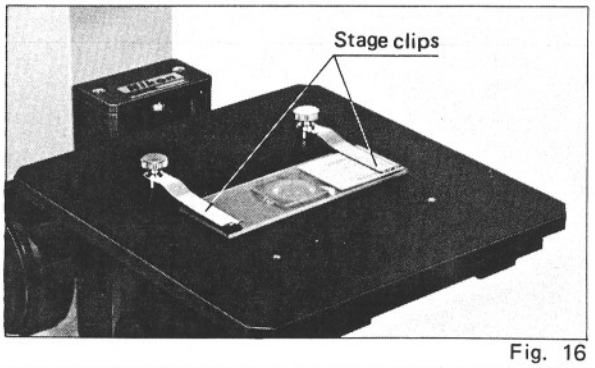


Fig. 16

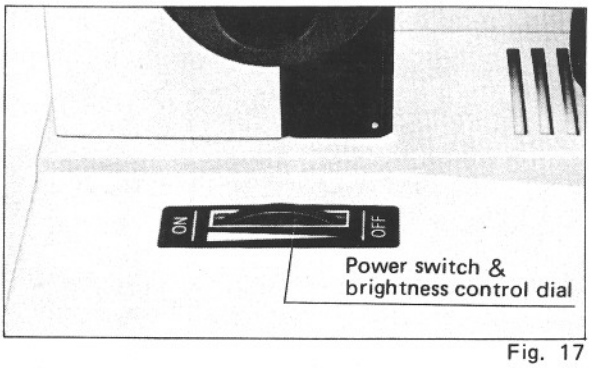


Fig. 17

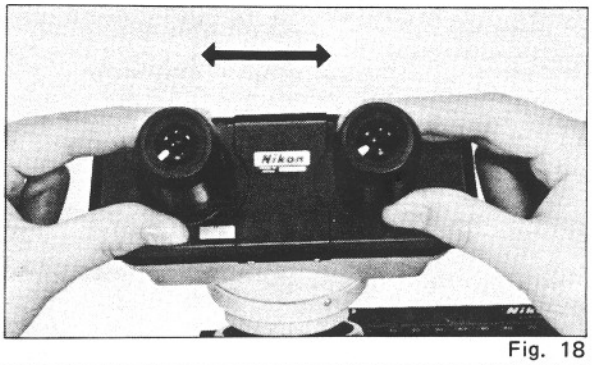


Fig. 18

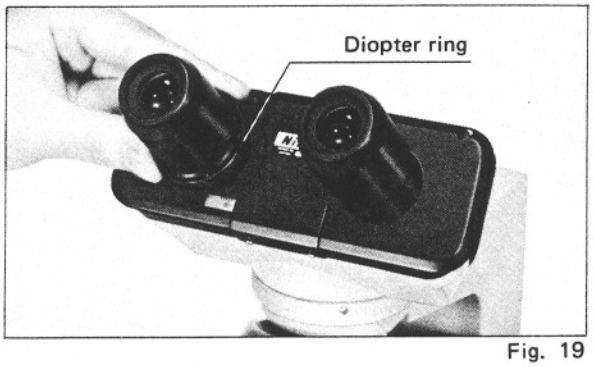


Fig. 19

5. **Coarse focusing**

1) The coarse focus knob is to be used for coarse focusing and for fine focusing with the 4× objective.
2) It can also be used for lowering the stage convenience when replacing a specimen, removing immersion oil, etc.
3) The relation between the direction of rotation of the coarse focus knob and that of vertical movement of the stage is as indicated by the arrows in **Fig. 20-A, B.**

6. **Fine Focusing**

1) The fine focus knob is to be used for fine focusing with the 10× or higher power objectives.
2) It is also used when exchanging objectives or focusing on each successive layer of a thick specimen.
3) The relation between the direction of rotation of the fine focus knob and that of vertical movement of the stage is the same as for the coarse focus knob. **(Fig. 20-A, B)**
4) The range of the fine focus knob is 2.2mm. The white line on the fine focus knob shows the center of the fine focusing range. It is necessary beforehand to position the white line on the fine focus knob opposite the end of the coarse focus knob. **(Fig. 21)**

7. **Working distance of objectives**

1) "Working distance" is the clearance between the front of objective and the upper surface of the coverglass when the image of the specimen is in sharp focus.
   In this microscope it is as follows for each objective:

Objective	Working distance
4×SC	28mm
10×SC	8mm
40×SC	0.73mm
100×SC	0.16mm

2) As shown above, the working distances of the 40× and 100× objectives are very small, incurring the danger of pressing on the specimen. These two objectives, therefore, are specifically equipped with a safety device, which permits rising of the front of objective, at the moment it touches the specimen.

