



A Microscope for Everyone



LMC-4000

MICROSCOPE SERIES

USER MANUAL

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Before Use

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1. Operation Notice

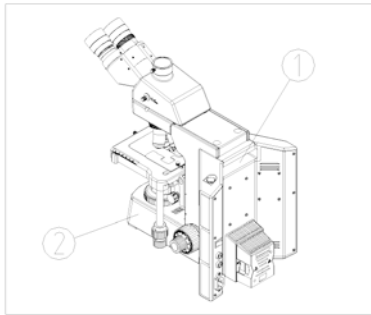


Fig. 1

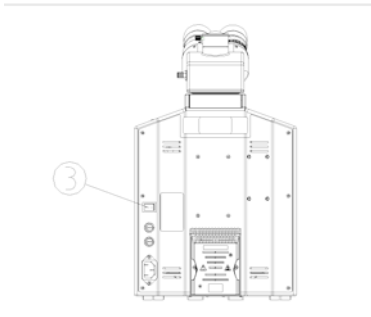


Fig. 2



1. The microscope is a precision instrument, please operate carefully: avoid vibrating or jolting the microscope during operation.
2. Do not operate the microscope under conditions of direct sunlight, high temperature, high humidity, dust, or close to sources of vibration. Make sure the worktable is flat.
3. When moving the microscope, use one hand to hold the arm of the microscope ① and another hand to carry the front base ②(see Fig. 1).
- ★The microscope will be damaged if the stage, focus knobs, or head are held when moving.
4. The lamp will be very hot when the microscope is on. Ensure there is enough space around the lamp housing for heat dissipation.
5. Ensure the microscope is properly grounded to avoid electric shock.
6. Ensure the power switch is in the “O” (off) position ④ and wait until the lamp cools completely before replacing the bulb or fuse (See Fig. 2).
7. The input voltage is clearly marked on the back of the microscope. Ensure the power supply voltage is in this range.
8. Use only the power cable supplied with the microscope.

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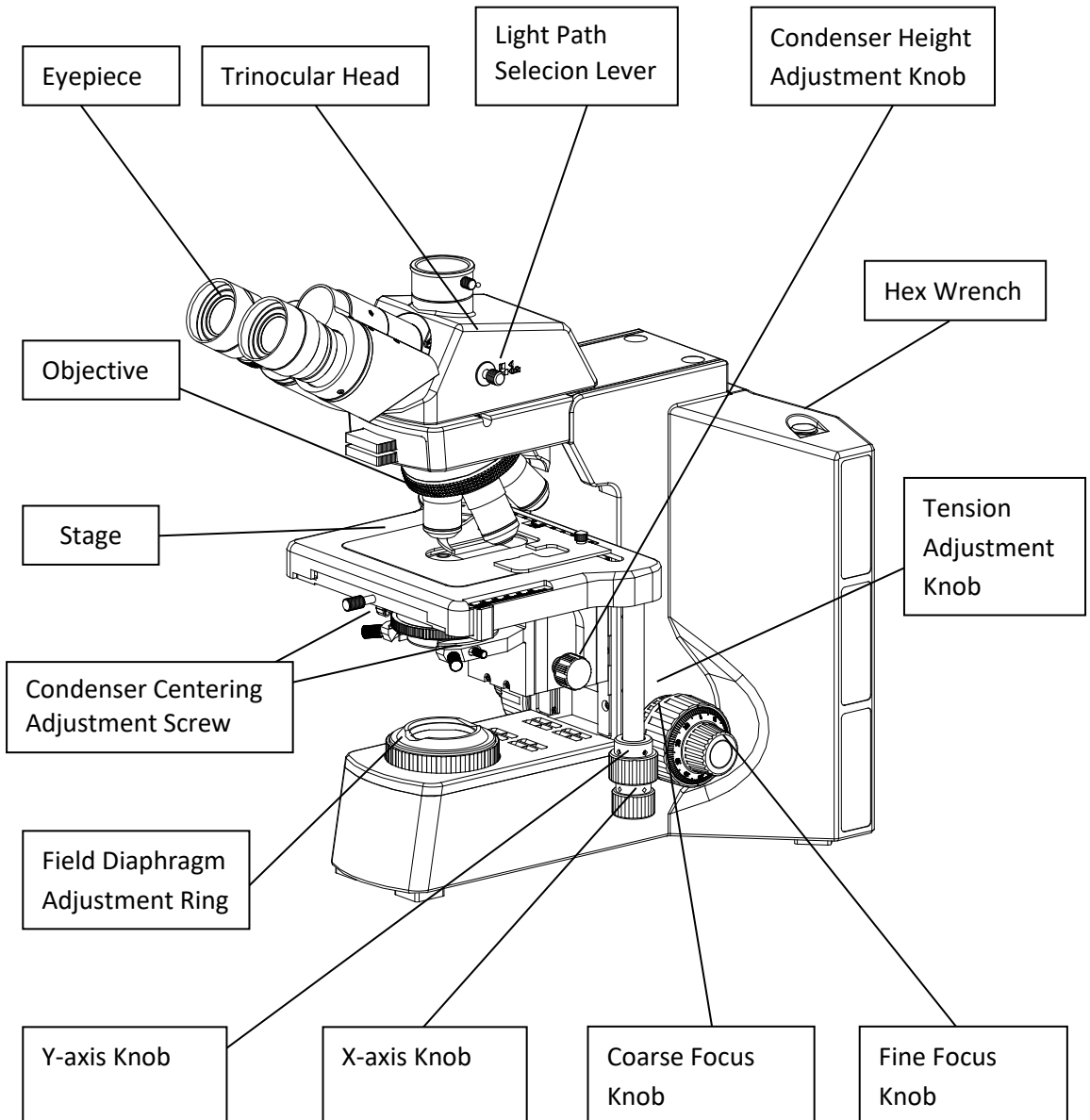
2. Maintenance

