BestScope

# Inverted Fluorescence Microscope

## BS-7020

# Instruction Manual


To ensure correct operation, please read this manual thoroughly before using the microscope and keep it near the product for easy reference.

# CONTENTS

# User notice

## 1. Application

BS-7020 Inverted Biological microscope is the dedicated microscope for biological and medical areas, applied in the field of microscopic measurement, health agencies, laboratories, research institutes and universities and other units for biology, genetics, immunology, chemistry, environment protection, oceanography, pharmacology, bacterial observation, education and professional studies.

## 2. Safety Precaution


Fig.1

1. Do not keep the instrument in a direct sunlight, high temperature or humidity, dusty and easy shaking environment. Make sure the stage is plane, horizontal and stable enough.(Weight: about 11.5 kg)
2. When moving the microscope, please hold the instrument by the lower side of the observation tube④ and the illumination column②. (Fig.1）
3. If the bacterium solution or the water splash to the stage, objective or viewing tube, set the main switch to off state and unplug the power cord. Then wipe away any liquid. Otherwise, the instrument will be damaged.
4. When working, the lamp house on the top of the arm③ (Fig.1) will become very hot, be sure there is enough room around the lamp house (especially the top side for cooling).

5. Before replacing the lamp bulb or fuse, turn the main switch① to the "O"(off) position, then cut off the power. If the lamp is on, or soon after it has been turned off, it is hot and will cause serious burns, please do the replacement after it cool down completely.

   ★ Specified lamp: the halogen lamp 6V30W (PHILIPS5761)

6. Earth this instrument to prevent the lightning strike.

7. Use the specified power cord, please.

8. The product should stored in a shady location and no acidic gases, alkalis, organic solvents and other hazardous materials surrounding, the storage period is usually not more than 6 months.

9. ★ always ensure that the grounding terminal of the microscope and that of the wall outlet are properly connected. If the equipment is not grounded, we can no longer warrant the electrical safety performance of the equipment.

## 3. Maintenance 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 source 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 attempt to use organic solvents to clean the microscope components other than the glass components. To clean them, use a lint-free, soft cloth slightly moistened with a diluted neutral detergent.

3. be careful not to spill any liquid – such as a culture solution –on the unit. if you do spill anything, immediately set the main switch to off and unplug the power cord. then wipe away any liquid on microscope.

4. Do not disassemble any part of the microscope as this could result in malfunction

or reduced performance.

5. If no objectives are mounted, be sure to cover the objective mounting threaded positions on the revolving nosepiece to prevent any dust and spilled culture solution

from getting on the lenses inside.

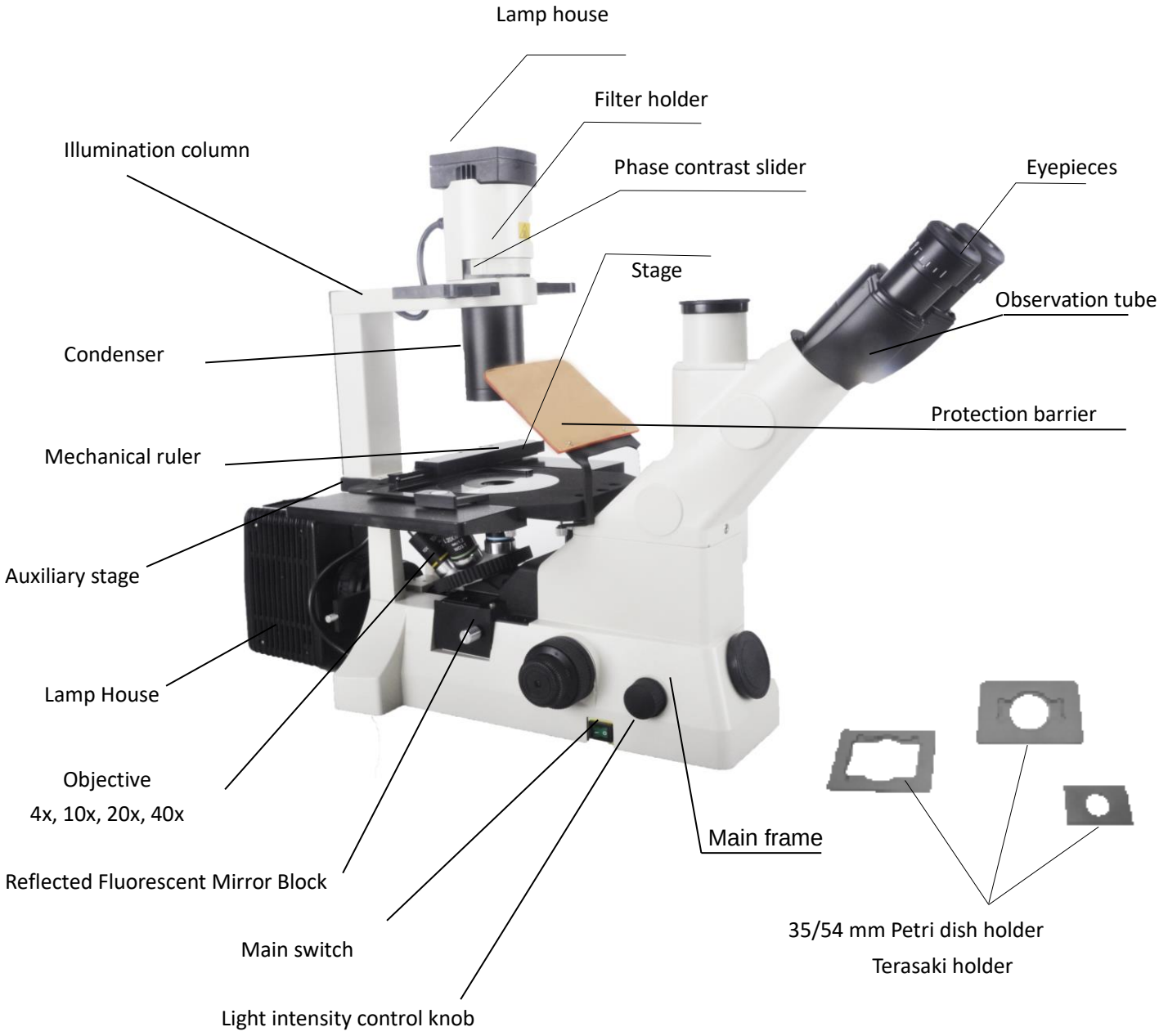
6. When not using the microscope, keep it covered with a dust cover. Make sure

the lamp socket is cool before covering the microscope.

## 4. Safety Symbols

| Symbol | Explanation |
|---|---|
|  | Indicate that the surface becomes hot, and should not be touched with bare hands. |
|  | Before use, carefully read the instruction manual. improper use could result in personal injury to the user and/or damage to the equipment. |
|  | Indicate that the main switch is ON. |
|  | Indicate that the main switch in OFF. |

## I. Nomenclature




BS-7020 Inverted Fluorescence Microscope

Fig.2

## 2. Installation

### 2-1 Installation Diagram

The following figure shows the installation sequence of the components. The number in the figure shows the installation sequence.

**Before installing, be sure every component is clean, do not score any parts or glass surface.**

★ **Keep well with the supplied S1.5 and S2 hexagon wrench. When changing the components, you will need it again.**

