NIKON ALPHAPHOT INSTRUCTIONS MANUAL

Quick Links

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Nikon

Biological Microscope
ALPHAPHOT

Instructions

NIPPON KOGAKU K.K.

CAUTIONS IN HANDLING

❶ Avoid sharp knocks !

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

❷ Locations of microscope

Avoid the following conditions: dust, vibration and exposure to high temperature, moisture or direct sunlight.

❸ Replacing the lamp bulb or fuse

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

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.

CARE AND MAINTENANCE

❶ Cleaning the lenses

To clean the lens surfaces, remove dust using a soft brush or gauze. Only for removing finger marks or grease, should soft cotton cloth, lens tissue or gauge 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 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 your agency.

CONTENTS

I. NOMENCLATURE

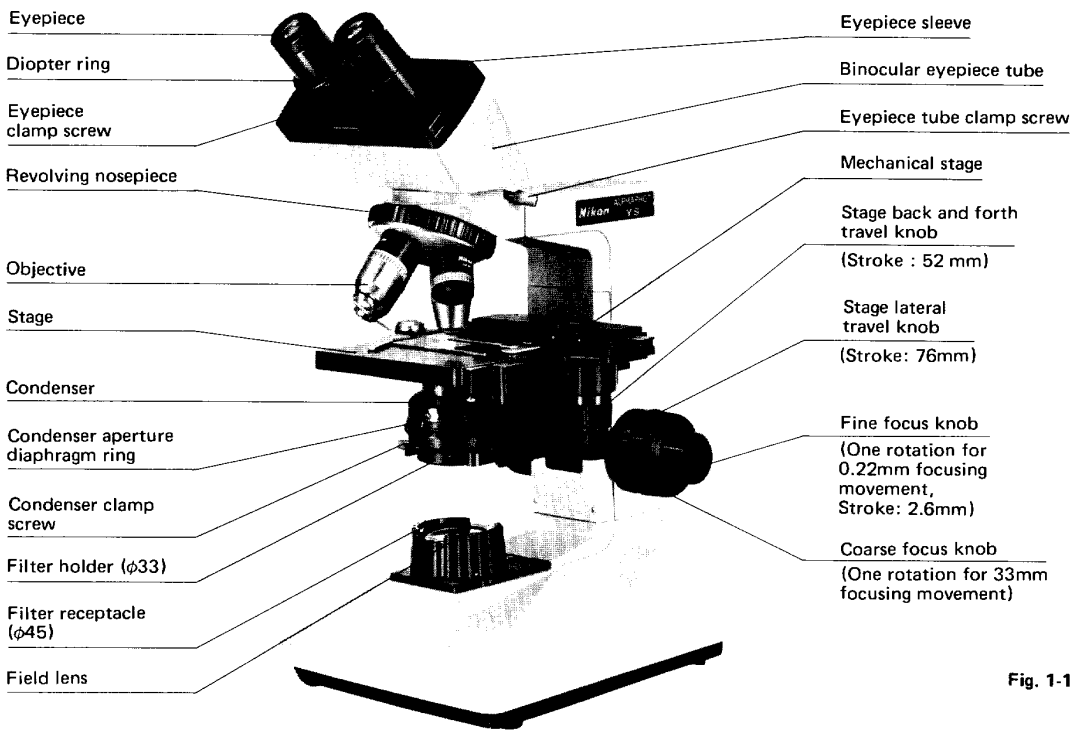
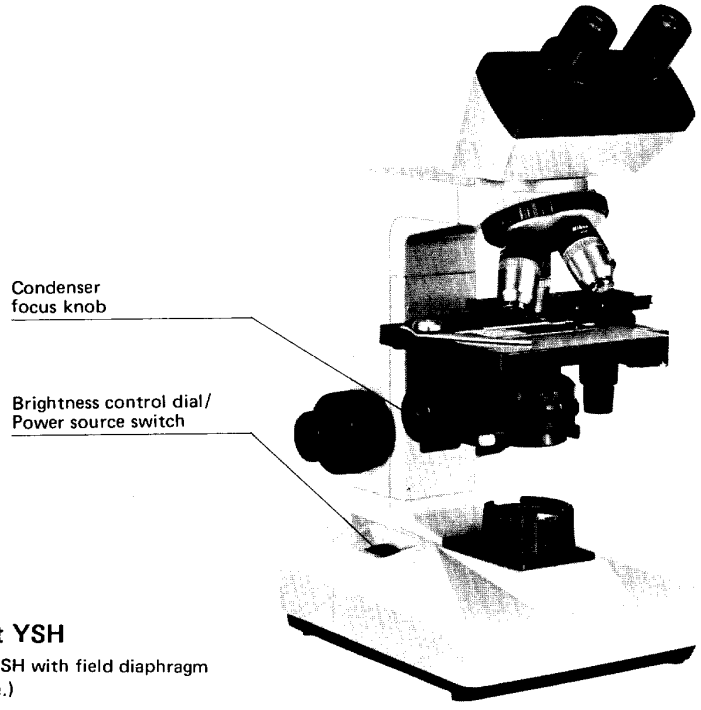


