
UNITRON®

CFM SERIES

COMPARISON FORENSIC
MICROSCOPE

MANUAL



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SAFETY NOTES

1. Open the shipping carton carefully -- your microscope arrived packed in a molded shipping carton. **Do not discard the carton:** the shipping carton should be retained for reshipment of your microscope if needed.
2. Carefully remove the microscope from the shipping carton and place the microscope on a flat, vibration-free surface.
3. Avoid placing the microscope in dusty surroundings, in high temperature or humid areas as mold and mildew can form. Carefully remove the microscope from the shipping carton and place the microscope on a flat, vibration-free surface.
4. Please check the complete microscope, spare parts and consumable parts according to the packing list.
5. All electrical connectors (power cord) should be inserted into an electrical surge protector to prevent damage due to voltage fluctuations.

NOTE: Always plug the microscope power cord into a suitable grounded electrical outlet. A grounded 3-wire cord is provided.

CARE AND MAINTENANCE

1. Do not attempt to disassemble any component including eyepieces, objectives or the 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 bulb. If dirt remains on the optical surface, use a soft, lint free 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 makes a useful tool for cleaning recessed optical surfaces. Avoid using an excessive amount of solvent 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 a dust cover when not in use.
5. UNITRON® microscopes are precision instruments which require periodic servicing to maintain proper performance 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.

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.

TECHNICAL PARAMETERS

Objective Magnification: 16205 & 16206: 0.4x, 1.0x, 1.5x, 2.0x, 3.0x, 4.0x
Optional auxiliary lens: 2X

Eyepieces with Standard Binocular Head: CWF 10x/22mm (*standard*)
CWF 20x/13mm (*optional*)
CWF 16x/16mm (*optional*)

Working Distance: 152 mm

**Adjustment of
Interpupillary Distance:** 55-75mm

Stage:

- Two Universal Holders
- Two flat stages
- Tilttable
- 25° gradient adjustment in different directions
- Combined operation for two stages: horizontal movement range -- 55mm; elevation and subsidence 80mm
- Independent operation for two stages: horizontal movement range of X and Y: 55mm x 55mm; elevation and subsidence -- 55mm

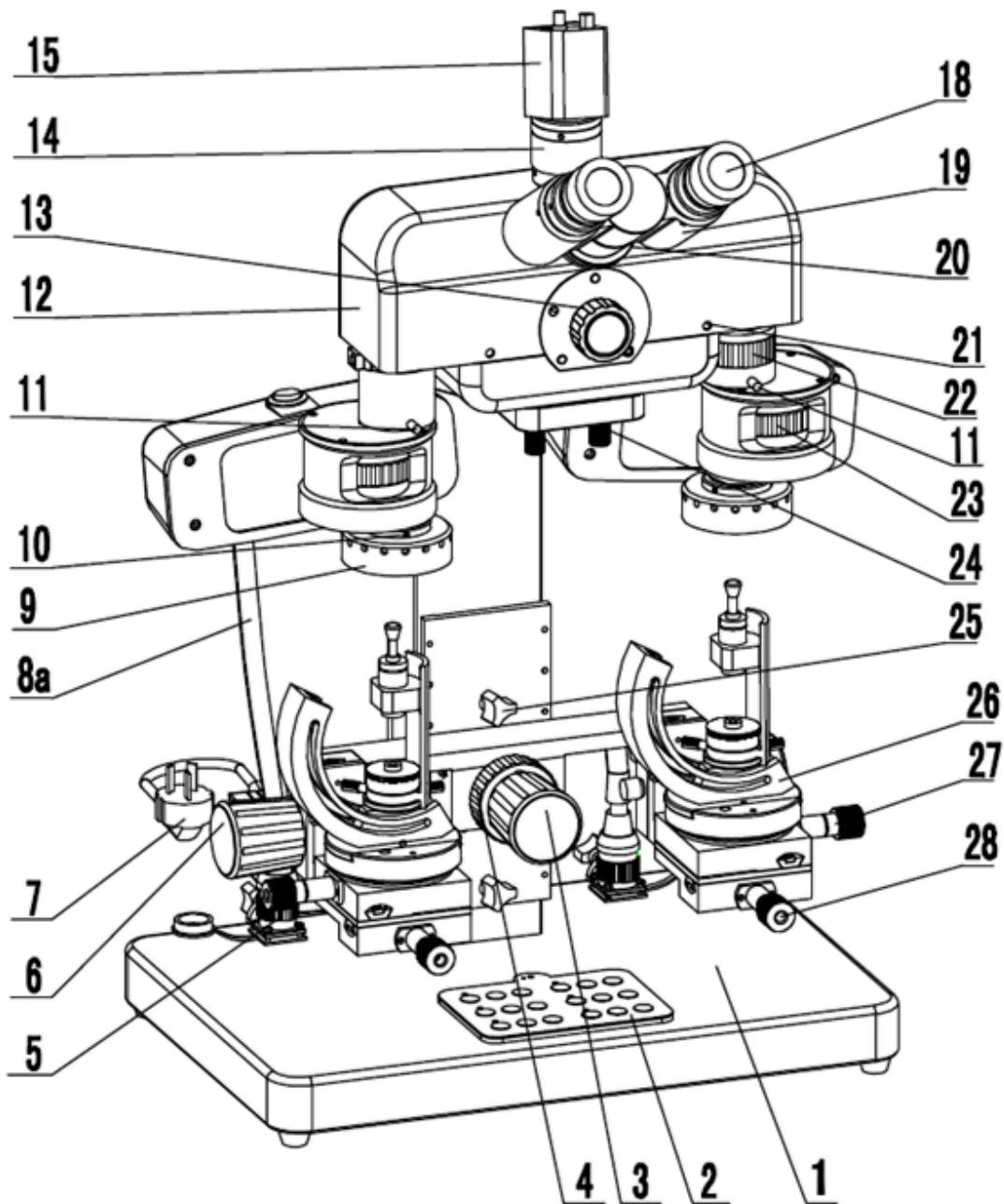
C- Mount Camera Adapter: *Optional:* 0.4x, 1.0x

