AmScope™

B270

Introduction

This manual will provide information pertaining to the setup and operation of the B270 biological compound microscope. Please familiarize yourself with the necessary precautions and procedures prior to operating this instrument. Certain features and specifications are subject to change.

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Safety

Before using your AmScope microscope, please read the following safety precautions carefully to avoid causing damage to your AmScope product, or injury to yourself or others.

Turn off power if the instrument exhibits unusual or dangerous behavior such as emitting smoke or unusual odors. These can be indications of electrical problems, in which case the instrument should be disconnected from any power source if safe to do so. Other indicators can be a loud buzzing sound or crackling. Contact AmScope to report such behavior.

Do not use around flammable liquids or gases. Electric instruments can ignite flammable substances which could result in an explosion or fire.

Do not use in a wet environment. Electrical components of the instrument can discharge when exposed to water, potentially resulting in damage to the instrument, or injury to yourself or others.

Do not dismantle. Dismantling can result in damage to the instrument, and potential exposure to dangerous materials or electric current.

Notices

AmScope reserves the right to change specifications of the product at any time without notice. Continuous efforts are made to improve performance and reliability, which can result in changes to design and compatibility. Please contact AmScope for any concerns regarding such changes.

Proposition 65 Notice for California Residents

Cables included with the products described in this manual can expose you to chemicals including lead, which is known by the state of California to cause cancer, birth defects or other reproductive harm. Visit www.P65Warnings.ca.gov for more information.

Contents

B270 Specifications	
Optical System	Finite conjugate
Mechanical Tube Length	160mm
Head	Binocular, 30° incline, 360° rotation
Interpupillary Adjustment	Siedentopf, 48-75mm
Ocular Diameter	23.2mm
Objective Lenses	DIN standard
Objective Parfocal Distance	45mm
Objective Mounting Thread	RMS 20.32mm
Objective Turret	Forward orientation quadruple
Focusing System	Coaxial coarse and fine focus, upper limit-stop
Fine Focusing Precision	0.002mm
Stage Design	Double-layer with caliper
Stage Vertical Stroke	25mm
Stage Dimensions	118mm x 127mm
X-Y Translation Range	70mm x 21mm
Transmitted Illumination	Variable-intensity 1W LED
Light Condenser	NA1.25 Abbe condenser with iris diaphragm
Sub-stage Condenser-holder	Rack and pinion, centerable
Power	100-240VAC 50/60Hz

What's In The Box

The B270 standard outfit includes:

- One microscope
- Four objective lenses: 4X, 10X, 40X, 100X
- One pair 10X eyepieces
- One blue color filter
- One dust cover
- One AC power cord
- 25 pipettes
- 50 blank slides with 100 cover slips
- One security leash with key

Additional items may be included depending on the model.

1. Assembly and Setup

1.1 The Head

The head can be swiveled 360° by loosening a thumb-screw on the left side of the body just below the head. Be careful not to loosen the screw too much, as the head can become detached. Should the head become detached, simply loosen the thumb-screw enough to allow the head to be re-seated until flush with the body, then tighten the thumb-screw.

CAUTION: Never lift the microscope by the head. If the head is not properly seated, it can become separated, causing the body to fall, or otherwise damage the coupling mechanism. During transport, hold the microscope by the body in an upright position to prevent the head, eyepieces, or other parts from falling.

1.1b The Eyepieces

This microscope uses 23.2mm eyepieces which can be easily mounted to or unmounted from the ocular tubes on the front of the head. During transportation, the eyepieces should not be mounted to the head to avoid falling. Dust caps should be inserted into the ocular tubes, or alternatively an anti-static cover can be placed over the head to prevent dust contamination. To use this instrument for standard observation, eyepieces must be attached to produce a viewable image.

Insert a pair of eyepieces into the ocular tubes. Ensure that the eyepieces have matching magnification, as some models contain multiple pairs of eyepieces with different magnifications. Once attached, adjust the diopter ring on the left ocular tube until it is neutrally aligned (no dioptric adjustment).