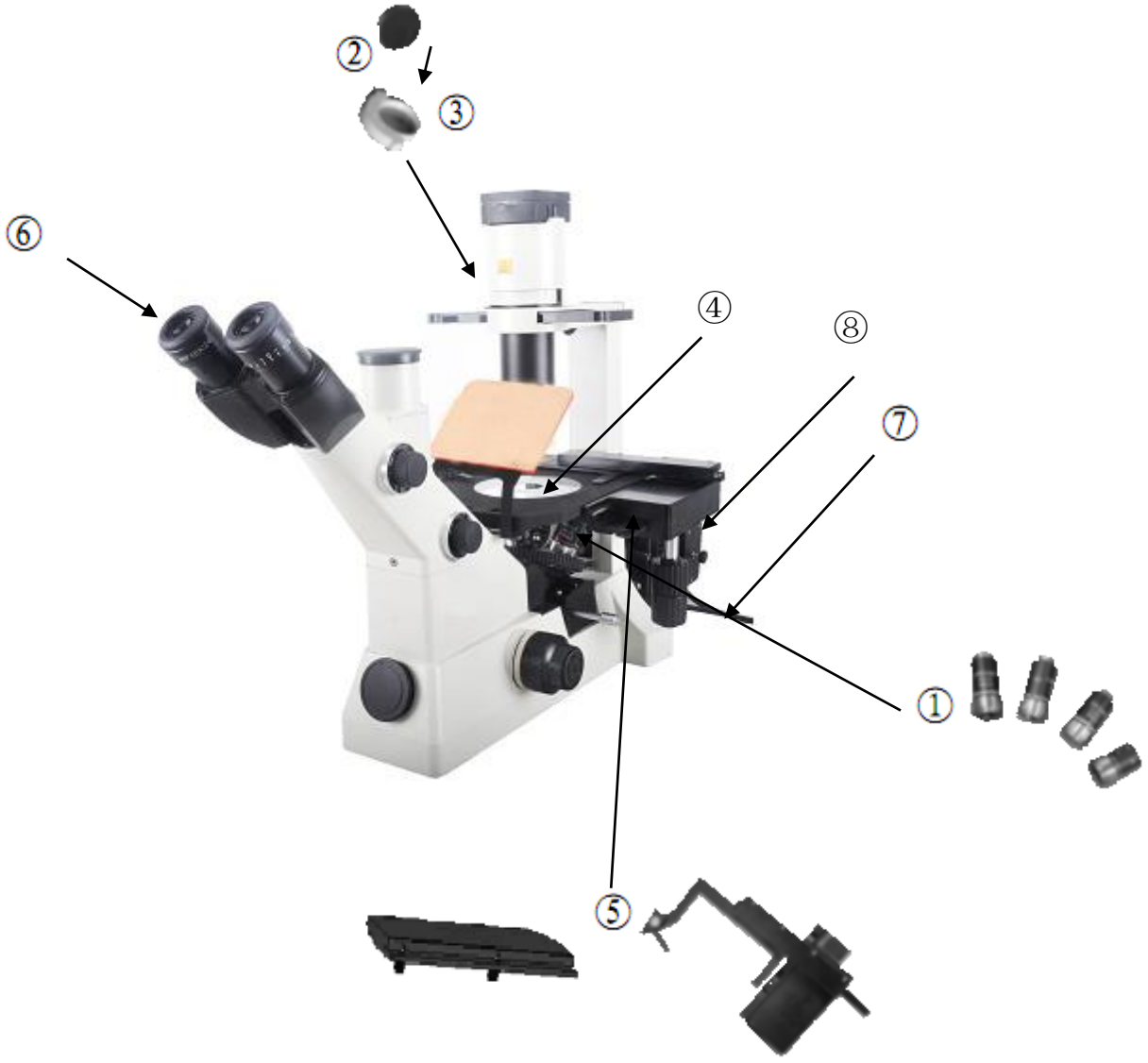



Fig.3

## 2-2 Installing steps

### 2-2-1 Installing and replacing the lamp (Fig.4)

## ✧ Please use the specified halogen Lamp 6V30W.

1. Hold to the bulb ①after you wrap it with gauze or other protection materials, then depress the plugs② into the jack④ on the lamp house, ensure the filament and the bolt③ are in a same level.
2. Replacing the lamp when using or soon after

When using, or soon after it is turned off, the lamp, the lamp house and nearby parts will be very hot and will cause serious burns. Please turn the main switch to “O” (off), pull up power plug, and make sure the bulb, the lamp house and periphery are all cool. Then, you can do your replacement.

**★ Please insert the bulb gently, or it will be damaged by excessive extrusion.**

**★ Do not touch the Halogen bulb with your bare hands. It will shorten the service life or cause it to burst. If you leave fingerprints on the surface carelessly, clean it with a dry soft cloth.**

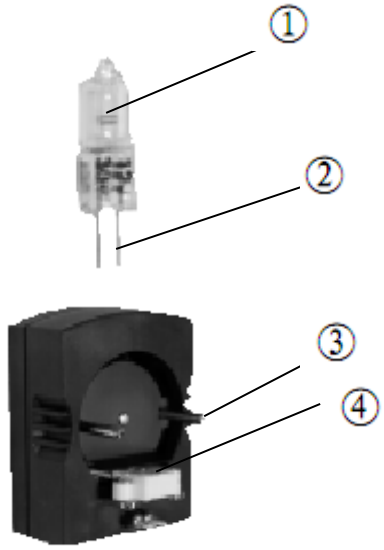



Fig.4

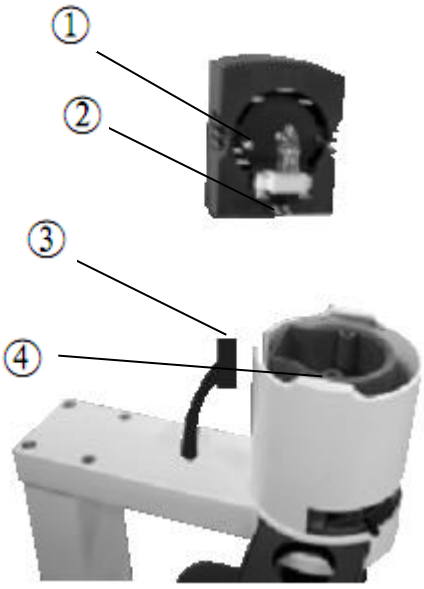



Fig.5

**2-2-2 Installing the lamp house (Fig.5)**

Keep the BNC connector plugs③ and the lamp house pin② in line, and keep the bolt① and the condenser jack④ in line, too. Then push the lamp house into the illumination unit gently until they are against each other.

**2-2-3 Mounting the objectives (Fig.6-7)**

1. Turn the coarse adjustment knob① as Fig.6 shows until the revolving nosepiece is set at its lower limit.

**★ For ensuring the safety of the instrument during transportation, the nosepiece is located in the lowest position and the tension adjustment collar② is adjusted to an appropriate tension while leaving the factory.**

2. Screw the lowest magnification objective onto nosepiece from the nearside, then turn the nosepiece clockwise, mount other objectives according the magnification sequence of low to high.

◎ Mount objectives in this way will make the change of magnification to be very easy in using.

◎ It also can install the objective through the stage opening.

★ Clean the objective regularly, the objective used in the inverted microscope is very sensitive to dust.

★ Be sure to cover any unused threaded positions with the objective caps to prevent dirt and dust from getting inside.

★ When operating, use the low magnification objective (4X or 10X) to search and focus the specimen at first, then use higher magnification objectives if necessary.

★ When replacing the objectives, slowly turning the nosepiece until you hear “clicked”, that means the objective enter into the right position—center of the light path.

Fig.6

Fig.7

**2-2-4 Installing the stage lengthen splint and the mechanical ruler (Fig. 8)**

◎ Stage lengthen splint can be installed at either side of the stage to enlarge the work surface. But you can't install the mechanical ruler together at the same side.

◎ Generally, the mechanical ruler will be installed at the right side for comfortable adjustment.

1. Installing the stage lengthen splint
   First, Screw the fixed bolt① on to the splint, then mount it on to the stage from right or left below, screwing down the bolt until it stay hard.
2. Installing the mechanical ruler
   Please install the ruler in the same way as the stage splint.

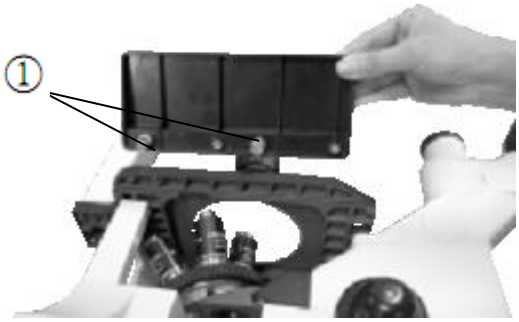



Fig.8

**2-2-5 Installing the stage inserted plate (Fig.9)**

1. When using the glass stage ①, there is no special requirement, you just need to place it in a plane.
2. Install the stage inserted plate on to the stage opening.

◎ Turn the disk, let the V nick face the user, so the recognition of the objective will become easier.

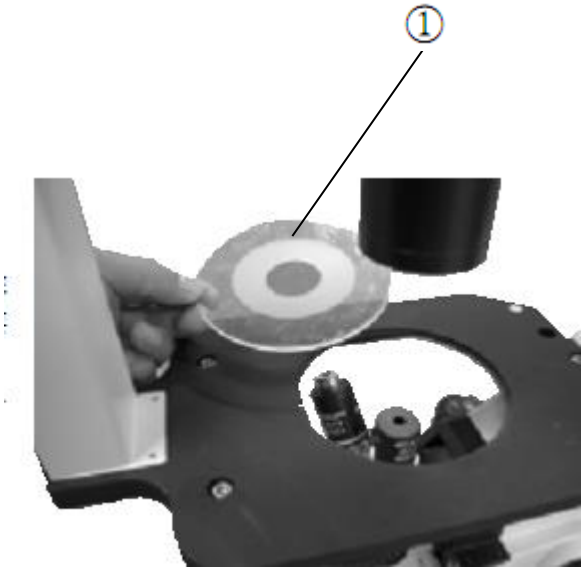



Fig.9

**2-2-6 Installing the eyepiece (**Fig.10)

1. Remove the cap of the eyepiece tube①.
2. Insert the eyepiece② into its tube③ until they are against each other.
3. screw tightly the bolt③ with provided S1.5 wrench to keep the eyepiece from dropping out.