Fig. 1-1



Halogen set YSH

(Halogen set YSH with field diaphragm is also available.)

Fig. 1-2

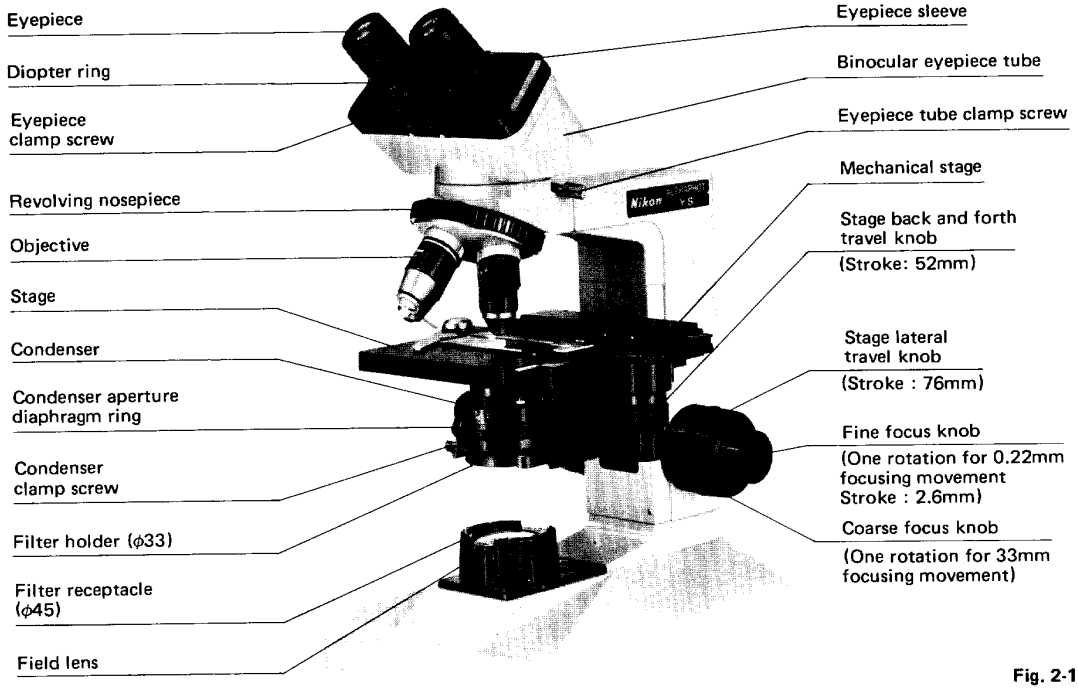
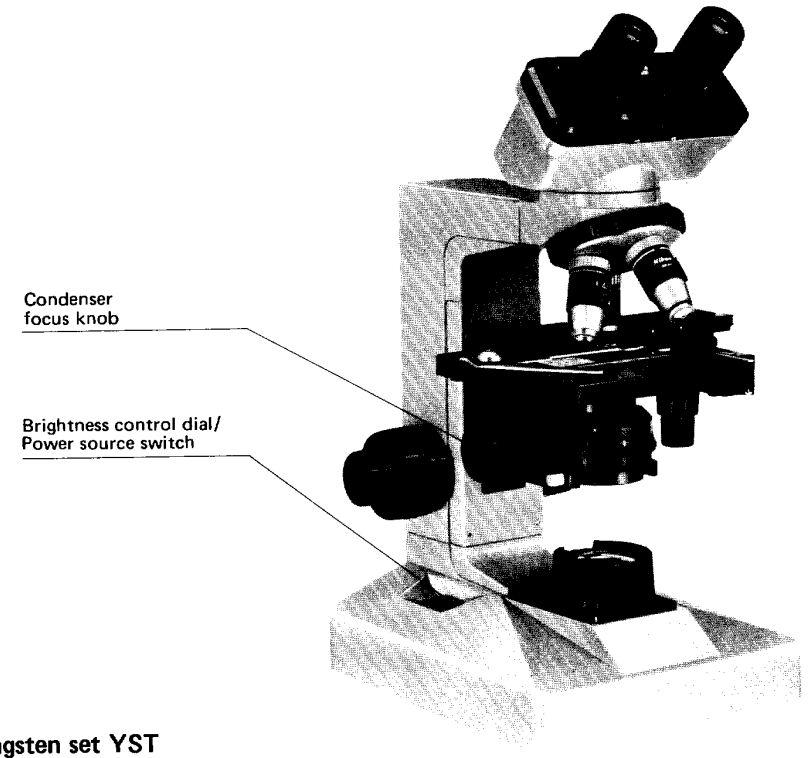


