AmScope

BIO740 Series

User Guide



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.

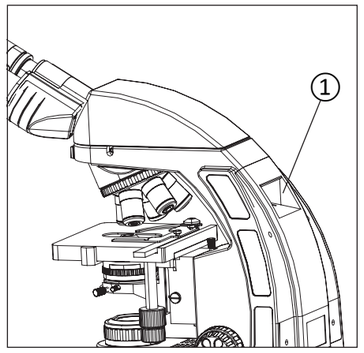
Notices

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.

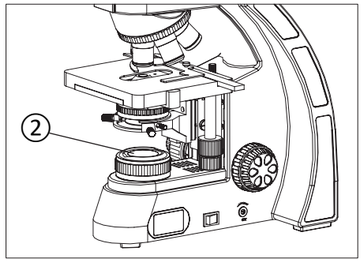
Proposition 65 Notice for California Residents

This product contains 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.

General Precautions



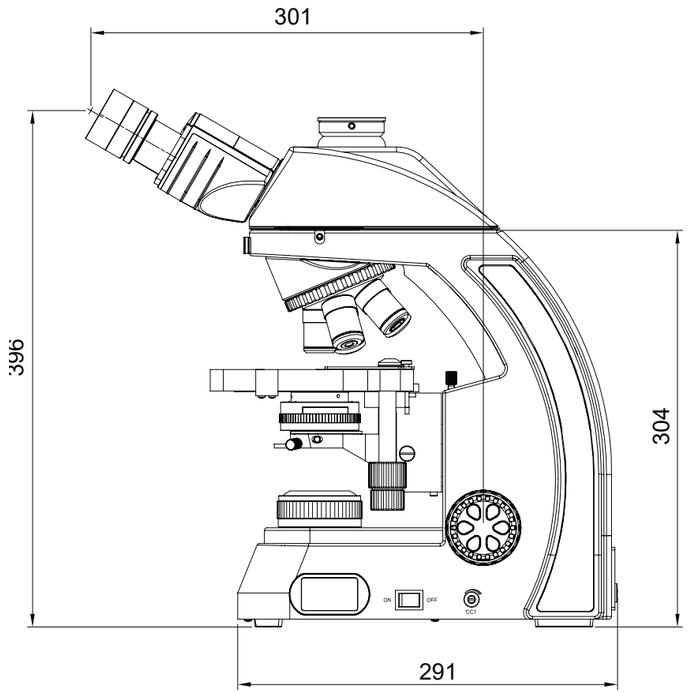
When carrying the microscope, use the hand grip ① on the rear of the microscope with one hand while supporting the bottom of the microscope with the other.

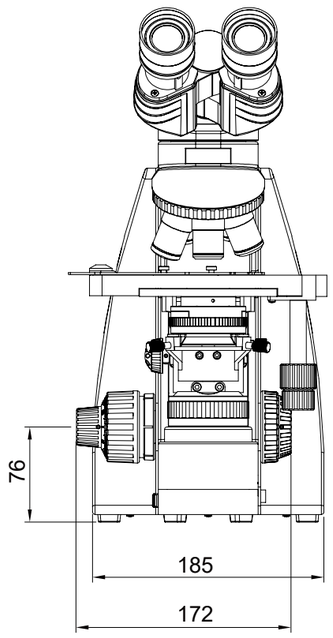


When the illuminator is active, the field lens ② may be hot. Avoid touching the glass surface.

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Measurements in millimeters

BIO740T Standard Specifications

Optical System	Infinite conjugate			
Head	Trinocular, 30° incline			
Ocular Diameter	30mm			
Eyepieces	10X FN22			
Interpupillary Adjustment	50-75mm, compensation-free Siedentopf			
Photo Port	Interchangeable, 80:20 simul-focal (80% left ocular, 20% photo), C-mount interface			
Objective Turret	Reverse orientation quintuple			
Objective Lenses	Infinity-corrected			
	4X	Plan-achromatic	NA 0.10	WD 15mm
	10X	Plan-achromatic	NA 0.25	WD 10.8mm
	20X	Plan-achromatic	NA 0.40	WD 1.5mm
	40X	Plan-achromatic	NA 0.65	WD 0.8mm
	100X (Oil)	Plan-achromatic	NA 1.25	WD 0.21mm
Objective Parfocal Distance	45mm			
Objective Mounting Thread	RMS 20.32mm			
Focusing System	Coaxial coarse and fine focus, upper limit-stop			
Fine Focusing Precision	0.002mm			
Stage Design	Double-layer with caliper			
Stage Dimensions	162mm x 150mm			
X-Y Translation Range	76mm x 50mm			
Transmitted Illumination	Variable-intensity 3W LED, 5600K color temperature			
Light Condenser	NA1.25 Abbe condenser with iris diaphragm			
Sub-stage Condenser-holder	Height adjustable, front-loading, centering			
Power	AC Input: 100-240V, 50/60Hz			

