

INSTRUCTIONS

BH3-MJLT **BH3-MJLA**

IC INSPECTION MICROSCOPE

WARNING

This instruction manual has been prepared for use with the Olympus IC Inspection Microscope Models BH3-MJLT and BH3-MJLA. Before putting the microscope into operation, it is recommended that you read this manual carefully and familiarize yourself with the use of this microscope in order to obtain the best performance.

OLYMPUS®

BEFORE USE

1 Operation

1. This microscope is a precision instrument. Always handle it with the care it deserves and avoid abrupt movements or shock.
2. Do not subject the microscope to direct sunlight, high temperature and humidity, dust, or excessive vibration.
The operating conditions are: Ambient temperature: 10°C – 35°C (50°F – 95°F)
Relative humidity: 15% – 85%
3. Prevent dust from accumulating on the lenses and avoid leaving fingerprints on the optics.
4. Unplug the power cord before replacing the light bulb or fuse.
5. Connect the grounding wire of the microscope.
6. Use the tension adjustment ring to adjust the rotational tension of the coarse focus adjustment knobs.
7. Confirm that the line voltage selector switch at the bottom of the microscope base is set to your local mains voltage.

Applicable Arms and Focus Units

Stage	Arm		Focus unit			Halogen lamp housing (for transmitted light)	
	8"	*10"	FO2	FO4	*FO4S	BHS-LSH50	BH3-LSH50-10
BH3-SIC6	○		○			○	
BH3-SIC8	○			○		○	
BH3-SIC106	○			○		○	
BH3-SIC128	○			○		○	
*BH3-SIC10		○			○		○
*BH3-SIC1410		○			○		○

The items marked with "*" are scheduled for future sale.

8. As listed above, use of different models of mechanical stages require different models of focus units and horizontal arms. Please consult your local agent/dealers for further details on the selection and/or exchange of these models.
9. To power the vertical illuminator and the transmitted light illuminator simultaneously, a power supply unit (TH3) for the halogen light source is required.
10. The breath shield and UV protective shield mounting pins (paragraph 3-3 **2**) permit attachment of the shield alternatingly. The pins have a central tap to accept the clamping screws of the breath shield. Exchange the pins without central tap.

2 Maintenance

1. Lens surfaces must always be kept clean. Fine dust on lens surfaces should be wiped off gently with gauze pads. Carefully wipe off oil or fingerprints on the lens surfaces with a gauze pad moistened with a small amount of xylene, or a 3 : 7 mixture of alcohol and ether.
2. Do not use organic solutions to wipe the surfaces of various components. Plastic parts, especially, should be cleaned with neutral detergent.
3. Fine dust on the half-mirror units of the universal illuminator should be lightly blown off. If dust still remains, contact an Olympus office, as listed on the back page of this manual.
4. Do not disassemble the microscope for any reason. Only authorized Olympus service personnel should make repairs.
5. When not in use, cover the microscope with the vinyl dust cover provided and keep it out of areas of high heat and humidity.

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1 STANDARD CONFIGURATIONS

The following shows only typical examples of the standard configurations. Check your configuration against the price list, catalogs, etc.

IC Standard Configurations

Model		Reflected Light Version					Reflected and Transmitted Light Version			
		BH3-MJLA2		BH3-MJLA4			BH3-MJLT2		BH3-MJLT4	
		Observation only	Photomicrography	Observation only		Photomicrography	Observation only	Photomicrography	Observation only	Photomicrography
		163B	863U	183B	183D	883U	163B	863U	183D	883U
Component										
Microscope Stand	BH3-MJLA2-F	1	1	—	—	—	—	—	—	—
	BH3-MJLT2-F	—	—	—	—	—	1	1	—	—
	BH3-MJLA4-F	—	—	1	1	1	—	—	—	—
	BH3-MJLT4-F	—	—	—	—	—	—	—	1	1
Power cord	UYCP	1	1	1	1	1	1	1	1	1
Binocular tube	BH2-BI30	1	—	1	1	—	1	—	1	—
Tilting binocular tube	BH2-TBI	—	—	—	—	—	—	—	—	—
Trinocular tube	BH2-TR30	—	—	—	—	—	—	—	—	—
Tilting trinocular tube	BH2-TTR	—	1	—	—	1	—	1	—	1
Motorized 5 revolving nosepiece for M objectives	BH3-5MRE-M	1	—	1	—	—	1	—	—	—
Motorized 5 revolving nosepiece for Neo objectives	BH3-5NRE-M	—	1	—	1	1	—	1	1	1
Universal vertical illuminator	BH2-UMA	1	1	1	1	1	1	1	1	1
Brightfield half-mirror unit	BH2-UBF	1	1	1	1	1	1	1	1	1
Darkfield half-mirror unit	BH2-UDF	—	1	—	1	1	—	1	1	1
ND filter slider, including ND12 filter and shutter	BH2-UND	—	1	—	1	—	—	—	1	—
Tint plate, including ND12 filter	BH2-UTP530	—	1	—	—	1	—	1	—	1
Polarizer	BH2-UPO	—	1	—	—	1	—	1	—	1
Analyzer	BH2-UAN	—	1	—	—	1	—	1	—	1
Roof cover	BH3-UCO	1	1	1	1	1	1	1	1	1
Breath shield	BH3-BSH	1	1	1	1	1	1	1	1	1
Yellow filter	20Y48-W	1	1	1	1	1	1	1	1	1
Light balancing filter	20LBD3-W	1	1	1	1	1	1	1	1	1
	45LBD2-N	—	—	—	—	—	1	1	1	1
Contrast filter	20IF550-W	—	1	—	—	1	—	1	—	1
	43IF550-W45	—	—	—	—	—	—	1	—	1
Halogen lamp housing (50W)	BH2-ULSH45/50	1	—	1	1	—	1	—	1	—
Halogen bulb	12V50WHAL-L-L-L1	2	—	2	2	—	2	—	2	—
Halogen lamp housing (100W)	BH2-HLSH45/100	—	1	—	—	1	—	1	—	1
Collector lens	BH2-HCL	—	1	—	—	1	—	1	—	1

IC Standard Configurations

Component		Model	Reflected Light Version					Reflected and Transmitted Light Version			
			BH3-MJLA2		BH3-MJLA4			BH3-MJLT2		BH3-MJLT4	
			Observation only	Photomicrography	Photomicrography		Photomicrography	Observation only	Photomicrography	Observation only	Photomicrography
			163B	863U	183B	183D	883U	163B	863U	183D	883U
Halogen bulb	JC12V100WHAL-L	—	2	—	—	2	—	2	—	2	
Halogen lamp housing (50W) for transmitted light	BHS-LSH-50	—	—	—	—	—	1	1	1	1	
Halogen bulb	JC12V50WHAL-L	—	—	—	—	—	2	2	2	2	
Mechanical stage with right-hand low drive controls	BH3-SIC6-R	1	1	—	—	—	1	1	—	—	
	BH3-SIC8-R	—	—	1	1	1	—	—	1	1	
Stage grip for right-hand side	BH3-SGR-R	1	1	1	1	1	1	1	1	1	
Wafer holder plate	BH3-WHP6	1	1	—	—	—	1	1	—	—	
6" and 5" wafer holder ring	BH2-WHR65	1	1	—	—	—	1	1	—	—	
Wafer holder plate, including 8" and 6" wafer holder ring	BH3-WHPR86	—	—	1	1	1	—	—	1	1	
5" x 5" mask holder	BH3-MH5	1	1	—	—	—	1	1	—	—	
7" x 7" mask holder	BH3-MH7	—	—	1	1	1	—	—	1	1	
Nomarski prism attachment	U-NIC5-N U-NIC10-N U-NIC20-N U-NIC50-N U-NIC100-N	—	1- each	—	—	1- each	—	1- each	—	1- each	
Screwdriver	AA7213	—	1	—	—	1	—	1	—	1	
Allen® wrench	MA7578	—	1	—	—	1	—	1	—	1	
Objectives	MS PL achromatic	MS PL5X MS PL10X-T MS PL20X-T MS PL50X MS PL100X	1- each	—	1- each	—	—	1- each	—	—	
	Neo SPL achromatic	Neo SPL5X Neo SPL10X-T Neo SPL20X-T Neo SPL50X Neo SPL100X	—	—	—	1- each	—	—	—	1- each	
	Neo SPL achromatic universal version	Neo SPL5X-NIC Neo SPL10X-NIC Neo SPL20X-NIC Neo SPL50X-NIC	—	1- each	—	—	1- each	—	1- each	—	
Standard mirror for color temperature determination	M-SM2	—	1	—	—	1	—	1	—	1	
LB eyepiece 10X	WHK10X	2	1	2	2	1	2	1	2	1	
LB eyepiece 10X with built-in 35mm mask	35WHK10X	—	1	—	—	1	—	1	—	1	
LB photo eyepiece 3.3X	NFK 3.3X LD	—	1	—	—	1	—	1	—	1	

IC Fluorescence Standard Configurations

Component		Model	BH3-MJLA2	BH3-MJLA4	BH3-MJLT2	BH3-MJT4	BH3-MJL
			363F	383F	363F	383F	FL-SET
Microscope Stand	BH3-MJLA2-F		1	—	—	—	—
	BH3-MJLA4-F		—	1	—	—	—
	BH3-MJLT2-F		—	—	1	—	—
	BH3-MJLT4-F		—	—	—	1	—
Power cord	UYCP		2	2	2	2	1
Trinocular tube	BH2-TR30		1	—	1	—	—
Tilting trinocular tube	BH2-TTR		—	1	—	1	—
Motorized 5 revolving nosepiece for M objectives	BH3-5MRE-M		1	1	1	1	—
Universal vertical illuminator	BH2-UMA		1	1	1	1	—
Brightfield half-mirror unit ND05 filter	BH2-UBFL		1	1	1	1	1
Dichroic mirror unit	for excitation B	BH2-UDMB	1	1	1	1	1
	for excitation G	BH2-UDMG	1	1	1	1	1
	for excitation V	BH2-UDMV	1	1	1	1	1
Roof cover	BH2-UCO		1	1	1	1	—
Breath shield	BH3-BSH		1	1	1	1	—
Light balancing filter	45BD2-N		—	—	1	1	—
Fluorescence supplementary unit consisting of slider for supplementary exciter filter, adapter to fit extension tube BH3-UET8 with BH2-UMA, supporting block and UV protective shield	BH2-URF		1	1	1	1	1
Extension tube	BH3-UET8		1	1	1	1	1

IC Fluorescence Standard Configurations

Component		Model	BH3-MJLA2	BH3-MJLA4	BH3-MJLT2	BH3-MJT4	BH3-MJL
			363F	383F	363F	383F	FL-SET
Fluorescence lamp housing	BH2-LSRF		1	1	1	1	1
Mercury burner	USH102D		2	2	2	2	2
Power supply	BH2-RFL-T3		1	1	1	1	1
Centering screen	BH2-SGRF		1	1	1	1	1
Halogen lamp housing (50W) (for transmitted light)	BHS-LSH-50		—	—	1	1	—
Halogen bulb	JC12V50WHAL-L		—	—	2	2	—
Mechanical stage with right-hand low drive controls	BH3-SIC6-R		1	—	1	—	—
	BH3-SIC8-R		—	1	—	1	—
Stage grip for right-hand side	BH3-SGR-R		1	1	1	1	—
Wafer holder plate	BH3-WHP6		1	—	1	—	—
6" and 5" wafer holder ring	BH3-WHR65		1	—	1	—	—
Wafer holder plate, including 8" and 6" wafer holder ring	BH3-WHPR86		—	1	—	1	—
5" x 5" mask holder	BH3-MH5		1	—	1	—	—
7" x 7" mask holder	BH3-MH7		—	1	—	1	—
Objective	MS PL achromatic	MS PL5X MS PL10X MS PL20X MS PL50X MS PL100X	1-each	1-each	1-each	1-each	—
LB eyepiece 10X	WHK10X		1	1	1	1	—
LB eyepiece 10X with built- in 35 mm mask	35WHK10X		1	1	1	1	—
LB photo eyepiece 3.3X	NFK 3.3X LD		1	1	1	1	—

LCD Standard Configurations

Component		Model	BH3-MJLT4 -088		BH3-MJLT4 -106		BH3-MJLT4 -128		BH3-MJLT4S -101	BH3-MJLT4S -141
		U	B	U	B	U	U	U		
Microscope Stand	BH3-MJLT4-F	1	1	1	1	1	—	—		
	BH3-MJLT4S-F	—	—	—	—	—	1	1		
Power cord	UYCP	1	1	1	1	1	1	1		
Tilting binocular tube	BH2-TBI	1	1	1	1	1	1	1		
Motorized 5 revolving nosepiece for M objectives	BH3-5MRE-M	—	1	—	1	—	—	—		
Motorized 5 revolving nosepiece for Neo objectives	BH3-5NRE-M	1	—	1	—	1	1	1		
Universal vertical illuminator	BH2-UMA	1	1	1	1	1	1	1		
Brightfield half-mirror unit	BH2-UBF	1	1	1	1	1	1	1		
Darkfield half-mirror unit	BH2-UDF	1	—	1	—	1	1	1		
Polarizer	BH2-UPO	1	—	1	—	1	1	1		
Tint plate, including ND12 filter	BH2-UTP530	1	—	1	—	1	1	1		
Polarizer for transmitted light	BH3-POL	1	1	1	1	1	1	1		
Rotatable analyzer	BH3-UAN360	1	1	1	1	1	1	1		
Light balancing filter	20LBD3-W	1	1	1	1	1	1	1		
	45LBD2-N	1	1	1	1	1	1	1		
Roof cover	BH3-UCO	1	1	1	1	1	1	1		
Breath shield	BH3-BSH	1	1	1	1	1	1	1		
Halogen lamp housing (50W) for transmitted light	BHS-LSH-50	1	1	1	1	1	—	—		
	BH3-LSH50-10	—	—	—	—	—	1	1		
Halogen bulb	JC12V50WHAL-L	2	2	2	2	2	2	2		
Halogen lamp housing (100W)	BH2-HLSH45/100	1	1	1	1	1	1	1		
Halogen bulb	JC12V100WHAL-L	2	2	2	2	2	2	2		
Collector lens	BH2-HCL	1	1	1	1	1	1	1		

LCD Standard Configurations

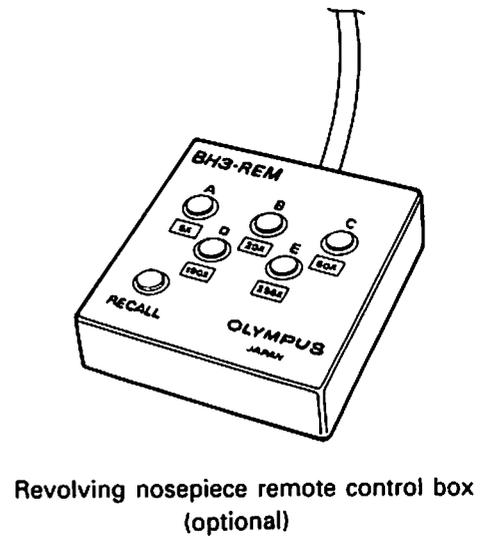
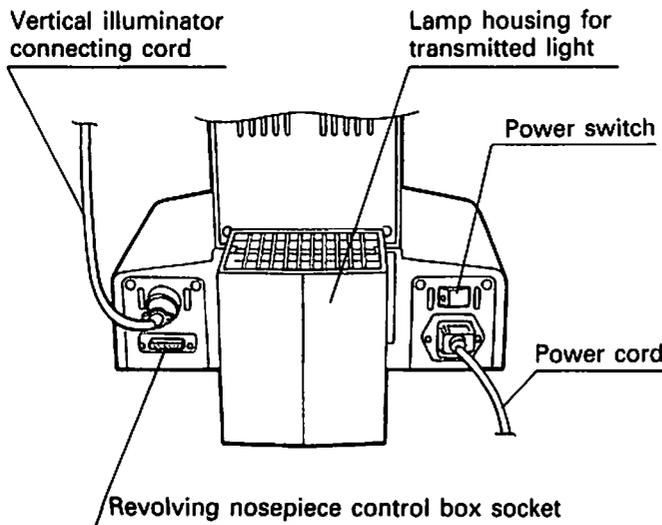
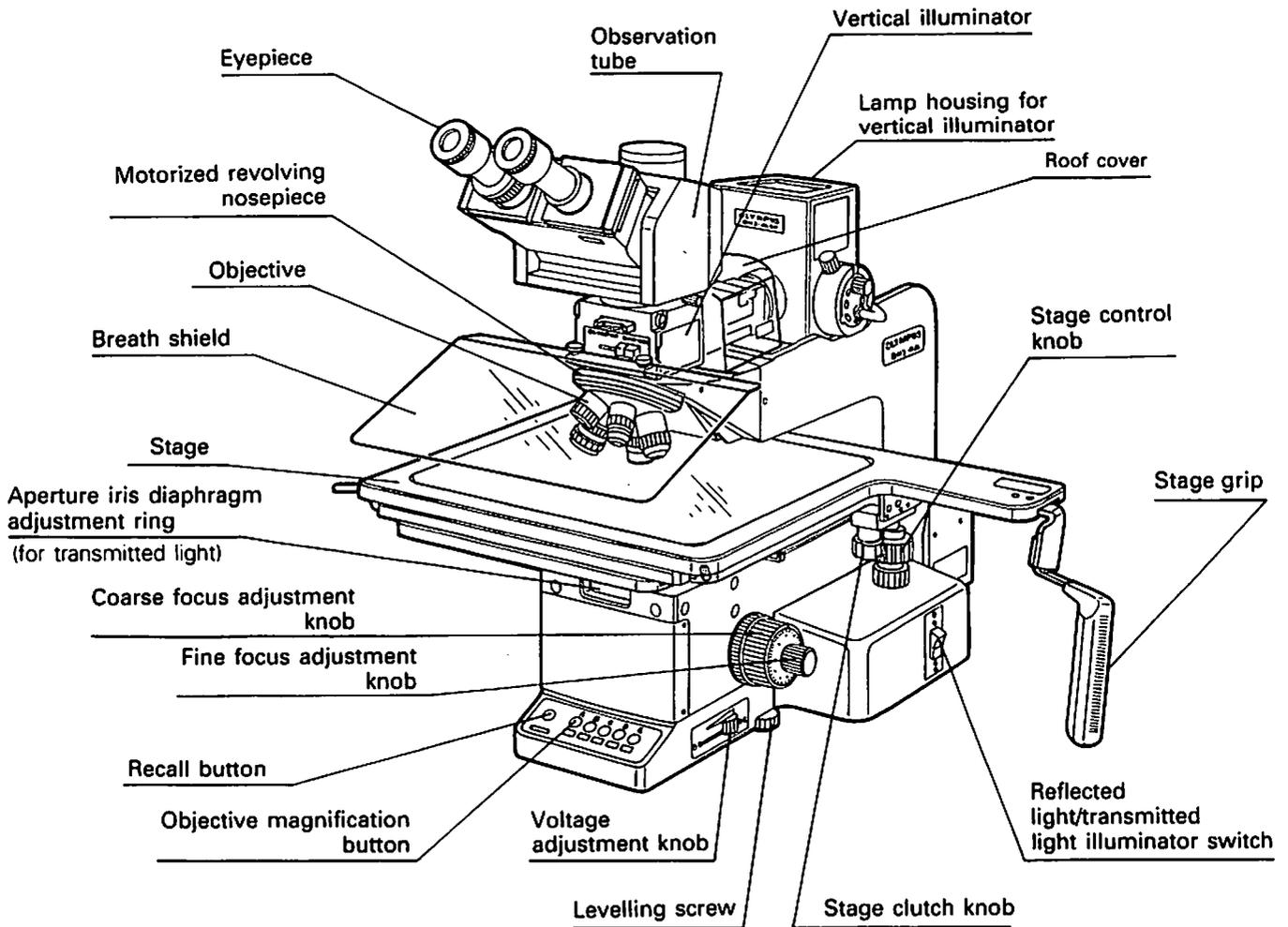
1 STANDARD CONFIGURATIONS