Fig. 2-1



Tungsten set YST

Fig. 2-2

II. ASSEMBLY

1 Lamp

- Halogen lamp (6V-20W)

Finger marks or dirt, if left on the lamp bulb, is to be wiped off clearly.

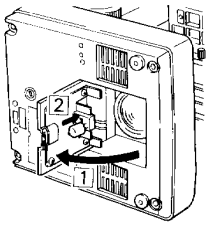


Fig. 3-1

- Tungsten lamp (100V-20W)

The silvered (mirror) surface of the bulb faces down.

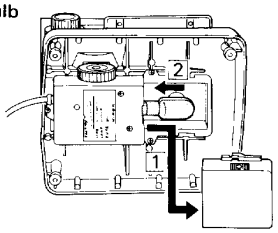


Fig. 3-2

2 **Eyepiece tube**
Mount the eyepiece tube onto the arm.

3 **Eyepiece**
Insert the eyepiece into the eyepiece sleeve.

4 **Objective**
Lower the stage to the limit and screw the objective into the revolving nose-piece.

5 **Mechanical stage**
Attach the mechanical stage to the microscope stage in such a position that the stage travel knobs come to the right for the operator, and fasten it by means of the two hexagonal socket bolts (M4) from below.

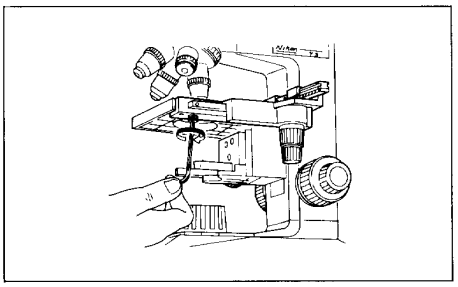
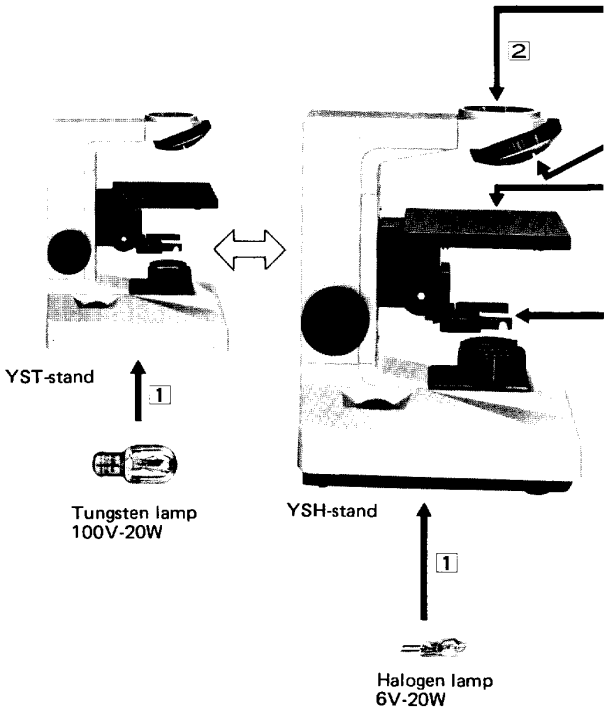


