INSTRUCTIONS

SZ4045TR
SZ6045TR
SZ1145TR

ZOOM STEREO MICROSCOPE

WARNING

This instructon manual has been prepared for use of the Zoom Stereo Microscope Model SZ4045TR/6045TR/1145TR. We recommend reading this manual carefully in order to familiarize yourself with its use so that you may obtain optimum performance from your model. As this instruction manual covers only the microscope, photo tube and video adapter, refer to each instruction manual when using the illuminator, photomicrographic equipment, etc.

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BEFORE USE

1 Operation

(1) As the microscope is a piece of precision equipment, always handle with care, avoiding abrupt movement or impact during transportation or operation of controls.

(2) Avoid exposure to direct sunlight, high temperature and humidity, dust and vibration.

(3) Avoid leaving dirt or fingerprints on the lens surfaces, as a dirty mirror or lenses may reduce image clarity.

(4) When using photomicrographic equipment or a large-size video camera, mount the microscope body at an angle of less than 3° from the perpendicular in order to assure microscope stability.

(5) Use a compact video camera, dedicated for C-mount, with a picture area of 2/3" or smaller and weighing 2.5 kg or less.

(6) Be sure to hold the camera with one hand when unloading film from a large-format camera in order to prevent it from falling over.

(7) Never turn the right and left zoom control knobs in opposite directions, as malfunction may result.

2 Care and Storage

(1) Clean all glass components by wiping gently with gauze. To remove fingerprints or oil smudges, wipe with gauze slightly moistened with a mixture of ether (70%) and alcohol (30%).

⚠ **Since solvents such as ether and alcohol are highly flammable, they must be handled carefully. Be sure to keep these chemicals away from open flames or potential sources of electrical sparks — for example, electrical equipment that is being switched on or off. Also remember to always use these chemicals only in a well-ventilated room.**

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

(3) Never attempt to disassemble the microscope as decreased performance may result.

(4) When not in use, be sure to cover the microscope with the dust cover provided, and store in an area free from moisture to prevent rust.

CONTENTS

1 STANDARD CONFIGURATIONS

Component \ Model		Quantity	SZ4045TRPT	SZ4045TRCTV	SZ6045TRPT	SZ6045TRCTV	SZ1145TRPT	SZ1145TRCTV
Zoom stereo microscope	SZ4045TR-F	1	○	○				
	SZ6045TR-F	1			○	○		
	SZ1145TR-F	1					○	○
Eyepiece	GSWH10X	2	○	○	○	○	○	○
Photo tube	SZ-PT	1	○		○		○	
Photo eyepiece	NFK3.3XLD	1	○		○		○	
C-mount video adapter	SZ-CTV	1		○		○		○
Stand	SZ-ST	1	○	○	○	○	○	○
Stage plate	SP-BW-2	1	○	○	○	○	○	○
Stage clip		2	○	○	○	○	○	○
Dust cover		1	○	○	○	○	○	○

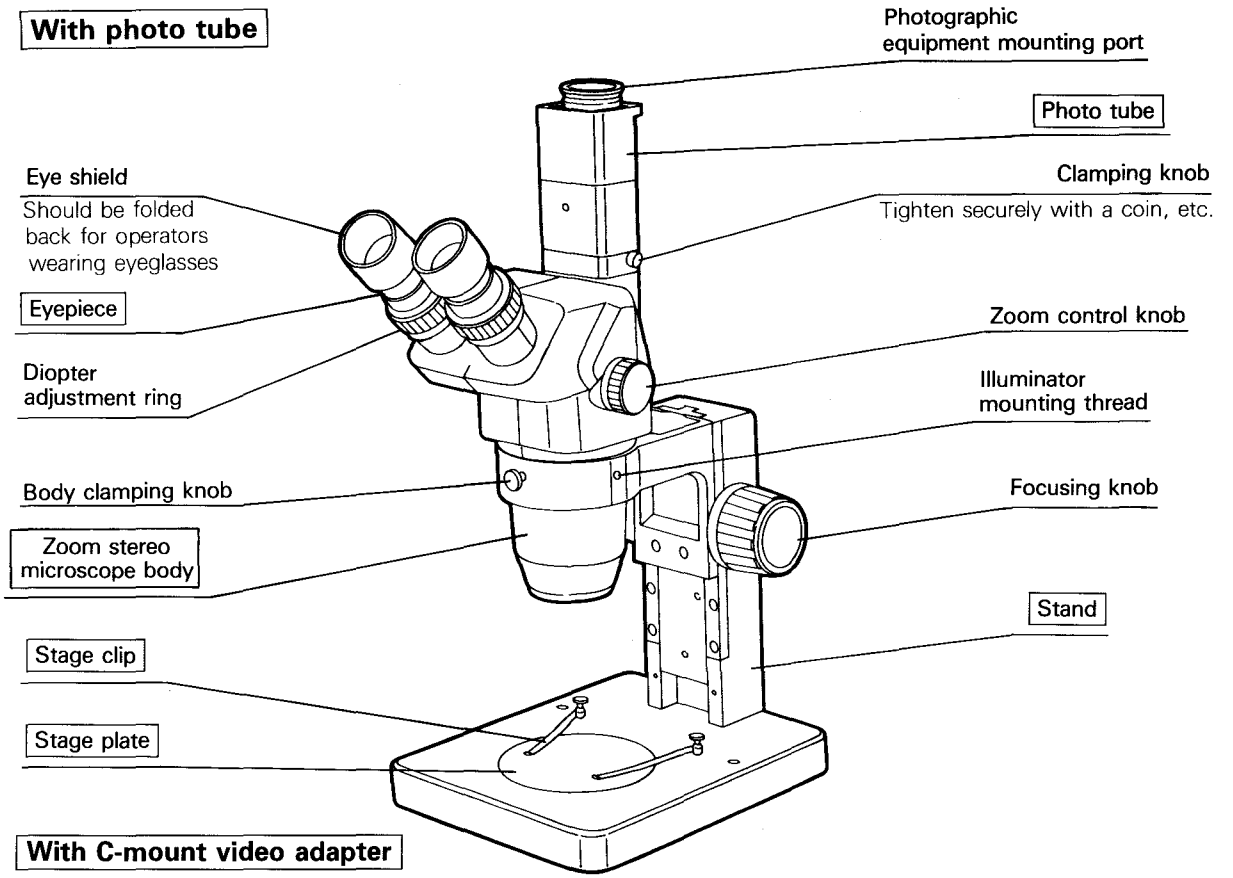
Note: ○ indicates the compatible components for each model.

