UNITRON®

MEC4

INVERTED METALLURGICAL MICROSCOPE

MANUAL

CONTENTS

SAFETY NOTES

1. Open the shipping carton carefully to prevent any accessory, i.e. objectives or eyepieces, from dropping and being damaged.
2. Do not discard the molded shipping carton; the container should be retained should the microscope ever require reshipment.
3. Keep the instrument out of direct sunlight, high temperature or humidity, and dusty environments. Ensure the microscope is located on a smooth, level and firm surface.
4. If any specimen solutions or other liquids splash onto the stage, objective or any other component, disconnect the power cord immediately and wipe up the spillage. Otherwise, the instrument may be damaged.
5. All electrical connectors (power cord) should be inserted into an electrical surge suppressor to prevent damage due to voltage fluctuations.
6. For safety when replacing the LED lamp or fuse, be sure the main switch is off (“O”), remove the power cord, and replace the LED bulb after the bulb and the lamp house has completely cooled.
7. Confirm that the input voltage indicated on your microscope corresponds to your line voltage. The use of a different input voltage other than indicated will cause severe damage to the microscope.

CARE AND MAINTENANCE

1. Do not attempt to disassemble any component including eyepieces, objectives or focusing assembly.
2. Keep the instrument clean; remove dirt and debris regularly. Accumulated dirt on metal surfaces should be cleaned with a damp cloth. More persistent dirt should be removed using a mild soap solution. Do not use organic solvents for cleansing.
3. The outer surface of the optics should be inspected and cleaned periodically using an air stream from an air bulb. If dirt remains on the optical surface, use a soft cloth or cotton swab dampened with a lens cleaning solution (available at camera stores). All optical lenses should be swabbed using a circular motion. A small amount of absorbent cotton wound on the end of a tapered stick such as cotton swabs or Q-tips, makes a useful tool for cleaning recessed optical surfaces. Avoid using an excessive amount of solvents as this may cause problems with optical coatings or cemented optics or the flowing solvent may pick up grease making cleaning more difficult. Oil immersion objectives should be cleaned immediately after use by removing the oil with lens tissue or a clean, soft cloth.
4. Store the instrument in a cool, dry environment. Cover the microscope with the dust cover when not in use.
5. UNITRON® microscopes are precision instruments which require periodic preventative maintenance to maintain proper performance and to compensate for normal wear. An annual schedule of preventative maintenance by qualified personnel is highly recommended. Your authorized UNITRON® distributor can arrange for this service.

INTRODUCTION

Congratulations on the purchase of your new UNITRON® microscope. UNITRON® microscopes are engineered and manufactured to the highest quality standards. Your microscope will last a lifetime if used and maintained properly. UNITRON® microscopes are carefully assembled, inspected and tested by our staff of trained technicians in our New York facility. Careful quality control procedures ensure each microscope is of the highest quality prior to shipment.

UNPACKING AND COMPONENTS

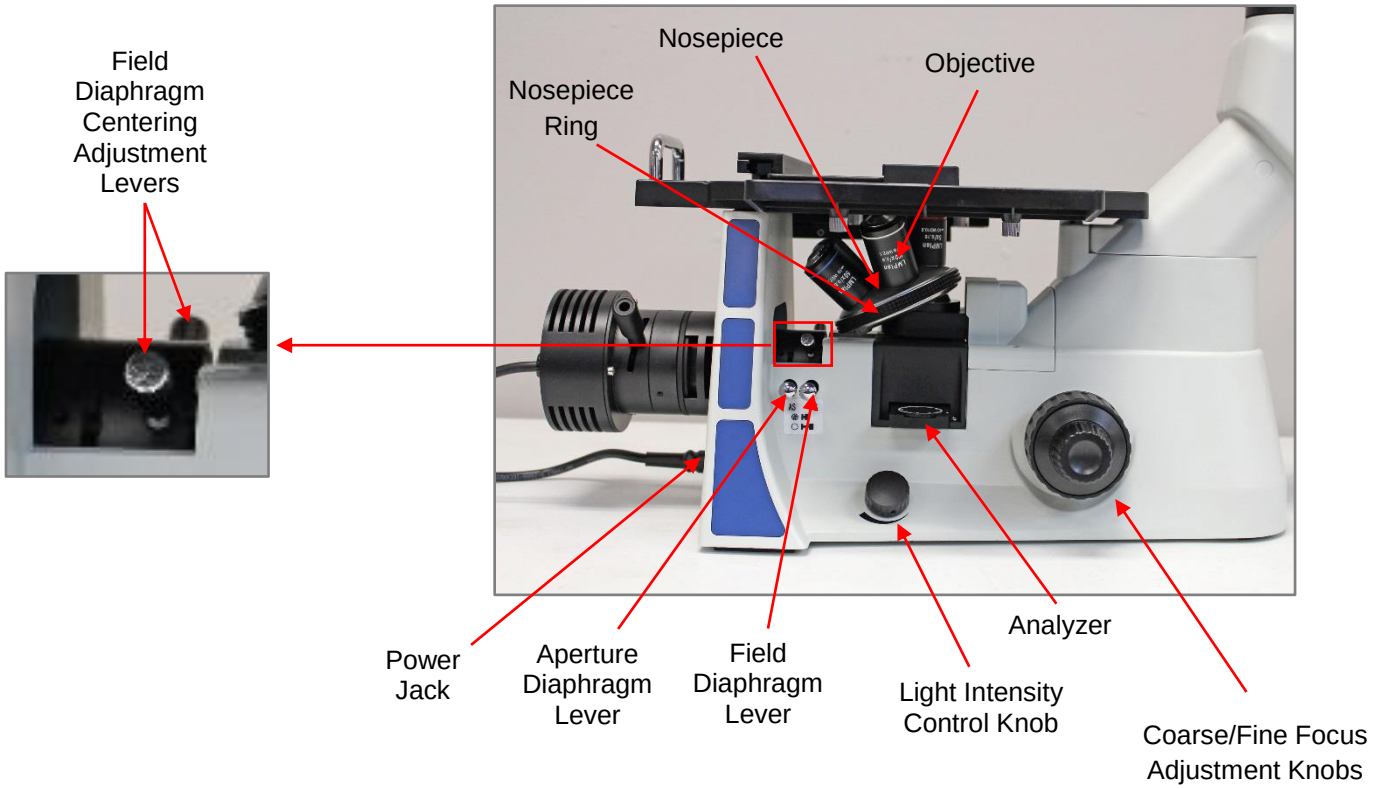
Your microscope arrived packed in a molded shipping carton. ***Do not discard the carton*:** the carton should be retained for reshipment of your microscope if needed. Avoid placing the microscope in dusty surroundings or in high temperature or humid areas as mold and mildew will form. Carefully remove the microscope from the EPE foam container by its arm and base and place the microscope on a flat, vibration-free surface. Check the components against the following standard configuration list:

