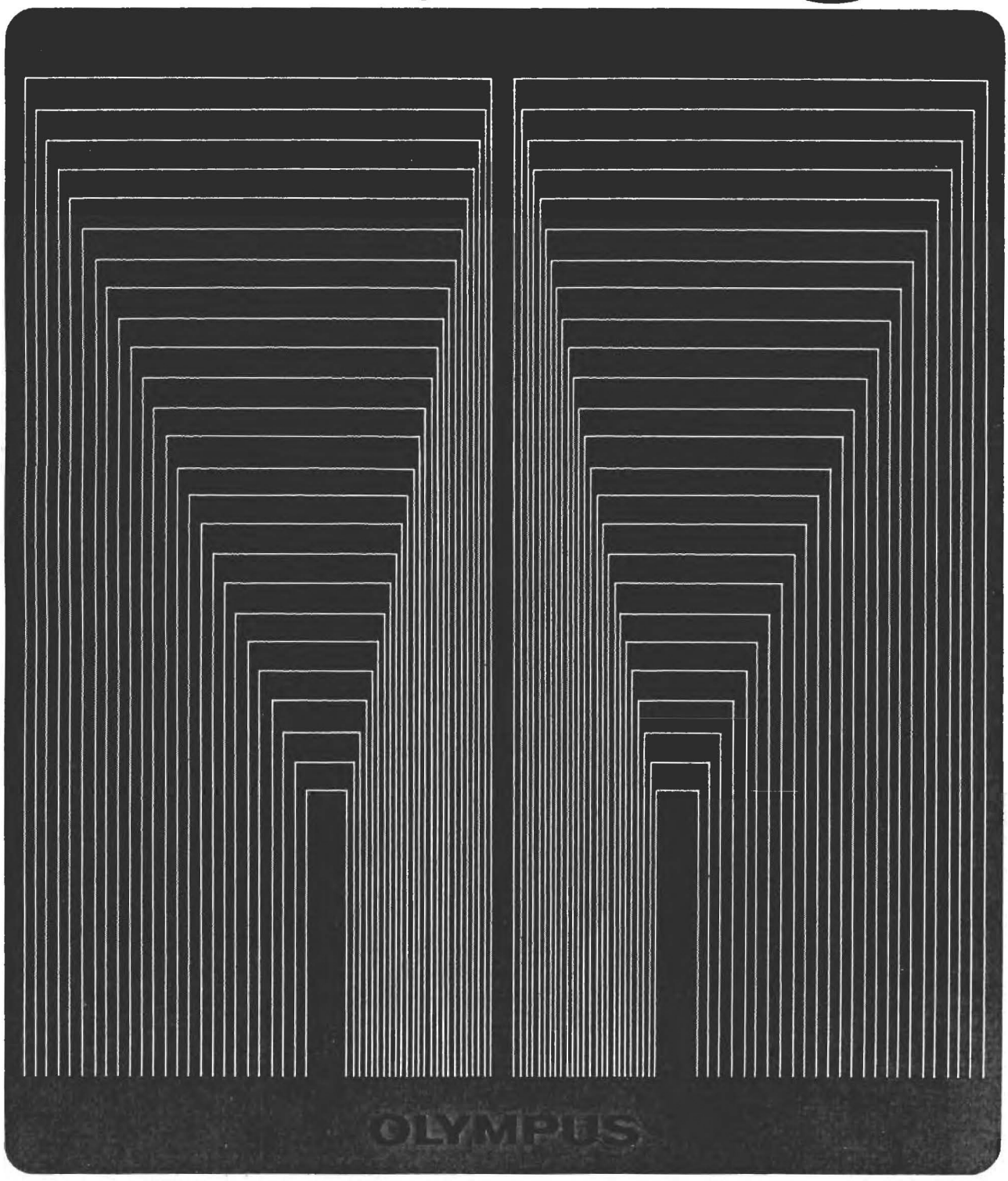
OLYMPUS POLARIZING MICROSCOPE

INSTRUCTION MANUAL

MODEL BHSP



This instruction manual has been written for the use of the Olympus Polarizing Microscope Model BHSP. It is recommended to read the manual carefully in order to familiarize yourself fully with the use of the microscope, so that you can obtain optimum performance from it.

IMPORTANT

Observe the following points carefully:

■ Operation

1. Always handle the microscope with the care it deserves, and **avoid abrupt motions.**
2. Avoid exposure of the microscope to **direct sunlight, high temperature*** and **humidity, dust** and **vibration.**
   * If the microscope is used in an ambient temperature higher than 40°C (104°F), it may cause a trouble to the microscope.
3. **Only use the tension adjustment ring for altering the tension of the coarse adjustment.** Do not twist the two coarse adjustment knobs in the opposite directions simultaneously, which might cause damage.
4. Ascertain that **the line voltage selector switch** on the base plate is set to conform with the local mains voltage.

■ 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 gause 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. Only authorized Olympus service personnel should make repairs.
4. The microscope should be stored in its container immediately after use. If this is not possible, it should be covered with a vinyl dust cover.

CONTENTS

1. STANDARD EQUIPMENT

Component		Model	BHS-			
			651P	653P	751P	753P
Microscope stand (with Allen wrench, KB-4 filter, immersion oil, and vinyl dust cover, one each)		BHSP-F	1	1	1	1
Line cord		UYCP	1	1	1	1
Observation tubes	Binocular tube	BH2-BI30	1	1	–	–
	Trinocular tube	BH2-TR30	–	–	1	1
Quadruple revolving nosepiece		BH-PRE	1	1	1	1
Polarizing intermediate attachment (with pin hole cap)		BH2-PA	1	1	1	1
Centerable circular stage (with stage plate, centering wrenches, paired, and stage clips, paired)		BH2-SRP	1	1	1	1
Test plates	Quarter wave plate (R = 147.3mμ)	AH-TP147	1	1	1	1
	Sensitive tint plate (R = 530mμ)	AH-TP530	1	1	1	1
100-watt halogen lamp housing (with collector lens and filter holder, one each)		BHS-LSH	1	1	1	1
Pre-centered halogen bulbs		12V100WHAL-L	2	2	2	2
Abbe polarizing condenser		BH2-POC	1	1	1	1
Objectives	PO-D Ach. 4X		1	–	1	–
	PO-D Ach. 10X		1	–	1	–
	PO-D Ach. 20X (spring)		1	–	1	–
	PO-D Ach. 40X (spring)		1	–	1	–
	PO-D Ach. 100X (spring, oil)		1	–	1	–
	PO-D Plan 4X		–	1	–	1
	PO-D Plan 10X		–	1	–	1
	PO-D Plan 20X (spring)		–	1	–	1
	PO-D Plan 40X (spring)		–	1	–	1
	PO-D Plan 100X (spring, oil)		–	1	–	1
Eyepieces	WHK 10X		1	1	1	1
	Cross-WHK 10X		1	1	1	1
	Micro-WHK 10X		1	1	1	1
Photo eyepiece NFK3.3X			–	–	1	1

