OLYMPUS STUDENT MICROSCOPES

INSTRUCTION MANUAL

MODELS **CHA & CHB**

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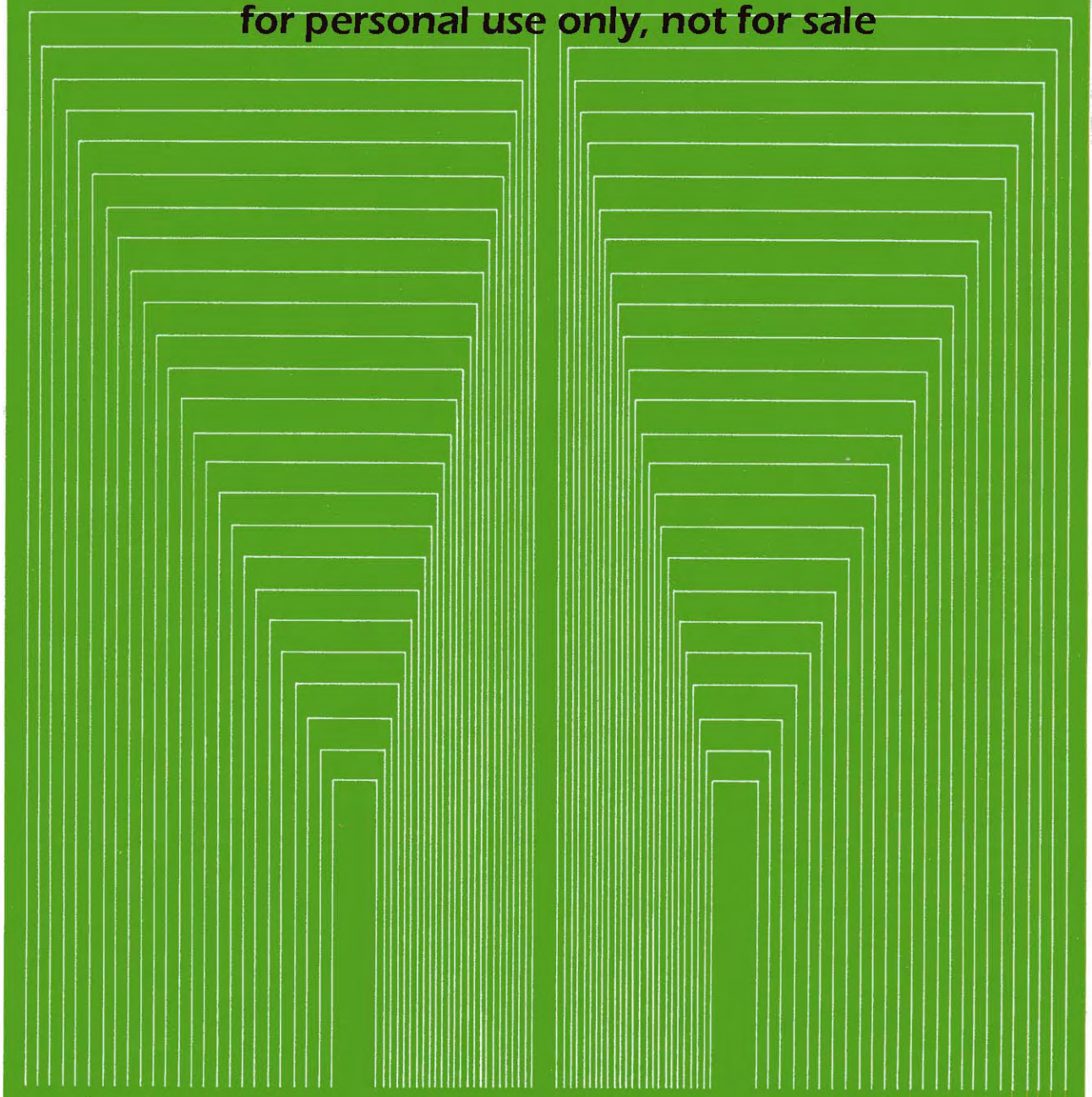

OLYMPUS

AX5185

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This instruction manual has been prepared for the Olympus Student Microscopes Models CHA and CHB. It is recommended that you read the manual carefully in order to familiarize yourself fully with your microscope, in order to obtain optimum performance from this precision instrument.

