

# Swift M3 Series Micro/Macro Microscope

Use and Care Manual

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## Swift M3 Series Micro/Macro Microscope

### **M3-M / M3-B**

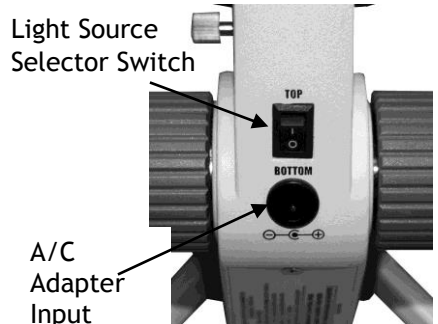
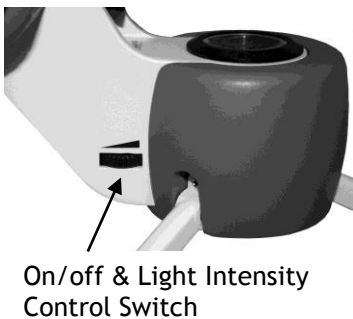
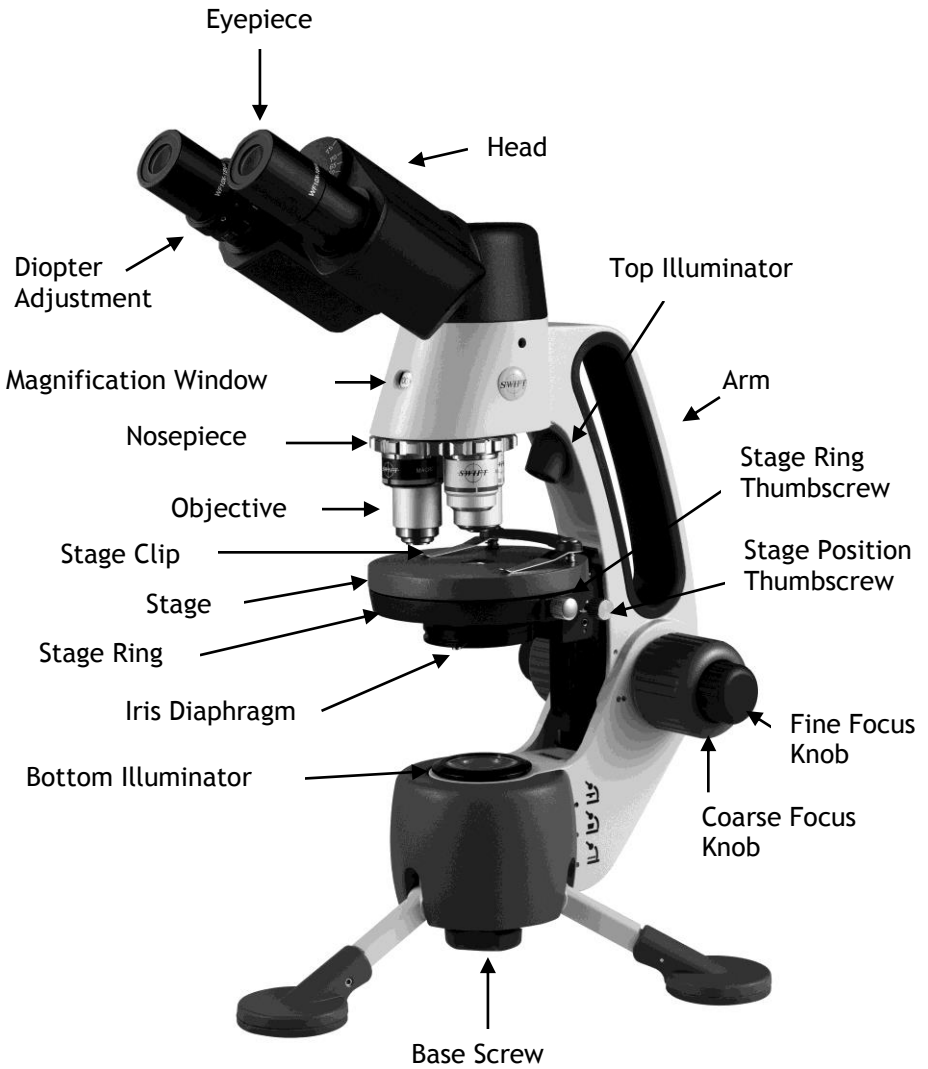
The Swift M3 is a versatile microscope designed for both microscopic (high magnification, small field of view) and macroscopic (low magnification, large field of view) applications. Micro/macro optical capability combined with an innovative modular stage design produce a sophisticated instrument designed to perform for many years in numerous applications.

