UNITRON®

12100 Polarizing

MICROSCOPE SERIES

MANUAL

Distributed by:

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Microscope Experts since 1979

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SAFETY NOTES

1. Open the shipping carton carefully to prevent any accessory, i.e. objectives or eyepieces, from dropping and being damaged.
2. 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.
3. 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.
4. All electrical connectors (power cord) should be inserted into an electrical surge protector to prevent damage due to voltage fluctuations.
5. **LED LAMP & FUSE REPLACEMENT** -- **CAUTION**: the glass housing of the lamp may be hot. DO NOT attempt to change the lamp before it is completely cooled For safety when replacing the LED bulb or fuse (ONLY replace with the same size, type and rating of original LED bulb or fuse), be sure the main switch is in the off position, disconnect the power cord from outlet, and replace the LED bulb or fuse. Reconnect the power cord and turn unit on.
6. 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. **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 cleaning.
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 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 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

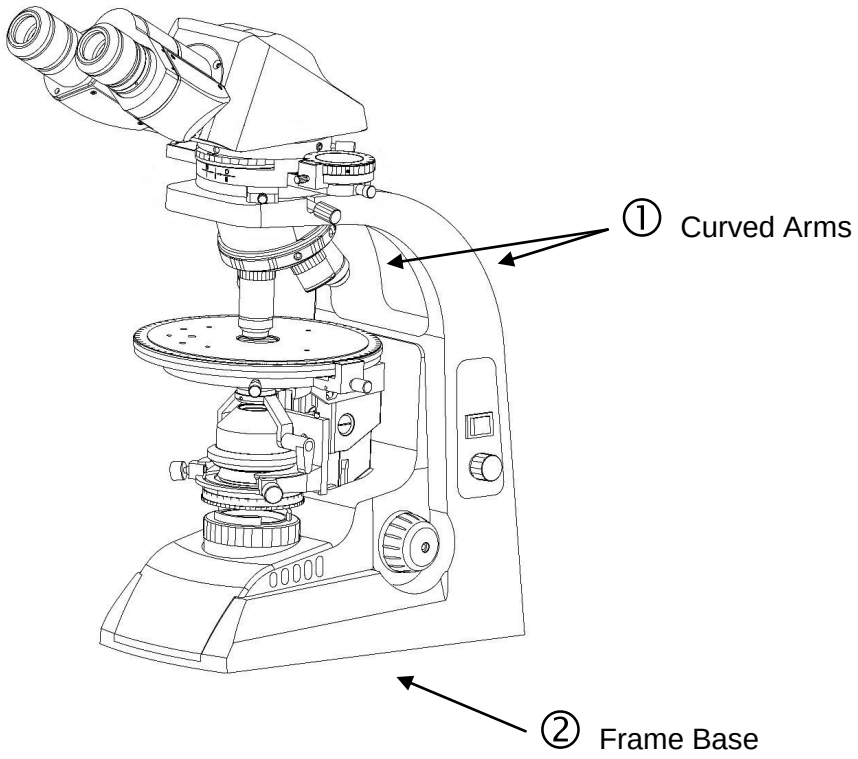
Congratulations on the purchase of your new UNITRON® microscope. UNITRON® microscopes are engineered and manufactured to the highest quality standards. Your microscope will last a lifetime if used and maintained properly. UNITRON® microscopes are carefully assembled, inspected and tested by our staff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

UNPACKING THE COMPONENTS

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. Avoid placing the microscope in dusty surroundings or in high temperature or humid areas as mold and mildew can form.

The components of the 12100 Polarizing Microscope are shipped “double-boxed” -- inside the inner cartons the microscope and its components are further protected by foam forms.

IMPORTANT: When lifting and moving the microscope, hold it by one of the microscope frame’s curved vertical arms ① with one hand and place your other hand under the base ② of the frame. ***NEVER*** hold the stage, focus knobs or eyepiece tubes when lifting or moving the microscope.

