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S-3000 LED Biological Microscope Series

Instruction Manual

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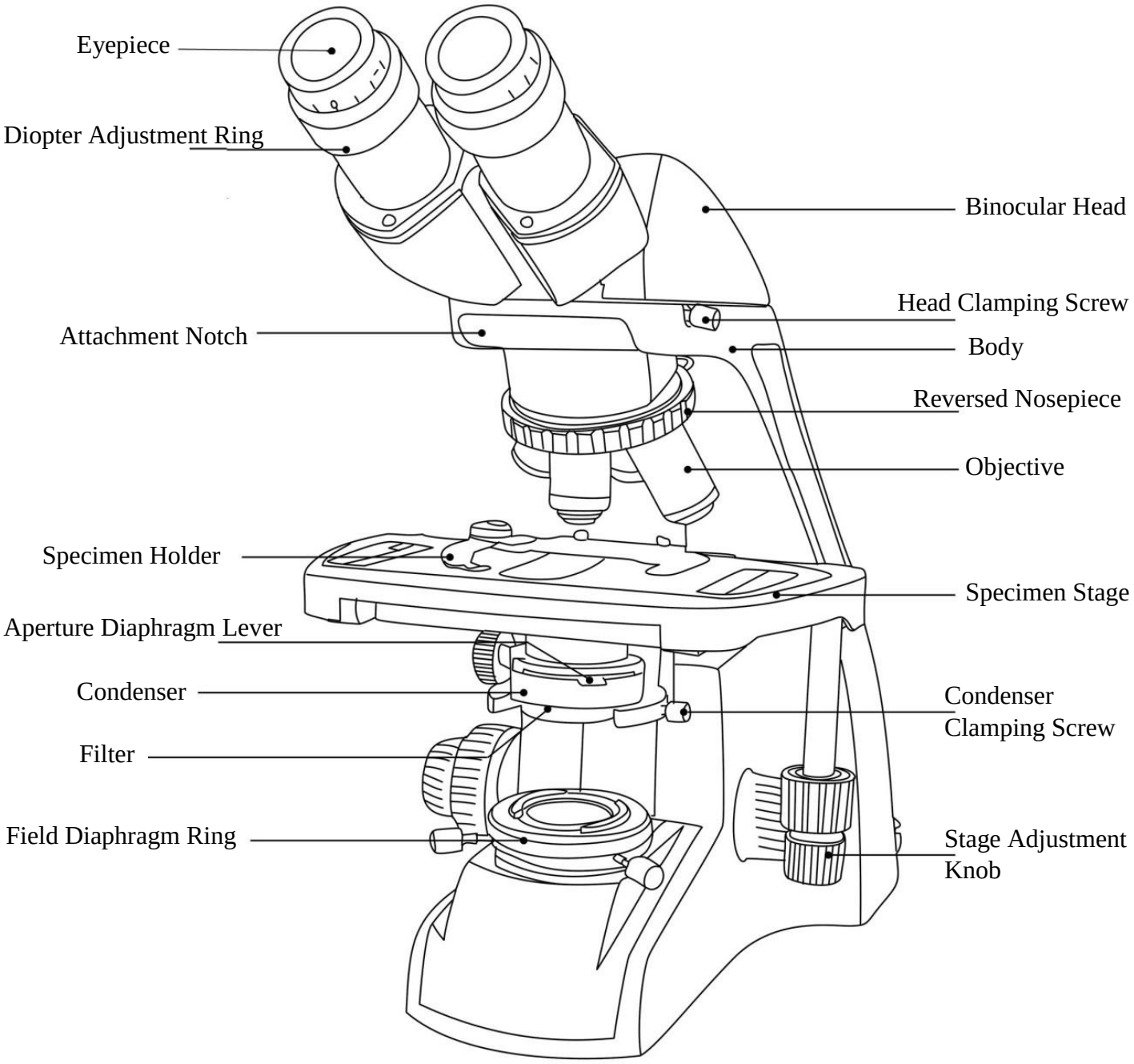
Eyepiece
Diopter Adjustment Ring
Binocular Head
Head Clamping Screw
Attachment Notch
Body
Reversed Nosepiece
Objective
Specimen Holder
Specimen Stage
Aperture Diaphragm Lever
Condenser
Condenser Clamping Screw
Filter
Field Diaphragm Ring
Stage Adjustment Knob