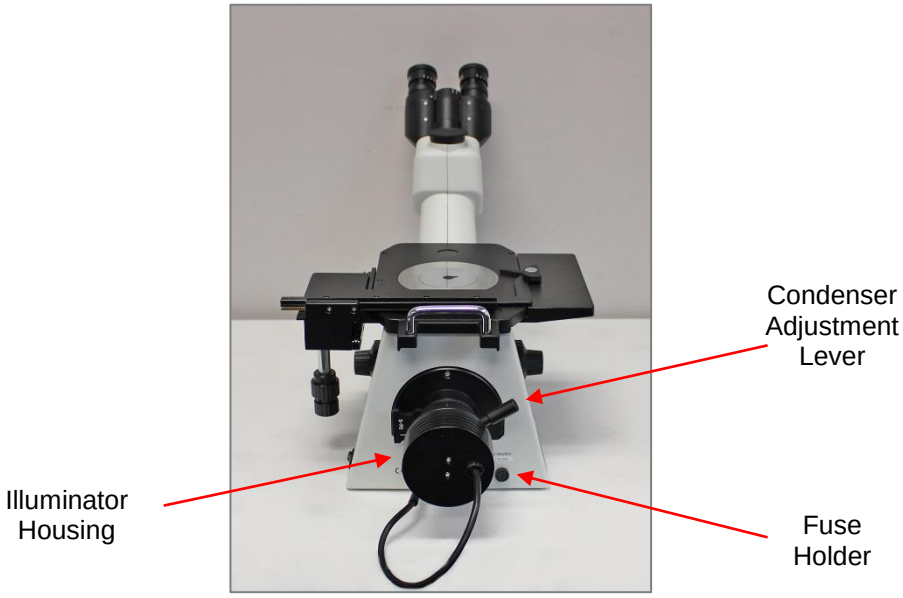
1. Stand, which includes the supporting arm, focusing mechanism, nosepiece, mechanical stage, condenser with iris diaphragm, and illumination system.
2. Binocular viewing head
3. Eyepieces as ordered
4. Objectives as ordered
5. Stage plate inserts, green, blue and frosted filters
6. Dust cover
7. 3-prong electric power cord
8. Camera adapters (optional)

Optional accessories such as optional objectives and/or eyepieces, slides sets, etc., are not shipped as part of the standard equipment. These items, if ordered, are shipped separately.

