

490 Series

*iScope Corp*

*User's Manual*

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## Introduction

Congratulations on the purchase of your new AmScope microscope!

This manual is designed for the 490 series microscopes (B490 & T490).

Though the two models have identical bases, the B490 is equipped with a binocular head (two eyepiece tubes), while the T490 is equipped with a trinocular head (two eyepiece tubes and a third photoport on the top).

Please take a few minutes to familiarize yourself with the features and functions of your new microscope.

If you'd like more information on microscopes, parts, or accessories, please visit our website at:

**[www.iScopeCorp.com](http://www.iScopeCorp.com)**

We highly recommend you study this manual thoroughly before operating the microscope, and that you keep it on hand for future reference.

If you have additional questions or need assistance, please send us an email at:

**[info@amscope.com](mailto:info@amscope.com)**

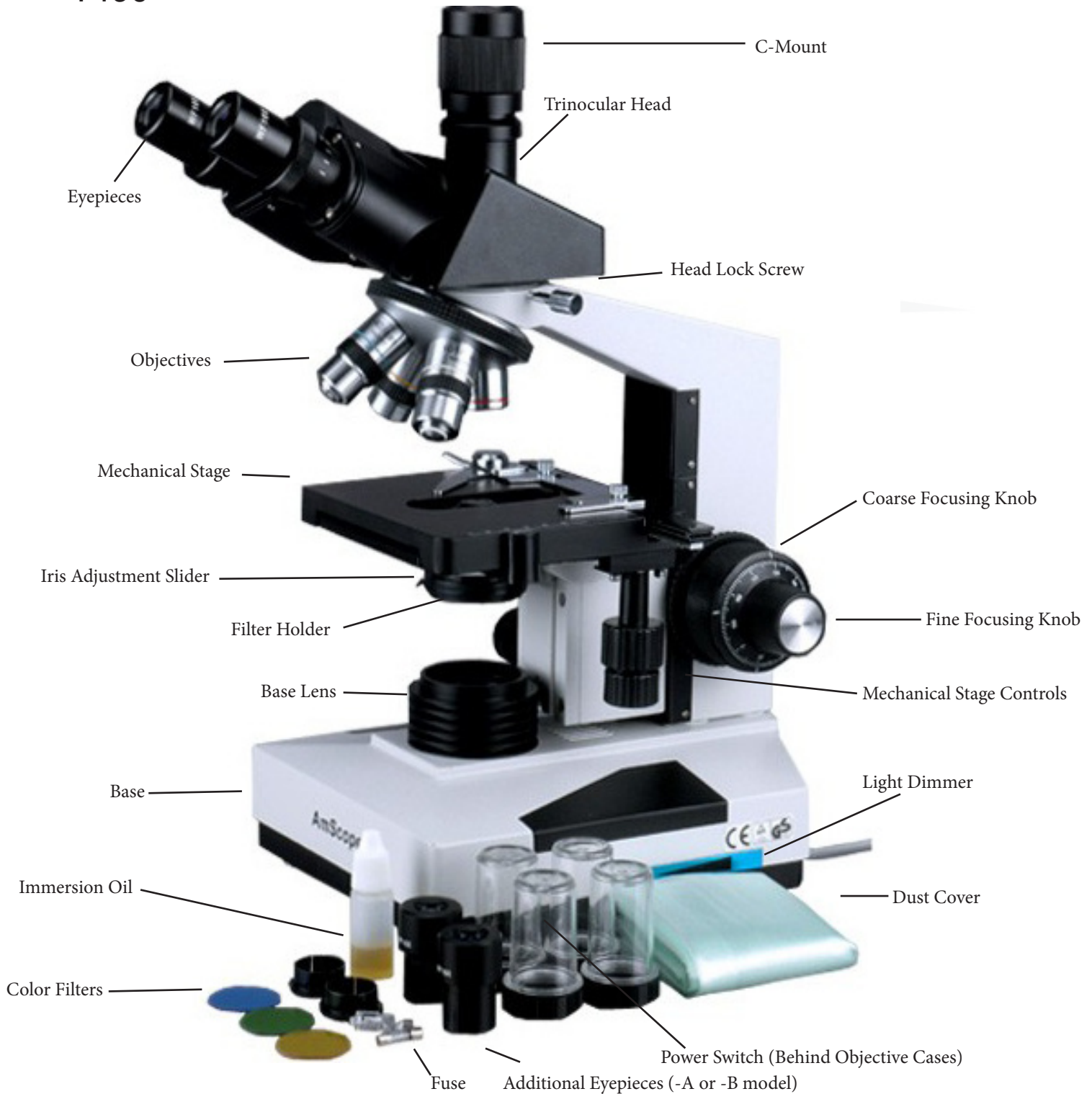
## Safety Precautions

1. As the microscope is a precision instrument, always handle it with care, avoiding impact or abrupt movement during transportation. Do not shake the package.
2. Do not place the microscope in direct sunlight or in high heat. Keep it indoors in a dry and clean place with temperatures between 32-100 degrees F (0-40 degrees C), and in maximum relative humidity of 85%.
