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INSTRUCTIONS FOR  
MODELS BTW1-205-RLED, BTW1-213-RLED, & BTW1-214-RLED  
COMPOUND MICROSCOPES

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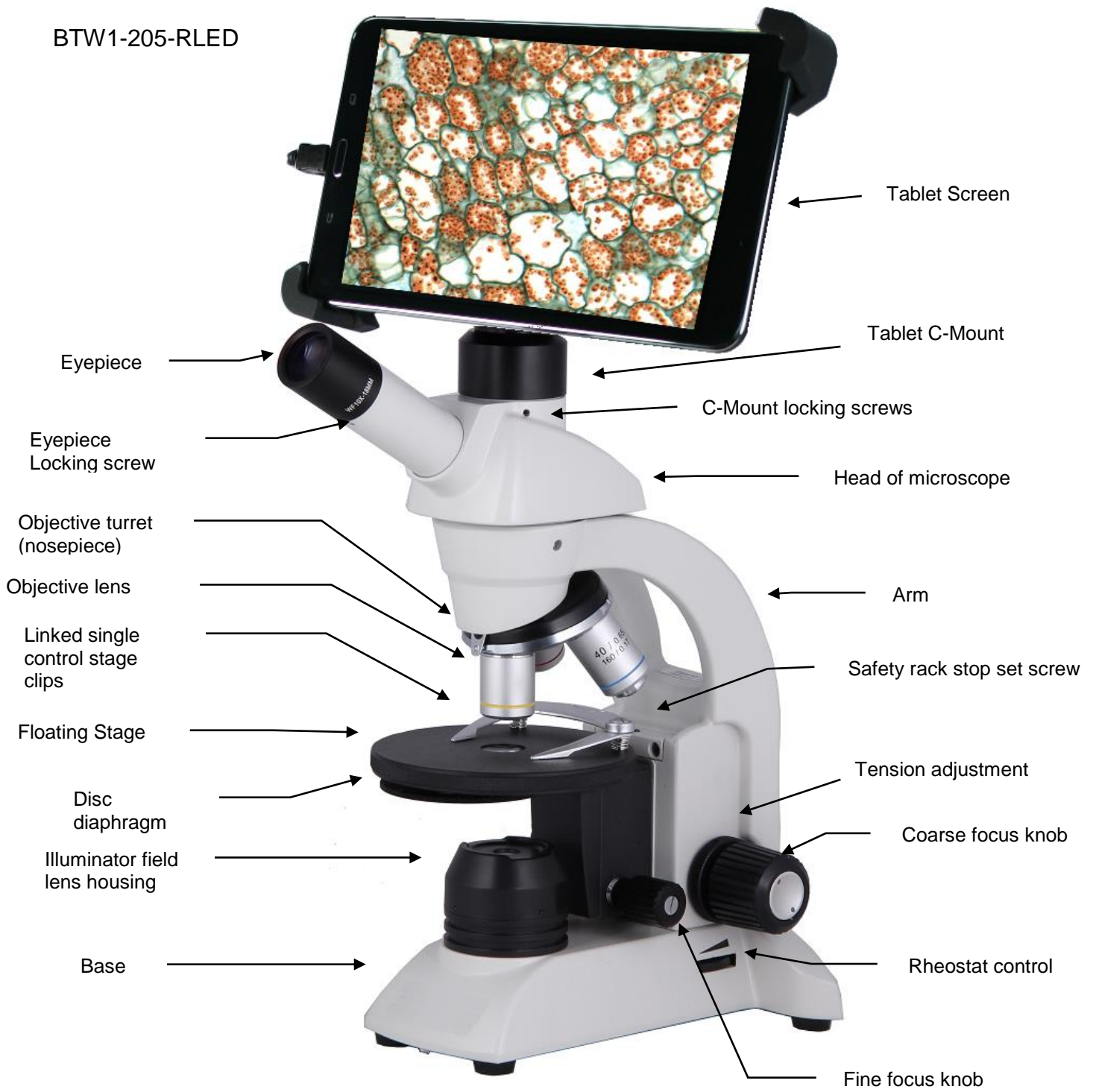
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 A smart (phone) way to see us on the web

\*Drawings done monthly, winners will be posted on our website

 **MICROSCOPES & DIGITAL IMAGING PRODUCTS**  
Find out more at: [www.nationaloptical.com](http://www.nationaloptical.com)

BTW1-205-RLED



On/Off Switch

Recharging socket

BTW1-213/214-RLED



For optimum viewing satisfaction, follow these simple procedures. Nomenclature used to describe components and controls can be identified by referring to the diagram at left.

## **UNPACKING**

The microscope and accessories have been carefully packed to assure they reach you in the best possible condition. Examine packing material before you discard it. **Retain the styrofoam container in case you need to transport, store or return the microscope for repairs.** Always handle and move microscope by securely holding the arm of microscope. Avoid touching any of the lens surfaces while handling the microscope. Dust, dirt, or fingerprints can damage the delicate lens surfaces or adversely affect image quality.