Component			Model	BH3-MJLT4 -088	BH3-MJLT4 -106		BH3-MJLT4 -128		BH3-MJLT4S -101	BH3-MJLT4S -141
			U	B	U	B	U	U	U	
Objectives	MS PL/ LWDMSL-LCD achromatic set	MS PL 5X	—	1	—	1	—	—	—	
		MS PL10X-T	—	1	—	1	—	—	—	
		LWD MSPL20X-LCD	—	1	—	1	—	—	—	
		LWD MSPL50X-LCD LWD MSPL100X-LCD	— —	1 1	— —	1 1	— —	— —	— —	
	Neo SPL achromatic NIC	Neo SPL 5X-NIC	1	—	—	—	—	—	—	
		Neo SPL10X-NIC	1	—	—	—	—	—	—	
		Neo SPL20X-NIC	1	—	—	—	—	—	—	
		Neo SPL50X-NIC	1	—	—	—	—	—	—	
		Neo SPL100X-NIC	1	—	—	—	—	—	—	
	Neo SPL/ ULWD Neo SPL achromatic	Neo SPL 5X-NIC	—	—	1	—	1	1	1	
Neo SPL10X-NIC		—	—	1	—	1	1	1		
ULWD Neo SPL20X		—	—	1	—	1	1	1		
ULWD Neo SPL50X		—	—	1	—	1	1	1		
ULWD Neo SPL100X		—	—	1	—	1	1	1		
Nomarski prism attachment	U-NIC set	U-NIC5-N	1	—	—	—	—	—		
		U-NIC10-N	1	—	—	—	—			
		U-NIC20-N	1	—	—	—	—			
		U-NIC50-N	1	—	—	—	—			
		U-NIC100-N	1	—	—	—	—			
	U-NIC set	U-NIC5-N	—	—	1	—	1	1	1	
		U-NIC10-N	—	—	1	—	1	1	1	
		U-NICUL20-N	—	—	1	—	1	1	1	
		U-NICUL50-N	—	—	1	—	1	1	1	
		U-NICUL80-N	—	—	1	—	1	1	1	
Screwdriver	AA7213	1	—	1	—	1	1	1		
Allen® wrench	MA7578	1	2	1	—	1	1	1		
LB eyepiece 10X	WHK10X	2	—	2	2	2	2	2		
Mechanical stage with right-hand low drive controls	BH3-SIC8-R	1	1	—	—	—	—			
	BH3-SIC106-R	—	—	1	—	—	—			
	BH3-SIC128-R	—	—	—	1	1	—			
	BH3-SIC10-R	—	—	—	—	—	1			
	BH3-SIC1410-R	—	—	—	—	—	—	1		
Stage plate glass	BH3-SPG8	1	1	—	—	—	—			
	BH3-SPG106	—	—	1	—	—	—			
	BH3-SPG128	—	—	—	1	1	—			
	BH3-SPG10	—	—	—	—	—	1			
	BH3-SPG1410	—	1	—	—	—	—	1		
Stage grip for right-hand side	BH3-SGR-R	1	—	1	1	1	1	1		
Rubber damper to absorb shock	BH3-DMP	—	—	—	—	—	1	1		

2 NOMENCLATURE

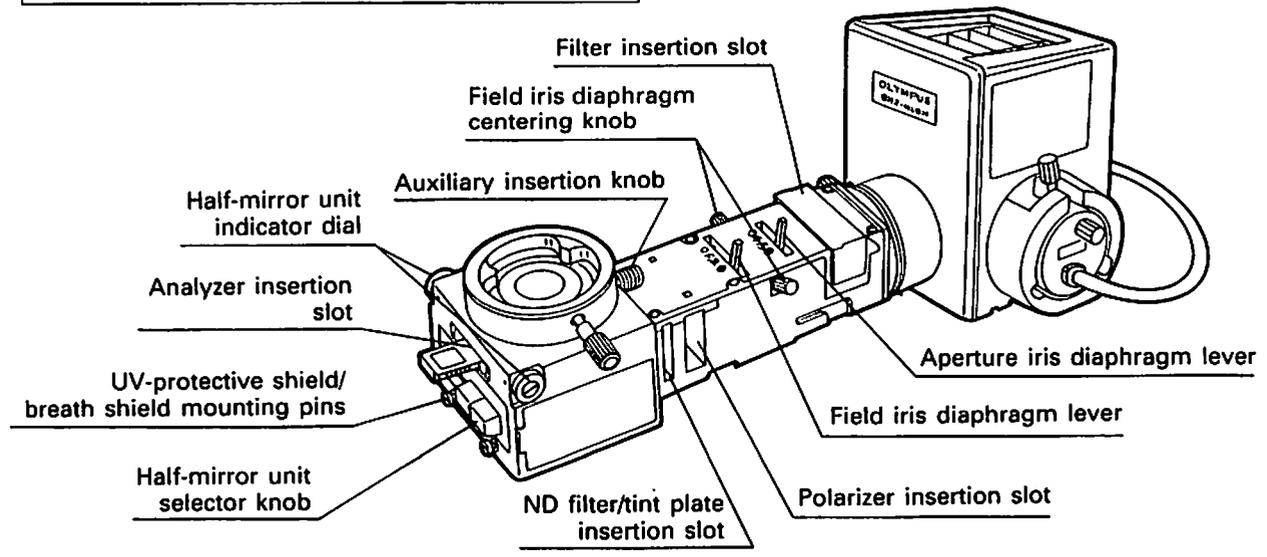
*The illustration below shows the BH3-MJLT4-883U combination.

NOMENCLATURE 2

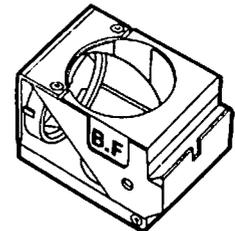


Universal Vertical Illuminator

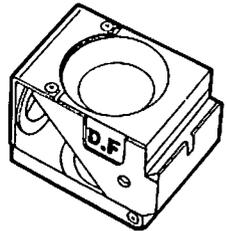
Standard Accessories for Universal Illuminator



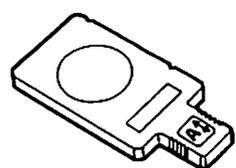
Accessories for Universal Vertical Illuminator



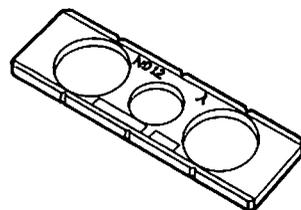
Brightfield half-mirror unit
BH2-UBF



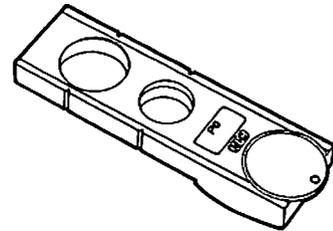
Darkfield half-mirror unit
BH2-UDF



Universal analyzer slider
BH2-UAM



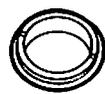
Universal tint plate slider
BH2-UTP530



Universal polarizer slider
BH2-UPO



Nomarski prism attachment
U-NIC



Nomarski prism mount



Brightfield objective adapter
NRE-MAD

3 ASSEMBLY

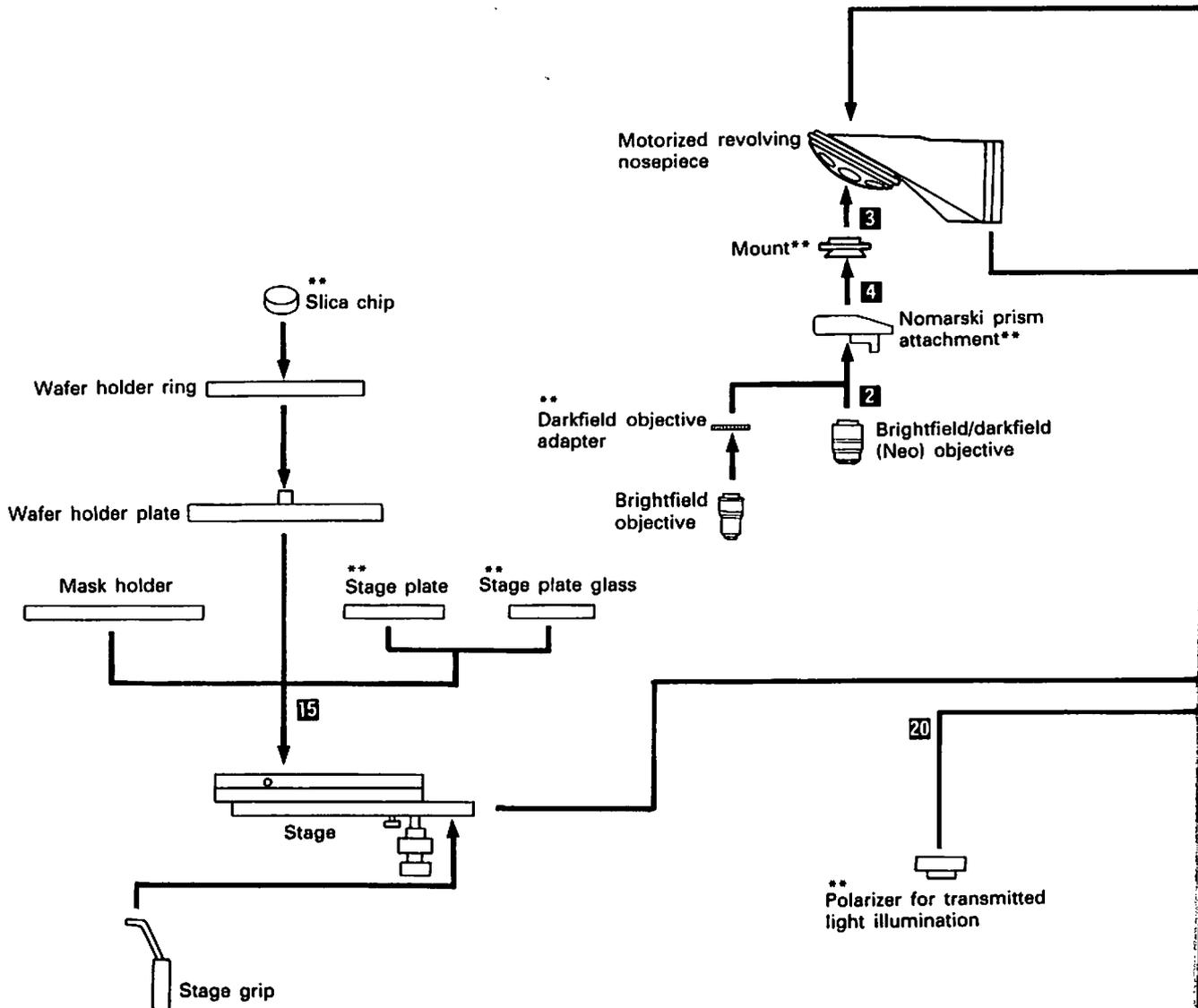
3-1 Assembly Outline

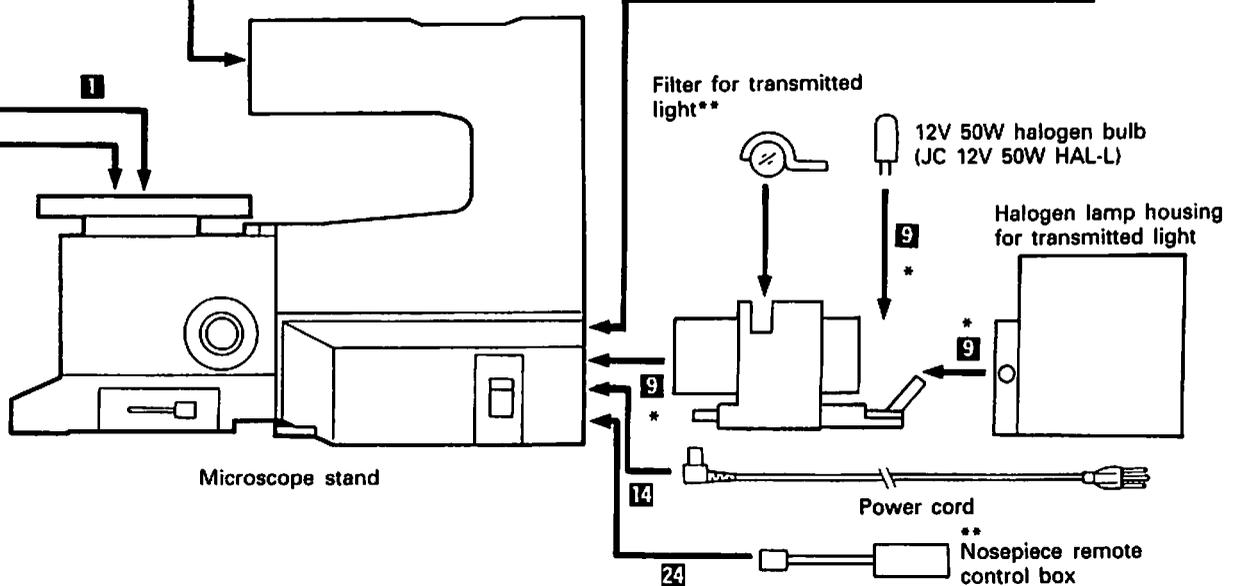
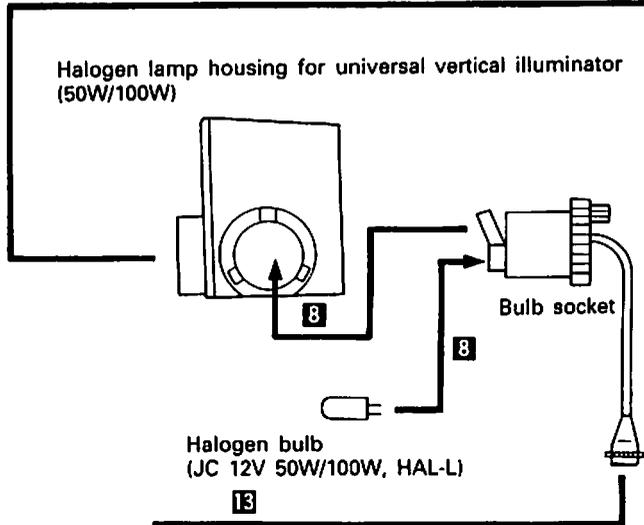
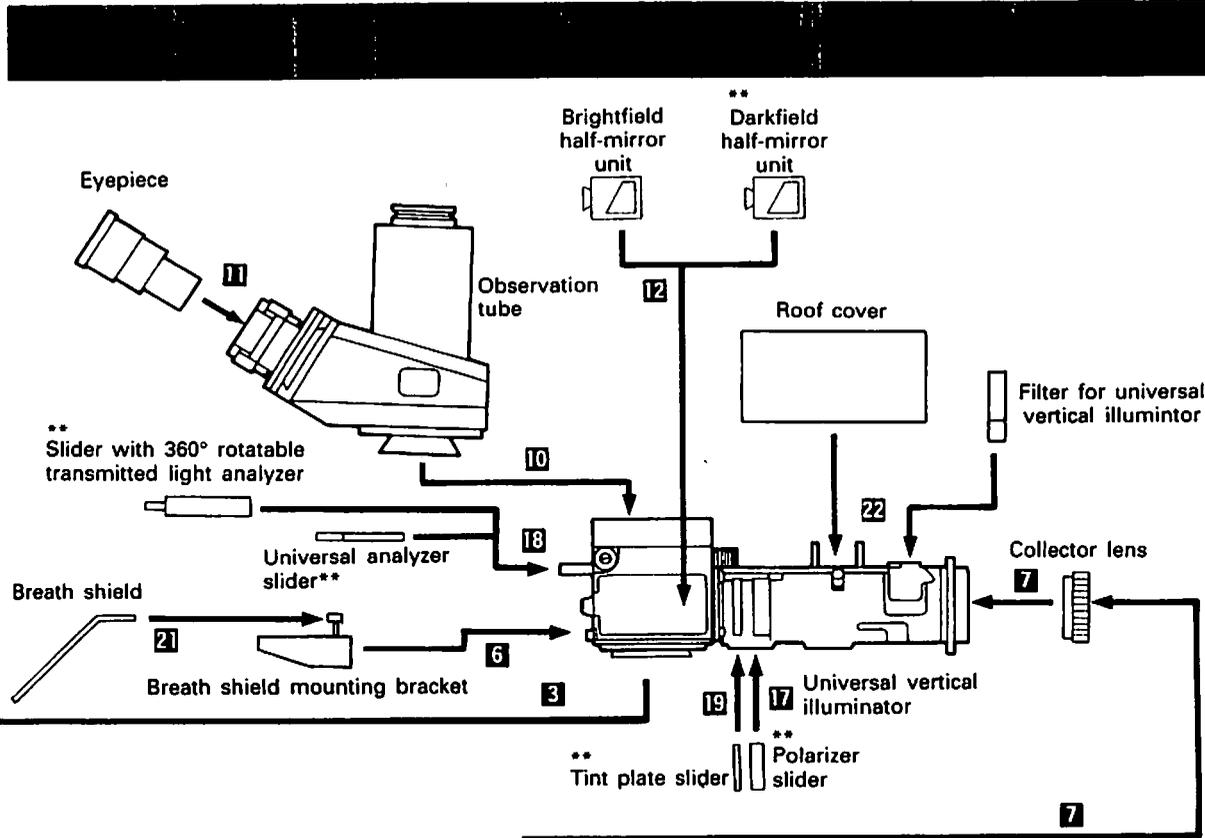
The diagram below illustrates the assembly procedure and the numbers indicate the order of assembly. Although the diagram covers all modules, select the steps pertinent to your modules and assemble accordingly. When assembling the fluorescence combination, refer to the instruction manual for the reflected light fluorescence attachment (BH2-URFL).