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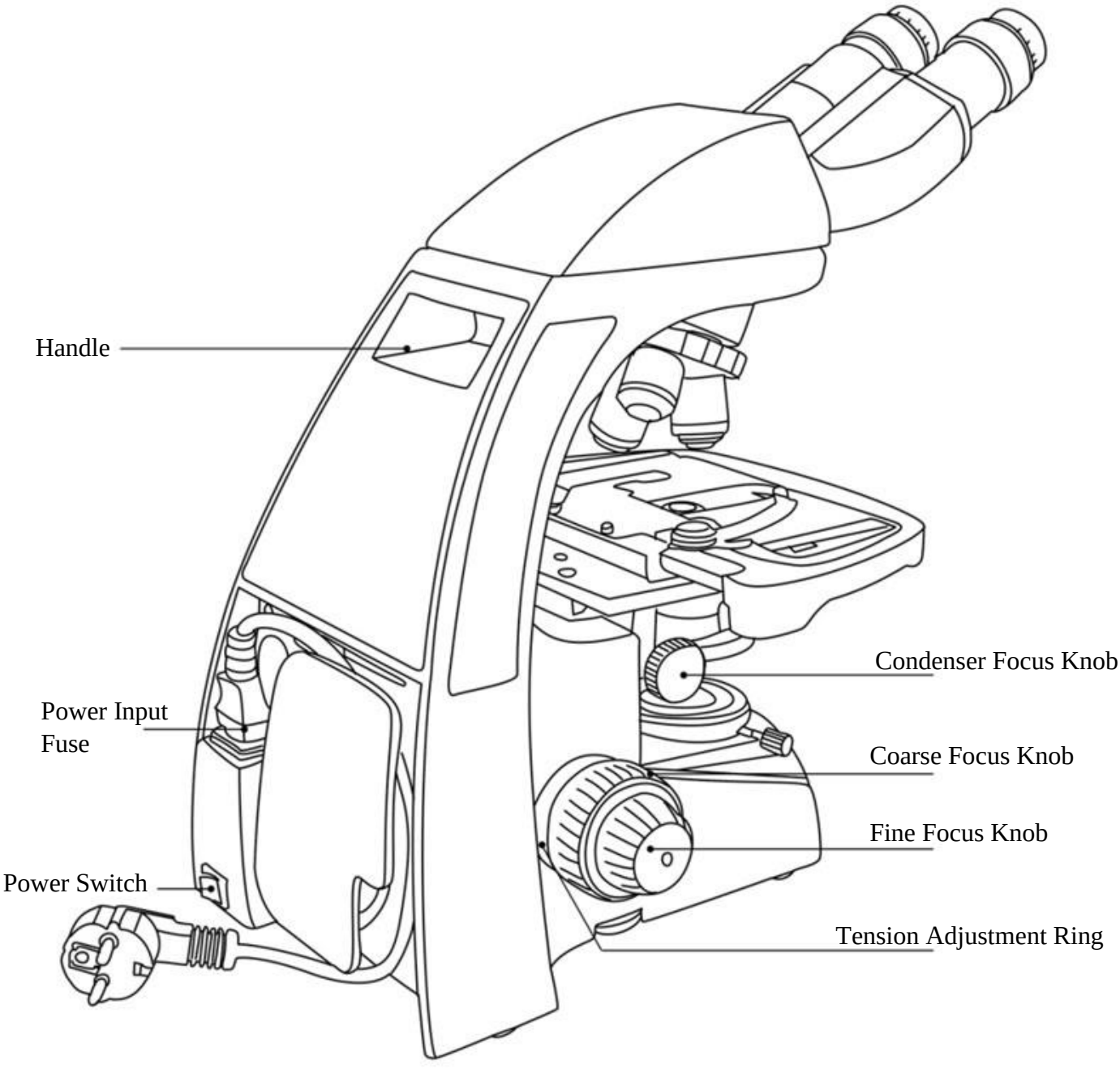
Handle
Power Input
Fuse
Power Switch
Condenser Focus Knob
Coarse Focus Knob
Fine Focus Knob
Tension Adjustment Ring

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1. UNPACKING AND PREPARATION

1.1. Unpacking

When unpacking the equipment, verify that all parts specified on the delivery note are present. Retain the original packaging for storage of the microscope in longer periods of non-use or for return to the manufacturer. Always keep the microscope in a clean, dry, and dust free environment.