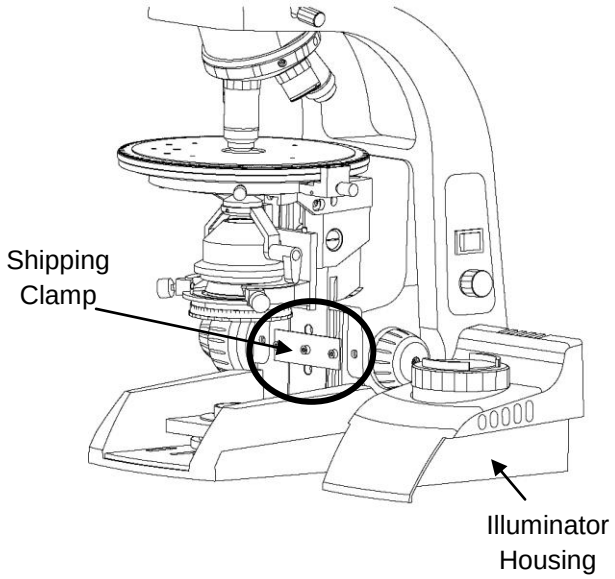


UNPACKING THE COMPONENTS *(continued)*

IMPORTANT

A shipping clamp secures the microscope's focusing mechanism during transportation. Once the microscope mainframe has been removed from the shipping carton and foam support, ***the clamp must be removed before proceeding further.***

The clamp is accessible by removing the Illuminator Housing at the base of the mainframe.



To remove the clamp:

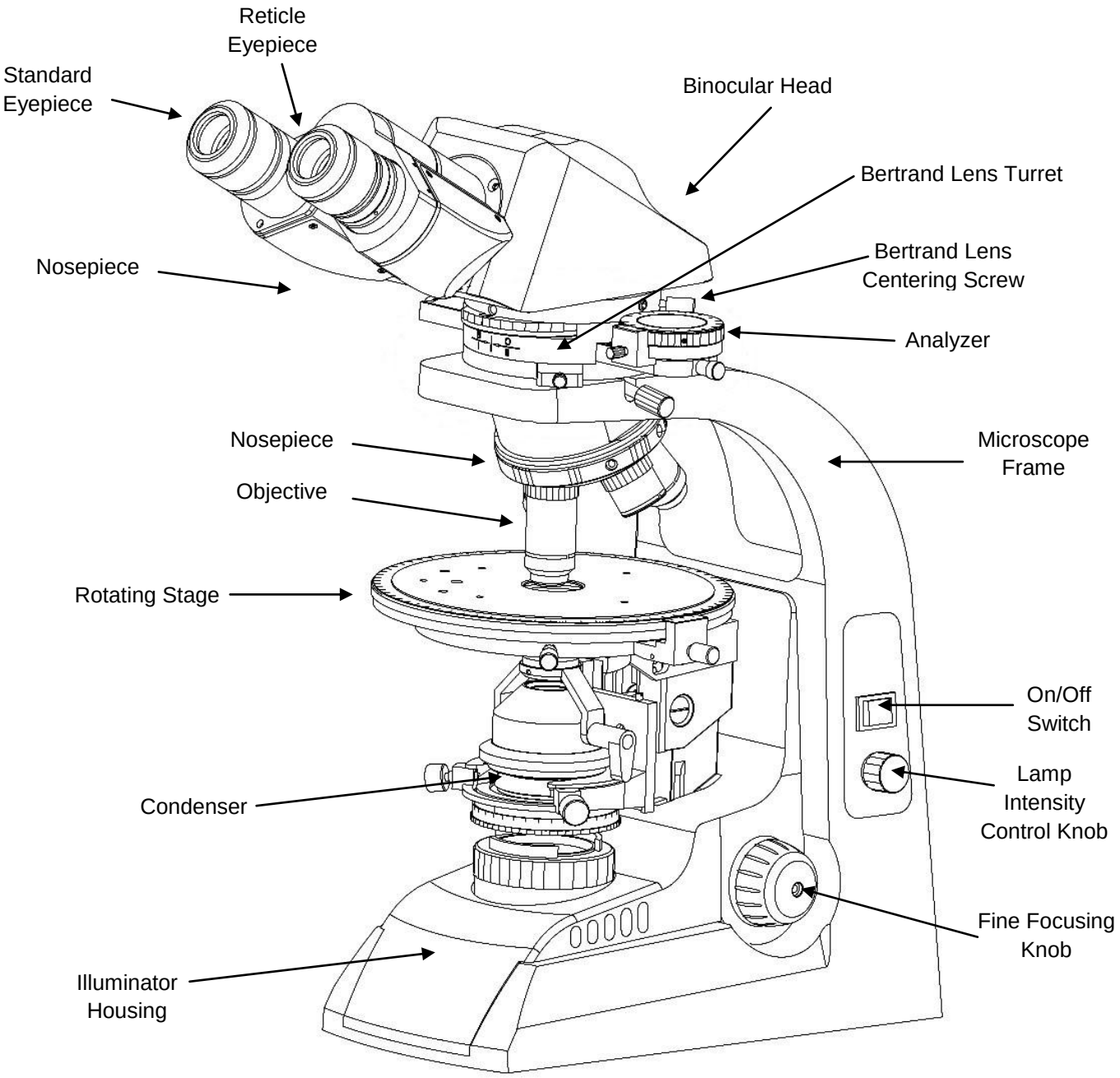
Grip the finger grooves on the sides of the housing and slide the housing off the microscope frame.