★ Before assembly, wipe off all glass and connecting surfaces with a soft cloth or gauze in order to remove any dust or dirt and carefully follow the assembly procedure illustrated below.

- * Modules necessary for the BH3-MJLT version
- ** Optional modules (available for some versions)

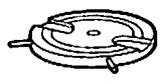
ASSEMBLY 3



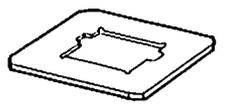


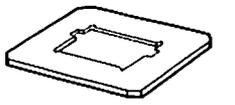
Stages and Related Accessories

ASSEMBLY 3


Wafer holder ring
 For 4", 3" wafers (BH2-WHR43)
 For 5", 4" wafers (BH2-WHR54)
 For 6", 5" wafers (BH2-WHR65)


Wafer holder plate
 (BH3-WHP6)

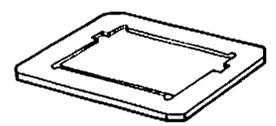

5" x 5" mask holder
 (BH3-MH5)

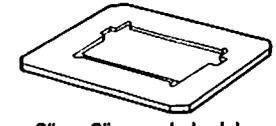

4" x 4" mask holder
 (BH3-MH4)


6" x 6" stage plate
 (BH3-SP6)


Stage plate glass
 (BH3-SPG6)

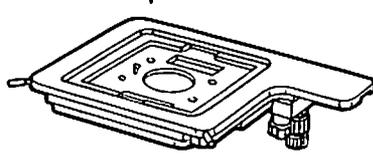

Silica chip
 (BH3-HCH)
Water holder plate
 (BH3-WHPR86)


7" x 7" mask holder
 (BH3-MH7)

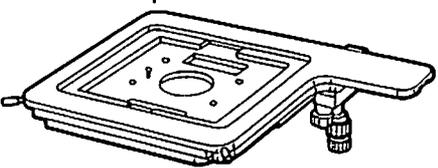

6" x 6" mask holder
 (BH3-MH6)

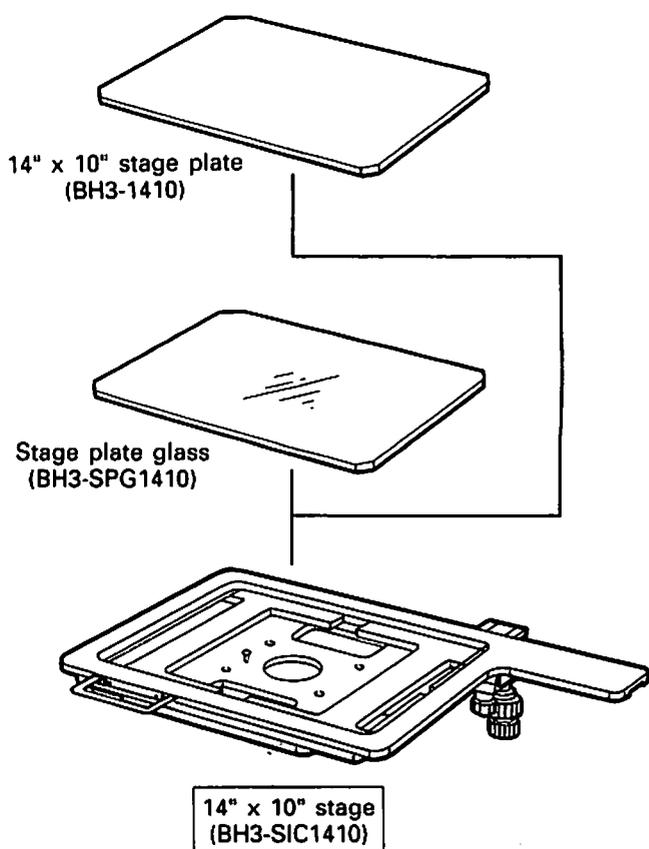
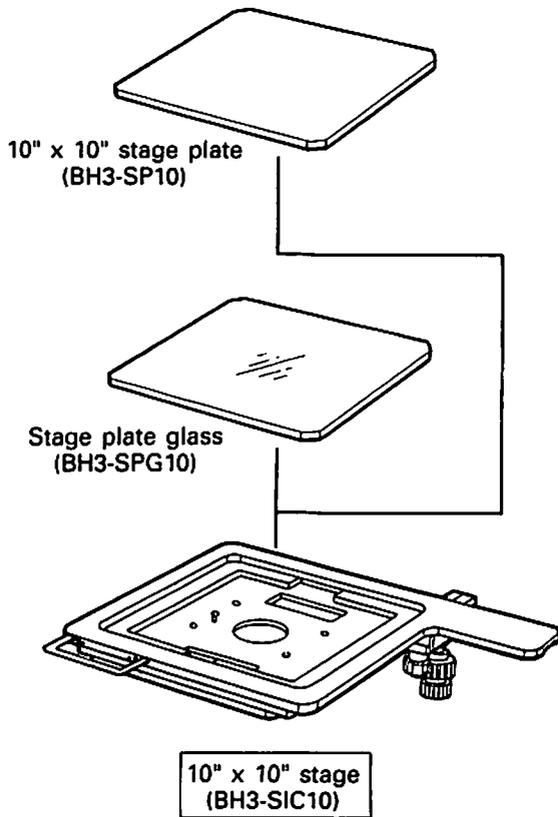
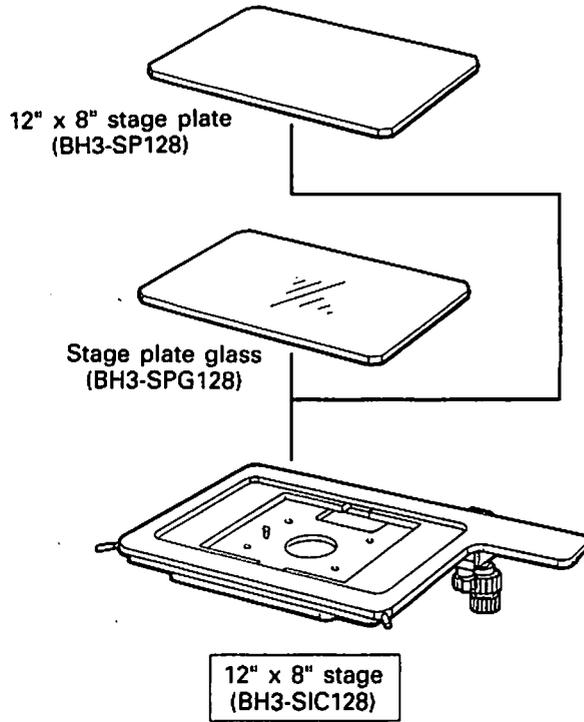
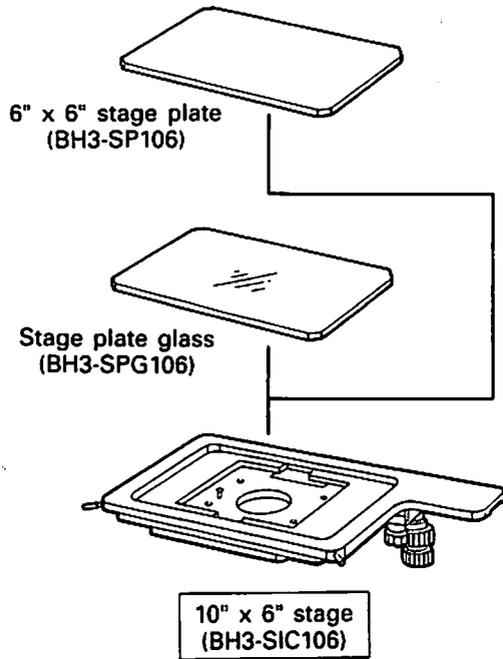

8" x 8" stage plate
 (BH3-SP8)


Stage plate glass
 (BH3-SPG8)


6" x 6"
 (BH3-SIC6)


6" unit for
BH3-SIC8
 (BH3-ADP86)


8" x 8"
 (BH3-SIC8)



3-2 Preparation for Assembly

1 Levelling the Table for the Microscope Stand

The stage will begin to slide at an inclination of 1° (7/400 mm) with the clutch disengaged, because the free-floating gearless rail system is extremely smooth. Therefore, it is very important to properly level the table before installation of the microscope.

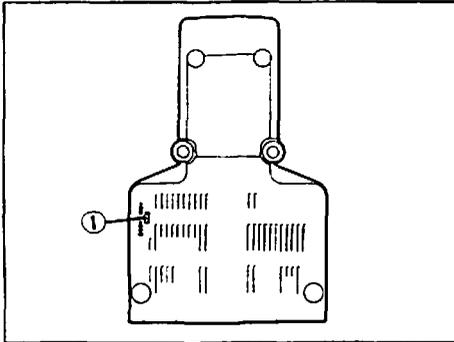


Fig. 1

2 Checking Line Voltage Setting (Fig. 1)

1. Gently tip the microscope cover, as shown in Fig. 1.
2. Determine if the line voltage selector switch ① at the bottom of the microscope base is set to your local voltage. If not, set the line voltage selector switch to the correct position using a screwdriver or similar tool.

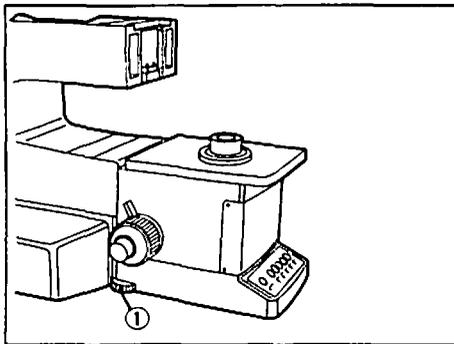


Fig. 2

3 Levelling Screw Adjustment (Fig. 2)

After placing the microscope stand, individually turn both levelling screws ① at the bottom of the microscope base until they make contact with the table surface. Then turn the screws a half or one full turn further to stabilize the microscope.

3-3 Detailed Assembly Procedure

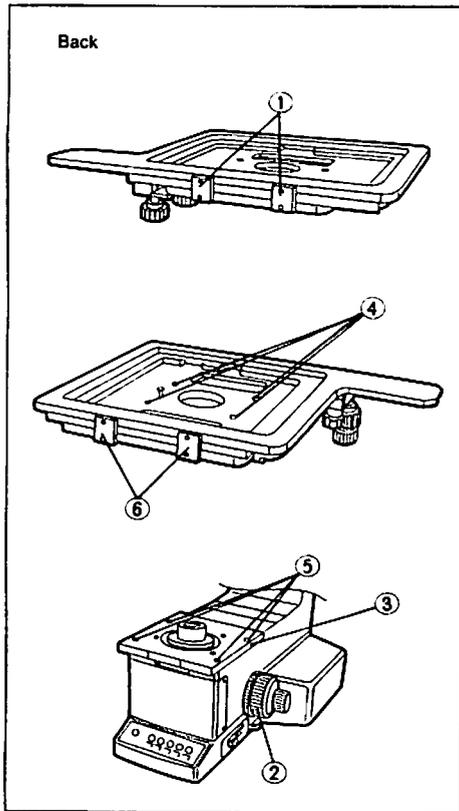


Fig. 3

1 Mounting the Stage (Fig. 3)

1. Remove the transport locking plates ① on the rear of the stage using the Allen® wrench provided.
2. Turn the coarse focus adjustment knob ② to bring the focus unit ③ down to its lowest position.
3. Place the stage gently onto the focus unit and align the mounting holes ④ on the stage with the screw holes ⑤ on the focus unit.
4. Attach the stage to the focus unit by lightly tightening the four hex screws with the Allen® wrench provided.
5. Push in the stage as far as it will go, making sure that the stage does not make contact with the pillar.
6. Securely clamp the stage with the Allen® wrench.
7. Remove the transport locking plates ⑥ on the front of the stage with the Allen® wrench.
8. Attach the caps to the four screw holes.
 - ★ Lower the focus unit as much as possible before removing the stage.
 - ★ The stage can also be rotated a full 180° for mounting.
 - ★ Keep the transport locking plates removed from the front and back of the stage in an appropriate place and use for reclamping the stage when it is removed.

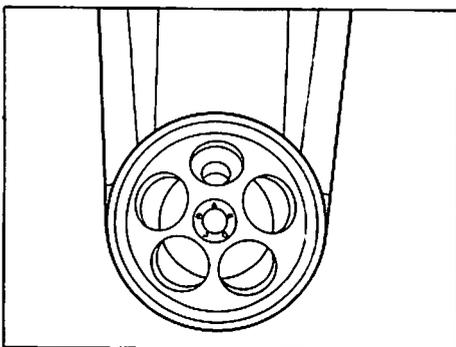


Fig. 4

2 Mounting the Objectives (Fig. 4)

- ★ For BH3-MHL combinations provided with the Nomarski Differential Interference Contrast Attachment, perform the procedures discussed in paragraphs 3 and 4.
 - ★ When mounting the brightfield objective to the darkfield revolving nosepiece, perform the procedure in paragraph 27.
1. Paste the labels provided near the objective apertures.
 2. Screw the objectives into the apertures marked "A" through "E", in either ascending or descending order of magnification.

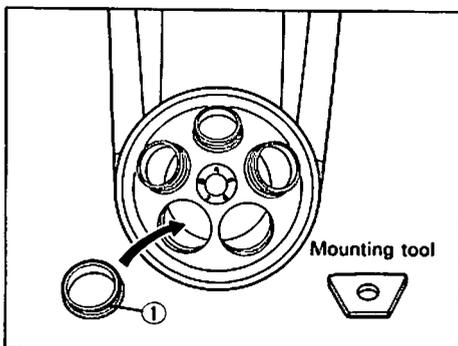


Fig. 5

3 Attaching the Nomarski Prism Mount (Figs. 5, 6)

1. Loosen the clamping screw ① of the Nomarski prism attachment, shown in Fig. 6, with the Allen® wrench and remove the Nomarski prism mount ①, shown in Fig. 5, from the Nomarski prism attachment.
2. Screw the Nomarski prism mount ① securely into the nosepiece with the mounting tool provided.

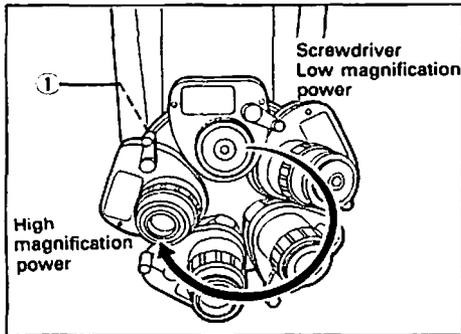


Fig. 6

4 Mounting the Nomarski Prism Attachments (Fig. 6)

Similar to the objective mounting procedure discussed in Section 2, mount the Nomarski prism attachments onto the circular dovetails of the Nomarski prism mounts, and temporarily clamp the prism clamping screw ① with the Allen® wrench.

- ★ Mount each Nomarski prism attachment in such a manner that the straight line passing through the centers of the nosepiece and the optical axis of each objective (Fig. 6). Tighten the prism clamping screws only after all attachments are mounted correctly.
- ★ When using brightfield objectives, screw the brightfield objective adapters (NRE-MAD) into the Nomarski prism attachments before mounting the objectives.

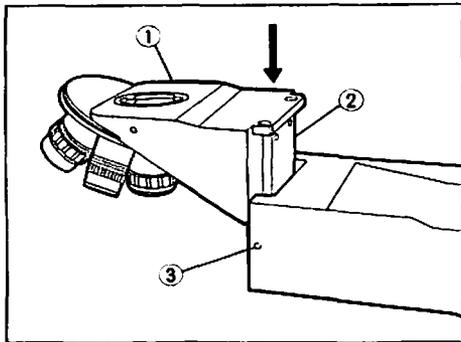


Fig. 7

5 Mounting the Motorized Revolving Nosepiece (Figs. 7, 8)

1. Gently insert the motorized revolving nosepiece ① along the slide dovetail ② as shown in Fig. 7.
 - ★ Do not force the nosepiece when tilted.
 - ★ A slight resistance may be felt at the bottom of the slide dovetail due to the engagement with the connector. Insert the nosepiece as far as it will go.
2. To clamp the dovetail slide, use the 3 mm Allen® wrench provided, to lightly tighten the hex screw ③ on the side of the arm as shown in Fig. 7, pressing the nosepiece against one side of the slide dovetail.
3. Clamp the revolving nosepiece by tightening the four hex screws ④ shown in Figs. 7, 8 (short screws for the top and long screws for the front) using the Allen® wrench.

