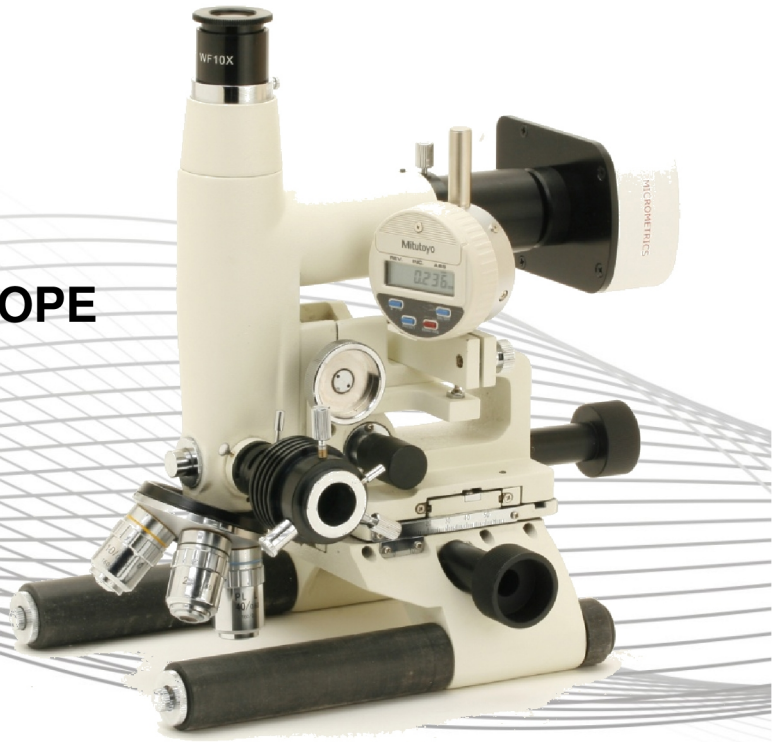
UNITRON®

RMM2

ROLLSCOPE MICROSCOPE

MANUAL



Distributed By:

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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.

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.  **LAMP REPLACEMENT -- CAUTION**: the glass envelope of the lamp may be extremely hot. DO NOT attempt to change the lamp before it is completely cooled or without wearing adequate skin protection.

5. All electrical connectors (power cord) should be inserted into an electrical surge protector to prevent damage due to voltage fluctuations.

6.  **FUSE REPLACEMENT** -- For safety when replacing the fuse (ONLY replace with the same size, type and rating of original fuse), be sure the main switch is in the off position, disconnect the power cord from outlet, and replace the fuse. Reconnect the power cord and turn unit on.

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. NOTE: Always plug the stereomicroscope 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 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, 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 such as a Q-tip or cotton swab, 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 servicing to maintain proper performance 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.

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.

The RMM2 Series Rollscopes are portable, compact, metallurgical camera-microscopes designed for measuring and photography of inaccessible or large objects that cannot be placed on the stage of an ordinary microscope.

RMM2 models can be furnished with optional easy-to-read dial gauges at eye level. In addition, the RMM models have the added feature of built-in graduated rack and pinion X-Y motion to traverse the object being studied. This feature is most desirable when using high-power objectives, as well as in choosing and composing areas for photography.

UNPACKING AND 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. Carefully remove the microscope from the shipping carton and place the microscope on a flat, vibration-free surface.

Unless you have specified otherwise, the RMM2 Rollscope is furnished with the following:

EYEPIECE: 10x Widefield high eyepoint

MICROMETER RETICLE: Installed in eyepiece; engraved scale; 10mm with 0.1mm divisions or 0.4 inch with 0.01 inch divisions depending upon model selected

ILLUMINATOR: Vertical illuminator with condenser system, diaphragm, filter holder and two knurled screws. Two filters (yellow and green) are included to enhance contrast. The knurled centering screws are used to adjust the position of the bulb for optimum illumination. Also included are two types of bulb socket and cord assemblies; one is used for AC operation with the transformer and the other is for DC operation with batteries.