Use the hex key tool provided to remove the three screws securing the gold-toned clamp.

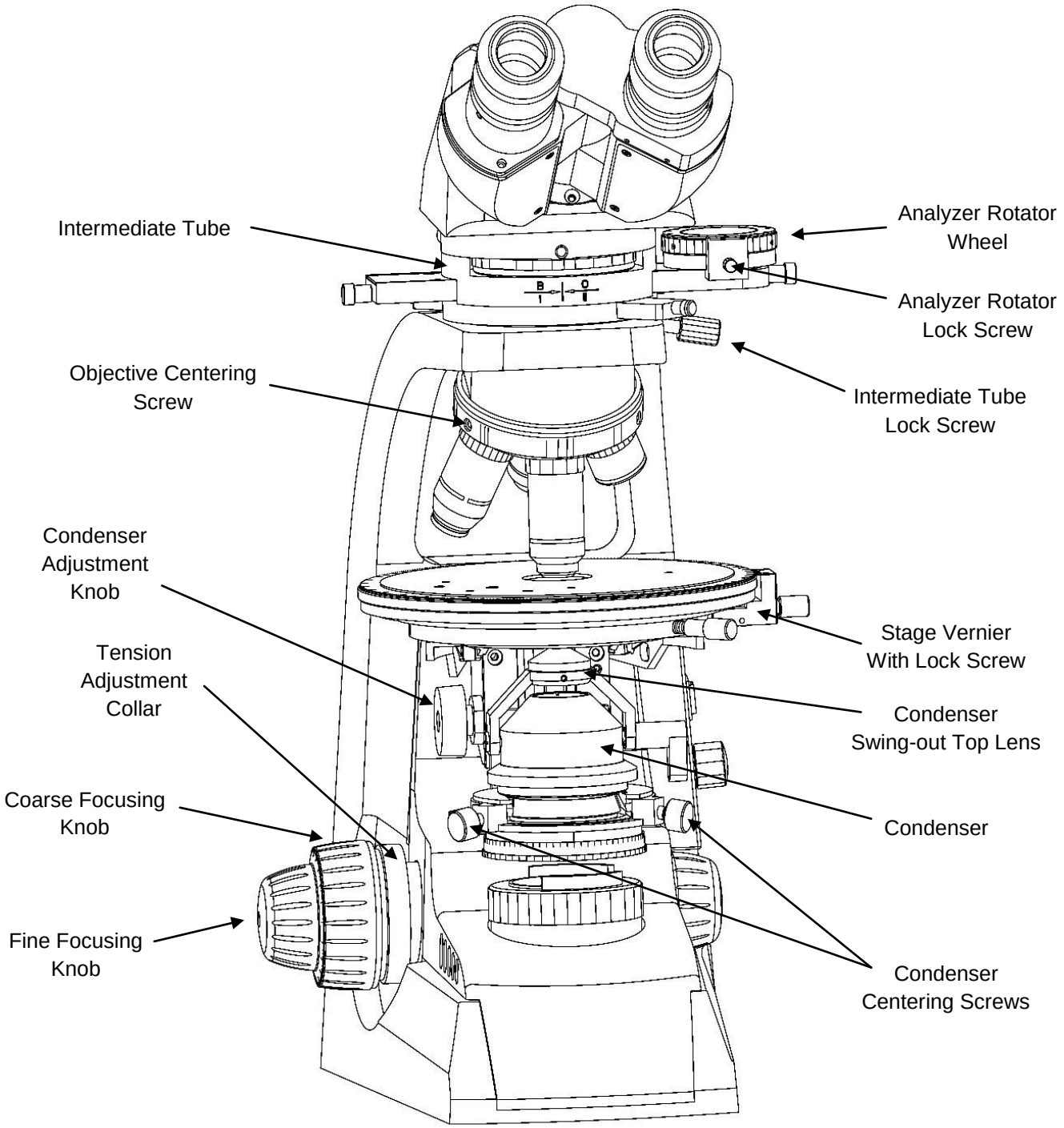
NOTE: Retain this clamp and screws for reuse in the event the microscope is reshipped.

