NATIONAL

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INSTRUCTIONS FOR

DC5-169 Series

DIGITAL COMPOUND BIOLOGICAL MICROSCOPE

INTRODUCTION

Thank you for your purchase of a National microscope. It is a well built, precision instrument carefully checked to assure that it reaches you in good condition. It is designed for ease of operation and years of carefree use. The information in this manual probably far exceeds what you will need to know in order to operate and maintain your microscope. However, is provided to answer questions which might arise, and to help you avoid any maintenance expense that may be unnecessary.

Your new compound microscope is a high performance microscope with high quality achromatic objective lenses that provide good resolution and optical centering. The microscope is designed with a built-in ball bearing mechanical stage providing a travel range of 75mm x 50mm in the X and Y direction with graduation reading up to 0.1mm for accurate positioning of specimen. Also included is a ball bearing quadruple nosepiece, precision coaxial focusing mechanism, rack and pinion mounted N.A. 1.25 Abbe condenser and built-in 3 watt LED variable light source. **Retain the styrofoam container in case the microscope must be transported or returned to factory for any reason.**

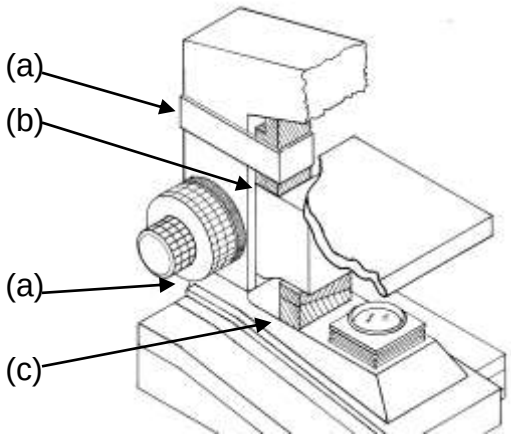
UNPACKING

The microscope and accessories have been carefully packed to assure they reach you in the best possible condition. Do not discard the packing container or materials until all components are accounted for. Save the packing container in case the microscope needs transporting to another location or shipped for repairs. Components are packed within the container as indicated below.

A. Microscope body with 1.25 N.A. Abbe condenser and iris diaphragm
B. Two WF10x eyepieces
C. Two rubber eyecups
D. Four objective lenses: DIN 4x, 10x, 40xR, 100xR oil immersion
E. Specimen holder for mechanical stage
F. 12VDC switching power supply, operates on 100v-240v, 50H/60H
G. Power cord
H. CD Motic Images software
I. Calibration slide
J. USB cable (for connecting to computer)
K. Dustcover

1. Lay container (A) flat and carefully remove microscope head and stand.

NOTICE To protect focus mechanism during shipment, two black plastic wedges (b) and one black plastic block (c) are inserted at strategic points as indicated. These plastic parts **MUST** be removed prior to operating microscope. Failure to do so will result in damage to focusing mechanism and will void your warranty.



1. Remove two black Velcro straps (a).
2. Remove wedges (b) by pulling apart the two parts of wedge in opposite directions.
3. Lower stage by rotating coarse focus knob, on side of microscope illustrated, in counter-clockwise direction
4. Remove blocks (c) from stand.
5. These components should be retained with styrofoam container

2. Carefully remove from the stand all tape and packing material used to protect microscope components during shipment.

3. Un-wrap the components, making certain that lens surfaces do not come in contact with dust, dirt, fingerprints. Damage to optical surfaces can result from such contaminants, and reduce image quality.

OPERATION

1. Illumination.

A. Before operating microscope, **adjust intensity control located on side of base to the minimum position.** This should be done prior to each time light is turned on or off. This will extend bulb life.

B. Insert power plug into 12VDC switching power converter, then insert plug on other end of converter into power jack on back of microscope base. Note that the 12VDC converter will operate on either 120v or 240v current, 50 hertz or 60 hertz, eliminating the need for any other transformer.

C. Push rocker switch at rear of base to ON position.

D. Rotate intensity dial on illuminator base until image is illuminated.

E. Adjust intensity of light to match requirements of objective and specimen slide.

F. Filter: Swing out filter holder has built in frosted filter – must be in place when using the 4x and 10x objectives.

G. In case of equipment malfunction, see “Trouble Shooting” procedures.

2. Adjustment of viewing head:

   1. The three-position sliding rod allows user to easily direct microscope image into desired path.

      A. Rod pushed completely into head – 100% of microscope image is directed into binocular eyepieces.

      B. Rod at mid-position (pull or push rod until you feel a gentle click stop) – 100% of microscope image is directed to built-in camera.

      C. Rod pulled to fully extended position – 30% of image is directed to binocular eyepieces and 70% directed to built-in camera.

3. Position sliding rod completely into head to operate microscope.

   Interpupillary adjustment of viewing head

   A. Look through microscope and adjust distance between the two eyepiece tubes by grasping the sliding mounts to left and right of eyepieces and sliding together or apart.

   B. When a full field of view is observed through both tubes, and images blend into one, interpupillary distance is corrected for your eyes. Check the interpupillary scale and note index reading for future reference, in case other users will be changing this adjustment from time to time.

