Version No.: V1.0

BestScope

BS-2064 Series Biological Microscope Instruction Manual

BS-2064B

BS-2064T

This instruction manual is for the operation guide, troubleshooting and maintenance to BS-2064 Series Biological Microscope. Please study this manual thoroughly before operating, and keep it with the instrument. The manufacturer reserves the rights to the modifications by technology development. On the basis of operation ensured, technical specifications may be subject to changes without notice.

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Before Use *BS-2064 Series*

1. Operation Notice

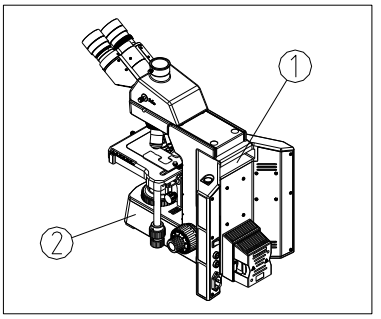


Fig. 1

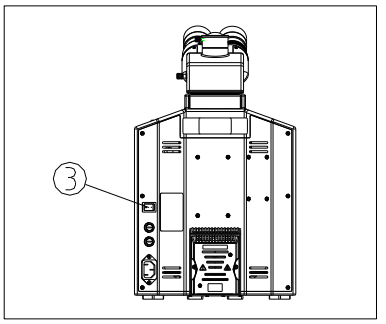


Fig. 2

1. As the microscope is a high precision instrument, always operate it with care, and avoid physical shake during the operation.
2. Do not expose the microscope in the sun directly, either not in the high temperature, damp, dust or acute shake. Make sure the worktable is flat and horizontal. Following environment is required when operating: Indoor temperature: 5℃～40℃, Max relative humidity: 80%.
3. When moving the microscope, use both hands to hold its back hand-clasping ① and the front base ②, and lay it down carefully (see Fig. 1).

★ **It will damage the microscope by holding the stage, focusing knob or head when moving.**

4. When working, the surface of light source will be very hot. Make sure there is enough room around the light source for cooling.
5. Connect the microscope to the ground to avoid lightning strike.
6. For safety, make sure the power switch is at "O" (OFF) and power it off before replacing the bulb or fuse (See Fig. 2), and wait until both the bulb and bulb holder have cooled down.

★**Bulb selected only: 6V/30W Halogen bulb (philips 5761).**

7. Wide voltage range is supported as 100~240V. Additional transformer is not necessary. Make sure the power supply voltage is in this range.
8. Use the special wire supplied by our company.
9. All the power OFF devices have been set in the position where is easy to operate.

2. Maintenance

1. Wipe the lens gently with a soft lens tissue. Carefully wipe off oil or fingerprints with tissue moistened with a little of 3:7 mixture of alcohol and ether or dimethylbenzene.
   ★**Alcohol and ether is flammable. Don't place these chemicals near to fire or fire source. Please use them in a ventilated place when turning on/off the electric device.**
2. Do not use organic solution to wipe the surface of other components. Please use the neutral detergent if necessary.
3. If the microscope is damped by the liquid, cut off the power immediately and wipe it

dry.

