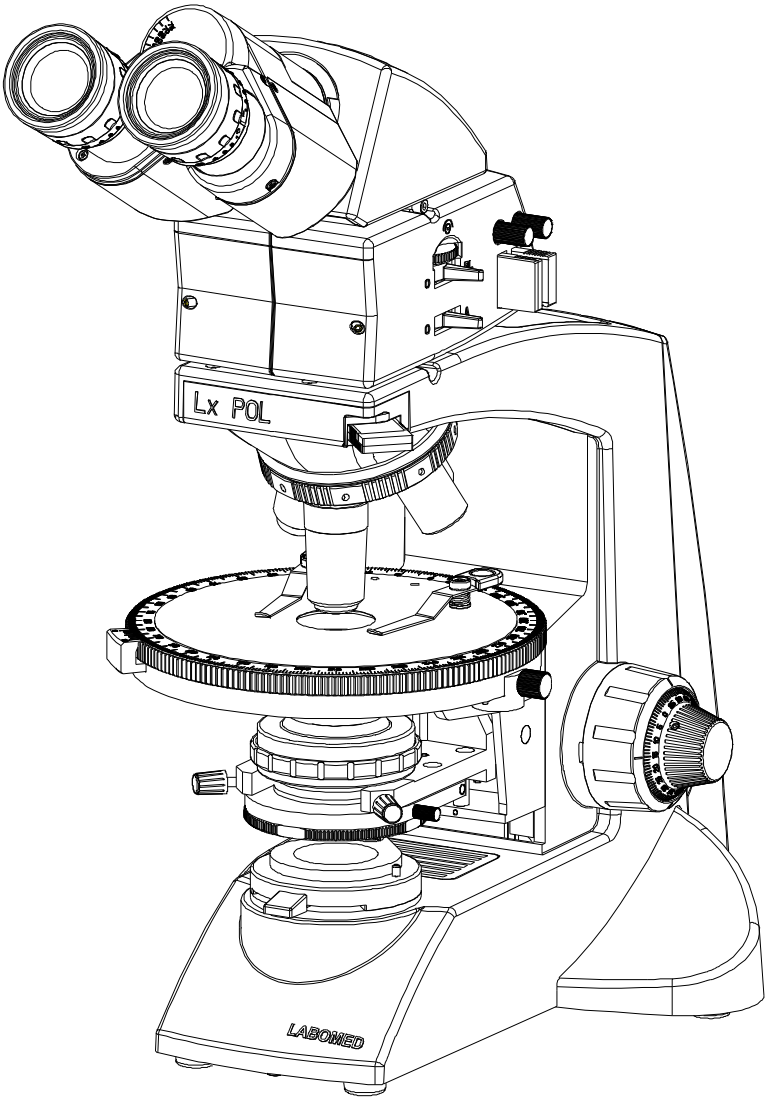
LABOMED
ideas for vision

Lx POL
Research Microscopy

User Manual



To ensure correct use of this instrument and to avoid injury during operation, read this manual completely before use.

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1 INTRODUCTION

The Lx POL is a research polarizing microscope that combines a modern design with the latest optical and mechanical engineering. Designed for professionals, it offers many features and functions for a wide range of applications. It is a truly professional polarizing microscope that meets, and indeed exceeds, the quality of competing microscopes. Its main benefits are:

- The 360° rotatable viewing body is inclined at 30° and has interpupillary distance (IPD) adjustment for extra clarity and contrast.
- The pressure die-cast stand has ball-bearing, frictionless side-mounted focusing that prevents any loss of motion.
- The sturdy, modern design provides a high degree of comfort and stability.
- The high-power objectives are spring-loaded to prevent accidental damage to specimen slides.
- The high-precision, parfocal and parcentered reverse-angle quadruple nosepiece allows centering of all objectives.
- The round ball-bearing rotatable stage has smooth 360° travel and 1° graduations on its scale for accurate location of the specimen.
- High-power illumination is supplied by our well-crafted universal power supply, which operates on any 100V-240V AC input. The LED configuration operates from a built-in rechargeable battery, P/N 9135000-902, which, when plugged in, draws power from a universal power supply operating at 100V-240V AC input. This ensures continuous operation even when the supply voltage fluctuates.
- Our LED has an average life of up to 50,000 hours.
- The Lx POL is equipped with an N.A. 1.25 Abbe condenser for brighter illumination. An iris diaphragm is also provided for better resolution and contrast control.
- High-quality polarizer and analyzer filters give perfect extinction.
- Polarizer: located below the condenser, 360° graduated and lockable in any desired position.
- Analyzer: the advanced analyzer module is located below the viewing tube and provides specific cross polarization through the full 90° quadrant.
- A center-adjustable, focusable Bertrand lens is a standard feature of the module and allows conoscopic observation.
- A set of high-quality compensators for advanced polarized observation includes a gypsum full-wave plate, a quartz wedge and a mica 1/4-wave plate.

2 SAFETY INFORMATION

a GENERAL INSTRUCTIONS

1. A microscope is a precision instrument with delicate glass components. Please handle it with care.
2. Do not use the microscope where it is exposed to direct sunlight, high temperature, humidity, dust or vibration.
3. The microscope is cooled by natural convection. Be sure to leave enough space (10 cm or more) around the body when installing the unit.
4. An arm handle is provided for carrying the microscope.

To prevent damage, do not hold the microscope by the stage or the observation tube. Be sure to remove the specimen from the stage clip when transporting the unit, to avoid damage to the specimen slide.

b SAFETY SYMBOLS

The following symbols are found on the microscope. For optimal use, users should understand these symbols and always use the equipment as prescribed:

Symbols	Explanation
	This surface tends to heat up and must not be touched until the system has cooled down completely.
	Before use, read the instruction manual carefully. Improper use could result in injury to the user and/or damage to the equipment.
	Warning: risk of electric shock.
	Main switch is ON.
	Main switch is OFF.

If the microscope is used in a manner not specified in this manual, the safety of the user may not be warranted, and the equipment may be damaged. Always use the equipment as described in this instruction manual.

c MAINTENANCE AND CARE

I) GENERAL CLEANING

Your microscope has been engineered for a long and safe operating life with the least amount of maintenance. In general, routine maintenance is limited to keeping the working parts of the microscope lubricated and the optics clean.

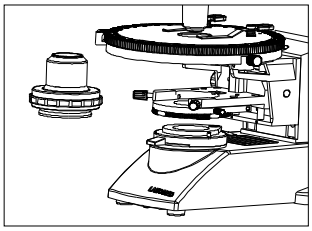
- Clean all glass components by wiping them gently with the cleaning cloth provided. To remove fingerprints or oil smudges, wipe with the cleaning cloth slightly moistened with a mixture of petroleum ether (85%) and isopropanol (15%).



Since solvents such as petroleum ether and isopropanol are highly flammable, they must be handled carefully. Keep these chemicals away from open flames and potential sources of electrical sparks, for example electrical equipment that is being switched "ON" or "OFF". Always use these chemicals only in a well-ventilated room.

1. Do not use organic solvents to clean microscope components other than the glass components. To clean non-glass components, use a lint-free, soft cloth slightly moistened with a diluted neutral detergent.

2. Do not disassemble any part of the microscope, as this could result in malfunction or reduced performance.
3. When the microscope is not in use, make sure that the frame has cooled down fully before storing the unit in a dry cabinet or covering it with the dust cover (provided).
4. To clean the condenser, fully loosen the securing thumb screw (1) and remove the condenser. Then wipe the front lens of the condenser with optical cleaning solution (the mixture suggested above) and lens tissue. To reattach the Abbe condenser, place it in its seat, tighten the securing thumb screw and raise the condenser bracket to the desired position (as shown in the picture).
5. Always cover the microscope with the dust cover provided when it is not in use.



II) OPTICAL CLEANING

1. The objectives have been adjusted for a tight fit to prevent any damage during transportation. To remove an objective, rotate it counterclockwise while gripping it with a rubber sheet or similar to avoid slipping.
2. To clean the lens surfaces, remove dust with a soft brush or gauze (compressed-air dust cans are ideal). To remove fingerprints or grease, use a soft cotton cloth or lens tissue lightly moistened with cleaning solution (85% petroleum ether and 15% isopropanol). For cleaning the optics, use methanol. Use sufficient caution when handling methanol. Place the objectives and/or eyepieces on a dust-free surface (e.g. aluminum foil). All other optical components to be cleaned should be as accessible as possible.
3. Blow all loose dust particles away with a dust blower.
4. Remove all water-soluble dirt with distilled water. If this is unsuccessful, repeat with a solution of diluted liquid hand soap. Remove any remaining residue with a dry cotton swab.
5. To remove oil, first use a solution of diluted liquid hand soap. If this does not produce a satisfactory result, repeat the cleaning with a solvent (optical cleaning solution: 85% petroleum ether and 15% isopropanol).
6. Grease must always be removed with a solvent.
7. Clean with a spiral motion from the center to the rim. Never wipe with zig-zag movements, as this will only spread the dirt. On larger optical surfaces (e.g. tube lenses), the spiral motion first goes from the rim to the middle and is then followed by a center-to-rim cleaning motion. Several spiral wipes are normally recommended.

We recommend pure, volatile petroleum ether or optical cleaning solution as described above.



Do not use a zig-zag motion



Wipe using a spiral movement

III) Cleaning painted surfaces

Do not use any organic solvent (e.g. thinner, xylene, ether, alcohol) to clean the painted surfaces of the instrument. Painted surfaces can be cleaned with a very lightly moistened microfiber cloth. Loose dust and other dirt particles can be removed with a soft-bristle brush used exclusively for this purpose.

d HEALTH RISKS

This microscope has an ergonomic design that keeps the effort required of the user to a minimum. However, the user should keep the following risks in mind:

I) RISK OF INFECTION:

After the microscope has been used to observe a specimen containing bacteria, clean all parts that came in contact with the specimen to prevent infection.