1.2. Handling

Always use two hands to carry your microscope. Always ensure that all microscope components (eyepieces, cameras, adaptors, stage plates etc.) are secured tightly or otherwise removed before transporting. NEVER CARRY THE MICROSCOPE UPSIDE DOWN IN ORDER TO PREVENT THE UNIT FROM DROPPING or the ocular components from falling out of alignments. Set up the microscope on a stable worktable with solid and smooth tabletop. DO NOT TOUCH OPTICAL SURFACES. THIS MAY AFFECT IMAGE QUALITY.

1.3. Storage

- Ensure light intensity switch is turned down to the lowest setting and the switch on the base is turned off.
- Store your microscope with a protective dust cover in a low humidity environment.
- Keep all of your eyepieces, objectives and other accessories in place during storage.

2. DESCRIPTION

2.1. Specifications

Viewing Head	Siedentopf Binocular or Trinocular head, 30° inclined and 360° rotatable, Interpupillary adjustment of 48mm-75mm
Eyepiece	High eyepoint WF 10x/22mm with diopter adjustable
Nosepiece	Reversed, quadruple or quintuple
Objectives	**Plan Finite:** (Models: NYMCS-3007 & NYMCS-3009) **4x**/0.1 160/0.17, **10x**/0.25 160/0.17, **40xR**/0.65 160/0.17, **100xR**/1.25 oil 160/0.17 **HC Infinity Plan:** (Models: NYMCS-3007HC & NYMCS-3009HC) **4x**/0.10 ∞/0.17, **10x**/0.25 ∞/0.17, **20x**/0.40 ∞/0.17, **40xR**/0.65 ∞/0.17, **100xR**/1.25 ∞/0.17
Focusing System	Low position coaxial coarse and fine focus adjustment knobs, 37.7mm per coarse rotation, 0.1mm per fine rotation, fine focus graduation of 1um, calibration 0.002mm
Stage	216mm x 150mm built-in double layer mechanical stage, Graphite surface, rounded edges, Non-extending rack, Cross travel range of 55mm x 75mm, Verniers for X/Y coordinates
Condenser	1.25 Abbe condenser with iris diaphragm position guide markings for different objectives.
Illumination	Built-in Köhler illumination with field diaphragm, 5w LED for optimum illumination
Imaging	Trinocular head 50/50 light splitting ratio
Optional Accessory	0.5x C-Mount, 1x C-Mount (not included)

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2.2. Main Features

The S-3000 series microscope is a transmitted-light microscope of compact design with flexibility. Equipped with 3w/or 5w LED lamp, field diaphragm, Abbe condensers and other optical components, the standard Köhler illumination system provides uniformly bright and free-from-glare specimen illumination, which provides a high image quality with brighter and sharper resolutions for photomicrography. The Compact body is designed for flexibility which can perform various applications such as brightfield, darkfield and polarization. Trinocular microscope can be equipped with digital camera and LCD screen for photo and video documentation and image analysis.

The major features of the microscope include:

- Ergonomically designed metal frame for stability and durability
- Carrying handle integrated in the back of the stand for easy carrying
- Arm and base made of one piece construction
- Antifungal treatment which prevents fungus growth
- Cord holder for convenient storage
- Siedentopf eyepiece tubes which will not change the length in the tubes when interpupillary distance adjustments are made; adjustable interpupillary distance range 4.8cm- 7.5cm
- 360° head rotation; fully up or down swiveled eyepiece tubes to adjust the viewing height to meet individual requirements
- High eyepoint 10X wide-field focusing eyepieces with 22mm eyepiece field-of-view, suitable for spectacle wearers and easy to observe.
- Diopter adjustment on both eyepieces for the compensation of defective vision, with diopter scales to facilitate finding the correct setting. Parfocality of focus is assured by independent diopter adjustment on each eyepiece.
- Optional reticule eyepiece for measurement purposes; choice of 0.1mm/1cm grid, 0.1mm/1cm cross or plain cross hair available (not included)
- Revolving reversed quadruple objective nosepiece with DIN objectives which are color-coded, parcentered, and parfocaled. The nosepiece runs on ball bearings and has internal click stops so that the image remains centered after each change in magnification.
- Finite "Plan-ACHROMAT" DIN objectives with magnifications of 4x, 10x, 40x, and 100x oil. Retractable 40xR and 100xR objectives equipped with resilient mounts for specimen protection.
- Convenient low position coaxial coarse and fine focusing drive (coarse focus knob on left side, fine focus knob on both sides) with coarse stroke per rotation of 37.7mm and fine focus 0.1mm/circle, fine focus graduation of 1μm; focusing range 16mm; smoothness of coarse focusing drive being adjustable
- 21.6cm x 15cm built-in double layer mechanical stage with graphite surface, rounded edges, and non-extending rack and specimen holder; smooth X/Y calibrated movement with cross travel range 7.5cm x 5.5cm
- Built-in Kohler illumination that uses continuously adjustable LED source with light intensity control. Light path can be further adjusted by using the field diaphragm.
- Full Kohler N.A. 1.25 Abbe condensers which height is controlled by a rack and pinion gear system that allows the condenser focus to be adjusted for proper illumination of the specimen;

adjustable aperture iris diaphragm incorporated into the condenser, which is important in securing correct illumination, contrast, and depth of field; a graduated scale indicates the approximate adjustment (size) of the aperture diaphragm.

- Trinocular phototube (50% vis, 50% doc) with 10MP digital eyepiece camera and 8" LCD camera available to capture images and view live video of the specimen on a computer or screen.

3. ASSEMBLY

Before assembly, make sure to remove the transportation security screws: two screws under the specimen stage, and one screw on the bottom of the stand to protect the focusing parts (please see picture above)

1. Mount the binocular or trinocular head onto the body of the microscope and tighten the head clamping screw.
2. Screw up the objectives in the order of powers.
3. Insert eyepieces into the tubes.
4. Mount the condenser
    a. Turn the coarse focus knobs to raise the specimen stage to the top of its range.
    b. Turn the condenser focus knob to bring the condenser down to its lowest position.
    c. Loosen the condenser clamping screw, put the condenser to the holder, and tighten the condenser clamping screw.
    d. Turn the condenser focus screw to raise the condenser to a working position.
5. Insert the illuminator source module onto the stand base.
6. If a trinocular head is mounted at step 1, install a CCD adaptor