   C. Adjust the diopter scales, located on each eyepiece tube, to the same numerical value as indicated on the interpupillary scale. This must be done in order to maintain parfocality of objective lenses. If interpupillary distance is changed, adjust eyepiece diopters accordingly.

4. Focusing the microscope.

   A. Position the 4x objective lens into the optical path, making sure that lens is properly indexed in its click-stop position.

B. Place standard specimen slide (cover slip up) on top of stage surface.Swing moveable finger on slide holder outward. Place specimen slide against fixed side of slide holder. Slowly release moveable finger until it makes contact with specimen slide.

C. Rotate coarse focusing controls until specimen comes into focus.

D. Adjust fine focus controls until specimen is in sharp focus.

E. Adjust diopter for difference in eyesight.

   a. Using right eye, peer into the right eyepiece tube. Adjust sharpness of image by utilizing fine focus controls.

   b. Using left eye, peer into the left eyepiece tube. Adjust sharpness of image by turning diopter adjustment located on left eyepiece tube.

F. Adjusting the aperture (opening) of iris diaphragm.

Iris diaphragm should not be used to control the brightness of illumination, use light intensity control knob to adjust light level. Iris diaphragms are designed to help achieve high resolution of specimen and provide contrast in the image. Smaller apertures will deliver higher contrast to image. However, closing aperture too much will reduce resolution. Experimentation is the best method of determining the correct opening of diaphragm. Some suggested openings for iris diaphragm are:

OBJECTIVE	DIAPHRAGM OPENING	
4x	1/8 open	(MIN)
10x	1/8 to 1/4 open	
40x	1/4 to 1/2 open	
100x	1/2 to 3/4 open	(MAX)

G. Changing magnification.

Objective Specifi

Objective	N.A.	Color Code Ring	Field of View	Magnification
Din 4X	0.10	Red	4.5mm	40X
Din 10X	0.25	Yellow	1.8mm	100X
Din 40X	0.65	Blue	0.45mm	400X
Din 100X	1.25	White	0.18mm	1000X

   a. Rotate revolving nosepiece to position 10x objective into optical path.

   b. This microscope has been parfocalized, which allows changes from one objective to another while requiring only a slight adjustment of the fine focus controls.

   c. When changing to the 40x and 100x objective lens, care must be exercised in order to prevent damaging the front lens element and specimen slide.

   d. In order to obtain maximum resolution of the 100x oil immersion lens, it is necessary to apply immersion oil between the coverglass of slide and front lens of the objective.

      1) **Use of a very small amount of immersion oil is required. Only the very tip of the lens should ever come in contact with the immersion oil. Oil should not come in contact with the white sealant ring on the objective. Excess use of immersion oil will ruin your objective and void your warranty.**

      2) All air bubbles must be removed from between lens and slide by rotating nosepiece back and forth.

H. When finished viewing, all parts that come in contact with oil must be cleaned. Failure to do so could permanently damage the 100x oil immersion objective lens. Use of Windex to clean immersion oil off lens surfaces is recommended.

I. Coarse focus tension adjustment.

a. Tension adjustment knob is located between stand and coarse focus knob of microscope, on the right side.

b. To tighten tension of coarse focus knobs, turn control in a counter-clockwise direction. It is advisable to leave controls as loose as possible, tightening only enough to keep stage from drifting down and out of focus. To loosen tension, turn control in clockwise direction.

A. ELECTRICAL MAINTENANCE

WARNING: FOR YOUR SAFETY, TURN SWITCH OFF AND REMOVE PLUG FROM POWER SOURCE OUTLET BEFORE MAINTAINING YOUR MICROSCOPE.

1. Replacement of lamp.
   a. Carefully lay instrument on its side, taking care to avoid damage to the specimen slide holder located on top of mechanical stage.
   b. Remove 5ea cross head screws, holding base plate.
   c. Carefully lay the base plate flat on the table.
   d. Disconnect the LED cable from the plug socket on the LED circuit card.

   e. Your microscope requires a 3W LED bulb assembly – Part # 800-500
   f. The LED bulb is located within the lamp housing. It is held in place with screw on holder. Simply unscrew the ring holder to remove the bulb assembly.

   g. Assemble the unit in the reverse order.

