

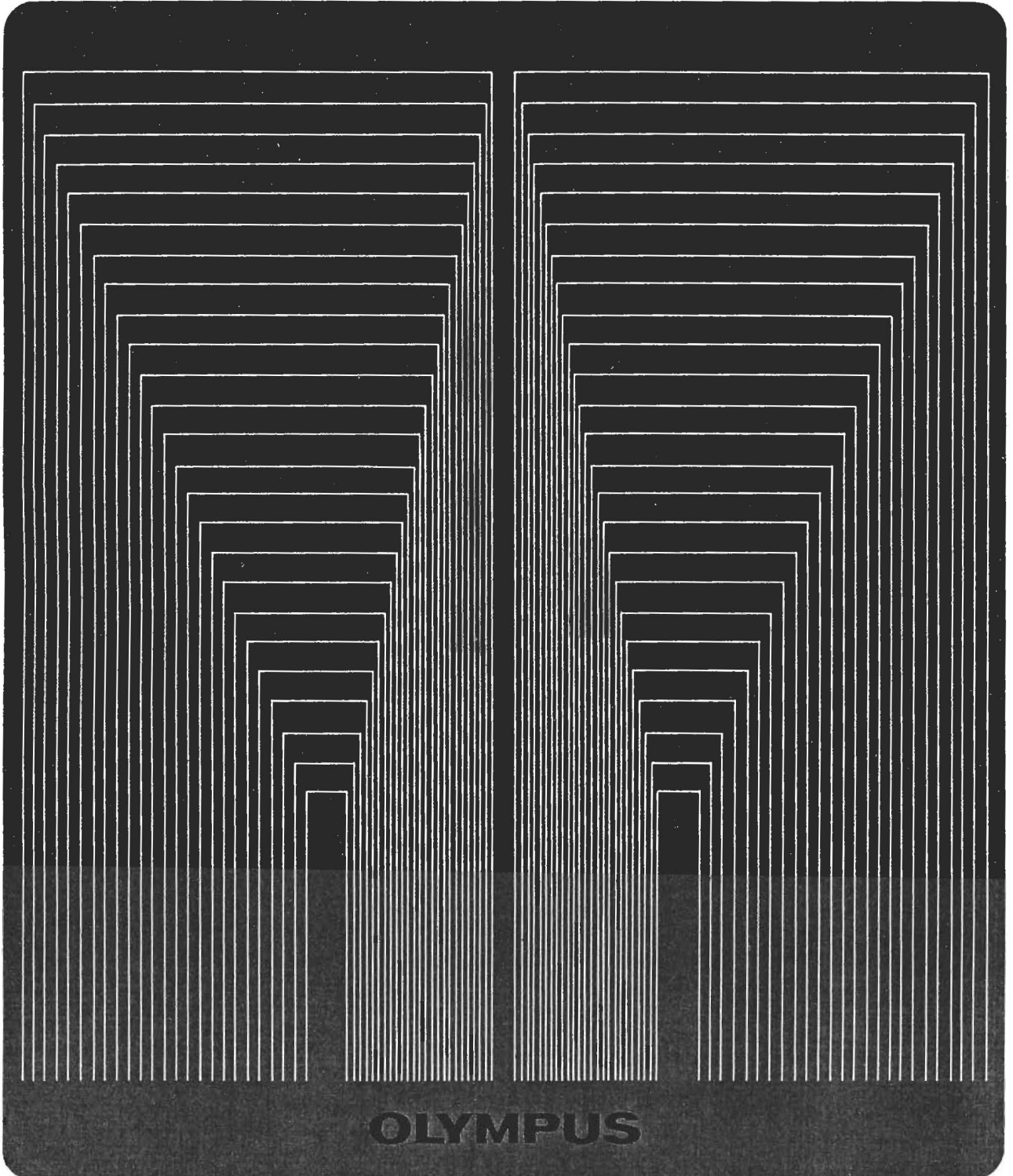
# OLYMPUS POLARIZING MICROSCOPE

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INSTRUCTION MANUAL

MODEL

# POS



The Model POS is a convenient polarizing microscope to study the optical characteristics of objects in the field of polarizing microscopy. An ordinary microscope permits microscopic observation of specimens by contrasts, colors, etc., with transmitted light or reflected light, while the polarizing microscope Model POS enables polarized work with even extremely minute details, basing on the optical properties of which the chemical composition can be determined. The application range of the Model POS includes mineralogy, petrology, chemistry, pharmacy, biology, medical science, ceramics and the textile industry. The Model POS can be used for research, as well as for routine, uses by professional and student microscopists.