What's In The Box

The standard outfit includes:

- One microscope
- Five objective lenses: 4X, 10X, 20X, 40X, 100X
- One pair 10X eyepieces
- One photo port adapter
- One dust cover
- One power cord
- Three hex wrenches

Additional items may be included depending on the model.

BIO740T-ILS Standard Specifications				
Optical System	Infinite conjugate			
Head	Trinocular, 30° incline			
Ocular Diameter	30mm			
Eyepieces	10X FN22			
Interpupillary Adjustment	50-75mm, compensation-free Siedentopf			
Photo Port	Interchangeable, 80:20 simul-focal (80% left ocular, 20% photo), C-mount interface			
Objective Turret	Reverse orientation quintuple			
Objective Lenses	Infinity-corrected			
	4X	Plan-achromatic	NA 0.10	WD 15mm
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Transmitted Illumination	Variable-intensity 3W LED, 3000K-5600K color temperature			
Light Condenser	NA1.25 Abbe condenser with iris diaphragm			
Sub-stage Condenser-holder	Height adjustable, front-loading, centering			
Power	Adapter AC Input: 100-240V, 50/60Hz			
	DC Output: 15V, 2.67A			

What's In The Box

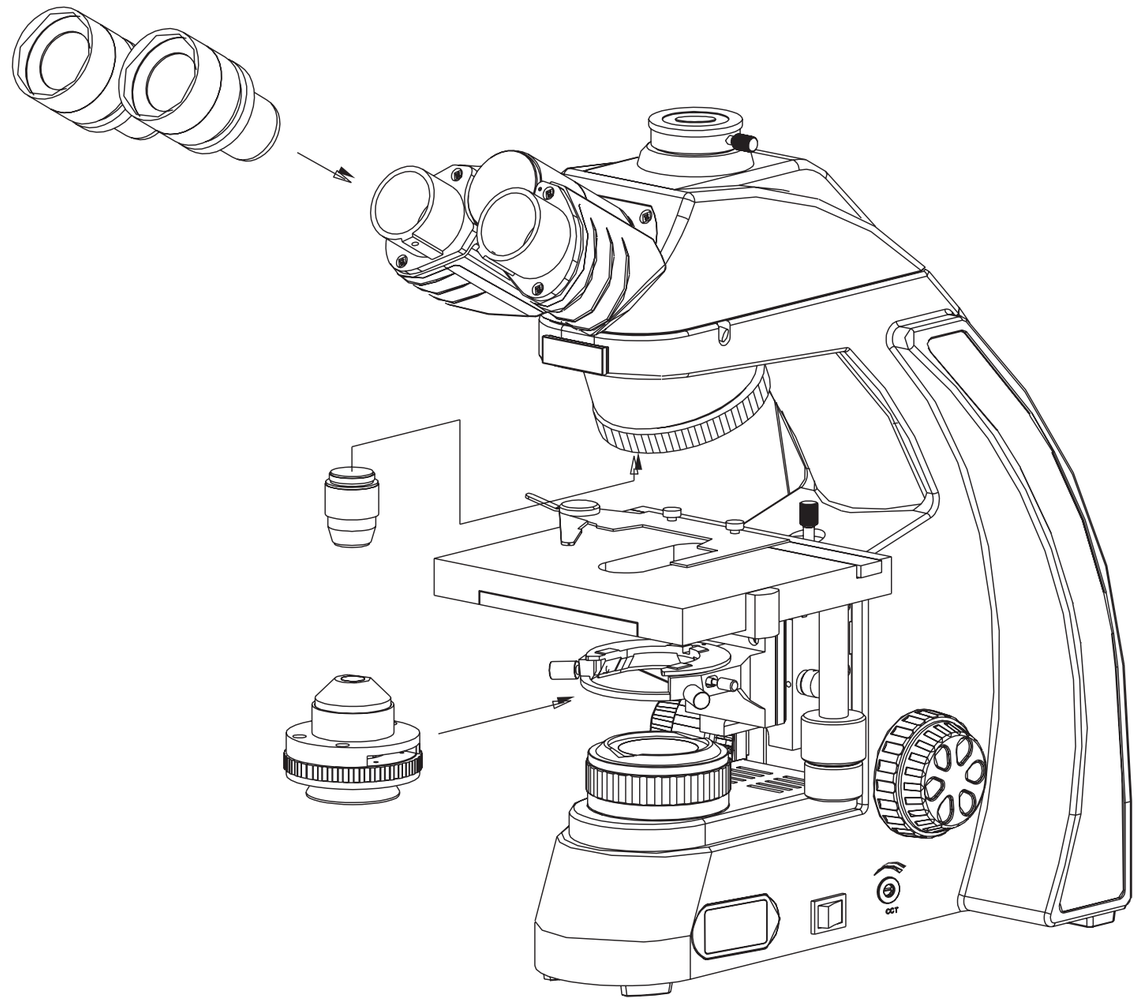
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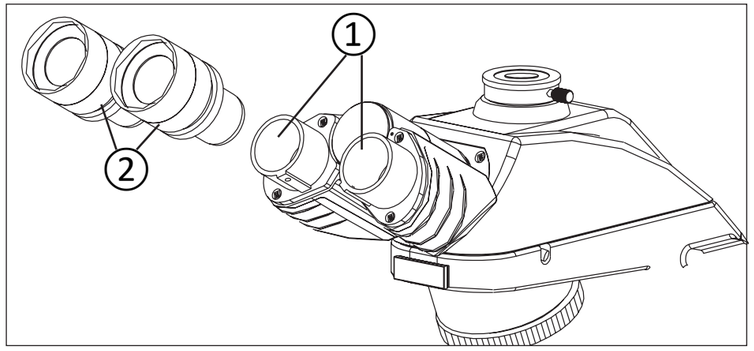
1. Assembly and Setup