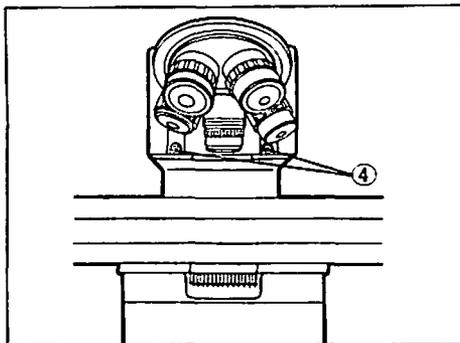


Fig. 8

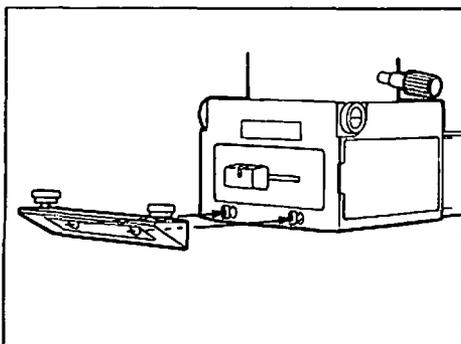


Fig. 9

6 Clamping the Breath Shield Mounting Bracket (Fig. 9)

Align the breath shield mounting bracket with two pins on the front of the vertical illuminator and insert it.

Securely clamp the screws with the Allen® wrench.

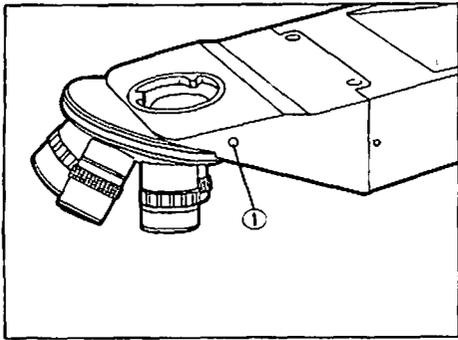


Fig. 10

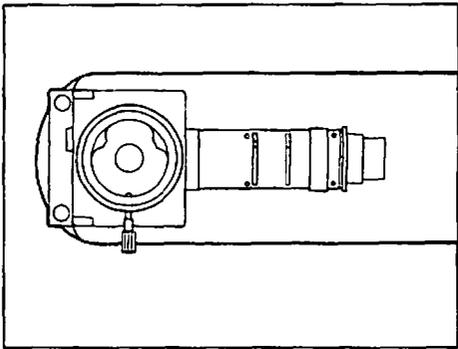


Fig. 11

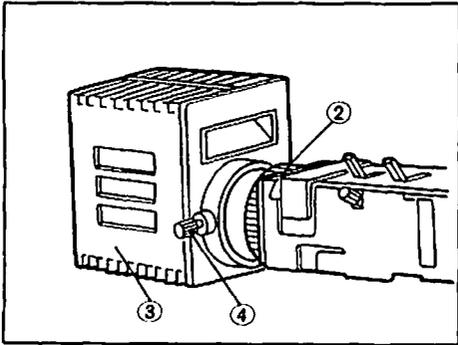


Fig. 12

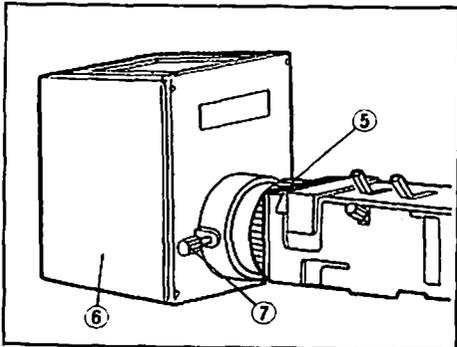


Fig. 13

7 Mounting the Universal Vertical Illuminator and Lamp Housing (Figs. 9, 10)

1. Fully loosen the vertical illuminator clamping screw ① as shown in Fig. 10 with the Allen® wrench, and attach the vertical illuminator to the top of the motorized revolving nosepiece. Clamp the unit lightly so that it is parallel to the arm. (Fig. 11)
★ Fully tighten the clamping screw ① only after having attached the lamp housing. (Fig. 10)

2. Mount the collector lens and lamp housing.

For the 50W Halogen Lamp Housing (BH2-ULSH) (Fig. 11)

Screw the BH2-UCLW collector lens ② provided with the BH2-ULSH lamp housing into the universal vertical illuminator, insert the lamp housing ③ as far as it will go, and then completely tighten the lamp housing clamping screw ④.

For the 100W Halogen Lamp Housing (BH2-HLSH) (Fig. 12)

Screw the BH2-HCL collector lens ⑤ provided with the BH2-HLSH lamp housing into the universal vertical illuminator, insert the lamp housing ⑥ as far as it will go, and then completely tighten the lamp housing clamping screw ⑦.

For Fluorescence Lamp Housing (BH2-LSRF)

For further details, refer to the instruction manual for the BH2-URFL reflected light fluorescence attachment.

- ★ The fluorescence lamp housing cannot be mounted to the 10" arm.
- ★ Use the BH3-UET8 extension tube especially designed for the BH3-MJL.

3. After mounting of the lamp housing is completed, adjust the universal vertical illuminator so that it is parallel with the arm and completely tighten the illuminator clamping screw ①. (Figs. 9, 10)

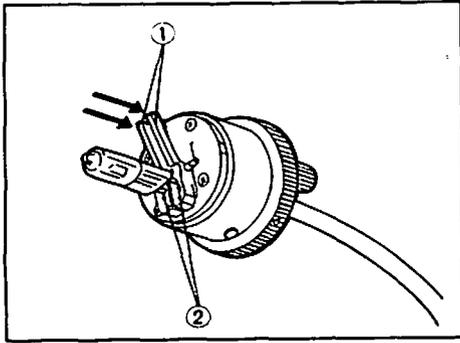


Fig. 14

8 Mounting the Halogen Bulb and Bulb Socket for the Vertical Illuminator

- ★ The BH3-MJL is available with two types of light sources for the universal vertical illuminator — 50W or 100W halogen.

Mounting the Bulb

(Fig. 14)

1. Pressing the spring levers ① in the direction of the ARROWS, insert the pins of the halogen bulb (JC 12V 50W HAL-L or 12V 100W HAL-L) into the socket holes ②.
2. Release the spring levers to hold the bulb in position.
 - ★ Never put the 100W bulb in the 50W lamp housing.
 - ★ Do not touch the bulb with bare fingers. If any fingerprints or dirt are on the bulb, wipe clean.
 - ★ Before replacing the bulb during microscopy, unplug the power cord or turn off the power and wait until the bulb cools.

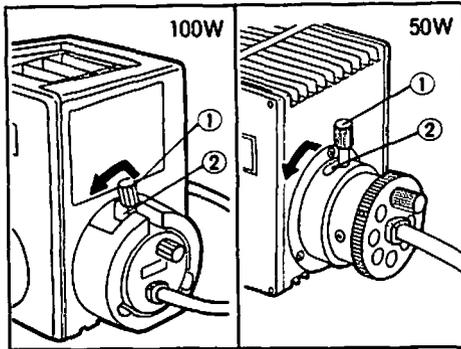


Fig. 15

Mounting the Socket and Cord Assembly

(Fig. 15)

1. Loosen the bulb socket clamping knob ①.
2. Aligning the bulb socket clamping knob with the positioning groove ② of the lamp housing, insert the socket and cord assembly into the lamp housing, and tighten the bulb socket clamping knob.

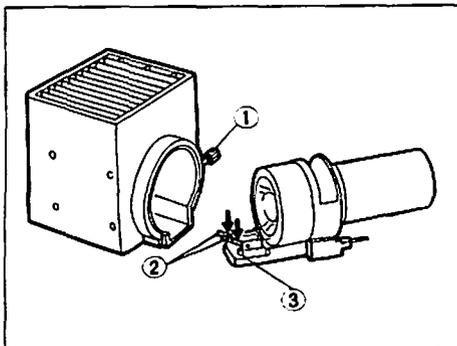


Fig. 16

9 Mounting the Halogen Bulb, Bulb Socket and Lamp Housing for the Transmitted Light Illuminator (for BH3-MJLT version)

(Fig. 16)

- ★ Use the BHS-LSH50 for 8" arm and the BH3-LSH50-10 for 10" arm.

Mounting the Bulb

1. Loosen the lamp housing clamping knob ① of the lamp housing for the transmitted light illuminator and remove the bulb socket.
2. Pressing the spring levers ② in the direction of the ARROWS, insert the pins of the halogen bulb (JC 12V 50W HAL-L) into the socket holes ③.

Mounting the Bulb Socket and Lamp Housing

1. Fully insert the bulb socket into the lamp housing for the transmitted light illuminator and tighten the lamp housing knob. (See Fig. 16 on page 17.)
2. Insert the lamp housing into the lamp housing mounting port on the microscope stand as far as it will go.
 - ★ When the 10" arm is in use, insert the lamp housing (BH3-LSH50-10) into the mounting port at the bottom of the arm.

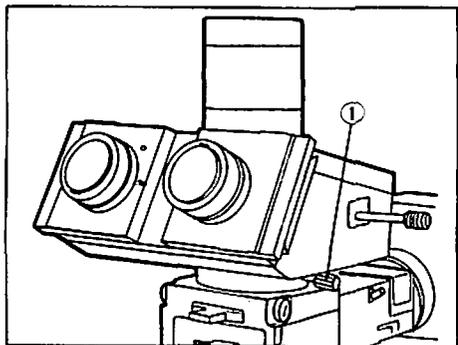


Fig. 17

10 Mounting the Observation Tube (Fig. 17)

1. Fully loosen the observation tube clamping knob ① of the universal vertical illuminator.
2. Mount the observation tube on the universal vertical illuminator and tighten the observation tube clamping knob securely, after aligning the eyepiece sleeves to point forward.

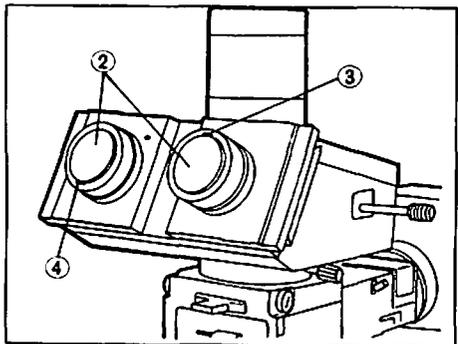


Fig. 18

11 Mounting the Eyepieces

Insert the eyepieces into the eyepiece sleeves ②.

When Using the Superwide Field Observation Tube (BH2-SWTR)

(Fig. 18)

1. Aligning the positioning pin of the field-of-view eyepiece (35 SWH10X) with the positioning groove ③ at the upper edge of the right eyepiece sleeve, insert the eyepiece.
2. Aligning the positioning pin of the eyepiece (SWHK10X) with the positioning groove ④ at the lower edge of the left eyepiece sleeve, insert the eyepiece.

When Using the Trinocular Tube (BH2-TR30/BH2-TTR) (Fig. 19)

1. Aligning the positioning pin of the field-of-view eyepiece (35 WHK10X) with the positioning groove ⑤ of the right eyepiece sleeve, insert the eyepiece.
2. Insert the eyepiece (WHK10X) into the left eyepiece sleeve.

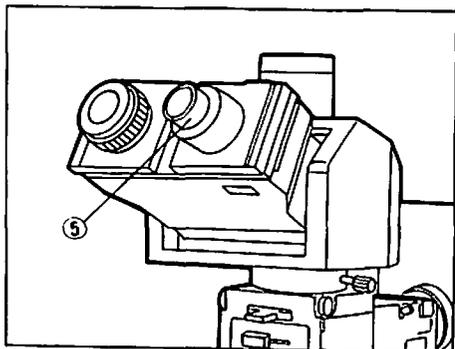


Fig. 19

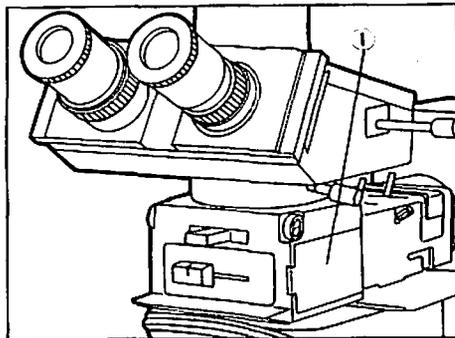


Fig. 20

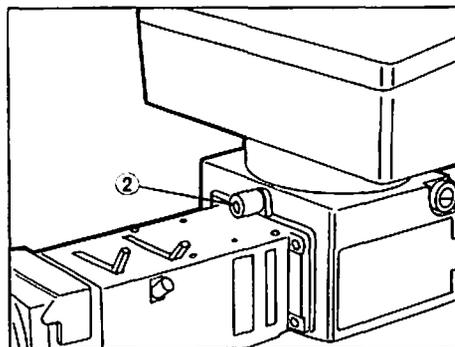


Fig. 21

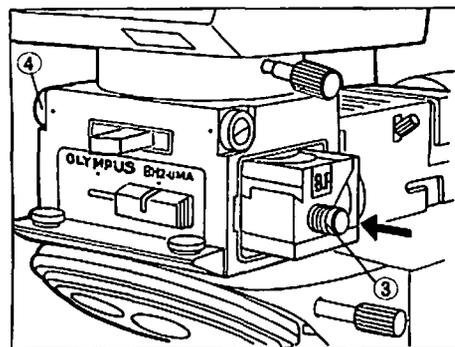


Fig. 22

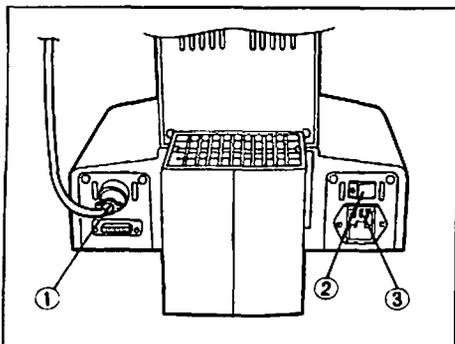


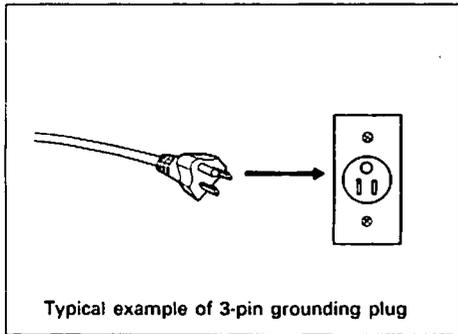
Fig. 23

12 Mounting the Half-mirror units (Figs. 20, 21, 22)

1. Remove the right and left half-mirror unit compartment cover plates ① (Fig. 19) from the universal vertical illuminator by grasping them with your fingertips.
 - ★ Half-mirror unit compartment cover plates are attached with a magnet. Set them aside carefully.
2. Remove the auxiliary mounting knob ② provided with the universal illuminator shown in Fig. 21 and attach it to the brightfield half-mirror unit (BH2-UBF). Looking at Fig. 22, hold the auxiliary knob ③ and carefully insert the brightfield half-mirror unit into the half-mirror unit compartment until a click is heard.
 - ★ A click will operate as soon as the half mirror unit is fully inserted and its side panel is flush with the body of the vertical illuminator.
 - ★ Half-mirror units can be inserted from either the right or left side of the universal vertical illuminator.
 - ★ For brightfield/darkfield and universal versions, mount the darkfield half-mirror unit (BH2-UDF) following procedure 2.
3. Remove the auxiliary mounting knob from the half-mirror unit and reattach to the universal vertical illuminator.
4. Reattach the half-mirror unit compartment cover plates.
5. Set the half-mirror unit indicator dial ④, located opposite the mounted half-mirror unit, to the "B.F." or "D.F." position.
 - ★ When the brightfield half-mirror unit is mounted on the right-hand side of the illuminator, set the left-hand side half-mirror unit indicator dial to the "B.F." position.

13 Connecting the Vertical Illuminator Bulb socket Cord (Fig. 23)

- Insert the connecting cord plug ① of the vertical illuminator socket and cord assembly into the receptacle at the rear of the microscope base.
- ★ When connecting, align the connector pin of the connecting cord with the groove on the microscope base.



Typical example of 3-pin grounding plug

Fig. 24

14 Connecting the Power Cord (Fig. 24)

Connect the primary cord with a 3-pin plug (it will fit into a ground type power outlet, and no need to connect it to any other grounding device) to a receptacle (wall mains outlet). (Fig. 24)

- ★ If a 2-pin grounding plug is used, ground the microscope to a properly grounded device (except a gas pipe). If necessary, use an extension cord.
- ★ This microscope incorporates a noise filter in the electric circuit built-in the microscope base, bleeding a very low voltage current in order to reduce effect of any external noises. Therefore, if the conductive part of the stand is touched without grounding, an electric shock may sometimes be felt depending upon the humidity conditions of the hands and foot wears.

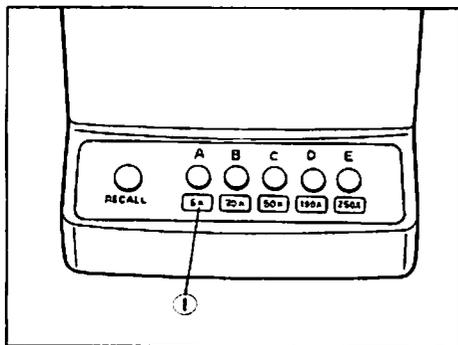


Fig. 25

15 Objective Magnification Button Setting (Fig. 25)

1. Turn ON the power switch.
2. If the LED light of an objective magnification button is blinking, rotate the revolving nosepiece manually until it clicks.
3. If the lit LED of the objective magnification button and the engaged objective match, the setting is complete.
4. If not, depress the lit button for 2 seconds. The lit button will change from "A" through to "E". Release the button when it matches the engaged objective.
5. Attach the labels showing the magnification powers of the mounted objectives to the convex sections ① below the respective objective magnification buttons.

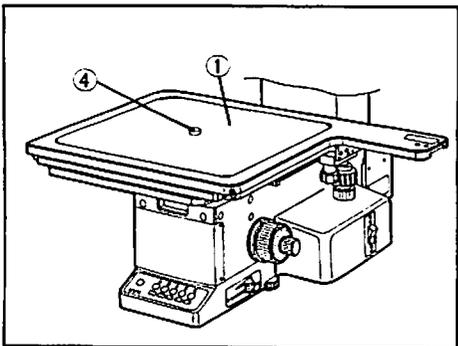


Fig. 26

16 Mounting the Holders

- ★ Lower the stage as much as possible to prevent it from hitting the objective.

