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INSTRUCTIONS FOR  
**MODEL DC4-211 / 212**  
COMPOUND BIOLOGICAL MICROSCOPE  
WITH DIGITAL CAMERA

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## **About the Digital Microscope**

Your new digital microscope incorporates a built in camera that utilizes ultra high-speed data transmission made possible through a simple plug and play USB 2.0 cable. In order to achieve optimum results, it is important that you carefully read both this and the software instructions located on Motic disc before operating your microscope or camera.

### **UNPACKING**

1. Your microscope is packed with the following components, all of which have been checked at the factory. Carefully remove all components and check against this list. Retain the styrofoam container in case microscope must be transported or returned to factory for any reason.
  - A. Microscope, with WF10x eyepiece, four objective lenses (DC4-212) three objective lenses (DC4-211), 1.25 N.A. Abbe condenser, and specimen holder already installed.
  - B. CD Motic Images software (instructions for software on disc)
  - C. Calibration slide
  - D. USB 2.0 cable (for connecting to computer)
  - E. 2mm "L" type key wrench (for rack stop adjustment)
  - F. 0.9mm "L" type key wrench (for tension adjustment collar)
  - G. Dustcover
2. Retain Styrofoam container in case microscope must be transported or returned to factory for any reason. If it becomes necessary to ship the microscope for any reason, repack it in the styrofoam container, and then pack the styrofoam in another corrugated shipping container for optimum protection. Use of the styrofoam alone will not provide adequate protection in transit, and will void your warranty.

### **DESCRIPTION OF COMPONENTS**

1. LED INDICATOR LIGHT: Indicates if camera is on, power supplied by USB.
2. EYEPIECE (ocular lens): Lens closest to the eye, magnifies the primary image formed by the objective lens.
3. OBJECTIVE TURRET (nosepiece): Revolving turret which holds objective lenses, permits changes of magnification by rotating different powered objective lenses into optical path. Reverse position permits easier access to stage when positioning specimen slides.
4. OBJECTIVE LENS: Lens closest to the object being viewed, forms first magnified image of the specimen.
5. MECHANICAL SPECIMEN HOLDER: Permits precise, mechanical manipulation of the specimen slide.
6. STAGE: Platform of the microscope where the specimen slide is placed.
7. CONDENSER: A 1.25 N. A. Abbe condenser lens positioned under center of stage, condenses light rays from substage illumination and fills the back lens element of objective lens to improve image resolution.
8. IRIS DIAPHRAGM: Attached to bottom of Abbe condenser, controls aperture of light by moving control lever left or right.
9. SWING OUT FILTER HOLDER: Contains frosted filter – diffuses LED light
10. SAFETY RACK STOP: When properly adjusted, controls maximum upward travel of stage. Prevents higher power objectives from breaking specimen slides, prevents damage to objective lenses. This stop has been pre-adjusted at the factory.
11. FOCUSING KNOBS: Coarse focusing knobs (larger knobs) located on each side of arm, raise or lower stage to bring specimen image into focus. Fine focus knobs (smaller knobs located just below coarse focusing knobs) permit more precise image adjustment.
12. ILLUMINATION: Built-in substage electric illuminator provides constant, reliable pre-focused illumination.

- 13. RHEOSTAT INTENSITY CONTROL: Controls illumination intensity. Always turn control to lowest intensity before turning microscope power on or off. This extends bulb life.
- 14. POWER CORD: Attached US 110V 60Hz, three prong UL approved power cord.
- 15. ON/OFF SWITCH: This turns microscope lamp on
- 16. USB 2.0 CABLE: Connects microscope & camera to computer.

**OPERATION**

Your microscope is fully functional as a standard microscope. The following instructions apply only to operation of the microscope. Refer to the software instructions for installation of the software and operation of the camera. Some steps for microscope operations are altered slightly in the software documentation, in order to utilize some of the unique features provided by the digital camera and software.

- 1. Illumination.
  - A. **Adjust intensity control on side of base to the minimum position.** This should be done prior to each time light is turned on or off, in order to extend bulb life.
  - B. Plug one end of power cord into power outlet. Flip power switch on microscope base “on”. Note that camera LED indicator will not light until USB 2.0 cable is connected to computer, and camera turned on by software commands.
- 2. 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. Swing moveable finger on slide holder outward. Place specimen slide (cover slip up) on top of stage surface 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. Adjusting the aperture (opening) of iris diaphragm.

