

Home LED Microscope

Instruction Manual for
MI-4100LST – Home LED Microscope
MI-4100LMS – Home Iris Diaphragm Microscope
MI-4100LDH – Home Dual-head Microscope
MI-4100LXL – Home LED 1000x Microscope
MI-4100LBH – Home Binocular Microscope



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Welcome to an exciting world of discovery with your new Home Microscope! This manual will give you a familiarity with the different features on your microscope, how to use them, and how to preserve your investment by proper maintenance and care.

These instructions are for five different models with LED lighting from the Home 4100 series. Pages 2-4 will cover the basic features and functions of the MI-4100LST model, most of which are common to all of these microscopes.

The small microscope icon  indicates a feature that is upgraded on the Home Dual-head (MI-4100LDH), the Home Advanced (MI-4100LMS), the Home Binocular (MI-4100LBH) and/or the Home 1000x LED (MI-4100LXL) microscopes. To learn about the upgraded features and their uses, turn to pages 4-6.

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General Microscope Care

Unpacking

The Home microscopes are shipped in a two-part Styrofoam case. Keep this case 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 will decrease image quality.

The MI-4100LDH and MI-4100LBH require some assembly (see p. 6). All other models will arrive completely assembled.

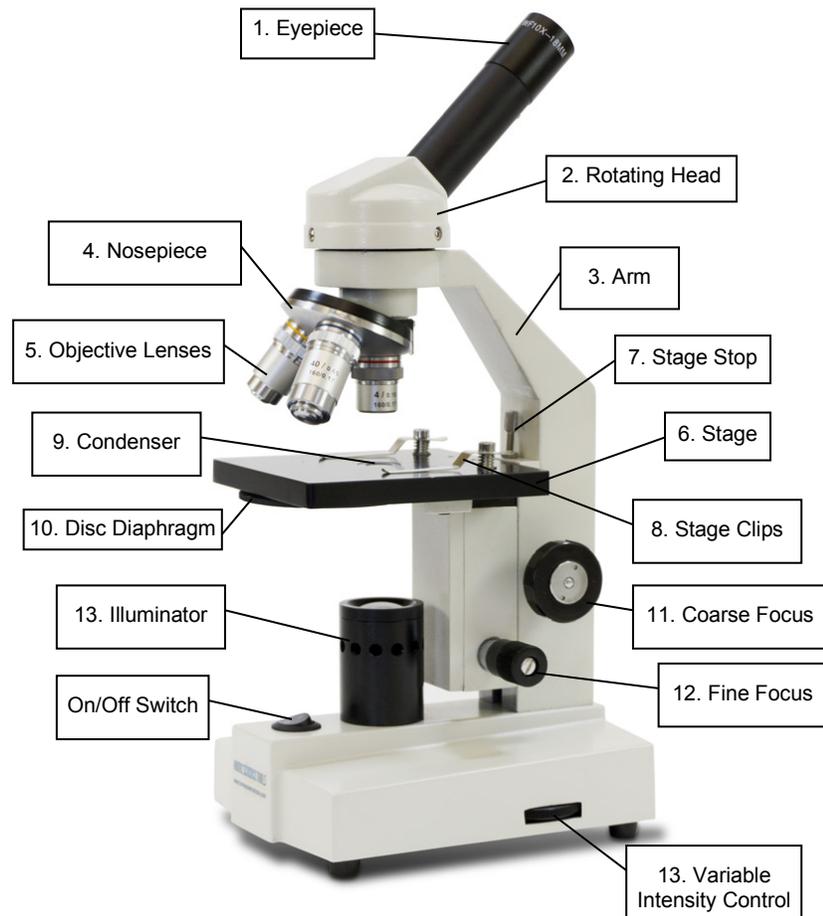
Cleaning

The best optical quality is compromised by dirty lenses. Use a dustcover and clean the lenses regularly to greatly enhance your microscope use.

