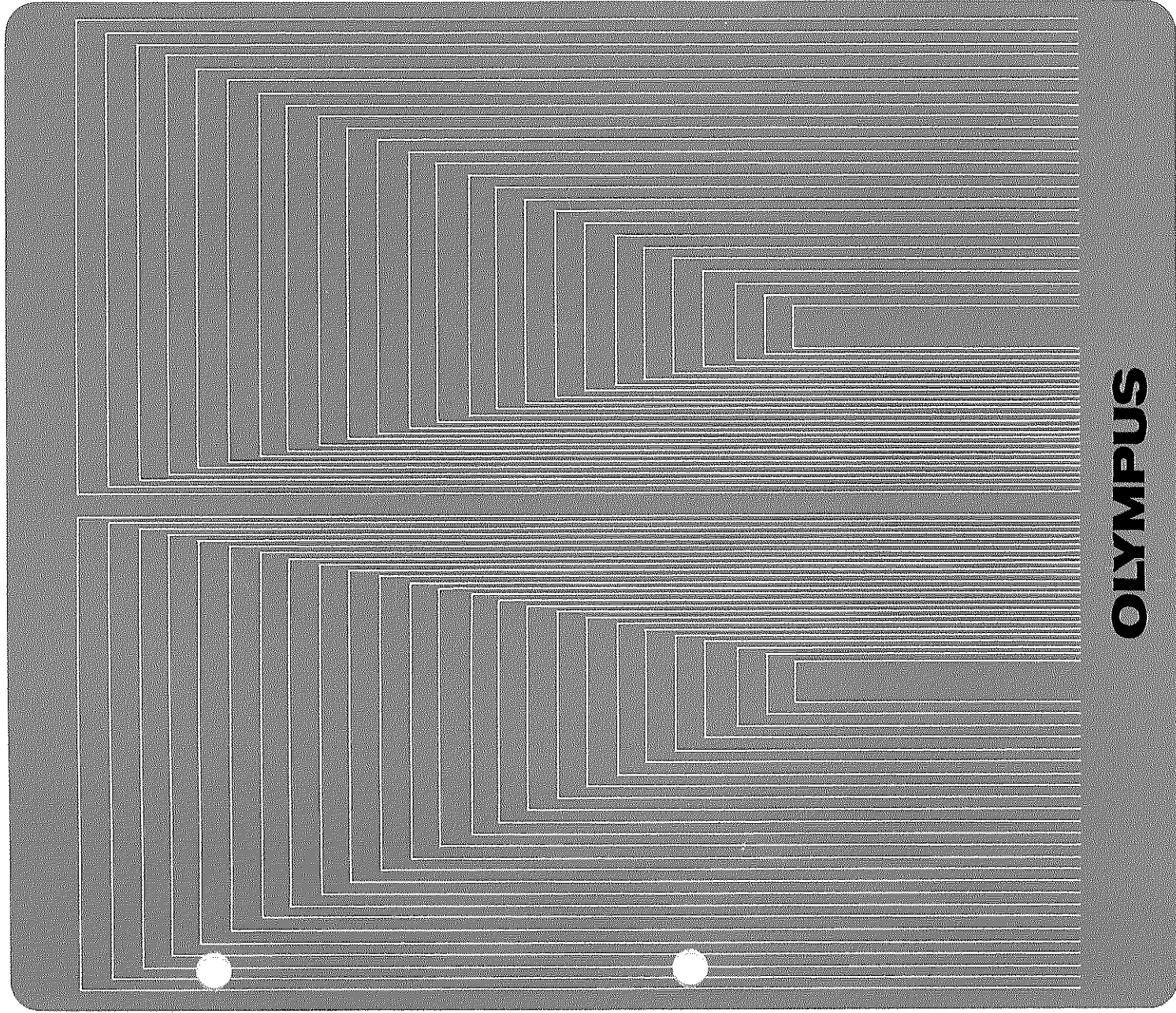


# OLYMPUS INVERTED MICROSCOPE

## INSTRUCTION MANUAL

# CKK

model



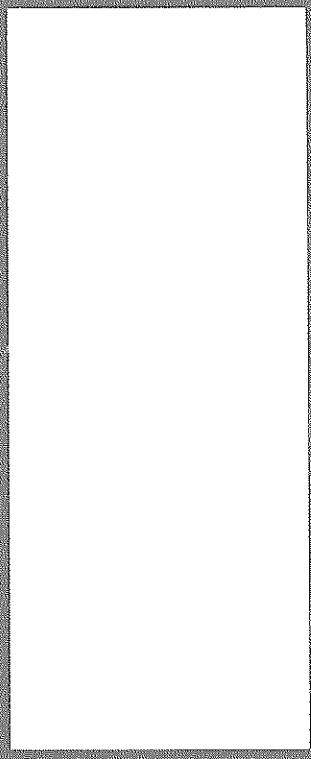
# OLYMPUS

AX5013

OLYMPUS OPTICAL CO., LTD.



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**OLYMPUS INVERTED MICROSCOPE  
MODEL CK**

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**I. STANDARD EQUIPMENT**  
**A. Olympus Inverted Microscope (with plain stage) Model CKP**

Model Name	CKP			
	Bi-1-W	Bi-2-W	Tr-1-W	Tr-2-W
Main Body with revolving nosepiece, built-in transformer and plain stage	1	1	1	1
Binocular Tube	1	1	0	0
Trinocular Tube	0	0	1	1
Objectives	1	1	1	1
Achromat 4X	1	1	1	1
Achromat 10X	1	1	1	1
Eyeieces BiCK10X	2	2	2	2
Photo Eyepiece FK 3.3X	0	0	1	1