Illumination:

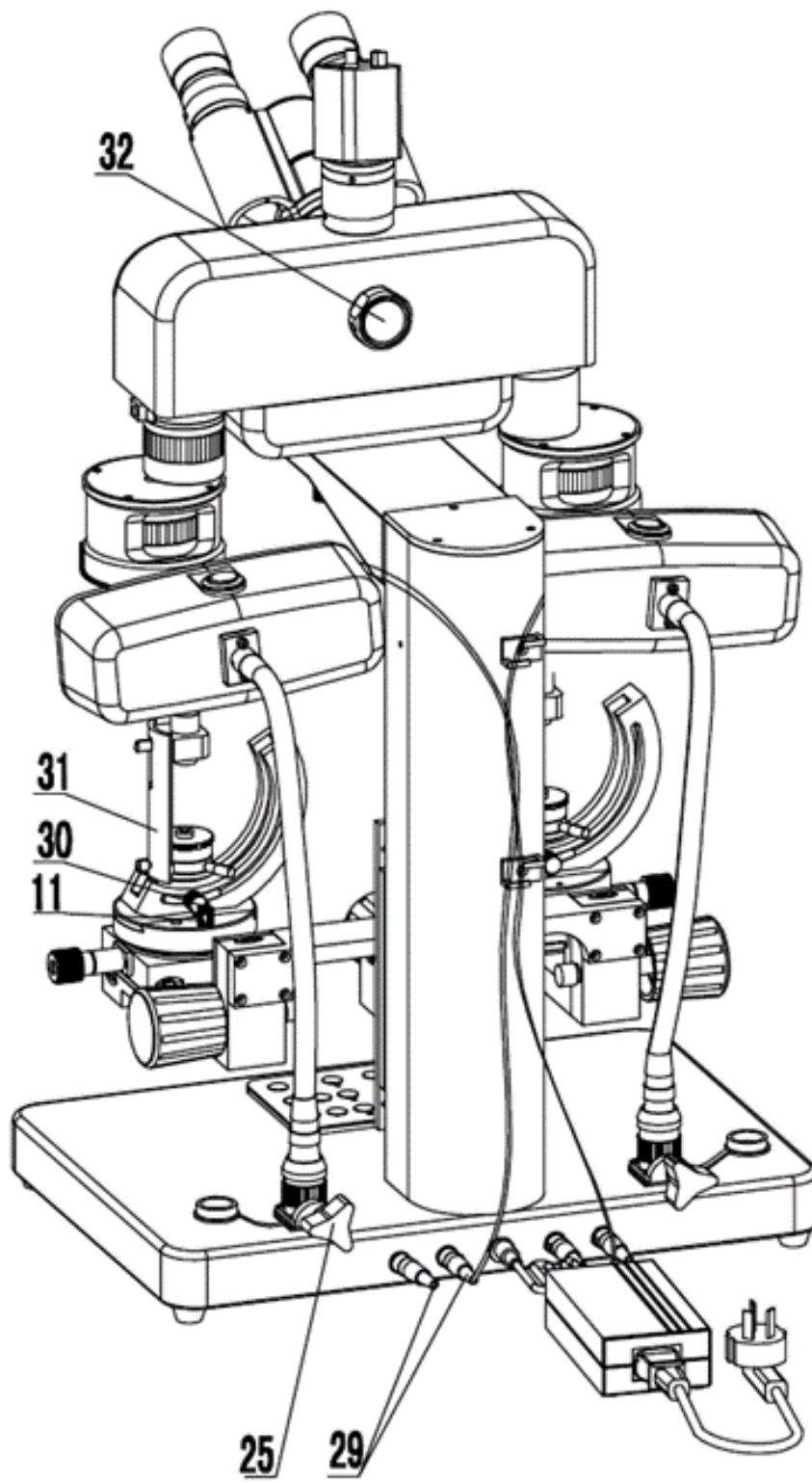
- Input voltage: 100V – 240V; Output voltage: 12V 5A
- 2.5W circular LED light (42 LED ring)
- Gooseneck LED spotlight (White LED light)
Optional: UV, Green, Red LED Light
- Gooseneck fluorescent light
- Remote phosphor gooseneck light
- 3W transmitted light (48 LED ring)
- Coaxial illuminator: high power, 1W LED

INSTRUMENT STRUCTURE - (Figure 1)