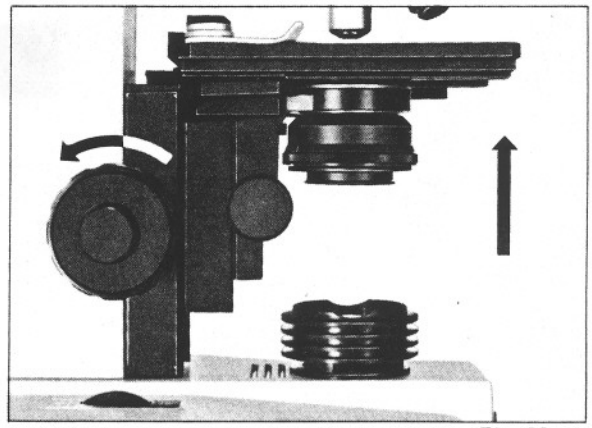


Fig. 20 - A

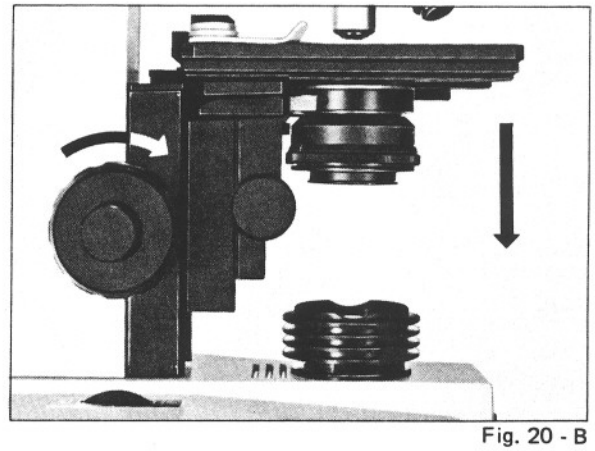


Fig. 20 - B

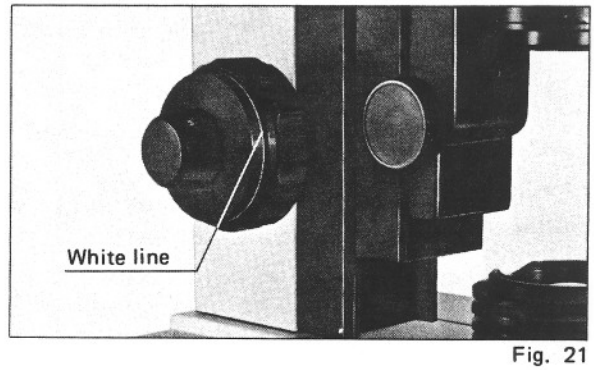


Fig. 21

3) To proceed to focusing, first raise the stage to the approximate working distance of the objective being used. Then, viewing into the microscope, lower the stage slowly, until the image is brought into sharp focus.

8. Vertical movement of condenser

1) For general use, raise the condenser to its upper limit.
2) When examining non-stained specimens, it is preferable to lower the condenser to such an extent that a sufficient image contrast is obtained, rather than to close the condenser diaphragm, because it has an advantage that the contrast and brightness do not change so abruptly and greatly.

9. Condenser diaphragm

The condenser diaphragm is intended to adjust its numerical aperture (N.A.) and not the brightness of illumination.

1) When closed, the condenser diaphragm will increase the image contrast but decrease the resolving power.
   If excessively closed, it causes fringes visible at the edge of image details.
2) Opening of the diaphragm is continuously adjustable within a range from 2.2mm to 30 mm in diameter. For general use, it should be stopped down to 70~80% of the numerical aperture of the objective to achieve an appropriate image contrast. For adjustment of the diaphragm, when observing, turn the diaphragm control ring so as to obtain an image quality suitable for the specimen.

10. Oil-immersion observation (Fig. 21)

When using the 100× objective marked with a black ring, the specimen should be immersed in oil by applying Nikon immersion oil between the coverglass and the front lens of the objective.