1. Be sure to remove the specimen before moving this product.
2. If the specimen is damaged by incorrect operation, clean all surfaces that may have come in contact with the specimen.

II) ELECTRICAL HAZARDS:

2. To avoid electrical hazards when replacing the LED, set the main switch of the microscope to OFF and disconnect the power cord from the wall outlet beforehand (Fig. 1).

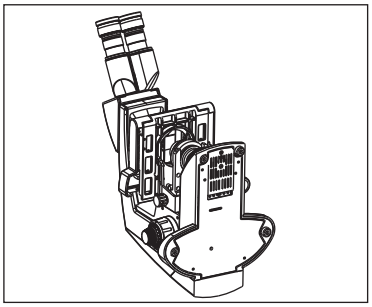


Fig. 1

Applicable LED replacement: LED P/N 9135000-901

3 GENERAL USE INSTRUCTIONS

1. Install the microscope on a sturdy, level table or bench and do not obstruct the air vents in the base of the unit. Do not place the microscope on a flexible surface, as this could block the air vents and cause overheating.
2. Always use the power cord provided by LABOMED. If the proper power cord is not used, the safety performance of the product cannot be warranted.
3. When installing the microscope, route the power cord away from the microscope frame. If the power cord comes in contact with the base of the microscope, it could melt from overexposure to heat.
4. Always make sure that the grounding terminal of the microscope and that of the wall outlet are properly connected. If the unit is not grounded, LABOMED cannot warrant electrical safety.
5. Never allow metal objects to enter the air vents of the microscope frame, as this could result in injury to the user and damage to the microscope.
6. After using the microscope, be sure to disconnect the power cord from the connector socket of the microscope or from the wall outlet.

4 REPLACEMENT OF PARTS

I) PROCEDURE FOR LED REPLACEMENT

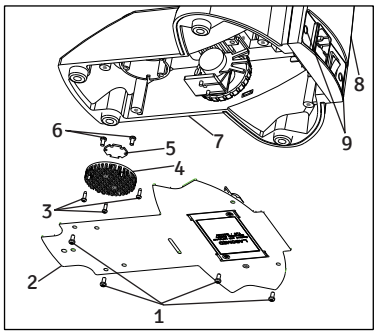


Fig. 3

1. Screws SS 658
2. Base plate 9126100-301
3. Heat shield screws SS 714
4. Heat shield 9135000-524
5. Star LED 9135000-901
6. LED screws SS 658
7. Stand
8. Back cover plate 9126000-102
9. Electric panel 9126000-103
10. Decorative cap 8123000-202

Figure 3

1. Pull out the two decorative caps (9) from the back cover plate.
2. Using a Phillips screwdriver, remove the two screws (9) to detach the back cover plate from the stand.
3. Lay the microscope on its back on a clean surface to expose the base plate.
4. Using a Phillips screwdriver, remove the four screws (1) to open the bottom plate of the microscope.
5. Cut the tie holding the LED wire and detach the LED wire connector from the PCB mounted on the back cover plate.
6. Detach the heat shield from the critical mount by removing the 3 screws (3) with a Phillips screwdriver.
7. Detach the LED from the heat shield by loosening the 2 screws (6).
8. Fit the new LED on the heat shield and connect the wires.

Applicable LED replacement: LED P/N 9135000-901

II) PROCEDURE FOR BATTERY REPLACEMENT

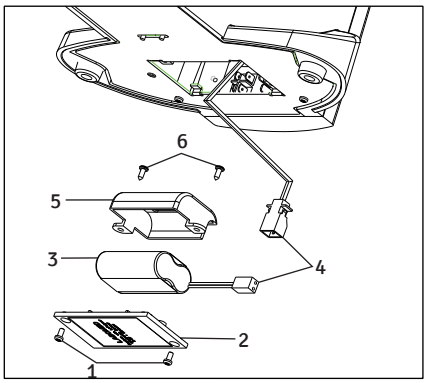


Fig. 4

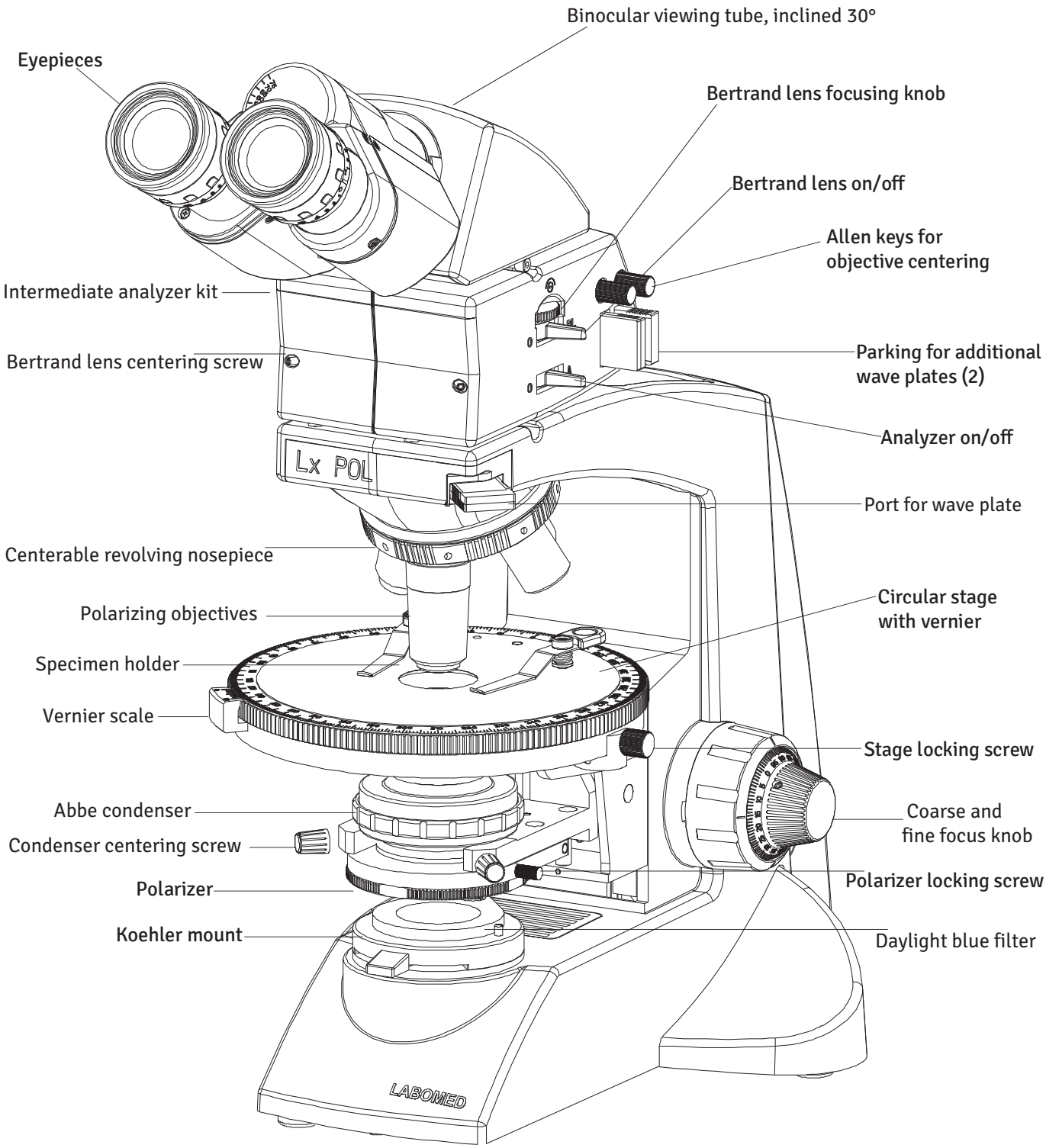
1. Battery cover screws, bottom SS 658
2. Battery cover 9135100-204
3. Battery 9135000-903
4. Cable clamp EL-488
5. Battery clamp X54383
6. Battery clamp screws SS 658