The M3 is equipped with an adjustable stage that allows the viewing mode to be changed. The microscope stage can be placed in the uppermost position, the “micro” mode, or by lowering the stage to its middle or lowest position it can be placed in the “macro” mode.

The M3 is equipped with multiple stage inserts for observation of specimens which include a stage plate with an integrated 0.65 N.A. condenser for microscopic use and an optically clear specimen cup or a black/white contrast plate for macroscopic use. The M3 features top and bottom rechargeable LED illumination for cordless operation both indoors and out.

### **M3-F**

A truly unique concept in microscopy! The M3-F forensic microscope offers professional features at a highly competitive price point. Use the M3-F's revolutionary technology to compare images in both micro and macro environments. The M3's dedicated macro lens, with a large working distance, allows you to view larger more bulky, “evidence” items. Swift's powerful optical system allows for images to be seen either 100% from the left microscope, 100% from the right, side-by-side, or overlapping. The M3-F is the first and only comparison microscope at this price level which can achieve overlapping images. With the optional C-mount adapter, you can easily attach any C-mount ready imaging device.



# Components of the Microscope

**ARM** – the frame that connects the head and the base of the microscopes. It also houses the illumination switch, carrying handle, stage ring, coaxial focus controls, and the incident (top) light.

**BASE** – attaches to the bottom of the M3 with a thumb screw located underneath the tripod base. The tripod legs extend out to ensure stable footing or fold in for storage. \*

\* The M3 can also be mounted on a standard camera tripod for use in the field.

**COAXIAL CONTROLS** – the coaxial focusing system combines both the coarse and fine focus into one focusing mechanism located on both sides of the microscope. The large gray knob is the coarse focus control and the smaller blue knob is the fine focus control.

**COARSE FOCUS** – the larger, outer knob of the focus control which facilitates rapid and heavy movement of the focusing mechanism. In order to prevent gear damage, the focus control is equipped with an upper limit stop that protects the high magnification objectives and slides.

**DIOPTR ADJUSTMENT (M3-B & M3-F only)** – located on the left eyepiece of the binocular head, this adjustment compensates for the differences between the users' eyes.

**EYEPIECE(S)** – the upper optical element that further magnifies the primary image of the specimen and brings the light rays into focus at the eye point. The M3 has widefield 10X magnification eyepiece(s) with an 18mm field of view.

**FINE FOCUS** – the smaller, inner knobs of the coaxial control which allow for slow and subtle focusing movement to bring the specimen into sharp focus.

**HEAD** – the upper portion of the microscope which contains the refracting prisms and the eyepiece tubes which hold the eyepieces.

Note that the head rotates, allowing operation from the front or back.

**ILLUMINATION** – the Swift M3 uses a low voltage Light Emitting Diode (LED) for both transmitted (bottom) and incident (top) light.

(The illumination system may be used while the M3 is charging.)

**IRIS DIAPHRAGM** – The iris diaphragm is a round device that is mounted below the stage. It has multiple leaves similar to a camera shutter. Moving the control lever from side-to-side causes the opening in the diaphragm increases or decreases, allowing the user to control the contrast of the specimen. If the image is "washed out" the iris diaphragm is opened too wide. If the image is too dark the iris is not open wide enough.