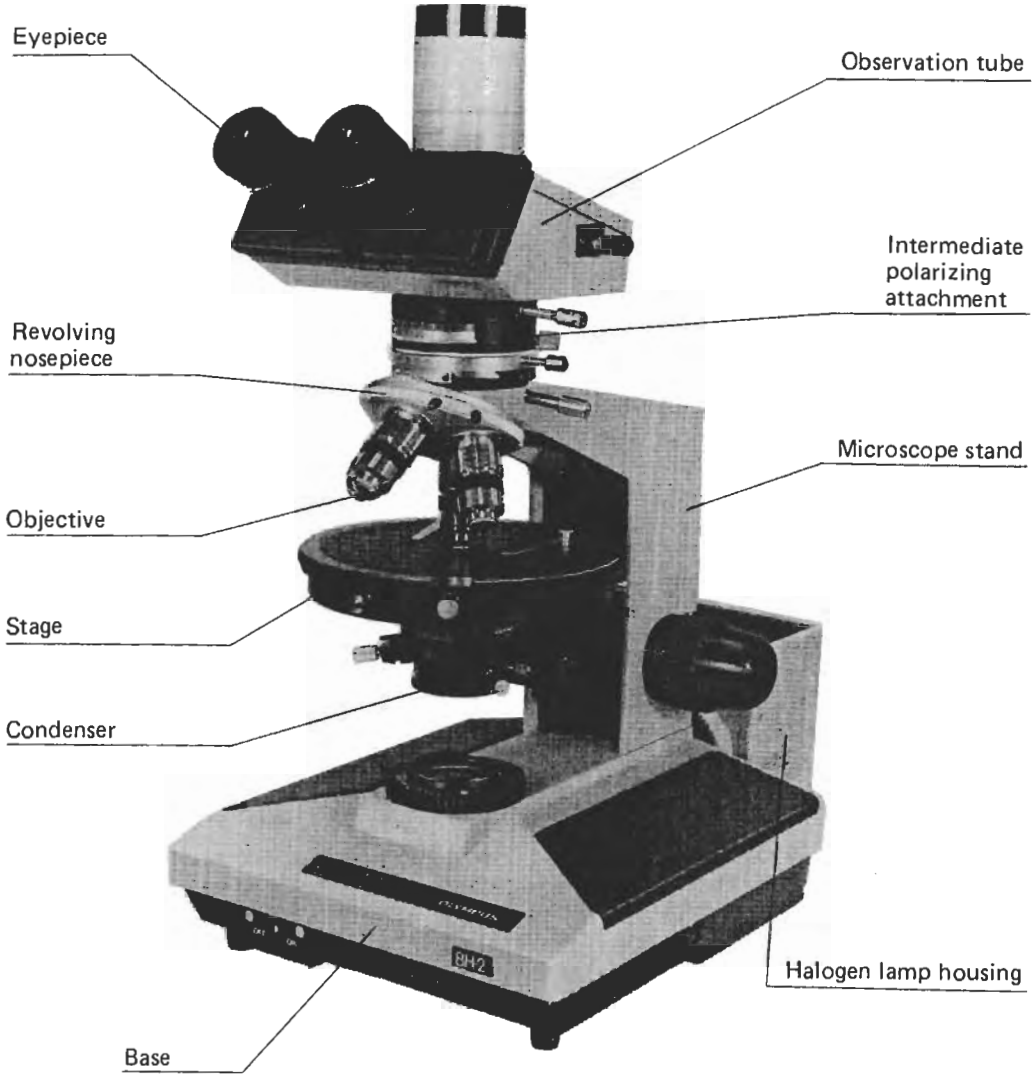
■ **Optional Accessories:**

Berek compensator AH-CTP-3

Attachable mechanical stage AH-FMP

II. NOMENCLATURE

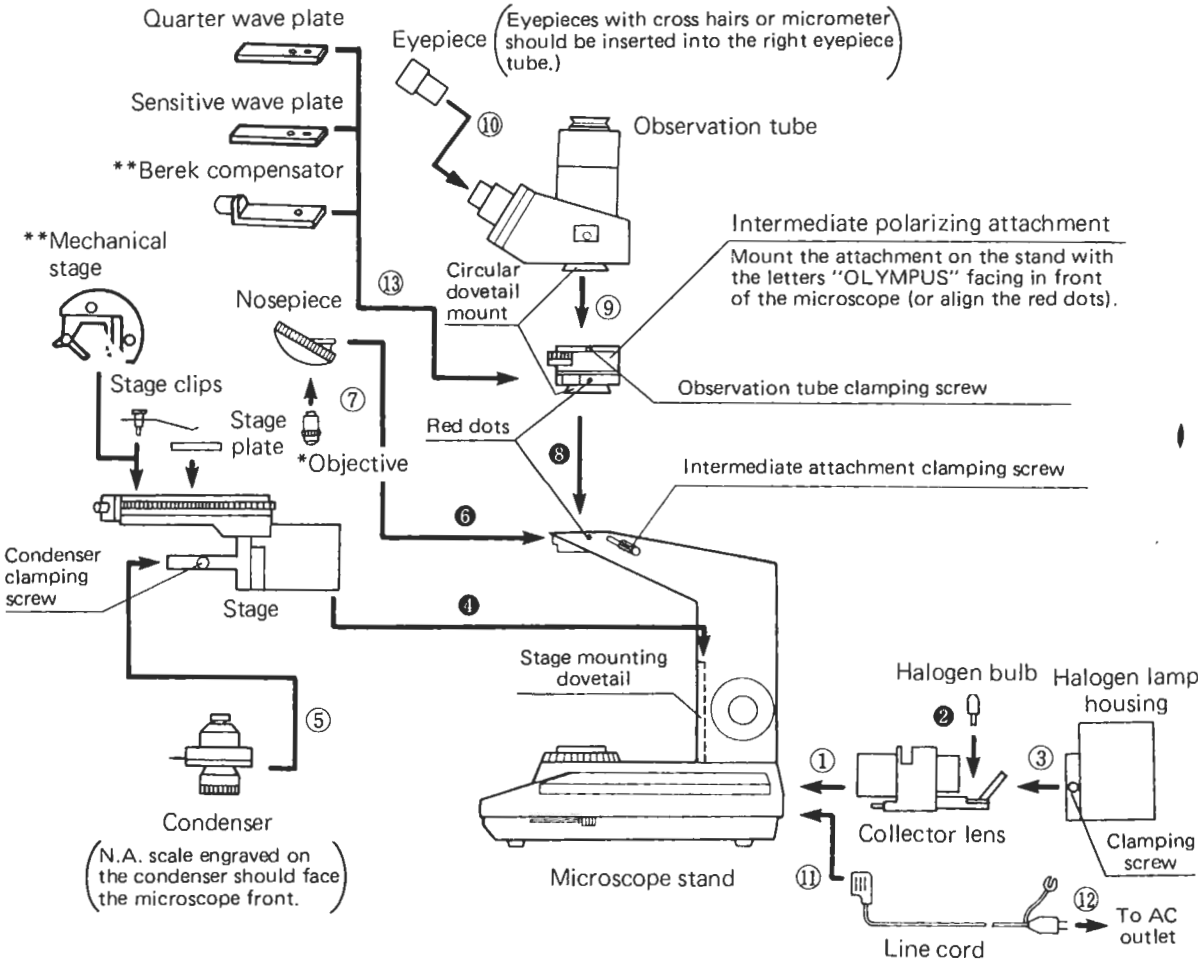
The Model BHSP consists of various components as shown in the photo below:



III. ASSEMBLY

This picture illustrates the sequential procedure of assembly. The numbers indicate the order of assembly of various components. Remove dust caps before mounting components. Take care to keep all glass surfaces clean, and avoid scratching the glass surfaces.