OBJECTIVES: Plan achromat 5x, 10x, 20x & 50x

ILLUMINATION: 6volt 20watt halogen with variable transformer for AC operation and 6volt 20watt halogen with four AA batteries in the roller feet for portable DC operation

BEAM SPLITTER: A built-in beam splitter directs approximately 50% image intensity to the visual eyepiece and approximately 50% to the photographic path. This assures ample light intensity for visual observations and sufficient light to accessory camera attachments for short shutter exposure speeds. Images may be seen in the visual eyepiece at the same time that photographs are being made.

PLANE GLASS REFLECTOR: No adjustment is necessary to provide ideal conditions for vertical illumination. The plane glass reflector has been factory installed, adjusted and inspected and is correctly positioned to assure even full-field illumination. No positioning change is required before use unless the reflector has been disturbed in transit, assembly or usage.

DIAL DEPTH GAUGE (OPTIONAL): A depth measuring attachment with graduations of either 0.0001 inch or 0.001mm is available in analog or digital formats.

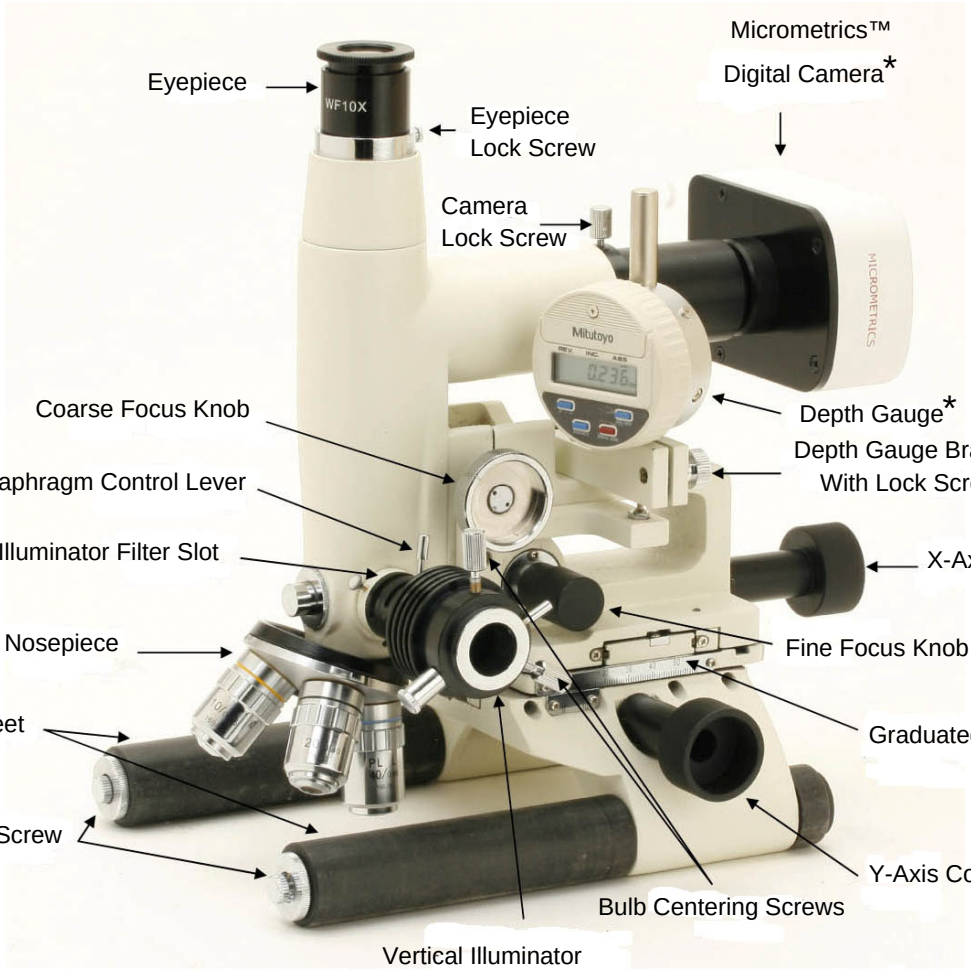
STAND: Monocular body with rack and pinion coarse focus and micrometer screw fine focus, precentered coated plane glass reflector, rack and pinion controls body movement, built-in beam splitter, camera port, and roller feet