3. Avoid touching the lenses on the objectives and the eyepieces so that oil and dirt from your fingerprints do not obstruct your view.
4. Before turning the power on, make sure that the power supply voltage is consistent with the voltage of your microscope.

B490



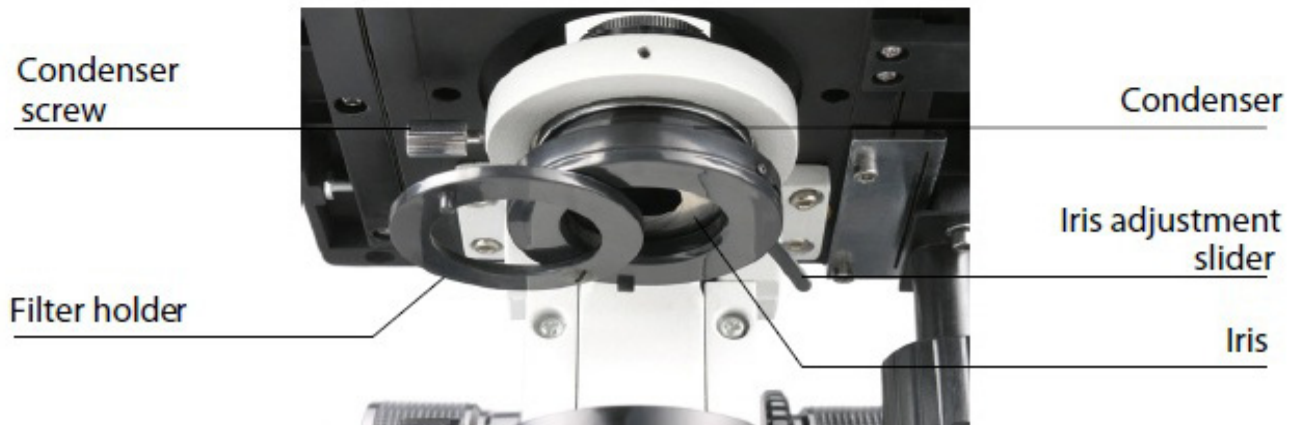
T490



Base & Condenser



Fig. 3: Bottom



## Definition of Parts

**Adjustable Trinocular Port**

*Threaded port with adjustable length of attachment of digital or video camera*

**Base Lens**

*Directs the light source towards the slide*

**Coarse Focusing Knob**

*Used to initially bring the slide into the sight and focus*

**Condenser & Iris Diaphragm**

*Control the amount of light that hits the slide*

**Condenser Screw**

*Screws the condenser in place, securing it to the mechanical stage*

**Dimmer**

*Controls the amount of light that escapes from the base lens*

**Diopter**

*Allows the focus to be perfected for both eyes, independent of each other*

**Fine Focusing Knob**

*Used to refine focus to clear image*

**Head Lock Screw**

*Screws the microscope head into place*

**Limit Stop Knob**

*Limits the upward movement of the mechanical stage in order to avoid damaging the slide and objective*