Figure 4

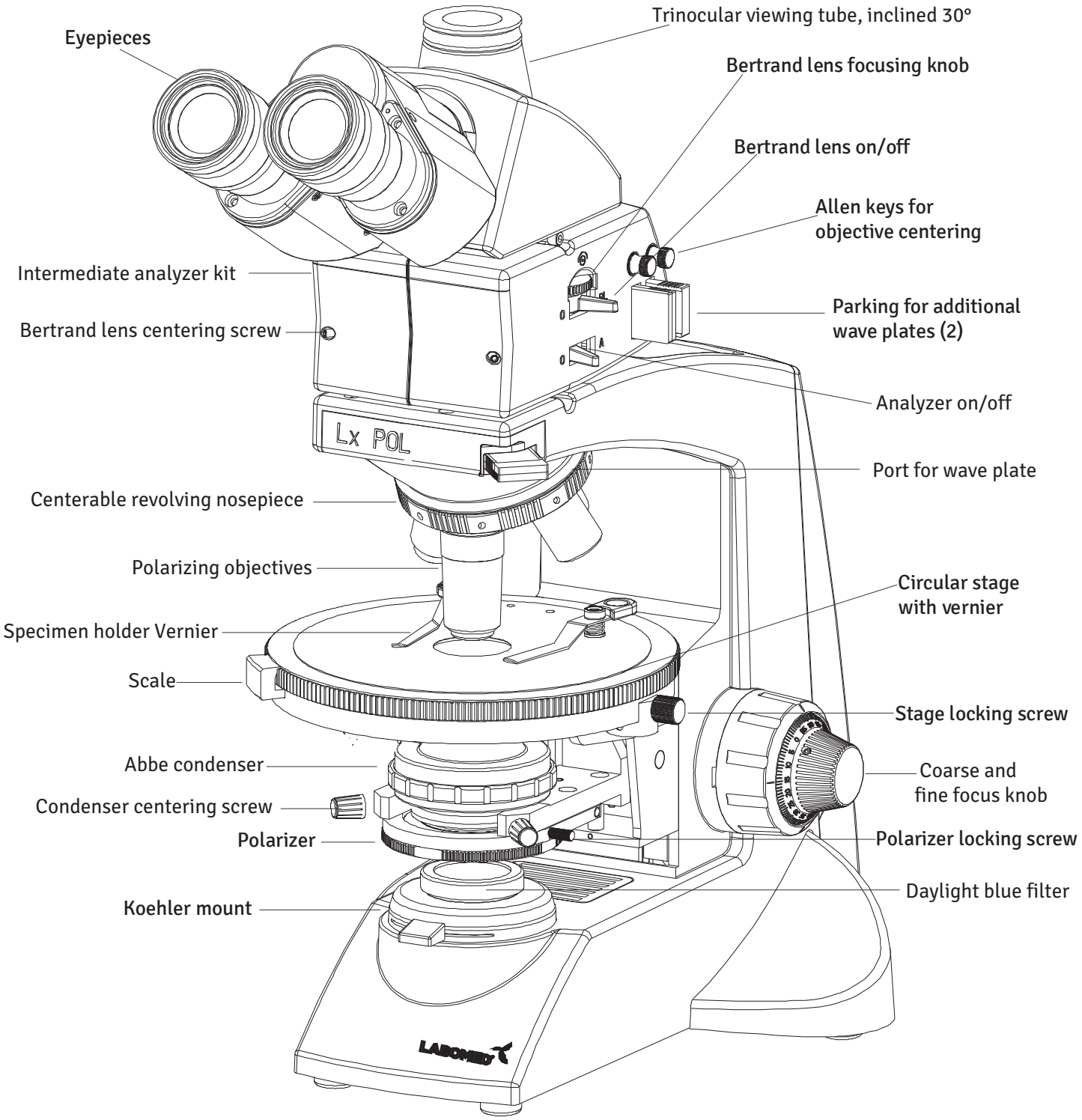
1. Lay the microscope on its back cover on a clean surface to expose the base plate.
2. Using a Phillips screwdriver, remove the four screws (1) to open the battery cover on the bottom plate.
3. Detach the connector of the connecting wires (4).
4. Remove the two screws (6) on the battery clamp with a Phillips screwdriver.
5. Replace the existing battery with a new battery from LABOMED (see the part number below).
6. Reverse steps 5 to 1 to complete the process.

Applicable battery replacement: battery P/N 9135000-903

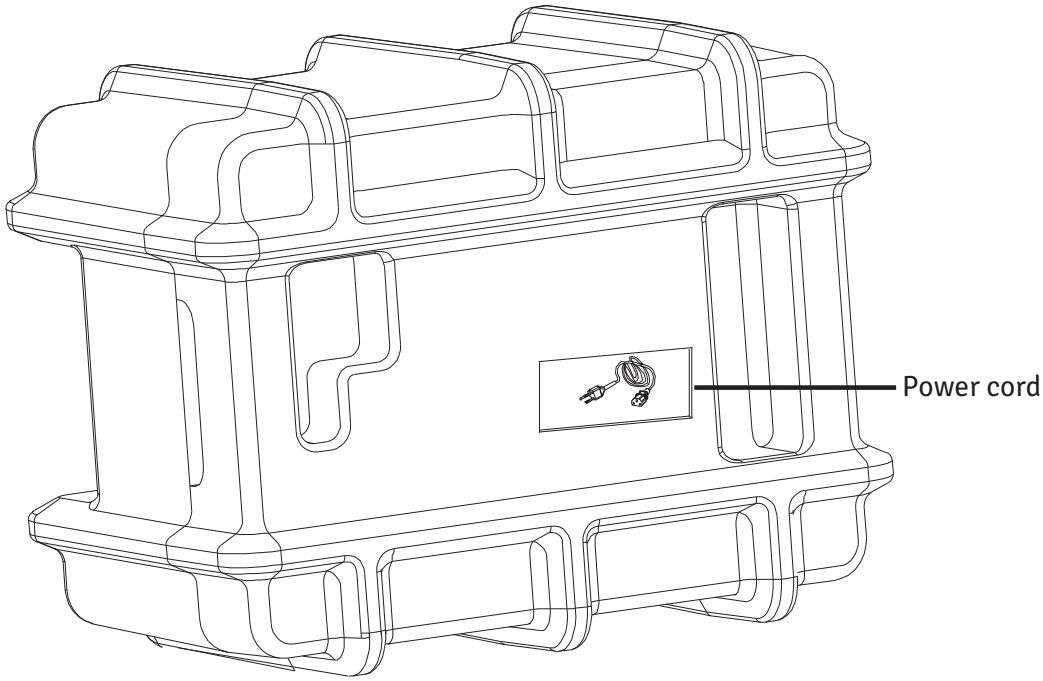
5 Lx POL BINOCULAR

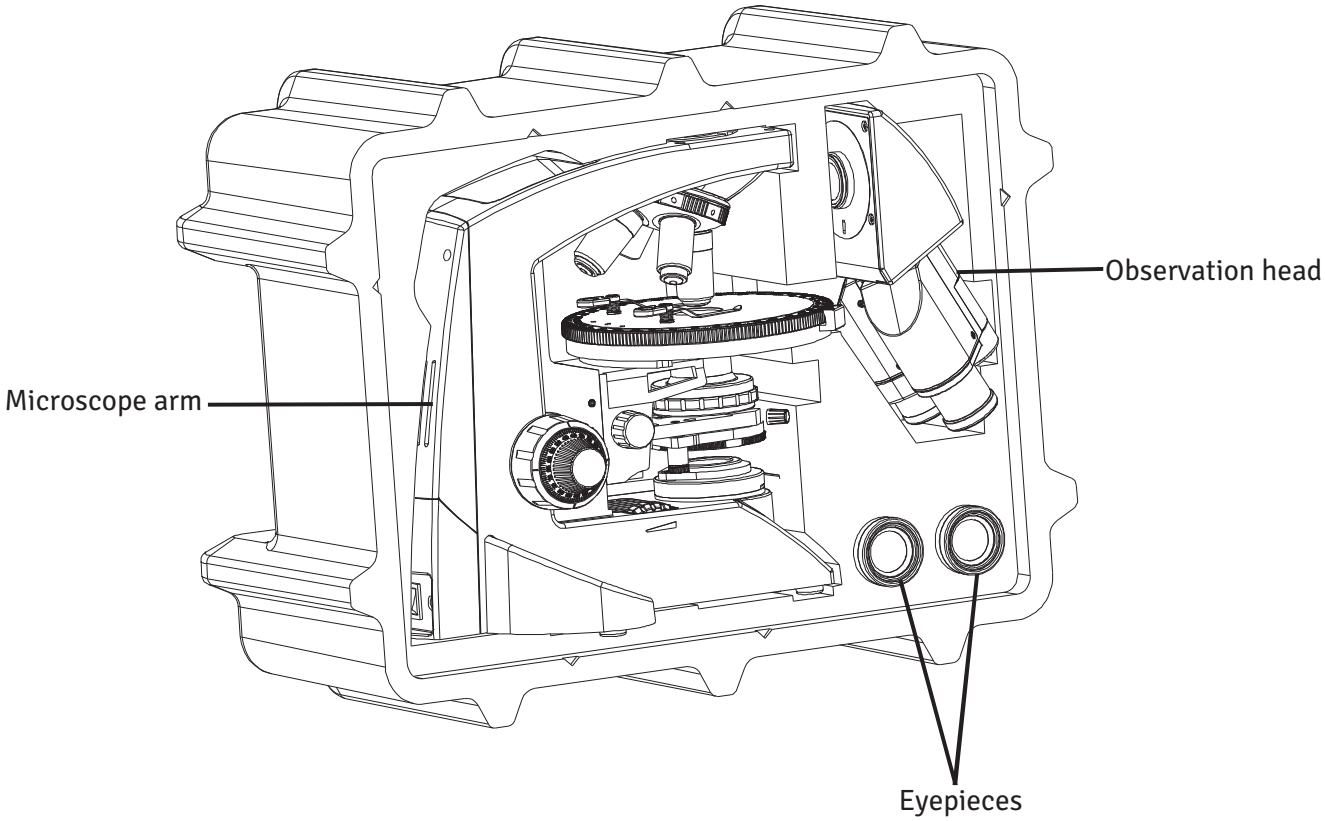


6 Lx POL TRINOCULAR



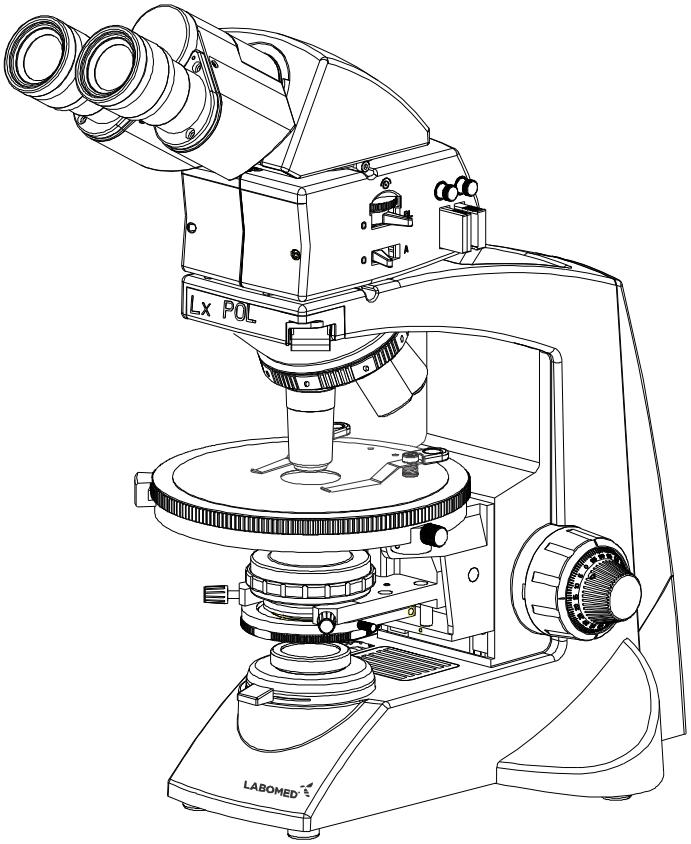
7 UNPACKING YOUR MICROSCOPE





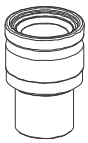
8 STANDARD COMPONENTS

After removing your microscope from its packaging, make sure that all of the following contents are present. Please note that the contents of your microscope may vary, because the optional configuration, contrast method or viewing body you ordered may differ from the standard configuration shown here.





