UNITRON®

# MEC3

## INVERTED METALLURGICAL MICROSCOPE

# MANUAL


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# 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

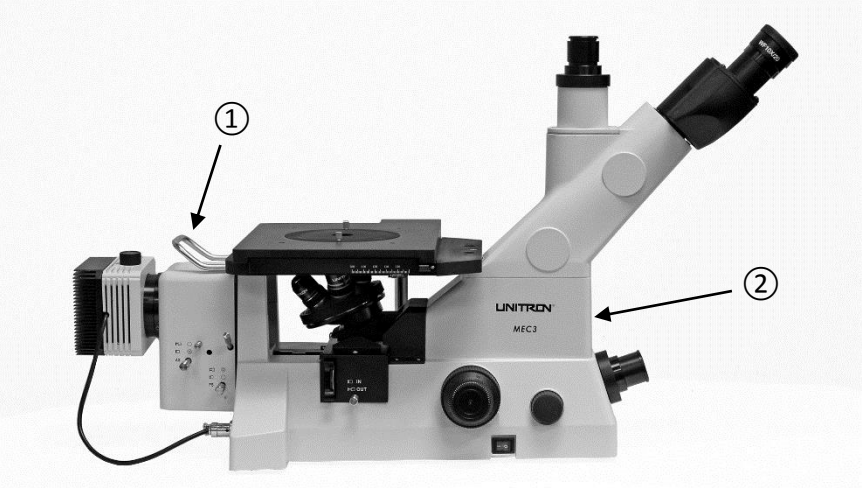
1. Do not attempt to disassemble any component including eyepieces, objectives or focusing assembly.
2. Keep the instrument clean; remove dirt and debris regularly. Accumulated dirt on metal surfaces should be cleaned with a damp cloth. More persistent dirt should be removed using a mild soap solution. 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.
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 handle ① and base ② and place the microscope on a flat, vibration-free surface.