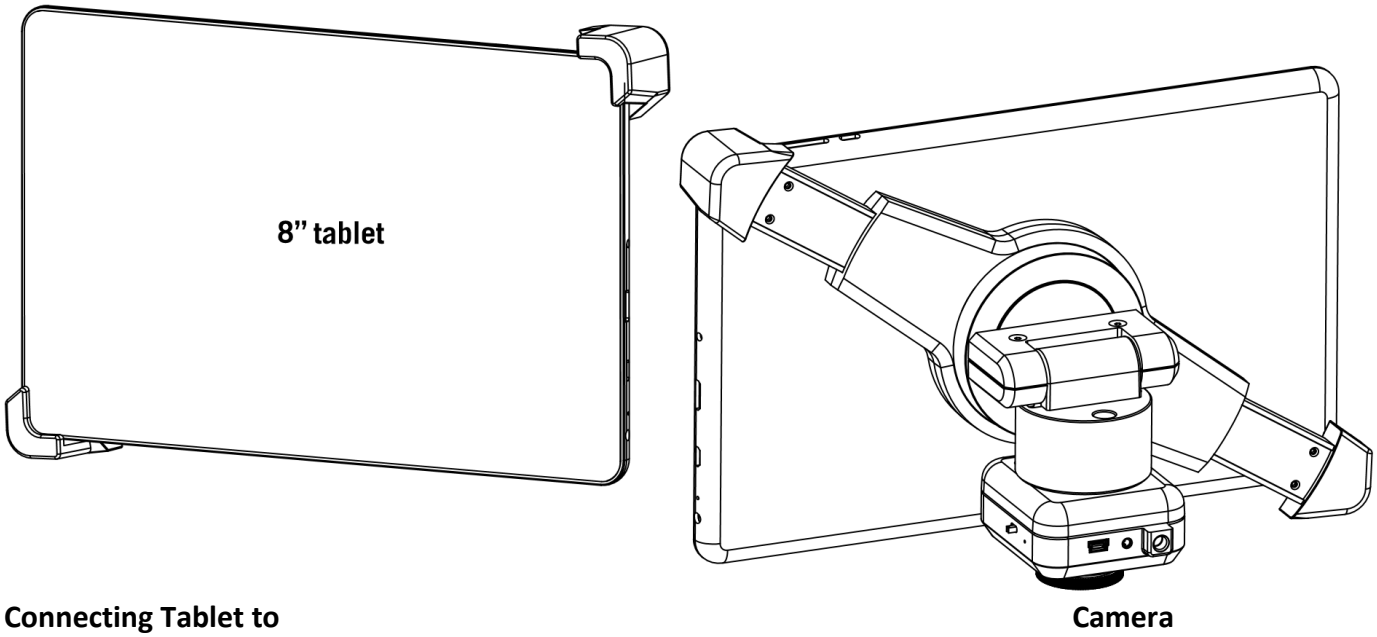
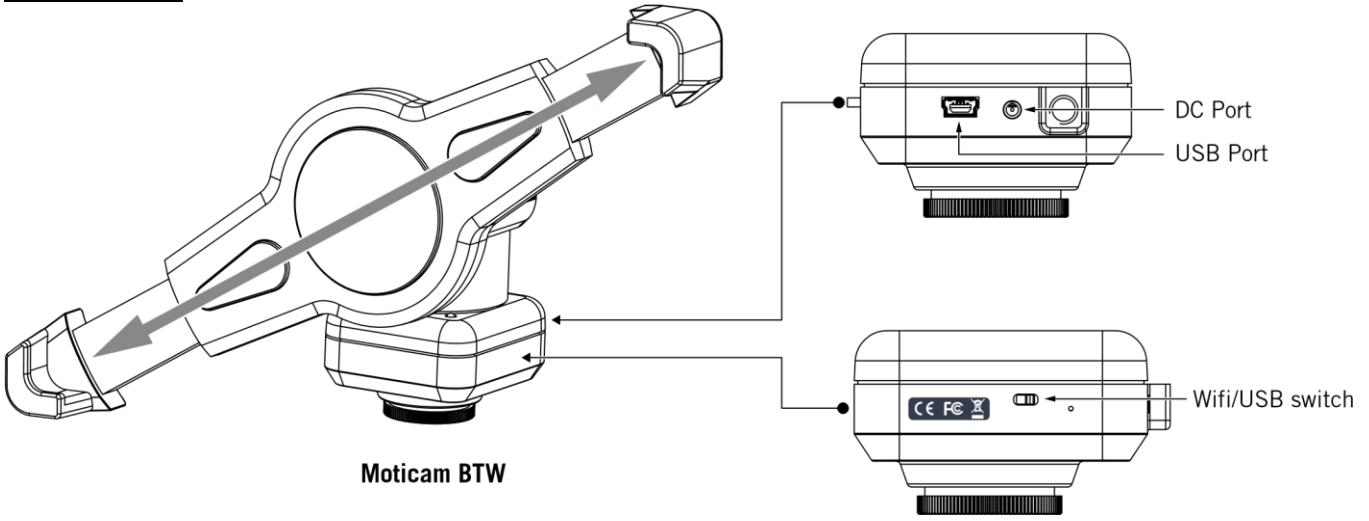
**Model DCS-205-RLED:** Stand with head, one WF10x eyepiece, 4x, 10x and 40x objectives, disk diaphragm, floating stage, c-mount, stage clips, dustcover, 2mm "L" hex wrench (for rack stop adjustment). 1.5mm "L" wrench (for installing C-Mount), 0.90mm "L" hex key wrench (for eyepiece socket set screw and for lamp replacement), auto cut-off (4.5v) recharger, tablet (5V) recharger, 2.1mm to 1.7mm DC Power adapter (Tablet Recharger).

**Model DCS-213-RLED & DCS-214-RLED:** Stand with head, one WF10x eyepiece, 4x, 10x, 40x and 100x (DCS-214-RLED) objectives, condenser, specimen holder, c-mount, dustcover, 2mm "L" hex wrench (for rack stop adjustment). 1.5mm "L" wrench (for installing C-Mount), 0.90mm "L" hex key wrench (for eyepiece socket set screw, tension adjustment collar and lamp replacement), auto cut-off (4.5v) recharger, tablet (5V) recharger, 2.1mm to 1.7mm DC Power adapter (Tablet Recharger).

