

Professional Laboratory Microscope

Instruction Manual for
MI-6000BIN – Professional Laboratory Binocular Microscope
MI-6000TRI – Professional Laboratory Trinocular Microscope
MI-6000DHD – Professional Laboratory Dual-Head Microscope
MI-6000STD – Professional Laboratory Microscope



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Unmatched optics and the finest mechanics comprise the ergonomic engineering of our new Professional Laboratory microscope series. While this is an advanced application microscope line, this manual is written with first-time users in mind. Sophisticated users may simply skip ahead to the pertinent sections, as much of the manual covers basic operation. Read about your microscope's different features, how to use them, and how to preserve your investment with proper maintenance and care.

The Professional Laboratory 6000 series includes four microscopes. Pages 2-4 cover the basic features and functions of the MI-6000BIN model, most of which are common to all four microscopes. The different heads on the MI-6000TRI, MI-6000DHD, and MI-6000STD models are discussed on page 6.

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General Microscope Care

Unpacking

The Professional Laboratory microscopes are shipped in a two-part Styrofoam case with the head and base separate. Keep it for storage, transport, and shipping. It is perfect packing material should you ever need to send your microscope in for repairs covered by the warranty.

When handling your microscope, always pick it up by the arm. Avoid touching the lens surfaces on the eyepiece or objective lenses, as fingerprints diminish image quality.

Cleaning

Dirty lenses compromise optical quality. Use a dustcover and clean the lenses regularly to greatly enhance your microscope use.

To clean lens surfaces, remove dust with a soft brush or a can of compressed air. Then moisten a piece of lens paper (our item MI-PAPER) with some lens cleaning solution (MI-LENSCLN). Gently clean the eyepiece, objective lens exterior surface, and condenser using a circular motion. Repeat with a second paper moistened with solution if necessary. Repeat once again with a piece of dry lens paper until the lens is clean and dry. **Do not spray lens cleaner directly on the lens.**

Features & Definitions

Microscope Diagram

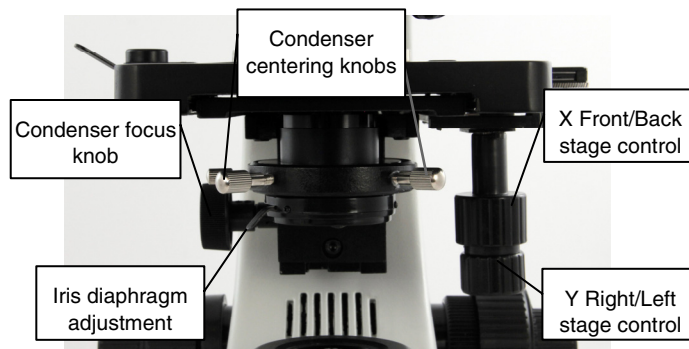


Description of Components

1. **Eyepieces:** This is the part of the microscope you look through. It is inclined at a 30° angle for comfortable viewing. Premium 20mm lenses magnify 10x and offer high eye relief for use with glasses.
2. **Rotating head:** The head rotates 360° so users may locate the most comfortable position and lock the eyepiece in place. The MI-6000BIN model has a *binocular* head, which means there are two eyepieces. See page 6 for descriptions of the different heads on the MI-6000TRI, 6000DHD, and 6000STD models.
3. **Arm:** The arm supports the head and nosepiece and is the best “handle” for picking up and moving the microscope.
4. **Nosepiece:** Also called the “objective turret,” it holds the objective lenses and rotates 360°. Change magnification by turning it until the lens you want to use “clicks” into place.
5. **Plan objective lenses:** These are the lenses closest to the specimen. The DIN plan objectives are 4x, 10x, 40x, and 100x, which multiply with the 10x eyepiece lens to provide 40x, 100x, 400x, and 1000x magnification levels. The shortest lens offers the lowest magnification level, while the longest offers the highest. The objectives have the following characteristics:
 - They are *plan* – meaning they are more complex than other objectives and flatten the image so virtually the entire field of view is in focus at once.
 - They are *DIN* – they meet an international standard of optical quality.
 - They are *achromatic* – they help prevent color distortion.
 - They are *parcentered* – if you center your slide using one objective, it will still be centered when you move to another objective.
 - They are *parfocal* – if you focus your specimen using one objective, it will stay coarsely focused when you move to another objective (you will still have to adjust the fine focus).