TRANSFORMER: Variable intensity, 110-120 volt AC

BATTERIES: Four AA (1.5volts)

COMPONENTS DIAGRAM

*Optional Accessory



Not shown: Bulb cord and socket assembly

ASSEMBLY

1. Remove the dust plug from the top of the monocular body and insert the WF10x eyepiece. A knurled lock screw holds the eyepiece firmly in position.

2. Remove the dust plug on the side of the monocular body and insert the vertical illuminator assembly completely into the aperture. A knurled lock screw will hold the vertical illuminator firmly in a position allowing easy access to the field diaphragm control lever and filter slot.

3. Thread the objectives into the revolving nosepiece, taking care not to touch the front lens surfaces.

OPERATION

Operation With Transformer

Illumination should be obtained with the transformer (110-120v AC) except when an electrical outlet is not available or convenient. The transformer provides maximum illumination intensity. The bulb cord and assembly with the longer extension cord should be used when operating the illuminator with the transformer. The transformer yields variable intensity illumination. For most applications a low intensity setting will provide ample light and give longer bulb life. In general, use higher illumination intensities to provide short exposure times during photography or for examining poorly reflecting materials. Always turn the transformer “off” when the microscope is not in use.

Operation With Batteries

The illuminator may be operated by batteries for completely portable operation.

NOTE: Insert the metal battery spacer into each foot before inserting the batteries.

Insert two AA batteries into each of the two roller feet. To install the batteries, unscrew the battery caps from the end of the roller feet. Insert two batteries and a metal battery spacer in one foot with all negative terminals facing the contact screw. Then insert two batteries and metal battery spacer in the other foot ensuring all positive terminals are facing the contact screw. Replace the battery caps into the ends of the roller feet and tighten the screws to make good electrical contact.

The pins on the cord assembly insert into sockets located at the ends of the roll feet. There is no on/off switch for battery operation. Therefore, disconnect one of the pin plugs from a roll foot when the microscope is not in use. To avoid possible damage to the microscope roll feet because of battery deterioration, remove the batteries from the roll feet before storing the microscope or when continuous battery operation is not anticipated.

Bulb Centration

The high intensity illuminator has been designed to provide optimum lighting for highest resolution. To achieve this, a preliminary alignment of the bulb is required. The following steps are to be used to achieve the correct centration.

1. Place a highly reflective specimen under the 10x objective. Open the field diaphragm completely and turn on the illuminator. Remove the eyepiece from the microscope eyepiece tube and focus.

   NOTE: the filament image will change position when any of the following adjustments are made:

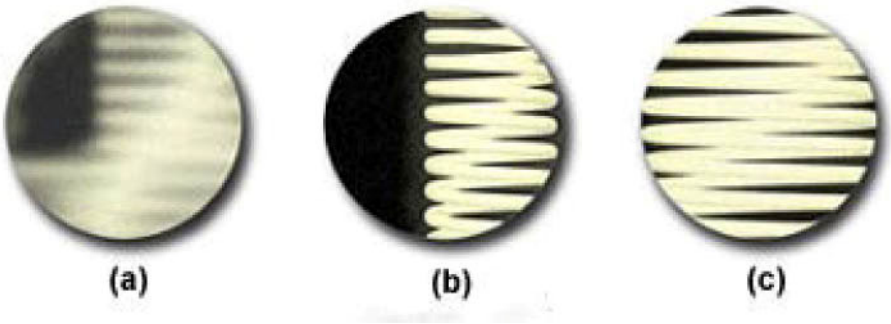
   a) Bulb socket is moved up or down in the centering adjustment sleeve of the lamp house.

   b) Bulb socket is rotated in the same sleeve.

   c) Bulb centering screws are tightened or loosened.