**Mechanical Stage**

*Mechanically moves the slide along an X and Y axis for optimal positioning*

**Nosepiece**

*Houses the objective lenses*

**Rotating Gemel Head**

*Adjusts eyepieces to fit the distance between the user's eyes for added comfort*

**Tension Knob**

*Adjusts the tension of the focusing knobs*



## Assembly

1. First, take the styrofoam container out of the cardboard carton and lay it on its side, paying attention to which side is labeled up. Remove the tape and open the container carefully so as to avoid dropping and damaging the optical items. Check carefully to ensure that all parts and accessories are intact.
2. Check the packing list to ensure that you're received all items:
  - One Microscope Body
  - One Binocular (B490) or One Trinocular (T490) Rotating Gemel Head
  - One Adjustable Trinocular Photo Port (for T490 only)
  - Four Objectives (4x, 10x, 40x, 100x)
  - 10x Widefield Eyepieces
  - 16x Widefield Eyepieces (for -A models only)
  - 20x Widefield Eyepieces (for -B models only)
  - Three Color Filters (Blue, Green, & Yellow)
  - One Bottle of Immersion Oil
  - One 6V/20W Spare Halogen Bulb (for 20W models only)
  - One 6V/30W Spare Halogen Bulb (for 30W models only)
  - One Spare Fuse
  - One Dust Cover

Note: LED models do not have a spare bulb, as the LED bulbs do not need replacing.

3. Remove the microscope body from the box and remove the plastic protective covering. The body of the microscope is composed of the base, the stage, the arm, and the nosepiece.
4. Loosen the metal knob located directly above the nosepiece (the head-lock screw) completely. Place the head (flat, circular side down) into the circular opening on top of the arm. Tighten the head-lock screw to secure the head in place.
5. For the T490 model, screw the photo port onto the top of the microscope head (trinocular C-mount port).
6. Remove the eyetube caps and drop the desired eyepieces into the eyepiece ocular tubes. Be sure to avoid touching the lens to ensure no artifacts appear in your image.
7. Screw the objectives into the microscope nosepiece from the lowest magnification to the highest, again avoiding touching the lenses.
8. Plug in the microscope and turn it on. If no light emerges from the light source, adjust the dimmer knob on the side of the base.

## Setting Up

1. Loosen the head lock screw and adjust the microscope head so that it is in a comfortable position for observation. Lock the head-lock screw.
2. With both eyes open, look into the eyepieces. adjust the interpupillary distance by holding the eyepieces and rotating the eyepiece tubes either towards or away from each other until only one circle of light is seen by both eyes.
3. Place the specimen to be studied on a glass slide (or use a prepared slide). Place it on the stage, holding it snugly in place with the metal slide holders (clips) of the mechanical stage.
4. Using the slide controls, center the specimen over the stage opening, lining it up with the light and the objective lens.
5. To adjust the illumination, slowly turn the dimmer on the right side of the base until the desired intensity of light is achieved.

## Focusing

1. Turn the nosepiece to choose an objective. It is easiest to use the lowest magnification first (4x objective) to locate and focus on the specimen. As you move up in magnification you may need to refocus the image a little each time.
2. When using the 100x objective, a drop of immersion oil should be placed between the cover slip and the objective to minimize distortion caused by air. Always be sure to wipe the oil off of the objective with either lens cleaning paper or a nonabrasive, lint free cloth.
3. Begin focusing by first looking with one eye through the eyepiece without the diopter. Close your other eye. Use the coarse focusing knob to adjust the height of the stage until the sample comes into clear focus.

Note: You may loosen the limit-stop knob (located on the inside of the coarse focusing knob on the left side of the microscope) in order to give yourself the full range of motion for fine tuning the focus.

4. Once the image is clear in your field of view, you will want to use the fine focusing knob to tune it for best results.