CAT# 16206



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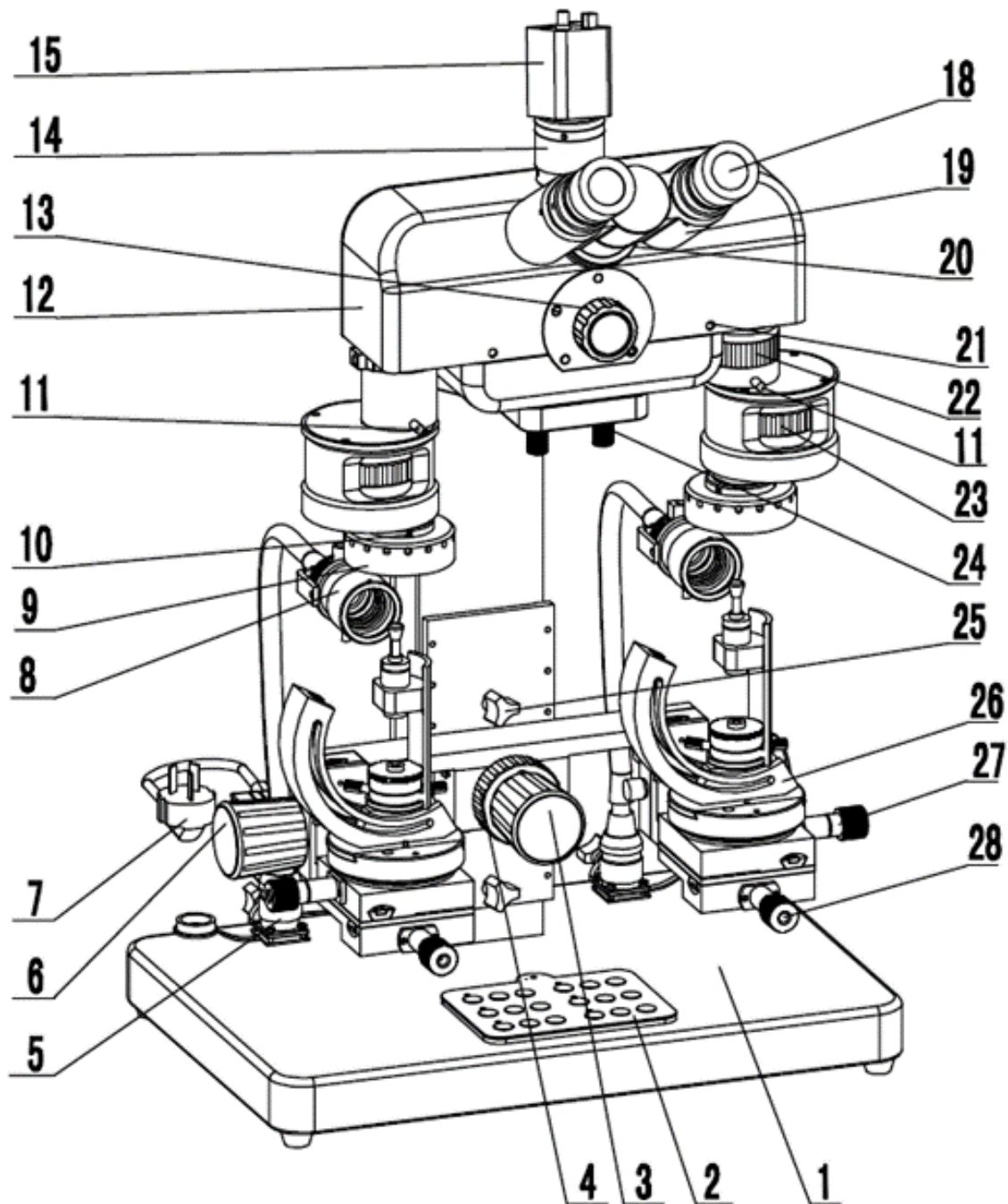


CAT# 16206 Item Identification

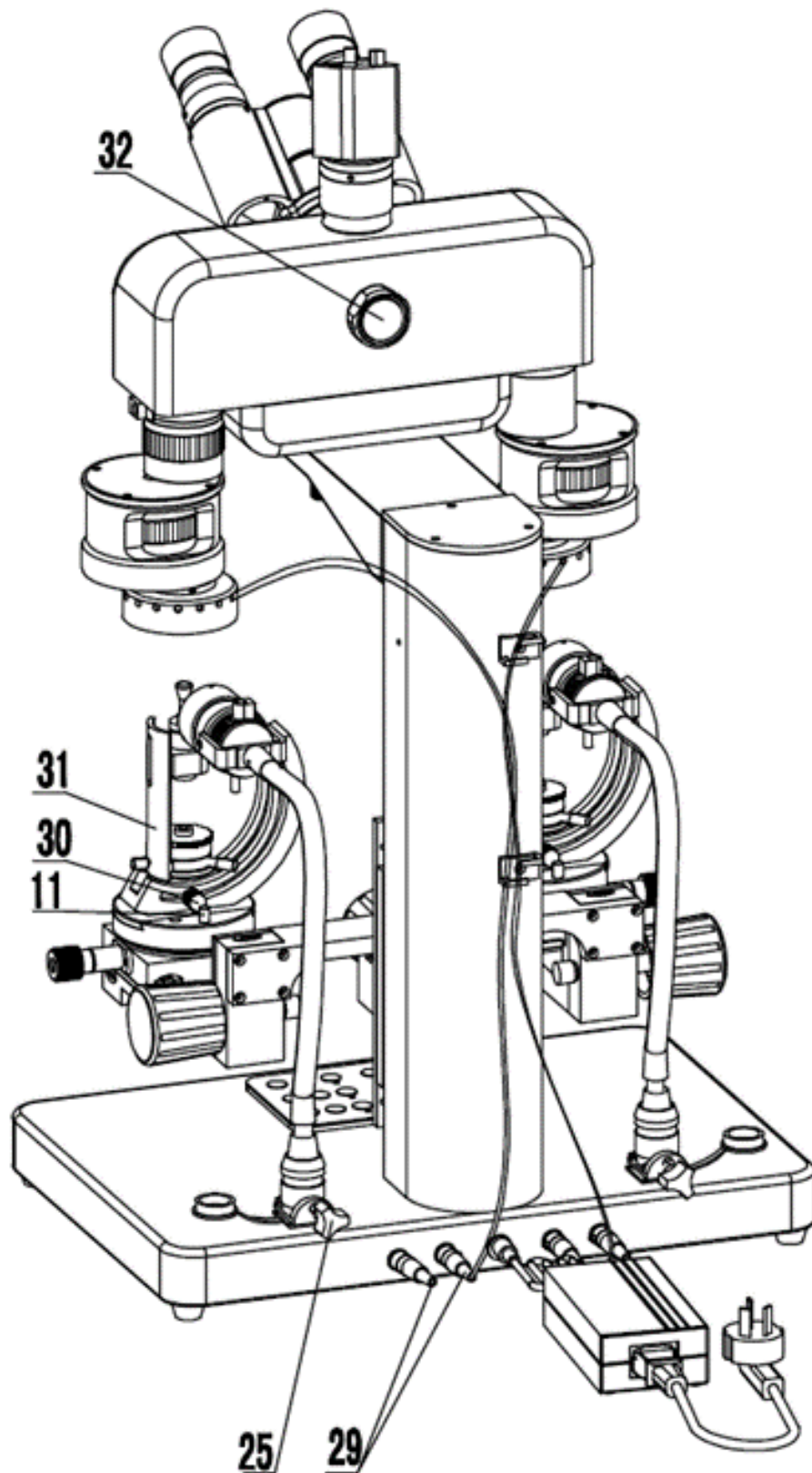
1. Base
2. Light Control Panel
3. Height Adjustment Focus Knob
4. Lateral Adjustment Focus Knob
5. Socket for Gooseneck Fluorescent Light
6. Focus Knob
7. Transformer
- 8a. Gooseneck Fluorescent Light or Remote Phosphor Gooseneck Light
9. LED Ring Light
10. Set Screw
11. Set Screw
12. Bridge Body
13. Separation Line Adjusting Knob
14. C-mount Camera Adapter
15. Digital Camera
16. n/a
17. n/a
18. Eyepiece
19. Binocular Head
20. Tightening Set Screw
21. Separation Adjustment Screw
22. Magnification Adjustment Knob
23. Magnification Changer Knob
24. Locking Screw
25. Tightening Knob
26. Universal Holder Stage
27. Front and Back Adjustment Knob
28. Left and Right Adjustment Knob
29. Socket for LED Ring Light
30. Set Screw
31. Long Case Holder
32. Observe Knob Changer