MOTIC IMAGES SOFTWARE – PC Full Help Menu

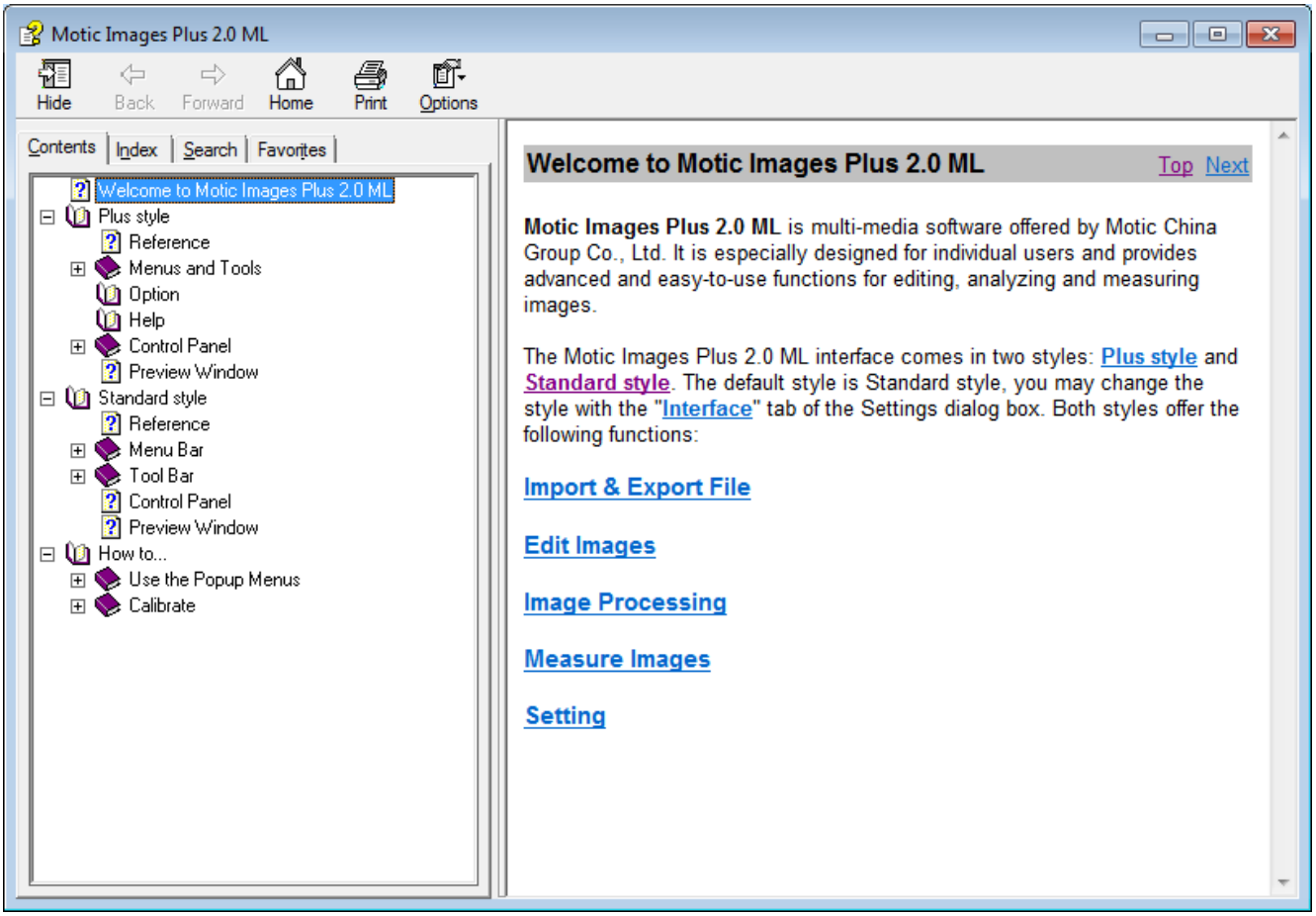
The full software manual for Motic Images is accessible within the software's main page.

To begin, open the Motic Images Software.

At the top of main screen find the menu tab labeled Help:

Click on Help and then select the help option:

This will open the Motic Images help file contents, containing the full help menu:

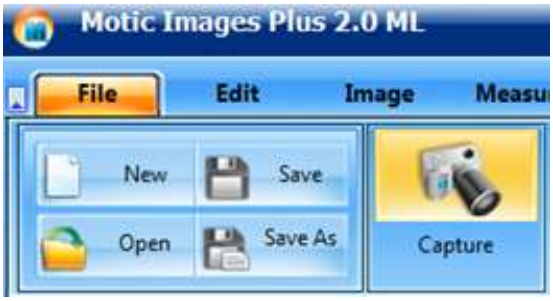


Motic Live Imaging Module – PC Full Help Menu

The full Live Imaging Module manual is accessible within the live Imaging main page.