Iris diaphragm should not be used to control the brightness of illumination. 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:

<b>OBJECTIVE</b>	<b>DIAPHRAGM OPENING</b>
4x	From fully closed to 1/8 open
10x	1/8 to 1/4 open
40x	1/4 to 1/2 open
100x	1/2 to 3/4 open

- a) Placing the frosted filter into the optical path will absorb and diffuse some of the light from the illuminator base, limiting the light output.
- F. Changing magnification.
  - 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 when positioning these lenses into the optical path, 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.
  - (2) All air bubbles must be removed from between lens and slide by gently rotating nosepiece back and forth.
  - (3) When finished viewing, all parts that come in contact with oil must be cleaned. Failure to do so could permanently damage the 100x oil objective lens. Use of Windex to clean immersion off lens surfaces is recommended.

**Microscope Specification Chart**

Objective	N.A.	Color Code Ring	Field of View	Working Distance	Magnification with WF10X eyepiece
Din 4X	0.10	Red	4.5mm	26.4mm	40X
Din 10X	0.25	Yellow	1.8mm	5.5mm	100X
Din 40X	0.65	Blue	0.45mm	0.48mm	400X
Din 100X	1.25	White	0.18mm	0.06mm	1000X

## **MAINTENANCE**

**WARNING: For your own safety, turn switch off and remove plug from power source before maintaining your microscope. If the power cord is worn, cut or damaged in any way, have it replaced immediately to avoid shock or fire hazard.**

### 1. OPTICAL MAINTENANCE

- A. Do not attempt to disassemble any lens components. Consult a microscope service technician when any repairs not covered by instructions are needed.
- B. Prior to cleaning any lens surface, brush dust or lint off lens surface using a camel hair brush. You can also use an ear syringe or canned compressed air, such as that sold by most computer stores.
- C. Do not remove eyepieces or objective lenses to clean. Clean only the outer lens surface. Breath on lens to dampen surface, then wipe with lens paper or tissue or use a cotton swab moistened with distilled water. Wipe lenses with a circular motion, applying as little pressure as possible. Avoid wiping dry lens surface as lenses are scratched easily. If excessive dirt or grease gets on lens surfaces, a small amount of Windex can be used on a cotton swab or lens tissue. To clean objective lenses, do not remove objectives from microscope. Clean front lens element only, following same procedure.

NOTE: Fingerprints or other matter on the front lens element of the objective lens is the single most common reason that you will have difficulty in focusing the microscope. Before having costly servicing done, or before returning to National for "warranty repair", make certain to examine the front lens element with a magnifying glass or eye loupe for the presence of such contaminants. If a microscope is returned to National for warranty repair, and it is determined that such contaminants are the problem, this is not covered under warranty and National will submit a cost estimate for cleaning.

### 2. MECHANICAL MAINTENANCE

- A. The rack stop screw has been pre-adjusted at the factory and should not require re-adjustment. However, if you do attempt re-adjustment, note the following procedure. Using a 2mm "L" type hex key wrench, loosen rack stop socket set screw. With fine focus adjustment at mid-range, focus on standard slide until sharp image is obtained. Rotate rack stop set screw in clockwise direction until tight.
- B. Coarse focus tension adjustment prevents the stage from drifting down from its own weight and causing the image to move out of focus. This has been adjusted at the factory, but over the course of time it may loosen and cause the stage of the microscope to slip downward on the focusing block.

The tension adjustment collar is located between arm and coarse focus knob on right side of microscope. Using a 0.9mm “L” type hex key wrench, loosen the socket set screw located in the hole on tension adjustment collar. Turn collar clockwise to tighten tension, counter-clockwise to loosen tension. Use of a wide rubberband will provide a better grip on the tension adjustment collar. After adjusting, tighten the socket set screw to lock collar in place.

NOTE: It is recommended that you leave the tension as loose as possible for ease of focusing, yet not so loose that it permits the stage of microscope to drift downward from its own weight and cause the microscope to “drift” out of focus.