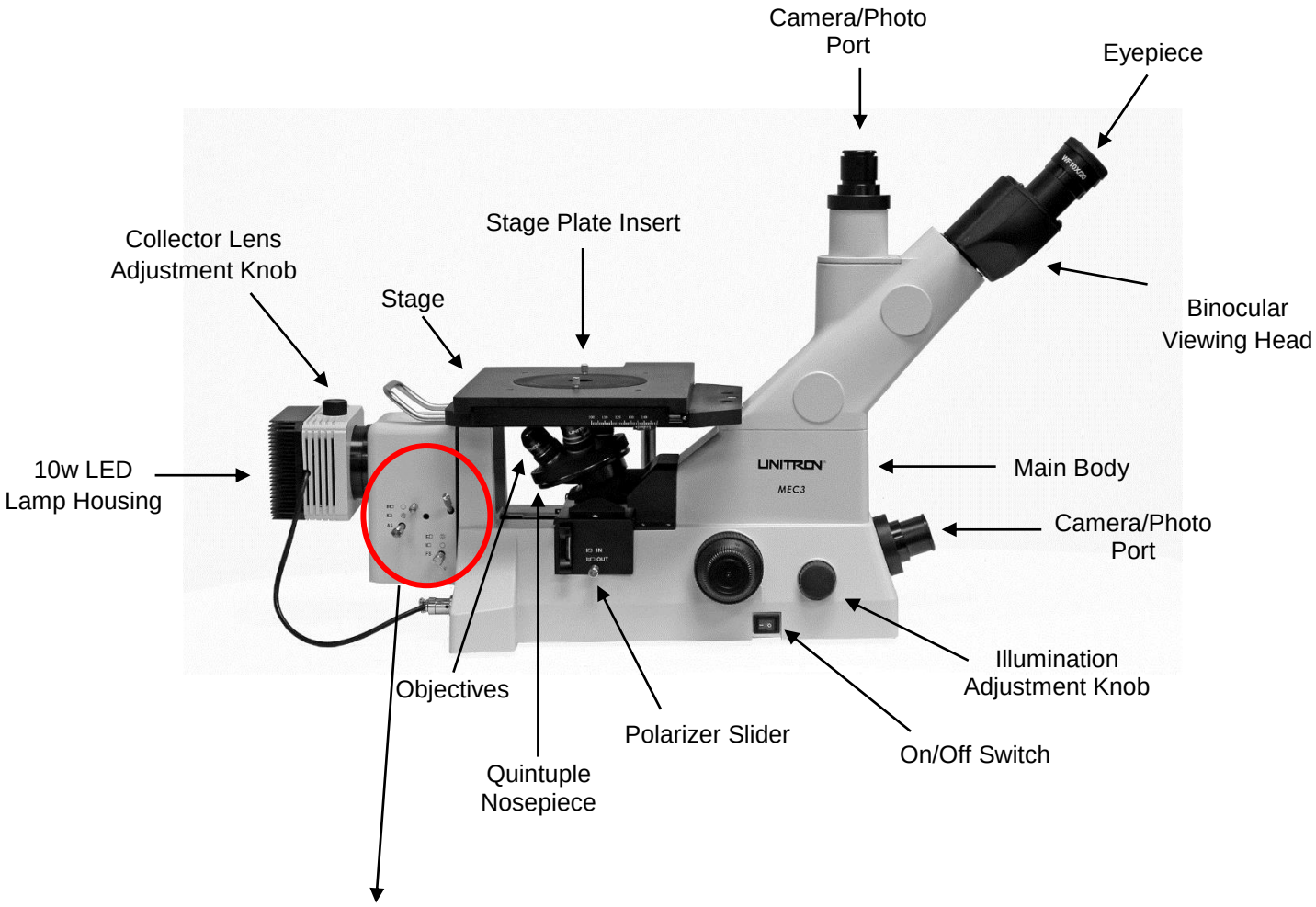


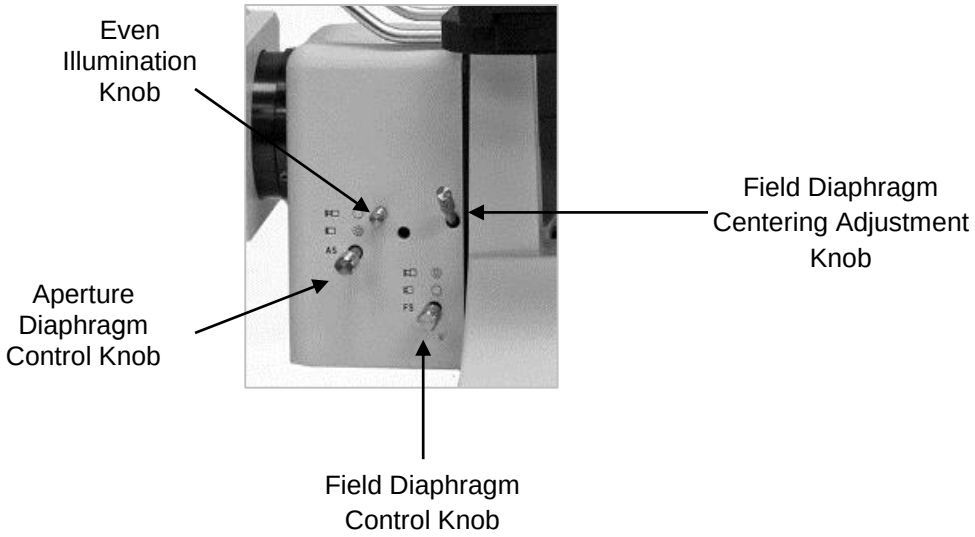

Check the components against the following standard configuration list:

1. Stand, which includes the supporting arm, focusing mechanism, nosepiece, mechanical stage and illumination system.
2. Eyepieces as ordered
3. Objectives as ordered
4. Stage plate inserts (20mm and 30mm teardrop)
5. Dust cover
6. 3-prong electric power cord
7. Camera adapters (optional)

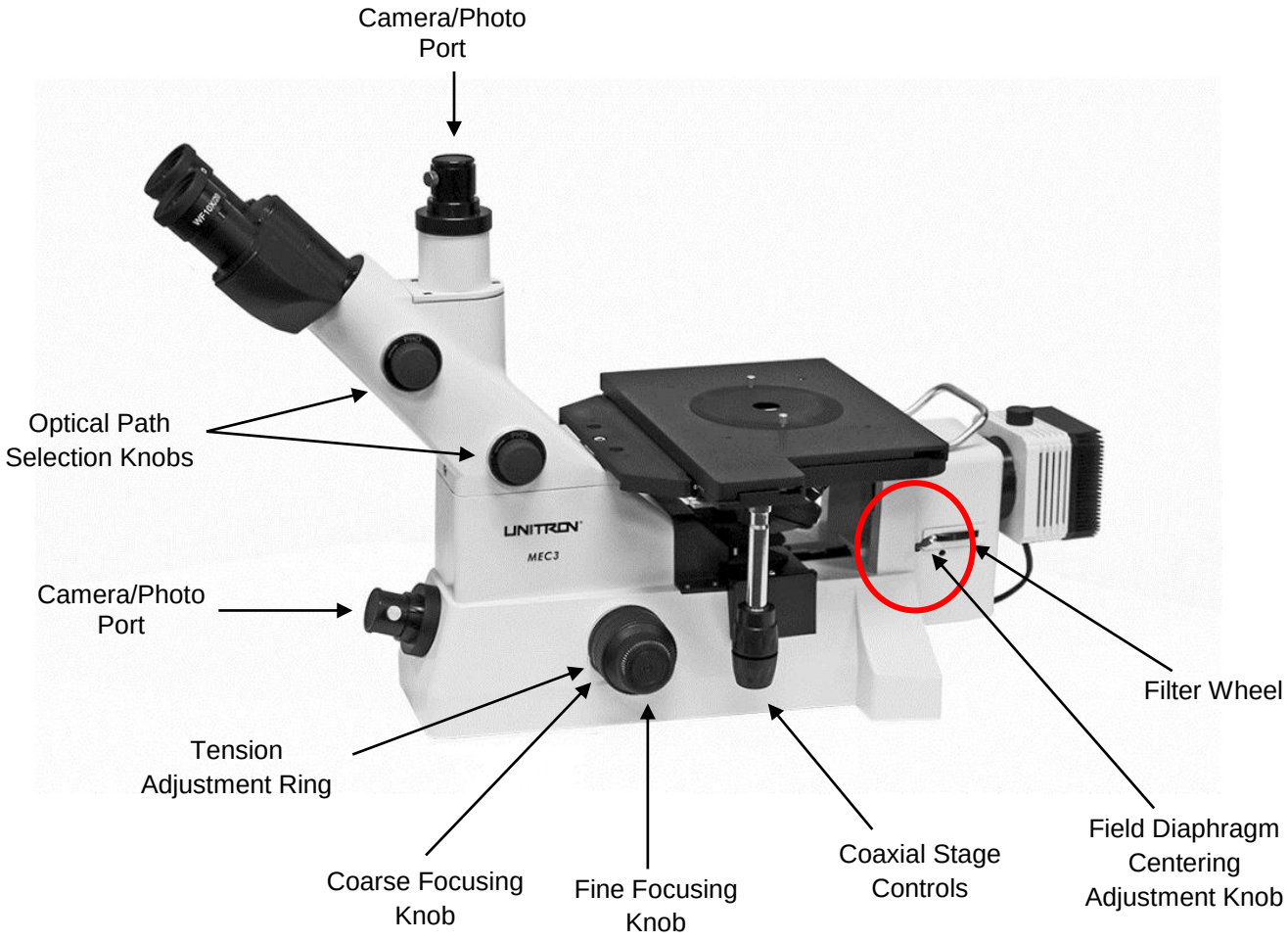
Optional accessories such as optional objectives and/or eyepieces, slides sets, etc., are not shipped as part of the standard equipment. These items, if ordered, are shipped separately.