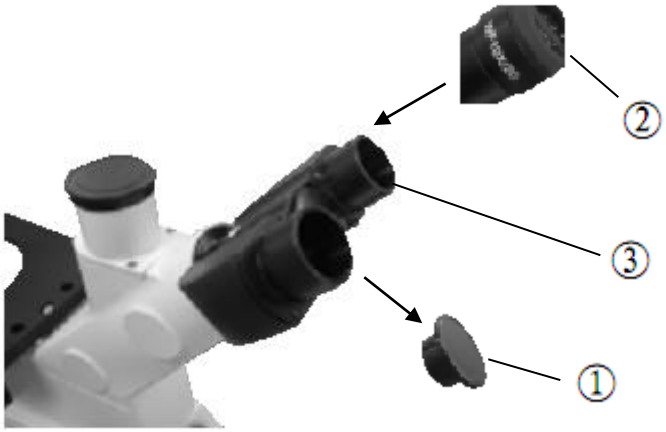



Fig.10

**2-2-7 Installing the color filters (Fig.11)**

Let the filters cool down sufficiently before replacing them. Take out the filter holder① and insert the required filters②.

Push the filter down to the bottom as shown in Fig.11 ③ so that it does not tilt. If the filter is inclined or is not pushed down to the bottom④, it may fall off the filter holder.

◎More than one filter can be stacked in the filter holder. You can mount as many as you like, as long as the total thickness does not exceed 11mm.


Fig.11

## 2-2-8 Mounting the Mercury Burner (Fig.12 & fig.13)

1. Loosen the burner socket clamping screw ①, and remove the burner socket. (fig.12)
2. After removing the plastic backstop ④, securely insert the + pole (the wide head) of the specified mercury burner②to the lower terminal first and then the – pole(the thin head) to the upper terminal, then tighten the two socket clamping screws③. (fig.13)

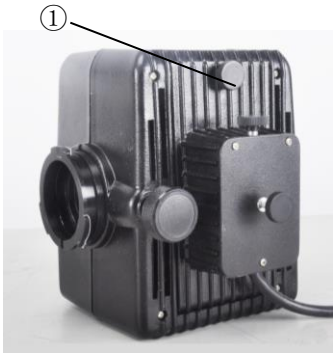



Fig.12

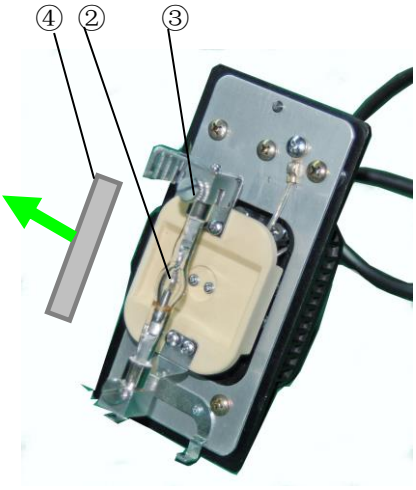



Fig.13

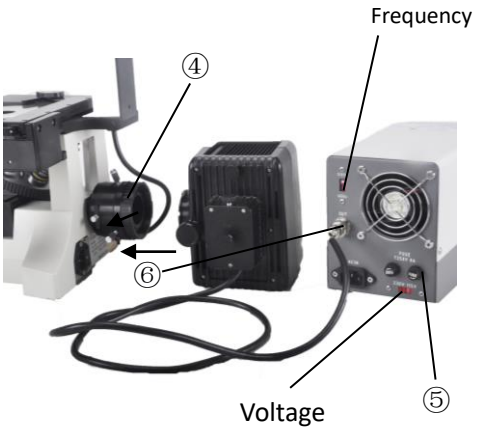



Fig.14


Fig.15

- Be sure to use a 100W HBO spherical mercury burner.
- Be sure to mount positive pole(the wide head) before the other , or the damage to the burner may occur.
- Never subject the burner to excessive force when mounting the Mercury Burner.
- Be careful and avoid leaving fingerprints or dirt on the mercury burner. Attached stain may cause distortion in glass which could result in a ruptured burner. If stained, wipe it a way gently with clean gauze.

★ To prevent any hazard, always turn the main switch on the power supply unit to “O” (OFF), unplug the power cord plug from the mains outlet, and wait for at least 10 minutes before replacing the burner.

### 2-2-9 Lamp house, power supply unit and cord connections (Fig.14＆15)

1. Connect The lamp house to the access tube, and then tighten the lamp house with the ring④, as shown in fig14.
2. Plug the connector from lamp house securely into the connector⑥ on the power supply unit and make sure the cord is correctly connected.
3. Connect the two ends of power cord to the power supply unit and wall outlet respectively. (Make sure that the main switch⑦of the power supply is set to “O”（OFF）before connecting cables.)

- Verify that the voltage and the frequency of the AC mains outlet matches the setting of the voltage and the frequency switches on the rear of the power supply units(fig.15) and improper setting may degrade burner performance , or in the worst case(although very rare), cause the burner to explode.
- It is better to use the supplied power cord and the same type power cord should be used if you lose or damage the old one.

**2.2.10 Attaching the protection barrier, stage center plate and Fluorescence mirror switching lever (Fig.16)**


Fig.16

1. Extend The light shielding plate into the lower part of the platform, then tighten the two clamping screws②.
2. Fit the stage center plate into the opening on the stage.
3. Screw the Fluorescence mirror switching lever③ into the reflected fluorescence illuminator unit below the nosepiece.

**2-2-11 Connecting the power cord (Fig.17,18 &19)**

**★ Cables and cords are vulnerable when bent or twisted. Never subject them to excessive force.**

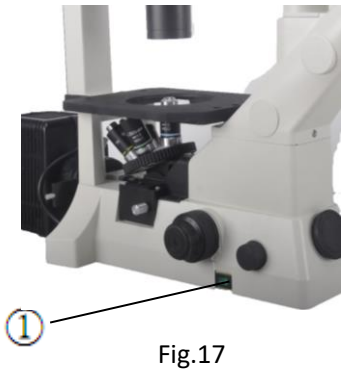



Fig.17

1.Make sure that the main switch of the power supply is set to "o"(OFF)before connecting cables.(Fig.17)
2.Connect the plug④ of the illumination column firmly to its jack⑤on the rear of the microscope.(Fig.18)
3. Connect one end of the power cord② into its connector ③ on the rear of the microscope.(Fig.18)
4. Connect the other end of the power cord② to a wall outlet⑥.(Fig.19)

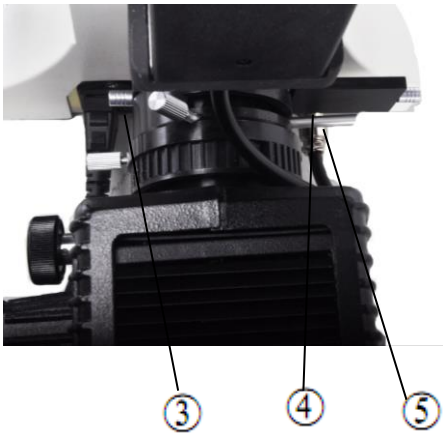



Fig.18

**★ Do always use the supplied power cord. If lost or damaged, select the same standard cord, please.**

**★ Connect the power cord correctly, to ensure the instrument is grounded.**

**2-2-12 Replacing the fuse (Fig.17-19)**

★ Do remember to turn the main switch① to the state of "O" (off) before replacing the fuse, and unplug the **power** cord②. Rotate the fuse kits out of the holder by the "--"type screwdriver, replace a new fuse, then rotate back to the holder again.

★ Fuse rating: 250V, 1A.