INSTRUMENT STRUCTURE - (Figure 2)

CAT# 16205



COMPARISON FORENSIC MICROSCOPE



CAT# 16205 Item Identification

1. Base
2. Light Control Panel
3. Height Adjustment Focus Knob
4. Lateral Adjustment Focus Knob
5. Socket for Gooseneck LED Light
6. Focus Knob
7. Transformer
8. Gooseneck LED Light
9. LED Ring Light
10. Set Screw
11. Set Screw
12. Bridge Body
13. Separation Line Adjusting Knob
14. C-mount Camera Adapter
15. Digital Camera
16. n/a
17. n/a
18. Eyepiece
19. Binocular Head
20. Tightening Set Screw
21. Separation Adjustment Screw
22. Magnification Adjustment Knob
23. Magnification Changer Knob
24. Locking Screw
25. Tightening Knob
26. Universal Holder Stage
27. Front and Back Adjustment Knob
28. Left and Right Adjustment Knob
29. Socket for LED Ring Light
30. Set Screw
31. Long Case Holder
32. Observe Knob Changer

SET UP

Please review **INSTRUMENT STRUCTURE** on pages (5-6) before attempting to set up the microscope.

MAIN BODY

1. Place the microscope on a suitable stable or motorized worktable.
2. Remove the dust cap in the middle of bridge and install the Binocular Head (19). Lock it in with the Set Screw (20).
3. Install the Bridge Body (12) into arm of stand and lock it with the Lock Screw (24).
4. Remove the dust caps on the Binocular Head (19) and insert the Eyepieces (18) into the tubes.
5. Insert the power cable of the transformer into the Base (1), and plug the other end into a grounded AC110V outlet.

ILLUMINATION

Ring Light

Set up the Ring Light (9) by plugging it into the Socket (29) and securing it by tightening the Set Screw (10).

Gooseneck LED Light or Gooseneck Fluorescent Light or Remote Phosphor Gooseneck Light

See Figure 1 and Figure 2, the Gooseneck Fluorescent Light (Figure 1, 8a) or the Gooseneck LED Light (Figure 2, 8) is secured to Socket (5).

FUNCTION AND OPERATION

ILLUMINATION

Using a Polarizer (Optional)

Using a Polarizer will eliminate scattered stray light and glare for better image quality.

Connect the Polarizer with a Spot Lamp or a Transmitted Lamp, then screw the Analyzer on.

Adjust the brightness and change the polarizing angle by rotating the Analyzer to get a polarizing effect.

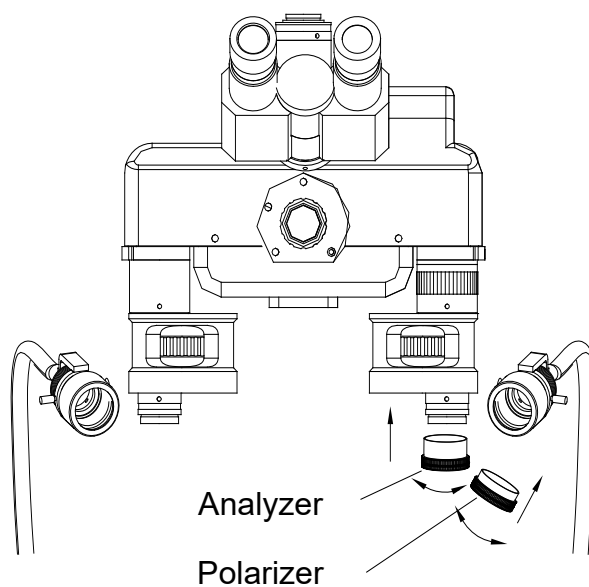


Figure 3

FUNCTION AND OPERATION *(Continued)*

ILLUMINATION *(continued)*

Light Control Panel -- (Figure 6)

The REFL and RING can control the light from all three-pin plugs such as Gooseneck LED Spot Light, LED Ring Light, and Fluorescent Light.