**NOSEPIECE** – the revolving turret that holds the objective lenses. Changes in magnification are accomplished by rotating different powered objective lenses into the optical path. The nosepiece must "click" into place for the objectives to be in proper alignment.

**OBJECTIVES** – the optical systems which magnify the primary image of the instrument. Microscopic magnifications are 4X, 10X, 40X. The macroscopic magnification is 1X. The magnification of the objective combined with the magnification of the eyepiece gives a total 10X macroscopic magnification of the subject, and allows for total microscopic magnifications of 40X, 100X and 400X.

**SIEDENTOPF (M3-B & M3-F only)** – a binocular head design where the interpupillary adjustment (increasing or decreasing the distance between the eyepieces) is achieved by pivoting the eyepiece tubes in an up and down arc motion similar to binoculars.

**STAGE RING** – the circular ring located in the center of the microscope that supports the stage plate, black/white contrast plate, or specimen cup. These components are held onto the stage ring with a thumbscrew.

## Other Important Terminology

**“COATED” LENS** – in attempting to transmit light through glass, much of the light is lost through reflection. Coating a lens increases the light transmission by reducing or eliminating reflection, thus allowing more light to pass through.

**COVER SLIP** – thin glass cut in circles, rectangles or squares usually a thickness of 0.15 to 0.17mm, for covering the slide specimen. The majority of specimens should be protected by a cover glass, and must be covered when using 40XR objective.

**DEPTH OF FOCUS** – the ability of a lens to furnish a distinct image above and below the focal plane. Depth of focus decreases with the increase of numerical aperture or with the increase of magnification.

**DIN** – (Deutsche Industrie Normen) A German standard for the manufacturing of microscope lenses. DIN is not a quality standard, but one of commonality.

**EYE POINT or EYE RELIEF** – the distance from the eyepiece lens to your eye where a full field of view can be seen. A higher eye point accommodates users who wear eyeglasses

**FIELD OF VIEW** – the area of the object that is seen when the image is observed. It may range in diameter from several millimeters to less than 0.1mm, depending on the level of magnification.

**FOCAL LENGTH** – parallel rays of light after refraction through a lens will be brought to a focus at the focal point. The distance from the optical center of the lens to the focal point is the focal length.

**NUMERICAL APERTURE (NA)** – a measure of an objective's light gathering capabilities. The concept may be compared to the F-value in photographic lenses. Generally speaking, N.A. values of less than 1.00 are "Dry" objectives. Values of 1.00 or greater require oil as a medium. Please note that condensers are part of the optical system and are also assigned an N.A. value. That value must be at least as high as that of the highest objective used.

**PARFOCAL** – a term applied to objectives and eyepieces when practically no change in focus is needed when changing objectives. The objectives on your Swift M3 microscope are parfocussed at the factory so that only a slight adjustment of the fine focus knob is needed to maintain focus when switching magnification.

**RESOLUTION or RESOLVING POWER** – the ability of a lens to define the details of the specimen at a maximum magnification. This is governed by the N.A. (Numerical Aperture) of the lens. For example, a 40X objective with a N.A. of 0.65 has a maximum resolving power of 650X, equal to 1000 times the N.A.. This rule of N.A. x 1000 is true of all achromatic objectives.

**WORKING DISTANCE** – the distance from the lens of the objective to the cover slip on the slide, when the specimen is in focus.

## Using Your Swift M3

**CORDLESS OPERATION** – The rechargeable battery should be fully charged for approximately 8 hours before the initial use. It can be charged by using the 4.5 volt A/C adapter included with the microscope. An LED indicator light on the A/C adapter will be red while the battery is charging and will turn green when the battery is fully charged. The battery can be used to power the illumination system for approximately 40 hours. If the microscope is used in the same location, the A/C adapter can remain plugged-in without damage to the battery or recharging system.

**MAGNIFICATION** – The M3 comes with silver 4X, 10X and 40X objectives (for microscopic use only) and a black 1X objective (for macroscopic use only). The objective magnifications shown in the magnification window are color coded to correspond to the stage position icons on the side of the arm. Micro magnifications are written in blue to coordinate with the blue micro mode stage position. The 1X macro magnification is written in red to coordinate with the two macro mode stage positions.