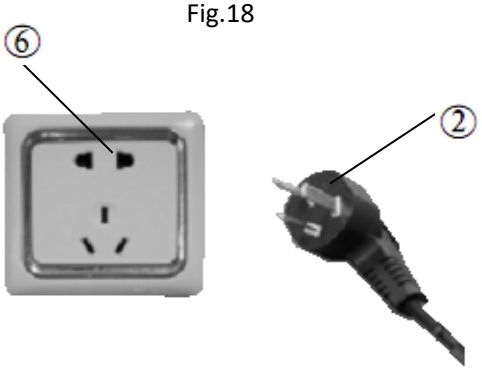



Fig.19

## 3. Controls

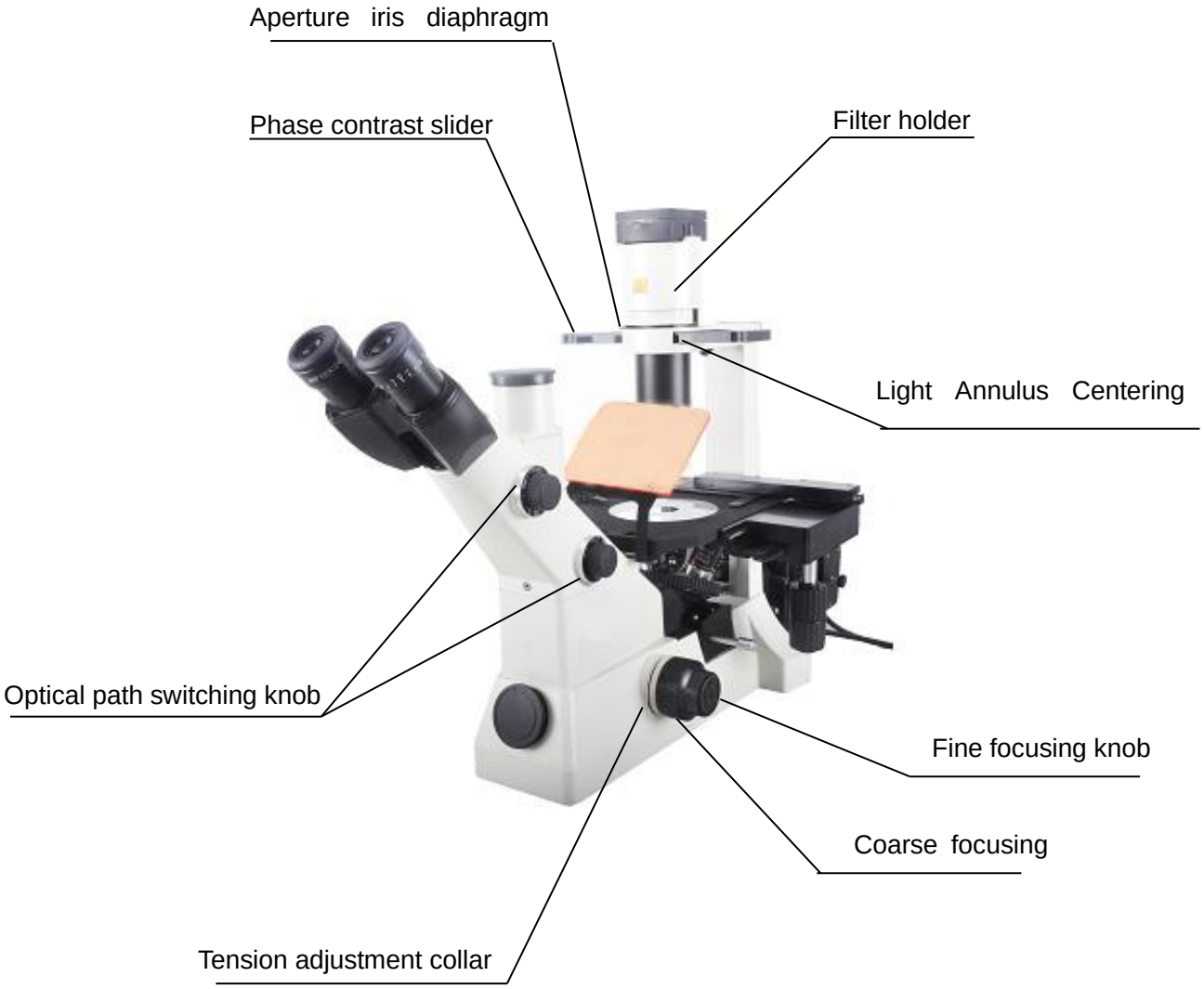



Fig.20

Connect the power supply, turn on the main switch①(shown in Fig.21)which on the bottom side of the base to "—"(on).

Turning the brightness adjustment knob② clockwise, the voltage raise, and the brightness strengthen; Whereas turning at the contrary direction, the voltage decline and the brightness weaken.

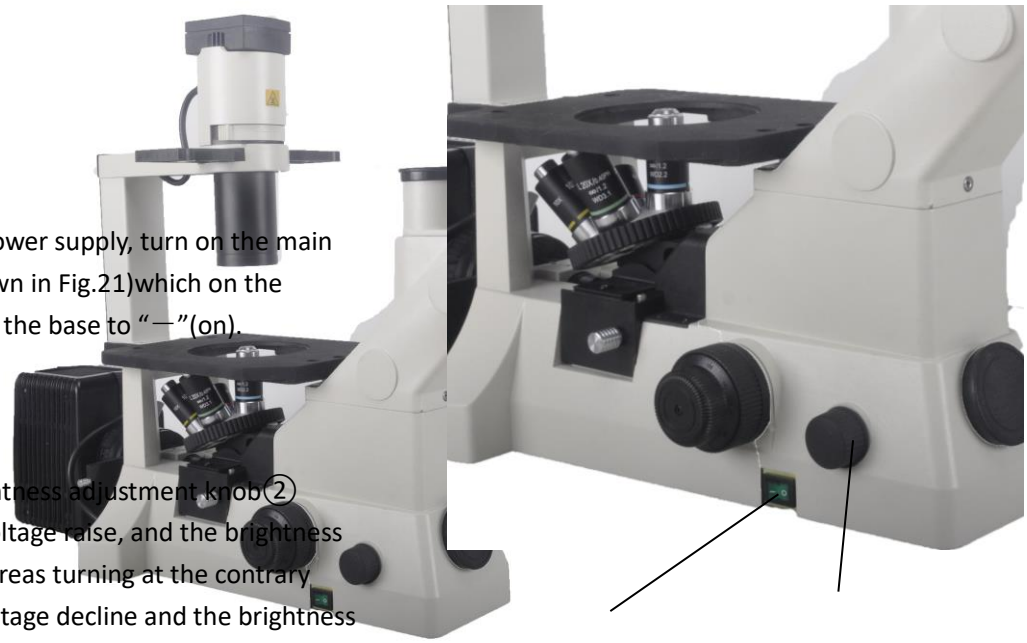


Fig.21

### 4-1-3 Adjusting the tension of the coarse adjustment knob (Fig.22)

★ Be **sure** to use the tension adjustment ring① to adjust the rotation tension of the coarse adjustment knob.

Adjustment procedure:

◎ How to adjust the tight tension

Turning the tension adjustment ring ① with your finger by counter-clockwise in the figure, the tight tension of the coarse focus knob② is increasing； And if at the contrary direction, the tight tension will decline.

If the nosepiece dropped automatically, or the specimen defocused soon even you focus with the fine focus knob③. It means the coarse focus knob is too loose, you should screw it down at the direction shown by the arrowhead in the Fig.22.


Fig.22

### 4-1-4 Using color filters (Fig.23)

◎ using appropriate filters according to the purposes allows you to observe and photograph specimens more effectively. Particularly, the use of the LED filter is recommended in observation and photomicrography because it renders more neutral colors.

◎ More than one filter can be stacked in the filter holder (filter diameter: 45mm maximum; thickness of stacked filters: 11mm)

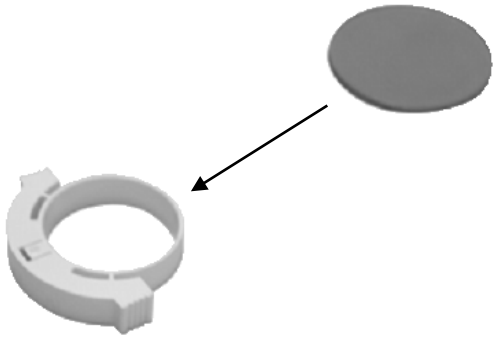


Fig.23

| Filter | Application |
|---|---|
| IF550 | Monochrome contrast filter (green) |
| LBD | Color temperature conversion filter (for observation and photomicrography) |
| SIF800 | Exposure time compensation in photomicrography |

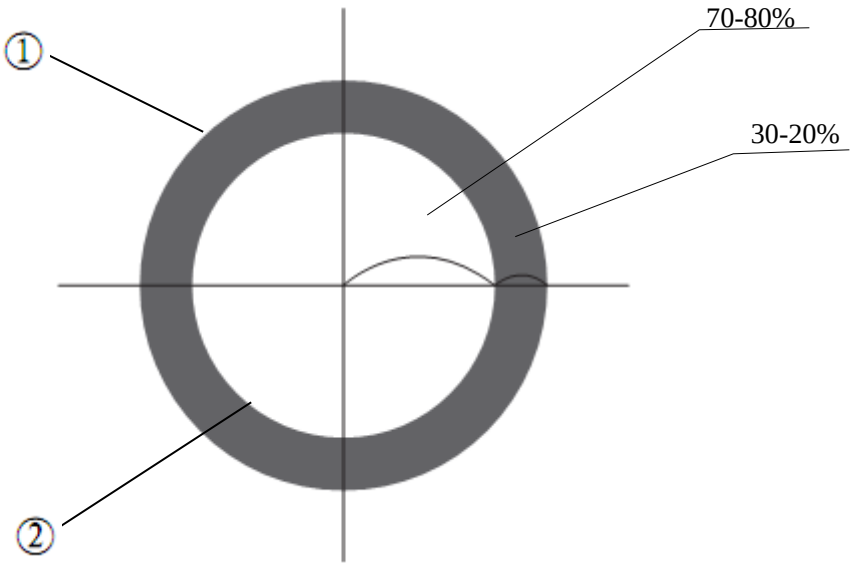



Fig.24

**4-1-5 Using the aperture diaphragm (Fig.24)**

◎ the aperture iris diaphragm determines the numerical aperture of the illumination system in bright field observation.Only when the numerical aperture of the objective and the illumination system being matching, you can obtain the higher image resolution and contrast, and the increased depth of focus, too.