IMPORTANT

Observe the following points carefully.

■ **Operation**

1. Always handle the microscope with the care it deserves, and **avoid abrupt motions** or any impact.

2. Avoid exposure of the microscope to **direct sunlight, dust** and **vibration.**

3. **Only use the tension adjustment ring for altering the tension of the coarse adjustment knobs.** Do not twist the two coarse adjustment knobs in the opposite directions simultaneously, as this will cause damage.

4. Ascertain that the voltage selector switch on the base plate of the Model CHA is set to conform with the local mains voltage.

5. Disconnect the line cord from the AC power outlet before fuse replacement.

■ **Maintenance**

1. Lenses must always be kept clean. Fine dust on lens surfaces should be blown or wiped off by means of an air blower or a clean brush. Carefully wipe off oil or fingerprints deposited on the lens surfaces with gauze moistened with a **small** amount of xylene, alcohol or ether.

2. Do not use organic solutions to wipe the surfaces of various components. Plastic parts, especially, should be cleaned with a neutral detergent.

3. **Never disassemble** the microscope for repair.

4. The microscope should be stored in its container immediately after use. If this is not possible, it should be covered with the vinyl dust cover provided.

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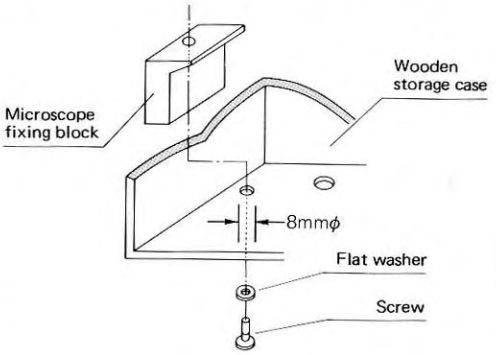
◉ **How to put microscope fixing blocks (provided with an optional wooden storage case)**

The blocks should be put at the bottom of the wooden storage case in the following order:

1. Insert the screw with the flat washer into one of the two holes (8mmϕ) as shown in the drawing.
2. Turn the screw to get into the block and tighten it with the spanner provided or a screwdriver.
3. Put the other block in the above order.