### STAGE SELECTIONS

**SPECIMEN CUP** – a container used for collecting and viewing specimens at a macroscopic level. This container has adequate depth and has a ventilated optically clear lid for use with a variety of specimens.

**CONTRAST PLATE** – offers a black or white viewing background

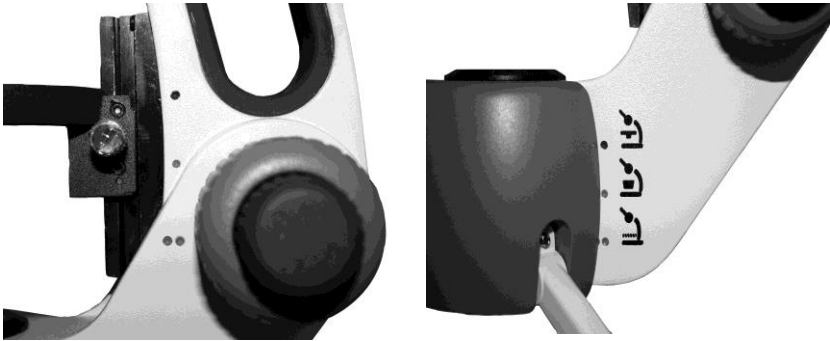
**STAGE PLATE** – the microscopic stage with a built-in 0.65 N.A. condenser, iris diaphragm, stage clips and swing out white filter.

**STAGE POSITION ADJUSTMENT** – proper stage height is critical for achieving the correct focusing distance for viewing micro or macro specimens. The stage can be set at 3 levels:

**MICROSCOPIC** – uppermost stage position. (Stage plate must be placed in the stage ring).

**MACROSCOPIC** – middle stage position. (Specimen cup must be placed in the stage ring).

**MACROSCOPIC** – lowermost stage position. (Black/white contrast plate must be placed in the stage ring).



For proper stage ring adjustment, loosen the stage position thumbscrew to raise or lower the stage ring housing to line up with the desired stage position indicator marks. Tighten the thumbscrew to secure the stage assembly in place. The macro indicator marks are the *suggested* positions for viewing most macro specimens. The macro stage ring positions may have to be adjusted slightly to find the best working distance for unusual sized specimens.

## Microscope Operation

**Step 1:** Loosen the stage ring thumbscrew on the right side of the stage ring. Insert the stage plate into the stage ring and secure it in place by tightening the thumbscrew.

**Step 2:** Loosen the stage position thumbscrew on the right side of the stage to move the stage assembly to its uppermost position. The red dot underneath the stage position thumbscrew should be lined up with the blue dot on the right side of the microscope arm near the coarse focus knob.

**Step 3:** Select the bottom (transmitted) illuminator by pressing the light source selector switch on the back of the microscope's arm to the bottom position.

**Step 4:** Turn on the illumination by rotating the light on/off & intensity control dial towards the bottom illuminator. (Note: Please notice that that the dial will "click" when turning on the light. When turning the unit off, please ensure that the dial is rotated all the way back until it "clicks" off to save power and prolong LED lifespan.)

**Step 5:** Place the slide on the stage, securing it with the stage clips. Center the specimen in the optical path.

**Step 6:** After securing and moving the slide into position, rotate the nosepiece to place the lowest power 4X objective into position over the specimen. Be sure the objective "clicks" into position. The iris diaphragm should be adjusted at this time to about a ¼ inch (5 mm) open.

**Step 7:** (M3-B & M3-F only) Adjust the Siedentopf binocular head (by moving the eyepiece tubes up and down in an arc-like motion, similar to adjusting binoculars) until one perfect circle is seen in the field of view

**Step 8:** While viewing through the eyepiece(s), rotate the coarse focus knob slowly and carefully to bring the specimen into focus. The specimen may require some centering in the field of view at this time. By using the fine focusing knob, slowly and carefully refine the focus to clearly observe the fine details of the specimen. Now you can turn the nosepiece to the higher magnification micro objectives. The objectives are parfocussed so that once the 4x objective is focused; only a slight turn of the fine focus is required to refine the focus when changing to higher power objectives.

