

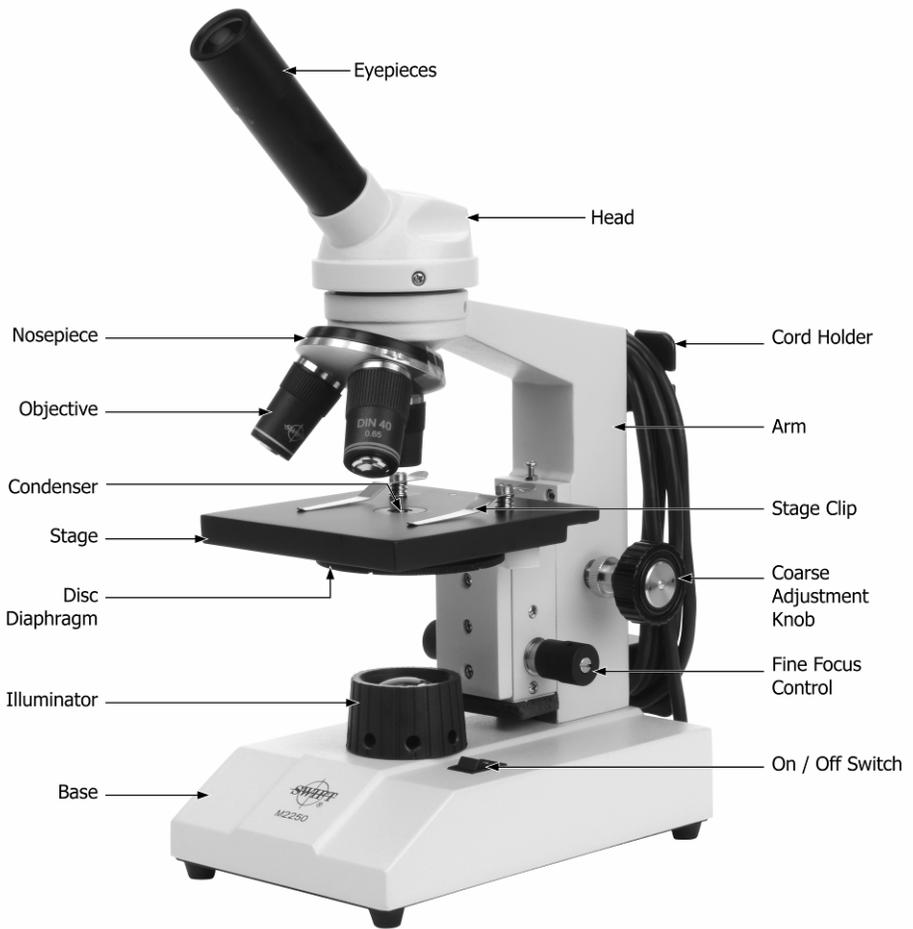
# Swift M2250 Series Microscope

## Care and Use Manual



## Swift Series M2250 Microscope

The M2250 Series is ideal for elementary to high school classrooms. Built to withstand student use, this series has locked-on eyepieces, objectives and stage clips, and a “slip-clutch” focusing system to protect gears from over-focusing. The M2250 Series is offered with several illumination options: standard tungsten; extra-bright, cool fluorescent; and LED for efficient, cool, white light that lasts up to 100 times longer than traditional tungsten bulbs.



PICTURED M2251B

## COMPONENTS OF THE MICROSCOPE

**ARM** - the vertical column (attached to the base) which supports the stage and contains the coarse and fine adjusting knobs and focusing mechanism.

**BASE** - the housing and platform of the instrument to which the arm is attached. The base stands on rubber feet and contains the illuminator assembly. The bulb replacement part number is printed on the underside of the base.

**COARSE FOCUS CONTROLS** - this model is a stage focusing model meaning the stage moves up or down by means of a brass rack and steel pinion gear to bring the specimen into focus. The movement is achieved by two large knobs on the sides of the arm. In order to prevent gear damage, the focus control is equipped with a slip clutch that allows slippage at both ends of the focusing range. The system is also furnished with a tension control to prevent "stage drift".

**CONDENSER** - the condenser is mounted in the stage and it is used in conjunction with a substage disc diaphragm (M2251B) or an iris diaphragm (M2251C, M2251CL). The function of the condenser is to provide full illumination to the specimen plane and to enhance the resolution and contrast of the object being viewed.

**DISC DIAPHRAGM (M2251B)** - the disc attached to the underside of the stage. The disc has 5 apertures (openings) and is used to increase or decrease the contrast of the specimen. Its purpose is to provide the appropriate aperture for the objective being used and assists with providing optimal contrast for viewing the specimen.