# COMPONENTS DIAGRAM



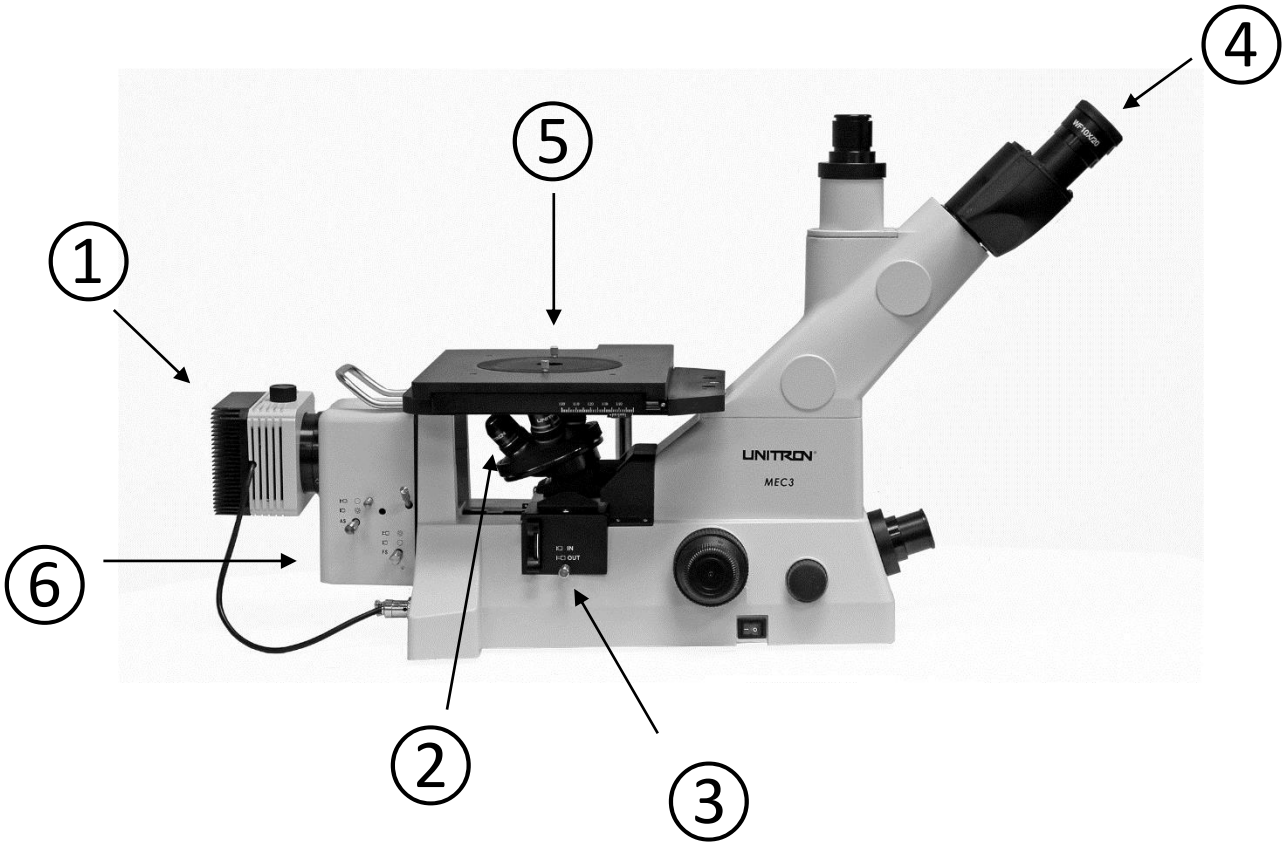
# COMPONENTS DIAGRAM *(continued)*



# 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 Illuminator Housing

② Objectives

③ Polarizer/Analyzer

④ Eyepieces

⑤ Stage insert plate

⑥ Power cord *(not shown)*

# ASSEMBLY

### Installing the Illuminator Housing (Fig. 1, 2 & 3)

Align the illuminator housing as shown with the port on the back of the microscope. (Fig. 1)

Using the 2mm Hex wrench supplied with your microscope, tighten the lock screw (Fig. 2)

Align the silver end of the illuminator housing power cable to the female receptacle on the back of the microscope.