**Step 9:** (M3-B & M3-F only) Set the diopter adjustment which is designed to help compensate for the difference between the user's eyes. To adjust, first bring the specimen into perfect focus by using the coaxial focusing knobs while looking through the eyepiece with the right eye only (close your left eye). Now, using your left eye only (close the right eye) turn the left eye diopter only (don't touch the focus controls) to obtain a crisply focused image. The diopter adjustment is now set and no further adjustment will be needed until a new operator uses the scope.

**Please note:** A smaller diaphragm aperture (opening) increases the contrast in the image while a larger aperture decreases the contrast. (The diaphragm is not intended for controlling the brightness of the illumination). A good procedure to follow in selecting the proper opening is to start with a large aperture and reducing it until the fine detail of the specimen is in exact focus. Using an inappropriate aperture results in a "washing out" of the image. Care must be exercised not to reduce the aperture too much to gain high contrast, as then the fine structure in the image of the specimen will be destroyed. Reducing the aperture *does* increase contrast and depth of focus, but it also reduces resolution and causes diffraction. The aperture for the 10X objective will not be the same as for the 40X objective, since the angle of the required light is determined by the numerical aperture (N.A.) of the objective. The proper aperture of the diaphragm can be easily achieved after minimal experience with the microscope.

## Macroscopic Operation

**Step 1:** Loosen the stage ring thumbscrew on the right side of the stage ring. Insert the specimen cup or the black/white contrast plate into the stage ring. The specimen cup is designed to be rotated while viewing a specimen so the thumbscrew does not need to be tightened. If the contrast plate is being used, tighten the thumbscrew to secure it in place.

**Step 2:** Loosen the stage position thumbscrew on the right side of the stage to move the stage assembly to the suggested middle position for specimen cup use (indicated by 1 red dot) or the lowest position for contrast plate use (indicated by 2 red dots). The red dot below the stage position thumbscrew should be lined up with the red dot(s) on the right side of the microscope arm near the coarse focus knob. If odd-sized specimens are being viewed, the stage assembly may have to adjust slightly off of the indicator marks to achieve the proper working distance in order to bring the specimen into focus.

**Step 3:** Select the top (incident) illuminator by pressing the light source selector switch on the back of the microscope's arm to the top position.

**Step 4:** Turn on the illumination by rotating the on/off & light intensity control dial towards the bottom illuminator.

**Step 5:** Place the specimen in the specimen cup or on the contrast plate and center it in the optical path.

**Step 6:** Rotate the nosepiece to place the 1X macro objective into position over the specimen. Be sure the objective "clicks" into position. (The 1X macro objective is the only objective that can be used in macro mode.)

**Step 7:** (M3-B & M3-F only) Adjust the Seidentopf binocular head until one perfect circle is seen in the field of view. This is accomplished by moving the eyepiece tubes up and down in an arc-like motion, similar to adjusting binoculars.

**Step 8:** While viewing through the eyepiece(s), rotate the coarse focus knob slowly and carefully to bring the specimen into focus. The specimen may require some centering in the field of view at this time. By using the fine focusing knob, slowly and carefully refine the focus to clearly observe the fine details of the specimen.

**Step 9:** (M3-B only) Set the diopter adjustment, which is designed to help compensate the difference between the user's eyes. To adjust, first bring specimen into perfect focus by using the coaxial focusing knobs while using your right eye only (close your left eye). Now, using your left eye only (close your right eye), adjust the left eye diopter only (do not adjust the focus control knobs) until the specimen is in sharp focus. The diopter is now set and no further adjustment to the diopter is needed until a new operator uses the scope.



## Care of Your Swift M3 Microscope

The M3 Series microscope is designed to function with minimal maintenance, but certain components should be cleaned frequently to ensure ease of viewing. The microscope's illumination should be turned off when the microscope is not in use to prolong electrical component life.