## TABLE OF CONTENTS

I.	STANDARD EQUIPMENT . . . . .	1
■	How to Unpack the Transport Case . . . . .	1
II.	NOMENCLATURE . . . . .	2
III.	ASSEMBLY . . . . .	4
IV.	OPERATING THE MICROSCOPE . . . . .	4
A.	Tension Adjustment of Coarse Adjustment Knobs . . . . .	4
B.	Focusing . . . . .	5
C.	Centering the Objective . . . . .	5
D.	Use of Analyzer . . . . .	5
E.	Use of Bertrand Lens . . . . .	6
F.	Compensator Plates . . . . .	6
■	Orthoscopic Observation . . . . .	7
■	Conoscopic Observation . . . . .	7
V.	OPTICAL DATA . . . . .	7
VI.	OPTIONAL ACCESSORIES . . . . .	8
A.	Photomicrographic Accessories . . . . .	8
B.	Use of the Mechanical Stage . . . . .	8
VII.	MAINTENANCE . . . . .	9

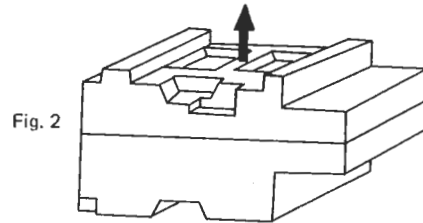
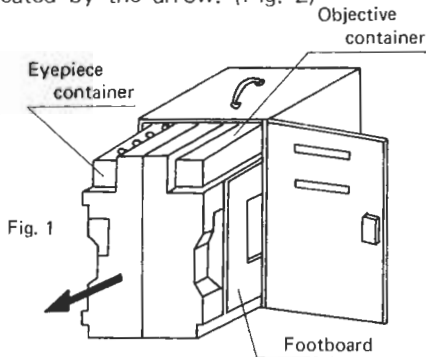
## I. STANDARD EQUIPMENT

Microscope stand with built-on rotatable stage and plano-concave mirror . . . . .	1
Compensator plates: 1/4 wavelength retardation . . . . .	1
1/2 wavelength retardation . . . . .	1
Eyepieces: H5X . . . . .	1
P7X with 10/100mm scale . . . . .	1
H10X with cross-hairs . . . . .	1
Objectives: Strainfree PS 4X, PS 10X and PS 40X . . . . .	1 each
Objective mount for PS 4X . . . . .	1
Objective centering mounts for PS 10X and PS 40X . . . . .	2
Polarizing condenser . . . . .	1
Stage clips, paired . . . . .	1
Circular specimen holder . . . . .	1
Filter (blue frosted) . . . . .	1

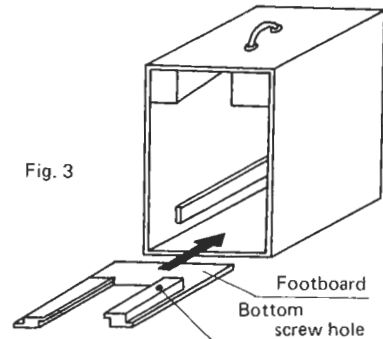
- **OPTIONAL ACCESSORIES:**
- Mechanical stage Model FMP
  - Berek compensator Model CTP
  - Vertical illuminator Model LSP