This microscope requires some assembly prior to use. Eyepieces, objective lenses, and the Abbe condenser must be installed.



1.1 The Head

1.1a The Eyepieces



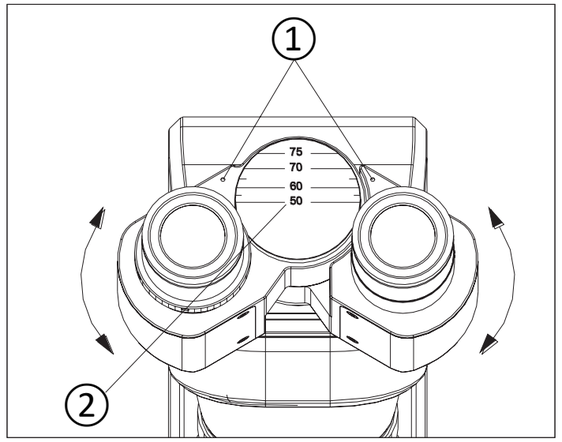
This microscope uses 30mm eyepieces which can be easily mounted to or unmounted from the ocular tubes on the front of the head. During transportation, the eyepieces should not be mounted to the head to avoid falling. Dust caps should be inserted into the ocular tubes, or alternatively an anti-static 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.

Prior to inserting eyepieces, remove any dust caps from the ocular tubes ①. Insert the eyepieces ② into the ocular tubes. Ensure that the eyepieces have matching magnification, as some models contain multiple pairs of eyepieces with different magnifications.

1.1b Dioptric Adjustment

This microscope's ocular ports do not have dioptric adjusters. The standard eyepieces included with the microscope have integrated dioptric adjusters to allow for individual adjustment based on your needs. As needed, dioptric adjustment can be performed through a simple process. This process requires a specimen to be in place with the illuminator active. Begin the process by setting the dioptric adjuster on each eyepiece a neutral position. Next, use the focus knobs to bring the image to sharp focus for your dominant eye. Once the image is sharply focused, rotate the dioptric adjuster (positive or negative) on the opposite eyepiece until the non-dominant eye achieves sharp focus.