1.1c Dioptric Adjustment

The dioptric adjuster can be used if your eyes do not focus the same. This process requires a specimen to be in place with the illuminator active. Begin the process by setting the dioptric adjuster on the left ocular tube to a neutral position. Next, use the focus knobs to bring the image to sharp focus for your right eye. Once the right eye attains sharp focus, rotate the dioptric adjuster until the left eye achieves sharp focus.

1.1d Interpupillary Adjustment

The head uses a Siedentopf adjustment mechanism which allows the ocular tubes to be moved inward or outward by lifting or lowering both halves of the housing in an arcing motion. This is referred to as interpupillary adjustment, which is designed to properly align the eyepieces with your eyes. The adjustment is meant to match the distance between your eyes' pupils which is called the interpupillary distance. The adjustment process should be performed prior to observation of a specimen, and requires that the illuminator is active. Attempt to look through both eyepieces, adjusting the interpupillary-adjustment mechanism accordingly until the eyepieces are aligned with your eyes, and an image can be seen with both eyes. This process should be repeated whenever viewing a specimen to ensure alignment.

1.2 Objective Lenses

The microscope is equipped with four objective lenses which are mounted to a rotating turret between the head and the specimen stage. Should the lenses be removed for transport, they are mounted and unmounted by rotating each lens clockwise or counter-clockwise respectively. The lenses are typically mounted in order from 4X to 100X, but can be interchanged as desired. This microscope is compatible with DIN-standard objective lenses, which allows aftermarket lenses to be used as needed. These lenses must comply with the following DIN* specifications:

- 20.32mm RMS mounting thread
- 160mm mechanical tube-length
- 45mm parfocal distance

*DIN stands for Deutsches Institut für Normung which is a German standards organization. Microscopes and objective lenses which are DIN compliant will use the aforementioned specifications.

1.3 Light Condenser

This microscope uses a light condenser to focus and control the amount of light which passes through the specimen. An Abbe condenser is pre-mounted so no initial setup is required. Additional condensers may be used such as darkfield condensers. This model uses a bottom-loading design, so the condenser is mounted from under the holder, sliding upward into position.

In order to remove the Abbe condenser and attach a different condenser, the illuminator's field lens must first be removed. Begin by raising the stage using a coarse focus knob to provide more space under the stage. Use the condenser-holder's height adjuster to raise the holder to its maximum height. Unscrew the illuminator's field lens by rotating it counter-clockwise until it can be removed. Once removed, locate the condenser's locking screw on the front of the holder. Use one hand to hold the condenser in place to avoid dropping it, then turn the screw counter-clockwise until the condenser is released. Once the condenser has been removed, insert the desired condenser into the holder until it is fully seated, then tighten the locking screw. Once the condenser is secured, replace the illuminator's field lens.

1.4 Specimen Stage

The stage has an adjustable height limit. This is used to prevent the stage from being raised too high which could result in damaging the specimen or even the objective lenses. The adjustment screw is located on the body just behind the stage.

Rotate the objective turret until the 100X objective lens is in place. With a specimen mounted on the stage, slowly raise the stage using the coarse-focus knob until the specimen is a few millimeters from the lens. Use the fine-focus knob to continue raising the stage until the specimen barely comes in contact with the lens. The 100X lens has a spring-loaded nose. If the nose begins to compress, the stage is too high. When the specimen is able to make contact with the lens without compressing the nose, this is the appropriate maximum height. The height-adjustment screw should be tightened to set the stopping position. If the specimen was too far from the lens, and could not make contact, loosen the adjustment screw slightly, then continue to make fine focus adjustments until the specimen is high enough. Once the height is properly set, tighten the adjustment screw.

1.5 Power

Before connecting the microscope to a power source, the power switch should be set to the “O” (off) position. Do not use the instrument near flammable materials, nor in wet environments. Attach the provided power cable, ensuring that the cable is fully inserted with a firm connection. Plug the cable into an AC outlet, then set the power switch to the “–” (on) position to activate the built-in illumination.