COMPONENTS DIAGRAM

COMPONENTS DIAGRAM

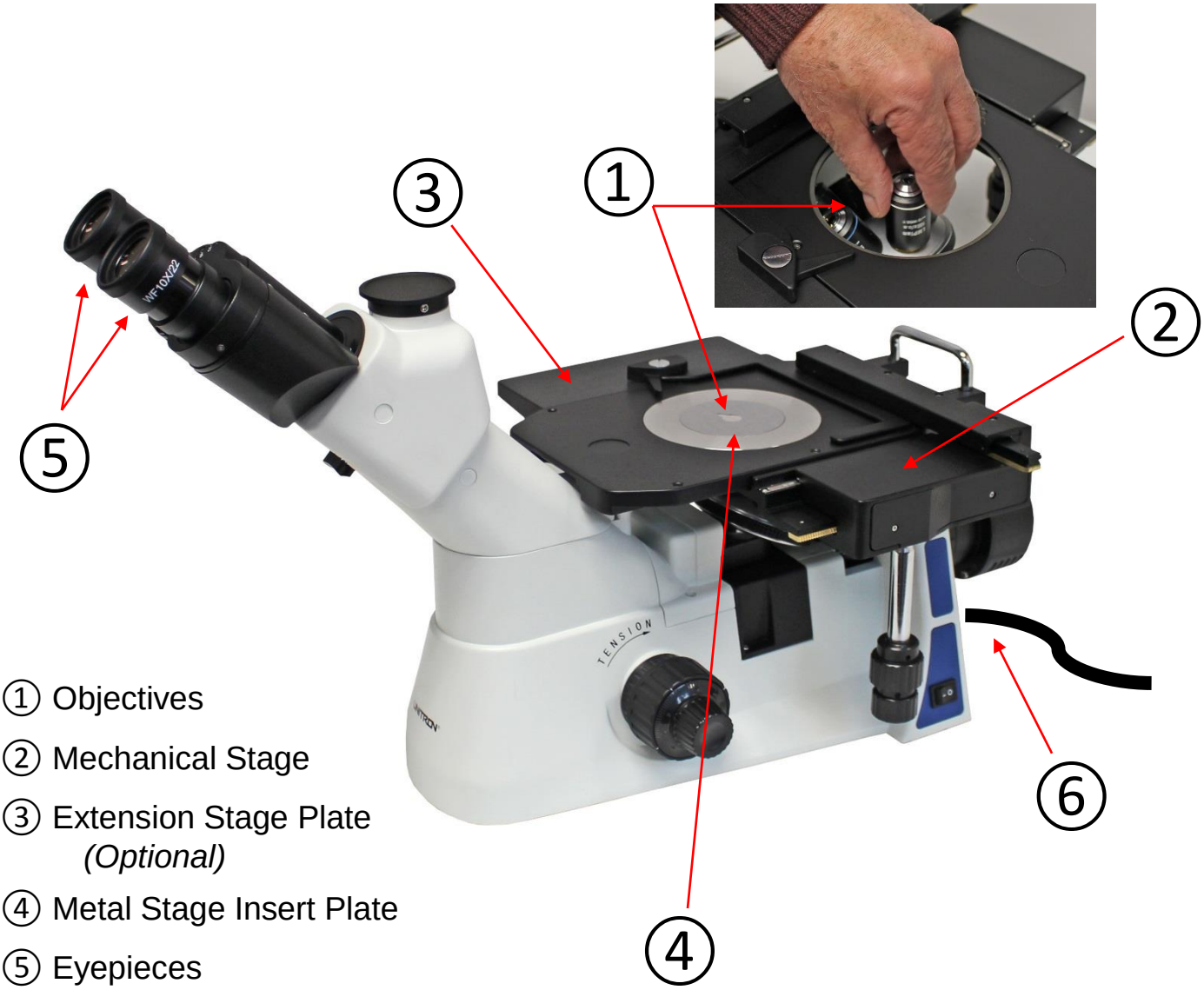




ASSEMBLY DIAGRAM

The diagram below shows how to assemble the various components. The numbers indicate the order of assembly. Use the 1.5mm and 2mm hex wrenches that are supplied with your microscope when required. Be sure to keep these wrenches for changing out components or making adjustments.

When assembling the microscope, make sure that all parts are free of dust and dirt, and avoid scratching any parts or touching glass surfaces.



① Objectives

② Mechanical Stage

③ Extension Stage Plate *(Optional)*

④ Metal Stage Insert Plate

⑤ Eyepieces

⑥ Power Cord

ASSEMBLY

Objectives (Fig. 1 & 2)

To install the objectives:

1. Turn the coarse adjustment knob ① (Fig. 1) until the revolving nosepiece is at its lowest position.
2. Through the opening in the top of the stage, remove the nosepiece cap and thread the lowest magnification objective ② (Fig. 2) onto the nosepiece opening, then rotate the nosepiece clockwise and thread the other objectives from low to high magnification.

NOTE:
- Always rotate the nosepiece by using the knurled nosepiece ring (Fig 1, ③).
- Keep the caps on any unused nosepiece openings to prevent dust and dirt from getting inside.

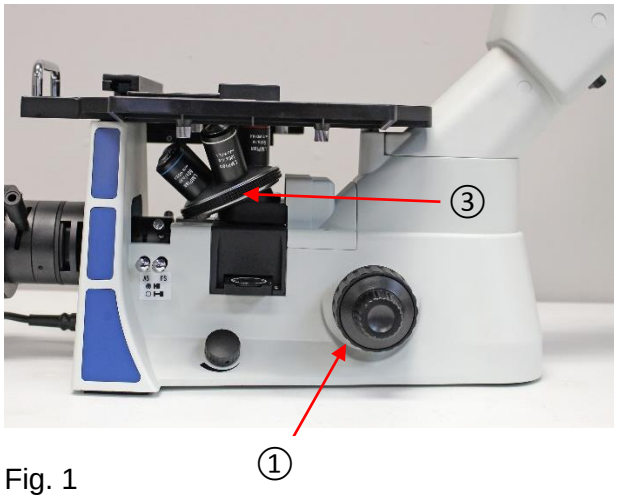


Fig. 1

Fig. 2

Assembly *(continued)*

Mechanical Stage and Extension Stage Plate (Fig. 3 & 4)

The MEC4 comes with an attachable mechanical stage and an extension stage plate. Both mount underneath the stage platform with the provided thumb screws.

To install the extension stage plate, *gently and carefully* lay the microscope on its side as shown (Fig. 3). Align the thumb screws on the top of the extension plate with the holes on the underside of the stage platform and tighten.

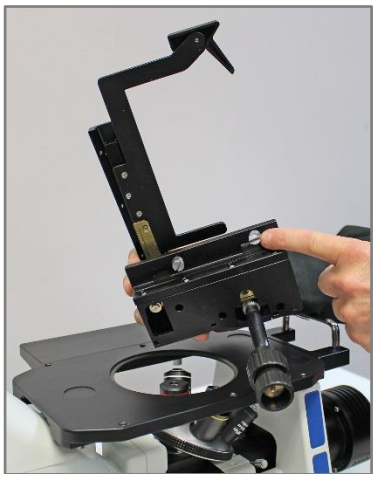
To install the mechanical stage, *gently and carefully* lay the microscope on its other side, align the thumbs screws on the top of the mechanical stage with the holes on the underside of the platform stage and tighten.