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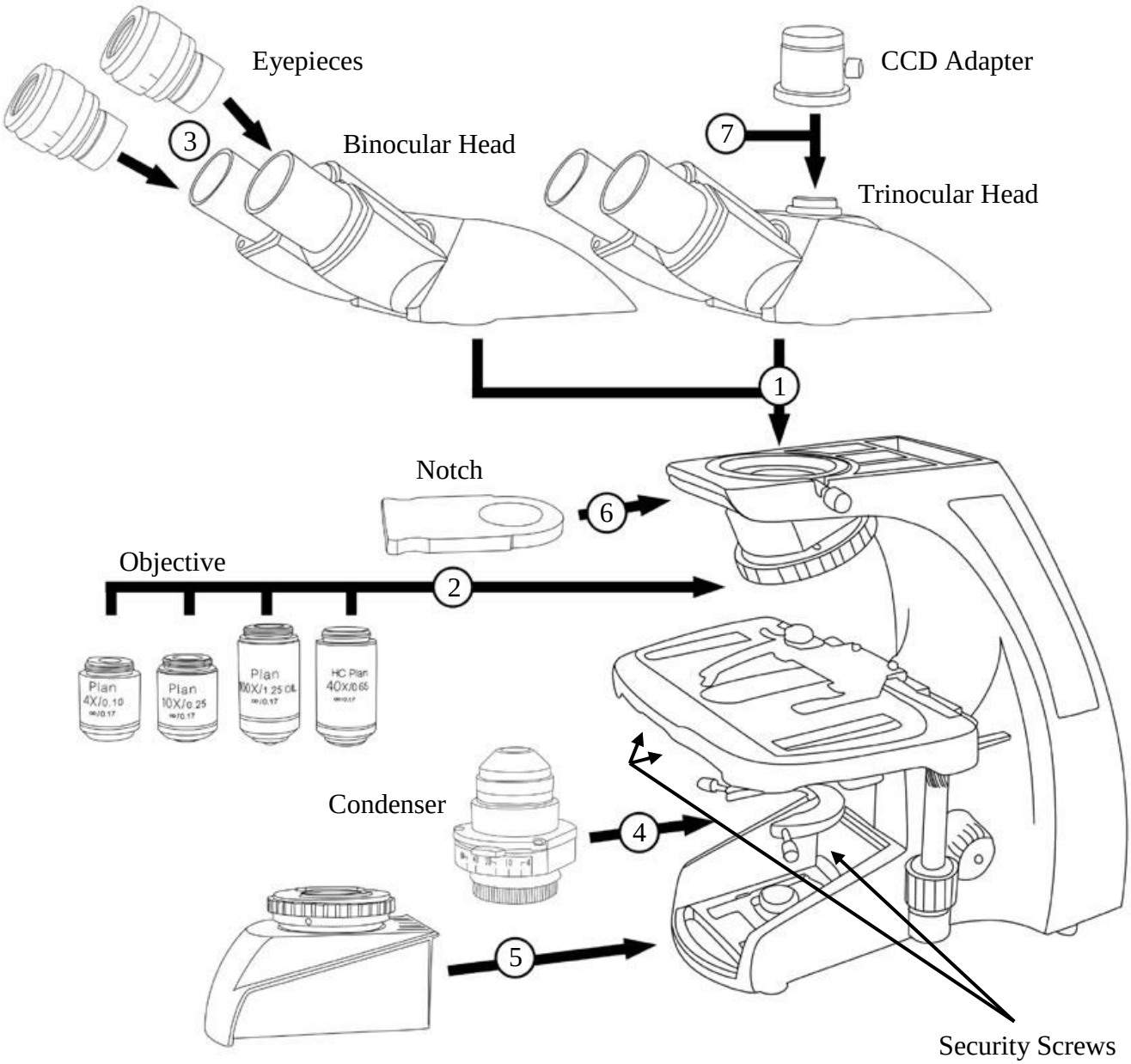
Eyepieces
3
Binocular Head
CCD Adapter
7
Trinocular Head
1
Notch
6
Objective
2
Plan 4X/0.10
Plan 10X/0.25
Plan 100X/1.25 OIL
HC Plan 40X/0.65
Condenser
4
5
Security Screws

4. OPERATION

4.1. Operating Procedure for Brightfield Observations

1. Turn the revolving nosepiece to engage the 4X objective (swing the 4x objective into the light path), make sure that the revolving nosepiece stops with an audible click.
2. Place a specimen slide on the stage and move it into the light path.
    - Turn the coarse adjustment knob clockwise to lower the stage.
    - Open the spring-loaded curved finger of the specimen holder on the specimen stage and place the specimen slide into the specimen holder from the front. Make sure that the cover slip of the slide is facing towards the objective.
    - After placing the slide as far as it can go, gently release the curved finger.
    - Turn the X-axis and Y-axis knobs on the right side under the stage to move the specimen into the light path. Do not use the specimen holder or stage to move the specimen, for this will damage the rotating mechanisms of the knobs.

- **Cover Glass**
  Use cover glasses of 0.17mm thickness in order to allow the objectives exhibit their full performances.

- **Specimen Slide**
  Use specimen slides of 0.9 to 1.4mm thickness. Using thicker specimen slides may result in inaccurate imaging of the field iris diaphragm image on the specimen.

3. Switch on the light source and adjust the light intensity control until the proper brightness of the light source is obtained.
4. Adjusting the interpupillary distance, and viewing height
    - Swing the eyepiece tubes symmetrically slightly toward or away from one another to adjust the distance between the tubes to your individual interpupillary distance. The adjustment of the interpupillary distance is correct when you see only one round image while looking down the two eyepieces.
    - The eyepiece tubes can be swiveled fully up or down to adjust the viewing height to your individual requirements.
    - Turn the diopter rings on both eyepieces to set them at the 0 position (match the 0 line with the index line). (This is to prepare for the following procedure.)
5. Turn the coarse and fine adjustment knobs to bring the specimen into focus.
    - Before looking down the eyepieces, turn the coarse adjustment knob and move the specimen stage up to its highest point. Make sure the slide does not touch the objective.
    - Look down the eyepieces, slowly turn the coarse adjustment knob clockwise until the image of the specimen is bright and clear, always moving the slide away from the objective.
    - If necessary, use the fine focus knobs to make minor adjustments to bring the specimen into sharp focus.