2 SPECIFICATIONS

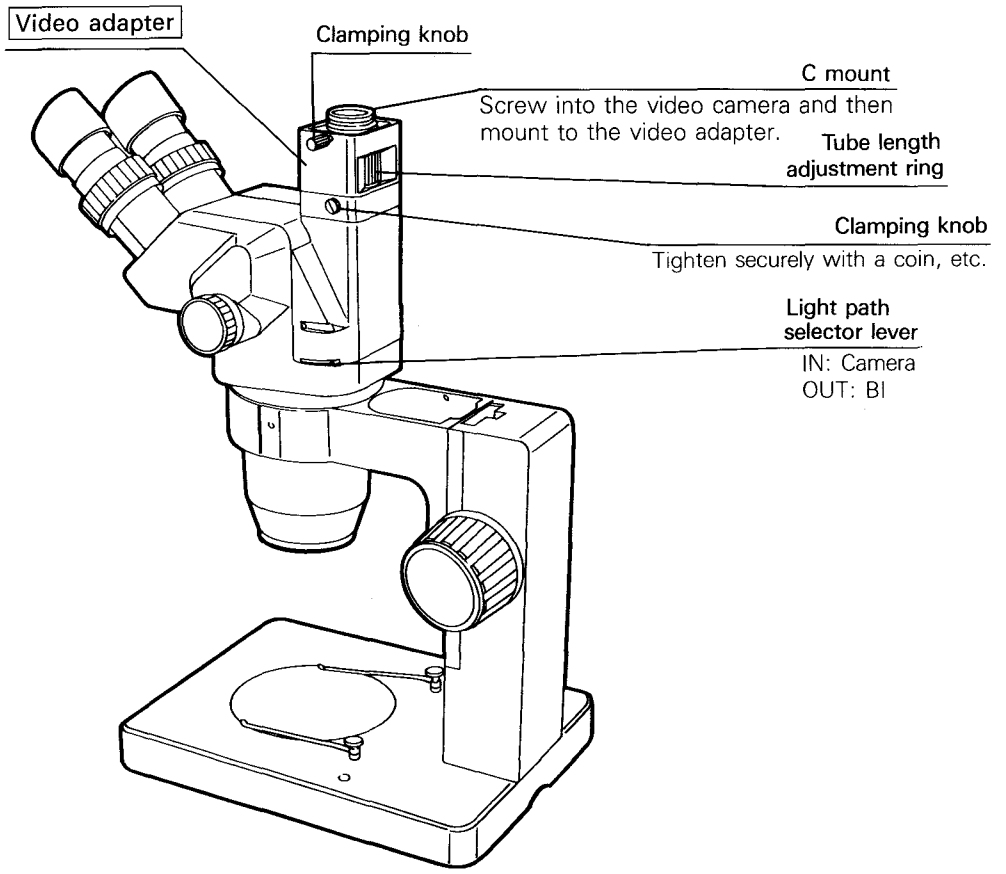
Item		Description		
Zoom stereo microscope body	Model	SZ4045TR	SZ6045TR	SZ1145TR
	Magnification	0.67X – 4X	1X – 6.3X	1.8 – 11X
	Zoom ratio	6	6.3	6.1
	Working distance (W.D.)	110 mm	100 mm	73 mm
	Zoom drive	Horizontal axial drive control knobs		
	Observation tube inclination	45°		
	Interpupillary distance adjustment	Right and left tubes interlocked Adjustment range: 50 – 76mm (with GSWH10X)		
	Diopter adjustment	Provided on one eyepiece tube only	Provided on both eyepiece tubes	
		Diopter adjustment range: ±5 m^{-1}(per metar)		
	Conversion lens mount	Screw-in (M48X0.75)		
	Photo tube/C-mount video adapter mount	Fit into mounting port with inner diameter of 38 mm With positioning pins		
	Light path selection	Controlled by lever, 100% BI or 100% CAMERA		
Eyepiece	Field number (F.N.)	22 (GSWH10X)		
	Eyepiece micrometer mount	ϕ24 mm micrometer mountable		
Stand	Microscope body mount	Fit into mounting port with inner diameter of 76 mm		
	Stage plate	ϕ100mm, frosted white on one side and black on the other side		
	Stage clip	Pressed down from above		
	Focusing	Rack-and-pinion drive on ball bearing guides, knob rotation tension adjustment, focusing range: 120 mm		
	Illuminator mount	Epi-illuminator (LSGA) and trans-illuminator base mountable		
Photo tube	Mounting to microscope body	Fit into mounting port with outer diameter of 38 mm With positioning groove		
	Photomicrographic equipment mount	Fit into mounting port with outer diameter of 38 mm 360° rotatable		
	Intermediate magnification	1X		
C-mount video adapter	Mounting to microscope body	Fit into mounting port with outer diameter of 38 mm With positioning groove		
	Video camera mount	Video camera mounting with C-mount C-mount detachable and rotatable 360°		
	Intermediate magnification	0.5X		
	Tube length adjustment	With tube length adjustment ring		

