

Swift M5 Series Microscope

Care and Use Manual



www.Swift-MicroscopeWorld.com
800-942-0528 Toll Free
760-438-0528 International
info@swift-microscopeworld.com



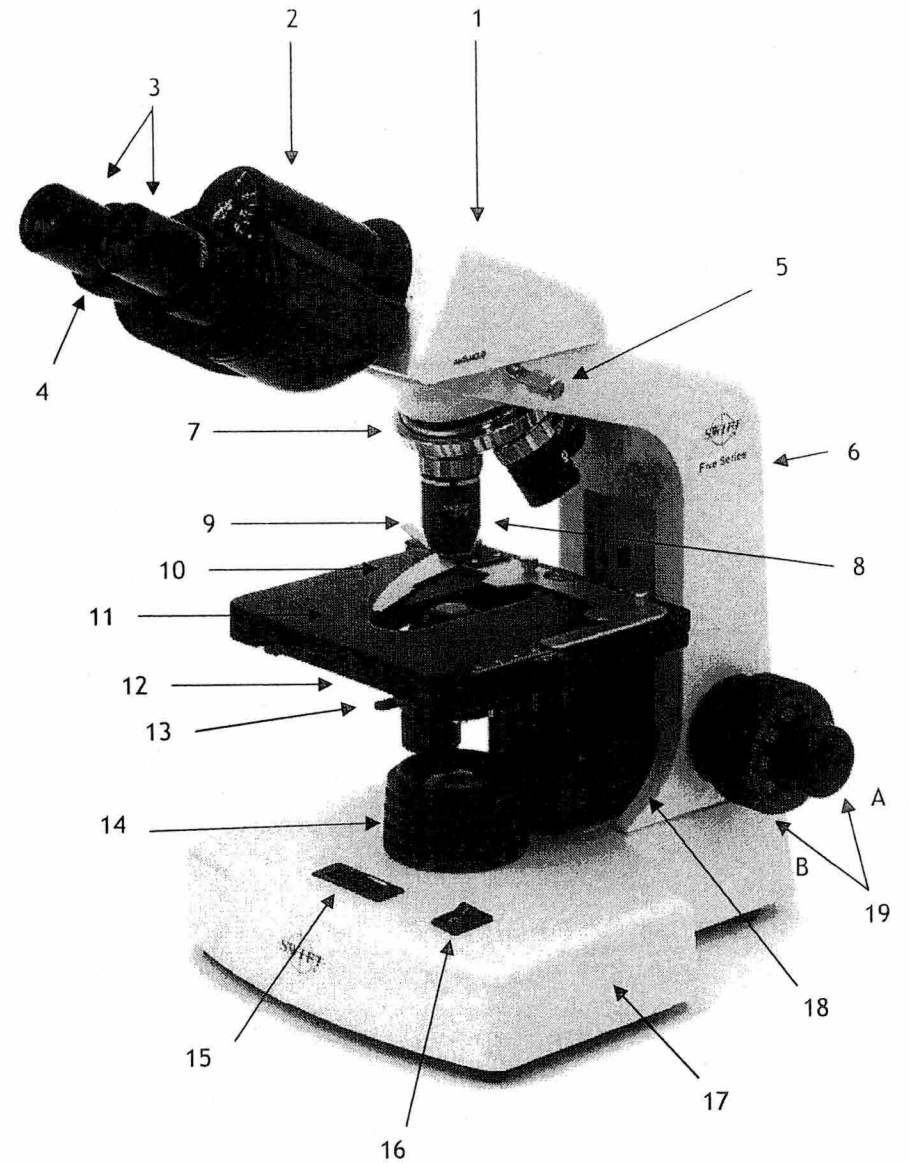
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PARTS LIST