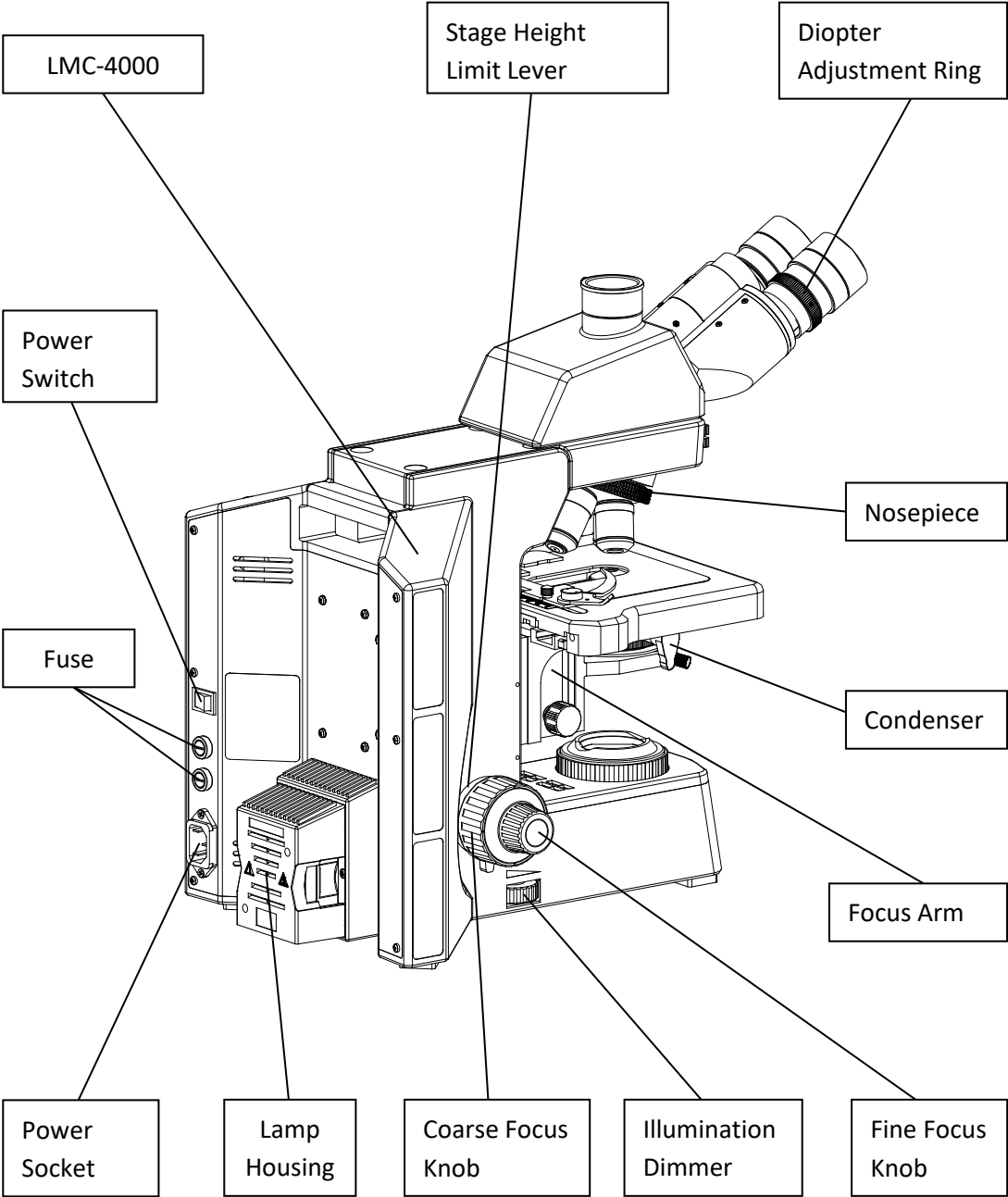
1. Wipe the lens gently with a lens cloth. Carefully wipe off the oil and fingerprints on the objective surfaces with a lens cloth moistened with a small amount of lens cleaning solution.
- ★ Lens cleaning solution is flammable. Turning on or off electronic devices (including the microscope) may produce a spark which could ignite the lens cleaning solution. Use these chemicals in a well-ventilated area.
2. Don't use organic solutions to wipe the surfaces of the other components. Please use a neutral detergent if necessary.
3. If the microscope is exposed to liquid during operation, power it off immediately and wipe it dry.
4. Never disassemble the microscope, the performance will be affected or the instrument will be damaged.
5. Cover the microscope with a dust cover when it is not in use.

3. Safety Sign

Sign	Signification
	The surface gets hot and don't touch it with bare hand.
	Read the manual before use. Unsuitable operation could lead to injury or instrument failure.
	Main switch is ON.
0	Main switch is OFF.