Note: Please be careful when moving the mechanical stage if you need to recenter the sample, or if moving the stage very close to the objectives. The limit stop is designed to prevent impact between objective and slide, so when it is off you will be able to damage the microscope. For safety, when using the 40x and 100x objectives, engage the limit stop once you have it close or in contact with the objective (if using oil contact is required).

## Adjusting The Condenser & Diaphragm

1. Using the condenser-adjustment knob, you can change the distance between the light condenser and the stage. This allows you to control the concentration of the light hitting your slide.
2. By changing the aperture (hole size) of the iris diaphragm, you can adjust the background brightness. Adjust the aperture of the iris diaphragm using the iris adjustment slider located directly under the stage.
3. If you want to use a color filter, swivel the filter holder out, towards you. You can now place the desired color filter into the circular opening. Slide the filter holder back to original position before observation.

Note: The filter holder is placed in from the factory in a manner in which it swings out and hits the arm of the microscope (backwards). If this happens, simply grip the condenser assembly and rotate it. It may take a small amount of force to rotate it, but after doing so, you will be able to swing the filter holder out towards the front of the unit for easier operation.

## Using the Trinocular Port

The AmScope T490 model is uniquely designed so that you can view the image through the eyepieces and the trinocular port simultaneously, as well as fine tune the focus of the camera with a C-mount focus adjustment.

This “parfocal” feature allows the images through the microscope’s eyepieces, and those displayed on your computer screen or television be viewed at the same time. You do not need an adapter to attach your AmScope camera to the trinocular port, however you may need one if you have a non-AmScope camera. Our photoport is a 23mm size.

## Attaching a Camera

1. If your camera has a C-mount, simply screw the camera onto the trinocular port.
2. If your camera has a 23mm mounting size, remove the C-mount from the top of the trinocular port by loosening the screw. Then, drop the camera directly into the trinocular port. It should slide in without issue.
3. To focus through the trinocular port, simply turn middle portion of the tube.

## Setting the Stage's Stop-Limit

1. Unlock the stop-limit on the stage.
2. Adjust the stage to the desired maximum height.
3. Lock the stop-limit. This will allow you to limit the movement of the stage from the bottom of the range up to the point that it is set at.
4. To reset it, unlock the stage and reset the stage to the new height that you would like it to limit at. If no limit is desired, simply unlock the stop-limit.

## Adjusting Focusing Tension

1. To adjust the tension of the focusing knobs, first locate the black ridged tension knob on the inside of the coarse focusing knob.
2. To decrease tension, rotate the adjustment forward, towards the stage (counterclockwise). To increase, rotate away from the stage (clockwise).

Note: If your stage is slipping down after setting the focus, you need to increase the tension.

## Changing the Bulb

1. Before changing the light bulb, first pull the plug out of the electrical socket and wait for the lamp to cool down. The light can get hot when a halogen system is in use, so please be careful to avoid being burned.
2. Be sure to remove the eyepieces from the unit before turning the microscope over to prevent them from falling and breaking.
3. Loosen the door screws on the bottom of the microscope and pull the small door open. Remove the old bulb and replace with a new one.
4. Close door and tighten the screws of the door.

## Maintenance/Precautions

- All glass surfaces must be kept clean. Fine dust on the optical surface should be blown off using a hand blower or gently wiped off with a soft lens paper tissue/nonabrasive lint free cloth.
- Carefully wipe off oil or fingerprints on the lens surfaces using tissue moistened with a small amount of lens cleaner (we recommend Sparkle brand optical cleaner).
- Do not use Sparkle to clean other elements of the microscope. Use a neutral detergent on any plastic or painted surfaces.
- Do not assemble or disassemble the microscope's electrical components yourself without advisement from one of our technicians. Doing so will void your warranty unless by advisement of one of our technicians to do so.
- After use, cover the microscope with the provided dust cover.
- Keep your AmScope microscope in a dry, clean location in order to prevent rust or other damages.