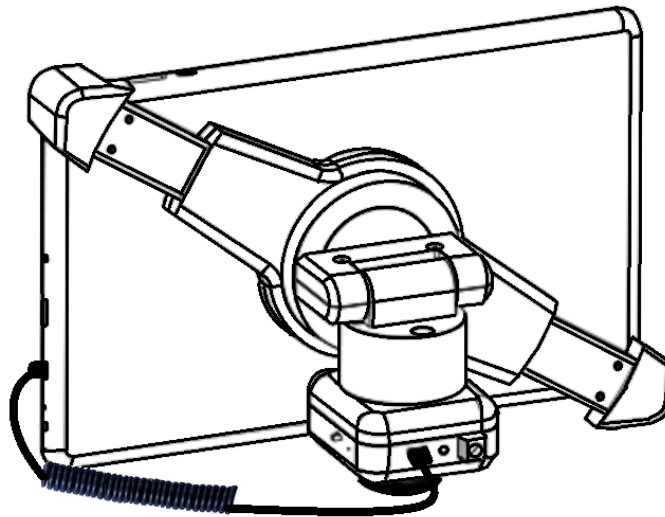
## **DESCRIPTION OF COMPONENTS**

1. **EYEPIECE (ocular lens)** Lens closest to the eye, magnifies the primary image formed by the objective lens. The eyepiece is equipped with a "pointer" that rotates as the eyepiece is turned.
2. **OBJECTIVE TURRET (nosepiece)** Revolving turret which holds objective lenses, permits changes of magnification by rotating different powered objective lenses into optical path.
3. **OBJECTIVE LENS** Lens closest to the object being viewed, forms first magnified image of the specimen.
4. **MECHANICAL STAGE** Permits precise, mechanical manipulation of the specimen slide.
5. **STAGE** Platform of the microscope where the specimen slide is placed.
6. **CONDENSER LENS** 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.
7. **IRIS DIAPHRAGM** Iris opening is controlled by lever, designed to help achieve optimum resolution of the objective lens. Larger apertures used for higher magnifications, and smaller apertures used for lower magnifications. Iris is protected by a frosted glass covering.
8. **FILTER HOLDER** Attached to bottom of iris diaphragm with swing out built in neutral filter. Swing out filter should be removed from optical path when using 40x and 100x objective lens.
9. **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.
10. **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 on each side of arm permit more precise image adjustment.
11. **ILLUMINATION:** Built-in sub stage electric LED illuminator provides constant, reliable, pre-focusing illumination equal to a 20 watt tungsten bulb. Powered by 3 rechargeable AA nickel metal hydride batteries, no power outlet or electrical cord are needed.

BTW Diagram



**Connecting Tablet to**



## TABLET ACCESSORIES



HDMI Cable	This cable will enable you to connect to an HDMI ready device, to view your tablet on a larger format. The displayed image will replicate the displayed image of the tablet.
Power Adapter	This 5V DC power adapter is for charging your tablet's battery. It is also used to power the camera in WiFi mode.
Calibration Slide	This slide will enable you to calibrate your tablet to your microscope, for accurate measurements.
C-Ring	This ring is used between the camera and c-mount to achieve par-focus. Only required if using another manufactures microscope and C-mount.
4GB Micro-SD	This storage card can be used with your tablet to store images and then transfer them to your computer. This card is provided as a courtesy and cannot be replaced.
Mini USB to Micro USB	Provides power and feed connection between the tablet and camera. To operate the camera, move the switch to the camera position.
L-Wrench	Optional Wrench for mounting bracket to Motic branded trinocular microscopes
Female USB to Micro USB	Optional Cable for Motic Peripheral Device
USB A to Micro USB	Optional Cable for Motic Peripheral Device

## **MICROSCOPE OPERATION**

1. Place microscope directly in front of you in a manner which permits you to comfortably look into the eyepiece. Note that the head of microscope is locked in forward position.
2. Assure that light is available for illuminating the specimen.
  - a. Your microscope has special LED illumination that is powered by 3 rechargeable AA nickel metal hydride batteries (supplied). These batteries may be recharged, as required, using the recharger (supplied). Each set of batteries may be recharged approximately 500 times before replacing, and each charge will provide up to 50 hours of microscope operation. The LED component (bulb) will last for up to 50,000 hours before replacement is required.

### **WARNING**

**DO NOT USE regular AA alkaline batteries. Using other than rechargeable AA nickel metal hydride batteries could result in batteries exploding during recharge. ONLY USE THE SUPPLIED SWITCHING BATTERY RECHARGER WITH AUTOMATIC "TRICKLE CHARGE".**

- b. It is recommended that you charge the batteries before initial use and after prolonged storage as the batteries may have discharged. Plug output cord from battery charger into DC recharging socket located on back of microscope base. Your automatic switching recharger operates on 100 to 240 volts AC 50/60 Hz. Plug recharger into your AC wall outlet. Battery recharger is also equipped with an automatic "trickle charge" feature, the red LED indicator lamp located on recharger will be illuminated when batteries are receiving maximum charge. After batteries are charged, the red LED indicator lamp will turn to green and charger automatically switches to "trickle charge". The charger can be left plugged in, but for safety reasons it is a good idea to disconnect the charger from the AC wall outlet and the output cord from recharging socket after 12 hours. Batteries and charger may feel warm when charging, and unplugging the recharger is a safety precaution.