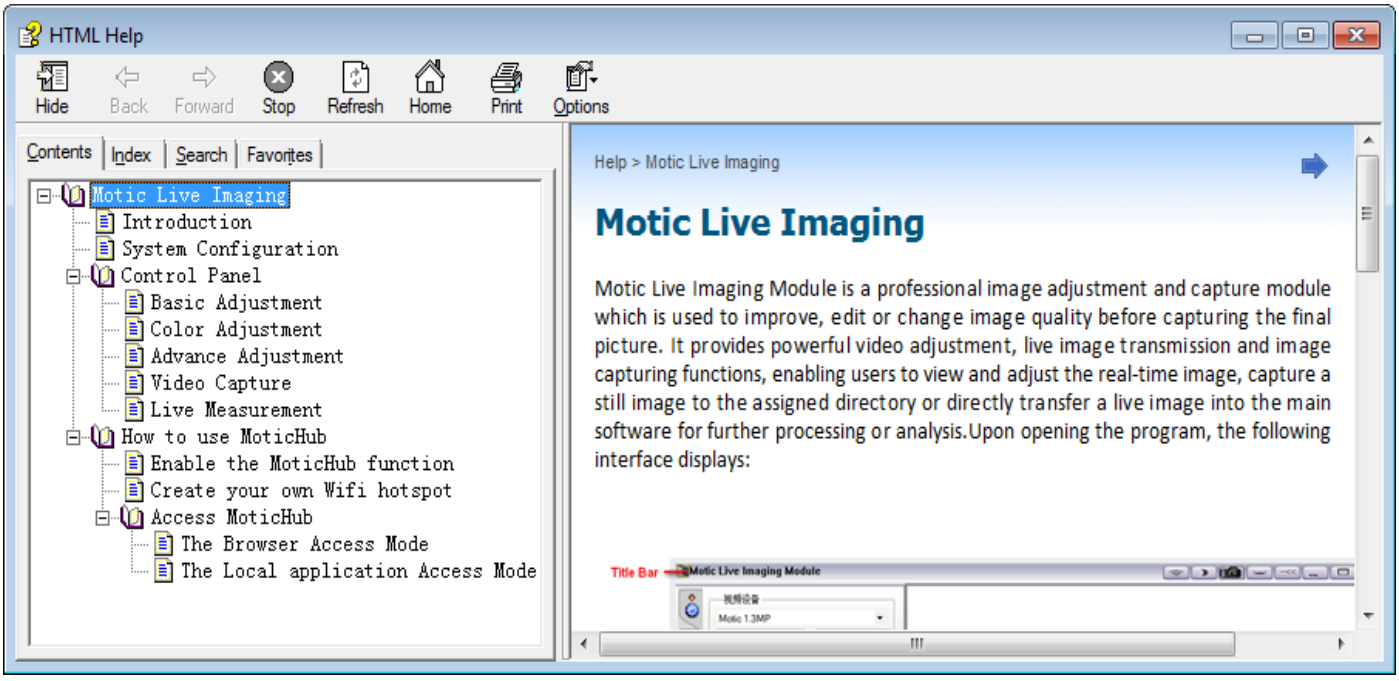
To begin, open the Motic Images Software.

At the top of main screen find the menu tab labeled File and click on Capture:



Once the Motic Live Imaging Module has opened, click on Help:

This will open the Motic Live Imaging Module help file, containing the full help menu:

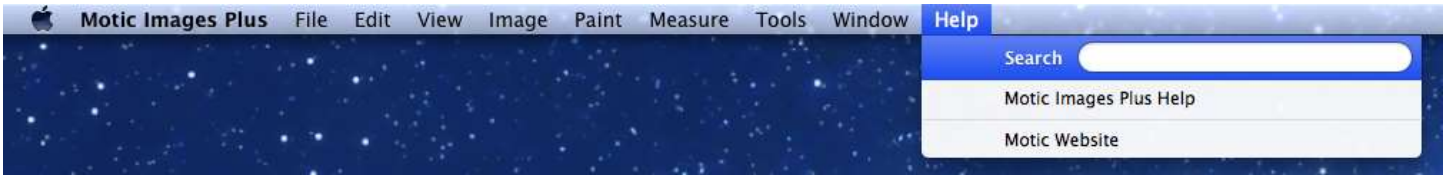


MOTIC IMAGES SOFTWARE – MAC Full Help Menu

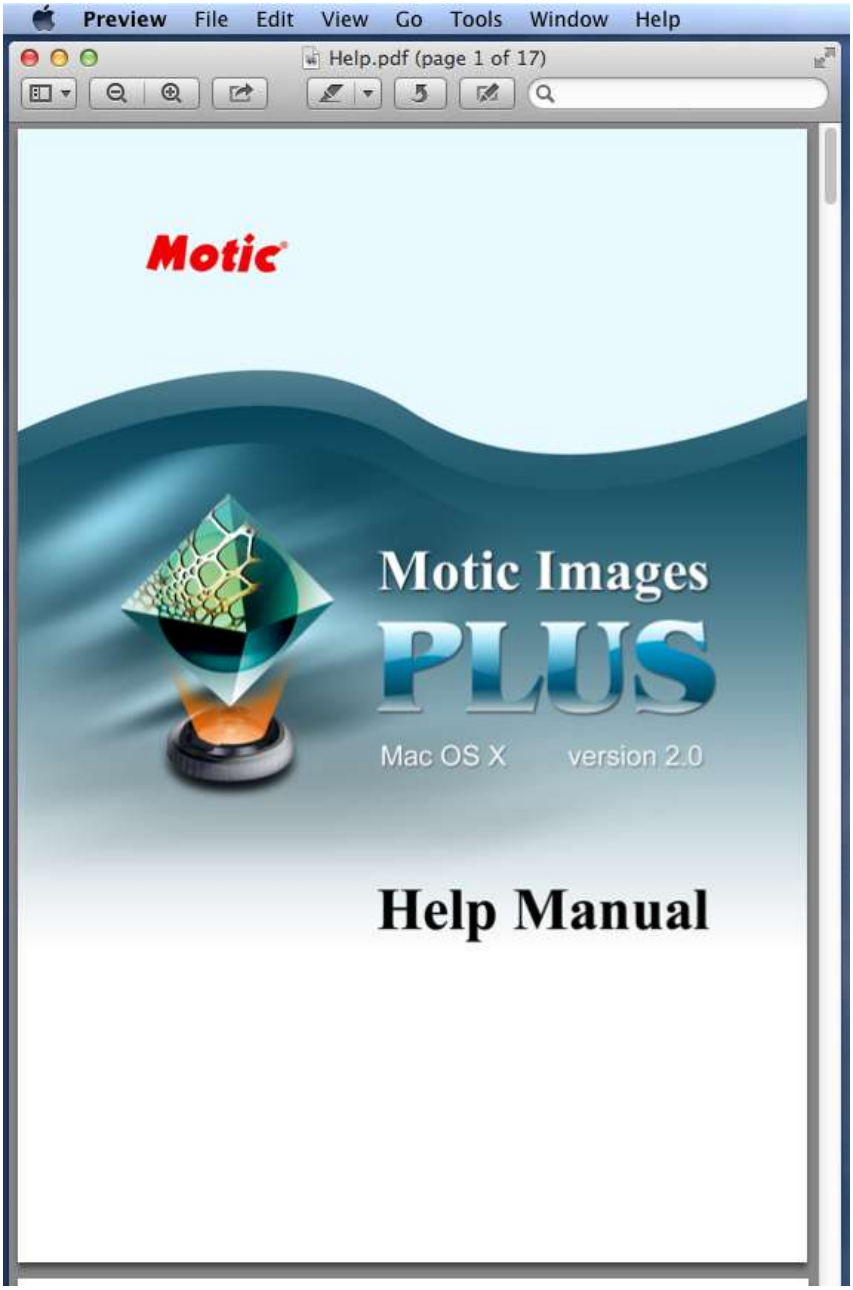
The full software manual for Motic Images is accessible within the software's main page.

To begin, open the Motic Images Software.

At the top of main screen find the menu tab labeled Motic Images Plus Help:



This will open the Motic Images Help Manual:



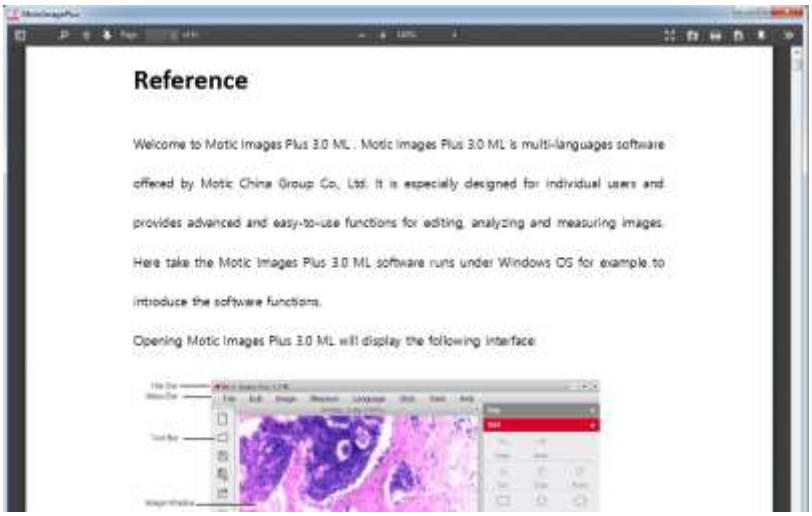
MOTIC IMAGES 3.0 SOFTWARE

The Motic Images 3.0 software, like the Motic Images 2.0 software will allow you to view, capture, annotate and save your images. For further assistance in using the Motic Images 3.0 software please refer to the Motic Help files. These files will help explain the functions of software. There are help files for both the main Motic Images software window, as well as the Motic Images Live Imaging window.

MOTIC IMAGES 3.0 HELP GUIDE

To access the Motic Images 3.0 help menu, click on Help, located at the top of the Motic Images software screen.

Once the Help window open you will find the help guide within.



Motic Live Imaging Module Help

To access the Motic Images Live Imaging help menu, click on Help located at the top left hand side of the screen.

Once the Help window open you will find the help guide within.

MODEL 926 PHASE CONTRAST SET

INTRODUCTION

Phase contrast microscopy provides a means to observe transparent specimens, which are very difficult to observe under bright field illumination. Another advantage of phase microscopy is that it allows the user to observe living

specimens that are usually destroyed by staining or fixing reagents. The phase turret control has five positions; one for standard brightfield illumination and four different annuli positions for phase contrast illumination.