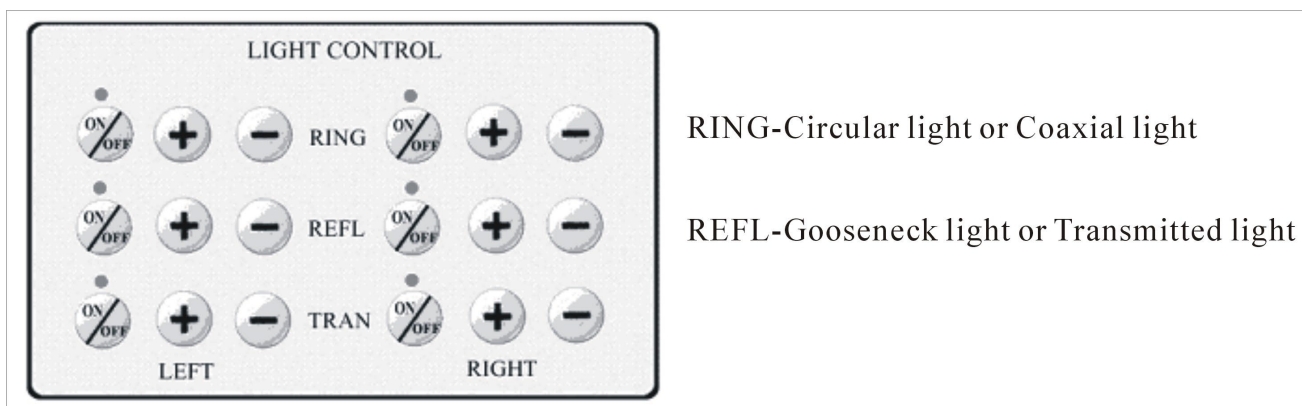


Figure 6

USING THE SEPARATION LINE

The separation line should be a thin, black and straight, as is shown in Figure 7-(c). Turning the Separation Line Adjusting Knob (13) can move the comparison line continuously to have a single, cutting or overlapping view field.

If the separation line appears as is shown in Figure 7-(a) or Figure 7-(b), this means the line has changed out of shape and needs to be adjusted by the following steps:

1. Insert the screwdriver that comes with the microscope into the screw slit in the calibration hole (21).
2. Observe the separation line through the eyepiece and slightly rotate the screwdriver until separation line is in the shape as shown in Figure 7-(c).
 - a. If the separation line is like in Figure 7-(a), adjust the screw in the right hole.
 - b. If it is like the line in Figure 7-(b), adjust the screw in the left hole.

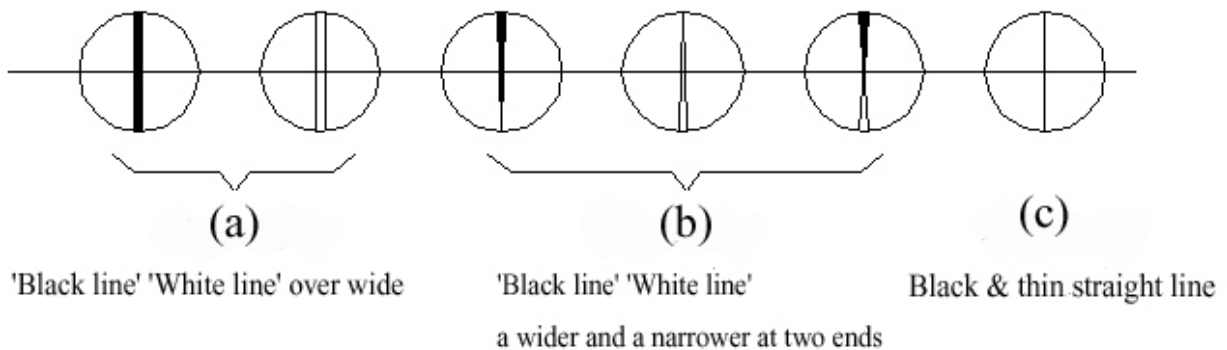


Figure 7

FUNCTION AND OPERATION *(Continued)*

ADJUSTING INTERPUPILLARY DISTANCE

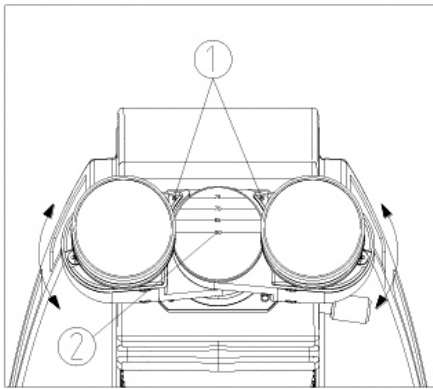


Figure 8

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 “.” ① on the eyepiece tube lines up, then that is the number for the interpupillary distance. Range: 55~75mm. (Fig. 8).

Remember your interpupillary for future operation.

ADJUSTING THE STAGE

Use Knobs (27) and (28) to adjust the stage movement from front to back and left to right. The Stage (26) can be rotated 360°. Move the Stage (26) to adjust it in different directions. The Lateral Adjustment Focus Knob (4) can link the two stages to make the same movements.