NOTE: the mechanical stage can *ONLY* be positioned on the RIGHT side of the microscope as shown (Fig 4).

Fig. 3

Extension Stage Plate

Attachable Mechanical Stage



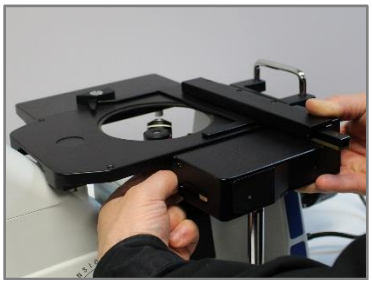


Fig. 4

Assembly *(continued)*

Stage Plate (Fig. 5)

Insert the metal stage insert plate ① into the opening on the stage.

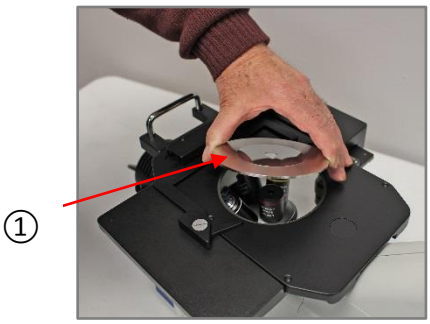


Fig. 5

Eyepieces (Fig. 6)

Remove the eyetube caps ① and insert the eyepieces② into the eyepiece tubes ③. Lock in the eyepieces using the supplied 1.5mm hex wrench to tighten the screw on each eyepiece tube.

Power Cord

VOLTAGE CHECK
Confirm that the input voltage indicated on the rear label of the microscope corresponds to your line voltage. The use of a different input voltage than indicated will cause severe damage to your microscope.

Connecting the Power Cord

Make sure the On/Off Switch is “O” (the off position) before connecting the power cord.

Insert the power plug into the power jack of the microscope; make sure the connection is snug.

Plug the power cord into a power supply receptacle.

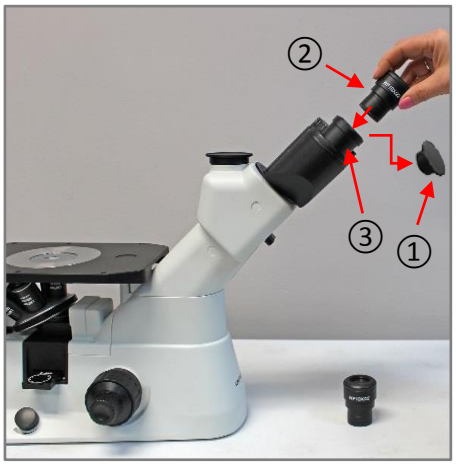


Fig. 6

NOTE: Always use the power cord that came with your microscope. If your power cord becomes damaged or lost, please call your authorized UNITRON dealer for a replacement.

OPERATION

Plug the 3-prong line cord into the microscope and then into a grounded 120V or 220V A.C. electrical outlet. Usage of a surge suppressor outlet is highly recommended. Turn on "—" the power switch ① (Fig. 7). For longer bulb life always turn the illuminator variable intensity knob ② to the lowest illumination intensity setting possible before turning the power on or off.

Adjusting the Illumination (Fig. 7)

The light level may need adjustment depending upon the specimen density and objective magnification. Adjust the light intensity for comfortable viewing by turning the light intensity control knob clockwise to increase brightness. Turn counterclockwise to decrease brightness.

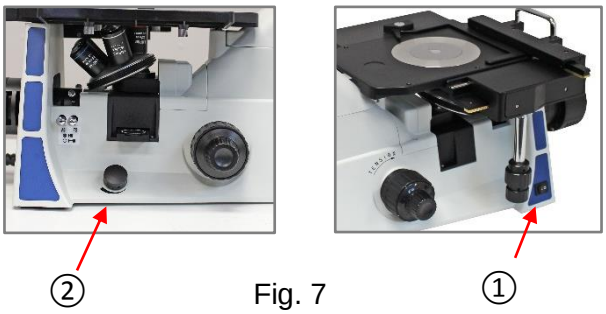


Fig. 7

Adjusting Interpupillary Distance (Fig. 8)

To adjust the interpupillary distance, hold the left and right eyetubes while observing a specimen. Rotate the eyetubes around the central axis until the fields of view of both eyetubes coincide completely. A complete circle should be seen in the viewing field when viewing the specimen slide. An improper adjustment will cause operator fatigue and will disrupt the objective parfocality.

Where the "●" ① on the eyepiece tube lines up, that is the number for your interpupillary distance. The range is 54-75mm. Be sure to write down you interpupillary number for future operation.