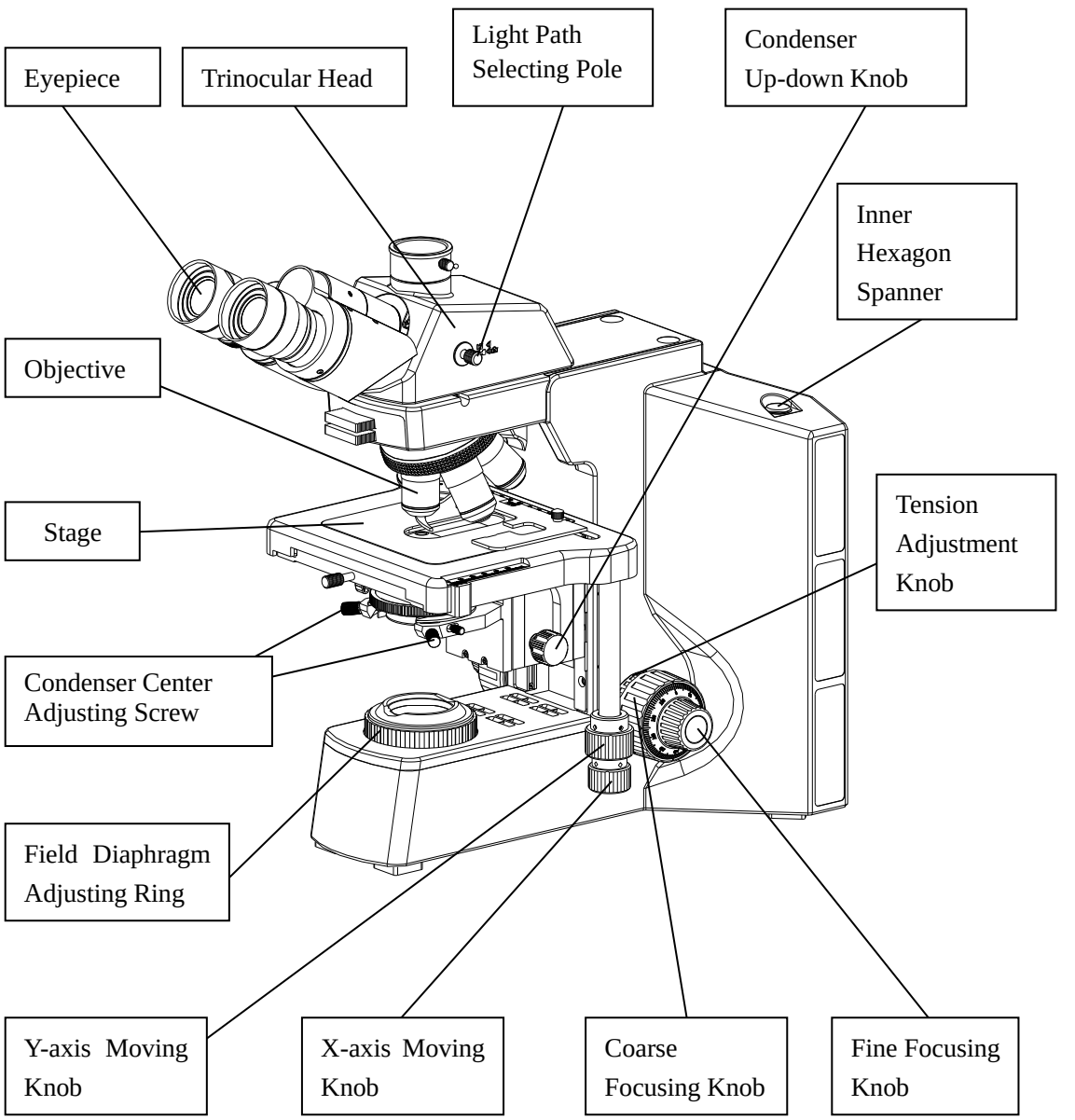
4. Never disassemble the microscope. It will influence its function or damage it.
5. After using, cover the microscope with a dust cover.