Replace the Illuminator Housing, making certain it is pushed fully back onto the microscope frame.

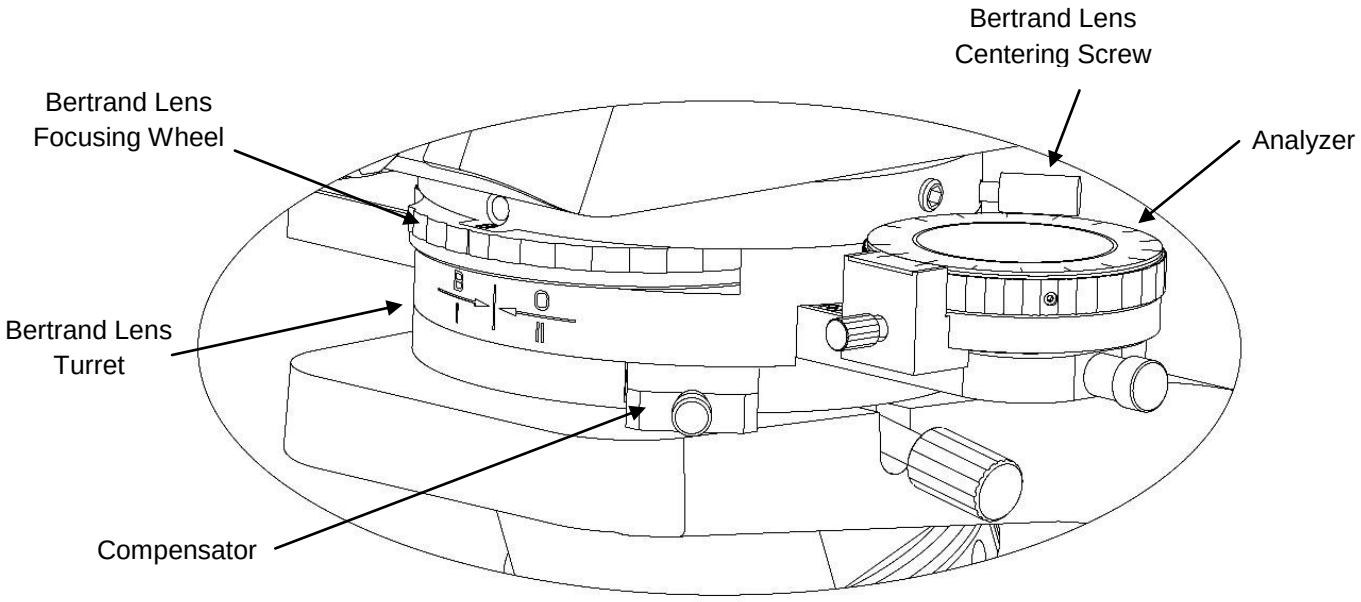
COMPONENTS DIAGRAM 1



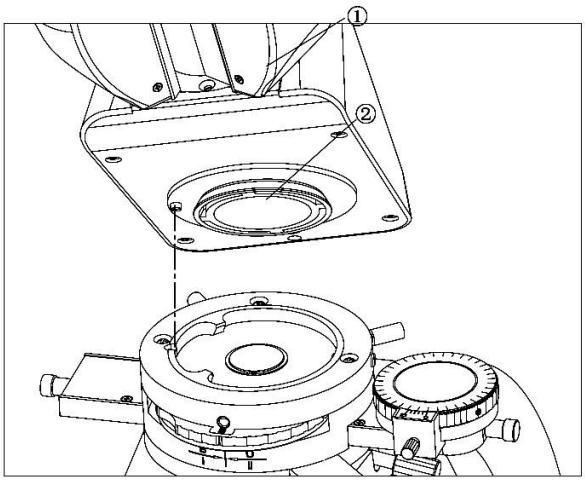
COMPONENTS DIAGRAM 2



COMPONENTS DIAGRAM 3



ASSEMBLY



Mounting The Viewing Head

Bertrand/Analyzer assembly is preinstalled onto the microscope frame. The viewing head is mounted to the Bertrand/Analyzer assembly. Note that the viewing head has a registration pin ①on its mounting flange. This pin must engage the corresponding slot ② on the top flange of the Bertrand/Analyzer assembly.

Secure the viewing head by tightening the hex type set screw on the right side of the Bertrand/Analyzer assembly.

Mounting The Condenser

The condenser incorporates a registration pin on its mounting flange. This pin engages a corresponding groove in the condenser mounting bracket.

ASSEMBLY *(continued)*

Eyepiece Installation

(Refer to photos on left)

LEFT: Turn the top of the Standard eyepiece (no reticle) clockwise until it stops and is in its lowest position.

Insert the eyepiece into the left eyepiece tube by aligning the notches on the eyepiece slightly to the left of the tabs on the eyepiece tube; rotate the eyepiece clockwise until the tabs engage the notches (it will stop rotating when engaged).

RIGHT: Turn the top of the Measuring eyepiece (with reticle) clockwise until it stops and is in its lowest position.