3 NOMENCLATURE

With photo tube



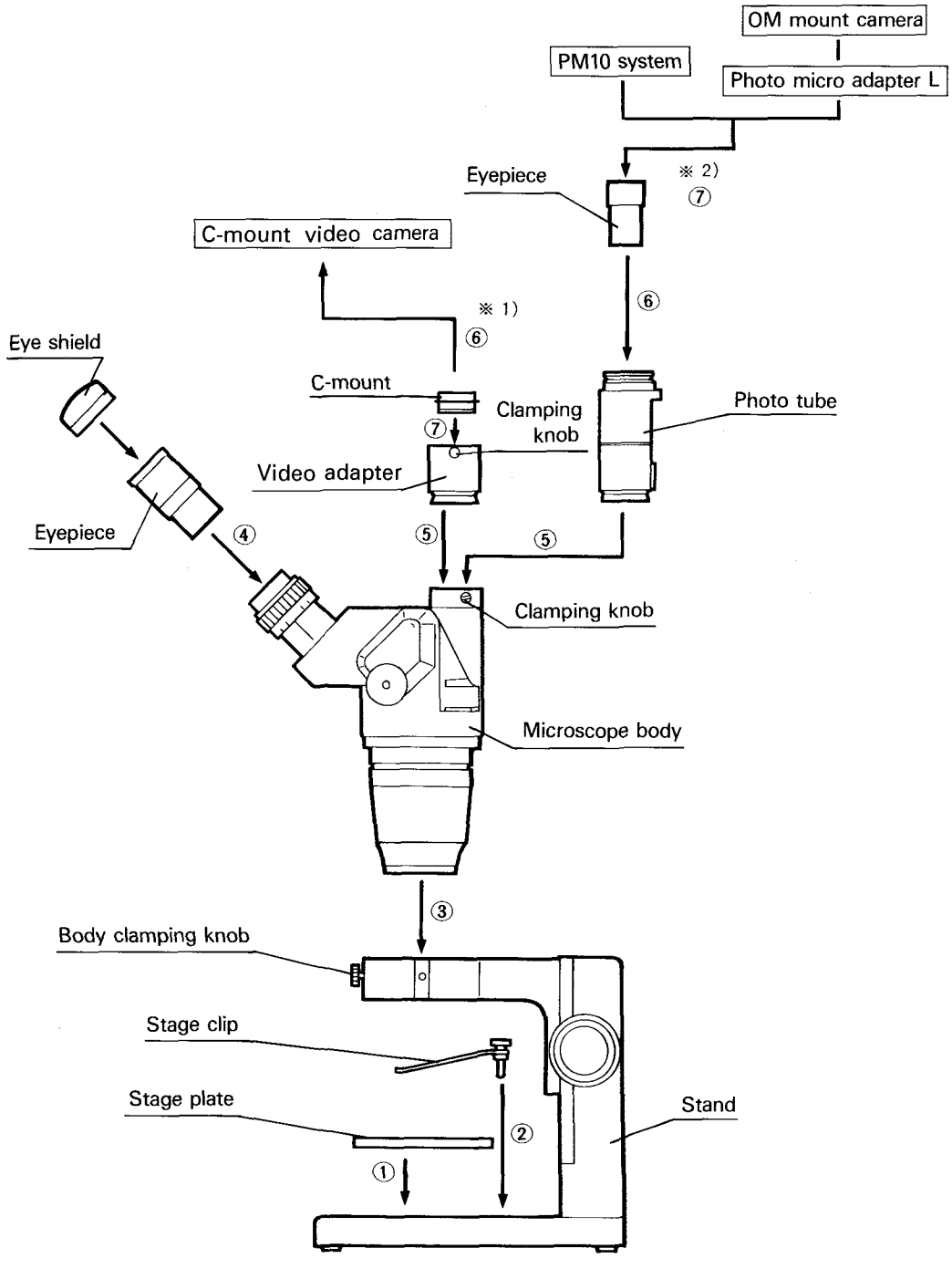
With C-mount video adapter



4 ASSEMBLY

The diagram below illustrates the assembly procedure. The numbers indicate the assembly sequence.

★ Make sure all connecting surfaces are clean before assembly and avoid scratching the glass surfaces.



*1) Mount the C-mount to the video camera and then to the video adapter.

*2) Mount photomicrographic equipment in accordance with its instruction manual.