Phase Contrast	0	1	0	1
Long-focus Phase Contrast Condenser with ring slit mounts for 10X and 20X Objectives				
Attachment	0	1	0	1
Phase Contrast Objectives	0	1	0	1
PC-PL 10X				
PC-PL-C20X	0	1	0	1
Centering Telescope CT	0	1	0	1
Wooden Case	0	1	0	1
Stage Extension Plates, paired	1	1	1	1
Stage Insert Plate	1	1	1	1
Stage Clips, paired	1	1	1	1
Illuminator with pillar	1	1	1	1
Spare Bulbs, 6V, 2A	2	2	2	2
Green, 36X50G-53	1	1	1	1
Cobalt, 36X50C	1	1	1	1
White Frosted, 36X50WF	1	1	1	1

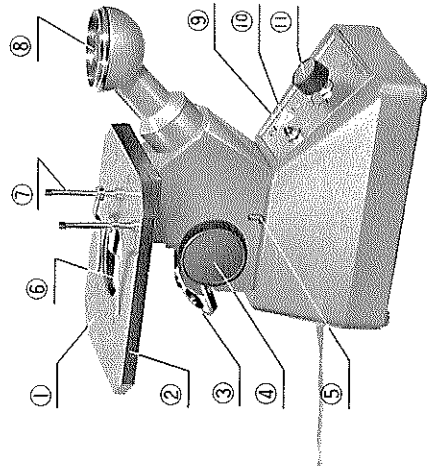




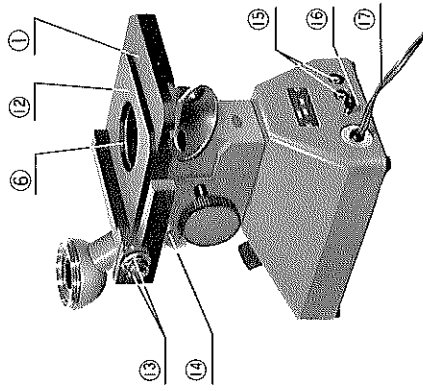
#### IV. NOMENCLATURE OF VARIOUS COMPONENTS

##### A. Main Body

Plain Stage (for CKP)



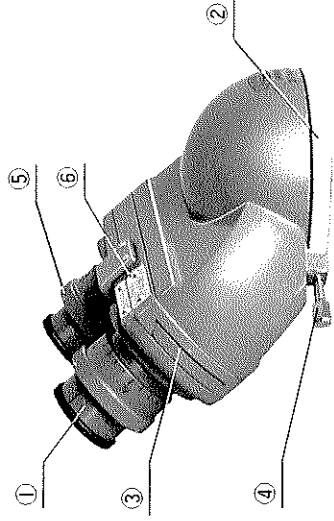
Cross Movement Stage (for CKC)