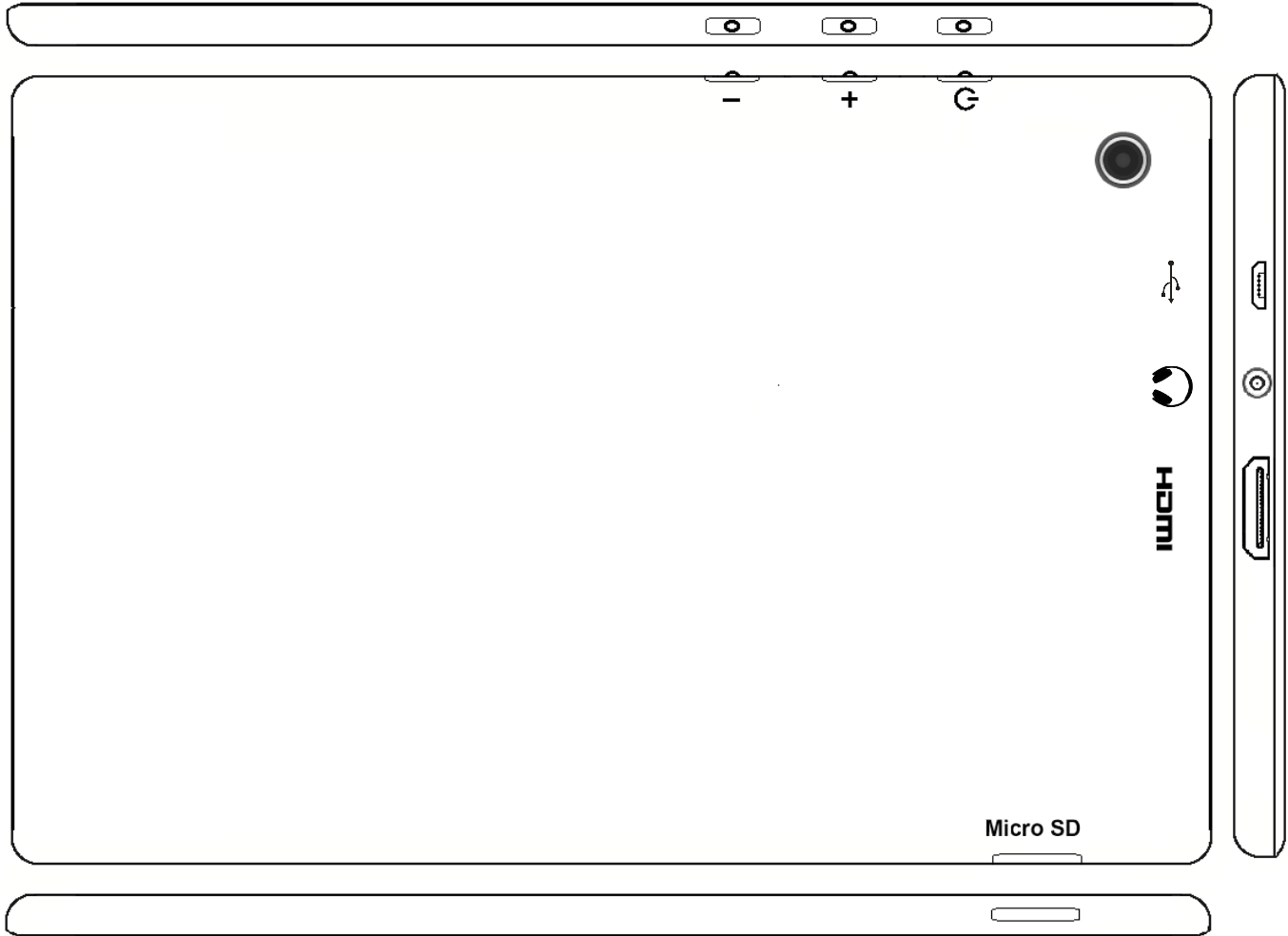
Note that your microscope can be used during recharging. **Simply turn "on/off" switch on back of microscope base to "on" position and proceed as follows.**



3. Rotate coarse focus knobs to move stage down (away) from objective lens as far as possible.
4. Position the objective turret until the 4x (smallest) objective lens "clicks" into position in the optical path. Note that each time you change from one objective lens to another you should turn the turret until you hear the "click", which indicates that the lens is properly indexed in the optical path.
5. 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.
6. Turn rheostat (dimmer) control in direction to reduce illumination brightness to about mid-point. Normally, brightness will need to be reduced as magnification is reduced, and increased as magnification is increased. Experiment with this adjustment until optimum resolution and contrast of specimen is obtained.
7. Locate lever beneath stage that controls the iris diaphragm. Move lever until iris diaphragm is about half open. Normally, aperture of iris should become smaller for lower magnifications and larger for higher magnifications. Experiment with this setting until optimum resolution and contrast of specimen is obtained.
8. While looking through the eyepiece, rotate coarse focusing knobs until specimen comes into focus. If image does not appear in field of view, move specimen slide slightly until image appears in field of view.
9. Adjust fine focus controls until specimen is in sharp focus.
10. Changing magnification.
  - a. Magnification is changed by rotating objective turret until a different objective lens is moved into optical path. Always turn turret until you hear the "click", indicating that lens is properly indexed. Otherwise, you will not be able to see anything when looking through the microscope.
  - b. Also note that each objective has a color ring, which permits you to instruct changes in magnification by referring to an easily observed color rather than to a number.
  - c. The microscope has been parfocussed at the factory, which allows easy change from one magnification to another, requiring little or no adjustment of the fine focus knobs.

- d. As magnification is increased, the field of view (area of specimen seen through the microscope) will decrease. That is why it is easier to find the specific area of interest on the specimen by starting with the lowest 4x objective lens, before increasing magnification with the higher power objective lens.
- e. NOTE: Care must be taken when rotating the 40x and 100x objective lenses into place. These lenses have a spring retractable mechanism, which retracts slightly into its housing if the front of the lens, strikes the specimen slide. With fine focus adjustment at mid-range, the rack stop has been adjusted at the factory to assure the 40x and 100x lens will clear the thickness of a normal specimen slide and cover slip. However, if the rack stop has been improperly adjusted, or if using a thicker than normal slide or cover slip, moving the 40x and 100x lenses too quickly or carelessly could cause damage to the front lens element or to the slide. Remove swing out filter from optical path when using the 40x and 100x objective lens.
- f. In order to obtain maximum resolution of the 100x oil immersion lens, it is necessary to apply immersion oil between the cover glass of slide and front lens of the objective. Use a very small amount of immersion oil. All air bubbles must be removed from between lens and slide by gently rotating nosepiece back and forth.
- g. When finished viewing, all parts that come in contact with oil must be cleaned. Failure to do so could permanently damage the 100x immersion objective lens.
- h. Do not let the front lens element of the 40x objective lens come into contact with a wet slide surface, as prolonged contact with any moisture could damage the lens. If lens is exposed to moisture, promptly wipe with soft tissue to remove moisture.