## 490 Series Specifications

Parts	Specifications	B490	T490	(B/T)490B-LED	(B/T)490B-30W
WF Eyepiece	WF10X/18mm	x	x	x	x
	WF10X/18mm w/ Pointer				
	WF10X/18mm w/ Reticle				
	WF16X/13mm	x (if -A)	x (if -A)		
	WF20X/10mm	x (if -B)	x (if -B)	x	x
Plan Eyepiece	P5X				
	P10X				
	P16X				
DIN Achromatic Objectives	4X/0.10	x	x	x	x
	10X/0.25	x	x	x	x
	40X(spring)/0.65	x	x	x	x
	60X(spring)/0.85				
	100X(spring, oil)/1.25	x	x	x	x
Plan Objectives	4X				
	10X				
	40X(spring)				
	100X(spring, oil)				
45 Degree Viewing Head	Binocular Sliding, 360 Degree Swiveling				
	Trinocular Sliding, 360 Degree Swiveling				
30 Degree Viewing Head	Binocular Sliding, 360 Degree Swiveling	x		x (if B-)	x (if B-)
	Trinocular Sliding, 360 Degree Swiveling		x	x (if T-)	x (if T-)
Trinocular Port	C-Mount Adjustable Photoport		x	x (if T-)	x (if T-)
	23mm Adjustable Photo Port		x	x (if T-)	x (if T-)
	Simultaneous Viewing		x	x (if T-)	x (if T-)
Focusing Nosepiece	Coaxial Focusing System	x	x	x	x
	Quadruple Nosepiece	x	x	x	x
Stage	130mm x 140mm Mechanical Stage	x	x	x	x
	Movement Range: 50mm x 76mm	x	x	x	x
Condenser	Abbe, NA= 1.25	x	x	x	x
Diaphragm	Iris Diaphragm	x	x	x	x
Illumination	Halogen Light w/ Dimmer	x	x		x
	LED Light w/ Dimmer			x	
Lamp	6V/20W	x	x		
	6V/30W				x
	LED			x	
Filter	Blue/Yellow/Green	x	x	x	x

## Optional Accessories

Parts	Description	Model #	Purpose
Eyepiece	5X	EP5X23	Obtaining 20x, 50x, 200x, and 500x magnification powers
	20x	EP20X23	Obtaining 80x, 200x, 800x, and 2000x magnification powers
	25x	EP25X23	For obtaining 250x and 2500x magnification powers
	10x w/ Pointer	EP10X23P	For easier identifying of objects
	10x w/ Reticle	EP10X23R	For measuring objects
Objective	2X	A2X	For obtaining 20x and 32x magnification powers
	5X	A5X	For obtaining 50X and 80X magnification powers
	20X	A20x	For obtaining 200x and 320x magnification powers
	60X	A60X	For obtaining 600x and 960x magnification powers
	Plan 4X	PA4X	For obtaining higher clarity in images
	Plan 10X	PA10X	For obtaining higher clarity in images
	Plan 40X	PA40X	For obtaining higher clarity in images
	Plan 100X	PA100X	For obtaining higher clarity in images
Darkfield Condenser	Dry Darkfield Condenser	DK-DRY100	For obtaining low power darkfield images
	Oil Darkfield Condenser	DK-OIL100	For obtaining high power darkfield images
Camera	CMOS Digital	MU035 (350k) MU130 (1.3mp) MU300 (3mp) MU500 (5mp) MU800 (8mp) MU900 (9mp) MU1000 (10mp)	To capture images, video, or view live display on a computer (PC/Mac OS X)
	Calibration Micrometer	MR400	To calibrate the camera software for on screen measurements
	CCD Digital (VGA, Trinocular Only)	CCD-MT	To view live display on a computer monitor (VGA)
	CCD TV/Video (Trinocular Only)	CCD-NP	To view live display on a television (RCA)
Case	Aluminum Case	AC-400	For carrying microscope around safely
	Hard Wood Case	WC-400	For storing microscope
Phase Contrast Kit	Simple	PCS	Phase contrast images
	Turret	PCT	High quality phase contrast images with ease of use
Stage Warmer		TCS-100	For controlling stage temperature
Fluorescent Kit		FK-YK	Fluorescent images