1.1c Interpupillary Adjustment



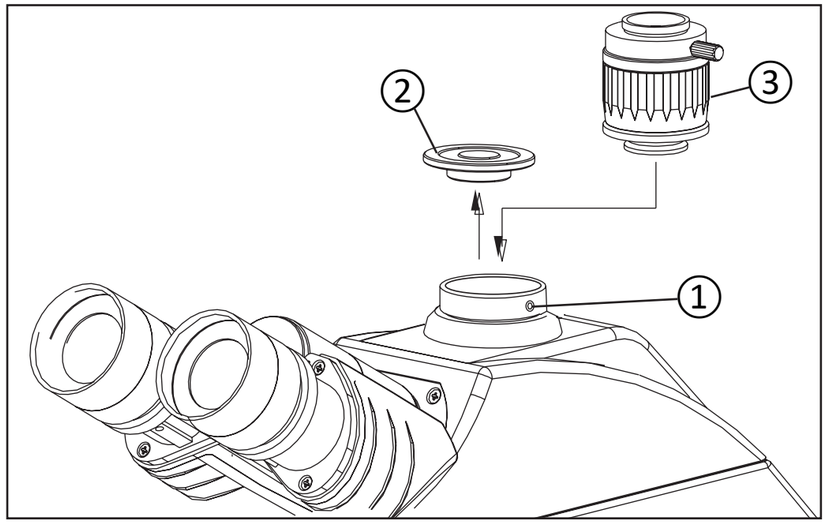
This microscope uses a Siedentopf adjustment mechanism which allows the ocular tubes to be moved inward or outward by lifting or lowering both halves of the housing in an arcing motion. This is referred to as interpupillary adjustment, which is designed to properly align the eyepieces with your eyes. The adjustment is meant to match the distance between your eyes' pupils which is called the interpupillary distance. There are registration points ① on the ocular tubes which will align with markings on the interpupillary scale ②. The numbers on the scale represent the interpupillary distance in millimeters.

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.

1.1d Trinocular Photo Port

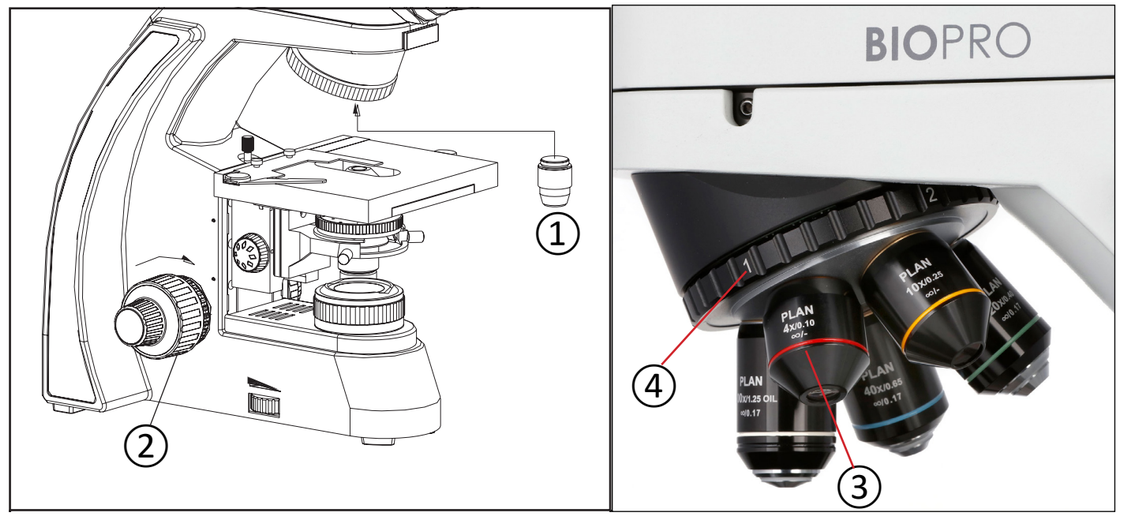
The trinocular model has an additional port on the top of the head intended for mounting a camera. This port is active simultaneously with the two ocular ports, so no switching is required. This model utilizes an interchangeable port system which includes an 1X C-mount threaded interface by default. Other C-mount port adapters are available which provide different magnifications which correspond to various camera sensor formats.