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The coarse adjustment knob tension is pre-adjusted for easy use. However, if desired, one can change the tension using the tension adjustment ring. Turning the ring clockwise decreases the tension, and vice versa.

6. Compensating for ametropia
   Both eyepieces are suitable for spectacle wearers. They also contain focusing rings on both eyepieces for the compensation of defective vision. The provided diopter scale serves to facilitate finding the correct setting.
   - Do not look into the eyepiece, and turn the diopter ring counterclockwise until it stops (in the maximum '+' direction).
   - Looking through the left eyepiece with your left eye, turn the diopter ring slowly clockwise (in the '-' direction), until the object can be seen clearly by this eye, i.e., bring the specimen into focus.
   - Set the diopter for the other eye in the same way.
   - Look into both eyepieces. Gently refocus if necessary by turning the focus knobs.

Interpupillary and diopter adjustment should be done each time the observer is changed since individual eyesight vary. Afterwards, you should focus on the specimen only by adjusting the focusing knobs.

The procedure of adjusting the diopter on reticule eyepiece is slightly different:

- Insert one reticule eyepiece into one of the eyepiece tubes. Only one reticule eyepiece is needed. Make sure the magnification power of both eyepieces and the field of view number are the same. Adjust the interpupillary distance if necessary.
- Use one eye and look through the reticule eyepiece and close the other eye. Stare at the reticule and bring the reticule into sharp focus by turning the diopter ring on the eyepiece. (Place the reticule in the position that's convenient for your observation.) When the reticule is in focus, do not move the diopter ring afterwards to keep the reticule in focus.
- Use the same eye to stare at the specimen, turn the focus knob to bring the specimen into sharp focus. Now both reticule and specimen is in focus through that eyepiece.
- Continue looking through the reticule eyepiece, adjust the focus knob and bring the specimen into sharp focus.
- Open your eyes, without looking through the eyepieces, turn the diopter ring of the other non-reticule eyepiece counter clockwise to the end.
- Close the eye on the reticule eyepiece side. Open another eye and look through the non-reticule eyepiece. Turn the diopter ring to bring the specimen into sharp focus.
- Look into both eyepieces. Gently refocus if necessary by turning the focus knobs.

So far, the diopter has been adjusted and should be fixed. Parfocality should have been achieved. No diopter adjustment is needed for later observation when changing to higher power objectives, unless different people use it.

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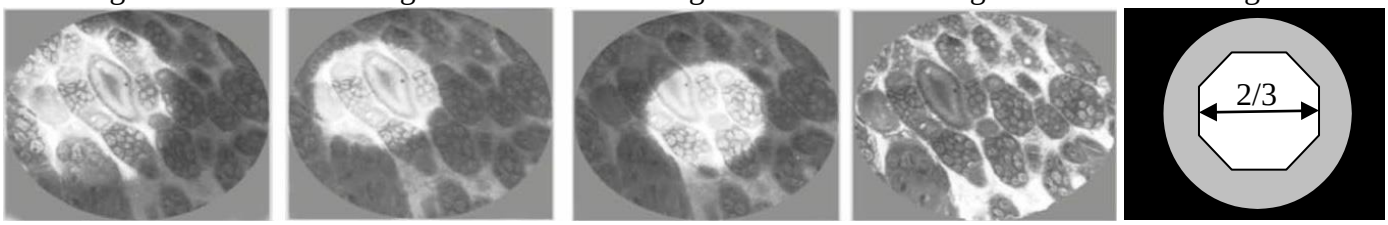
The whole point to adjust diopter for reticule eyepiece is to put both reticule and the specimen into focus. To achieve this, you should first adjust the **diopter ring** to focus reticule, and then adjust the **focus knob** to focus the specimen through reticule eyepiece. After the reticule side eyepiece is ready, adjust the other side by only turning the **diopter ring**. Pay attention to which part should be adjusted in each step. This procedure is suitable for both eyepieces are diopter adjustable microscopes.