5 OPERATION

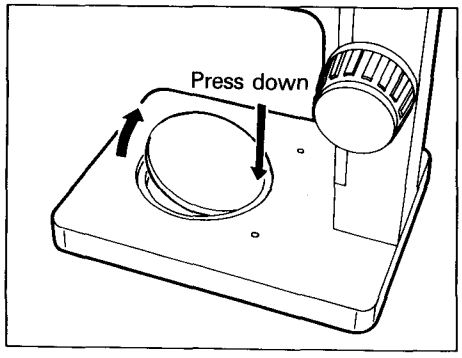


Fig. 1

1 Use of Stage Plates

(1) Usually, the stage plates are used with the frosted white side facing the objective. However, if the specimen is white or brightly colored, use the black side of the plate as the darkened background increases image contrast.

(2) To remove the stage plates, press down the supporting end of the plate with a fingertip, and the other end will flip up. (Fig. 1)

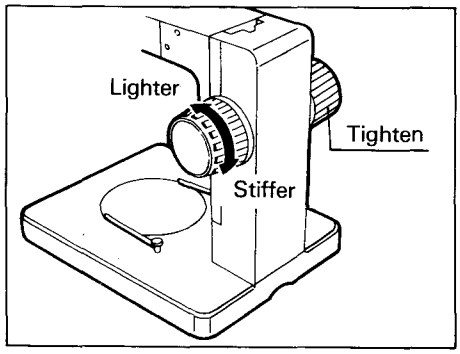


Fig. 2

2 Tension Adjustment of Focusing Knobs

(1) Turn one focusing knob with the other focusing knob tightened, by holding both knobs, in order to increase or decrease the rotation tension, depending on the turning direction. (Fig. 2)

(2) This adjustment is intended to prevent the microscope body from drifting. Set the knob tension at a level slightly stiffer than that to insure no unintentional movement and facilitate easy operation.

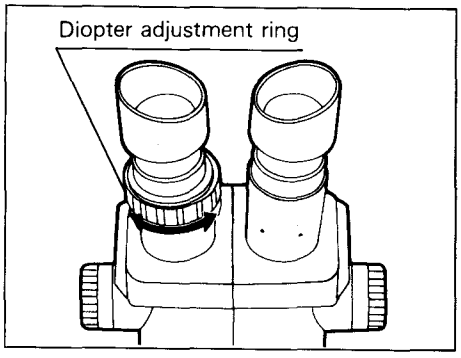


Fig. 3

3 Placement of a specimen

(1) Place the specimen in the center of the stage plate, and hold the specimen with the stage clips if necessary.

(2) Illuminate the specimen using an optional illuminator.

4 Diopter Adjustment and Focusing

For SZ4045TR

(1) Minimize the magnification power by turning the zoom control knobs.

(2) Looking through the right eyepiece, bring the specimen into focus by turning the focusing knobs.

(3) Looking through the left eyepiece, bring the specimen into focus by turning the diopter adjustment ring. (Fig. 3)

(4) Maximize the magnification power by turning the zoom control knobs, and bring the specimen into focus by turning the focusing knobs.

For SZ6045TR and SZ1145TR

(1) Maximize the magnification power by turning the zoom control knobs.

(2) Looking through the right eyepiece, bring the specimen into focus by turning the focusing knobs.

(3) Minimize the magnification power by turning the zoom control knobs. (Fig. 3)

(4) If the specimen goes out of focus, read just the focus by turning the right diopter adjustment ring only. (Fig. 4)

(5) Maximize the magnification power again by turning the zoom control knobs. If the specimen goes out of focus, repeat steps (2) through (4) above. This allows more precise diopter adjustment.

(6) Minimize the magnification power by turning the zoom control knobs and, looking through the left eyepiece, bring the specimen into focus by turning the left diopter adjustment ring only. (Fig. 4)

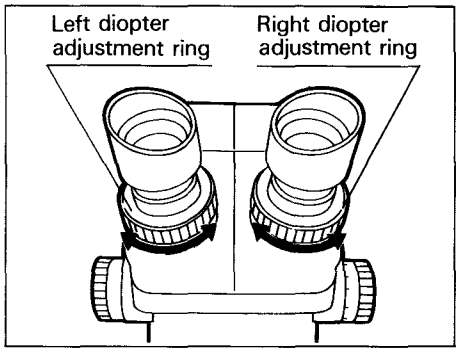


Fig. 4

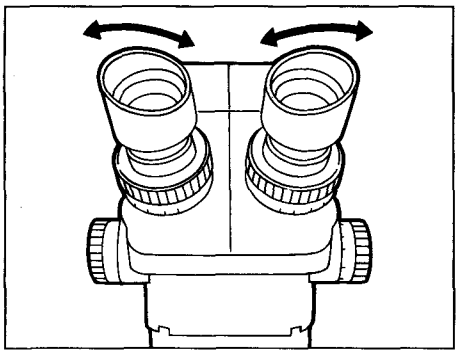


Fig. 5

5 Interpupillary Distance Adjustment

Holding the right and left eyepiece tubes, push or pull the tubes in the direction of the ARROWS until perfect binocular vision is obtained. (Fig. 5)

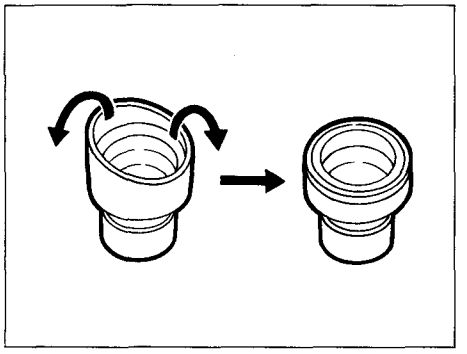


Fig. 6

6 Use of Eyepiece Shields

(1) **For those who do not wear eyeglasses**
The observer can keep his eyes closer to the eyepiece shields during hold the diopter adjustment rings so that they can not rotate, and align the direction of the eyepiece shields to the observer's face by turning the eyepieces.