NOTE: For numbers ❷, ❹, ❻ and ❽ please refer to explanations in detail on the next page.



* Screw the 10X objective into the fixed aperture of the nosepiece.

** Optionally available.

■ Explanations in detail

❷ Mounting the halogen bulb

1) Releasing the bulb clamping levers ② of the collector lens ① in the direction of the arrow, insert two contact pins of the halogen bulb into the socket ③. (Fig. 1) (Recommended to use a glove or gauze to handle the halogen bulb.)
2) Secure the bulb in position with the two levers.

★ **Before use, wipe off any fingerprints or stains on the bulb.**

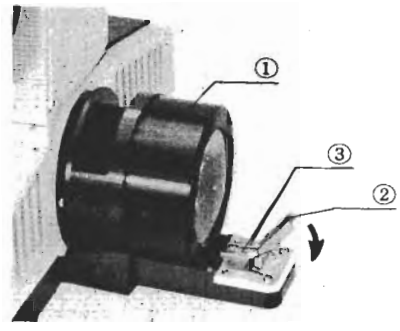


Fig. 1

❹ Mounting the stage

1) Prior to mounting the stage, rack down the stage mounting dovetail ① all the way. (Fig. 2)
2) Loosen the stage clamping screw ② by rotating counterclockwise with Allen wrench provided. (Fig. 2)
   Insert the stage into the mounting dovetail ① from above slowly. (Fig. 2)
3) Lower the stage until it comes in contact with the stop pin ③; then clamp with screw ②. (Fig. 2)

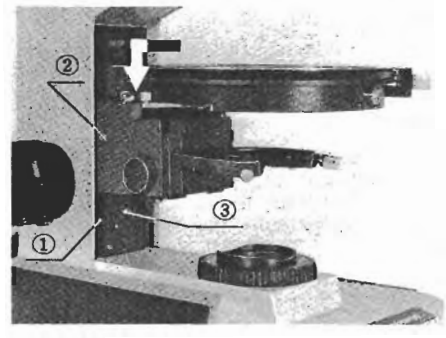


Fig. 2

❻ Mounting the revolving nosepiece

1) Loosen the nosepiece clamping screw ①. (Fig. 3)
2) Aligning the nosepiece dovetail slide to the mounting block ②, push in the nosepiece slowly all the way.

★ **Do not tilt or lock the nosepiece while inserting into the mounting block.**

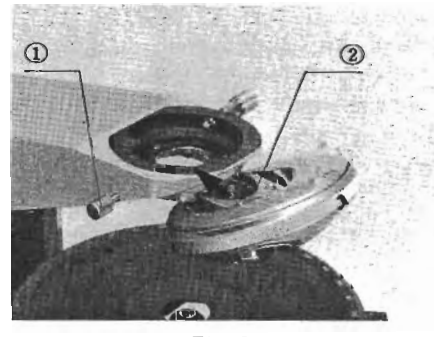


Fig. 3

❽ Mounting the intermediate polarizing attachment

1) Loosen the clamping screw ① fully. Pull spring-loaded clamping screw ①. This will cause the locating pin ② to withdraw. (Fig. 4) If the pin does not, loosen the screw further until the pin withdraws.
2) With clamping screw ① pulled out, insert the circular dovetail of the intermediate attachment into the ring dovetail.
3) Tighten the clamping screw.

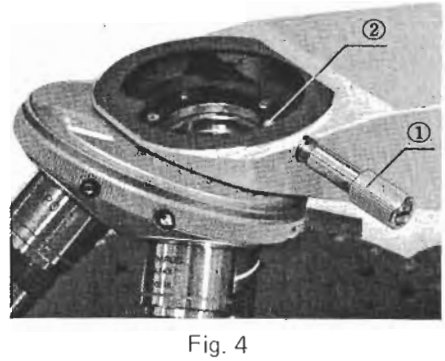
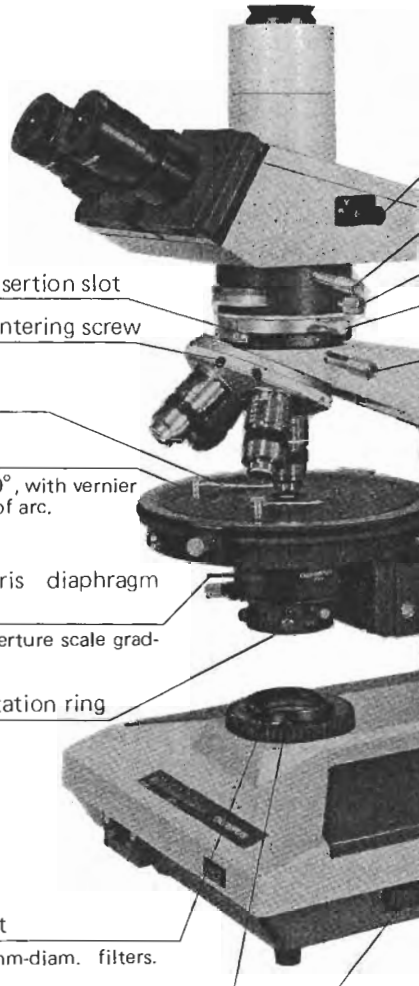


Fig. 4

IV. IDENTIFICATION AND FUNCTION OF VARIOUS COMPONENTS



Light path selector knob
The knob can be operated in 3 positions to deflect the light as desired.

Observation tube clamping screw

Analyzer positioning screw

Analyzer rotation screw

Intermediate attachment clamping screw

Test plate insertion slot

Objective centering screw

Tension adjustment ring
Arrow mark indicates increase in coarse adjustment tension.

Stage clip

Stage
Rotatable 360°, with vernier reading to 6' of arc.

Coarse adjustment knob

Aperture iris diaphragm lever
Numerical aperture scale graduated.