Before inserting the eyepiece, look through the eyepiece to determine the correct orientation of the scale (i.e., it should be horizontal and readable).

Insert the eyepiece into the right eyepiece tube by aligning the notches on the eyepiece slightly to the left of the tabs on the eyepiece tube; rotate the eyepiece clockwise until the tabs engage the notches (it will stop rotating when engaged).

NOTE: Only one orientation on the right Measuring eyepiece is correct: the one in which the numbered scale is horizontal when you look through the eyepiece.

COMPONENT SPECIFICATIONS

Optical system: Infinity tube length design
Objectives: Stress-free, infinity corrected, Plan Achromats

Objective Magnification	NA	Cover glass thickness(mm)	Working Distance (mm)	Color Band
4X	0.10	-	25	red
10X	0.25	0.17	6.7	yellow
20X	0.40	0.17	6.4	green
40X	0.65	0.17	0.17	light blue
60x (optional)	0.8	0.17	0.3	light blue

Component	Description
Viewing Head	Seidentopf binocular, or Trinocular depending on model ordered.
Eyepieces	WF10x/20mm field of view with -5 to + 5 diopter adjustment Two eyepieces are supplied: 10x Standard eyepiece (no reticle) 10x Measuring eyepiece with 0.1mm/division horizontal scale and vertical crosshair Also supplied: Plain 20mm field-stop eyepiece insert Optional: 10x eyepiece with crosshair reticle
Nosepiece	RMS Thread 4-position, one fixed and three individually centerable