LMC-4000 Series Biological Microscope Components

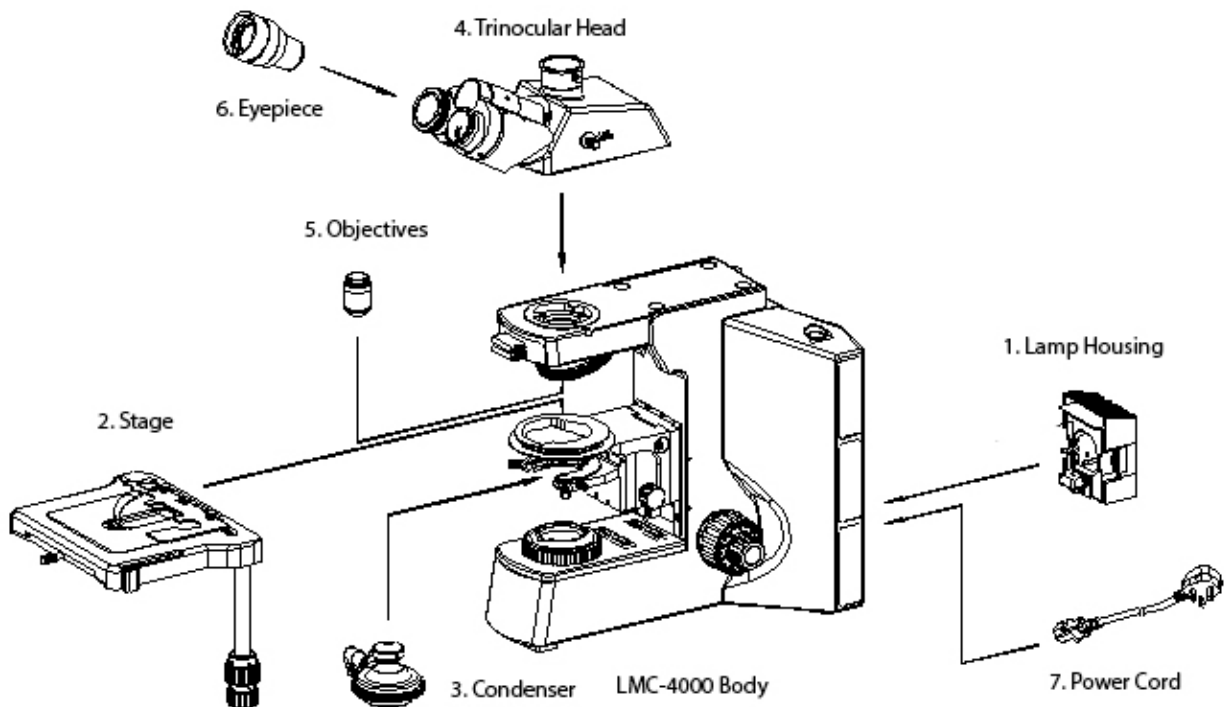




2-1 Assembly Schematic

Assemble the microscope in the order denoted below.

★ Ensure all parts are dust- and dirt-free before assembly. Carefully assemble the microscope to avoid scratching the components and touching the glass surfaces.



2-2 Assembling Steps

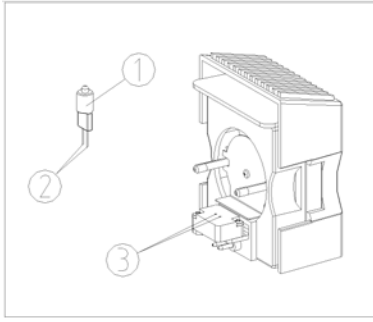


Fig. 3

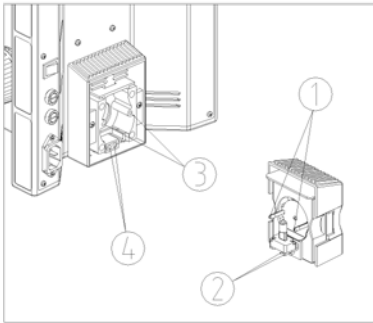


Fig. 4

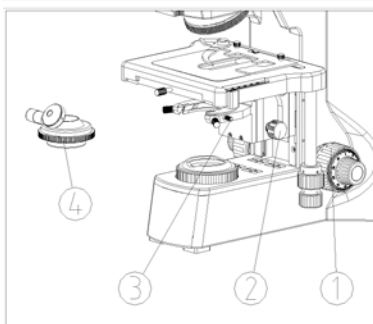
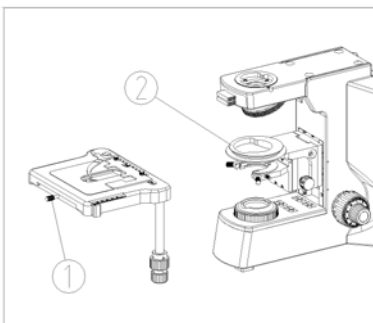


Fig. 6

2-2-1 Assemble the Halogen Bulb (for halogen models)

Hold the bulb ① with clean cloth or tissue and insert the pins ② into the receptacle ③ fully. Make sure the bulb is vertical (See Fig. 3).

★Don't touch the bulb with bare hands. If there is a fingerprint left on the bulb, please wipe it with clean soft cloth.

★Before replacing the bulb, make sure to turn off the main power and wait for both the bulb base and bulb to cool completely.

2-2-2 Assemble the Lamp House

Align the guide pins ① and power pin ② on the lamp house to the corresponding holes on the back of the microscope ③ and ④, then insert the lamp house. (See Fig. 4)

2-2-3 Assemble the Stage

(1) Loosen the lock-screw ① on the stage. (See Fig. 5)
 (2) Place the stage onto the stage mount ②, align the stage and tighten the lock screw ①.

2-2-4 Assemble the Condenser

(1) Rotate the coarse focusing knob ① to raise stage to the highest position. (See Fig. 6)
 (2) Rotate the condenser height adjustment knob ② to lower the condenser bracket to the lowest position.
 (3) Loosen the condenser lock screw ③ fully.