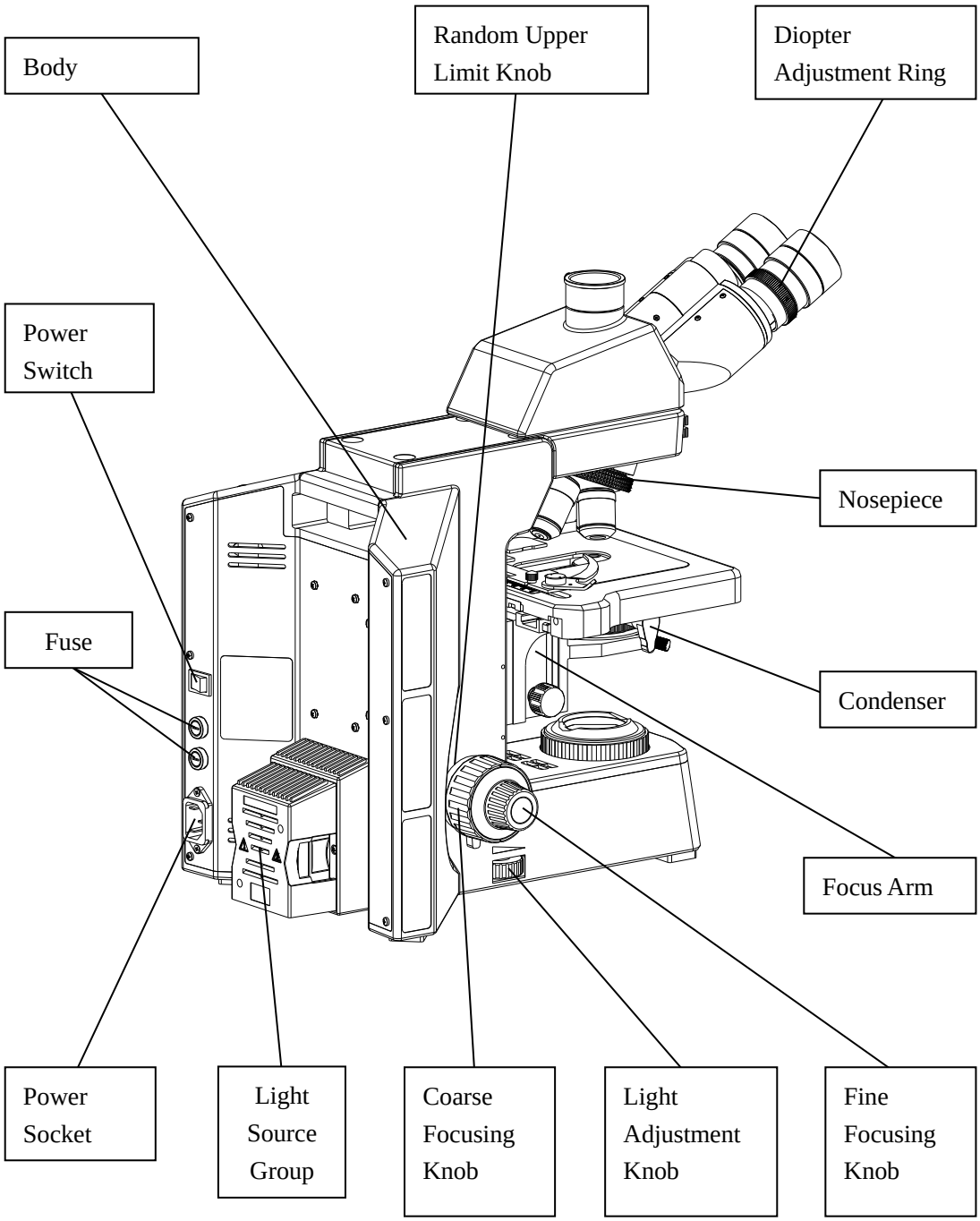
3. Safety Sign

Sign	Signification
	The surface gets hot and don't touch it with bare hand.
	Read the introduction before use. Unsuitable operation would lead to person hurt or instrument faulty.
I	Main switch is ON.
O	Main switch is OFF.

1. Components *BS-2064 Series*

BS-2064 Series Biological Microscope Components



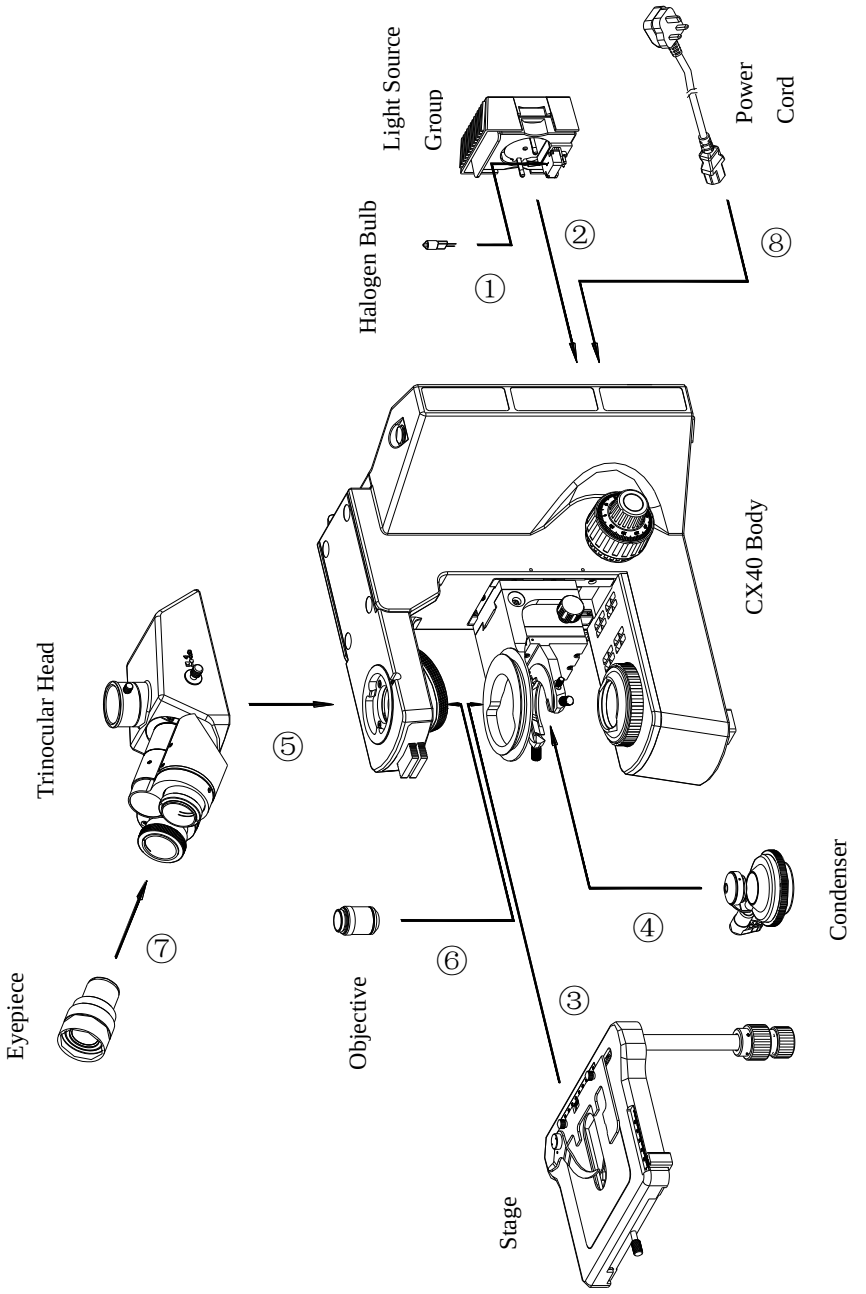

Body
Random Upper Limit Knob
Diopter Adjustment Ring
Power Switch
Nosepiece
Fuse
Condenser
Focus Arm
Power Socket
Light Source Group
Coarse Focusing Knob
Light Adjustment Knob
Fine Focusing Knob

2. Assembling *BS-2064 Series*

2-1 *Assembling Scheme*

Following is the Assembling Scheme to describe how to assemble the components, and the numbers denote the assembling order.