(2) **For those who wear eyeglasses**
Fold back the eyepiece shields with both hands as shown in Fig. 6.

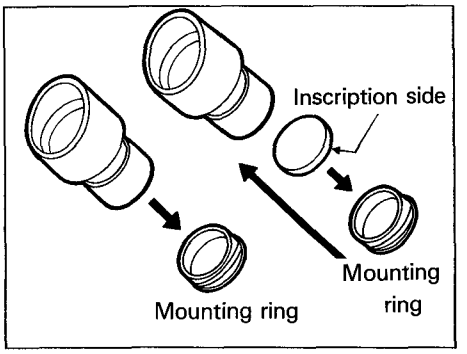


Fig. 7

7 Mounting and Removing the Optional Eyepiece Micrometer

(1) Twist and remove the mounting rings from the eyepiece. (Fig. 7)
(2) Remove dirt or dust from the eyepiece micrometer, and mount it to the mounting ring by turning the ring clockwise with the inscription side facing downward. (Fig. 7)
(3) Gently screw the mounting ring containing the eyepiece micrometer into the eyepiece and tighten securely. (Fig. 7)
(4) To remove the eyepiece micrometer, twist the mounting ring. Wrap the micrometer in clean, soft paper for storage.

★ **The ø24-mm eyepiece micrometer can also be mounted on the GSWH15X, However, since the eyepiece's field number is 16, the micrometer graduations and grids beyond 16 mm are not visible.**

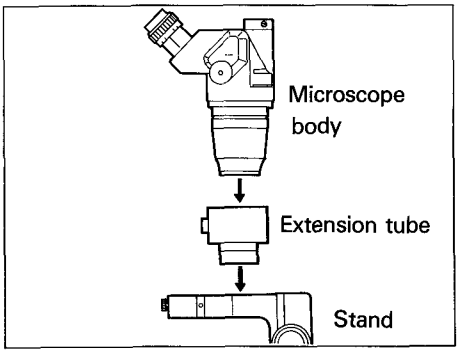


Fig. 8

8 Use of Optional Conversion Lens

(1) Screw the conversion lens into the mounting thread at the bottom of the microscope body.
(2) As the working distance of the 0.5X conversion lens (110AL0.5X and 100AL0.5X) is long, use the extension tube (VM-ET) when making observations using the stand. (Fig. 8)

★ **Please note that three types of conversion lenses are available— one for the SZ4045 one for the SZ6045TR and the other for the SZ1145TR.**
★ **73AL0.5X doesn't require extension tube.**

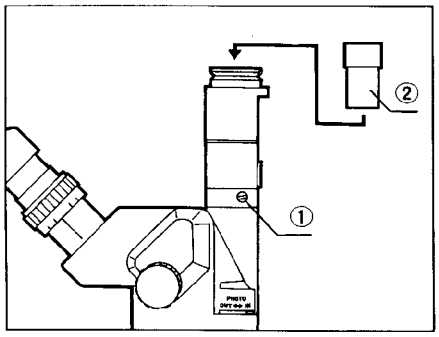


Fig. 9

9 Mounting the Photo Tube and Photo Eyepiece

(1) After loosening the body clamping knob ①, align the positioning groove of the photo tube with the positioning pin and mount the photo tube. (Fig. 9)

(2) Securely attach the photo tube by tightening the clamping knob.

★ **Be sure to tighten the clamping knob with a coin, etc.**

(3) Insert the photo eyepiece ② into the photo tube. (Fig. 9)

★ **When mounting photomicrographic equipment, refer to the instruction manual for the unit in use.**

★ **NFK2.5LD, NFK5XLD and NFK6.7XLD photo eyepiece are optionally available.**

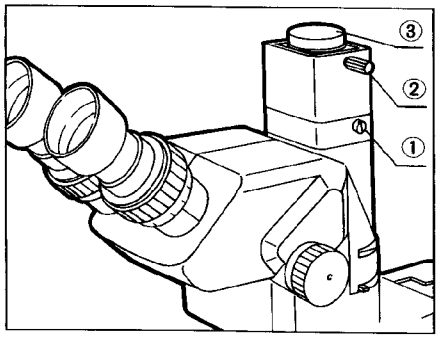


Fig. 10

10 Mounting the C-Mount Video Adapter and Video Camera

(1) Loosen the right and left body clamping knobs ①, and mount the video adapter by aligning the positioning groove of the video adapter with the positioning Pin. (Fig. 10)

(2) Secure the video adapter by tightening the clamping knobs.

★ **Be sure to tighten the clamping knobs with a coin, etc.**

(3) Loosen the video adapter clamping knob ② and remove the C-mount ③ from the video adapter. (Fig. 10)

(4) Screw the C-mount into the video camera.

(5) Mount the video camera with the C-mount attached to the video adapter, and tighten the clamping knob ②.