● Checking the aperture iris diaphragm

Remove the eyepiece when necessary (and inset the centering telescope if you have one), then look into the eyepiece sleeve; you will see the field of view as shown in Fig.24.now adjust the aperture iris diaphragm lever as required.

● Generally, when observing a dyed specimen, set the aperture iris diaphragm② to 70% to 80% of the N.A. of the objective① in use. However, when observing a culture specimen, which is not dyed, set the aperture iris diaphragm lever toward“◎” .

**4-1-6 Removing the condenser lens (Fig.25)**

To provide more working distance, turn the condenser's lower section ① and remove it. The height of Petri dish can be up to 150mm.

★When you do this, however, keep in mind that proper illumination cannot be achieved. Remove the condenser lens only when using a large culture vessel.


Fig.25

## 4-2 Stage

### 4-2-1 Placing the specimen (Fig.26& Fig.27)

**Put the specimen in the center of the stage.**

**★ to obtain the best image effect, please select the containers, such as culture dish and culture bottle, with the bottom thickness of 1.2mm, and the same thickness is also required for the specimen slide.**

◎Using the Φ35mm culture dish

You can lay a Φ35mm culture dish on the stage directly by using the standard center board① of the stage.

◎ Using the mechanical ruler

1. When using the 96bit or 24bit micro-titration board, please fasten it tightly by the stage clips ②.
2. When fastening other model boards, please use the following supplied brackets with mechanical ruler:

- Terasaki bracket⑦ for Terrasaki board.
- Culture dish bracket⑤forΦ35mm culture dish.
- Slide bracket⑥ for slide and Φ54mm culture dish

Turning the transverse knob③and lengthways knob④, move the specimen to the required position.

(Movement Range: 120 (width)×78 (Length) mm)

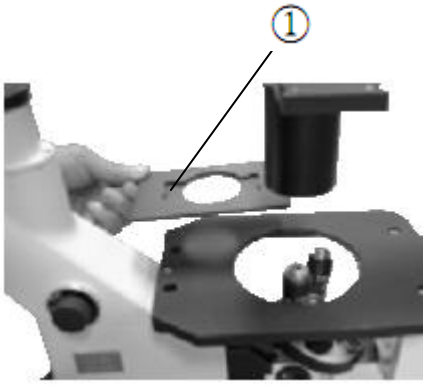



Fig.26

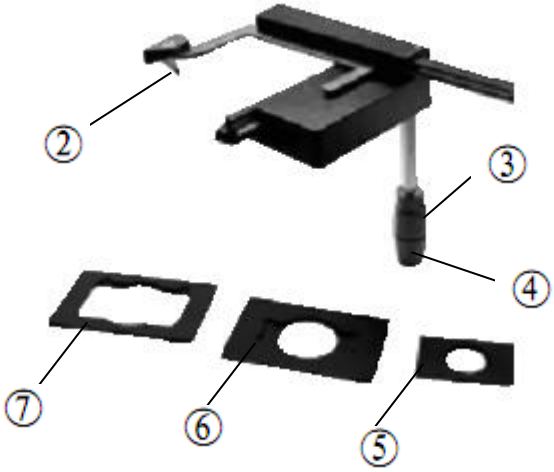



Fig.27

### 4-2-2 Moving the specimen

Turn the X-axis and Y-axis knobs of the mechanical stage or move the specimen directly by hand.

**★ Be careful when changing objectives. When objectives are switched after observing the specimen with an objective with short working distance, the newly selected objective may interfere with the stage center plate or Petri dish holder. Turn the coarse focusing knob slightly to lower the objective properly for that.**

## 4-3 The viewing tube

### 4-3-1 Adjusting the diopter (Fig.28)

1. Look into the right ocular by your right eye, then revolving the coarse focus knob to focus on the specimen.
2. Then use your left eye to look into the left ocular. If the image is not sharp, just use the diopter adjustment ring① to adjust please.

★ **There are ±5 diopter in the adjustment ring. The number which the reticle on the eyepiece holder pointed is your eye's diopter graduation.**

1. While looking through the left eyepiece with your left eye, turn the coarse and fine focus adjustment knobs to bring the specimen into focus. While looking through the right eyepiece with your right eye, turn only the diopter adjustment ring ①to focus on the specimen.

★ **There are ±5 diopter in the adjustment ring. The number which the reticle on the eyepiece holder pointed is your eye's diopter graduation.**

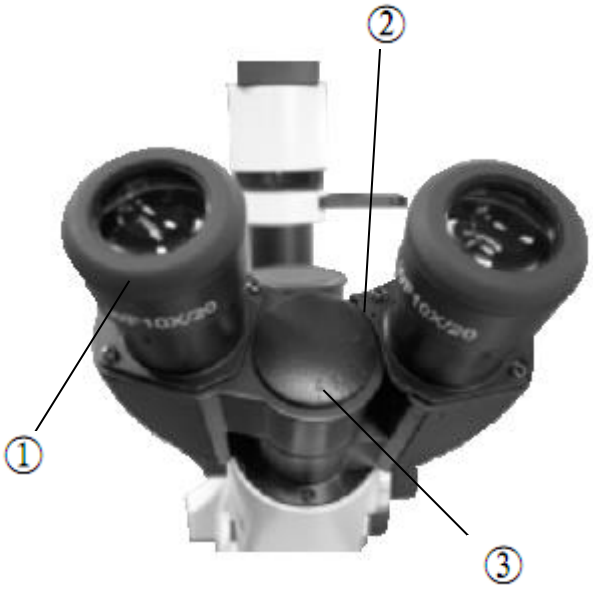



Fig .28

### 4-3-2 Adjusting the interpupillary distance

(Fig.28-29)

While looking through the eyepieces, move both eyepieces until the left and right fields of view coincide completely.

★ **The reticle on the interpupillary distance indicator③, pointed by the spot "." ②on the eyepiece holder, shows the scale of the interpupillary distance. (**Fig.28)

The range of the interpupillary distance:48～75mm.

Fig.29

**4-3-3 Selecting the light path**

◎Used for digital photography, CCD and 135 camera.

◎ Revolve two knobs in fig.30 respectively to select the light path you need.

◎ when in the binocular observation, turn the knob to the gap position until you heard a “clicked”. while using video or photography with upper or lower port, turn the upper or lower knob until it reached the “clicked” position.

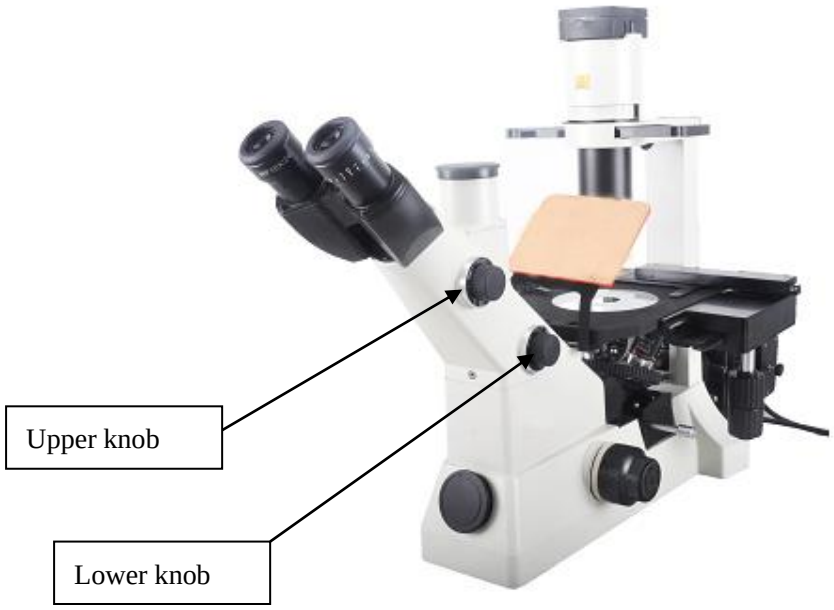



Fig.30

| Light path switching knob | Light Intensity ratio | Application |
|---|---|---|
| Both the upper and lower knob is set to gap position | 100% for binocular observation | Dark specimen observation |
| The upper knob is set to“PHO”position | 80% for binocular eyepieces, 20% for TV/photography | Observation of bright Specimens, photography, TV observation |
| The lower knob is set to“PHO”position | 100% for TV/photography | Photography, TV observation |

## 4-4 Adjustment of Power Supply Unit (Fig.31)

### 4-4-1 Power supplier connection

Set the main switch of the power supply unit to“—”（ON）. The arc will stabilize in 5 to 10 minutes after ignition.