## Tablet Features



<b>-</b>	Volume adjustment - decrease
<b>+</b>	Volume adjustment - increase
<b>G</b>	Hold for a few seconds to turn unit on
	Micro USB Port for charging tablet and connecting to bracket camera
	Provides sound via earphone/speaker
<b>HDMI</b>	Connects to HD ready device via HDMI cable
<b>Micro SD</b>	Micro SD Card Slot for storing images on Micro SD Card (4GB included)

### Camera Switches and Ports – Limited Production

This feature is limited to a small production batch, not a standard feature of this camera. Placing the switch in the WiFi mode, turns the camera into a WiFi only camera. Connection to camera can only be made via WiFi connection. Power adapter must be connected to camera, in order to supply power to camera in WiFi mode. Placing the switch in the USB mode, allows camera to be accessed by tablet via micro USB to mini USB cable. The cable supplies connection and power to the camera.



Camera Switch Camera Reset



Mini USB Camera Power / WiFi

### WiFi Operation for BTW

1. Mount the BTW camera onto your trinocular microscope using a 0.5x c-mount adapter. The c-mount adapter is a specific part of your microscope and should be purchased from your microscope supplier.
2. Mount your own tablet up to 10" in diagonal size onto the spring loaded clamp situated on top of the camera part taking care not to drop the tablet. Ensure that the tablet is securely held on its diagonal corners so that there is no movement of the tablet within the clamp.
3. Connect the camera and the tablet to a power source.
4. Switch the camera to WiFi transmission mode.
5. Turn on your tablet and connect its WiFi system to the SSID provided with the BTW package,
6. Start the MotiConnect application and connect to the WiFi camera using the connection interface within the application.
7. Ensure that your microscope is turned on, and if your microscope has a beamsplitter, ensure that it is switched to a trinocular position so that there is light passing to the camera on the trinocular tube.
8. You can now view the image live on the MotiConnect app as well as capture, measure and annotate the image using the tools provided.
9. You can connect up to 5 other tablets or other WiFi devices to the BTW signal at the same time in order to share the live image.

### Using a WiFi device that operates with Android or IOS

1. For best performance, we recommend to use WiFi devices, such as tablets, with a screen not smaller than 7 inches. For iOS devices we suggest using iOS 5 or higher while for Android Devices we suggest using Version 4.0 or higher.
2. To operate and use the camera on your tablet, please download our free App called MotiConnect. For iPad you can find this on the AppStore, for Android devices you can find this on Google Play and Ipad
3. You can also use certain web browsers such as Chrome, Firefox, or Safari to view, measure, and capture without the need of the App. To view the camera stream on the browser, please type in the IP number also shown on the label on the camera. For example 192.168.1.151:8080 and you will be connected straight to the camera.

## Use WiFi setting to connect to your WiFi enabled computer

The BTW camera can also be used with Motic Images Plus software for Windows computers. If you have a WiFi enabled laptop you can install Motic Images Plus from the CD provided. To view the camera in our product's MI Devices interface, simply log your computer onto the BTW camera signal, by selecting this WiFi connection and entering the password. Then open the MI Devices interface by clicking on the camera icon within Motic Images Plus and select MotiCam X from the drop down menu. Then click on Open.

## TABLET SOFTWARE


This android tablet comes equipped with all the necessary software needed to start using your equipment out of the box. Since it is an android tablet, you will be able to connect to your office/school Wi-Fi network to access the internet and download additional applications. The primary application for accessing your camera is MotiConnect T.

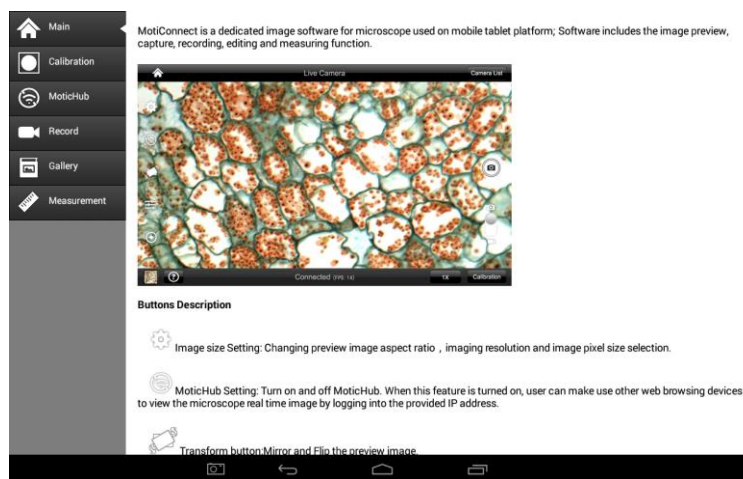
## MOTICONNECT-T OVERVIEW – HELP MENU

MotiConnect is a dedicated image processing Android app for Motic cameras, which includes image preview, capture, recording, editing and measuring functions. Please refer to the Application Help guide for a complete description of the MotiConnect Application.



## HELP BUTTON

	Help Menu - Opens a new window which provides a complete description of all the features available with the MotiConnect Application
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## MOTICHUB CONNECTION GUIDE

### Connecting to the hub with Motic Images Plus 2.0 on PC:

After you have connected to your network/hotspot, open Motic Images 2.0 software and click the capture button. After you've opened the Motic Live Imaging Module, the drop down box under "Video Device" should say Moticom X. Then you will need to click "Open" which is located beneath the drop down box that says Moticom X. A dialog box will appear, instructing you to input an IP address. Input the IP address you wrote down without the: 8080. Your image should appear.

### Connecting to the hub with Android/iOS/Chromebook:

Download the MotiConnect app from the App Store, Google Play, or Chrome Store. After connecting to your network/hotspot via Wi-Fi, open the MotiConnect app. Select Live Camera on the left side. At the top right, click Options. Click Add (on iOS: Click Cameras→New Camera).

Input the following for Android/Chromebook:

Input the following for iOS:

Name: MotiHub

Name: MotiHub

IP Address: (IP address you wrote down without the: 8080)

URL: (IP you wrote down)

Port Number: 8080

Click OK (on iOS: Click Save). Click options and make sure there is a check mark by the camera you just added. You should have a picture.

### Connecting to the hub with a web browser:

Open your web browser and type the IP address you wrote down exactly as it appears (with: 8080) into the address bar, then hit enter.