I. STANDARD EQUIPMENT

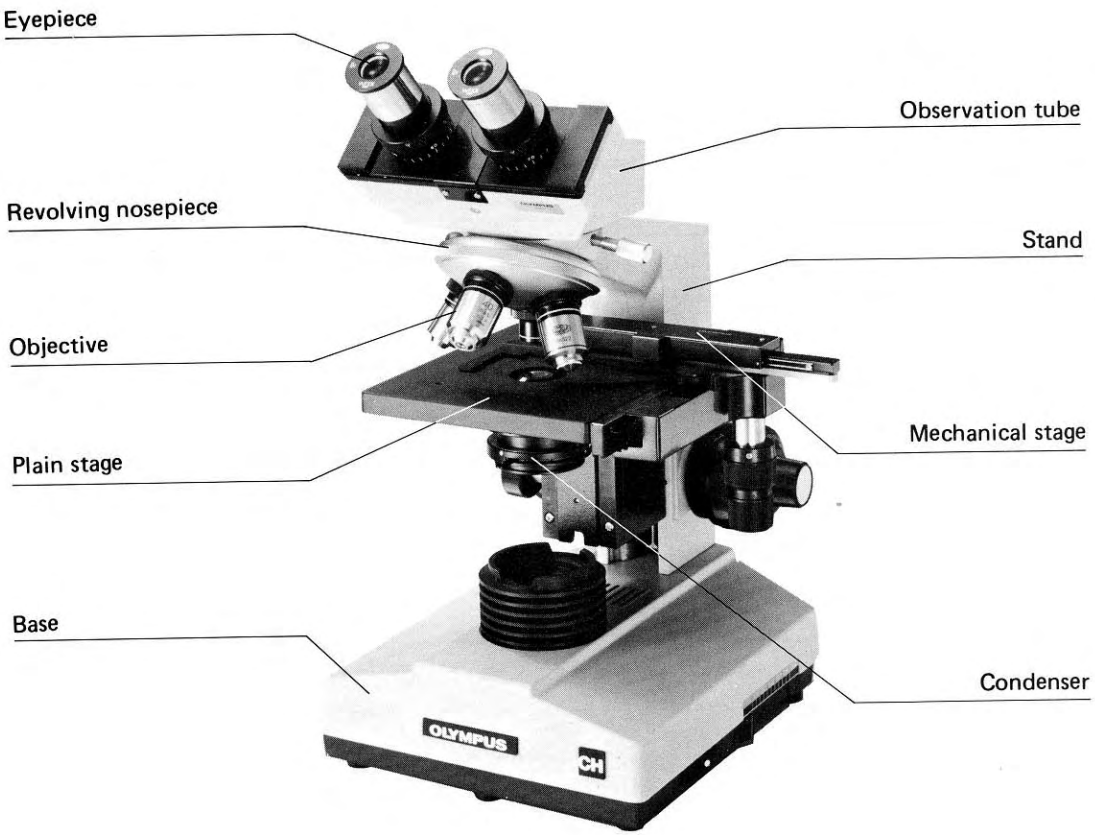
Model			CHA-213-W	CHB-213-W
Microscope stand with quadruple revolving nosepiece, plain stage and in-base illuminator (6V 10W halogen)		CHA-F-W	1	0
Microscope stand with quadruple revolving nosepiece, plain stage and in-base illuminator (20W tungsten)		CHB-F-W	0	1
Binocular observation tube, inclined 45°		BH-B145-W	1	1
Mechanical stage with coaxial right-hand low drive controls		CH-MVR	1	1
Abbe condenser		CH-CD	1	1
Objectives	Ach. 4X		1	1
	Ach. 10X		1	1
	Ach. S40X, spring-loaded		1	1
	Ach. S100X, oil, spring-loaded		1	1
Eyepieces	BiWF 10X		2	2
Halogen light source CH-LSH	Lamp socket	CH-LSHB	1	0
	Halogen bulbs 6V 10W	HALCH	2	0
Tungsten bulbs		20WCHB	0	3
Spare fuses 0.5A for 100-110-120V (or 0.3A for 220-240V)			2	2
Eyepiece caps			2	2
Immersion oil, bottled			1	1
Vinyl dust cover			1	1

■ **Optional Accessories:**

- Monocular tube, inclined 45° — CH-MO45
- Mechanical stage with coaxial left-hand drive controls — CH-MVL
- Tungsten bulb, 6V 10W for CHA — CH-6V 10W-TP
- Wooden storage case — CHA-B/WSC