To clean lens surfaces, remove dust by using 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. **Eyepiece:** This is the part of the microscope you look through. It is inclined at a 45° angle for comfortable viewing. It contains a lens that magnifies 10x.
2. **Rotating head:** The head rotates 360° so multiple users can look in the eyepiece comfortably without moving the microscope itself.
3. **Arm:** The arm not only supports the head and nosepiece but it is also the best “handle” for picking up and moving the microscope.
4. **Nosepiece:** This is also called the “objective turret.” It holds the objective lenses and rotates 360°. You can change magnification by turning it until the lens you want to use “clicks” into place.
5.  **Objective Lenses:** These are the lenses closest to the specimen. The standard objectives are 4x, 10x, and 40x, which multiply with the 10x eyepiece lens to provide magnification levels of 40x, 100x, and 400x. The 4100LXL model also includes a 100x objective for 1000x magnification. The shortest lens has the lowest magnification level, while the longest has the highest. The objectives have the following characteristics:
 - 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 slide and the lens. The MI-4100LXL, 4100LMS, 4100LDH, and 4100LBH models have an integrated mechanical stage that allows for precision adjustment of the specimen slide.
7. **Stage stop:** This is a screw with a lock nut located between the stage and the arm of the microscope. It prevents the stage from coming too far up and grinding against the objective lenses. It is also called a “safety rack stop,” and is pre-adjusted by the manufacturer. Instructions for readjusting it manually are on page 6.
8.  **Stage clips:** The stage clips hold the microscope slide in place. Pressing on the end closest to the arm of the scope will lift up the other end allowing you to place your slide underneath. There is a single stage clip on the MI-4100LXL, 4100LMS, 4100LDH, and 4100LBH models that is easily adjusted with a lever.
9.  **Condenser:** The MI-4100LST has a fixed condenser and the other models have an adjustable condenser with spiral focusing.
10.  **Diaphragm:** The diaphragm controls the amount of light coming through the specimen in order to provide optimum resolution for the objective lens. The MI-4100LST has a rotating disc diaphragm under the stage with various-sized holes. The other models have an adjustable iris diaphragm.
11. **Coarse focus:** The large coarse focus knob is used to raise or lower the stage until the image is in focus. The focus mechanism uses a slip clutch to prevent damage to the gears.
12. **Fine focus:** The smaller fine focus knob allows more precise image resolving after the image has been brought into focus with the coarse focus knob.
13. **Illuminator:** The illuminator provides necessary light underneath the stage. It contains a long-lasting LED bulb. In addition to an on/off switch, the light source also features a variable intensity control on one side of the base.

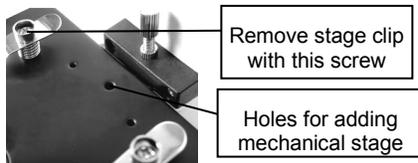
Installing a Mechanical Stage

The MI-4100LST model comes pre-drilled for the addition of an optional mechanical stage (our

item MI-MESTAGE). This added feature gives precise slide control for optimal viewing.

To install the mechanical stage follow these steps:

1. Remove the stage clips with a Phillips #2 screwdriver. The clips are screwed in tightly, so be careful not to strip the screw heads.
2. The mechanical stage attaches to the three holes that are located between the stage clips. The two pins on the bottom of the mechanical stage fit into the smaller holes on each side of



the threaded hole in the center. Align the pins with these holes and seat the mechanical stage firmly against the microscope stage.

3. Secure the mechanical stage to the microscope stage by tightening the center set screw securely into the center (threaded) hole. Do not overtighten or strip the screws.

Operating Procedure

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

1. Set the microscope on a tabletop or other flat sturdy surface where you will have plenty of room to work. Plug the 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. Flip the switch to turn on your microscope's light source and then turn the disc diaphragm to the largest hole (number 5), which allows the greatest amount of light through. For advanced models, open the iris diaphragm to the fully open position.
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. Set a microscope slide (coverslip facing up) in place under the stage clips. A prepared slide works best when you do this for the first time. (If

you do not have a prepared slide, place a strand of colored yarn or thread on a blank slide and place a coverslip over it.) Move the slide until the specimen is under the objective lens.