1. Head
2. Siedentopf Binocular Head
3. Eyepieces
4. Diopter Adjustment
5. Thumbscrew
6. Arm
7. Nosepiece
8. Objectives
9. Finger Clip Lever
10. Finger Clip
11. Built-in Mechanical Stage
12. NA 1.25 Abbe Condenser (not shown)
13. Iris Diaphragm
14. Halogen Illuminator Assembly
15. Illuminator Rheostat (Dimmer Switch)
16. On/Off Switch
17. Base
18. Condenser adjustment knob
19. Coaxial Controls
 - A. Fine Focus Control
 - B. Coarse Focus Control



Swift M5 Series

UNPACKING INSTRUCTIONS

The Swift M5 microscope will arrive in multiple containers to accommodate the custom configurations available. Assembly is required before use. This includes the attachment of the objectives to the nosepiece, the head to the stand, the eyepieces to the head and the installation of the blue diffusing filter.

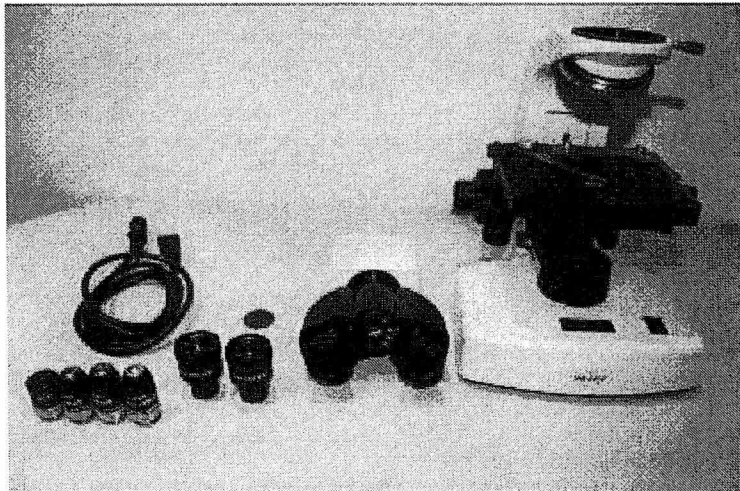
The Swift M5 microscope is packaged separately:

- Container One - Microscope Stand, blue diffusing filter and power cord, dust cover, immersion oil
- Container Two - Microscope Head (MA11008 - Trinocular Head comes with one W10XD, 18mm Eyepiece)
- Container Three - Eyepieces (MA10505 - W10XD, 20mm pair)
- Container Four - Objective Kit

If purchasing an M5-5, a Fifth box will contain a Single Objective (MA10025 or MA10036)

SWIFT M5 SERIES ASSEMBLY INSTRUCTIONS

The M5 microscope will come in multiple pieces because of the many customizable options available. The M5 will have to be assembled before use, which will include the attachment of the objectives to the nosepiece, the head to the body, the eyepieces to the head and the installation of the blue diffusing filter.