(4) Swing out the front lens of condenser with the scale forward. Align the pin on the back of the condenser with condenser mount and insert the condenser.

(5) Tighten the condenser lock screw③, and raise the condenser to the highest position with the condenser height adjustment knob②.

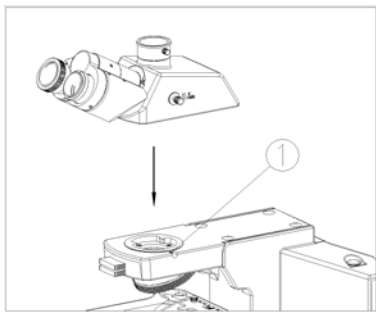


Fig.7

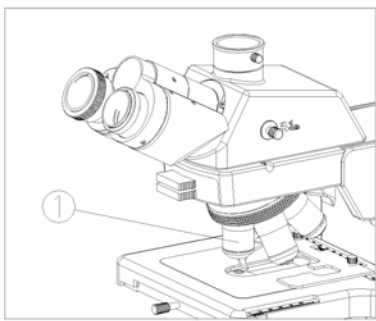


Fig. 8

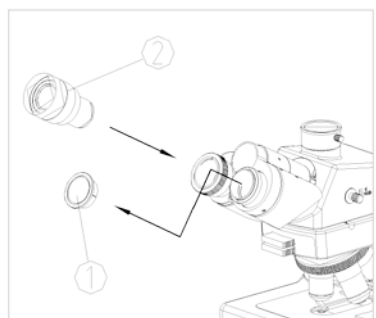


Fig.9

2-2-5 Assemble the Head

(1) Loosen the head lock screw①. (See Fig. 7)

(2) Insert the dovetail on the head into the stand. Insert the left side of the dovetail first, then tighten the lock screw.①.

2-2-6 Assemble the Objective

Rotate the coarse focusing knob to lower the stage. Install the objectives into the nosepiece from the lowest magnification to the highest in a clockwise direction.

(See Fig.8)

★Search and focus the sample by low magnification objective (4X or 10X) when operating. Then increase the magnification according to the observation requirements.

★When replacing the objective, rotate the nosepiece until it clicks in place.

2-2-7 Assemble the Eyepiece

(1) Remove the eyetube cover①. (See Fig.9)

(2) Fully insert the eyepiece② into the eyetubetube.

2-2-8 Connect the Power Cord

(1) Make sure the power switch is in the "O" (OFF). (See Fig. 10)

(2) Fully insert the power cord ① into the power socket ② of the microscope.

(3) Fully insert the wall connector into a wall socket.

★ **Avoid pulling on the power cord when the cord is bent or twisted.**

★ **Only use the power cord that came with the microscope, or a replacement power cord from Laxco.**

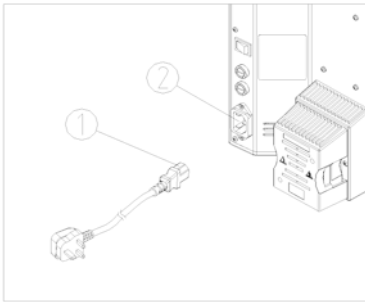


Fig. 10

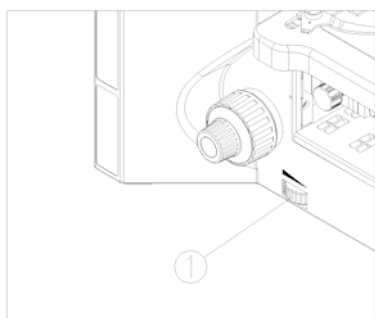


Fig. 11

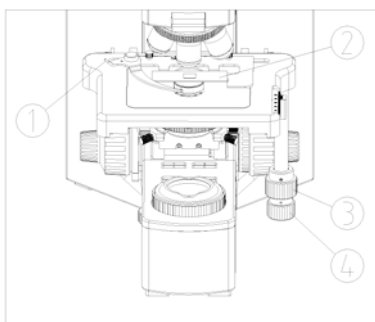


Fig. 12

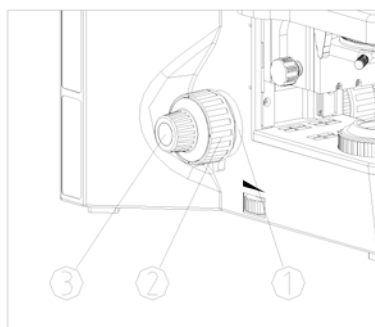


Fig. 13

3-1 Set Illumination

- (1) Turn on the microscope. (see Fig. 11)
- (2) Adjust the light adjustment knob ① to a desirable level (see Fig. 9). Rotate the light adjustment knob ① clockwise to raise the brightness. Rotate the light adjustment knob ① counterclockwise to lower the brightness.

3-2 Place the Specimen Slide

- (1) Open the stage clip ① of the specimen holder. (See Fig. 12)
- (2) Place the slide with the specimen facing up; carefully release the stage clip ① onto the slide ②.
- (3) Rotate the X-axis knob ④ and Y-axis knob ③ to center the slide.

3-3 Adjusting the Focus

- (1) Place slide on stage and rotate the 4X objective into the light path. (See Fig. 13)
- (2) Loosen the stage height lock screw if necessary ①. Rotate the coarse focus knob ② until the image is in focus and tighten the stage height lock ①.

★The stage height lock screw can prevent the objective touching the slide when focusing.

★The stage height lock does not affect the fine focus knob.