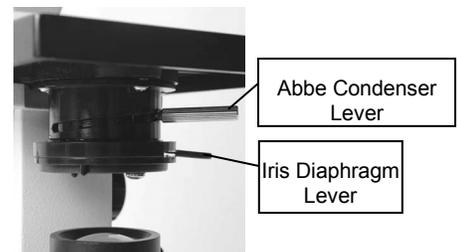
6. Adjust the larger coarse focus knob until the specimen is in focus. Slowly move the slide to center the specimen under the lens, if necessary, by nudging it with your fingers.
7. Adjust the small fine focus knob until the specimen is clearly in focus. Then adjust the diaphragm to get the best lighting. Start with the most light and gradually lessen it until the specimen image has clear, sharp contrast.
8. Scan the slide (right to left and top to bottom) at low power to get an overview of the specimen (nudge the slide very slowly with your fingers). Then center the part of the specimen you want to view at higher power.
9. Rotate the nosepiece to the 10x for 100x magnification. Refocus using the fine focus knob and view your specimen carefully. Adjust the diaphragm again until the image has the best contrast. Repeat with the 40x objective for 400x magnification.

Features for Advanced Models

As indicated by the  symbol in the previous pages, this model is upgraded from the MI-4100LST. This section describes each feature and how it is used.

1.25 Abbe Condenser

Unlike the fixed condenser on the MI-4100LST model, this condenser on the 4100LXL models is movable. Rotate it using the upper lever under the stage.



Moving it clockwise will lower it; counter-clockwise will raise it. In most cases it can be left all the way up, though it may need adjustment when you use a 100x objective lens to achieve a clear image.

Iris Diaphragm

The iris diaphragm replaces the disc diaphragm on the MI-4100LXL, 4100LMS, 4100LDH, and 4100LBH models. It provides greater control of the amount of light coming through the specimen and optics, thus giving you more precise resolution and contrast for each specimen. The diaphragm adjusts very easily with a sliding control

lever instead of a rotating disk. This lever is the lower lever under the stage.

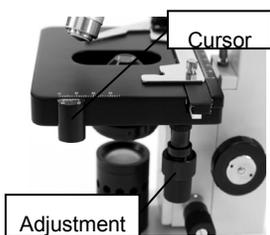
Begin looking at any specimen with the iris diaphragm all the way open (clockwise is open, counter-clockwise is closed). After focusing, reduce the light by moving the lower lever until the specimen is in sharp, clear contrast. As with the disc diaphragm, you will need less light on lower power and more 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 3/4 open

Mechanical Stage

The MI-4100LXL, 4100LMS, 4100LDH, and 4100LBH models have a mechanical stage built-in, a component that allows precise movement of the slide on the stage while maintaining relatively good focus. It is ideal for scanning specimens. The mechanical stage has three operating components: the slide clamp arm, the “x” or right/left adjustment knob and the “y” or front/back adjustment knob.

1. Move the small lever on top of the stage to open the curved slide clamp arm.
2. Carefully place the slide squarely against the fixed side and back edge of the mechanical stage. Make sure the slide lies flat on the microscope stage.
3. Gently release the small lever allowing the slide clamp arm to securely hold the specimen slide in place. Releasing the lever too quickly may damage slides.
4. Move the specimen under the objective lens by turning the adjustment knobs. The front/back adjustment knob is at the top. It allows precise movement to the front and back of the stage. The right/left adjustment knob is at the bottom, towards the base of the microscope. It allows precise movement to the right and left of the stage.
5. Turn these adjustment knobs without putting any pressure on the stage. This will allow you to scan a slide while maintaining fairly good focus. The integrated mechanical stage has a 70 mm range of motion along the



“y” axis and a 30 mm range of motion along the “x” axis.

6. The cursor will need to be attached prior to using it. Carefully screw the cursor on using the pre-drilled holes on the bottom side of the stage and the included screws.

Filters

The MI-4100LXL and 4100LMS models come with a blue filter that can be placed in the filter holder located below the iris diaphragm. The filter absorbs some of the light from the illuminator and makes the light slightly blue. In some cases this may enhance the image of your specimen, though generally it is not necessary. Use the following procedure to insert the filter:



1. Locate the tiny filter holder knob underneath the iris diaphragm. 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.

100x Oil Immersion Objective

The MI-4100LXL model has an additional 100x objective that provides 1000x magnification. At this magnification 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 highest position by turning its lever counter-clockwise. Open the iris diaphragm by turning its lever clockwise.
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 a good image.)
4. Move the 100x objective lens 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.