Push the connector in and secure it in place by threading the collar around the connection. (Fig. 3)

Fig. 1

Fig. 2

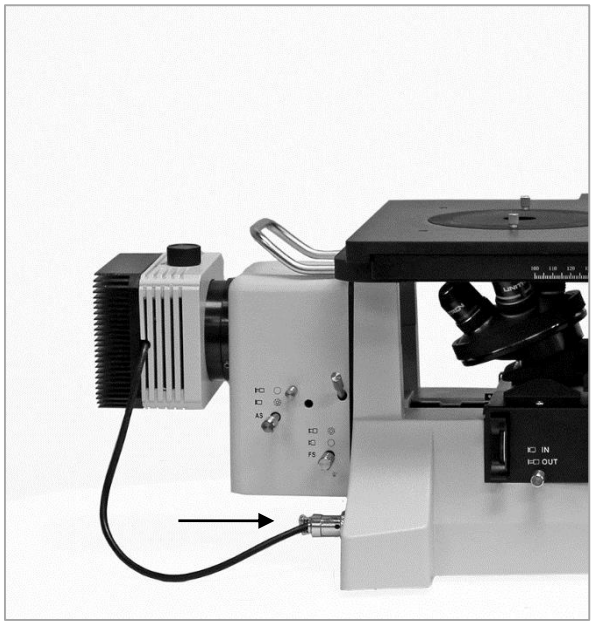


Fig. 3

# ASSEMBLY *(continued)*

**Objectives** (Fig. 4 & 5)

To install the objectives *(if required)*:

1. Turn the coarse adjustment knob ① (Fig. 4) until the revolving nosepiece is at its lowest position.
2. Remove the nosepiece cap ② closest to you and thread the lowest magnification objective onto the nosepiece opening, then rotate the nosepiece clockwise and thread the other objectives from low to high magnification. (Fig. 5)

   NOTE:
   - Always rotate the nosepiece by using the knurled nosepiece ring.
   - Keep the covers on any unused nosepiece openings to prevent dust and dirt from getting inside.

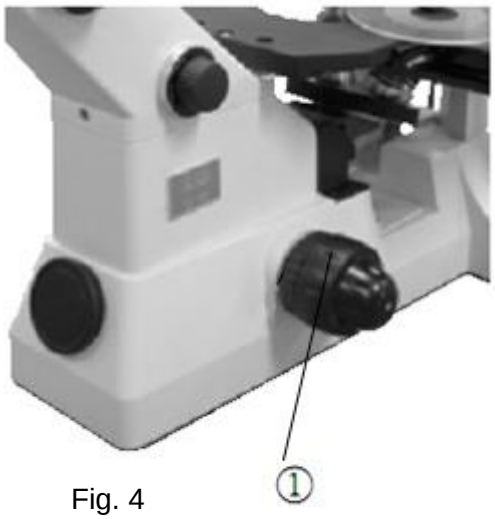



Fig. 4

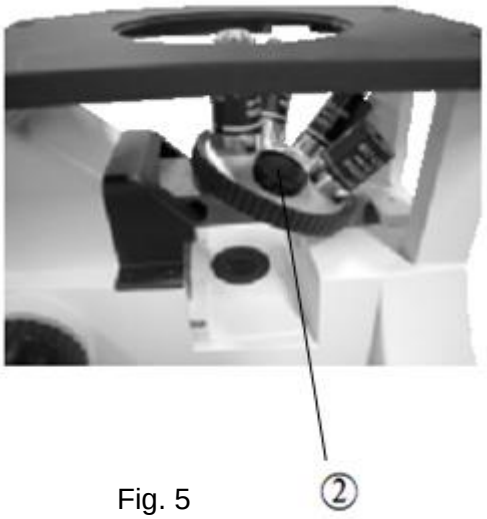


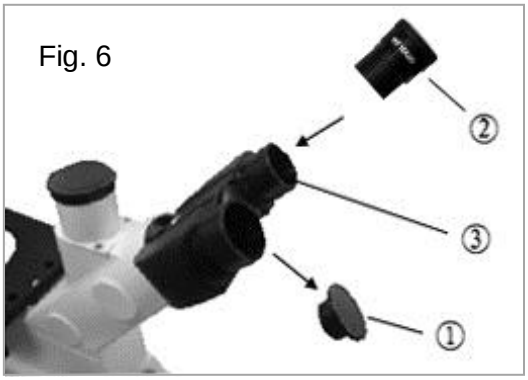

Fig. 5

**Eyepieces** (Fig. 6)

Remove the eyetube plugs 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 eyetube.