ADJUSTING THE FOCUS

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:

1. Set both diopter collars on the eyepieces to “0.”
2. Set the magnification on the microscope to 4.0x
3. Set the indicator line to be viewed on the right side only.
4. Place the enclosed stage micrometer on the right side stage.
5. Adjust the focus of the microscope to bring the micrometer to its sharpest focus using your left eye only to observe.
6. Rotate the diopter collar to obtain the sharpest focus.
7. Now using your right eye only obtain the same sharp focus by rotating the right diopter collar until the sharpest image appears.
8. Repeat the above procedures by changing the Indicator Line to view the specimen from the left side only.
9. Repeat these procedures several times going from the maximum to minimum magnification to ensure you get a sharp image at all magnifications.

FUNCTION AND OPERATION *(Continued)*

ADJUSTING THE MAGNIFICATION

To get the highest quality image, set both the left and right objectives at the same magnification; rotate the Magnification Adjustment Knob (25) to change the objective magnification; under the nominal magnification ratio, the right-side magnification still needs to make fine adjustment. The steps of fine adjustment on the magnification are below:

Separately place the stage micrometer on the left and right stage surface, observe the scales image by the eyepiece, move the stage micrometer to keep the reticle scales matched; if the two objective magnifications are not identical, all scales in the view field will not match. Rotate the Magnification Adjustment Knob [Figure 1-(23)] in a clockwise or counter-clockwise direction. Using the fine focus adjustment knob, refocus it until the image is clear and move the stage micrometer to overlap the scales. Repeat the above procedures until the magnifications of both left and right objectives are identical.

Shown as **Figure 6** the same adjustment should be done when the objective magnification changes.

CAMERA CENTRATION

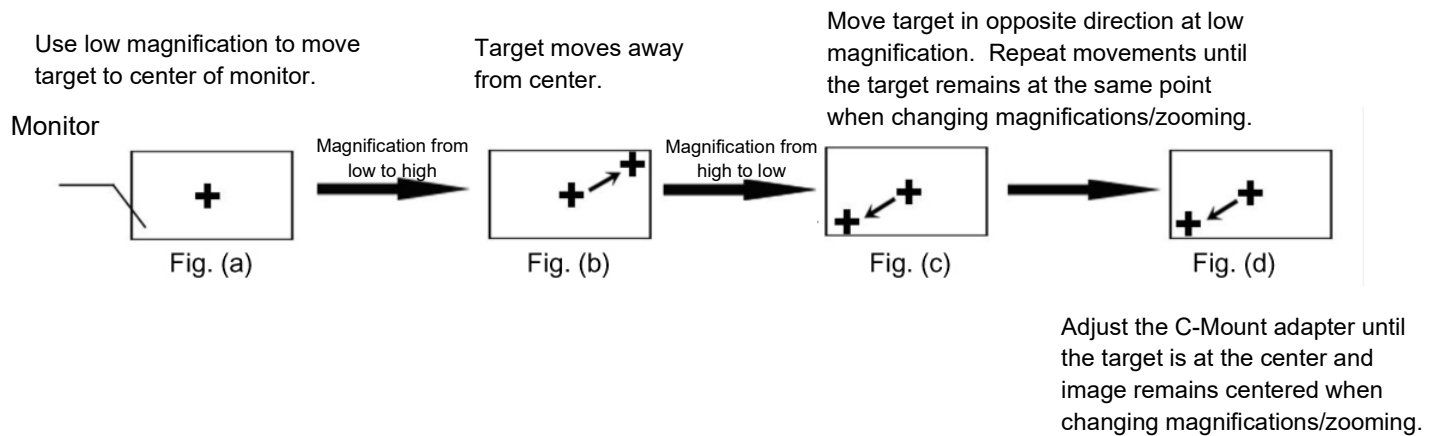
Centering a digital camera that is connected to the microscope and observed with a monitor. The C-Mount Adapter was pre-centered during final inspection so the monitor image coincides with the eyepiece image. The following procedure is provided for reference.

1. Set the B/T selector (located on the back of the CFM Main Bridge) to the "T" position.
2. Set the Beam Selector Knob (located on the front of the Main Bridge) to the Left Fieldview position (knob rotated fully CCW).
3. Place one of the Calibration Slides on the left stage. Note: Placing a piece of white paper under the slide will increase contrast of the scale.
4. Select the 1.0x objective of the Magnification Changer.
5. Using the left Stage X/Y movement controls and left side Focus Knob, focus on the scale of Calibration Slide.
6. Position the center of the Calibration scale (the numeral 5) in the center of the eyepiece field of view (FOV). The 5 on the calibration Slide will from now on (in this procedure) be called the Target.
7. Increase the magnification from 1.0x up to 4.0x. If the Target shift—remember the direction it moved (See Fig. b).
8. Set the magnification back to 1.0x and move the Target in the opposite direction of the movement observed in the previous step.
9. Repeat steps 6. & 7 until the Target does not move.
10. Next loosen the three set screws of C-Mount adapter and move the camera until the image of target is in the center of the monitor FOV.
11. Sequentially tighten each of the 3 centering set screws so as to maintain the Target image in the center of the monitor FOV.

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12. The center of the eyepieces FOV and the center of the monitor FOV now coincide with each other through the CFM's magnification range.

