

Swift M7000 Series Microscope

Use and Care Manual

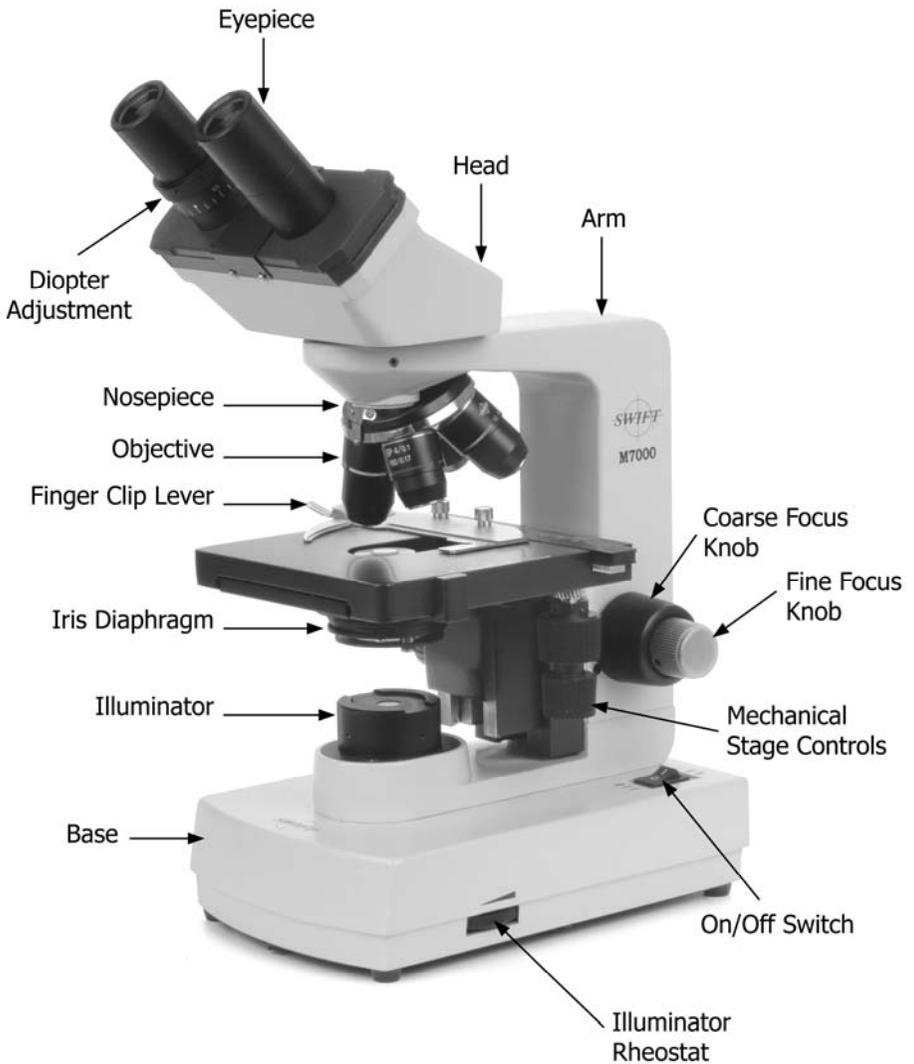
SWIFT OPTICAL

Enduring Quality and Technical Excellence



SWIFT M7000 SERIES

The Swift M7000 Series offers tremendous value and quality. The smaller footprint accommodates small spaces, yet, it has all the standard research microscope features. This series is ideal for advanced high school biology, college or vet/medical applications. Combining rugged design with high-performance semi-plan objectives (sealed 40x and 100x), this microscope is ideal for multi-user, clinical, and taxing student environments.



PICTURED M7000C

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 focus 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.

COARSE FOCUS - the larger, outside 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 stopper that protects the high magnification objectives and slides. The system is also furnished with a tension control to prevent "stage drift".

COAXIAL CONTROLS - the focusing mechanism moves the stage up and down to bring the specimen into focus. The coaxial focusing system combines both the coarse and fine focus into one knob located on both sides of the microscope. The clutch mechanism is equipped with a safety slipping feature (which comes in to play at either end of the focus range) as a protection for the brass rack and steel pinion gears. The control is designed for a continuous operation over the range of the stage movement.

CONDENSER - 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. The standard condenser of the M7000 has a Numerical Aperture of 1.25 with iris diaphragm. It is mounted in a sub-stage focusing assembly that can be raised or lowered for precise light control.

DIOPTRER ADJUSTMENT - located on the left eyepiece of the binocular head and is designed to help compensate the difference between the user's eyes.

EYEPIECES - 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 - the smaller inner knobs of the focus control which allows 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 M7000C base uses a 3.4V, .06W LED (Part # MA2215). The M7000D base uses a 12V, 20W halogen bulb (Part # MA781).