★ Before assembling, make sure there is no dust, dirt or other materials which will disturb it. Assemble carefully and do not scrap any part or touch the glass surface.



2-2 *Assembling Steps*

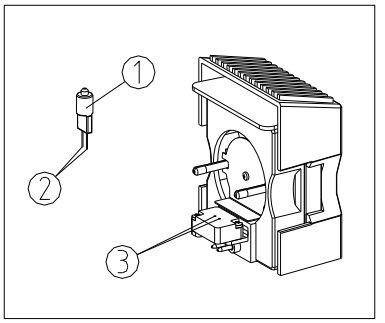


Fig. 3

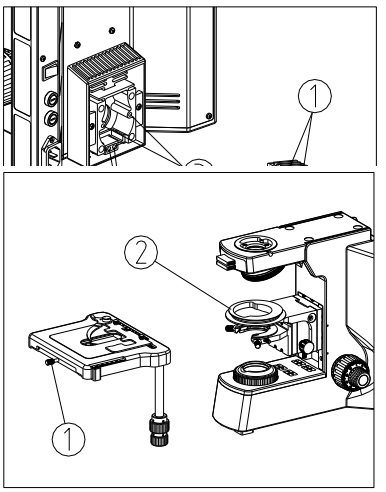


Fig. 5

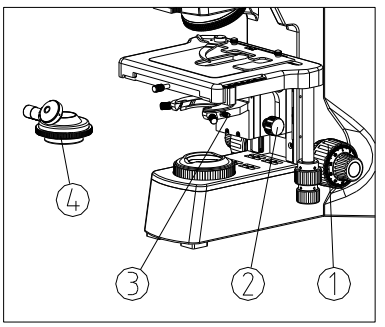


Fig. 6

2-2-1 *Assemble the Halogen Bulb*

Hold the bulb ① with clean glove or tissue and insert the pins ② into the receptacles ③ thoroughly. Make sure the bulb is vertical (See Fig. 3).

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

★Before replacing the bulb, make sure to cut off the main power and wait for both the bulb base and bulb cooling down.

★Bulb selected only: 6V/30W Halogen bulb (Philips 5761).

2-2-2 *Assemble the Light Source Group*

Align the oriented pin① and power pin② on the light source to oriented holder③ and power socket④, and then push light source into arm smoothly and plug it thoroughly. (See Fig. 4)

2-2-3 *Assemble the Stage*

(1) Loosen the lock-screw① on the stage fully. (See Fig. 5)

(2) From a rear area of the rounded hole center on the base, carefully ring the two "V" buttons on the bottom of the stage into the "V" rounded groove②, then screw down the lock screw①.

★The stage of different size and shape is available according to customer.

2-2-4 *Assemble the Condenser*

(1) Rotate the coarse focusing knob① to raise stage to the highest. (See Fig. 6)

(2) Rotate the condenser up-down knob② to lower the condenser bracket to the lowest.

(3) Loosen the condenser lock-screw③ fully.

(4) Swing out the front lens of condenser with the

scale forward. Make the lock screw of condenser in alignment with the groove of the condenser stand. Push the condenser into the innermost of stand.

(5) Screw down the condenser lock-screw③, and raise the condenser to the highest position with the condenser up-down knob②.

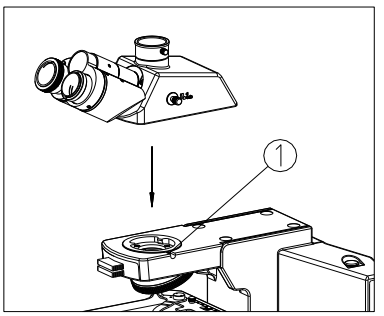


Fig.7

2-2-5 ***Assemble the Head***

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

(2) From a little right position, insert the coattail interface on the bottom of head into the hole of middle head with a little left inclined. Keep the two eyepiece tubes forward, and then screw down the lock screw①.

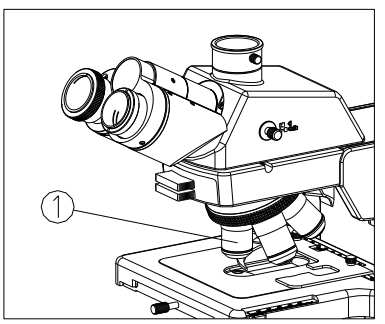


Fig. 8

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 (5X or 10X) when operating. Then get change to the high magnification ones according to the observation requirements.

★When replacing the objective, rotate the nosepiece until it sounds "ka-da", to make sure the objective is in the center of the light path.

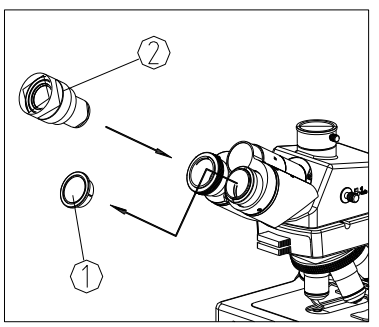


Fig.9

2-2-7 ***Assemble the Eyepiece***

(1) Take down the cover of eyepiece tube①. (See Fig.9)

(2) Insert the eyepiece② into the eyepiece tube, until touch the bottom.