The schematic diagram is below:



USING THE BULLET HOLDER



Figure 9

1. Insert the spring-loaded bullet holder into casing shell and turn to expand, using the appropriate size. (Figure 9 and 12)

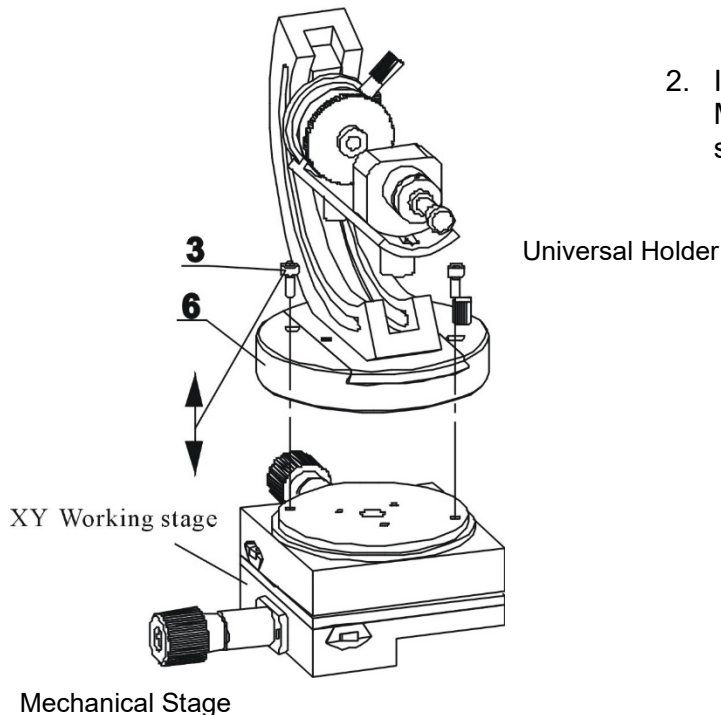


Figure 10

FUNCTION AND OPERATION (Continued)

USING THE BULLET HOLDER (Continued)

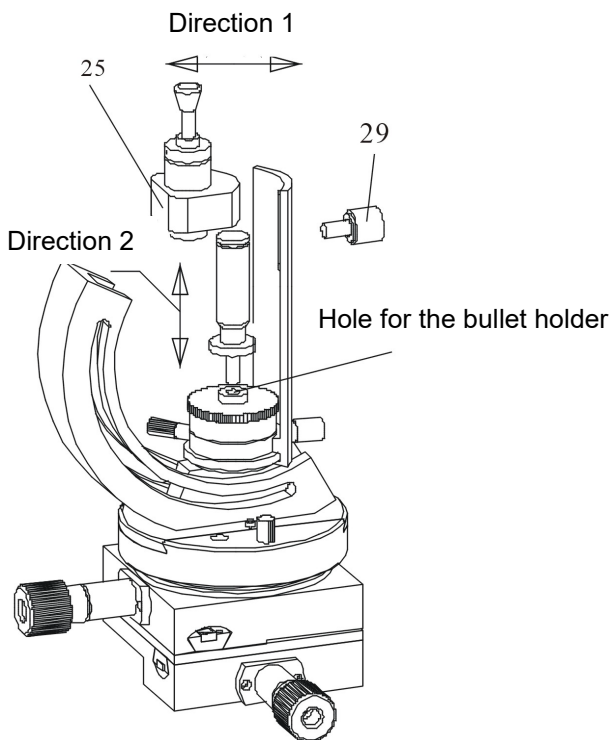


Figure 11

3. Viewing Samples (Figures 11 & 12)

To view trace on the bottom of the bullet shell, thread the wire brush holder with bullet shell into the base in an upright position (Figure 11).

To view trace on the side of the bullet shell, put (25) on the end of the bullet shell and secure its position by locking it in place with (29) (Figure 11).

To inspect a sample with a large diameter, unscrew (11) and remove (30) (Figure 12).

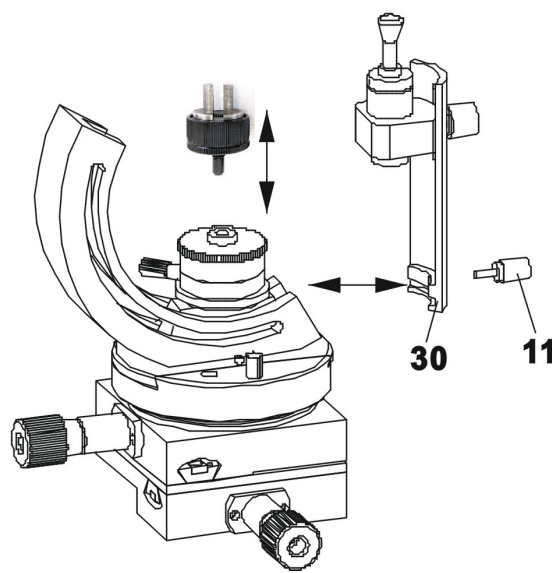


Figure 12

FUNCTION AND OPERATION *(Continued)*

USING THE BULLET HOLDER *(Continued)*

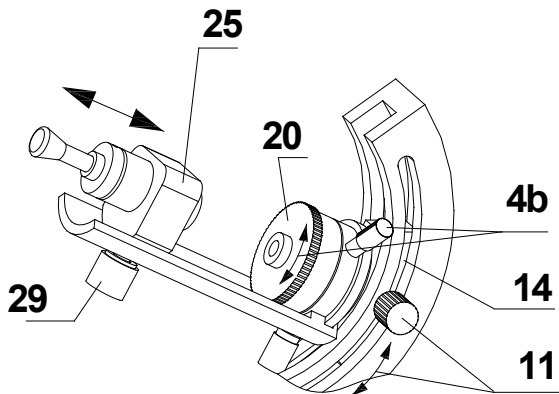


Figure 13

4. Positioning Samples (Figures 13, 14, 15)

Rotate the base of the Universal Holder by loosening the locking screw (4a) (Figure 14).