6. Adjust the condenser and diaphragm until you see the specimen in clear, sharp contrast.
7. When you are done or ready to switch to a lower objective, clean the oil off the lenses and slides using lens paper and lens cleaning solution (instructions are on page 2).
8. Never leave oil on objectives or slides for extended periods of time, as it becomes extremely difficult to remove.

MI-4100LDH Model

The MI-4100LDH model comes with a dual teaching head. In addition to a 30° inclined eyepiece, its vertical eyepiece allows simultaneous viewing or digital camera photography. The vertical eyepiece is equipped with a diopter, which adjusts for focusing differences between the different eyepiece users. Have the inclined eyepiece user focus the microscope first. Then have the vertical eyepiece user rotate the diopter adjustment (the knurled band) until the specimen is also in focus for his or her eyes.

Installing the Dual-head

While unpacking the MI-4100LDH you will find two separate components: the vertical eye tube, and the eyepiece (contains the lens).

1. Remove any plastic caps from the eye tube, eyepiece, and the head.
2. Place the eye tube onto the head of the microscope and screw it into place.
3. Place the eyepiece on top of the eye tube. (You may have to loosen the screw using a screwdriver before setting the eyepiece into place, and then tighten it in place.) Secure the eye tube by tightening the set screw with a screwdriver.

MI-4100LBH Model

The MI-4100LBH model comes with a binocular head for enhanced image examination and extended viewing comfort.

Installing the Binocular Head

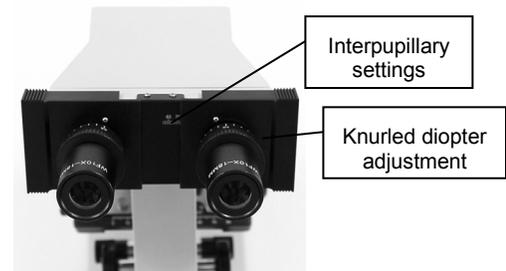
The binocular head is packaged separately and will need to be installed using the following procedure:

1. Remove the binocular head carefully from the packaging.

2. Take off any protective plastic caps from the bottom of the binocular head and on the base above the nosepiece.
3. Locate the set screw and insert loosely above the nosepiece.
4. Set the binocular head firmly in place, making sure the v-groove fits against the two fixed screws and flush against the head support, and tighten the set screw.
5. The screw should be tight enough that the head doesn't wobble. When the head is stable, the slide is easier to view.
6. To readjust the binocular head, loosen the screw, turn the head (it rotates 360°) and then tighten the set screw making sure the head is stable on the base and does not wobble.
7. Place an eyepiece in each eye tube. (You may have to loosen the small screws before setting the eyepieces into place, and then tighten them again.)

Using the Binocular Head

To use this feature to the best advantage, you



must set the interpupillary distance to match the distance between the pupils of your eyes. You must also adjust the diopter to compensate for focusing differences between your eyes. Each user of the microscope must make these adjustments 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.

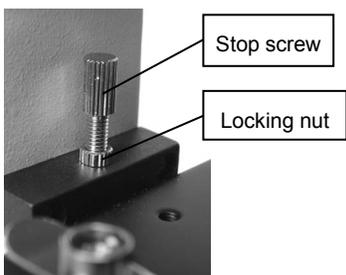
5. Turn the nosepiece until the lowest power (4x) objective clicks into place.
6. Holding a card over your right eye (the eye in front of the eyepiece with the diopter) bring the specimen into focus for the left eye.
7. Cover your left eye with a card and bring the specimen into sharp focus for your 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.

Maintenance

Adjusting the Stage Stop

The stage stop is set at the factory to insure that the stage cannot come up far enough to hit the objective lenses. In normal circumstances you will not have to adjust this. However, if it falls out of adjustment or you are using a thinner slide that cannot be focused, follow these steps:

1. Loosen the round knurled locking nut by turning it counter-clockwise. You may need to use needle-nose pliers for this.
2. Loosen the stop screw.
3. Focus on a standard slide until you obtain a sharp image.
4. Tighten the stop screw by turning it clockwise until it stops, then turn it back a half turn.
5. Lock into position by tightening the locking nut.