### Connecting to the hub on a Mac:

Open Motic Images Plus 2.0. At the top of the screen, click Tools, and then click MotiConnect setting from the drop down menu. The IP Address is the same as you wrote down without: 8080, and the Port should be 8080. Click "OK" after making sure settings are correct. Then, click File at the top, and then click Capture or New. Click OK, and a live video from your camera should appear.

## MOTIC IMAGES SOFTWARE

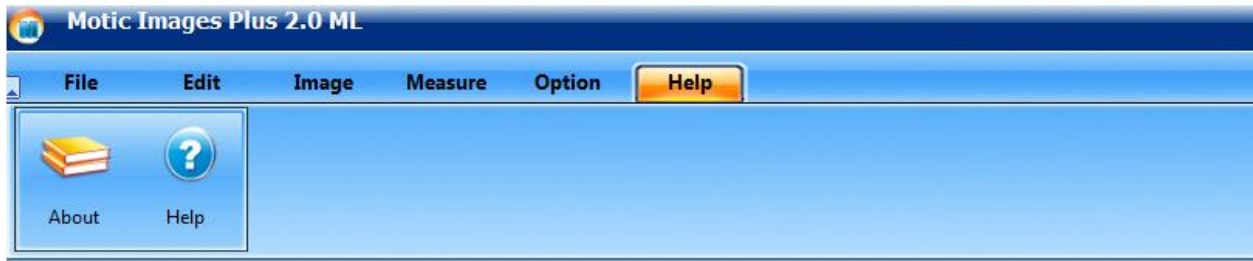
### Full Help Menu

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

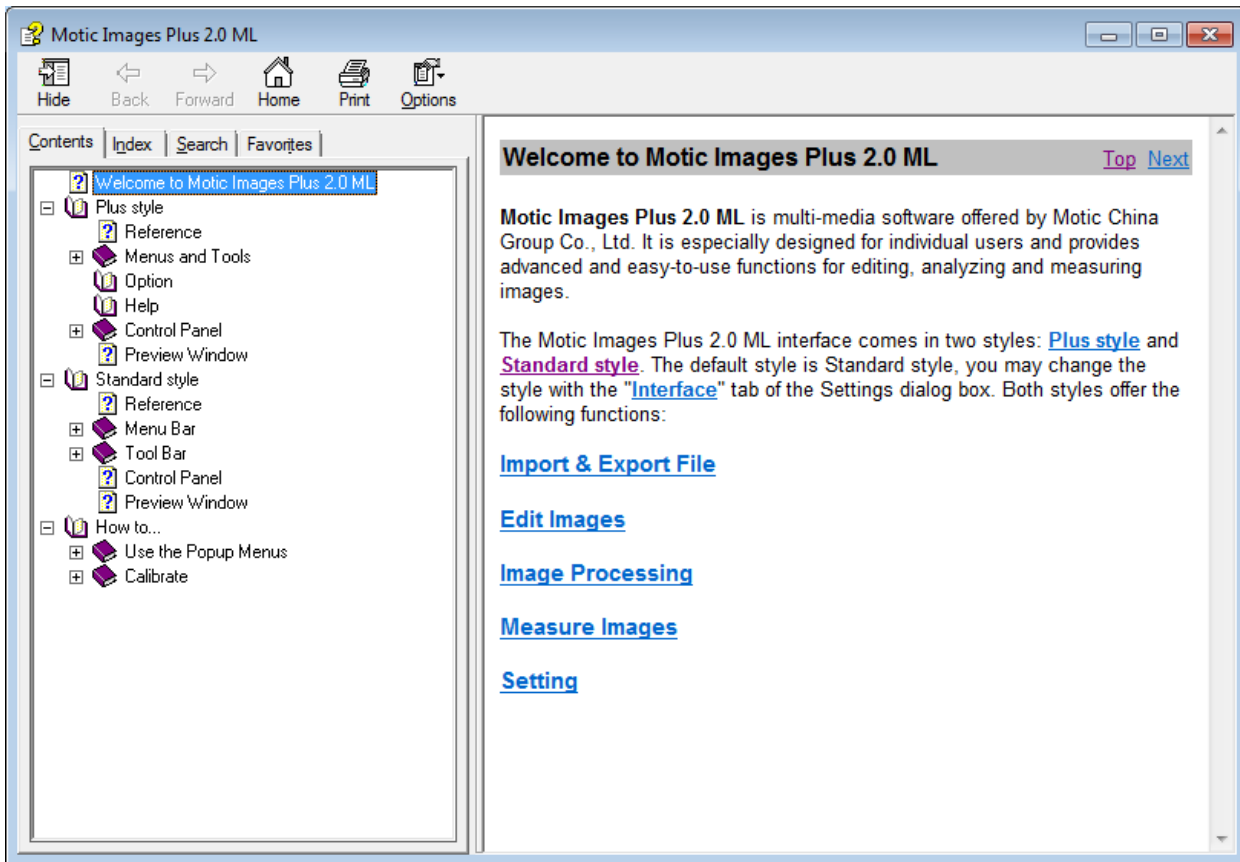
- To begin, open the Motic Images Software.
- At the top of main screen find the menu tab labeled Help:



- Click on Help and then select the help option:



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



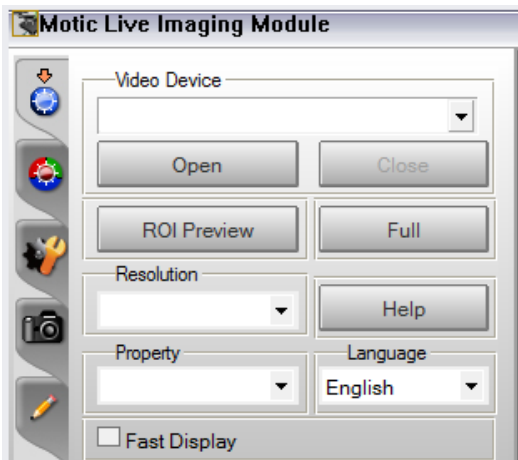
## Motic Live Imaging Module

### Full Help Menu

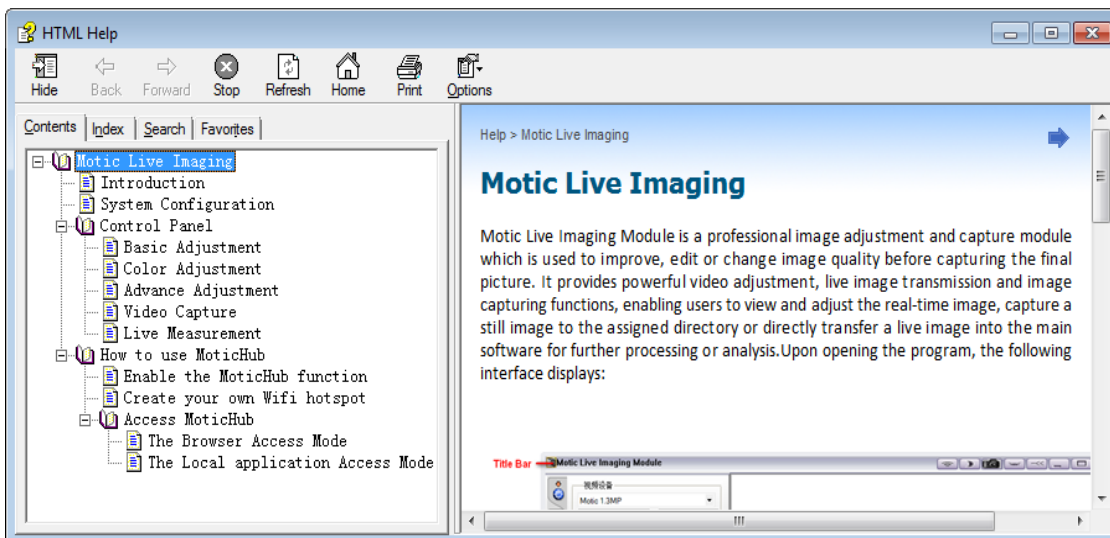
- The full Live Imaging Module manual is accessible within the live Imaging main page.
- To begin, open the Motic Images Software.
- At the top of main screen find the menu tab labeled File and click on Capture:



- 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:



## COMMON MICROSCOPY PROBLEMS

If you have a problem, you may be able to correct it yourself. Here are a few common problems and easy solutions you may want to try before calling for service.

**CAUTION** – Never disassemble, electrical, mechanical or optical components. This servicing should only be done by an authorized Swift technician. The Limited Lifetime Warranty will be null and void if disassembled by a non-Swift dealer.

- A. **PROBLEM** - Image appears “washed out” or weak  
**CORRECTION** -
  1. Slowly close the iris diaphragm.
  2. Objective lens is dirty. See “Care and Cleaning” Section
  3. Eyepiece is dirty. See “Care and Cleaning” Section
- B. **PROBLEM** - Hairs or dust seem to be moving in the image  
**CORRECTION** - The iris diaphragm is not open wide enough. Slowly open the iris diaphragm to increase the size of the opening allowing for additional illumination.
- C. **PROBLEM** - Unable to bring specimen into focus with any objective  
**CORRECTION** - Eye lens of the eyepiece is partially unscrewed. Remove the eyepiece and screw the two sections together.
- D. **PROBLEM** - Image of the specimen goes out of focus all by itself.  
**CORRECTION** – Increase the focus tension by turning the tension knob found next to the left coarse focus knob.
- E. **PROBLEM** – Focusing knobs turn with difficulty even with tension knob loosened.  
**CORRECTION** - Microscope should be disassembled by qualified, authorized repairman, cleaned and re-lubricated.

## CLEANING YOUR MICROSCOPE

Swift 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 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:

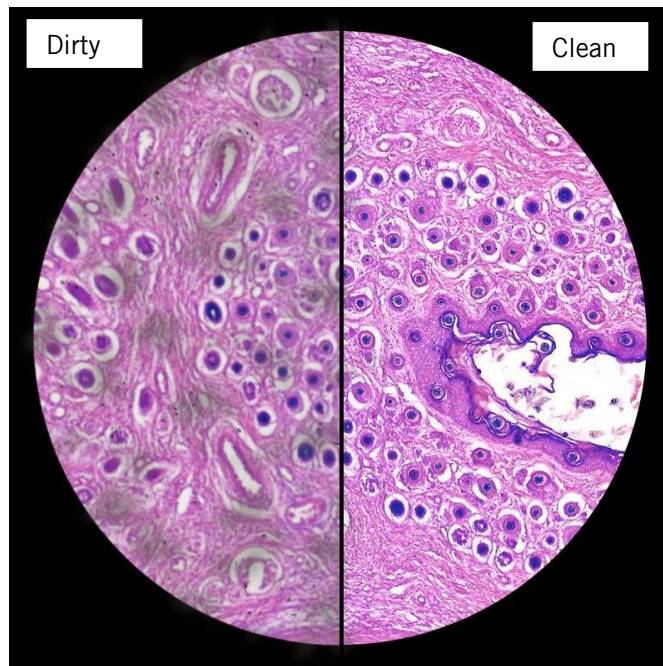
- Dirt on the outer or inner eyepiece lens.
- Dirt on the front lens of the objective.
- Dirt on the upper lens of the condenser.
- Dirt on the surface of the sample slide glass.
- Dirt on the upper lens of illuminator.
- Dirt on other optical components of the microscope such as mirrors, lamps, filters,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

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.