Fig. 3-3

Assemble the following components in order of number.



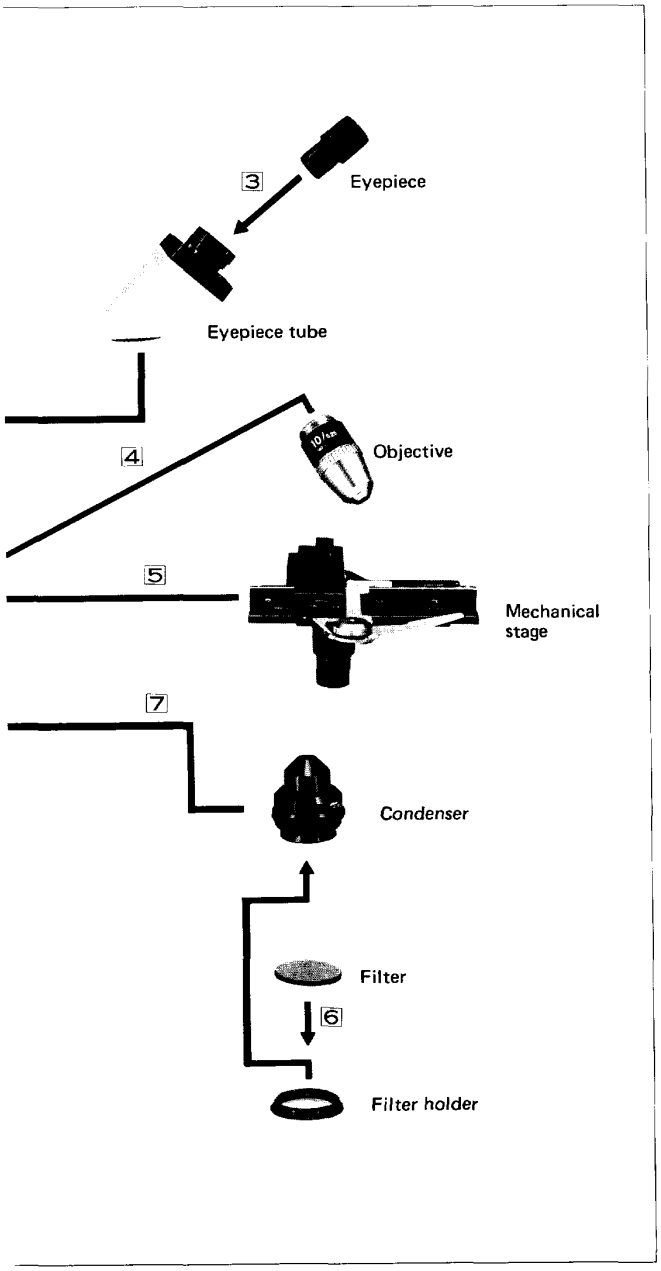


Fig. 3

6 Filter (ϕ33)

Put the filter in the filter holder, push the filter holder into the bottom of the condenser.

[For the type with field diaphragm]

Push the filter holder with filter into the bottom of the auxiliary lens, insert the auxiliary lens in the bottom of the condenser.