Mounting the Wafer Holder Plate (Figs. 25, 26)

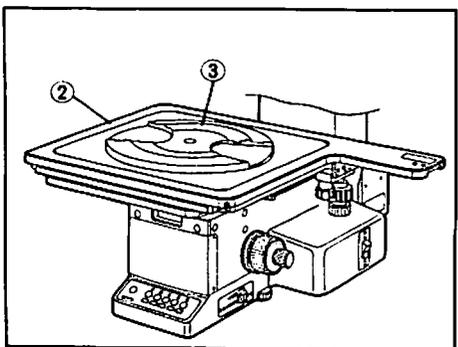


Fig. 27

1. Insert the edge of the wafer holder plate ① into the stage.
2. Pressing from the top, make sure that the wafer holder plate is firmly in position.
3. Tighten the holder clamping screw ② on the left-hand side of the stage with the 1.5 mm Allen® wrench.
4. Move the stage towards the right as far as it will go.
5. Mount the wafer holder ring ③ onto the mounting pin ④ of the wafer holder plate.

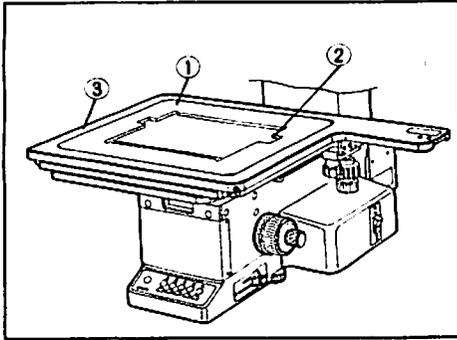


Fig. 28

Mounting the Mask Holder (for BH3-MJLT)

(Fig. 28)

1. Gently place the mask holder ① on the stage and check that it is firmly in position.
2. Tighten the holder clamping screw ③ at the left-hand side of the stage with the 1.5 mm Allen® wrench.

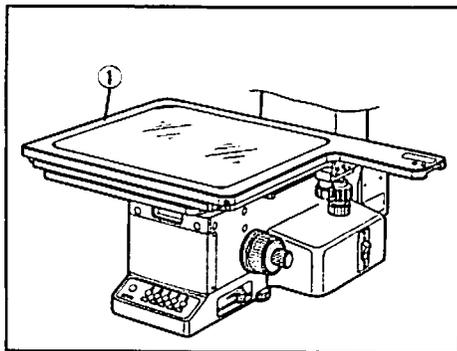


Fig. 29

Mounting Other Holder Plates

(Fig. 29)

Insert the holder into the stage and tighten the holder clamping screw ① at the left-hand side of the stage with the 1.5 mm Allen® wrench.

★ Do not tighten the screw with excessive force when mounting the stage plate glass so as not to break the glass.

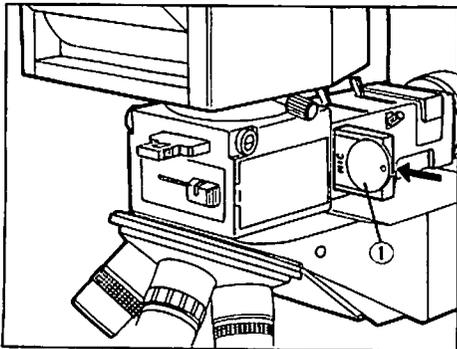


Fig. 30

17 Mounting the Universal Polarizer Slider

For Reflected Light DIC Observation

(Fig. 30)

With the inscription "NIC" facing the operator, insert the universal polarizer slider ① into the polarizer insertion slot of the vertical illuminator.

★ Engage the polarizer slider into the light path. (First click)

For Simple Polarizing Observation

With the inscription "PO" facing the operator, insert the universal polarizer slider into the polarizer insertion slot of the vertical illuminator.

★ Since the polarizer slider has two click stops, push it all the way into the light path. (Second click)

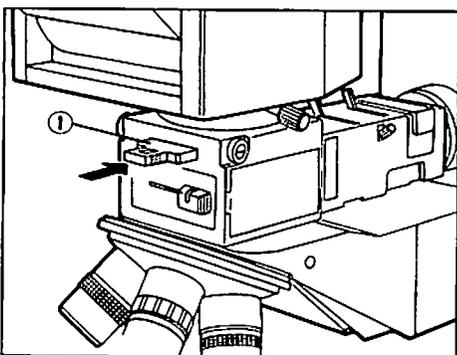


Fig. 31

18 Mounting the Universal Analyzer Slider

(Fig. 31)

1. Remove the dust slider from the vertical illuminator.
2. With the inscription facing up, push the universal analyzer slider ① into the insertion slot until it stops. The analyzer slider can be engaged or disengaged by pushing or pulling until a click is heard.

★ To prevent dust from entering the vertical illuminator, be sure to insert the dust slider when the universal analyzer slider is not in use.

★ When performing transmitted light simple polarized light observation, use the analyzer slider with 360° rotatable analyzer (BH3-UAN360).

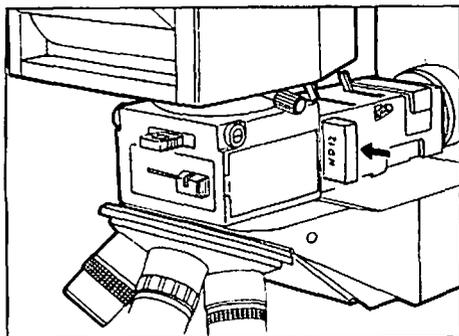


Fig. 32

19 Mounting the Universal Tint Plate Slider or ND Filter Slider (Fig. 32)

Insert the universal tint plate slider (or the ND filter slider) into the ND filter/tint plate insertion slot on the vertical illuminator. (See the ARROW.)

- ★ Engage the empty aperture of the tint plate slider into the light path.
- ★ with the inscription facing the operator, insert the ND filter slider so that the ND filter is engaged into the light path.

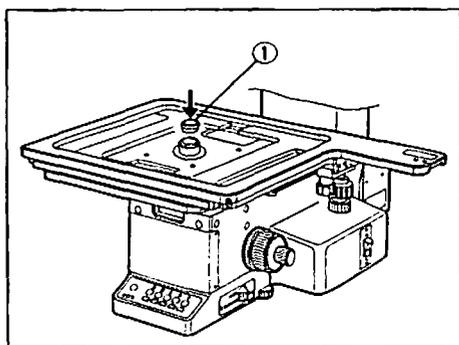


Fig. 33

20 Mounting the Polarizer for Transmitted Light Illumination (Fig. 33)

The polarizer for transmitted light illumination should be mounted only when performing a transmitted light simple polarized light observation. Mount the polarizer ① onto the condenser mounting port by aligning the positioning dots.

- ★ Use the 360° rotatable analyzer (BH3-UAN360).

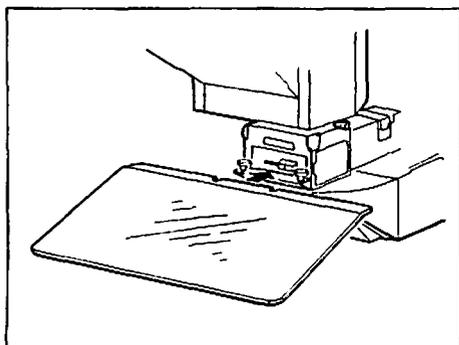


Fig. 34

21 Mounting the Breath Shield (Fig. 34)

1. Loosen the two clamping screws on the top surface of the breath shield mounting bracket (Fig. 34) and insert the breath shield underneath the screws. Tighten the screws securely.

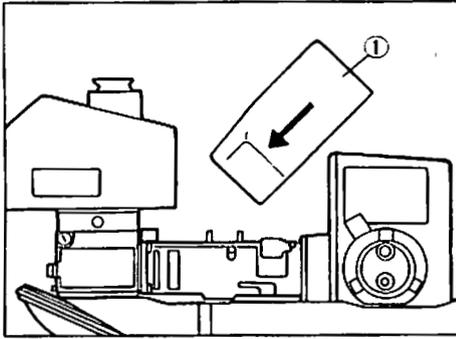


Fig. 35

22 Mounting the Roof Cover

(Fig. 35)

After adjusting the aperture iris diaphragm and field iris diaphragm according to image requirements and inserting the necessary filter, place the UMA roof cover ① on the arm.

★ Depending on the observation tube in use, the cover may be difficult to mount. If that is the case, mount it in a titled fashion in the direction of the ARROW.

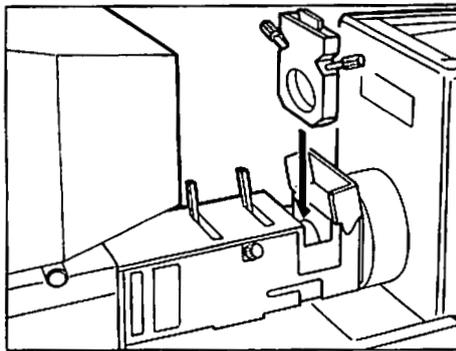


Fig. 36

23 Mounting the Pinhole Unit

(Fig. 36)

★ The pinhole unit is used with 100X objectives such as LW-DMPL100XPC.

With the inscription facing the operator, insert the pinhole unit into the filter insertion slot of the universal vertical illuminator.

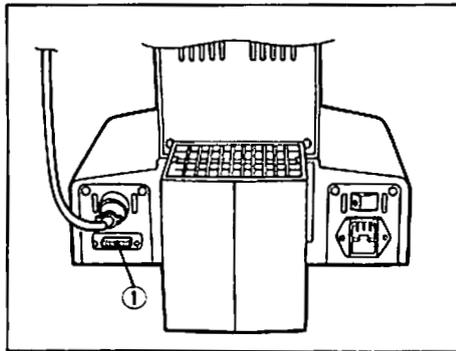


Fig. 37

24 Mounting the Nosepiece Remote Control Box

(Fig. 37)

Plug the nosepiece remote control box cable into the multi-pin socket ① on the rear left-hand side of the microscope base.

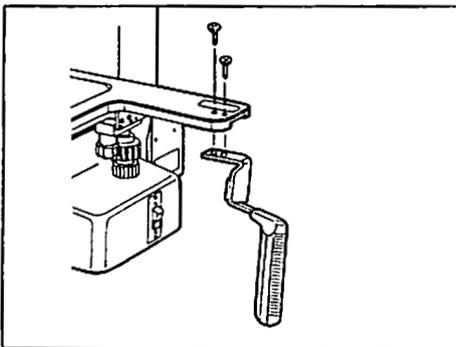


Fig. 38

25 Mounting the Stage Grip

(Fig. 38)

Mount the stage grip below the projection at the rear of the stage and tighten the two screws with the 2.5 mm Allen® wrench provided.

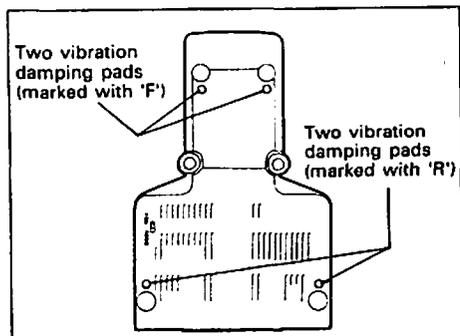


Fig. 39

26 Mounting the Vibration Damping Pads (Fig. 39)

- ★ Do not use the vibration damping pads for 6" stage (BH3-SIC6).
- ★ Vibration damping pads are used to prevent external vibrations from being transmitted to the microscope stand. Use as necessary. Place the vibration damping pads at the bottom of the microscope base after placing the microscope stand on the table as shown in the drawing.

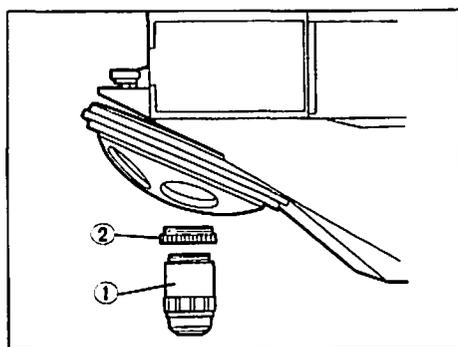


Fig. 40

27 Mounting the Objective Adapter (Figs. 40, 41)

1. When mounting a brightfield objective to the motorized revolving nosepiece (BH3-5NRE-M), first mount the objective adapter (NRE-MAD) in the threaded hole of the revolving nosepiece, and insert the bright-field objective into the adapter. (Fig. 40)
2. If one or more Nomarski prism attachments ③ are mounted on the motorized revolving nosepiece (BH3-ENRE-M) and you want to obtain the same focal distance when the objective adapter is in use, first mount the objective adapter (NRE-MSP2) ④ and then mount the brightfield objective. (Fig. 41)
3. If the brightfield/darkfield objective is to be used under the same conditions, first mount the objective adapter (NRE-NESP2) ⑤ and then mount the brightfield/darkfield objective. (Fig. 41)

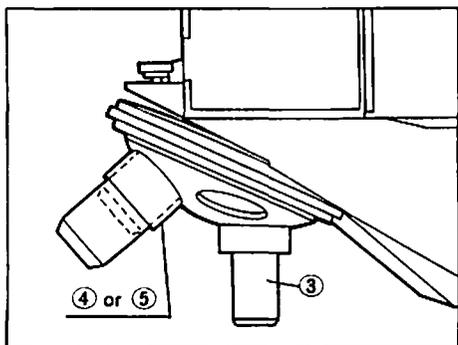


Fig. 41

28 Replacement of the Focus Unit and the Arm

Since the focus unit and arm of your microscope are replaced only by the manufacturer, contact your nearest Olympus office (see back page).

4 OPERATION

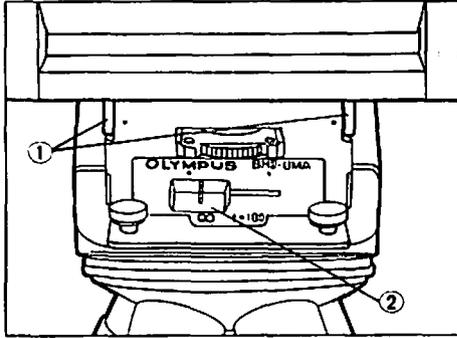


Fig. 42

1 Selecting the Vertical Illuminator Mode (Fig. 42)

In accordance with the half-mirror unit indicator dial ①, slide the half-mirror unit selector knob ② to the desired position.

★ Slide the half-mirror unit selector knob until it stops.

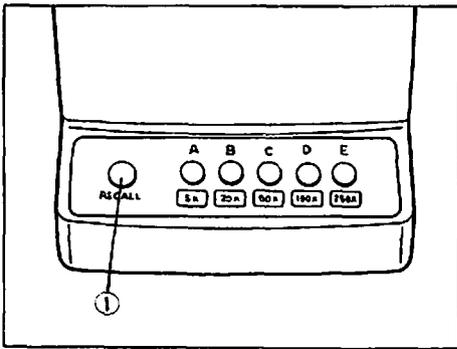


Fig. 43

2 Changing the Objective (Fig. 43)

1. Confirm that any one of the objective magnification buttons is lit.
 - ★ If any button is blinking, the corresponding objective is not engaged. Press a button other than the blinking button.
 - ★ Do not rotate the revolving nosepiece manually, as memory setting may change or a malfunction may result.
2. Press the button for the objective of choice to engage.

Alternative Objectives

Two objectives can be interchanged alternately.

1. Select the first objective and press the corresponding objective magnification button.
2. Pressing the second objective's button completes the setting.
3. By pressing the recall button ①, only the two objectives can be alternated.

Emergency Termination of Nosepiece Revolution

If an objective magnification button is pressed by mistake, immediately press the recall button. The revolving nosepiece will immediately return to the original position.

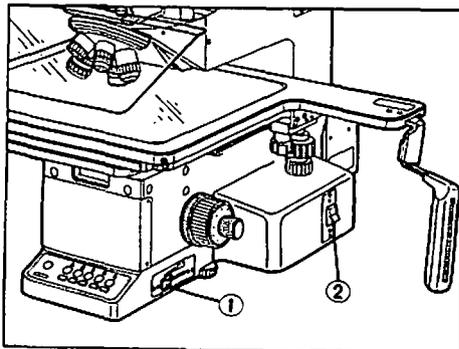


Fig. 44

3 Light Intensity Adjustment (Figs. 44, 45)

1. Turn the voltage adjustment knob ① on the right-hand side of the microscope base towards the front ("low voltage" position) and turn on the power switch ② on the rear panel. (Fig. 45)
2. To increase the light intensity, slide the voltage adjustment knob backward ("high voltage" position).
 - ★ To adjust the light intensity without affecting the color temperature during photomicrography, etc., use an ND filter provided.For further details, refer to paragraph 4 17, "Filter Insertion".

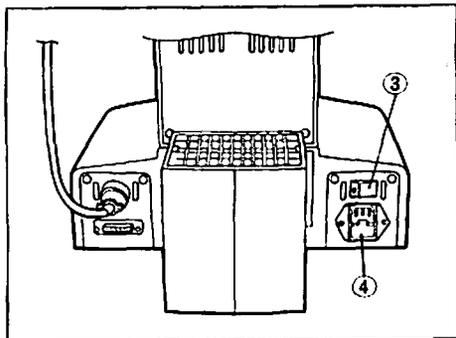


Fig. 45

Switching from Vertical Illuminator to Transmitted Light Illuminator (Figs. 44, 45)

Press the illuminator selector switch ② (Fig. 44) to switch between the vertical illuminator and the transmitted light illuminator.

EPI: Reflected light

DIA: Transmitted light

★ When switching between the vertical and transmitted light illuminators during observation, adjust the transmitted light intensity with an ND filter and frosted filter without touching the voltage adjustment knob, in order to obtain equal brightness in reflected light and transmitted light.

★ To use on the vertical illuminator and the transmitted light illuminator simultaneously, a separate power supply unit (TH-3) for the vertical illuminator is needed.