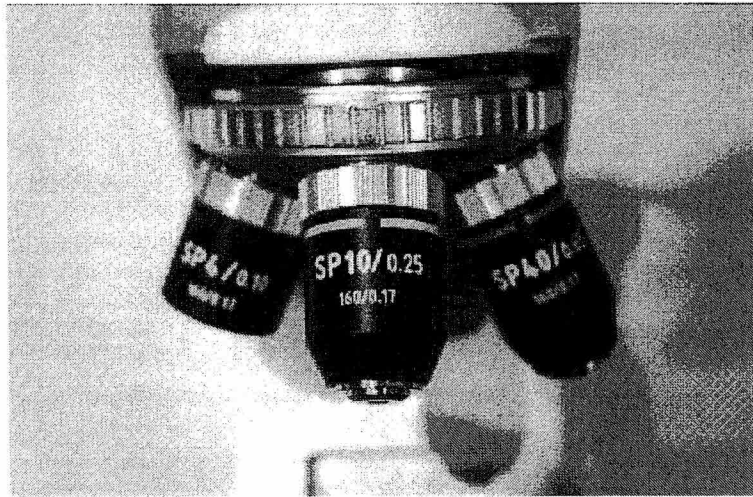
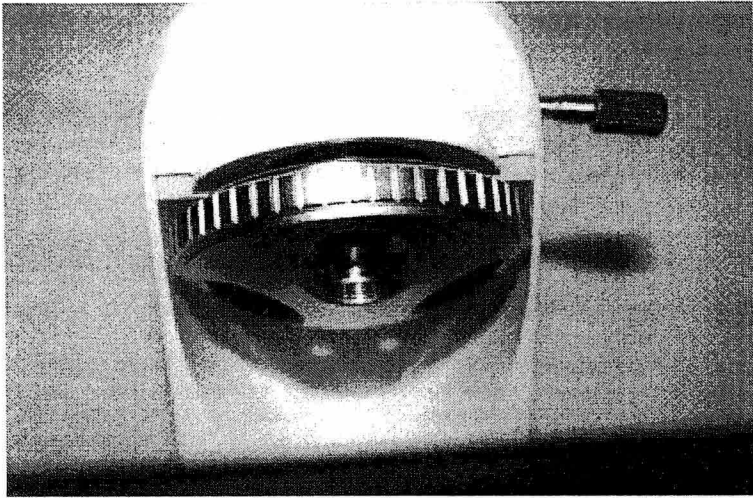
STEP 1: FILTER INSTALLATION

To install the blue diffusing filter use the silver knob at the bottom of the condenser to swing out the filter holder. Set the filter on top of the holder and swing the holder back into position.



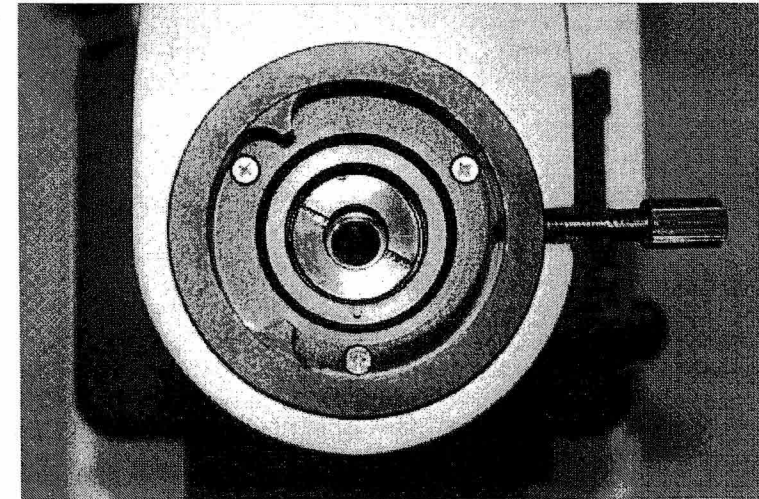
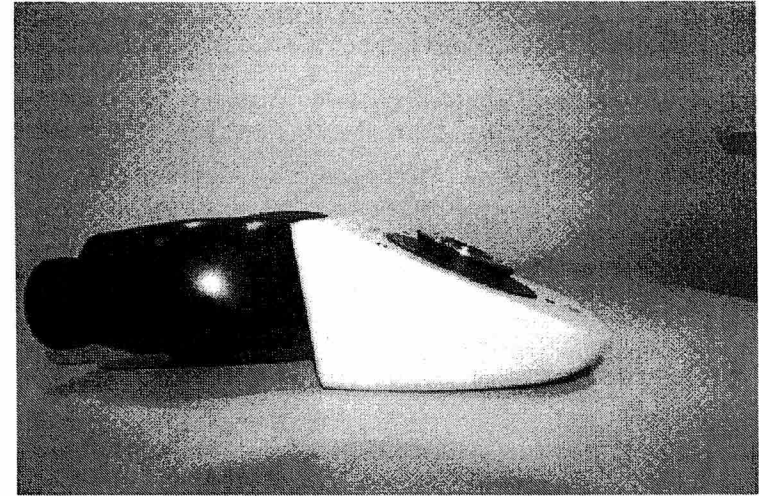
STEP 2: OBJECTIVE INSTALLATION

The objectives need to be screwed into the nosepiece by hand. All the holes in the nosepiece are the same. It does not matter which hole is used for a particular objective. The objectives are typically installed from the lowest to the highest magnification in a counter clockwise rotation (i.e. If the nosepiece is rotated to the left, the next highest power objective should be selected unless the 100X is being switched to the lowest power).