Polarizer rotation ring

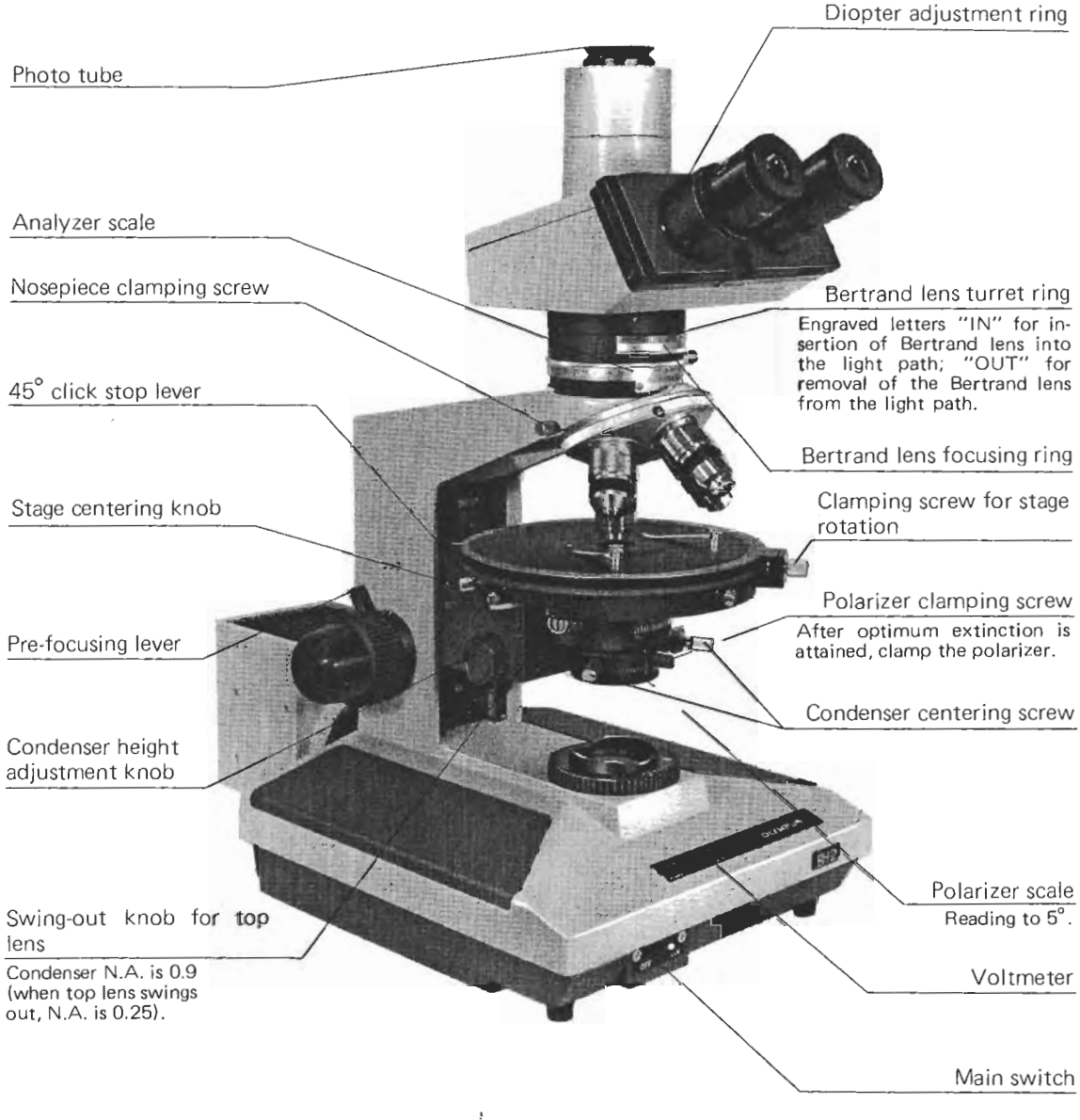
Fine adjustment knob
Graduated in increments of 2μ.

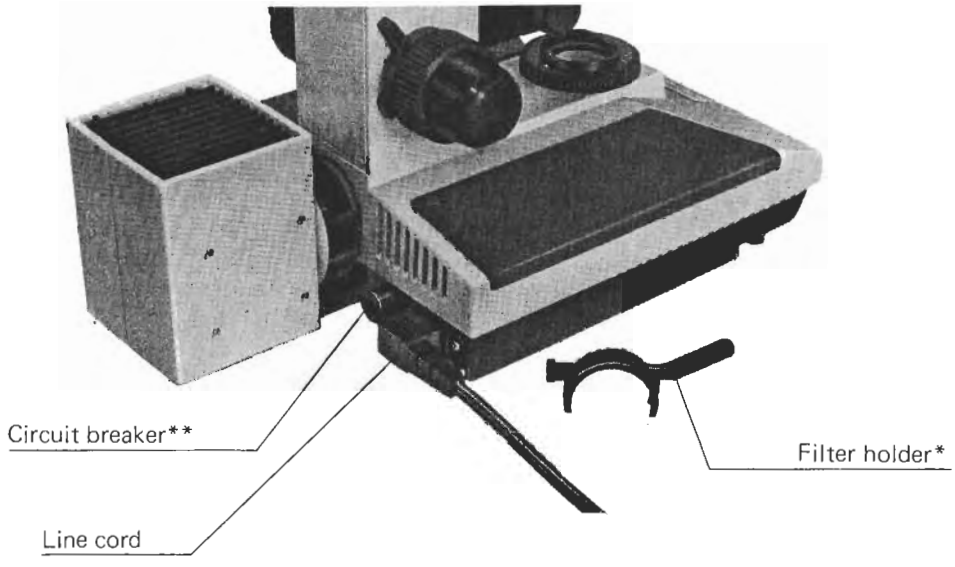
Filter mount
Accepts 45mm-diam. filters.

Field iris diaphragm ring
Arrow mark ⊗ → ○ indicates increase in diaphragm diameter.

Sliding control lever
For continuously variable light intensity.

Filter mount
Accepts the filter holder provided.


Diopter adjustment ring
Photo tube
Analyzer scale
Nosepiece clamping screw
Bertrand lens turret ring
Engraved letters "IN" for insertion of Bertrand lens into the light path; "OUT" for removal of the Bertrand lens from the light path.
45° click stop lever
Bertrand lens focusing ring
Stage centering knob
Clamping screw for stage rotation
Polarizer clamping screw
After optimum extinction is attained, clamp the polarizer.
Pre-focusing lever
Condenser centering screw
Condenser height adjustment knob
Polarizer scale
Reading to 5°.
Swing-out knob for top lens
Condenser N.A. is 0.9 (when top lens swings out, N.A. is 0.25).
Voltmeter
Main switch



*Do not replace filters for about a few minutes after use, in order to give time to cool.

**The circuit breaker protrudes its central part to cut off the electrical power in case of the dimmer circuit trouble (due to short circuit, etc.) or overcurrent. To restore the breaker, press the central part. If the breaker is actuated again, disconnect the line cord from the AC outlet and contact the Olympus service center.

Summary of Putting the Microscope in Operation

Model BHSP

A. Match the line voltage selector switch to local mains voltage (see page 10).
B. Switch on the light source.
C. Place a specimen slide on the stage.
D. Remove the Bertrand lens and analyzer from the light path.
E. Coarse focus with the 10X objective.
F. Make interpupillary and diopter adjustments (page 10).
G. Set the analyzer to optimum extinction position (page 11).
H. Center the condenser (page 12).
I. Center the stage (page 13).
J. Center objectives other than 10X (page 13).
K. Swing in the desired objective.
L. Set the condenser, analyzer and Bertrand lens correctly according to your microscopic purpose (pages 15 and 16).
M. Fine focus.
N. Adjust aperture iris diaphragm and field iris diaphragm (page 13).