II. VARIOUS COMPONENTS OF THE STUDENT MICROSCOPES MODELS CHA & CHB

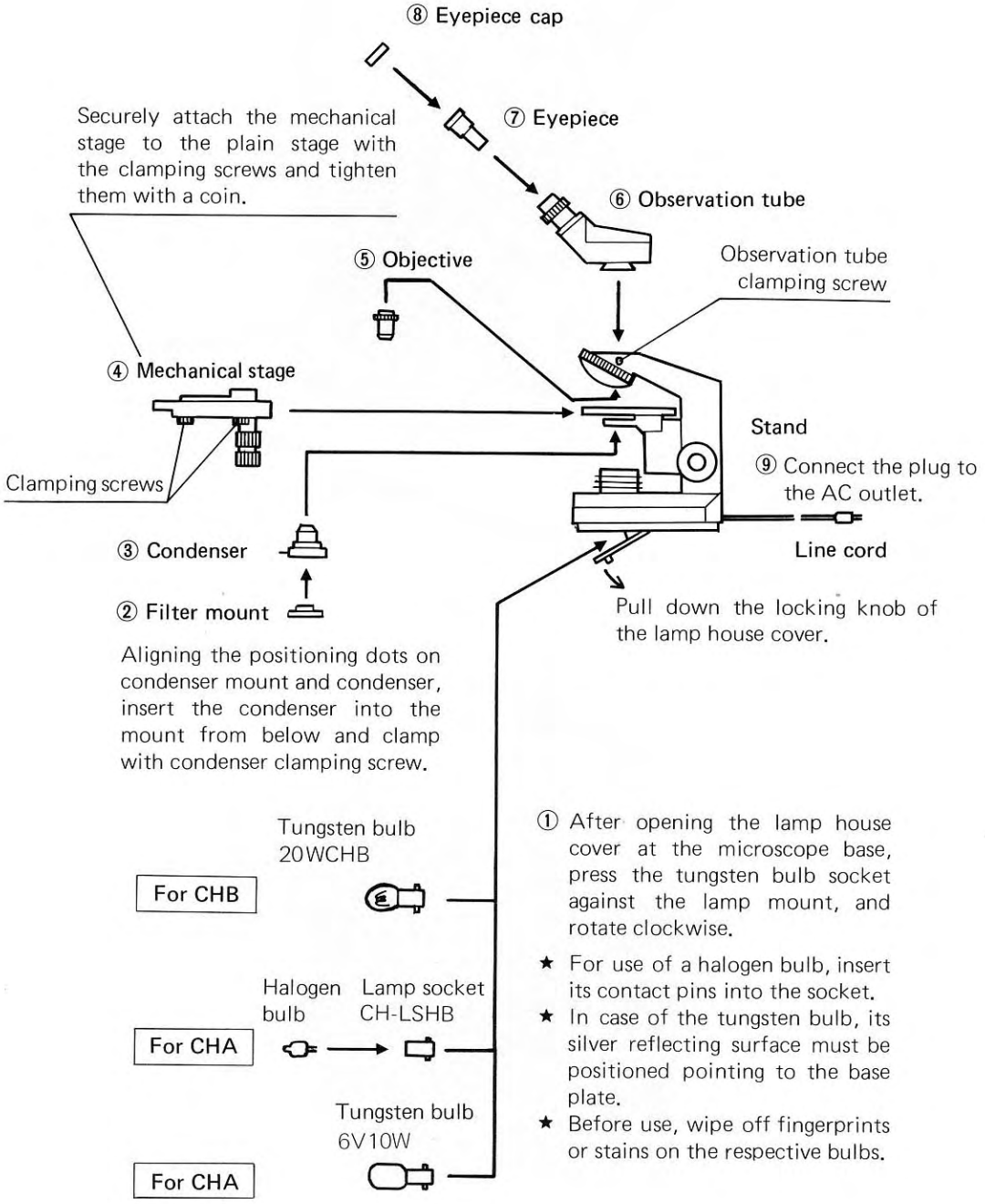
These models are composed of various components and interchangeable accessories. A variety of combinations, standard or optional, is available according to your requirements. This is a picture of the Model CHA.



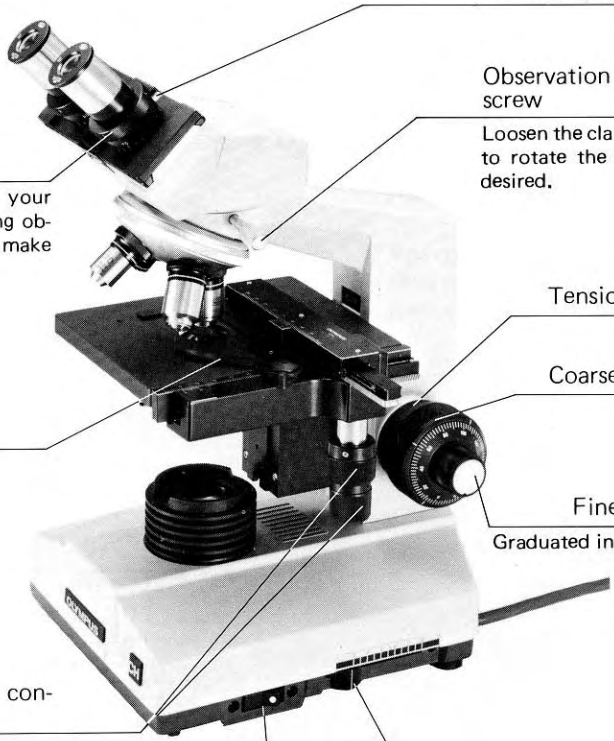
III. ASSEMBLY

The picture below illustrates the sequential procedure of assembly. The numbers indicate the assembly order of various components.

★ Take care at assembly to keep all glass surfaces clean and avoid scratching the lens surfaces.



IV. IDENTIFICATION AND FUNCTION OF VARIOUS COMPONENTS



Interpupillary distance scale

Observation tube clamping screw

Loosen the clamping screw slightly to rotate the observation tube as desired.