COMPONENT SPECIFICATIONS *(continued)*

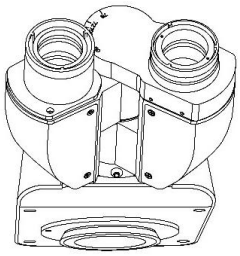
Component	Description
Intermediate Tube features	The Intermediate Tube is pre-installed on the mainframe It incorporates several advanced features: 1. A Bertrand Lens that is both focusable and centerable. It can be switched in or out of the optic path. The Bertrand lens permits observation of the back focal plane of the objectives for polarized light conoscopic observation. The centerablity feature allows it to be precisely aligned over back focal plane of the objective in use. 2. A Two-position Analyzer Slider (P2) that can be moved **in** or **out** of the optic path. When pulled **out**, the Rotatable Analyzer (P2) is in optic path. Push the slider **in** to move it out of the optic path. The rotatable Analyzer control ring is calibrated 0 – 360 degrees. Its built-in vernier scale allows discrimination to 0.1 degree and is lockable at any setting. 3. An Accessory Slot accepts standard DIN test and compensators plates
DIN accessory Sliders	Two sliders are supplied as standard equipment. 1. A three-position Test Plate. The center position is an open aperture. When pushed fully in, a λ first-order red tint plate is placed in the optic path. Pulling the slider fully out introduces a 1/4λ retarder. This plate is used to amplify very weak birefringence and the determination of x' and y' of the specimen. 2. The Quartz Wedge Compensation Plate is installed in the DIN accessory slot to enable an approximation of the retardation in the range of 1 -6 Lambda. Rotatable stage：The stage diameter is 160mm. It incorporates a 360 degree scale and increments of 0.1 degree can be determined by means of the built-in vernier scale. The stage's center of rotation is centerable on the optics axis. This feature assures the feature of the specimen in the center of the field of view remains there as stage is rotated. The stage is lockable at any orientation.
Focusing System	The knob on the right side of the microscope controls the Fine focus. On the left side is a Coaxial Coarse/Fine knob. The Fine Focus on the left side has graduations of 0.002mm. Maximum focusing travel: 24mm
Mechanical Stage (optional)	This mechanism facilitates holding and moving the specimen being observed. A spring-loaded arm secures the specimen slide and two control knobs facilitate x-y translation. The movement range is 30X40mm
Stage spring clips	Two finger-type spring clips are supplied to assist in securing specimens on the stage. These clips provide an alternative method of securing the specimen slide on the stage.

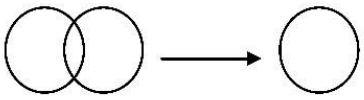
COMPONENT SPECIFICATIONS *(continued)*

Component	Description
Swing-out Condenser	A lever on the right side of the condenser moves the top lens of the condenser in or out of the optic path. When the top lens is in the path the NA is 0.9; when it is swung out, the NA is 0.3.
Polarizer (P1)	The Polarizer is located below the condenser lens. It is permanently attached to the bottom of the condenser carrier bracket. It has a 360 scale. When set to 0 (zero) degrees the orientation of polarization is East-to-West. There are detents at 0, 90, 180 and 270 degrees. A lock screw permits it to be secured in any orientation
Illuminator Housing	The slide-out illuminator housing is easily removable for access to the LED bulb and the shipping clamp (installed prior to shipping the microscope to protect the focus mechanism)
Illumination	Transmitted light observation Continuously variable intensity 5 watt LED lamp
Frame	Rigid cast aluminum
Fuse	1.0 Amp (T1 AL 250) – CAT# 149-30-37
Filter	45mm Clear Blue
Power Cord	110V with integral ground wire; 220V version optional

ADJUSTMENT & 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 to "_." 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.

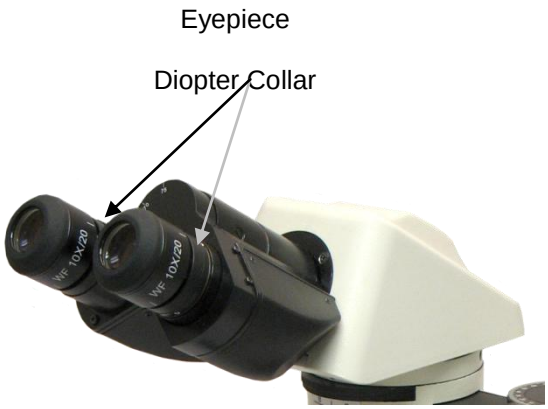




Adjusting Interpupillary Distance

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.



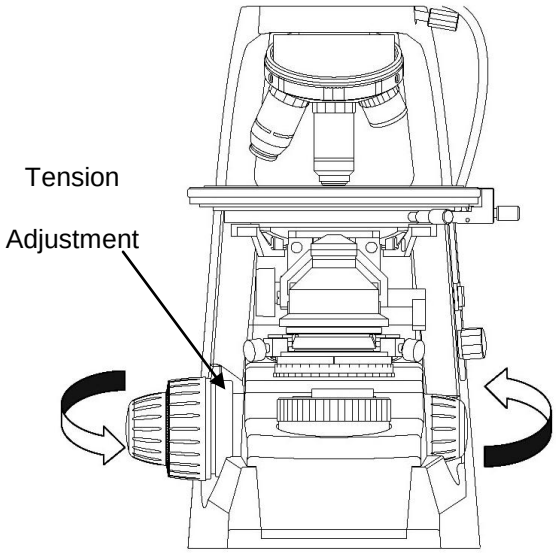
Focusing

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:

- Select the 10x objective
- Place a specimen on the stage and secure it with the stage clips
- Set both eyepiece diopter collars to "0".
- The right eyepiece contains the measuring reticle. Using your right eye only, rotate the eyepiece's diopter collar until the reticle is in sharp focus
- 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.
- Now look through the left eyepiece. Do not adjust the microscope's focusing knobs. Rotate the left eyepiece diopter collar to obtain the sharpest focus of the specimen.