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

**CLEANING** - The front lens of the objectives should be cleaned periodically. First brush 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. 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.

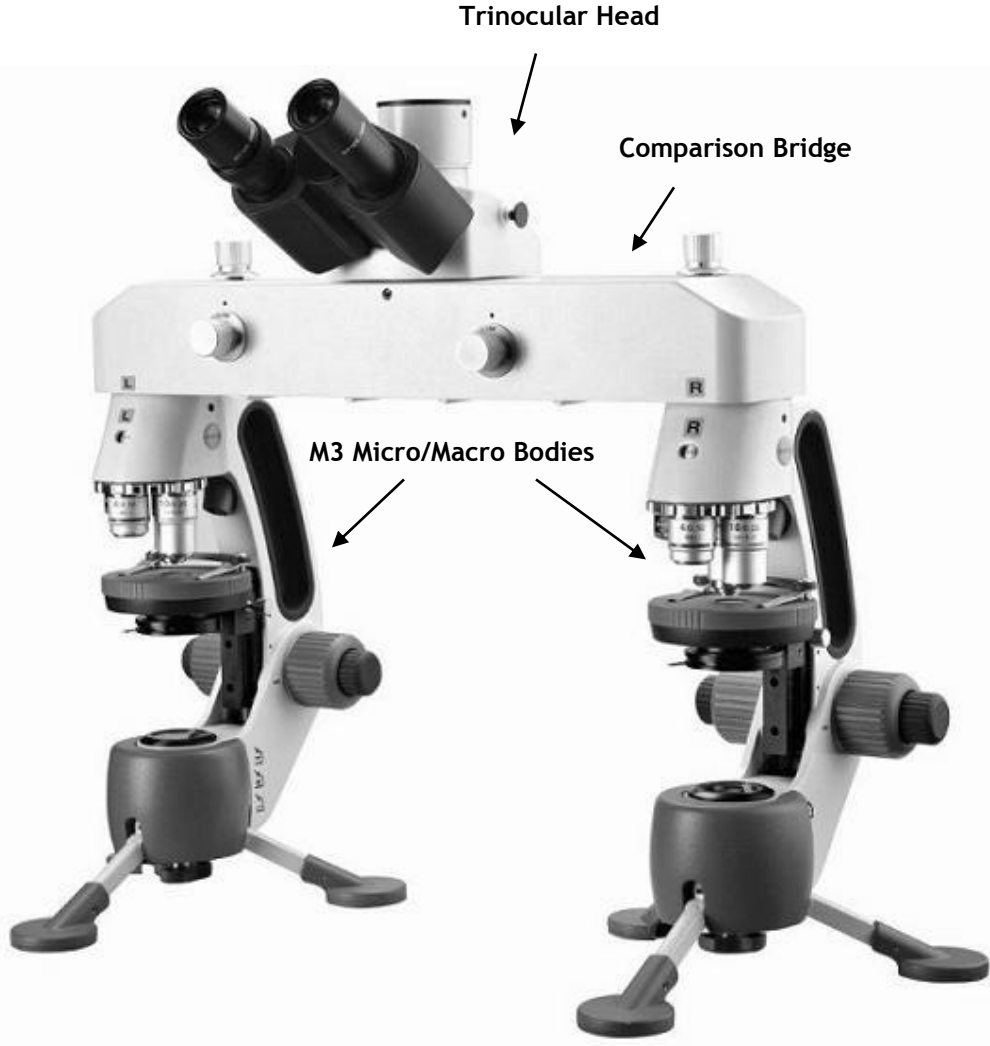
Periodically, the microscope should be disassembled, cleaned and lubricated. This should only be done by a qualified, authorized microscope technician.

**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.

**SERVICE** - If your microscope needs to be serviced or if parts need to be replaced, please contact Swift customer service for more information at (877) 967-9438.