C. Metal parts: Use a clean, damp cloth to remove dust or dirt from metal parts, followed by a dry cloth.

## ELECTRICAL MAINTENANCE

A. The extent of electrical maintenance, by other than a qualified technician, should be bulb replacement. **BE CERTAIN TO TURN SWITCHES OFF AND REMOVE PLUG FROM POWER SOURCE OUTLET BEFORE CHANGING BULBS.**

B. Replacing LED element:

To open the illuminators field lens housing, use 0.9mm “L” type hex key wrench supplied with your microscope. Loosen hex screws on lens housing. Remove lens housing to expose LED “bulb”. Remove bulb by grasping the plastic base of bulb and gently pulling straight up. Insert new LED “bulb”, replace lens housing and tighten hex screw to secure lens housing in place.

## INSTALLING THE MOTIC IMAGES SOFTWARE

1. Insert the Motic Images software disk into your media drive.
2. Follow the prompted instructions for installation.
3. Each part of the installation will prompt you for a determined response.
4. Unless you want to make changes to defaulted installation process, allow the software to install as needed.
5. Motic Images will create a folder on your C:\ driver called “Motic”. You must have administrative privileges to read and write to this folder. Temporary images are saved to this folder. Without those privileges the software capture feature will not function.

## INSTALLING THE MOTIC USB2 Driver

1. Before connecting your microscope to your computer, please insert the software disc.
2. With the CD in your drive, connect your microscope or camera to the computer USB port.
3. Your computer should detect the new hardware and prompt you to install the drivers for your new device. The Motic USB2 camera driver has not passed logo testing. You will be prompted to continue anyway. Please do so.
4. If you plan on using the same USB port, you are finished at this point. However, if you will be using different USB ports on the computer, you will need to make sure the driver is installed on all the available USB ports.
  - Note: Do not plug your Motic device into a USB hub, unless it is a powered USB hub. Your camera will not be detected or work properly in an unpowered USB hub. It is always best to plug your Motic device into the computer/laptop directly.
5. If you are using a laptop with a built in webcam, you should disable it at this time. You do not need to uninstall the driver. Built in webcams can cause conflicts.
6. Once the Motic USB2 driver has been installed, you should restart your computer.
7. You may now open the Motic Images software and begin using the software.

# MOTIC IMAGES SOFTWARE

## Full Help Menu

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

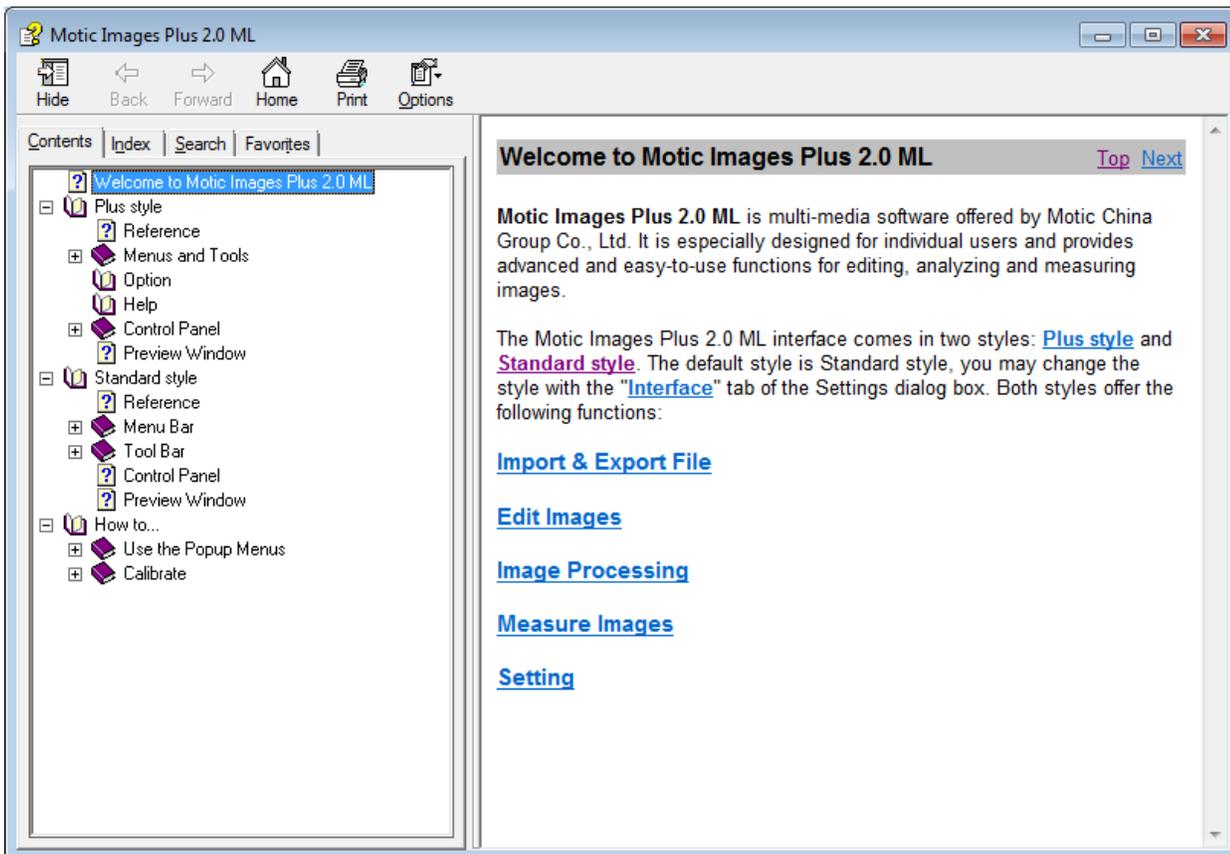
- To begin, open the Motic Images Software.