**EYEPIECE** - the upper optical element that further magnifies the primary image of the specimen and brings the light rays in focus at the eyepoint.

**FINE FOCUS CONTROLS** - the fine focusing knobs, located on either side of the microscope, in front of and slightly lower than the coarse focusing knobs, are used for precise focusing adjustments once the specimen has been brought into view with the coarse focus controls

**HEAD** - it is the top portion of the microscope that contains the refracting prisms and the eyepiece tube. The eyepiece is locked onto the eyepiece tube with a set screw. The head rotates allowing operation of the microscope from the front or the back, whichever is more

convenient, or allows the microscope to be shared by simply rotating the head.

**IRIS DIAPHRAGM (M2251C, M2251CL)** - a round multi-leaf device mounted below the condenser which is controlled by a lever. It is similar to a camera shutter and controls the amount of light entering the condenser, allowing the user to control contrast.

**NOSEPIECE** - a revolving turret that holds the objective lenses, permitting changes in magnification by rotating different powered objective lenses into the optical path.

**OBJECTIVES** - the optical systems which magnify the primary image of the instrument. Typical magnifications are 4X, 10X, and 40X.

**STAGE** - the platform on which the specimen slide is placed. The standard version comes equipped with locked-on stage clips, and is pre-drilled to accept an optional mechanical stage.

## 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.

**EYE POINT or EYE RELIEF** - the distance from the eye lens of the eyepiece to your eye where a full field of view is seen.

**FIELD OF VIEW** - the actual circular area seen through the eyepiece.

**PARFOCAL** - a term applied to objectives when very little fine focusing is needed to bring the specimen into focus when changing objectives.

**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 N.A. 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 MICROSCOPE

Once you have learned the terminology, the operation of the microscope is simple. By following these easy steps, you will be able to begin studying the specimen quickly and easily:

1. Place the slide on the stage and secure it under the stage clips. Be sure the specimen is directly over the opening in the stage.
2. Rotate the disc diaphragm to align the largest aperture (opening) in the disc with the opening in the stage.
3. Rotate the nosepiece to place the lowest power objective over the specimen. Be sure the objective “clicks” into position.
4. While viewing through the eyepiece, rotate the coarse focusing knob to bring the specimen into view. Next, sharpen the focus using the fine focus knob.
5. If the image of the specimen appears weak or pale, the disc diaphragm should be rotated to the next smaller aperture of the disc diaphragm or the iris diaphragm should be closed slightly. This will increase contrast in the specimen’s image.
6. Move the slide to place the specimen directly into the center of the field of view.
7. Rotate the nosepiece to the highest power objective. A slight turn of the fine focusing knob may be required to bring the image of the specimen into sharp focus. Once the specimen is in focus with the highest power objective, it will be in focus with each lower power objective.

EYEPIECE	OBJECTIVE	MAGNIFICATION	FIELD OF VIEW
W10X	4X, 10X, 40X	40X, 100X, 400X	4.10mm, 1.65mm, 0.41 mm

### (Model M2251C only)

The M2251C contains a rechargeable battery which allows the illuminator to operate without the need to have the microscope plugged into an electrical outlet. The rechargeable battery may need to be initially charged before the microscope can be used cordlessly. Use the power

adapter that was included with the microscope to fully charge the rechargeable battery which will take approximately 8 hours. Once the batteries are fully charged, the microscope illuminator will operate for approximately 40 hours without being connected to an electrical outlet. The M2251C can also be used while the power adapter is connected. If the power adapter is left connected to the microscope, the rechargeable batteries will stop charging when they are fully charged and there is no danger of over charging the batteries. The rechargeable batteries have a life of approximately 500 power cycles.

## PARTS AND ACCESSORIES

MA10071	4XD Objective
MA10072	10XD Objective
MA10073	40XRD Objective
MA10512	W10X Eyepiece
MA10513	W10X Eyepiece with pointer
MA12004	High-drive mechanical stage
MA14281	Power adapter for M2251C (4.5V, 1A)
MA14283	Cold Holder for M2251B or M2251CL (Pair)
MA2201	120V, 20W bulb for M2251B
MA2215	3.4V, .06W LED for M2251C, M2251CL
MA268	Stage Clips
MA336	Dustcover

## CARE OF YOUR SWIFT SERIES M2250 MICROSCOPE

Swift M2250 microscopes are designed to function satisfactorily with minimum maintenance. Certain components should be cleaned frequently to ensure ease of viewing.