Mechanical tube length adjustment ring

Rotate the ring to match your interpupillary distance setting obtained from the scale, and make diopter adjustment.

Tension adjustment ring

Coarse adjustment knob

Specimen holder

Fine adjustment knob

Graduated in increments of 2.5μ.

Low drive coaxial stage controls

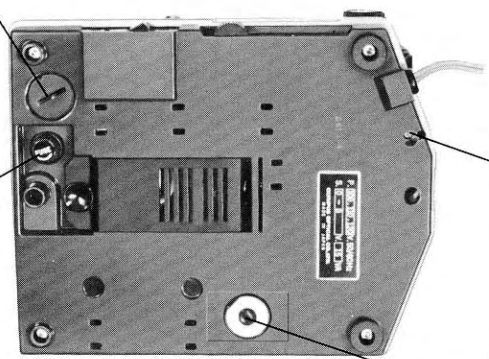
Main switch

Sliding control lever

For continuously variable light intensity.

Rheostat trimmer screw

After switching on, if necessary, rotate this screw with a coin until the bulb is dimly lit, with the sliding control switch at minimum voltage position.

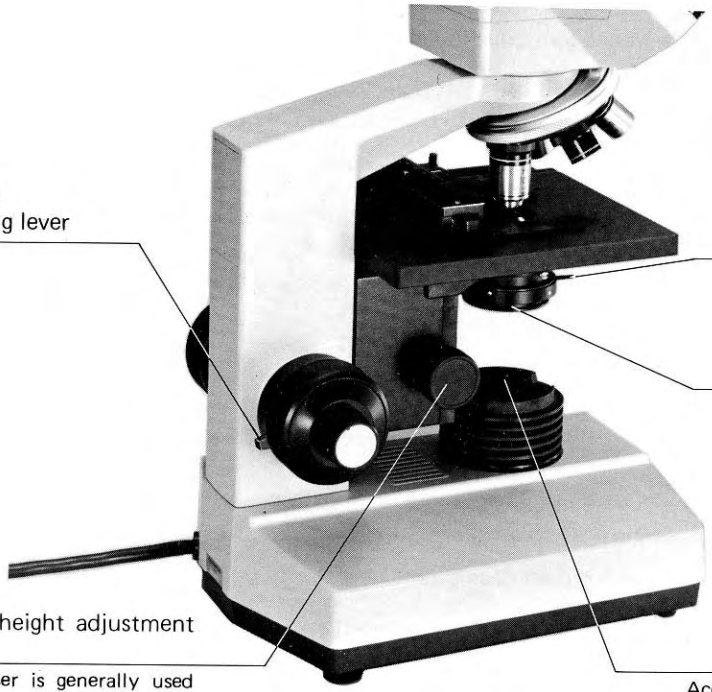


Grounding terminal

Fuse holder

Line voltage selector switch

(For CHA) Set the switch to conform with the local mains voltage.



Automatic
pre-focusing lever

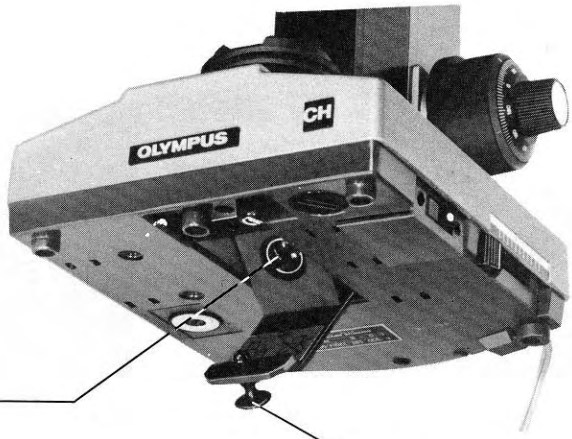
Aperture iris
diaphragm lever

Filter mount
Slip-in type.

Condenser height adjustment knob

The condenser is generally used at top position. For use with objectives 10X and lower power, however, it is recommended to lower the condenser properly to eliminate uneven field illumination.

Filter mount
Accepts 45mm diam. filters.

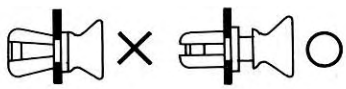


Lamp mount

Lamp house clamping knob

The lamp house cover can be opened by pulling down the knob; or closed by pushing it up until it snaps in place.