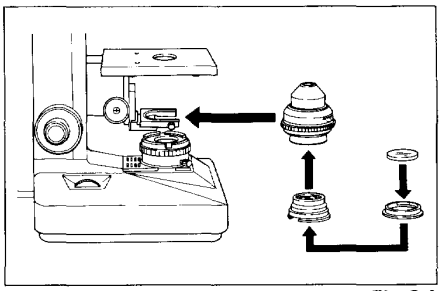


Fig. 3-4

7 Condenser

Slide the condenser into the condenser carrier and tighten the condenser clamp screw in the position where the aperture number plate turns toward the operator.

- **Replacement of the lamp and fuse [Be sure to disconnect the power source cord, beforehand.]**
- For exchanging the lamp bulb, refer to the item 1 .
- Fuse (1A/250V or 0.5A/250V) can be exchanged by removing the fuse holder unscrewing the holder cap with a ⊖ screw driver.

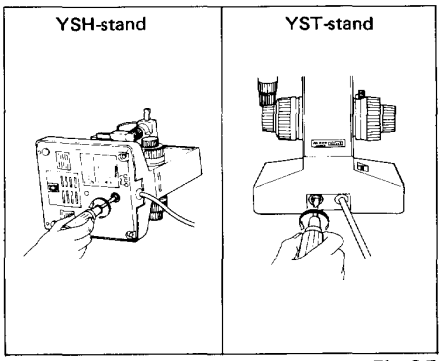
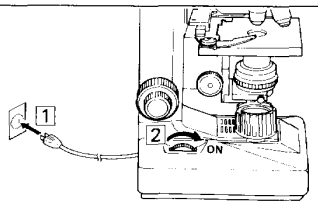


Fig. 3-5

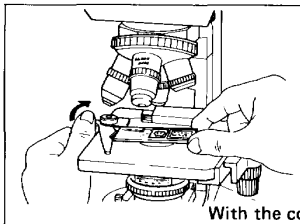
III. MICROSCOPY

1. Lighting the lamp



Turn the dial until the adequate brightness is obtained.

2. Setting the specimen



With the cover glass turned upward.

Fig. 5

3. Focusing with 10× objective

The relation between the rotation of the coarse and fine focus knobs and the vertical movement of the stage.

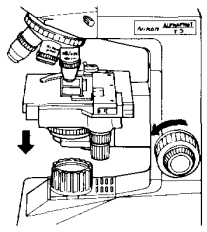


Fig. 6

4. Adjusting the interpupillary distance

Both the right and left images become one.

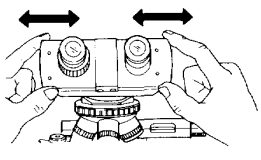
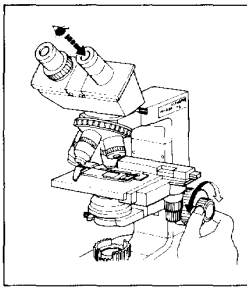


Fig. 7

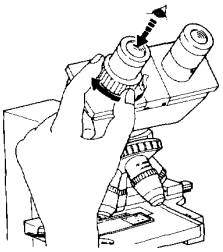
5. Adjusting the eyesight difference

5. Adjusting the eyesight difference



Looking into the righthand eyepiece with the right eye, focus the image by turning the focus knob.

Fig. 8-1

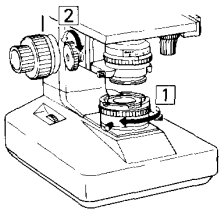


Looking into the lefthand eyepiece with the left eye, focus the image by turning the diopter ring.

Fig. 8-2

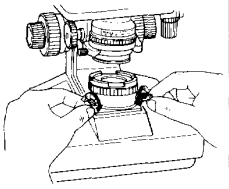
6. Centering the field diaphragm

[Only for the type with field diaphragm]



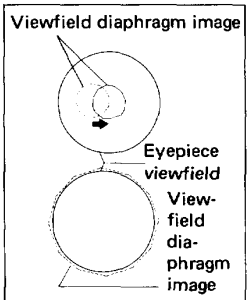
[1] Close the field diaphragm to its minimum opening.
[2] Form a sharp image of the field diaphragm on the specimen surface by moving the condenser vertically.