### ■ How to Unpack the Transport Case

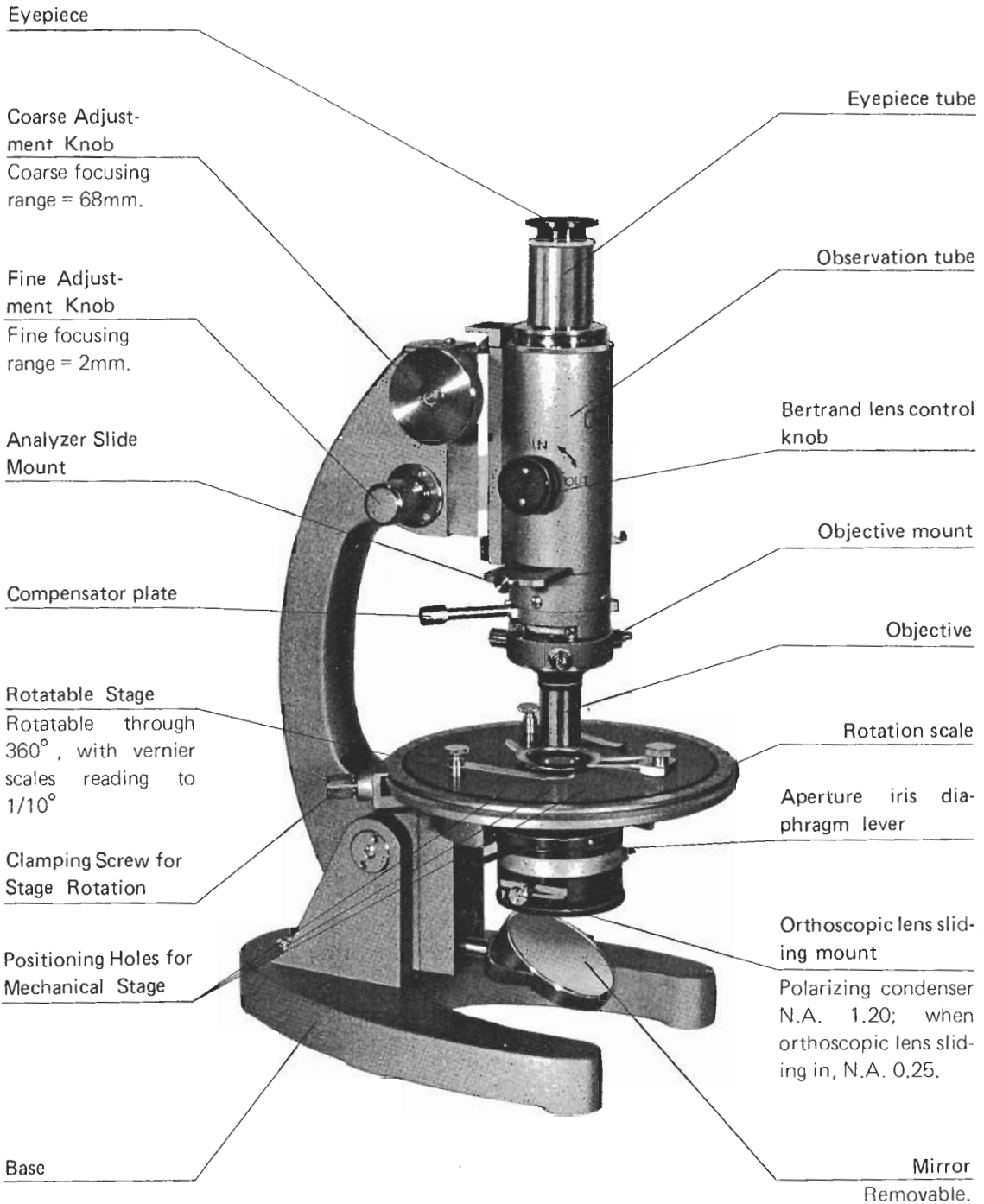
1. Pull out the styro-foam packing. (Fig. 1)
2. Open the upper packing in the direction indicated by the arrow. (Fig. 2)

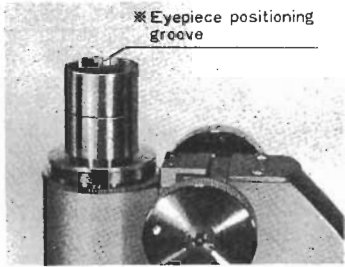


3. Put the eyepieces and objectives into the wooden cases provided.
4. Insert the footboard into the wooden case (Fig. 3), and clamp with bottom screw.
5. Put the microscope into the wooden case.
6. It is convenient to keep aside the used styro-foam packing for re-use.



## II. NOMENCLATURE





Analyzer rotation scale

Analyzer rotation knob

Objective mount  
For 4X objective.