Fuse Replacement

1. Turn off the power switch and unplug the power cord from the AC outlet.
2. Insert a Phillips screwdriver into the fuse holder ④ at the rear of the microscope base, turn counterclockwise and remove the fuse holder.
3. Remove the fuse from the fuse holder and replace with a new fuse.

Applicable fuse:

100V: 4A
200V: 3.15A

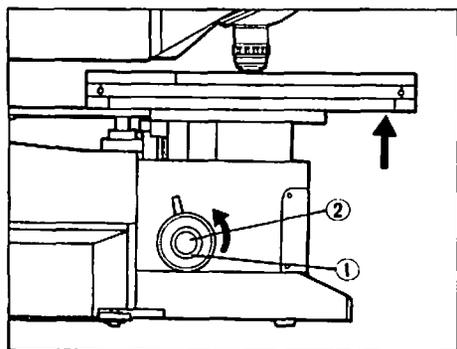


Fig. 46

4 Focusing (Fig. 46)

The specimen can be brought into focus by raising and lowering the stage using the coarse focus adjustment knobs ① and fine focus adjustment knobs ②. When the fine and coarse focus adjustment knobs are turned in the direction of the ARROW, the stage will rise (the objective and specimen approach each other).

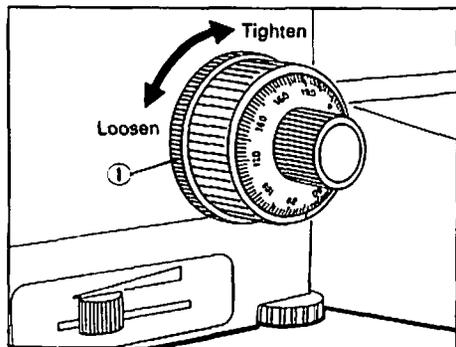


Fig. 47

5 Setting Tension of Coarse Focus Adjustment Knobs (Fig. 47)

The rotational tension of the coarse focus adjustment knobs is adjustable by rotating the outer tension adjustment ring ①. Rotating the ring clockwise increases the tension, while turning it counterclockwise decreases the tension.

★ If loosened excessively, the stage may drop or defocus even after the specimen is brought into focus with the fine focus adjustment knob. If that is the case, increase the tension by rotating the tension adjustment ring clockwise.

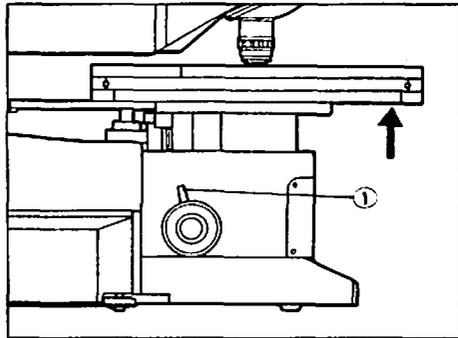


Fig. 48

6 Use of Coarse Focus Stopper

(Fig. 48)

The coarse focus stopper is provided to prevent the objective from hitting the specimen and to speed focusing. Locking the coarse focus stopper lever ① by turning it in the direction of the ARROW will define the coarse focus adjustment knob's upper limit.

- ★ The fine focus adjustment knob's movement is not affected.
- ★ Even when replacing the specimen by lowering the stage once, the specimen can be brought into an approximate focus by raising the stage up to the upper limit specified by the coarse focus stopper. Then, by making fine focus adjustment with the fine focus adjustment knob, the specimen can quickly be brought into focus.

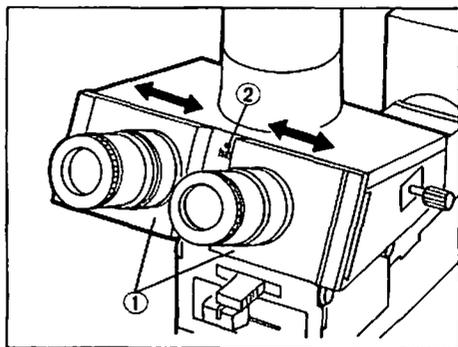


Fig. 49

7 Interpupillary Distance Adjustment

(Fig. 49)

1. Press the objective magnification button to engage the 10X objective.
2. Looking through the eyepieces with both eyes, adjust the interpupillary distance by sliding the knurled dovetail slides ① of the right and left eyepiece sleeves until perfect binocular vision is obtained.
 - ★ The knurled dovetail slides are provided with an interpupillary distance scale ②. Once you know your interpupillary distance, you may wish to use the scale for rapid adjustment of your I.P.D.

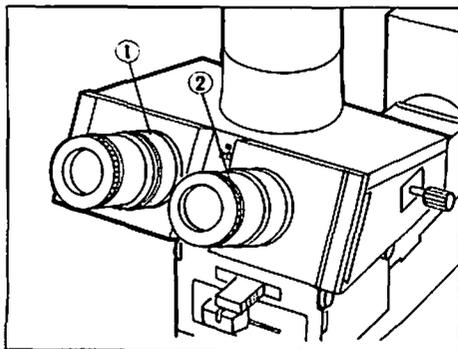


Fig. 50

8 Diopter Adjustment

(Fig. 50)

1. Looking through the right eyepiece with the right eye, bring the specimen into focus using the coarse and fine focus adjustment knobs.
2. Looking through the left eyepiece with the left eye, rotate the dipter adjustment ring ① to bring the specimen into focus.

When a Field-of-view Eyepiece ([35]WHK10X) is used with the Trinocular Tube (BH2-TR30/BH2-TTR) (Figs. 50, 51)

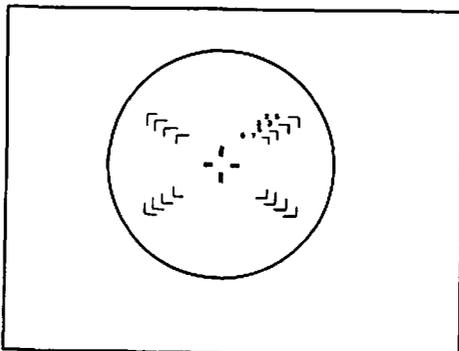


Fig. 51

1. Looking through the field-of-view eyepiece with the right eye, rotate the knurled collar ② on the eyepiece (Fig. 50) until the double reticle lines (Fig. 51) can be sharply distinguished as two separate lines. Then bring the specimen into focus using the coarse and fine focus adjustment knobs.
2. Looking through the left eyepiece with the left eye, rotate the dipter adjustment ring ① (Fig. 50) to bring the specimen into focus.

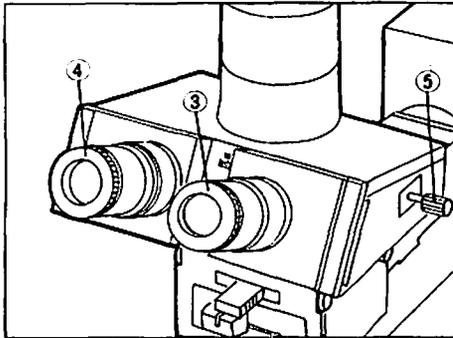


Fig. 52

**When Using the Superwide Field Trinocular Tube (BH2-SWTR)
(Fig. 52)**

1. Looking through the right field-of-view eyepiece with the right eye, rotate the knurled collar ③ on the eyepiece until the double reticle lines (Fig. 51) can be sharply distinguished as two separate lines.
2. Adjust the coarse and fine focus adjustment knobs so that both the reticle lines and the specimen are sharply in focus.
3. Looking through the left eyepiece, rotate the knurled collar ④ on the eyepiece to bring the specimen into focus.

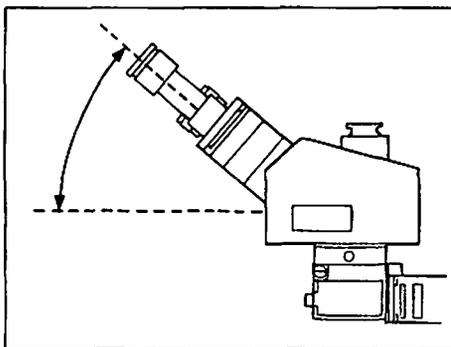


Fig. 53

**9 Tilting the Observation Tube (for BH2-TTR/TBI only)
(Fig. 53)**

The observation tube can be tilted to an angle for viewing in the most comfortable position. Grasp the observation tube and raise or lower it to the desired position.

Light path selector knob	IN	Halfway	OUT
Indication	V (white)	C · V (green)	C (red)
Light path	100% to binocular tube	20% to binocular tube 80% to photo tube	100% to photo tube
Application	General observation Observation of dark specimens	Observation of too-bright specimens Photomicrography with focusing through binocular tube	Photomicrography of dark specimens

Table 1

**10 Selecting the Light Path (for Trinocular Tube)
(Fig. 52, Table 1)**

BH2-TR/BH2-SWTR

Slide the light path selector knob ⑤ on the right-hand side of the trinocular tube to the desired position (Table 1) until a click is heard.

BH2-TTR

There are two positions to choose from:

- Pushed in: For observation only (100% to binocular)
- Pulled out: 20% to binocular tube, 80% to photo tube

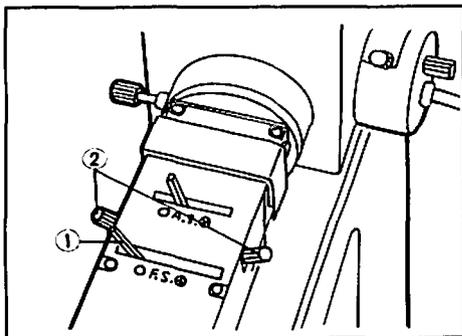


Fig. 54

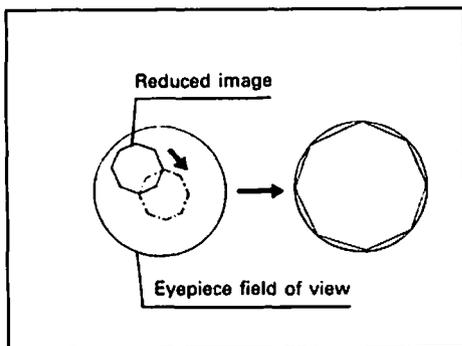


Fig. 55

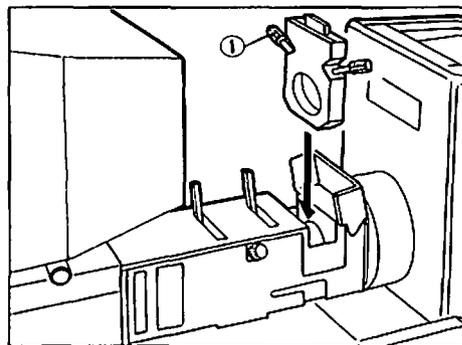


Fig. 56

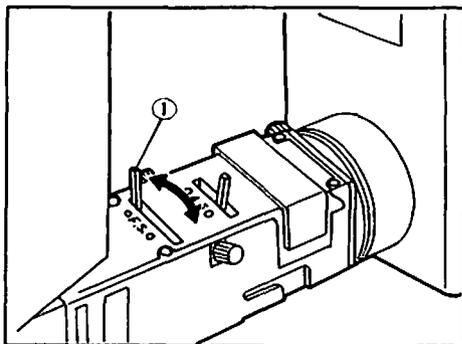


Fig. 57

11 Field Iris Diaphragm Centration for Vertical Illuminator (Figs. 54, 55)

1. Press the objective magnification button to engage the 10X objective, place the specimen on the stage, and bring it into focus.
2. Turn the field iris diaphragm lever ① of the vertical illuminator clockwise to stopdown the field iris diaphragm to a minimum.
3. Rotate the right and left field diaphragm centering knobs ② of the vertical illuminator counterclockwise to bring the reduced diaphragm image into the center of the field of view.
4. Rotate the field iris diaphragm lever counterclockwise in order to widen the opening of the field iris diaphragm until the polygonal image of the diaphragm is barely touching the rim of the circle indicating the field of view. If the image is off center, repeat the field iris diaphragm centering operation.
5. Continue widening the opening of the diaphragm until the reduced image circumscribes the field of view.

12 Aperture Iris Diaphragm Centration for Vertical Illuminator

Since it is pre-aligned, aperture iris diaphragm centering adjustment is unnecessary.

13 Pinhole Centration for the Pinhole Unit (Fig. 56)

1. Engage the 100X or higher power objective.
2. Remove one of the eyepieces from the eyepiece sleeve and look at the objective pupil through the eyepiece sleeve.
3. Turn the centering screws ① of the pinhole unit to bring the pinhole to the center of the objective pupil.

14 Field Iris Diaphragm Adjustment (Fig. 57)

This step adjusts the beam of light on the specimen to achieve the optimum image contrast.

Reflected Light Brightfield Observation (Fig. 58)

Depending on the objective in use, turn the field iris diaphragm lever ① of the universal vertical illuminator clockwise to reduce the diaphragm opening until the reduced image circumscribes the field of view and shuts out unnecessary light. (This setting varies with the objective power in use.)

Reflected Light Darkfield Observation

When performing the darkfield observation, open the field iris diaphragm fully by turning the field iris diaphragm lever of the universal vertical illuminator counterclockwise.

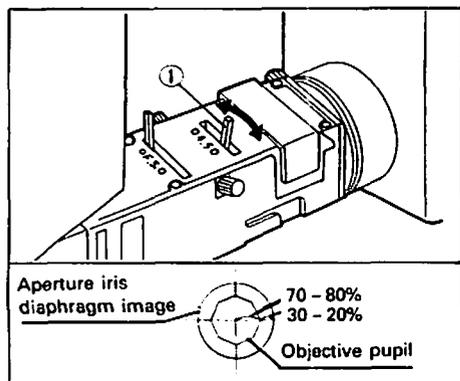


Fig. 58

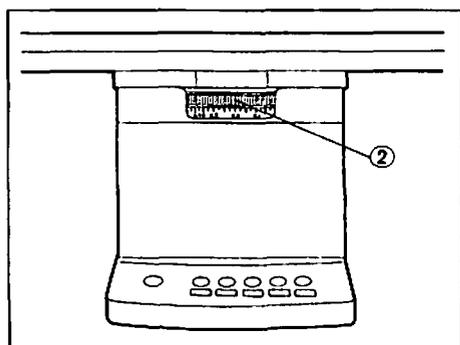


Fig. 59

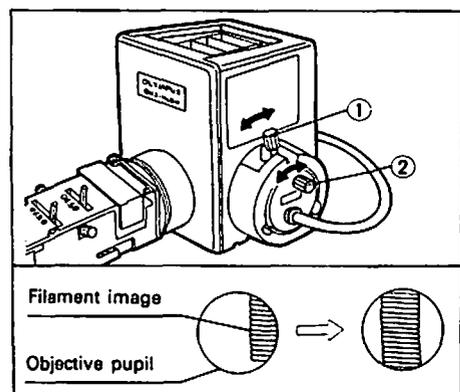


Fig. 60

15 Aperture Iris Diaphragm Adjustment

This step adjusts the numerical aperture of the vertical illuminator which influences the resolution, contrast, and focal depth of the observed image.

★ When observing under reflected light, a glare can occur due to an effect of the condenser for transmitted light depending upon the specimen to be observed. Be sure to reduce the opening of the diaphragm to its minimum by turning the aperture iris diaphragm adjustment ring fully clockwise.

Reflected Light Brightfield Observation

(Fig. 58)

Remove one of the eyepieces from the eyepiece sleeve and turn the aperture iris diaphragm lever ① on the vertical illuminator to adjust the diaphragm opening, while looking in the empty eyepiece sleeve. Turning the aperture iris diaphragm lever clockwise reduces the opening of the diaphragm.

★ Generally, reducing the diaphragm opening to 70 - 80% of the objective N.A. will provide an image of favorable quality.

Reflected Light Darkfield Observation

In case of reflected light darkfield observation, open the aperture iris diaphragm fully by turning the aperture iris diaphragm lever counterclockwise.

★ Depending upon the specimen to be observed, slightly reduce the diaphragm opening to obtain an excellent darkfield image with minimal glare. Unlike in brightfield observation, the objective exit pupil is not visible even after the eyepiece is removed. Adjust the diaphragm while observing the image until an optimum image with minimal glare is obtained.

Transmitted Light Brightfield Observation

(Fig. 59)

Turn the aperture iris diaphragm adjustment ring ② of the condenser to adjust the opening of the diaphragm. Rotating the aperture iris diaphragm adjustment ring clockwise reduces the size of the opening.

16 Centering the Halogen Bulb (50W/100W) for Vertical Illuminator

(Fig. 60)

Disengage the analyzer slider, polarizer slider and filters from the light path.

- Slide the half-mirror selector knob to bring the brightfield half-mirror unit into the light path.
- Press the objective magnification button to engage the 10X objective.
- Place a highly reflective specimen such as a mirror on the stage, and bring it into rough focus.
- Remove the right or left eyepiece, and adjust the bulb centering knob ① and socket clamping knob ② so that the filament image visible through the observation tube is located in the center of the objective pupil.
 - Right/left: Turn the bulb centering knob ①.
 - Up/down: Loosen the socket clamping knob ② and rotate in the direction of the ARROW. After adjusting, tighten the knob.
- Engage the universal analyzer slider, polarizer slider, and filters.

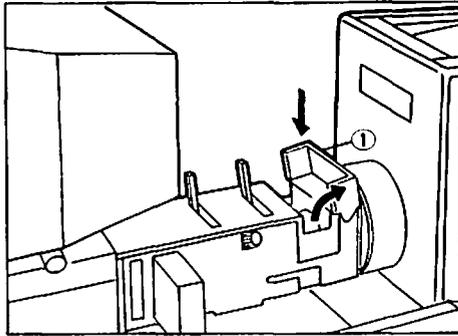


Fig. 61

17 Filter Insertion**Reflected Light Observation**

(Fig. 61)

Generally, to change the color temperature of halogen light to daylight, open the filter cover ① of the universal vertical illuminator and insert the 20LBD3-W filter according to the purpose of observation.

20LBD3-W filter: Changes the color temperature of the illumination to daylight.

20IF550-W filter: Adds contrast to the observed image.

20ND6-W filter: Attenuates the light intensity.
(light transmission: 6%)

20ND25-W filter: Attenuates the light intensity.
(light transmission: 25%)

★ If the filter is difficult to insert or remove, spread the sides of the filter cover ① and remove.