Sensor Optical Format	Adapter Magnification	Adapter Model
1”	1X	AD-C10-CX
1/1.2”	1X	AD-C10-CX
1/1.6”	0.65X	AD-C65-CX
1/1.8”	0.5X	AD-C05-CX
1/2”	0.5X	AD-C05-CX
1/3”	0.35X	AD-C035-CX



To attach the photo port adapter, first loosen the locking screw ① using the provided 3mm hex wrench. Next, remove the dust cap ② from the port. Slide the adapter’s port interface ③ into the port, further loosening the locking screw as needed. Once the adapter is fully seated, tighten the locking screw until the adapter is secure.

1.2 Objective Lenses



1.2a Installation

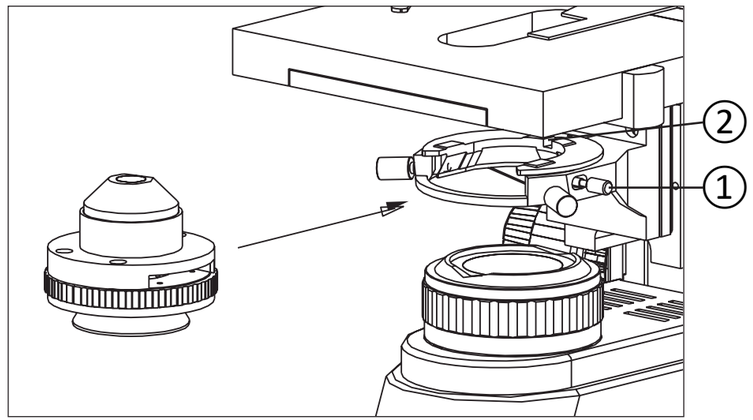
The microscope includes five objective lenses which will need to be mounted to the lens turret ① between the head and the specimen stage. Before mounting the lenses, rotate the coarse focus knob ② to lower the stage. They are mounted rotating each lens clockwise. The lenses are typically mounted in order from 4X to 100X, but can be interchanged as desired.

On the BIO740T-ILS model, objective lenses should be mounted in order from 4X to 100X, and attaching the 4X lens ③ to the #1 objective port ④ on the lens turret. The intelligent lighting system is pre-programmed to associate objective lenses with the numbered ports in order to display the correct magnification on the LCD screen located on the microscope’s base. Mounting the objective lenses out of order will not affect functionality, but will lead to a mismatch between the objective lens and the displayed magnification.

1.2b Compatibility

This microscope uses infinity-corrected objective lenses with 20.32mm RMS mounting thread and 45mm parfocal distance.

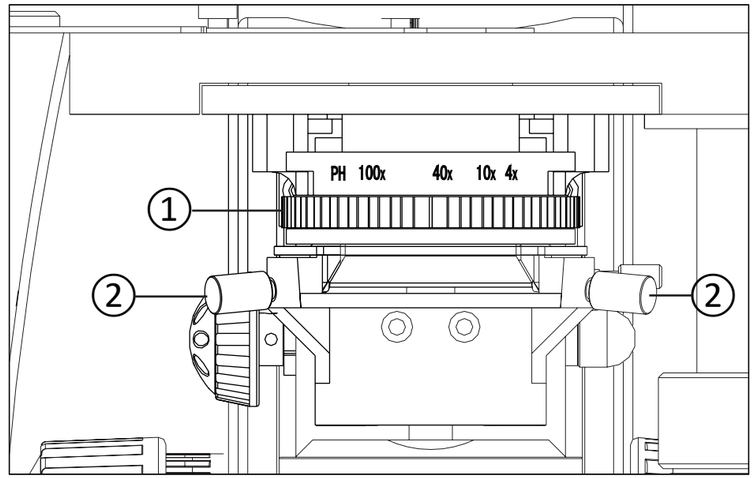
1.4 Light Condenser



1.4a Installation

Prior to installing the condenser, the condenser holder may need to be lowered. See Section 1.4d for information about setting the condenser holder's height.