## Objectives

Type	Magnification	Numerical Aperture (N.A.)	Medium	Parfocal Distance (mm)	Magnification Marks (Color Ring)
DIN Achromatic Objective (195mm)	4X	A2X	Air	45	Red
	10X	A5X	Air	45	Yellow
	40X	A20x	Air	45	Light Blue
	60X	A60X	Air	45	Deep Blue
	100X	A100X	Cedar Oil	45	White
Plan Objective (195mm)	Plan 4X	PA4X	Air	45	Red
	Plan 10X	PA10X	Air	45	Yellow
	Plan 40X	PA40X	Air	45	Light Blue
	Plan 100X	PA100X	Cedar Oil	45	White

## Eyepieces

Type	Widefield Eyepiece Medium			Plan Eyepiece		
Magnification	10X	15X	20X	5X	10X	16X
Field of View	Φ18	Φ13	Φ11	Φ18	Φ18	Φ15



## Electrical System

There are two options for electrical systems for this series of microscope. The light source is dependent on which model you have, but can either be a 6V/20W halogen, a 6V/30W halogen, or an LED system.

1. 220V~240V power supply: 220V~240V  $\pm 10\%$ , 50Hz

This electrical system is CE and GS certified

2. 100V~120V power supply: 100V~120V  $\pm 10\%$ , 60Hz

This electrical system is UL certified.

All units come standard as 110V units unless an upgrade to a 220V system is requested. Upgrade fee is dependent on which unit is purchased.

## Parameters

<b>Magnification</b>	-A Model: 40x-1600x -B Model: 40x-2000x
<b>Field of View</b>	$\Phi 0.8\text{mm} \sim \Phi 4.5\text{mm}$
<b>Mechanical Tube Length</b>	165mm
<b>Object to Primary Image Distance</b>	195mm
<b>Fine Focusing Sensitivity</b>	0.002mm

## Technical Terms & Concepts

### Total Magnification

Total magnification of a microscope is calculated by the magnification of the objective multiplied by the magnification of the eyepieces.

-Ex: (10x Eyepieces) x (4x Objective) = 40x Total Magnification

### Field of View

Linear field of view of the eyepiece divided by the magnification of the objective

### Numerical Aperture (N.A)

Calculated by  $n \sin \alpha$  (max), the Numerical Aperture (N.A) is an important parameter that marks the features of the objective and condenser's image quality and resolution. The "n" is a refractive index of the medium (air or immersion cedar oil) between the objective lens and the specimen. The "α" is 1/2 of the angle between the aperture on the objective and path of light. The larger the N.A, the higher the resolution of the objective (and better quality of the image).

### Object to Primary Image Distance

The distance between the object plane and the primary image plane. The conjugate distance is fixed.

### Mechanical Tube Length

The distance between the objective shoulder and the ocular shoulder

## Common Issues

Symptom	Cause	Remedy
<b>OPTICAL ISSUES</b>		
<b>One side of the field of view is darker</b>	The nosepiece is misaligned	Turn the nosepiece until it clicks into place
	Stains or dust has accumulated on the condenser, objective, eyepieces, or base lens	Clean all lenses with lens cleaner or a lint free non-abrasive cloth
<b>Obstructions are observed in the field of view</b>	Stains, dust, or dirt has accumulated on the specimen	Clean the slide or use a new specimen if sample is destroyed
	Stains, dust, or dirt have accumulated on the lens	Clean the lens
<b>Unclear Image</b>	There is no cover slip on the slide	Add a cover slip. The objectives are designed for use with a 0.17mm cover slip, so it is a requirement to use one for proper images.
	The cover slip is not standard sized	Replace the cover slip with the appropriate 0.17mm thickness slip
	The immersion oil has accumulated on the dry objective	Thoroughly clean the objective lens with lens cleaner or a lint free nonabrasive cloth
	No immersion oil is used with the 100x objective	Use immersion oil for better clarity and resolution
	Air bubble in the immersion oil	Pop the air bubble
	Used wrong oil	Use standard cedarwood oil
	The aperture is not open to an appropriate diameter	Adjust the aperture to have the light just larger than the size of the condenser
	Stain or dust has accumulated on the lens in the inlet of the head	Clean the lens with lens cleaner or a nonabrasive lint free cloth, as well as spray with compressed air
	The condenser is not in the right position	Adjust condenser height to the top of the travel range, then adjust down to focus image
<b>One side of the field of view is dark or the image moves while focusing</b>	The specimen slide is not fixed	Secure the slide to the stage with clips
	The nosepiece is not in the right position	Turn the nosepiece until it clicks into place
<b>The field of view is not bright enough</b>	The iris diaphragm is not big enough	Adjust the iris diaphragm to allow the light to be just larger than the condenser
	The condenser is not in the right position	Adjust condenser height to the top of the travel range, then adjust down to focus image
	Stains, dust, or dirt has accumulated on the condenser, objective, eyepieces, or base lens	Thoroughly clean all lenses with lens cleaner or a lint free nonabrasive cloth