1.6 Security Leash

A security leash can be used with the B270 as a theft deterrent. The leash should be secured to an immobile object by guiding the leash around or through the object, then through the leash’s loop. Once the leash is secure, the lock portion of the leash can be attached to the microscope. The microscope’s security slot is located on the rear power panel between the power switch and power port. With the lock in its unlocked position, insert the tab into the security slot. Set the lock to its locked position using key or combination pad.

This security system is designed to be a deterrent against opportunistic theft. Extreme force can cause the security slot to warp or break which can result in damage to the microscope’s electrical system.

2. Operation

2.1 Mounting a Specimen

This microscope is designed to view translucent specimens mounted primarily on 3” x 1” glass slides. A metal template with caliper is attached to the top of the stage. A prepared slide can be placed on the stage by pushing the caliper lever outward to open the caliper, then sliding the slide in place so the long edge is flush against the back edge of the template. Gently releasing the caliper will secure the slide in place.

2.2 Illumination

[image: brightness wheel]

The microscope's power switch is located on the rear of the body. Turn on the microscope's illumination by pressing the power switch to the "–" (on) position. As magnification increases, more light will be necessary to view the specimen. Use the wheel on the right side of the microscope's base to adjust the illuminator's brightness as needed. Avoid using the microscope for long durations with excessive brightness, as this can strain the eyes.

2.3 Using the Condenser

The condenser focuses light from the microscope's lamp onto the specimen in order to maximize brightness and resolution. There are multiple adjustments which can be made to suit different applications.

2.3a Condenser Height

[image: adjusting condenser height]

The condenser should be raised to its maximum height to achieve optimal brightness and resolution. The height-adjustment knob is located on the left side of the microscope, just behind the condenser holder. Rotate the knob clockwise to lower the condenser, and counter-clockwise to raise the condenser. Lowering the condenser is typically done to perform a function such as applying immersion oil. The height of the condenser also affects its numerical aperture. Lowering the condenser will decrease the effective aperture, therefore increasing the observed depth of field in a manner similar to using the iris diaphragm. This can negatively impact image quality due to diffraction, so it is recommended to use the condenser at its maximum height.

2.3b Adjusting the Aperture

[image: aperture lever]

The condenser has a built-in iris diaphragm which creates an internal aperture. This aperture controls the amount of light which passes through the condenser, and partially collimates the light. Decreasing the size of the aperture restricts the amount of light used which in turn reduces the amount of scattered light. The notable effects are a reduction in brightness as well as increased depth of focus. Decreasing the aperture too much will result in diffraction artifacts which deteriorate image quality. As objective magnification increases, more light will be requires to accommodate higher numerical apertures. The aperture should be increased accordingly.

2.3c Centering the Condenser

The condenser can also be centered to improve alignment with the set objective lens. Two recessed centering screws are located on the front of the condenser-holder -- one on either side of the locking screw. Adjustment requires a 2.5mm hex wrench. Rotating either screw clockwise will increase tension and push the condenser diagonally. Because the microscope's viewing head produces an inverted image, the condenser will appear to move in a direction opposite the mechanical movement.

To center the Abbe condenser, its iris diaphragm must be used as reference. This is ideally done using a telescoping eyepiece which can be adjusted to focus on the condenser's iris. Otherwise, an eyepiece can be removed from the viewing head, allowing you to view an image of the iris inside the ocular tube. The illuminator must be active to provide the necessary light, but the brightness should be adjusted to a low level since you will be looking directly at the light. With the condenser raised to its maximum height, you should see an image of the iris. Use the condenser's adjustment lever to increase or decrease the size of the aperture until it is slightly smaller than the field of view. Tightening the right screw will move the image of the iris downward and to the right. Tightening the left screw will move the image of the iris downward and to the left. Loosening either screw will move the image of the iris in an opposite direction. Make gradual adjustments to both screws until the iris appears centered in the field of view. You can increase or decrease the aperture as needed to gauge the alignment.