★ When the filter is not in use, replace the filter cover to prevent dust from entering.

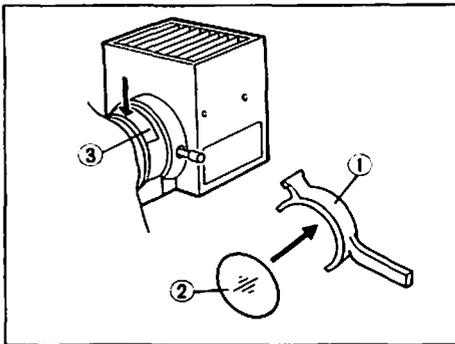


Fig. 62

Transmitted Light Observation

(Fig. 62)

Mount the filter ② in the filter holder ① provided with the lamp housing for the transmitted light illuminator and then insert the filter holder in the filter insertion slot ③. Choose the filter according to the purpose of observation.

45LBD3 filter: Changes the color temperature of the illumination to daylight.

45IF550 filter: Adds contrast to the observed image.

45ND6 filter: Attenuates the light intensity.
(light transmission: 6%)

45ND25 filter: Attenuates the light intensity.
(light transmission: 25%)

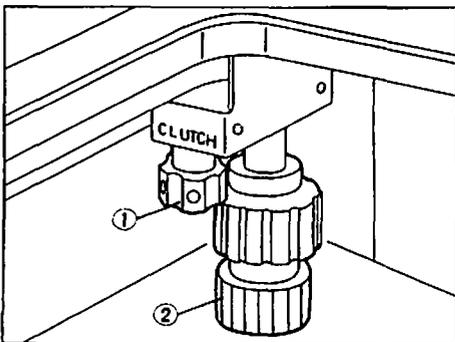


Fig. 63

18 Stage Travel

(Fig. 63)

1. Turn the clutch knob ① on the bottom right of the stage to the "A" position. (Fig. 64)

2. The stage can be moved vertically (Y-axis direction) by rotating the upper section of the stage control knob ②, and horizontally (X-axis direction) by rotating the lower section of the knob.

★ Clutch knob should be set so that the mark faces the operator.

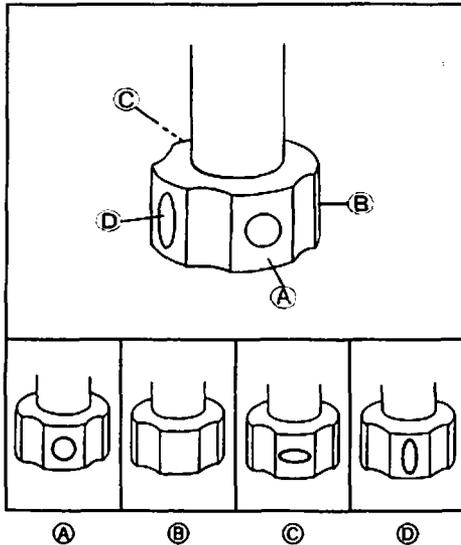


Fig. 64

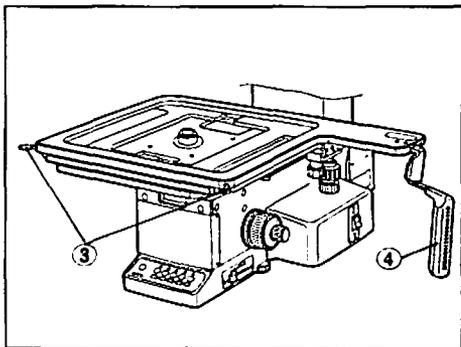


Fig. 65

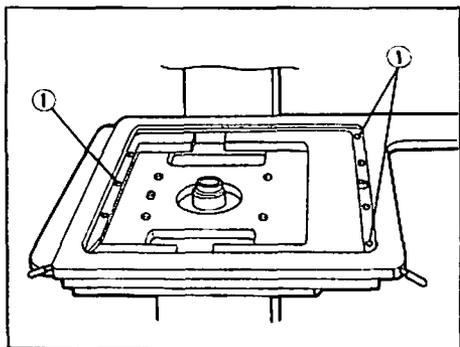


Fig. 66

Use of Stage Clutch

(Figs. 64, 65)

Clutch knob (A)

When the clutch knob is set to "A", the clutch is engaged for both the X and Y axes, and fine travel of stage can be conducted by following the previous procedure.

★ If the clutch is engaged, turn the stage control knob slowly since abrupt movement may cause the stage to slip.

Clutch knob (B)

When the clutch knob is set to "B", the clutch is disengaged for both the X and Y axes, and stage travel is not possible with the stage control knob. (The stage will not move when the stage control knob is turned.)

Since the stage travels lightly and smoothly, it can be moved over a large distance by hand. It is convenient to grip the travel pins ③ at the front of the stage or the optional stage grip ④ when moving the stage.

Clutch knob (C)

When the clutch knob is set to "C", the clutch is engaged for the X-axis and disengaged for the Y-axis. This enables X-axis travel only with the stage control knob. Since there is no X-axis travel, the specimen needing repeated patterns can be observed conveniently by fixing the X-axis and moving along the Y-axis.

Clutch knob (D)

When the clutch knob is set to "D", the clutch is engaged for the Y-axis and disengaged for the X-axis. This allows stage travel reversed to the "C" setting of the clutch knob.

★ Never move the stage manually with the clutch engaged, as this may wear out or damage the stage.

Tilt Adjustment of Holders and Plates

(Fig. 66)

When placing a holder (BH3-WHPR86, etc.) or plate (BH3-SPG8, etc.) on the stage, parallel adjustments of the stage and the top surfaces of the holder or plate are not necessary since the assembly has been preset. However, to make fine adjustments, apply a drop of alcohol to the screws ①, unlock the screws and adjust them vertically using a slotted screwdriver from the underside of the stage.

★ The stage can support up to 2 kgf (4.4 lb) including holders.

5 OBSERVATION

The BH3-MJLT/MJLA allows a quick change between the brightfield/darkfield, Nomarski differential interference contrast, simple polarizing, and fluorescence observation.

★ For reflected light fluorescence observation, refer to the instruction manual for the reflected light fluorescence attachment (BH2-URFL).

5-1 Reflected Light Brightfield/Darkfield Observation

Preparation for Observation

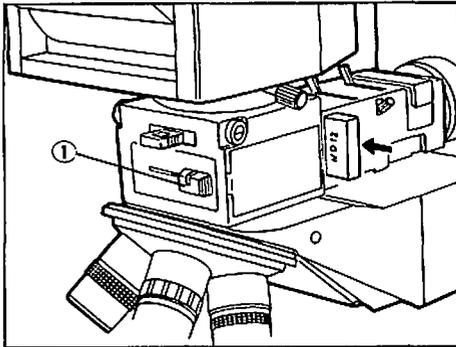


Fig. 67

1 Half-mirror Unit Setting (Fig. 67)

Confirm that the brightfield half-mirror unit and darkfield half-mirror unit are inserted into the half-mirror unit compartment and slide the half-mirror unit selector knob ① to engage the desired half-mirror unit into the light path.

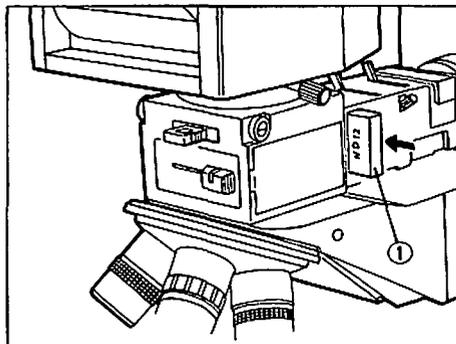


Fig. 68

2 Selecting the ND Filter Slider (Fig. 68)

Engage the ND filter ① of the ND filter slider into the light path. This minimizes changes in light intensity (glare) when changing the observation method from darkfield to brightfield.

If light intensity is insufficient during brightfield observation, or a reduced exposure time is required for photomicrography, engage the empty aperture of the ND filter slider.

Observation Procedures

1	Engage the desired half-mirror unit with the half-mirror unit selector knob, according to the purpose of observation.	p. 33
2	Disengage the universal analyzer slider, polarizer slider, tint plate slider and Nomarski prism attachment.	p. 34
3	Press the illuminator selector switch to "EPI" and switch ON the microscope main switch, turning ON the halogen bulb.	p. 26
4	Place the specimen to be observed on the stage.	p. 30
5	Engage the 10X objective and focus.	p. 27
6	Adjust the aperture and field iris diaphragms.	p. 27
7	Check that the bulb is centered correctly.	p. 30
8	Insert the desired filter into the universal vertical illuminator.	p. 31
9	Engage the desired objective and focus again.	p. 26
10	Adjust the light intensity with the voltage adjustment knob.	p. 25
11	Turn the aperture iris diaphragm adjustment ring fully clockwise to reduce the opening of the diaphragm.	p. 30
12	Brightfield observation	Adjust the field and aperture iris diaphragms. pp. 29, 30
	Darkfield observation	Open the field and aperture iris diaphragm. pp. 29, 30

5-2 Reflected Light Nomarski Differential Interference Contrast Observation

Preparation for Observation

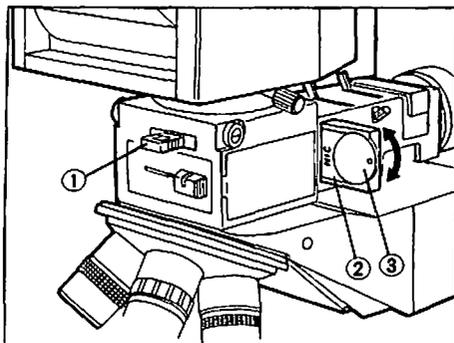


Fig. 69

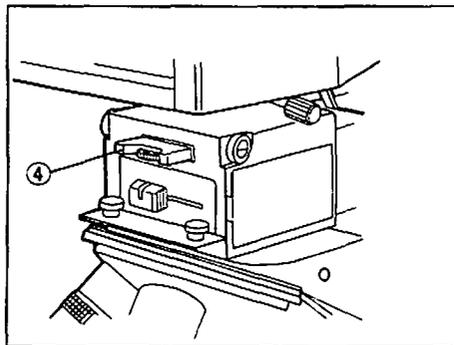


Fig. 70

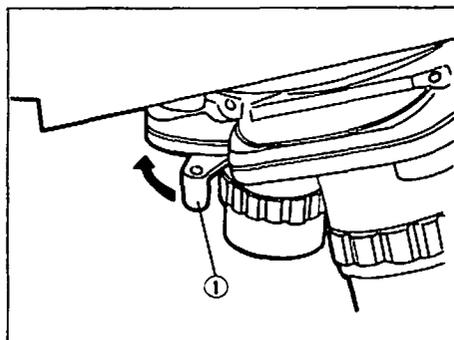


Fig. 71

Interference color	Observation features
Black	Darkfield-like observation
Gray	The highest gray sensitivity observation
Magenta	Even minute optical differences (refraction, thickness, height, etc.) can be observed as a color change.

Table 2

1 Half-mirror Unit Setting

Slide the half-mirror unit selector knob to the "B.F." position to engage the brightfield half-mirror unit into the light path.

2 Checking the Analyzer and Polarizer (Figs. 69, 70)

Confirm that the universal analyzer slider ① and polarizer slider ② are correctly pushed all the way into the universal vertical illuminator.

- ★ Make sure that the "NIC" inscription of the universal polarizer is facing the operator.
- ★ When using the BH3-UAN360 analyzer, position the polarizer with its "NIC" inscription facing the operator and turn the analyzer rotation dial ④ so that the dot is also facing the operator.

3 Engaging the Nomarski Prism Attachment (Fig. 71)

Move the prism control lever ① of the Nomarski prism attachment to the "IN" position to bring the prism into the light path.

4 Setting the Interference Color (Fig. 69, Table 2)

Turn the polarizer rotation dial ③ of the universal polarizer slider until the desired background color is obtained for maximum contrast of the specimen under observation.

- ★ To obtain a magenta background, put the universal tint plate slider into the ND filter/tint plate insertion slot and push it all the way into light path.
- ★ The interference color can be changed continuously from black to blue (0 - 700 nm)

5 Brightfield/Darkfield Observation

1. Move the prism control knob to the "OUT" position to disengage the prism from the light path.
2. Disengage the universal analyzer slider, polarizer slider and tint plate slider.

Observation Procedures

- | | | |
|----|--|------------|
| 1 | Confirm that the half-mirror unit selector knob is at the "B.F." position. | p. 34 |
| 2 | Engage the universal analyzer slider, polarizer slider, and Nomarski prism attachment. | p. 34 |
| 3 | Press the illuminator selector switch to "EPI", and switch ON the microscope main switch, turning ON the halogen bulb. | p. 26 |
| 4 | Place the specimen to be observed on the stage. | p. 30 |
| 5 | Engage the 10X objective and focus. | p. 27 |
| 6 | Perform diopter and interpupillary distance adjustments. | p. 27 |
| 7 | Check that the bulb is centered correctly. | p. 30 |
| 8 | Insert the desired filter into the universal vertical illuminator. | p. 31 |
| 9 | Engage the desired objective and focus again. | p. 26 |
| 10 | Adjust the light intensity with the voltage adjustment knob. | p. 25 |
| 11 | Adjust the aperture and field iris diaphragms. | pp. 29, 30 |
| 12 | Adjust interference color and contrast by turning the polarizer rotation dial and inserting or removing the tint plate slider. | p. 34 |

5-3 Reflected Light Simple Observation in Polarized Light

Preparation for Observation

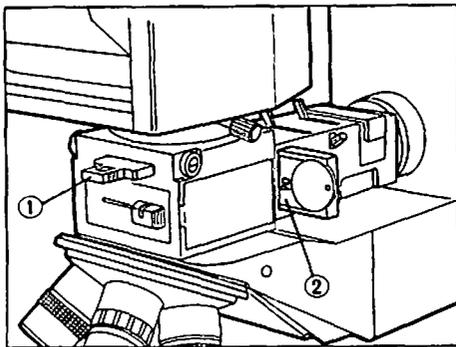


Fig. 72

1 Half-mirror Unit Setting

Slide the half-mirror unit selector knob to the "B.F." position to engage the brightfield half-mirror unit into the light path.

2 Checking the Analyzer and Polarizer (Fig. 72)

Confirm that the universal analyzer slider ① and polarizer slider ② are correctly pushed all the way into the universal vertical illuminator.

- ★ Make sure that the "PO" inscription of the universal polarizer is facing the operator.
- ★ When the BH3-UAN360 analyzer is in use, position the polarizer slider so that its "PO" inscription is facing the operator and turn the analyzer rotation dial so that the dot is also facing the operator (see Fig. 70 on page 34).

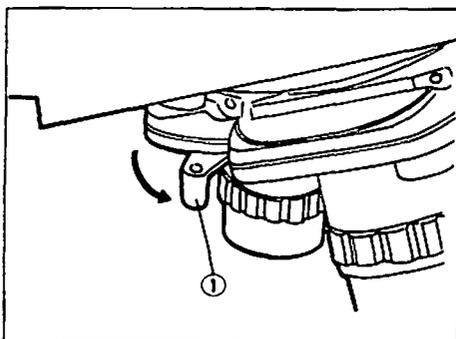


Fig. 73

3 Engaging and Disengaging the Nomarski Prism Attachment (Fig. 73)

When the Nomarski prism attachment is mounted, swing the prism control lever ① of the Nomarski prism attachment to the "OUT" position to disengage the prism from the light path.

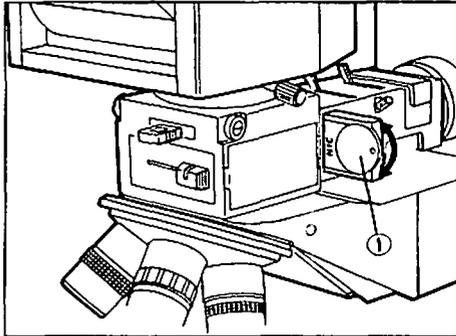


Fig. 74

4 Setting the Crossed Filter Position (Fig. 74)

Turn the polarizer rotation dial ① of the universal polarizer slider so that the dot faces to the side in order to obtain a crossed filter position.

Observation Procedures

1	Confirm that the half-mirror unit selector knob is at the "B.F." position.	p. 34
2	Engage the universal analyzer slider, polarizer slider, and Nomarski prism attachment.	p. 34
3	Disengage the Nomarski prism attachment.	p. 34
4	Press the illuminator selector switch to "EPI", and switch ON the microscope main switch, turning ON the halogen bulb.	p. 26
5	Place the specimen to be observed on the stage.	p. 30
6	Engage the 10X objective and focus.	p. 27
7	Perform diopter and interpupillary distance adjustments.	p. 27
8	Check that the bulb is centered correctly.	p. 30
9	Insert the desired filter into the universal illuminator.	p. 31
10	Turn the polarizer rotation dial until a crossed filter position is obtained.	p. 36
11	Engage the desired objective and focus.	p. 26
12	Adjust the light intensity with the voltage adjustment knob.	p. 25
13	Adjust the aperture and field iris diaphragms.	pp. 29, 30

5-4 Transmitted Light Observation

Preparation for Observation

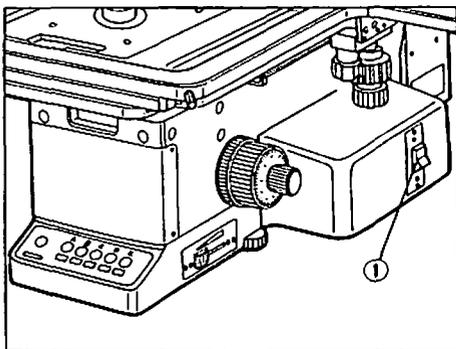


Fig. 75

1 Selecting the Illumination Method (Fig. 75)

Select transmitted light by pressing the illuminator selector switch ① to the "DIA" position.

2 Half-mirror Unit Setting

If a half-mirror unit is mounted, slide the half-mirror unit selector knob to the "B.F." position to engage the brightfield half-mirror unit into the light path.

★ If no half-mirror unit is mounted, observation is possible without moving the half-mirror unit selector knob.