- (3) Adjust the fine focus knob ③ to improve the focus.

★When observing with the 4X or 10X objective, open both the aperture diaphragm and field diaphragm to the maximum position and swing out the front condenser lens. See "3-7 Center the Condenser" for condenser operations.

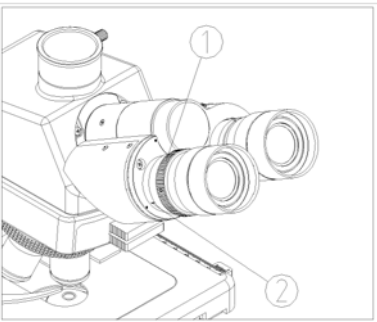
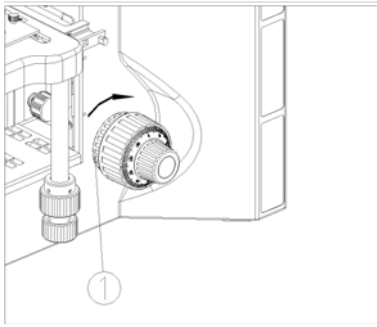


Fig. 15

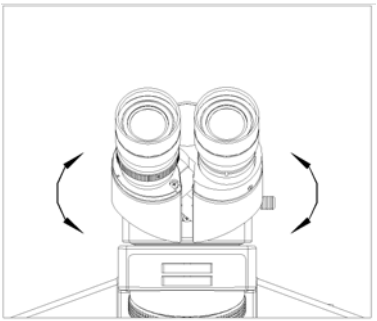


Fig. 16

3-4 Adjust the Focusing Tension

If the coarse focusing knob's tension is too high; or if the stage moves out of focus, adjust the focus tension ① according to the indicator on the knob. (See Fig. 14)

3-5 Adjust the Diopter

Focus on a sample looking through only the right eyepiece, then look through the left eyepiece with the left eye. Rotate the diopter adjustment ring ① until the image is clear (See Fig. 15).

There is ± 5 diopter adjustment on the ring ①, and the value aligned with the scale is your eye's diopter.

★Remember your eye's diopter for future use.

3-6 Adjust the Interpupillary Distance

Rotate the eyepieces until the field of view is clear and aligned. (See Fig. 16)

The dot “·” on the left eyepiece base indicates the interpupillary distance indicator.

Adjustable range: 50~76mm.

★Remember you eye's interpupillary distance for future use.

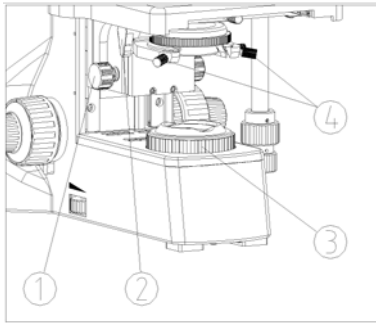


Fig. 17

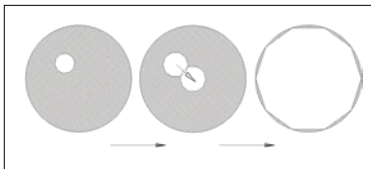


Fig. 18

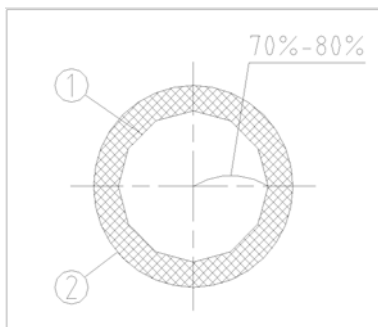


Fig. 19

3-7 Center the Condenser

- (1) Rotate the condenser knob ① to raise it to the highest position (see Fig. 17).
- (2) Rotate the condenser swing-in lens ② into light path.
★ Move the front lens of condenser into light path when the objective is beyond 20X.
- (3) Move the 20X objective into light path and focus the specimen.
- (4) Rotate the field diaphragm adjustment ring ③ to adjust the field diaphragm to the smallest position, the field diaphragm should be visible through the eyepieces .
- (5) Rotate the condenser adjustment knob to adjust the height of the condenser until the edges of the field diaphragm are in focus.
- (6) Adjust the condenser centering adjustment screws ④ to center the opening of the field diaphragm to the center of the field of view..
- (7) Open the field diaphragm gradually The image will not move away from the center if the condenser is centered properly. (See Fig. 18)
- (8) 6. The field diaphragm can be enlarged bigger than the field of view.

3-8 Adjust the Field Diaphragm

By limiting the diameter of the beam entering the condenser, the field diaphragm can prevent other light and strengthen the image contrast. When the image is just on the edge of the field of view, the objective can show the clearest image.

3-9 Adjust the Aperture Diaphragm

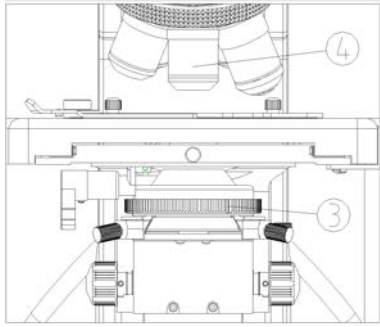


Fig. 20

The aperture diaphragm controls the numerical aperture (NA) of the illumination. A matching NA between the illumination and the objective will provide better resolution, contrast, and depth of field.

If your sample has low contrast, it is advised to adjust the condenser aperture diaphragm to be 70%-80% of the N.A. of objective. The eyepiece can be removed to observe this through the eyetube. Adjust the aperture diaphragm adjustment ring ③ until it matches Fig. 19.