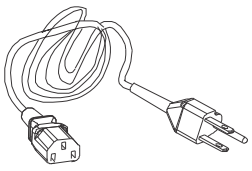
Daylight (blue) filter



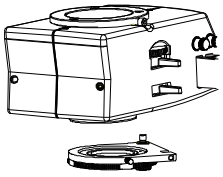
Paired eyepieces



Allen wrench, 3mm



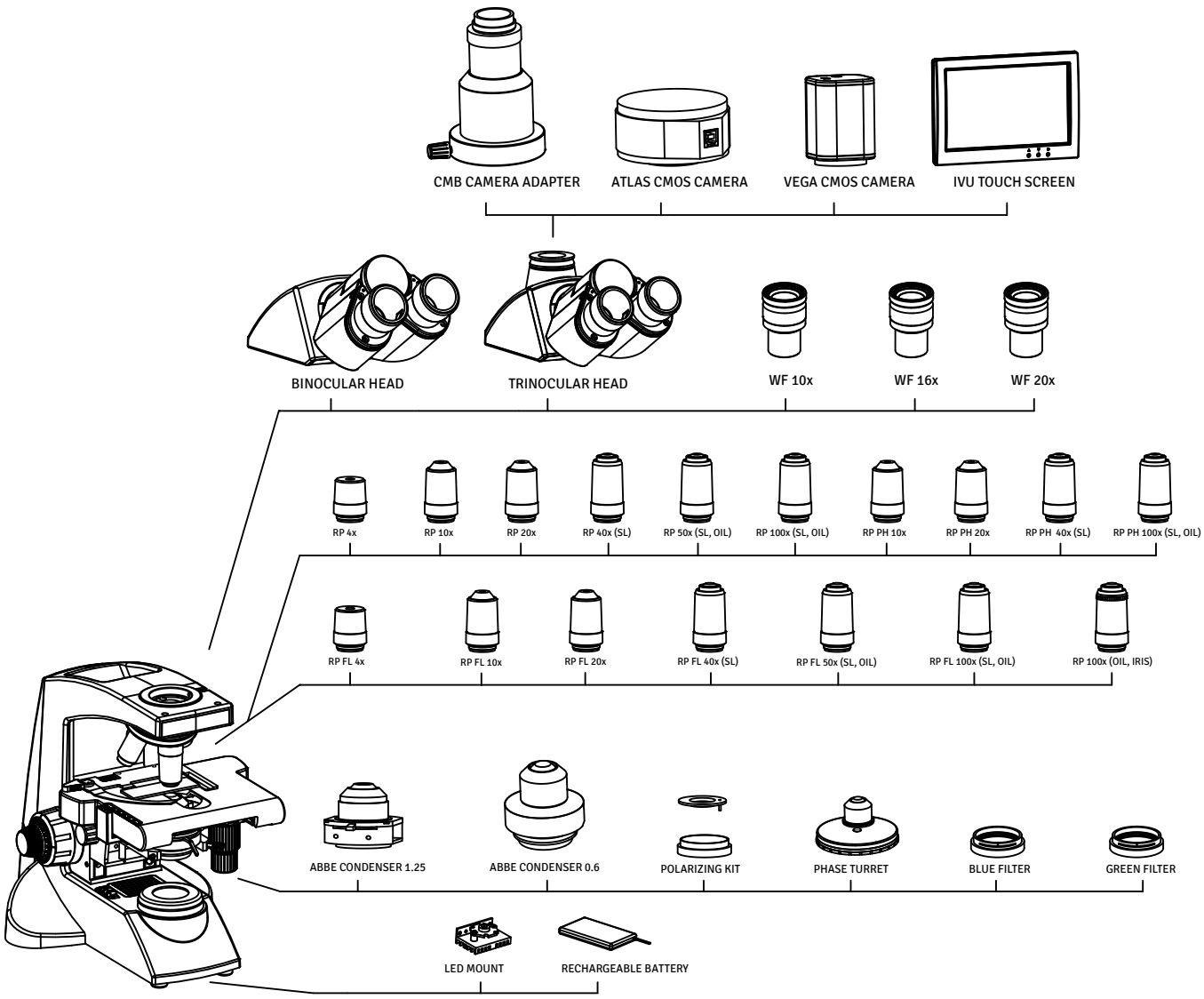
Power cord



Polarizing attachment

9 OPTIONAL ACCESSORIES

SYSTEM DIAGRAM OF OPTIONAL ACCESSORIES



10 INSTALLATION AND OPERATION OF OPTIONAL ACCESSORIES

a CAMERA MODULE SYSTEM

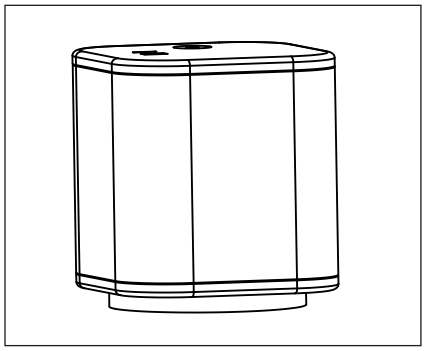


Fig. 5

1. Mount the 1/2” video adapter on the trinocular observation head.
2. Mount the camera module system on the video adapter.

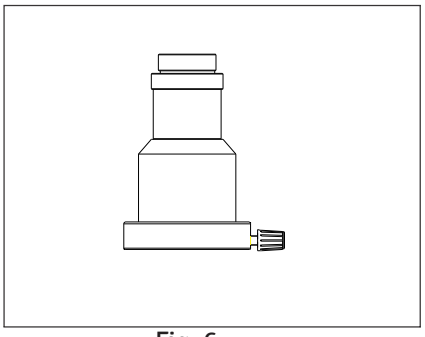


Fig. 6

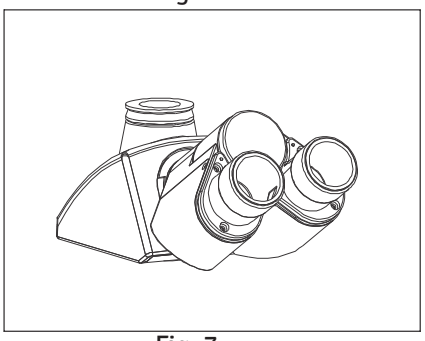


Fig. 7

b OPTIONAL EYEPIECES

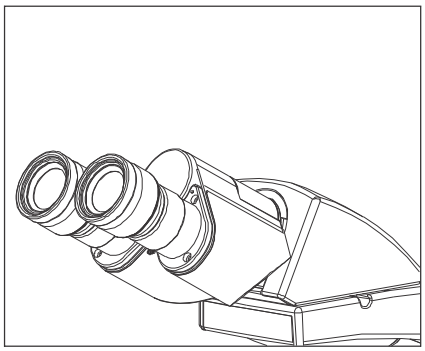


Fig. 8

10x eyepieces are provided. To replace them:

1. Pull the 10x eyepieces out of the eyepiece tubes of the observation head.
2. Insert the desired eyepieces in the empty eyepiece tubes.

11 DETAILED INTRODUCTION OF ASSEMBLIES

a ABBE CONDENSER

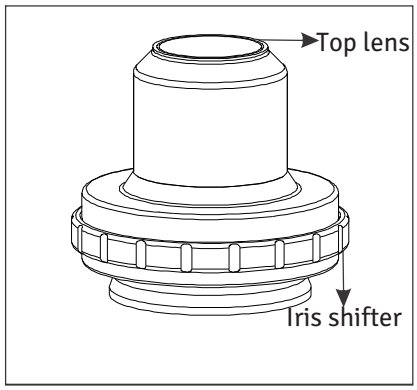


Fig. 9

The Lx POL Abbe condenser has the following important basic features:

1. Strain-free optical system.
2. A knurled ring opens and closes the iris diaphragm for the magnification of each objective, to match the numerical aperture.

b POLARIZER

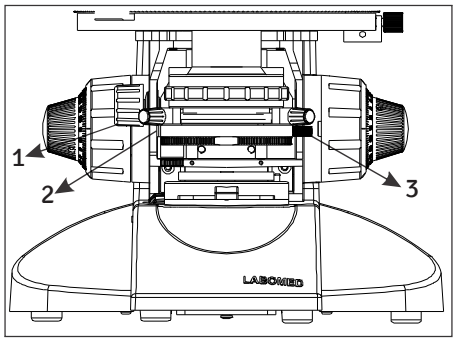


Fig. 10

This high-quality primary polarizer (1) rotates through 360° and has a fiducial mark (2) for quick identification of the polarized and cross-polarized positions (Fig. 10).