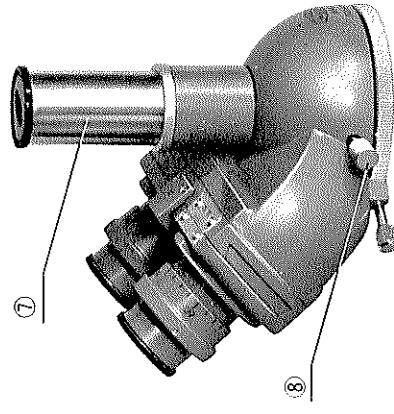
- ① Stage: Two kinds of stages are available; one is a plain stage built-on the Model CKP, and the other a cross-movement stage built-on the Model CKC.
- ② Mounting Holes for extension plate: The holes are provided on the right and left sides of the plain stage, and on the right side of the cross-movement stage.
- ③ Revolving Nosepiece
- ④ Focus Adjustment Knob
- ⑤ Cord Holder
- ⑥ Opening for stage insert plate
- ⑦ Stage Clip
- ⑧ Observation Tube Mount
- ⑨ Main Switch
- ⑩ Pilot Lamp: As you push the main switch ON, the pilot lamp and illuminator will light up.
- ⑪ Voltage Adjustment Knob: Controls the bulb voltage from 3V to 8V in 6 steps.
- ⑫ Cross-Movement Plate: Holds a stage slide on it.
- ⑬ Coaxial Drive Control Knobs: Traversing area 56mm x 70mm.
- ⑭ Stop Lever for specimen holder: Turn the lever counterclockwise by 90°, and remove the specimen holder to obtain a plain stage.
- ⑮ Low Voltage Outlet: Accepts the plugs of the illuminator cord.
- ⑯ Grounding Terminal
- ⑰ Line Cord Socket

##### B. Observation Tubes

Binocular Tube

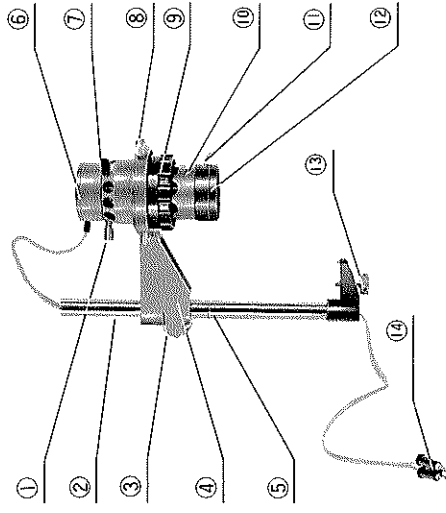


Trinocular Tube



- ① Eyepiece Tubes
- ② Knurled Ring: Clamps the observation tube on the threaded mount of the main body.
- ③ Eyepiece Tube Mount: Holding the mounts with both hands, pull or push the mounts as required for interpupillary distance adjustment.
- ④ Clamping Screw: Clamps the observation tube at any direction through 360°.
- ⑤ Optical Tube Length Adjustment Ring
- ⑥ Interpupillary Distance Scale
- ⑦ Photo Tube
- ⑧ Light Path Selector Knob: Push the knob to direct all the light to observation tube or pull it all the way to direct the light to photo tube.