Use of scale: set the scale of condenser N.A. to the 80% value of objective ④ N.A.

For example, use 40X objective (N.A. 0.65), set the scale of aperture diaphragm to $0.65 \times 0.8 = 0.52$.

3-10 Select the Light Path

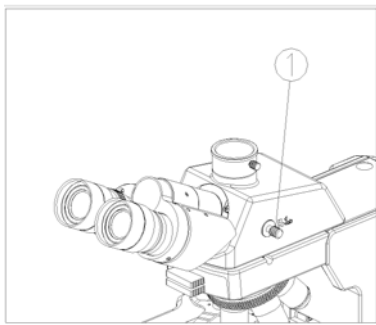


Fig. 21

When using a trinocular head, the light path selection lever ① controls the light split between the eyepieces and photo port. When the lever is pushed in, all the light will be directed to the eyepieces; when it is pulled out, the light will be split 50:50 between the eyepieces and photo port. (See Fig. 21)

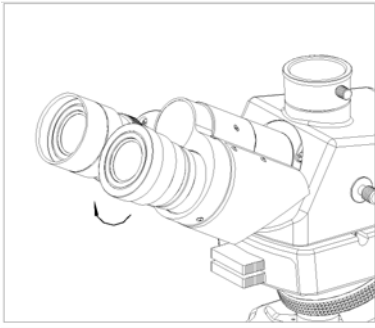


Fig. 22

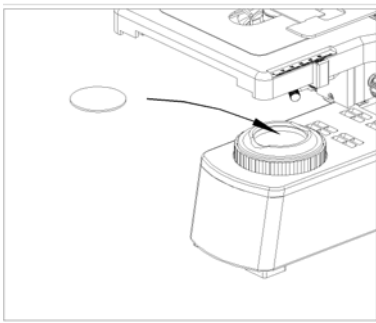


Fig. 23

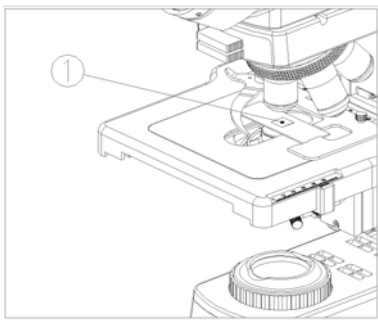


Fig. 24

3-11 Eye Cup

- (1) When wearing glasses, fold the eye cups inward to prevent damage to eyeglasses.
- (2) When not wearing glasses, fold out the eye cups to prevent stray light. (See Fig. 22)

3-12 Color Filter

The color filter can improve the image background and increase contrast for some observation techniques (See Fig. 23).

There are four colors of filters available: blue, green, yellow and white/frosted.

★ **Place the rough side of filter downward.**

3-13 Use the Oil Objective (100X)

- (1) Use the 4X objective to focus the specimen.
 - (2) Place a drop of oil ① on the specimen (see Fig. 24).
 - (3) Rotate the nosepiece counterclockwise and rotate the oil objective (100X) to the light path.
- Then use the fine focusing knob to focus.

★ **Make sure there are no air bubbles in the oil.**

A. Move the eyepiece to examine the air bubble. Open the aperture diaphragm and field diaphragm fully and observe the edge of the objective from the.

B. Rotate nosepiece slightly and swing the oil objective from side to side to remove the air bubble.

(4) After using, wipe the front lens with a tissue moistened with a small amount of 3:7 mixture of alcohol and ether or with dimethylbenzene. Wipe off the oil on the specimen.

★ **Avoid using another objective before removing the oil from the specimen.**

★ **Too much dimethylbenzene will dissolve the lens's coating.**

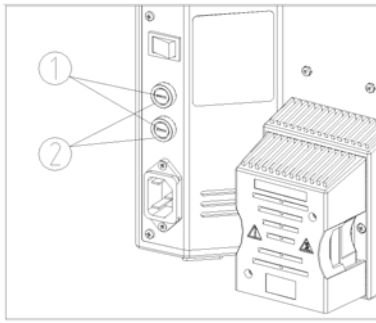


Fig. 25

3-14 Replace the Fuse

Turn the power switch to "O" (OFF) before replacing the fuse. Pull out the power cord. Then remove the fuse holder ① from the fuse base ② with a flathead screwdriver. Install a new fuse and install it in the fuse base (See Fig. 25).

★ **Specifications of the fuse: 250V, 3.15A.**

3-15 Assembling and Operation of Simple Polarizing

Simple polarizing system includes polarizer ④ and 360° rotatable analyzer ③.

(1) Remove the dust-cover ① from the filter slot ② and insert the 360° rotatable analyzer ③ into the slot ②. (See Fig. 26)

(2) Place the polarizer ④ into the light well ⑤.

(3) Rotate the 360° rotatable analyzer ③ to achieve polarizing observation.