It is located below the condenser and has a locking mechanism (3) (Fig. 10) to hold the polarizer filter in the desired position for comfortable observation.

The Lx POL polarizer can also be swung in and out of the light path.

C ROUND STAGE

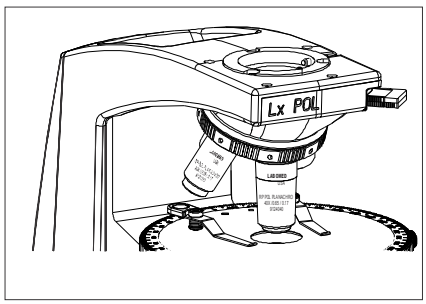


Fig. 11

The Lx POL round stage is both rotatable and centerable (Fig. 11). Its 360° rotation lets the user study orientation; centering the objectives on the optical axis of the microscope makes the center of rotation coincide with the center of the field of view. Rotation also allows the user to observe the specimen in the diagonal position (the brightest position of anisotropy).

It has a vernier scale that reads to 0.1° and a lock to hold the stage in the desired position. The Lx POL round mechanical stage runs on hardened steel ball bearings for even, smooth, jerk-free motion through 360°.

d CENTERABLE REVOLVING NOSEPIECE

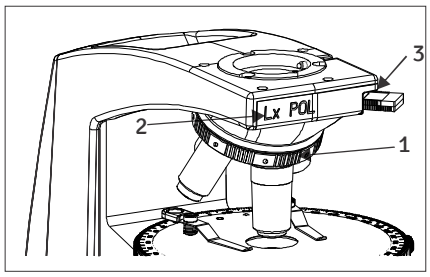


Fig. 12

The Lx POL has a centerable revolving nosepiece that compensates for the optical axis of each objective, which varies from one assembly to another. Each position of the nosepiece has a centering mechanism, so that the specimen remains centered when the stage is rotated. The turret runs on hardened steel ball bearings for smooth, jerk-free motion through 360°.
The nosepiece is high-precision, parfocal and parcentered.

Fig. 12

1. Objective centering Allen screws
2. Nosepiece cover
3. Port for lambda plate

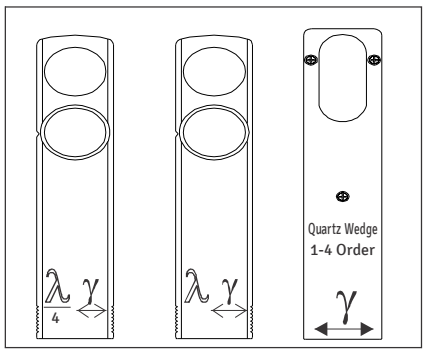


Fig. 12-a

The centerable revolving turret also has a nosepiece cover with a click-stop, lockable port for gypsum lambda wave plates (Fig. 12-a), which makes it easy to use different lambda wave plates. The port is located between the specimen and the analyzer. It allows compensators and retardation plates to be introduced between the crossed polarizers to enhance optical path differences in the specimen details.

e OBJECTIVES

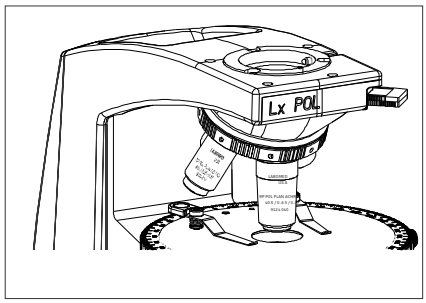


Fig. 13

Lx POL objectives are free from stress and from both types of strain, i.e. strain in the glass and strain introduced during assembly, such as cementing or mounting in tightly fitted frames. Lx POL objectives are assembled only after passing strict testing. The Lx POL comes with standard 4x, 10x and 40x objectives for viewing specimens in conoscopic and orthoscopic modes. These objectives are antireflection coated. Other objectives, such as 20x and 100x, are also available.

f EYEPIECES

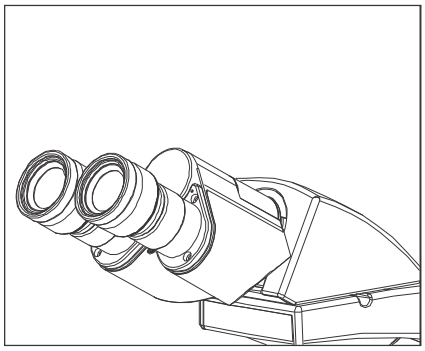


Fig. 14

The Lx POL comes with a pair of eyepieces. One eyepiece has a crosshair reticle that marks the center of the field of view; the other is for normal viewing. The orientation of the eyepiece with respect to the polarizer and analyzer is ensured by a key on the eye tube that slides into the binocular body tube. The eyepieces also have a focusing mechanism for diopter correction and foldable eye guards that keep ambient light out of your line of vision.

g BERTRAND LENS

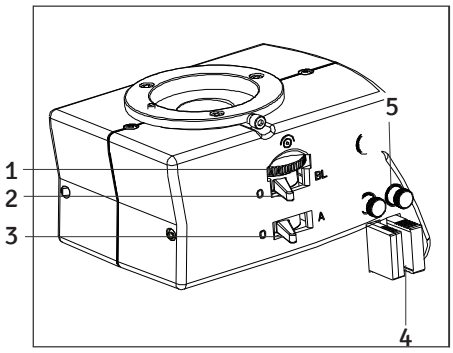


Fig. 15

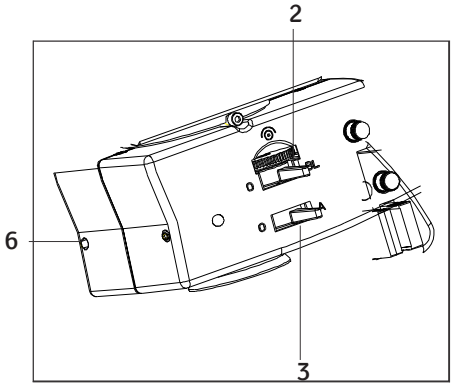


Fig. 16

The Lx POL has a Bertrand lens that projects the interference pattern formed in the rear focal plane of the objective into focus at the image plane of the microscope. It is used to examine the rear focal plane of the objective, to adjust the illumination aperture diaphragm exactly, and to view interference images. These images form in the rear focal plane of the objective when an optically anisotropic specimen is viewed between crossed polarizers with a high numerical aperture objective and condenser. The Bertrand lens is located between the analyzer and the eyepieces and moves easily in and out of the light path. It can be centered on the optical axis of the microscope and has a focusing mechanism for comfortable viewing.

Fig. 15 and 16

1. Bertrand lens focusing knob
2. Bertrand lens operating lever
3. Analyzer operating lever
4. Gypsum wave plate
5. Allen wrench for objective centering
6. Allen screw for Bertrand lens centering

Fig. 15: Bertrand lens lever (2) in the out “O” position, i.e. out of the light path. Analyzer lever (3) in the out “O” position, i.e. out of the light path.

Fig. 16: Bertrand lens lever (2) in the “BL” position, i.e. in the light path. Analyzer lever (3) in the “A” position, i.e. in the light path.

12 INITIAL SETUP

a OBSERVATION HEAD

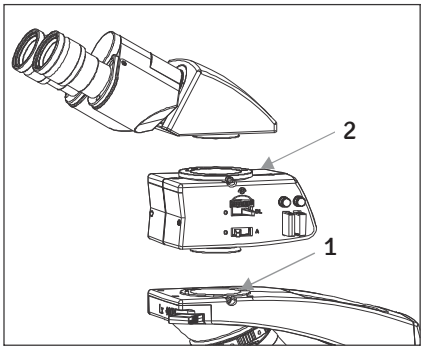


Fig. 17

Install the observation head as follows:

See Fig. 17.

1. Using the 3mm Allen wrench (provided), loosen the head locking screw (1) and remove the dust caps from the dovetail cavity and from the dovetail of the observation head.
2. Mount the analyzer by engaging the dovetail of the attachment in the dovetail cavity of the microscope arm, and tighten the head locking screw (1). See Fig. 17.
3. Remove the dust cap from the observation head dovetail and mount the observation head by engaging the dovetail at the bottom of the head in the dovetail cavity of the analyzer attachment.
4. Position the observation head as desired, then tighten the head locking screw (2). See Fig. 17.

b EYEPIECES

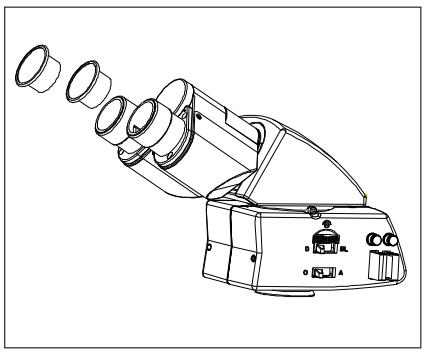


Fig. 18

Insert the eyepieces into the eyepiece tubes of the observation head as follows:

1. Remove the protective caps from the observation tube (Fig. 18).
2. Insert the eyepieces into the eyepiece sleeves (Fig. 19).

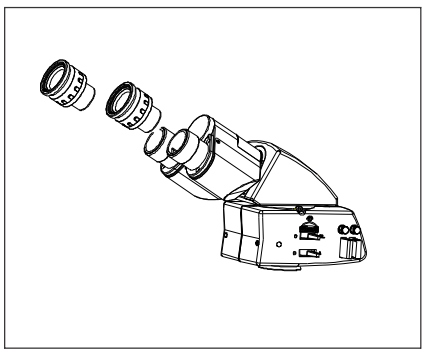


Fig. 19

c MOUNTING THE DAYLIGHT (BLUE) FILTER

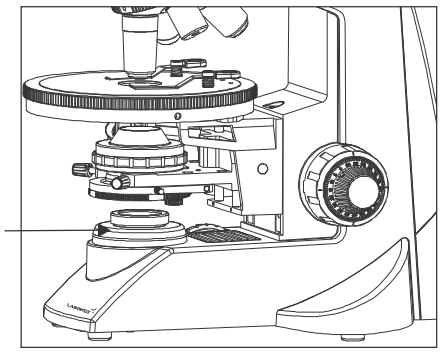


Fig. 20

This filter changes the color of the observation light to a natural daylight color.