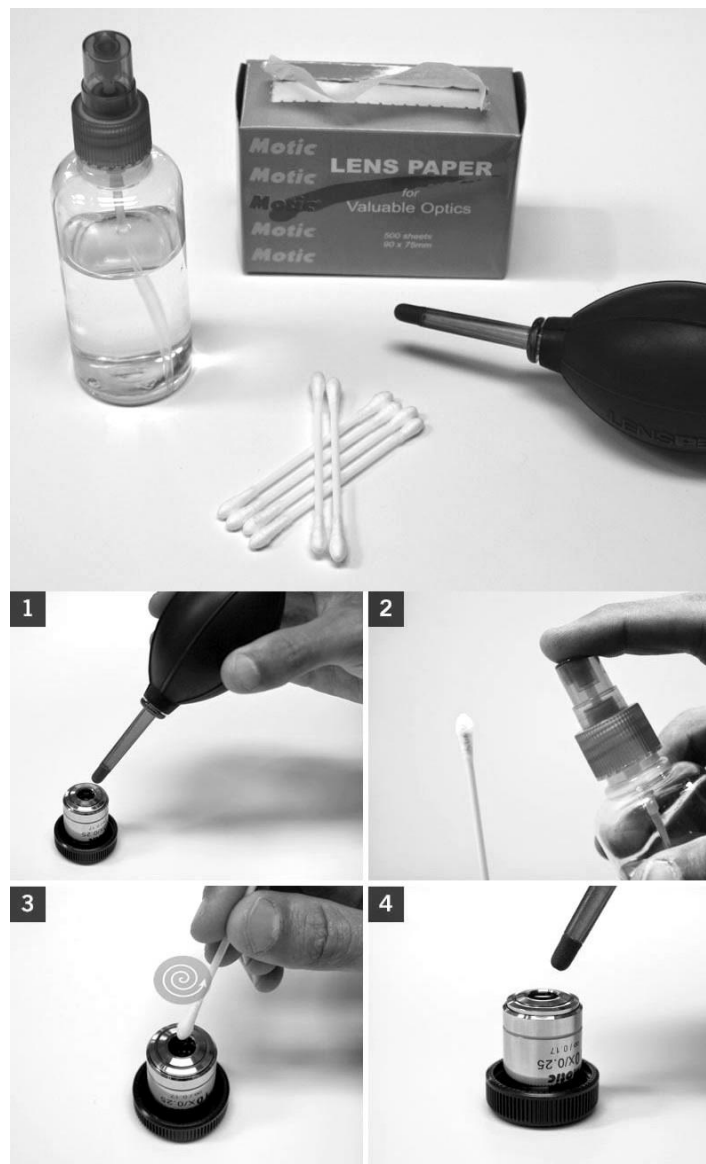


**Objectives** are the optical component of the microscope that require the most maintenance. Because for their actual use, they can get dirty easily.

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.



**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 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 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.

## **MAINTENANCE**

### **WARNING**

**For your own safety, make certain that battery recharger is unplugged and removed from microscope jack before maintenancing your microscope.**

#### 1. OPTICAL MAINTENANCE

Do not attempt to disassemble any lens components. Consult a microscope service technician when any repairs not covered by instructions are needed.

Prior to cleaning any lens surface, brush dust or dirt off lens surfaces using a camel hair brush. Or use air to blow dust and lint off surfaces. Use of compressed air in a can, available at any computer supply store, is a good source of clean air.

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 hex socket set screw by rotating in a counterclockwise direction. With fine focus adjustment at mid-range, focus on a standard slide until sharp image is obtained. Rotate rack stop 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 the arm and coarse focus knob on left side of microscope. With 0.90mm "L" type key wrench, loosen the 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 rubber band will provide a better grip on the tension adjustment collar. After adjusting, tighten the 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 microscope stage 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.

### 3. ELECTRICAL MAINTENANCE

The extent of electrical maintenance, by other than a qualified technician, should be LED replacement, battery recharging and battery replacement. Before maintenance, be sure that recharger is not connected to microscope.

#### a. Recharging batteries:

Plug output cord from battery charger into DC recharging socket located on back of microscope base. Your automatic switching recharger operates on 100 to 240 volts AC 50/60 Hz, plug recharger into your AC wall outlet. The red LED indicator lamp located on recharger will be illuminated when batteries are receiving maximum charge. After batteries are charged, the red LED indicator lamp will turn to green and charger automatically switches to “trickle charge”. The charger can be left plugged in, but for safety reasons it is a good idea to disconnect the charger from the AC wall outlet and the output cord from recharging socket after 12 hours. Batteries and charger may feel warm when charging, and unplugging the recharger is a safety precaution.

You may operate the microscope light even while it is being recharged. Simply flip light switch to “on” position and continue using microscope while the recharger is fully engaged.

#### b. Replacing batteries:

Your microscope includes 3 rechargeable AA nickel metal hydride batteries. These may be recharged up to 500 times, but if you observe that a recharge is providing significantly less than 40 hours of operation. It is probably time to replace to batteries.

**IMPORTANT WARNING: DO NOT USE REGULAR ALKALINE BATTERIES IN THIS MICROSCOPE. ANY ATTEMPT TO RECHARGE ALKALINE TYPE BATTERIES COULD RESULT IN BATTERIES EXPLODING.**

Gently lay microscope on its side or back. Observe small door in center of microscope bottom base. Loosen slotted screw on door and open. Battery case is mounted on inside of door. Using small Phillips screwdriver, carefully remove Phillips screw that holds battery case together. Slide lid of case straight out to remove and expose batteries. Remove all 3 batteries and replace with new rechargeable AA nickel metal hydride batteries, making certain to insert with correct polarity according to markings on battery holder. Replace lid, close and secure door.

Follow instructions on new battery packaging to determine if they are already charged, or if they should be charged before initial use. If recharging is required, following directions in “3.a” above.

#### c. Replacing LED element:

An LED “bulb” will last up to 50,000 hours, so you don’t have to do this exercise very often.

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.

## **TROUBLESHOOTING**

<b>PROBLEM</b>	<b>REASON FOR PROBLEM</b>	<b>SOLUTION</b>
Light fails to operate.	Batteries fully discharged. Rheostat control not turned far enough. Light switch in 'off' position. LED "bulb" burned out. Fuse Blown	Recharge batteries. Turn rheostat to increase light intensity. Turn light switch on. Replace LED "bulb". Replace Fuse
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 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:**

#800-001 Replacement LED light  
#802-003 Auto cut-off recharger for rechargeable LED microscopes

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



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