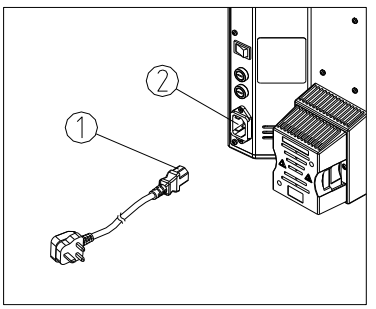


Fig. 10

2-2-8 ***Connect the Power Cord***

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

(2) Insert one end of power cord① into the power socket② of the microscope.

(3) Insert the other end of power cord into the power supply socket.

★Don't use strong force when the power cord is bended or twisted, otherwise it will be damaged.

★Use the special wire supplied by our company. If it's lost or damaged, choose one with the same specifications.

★Connect the power cord appropriately to make sure the instrument is connected to ground.

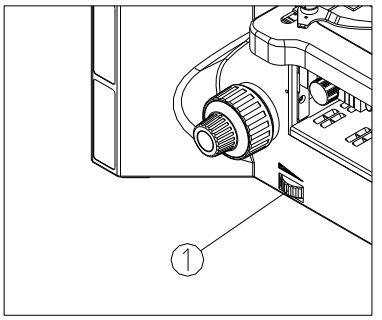


Fig. 11

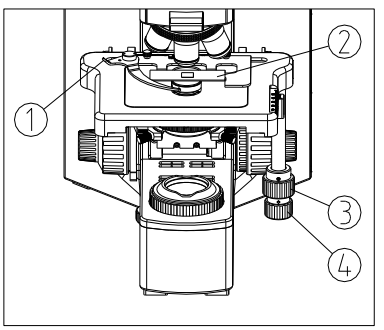


Fig. 12

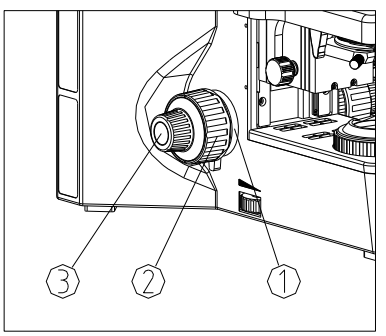


Fig. 13

3-1 ***Set Illuminations***

(1) Put through the power and turn on the main power switch to"—". (see Fig. 11)

(2) Adjust the light adjustment knob① until the illumination is comfortable for observation. Rotate the light adjustment knob① clockwise to raise the brightness. Rotate the light adjustment knob① counterclockwise to lower the brightness.

★ Use bulbs in the low-voltage state can extend the bulb life.

3-2 ***Place the Specimen Slide***

(1) Push the wrench① of the specimen holder backwards. (See Fig. 12)

(2) Loosen the wrench①, and clamp the slide② by the clips while the cover glass faces up.

(3) Rotate the X-axis knob④ and Y-axis knob③. Move the specimen to the center (alignment with the center of the objective).

3-3 ***Adjust Focusing***

(1) Put the slice on the stage, and hold it down with the clip. Shift the 4X objective into the light path. (See Fig. 13)

(2) Loosen the random upper limit knob①, then observe the right eyepiece with the right eye. Rotate the coarse focusing knob② until the image appears in the view field, then lock the random upper limit knob①.

★The random upper limit knob can prevent the objective touching the slice when focusing.

★The random upper limit knob does not react on the fine focusing knob.

(3) Rotate the fine focusing knob③ for clear details.

★When observing with the 4X or 10X objective,

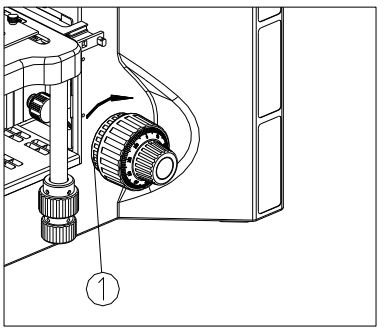


Fig. 14

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.

3-4 *Adjust the Focusing Tension*

If the handle is very heavy when focusing or the specimen leaves the focus plane after focusing, or the stage declines itself, please rotate the tension adjustment knob① according to the arrowhead pointed direction. (See Fig. 14)

3-5 *Adjust the Diopter*

After the image is clear in the right eyepiece, observe the left eyepiece with the left eye. Rotate the diopter adjustment ring① until the image is clear (Fig. 15).

There are ±5 diopters on the diopter adjustment ring①, the value aligned with the scale is your eye's diopter. The dot "·" on the left side can also indicate.

★Remember your eye's diopter, so that you can use it next time.

★ The user could select any side of the eyepieces as a standard of reference if there is diopter adjustment ring on both eyepiece tubes, then adjust the other one. The eyepiece which is selected as a standard of reference must line up with "0" before focusing observation.