The bulb position is optimum when the filament image appears as shown in Figure C below. Figures A and B illustrate an off centered filament.

Lamp Filament Alignment



2. Referring to the figure above, note that there are three conditions to be met:

   a) The full square area of the filament should be seen. This is obtained by rotating the bulb socket in the sleeve of the centering adjustment sleeve of the lamp house.

   b) The filament image should be centered in the up-down direction. This adjustment is obtained by moving the bulb socket up or down in the same sleeve. Tighten the bulb socket screw to hold the socket securely in place. Then insert the eyepiece into the eyetube.

   c) The filament image should be centered in the correct direction. Use the two bulb centering screws to center the filament.

The bulb will be adjusted correctly by following the above instructions. The field of view will be evenly illuminated with no distortion of the filament lines to impair the image.

Using the Field Diaphragm

While observing a specimen that has been focused, slowly open and close the field diaphragm using the lever on the illuminator assembly. The diaphragm is used to eliminate glare by restricting the specimen illumination to the area actually being observed. Therefore, the diaphragm should be opened only until the full field of view is seen completely illuminated and no more. Opening the diaphragm more may cause glare that will produce “washed-out” images.

Visual Observation

The top eye lens of the WF 10x eyepiece has a threaded focusable mount. Before focusing the specimen, hold the lower part of the eyepiece with one hand and rotate the upper threaded focusable eye lens with the other hand until the image of the eyepiece reticle is in focus. Rotate the coarse focus knob to obtain approximate focus of the specimen using the 5x objective. Then rotate the fine focus knob until the specimen is in sharp focus. A slight adjustment with the fine focus knob may be necessary when changing objective power.

Changing Objective Magnifications

Total magnification is the product of the eyepiece power multiplied by the power of the objective. The objectives are parfocal. Therefore, once an image is in sharp focus, only a slight adjustment of the fine focus control will be needed when rotating the nosepiece from one objective power to another.

Filters

Two filters, green and yellow, are supplied in metal mounts with handles. These fit into the illuminator filter slot. The filters are used to create contrast in the specimen, minimize reflections and produce images that are most satisfactory to the observer. The achromatic objectives are designed to give the highest degree of color correction and maximum image quality when used with green light, the color to which the human eye is most sensitive. Therefore, the green filter is recommended for most visual observations.

Measuring Reticle

The crossline reticle is already installed into the eyepiece. The reticle, when magnified and seen through the microscope, is approximately equal to the ruled value of the reticle divided by the magnification of the objective.

Making Depth Measurements

The optional mechanical metric dial gauge is calibrated in units of 0.001mm; the inch gauge in units of 0.0001". Optional digital gauges are available with various accuracies.

First adjust the fine focusing control so that the mechanism is approximately midway between its limit of travel. Next attach the dial gauge to the top of the arm which is directly in back of the coarse focus knob. Loosen the lock-screw on the depth gauge bracket; insert the dial gauge in the hold furthest from the microscope body making sure the feeler pin is just touching the "L" shape bracket so that any movement of the fine focus knob will move the dial gauge needle. Tighten the dial gauge lock-screw. To make a depth reading using an **analog** gauge, first focus on one specimen level and turn the rotatable face of the gauge to the "0" position. hen, using the fine focus only (leaving the coarse focus setting unchanged), refocus on the second specimen level. The gauge reading gives a direct measurement of the difference in height between the two levels. The highest measuring accuracy will be obtained by using the 50x objective since this objective has the smallest depth focus.

NOTE: This procedure is not necessary with the ***digital*** depth gauge

X-Y Motion

The RMM2 Series is equipped with a built-in mechanical bench which slides the microscope body in X-Y directions by rack and pinion controls (30mm x 50mm). These motions are operated by two large knobs; one knob is located on the back of the microscope and the other on its side.

Each motion has its own graduated positioning scale which reads to 0.01mm with verniers.