Ensure the condenser locking screw ① has been loosened enough to allow the condenser to be inserted. When inserting the condenser, the numbered surface of the condenser should be facing outward, and the alignment screw on the bottom of the condenser (see Section 1.4e) should face the alignment slot ② on the rear of the condenser holder. Slide the condenser's grooved flange into the condenser holder until the alignment screw is seated in the alignment slot. Once the condenser is seated, tighten the locking screw to secure the condenser. After the condenser is installed, the condenser holder should be raised to its maximum height.

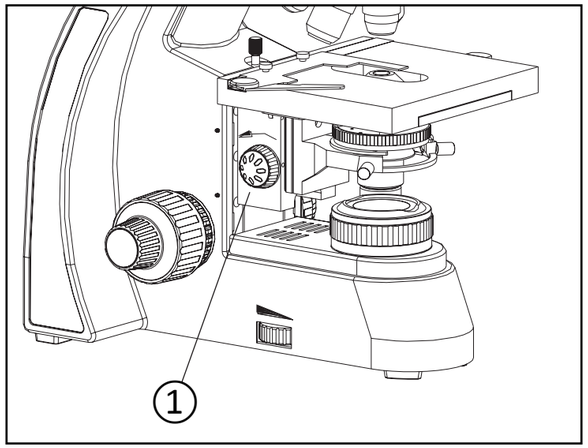


1.4b Aperture

The light condenser is responsible for collecting light from the illuminator field lens, and focusing it onto the specimen. This model is equipped with an Abbe condenser which can be used with objective lenses with numerical apertures up to 1.25. The condenser has an integrated iris diaphragm which controls the amount of light which passes through it by increasing or decreasing the size of its aperture. As the aperture is reduced, light becomes more collimated by eliminating stray, out-of-focus light. Collimation provides greater depth of focus. However, as magnification increases, the aperture will need to be increased accordingly. The aperture is controlled by moving a ring ① on the front of the condenser. Moving the ring to the left will increase the aperture, and moving it to the right will decrease the aperture. When using a phase-contrast annulus board, the aperture should be set to its fully-open position.

1.4c Centering the Condenser

Before centering the condenser, turn on the illuminator, raise the condenser to its maximum height, and place a specimen slide on the stage to adjust the focus. Bring the slide into focus to set the appropriate focal distance. Once set, the slide can be removed. Close the field diaphragm until the blades of the diaphragm can be seen through the eyepieces. The field diaphragm's aperture can be used to gauge how well centered the condenser is. Use both centering screws ② located on the front of the condenser holder to adjust the position of the condenser until the aperture appears centered. Opening the aperture until the diaphragm's blades are only slightly visible will help determine the accuracy.



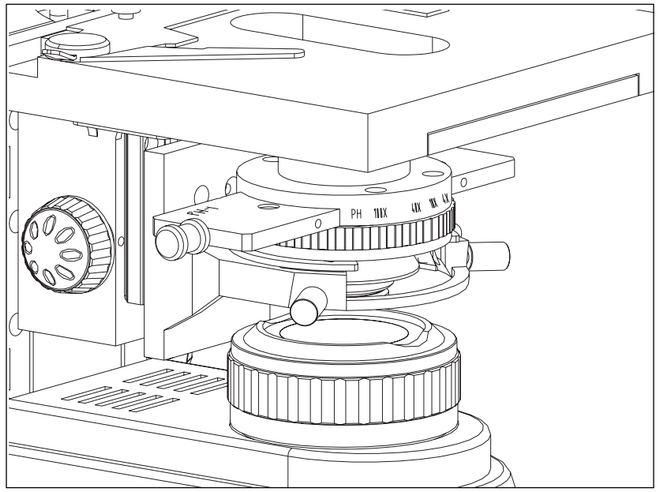
1.4d Condenser Height

The condenser's height can be adjusted by rotating the height-adjustment knob ① located behind the condenser on the left side of the microscope. The condenser may need to be lowered to apply immersion oil to the condenser's lens when working with high magnification lenses. It is recommended to use immersion oil if the objective lens' numerical aperture is larger than 1.

1.4e Alignment Screw

Before using the condenser's accessory slot, the alignment screw on the bottom of the condenser should be moved to a secondary position. This screw is used when mounting the condenser into the condenser holder. It aligns with a notch in the rear of the condenser holder to align the condenser so it faces forward. Accessory sliders such as phase-contrast annulus boards can make contact with the stage's X-Y controls when the condenser is in its default orientation. By moving the alignment screw ② to the secondary position ③, the condenser's orientation will change be offset enough to provide the clearance necessary for accessory boards.