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Adjustment of Illumination System

Microscopic application	Objective	Bertrand lens in intermediate polarizing attachment	Condenser top lens
Orthoscopic observation	4X to 100X	OUT	OUT
Conoscopic observation	20X to 100X	IN	IN

Generally for biological use, however, remove the analyzer, Bertrand lens and test plates from the light path.

★ Cut off this page at dotted line and put it on the wall near the microscope for use as a reminder of microscopic procedure.

V. OPERATION

A. Switching on the Light Source

1) Ascertain that the voltage selector switch ① is set to conform with the local mains voltage. (Fig. 5) If the switch is not correctly set, adjust it by means of the Allen wrench provided or a screwdriver.

2) Place the sliding voltage control lever ① on the right side of the microscope base to a position closest to you (low voltage position). (Fig. 6)

3) Actuate the main switch ②. (Fig. 5)

Voltage Adjustment and Light Intensity

- As you push the control lever ① in the direction of the arrow in order to obtain increasing intensity (Fig. 6), the LED readout ② will display the lamp voltage.
- Two LEDs on the left side indicate the voltage from 0V to 6V, and twelve LEDs on the right side from 6.5V to 12V in 0.5V increments. The indication with the letters "PHOTO" can be used as a guide line for color photomicrography.

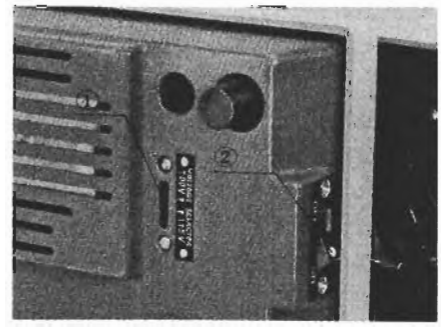


Fig. 5

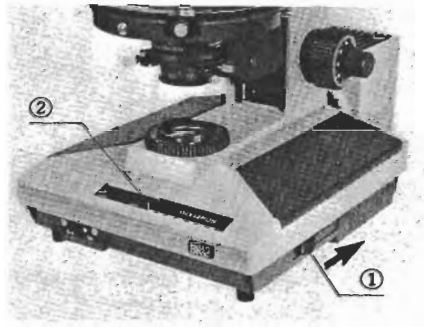


Fig. 6

B. Adjusting the Observation Tube

1) At the time of inserting the eyepieces into the observation tube, take care to insert the eyepiece with cross hairs or micrometer of your choice into the right eyepiece tube, aligning the positioning slot ① and positioning pin ②. (Fig. 7)

2) Looking through the both eyepieces with both eyes, adjust the interpupillary distance, sliding the knurled dovetail slides of the right and left eyepiece tubes, until perfect binocular vision is obtained. (Fig. 8)

3) Looking through the right eyepiece (with cross hairs or micrometer) with your right eye, rotate the upper helicoid ring ① of the eyepiece until the cross hairs (or micrometer) are sharply focused. (Fig. 8)

4) Focus on the specimen with the coarse and fine adjustment knobs so that the sharp images of the specimen and cross hairs (or micrometer) can be obtained simultaneously.

5) Now look at the image through the left eyepiece with your left eye and rotate the diopter adjustment ring ② to focus on the specimen without using the coarse and fine adjustment knobs. (Fig. 8)

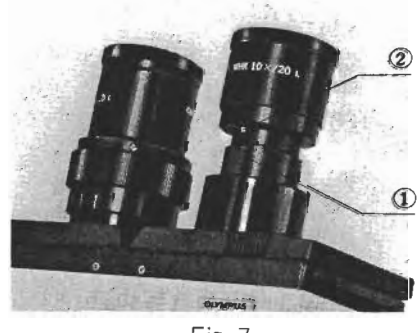


Fig. 7

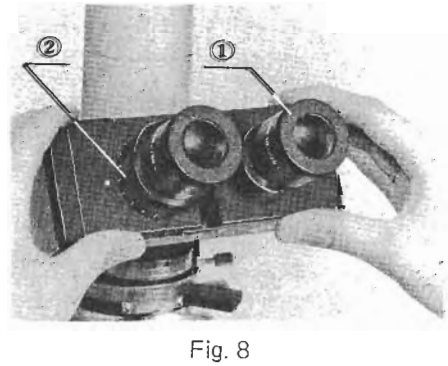


Fig. 8

Light Path Selection

The trinocular tube is provided with a light path selector knob ① to direct the light to the observation tube and/or to the photo tube in 3 positions. (Fig. 9)

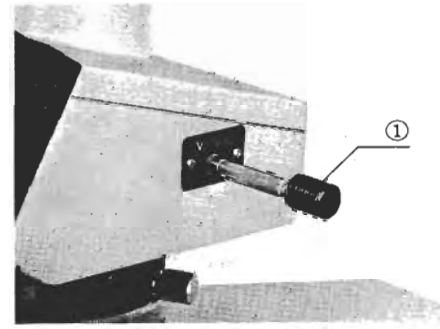


Fig. 9

Knob position	Pushed in all the way (V)	Pulled out halfway (C.V)	Pulled out all the way (C)
Amount of light	100% into binocular tube	20% into binocular tube 80% into photo tube	100% into photo tube
Application	"Crossed filter" observation	(1) Normal observation (2) Photomicrography (focusing through the binocular tube)	Photomicrography

An indicator plate is provided at the knob port to summarize the usage of the above table; it can be consulted before operating the knob.

V: Viewer (white letter)
C.V: Camera and viewer (yellowish green letters)
C: Camera (red letter)

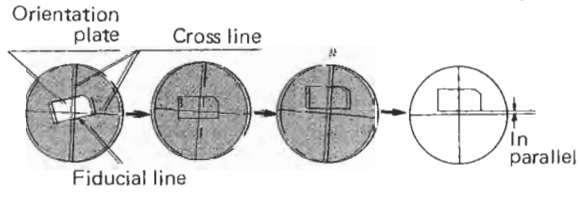
The colors of the letters correspond with the color bands on the knob shaft.

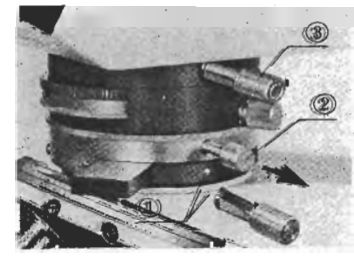
C. Use of the Orientation Plate

The analyzer built in the intermediate attachment should be adjusted for optimum extinction by means of the orientation plate provided in the following steps:

1) Bring the 10X objective into the light path, and make sure that the red dots ① on both intermediate attachment and microscope stand are aligned. (Fig. 10)
2) Set both polarizer and analyzer at position "0" to attain the "crossed filter" position.
3) Place the orientation plate on the center of the stage.
4) Looking at the orientation plate through the eyepieces, rotate the stage (as you rotate the stage, the orientation plate darkens and brightens alternately) until it most darkens or attains the extinction position; then, touch up the position of the orientation plate manually so that the lower edge (fiducial line) of the orientation plate nears the cross line (X axis).
5) Disengage the analyzer ② from the light path, which makes the field of view bright.
6) Loosening the observation tube clamping screw ③ , rotate the observation tube slightly until the fiducial line of the orientation plate is in parallel with the cross line; then, reclamp the observation tube. (Fig. 10)

Fig. 10





D. Centering the Condenser

1) Bring the objective 10X into the light path.