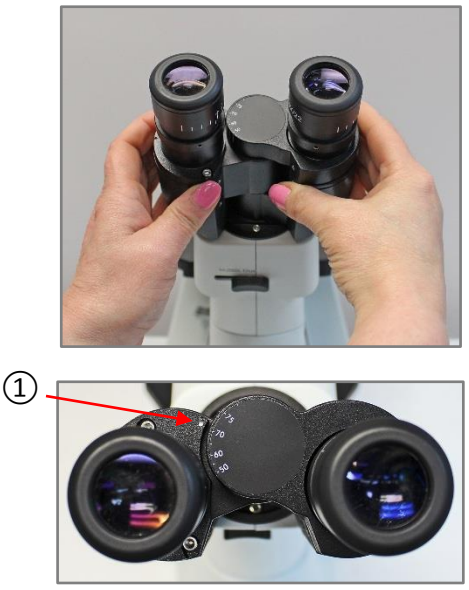


Fig. 8

Adjusting the Focus (Fig. 9)

To ensure that you obtain sharp images with both eyes, (since eyes vary, especially for those wearing glasses) any eyesight variation can be corrected in the following manner. Set both diopter collars ② to "0". Using your left eye only and the 10X objective, focus your specimen by adjusting the coarse adjustment knob. When the image is in view, refine the image to its sharpest focus by turning the fine adjustment knob. Rotate the diopter collar to obtain the sharpest focus. To obtain the same sharp image using your right eye, do not touch the coarse or fine adjustments. Instead, rotate the right diopter collar until the sharpest image appears. Repeat several times to check.

IMPORTANT: do not counter rotate the focusing knobs as this will cause severe problems and damage to the focusing system.

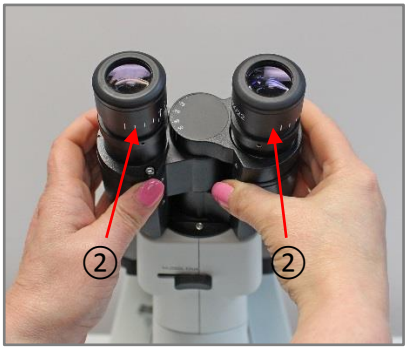


Fig. 9

Operation *(continued)*

Adjusting the Focusing Tension (Fig. 10)

If the feel is very heavy when focusing with the focusing knobs ②③, or the specimen leaves the focus plane after focusing, adjust the tension with the tension adjustment ring ①.

Turn the tension adjustment ring clockwise to loosen or counterclockwise to tighten according to user preference.

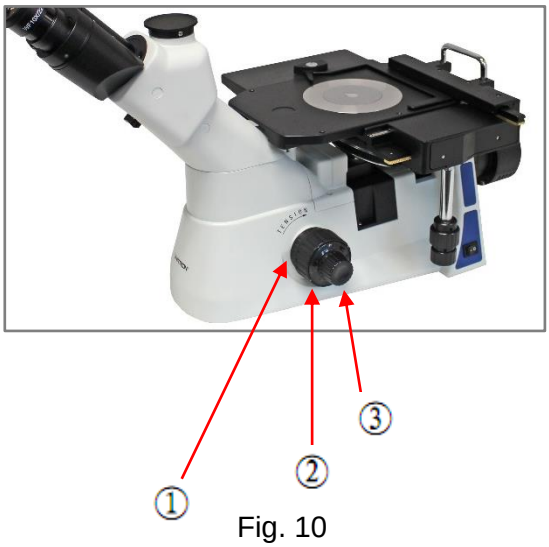


Fig. 10

Using the Stage Plates (Fig. 11 & 12)

With the mechanical stage (Fig. 12) and the included rectangular metal stage plate (Fig. 11), a user can precisely move the specimen by turning the Y ① and X ② stage control knobs.

Fig. 11

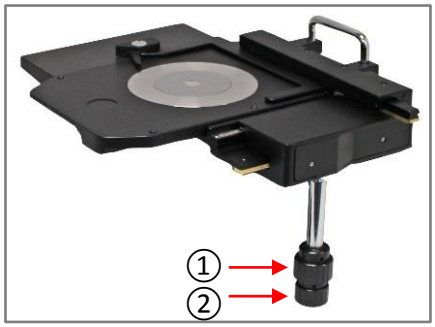


Fig. 12

Operation *(continued)*

Selecting the Light Path (Fig. 13)

The MEC4 is outfitted with a binocular viewing head with one photo port for HDMI/digital imaging. You must select the appropriate light path for observing specimens.

The light path is set to 100% to the binocular eyepieces as the default setting at our facilities where the light path selection slider is set to the "OUT" position (pushed all the way to the right).

Slide the light path selection slider to the left to the "IN" position. This will send 20% of the light to the binocular viewing head and 80% to the top photo port for HDMI/digital imaging and documentation.

Fig. 13

Light Path Selection Knob	Light Intensity Ratio	Application
"OUT" Position	100% for binocular observation through the eyepieces	Dark specimen observation
"IN" Position	20% for binocular eyepieces 80% for top photo port	Observation for digital imaging and documentation

Operation *(continued)*

Adjusting the Field Diaphragm (Fig. 14 & 15)

By limiting the diameter of the light entering the condenser, the field diaphragm can prevent stray light and improve the image contrast. When the image is just on the edge of the field of view, the objective can show the best performance and obtain the clearest image.

Move the field diaphragm lever (FS) ① in or out to adjust the field diaphragm.

The image of the field diaphragm can be seen when observing through the eyepiece.

Adjust the right and left centering screws ② until the field diaphragm is centered in the field of view.