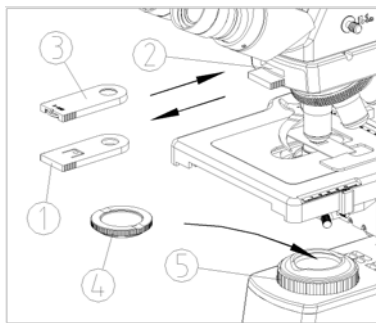


Fig. 26

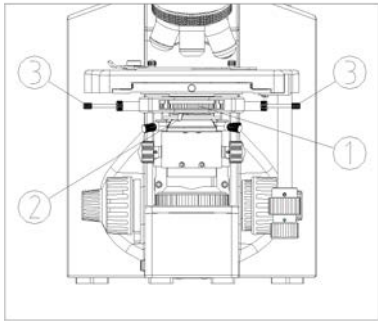


Fig. 27

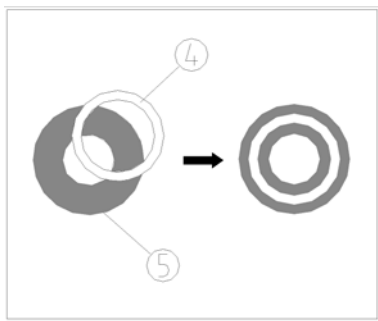


Fig. 28

3-16 Assembly and Operation of Disc Phase Contrast

Condenser

Assembly of Disc Phase Contrast Condenser refers to **2-2-4 Assemble the Condenser.**

For phase contrast observation, rotate the correct phase contrast ring into place ① for the objective in the light path. For brightfield observation, rotate the phase contrast ring ① to the “BF” position. (see Fig. 27).

3-16-1 Centering Halo

- (1) Rotate the 10X phase contrast objective into the light path, then rotate the condenser until the 10X phase contrast ring is in position.
 - (2) Turn the aperture diaphragm lever ② to the fully open position
 - (3) Focus on specimen.
 - (4) Remove eyepiece and insert a CT (centering telescope) into the eyetube without diopter adjustment.
 - (5) Loosen the lock screw of the centering telescope, move the telescope tube up and down until the image of the halo ④ and phase ring ⑤ are in focus, then lock the screw. (See Fig. 27 & 28)
 - (6) Use the phase contrast ring adjusting levers ③ to center the halo ④ with the phase ring ⑤ (Fig.28).
 - (7) Remove the CT, and insert the eyepiece.
 - (8) Repeat the above steps for all magnifications.
- ★ **Center the brightest halo to the objective phase ring if double image appears.**

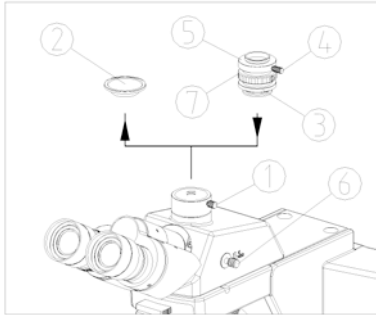


Fig. 29

3-17 Assembling Camera Adapter

- (1) Loosen the lock screw ① on the trinocular head, and remove the dust cap ② (See Fig.29).
- (2) Remove the dust cap from the c-mount adapter ③. Insert the c-mount adapter into the trinocular head as shown in the figure and tighten the lock screw ①.
- (3) Loosen the lock screw ④ on the c-mount adapter. Attach camera to the c-mount adapter.
- (4) For binocular observation, pull the light path selection lever ⑥ out and observe the image. If the image is unclear, rotate the focus adjustment ⑦ until image is in focus.

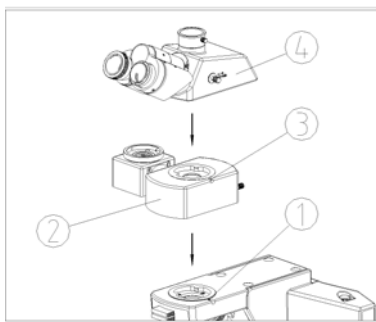


Fig. 30

3-18 Assembly and Use of Intermediate Optical Splitter

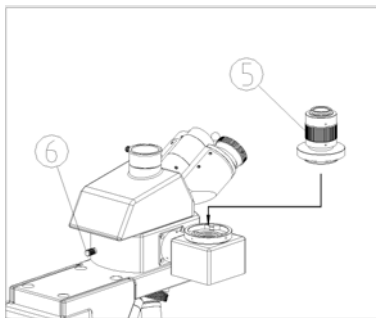


Fig. 31

- (1) Loosen the lock screw on illumination arm ①. (See Fig. 30)
- (2) Insert dovetail interface on the bottom of intermediate optical splitter ② into the stand, then tighten the lock screw ①.
- (3) Loosen the lock screw on optical splitter ③.
- (4) Insert dovetail interface on the bottom of the observation head ④ into the optical splitter and tighten the lock screw ①.
- (5) Insert the c-mount adapter ⑤ into the intermediate optical splitter ② as shown in Fig. 31. See **3-17 Assembling Camera Adapter** for more details.
- (6) For binocular observation, pull the light path selection lever ⑥ out and observe the image. If the image is unclear, rotate the focus adjustment ⑦ until image is in focus.

4. Technical Specifications

LMC-4000 Series

4-1 Key Technical Specifications: LMC-4000 Series Biological Microscope

Optical System	Color corrected infinity optical system
Head	Gemel Binocular head, 30° inclined, 360° rotatable. Gemel Trinocular head, 30° inclined, 360° rotatable, Splitting ratio: Binocular Head 100%, Binocular Head/ Trinocular Head 50%/50%. Gemel Binocular head, 30°~60° inclined adjustable, 360° rotatable.
Eyepiece	PL10X high eye-point plan eyepiece, line field of view: 22mm.
Nosepiece	Reversed quintuple nosepiece
Objective	Infinity plan achromatic objective(4X、 10X、 20X、 40X、 100X), Infinity plan phase contrast objective (10X、 20X、 40X、 100X)
Focus	Coaxial coarse & fine focusing system with limit-stopper & tension adjustable. Travel rang: 30mm. Height-adjustable bracket group stage. Fine focusing precision : 0.002mm
Stage	Double-layer mechanical moving stage. Area: 185×165mm. Moving range: 80x55mm. Accuracy: 0.1mm. Superhard oxidation metal platform, left or right hand position is optional. Double-layer mechanical moving stage. Area: 175×145mm. Moving range: 75x50mm. Accuracy: 0.1mm. Left or right hand position is optional.
Condenser	NA1.2/0.22 Shake-out Achromatic condenser NA1.25 five-hole disc phase contrast condenser NA0.9 Dry dark field condenser NA1.25 Oil-immersed dark field condenser
Illumination System	100-240V wide range of voltage, transmission and reflection Koehler illuminator systems, 6V/30W Halogen bulb, filament center and brightness continuously adjustable.
Polarizer	The analyzer vibration direction is 360°adjustable. Both the polarizer and the analyzer can be moved out of the light path
Filter	Yellow, green, blue, and neutral filter.