Circular specimen holder

Condenser clamping screw

Filter mount

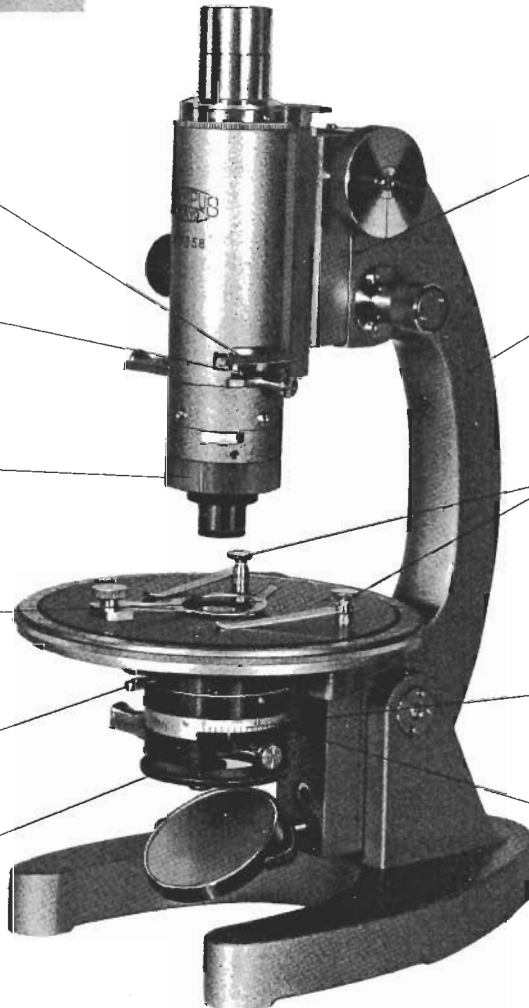
Fine adjustment indicator line

Arm  
Inclinable to any angle up to 90°

Stage clips

Polarizer rotation scale

Polarizer rotation knob



Centering knobs

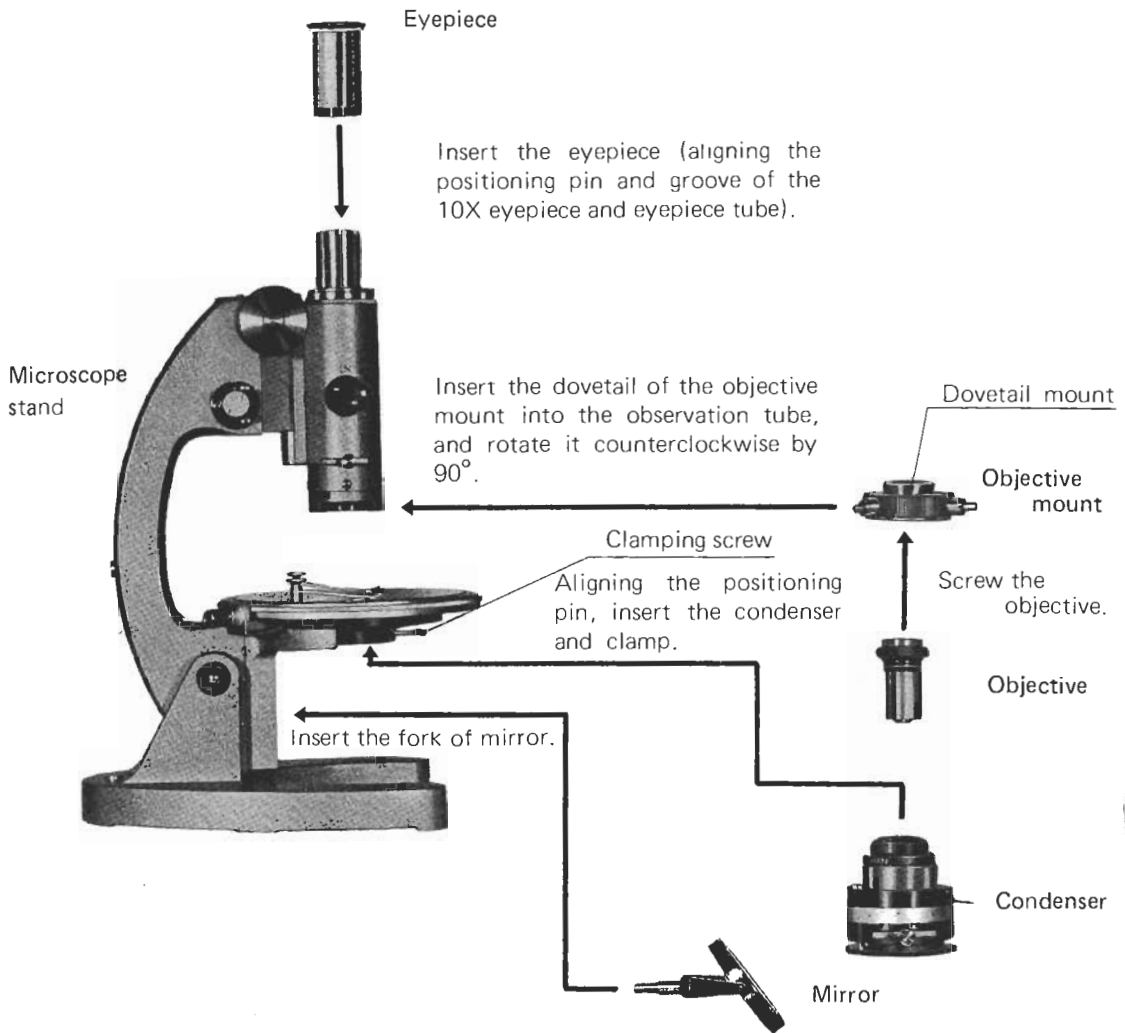


Pinhole cap



※ When the eyepiece positioning pin is aligned to this groove, the cross-hair reticles in the eyepiece coincide with the vibration directions of polarizer and analyzer at "0" settings respectively. When aligned to another groove, the cross-hairs coincide with the diagonal directions.

### III. ASSEMBLY



### IV. OPERATING THE MICROSCOPE

Remove visible spots, specks of dirt, dust or grease from all exposed glass surfaces before use.

#### A. Tension Adjustment of Coarse Adjustment Knobs

While the coarse adjustment motion is normally stiff and heavy, it is freely adjustable for either heavy or light movement depending on the observer's preference. To adjust the tension, hold the two coarse adjustment knobs with both hands and rotate them in the opposite directions at the same time. (Fig. 1)

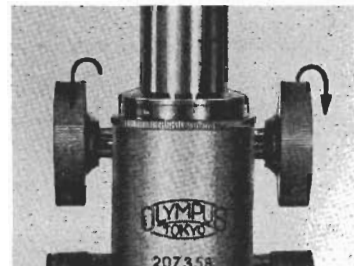


Fig. 1

## B. Focusing

1. Operate the fine adjustment knobs to bring the fine adjustment indicator line to the center of the fine adjustment range.
2. Place the specimen slide on the stage, and clamp.
3. Attach the eyepiece and objective of your choice to the microscope.