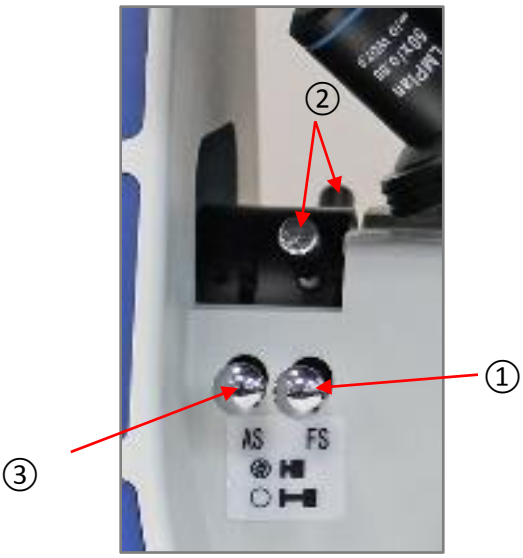


Fig. 14

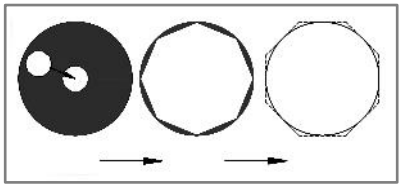


Fig. 15

Using the Aperture Diaphragm (Fig. 14)

The iris diaphragm determines the numerical aperture (N.A.) of the illumination system in bright field observation. When the N.A. of the objective and the illumination system match, you can obtain higher image resolution and contrast, as well as an increased depth of focus.

Move the aperture diaphragm lever (AS) ③ in or out to adjust the aperture diaphragm.

Operation *(continued)*

Condenser & Polarizer Adjustment
(Fig. 16, 17 & 18)

To adjust the light intensity, loosen the condenser lever ① by turning the knob on the condenser lever counterclockwise and then move the lever up or down.

With the "Λ" ② groove on the bottom, insert the polarizer into the polarizer slot ③ until you hear it "click" into place.

With the printed side face up ④ on the analyzer, insert the 360° analyzer into the slot ⑤ until you hear it "click" into place.

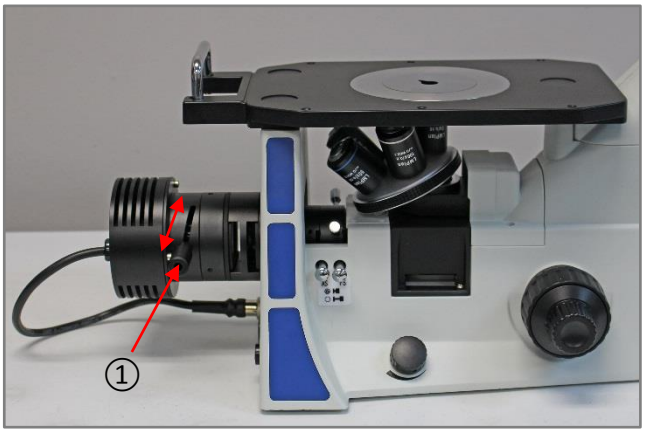


Fig. 16

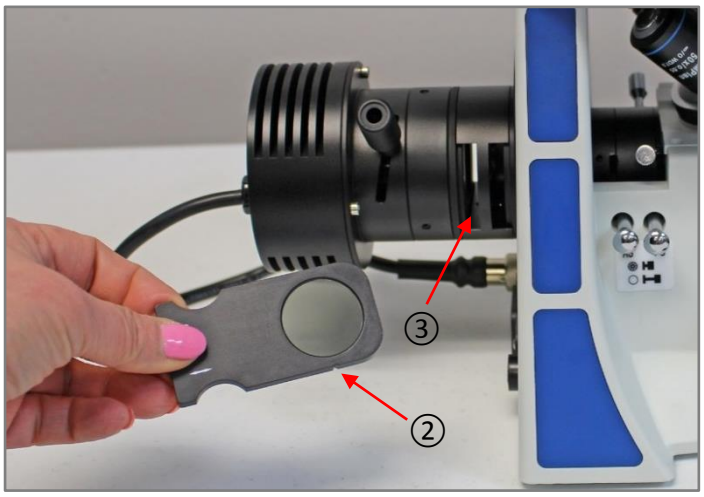


Fig. 17

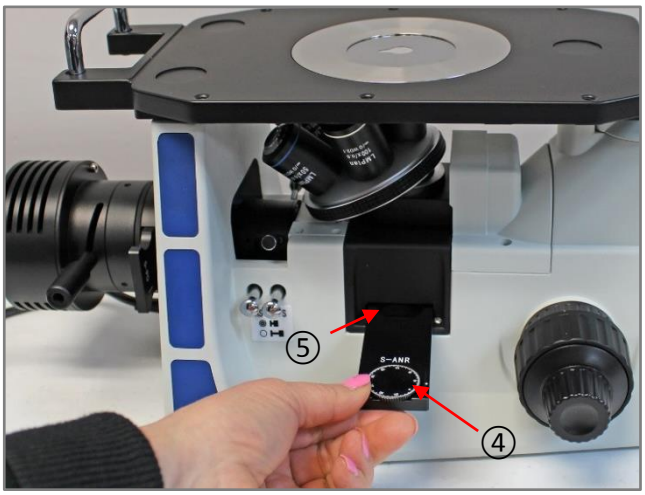


Fig. 18

Operation *(continued)*

Using Filters
(Fig. 19, 20 & 21)

The MEC4 is equipped with three 32mm filters (blue, green and frosted), and a three position filter slider ① (Fig. 19) that is inserted into the filter slot ② (Fig. 20).

The middle position on the filter slider contains the frosted filter. The other two positions are empty so that you may insert the green and blue filters into those positions, or leave one empty for brightfield observation, (or simply remove the filter slider).

To insert a filter into the filter slider, position the rounded side as shown ③ (Fig. 19) and simply slide the filter into place (as shown with the green filter).