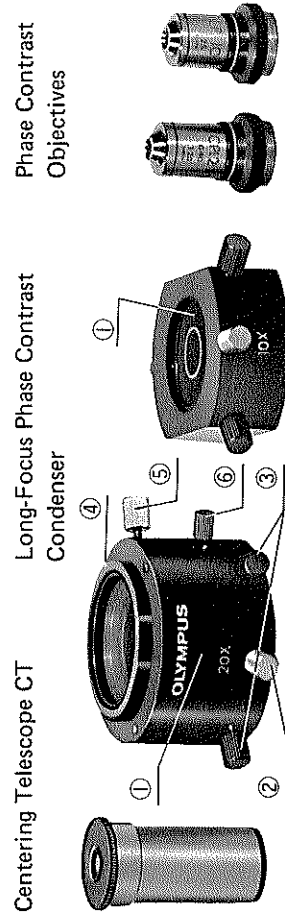
##### C. Illuminator



- ① Socket Clamping Knob: Spring-loaded to clamp the socket. Pull it back to remove the socket.
- ② Pillar: Permits the illuminator to travel a vertical range of 146mm.
- ③ Clamping Knob: Clamps the illuminator bracket to the pillar.

- ④ Bracket: Supports the illuminator on the pillar.
- ⑤ Lamp House Height Indicator Mark: Align the bottom edge of the lamp house to the mark for coarse focus adjustment of the illuminator.
- ⑥ Socket
- ⑦ Bulb Centering Knobs: Two knobs are provided for bulb centration.
- ⑧ Lamp House Centering Knobs: Two knobs are provided for lamp house centration.
- ⑨ Condenser Lens Focusing Ring
- ⑩ Filter Mount
- ⑪ Iris Diaphragm Lever: Controls the aperture of the iris diaphragm.
- ⑫ Mount Thread: Accepts the long-focus phase contrast condenser.
- ⑬ Clamping Screw: Clamps the pillar to the stage.
- ⑭ Plugs: Connect to the low voltage outlet.

#### D. Phase Contrast Attachment



- ① Ring Slit Mount: Ring slit (light annulus) is centerable in this slide-in mount. Two mounts are available for 10X and 20X objectives.
- ② Ring Slit Knob: Slide the mount into or out of the condenser with this knob.
- ③ Ring Slit Centering Knobs: Operate the centering knobs for centration of light annulus.
- ④ Mounting Thread: Screw the phase contrast condenser securely into the thread of the illuminator.
- ⑤ Rotation Clamping Knob: Clamps the condenser in a manner that the letters "OLYMPUS" face the observer.
- ⑥ Mount Clamping Knob: Clamps the ring slit mount.

#### V. ASSEMBLY

##### A. Attach the Illuminator.

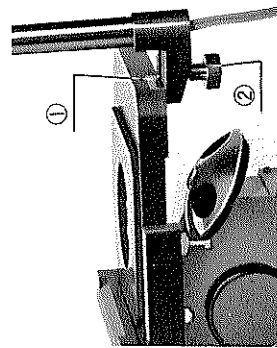


Fig. 1

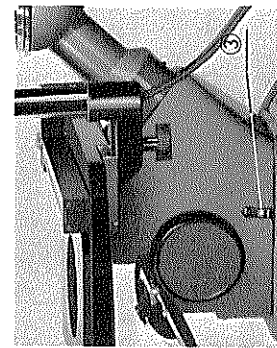


Fig. 2

- (1) Slide the dovetail base of the pillar into the groove ① and tighten the clamping screw ② with a steel bar provided. (Fig. 1)
- (2) When the pillar is attached at the rear side of the stage, hook the illuminator cord on the cord holder ③ for convenience of your microscopy. (Fig. 2)

##### B. Mount the observation tube.

- (1) Loosen the clamping screw.
- (2) Mounting the observation tube onto the observation tube mount, clamp the knurled ring.
- (3) Clamp the observation tube with the clamping screw at any direction as desired.

##### C. Mount the objectives. (Fig. 3)

- (1) Bring the nosepiece down to the lowest position by means of the focusing knob ①.
- (2) Mount the objective ② into the hole on the nosepiece.

NOTE: It is suggested to insert the objective into the hole nearest to the observer. (Fig. 3)

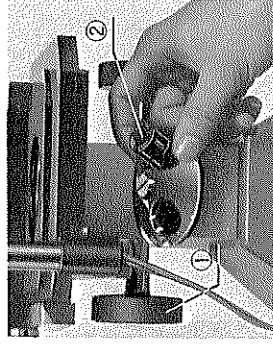


Fig. 3

##### D. Insert the eyepieces into the observation tube.

##### E. Connect the electric cords.

- (1) Ascertain that the voltage control knob is set at "3" and that the main switch is OFF, and then insert the plug of the line cord into the line cord socket.
- (2) Insert the plugs of the illuminator cord into the low voltage outlet.
- (3) Ground the microscope. (Not required if the line cord is of the 3-wire type.)