COMPONENTS

Plan 10X Ph/0.25 phase din objective.
Plan 20X Ph/0.40 phase din objective.
Plan 40X Ph/0.65 phase din objective.
Plan 100X Ph/1.25 phase din objective.
Five position 1.25NA Phase turret condenser.
Centering telescoping eyepiece
Green filter, 45mm diameter
Blue filter, 45mm diameter

ASSEMBLY

A. Install phase turret condenser

1. Rotate coarse focusing knob to move microscope state platform to its highest position.
2. Loosen knurled locking screw located on the side of microscope condenser mounting ring.
3. Insert the phase turret condenser sleeve into condenser mounting ring.
4. Tighten the knurled locking screw to secure phase turret condenser.

B. Install filter

1. Insert filter into filter recess located at top of illuminator lighthouse condenser lens.
   a. Blue filter is utilized for bright field observation.
   b. Green filter is utilized for phase observation.

C. Install objectives

1. Rotate coarse focusing knob to move microscope stage platform to its highest position.
2. Remove objective dust caps from the revolving nosepiece.
3. Screw objective lenses into nosepiece, making certain to mount them in consecutive order, 10x, 20x, 40x, and 100x.

OPERATION

A. Rotate condenser focusing control knob to move phase turret condenser to the top of its travel.

B. Rotate phase turret annuli control until the letters BF (brightfield) can be seen at front of phase turret condenser assembly. BF opening must click into locked position to insure proper centering.

C. Rotate revolving nosepiece to position 10X Ph/0.25 phase objective into optical path.

D. Place a standard specimen slide (cover slip up) on top of stage surface.

E. Adjust microscope focus controls until specimen is in sharp focus.

F. Remove specimen slide from stage.

G. Remove eyepiece from eyepiece tube, if binocular version remove one of the two eyepieces.

H. Install centering telescope eyepiece into eyepiece tube.

I. Loosen knurled locking screw located on side of centering telescope eyepiece.

J. Hold knurled locking screw with one hand, grasp very top of centering telescope eyepiece with other hand, peer through eyepiece while sliding sleeve up until the phase ring in the objective is in focus (sleeve is approximately 1” up from knurled locking screw).

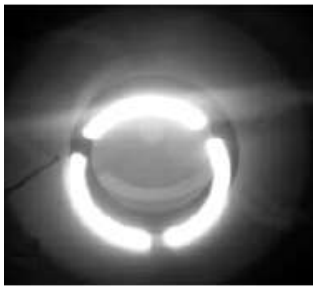
K. Tighten eyepiece knurled locking screw.

L. Rotate the phase turret annuli control until the number 10 can be seen at front of phase turret condenser assembly. Annuli must click into position to assure proper centering.

M. Using condenser focusing control knob, focus the bright annuli ring located in phase turret annulus condenser.

N. Observe the two rings in the field of view.

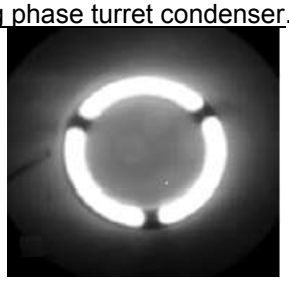
1. The dark larger annulus ring is located in the objective lens
2. The bright smaller annulus is located in the phase turret condenser.



O. Centering of the annuli:

P. Depress the two knurled head centering screws that extend out from each side of phase turret condenser assembly until they engage the hex socket screws of annuli centering mechanism.

Q. While keeping the two centering screws depressed, look through the centering telescope and observe rings located in objective and phase turret condenser. Rotate the centering screws in or out, moving image of the smaller bright annulus ring annuli located in phase turret condenser until it is centered to the larger dark annulus located in the objective. Both rings must be concentric to each other to achieve maximum performance. <u>Make sure that the knurled head centering screws are disengaged from the hex socket screws of annuli centering mechanism and in the “out” position before rotating phase turret condenser</u>.



R. Repeat above steps with the 20x, 40x and 100x phase objectives, making sure to position the corresponding annuli of phase turret condenser to matching objective indexed in optical path. (Plan 10Ph/0.25 matched to the number 10 on rotating phase turret condenser.)

S. It will be necessary to focus the telescoping eyepiece and phase turret condenser with each objective lens.

T. When you have adjusted all 4 annuli to their respective objective lenses remove centering telescope from eyepiece tube and install eyepiece.

1. Microscope is now ready for use.
2. The phase objectives will work well as standard bright field objective lenses. To view in bright field simply position the O position to the front of condenser turret and adjust condenser and iris diaphragm for standard use.

CLEANING YOUR MICROSCOPE

National microscopes are designed to function with minimal maintenance, but certain components should be cleaned frequently to ensure ease of viewing. The power switch should be turned off or the microscope should be unplugged when not in use.

Do not disassemble your microscope
Disassembly may significantly affect the performance of the instrument, and may result in electric shock or injury and will void the terms of the warranty.
Never attempt to dismantle any parts other than the ones described below. If you notice any malfunction, contact your nearest National Optical supplier.