Before pushing, ascertain that the knob is positioned as shown in the picture right, marked with circle.



V. OPERATION

■ **Summary of Putting the Microscope in Operation**

1. Match the line voltage selector switch to local mains voltage (for CHA). (See page 5.)
2. Switch on the light source.
3. Adjust the trimmer screw. (See page 7.)
4. Place a specimen slide on the stage. (See page 7.)
5. Loosen the automatic pre-focusing lever.
6. Coarse focus with a low power objective.
7. Make interpupillary and diopter adjustments. (See page 8.)
8. Swing in the desired objective.
9. Adjust light intensity.
10. Fine focus.
11. Lock the automatic pre-focusing lever. (See page 8.)
12. Adjust the aperture iris diaphragm. (See page 9.)

A. Adjustment of Minimum Line Voltage (CHA)

The minimum voltage required for the light source can be adjusted with the rheostat trimmer screw at the microscope base plate in accordance with the line voltage and frequency.
The built-in rheostat incorporates a thyristor in its semi-conductor circuit for the following advantages:

(a) Extremely fine adjustment of light intensity can be easily achieved.

(b) Flickering of the bulb filament is eliminated and the light intensity is stabilized.

(c) Increased life expectancy of the bulb.

For adjustment of the minimum line voltage, ascertain that the voltage selector switch is set to conform with the local mains voltage, and the sliding control lever ② is positioned closest to you (low voltage), and then activate the main switch ①. If the bulb is dimly lit, the secondary voltage is correct. If it is not lit at all, rotate the rheostat trimmer screw ③ gradually with a coin, until the bulb is dimly lit; then push the sliding control lever forward in order to obtain optimum light intensity. (Fig. 1)

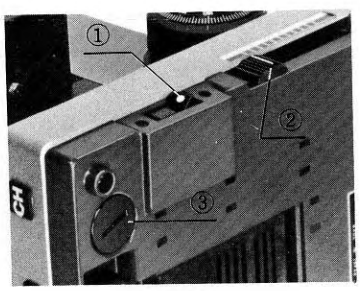


Fig. 1

B. Placing a Specimen Slide on the Stage

NOTE: **1) Cover glass:** Olympus objectives with an engraving "0.17" are corrected for use with cover glasses of 0.17mm thickness (No. 1½).

2) Specimen slide: It is recommended to use specimen slides of 0.8mm to 1.5mm thickness.
However, for use with the immersion darkfield condenser BH-DCW (optionally available), a specimen slide between 0.8mm to 1.2mm thickness is preferable.

C. Interpupillary Distance and Diopter Adjustments (Binocular tube)

1) Hold the knurled dovetail slides ① of the right and left eyepiece tubes with both hands and push the tubes together, or pull them apart laterally, whichever is required, while looking through the eyepieces with both eyes, until perfect binocular vision is obtained (Fig. 2).

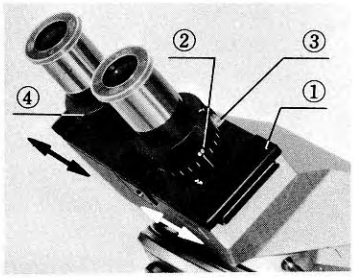


Fig. 2

2) Rotate the tube length adjustment ring ② on the right eyepiece tube to match your interpupillary distance setting which you obtained from the scale ③.

3) Look at the image through the right eyepiece with your right eye and focus on the specimen with the coarse and fine adjustment knobs.

4) Next, looking at the image through the left eyepiece with your left eye rotate the tube length adjustment ring ④ to focus on the specimen without using the coarse and fine adjustment knobs.

D. Tension Adjustment of Coarse Adjustment Knobs

A tension adjustment ring ① is provided next to the right hand coarse adjustment knob. With this device the tension of the coarse adjustment is freely adjustable for either heavy or light movement depending on operator preference. However, do not loosen the tension adjustment ring too much, because this may cause the stage to drop or the fine adjustment knobs to slip.
The arrow mark indicates increase of the tension.