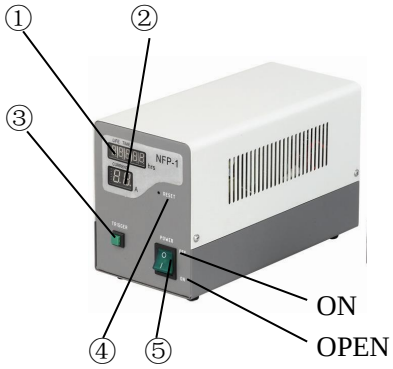



Fig.31

- Some mercury burners may not ignite the first time the power is turned on due to variance in production. If this occurs, set the main switch to “1”（ON）, then press the trigger button③ on the front panel of the power supply and between 1 to 4 seconds are required for igniting the burner. Repeat this if necessary.

◎ To avoid shortening the burner life, do not turn power on and off within short time intervals. Use the shutter instead.

◎ The burner cannot be re-ignited for about 15mimutes after turned off, that is, until the mercury vapor inside it has cooled down and condensed to liquid.

- Ensure that the hour counter is reset to “000.00” after replacement of the burner. And you can insert a thin isolator into the hole of the reset switch （fig.31 ④ ）on the front panel of the power supply unit to press the internal switch.

### 4-4-2 Controls on Power Supply Unit (fig.31)

1. The counter (①) shows elapsed time, in hours before radix point and in minutes after radix point.In order not to impair the safety of the equipment,replace the burner when the counter indicates“100.00”.

2. Ammeter (②)shows current flowing past the burner. And if the current indication is unusual, set the main switch to “O” (OFF) and check the equipment.

3. The trigger button, to ignite the burner.

4. the reset switch, to reset the counter to zero.

5. main switch.

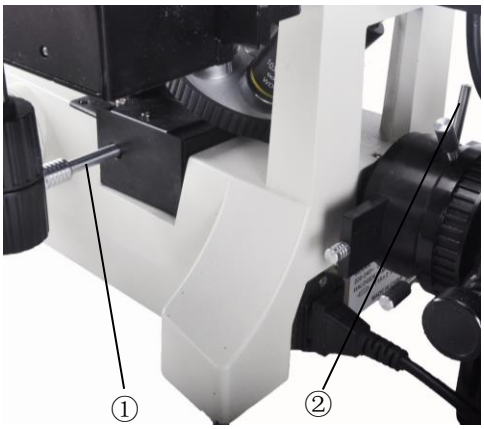



Fig.32

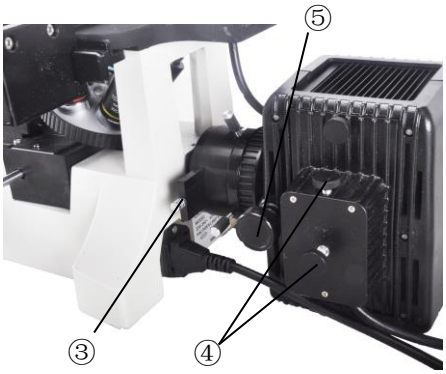



Fig.33

**4-4-3 Centering the Mercury Burner (Fig.32-33)**

◎ before proceeding to center the burner, wait for the arc image to stabilize. to protect against glare during image centering, it should be viewed across the protection barrier.

1. Remove the cap (or objective) from a revolving nosepiece position and engage this position in the light path.
2. Push in the fluorescent mirror switching knob① to engage the B-excitation mirror in the center position in the light path.
3. Turn the field iris diaphragm lever② clockwise to open the iris diaphragm.
4. Place a piece of white paper on the top of the stage, set the filter slider③to the center position and project the arc image.
5. Sharpen the arc image by manipulating the collector focusing knob⑤; center the arc image by the centering knob④.
6. Manipulate the burner centering knob④ slightly to move the arc image to one side.

◎ manipulate the collector focusing knob⑤ to make the field as bright as regular as possible.

◎ maintain this condition until the next time the burner is replaced.

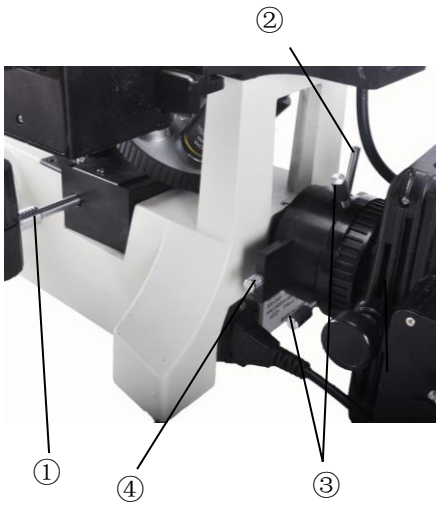
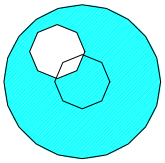
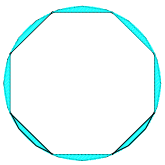


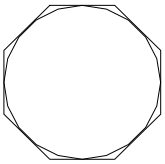

Fig.34



a



b



c

Fig.35

### 4-4-4 Centering the Field Iris Diaphragm (Fig.34-35)

1. Engage the 10X objective in the light path, push in the fluorescent mirror switching lever① to engage the B-excitation mirror into the light path. And set the filter slider the central open position.
2. Place a specimen on the stage and bring into approximate focus.
3. Turn the field iris diaphragm lever② little by little to confirm the iris diaphragm position.
4. Using the provided wrench, turn the two field iris diaphragm centering screws③ alternately to move the image of diaphragm to the center,as shown in fig.34.
5. Open the field iris diaphragm by the field iris diaphragm lever② to make slight deviation noticeable, adjust the centering precisely.
6. After completion of centering, engage the iris diaphragm diameter until it is just circumscribes the field of view, as shown in fig.35-c.

**★Adjust the field iris diaphragm**

The field iris diaphragm adjusts the diameter of the illuminating beam to obtain good image contrast.

Keeping the field iris diaphragm stopped down to the smallest required area for each observation makes it possible to prevent color fading of areas outside the observation target region.

According to the objective in use, adjust the diaphragm image using the field iris diaphragm lever so that the field of view is circumscribed by the field iris diaphragm to exclude stray light.

# 5. Phase Contrast Observation

## 5-1 Name of components

### 5-1-1 Phase contrast objective (Fig.36)

◎phase contrast objective 10x, 20x, 40x;
◎installation type: refer to 2-2-3: replace the normal objective with phase contrast objective on nosepiece

Fig.36

### 5-1-2 Phase contrast slider (Fig.37)

◎ Center adjustable phase contrast slider

- The light ring was centered beforehand, so it needn't adjust in the using process. If the ring is not in the center, you could adjust it by the centering bolt with S2 wrench.
- Match 10-20-40 light annulus with phase contrast objective 10X-20X-40X.


Fig.37

## 5-2 Installation and usage

### 5-2-1 Installing the phase contrast slider (Fig.38)

1. Hold the phase slider ① face up (engraving side up) with the finger hold on the right, and insert it into the illumination column slot.
2. Every light ring or opening has its own located position, so you need to move them until you heard the "clicked" to ensure the ring or the opening reach the center of the light path.
3. When in the phase contrast observation, do keep the aperture iris diaphragm adjustment lever② to "O" (wide opening).