To move the bullet into a horizontal or inclined setting, loosen the locking screw (4a) and slide the bullet holder along the groove. Secure into place by tightening the locking screw.

To adjust the big diameter sample, unscrew (9) and move (8) (Figure 12) forwards or backwards until you obtain a suitable position.

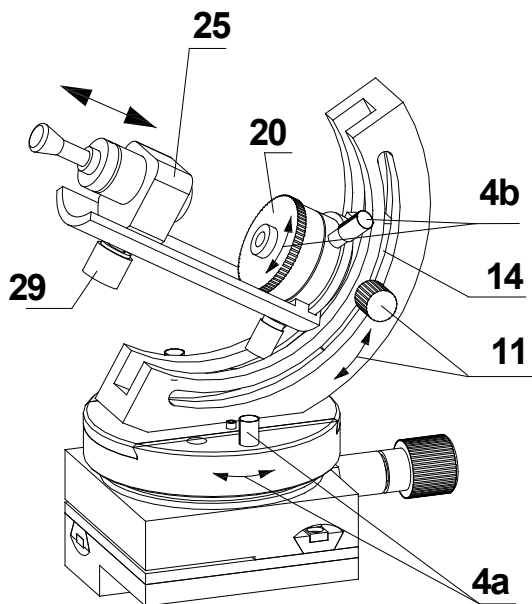


Figure 14

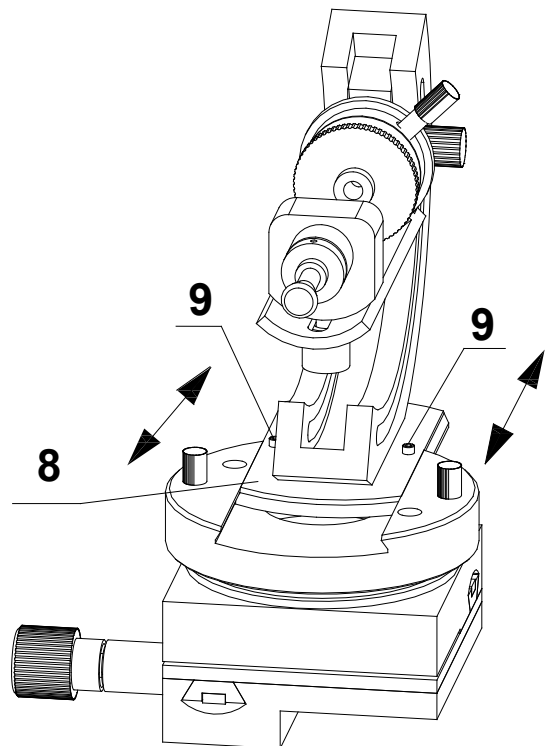


Figure 15

FUNCTION AND OPERATION *(Continued)*

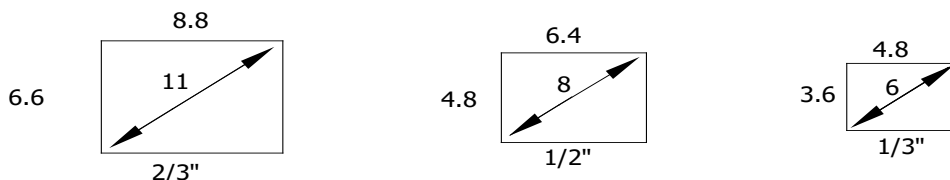
SELECTING PROPER MAGNIFICATION OF DIGITAL CAMERA

Formulas for Magnification Calculation

Total Magnification = magnification of body x Magnification of digital camera x Digital magnification
(x magnification of optional auxiliary lens)

Diameter of Object view field = length of digital camera sensor target surface diagonal line/magnification of objective/magnification of digital camera/ (x magnification of optional auxiliary lens)

Sensor Size of Digital Camera (Unit: mm)



Digital magnification = length of monitor diagonal line/ camera sensor target surface diagonal line

For example:

$$\text{Digital magnification of 8" monitor with 1/3" camera sensor} = \frac{8 \times 25.4}{6} = 33.87$$

$$\text{Digital magnification of 17" monitor with 1/3" camera sensor} = \frac{17 \times 25.4}{6} = 71.97$$

TROUBLESHOOTING GUIDE

PROBLEM	CAUSE AND SOLUTION
Lamp does not work	<ul style="list-style-type: none"> • Confirm the power is on • Confirm the power connection is secure • Check transformer, if it was damaged, replace it by contacting your authorized UNITRON distributor • Check lamp, if it is damaged, replace it by contacting your authorized UNITRON distributor • Check whether service voltage matches with instrument voltage. If the problem is not caused by the reasons above, please consult your authorized UNITRON distributor
Specimen is not focused	<ul style="list-style-type: none"> • Check whether the specimen is too high to get enough distance to focus • Check focusing range. If focus distance is not enough, adjust the height of microscope, (the specific approach please read item 6 in this operating instruction) -- Focusing Section • Check whether lens is dirty -- If it is dirty please clean the lens, the specific approach please read notes before use in this operating instruction
Image is not clear	<ul style="list-style-type: none"> • Specimen is unfocused; please adjust according to the above procedures • Objective is dirty; please clean the objective according to operating instruction • Eyepiece is dirty; please clean the eyepiece according to operating instruction

MAINTENANCE

Please remember to **never** leave the microscope with eyepieces removed and always protect the microscope with a 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:

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

If it is determined that the microscope should be returned to your UNITRON distributor or to UNITRON for warranty repair, contact UNITRON or your authorized UNITRON distributor for guidance on packaging and shipping of the instrument.

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 than 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.

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