Place the blue filter on the Koehler mount.

d STAGE CLIPS

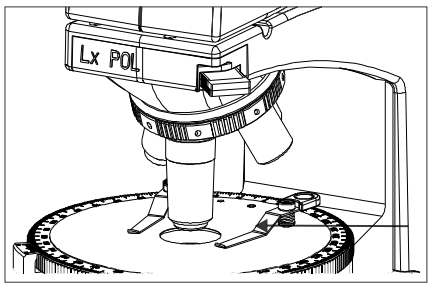


Fig. 21

Fit the stage clips on the round rotatable stage to hold the POL specimen.

e CONNECTING THE POWER CORD

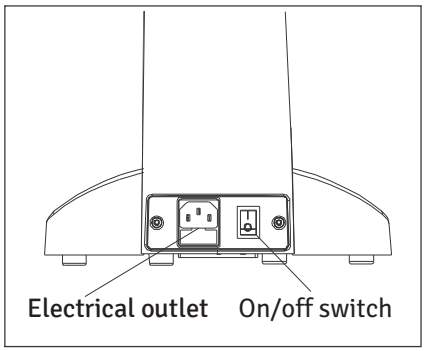


Fig. 22

Connect the power cord to a grounded electrical outlet.

1. Set the main switch to “I” (ON), as shown in Fig. 22.
2. Turning the light intensity knob in the direction of the arrow increases the brightness; turning it in the opposite direction decreases the brightness. The intensity bar next to the knob shows the direction of the intensity level.

Note: Never use an adapter between the power cord and the power source; it would make the grounding feature of the microscope ineffective.

13 CENTRATION

a PREPARATION FOR CENTRATION

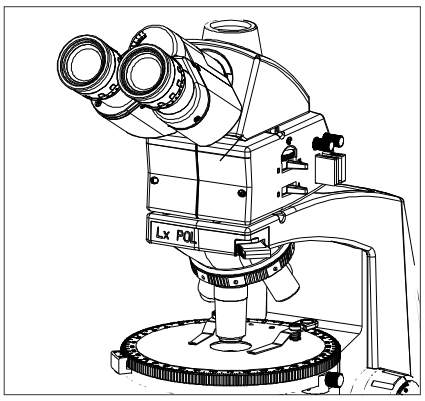


Fig. 23

Step 1

Disengage the analyzer and the Bertrand lens by setting their operating levers to the "O" position, as shown in Fig. 23. Fully open the aperture diaphragm of the condenser by rotating its ring to the extreme left.

Lower the microscope stage. Place a POL specimen on the stage. Swing the 10x objective into the working position. Raise the stage with the coarse focus knob until it reaches its positive stop. Use the fine focus knob to bring the POL specimen into focus by lowering the stage.

b KOEHLER ILLUMINATION CENTRATION

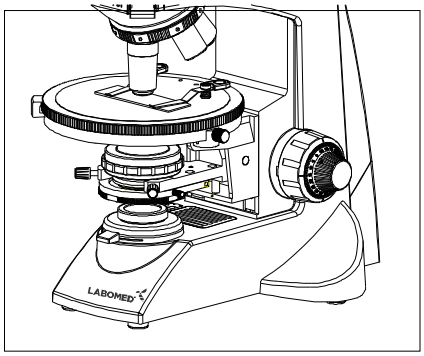
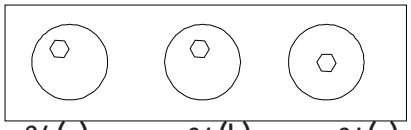


Fig. 24

Step 2

Swing the 10x objective into the working position. Flip the top lens of the condenser into the light path. Close the Koehler field diaphragm until the image of its closed iris leaves is visible within the field of view. Use the condenser focusing knob to bring the image into sharp focus. Turn the condenser centering screws simultaneously to center the image of the field diaphragm (Fig. 24 (a), (b), (c)). After centering, open the field diaphragm until the image of the iris leaves disappears just beyond the field of view.



24(a) 24(b) 24(c)

c ABBE CONDENSER CENTRATION

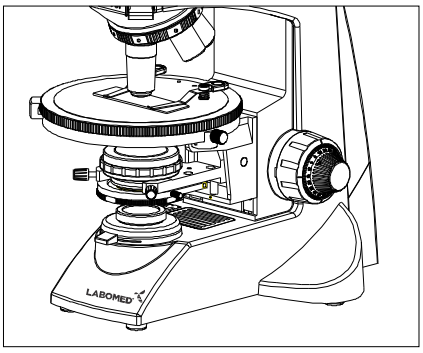


Fig. 25

Step 3

Look through the 10x objective and the crosshair scale of the eyepiece. Close the condenser diaphragm until the iris leaves fill approximately 20-25% of the field of view. Center the diaphragm by turning the condenser centering screws simultaneously, with reference to the crosshair scale of the eyepiece (Fig. 25 (a)).

Note: When changing the objective, adjust the condenser field diaphragm for each objective.

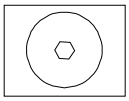


Fig. 25 (a)

d OBJECTIVE CENTRATION

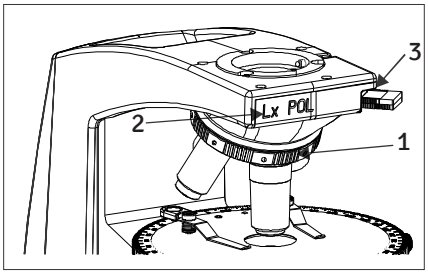


Fig. 26

Swing the 10x objective into the light path. Adjust the condenser aperture diaphragm. Take the two centering keys (Fig. 15, part 5) and insert them in the centering holes (Fig. 12, part 1) above the objective you want to center. Focus the POL sample.

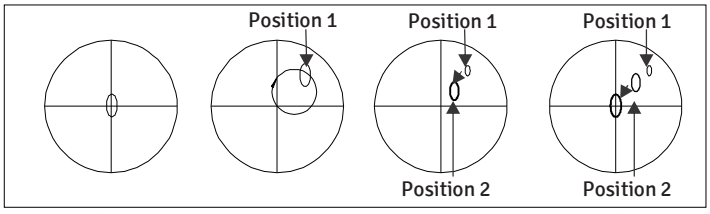
i) Bring a prominent point of the specimen to the center of the eyepiece crossline (Fig. 26 (a)).

ii) Loosen the stage locking thumb screw so that the round stage can rotate 360° horizontally. Rotate the round stage through 360° until the prominent point of the specimen is farthest from the center of the eyepiece crossline; it may even be outside the field of view (Fig. 26 (b)).

iii) Adjust the image with the centering screws above the objective until the prominent point of the specimen is halfway toward the center of the eyepiece crossline (Fig. 26 (c)).

iv) Move the specimen so that the prominent point is at the center of the eyepiece crossline (Fig. 26 (d)). Check that it stays at the center of the eyepiece crossline when the stage is rotated through 360°. Repeat the centering process if necessary.

Note: Each objective must be centered separately.



26 (a) 26 (b) 26 (c) 26 (d)

e EXTINCTION ADJUSTMENT

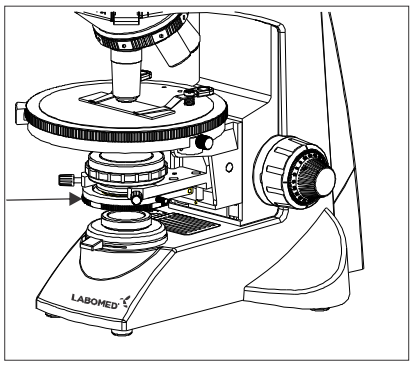
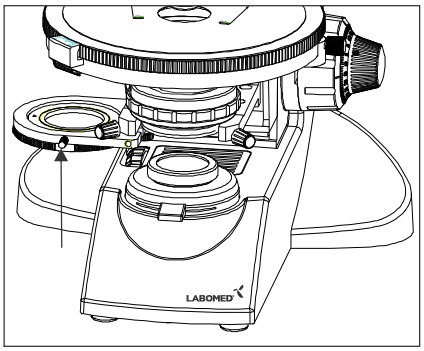


Fig. 27



Polarizer out of the light path
Fig. 27-a

1. Move all compensators, specimens and test plates out of the light path.
2. Swing the 10x objective into the light path.
3. Bring the analyzer plate, with its preset vibration direction, into the light path by moving the analyzer lever to the “A” position (Fig. 17, part 3).
4. Bring the polarizer into the light path (Fig. 27) and loosen the polarizer locking screw so that the polarizer can rotate freely through 360°.
5. Rotate the polarizer until you achieve complete extinction. Lock the polarizer by tightening the polarizer locking screw.

f CONOSCOPIC OBSERVATION

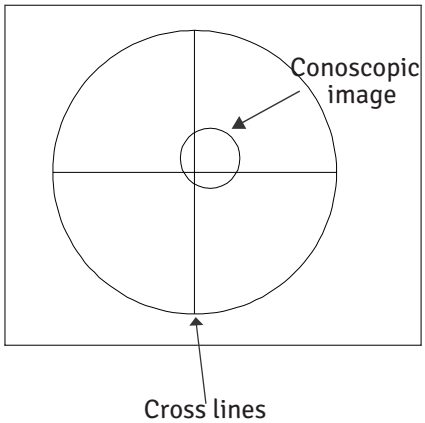


Fig. 28

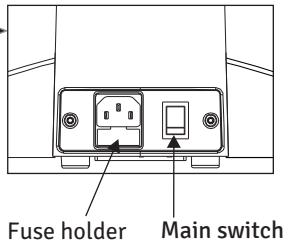
1. Bring an objective of your choice, from 20x to 100x, into the light path. Bring the POL specimen into focus.
2. Keep the Abbe condenser in its lowest position.
3. Open the aperture diaphragm.
4. Swing the Bertrand lens lever to “BL” (Fig. 17, part 2) and focus the image by rotating the Bertrand lens focusing knob (Fig. 16, part 1).