Fig. 6



# ASSEMBLY *(continued)*

## Power Cord (Fig. 7)

**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.

**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.

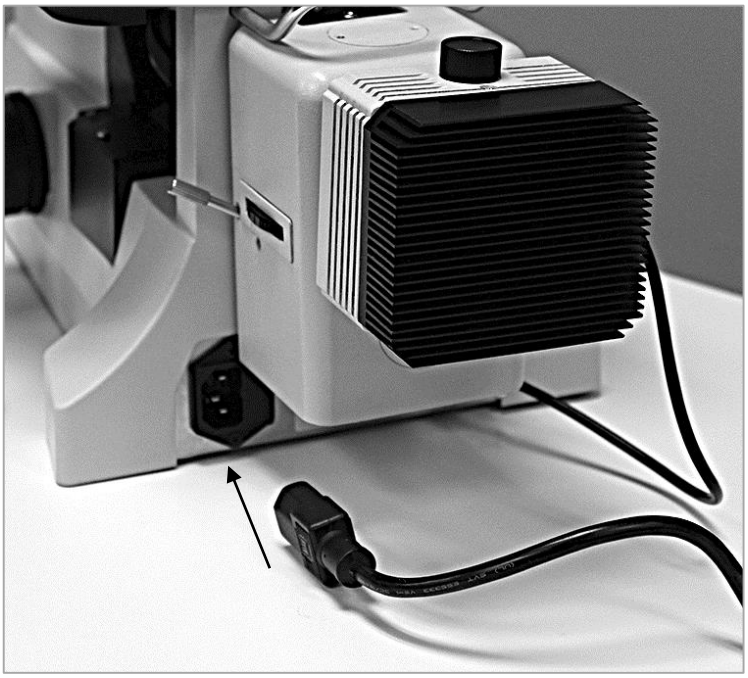


Fig. 7

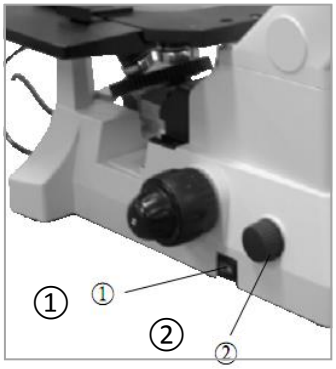
# OPERATION

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 the illuminator switch ① to "—" (Fig. 6) For longer bulb life always turn the illuminator variable intensity knob to the lowest illumination intensity setting possible before turning the power on or off.

### **Adjusting the Illumination** (Fig. 8)

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. 8




### **Adjusting Interpupillary Distance** (Fig. 9 & 10)

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.

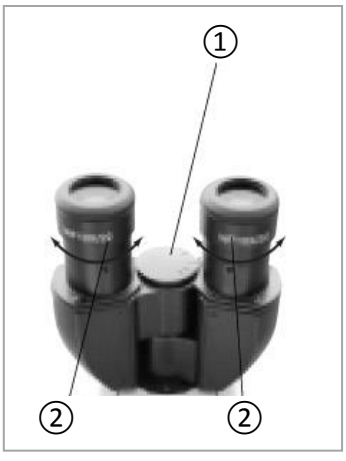
Where the "●" ① on the eyepiece tube lines up, that is the number for your interpupillary distance. The range is 48-75mm. Be sure to write down you interpupillary number for future operation.

Fig. 9

### **Adjusting the Focus** (Fig. 10)

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.

Fig. 10




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

# Operation *(continued)*

### Adjusting the Focusing Tension (Fig. 11)

If the feel is very heavy when focusing with the focusing knobs ②③, or the specimen leaves the focus plane after focusing, or the stage lowers by itself, 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.

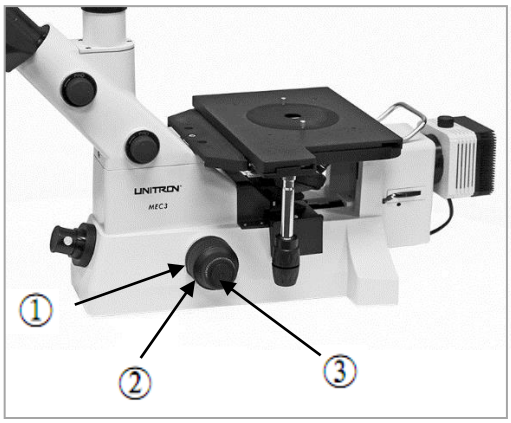



Fig. 11

### Placement & Moving of Specimens (Fig. 12 & 13)

Place the polished surface of specimen face down on insert plate.

Rotate knob ① for the X axis movement (side to side) of the stage, and knob ② for the Y axis movement (front to back) of the stage.

**NOTE:** The travel distance of the stage is 40mm X 40mm.

The scale value ③ (Fig. 13) indicates the distance with an accuracy of 0.1mm.