1.4f Phase-Contrast Slider



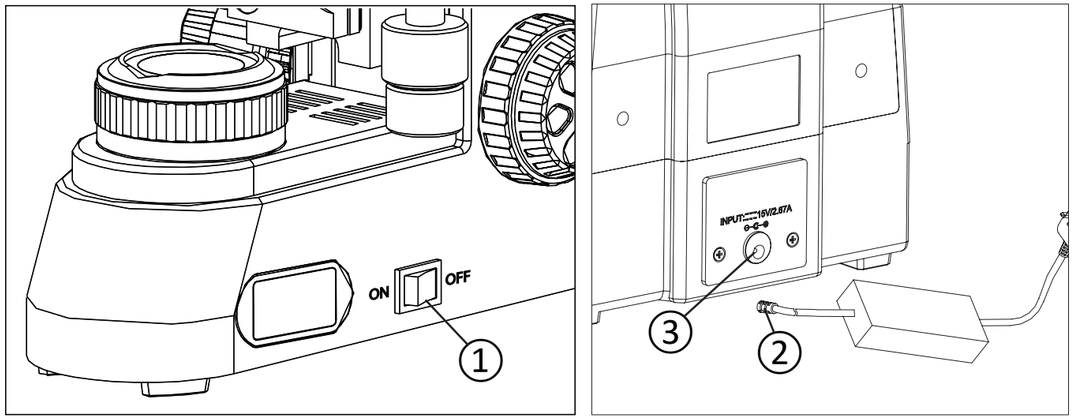
The condenser has an accessory slot which can be used with annulus boards included with optional phase-contrast kits. The annulus board can be slid into place rather than using a separate condenser.



By default, the condenser will have a placeholder insert ①. This can be removed by pushing it from either side, then pulling from the other side. The annulus board will have a grip ② on both ends. One of the gris will need to be removed by unscrewing it before the board can be inserted into the accessory slot. Once the board is installed, the grip can be re-attached. Prior to using an annulus board, read Section 1.4e regarding the condenser's alignment screw.



1.5 Power



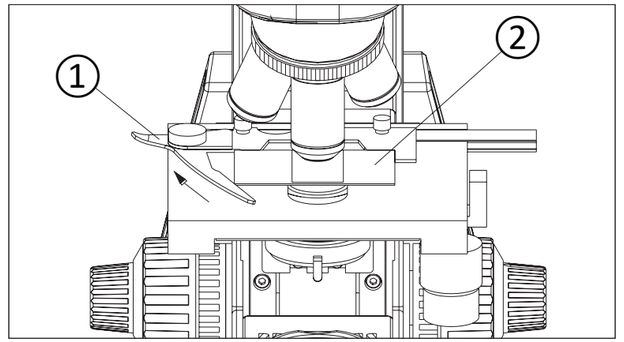
Before connecting the microscope to a power source, the power switch ① should be set to the “OFF” position. Do not use the instrument near flammable materials, nor in wet environments. The BIO740T-ILS model uses an external transformer, so the microscope's power port uses a DC barrel connection. Attach the provided power cable's barrel connector ③ to the microscope's power port ②. Plug the power adapter into an AC outlet, then set the power switch to the “ON” position to activate the built-in illumination.



The BIO740T model uses a 3-conductor AC power port and power cable. First attach the power cord to the microscope, then to the AC outlet.

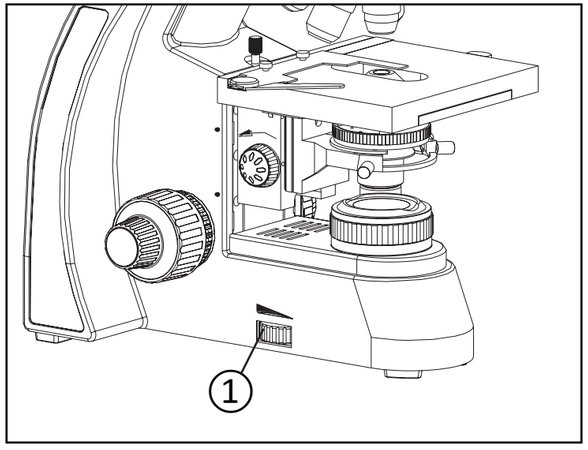
2. Operation

2.1 Mounting a Specimen



This microscope is designed to view translucent specimens mounted primarily on 3” x 1” glass slides. The specimen slide can be placed on the stage by pushing the caliper lever ① outward to open the caliper, then sliding the slide in place ② 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