   Note: If the conoscopic image is dark, move the condenser upward to find the position where the image is brightest.

   The conoscopic image may not be at the center of the eyepiece crossline intersection. However, this has no measurable effect, owing to the universal infinity optical design.

14 SUMMARY OF POLARIZED LIGHT OBSERVATION PROCEDURE

Set the main switch to “ON”.



Set the analyzer and Bertrand lens levers to the “O” position.

Engage the 10x objective in the light path.

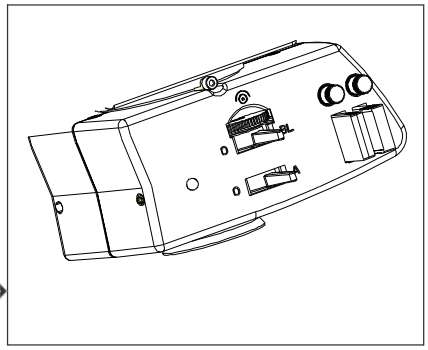
Adjust the observation tube and eyepieces.
Adjust the interpupillary distance.
Adjust the diopter setting.

Adjust the Koehler aperture iris diaphragm.

Adjust the aperture iris diaphragm of the Abbe condenser.

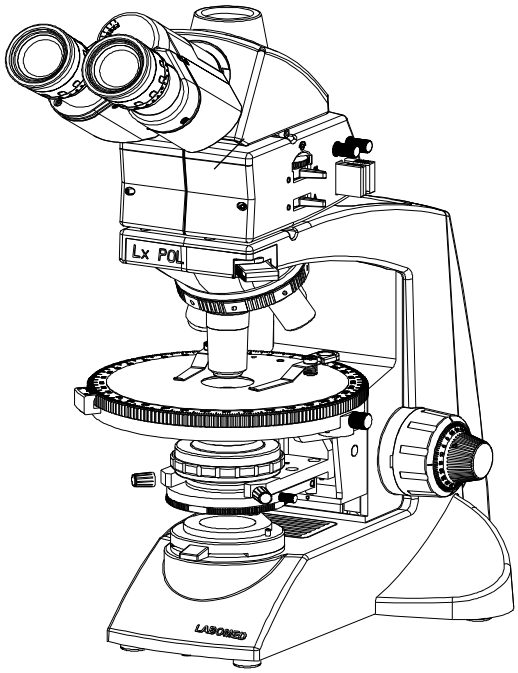
Bring the specimen into focus and adjust the in/out position of the condenser. Adjust objective centering and stage centering with respect to the eyepiece crosshair scale.

Engage the polarizer and analyzer filters in the light path and use the Bertrand lens and wave plates.



Adjust the light intensity.

Observe the specimen.



15 DETAILED OBSERVATION PROCEDURE

a PLACING THE SPECIMEN ON THE STAGE

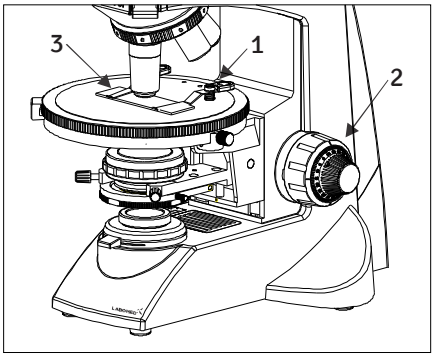


Fig. 29

1. Turn the coarse focus knob (2) counterclockwise to lower the stage fully.
2. Press the spring-loaded clip lever (3) by pushing the lever handle (1), and place the specimen by sliding the specimen glass plate(s) onto the stage.
3. After positioning your specimen slide (1 max.), release the lever handle.
4. Rotate the stage through 360° to find the best viewing position. The angular position can be noted.

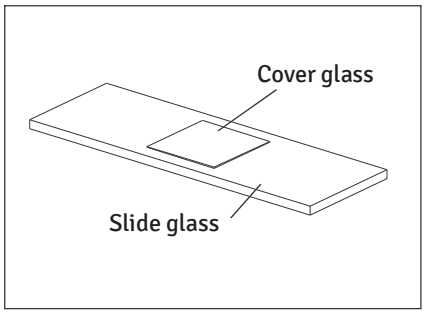


Fig. 30

Cover glass

This is the glass plate placed on the specimen. For optimum optical performance, the cover glass thickness, which is the distance from its surface to the specimen surface, should be 0.17mm.

Slide glass

This glass plate should ideally have a length of 76mm, a width of 26mm ± 1mm and a thickness between 0.9 and 1.4mm.

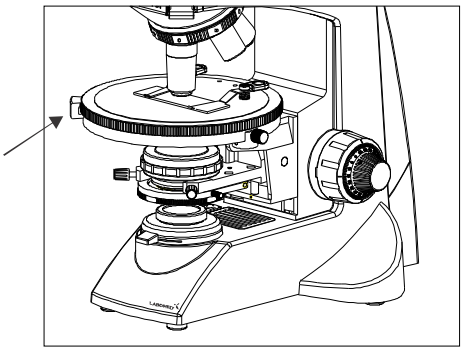


Fig. 31

Vernier scales

These scales allow easy identification of the specimen position (coordinates), so that you can easily return to a particular region of interest after scanning the slide (Fig. 31).

b ADJUSTING THE FOCUS

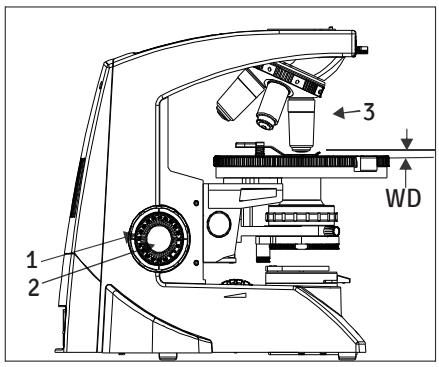


Fig. 32

Focusing procedure (Fig. 32)

1. Turn the coarse focus knob (1) clockwise so that the objective (3) is as close as possible to the specimen (we recommend starting with the 10x objective).
2. While observing the specimen through the eyepieces, slowly turn the coarse focus knob (1) counterclockwise to lower the stage.
3. When the specimen is coarsely focused (an image is visible), turn the fine focus knob (2) to focus the fine detail.

Working distance (WD)

The WD is the distance between each objective and the specimen when the specimen is in sharp focus.

OBJECTIVES					EYEPIECE 10x/20 W.F. (4140010)			ABBE CONDENSER	
Objective magnification	N.A.	W.D. (mm)	Cover Glass	Resolution (µm)	Total mag.	Field of view/mm	Depth of focus (µm)	Obj. N.A.	Flip Position (In / Out)
2.5x (9124002)	0.08	20.0	0.17	5.0	25x	8.0	400	0.08	Out
4x (9124005)	0.10	30.0	0.17	3.36	40x	5.0	200	0.10	Out
10x (9124010)	0.25	4.04	0.17	1.34	100x	2.0	30	0.25	Out
20x (9124010)	0.45	1.10	0.17	0.75	200x	1.0	6	0.45	In
40x (9124010)	0.65	0.45	0.17	0.52	400x	0.50	3	0.65	In
100x(oil)(9124010)	1.25	0.14	0.17	0.27	1000x	0.20	0.70	1.25	In

c ADJUSTING THE INTERPUPILLARY DISTANCE (IPD)

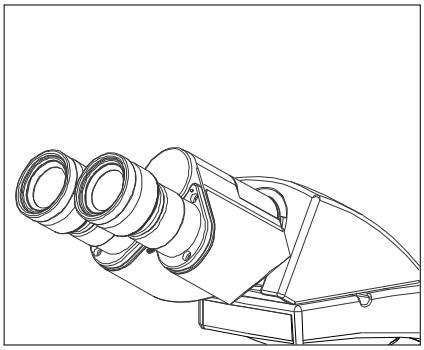


Fig. 33

Interpupillary distance adjustment aligns the two eyepieces with the pupils of both eyes, so that you observe a single microscope image through the two eyepieces in stereo vision. This greatly helps to reduce fatigue and discomfort during observation.

While looking through the eyepieces, move both eye tubes sideways until the left and right fields of view coincide completely. The position of the index dot (•) indicates the interpupillary distance.

Note your interpupillary distance so that you can quickly set it again in the future. This is useful when several users work with the microscope.

d ADJUSTING THE DIOPTER

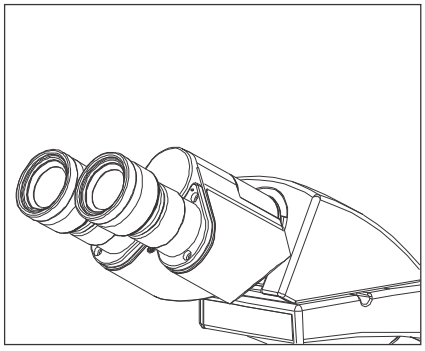


Fig. 34

Procedure for adjusting the diopter:

1. Turn the right eyepiece to match the marking of your IPD (if your IPD is 64, turn the eyepiece to the 64 mark).
2. While looking through the right eyepiece with your right eye, turn the coarse and fine focus knobs to bring the specimen into focus.
3. While looking through the left eyepiece with your left eye, turn only the diopter adjustment ring on the eyepiece until the specimen is in the best possible focus.