# M3-F Comparison Microscope

The M3-F will allow you to observe both micro (prepared slides) and macro (bullets, minerals, insects ...) and compare them in one microscope.



## M3-F Elements

**Two M3 micro/macro bodies:** These two units consist of 4x, 10x, and 40x micro objectives and a dedicated 1x macro objective. The macro objective can be easily identified by its black color. The illumination is switched on by turning the illumination wheel on the bottom left of the scope. This also adjusts the intensity. Top or bottom light can be chosen by a switch on the back arm of each scope.

**One M3-F comparison bridge:** The bridge acts as a director of image paths from the two M3 bodies.

**One trinocular head:** The head consists of two WF10X/18mm eyepieces with a diopter on the left eye tube. The trinocular head has a beam-splitter built-in which will redirect the light path up into the trinocular port. The trinocular port allows the use of an optional c-mount camera adapter (MA15602).

**Two floating stage plates with stage clips:** These stages are used to carry prepared slides and have a sub-stage condenser already built in. These stages are easy to use as they feature the “one-touch” stage clip release and a “floating” stage movement mechanism. These stages can be removed and replaced with the other stage inserts mentioned below.

**Two sets of black/white stage plates:** These stage plates are useful when looking at 3D objects when either a white or a black background is needed for better contrast.

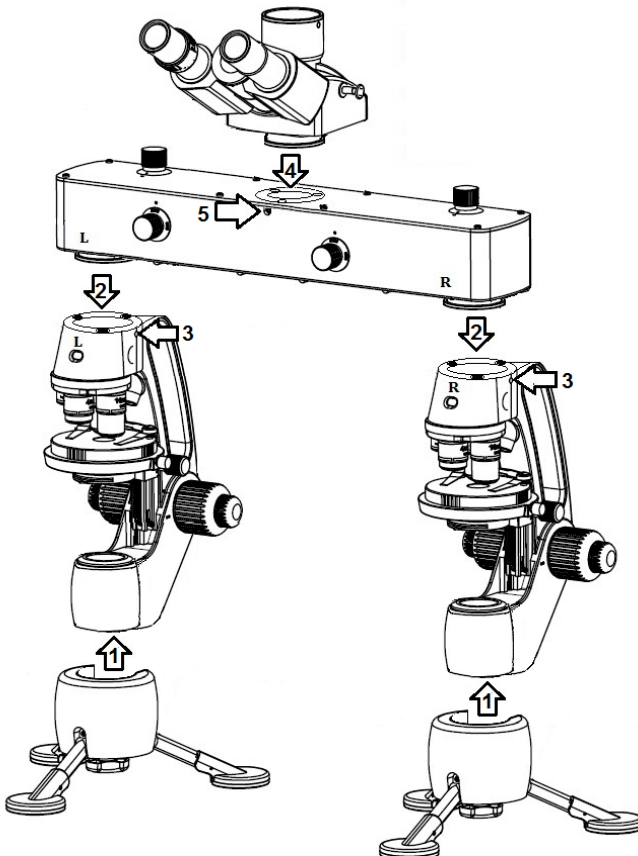
**Two sets of well-cups with lids:** These can be used to house even larger objects such as rocks or live specimens.

## Using the Comparison Bridge

### SETUP

The Bridge attaches to the top of the two M3 scope bodies. Please ensure that you align the stickers on the front of the scope with the stickers on the front of the bridge so that you have the left and right body in the proper place.

1. Using the included allen key wrench, tighten the bridge onto the two microscope bodies at the locking set screws located on the top right side of each M3. **Please do not, under any circumstance, pickup the unit by the forensic bridge.** If you need to move the unit from place to place, use the blue hand grips on the back of each M3 body.
2. Next, mount the trinocular head onto the top middle of the comparison bridge and tighten the corresponding locking set screw located on the center front of the bridge with the included allen key wrench.