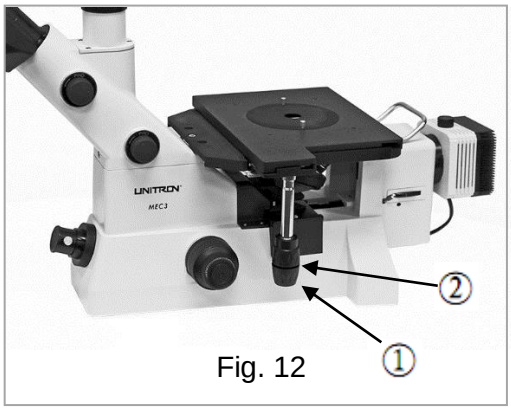



Fig. 12

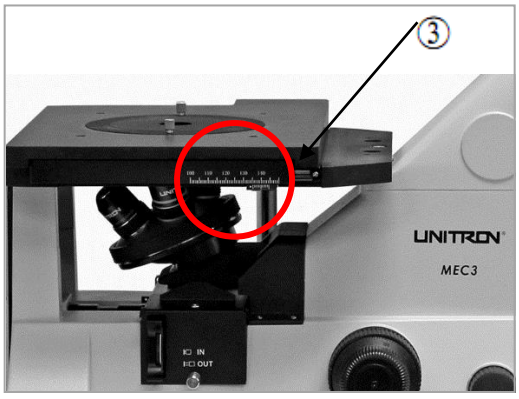



Fig. 13

# Operation *(continued)*

### Selecting the Light Path (Fig. 14)

*(See p. 17 for mounting a camera)*

The MEC3 is outfitted with a binocular viewing head and two photo ports for HDMI/Digital imaging. You must select the appropriate light paths for observing specimens.

The light path is set to 100% to the binocular eyepieces as the default setting at our facilities where both the Upper and Lower Knobs are set to the "closed" position (or turned counter clockwise all the way until you hear a "click").

**Lower Knob ①**
Turning it clockwise all the way to the "PHO" position will send 100% of the light to the bottom front photo port.

Turning it counter clockwise to the "closed" position sends 100% of the light to the binocular viewing head.

**Upper Knob ②**
Turning it clockwise all the way to the "PHO" position will send 80% of the light to the binocular viewing head and 20% to the top photo port.

Turning it counter clockwise to the "closed" position sends 100% of the light to the binocular viewing head.

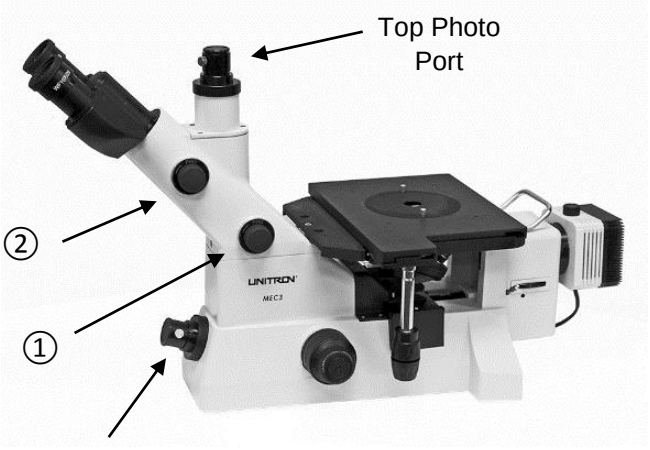



Fig. 14

| Light Path Selection Knob | Light Intensity Ratio | Application |
|---|---|---|
| Both the upper and lower knob is set to "Closed" position | 100% for binocular observation through the eyepieces | Dark specimen observation |
| The upper knob is set to "PHO"position | 80% for binocular eyepieces<br>20% for top photo port | Observation of bright specimens, photography, HDMI imaging |
| The lower knob is set to "PHO"position | 100% for bottom photo port | Photography, HDMI imaging |

# Operation *(continued)*

## Using Filters & the Filter Wheel

(Fig. 15)

Choose an appropriate color filter to enhance observation and photographing of specimens.

Rotate the filter wheel ①. It indicates that a certain filter color is in the optical path. The color shows through the outside of the collar.

The blank or no color indicates no filter is in place.

| Filter | Application |
|---|---|
| Green | Monochrome Contrast Filter |
| Frosted Glass | Wipe out the image of the filament and make the field bright and flat |
| Blue | Monochrome Contrast Filter |
| Yellow | Monochrome Contrast Filter |

## Using the Lamp Collector Lens

(Fig. 15)

Rotate the collector lens adjustment knob ② to provide even illumination. The collector lens provides full illumination to the specimen depending upon which objective is being used.


Fig. 15

# Operation *(continued)*

### Using the Aperture Diaphragm (Fig. 16 & 17)

The aperture diaphragm determines the numerical aperture of the illumination system and effects the resolution of the optical image, the contrast, the brightness and depth of focus.

When the size of the aperture diaphragm is made smaller, the resolution and brightness of the image are reduced while the contrast and depth of focus are increased. If the aperture diaphragm is increased in size, the resolution and brightness will improve, however the contrast and depth of focus will be lowered.

To adjust the aperture diaphragm use the aperture diaphragm control knob (Fig. 16). To properly adjust the aperture diaphragm follow the following procedure:

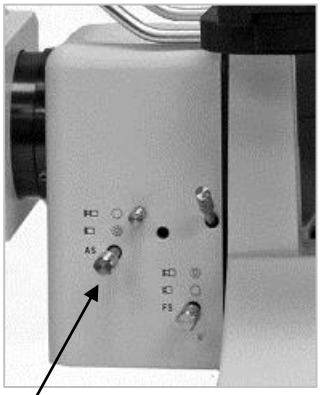



Fig. 16

1. Place a sample with a flat and plane surface onto the stage. A sample with a high reflectance (i.e. a mirror surface) is best.