★ If a specimen is placed on the circular rotatable stage without a mechanical stage it is recommended to hold the peripheries of the specimen with the stage clips provided.

2) Swing in the condenser top lens, and bring the specimen into focus.

3) Stop down the field iris diaphragm ①. A slightly blurred image of the field diaphragm can now be seen in the eyepiece. (Fig. 11)

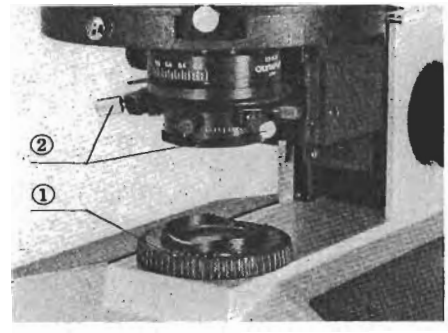
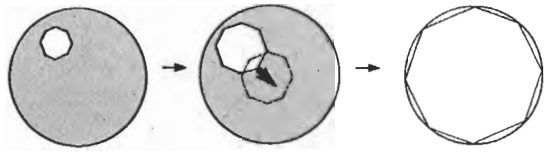


Fig. 11

4) Adjusting the condenser height, focus on the image of the field diaphragm.

★ If the specimen slide is too thick, it is sometimes impossible to obtain a sharply-focused image.

5) While widening the diameter of the field progressively, use the condenser centering screws ② to bring the diaphragm image into the center of view. (Fig. 11)



6) Push analyzer ① into the light path, and make sure that both polarizer and analyzer are set at position "0" to attain the "crossed filter" position. Then loosen the clamping screw ② of the polarizer. (Fig. 12)

7) Remove the specimen out of the light path so that a transparent area comes into the light path. Keeping the polarizer at the "0" position, rotate the polarizer rotation ring ③ until the optimum extinction is obtained, then clamp the ring. (Fig. 12)

★ Make sure that no test plate is engaged.

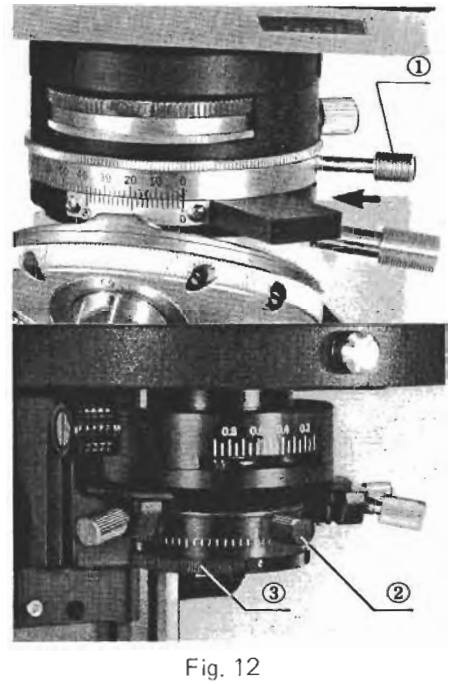


Fig. 12

E. Centering the Stage

1) Place a specimen on the stage, and insert two centering wrenches ① into the stage centering screws (Fig. 13). Looking through the eyepiece and objective 10X, fix your eyes on some particular point, for instance, at the point A or the center of the cross hairs.

2) As you rotate the stage, the particular point in the specimen image moves from the point A in a circular path (A → B → C → D → A or A → D → C → B → A) around the center of the circular path E. (Diag. a)

3) When the stage is turned by 180° from the point A, the particular point coincides with the point C.

4) Coincide the particular point to the point E by means of the two centering wrenches ① (Fig. 13). (Diag. b)

5) Next, move the particular point from the point E to the center A of the cross hairs (Diag. c).

★ **Repeat this procedure until the stage centration is complete. After completing the centration, remove the wrenches.**

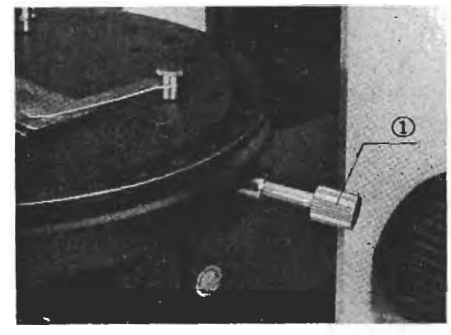
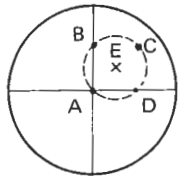
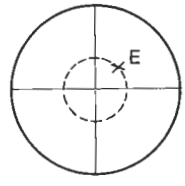


Fig. 13

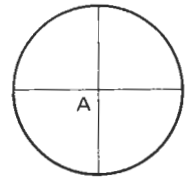
Diag. a



Diag. b



Diag. c



F. Centering the Objectives

This objective centration is necessary to all the PO objectives except PO10X. After completing the stage centration, insert two centering wrenches ① into the objective centering screws provided at each centerable objective aperture in the nosepiece. (Fig. 14) The other procedure is just the same as with stage centration.

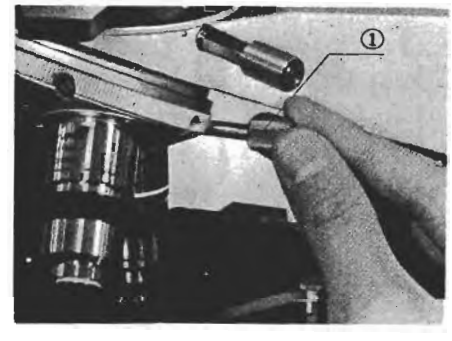


Fig. 14

G. Use of Iris Diaphragms

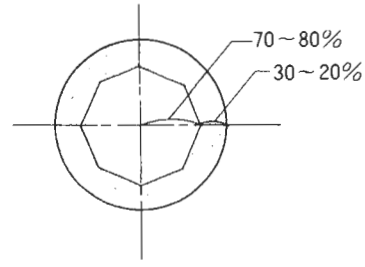
When the top lens of the polarizing condenser is swung out for orthoscopic observation, the aperture iris diaphragm serves as a field iris diaphragm and the field iris diaphragm as an aperture iris diaphragm.

For conoscopic observation, generally the aperture iris diaphragm is fully opened and the field iris diaphragm can be effectively used for reduction of glares and conoscopic observation of very small objects.

1) Aperture iris diaphragm

Adjust the opening of the aperture iris diaphragm according to the various conditions such as the numerical aperture of the objective, image contrast, depth of focus, and flatness of field. Generally it is often preferable to stop down the aperture iris diaphragm to about 70% or 80% of the N.A. of the objective.

After the eyepiece is removed from the observation tube, if necessary, look through the observation tube and check the opening of the aperture diaphragm at the objective pupil.



2) Field iris diaphragm

The field iris diaphragm controls the diameter of the ray bundle impinging on the specimen surface and thus increases image definition.