##### F. Take following steps, if necessary, in accordance with your microscopic requirements.

- (1) Insert the stage insert plate into the center hole of the stage (if the specimen is small).
- (2) Insert a filter of your choice into the filter mount of the illuminator.
- (3) Attach the stage clips (if the specimen is mounted on a slide glass).
- (4) Attach the extensions to the stage (if the specimen is large). (Fig. 4)



Fig. 4

Two dovetail grooves are provided on the underside of the stage so that the pillar can be mounted either at the front or rear side of the stage according to your preference. (Fig. 1 & 2)

## VI. OPERATING THE MICROSCOPE

### A. Light the illuminator.

- (1) Push the main switch ON, and the pilot lamp and illuminator will light up.
- (2) Adjust light intensity to suit your requirement.  
**NOTE:** Avoid prolonged use of the light source at voltages in the red zone. At the following steps B, C & D, the specimen should be disengaged from the light path.

### B. Center the lamp house.

- (1) Ascertaining that the specimen is removed out of the light path, lower the illuminator bracket all the way down until it stops, and tighten the bracket clamping knob firmly.
- (2) Insert the white frosted filter into the filter mount of the illuminator.
- (3) Swing the 10X objective into the light path, and minimize the opening of the iris diaphragm by stopping down the iris diaphragm lever ①. (Fig. 5)
- (4) Remove one of the eyepieces from the observation tube, and looking through the observation tube, bring the image of the iris diaphragm to the center of the field by means of the lamp house centering knobs. (Diag. below)

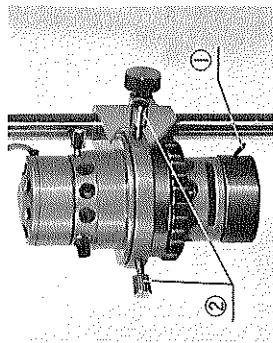
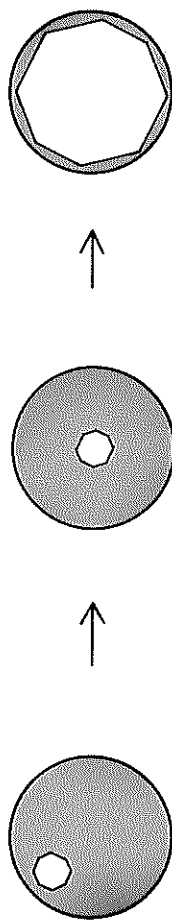


Fig. 5



Re-open the iris diaphragm, and adjust the centering knobs ② until the small ring of the iris diaphragm becomes a larger polygonal ring around the circular edge of the field.

**NOTE:** If you have the centering telescope (CT), insert the CT into the observation tube after removal of the eyepiece, and rotate the top lens assembly of the CT to bring the image of the iris diaphragm into focus for easier centration, because the image of the diaphragm is magnified with the CT.

### C. Determine the height of the lamp house for proper illumination.

- (1) Loosen the bracket clamping screw ② with one hand, while the bracket ① is supported by the other hand. (Fig. 6)
- (2) Align the lower edge of the bracket to the mark ③ on the pillar, and tighten the clamping screw firmly.

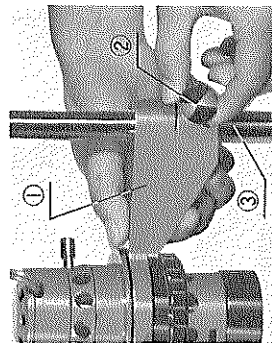
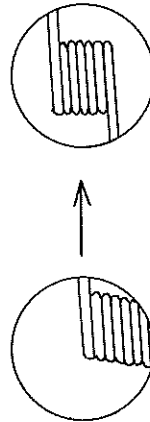