6. Note: The higher the stop screw is, the higher the stage will rise.

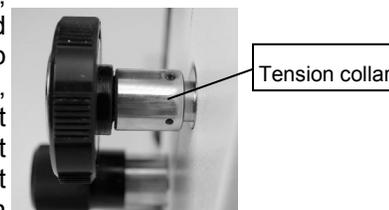
Changing the Bulb

Your microscope bulb should last for years—approximately 50,000 hours of continuous use. If it breaks or it burns out, follow these steps for replacing it:

1. Obtain the correct LED replacement bulb (our item MI-BULB14).
2. Unplug your microscope from the power supply and allow it to cool before replacing the bulb.
3. Twist illuminator housing counter-clockwise to remove. Pull out old bulb and insert new bulb.
4. Plug microscope into a power supply and turn it on, ensuring the bulb lights up. If it doesn't, repeat step 2, then lift bulb out, rotate it 180° and re-insert. Repeat step 4.
5. Replace illuminator housing.

Adjusting Tension

Although coarse focus tension is pre-adjusted by the manufacturer, temperature changes and normal use may cause it to fall out of adjustment, allowing the stage to drift down under its own weight and moving the image out of focus. The tension adjustment collar is located between the microscope arm and the coarse focus knob on the right side (when the stage is facing you). To adjust the tension, follow these steps.



1. To tighten tension, use the provided C-wrench to turn the collar clockwise.
2. Only tighten the tension knob enough to keep the stage from drifting downward.

Troubleshooting

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

Problem	Possible Reason and Solution
Light fails to operate	<ol style="list-style-type: none"> 1. The AC power cord is not connected. <i>Connect the cord to an outlet.</i> 2. The bulb is burned out. <i>Replace the bulb. (See "Changing the Bulb," p. 7.)</i> 3. The power source outlet is inoperative. <i>Have a qualified electrician repair the outlet.</i> 4. The incorrect bulb is installed. <i>Replace with the correct bulb.</i> 5. The bulb is oriented wrong. <i>Rotate the bulb 180° and re-insert.</i>
Light flickers	<ol style="list-style-type: none"> 1. The bulb is not properly inserted into the socket. <i>Properly insert the bulb.</i> 2. The bulb is about to burn out. <i>Replace the bulb.</i> 3. The connection at the AC outlet is loose. <i>Have a qualified electrician repair the outlet.</i>
No image	<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 light is too bright. <i>Adjust the diaphragm.</i>

Unable to focus slide	<ol style="list-style-type: none"> 1. The slide coverslip is too thick. <i>Use 0.17 mm thick (No. 1) coverslip.</i> 2. The stage drops under its own weight. <i>Adjust tension of coarse focus knob. (See "Adjusting Tension," p. 7.)</i> 3. The slide is upside down. <i>Place the slide on the stage with the coverslip facing up.</i> 4. The stage stop is not set at the proper position. <i>Adjust the stage stop. (See "Adjusting the Stage Stop," p. 7.)</i>
Poor resolution, image not sharp	<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. There is too much light. <i>Adjust the diaphragm.</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 with 18 mm exit pupil and fully coated optics.
Head	Monocular, 45° inclined head rotates 360°. MI-4100LDH has dual head: one 30° inclined eyepiece, one vertical eyepiece with diopter. MI-4100LBH has binocular head with dual diopters.
Nosepiece	3-hole or 4-hole nosepiece is ball-bearing mounted with positive click stops.
Objectives	All 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 (model MI-4100LXL and 4100LBH only)
Focusing	Separate low position coarse and fine focusing controls with slip clutch, and tension adjustment.
Focus Rack	All metal rack-and-pinion focusing with adjustable stage stop.
Stage	Acid and chemical resistant 110 x 120 mm metal stage with stage clips and predrilled for an optional mechanical stage.
Mechanical Stage	Top-position x-y controls provide precise 60 mm movement on the x-axis and 30 mm movement on the y-axis (all models except MI-4100LST).
Condenser	Fixed 0.65 N.A. condenser on model MI-4100LST. Adjustable 1.25 N.A. Abbe condenser on all other models.
Diaphragm	Calibrated 5-hole disc diaphragm on model MI-4100LST. Iris diaphragm with 2 mm to 30 mm diameter opening on all other models.
Illuminator	Bright LED illuminator with variable intensity control and grounded 110 volt cord.

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. This 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 date of purchase.

You will need to 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.