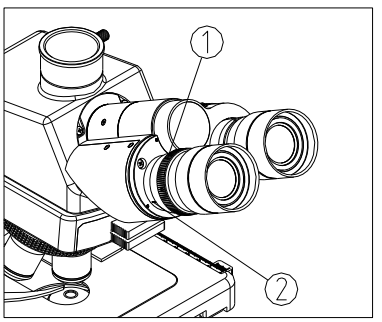


Fig. 15

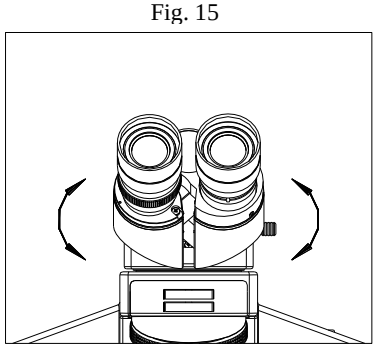


Fig. 16

3-6 *Adjust the Interpupillary Distance*

When using two eyes to observe, hold the bases of the prism and rotate them around the axis to adjust the interpupillary distance, until there is only one field of view. (See Fig. 16)

The dot "·" on the left eyepiece base points to the

scale of the interpupillary distance indicator. The scale value is the interpupillary distance.

Adjustable range: 50~76mm.

★Remember your eye's interpupillary distance, so that you can use it next time.

3-7 *Center the Condenser*

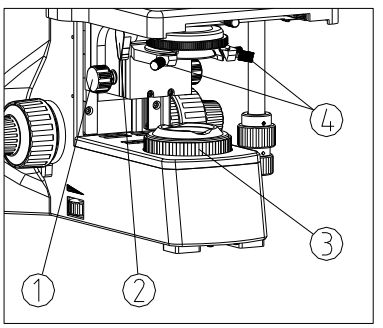


Fig. 17

(1) Rotate the condenser up-down knob① to raise it to the highest position. (See Fig. 17)

(2) Rotate the spanner② to move the front lens 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 ring③ to put the field diaphragm to the smallest position, then the image of field diaphragm can be observed through eyepiece.

(5) Rotate the condenser up-down knob to adjust the image to the clearest.

(6) Adjust the condenser center adjusting screw④ to put the image to the center of the field of view.

(7) Open the field diaphragm gradually. If the image is in the center all the time and inscribed to the field of view, it shows condenser has been centered correctly. (See Fig. 18)

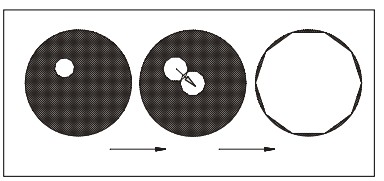


Fig. 18

(8) In use, you can enlarge the field diaphragm and make the image circumscribed to the field of view.

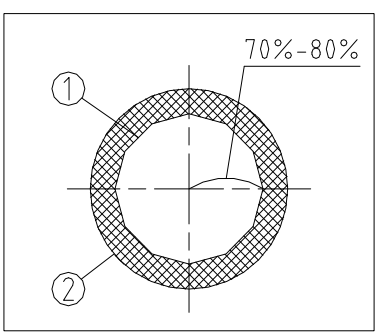


Fig. 19

3-8 *Adjust the Field Diaphragm*

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

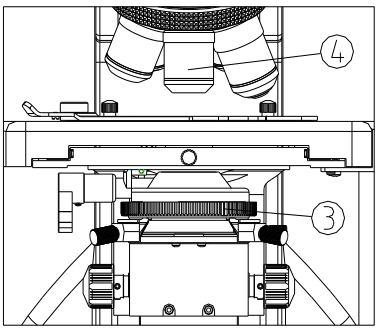


Fig. 20

3-9 *Adjust the Aperture Diaphragm*

The aperture diaphragm decides the numerical aperture of the illumination system. If the N.A. of illumination system matches with the N.A. of the objective, it can obtain better resolution and contrast, and increase the depth of field.

As the contrast is usually low, it is advised to adjust the condenser aperture diaphragm to be 70%-80% of the N.A. of objective. The eyepiece can be taken off when it's necessary to observe from the tube. Adjust the aperture diaphragm adjusting ring③ until see the figure as shown in Fig. 19, to adjust the proportion (see Fig. 19&20, ① is the image of aperture diaphragm, ② is the edge of objective).

Use of scale: set the scale of condenser N.A. to the 80% value of objective④ N.A.