Fig.38

**5-2-2 Centering the light annulus (Fig.39-40)**

Usually you needn't the operation of centering. If necessary, please accord to the following steps:

1. Place a specimen on the stage and bring it into focus.
2. Replace the eyepiece in the sleeve with the centering telescope.
3. Make sure the magnification of the objective in the light path matches that of the light annulus on the phase slider.
4. While looking into the centering telescope, adjust its position to focus on the phase annulus② of the objective corresponding to the light annulus①.
5. Insert S2 wrench into the two centering screw holes on the phase slider. Tighten and loosen the centering screws until the light annulus is superimposed on the phase annulus of the objective.
6. Repeat the above steps to adjust centering with other objectives. the 10x , 20x and 40x objectives use the same light annulus. To ensure the use with other objectives, put other objectives that has not been used for centering into the light path and make absolutely sure the light annulus① is not deviating from the phase annulus②. If there is any deviation, perform the centering procedure with the other objectives again.

★ Optimum performance cannot be achieved if the light annulus is not properly centered.

★ Ghost images of the light annulus may sometimes emerge. If this happens, superimposed the brightest light annulus image with the phase annulus.

★ When a thick specimen is moved or replaced, the light annulus and the phase annulus may deviate. This can reduce image contrast. If this happens, repeat steps 1 to 5 for readjustment.

★ The centering procedure may have to be repeated in order to get the best possible contrast if a specimen slide or the bottom surface of a culture vessel is not flat. Center the light annulus using objectives in the order of lower to higher magnifications.

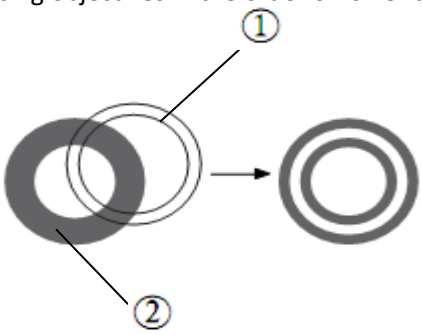



Fig.39

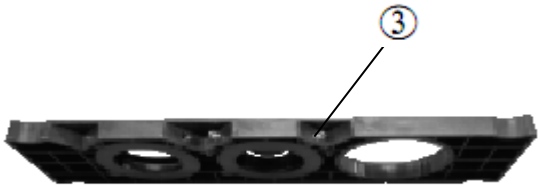



Fig.40

## 6. Microscope photography and video

### 6-1 Microscope video

#### 6-1-1 Selecting the light path (Fig.41)

**★ Just used in the trinocular observation.**

1. when using the upper trinouclar port: turn the upper knob① to "PHO" position and the lower knob② to gap position. When using the lower port: turn the lower knob② to "PHO" position.
2. Make sure you heard the "clicked" for your setting.

★ For the dark specimen observation, you can make the focus by binocular at first, then switching the light path.

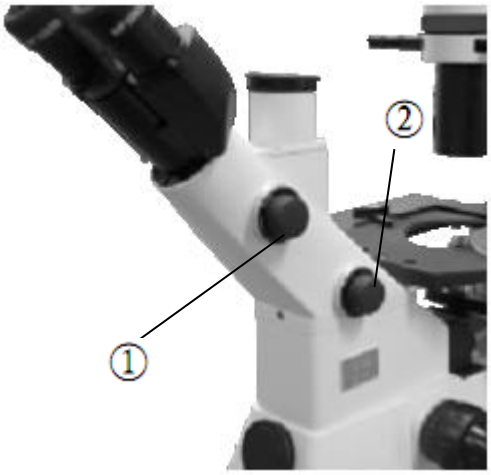



Fig.41

#### 6-1-2 Installing the video set (Fig.42)

1. Take away the dust cap① on trinocular tube.
2. Inset the video accessory② into trinocular tube and screw the pressing ring③ tightly.
3. Screw the mount adapter with CCD camera into the video accessory port② in the direction as shown in Fig.42.

#### 6-1-3 Focus (Fig.42)

Doing binocular observation and focus the specimen at 80% brightness, check that whether the image on the video or the computer which connected with the microscope video system is sharp.

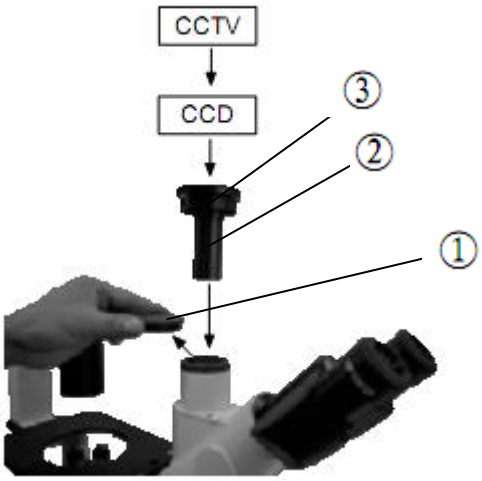



Fig.42

## 6-2 Microscope photography

**6-2-1 selecting the light path**

**★ Just used in the trinocular observation**

Refer to section 6-1-1 for operation information. More details about light path selection can be obtained in section 4-3-3.

**6-2-2 Installing the photography set (Fig.43)**

1. Take away the dust cap① on trinocular tube.
2. Aligning the port of 135 camera with the latch notch on the photography accessory ② , revolve it clockwise tightly.
3. Inset the photography accessory② into trinocular tube and screw the pressing ring③ tightly.

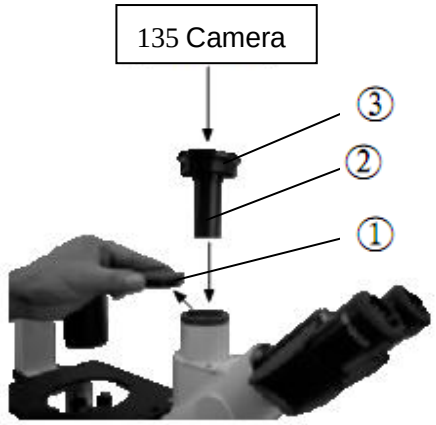



Fig.43

● Before connecting the camera and the latch notch on the photography accessory, remove the camera lens firstly, then connect the lens port with the accessory. Pay attention to the notch type, please.

● Magnification of micrograph= objective magnification ×camera lens magnification

**★ When shooting the micrograph, the lens close will bring an impact in some camera. In order to weaken the impact and obtain a clear image, you could select a longer time of exposure or decrease the brightness to have some compensation.**

**6-2-3 Focus**

Do binocular observation at 80% brightness, and focus the specimen primarily. When in microscope photography, do use the camera viewfinder to focus the specimen. Please refer to the user manual of the camera set to obtain the details.

**6-2-4 Adjusting the color temperature**

◎ When shooting the chromophotograph, please use the sunlight film.

1. Mount the LBD temperature changed color filter on to the color filter bracket.
2. Turn the brightness adjustment knob to the maximal position, so you can obtain a sunlight illumination.

## 6-3 Digital photography

### 6-3-1 Selecting the light path

**★ Just used in the trinocular observation**

Refer to section 6-1-1 for operation information. More details about light path selection can be obtained in section 4-3-4.

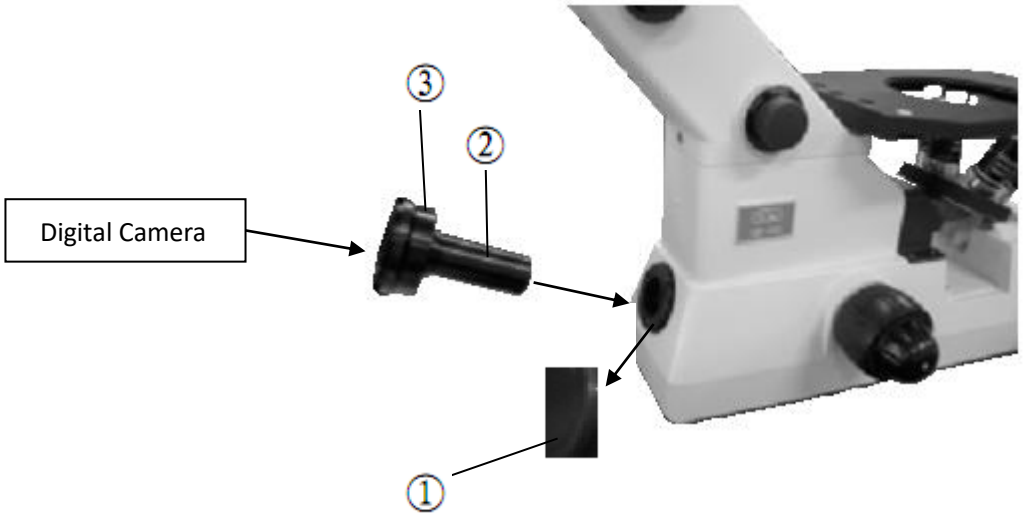



Fig.44

### 6-3-2 installing the photography set (Fig.44)

1. Take away the dust cap① on trinocular tube.
2. Insert the digital photography accessory ② into the lower tri-through port and screw the pressing ring tightly, then connect digital camera.
   (The camera interface of other digital cameras may be different, so the accessory may need customization)