Fig. 6

### D. Center the light bulb.

- (1) Looking through the observation tube, center the filament image with the two centering knobs provided on the lamp socket. (Diag. right)



### E. Focusing

- (1) Put the specimen into the light path.
- (2) Insert the eyepieces into the observation tube, and bring the objective 10X into the light path.  
**NOTE:** Be sure to rotate the nosepiece only by its knurled ring.
- (3) Bring the objective close to the specimen slowly with the focus adjustment knobs.
- (4) Looking through the eyepieces, lower the objective slowly and focus on the specimen.  
**NOTE:** When the objectives are changed, re-adjust the condenser focusing ring for even illumination.  
Always use the white frosted filter for the 4X objective.

### F. Interpupillary Distance and Diopter Adjustments

- (1) In order to obtain perfect binocular vision through the eyepieces, it is necessary to adjust interpupillary distance and diopter difference in eye acuity; otherwise, prolonged observation would put considerable strain on the observer's eyes.
- (1) Hold 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. Memorize your interpupillary distance setting on the scale ①. (Fig. 7)
- (2) Rotate the diopter ring ② on the right eyepiece tube to match the scale to your interpupillary distance you obtained from the scale.
- (3) Look at the image through the right eyepiece with your right eye and focus on the specimen with the focus adjustment knobs.
- (4) Next, look at the image through the left eyepiece with your left eye and rotate the diopter ring ③ to focus on the specimen without using the focus adjustment ring.

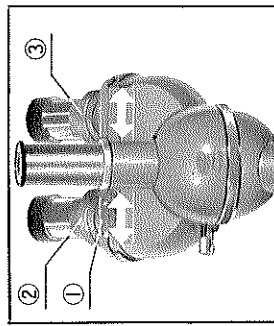


Fig. 7

- NOTE:** (1) The interpupillary distance adjustment is necessary each time observers are changed. Re-focusing is also necessary whenever the interpupillary distance is changed.
- (2) By completing this focus adjustment, the mechanical tube length is kept at 160mm.

### G. Tension Adjustment of Focus Adjustment Knobs

While the focus 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 adjustment knobs with both hands and rotate them in the opposite directions at the same time.

## H. Use of Filters

**Green filter (36X50G-53):** This filter is most recommended, since it aids in obtaining photographs (B & W) of highest resolution and maximum contrast.

**Cobalt filter (36X50C):** Use it as a daylight filter for specific application only when it is desirable to emphasize yellow in the stained portion of a specimen.

**White frosted filter (36X50WF):** This filter must be always used with the objective 4X to eliminate uneven illumination.

## I. Use of Aperture Iris Diaphragm

An aperture iris diaphragm opened too wide impairs image contrast due to internal reflections and related factors. On the other hand, if the diaphragm is stopped down excessively, resolution is unduly reduced. It is therefore suggested to match the opening of the aperture iris diaphragm to the numerical aperture of the objective in use in order to achieve maximum objective performance. (See the optical data at the end of this manual.)

## J. Bulb Replacement

- (1) Pull out the socket clamping knob ① and slide out the socket ②. (Fig. 8)
- (2) Remove the bulb ③ by slightly depressing it against the seat and then rotating it counterclockwise.
- (3) Insert replacement bulb in reversed order.
- (4) Before use, wipe off thoroughly any fingerprints or stains on the bulb.

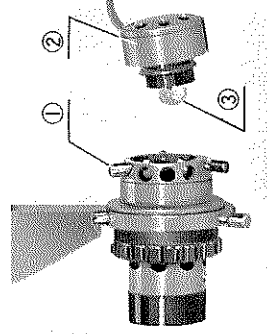


Fig. 8

## K. Photomicrography

For photomicrographic work, the binocular tube requires a vertical photo tube to attach the photomicrographic equipment Model PM-6 or PM-10 to the microscope. (For details, read the instruction manual for the Model PM-6 or PM-10.)