4-2 Objective Specifications

Type	Magnification	Numerical Aperture (N.A)	Operating Range (mm)	Conjugate Distance (mm)	Parfocal Distance (mm)	Thickness of Cover Glass	Magnification Mark (color ring)
Infinity plan achromatic objective	4X	0.10	11.9	∞	45	0.17	Red
	10X	0.25	12.1	∞	45	0.17	Yellow
	20X	0.40	1.56	∞	45	0.17	Light green
	40X(S)	0.65	0.36	∞	45	0.17	Light Blue
	100X(S)(OIL)	1.25	0.18	∞	45	0.17	White
Infinity plan phase contrast objective	10X	0.25	12.1	∞	45	0.17	Yellow
	20X	0.40	1.56	∞	45	0.17	Light green
	40X(S)	0.65	0.36	∞	45	0.17	Light blue
	100X(S)(OIL)	1.25	0.18	∞	45	0.17	White

Problem	Cause	Solution
1. Optical system		
(1) The bulb is bright but it is dark in the field of view.	Field diaphragm is not large enough.	Enlarge the field diaphragm.
	Condenser is too low.	Adjust the condenser.
	Condenser is not centered.	Center the condenser.
	Light path selecting pole is in the trinocular observation position.	Push the light path selecting pole to the binocular observation position.
(2) The side of the field of view is dark or not even.	The nosepiece is not in the right position.	Turn the nosepiece into the right position.
	Stain or dust has accumulated on the lens (condenser, objective or eyepieces).	Clean the lens.
(3) Stain or dust is observed in the field of view.	Stains have accumulated on the specimen.	Clean the specimen.
	Stains have accumulated on the lens.	Clean the lens.
(4) Unclear image	No cover glass on the specimen slide.	Add the cover glass.
	The cover glass is not standard.	Use a standard cover glass with thickness of $\delta 0.17\text{mm}$.
	The specimen faces down.	Put the specimen to face up.
	The immersion oil has accumulated on the dry objective.	Clean thoroughly.
	The immersion oil is not used for oil objective.	Use immersion oil.
	Air bubble in the immersion.	Get rid of the air bubble.
	Use wrong immersion oil.	Use a correct one. (Cedar oil)
	The aperture diaphragm is not opened correctly.	Adjust it.
	Stain or dust has accumulated on the lens of eyepiece.	Clean the lens.
	Condenser is too low.	Adjust the condenser.
(5) One side of the image is dark or the image moves while focusing.	The specimen slide is not fixed.	Fix it with clips.
	The nosepiece is not in the right position.	Turn the nosepiece into the right position.
	Condenser is not centered.	Center the condenser.
(7) The eyes feel tired easily. The right field of view doesn't	Interpupillary distance is incorrect.	Adjust the interpupillary distance.
	Diopter adjustment is incorrect.	Adjust the diopter.

Problem	Cause	Solution
superpose with the left.	The eyepiece for the right eye is different from the left one.	Use the same eyepieces.
2. Mechanical system		
(1) Cannot focus when using high magnification objective	The cover glass faces down.	Put the cover glass to face up.
	The cover glass is not standard.	Use a standard cover glass with thickness 0.17mm.
(2) The objective touches the cover glass while turning the nosepiece.	The cover glass faces down.	Put the cover glass to face up.
	The cover glass is not standard.	Use a standard cover glass with thickness 0.17mm.
(3s) Coarse focusing knob is too tight.	Tension adjustment knob is too tight.	Loosen it to an appropriate position.
(4) Stage declines itself and can not stay on the focal plane.	Tension adjustment knob is too loose.	Tighten it to an appropriate position.
(5) Coarse focusing knob can not rise.	The coarse focusing limit knob is locked.	Loosen the coarse focusing limit knob.
(6) Coarse focusing knob can't decline.	The base of the condenser is too low.	Raise the base.
(7) Cannot move the slide smoothly.	The slide is not fixed correctly.	Adjust it correctly.
	The movable specimen holder is not fixed properly.	Adjust it correctly.
(8) The image moves obviously when touching the stage.	The stage is fastened incorrectly.	Fasten the stage correctly.
3. Electrical Part		
(1) The bulb does not work.	No power supply.	Check the connection of the power cable.
	The bulb is not installed correctly.	Install it correctly.
	The bulb burns out.	Replace it.
(2) The bulb burnt out usually	A wrong bulb is used.	Replace it with a correct one.
(3) The field of view is not bright enough	A wrong bulb is used.	Replace it with a correct one.
	The use of light adjusting knob is incorrect.	Adjust it correctly.
(4) The bulb flickers or the brightness is not stable	The bulb will burn out soon.	Replace it with a new one.
	The wire doesn't connect well.	Connect it correctly.