CAUTION: ***DO NOT*** turn the focusing knobs in opposite directions – this will seriously damage the focusing mechanism.

ADJUSTMENT & OPERATION *(continued)*



Adjusting the Focusing Tension

In the event the microscope “drifts” out of focus or seems to require more effort to turn the focus knob than in the past, the focus tension may require adjustment. An adjustment collar is provided for this purpose.

NEVER turn the focusing knobs in opposite directions. This **WILL** seriously damage the focusing mechanism.

The tension adjustment collar is located on the left side of the microscope between the coarse focus knob and the vertical arm. Gripping the knurled surface of the collar, rotate clockwise to increase or counter-clockwise to reduce tension according to individual preference.

Adjusting the Condenser Aperture Diaphragm

The condenser contains an iris-type variable diaphragm, usually referred to as the microscope’s Aperture Diaphragm. The diameter of the aperture opening is controlled by moving the control lever that projects from the front of the condenser housing. The scale facilitates the setting of the diaphragm opening.

As the aperture is closed, the contrast and range of focus increase, however the brightness and resolution are simultaneously decreased. The optimal setting often depends on the characteristics of the specimen and the viewing conditions.

For general observing, we recommend the aperture diaphragm setting be adjusted to match the magnification of the objective in the optical path.

ADJUSTMENT & OPERATION *(continued)*

Centration

When using a polarizing light microscope it is desirable for the object under study to remain centered in the field of view as the stage is rotated.

The components of your microscope were adjusted for optimal centration prior to shipment. In the event the pre-adjustment is lost, it can be re-established following procedure below.

This is a two part procedure involving the STAGE and the OBJECTIVES:

STAGE

1. Place a specimen under the stage clips.
2. Remove analyzer from the optical path.
3. Focus on the specimen with 10x objective. One eyepiece must have a crosshair reticle.
4. Select an easily recognizable feature and move the slide so the feature is at the intersection of the eyepiece crosshair.
5. Loosen the stage-rotation clamp thumbscrew (knurled screw at the front of the stage).
6. Insert the two stage-centering tools.
7. Rotate the stage 180 degrees.
8. If the feature selected in Step 4. above shifts away from the center, simultaneously turn the two stage- centering screws so that the eyepiece intersection point of the crosshairs moves halfway towards the feature.

(**NOTE**: The reticle is not actually moving, the motion is the object moving beneath the objective. Thus the apparent motion of the reticle in relation to the feature is an illusion. However, it is common to refer to the reticle as “moving toward the feature”).

9. It may be necessary to repeat steps 7 and 8 several times. The factory specification for centration is approximately +/- 2 div. of the Measuring eyepiece horizontal scale.
10. Remove the two stage-centering tools when satisfied with the centration.
11. Tighten the stage-rotation clamp thumbscrew. The stage now rotates on the optic axis of the 10x objective. Do not move the specimen.

OBJECTIVES

NOTE: *The following procedure assumes the stage has been centered to rotate about the center of the 10x field of view. See previous section on page 14 for instruction.*

The design of the 12100 Polarizing Microscope allows the remaining objectives to now be precisely aligned with the stage’s new axis of rotation. This advanced feature assures the object under study remains in the center of the field of view as different magnifications are used.

1. Select the 20x objective.
2. Insert the two objective-centering screws into the access openings in the nosepiece above the objective.
3. Turn the objective-centering screws to move the crosshair intersection to the feature selected in step 4 of stage centration procedure (see previous section).
4. Rotate the stage 180 degrees.
5. If the feature shifts away from the center, simultaneously turn the two objective-centering screws so that the eyepiece intersection point of the crosshairs moves halfway towards the feature.
6. It may be necessary to repeat this steps several times. When the feature rotates in the center of the field of view, the 20x is properly centered.
7. Remove the two stage-centering tools and proceed to center the remaining objectives using the same procedure (1. – 6. above).