Observation Procedures

- | | | |
|----|--|-------|
| 1 | Slide the brightfield half-mirror unit into the light path (or confirm that no half-mirror unit is inserted into the half-mirror unit compartment) | p. 34 |
| 2 | Press the illuminator selector switch to "DIA", and switch ON the microscope main switch, turning ON the transmitted light halogen bulb. | p. 26 |
| 3 | Disengage the universal analyzer slider and Nomarski prism attachment. | p. 34 |
| 4 | Place the specimen to be observed on the stage. | p. 33 |
| 5 | Engage the 10X objective and focus. | p. 27 |
| 6 | Perform diopter and interpupillary distance adjustments. | p. 27 |
| 7 | Insert the desired filter into the filter insertion slot on the transmitted light lamp housing. | p. 31 |
| 8 | Engage the desired objective and focus again. | p. 26 |
| 9 | Adjust the light intensity with the voltage adjustment knob. | p. 25 |
| 10 | Adjust the aperture iris diaphragm. | p. 30 |

5-5 Transmitted Light Simple Observation in Polarized Light

Preparation for Observation

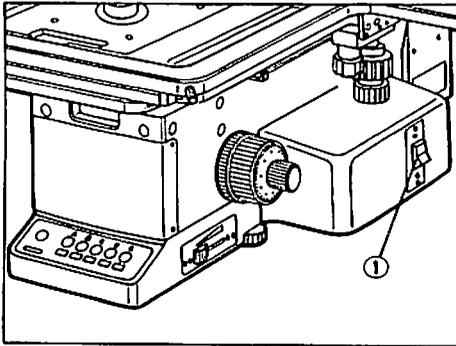


Fig. 76

1 Selecting the Illumination Method (Fig. 76)

Select transmitted light by pressing the illuminator selector switch ① to the "DIA" position.

2 Half-mirror Unit Setting

If the brightfield half-mirror unit is mounted, slide the half-mirror unit selector knob to the "B.F." position to engage the brightfield half-mirror unit into the light path.

★ If no half-mirror unit is mounted, observation is possible without moving the half-mirror unit selector knob.

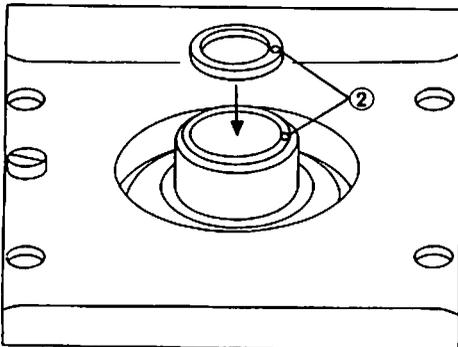


Fig. 77

3 Checking the Analyzer and Polarizer (Fig. 77)

★ Use the BH3-UAN360 analyzer and the BH3-POL polarizer.

1. Insert the polarizer into the condenser frame so that their positioning dots ② are aligned with each other.
2. Turn the analyzer rotation dial until a crossed filter position is obtained with the dot facing the operator (see Fig. 70 on page 34).

Observation Procedures

- | | | |
|----|---|-------|
| 1 | Slide the brightfield half-mirror unit into the light path (or confirm that no half-mirror unit is mounted in the half-mirror unit compartment) | p. 34 |
| 2 | Press the illuminator selector switch to "DIA", and switch On the microscope main switch, turning ON the transmitted light halogen bulb. | p. 26 |
| 3 | Engage the universal analyzer (BH3-UAN360) and the polarizer for transmitted light. | p. 34 |
| 4 | Disengage the Nomarski prism attachment. | p. 35 |
| 5 | Turn the analyzer rotation dial until a crossed filter position is attained. | p. 36 |
| 6 | Place the specimen to be observed on the stage. | p. 30 |
| 7 | Engage the 10X objective and focus. | p. 27 |
| 8 | Perform diopter and interpupillary distance adjustment. | p. 27 |
| 9 | Insert the desired filter into the filter insertion slot on the transmitted light lamp housing. | p. 31 |
| 10 | Engage the desired objective and focus again. | p. 26 |
| 11 | Adjust the light intensity with the voltage adjustment knob. | p. 25 |
| 12 | Adjust the aperture iris diaphragm. | p. 30 |

6 PHOTOMICROGRAPHY

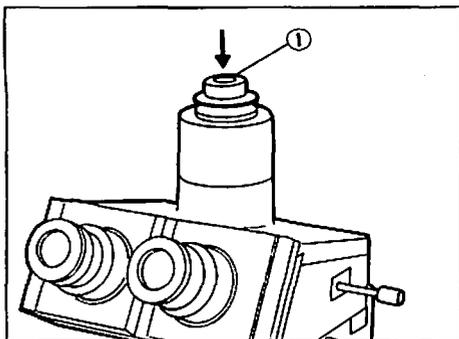


Fig. 78

With respect to handling photographic equipment, also refer to the instruction manual for the camera in use.

1 Inserting the Photo Eyepiece (Fig. 78)

Use NFK photo eyepieces specially designed for photomicrography. Insert the photo eyepiece ① into the photo tube of the trinocular observation tube.

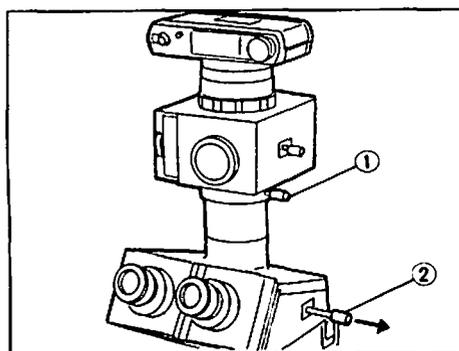


Fig. 79

2 Mounting the Photomicrographic Equipment (Fig. 79)

Place the photomicrographic equipment on the photo tube of the trinocular tube. Align the dots on the trinocular tube and the photomicrographic equipment and clamp the photomicrographic equipment with the clamping screw ①.

Light path selector knob	Pulled out halfway	Pulled out fully
Indication	C · V (green)	C (red)
Light path	20% into binocular tube 80% into photo tube	100% into photo tube
Application	Photography (focusing through the binocular tube)	Photography of dark specimens

Table 3

3 Light Path Selection

With the BH2-TR30 Trinocular Tube or BH2-SWTR30 Superwide Field Trinocular Tube (Fig. 79, Table 3)

Pull out the light path selector knob ② on the right-hand side of the trinocular tube to the "C.V." or "C" position.

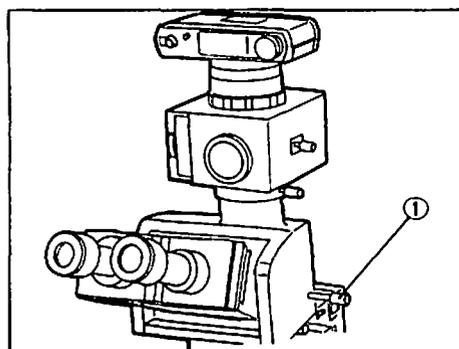


Fig. 80

With the BH2-TTR Tilting Trinocular Tube (Fig. 80)

Pull out the light path selector knob ① on the right-hand side of the tilting trinocular tube to the "C" position in order to direct light to the photo tube. 20% light is directed to the binocular tube and 80% to the photo tube.

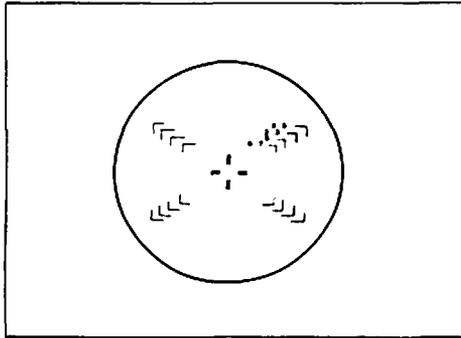


Fig. 81

4 Focusing (Fig. 81)

Use the binocular tube of the trinocular tube for focusing on the film plane.
 ★ If the viewer of the photomicrographic equipment is not to be used, remove the viewer and attach the dust cap.

1. Confirm that the field-of-view eyepiece is inserted into the right eyepiece sleeve.

2. Each field-of-view eyepiece has a focusing front lens and a reticle with four frames, with each frame indicating the area covered by the specific photo eyepiece:

The image in the focusing front lens and the image on the film plane are in focus at the same time.

★ Several types of field-of-view eyepieces are available according to the camera back in use. **[35]** WHK10X (or **[35]** SWHK10X) are standard field-of-view eyepieces.

Field-of-view eyepiece	[35] WHK10X	[P] WHK10X	[4.5] WHK10X
	[35] SWHK10X	[P] SWHK10X	[4.5] SWHK10X
Camera in use	35 mm camera back	Sheet film or 3-1/4" x 4-1/4" Polaroid® back	Intermediate adapter for 4" x 5" film

7 OPTICAL DATA

Objective	Type	MSPlan					MDPlan	NeoDPlan
		Magnification	5X	10X	20X	50X	100X	150X
Eyepiece	N.A.	0.13	0.30	0.46	0.80	0.95	0.95	0.90
	W.D. (mm)	21.10	9.00	3.00	0.47	0.30	0.27	0.27
	Focal length (mm)	35.9	18.0	9.0	3.6	1.8	1.2	1.2
	Resolving power (μ)	2.58	1.12	0.73	0.42	0.35	0.35	0.37
WHK10X (Field number 20)	Total magnification	50X	100X	200X	500X	1000X	1500X	1500X
	Focal depth (μ)	70.1	14.7	5.1	1.3	0.67	0.55	0.60
	Field of view (mm)	1	2	1	0.4	0.2	0.13	0.13

Objective	Type	NeoSPlan/NeoSPlanNIC				
		Magnification	5X	10X	20X	50X
Eyepiece	N.A.	0.13/0.13	0.30/0.25	0.46/0.40	0.80/0.70	0.90/0.90
	W.D. (mm)	10.00	4.00	3.00	0.50	0.30
	Focal length (mm)	35.9	18.0	9.0	3.6	1.8
	Resolving power (μ)	2.58/2.58	1.12/1.34	0.73/0.84	0.42/0.48	0.37/0.37
WHK10X (Field number 20)	Total magnification	50X	100X	200X	500X	1000X
	Focal depth (μ)	70.1	14.7	5.1	1.3	0.73
	Field of view (mm)	4	2	1	0.4	0.2

Objective	Type	ULWDMSPan/ULWDMNeoSPlan				LWDMSPanApo	
		Magnification	20X	50X	80X	100X	50X
Eyepiece	N.A.	0.4	0.55	0.75	0.80	0.95	0.90
	W.D. (mm)	11.00	8.00	4.10	3.20	0.24	0.80
	Focal length (mm)	9.0	3.6	2.25	1.80	3.60	0.72
	Resolving power (μ)	0.84	0.61	0.45	0.42	0.35	0.37
WHK10X (Field number 20)	Total magnification	200X	500X	800X	1000X	500X	2500X
	Focal depth (μ)	6.09	2.18	1.07	0.87	1.04	0.50
	Field of view (mm)	1	0.4	0.25	0.2	0.4	0.08

Objective	Type	LWDMNeoSPlanApo	LWDMSP20X-LCD	LWDMSP50X-LCD	LWDMSP100X-LCD
		Magnification	250X	20X	50X
Eyepiece	N.A.	0.90	0.40	0.60	0.80
	W.D. (mm)	0.80	7.87	3.02	1.04
	Focal length (mm)	0.72	9.0	3.60	1.80
	Resolving power (μ)	0.37	0.84	0.56	0.42
WHK10X (Field number 20)	Total magnification	2500X	200X	500X	1000X
	Focal depth (μ)	0.50	6.09	1.93	0.87
	Field of view (mm)	0.08	1	0.4	0.2

Note: All the objectives are dry type. Resolving power is calculated with the aperture iris diaphragm fully opened.

Technical terms:

W.D. (Working Distance): The distance between the specimen and the nearest point of the objective.

N.A. (Numerical Aperture): The numerical aperture represents a performance number which can 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 the N.A., the higher the resolving power.

Resolving power: The ability of an objective to register small details. The resolving power of an objective is measured by its ability to separate two points (resolution).

Focal depth: The distance between the upper and lower limits of sharpness at an image formed by an optical system. The smaller the opening of the aperture diaphragm or the objective N.A., the larger the focal depth.

Field number: This number represents the diameter in millimeters 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 millimeters.

8 TROUBLESHOOTING GUIDE

If you are unfamiliar with any aspect of this model or feel that performance is less than 100%, check the items on the following table.

Trouble	Cause	Remedy
1. Optical System		
a. The bulb is burning, but image cannot be seen or is dark.	The field iris diaphragm is not opened correctly.	Open until the diaphragm image circumscribes the field of view. (p. 29)
	The aperture iris diaphragm is stopped down with the darkfield half-mirror unit engaged (for reflected light brightfield/darkfield observation).	Open fully. (p. 30)
	The light path selector knob of the trinocular tube is between settings.	Pull it out to "C.V" or "V" position. (p. 28)
	The line voltage selector switch is set incorrectly.	Set it to match the local line voltage. (p. 20)
	The half-mirror unit is not correctly inserted into light path.	Engage the half-mirror unit properly with the half-mirror unit selector knob. (p. 25)
b. Image is partially obscured or unevenly illuminated.	The bulb is not centered correctly.	Center the bulb. (p. 30)
	The universal analyzer, polarizer or tint plate slider is not inserted far enough.	Insert the universal analyzer, polarizer and tint plate slider as far as it will go. (pp. 21, 22)
	The light path selector knob of the trinocular tube is between settings.	Pull it out to "C.V" or "V" position. (p. 28)
	The half-mirror unit is not correctly inserted into the light path.	Engage the half-mirror unit properly with the half-mirror unit selector knob. (p. 25)
c. Stains or dust can be seen in the field of view.	Dirty objectives	Clean.
	Dirty half-mirror units	
	Dirty specimen	
	Dirty condenser top lens	
	Dirty objective front lens	
	Dirty eyepieces	
	Dirty prism on the bottom of the observation tube	
	Dirty stage plate glass	
d. The image has excessive contrast.	The aperture iris diaphragm is stopped down too much.	Open the aperture iris diaphragm as required. (p. 30)
e. Resolution problems: • Image is not sharp. • Insufficient contrast • Image details lack definition	Objective is not engaged correctly.	Click the nosepiece into position. (p. 30)
	Dirty condenser and/or objective front lens	Clean.
	Designated IC (infinity corrected) objectives and eyepieces are not used.	Use designated IC objectives and eyepieces.
f. One side of the image is out of focus.	The specimen is not positioned correctly.	Reposition the specimen on the stage.
	The objective is not engaged correctly.	Click the nosepiece into position

Trouble	Cause	Remedy
Normarski Differential Interference Contrast Observation		
g. No interference color	The universal analyzer and polarizer are not correctly placed into the light path.	Place the universal analyzer and polarizer correctly. (p. 21)
	Nomarski prism control lever is in the "OUT" position.	Swing the prism control lever to the "IN" position. (p. 34)
h. Interference color is uneven or differential interference contrast is low.	The proper objectives suitable for differential interference contrast are not used.	Use the proper objectives.
2. Observation Tube		
Incomplete binocular vision	The interpupillary distance is not adjusted correctly.	Set correctly interpupillary distance. (p. 27)
	Diopter adjustment is incomplete.	Complete diopter adjustment. (p. 27)
	The right and left eyepieces are different.	Mount matching eyepieces. (p. 18)
	The operator is not familiar with the parallel optical axis.	Try to look at the entire field of view before looking at the image. It may help if you look at a distant location before looking at the image.
3. Stage		
The image goes out of focus excessively when the stage is touched.	The stage is not clamped correctly.	Clamp correctly. (p. 14)
	Stage clutch is disengaged.	Engage the clutch. (p. 32)
4. Coarse and Fine Focus Adjustment Knobs		
a. The coarse focus adjustment knob movement is stiff.	The tension adjustment ring is tightened excessively.	Loosen appropriately. (p. 26)
	The coarse focus adjustment stopper is locked at the upper limit.	Release the coarse focus stopper. (p. 27)
b. Poor focus during observation due to unexpected lowering of the stage.	The tension adjustment ring is too loose.	Tighten appropriately. (p. 26)
c. The stage cannot be raised completely with the coarse focus adjustment knob.	The coarse focus stopper is locked at the lower limit.	Release the coarse focus stopper. (p. 27)
5. Electrical System		
a. The bulb flickers.	The bulb is approaching the end of its life.	Replace the bulb. (p. 17)
	Loose electric connections.	Connect cords and plugs correctly. (pp. 19, 20)
b. Although an objective LED lights up, the bulb does not come on.	The bulb is burned out.	Replace the bulb. (p. 17)
	Loose electric connections.	Connect cords and plugs correctly.
c. Light intensity at maximum voltage adjustment range is insufficient.	The line voltage selector switch is not set to your local line voltage.	Switch to your local line voltage. (p. 13)
d. Bulb does not burn.	Fuse has blown.	Replace the fuse. (p. 26)

Voltage and Frequency	100/115V AC, 200/220/240V AC 50/60 Hz
Bulb	For reflected light: 12V, 100W halogen bulb JC12V100WHAL-L 12V, 50W halogen bulb JC12V50WHAL-L
	For transmitted light: 12V, 100W halogen bulb JC12V50WHAL-L
Fuse	4A
Power Consumption	150VA (max.)



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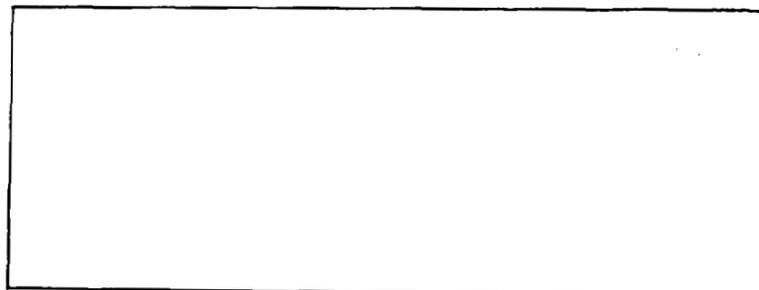
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The design of the product is under constant review and whilst every effort is made to ensure that the design is up to date, the right is reserved to change specifica-