# 7. Specifications

## 7-1 Main specifications

| | |
|---|---|
| Optical system | Infinite Optical System |
| Viewing Tube | Seidentopf binocular viewing head Inclined at 45°; Division ratio: 80% of Binocular Viewing and 20% of Video Viewing & Micrography |
| Eyepiece | Wide Field Eyepiece 10X, Linear Field of View : Φ20 mm |
| Nosepiece | Quintuple Nosepiece |
| Objective | Infinite Long Working Distance Plan Achromatic objective: 4X<br>Infinite Long Working Distance Plan Phase Contrast objective: 10X,20X,40X |
| Focusing System | Coaxial Coarse and Fine Focusing System<br>Sensitivity and Graduation of Fine Focus: 0.002mm<br>Movement Range(from the surface focus of stage plate): up 4.5mm, down 4.5mm |
| Stage | Area: 170(width) ×230 (Length) mm |
| Mechanical ruler | Movement Range: 120 (width) ×78 (Length) mm |
| Reflected Light Source | Halogen Lamp 6V30W, Preset Center, Intensity Continuously Adjustable |
| Fluorescence Illumination | 100WHBO Hi-voltage spherical mercury lamp |
| Condenser | Long working Distance Condenser, Numerical Aperture 0.3, Working Distance 72mm<br>After removing condenser, the height of culture dish can be up to 150 mm |
| Operation environment | ● Use indoor<br>● Altitude: Maximum 2000 m<br>● Temperature: 5℃~40℃ (41°F~109°F)<br>● Maximum Relative Humidity: 80% at 31℃ (88°F), then Fall Linearly.70% at 34℃ (93°F), 60% at 37℃ (104°F), 50% at 40℃ (104°F)<br>● Pollution Degree:2 (refer to IEC60664)<br>● Power inputing:100-240V~ 50/60 HZ<br>● Atmospheric pressure: 80kPa~106kPa<br>● Overvoltage category:II |

## 7-2 Objective Specifications

| Category | magnification | numerical aperture (N.A) | working distance (mm) | Conjugate distance (mm) | Parfocal distance (mm) | Coverslip thickness |
|---|---|---|---|---|---|---|
| Infinite Long Working Distance Plan Achromatic Objective | 4X | 0.10 | 22 | ∞ | 60 | 1.2 mm |
| Infinite Long Working Distance Plan Phase Contrast Objective | 10X | 0.25 | 6 | ∞ | 60 | 1.2mm |
| | 20X | 0.4 | 3.1 | ∞ | 60 | 1.2mm |
| | 40X | 0.55 | 2.2 | ∞ | 60 | 1.2mm |

## 7-3 Fluorescence mirror block

| Fluorescence mirror block | Excitation | Dichroic Mirror | Barrier Filter | Application |
|---|---|---|---|---|
| Blue excitation | BP460-490 | DM500 | BA520 | ·FITC: Fluorescent antibody method<br>·Acidine orange: DNA, RNA<br>·Auramine: Tubercle bacillus<br>·EGFP, S65T, RSGFP |
| Green excitation | BP510-550 | DM570 | BA590 | ·Rhodamine, TRITC: Fluorescent antibody method<br>·Propidium iodide: DNA<br>·RFP |
| Ultraviolet excitation | BP330-385 | DM400 | BA420 | ·Auto-fluorescence observation<br>·DAPI: DNA<br>·Hoechest 332528, 33342: Chromosome |
| Violet excitation | BP400-410 | DM455 | BA455 | ·Catecholamines<br>·5-hydroxy tryptamine<br>·Tetracycline: Skeleton, Teeth |

## 8. TROUBLE SHOOTING

Under certain conditions, performance of the microscope may be adversely affected by factors other than defects. If problems occur, please review the following list and take remedial action as needed. If you cannot solve the problem after checking the entire list, please contact us for assistance.

| Trouble | Cause | Remedy<br>Page |
|---|---|---|
| **Ⅰ. Optical System** | | |
| 1.The illumination is on, but the field of view is dark | The socket pin is not connected to the illumination column. | Connect it securely |
| | The bulb is burned out | Replace it with a new one |
| | The light intensity control is set too low | Set it to the appropriate position |
| | Too many filers are stacked. | Reduce them to the minimum required number. |
| | The mounted bulb is not the one designated. | Use the designated 6V,30W halogen bulb. |
| 2.the edge of the field of view is obscured or not evenly illuminated | The revolving nosepiece is not correctly engaged. | Make sure the revolving nosepiece clicks properly into place. |
| | The filter is stopped halfway | Push it in all the way |
| | The phase slider is not engaged properly | Move the slider until it clicks into place |
| 3.Dirt or dust is visible in the field of view | Dirt/dust on the specimen | Replace it with a clean specimen |
| | Dirt/dust on the eyepieces | Clean them thoroughly |
| 4. the image glares | The aperture iris diaphragm and the field iris diaphragm is stopped down too far | open |
| 5. Visibility is poor:<br>● Image is not sharp;<br>● Contrast is poor;<br>● Details are indistinct;<br>● Phase contrast effect cannot be obtained. | The objective is not correctly engaged in the light path. | Turn the revolving nosepiece until it clicks properly into place. |
| | The aperture iris diaphragm is opened or stopped down too far in brightfield observation | Adjust the aperture properly |
| | A lens (condenser, objective, eyepiece) is dirty. | Clean it thoroughly |
| | You are using a brightfield objective | Use a phase contrast objective |

| | | |
|---|---|---|
| | The light annulus of the condenser does not match the phase annulus of the objective | Adjust the light annulus so that it matches the phase annulus of the objective |
| | The light annulus and phase annulus are not centered. | Center them correctly |
| | When the edge of the culture vessel is viewed, the phase annulus and light annulus deviate from one another | Move the vessel until phase contrast effect is achieved. Also, remove the slider and set the aperture iris diaphragm lever to "◎". |
| 6. One side of image is blurred. | The revolving nosepiece is not correctly engaged. | Make sure that the revolving nosepiece clicks properly into place |
| | The specimen is not correctly mounted on the stage | Place it correctly on the stage. |
| **Ⅱ. Mechanical System** | | |
| 1.The coarse focusing knob is too difficult to rotate. | The tension adjustment ring is tightened too much | Turn the tension adjustment collar to loosen the knob appropriately |
| 2. The image goes out of focus during observation. | The tension adjustment ring is loosened too much. | Revolve the collar to tighten the focusing knob appropriately. |
| **Ⅲ. Electrical System** | | |
| 1. The burner does not ignite. | The power cord is connected improperly. | Connect it properly |
| | The mercury burner is not mounted correctly | Attach a mercury burner correctly |
| | The bulb is burned out | Replace with a new one |
| 2.The bulb is burned out frequently | Use the bulb other than specified. | Use the specified bulb. |
| 3.The brightness is not low | The bulb is not the specified one. | Use the specified one. |
| | Brightness adjustment knob is not set properly | Revolve it to a proper position |
| 4.The mercury burner flickers | The bulb will expire。 | Replace it with a new one。 |
| | This phenomenon is observed in a short period after ignition | Press the switch inside the starter reset hole on the right panel of the power supply unit, and then set the main switch to "I"(ON) again. |
| | The burner life has expired | Replace the mercury burner |

| | | |
|---|---|---|
| 5.The main switch can be set to on but burner does not ignite | The mercury burner is not mounted. | Mount a mercury burner |
| | The auto ignition system is malfunctioning. | Repeated ON-OFF is possible in this case. |
| **Ⅳ. Observation tube** | | |
| 1. The field of view of one eye does not match that of the other. | Incorrect interpupillary distance adjustment | Adjust the interpupillary distance |
| | Incorrect diopter adjustment | Adjust the diopter |
| | Your view is not accustomed to microscope observation | Upon looking into eyepieces, try looking at the overall field before concentrating on the specimen rang. You may also find it helpful to look up and into distance for a moment before looking into the microscope again. |
| **Ⅴ. Photomicrography** | | |
| 1.The image is out of focus | Poor focusing | Adjust focusing so that the double cross lines and specimen look clearly defined. |
| 2.The image periphery is blurred uniformly | the achromatic objective cannot bring edges into sharp focus | Blurriness is unavoidable. |
| 3.The window or Fluorescence lamp in the room is photographed. | The stray light entered through the eyepieces or viewfinder is reflected. | Cap both the eyepieces and the photo micrographic system's viewfinder. |

## 9. Product Standard

1. standard of product: GB/T2985-1999 "Biological Microscope"
2. Medical apparatus registration standard: 1
3. Medical apparatus production license: the production license Number: 2001-0111