- The 40x and 100x objectives are *retractable* – the tip containing the lens is spring-loaded to prevent damage to the objective or slide.
- The 100x objective is *oil immersion* – this is described on page 5.

6. **Stage:** The stage is the platform that supports the specimen slide below the objective lenses. It moves up and down when you turn the focus knobs, allowing you to control the distance between the specimen and the lens. The 132 x 140 mm stage has an integrated mechanical stage with 50 mm y and (front/back) 75 mm x (right/left) movement. The x-y coaxial stage adjustment controls allow precise movement of the slide for optimal viewing.
7. **1.25 N.A. Abbe condenser:** This movable lens in the center of the stage condenses and focuses the light rays from the illuminator to provide better image resolution. Rotate the condenser knob to raise or lower the lens.



8. **Iris diaphragm:** The diaphragm controls the amount of light coming through the specimen in order to provide the best contrast for the objective lens. It is fully adjustable by moving the lever below the stage. Generally, you need less light on lower power and more light on higher power.
9. **Filter holder:** Your microscope comes with blue, green, and yellow filters that go in the filter holder beneath the iris diaphragm. The filter absorbs some of the light from the illuminator and makes the light change color slightly. Though generally unnecessary, this will enhance the image of your specimen, in some cases.
10. **Coarse focus:** The low-position large coarse focus knob raises or lowers the stage until the image is in focus.

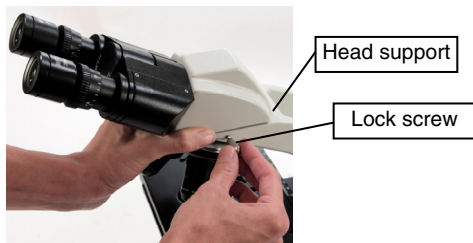
11. **Fine focus:** The smaller fine focus knob is coaxial with the coarse focus, which means they turn on the same axis. This knob allows more precise image resolving after the image has been brought into focus with the coarse focus knob.
12. **Illuminator:** The illuminator provides necessary light underneath the stage. It contains a 20-watt halogen bulb. Instructions for changing the bulb are on page 6.
13. **Illumination intensity control:** This control adjusts the intensity of the light produced by the illuminator. It should be in a low position when turning the illuminator on or off. Use the iris diaphragm to adjust the light for *contrast*; use the illumination intensity control to adjust the light for brightness and intensity.

Operating Procedure

Now that you have an overview of each component on your microscope, you can follow this step-by-step procedure to get started using it.

Installing the Microscope Head

The microscope head is shipped in a separate carton and will need to be installed.



Carefully remove the head from the packaging.

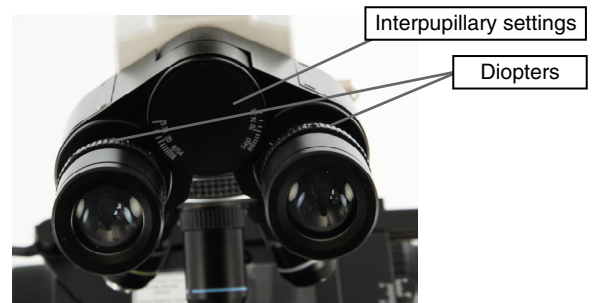
1. Loosen the set screw located above the nosepiece.
2. Set the head firmly in place, making sure it's flush against the head support, and tighten the set screw just enough to hold the head in place.
3. Rotate the head to desired position, and then tighten the set screw to hold it securely.

MI-6000BIN Model

The MI-6000BIN model comes with a Seidentopf binocular head for enhanced image examination and extended viewing comfort.

Using the Binocular Head

To best use this feature, you must set the interpupillary distance to match the distance between your eyes' pupils and adjust the diopters to compensate for focusing differences between your eyes. Each user must adjust it for his or her own eyes. To do so, follow these steps:



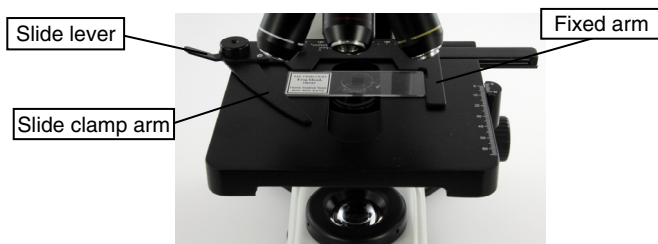
1. Start by focusing a small specimen in the center of the viewing field using the 10x objective. The iris diaphragm should be in the closed position.
2. Focus your eyes on the specimen.
3. Pull your eyes back from the eyepieces about 1". In your peripheral vision you will see two field view circles overlapping each other.
4. Open or close the distance between the eyepieces by pulling them apart or pushing them together until the two circles merge together and appear as one circle. The interpupillary distance is set correctly when you see just one field view circle. Record the settings so you can return to your adjustment easily.
5. Turn the nosepiece until the lowest power (4x) objective clicks into place.
6. Holding a card over your right eye (the eye in front of the eyepiece with the diopter) bring the specimen into focus for the left eye using the coarse and fine focus controls.
7. Cover your left eye with a card and bring the specimen into sharp focus for your right eye by turning the knurled diopter band on the right eyepiece. Do not use the coarse and fine focus controls for this last step – use only the diopter adjustment.

Getting Started

1. Set your microscope on a tabletop or other flat sturdy surface where you will have

plenty of room to work. Plug the microscope's power cord into an outlet, making sure that the excess cord is out of the way so no one can trip over it or pull it off of the table.

2. Turn on your microscope's light using the switch located at the rear of the base next to the cord. Open the iris diaphragm all the way by sliding the lever away from you (when facing the stage).
3. Rotate the nosepiece to the lowest-power (4x) objective. You will hear a click when it is properly in place. Always start with the lowest power: it is easiest to scan a slide at a low setting, as you have a larger field of view.
4. Turn the coarse focus knob to move the stage down (away) from the objective lens as far as possible.
5. Move the small lever on top of the stage to open the curved slide clamp arm.



6. Carefully place a prepared slide squarely against the fixed arm and back edge of the mechanical stage. Make sure the slide lies flat on the microscope stage.
7. Gently release the small lever allowing the slide clamp arm to securely hold the specimen slide in place. The extra large stage allows room for another slide and side-by-side scanning.
8. Move the specimen under the objective lens by turning the stage control knobs. The upper knob is the front/back (y) adjustment control, which allows precise movement to the front and back of the stage. The lower knob is the right/left (x) adjustment control, which allows precise movement to the right and left of the stage. Turn these controls without putting any pressure on the stage. This allows you to scan a slide while maintaining fairly good focus.
9. Adjust the larger coarse focus knob until the specimen is in focus. Center the slide under the lens, if necessary, using the stage

adjustment controls. Adjust the small fine focus knob until the specimen is clearly in focus.

10. Adjust the iris diaphragm to reduce light by pulling the lever toward you (when facing the stage) until the image has clear, sharp contrast. You need less light on lower power and more light on higher power. The following table gives suggested opening sizes for each power level:

Objective	Diaphragm Opening
4x	From fully closed to 1/8 open
10x	1/8 to 1/4 open
40x	1/4 to 1/2 open
100x	1/2 to fully open

Note: One method for finding the most suitable iris diaphragm opening is to remove the eyepiece, put your eye up to the eyepiece tube, and look at the bright circle of the aperture. Close the iris diaphragm until you see its outline in the aperture. Adjust it so that its silhouette takes up 10-15% of the edge of the aperture. Replace the eyepiece. The contrast and resolution should be nicely balanced on your specimen. If necessary, make minor adjustments to the diaphragm while looking at the specimen.



Changing Magnification

1. Use the stage controls to scan the slide (right to left and front to back) at low power to get an overview of the specimen. Then center the part of the specimen you want to view at higher power.
2. Rotate the nosepiece to the 10x for 100x magnification (make sure it "clicks" into place). Refocus using the fine focus knob and view your specimen carefully. Adjust the iris diaphragm again until the image is most clear. Repeat with the 40x objective for 400x magnification.
3. This series does not come with a stage stop, since it's unnecessary for experienced users. However, be aware of slide and objective positioning when changing magnification levels to avoid damage.

Using the 100x Oil Immersion Objective

When using the 100x oil immersion objective, it is important to reduce light diffraction to enhance the image quality. This is done by using immersion oil according to the following steps:

1. Lower the stage using the coarse focus knob.
2. Raise the Abbe condenser to the upright position by turning the condenser knob. Open the iris diaphragm by pulling it toward you (when facing the stage).
3. Place one drop of high quality immersion oil (our item MI-IMMOIL) on top of the coverslip. (In some cases, it may be beneficial to place a drop of oil between the condenser and the slide also, but this is usually not necessary for most applications.)
4. Move the 100x objective lens until it clicks into position, and then slowly move the stage up until the lens makes contact with the oil.
5. Continue focusing with the coarse knob until the color or blurred outline of the specimen appears. Finish focusing with the fine focus knob. Adjust the condenser and diaphragm until you see the specimen in clear, sharp contrast.
6. When you are done, clean all the oil off the lenses and slides using lens paper and lens cleaning solution (instructions are on page 2 of this manual).