## L. Use of Phase Contrast Attachment

### 1. Assembly

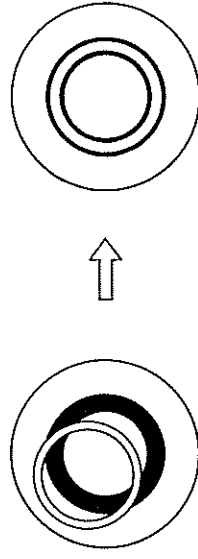
- (1) Attach the long-focus phase contrast condenser. Screw the phase contrast condenser securely into the light exit thread at the bottom of the lamp house.
- (2) Loosen the rotation clamping knob of the phase contrast condenser and rotate the condenser in such a manner that the letters "OLYMPUS" face the observer then clamp.
- (3) Insert a proper ring slit (light annulus) mount, corresponding to the magnification of the objective in use, into the condenser from the front and tighten the mount clamping screw.  
**NOTE:** Start with the 20X ring slit, because the 20X objective is used for alignment of the light annulus and the phase annulus.
- (4) Remove the standard objectives from the revolving nosepiece and mount the phase contrast objectives.
- (5) Bring the lamp house into position for proper illumination. Set the lower edge of the lamp bracket, supporting the lamp house, 35mm above the mark on the pillar, and tighten the bracket clamping screw securely.

## 2. Phase Contrast Microscopy

- (1) Lower the condenser lens approximately 5mm from its top position by means of the condenser lens focusing ring.

**NOTE:** If the illumination is uneven, turn the knurled ring to adjust the condenser height, with the iris diaphragm at fully opened, until even illumination is obtained.

- (2) Swing the 20X phase contrast objective into the light path and insert the ring slit mount for the 20X objective.
- (3) Place specimen on the stage and focus.
- (4) Remove one of the eyepieces from the observation tube, and insert the centering telescope into the observation tube.
- (5) Rotate the top lens assembly of the centering telescope to bring the bright ring (light annulus) and the dark ring (phase annulus) into focus.
- (6) Operate the centering knobs of the ring slit mount until light annulus and phase annulus are concentric and superimposed. (Diag. below)



Phase annulus and light annulus are initially aligned with the 20X phase contrast objective.

Before re-insertion of the eyepiece into the observation tube, move your head to the right or left to ascertain that the images of phase and light annuli are correctly superimposed; if not, move the illuminator up and down to eliminate eccentricity.

- (7) Remove the centering telescope, and insert the eyepiece back into the eyepiece tube.
- (8) Repeat this procedure for the 10X phase contrast objective, using the ring slit mount for the 10X objective.  
After initial alignment of both ring slit mounts only occasional touch ups are required to maintain ring alignment.  
**NOTE:** ○ Always use the frosted filter which can be inserted into the filter mount in the lamp house.  
○ The standard Petri dish (small size) is 1.2mm thick, and optimum thickness of specimen (culture medium) is 3mm.  
(Ref. A large size Petri dish is 1.8mm thick.)  
○ Open the iris diaphragm to maximum aperture.  
○ In case the illumination intensity is insufficient for observation with the 20X objective, the frosted filter can be removed.

## VII. OPTICAL DATA

Objective	Initial magnification	Ach. 4X	Ach. 10X	C20X (Option)
	Numerical aperture	0.10	0.25	0.40
	Working distance (mm)	19.87	5.40	1.60
Eyepiece	Focal length (mm)	29.20	15.98	8.16
	Total magnification	40X	100X	200X
	Depth of focus ( $\mu$ )	124.2	27.9	9.3
	Field of view (mm)	4.3	1.72	0.86
CK10X Focal length 25.0mm Field number 17.2				

## VIII. MAINTENANCE

Moisture and dust are the most deadly factors to microscopes, so that microscopes should be kept in containers immediately after use. If this is not possible, they should be covered with the vinyl dust cover provided. As for objectives and eyepieces, it is best to keep them in desiccators. Failing this, they should be kept in cases containing such desiccants as silica gel. After the eyepieces are removed from the microscope, the vacant eyepiece tubes should be covered with protective caps. By no means should a microscope be disassembled for repairs. This should be left to the Olympus repair service.

Microscopes must always be kept clean. Fine dust on parts that cannot be reached by hand should be blown or wiped off by means of an air blower or a clean feather.