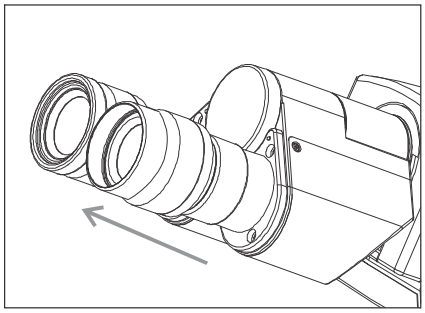


Fig. 35

Using the eye guards

When wearing eyeglasses
Use the eye guards in the normal, folded-down position. This prevents the eyeglasses from being scratched.

When not wearing eyeglasses
Extend the folded eye guards outward (direction of the arrow) to keep ambient light out of your line of vision.

e ADJUSTING THE CONDENSER POSITION AND APERTURE IRIS DIAPHRAGM

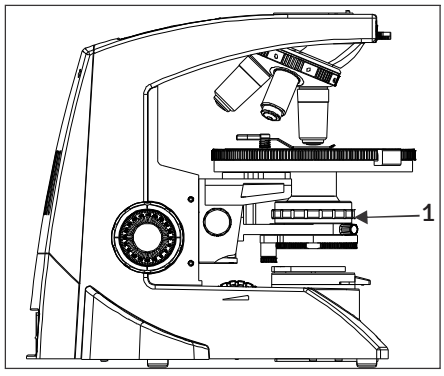


Fig. 36

The condenser is most often used in its highest position. If the observed field of view is not bright enough, brightness may be improved by lowering the condenser slightly.

1. Turn the condenser height adjustment knob (2) to move the condenser to the highest or desired position.
2. The aperture iris diaphragm ring (1) has an objective magnification scale. Slide the diaphragm lever left or right to obtain the desired illumination level.

f SWITCHING THE OBJECTIVES

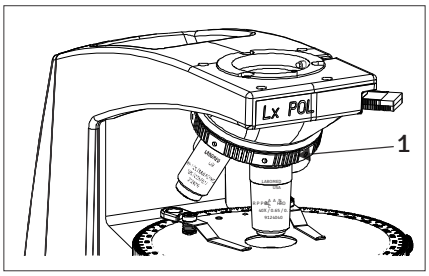


Fig. 37

Rotate the revolving nosepiece (1) so that the objective to be used is in line above the specimen. Always use the knurled surface to rotate the objective nosepiece.

g USING THE 100x IMMERSION OBJECTIVE

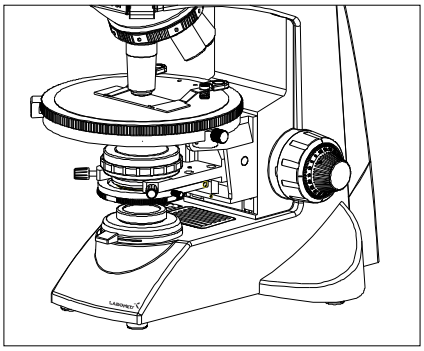


Fig. 38

The designated immersion oil must be in contact with the front lens of the 100x immersion objective; otherwise the specimen will appear distorted and dull. We recommend always using LABOMED immersion oil.

Immersion procedure:

1. Bring the specimen into focus, first with the 10x and then with the 40x objective.

2. Move the 40x objective out of the light path, turning toward the 100x, and place a drop of immersion oil on the center of the specimen.
3. Rotate the revolving nosepiece to engage the immersion objective and turn the fine focus knob to bring the specimen into focus.

(Air bubbles in the oil affect the image quality, so make sure that the oil is free of bubbles. To remove bubbles, rotate the revolving nosepiece slightly to agitate the oil.)

4. The condenser of this microscope delivers its full performance when oil is placed between the slide glass and the front lens of the condenser. If no oil is placed there, the observed image may appear dark.

5. After use, remove the oil from the front lens of the objective by wiping it with lens tissue slightly moistened with a mixture of ether (70%) and alcohol (30%).

Caution:
If immersion oil gets into your eyes, rinse them thoroughly with fresh water. If immersion oil gets on your skin, wash the affected areas with soap and water.
If discomfort persists, consult your physician immediately.

16 TROUBLESHOOTING GUIDE

Under certain conditions, the performance of the unit may be adversely affected by factors other than defects. If problems occur, review the following list and take corrective action as needed. If the problem persists, contact LABOMED or your local LABOMED dealer.

OBSERVATION	CAUSE	REMEDY
1. Uneven brightness in the field of view	The objective is not engaged in the light path	Engage the objective in position until the nosepiece clicks
	The condenser is too low	Raise it to obtain more light
	The objective, eyepieces, condenser and/or window lens are dirty	Clean them thoroughly as described in “Optical cleaning”
2. Dust or stains are visible in the field of view	The eyepieces, condenser, window lens and/or specimen glass are dirty	Clean the glass parts thoroughly with lens tissue and cleaning solution as described in “Optical cleaning”
3. Glare is visible in the field of view	The condenser is too low The condenser iris diaphragm ring is closed	Raise the condenser Adjust the aperture according to the objective magnification
4. The image is hazy or unclear	The objective is not engaged in the light path	Engage the objective in position until it clicks
	The objective, eyepieces, condenser and/or specimen glass are dirty	Clean the glass parts thoroughly with lens tissue and a cleaning cloth
	Immersion oil is not used with an immersion objective	Use immersion oil as described
	Bubbles in the immersion oil	Remove the bubbles by agitation
	The specified immersion oil is not used	Use the immersion oil supplied by LABOMED
5. Part of the image is out of focus	The objective is not engaged in the light path	Engage the objective in position until the nosepiece clicks
	The specimen is not set properly on the stage	Set the specimen correctly on the stage and secure it with the specimen holder
6. The coarse focus knob cannot lower the stage far enough	The condenser is too low	Raise the condenser
7. The fields of view of the two eyepieces do not match	The interpupillary distance is not adjusted properly	Adjust the IPD to the appropriate setting
	Diopter compensation for the two eyes is not set	Adjust the diopter settings
	The left and right eyepieces have different magnifications	Make sure that both eyepieces have the same magnification. LABOMED does not recommend using third-party eyepieces with LABOMED eyepieces

OBSERVATION	CAUSE	REMEDY
8. The objective hits the specimen when switching to a higher-magnification objective	The specimen slide is upside down	Set the specimen correctly with the cover glass facing upwards
	The cover glass is too thick	Use a cover glass 0.17mm thick
	The stage is raised too high	Lower the stage
	The slide has slipped from the slide holder	Reposition the slide in the slide holder
	The slide is too thick	Use slides 0.9 to 1.4mm thick
9. The LED does not turn on	The LED is not mounted	Fit an LED
	The LED has failed	Replace the LED
	The power cord is unplugged or not firmly connected	Plug the power cord securely into the microscope and the wall outlet
	The fuse has blown	Replace with a working fuse
	The battery is low	Charge the battery
10. The LED fails frequently	The specified LED is not used	Replace with the specified LED
11. The field remains dark even though the LED is on	The polarizers are in the extinction position	Move the analyzer out of the light path by setting the analyzer lever to the out “O” position. Swing the polarizer out of the light path.
	The Bertrand lens is in the light path (BL).	Swing the Bertrand lens to the out “O” position, i.e. out of the light path.
12. The conoscopic image is not visible	The Bertrand lens is out of the light path.	Bring the Bertrand lens into the light path at the “BL” position.
	The condenser top lens is not in the light path.	Swing the condenser top lens into the light path.
	A low-magnification objective is in use.	Use an objective of the specified magnification, i.e. 20x to 100x.
13. Extinction failure	The analyzer and polarizer are out of the light path.	Bring the analyzer and polarizer into the light path.
	The analyzer and polarizer are not crossed.	Rotate the polarizer to obtain complete extinction.

17 SPECIFICATIONS

1. Illumination	Built-in illumination system, LED		
2. Focusing mechanism	Stage height adjustment mechanism Fine adjustment scale: 3.0µm per graduation Fine adjustment stroke: 0.3mm per turn Total stroke: 12.7mm Coaxial coarse and fine focusing on ball drive		
3. Revolving nosepiece	Quadruple, fixed positions (reverse angle)		
4. Observation tube		Binocular	Trinocular
	Field number	20 (standard)	20 (standard)
	Tube tilting angle	30°	30°
	Interpupillary distance adjustment range	48-75	48-75
5. Stage	Size	160mm diameter	
	Rotatability	360°	
	Specimen holder	Spring-loaded stage clips	
6. Condenser	Type	Abbe condenser (daylight filter detachable)	
	N.A.	1.25	
	Aperture iris diaphragm	Built-in	
7. Dimensions and weight	405mm (L) x 210mm (W) x 425mm (H); 7 kg net		
8. Electrical	LED battery	7.4V, 1000mAh	
	Charging time	Up to 5 hours (with fully discharged battery)	
	Total battery time	Up to 2 hours when fully charged	
	LED life	50,000 hours	
9. Operating environment	Indoor use Altitude: max. 2000 meters Ambient temperature: 5° to 40°C (41° to 104°F) Maximum relative humidity: 80% for temperatures up to 31°C (88°F), decreasing linearly through 70% at 34°C (93°F) to 50% relative humidity at 40°C (104°F) Supply voltage fluctuations: not to exceed ±10% of the nominal voltage Pollution degree: 2 (in accordance with IEC 60664) Installation/overvoltage category: II (in accordance with IEC 60664)		

Revision History

Rev. No.	Date of Release	ECR #	Change	App. By
1.4	July 23, 2021	DCR/06/21	Added LED Information Index & Pages Reset	S.Bal

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