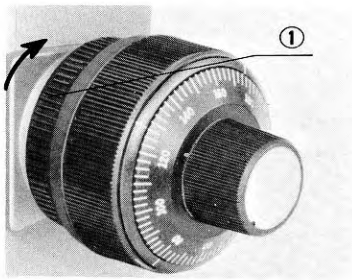


Fig. 3

★ Be careful not to rotate the right and left coarse adjustment knobs in the opposite directions simultaneously.

E. Automatic Pre-focusing Lever

This lever ① is provided to prevent possible contact between specimen and objective as well as to simplify coarse focusing. The lever is locked after coarse focus has been accomplished. This prevents further upward travel of the stage by means of the coarse adjustment knobs, and automatically provides a limiting stop if the stage is lowered and then raised again. The automatic pre-focusing lever does not restrict fine focusing. (Fig. 4)

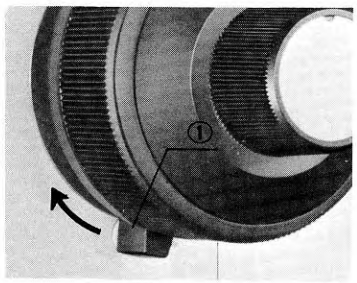
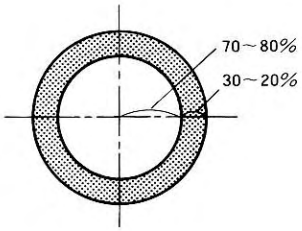


Fig. 4

F. Aperture Iris Diaphragm



An aperture iris diaphragm is provided on the condenser, the opening of which can be adjusted to match with the numerical aperture of the objective in use, in order to achieve optimum objective performance, as depth of focus, image contrast and resolution.
However, since microscopic specimens generally are low in contrast, their image lacks contrast if the objective is used with its full numerical aperture. Therefore, it is often preferable to stop down the aperture diaphragm slightly more than indicated by the objective N.A. An aperture setting at 70% to 80% of the objective N.A. is recommended. If necessary, remove the eyepiece and, looking at the exit pupil of the objective, adjust the opening of the diaphragm.

G. Immersion Objectives

To utilize the full numerical aperture of an immersion objective (with engraving "HI" for homogeneous immersion), the objective, specimen and condenser are immersed in an immersion oil.

★ Care should be taken to prevent oil bubbles from forming in the oil film between condenser, specimen slide or objective.

After use, carefully wipe off the immersion oil deposited on the lens surfaces with gauze moistened with xylene.
Never leave oil on lens surfaces after use as oil remnants will seriously impair the performance of the lens systems. It is recommended to use Olympus immersion oil for immersion objectives.

VI. OPTICAL DATA

Objective / Eyepiece	Type	Achromat			
	Magnification	4X	10X	S40X	S100X*
	N.A.	0.10	0.25	0.65	1.30
	W.D. (mm)	19.87	5.40	0.39	0.11
	Focal length (mm)	29.20	15.98	4.31	1.81
	Resolving power**(μ)	3.4	1.3	0.52	0.26
	Remarks			Spring-loaded	Spring-loaded
WF10X (Field number 18)	Total magnification	40X	100X	400X	1000X
	Focal depth (μ)	172.5	27.60	3.03	0.66
	Field of view (mm)	4.5	1.8	0.45	0.18

* Immersion objective.

** The resolving power is obtained if the objective is used with the fully opened aperture diaphragm.

- **Working distance:** The distance from the specimen or cover glass to the nearest point of the objective.
- **Numerical aperture:** The N.A. represents a performance number which could be compared to the relative aperture of a camera lens. The quantity of light which the objective receives from the object increases with the square of the performance number.
- **Resolving power:** The resolving power of a lens is measured by its ability to separate two points.
- **Focal depth:** The distance between the upper and lower limits of sharpness in the image formed by an optical system. As you stop down the aperture iris diaphragm, the focal depth becomes deeper. The larger the N.A. of the objective the shallower the focal depth.
- **Field number:** A number that represents the diameter in mm of the image of the field diaphragm that is formed by the lens in front of it.
- **Field-of-view diameter:** The actual size of the field of view in mm.

VII. TROUBLESHOOTING

Troubles	Causes	Remedies
1. Optical System		
a) Field of view is cut off, or illuminated irregularly.	Nosepiece did not change properly.	Slightly rotate the nosepiece until it clicks into position.
	Condenser is not correctly mounted on the ring mount.	Re-insert the condenser all the way.