2.3d Color Filters

[image: filter holder with filter]

32mm filters can be used with this microscope to alter the color of light. Common filters include green, yellow, and blue. A green filter is commonly used to concentrate light in the middle of the spectrum, as most optics are designed to produce optimal results using these center wavelengths. Blue filters can be used to compensate for light sources with warmer color, or to better image certain specimens. Yellow filters can be used with cooler light sources like LED to decrease higher-intensity wavelengths which can fatigue the eyes over long periods.

The condenser is equipped with a filter-holder located on its bottom. The holder has a small peg which can be pulled in a clockwise motion to swing the holder outward. The condenser may need to be rotated to allow the space needed to open the holder. Once the holder has been fully opened, a 32mm filter can be placed within the holder's recess. Close the holder to engage the filter.

2.4: Locating the Specimen, and Focusing

With the specimen mounted on the stage, and the illuminator turned on, use the stage's X-Y control knobs under the right side of the stage to adjust the position of the specimen. The larger knob will move the specimen forward and backward, while the smaller knob will move the specimen left and right. Compound microscopes produce inverted images due to the nature of the optical system. Sliding the specimen towards the front of the microscope will result in the viewed image moving in the opposite direction. Use the knobs until the specimen appears to be centered under the objective lens. This will be the starting point.

Observation should typically begin at the lowest magnification. This provides the broadest view of the specimen. Rotate the objective turret to set the lowest magnification lens in place. The condenser is typically designed with a range of aperture values ranging from approximately 0.10 to 1.25. If using a 4X objective lens with a 0.10 aperture, adjust the condenser's aperture using the lever on the outside of the condenser to reduce the size of the aperture. This will maximize the focus depth. When higher magnifications are used, the aperture should be adjusted more open to better match the objective lens' aperture.

Look through the eyepieces, adjusting the interpupillary adjusters as needed to achieve proper alignment. Both eyes should see the same image with a bright, round background. If the image appears offset or obscured, you should continue to adjust the interpupillary distance until the image appears correct. The left ocular tube also has a dioptric adjuster which can be used if the eyes do not focus the same. If the eyepieces are properly aligned, but the light-source appears offset, use the two centering screws attached to the condenser holder to adjust the condenser's position until it is centered. For trinocular models, the photo tube can be adjusted to parfocal by first obtaining focus with the right eye, then adjusting the length of photo tube by unscrewing the top portion of the tube from the bottom portion until the camera obtains focus, then tightening the locking ring in the middle until it engages against the bottom portion of the photo tube.

[image: adjusting the coarse/fine focus]

The stage should be set to a low position when mounting the specimen. Gradually raise the stage using the coarse-focus knob. If you have already performed the height-limit adjustment, the specimen should come into focus near the maximum height. Once you begin to see shapes through the eyepieces, use the fine-focus knobs to adjust the focus until you can see details with clarity. Use the X-Y control knobs to reposition the specimen until the area of interest is in view. You can increase magnification as needed by rotating the objective turret. When doing so, it is advisable to watch the lens as it is set in place to ensure it will not collide with the specimen. Slight adjustments to focus should be made at each magnification, as well as to the condenser's aperture and the illuminator's brightness.

2.5 Immersion Oil

Certain high-magnification objective lenses with numerical-apertures over 1.0 will be marked with the word “oil.” This signifies that the lens is designed to work with specialized oil as an immersion medium. The immersion oil is used between lenses and specimens to eliminate air from the optical path in order to maintain high resolution. This oil is only intended to be used with compatible lenses, and should not be used with non-oil lenses. The most-common lens to use oil is a 100X objective lens with a numerical aperture of 1.25 or higher. A small drop of oil is placed on the specimen, then the lens would be rotated into place. The specimen must be appropriately prepared to allow the use of oil, such as by using a cover slip. When the stage is raised to achieve focus, the objective lens will make contact with the oil.

Immersion oil should also be used with oil-compatible condensers. Condensers with numerical apertures over 1.0 must use an immersion medium to achieve the high numerical apertures. A drop of immersion oil would be placed on the condenser’s top lens, then the condenser would be raised so the oil makes contact with the underside of the specimen. This technique should only be used with specimens which have been properly prepared, such as being mounted on a glass slide.