## Common Issues (Continued)

Symptom	Cause	Remedy
<b>OPTICAL ISSUES</b>		
<b>The color of the image is not accurate</b>	The brightness adjustment knob is not in the right position	Adjust the brightness knob to a higher or lower setting for color clarity
	No filter is used or filter is in use	Remove color filter if natural light is desired, or insert desired filter
<b>MECHANICAL ISSUES</b>		
<b>The objective touches the cover slip</b>	The cover slip is not standard sized	Replace the cover slip with the appropriate 0.17mm thickness slip
	The limit-stop is set too high or not engaged	Be careful to avoid contact between objective and the slide when the limit stop is not engaged (unless using the 100x objective with oil). To reengage, focus the sample, then lock the limit stop into place to set max height at a safe but usable distance.
<b>Unable to move the slide smoothly</b>	The slide is not secured correctly	Adjust the slide to use the stage clips and secure the sample
	The mechanical stage is not properly secured	Tighten the mechanical stage screws to better secure the stage
<b>Focus knob does not turn</b>	The tension knob is too tight	Loosen it by adjusting the tension ring inside the coarse focus knob counterclockwise (close to the arm of the microscope on the left of the microscope)
<b>Stage declines by itself</b>	The tension knob is too loose	Tighten it by adjusting the tension ring inside the coarse focus knob clockwise (close to the arm of the microscope on the left of the microscope)
<b>The coarse focusing knob won't raise the stage</b>	Limit-stop is engaged	Disengage the limit stop on the left side of the microscope inside the coarse focusing knob
<b>The fine focusing knob won't raise the stage</b>	Limit-stop is engaged	Disengage the limit stop on the left side of the microscope inside the coarse focusing knob
<b>ELECTRICAL ISSUES</b>		
<b>The bulb/light source flickers</b>	The bulb is close to burning out	Replace the bulb. This unit uses our BH-6V20W with our 20w unit, or our BH-6V30W for the 30W unit.
<b>The microscope does not light up</b>	The microscope is unplugged	Insert the plug into the wall socket to achieve electrical illumination
	The bulb is not inserted correctly	Check the bulb by unscrewing the base (remove eyepieces first to prevent falling out) door and ensuring that the bulb is inserted
	The bulb burned out	Replace the bulb. This unit uses our BH-6V20W with our 20w unit, or our BH-6V30W for the 30W unit.
	The fuse burned out	Replace with fuse on the bottom of the microscope
<b>The fuse burns out frequently</b>	The voltage is too high	Use the correct power supply (110v if 110v unit, 220v if 220v unit), or get a voltage adapter to convert to the proper electrical system
<b>The bulb burns out frequently</b>	The voltage is too high	Use the correct power supply (110v if 110v unit, 220v if 220v unit), or get a voltage adapter to convert to the proper electrical system
	Used the wrong bulb	Use the correct wattage bulb for the unit. Using a higher wattage than it is rated for can damage your unit (melt components with additional heat), so please be sure to use the correct one. Damage from incorrect usage is not covered under warranty.