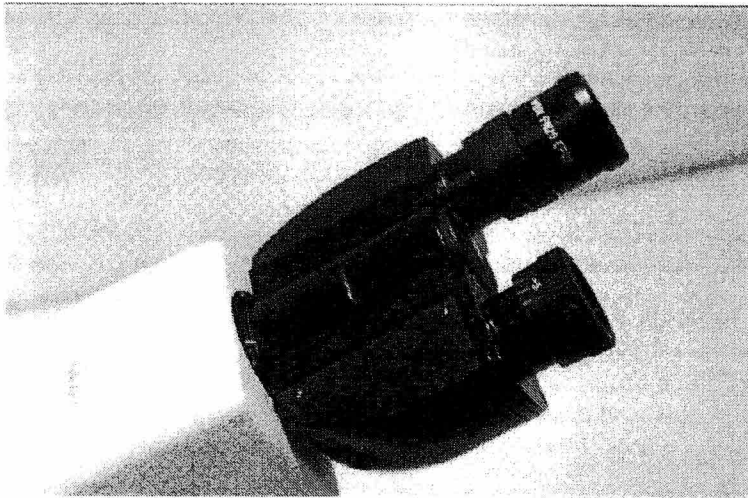
STEP 3: ATTACHING THE HEAD TO THE BODY

The bottom of the microscope head will have a round silver connector ring. The top of the microscope body will have a thumbscrew located next to the head mount. Loosen the thumbscrew to give the connector ring enough room to fit into the head mount. Lower the head so the connector ring fits level inside the head mount and tighten the thumbscrew to secure the head on to the body. To rotate the head in the future, loosen the thumbscrew and re-tighten it after the head is moved to the desired position.



STEP 4: EYEPIECE INSTALLATION

To install the eyepieces into the microscope head, gently slide the bottom of the eyepiece into the eyepiece hole of the microscope head. The smaller tube on the bottom of the eyepiece should slide all the way into the hole. If the eyepiece does not slide in smoothly, back out (loosen) the allen screw(s) located on the outside of the eyepiece hole. Once the eyepiece is installed, the allen screw(s) can be tightened to secure the eyepiece and prevent it from being removed.



COMPONENTS OF THE MICROSCOPE

HEAD - the casting which contains the refracting prisms and the eyepiece tubes which hold the eyepieces (with set screw).

SIEDENTOPF - a binocular head design where the interpupillary adjustment (increasing or decreasing the distance between the eyepieces) is achieved by twisting the eyepiece tubes in an up and down arc motion similar to binoculars.

The entire binocular assembly can also be rotated 180 degrees to gain an extra 2" in microscope height to accommodate diverse users.

TRINOCULAR - a binocular head with an additional vertical eyepiece tube and eyepiece primarily used for imaging purposes.

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

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

NOSEPIECE - the revolver that carries the objectives. The nosepiece must click into place for the objectives to be in the proper alignment.

OBJECTIVES - the optical systems which magnify the primary image of the instrument. Magnifications are usually 4X, 10X, 40XRD and 100XRD.

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.

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

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 M5 has a built-in mechanical stage with a below-stage ergonomic "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.

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 M5 has a Numerical Aperture of 1.25 with filter carrier and iris diaphragm. It is mounted in a sub-stage focusing assembly that can be raised or lowered for precise light control.

IRIS DIAPHRAGM - a multi leaf round shaped device similar to a camera shutter, with lever 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.