2. Using the 10x objective in bright-field mode focus on the specimen.

3. Remove one eyepiece and look through the eyepiece tube to determine that the aperture image is shown in the pupil of the objective. Adjust the aperture diaphragm (using the aperture diaphragm control knob) as necessary so that the aperture diaphragm image covers 70% to 80% of the pupil of the objective. (Fig. 17)

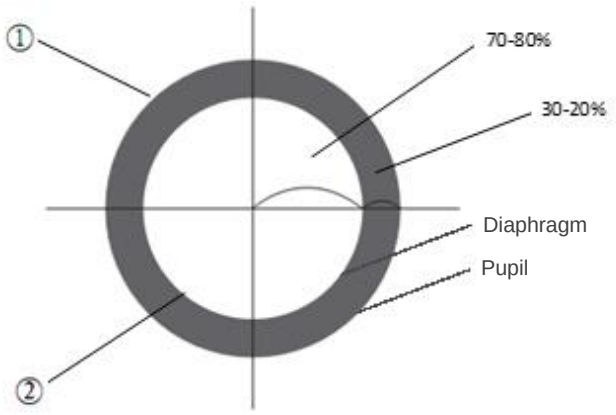



Fig. 17

# Operation *(continued)*

### Operating the Polarizer/Analyzer
(Fig. 18, 19 & 20)

The MEC3 is equipped with a polarizer and analyzer slider to perform simple polarization using the epi illumination.

The polarizer and analyzer work in tandem. The polarizer and the analyzer can be inserted into or moved away from the optical path at the same time by operating either slider.

To place the slider into the optical path push the slider in all the way. (Fig. 18)


Fig. 18

To remove the polarizer and analyzer from the optical path, pull the slider out half way. (Fig. 19) In this position, the empty position is placed in the optical path.

To obtain polarized light, push the analyzer into its "IN" position.

Next, push the analyzer into its end-stop position.

Rotate the polarizer ring (Fig. 20) until you achieve a solid full black background. You are now at Crossed Polars or Full Extinction and can view specimens under polarized light.


Fig. 19

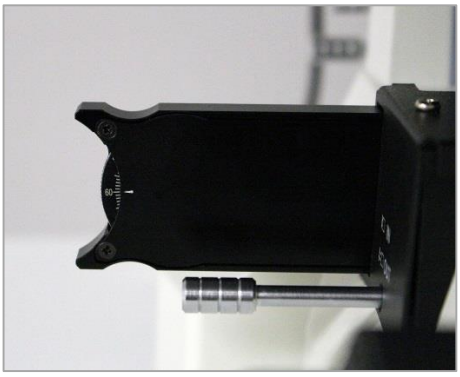


Fig. 20

# Operation *(continued)*

### Mounting a Microscopy Camera - (Fig. 21)

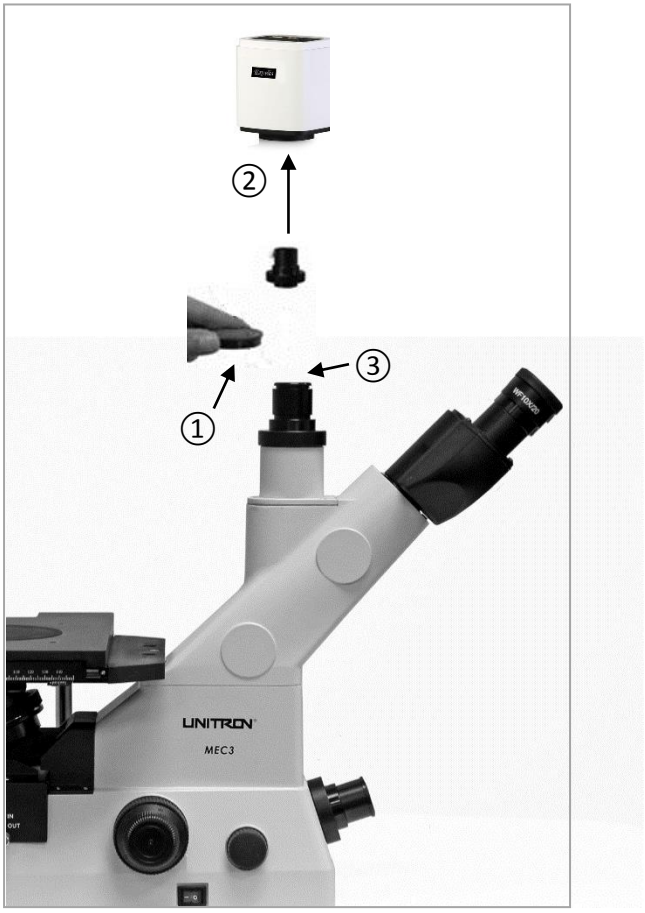
*(Optional)*

The microscope is equipped with two imaging ports. A camera can be installed onto either port.

**Attaching a Camera**

1. Remove the dust cap on the top or bottom photo port *(whichever one you prefer to use).*
2. Attach the camera to a c-mount adapter.
3. Thread the c-mount adapter with camera in the top photo port or bottom port and secure with the locking screw.
4. To parfocalize the camera image to the image seen through the binocular observation tube, the adapter can be adjusted up or down as necessary by loosening the locking screw and then retightening.