4. Looking at the objective sideways, bring carefully the objective as closely as possible to the specimen with the coarse adjustment knobs.
5. Raise the observation tube slowly, and focus on the specimen, first with the coarse adjustment, and then with the fine adjustment.

☉ For normal observation, remove the analyzer, compensator plates, Bertrand lens out of the light path.

## C. Centering the Objective

The objectives 10X and 40X are centerable by rotating two centering screws, provided on the objective mounts.

1. Attach two centering knobs ② to the centering screws ① of the objective mounts. (Fig. 2)
2. Looking through the eyepiece H10X, determine a spot on the specimen surface that coincides with the center of the cross hairs.
3. Rotate the stage, and manipulating the two centering knobs, coincide the center of the cross hairs and the center of the rotation of the specimen. (Fig. 3)

★ Repeat this procedure until correct centeration of the specimen is achieved.

After completing the centration, remove the two centering knobs.

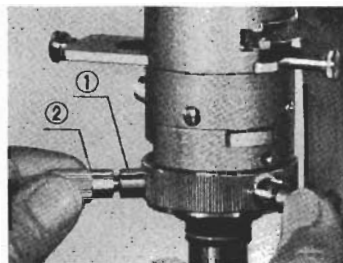


Fig. 2

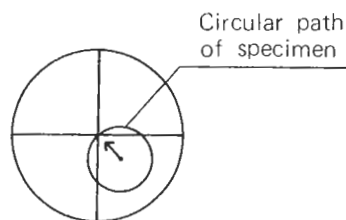


Fig. 3

## D. Use of Analyzer

1. Pull out the analyzer sliding mount in the arrow direction (Fig. 4), to engage the analyzer in the light path.
2. The analyzer is rotatable up to  $90^\circ$  by means of the rotation knob ①.