Fig. 9-1



Bring the field diaphragm image to the center of the field of view by manipulating the centering screws.

Fig. 9-2



Change over to the 40× objective. Adjust the field diaphragm so that the image of the diaphragm is about the same as that of the field of view.
If not centered, use the centering screws again.

Fig. 9-3

7. Changing over to the objective to be used

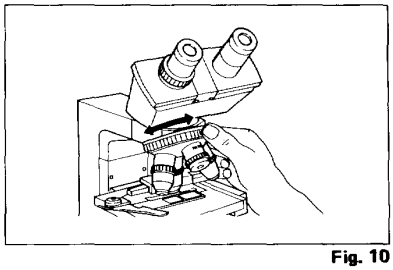
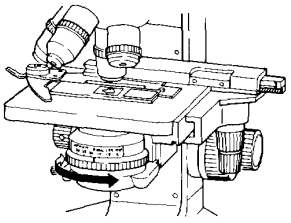


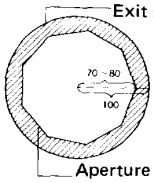
Fig. 10

8. Adjusting the aperture diaphragm



(This diaphragm is intended to adjust its numerical aperture and not the brightness of illumination.)

Fig. 11-1

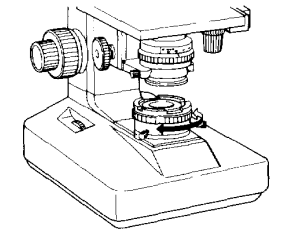


In general, when it is stopped down to 70 ~ 80% of the numerical aperture of the objective, a good image of appropriate contrast will be obtained. For observing the image of the diaphragm, remove the eyepiece and look into the exit pupil of objective inside.

Fig. 11-2

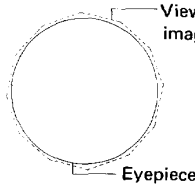
9. Adjusting the field diaphragm

[Only for the type with field diaphragm]



Stop it down to such an extent that the circumference of the illuminated area circumscribes that of the eyepiece field of view.

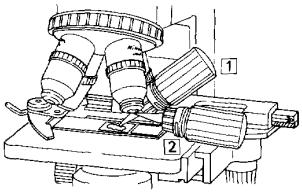
Fig. 12-1



This diaphragm is used for determining the illuminated area on the specimen surface in relation to the field of view of the microscope. If it is opened larger than needs, extraneous light will enter the field of view, causing lowering the contrast.

Fig. 12-2

10. Oil-immersion observation



Apply the immersion oil between the coverglass and the front lens of the objective.

Fig. 13

The black band marking around the barrel end of the 100× objective indicates that this objective is of oil-immersion type, thus necessitating the application of the immersion oil between the coverglass and the front lens of the objective.

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.

After finishing the oil-immersion observation, be sure to clean the front lens of the objective and other parts soiled with oil.

IV. ADJUSTMENTS SO FAR AS EXPEDIENT FOR OPERATORS

1. Adjustment of brightness of image

[Only for the YST-stand]

When the brightness control dial is turned ON, if an extreme bright image or, even when the dial is turned toward the brighter side, if the lamp does not light immediately, it is necessary to make the following adjustment.

① Adjust the resistance compensator in the illuminator by means of a screw driver, so that the lamp slightly lights when the brightness control, dial is turned ON, that is, the illuminating light appears somewhat red. (Fig. 14)

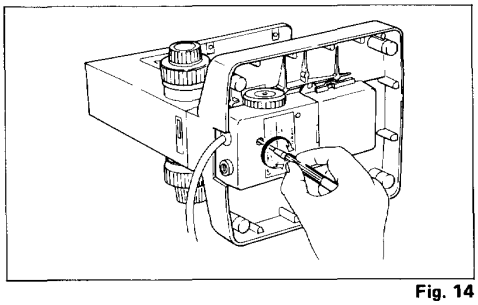


Fig. 14

② Turning the resistance compensator clockwise, the illuminating light will become dark, and counterclockwise, light.