**NOTE:** Follow the instructions for the camera selected for connection and operation issues to the specific camera.




(Fig. 21)

**Selecting the Light Path for Observation With a Camera**

*Refer to page 13.*

# SPECIFICATIONS

| | |
|---|---|
| **Optical system** | Infinity optical system |
| **Observing head**<br>**Optical Path Change** | Seidentopf binocular head, inclined at 45°;<br>100% binocular; 100% trinocular, or 80% binocular / 20% trinocular |
| **Eyepiece** | 10X/20mm WF<br>15X/16mm WF(optional);<br>20X/12mm WF(optional);<br>10X micrometer ocular |
| **Nosepiece** | Quintuple nosepiece |
| **Objective** | Infinity M Plan LWD objectives: 5X, 10X, 20X, 50X, or optional 100X |
| **Focusing System** | Coaxial coarse and fine focus with tension adjustment collar<br>Scale of the fine focus knob: 2µm per scale<br>Displacement of the objective (fine focusing) 0.2mm in the vertical direction per rotation<br>Displacement of the objective (coarse focusing) 37.7mm in the vertical direction per rotation<br>Displacement of the nosepiece: 8mm |
| **Stage** | Mechanical Stage Dimension: 226 mm (length) × 178mm (width)<br>Travel Distance: 40mm (X Axis) X 40mm (Y Axis) |
| **Illumination** | 10 watt variable LED |
| **Power Cord** | For the 100 – 120v area (for equipment corresponding to 100, 110 and 120 VAC)<br>Attachable and detachable power cord set approved by the UL:<br>3 conductor grounding Type SVT, No. 18 AWG, 3m long maximum, rated at 125 VAC minimum |
| **Dimensions** | 270mm (W) X 700mm (D) X 430mm (H) |
| **Weight** | 15 kg |
| **Operating Environment** | Indoor use ONLY<br>Temperature: 0 to 40° C<br>Humidity: 85% RH maximum (non-condensing)<br>Altitude: 2000m maximum<br>Pollution degree: Degree 2<br>Installation Category: Category II<br>Electric shock protection class: Class I, limited to the use in a room |
| **Storage Conditions** | Temperature: -20 to 60° C<br>Humidity: 90% RH maximum (non-condensing) |
| **Applicable Standards** | (Equipment corresponding to 220, 230 and 240 VAC)<br>CE marking: The product meets EU Low Voltage Directive requirements<br>The product meets EU EMC Directive requirements (61010-1) |

# SPECIFICATIONS *(continued)*

## Objectives

| Type | Magnification | N.A | Working Distance （mm） | Conjugate Distance （mm） | Parfocal Distance (mm） |
|---|---|---|---|---|---|
| Infinity M Plan LWD Objectives | 5X | 0.12 | 18 | ∞ | 45 |
| | 10X | 0.25 | 10 | | |
| | 20X | 0.4 | 5.1 | | |
| | 50X | 0.75 | 1.3 | | |
| | 100X | 0.90 | 0.7 | | |

# 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 socket pin is not connected to the illumination column | Connect it securely |
| | The bulb is burnt out. | Replace it with a new one |
| | The brightness is set too low | Set it to the appropriate position |
| | Two many filters are stacked | 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 | Turn the nosepiece into the position where you can hear it engaged |
| | the color filter is not inserted fully | Push it in all the way |
| Dirt or dust is visible in the field of view | Dirt/dust on the specimen | Replace with a clean specimen |
| | Dirt/dust on the eyepiece | Clean the eyepieces |
| The image glares | The iris diaphragm is closed too much | Open up the iris diaphragm |
| Visibility is poor<br>● Image is not sharp<br>● Contrast is poor<br>● Details are indistinct | The objective is not correctly engaged in the light path | Turn the nosepiece into the engaged position |
| | the aperture diaphragm is opened or stopped down too far in brightfield observation | adjust the aperture diaphragm properly |
| | The lens (condenser, objective, ocular or culture dish) become dirty | Clean it thoroughly |
| One side of the image is blurred | The objective is not in the center of the light path | Insure the nosepiece is in the “clicked” position |
| | The specimen is not correctly mounted on the stage. | Place the specimen on the stage correctly. |
| | The optical performance of the culture vessel bottom plate is poor (profile irregularity, etc.) | Use a vessel with a good profile irregularity characteristic. |

# TROUBLESHOOTING *(continued)*

## 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 |
| The image goes out of focus during observation | The tension adjustment collar is too loose | Tighten it appropriately |

## ELECTRICAL SYSTEM

| PROBLEM | CAUSE | SOLUTION |
|---|---|---|
| The lamp can't light | No power to the lamp | Check the power cord is connected correctly<br><br>**NOTE: Lamp Replacement**<br>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 | Not use an designated lamp<br>The brightness adjustment knob is used wrong | use an designated lamp<br>Adjust the brightness adjustment knob in a correct way |

## MISCELLANEOUS

| | | |
|---|---|---|
| The field of view of one eye does not match that of the other | The interpupillary distance is not correct<br>The diopter is not right<br>Your view is not accustomed to the microscope observation and widefield eyepieces | Adjust the interpupillary distance<br>Adjust the diopter<br>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. |
| The indoor window or the fluorescence lamp is photographed. | The stray light entered through the eyepieces or viewfinder is reflected | Cap both the eyepieces and photomicroscope system's viewfinder |

# MAINTENANCE

Please remember to ***never*** leave the microscope with 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 service 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 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.