PHOTOMICROGRAPHY

The RMM2 Series Rollscope Microscope contains a built-in camera mechanism consisting of a beam splitter. The beam splitter directs images to both the visual eyepiece and accessory camera attachments. A variety of digital cameras are available for the RMM2. An adapter, not included, is required to ensure the camera fits properly to the microscope. The adapter must be specific for your brand and model digital camera. The adapter gives a 1 to 1 magnification so camera's image is the same as the image you see visually through the eyepiece. Follow the camera's instructions to obtain a picture.

ADJUSTMENTS AND CARE OF THE MICROSCOPE

Adjusting the Coarse Focus Tension

The tension of the coarse focusing controls have been factory adjusted. To change the tension, grasp both coarse focusing knobs, one in each hand, turn the knobs in opposing directions. Turning the knobs in one direction increases the tension; turning the knobs in opposite directions decreases the tension.

Intensity Switch

The life of the halogen filament bulb depends upon the intensity of the illumination being used. To prolong the life of the bulb, use at low intensity unless a higher intensity is required.

Bulb Replacement

Unplug the microscope from its electrical source. Loosen the locking screw that connects the socket to the illuminator. Gently, but firmly, pull out the old bulb. Insert a new bulb into the socket using caution not to touch the glass envelope or bend the pins on the bulb. Follow the preceding instructions for bulb alignment instructions.

Care of Optics

Objectives and eyepieces should always be scrupulously clean. When not in use, the microscope should be covered with the dust cover. The eyepiece should always be in the microscope to eliminate the possibility of dirt or dust from entering the vertical tube and falling onto the back lenses of the objectives.

Should the optics require cleaning, only use the finest grade of soft camera lens tissue. If foreign matter or stubborn dirt has adhered to a lens surface, a small amount of xylene, applied sparingly, can be applied with lens tissue. An alternate recommendation is “coated lens cleaner”.

Under no circumstance should alcohol, benzene or similar strong solvents be used that would damage the lens coating and cement.

Spots which are superimposed on the field of view and which rotate when the eyepiece is turned are caused by dust specks on the eyepiece lenses or reticle. If the image appears cloudy or hazy, check the front lens of the objective and the front lens of the eyepiece for fingerprints or accumulation of foreign material. If dust accumulates on the back lens of an objective, remove the objective and use a small hand syringe or aspirator to dislodge the dust.

Under no circumstances should the eyepiece or objectives be disassembled.

Spots visible in the field of view which rotate when the complete illuminator-condenser unit is turned are caused by dust on the condensed lenses. If required, the lenses can be cleaned using a soft cotton swab around which a lens tissue has been wrapped.

SPECIFICATIONS

Optical System	Unitron® plan achromat 5x, 10x, 20x and 50x objectives are standard. Optional 40x, 60x and 80x objectives are available
Observation Method	Brightfield
Focusing	Rack and Pinion coarse focus 60mm vertical travel with precise micrometer screw fine focus mechanism
Eyepiece	eyepiece with built-in diopter adjuster, 22mm field of view and 10mm/100 division crossline reticle
Nosepiece	Quadruple revolving nosepiece
X – Y Travel	Rack and pinion controls for graduated movement. Stand will move 40mm (X) and 50mm (Y)
Illuminator	Variable 6 volt 20 watt Koehler type vertical halogen illuminator with field diaphragm for both AC and DC operation
Filters	Green and yellow filters are standard. A filter slot is built-into the illuminator housing
Dimensions & Weight	Physical weight & dimensions: 9 lbs.; 9” x 11” x 10” (WDH): Shipping weight and dimensions: 28 lbs.; 21" x 14" x 16"
Warranty	5 year limited warranty, instruction manual and dust cover are supplied with each complete unit
Accessories	Micrometrics® CCD and CMOS digital c-mount cameras with measurement and materials software Digital still cameras, analog color and black and white cameras Video c-mount adapters: 0.5x, 0.67x, and 1x magnifications Reticles: Grain size, crossline, grid, metric, inch, austentite and custom patterns are available Stage micrometers in inch or metric rulings with N.I.S.T. traceability are available

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 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. 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.