★ Make sure that both polarizer and analyzer are set at position "0", to attain "crossed Nicol" position.

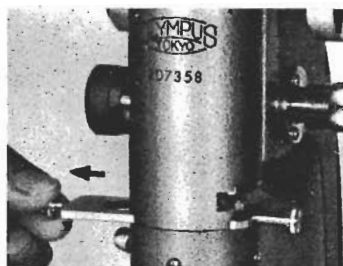


Fig. 4

### E. Use of Bertrand Lens

1. To insert the Bertrand lens into the light path, turn the Bertrand lens control knob ① to position "IN." (Fig. 5)
2. Looking through the eyepiece, you can now observe the magnified interference image at the rear focal plane of the objective.
3. For direct observation of the interference image without the Bertrand lens, replace the eyepiece with the pinhole cap, and set the Bertrand lens control knob to position "OUT"

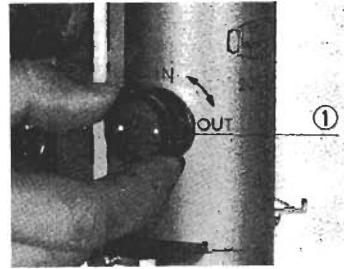


Fig. 5

### F. Compensator Plates

Two compensator plates available include a 1/4 wavelength retardation plate (mica,  $147.3\text{m}\mu$ ) and 1/2 wavelength retardation plate (quartz,  $530\text{m}\mu$ ). They can be inserted into the slot in the observation tube. (Fig. 6)



1/2 wavelength  
retardation plate



1/4 wavelength  
retardation plate

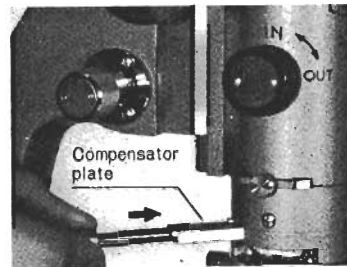


Fig. 6

#### ● 1/4 wavelength retardation plate

This plate has retardation of  $147.3\text{m}\mu$ , a quarter wavelength of light ( $589.3\text{m}\mu$ ). It is useful in determining crystal types by converting elliptical polarized light into linearly polarized light, and vice versa.

#### ● 1/2 wavelength retardation plate

With a retardation of  $530\text{m}\mu$ , its purplish-red interference color changes rapidly in proportion with the retardation change. That is, if the retardation is increased slightly, the interference color turns purple (or near blue), and when decreased, the color turns orange (or near yellow). Thus in either case, this sensitive tint plate converts small variations in specimen retardation into color changes to which the eye is quite sensitive.



■ Orthoscopic Observation

The orthoscopic method adopted for the Model POS permits polarized light almost parallel to the optical axis to enter the field of view, enabling you to view the optical characteristics of the specimen.

Since this method will darken the field and lower the resolving power of the objective extremely, the orthoscopic lens must be engaged in conjunction with the low magnification objective 4X or 10X.

The opening of the condenser iris diaphragm must be adjusted according to the N.A. of the objective in use to obtain effective contrast.

The two centering screws of the objective mounts can be used for coincidence of the rotation center of the specimen and the center of the viewing field.

When both polarizer and analyzer are set at position "0", the vibration direction of the polarizer coincides with the north-south direction and that of the analyzer with the east-west direction, of the cross hairs of the eyepiece, so that the "crossed Nicol" position is attained.

■ Conoscopic Observation

For this method, it is necessary to illuminate the specimen with converging light. Slide out the orthoscopic lens from the light path, and use a high magnification objective such as 40X.

After appropriate focusing on the specimen, insert the Bertrand lens into the light path, and rotating the helicoid ring at the eyepiece, focus on the interference figure formed at the back focal plane of the objective.

The pinhole cap provided may be used in place of the eyepiece to directly view the interference figure mentioned above. In this use, the Bertrand lens is disengaged.

(If the eyepiece with the micrometer is used, it is convenient to measure angular directions of the interference figure.)