Turn on the microscope's illuminator by pressing the power switch to the "ON" position. Use the brightness control wheel ① to increase or decrease the illuminator brightness as needed. As magnification increases, more light will be necessary to view the specimen. Avoid using the microscope for long durations with excessive brightness, as this can strain the eyes.

2.2a Intelligent Lighting System



Illuminator Memory

The Intelligent Lighting System uses five memory settings corresponding with the five objective ports on the lens turret which are numbered from 1 to 5. When installing the objective lenses, the lenses should be installed in the following order to match the numbered ports:

- 1: 4X
- 2: 10X
- 3: 20X
- 4: 40X
- 5: 100X

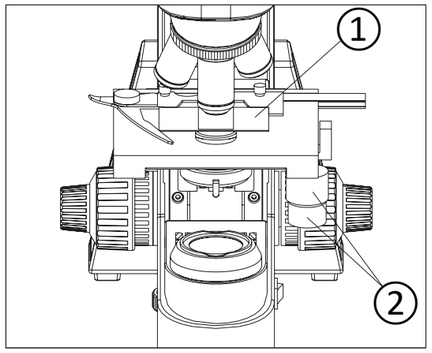
This numbering scheme is used to match the objective lens magnification with the magnification displayed on the right side of the LCD screen. Installing the lenses out of order – or installing lenses with other magnifications – will result in a mismatch with the LCD's display magnification, but otherwise has no effect on the functionality.

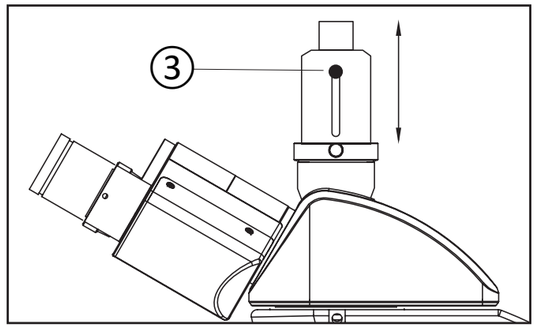
While adjusting the illuminator's brightness, the percentage of maximum brightness will be displayed in the top left corner of the LCD. Rotating the lens turret to select a different objective lens will cause the illuminator to reset to the brightness previously used for that lens. Adjusting the brightness will update the memory setting for that lens.

Color Temperature

The illuminator's color temperature can be adjusted within a range of 3000K to 5600K using the recessed dial marked CCT. Use a small flathead screwdriver to rotate the dial counter-clockwise to decrease the color temperature, or clockwise to increase it.

2.3 Locating the Specimen and Focusing





With the specimen slide ① mounted on the stage, and the illuminator turned on, use the stage's X-Y control knobs ② under the right side of the stage to adjust the position of the specimen. The upper knob will move the specimen forward and backward, while the lower 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's aperture should be adjusted to match the magnification. If using a 4X objective lens with a 0.10 aperture, slide the iris control lever on the condenser to the right to reduce the aperture. Reducing the aperture size too much may result in visible diffraction artifacts. If this happens, move the lever to the left until the artifacts are no longer visible. When higher magnifications are used, the aperture size should be increased to better match the objective lens' aperture. Increasing the aperture size will allow more light through resulting in a brighter image, but with less focus depth. Reducing the aperture size will have the opposite effect.

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.

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.

For trinocular models, the photo tube can be adjusted to allow a camera to achieve simultaneous focus. After focus has been set using the eyepieces, the photo tube's height should be adjusted until a clear image can be seen on the camera or viewing device. Loosen the photo tube's lock screw ③, then slide the tube upward. Raise or lower the tube as needed until the image is focused, then tighten the lock screw.

2.4 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.

Condensers with numerical apertures over 1.0 must use an immersion medium to achieve the high numerical apertures. A drop of immersion oil should 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.



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