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

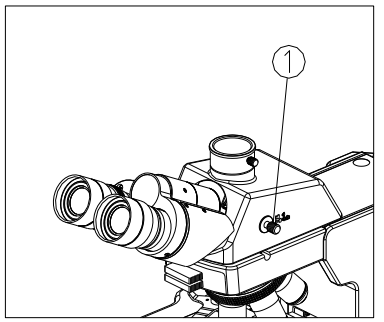


Fig. 21

3-10 *Select the Light Path*

For trinocular head, the light path selecting pole① control the light-energy ratio of binocular and trinocular. When the light path selecting pole is pushed to the innermost, all the light will enter the binocular head; when it is pulled to the outmost, the ratio of binocular and trinocular is 5:5. Usually, push the selecting pole to the innermost for binocular observation, and must pull the selecting pole to the outmost for trinocular observation (TV&Photography). (See Fig. 21)

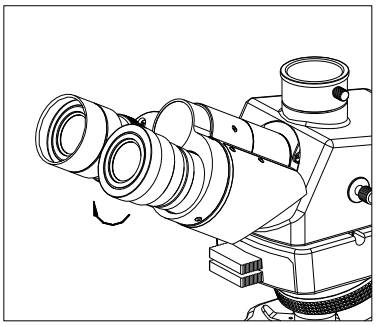


Fig. 22

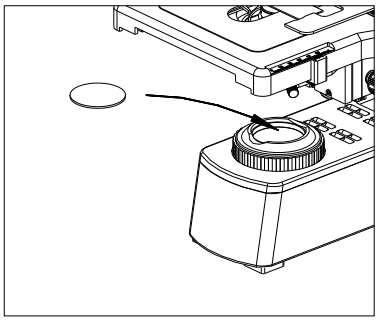


Fig. 23

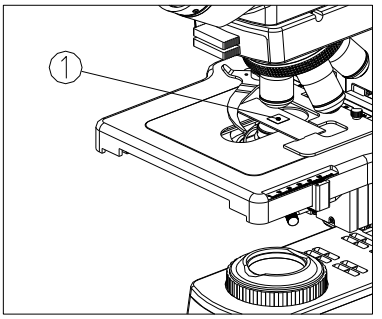


Fig. 24

3-11 *Use the Eye-cap*

(1) Turn over the eye-cap if the user is wearing glasses, so that it can prevent the glasses touching the eyepieces and avoid damaging to both glasses and eyepieces.

(2) Open the eye-cap if the user doesn't wear glasses, so that it can prevent stray light disturbing the observation. (See Fig. 22)

3-12 *Use the Color Filter*

The color filter can make the background light more suitable and strengthen the image contrast (Fig. 23).

There are four colors of filter selectable: blue, green, yellow and white.

★Place the rough side of filter downwards.

3-13 *Use the Oil Objective (100X)*

(1) Use the 4X objective to focus the specimen.

(2) Place a drop of oil① 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 is no air bubble in the oil for fear affect the image.

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 tube (It seems round and light).

B. Rotate nosepiece slightly and swing the oil objective for some times 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.

★ **Don't put another objective to the light path before the oil is wiped to avoid wetting the dry objective.**

★ **Too much dimethylbenzene would dissolve the lens's stickiness.**

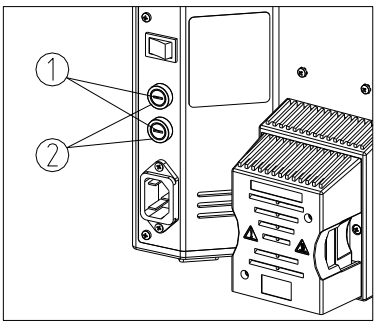


Fig. 25

3-14 *Replace the Fuse*

Turn the main switch to "O" (OFF) before replacing the fuse. Pull out the power cord. Then screw off the fuse group① from the fuse base② with a "-" type screwdriver. Install a new fuse and screw it in the fuse base (See Fig. 25).

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

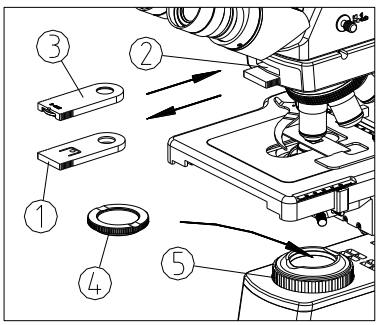


Fig. 26

3-15 *Assembling and Operation of Simple Polarizing*

Simple polarizing system includes polarizer④ and 360° rotatable analyzer③.

(1) Unplug the dust-cover① from the socket② of front body, and insert the 360° rotatable analyzer③ into the socket②. (See Fig. 26)

(2) Put the polarizer④ into the condenser⑤ groove.

(3) Rotate the 360° rotatable analyzer③ can start simple polarizing observation.

★**When view field of eyepiece is the darkest, the polarizer④ and 360° rotatable analyzer③are in the polarized orthogonal state.**

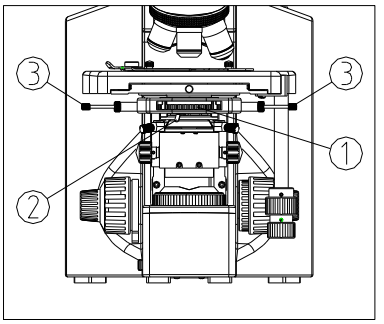


Fig. 27

3-16 *Assembling and Operation of Disc Phase Contrast Condenser*

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

There are each magnification ring diaphragm and bright field "BF" hole positions on the phase contrast.

ring①. In phase contrast observation, ring diaphragm magnification of phase contrast ring① should match with the phase contrast objective, and center the ring diaphragm. In bright field observation, rotate the phase contrast ring① to "BF" position. When it sounds "ka-da" in rotating, it indicates that one diaphragm or hole is rotated into the center of optical path (see Fig. 27).