- 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

### Full Help Menu

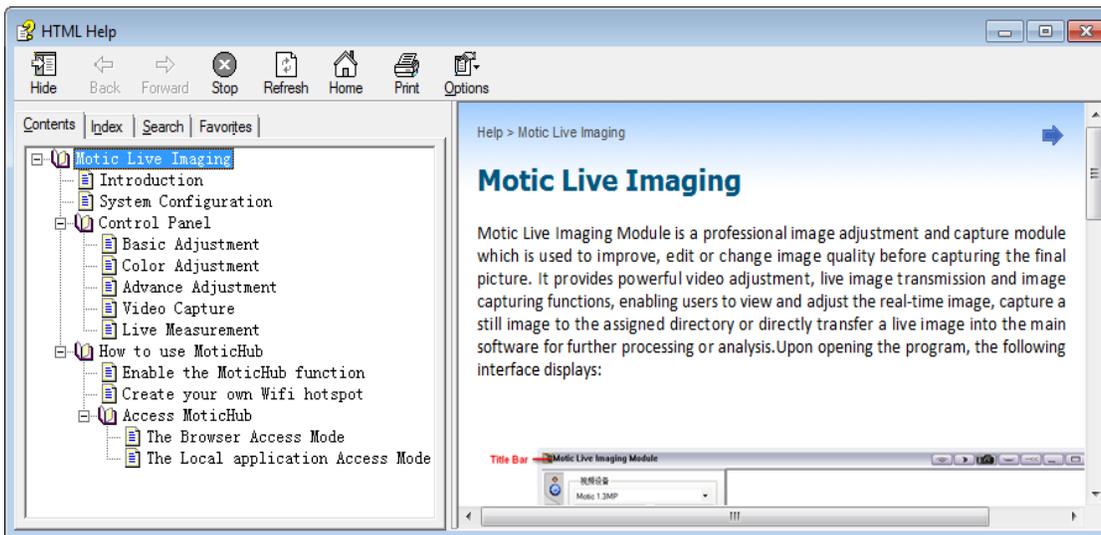
- The full Live Imaging Module manual is accessible within the live Imaging main page.
- To begin, open the Motic Images Software.
- At the top of main screen find the menu tab labeled File and click on Capture:



- 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:



## Cleaning Your Microscope

This microscope was 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 Swift 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:

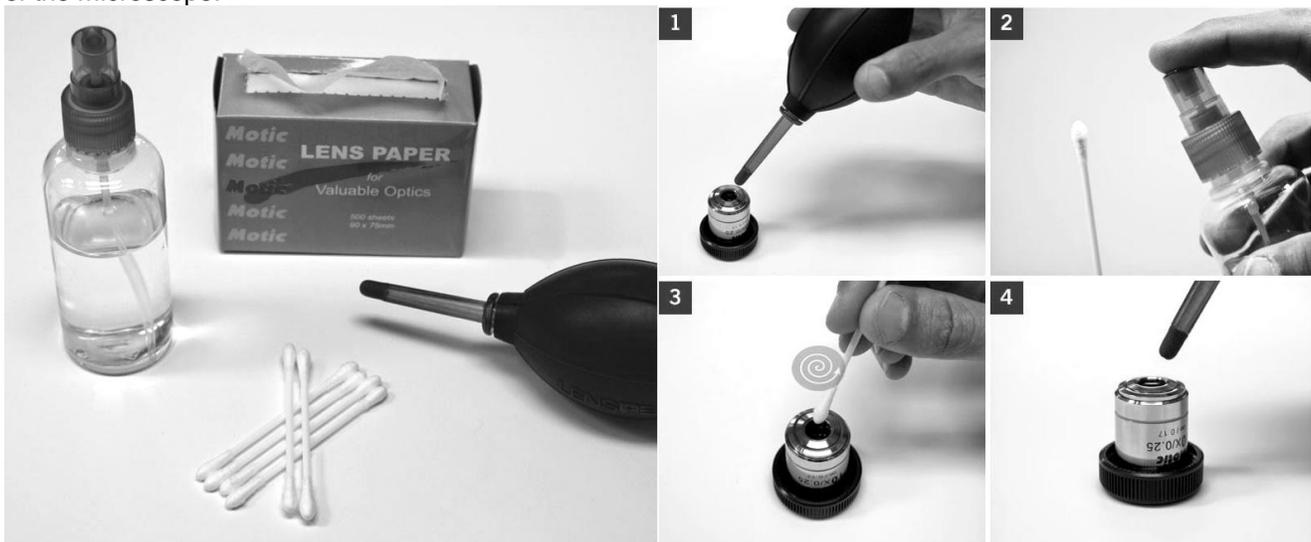
- Dirt on the outer or inner eyepiece lens.
- Dirt on the front lens of the objective.
- Dirt on the upper lens of the condenser.
- Dirt on the surface of the sample slide glass.
- Dirt on the upper lens of illuminator.
- Dirt on other optical components of the microscope such as mirrors, lamps, filters, intermediate lenses ...



**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.

**(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.



**For objectives that work with immersion oil** 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 or 50X-Oil). It is important for those objectives that work at a very close distance to the sample.

Users of inverted biological microscopes have to take special care with the objectives because they can get dirty with dust or liquid that spills from the sample/s.

**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 Swift 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 persists, 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 persists you can either contact us or you can contact your Swift 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 40XRD and 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**

<b>PROBLEM</b>	<b>REASON FOR PROBLEM</b>	<b>SOLUTION</b>
Light fails to operate.	Outlet inoperative. AC power cord not connected. Lamp burned out.	Have qualified service technician repair outlet. Plug into outlet. Replace lamp.
Image does not remain in focus	Stage of microscope drops from its own weight.	Adjust tension control.
Image will not focus	Rack stop not set at proper position. Slide upside down. Slide cover slip too thick.	Adjust rack stop. Place slide on stage with cover slip up. Use 0.17mm thick cover slip (No.1 cover slip)
Poor resolution (image not sharp)	Objective lenses dirty. Eyepiece lens dirty. Too much light.	Clean objective lenses. Clean eyepiece lenses. Adjust disc diaphragm.
Spots in field of view.	Eyepiece or condenser lens dirty. Specimen slide dirty.	Clean lens. *** Clean slide.
***Spots in field of view can also result from dirt on inside of eyepiece. It is recommended that you have service technician clean inside of lens.		

### **OPTIONAL ACCESSORIES AND PARTS:**

#610-155      WF10x eyepiece w/pointer  
#800-001      Replacement LED light

### **LIMITED LIFETIME WARRANTY**

Please see our website, [www.nationaloptical.com](http://www.nationaloptical.com), for complete warranty details and exclusions.