Using Filters

The Professional Laboratory microscopes come with blue, green, and yellow filters that can be placed in the filter holder located below the iris diaphragm. Use the following procedure to insert the filter:



1. Underneath the iris diaphragm there is a small filter holder knob. Use this to swing the filter holder out from under the diaphragm.
2. Place the filter in the holder, and swing back into place.
3. Adjust focus and diaphragm normally.

MI-6000TRI Model

Trinocular Head

The MI-6000TRI model comes with a trinocular teaching head. With its comfort-viewing 30° inclined binocular eyepieces and a vertical eyepiece, it is ideal for simultaneous viewing or



digital camera photography. The vertical eyepiece is equipped with a diopter, as are the binocular eyepieces, which are described on page 3. Adjustments will vary among different users.

1. Have inclined eyepiece user focus the microscope.
2. Have the vertical eyepiece user rotate the diopter adjustment (the knurled band) until the specimen is also in focus for his or her eyes.

MI-6000DHD Model

The MI-6000DHD model comes with one inclined eyepiece and a vertical eyepiece with diopter, which allows simultaneous viewing or digital camera photography.

Dual Teaching Head

Adjust the vertical eyepiece according to the trinocular instructions above. Or, follow the digital camera instructions below.

Adding a Digital Camera

While a digital camera can be used with the other models, it works especially well with the dual teaching head and trinocular head.

A digital eyepiece package (our item MI-DCT5000) will include a digital camera eyepiece to replace your microscope's vertical eyepiece. To remove the eyepiece, loosen the tiny screw until you can lift the eyepiece out (you will not need to completely unscrew it).

MI-6000STD Model

The MI-6000STD model features a 360°-rotating head with a monocular eyepiece.

Maintenance

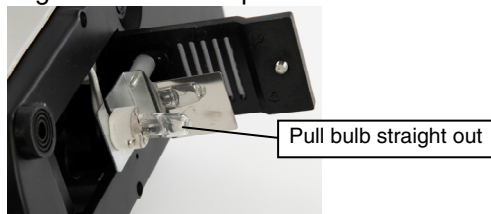
Changing the Bulb

Your microscope halogen bulb should last for years of normal use. Follow these steps for replacing it:

1. Obtain the correct 20-watt halogen replacement bulb (our item MI-BULB7).
2. Unplug your microscope and allow it to cool before replacing the bulb.
3. Lay the microscope on its side to access the bottom.



- Loosen the locking screw on the hinged door and swing the door open.
- Gently grasp the halogen bulb. Pull it straight out of the lamp socket.



- Use a tissue or cloth to grasp the new bulb. Insert it straight into the lamp socket, then close the door and tighten the locking screw.

Adjusting Tension

While the coarse focus tension is pre-adjusted by the manufacturer, if it falls out of adjustment, the stage will drift down under its own weight moving the image out of focus. To tighten tension, turn the collar clockwise.



- Leave the tension as loose as possible. Tighten only enough to keep the stage from drifting downward.

Replacing the Fuse

If your microscope light flickers or fails to operate, the fuse may be burned out or not locked into position. To change the fuse, follow these steps:

- Obtain the appropriate T1L 250 volt replacement fuse.
- Lay the microscope carefully on its side.
- Unscrew the fuse holder on the bottom of the microscope.
- Pull the fuse straight out from the socket and replace with a new one.
- Screw the fuse holder back in.



Troubleshooting

If you experience difficulty with your microscope, try these troubleshooting techniques:

Problem	Possible Reason and Solution
Light fails to operate	<ol style="list-style-type: none"> The AC power cord is not connected. <i>Make sure the cord is fully connected to the socket on the microscope. Connect the cord to an outlet.</i> The bulb is burned out. <i>Replace the bulb. (See "Changing the Bulb," p. 7.)</i> The power source outlet is inoperative. <i>Have a qualified electrician repair the outlet.</i> The incorrect bulb is installed. <i>Replace with the correct bulb.</i> Power switch is off or intensity control turned too low. <i>Turn power on or rotate illumination intensity control.</i>
Light flickers	<ol style="list-style-type: none"> The bulb is not properly inserted into the socket. <i>Fully insert the bulb.</i> The bulb is about to burn out. <i>Replace the bulb.</i> The connection at the AC outlet is loose. <i>Have a qualified electrician repair the outlet.</i> Fuse is not tightly screwed in. <i>Screw fuse in all the way.</i>
No image	<ol style="list-style-type: none"> The nosepiece is not indexed properly. <i>Move revolving nosepiece until the objective lens clicks into position.</i> The light is too bright. <i>Adjust the diaphragm or illumination intensity control.</i>
Unable to focus slide	<ol style="list-style-type: none"> The slide coverslip is too thick. <i>Use 0.17 mm thick (No. 1) coverslip.</i> The stage drops under its own weight. <i>Adjust tension of coarse focus knob. (See "Adjusting Tension," p. 6.)</i> The slide is upside down. <i>Place the slide on the stage with the coverslip facing up.</i>
Poor resolution, image not sharp	<ol style="list-style-type: none"> The condenser, objective, or eyepiece lenses are dirty. <i>Clean the lenses. (See "Cleaning," p. 2.)</i> There is too much light. <i>Adjust the diaphragm or illumination intensity control.</i>

Spots in field	<ol style="list-style-type: none"> 1. The condenser, objective, or eyepiece lenses are dirty. <i>Clean the lenses. (See "Cleaning," p. 2.)</i> 2. The specimen slide is dirty. <i>Clean the slide.</i>
Uneven illumination of field	<ol style="list-style-type: none"> 1. The nosepiece is not indexed properly. <i>Move revolving nosepiece until the objective lens clicks into position.</i> 2. The diaphragm is not properly indexed. <i>Adjust the diaphragm to the proper level.</i>

Specifications

Eyepiece	Widefield 10x, large 20 mm diameter lens, with 20 mm exit pupil and fully coated optics.
Head	Binocular head, 30° inclined Seidentopf with interpupillary adjustment and dual diopters (MI-6000BIN). Trinocular, 30° inclined Seidentopf binocular eyepiece with interpupillary adjustment and dual diopters and vertical eyepiece with diopter (MI-6000TRI). Dual Head, 30° inclined eyepiece and vertical eyepiece with diopter (MI-6000DHD). Monocular, 30° inclined head rotates 360° (MI-6000STD).
Nosepiece	4-hole nosepiece is ball-bearing mounted with positive click stops.
Objectives	All plan objectives are DIN achromatic, parfocalled, parcentered, and fully coated. <ul style="list-style-type: none"> • 4x, 0.10 N.A., red ring, 4.5 mm field of view, 40x magnification • 10x, 0.25 N.A., yellow ring, 1.8 mm field of view, 100x magnification • 40xR, 0.65 N.A., blue ring, 0.45 mm field of view, 400x magnification, retractable • 100xR, 1.25 N.A., white ring, 0.18 mm field of view, 1000x magnification, retractable, oil immersion
Focusing	Separate low position coarse and fine coaxial focusing controls with slip clutch, tension adjustment, and precise 0.002 mm fine focus division.
Focus Rack	All metal rack-and-pinion focusing.
Stage	Acid and chemical resistant 132 x 140 mm metal stage with stage clips and integrated mechanical stage.
Mechanical Stage	Low-position coaxial x-y controls provide precise 75 mm movement on the x-axis and 50 mm movement on the y-axis.
Condenser	Adjustable 1.25 N.A. Abbe condenser with rack-and-pinion focusing and centering controls.
Diaphragm	Iris diaphragm with 2 mm to 30 mm diameter opening and swing-out filter holder.
Illuminator	20-watt, 6-volt halogen illuminator with variable brightness. The illuminator works with 100-240 volt AC power.

Warranty

Home Science Tools warrants this microscope to be free from defects in material and workmanship under normal use and service for the life of the instrument. Warranty does not cover light bulbs, batteries, or damage due to misuse, abuse, alterations, or accident. Warranty does not cover lenses that have become inoperable due to excessive dirtiness as a result of misuse or lack of normal maintenance.

Any cameras and software supplied with this microscope are under warranty for one year from the purchase date.

Return your microscope freight prepaid for warranty service to Home Science Tools, or the repair facility we designate. We will repair or replace your microscope at no charge and return it freight prepaid to you. Please call 1-800-860-6272 to arrange warranty service before returning this instrument. Please note that warranties apply only to the original purchaser and are not transferable.