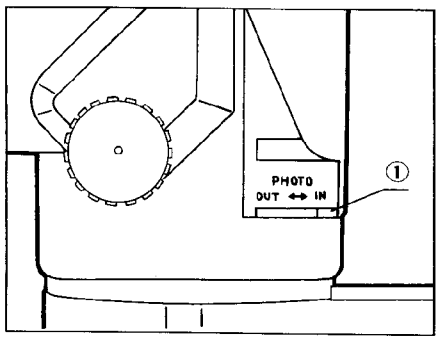


Fig. 11

11 Selecting the Light Path

(1) For binocular tube observation, slide the light path selector lever ① to the OUT position until it stops. (Fig. 11)

(2) To select the photo or video light path, slide the light path selector lever ① to the IN position. (Fig. 11)
This engages the mirror and allows 100% of the light in the right observation tube to go to photomicrographic equipment or video camera.

★ **Be sure to slide the light path selector lever as far as it will go.**

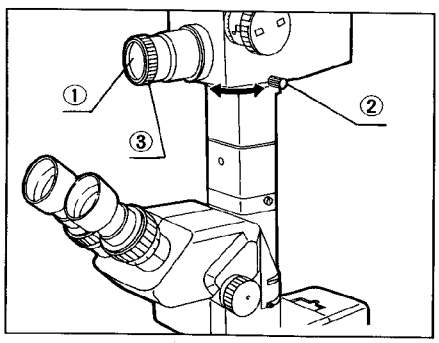


Fig. 12

12 Framing and Focusing for Photomicrography

(1) As focusing of photomicrographic equipment is impossible on the binocular tube (because this microscope is not designed to maintain parfocality between observation and photomicrography), be sure to use the viewer ① of the photomicrographic equipment for focus adjustment for photomicrography. (Fig. 12)

(2) If the eyepieces interfere with locking through the viewer of the photomicrograpic equipment, either remove the eyepieces or loosen the clamping knobs ② to turn the photomicrogrpahic equipment (Fig. 12).

(3) For the framing of the photomicrographic equipment, either turn the specimen or loose the microscope body clamping knobs of the stand to turn the microscope body.

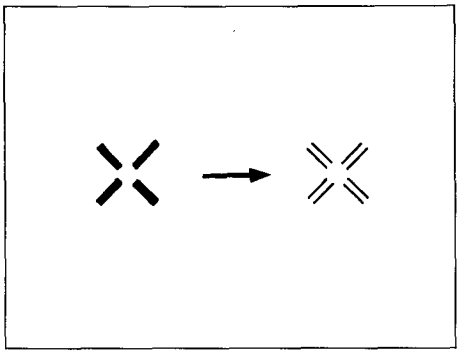


Fig.13

(4) Looking through the viewer of the photomicrographic equipment, bring the double cross lines into focus by turning the diopter adjustment ring ③ (Fig. 12) of the viewer. Adjust until both cross lines are clearly distinguishable from each other. (Fig. 13)

(5) Turn the focusing knobs until both cross lines and the specimen are sharply in focus.

★ As focusing at a low magnification power requires a special skill, the use of the FT focusing telecope (optional) is recommended.

★ Should a bright lighting fixture be mounted to the ceiling of the room where photomicrography is conducted, cover the binocular observation tubes to prevent light from entering the binocular tubes.

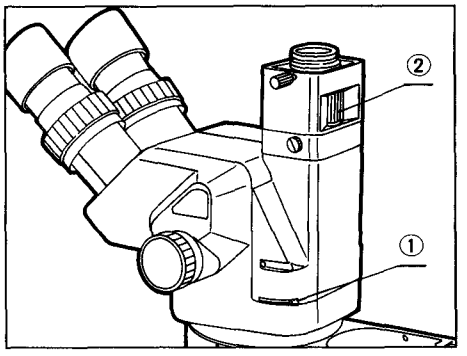


Fig.14

13 Focusing the Video Camera

(1) Slide the light path selector lever ① to the IN position in order to set the light path to video. (Fig. 14)

(2) Maximize the zoom magnification power and adjust the focus by turning the focusing knobs while viewing the video monitor.

(3) Minimize the zoom magnification power, and adjust the focus by turning the tube length adjustment ring ② of the video adapter.

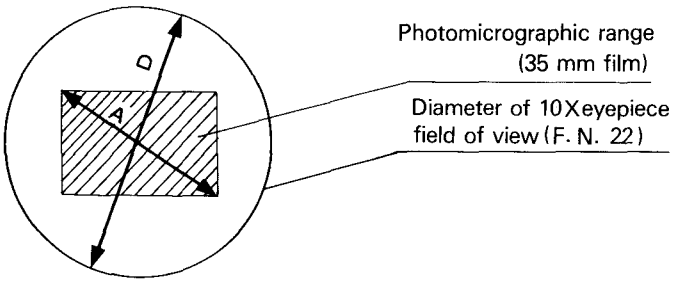
(4) Maximize the zoom magnification power again, and check to see if the image goes out of focus. If the image does go out of focus, repeat steps (2) and (3) above until focus is maintained even when zoomed.

★ After focusing the binocular tube beforehand in accordance with the procedure listed in section 4 on page 4, focus deviation due to zooming will be virtually eliminated simply by selecting the video light path, minimizing the zoom magnification power and focusing with the tube length adjustment ring.

★ For further details regarding photomicrographic procedures, refer to the instruction manual for the photomicrographic equipment in use.

★ The photomicrographic range in relation to the binocular tube's observation range (35 mm film diagonal line length in relation to the diameter of 10x eyepiece field of view) is as shown below.

Photo eyepiece in use	A/D × 100
NFK2.5× LD*	79%
NFK3.3× LD	60%
NFK5× LD	39%
NFK6.7× LD	29%



*For the SZ1145TR, multiply the above figures by 1.4.