V. OPTICAL DATA

Objective	Magnification	PS 4X	PS 10X	PS 40X
Eyepiece	Numerical Aperture (N.A.)	0.10	0.25	0.65
	Working Distance (W.D.)(mm)	19.97	5.13	0.37
H5X (Field Number 21)	Total Magnification	20X	50X	200X
	Depth of Focus ( $\mu$ )	300	48.0	4.99
	Field of View (mm)	5.25	2.1	0.53
P7X with 10/100mm scale (18)	Total Magnification	28X	70X	280X
	Depth of Focus ( $\mu$ )	227	36.3	3.87
	Field of View (mm)	4.5	1.8	0.45
H10X with cross-hairs (13)	Total Magnification	40X	100X	400X
	Depth of Focus ( $\mu$ )	173	27.6	3.03
	Field of View (mm)	3.25	1.3	0.33

## VI. OPTIONAL ACCESSORIES

### A. Photomicrographic Accessories

1. The photomicrographic accessories, optionally available, are the Photomicrographic Cameras Model PM-10 and PM-6, Photo Eyepieces FK, Centering Telescope Model CT and Exposure Meter Model EMM.
2. Orthoscopic Photomicrography.  
The photomicrographic equipment for orthoscopic photography can be used in the case of normal photomicrography.
3. Conoscopic Photomicrography.
  - (1) After focusing on the specimen, replace the eyepiece with the centering telescope CT in the photo tube.  
(The Bertrand lens should be disengaged at this.)
  - (2) Rotating the slide-in focusing ring of the CT, focus on the conoscopic figure.
  - (3) After focusing on the conoscopic figure, rotate the slide-in focusing ring counter-clockwise by about  $70^\circ$  from the best focusing position, so that you can obtain correct focus when you look through the viewer of the photographic camera.

- (4) Mount the photomicrographic camera on the CT.

- (5) Looking through the viewer ① of the photomicrographic camera, ascertain that the conoscopic figure is in focus. (If out of focus, re-adjust the slide-in focusing ring until the figure is in focus.)  
Lift the photomicrographic camera upward ② so that you can rotate the slide-in focusing ring ③ to cross focusing position. (Fig. 7)

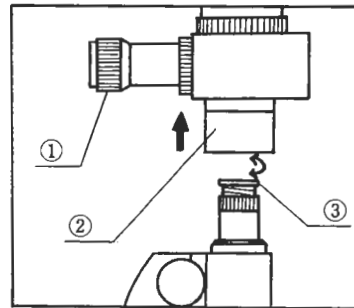


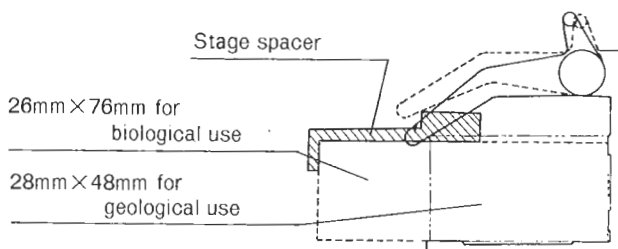
Fig. 7

- ★ Repeat this procedure over and over again until correct focusing is obtained.

The rest of the procedure will be the same as the normal photomicrography. For details, read the instruction manuals for the photomicrographic equipment.

### B. Use of the Mechanical Stage

Slide glasses are held on the mechanical stage as shown below.



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## VII. MAINTENANCE

1. Rapid changes of temperature or humidity may cause drops of water on the surfaces of optical elements, which deteriorate not only the visibility of the microscope, but also cause mold or corrosion. Avoid placing the microscope in high temperature.
2. Always handle the microscope with the care it deserves, and avoid abrupt motions, especially in transportation.
3. Dust and dirt cause deterioration of the performance of the lens system. Specially, when dust is deposited on polarizer and analyzer, it reduces the contrast due to birefringence. After use make it a practice to cover the microscope with dust cover provided. When not used for a long time, keep it in the case.
4. The polarizer and analyzer may be deteriorated when kept in temperature over <sup>150°F</sup>18°F (60°C). Avoid exposure of them to direct sunlight.
5. Do not disassemble the microscope. When disorder occurs, contact the manufacturer. Never disassemble the microscope for repair.