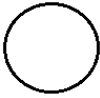

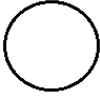






## Operation

On the front of the microscope, you will see two knobs marked "OPEN" and "CLOSE". These two knobs will regulate the light flow from the left and the right microscope. For example, if you wish to only look at the image of the left microscope, then turn the left knob to OPEN and the right knob to CLOSE. For viewing only the image of the right microscope, turn the left knob to CLOSE and the right knob to OPEN.

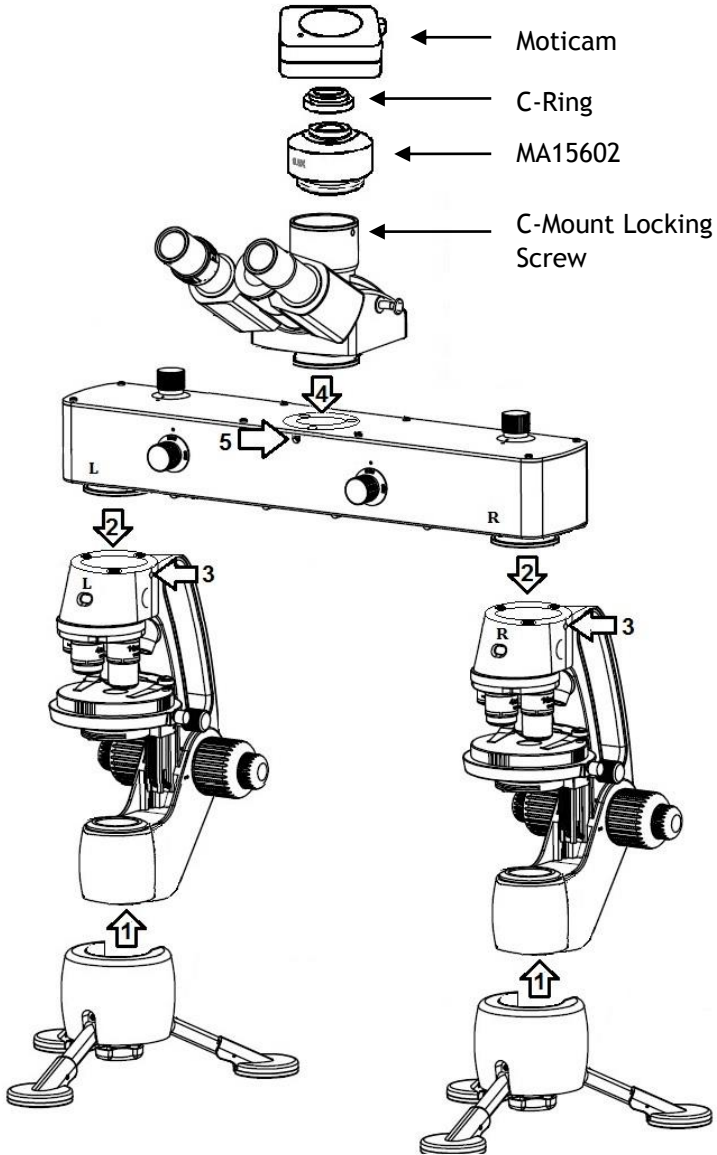
On the top of the microscope you will find two more knobs marked with an empty circle and a circle that is half dark. These knobs will allow you to regulate whether you wish to look at a side-by-side comparison (half dark circle) or an optical overlay comparison (empty circle).

**The following is a quick setting guide. This will show you the variety of combinations you can use.**

I want to see:	Front Left Knob	Front Right Knob	Top Left Knob	Top Right Knob
Only the image from the right microscope	CLOSE	OPEN		
Only the image from the left microscope	OPEN	CLOSE		
The images from the left and the right microscopes in a side-by-side comparison	OPEN	OPEN		
The images from the left and the right microscopes in an optical overlay comparison	OPEN	OPEN		

## Attaching D-Moticam Series Camera

Please note: Purchase of C-Mount Lens is necessary for camera attachment\*



\*C-Mount: Swift Part Number MA15602

Instruction for camera operation covered in separately.

**SWIFT OPTICAL INSTRUMENTS, INC. LIMITED 3 YEAR WARRANTY**

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