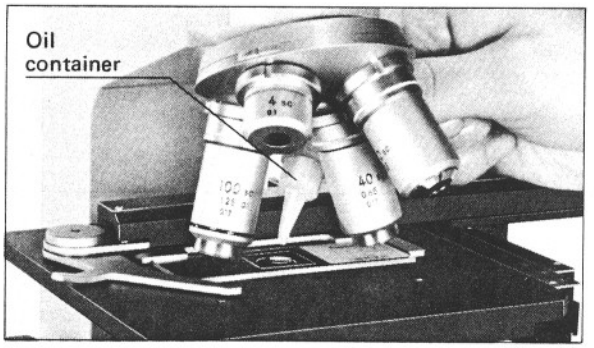


Fig. 22

1) Using a 10× or 40× objective focus on the specimen. Bring the desired detail in the specimen to the center of the field of view.
2) Turning the revolving nosepiece, place the 100× objective in a position where it is convenient to apply oil. Then, tilt the oil container, until oil enters the nozzle. Depressing the container, attach an appropriate amount of oil onto the coverglass. (Fig. 22) The oil may take in air bubbles. If any air bubble is seen, clear off the oil using lens tissue, and apply the oil once again.
3) Thereafter, keeping the container depressed, apply the oil on the top end of the nozzle to that of the objective. Then, rotate the 100× objective into the optical path.
4) If air bubbles enter the oil layer, a poor image will result. To remove the air bubbles, turn the revolving nosepiece several times laterally or apply an additional drop of oil.
5) If a higher resolving power is desired, also apply oil between the bottom of the glass slide and the condenser top lens.

Note: For cleaning the oil, after finishing oil-immersion observation, wipe it off thoroughly with lens tissue.

11. Moving the glass slide

The lateral travel range of the glass slide by means of the smaller knob on the mechanical stage is 76mm (2.99 in), and the back and forth travel range by means of the larger knob, 38mm (1.5 in).

IV. OPTICAL FEATURES OF SC MICROSCOPE

Combination of Eyepiece 10×SC (field number 18) with Objective SC series

Objective	Total Magnification	Numerical aperture (N.A.)	Real viewfield	Depth of focus	Resolving power	Working distance (W.D.)
4×SC	40×	0.1	4.5 mm	63.2 μm	2.8 μm	28 mm
10×SC	100×	0.25	1.8 mm	10.1 μm	1.1 μm	8 mm
40×SC	400×	0.65	0.45mm	0.97μm	0.42μm	0.73mm
100×SC	1000×	1.25	0.18mm	0.33μm	0.22μm	0.16mm

TERMS DESCRIBING THE OPTICAL FEATURES OF MICROSCOPES

- **Total magnification**
  Total magnification of a microscope is the individual magnifying power of the objective multiplied by that of the eyepiece.
- **Numerical aperture (N.A.)**
  One of the important factors determining the efficiency of condenser and objective. It is represented by the formula:
  $$N.A. = n \sin \alpha,$$
  Where n is the refractive index of a medium (air, immersion oil, etc.) between the objective lens and the specimen or condenser, and α is a half of the maximum angle at which the light rays enter or leave the lens from or to a focused object point on the optical axis. The larger the numerical aperture, the brighter and better resolved the image.
- **Resolving power**
  Capability of discriminating two object points separated by a minute distance on the image the optical system produces, thus being taken as a definition standard of image resolution. The more minute such a distance, the higher the resolving power of the optical system.
  In relation to the numerical aperture, the resolving power is represented by the value:
  $$\lambda/2 \text{ N.A.}$$
  where λ is the wavelength of light being used.
- **Mechanical tube length**
  Length from the attaching surface of the objective on the nosepiece to the top end of the sleeve into which the eyepiece is inserted.
- **Working distance (W.D.)**
  Clearance between the front of the objective and the upper surface of the coverglass, when the image of a specimen is brought into sharp focus.
- **Real viewfield**
  Diameter of the circular area of the specimen actually covered under the microscope.
  Real viewfield = Field number/objective magnification
- **Field number**
  Generally, it means the diameter of the field diaphragm of the eyepiece.
- **Depth of focus**
  Depth (thickness) of specimen image appearing sharp, extending above and below the focused image plane.

V. TROUBLE SHOOTING CHART

If any trouble cited below occurs, take appropriate action, referring to the following chart, before requesting our repair service.