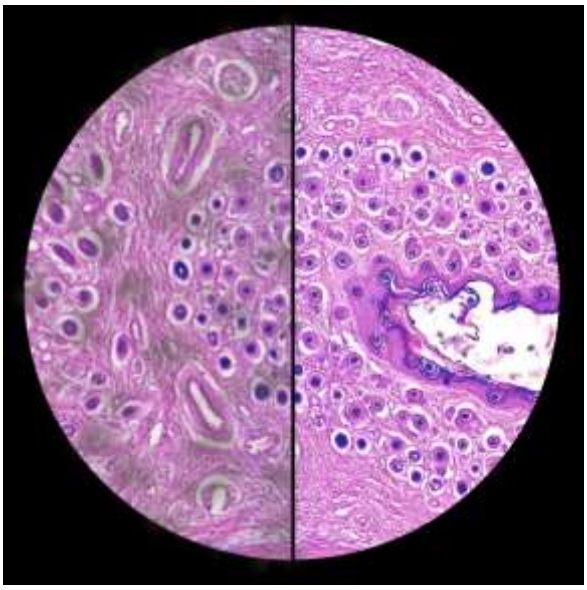
Optics
Keeping the optics of your microscope clean is essential for obtaining clear images.
Choosing the best cleaning method depends on the nature of the optical surface and type of dirt.

Dirtiness on the image may be caused by the following variables:

- Dirt on the outer or inner eyepiece lens.
- Dirt on the front lens of the objective.
- Dirt on the upper lens of the condenser.
- Dirt on the surface of the sample slide glass.
- Dirt on the upper lens of illuminator.
- Dirt on other optical components of the microscope such as mirrors, lamps, filters, intermediate lenses …
  In the case of microscopes with a camera attached to it:
- Dirt on the camera adapter.
- Dirt on the protection filter of the camera sensor.
  For Eyepieces with reticules:
- Dirt on the outer or inner reticle glass.

Dirty

Clean



Objectives are the optical component of the microscope that require the most maintenance. Because for their actual use, they can get dirty easily.

For objectives that work without oil (dry): The first step is to carefully unscrew the objective from the nosepiece.

In order to make things easier and safer, screw the objective onto one of the objective cases supplied with microscope. By doing it this way, the objective will be in a stable position avoiding possible falls.

(1) Proceed by cleaning it using pressurized dry air - or an air gun if available – and, if after this is done we still observe spots of dust or dirt, **(2)** Clean with a cotton swab dampened with a low graduation of alcohol 70% or with a mixture of alcohol and ether (ratio alcohol: 3 to ether: 7). **(3)** With a spiral movement (starting from the center of the lens) we will then clean the surface of the lens. **(4)** Dry its surface by using pressurized dry air and check that the lens is clean either with the help of a magnifying glass or by screwing the lens back on the revolving nosepiece of the microscope.

<u>For objectives that work with immersion oil</u> it is essential to clean them after each observation session. To clean use a cleaning cloth for lenses slightly dampened with a low graduation of alcohol. Proceed by cleaning

the frontal objective lens (normally 100X-Oil). It is important for those objectives that work at a very close distance to the sample.

For optical components such as eyepieces, condensers, filters, etc. we recommend using the same cleaning method. First cleaning it with pressurized dry air, then cleaning it with a cotton swab or a cleaning cloth for lenses (slightly moistened with a low graduation of alcohol) and finally drying it with pressurized dry air. Once the cleaning process is finalized if the image is still not clear, you can either contact us or you can contact your National Optical supplier.

For users that have a digital camera mounted on the microscope and whom observe dirt on the digital image, it is important that the first step is to proceed with objectives maintenance, as explained above. If the dirt persist, it must be determined if it is within the microscope or the camera. To check this simply loosen the adapter and rotate the camera. If the dirt rotates while turning it, then it means that it is in the microscope. If it does not rotate, then it is either in the adapter or in the protection filter of the sensor. If the dirt is on the surface lens of the adapter then you can use the same cleaning method that we have explained above, but if the dirt is in the protection filter of the sensor then use pressurized dry air only. If the dirt persist you can either contact us or you can contact your National Optical supplier.

Mechanics
The mechanical components of the microscope require less maintenance than the optical components. Our first maintenance advice is to **use the dust cover** provided with the microscope, to avoid the accumulation of dust on the microscope.

To clean the stand or the specimen holder, Use a cleaning cloth moistened with soap diluted in distilled water. After this proceed drying the entire surface of the microscope. Take special care with the electrical components of the microscope such as the ON / OFF switch, the dimmer, the lamp holder…
If there are grease stains, use the same cloth moistened with a low graduation of alcohol.

If you face any problems related to the maintenance of your microscope, please contact us. Our technicians will gladly help you solve your maintenance issue/s.

CLEANING – The front lens of the objectives (particularly the 100XRD) should be cleaned after use. The lens surface may be gently cleaned with a soft camel hair brush, or blown off with clean, oil-free air to remove dust particles. Then wipe gently with a soft lens tissue, moistened with optical cleaner (eyeglass or camera lens) or clean water. Immediately dry with a clean lens paper.

CAUTION - Objectives should never be disassembled by the user. If repairs or internal cleaning should be necessary, this should only be done by qualified, authorized microscope technician. The eyepiece(s) may be cleaned in the same manner as the objectives, except in most cases optical cleaner will not be required. In most instances breathing on the eyepiece to moisten the lens and wiping dry with a clean lens tissue is sufficient to clean the surface. Lenses should never be wiped while dry as this will scratch or otherwise mar the surface of the glass.