*Although photomicrography is possible over a wide range, the field of view may go slightly out of focus at the periphery. If photos perfectly focused up to the periphery are needed, use photo eyepieces with 3.3× or higher magnification powers.

★ As vibration may adversely affect photomicrographic results, photomicrography should be conducted in a place subject to minimal vibration. Be sure to check that no vibration occurs and the image is free from wavering through the viewer before releasing the shutter.

6 OPTICAL DATA

The following data indicates typical zoom magnification factors.

1. SZ4045TR

Zoom magnification	W.D. (mm)	Eyepiece GSWH10× F.N.22		Eyepiece (option) GSWH15× F.N.16		GSWH20× F.N.12.5		GSWH30× F.N.7	
		Total magnification	Field of view (mm)	Total magnification	Field of view (mm)	Total magnification	Field of view (mm)	Total magnification	Field of view (mm)
0.67×	110	6.7×	32.8	10×	23.9	13.4×	18.7	20×	10.4
1×		10×	22	15×	16	20×	12.5	30×	7
2×		20×	11	30×	8	40×	6.3	60×	3.5
4×		40×	5.5	60×	4	80×	3.1	120×	1.8

Conversion Lens for SZ4045TR (Option)

Conversion lens	W.D. (mm)	Conversion lens	W.D. (mm)
110AL 0.25×	400	110AL 0.62×	160
110ALK 0.4×	250–180	110AL 1.5×	61
110AL 0.5×	200	110 AL 2×	38

★ The working distances of the 110ALK0.3X and 0.4X may vary depending on the microscope. The indicated values (0.3X and 0.4X) show the magnification power at a working distance of 350 mm and 250 mm.

★ 0.25X, 0.3X, and 0.4X conversion lenses cannot be used with the stand due to their long working distances.

2. SZ6045TR

Zoom magnification	W.D. (mm)	Eyepiece GSWH10× F.N.22		Eyepiece (option) GSWH15× F.N.16		GSWH20× F.N.12.5		GSWH30× F.N.7	
		Total magnification	Field of view (mm)	Total magnification	Field of view (mm)	Total magnification	Field of view (mm)	Total magnification	Field of view (mm)
1×	100	10×	22	15×	16	20×	12.5	30×	7
2×		20×	11	30×	8	40×	6.3	60×	3.5
4×		40×	5.5	60×	4	80×	3.1	120×	1.8
6.3×		63×	3.5	95×	2.5	126×	2	189×	1.1

Conversion Lens for SZ6045TR (Option)

Conversion lens	W.D. (mm)
110AL 0.5×	186
100AL 1.5×	56
100AL 2×	36

★ 100AL2X cannot be used with the Fiber Optics Ring Light Model LGR-2.

3. SZ1145TR

Zoom magnification	W.D. (mm)	Eyepiece GSWH10× F.N.22		Eyepiece (option) GSWH15× F.N.16		GSWH20× F.N.12.5		GSWH30× F.N.7	
		Total magnification	Field of view (mm)	Total magnification	Field of view (mm)	Total magnification	Field of view (mm)	Total magnification	Field of view (mm)
1.8×	73	18×	12.2	27×	8.9	36×	6.9	54×	3.9
4×		40×	5.5	60×	4	80×	3.1	120×	1.8
8×		80×	2.8	120×	2	160×	1.6	240×	0.9
11×		110×	2	165×	1.5	220×	1.1	330×	0.6

Conversion Lens for SZ1145TR

Conversion lens	W.D. (mm)
73AL 0.5×	114
73AL 1.5×	36
73AL 2×	19

★ The 73AL1.5X and 73AL2X cannot be used with the Fiber Optics Light Model LGR-2.

4. Total Observation, Photomicrographic and Video Recording Magnification

(1) Total observation magnification

Total magnification = Zoom magnification (× Conversion lens magnification) × Eyepiece magnification

(2) Photomicrographic magnification

(SZ4045TR, SZ6045TR)

Image magnification on film plane = Zoom magnification (× Conversion lens magnification) × Photo eyepiece magnification

(SZ1145TR)

Image magnification on film plane = Zoom magnification × 0.7 (× Conversion lens magnification) × Photo eyepiece magnification

★ When large format film is used, multiply the above by 3.

(3) Video recording magnification

(SZ4045TR, SZ6045TR)

Image magnification on video monitor = Zoom magnification (x Conversion lens magnification) x 0.5 x video monitor size/Picture area

(SZ1145TR)

Image magnification on video monitor = Zoom magnification x 0.7 (x Conversion lens magnification) x 0.5 x video monitor size/Picture area

7 OPTIONAL ACCESSORIES

1. Epi-illuminator Model LSGA-3, LSGA-6

Employing a 6V 15W halogen bulb, this illuminator mounts directly onto the microscope stand (SZ-ST). A heat-insulating filter and frost glass are built-in.

2. Fluorescent ring illuminator Model SZ-FLR

This illuminator is mounted to the objective of the microscope, providing bright, even fluorescent illumination. A 10 W ring fluorescent bulb is incorporated.

3. Trans-illuminator base Model SZ-ILA

Used in combination with the SZ-ST stand. Capable of polarizing illumination, the SZ-ILA also provides a choice of 6V 15W or 12V 50W halogen bulb.

4. Arms for equipment mounting

4 types of arms for equipment mounting are available depending on the application.