7. Obtaining proper Kohler illumination

Figure A Figure B Figure C Figure D Figure E



- With the 4x objective engaged and the specimen brought into focus, turn the field iris diaphragm ring clockwise to close the field diaphragm to near its minimum size. The field diaphragm is then visible (even if not in focus) (See Figure A).
- Turn the sub-stage condenser focusing knob to adjust the height of the condenser to bring the field iris diaphragm image into focus, i.e., the EDGE of the polygon (i.e. field diaphragm image) should be as clearly in focus as possible. (See Figure B)

Aperture adjustment and proper focusing of the condenser are of critical importance in realizing the full potential of the objective. Condenser height is controlled by a rack and pinion gear system (i.e., the condenser focusing knob) that allows the condenser focus to be adjusted for proper illumination of the specimen. Correct positioning of the condenser with relation to the cone of illumination and focus on the specimen is critical to quantitative microscopy and optimum photomicrography.

- Using the sub-stage condenser centering screws to center the octagon of light, i.e., the field iris diaphragm image is centered in the eyepiece field of view. (See Figure C)
- To check centration, open the field iris diaphragm until its image touches the perimeter of the field of view. If the image is not precisely inscribed in the field of view, center again.
- For actual observation, open the field diaphragm until its image is slightly larger than the field of view (i.e., the dark area is just out of view) (See Figure D)
- Carefully adjust the sub-stage condenser iris diaphragm, learn to adjust the contrast to optimize your image without introducing artifacts and without losing detail.

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The aperture iris diaphragm determines the numerical aperture of the illumination system. Appropriate use of the adjustable aperture iris diaphragm (incorporated into the condenser) is most important in securing correct illumination, contrast, and depth of field. Care must be taken to guarantee that the condenser aperture is opened to the correct position with respect to objective numerical aperture. Matching the numerical aperture of the illumination system with that of the objective provides better image resolution and contrast, and also increases the depth of focus.

To adjust the aperture diaphragm,

- Remove one eyepiece from the tube and look through the tube with your naked eye.
- Swing lever to adjust the aperture diaphragm to approximately 2/3~4/5 of the diameter of the exit pupil of the objective. (See Figure E)
- Insert the eyepiece back in the tube.

Since the contrast of microscope specimens is ordinarily low, setting the condenser aperture iris diaphragm to between 70% and 80% of the N.A. of the objective in use is usually recommended. In most applications, this aperture diaphragm setting provides optimum contrast at almost ideal resolution, and is therefore the best compromise for the human eye.

8. Engage the objective to be used for observation in the light path, then readjust the focus.

S-3000 series microscopes are parfocaled, so only minor adjustments using FINE FOCUS knobs are needed after engaging higher power objectives.

Because of our built-in stop the 4x and 10x can never come into contact with your microscope slides. The 40xR and 100xR may occasionally touch the micro-slide but because these objectives have retractable resilient mounts your slides will not be damaged

9. Re-adjust the field iris diaphragm, the aperture iris diaphragm and the brightness and start observation.

Specimen field size and objective aperture change after every objective change. Therefore, the complete procedure of focusing, adjustment of field diaphragm, and adjustment of condenser iris diaphragm, at the same time centering the illumination has to be repeated each time an objective is changed to obtain optimum results.

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4.2. Use of the 100XR, Oil Immersion Objective

1. Focus on the specimen by switching the objectives from the lowest power to highest power.
2. Before engaging the immersion objective in the light path, place a drop of immersion oil onto the specimen at the area to be observed.
3. Turn the revolving nosepiece to engage the immersion objective, then focus using the fine adjustment knob.
4. Make sure the oil is free of bubbles. To remove bubbles, turn the revolving nosepiece to move the oil immersion objective back and forth a few times.
5. Immersion oil is used in the contact beneath the underside of the slide and the condenser top lens, and also between the objective and cover slip

If the condenser engraving shows a numerical aperture (NA) of 1.0 or higher, the number applies only when oil is applied between the slide glass and the top surface of the condenser. When oil is not present, the NA is about 0.9.

6. After use, remove oil from the objective front lens by wiping with gauze slightly moistened with an ether (70%)/alcohol (30%) mixture.