Generally, it is preferable to slightly increase the diameter of the field iris diaphragm until it is just outside the field of view.

H. Focus Adjustment

1. Tension of Coarse Adjustment Knobs and Fine Adjustment

Although the tension of the coarse adjustment knobs has been already adjusted for optimum performance by the manufacturer, it is possible to personally adjust the tension of the coarse adjustment for either heavy or light movement depending on the operator's preference by rotating the tension adjustment ring ①. (Fig. 15)

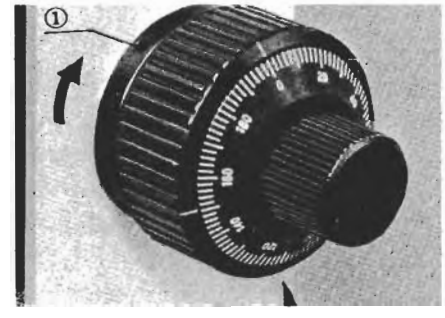


Fig. 15

The ring can be rotated by inserting a screwdriver into one of the holes on the periphery of the ring. The clockwise rotation (in the direction of the arrow) tightens the coarse adjustment knobs. Do not loosen the ring too much, because the stage may drop or the fine adjustment knobs may slip.

NOTE: Do not rotate the right and left coarse adjustment knobs in the opposite directions simultaneously. If the stage drops and the specimen goes out of focus, the tension adjustment ring is too loose. Tighten the ring.

2. Pre-focusing Lever

This lever ② is provided to prevent possible contact between specimen and objective as well as to simplify coarse focusing. (Fig. 16) 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 pre-focusing lever does not restrict fine focusing.

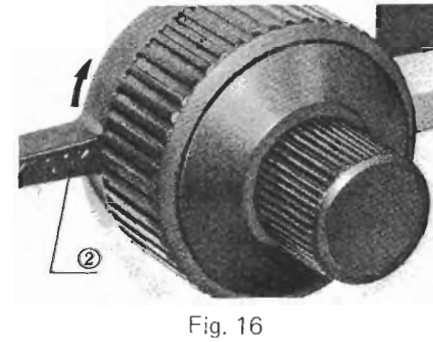


Fig. 16

3. Adjustment of Stage Block Height

In addition to the vertical movement of the stage by means of coarse and fine adjustments, the stage block height can be changed for observation of specimens which are thicker than standard slides. To lower the stage block;

1) Loosen the stage block locking screw ① with Allen wrench provided, and raise the stage block until the stopping screw ② can be seen, then reclamp.
2) Replace the stopping screw into the lower threaded hole ③. (Fig. 17)
3) Unclamping the stage block again, lower until it stops, and clamp.

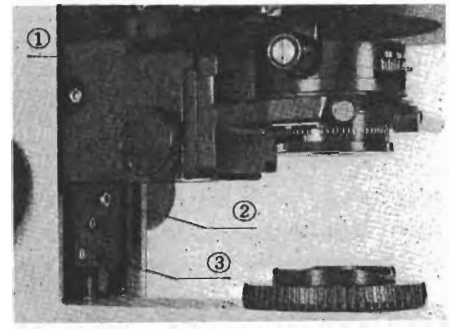


Fig. 17

I. Use of Immersion Objectives

1) Focus the specimen with a low power objective.
2) Put a drop of immersion oil on the specimen slide and the front lens of the immersion objective.
3) Turn the revolving nosepiece to bring the immersion objective into the light path, and focus with the fine adjustment knobs.

NOTE: ① Care should be taken to prevent oil bubbles from forming in the oil film. If any, re-apply immersion oil, for these bubbles greatly deteriorate the lens performance.
② After use carefully wipe off the immersion oil deposited on the lens surfaces with gauze moistened with xylene. Never leave oil on the lens surfaces after use as oil remnants will seriously impair the performance of the lens system.

J. Orthoscopic Observation

1) Swing out the top lens of the condenser.
In principle, polarized light enters the light path, parallel to the optical axis, to enable observation of the optical characteristics of the specimen. However, this method will darken the field of view and lower the resolving power of the objective extremely. Therefore, swing out the top lens of the condenser, using only the lower aperture of the lower condenser lens (N.A. 0.25).
2) Insert the analyzer into the light path, and attain the crossed filter position with analyzer and polarizer at 0 setting. At this position, the polarizer vibration is in the X direction, and the analyzer vibration in the Y direction. To open the filter position, pull out the analyzer rotation screw.
3) Rotate the stage until the extinction of the image is attained, and move the 45° click stop lever ① toward the operator. (Fig. 18)

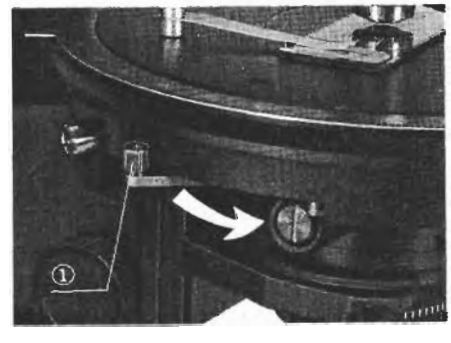


Fig. 18

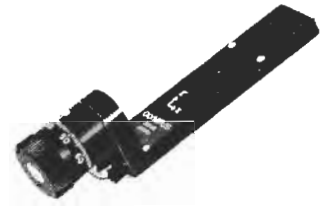
From this position, it is easy to rotate the stage in 45° increments without having to refer to the angular scale, and the stage clicks at the diagonal position, at which position, the retardation angle is measured. (Take care if you rotate the stage too fast, it sometimes overrides the click stop position.) To release the 45° click stops, push back the 45° click stop lever.

4) Insert the quarter wave plate or sensitive tint plate into the slot, closest to you at your right hand side in the intermediate polarizing tube.
To disengage the test plate, you can just pull it back to its click stop position.

★ **A Berek compensator is optionally available to measure the birefringence of a specimen.**

Sensitive tint plate

Quarter wave plate



Berek compensator

K. Conoscopic Observation

1) Swing in the top lens of the condenser (N.A. 0.9), and illuminate the specimen with no need to immerse between the condenser and specimen slide.

2) Bring the specimen into focus, rotate the Bertrand lens turret ring into the IN position.

3) Focus on the interference figure formed at the back focal plane of the objective from 20X to 100X. (Recommended to stop down the field iris diaphragm in case of very small objects.)
The pinhole cap provided may be used in place of the eyepiece to directly view the interference figure mentioned above. In this case, the Bertrand lens is disengaged.

L. Photomicrography

1) Photomicrographic equipment
Photomicrography with the Model BHSP requires photomicrographic equipment such as the photomicrographic system camera, exposure meter, photo eyepiece, etc. Read the instruction manuals for each equipment.

2) Photo eyepieces NFK3.3X and NFK5X are recommended for orthoscopic photomicrography, and NFK2.5X for conoscopic photomicrography.

3) Image magnification is obtained from the equation below:
Objective magnification X NFK photo eyepiece magnification.