(1) Prober arm Model SZ-STP

(2) B&L sterecBonder arm Model SZ-STB1

(3) Bonder arm Model SZ-STB2

(4) Arm Model SZ-STS for SZH stereo microscope bases

5. Large size microscope stand Model SZ-STL

6. Universal stand Model SZ-STU1

7. Fiber optics ring light Model LGR-2
   The illuminator has a 15V 150W halogen bulb to provide a bright, clear and shadow-free field of view.

8. Light guide with bifurcated fiber optics Model LGW
   Capable of illuminating from any angle or position with the flexible arm, the LGW employs a 15V 150W bulb.

9. Stand illuminator Model LSD
   This stand illuminator is used when intense lighting is required. Either parallel or convergent luminous flux can be selected.

10. Extension tube Model SZ-ET
    When a 0.5X conversion lens (110AL0.5X or 100AL0.5X) is used, combine the extension tube with the stand.

11. Eyepiece micrometer
    The eyepiece micrometer is mounted to the field iris diaphragm and used for length measurement within the field of view. 9 types of micrometer reticles are available as shown in Fig. 15.

Eyepiece micrometers

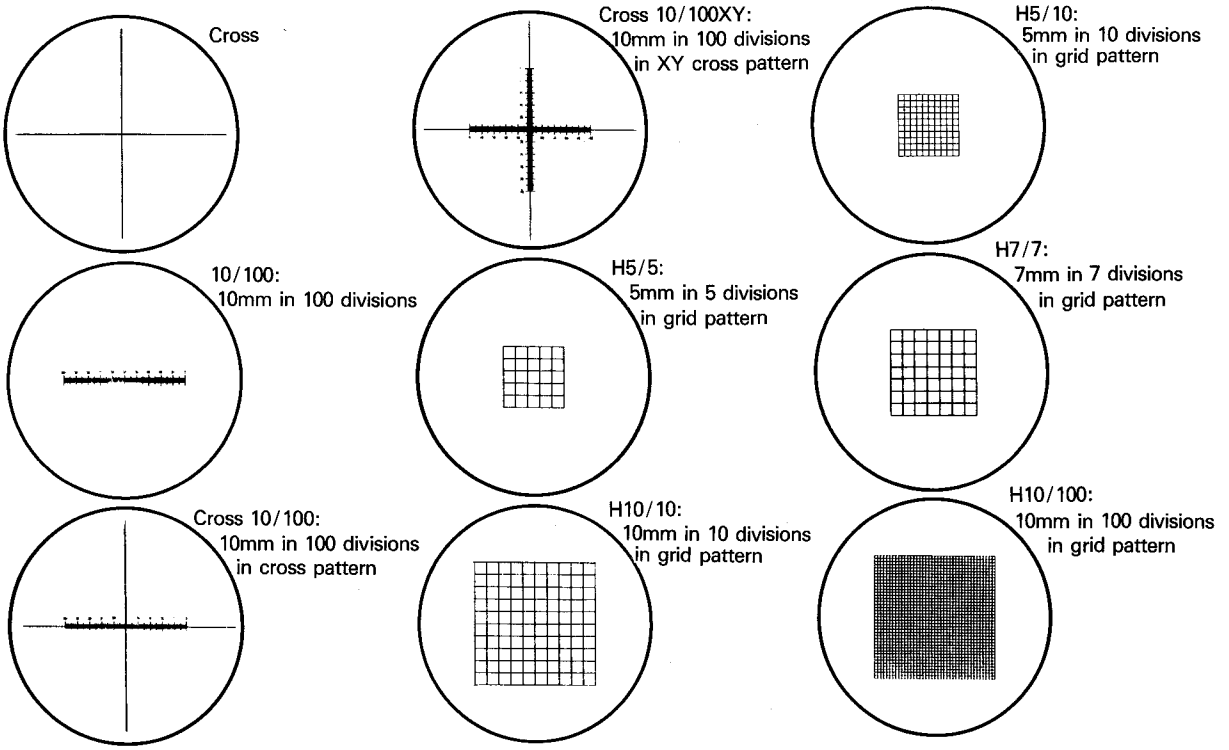


Fig.15

8 TROUBLESHOOTING GUIDE

If 100% performance is not obtained from your microscope due to unfamiliarity with its use, the table below may provide

Symptom	Cause	Remedy
1. Incomplete binocular vision	The interpupillary distance is not adjusted correctly.	Correct the interpupillary distance.
	Diopter adjustment is incomplete.	Complete diopter adjustment.
	The right and left eyepieces are different.	Replace and mount the same eyepieces.
2. Stains or dust are observed on the field of view.	Stains or dust have accumulated on the specimen.	Clean thoroughly.
	Stains or dust have accumulated on the eyepieces.	Clean thoroughly.
3. Unclear image	Stains or dust have accumulated on the objective.	Clean thoroughly.
4. Image blurs when zoomed.	Diopter adjustment of the eyepieces is incomplete.	Complete diopter adjustment.
	Focus adjustment is incomplete.	Complete focus adjustment.
5. The focusing knob is stiff.	The focusing knob tension adjustment is too tight.	Loosen appropriately.
6. Poor focus during observation due to unintentional lowering of the zoom microscope body.	The focusing knob tension is too loose.	Tighten appropriately.
7. The right eyepiece field or the photomicrographic equipment viewer field is partially cut off.	The light path selector lever is between settings.	Set to the correct position.
8. The video monitor image goes excessively out of focus when zoomed.	The tube length adjustment is incomplete.	Complete tube length adjustment.

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