**CLEANING** - The front lens of the objectives (particularly the 40XRD) should be cleaned after use. First brush with a soft, camel hair brush or blow off with clean compressed air to remove dust particles. Then wipe gently with a soft lens tissue, moistened with optical cleaner (eyeglass or camera lens) or clean water and 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 a qualified, authorized 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 surely 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 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.

**BULB REPLACEMENT** - To prolong the life of the bulb you should always turn off the unit when not in use.

**NOTE:** Use a piece of lens paper instead of your bare hand when touching new bulbs. The oil from your hand will contaminate the bulb's glass envelope and cause it to fail prematurely.

(M2251B) To replace a bulb, you must first unplug the microscope and remove any slides on the stage. Carefully turn the microscope on its side, unscrew and open the hinged cover. The cable tie must be cut and removed in order to remove the bulb. Make sure the bulb is cool and remove it by carefully unscrewing the tungsten bulb. Install the new bulb into the socket. Close the hinged cover and tighten the screw to hold the hinged cover closed.

(M2251C, M2251CL) To replace an LED, you must first unplug the microscope, turn the power off and remove any slides on the stage. Use

the small allen wrench (.09mm) that was included with the microscope to loosen the set screws that hold the black plastic illuminator housing onto the base of the microscope. Remove the illuminator housing to expose the LED. Simply pull the LED straight up to remove it from the light socket. Align the 2 metal socket pins with the holes at the bottom of the new LED and push the LED onto the socket. Re-install the illuminator housing. (If the new LED does not work, try repeating the above procedure. Remove the bulb and re-install it using the opposite bulb socket pins to reverse the polarity.)

## TENSION CONTROL OF FOCUSING MOVEMENT

The focus tension is easily adjusted by using the collar found on the coarse focusing controls, between the knob and upright support. A clockwise turn of this collar moves it toward the upright support and increases tension, while a counter clockwise turn moves the collar toward the knob and decreases tension.

## COMMON PROBLEMS IN MICROSCOPY

**A. PROBLEM** - The illuminator light does not come on.

### CORRECTION

1. Make sure the microscope is plugged into a functional electrical socket.
2. Make sure the batteries are properly charged. Plug the power adapter in and see if the microscope will turn on (M2251C).
3. The bulb may need to be replaced. See "Bulb Replacement on page 7.

**B. PROBLEM** - Image appears "washed out" or weak.

### CORRECTION

1. Rotate disc diaphragm to smaller aperture or slightly close the iris diaphragm.
2. Objective lens is dirty. Clean as described under "Cleaning".
3. Eyepiece is dirty. Clean as described under "Cleaning".

**C. PROBLEM** - Dust or hairs seem to be moving in the image.

### CORRECTION

Disc diaphragm is at too small an aperture. Rotate to larger aperture.

**D. PROBLEM** - Unable to bring specimen into focus.

**CORRECTION**

1. Eye lens of the eyepiece is partially unscrewed. Remove the eyepiece and screw the two sections together.
2. The nosepiece may need to be rotated to "click" an objective into the correct position.
3. The specimen may not be centered properly on the stage and needs to be re-positioned to be in the optical path

**E. PROBLEM** - Image of the specimen goes out of the focus all by itself.

**CORRECTION**

Use the tension control collar to tighten the focusing mechanism found on the coarse focus spindle.

**F. PROBLEM** - Focusing knobs turn with difficulty even with tension-collar loosened.

**CORRECTION**

Microscope should be disassembled, cleaned and re-lubricated by a qualified, authorized technician.

## **SWIFT OPTICAL INSTRUMENTS, INC. LIMITED LIFETIME WARRANTY**

The Swift Optical Instruments, Inc. Limited Lifetime Warranty assures that the microscope is guaranteed against defects in material and workmanship for the life of the product. Electrical components are covered for three years; video components are covered for one year after purchase. Normal wear, routine maintenance, light bulbs, power supplies, rechargers, batteries, fuses, cords, add-on accessories, damage resulting from repair by unauthorized parties, accident, alteration, shipping, misuse or abuse is not covered. Warranty service is provided by Swift Optical Instruments, Inc.'s authorized technicians. Determination of warranty is at the technician's discretion.

Other than set forth above, Swift hereby disclaims all warranties, expressed or implied, of fitness for a particular purpose.

Defective products covered by the warranty will be repaired free of charge when they are returned, postpaid, to:

Swift Optical Instruments, Inc.  
Attn: Warranty Repair  
11113 Landmark 35 Drive  
San Antonio, TX 78233

For all warranty repairs or service requests, please call the Swift repair department at (877) 967-9438 before anything is shipped. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

\*For customers living outside the United States, Swift Optical Instruments, Inc. will provide standard warranty service. However, inbound & outbound shipping cost is the responsibility of the consumer.

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