1. Optical system

Failures	Causes ——→ Actions
Cutting off or uneven brightness of viewfield	• Revolving nosepiece is not correctly set; objective is out of optical path ——→ Reset the nosepiece (with click) • Condenser is not raised to its limit ——→ Raise the condenser • Lamp bulb is not correctly inserted ——→ Insert the lamp bulb correctly • Lens surfaces of condenser, objective, and/or eyepiece are not clean ——→ Clean the lens surfaces • Surface of lamp bulb is not clean ——→ Clean the bulb surface
Dirt is seen in the viewfield	• Dirt or dust on the lens surfaces of condenser, objective and/or eyepiece ——→ Clean the lens surface • Dirt on the specimen ——→ Remove the dirt
Poor image (too low contrast and/or resolving power)	• No coverglass is used on the specimen ——→ Place a coverglass • Immersion oil is smeared on the objective of a dry-system (40× objective is liable to accept oil) ——→ Clean off the oil • No immersion oil is applied to the end of 100X objective ——→ Apply immersion oil • Air bubbles enter the oil layer ——→ Remove the air bubbles • Too thick specimen is observed ——→ Use a thinner specimen • Too thick coverglass is used ——→ Use a coverglass of standard thickness 0.17 mm • Unspecified immersion oil is used ——→ Apply Nikon Immersion oil • Too large opening of condenser diaphragm ——→ Close the diaphragm properly
Image shows poor details for too much contrast	• Condenser diaphragm is excessively closed ——→ Open the diaphragm properly

Failures	Causes ⟶	Actions
Image is blur on one side	• Revolving nosepiece is not set correctly ⟶	Set the nosepiece correctly (with click)
	• Specimen is not held in position ⟶	Hold the specimen securely on the stage
Fringes appear around the image	• Condenser diaphragm is excessively closed ⟶	Open the diaphragm properly
	• Condenser is excessively lowered ⟶	Raise the condenser

2. Manipulation system

Failures	Causes ⟶	Actions
No sharp image is obtained with high power objectives	• Specimen is placed upside down ⟶	Place the specimen correctly
	• Fine focus knob has not been adjusted correctly before focusing ⟶	Bring the white line on the fine focus knob into coincidense with the end of coarse focus knob
Image moves irregularly when manipulating the X- or Y-axis travel knob	• Mechanical stage is not fastened ⟶	Fasten the stage securely
Left and right images do not coincide with one	• Interpupillary distance is not adjusted ⟶	Adjust the interpupillary distance
Eye becomes too fatigued during observation	• Diopter (eyesight) adjustment has not been made ⟶	Adjust diopter for operator
When changing-over low power objective to high power, the later touches the specimen	• Specimen is placed upside down ⟶	Place the specimen correctly

3. Electrical system

Failures	Causes ⟶	Actions
Lamp does not light even though brightness control dial turned ON	• No electric current flows	Insert the power source cord into the socket
	• Lamp bulb has burned out	Replace the lamp bulb
	• Fuse has burned out	Replace the fuse (1A)
	• Disconnection in the circuit	Repair the disconnection
Lamp bulb burns out immediately after being lit	• Unspecified lamp bulb is used	Use the specified Nikon bulb
	• Instrument is used in a place subject to vibration	Choose a place free from vibration
Lamp lights but no light appears in eyepiece	• Revolving nosepiece is not correctly set	Set the revolver correctly with a click
Image brightness is insufficient	• Silver surface of the bulb is turned upward	Attach the bulb correctly
	• Surface of the bulb is not clean	Clean the bulb surface
	• Condenser diaphragm is closed	Open the diaphragm to match specimen
	• Condenser is excessively lowered	Raise the condenser to its limit
	• Unspecified lamp bulb is used	Use the specified Nikon bulb
	• Brightness control dial is not turned sufficiently	Control the dial properly
	• Dirt on the lens surfaces of condenser, objective and/or eyepiece	Clean the lens surfaces
Flickering or unstable brightness of lamp	• Lamp bulb is going to burn out	Replace the lamp bulb
	• Poor contact of electrical part	Repair the contact
Fuse is liable to be blown up	• No specified fuse is used	Use the specified fuse 1A/250V

ELECTRIC SPECIFICATIONS

Power source	100V 115/120V 220/240V
Light source	Tungsten lamp bulb built in the base 100V–30W 115/120V–30W 220/240V–30W
	Lamp bulb in the simplified illuminator 100/120V–10W 220/240V–12W
Fuse	1A/250V

We reserve the right to make such alterations in design as we may consider 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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