REPLACING THE FUSE

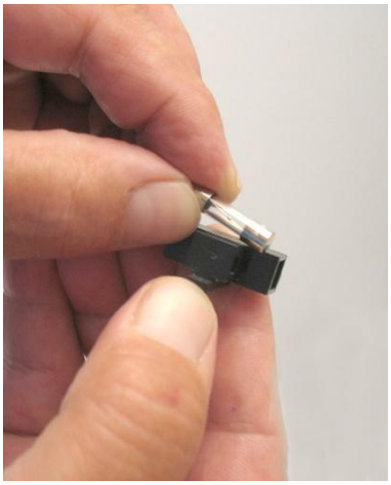
(Refer to photos on left and bottom of page)

FUSE: 1.0 Amp (T1 AL 250)
CAT#: 149-30-37

To replace the fuse, use a small flat head screwdriver and insert it into the notch on the bottom of the plug receptacle on the back of the microscope and pull it toward you to slide the fuse holder out.

Press the tab on the bottom of the fuse holder to release the fuse.

Insert a new fuse into the holder and slide the fuse holder back into the bottom of the plug receptacle making sure it is firmly in place.



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	Corrective Measure
Double images	Interpupillary distance is not correct	Readjust it
	Diopter adjustment is not correct	Readjust it
Dirt appears in the view field	Dirt on the specimen	Clean specimen
	Dirt on the surfaces of eyepieces	Clean eyepieces
Image is not clear	Dirt on the surface of objectives	Clean objectives
Image is not clear while focusing change	Diopter adjustment is not correct	Readjust diopter
	Focusing is not correct	Readjust it
The focusing knob does not turn smoothly	The focusing knob is too tight	Loosen it to a suitable position
Darkness at the periphery or uneven brightness of field of view	Revolving nosepiece not in click stop position	Revolve the nosepiece to click stop position by swinging the objective correctly into the optical path
Dirt or dust on the field of view	Dirt or dust on the lens - eyepiece, condenser, objective, collector lens or specimen	Clean the lens

TROUBLESHOOTING *(continued)*

IMAGE

Problem	Cause	Corrective Measure
Poor image quality	No cover glass attached to the slide	Attach a 0.17mm cover glass
	Cover glass is too thick or thin	Use a cover glass of the appropriate thickness (0.17mm)
	Slide maybe upside down	Turn slide over so the cover glass faces up
	Condenser aperture is closed or open too much	Open or close properly
	Condenser is positioned too low	Position the condenser slightly lower than the upper limit
Image moves while focusing	Revolving nosepiece is not in the click-stop position	Revolve the nosepiece to the click-stop position
Image tinged yellow	Lamp intensity is too low	Adjust the light intensity by rotating the intensity control dial and/or iris diaphragm
	Blue filter not used	Use daylight blue filter
Image is too bright	Lamp intensity is too high	Adjust the light intensity by rotating the intensity control dial and/or iris diaphragm
Insufficient brightness	Lamp intensity is too low	Adjust the light intensity by rotating the intensity control dial and/or iris diaphragm
	Aperture diaphragm closed too far	Open to the proper setting
	Condenser position too low	Position the condenser slightly lower than the upper limit

TROUBLESHOOTING *(continued)*

MECHANICAL

Problem	Cause	Corrective Measure
Image will not focus with high power objectives	Slide upside down	Turn the slide over so the cover glass faces up
	Cover glass is to thick	Use a 0.17mm cover glass
High power objective contacts slide when changed from low power objective	Slide upside down	Turn the slide over so the cover glass faces up
	Cover glass is to thick	Use a 0.17mm cover glass
	Diopter adjustment is not set properly	Readjust the diopter settings as outlined in section 4.3
Lamp does not light when switched on	No electrical power	Check power cord connection
	Lamp bulb burnt out	Replace bulb
	Fuse blown out	Replace fuse
Slippage of focus when using the coarse focusing knob	Tension adjustment is set too low	Increase the tension on the focusing knobs
Fine focus is ineffective	Tension adjustment is set too high	Loosen the tension on the focusing knobs

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.