IRIS DIAPHRAGM - a multi-leaf round shaped device which is controlled by a lever. It is similar to a camera shutter, and is installed under the condenser. By moving the lever back and forth, the iris diaphragm opens and closes, increasing and decreasing 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, permitting changes in magnification 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. Magnifications are usually 4X, 10X, 40X and 100X.

STAGE - the table of the microscope where the slide is placed for viewing. This component moves upward and downward when the focusing knobs are turned. The stage of the Swift M7000 has a built-in mechanical stage with a sub-stage "X" and "Y" axis controls. A finger clip holds the slide securely and is designed to be a slow return holder to provide protection to the specimen.

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.

COMPOUND MICROSCOPE - a microscope having a primary magnifier (the objective) and a second (the eyepiece) to both conduct light, amplify magnification and convert the image into a field of view easily seen by the human eye.

COVER GLASS - thin glass cut in circles, rectangles or squares, for covering the specimen, usually a thickness of 0.15 to 0.17mm. The majority of specimens should be protected by a cover glass, and must be covered when using 40XRD or 100XRD objectives.

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 Industrial Normen *originally Deutsches Institut für Normung.*) A German standard for the manufacturing of microscope lenses. DIN lenses will be interchangeable from one DIN microscope to another.

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

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.

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 M7000 microscope are parfocalized 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 NA (Numerical Aperture) of the lens. For example, a 40X objective with NA 0.65 has a maximum resolving power of 650X, equal to 1000 times the NA. This rule of $NA \times 1000$ 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 M7000 SERIES MICROSCOPE

Once you have learned the terminology and purpose of each component of the microscope, use of the microscope is simple and enjoyable. By following these easy steps, you will be able to begin studying the specimen quickly and easily.

1. Open the specimen holder of the mechanical stage by pressing the finger clip lever. Carefully place the slide against the stationary side and back edge of the mechanical stage. Now slowly release the finger clip lever allowing the specimen holder finger to hold the slide in place.
2. Align the specimen under the objective lens by using the adjustment knobs under the mechanical stage. The bottom knob moves the slide from right / left while the top knob adjusts the slide from front / back. These knobs allow for precise movement and scanning of the slide.
3. After securing the slide into position with the slide holder, turn the power switch on. Rotate the nosepiece to place the lowest power objective (4XD) into position over the specimen. Be sure the objective "clicks" into position. The iris diaphragm should be adjusted at this time to $\frac{1}{4}$ inch (5 mm) open.

If you have a Swift M7000 with a monocular head please omit steps 4 - 5.

4. For a binocular head, which has two eyepieces, the next step is to adjust the interpupillary distance (I.D.) and diopter adjustment ring of the binocular head. Set the interpupillary distance gauge and the diopter adjusting ring (on the left eyetube) to "62". Look through both eyepieces with both eyes open to see whether you can comfortably observe the specimen. If it is not comfortable for your

eyes, then carefully and slowly slide the front plate of the binocular head inwards or outwards until your eyes can see a single bright spot. Read the I.D. gauge, and then rotate the diopter adjusting ring to set it at the same number as the I.D. setting. Please note that binocular heads are aligned at "62" at the factory, as it is the standard I.D. for most people.

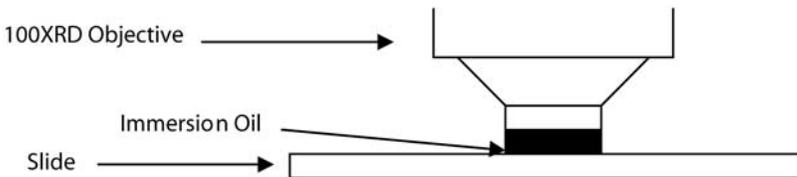
5. For additional optical correction of the binocular head, use the left eye diopter adjustment to correct the differences between the user's eyes. Close your left eye and focus with your right eye only. Now switch eyes. Using your left eye (close your right eye), adjust the diopter ring until a clear image is seen. The binocular head is now set for you to observe the specimen.
6. While viewing through the eyepiece, rotate the coarse focus knob slowly and carefully to raise the stage and bring the specimen into focus. The specimen may require some centering to the field of view at this time. Now 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 objectives. The objectives are parfocalized so that once the 4x objective is focused, only a slight turn of the fine focus is required in changing to higher power objectives.
7. Please note that smaller apertures of the iris diaphragm increase contrast in the image while large apertures decrease the contrast. (The iris 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 the largest and reduce 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 40XRD objective, since the angle of the required light is determined by the numerical aperture (N.A.) of the objective, the proper aperture of the iris diaphragm must be selected. This can be easily achieved after minimal experience with the microscope.

- When a dual view head is being used, please note that one side has a "straight" eyetube and the other has a "diopter adjustable" eyetube on the other. Focus the specimen using the straight eyetube first, then focus the other eyetube by adjusting the diopter ring to obtain the clearest image.