Troubles	Causes	Remedies
b) Dust or dirt is visible in the field of view.	Dust or dirt on the glass surface at the light exit on the base.	Remove dust or dirt.
	Dust on condenser top lens.	
	Dirty specimen.	
	Dust on eyepiece.	
c) Excessive image contrast.	Condenser is lowered excessively.	Raise the condenser.
	Aperture iris diaphragm is stopped down excessively.	Open the diaphragm.
d) Resolution problems: • Image is not sharp. • Insufficient contrast. • Image details lack definition.	Objective is not correctly positioned in the light path.	Slightly rotate the nosepiece until it clicks into position.
	Dirt on objective front lens.	Clean the objective.
	Immersion objective is used without immersion oil.	Apply immersion oil.
	Bubbles in the immersion oil.	Remove bubbles.
	Olympus immersion oil is not used.	Use Olympus immersion oil.
	Dirty specimen.	Clean.
	Dust on eyepieces and condenser top lens.	
e) Field of view is partially out of focus.	Objective is not correctly positioned in the light path.	Slightly rotate the nosepiece until it clicks into position.
	Specimen is not correctly positioned on the stage.	Place the specimen on the stage and secure it with the specimen holder or stage clips.
f) When objectives are changed they are not parfocal.	Mechanical tube length is not correctly adjusted.	Adjust with the tube length adjustment rings on the observation tube.
g) Light intensity does not increase although the voltage is raised.	Condenser is lowered excessively.	Raise the condenser.
	Rheostat trimmer screw is not correctly adjusted.	Adjust it correctly.
2. Electric System		
a) Illuminator is too bright (or too dark).	Voltage selector switch is not matched with the mains voltage (for CHA).	Set the switch to match the mains voltage.
	Mains voltage is too high (or too low).	Adjust the mains voltage with a variable voltage transformer.
	Rheostat trimmer screw is not correctly adjusted.	Adjust it correctly.
b) Output voltage for the illuminator cannot be regulated.	Voltage selector switch is not matched with the mains voltage (for CHA).	Set the switch to match the mains voltage.
	Mains voltage is too low (or too high).	Adjust the mains voltage with a variable voltage transformer.

Troubles	Causes	Remedies
c) Light flickers and the intensity is unstable.	Mains voltage is unstable.	Use a voltage stabilizer.
	Filament of the bulb is likely to burn out.	Replace the bulb.
	Loose electrical connection.	Secure the connection.
d) Fuse burns out too often.	Fuse is not a standard fuse.	Use a standard fuse.
	Voltage selector switch is not matched with the mains voltage.	Set the switch to match the mains voltage.
e) Bulb does not light.	Bulb is burned out.	Replace the bulb.
	Loose electrical connection.	Secure the connection.
f) Reduced bulb life.	Voltage selector switch is not matched with the mains voltage.	Set the selector switch to match the mains voltage.
	Bulb is not a standard one.	Use a standard bulb.
	Bulb was over volted too long.	Reduce bulb voltage.
3. Focusing		
a) Coarse adjustment is too tight.	Tension adjustment ring is tightened too much.	Loosen the tension adjustment ring slightly.
	User is trying to raise the stage, passing over the upper focusing limit imposed by the engaged pre-focusing lever.	Unlock the pre-focusing lever.
b) Stage drops and the specimen goes out of focus.	Tension adjustment ring is too loose.	Tighten the ring slightly.
c) Stage cannot be raised to the upper limit.	Pre-focusing lever is engaged in lower than focusing position.	Unlock the pre-focusing lever.
d) Stage cannot be lowered to the lower limit of the working range.	Substage is lowered to much.	Raise the substage.
e) Objective front lens touches the specimen.	Specimen is mounted on the stage upside down.	Reverse the specimen.
4. Binocular Observation Tube		
a) Incomplete binocular vision.	Interpupillary distance is not correctly adjusted.	Correct the interpupillary distance.
	Diopter adjustment is incomplete.	Complete the diopter adjustment.
	Right and left eyepieces are not matched.	Use a pair of matched eyepieces.
	User is unaccustomed to binocular vision.	Prior to looking at the image of the specimen, try to look at the entire field of view, or look at a far away object before resuming microscopic observation.

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