2. Adjustment of tension of the coarse focus knob

Tension of the coarse focus knob has been adjusted so as to fulfil the requirements for its precise manipulation. If, however, it happens to be too loose (so that the stage drops under its own weight), make the following adjustment:

① Using a hexagonal wrench (nominal size: 2mm), release the three retaining screws, and turn the tension adjusting ring toward the operator to increase tension. (Fig. 15)

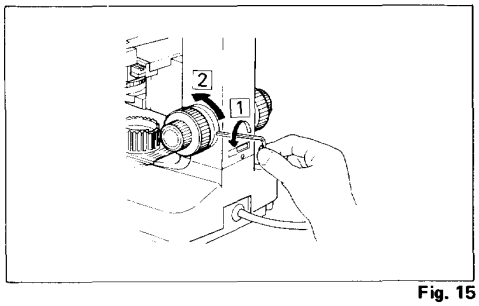


Fig. 15

② After the above adjustment, using the hexagonal wrench, fasten up the three retaining screws uniformly. Do not lock them too forcibly.

3. Height adjustment by leveling foot screw

[Only for the YSH-stand]

If the microscope is not settled on the desk, etc., make leveling adjustment by turning the rubber foot screw at the right side of the front of the base.

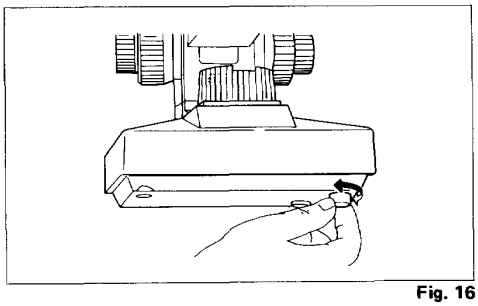


Fig. 16

V. OPTICAL FEATURES OF ALPHAPHOT

1. Combination of eyepiece 10×(field number 18) with CF E achromat and CF achromat objectives

CF E achromat and CF achromat objectives	Total Magnification	Numerical Aperture (N.A.)	Real viewfield	Depth of focus	Resolving power	Working distance (W.D.)	
						CF E achromat	CF achromat
4×	40×	0.1	4.5 mm	63.2 μm	2.8 μm	25 mm	20 mm
10×	100×	0.25	1.8 mm	10.1 μm	1.1 μm	5.2 mm	5.6 mm
CF achromat type only 20×	200×	0.40	0.9 mm	3.5 μm	0.69μm		2.23mm
40×	400×	0.65	0.45mm	0.97μm	0.42μm	0.6 mm	0.53mm
100×	1000×	1.25	0.18mm	0.4μm	0.22μm	0.14mm	0.14mm

2. 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 :

  $$\frac{\lambda}{2 \times N.A.}$$

  where λ is the used wavelength of light. (The resolving power in the above table is indicated for $\lambda = 0.55\ \mu m$.)
- **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. The mechanical tube length is made 160mm in the Nikon Biological Microscopes.
- **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. Generally, the higher the magnifying power of objective, the shorter the working distance.
- **Field number**
  Diameter (mm) of the field of view which can be observed through the eyepiece. Indication "10×/18" on the top of the eyepiece shows that the eyepiece magnification is 10× and the field number, 18.
- **Real viewfield**
  Diameter of the circular area of the specimen actually covered under the microscope.

  $$\text{Real viewfield} = \frac{\text{Field number}}{\text{Objective magnification}}$$

- **Depth of focus**
  Depth (thickness) of specimen image appearing sharp, extending above and below the focused image plane. The larger the N.A. of objective, the shallower the depth of focus.