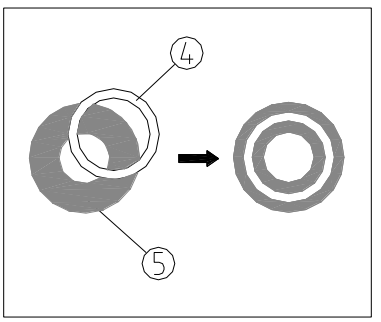


Fig. 28

3-16-1 ***Centering Halo***

(1) Rotate the 10X phase contrast objective into the light path, then rotate the ring diaphragm of phase contrast ring① to the 10X position.

(2) Turn the aperture diaphragm lever② to the leftmost.(Always keep the aperture diaphragm to the maximum in phase contrast observation.)

(3) Put specimen on the slice clip and focus.

(4) Take out one observation eyepiece and replace it with a CT (centering telescope) into the tube without diopter adjustment.

(5) Loosen the lock screw of the centering telescope, move the telescope tube up and down, to adjust the image of the halo④ and phase ring⑤ to be clear, and then lock the screw. (See Fig. 27 & 28)

(6) Adjust the phase contrast ring adjusting lever③ when observing from the centering telescope, and center the halo④ with the phase ring⑤.

(7) Take off the CT, and insert the eyepiece, to observe the phase contrast effect.

(8) Adjust phase contrast objectives of other magnification and ring diaphragm according to above steps.

★ **It cannot get the best phase contrast observation effect if the halo is not centered correctly.**

★ **Center the brightest halo to the objective phase ring if double image appears.**

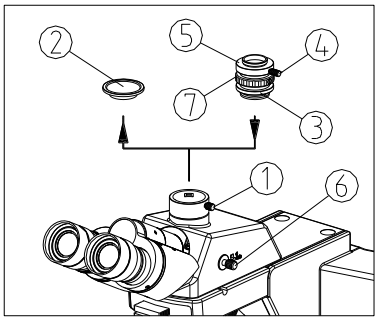


Fig. 29

3-17 *Assemble and Use the TV Device*

(1) Loosen the lock screw① of trinocular head, and take out the dust-cover②(See Fig.29).

(2) Take off the dust-cap of the TV adapter③. Insert the TV adapter into the trinocular head as shown in the figure and screw down the lock screw①.

(3) Loosen the lock screw④ of the TV adapter. Take down the vidicon interface (C type) ⑤ from the TV adapter, and screw into the CCD or vidicon. Then install the interface into the TV adapter, and screw down the lock screw④.

(4) For binocular observation, pull the light path selecting pole⑥ to the outmost and observe the image. If the image is unclear, rotate the adjustment tube⑦ until it is clear.

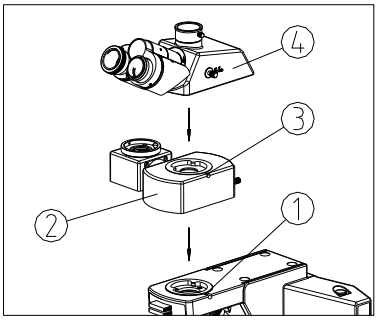


Fig. 30

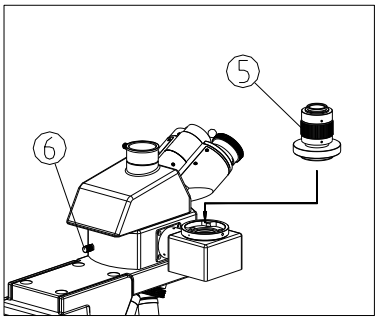


Fig. 31

3-18 *Assemble and Use Intermediate Optical Splitter*

(1) Loose the lock-screw ① completely. (See Fig. 30)

(2) From a little right position, insert the coattail interface on the bottom of intermediate optical splitter ② into the hole on the stand with a little left inclined, and keep the TV device interface on the left side of the body. Then screw down the lock screw①.

(3) Loose the lock-screw ③ completely.

(4) Insert the middle coattail on the bottom of the head④ to the round hole of the intermediate optical splitter from its center a little right. Keep the two eyepiece tubes ahead. Screw down the lock-screw①.

(5) Insert the TV device ⑤ into the intermediate optical splitter ② as shown in Fig. 31. See ***3-17 Assemble and Use the TV Device*** for more details.

(6) For binocular observation, pull the light path selecting pole⑥ to the outmost and observe the image. If the image is unclear, rotate the adjustment tube until it is clear.

4. Technical Specifications *BS-2064 Series*

4-1 *Key Technical Specifications of BS-2064 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 *Parameters of Objective*

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

5. Troubleshooting *BS-2064 Series*

As the performance of microscope can't play fully due to unfamiliar operations, the table below can provide some solutions.

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 δ0.17mm.
	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.

Problem	Cause	Solution
	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 superpose with the left.	Interpupillary distance is incorrect.	Adjust the interpupillary distance.
	Diopter adjustment is incorrect.	Adjust the diopter.
	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.

Problem	Cause	Solution
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.