NOTE: be sure to keep the filter slider in an upright position as the green and blue filters when inserted do not click into place and can slide out if the slider is turned sideways or upside down.

To insert the filter slider into the filter slot on the MEC4, you must remove one of the end screws ④ (Fig. 21) by turning it counterclockwise. You may then insert the filter slider into the filter slot from either side of the microscope. Once inserted, replace the end screw by turning it clockwise.

To move a filter into the light path, slide the filter slider until the desired filter is in the light path.

NOTE: the frosted filter has a "Λ" ⑤ groove on the bottom and you will hear/feel it "click" into place. The other two positions will be aligned when you push the filter slider to either end and it stops (as long as the end screws on the filter slider are in place).

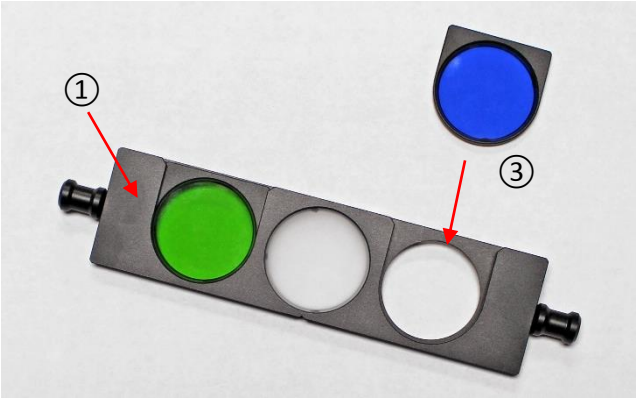


Fig. 19

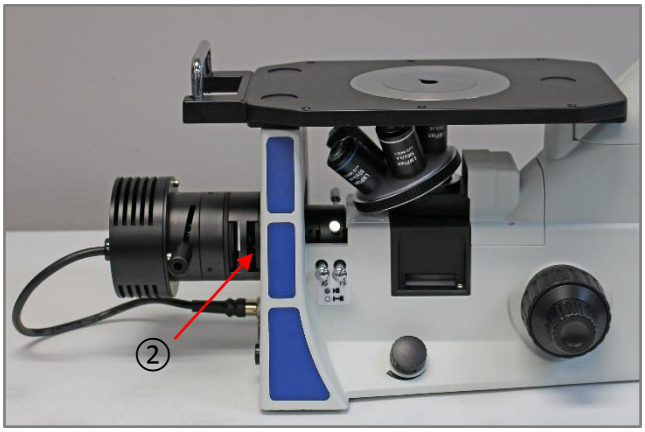


Fig. 20

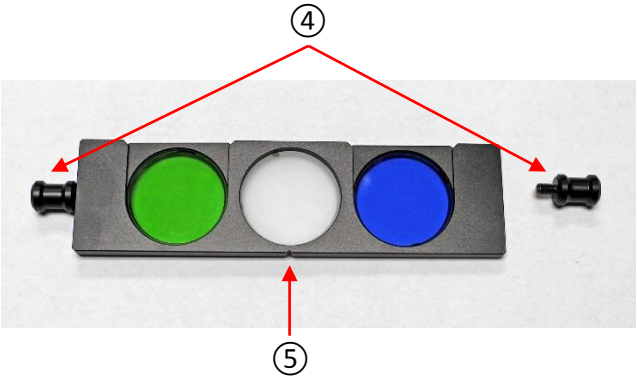


Fig. 21

Operation *(continued)*

Mounting a Microscopy Camera *(Optional)* (Fig. 22)

Installing Couplers

Loosen the lock screw ① and remove the dust cap ② on the photo port ③.

Loosen the lock screw ① until it is flush with the inside of the photo port.

Remove caps from your CCTV lens ④ and attach the top opening to the threaded mount on your camera.

Attach the bottom threaded mount of the CCTV lens ④ (with the mounted camera) onto the photo port ③ and tighten the lock screw ①.

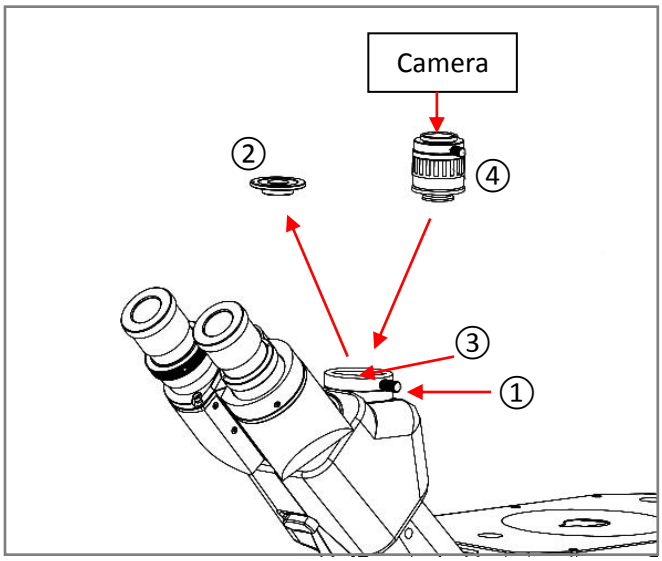


Fig. 22

Selecting the Light Path for Observation With a Camera

Refer to page 12.

TROUBLESHOOTING

Under certain conditions, performance of this unit may be adversely affected by factors other than defects. If a problem occurs, please review the following list and take remedial action as needed. If you cannot solve the problem after checking the entire list, please contact your local dealer for assistance.