VI. OPTICAL DATA

Objective / Eyepiece	Type	PO D Ach.				
	Magnification	4X	10X	20X	40X	100X
	N. A.	0.1	0.25	0.4	0.65	1.3
	W. D. (mm)	18.23	7.18	1.63	0.6	0.18
	Focal length (mm)	30.03	16.9	8.63	4.58	1.92
	Resolving power (μ)	3.36	1.34	0.84	0.52	0.26
WHK10X (Field number 20)	Total magnification	40X	100X	200X	400X	1000X
	Focal depth (μ)	172.5	27.6	9.14	3.0	0.65
	Field of view diameter (mm)	5	2	1	0.5	0.1

Objective / Eyepiece	Type	PO D Plan				
	Magnification	4X	10X	20X	40X	100X
	N. A.	0.1	0.25	0.4	0.65	1.25
	W. D. (mm)	7.03	7.4	0.83	0.23	0.17
	Focal length (mm)	34.23	17.5	8.99	4.67	1.75
	Resolving power (μ)	3.36	1.34	0.84	0.52	0.27
WHK10X (Field number 20)	Total magnification	40X	100X	200X	400X	1000X
	Focal depth (μ)	172.5	27.6	9.14	3.0	0.68
	Field of view diameter (mm)	5	2	1	0.5	0.1

★ **Immersion objective. Resolving power is obtained when the objective is used at the full aperture diaphragm.**

○ **W.D. (Working distance):**
The distance between the specimen or cover glass and the nearest point of the objective.

○ **N.A. (Numerical aperture):**
The numerical aperture represents a performance number which could be compared to the relative aperture (f-number) of a camera lens. N.A. values can be used for directly comparing the resolving powers of all types of objectives. The larger N.A., the higher the resolving power.

○ **Resolving power:**
The ability of a lens to register small details. 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.

○ **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

If you are unable to obtain full performance from your microscope, please consult with the table below as pointers for troubleshooting.

Troubles	Causes	Remedies
1. Optical System		
(a) With illuminator switched on, field of view cannot be seen.	Bertrand lens is engaged.	Disengage.
	Analyzer and polarizer are in "cross filter" position ("0:0").	Disengage analyzer.
(b) Field of view is cut off or illuminated irregularly.	Light path selector lever is stopped midway.	Push in lever up to C. V. or V.
	Nosepiece is not click stopped.	Slightly rotate nosepiece until it clicks into position.
	Nosepiece is not correctly attached to stand.	Insert sliding dovetail mount into stand all the way, until it stops, then lock.
	Condenser is not correctly mounted on ring mount.	Re-insert condenser all the way.
	Test plate is stopped midway.	Push plate all the way until it clicks.
	In case of orthoscopic observation, condenser top lens stays in light path or stops midway.	Swing it out of light path.
	Field iris diaphragm is stopped down excessively.	Open diaphragm fully.
	Lamp is not correctly attached.	Re-insert lamp correctly.
(c) Dust or dirt is visible in field of view.	Dust or dirt on glass surface at light exit on base.	Clean off dust or dirt.
	Dust on condenser top lens.	
	Dirty specimens.	
	Dust on eyepiece.	
(d) Excessive image contrast.	Condenser is lower excessively.	Raise condenser.
	Aperture iris diaphragm is stopped down excessively.	Open diaphragm.
(e) Resolution problems: o Image is not sharp. o Insufficient contrast. o Image details lack definition.	Nosepiece is not correctly attached.	Insert sliding dovetail mount all the way, until it stops, then lock.
	Objective is not correctly positioned in light path.	Slightly rotate nosepiece until it clicks into position.
	Dirt on objective front lens.	Clean objective.
	Immersion objective is used without immersion oil.	Apply immersion oil.
	Bubbles in immersion oil.	Remove bubbles.
	Olympus designated oil is not used.	Use designated oil.
	Dirty specimen.	Clean.
	Dirt on condenser lens.	
	Specimen is not properly illuminated.	Adjust illumination.

Troubles	Causes	Remedies
(f) Field of view is partially out of focus.	Nosepiece is not correctly attached.	Insert sliding dovetail mount into stand all the way, then lock.
	Objective is not correctly positioned in light path.	Slightly rotate nosepiece until it clicks into position.
	Specimen is not correctly positioned on stage.	Place specimen on stage and secure it with specimen clips.
(g) Image goes out of focus eccentrically.	Nosepiece is not correctly attached.	Insert sliding dovetail mount all the way, until it stops, then lock.
	Objective is not correctly positioned in light path.	Slightly rotate nosepiece until it clicks into position.
	Condenser is out of center.	Center condenser.
(h) Light intensity does not increase although voltage is raised.	Condenser is not correctly centered.	Center condenser.
	Condenser is lowered excessively.	Raise condenser.
(i) No conoscopic image can be seen.	Condenser top lens is not in light path.	Swing it in.
(j) Crossed filter position is not attained.	Analyzer is out of light path.	Push it in.
2. Electric System		
(a) Illuminator is too bright (or too dark).	Line voltage selector switch is not matched to the mains voltage.	Match selector switch with mains voltage.
	Mains voltage is too high (or too low).	Adjust mains voltage with a variable voltage transformer.
(b) Output voltage for illuminator cannot be regulated.	Voltage selector switch is not matched to mains voltage.	Adjust mains voltage selector switch to mains voltage.
	Mains voltage is too low or too high.	Adjust mains voltage with a variable voltage transformer.
(c) Lamp flickers and intensity is unstable.	Mains voltage is unstable.	Use a variable voltage transformer.
	Loose electrical connection.	Secure connection.
(d) Reduced bulb life.	Bulb is not a standard bulb.	Use a standard bulb.

Troubles	Causes	Remedies
3. Focusing		
(a) Coarse adjustment is too tight.	Tension adjustment ring is tightened too much.	Loosen tension adjustment ring properly.
	User is trying to raise stage passing over upper focusing limit imposed by engaged pre-focusing lever.	Unlock pre-focusing lever.
(b) Stage drops or specimen goes out of focus.	Tension adjustment ring is too loose.	Tighten ring properly.
(c) Stage cannot be raised to upper limit.	Pre-focusing lever is engaged in lower than focusing position.	Unlock pre-focusing lever.
(d) Stage cannot be lowered to lower limit of working range.	Condenser mount is lowered too much.	Raise condenser mount.
(e) Objective front lens hits against specimen.	Specimen is mounted on stage upside down.	Reverse specimen.
4. Observation Tube		
(a) Incomplete binocular vision.	Interpupillary distance is not correctly adjusted.	Correct interpupillary distance.
	Diopter adjustment is incomplete.	Complete diopter adjustment.
	Right and left eyepieces are not matched.	Use a pair of matched eyepieces.
	User is unaccustomed with a binocular vision.	Prior to looking at the image of specimen, try to look entire field of view, or look at a far away object before resuming microscopic observation.
5. Stage		
(a) Image easily goes out of focus when you touch stage.	Stage is not correctly clamped.	Clamp stage securely.
(b) Specimen stops midway on the X or Y traverse.	Specimen is not correctly positioned on stage.	Adjust specimen position.
(c) When stage is rotated, image of specimen goes out of field of view.	Stage is not centered or objective is not.	Center.