VI. TROUBLE SHOOTING TABLE

Although nowhere the user can find any disorder or derangement in the instrument, if he encountes some difficulty or dissatisfaction, recheck the use, referring to the table below:

1. Optical

Failures	Causes → Actions
Darkness at the periphery or uneven brightness of viewfield	● Revolving nosepiece not in click-stop position (Objective not centered in optical path) → Revolve it to click-stop position (Swing the objective into the optical path) ● Field diaphragm not centered → Centering ● Field diaphragm too much closed → Open it properly ● Dirt or dust on the lens (Condenser, objective, eyepiece, slide) → Cleaning
Dirt or dust in the viewfield	● Dirt or dust on the lens (Condenser, objective, eyepiece, field lens) → Cleaning ● Dirt or dust on the slide → Cleaning ● Too low position of condenser → Correct positioning (Refer to P.9)
No good image obtained (low resolution or contrast)	● No coverglass attached to slide → Attach coverglass ● Too thick or thin coverglass → Use specified thickness (0.17mm) coverglass ● Upside down of slide → Turn over the slide ● Immersion oil soils the top of dry system objective (especially 40×) → Cleaning ● Dirt or dust on the lens (Condenser, objective, eyepiece, slide) → Cleaning ● No immersion oil used on immersion system objective → Use immersion oil ● Air bubbles in immersion oil → Remove bubbles ● Not specified immersion oil used → Use Nikon immersion oil ● Condenser aperture and field diaphragm too much opened → Close properly ● Dirt or dust on the entrance lens → Cleaning ● Condenser aperture too much closed → Open properly (Refer to P.10) ● Too low position of condenser → Bring it up to coincidence with field diaphragm image (Refer to P.9)
Oneside dimness of image	● Revolving nosepiece not in click-stop position → Revolve it to click-stop position
Image moves while being focused	● Specimen rises from stage surface → Place it stable ● Revolving nosepiece not in click-stop position → Revolve it to click-stop position
Image tinged yellow	● Daylight filter not used → Use daylight filter

Failures	Causes → Actions
Insufficient brightness of illumination	● Condenser aperture too much closed → Open it properly (Refer to P.10) ● Too low position of condenser → Correct positioning (Refer to P.9) ● Dirt or dust on lens (condenser, objective, eyepiece, field lens, filter) → Cleaning

2. Manipulation

Failures	Causes → Actions
No focused image obtained with high power objectives	● Upside down of slide → Turn over the slide ● Too thick coverglass → Use specified thickness (0.17mm) coverglass
High power objective touches the slide, when changed-over from low power	● Upside down of slide → Turn over the slide ● Too thick coverglass → Use specified thickness (0.17mm) coverglass
Movement of image not smooth by moving the slide	● Slide holder not tightly fixed → Fix it tightly
Travel of stage limited to one half length of slide	● Improper attaching of slide holder → Shift the attaching position
No fusion of binocular images	● Interpupillary distance not adjusted → Adjustment (Refer to P.8)
Fatigue of observing eyes	● Incorrect diopter adjustment → Correct adjustment (Refer to P.9) ● Inadequate brightness or illumination → Change power voltage

3. Electrical

Failures	Causes → Actions
Lamp does not light even though switched ON	● No electricity obtained → Connect the cord to socket ● No lamp bulb attached → Attaching ● Lamp bulb blown → Replacement ● Fuse blown → Replacement
Unstable brightness of illumination	● House current voltage fluctuates too much → Use transformer or the like (For adequate voltage)
Lamp bulb promptly blown	● Not specified lamp bulb used → Use specified lamp bulb ● Too high voltage of house current → Use transformer for adjustment
Insufficient brightness of illumination	● Not specified lamp bulb used → Use specified lamp bulb ● Too low voltage → Raise the voltage
Fuse blown	● Not specified fuse used → Use 1A (250V) or 0.5A (250V)
Flickering or unstable brightness of lamp bulb	● Lamp bulb going to be blown → Replacement ● Lamp bulb not inserted to the limit → Secure connection ● Fuse holder not firmly fastened → Firm fastening ● Irregular change of house current voltage → Use stabilizer ● Lamp bulb insufficiently inserted into the socket → Positive connection

ELECTRIC SPECIFICATIONS

	Tungsten set	Halogen set
Power source	100V 120V 50/60Hz 220/240V	100V 120V 50/60Hz 220/240V
Lamp bulb	100V – 20W	6V – 20W
Fuse	100V, 120V } 1A/250V 220/240V 0.5A/250V	100V, 120V } 1A/250V 220/240V 0.5A/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.