OIL IMMERSION

It is desirable to use immersion oil with the 100XRD objective. Using oil slightly increases the resolution and brightness of the image being viewed through the microscope. Drop a tiny amount of oil onto the slide prior to focusing with the 100XRD objective (between the slide and the objective tip). It is essential to thoroughly clean the objective tip after use. Please contact Swift Optical or your authorized Swift dealer for the appropriate immersion oil to use.

IMPORTANT: The focal distance of the 40XRD and 100XRD objectives to the slide surface is very close and although the 40XRD objective on the M7000 Series is sealed to prevent immersion oil contamination, it is a good practice to avoid dragging the 40XRD objective through an oiled slide.



PARTS AND ACCESSORIES

OCULAR HEAD REPLACEMENTS

MA11002	Monocular
MA11003	Binocular
MA11004	Trinocular
MA11013	Dual-view

EYEPIECE REPLACEMENTS

MA10512	W10XD, 18mm Eyepiece (single)
MA10513	W10XD, 18mm Eyepiece with pointer (single)

OBJECTIVE REPLACEMENTS

MA10081	4XD Semi-Plan
MA10082	10XD Semi-Plan
MA10083	40XRD Semi-Plan
MA10084	100XRD Semi-Plan

MISC. ACCESSORIES

MA336	Dustcover
MA516A	Diffusing filter (M7000D)
MA781	Halogen light bulb 12V, 20W (M7000D)
MA2215	LED 3.4V, .06W (M7000C)
MA14281	Power adapter (M7000C)
MA14283	Cord Holders (M7000D)

COMMON PROBLEMS IN MICROSCOPY

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.

WARNING - When working on the electrical systems, checking exposed wires or replacing components, make sure to unplug the electrical cord.

CAUTION - Never disassemble 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 the mechanical or optical components are disassembled by a non-Swift dealer.

A. **PROBLEM:** No Illumination

CORRECTION:

1. Is the power plug connected to an active A.C. outlet?
2. Is the battery pack charged? (M7000C)
3. Is the on/off power switch working properly?
4. Check the bulb. Try a new bulb if you have one.
5. Check the contact points of the bulb and socket

B. **PROBLEM:** Illumination "hot spots" and uneven brightness in the field of view.

CORRECTION:

1. Is the swing-out diffusing filter closed over the iris diaphragm? (M7000D)
2. Is the Abbe condenser in the correct position?
3. Is the nosepiece and objective in the click stop position?

C. **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.

D. **PROBLEM:** Dust or hairs 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.

E. **PROBLEM:** Focusing knobs turn with difficulty.

CORRECTION: The microscope should be disassembled, cleaned and re-lubricated by a qualified, authorized technician.

CARE AND CLEANING

The M7000 Series microscope is designed to function with minimal maintenance, but certain components should be cleaned frequently to ensure ease of viewing. The power switch should also be turned off or unplugged when the microscope is not in use.

CLEANING - The front lens of the objectives (particularly the 40XRD and 100XRD) should be cleaned after use. First brush with a soft, camel hair brush or blow 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 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 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.

BULB REPLACEMENT

M7000C LED Illumination

The Swift M7000C base is equipped with a 3.4 volt, .06 watt illumination system. The LED for this illumination system has approximately 100,000 hours of service. The time may vary depending on use and intensity. To prolong the life of the LED, you should always turn off the unit when not in use.

When purchasing replacement LEDs, it is important that you use only the Swift approved LED (Swift # MA2215). This LED has been tested and approved for life span, color temperature and brightness.

To replace an LED, you must first make sure the microscope is turned off. Use the 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.

M7000D Halogen Illumination

The Swift M7000D base is equipped with a 12 volt, 20 watt illumination system. The bulb for this illumination system is a Halogen type bulb with approximately 200 hours of service. The time may vary depending on use, intensity and brand of bulb used. To prolong the life of the bulb, you should always turn off the unit when not in use and turn down the dimmer switch when first turning the system on. This will prevent unnecessary filament shock to the bulb resulting in a much longer life.

When purchasing replacement bulbs, it is important that you use only the Swift approved bulb (Swift # MA781). This bulb has been tested and approved for life span, color temperature and brightness.

NOTE: Use a piece of lens paper instead of your bare hand because Halogen bulbs should never be handled. The oil from your hand will contaminate the bulb's glass envelope and cause it to fail almost immediately.

To replace a bulb, you must first unplug the microscope. Remove the eyepieces if they are not held in by screws and remove any slides on the stage. Carefully turn the microscope on its side, unscrew and open the illumination port. Make sure the bulb is cool and remove it by carefully pulling the bulb out of its two prong socket. Insert the new bulb by seating the bulb firmly into the socket. The bulb should not need further alignment. Close the port door and secure firmly.

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 five years; video components are covered for one year after purchase. Normal wear, routine maintenance, light bulbs or 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.

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 our 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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To Order Parts:
www.Swift-MicroscopeWorld.com
800-942-0528 Toll Free
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