OPTICAL

PROBLEM	CAUSE	SOLUTION
The illumination is on, but the field of view is dark.	The bulb is burnt out. The brightness is set too low Too many filters are in the optical path	Replace it with a new one Set it to the appropriate position Reduce them to the minimum required number
The edge of the field of view is obscured or not evenly illuminated.	The nosepiece is not in the located position the color filter is not inserted fully	Turn the nosepiece into the position where you can hear it engaged Push it in all the way
Dirt or dust is visible in the field of view	Dirt/dust on the specimen Dirt/dust on the eyepiece	Replace with a clean specimen Clean the eyepieces
The image glares	The iris diaphragm is closed too much	Open up the iris diaphragm
Visibility is poor ● Image is not sharp ● Contrast is poor ● Details are indistinct	The objective is not correctly engaged in the light path the aperture diaphragm is opened or stopped down too far in brightfield observation The lens (condenser, objective, eyepieces) are dirty	Turn the nosepiece into the engaged position adjust the aperture diaphragm properly Clean it thoroughly
One side of the image is blurred	The objective is not in the center of the light path The specimen is not correctly mounted on the stage.	Insure the nosepiece is in the “clicked” position Place the specimen on the stage correctly.

MECHANICAL PART

PROBLEM	CAUSE	SOLUTION
The coarse adjustment knob is too difficult to rotate	The tension adjustment ring is tightened too much	Loosen it appropriately (p. 12, Fig. 10)
The image goes out of focus during observation	The tension adjustment collar is too loose	Tighten it appropriately (p. 12, Fig. 10)

TROUBLESHOOTING *(continued)*

ELECTRICAL SYSTEM

PROBLEM	CAUSE	SOLUTION
The lamp can't light	No power to the lamp	Check the power cord is connected correctly **NOTE: Lamp Replacement** The LED illuminator will provide approximately 20,000 hours of illumination under normal use. If you should need to replace the LED bulb, please contact an authorized UNITRON service center or call UNITRON at 1-888-289-2228 for an authorized service center near you.
The light intensity is not enough	The light intensity adjustment knob is not set properly	Adjust the light intensity adjustment knob. (p. 11, Fig. 7)

MISCELLANEOUS

The field of view of one eye does not match that of the other	The interpupillary distance is not correct The diopter is not right Your view is not accustomed to the microscope observation and widefield eyepieces	Adjust the interpupillary distance (p. 11, Fig. 8) Adjust the diopter (p. 11, Fig. 9) Upon looking into eyepieces, try looking at the overall field before concentrating on the specimen range. You may also find it helpful to look up and into distance for a moment before looking into the microscope again.
When using a camera and viewing on a monitor, a reflection from a window or indoor lighting is seen in the image	The stray light entered through the eyepieces or viewfinder is reflected	Cover both eyepieces to prevent stray light from entering

MAINTENANCE

Please remember to ***never*** leave the microscope with any of the objectives or eyepieces removed and always protect the microscope with the dust cover when not in use.

SERVICE

UNITRON® microscopes are precision instruments which require periodic servicing to keep them performing properly and to compensate for normal wear. A regular schedule of preventative maintenance by qualified personnel is highly recommended. Your authorized UNITRON® distributor can arrange for this service. Should unexpected problems be experienced with your instrument, proceed as follows:

1. Contact the UNITRON® distributor from whom you purchased the microscope. Some problems can be resolved simply over the telephone.

2. If it is determined that the microscope should be returned to your UNITRON® distributor or to UNITRON® for warranty repair, pack the instrument in its original Styrofoam shipping carton. If you no longer have this carton, pack the microscope in a crush-resistant carton with a minimum of three inches of a shock absorbing material surrounding it to prevent in-transit damage. The microscope should be wrapped in a plastic bag to prevent Styrofoam dust from damaging the microscope. Always ship the microscope in an upright position; ***NEVER SHIP A MICROSCOPE ON ITS SIDE***. The microscope or component should be shipped prepaid and insured.

LIMITED MICROSCOPE WARRANTY

This microscope is warranted to be free from defects in material and workmanship for a period of five (5) years for mechanical and optical components and one (1) year for LED bulb and electrical components from the date of invoice to the original (end user) purchaser. This warranty does not cover damage caused in-transit, misuse, neglect, abuse or damage resulting from improper servicing or modification by other then UNITRON® approved service personnel. This warranty does not cover any routine maintenance work or any other work, which is reasonably expected to be performed by the purchaser. Normal wear is excluded from this warranty. No responsibility is assumed for unsatisfactory operating performance due to environmental conditions such as humidity, dust, corrosive chemicals, deposition of oil or other foreign matter, spillage or other conditions beyond the control of Unitron Ltd. This warranty expressly excludes any liability by Unitron Ltd. for consequential loss or damage on any grounds, such as (but not limited to) the non-availability to the End User of the product(s) under warranty or the need to repair work processes. Should any defect in material, workmanship or electronic component occur under this warranty contact your UNITRON® distributor or UNITRON® at (631) 543-2000. This warranty is limited to the continental United States of America. All items returned for warranty repair must be sent freight prepaid and insured to Unitron Ltd., 73 Mall Drive, Commack, NY 11725 – USA. All warranty repairs will be returned freight prepaid to any destination within the continental United States of America. For all foreign warranty repairs, return freight charges are the responsibility of the individual/company who returned the merchandise for repair.