The finish of the microscope is hard epoxy and is resistant to acids and reagents. Clean this surface with a damp cloth and mild detergent.

Periodically, the microscope should be disassembled, cleaned and lubricated. This should only be done by a qualified, authorized microscope technician.

DUST COVER AND STORAGE – All microscopes should be protected from dust by a dust cover when in storage or not in use. A dust cover is the most cost-effective microscope insurance you can buy. Ensure that the storage space is tall enough to allow the microscope to be placed into the cabinet or onto a shelf without making undue contact with the eyepieces. Never store microscopes in cabinets containing chemicals which may corrode your microscope. Also, be sure that the objectives are placed in the lowest possible position and the rotating head is turned inward and not protruding from the base. Microscopes with mechanical stages should be adjusted toward the center of the stage to prevent the moveable arms of the mechanical stage from being damaged during storage in the cabinet.

TROUBLESHOOTING

ELECTRICAL

PROBLEM	REASON FOR PROBLEM	SOLUTION
Light fails to operate	Outlet inoperative.	Have qualified service technician repair outlet
	AC power cord not connected.	Plug into outlet.
	Lamp burned out.	Replace lamp.
	Fuse burned out.	Replace fuse.
	Fuse burns out too soon.	Replace with proper fuse (Time delay).
	Fuse blows instantly when replaced.	Unit has short, have qualified technician repair electrical short.
	Incorrect lamp used improper voltage or base.	Replace with specified lamp.
Light burns out too soon	The voltage is too high.	Adjust intensity control to the minimum position before turning the power switch on.
Light bulb burns out immediately	Incorrect lamp used.	Use proper lamp (12 volt 20 watt). Plug unit into proper outlet 120v or 220v
Light flickers	Lamp not properly inserted into socket.	Properly insert lamp.
	Lamp about to burn out.	Replace lamp.
	Fuse holder not locked into proper position.	Properly install fuse holder.
	Loose connection at AC outlet.	Have qualified service technician repair outlet.

IMAGE QUALITY

PROBLEM	REASON FOR PROBLEM	SOLUTION
No image.	Nosepiece not indexed properly.	Move revolving nosepiece until objective lens clicks into position.
	Light too bright	Adjust light intensity control to a lower position.
Poor resolution. (Image not sharp)	Objective lens dirty.	Clean objective lens.
	Eyepiece lens dirty.	Clean eyepiece lens.
	Slide upside down.	Turn specimen slide over (cover slip facing up).
	Cover slip on specimen slides too thick.	Use 0.17mm thick cover slip.
	Too much light.	Adjust light intensity control to a lower position. Iris diaphragm not properly adjusted.
	Condenser lens dirty.	Clean condenser lens.
	Rack stop not set a proper position.	Adjust rack stop.
Spots in field of view.	Eyepiece dirty.	Clean eyepiece lenses.
	Specimen slide dirty.	Clean slide.
	Condenser lens dirty.	Clean lens of condenser.
Uneven illumination of field.	Nosepiece not properly indexed.	Revolve nosepiece into positive index stop.
	Diaphragm not properly indexed.	Adjust iris diaphragm to proper level.

MECHANICAL PROBLEM

PROBLEM	REASON FOR PROBLEM	SOLUTION
Does not stay in focus.	Stage drops down	Adjust tension adjustment knob.

OPTIONAL ACCESSORIES AND PARTS:

#610-160	WF10X Eyepiece
#704-160SP	DIN 4X objective lens, 0.10 N.A.
#710-160SP	DIN 10X objective lens, 0.25 N.A.
#740-160SP	DIN 40X objective lens, 0.65 N.A.
#799-160SP	DIN 100X objective lens, 1.25 N.A.
#704-160ASC	DIN 4X Super High Contrast objective lens, 0.10 N.A.
#710-160ASC	DIN 10X Super High Contrast objective lens, 0.25 N.A.
#740-160ASC	DIN 40X Super High Contrast objective lens, 0.65 N.A.
#799-160ASC	DIN 100X Super High Contrast objective lens, 1.25 N.A.
#704-160P	DIN 4X Plan objective lens, 0.10 N.A.
#710-160P	DIN 10X Plan objective lens, 025 N.A.
#740-160P	DIN 40X Plan objective lens, 0.65 N.A.
#799-160P	DIN 100X Plan objective lens, 1.25 N.A.
#800-500	BULB ASSEMBLY, 3W LED
#926	Phase contrast set: Centering telescope, PLAN/Phase 10x, 20x, 40x, 100xR (oil immersion) objectives, Phase turret condenser assembly including one brightfield position, blue & green filters, storage case
#D-905	Power Supply Converter (100-240V 47-63 Hz IN 12V, 2AMP OUT) with power cord

LIMITED LIFETIME WARRANTY

Please see our website, www.nationaloptical.com, for complete warranty details and exclusions.

(Revised 1/05/2016)