4.3. Darkfield Observation

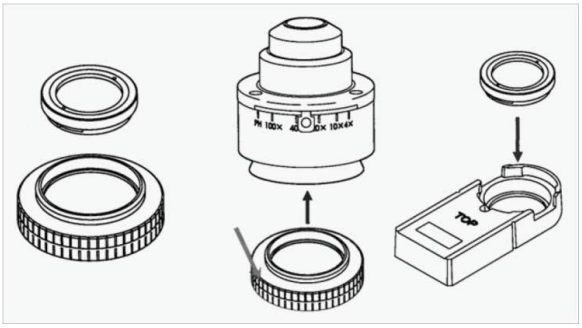
There are two kinds of darkfield condenser available, one darkfield dry (NA 1.25), one darkfield oil (NA 1.25~1.36)

- Replace the condenser with the darkfield condenser as needed.
- If darkfield oil observation is needed, make sure use oil between the condenser and back part of the specimen slide, and also between the front part of the specimen slide and the objective (oil). Only in this way, we can get the numerical aperture that is desired.
- Open the field diaphragm.
- Observe the specimen for darkfield observation.

4.4. Polarizing Observation

A polarizing kit includes a polarizer and an analyzer.

- Hold the upper part of the polarizer and screw it in the condenser.
- Pull out the attachment notch, put the analyzer in, and put the notch back.
- Observe



Hold the upper part of the polarizer to screw in.

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4.5. Digital observation

3009 Trinocular Head microscope provides the availability of digital imaging. Trinocular phototube (50% vis, 50% doc) with 10MP digital eyepiece camera and 8" LCD camera available to capture images and observe the specimen lively on a computer or LCD screen.

Choice of 0.5x and 1x C-mount. Adapters might be needed. Please refer to the instruction manual for different cameras or digital equipment. The optional sets below are available for our product.

- S-3009-DG Trinocular with 10.0MP Camera
- S-3009-LCD Trinocular with 8" LCD Camera

5. TROUBLESHOOTING GUIDE

Problem	Cause	Remedy
Field of view is not completely visible or not evenly illuminated	Nosepiece with objectives has not been switched into click-stop position	Switch nosepiece with objective into click-stop position
	Field iris diaphragm is not properly centered	Center it using condenser centering screws
	Field iris diaphragm is stopped down too far.	Open it to an optimum stop position
	Dirt/dust on objective, eyepieces, condenser or light exit glass.	Clean them
	The aperture diaphragm has not been adjusted correctly	Adjust aperture diaphragm correctly
	The filter has not been inserted correctly in the filter mount	Insert filter correctly into filter mount
Low resolving power, poor image contrast, indistinct details	The aperture diaphragm has not been opened to the correct size.	Set opening of aperture diaphragm to correct size.
	Condenser not focused correctly	Focus the condenser.
	Wrong cover slip thickness selected for use of transmitted light objectives corrected for 0.17mm cover slips	Use standard 0.17mm cover slips.
	Dirt/dust on front lens of objective	Clean it thoroughly.
	Immersion oil is not being used with an oil immersion objective.	Use immersion oil.
	Immersion oil contains bubbles	Remove bubbles.
	Dirt/dust on specimen or condenser	Clean them.

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Dirt or dust is visible in the field of view.	Dirt/dust on light exist glass	Clean thoroughly.
	Dirt/dust on top lens of condenser	
	Dirt/dust on specimen	
	Dirt/dust on eyepiece	
Image shows diffraction	Condenser is lowered too far	Adjust the condenser height position
	Aperture iris diaphragm is stopped down too far	Open it.
Stage drifts down by itself, or focus is lost during observation.	Tension adjustment ring is too loose	Tighten it.
Coarse adjustment will not go all the way down	Condenser holder is too low	Raise condenser holder.
Field of view of one eye does not match that of the other	Interpupillary distance is incorrect	Adjust interpupillary distance.
	Incorrect diopter adjustment	Adjust diopter.
	Your view is not accustomed to microscope observation.	Try looking at overall field before concentrating on specimen range. Or look up and into distance for a moment before looking back into microscope.
Objective makes contact with specimen before focus is obtained	Specimen is mounted upside down	Mount specimen correctly.
	Cover glass is too thick	Use 0.17mm thick cover glass.
Bulb does not light	Bulb is not mounted or burnt out	Mount designated bulb.
	Power cord plug is not connected	Connect power cord.

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