ILLUMINATION - the M5 Series uses a 6V, 20 watt Halogen bulb.

COAXIAL CONTROLS - 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.

COARSE FOCUS - the coarse focus control knobs move the stage up or down 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”.

FINE FOCUS - the fine focus control knobs bring the specimen into sharp focus.

PHASE CONTRAST - the phase contrast microscope reveals fine detail in transparent objects which possess very little contrast. Unstained living organisms and cells can be studied without destroying the specimen or changing its composition by using fixing and staining reagents. Before the advent of phase contrast such specimens could only be examined in transmitted light by closing down the substage condenser diaphragm to a small aperture. The narrow cone of illumination produced diffraction with destruction of detail.

OTHER IMPORTANT TERMINOLOGY

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.

PARFOCAL - a term applied to objectives and eyepieces that require little or no focus adjustment when switching from one power to another. The objectives on your M5 Series microscope are

parfocalized during manufacturing so that only a slight movement or no movement at all of the fine focus control is required when change is made from high to lower powers.

NUMERICAL APERTURE (NA) - a mathematical formula devised by Ernst Abbe for the direct comparison of dry and all types of immersion objectives for resolving power. Numerical Aperture (NA) is the sine of half the angular aperture of the objective multiplied by the refractive index of the medium between the front lens of the objective and the cover glass on the slide.

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

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 or focus.

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

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.

DIN - (Deutsche Industrial Norman) was originated as a West German standard of interchangeability. It is not a quality standard but one of commonality.

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.

“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.

USING YOUR SWIFT M5 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 "finger clip" of the mechanical stage by holding the "finger clip lever," and carefully place the slide against the fixed side and back edge of the mechanical stage. Now slowly release the "finger clip lever" allowing the "finger clip" 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. Rotate the nosepiece to place the lowest power objective (4XD) over the specimen. Be sure the objective "clicks" into position.
4. Adjust the interpupillary distance of the Siedentopf Binocular Head for a comfortable view. Align the barrels of the binocular head to create one perfect circle, by moving the barrels in an arc motion.
5. For additional focus on the Binocular Head, use the left eye diopter adjustment to correct the differences between the user's eyes. Set the adjustable left eye diopter at zero. Then focus, with the coaxial focusing knob, your right eye (close your left eye). Now using your left eye, adjust the diopter ring until a clear image is seen (close your right eye). Now the binocular head is set for you to observe the specimen.
6. While viewing through the eyepiece, rotate the coarse focus knob to bring the specimen into focus. This should be done slowly and carefully.
7. For additional contrast of the specimen, open the iris diaphragm to its largest aperture. If additional contrast is required to permit accurate viewing of the specimen, the diaphragm should be slowly closed until the details of the specimen are sharply defined. Be careful not to close the aperture too much. Although you may be achieving a higher contrast the fine structure of the image maybe destroyed. Reducing the aperture does increase contrast and depth of focus, but it also reduces resolution and introduces diffraction. The aperture must be adjusted for each objective.

NA 0.25 for 10XD
NA 0.65 for 40XRD
NA 1.25 for 100XRD

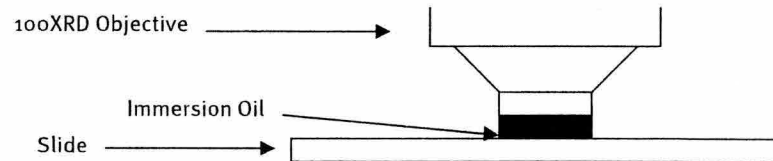
The iris diaphragm is not intended to control the brightness of the illumination but induce contrast of the specimen by diffracting light rays.

8. Use the fine focus control to complete the focus and produce the sharpest image.
9. Now you can rotate the nosepiece to higher magnification objectives. The objectives are parfocalized so that once the lowest objective (4XD) is focused, only a slight turn of the fine focusing knob is required when changing to 10XD, 40XRD or 100XRD objectives.

OIL IMMERSION

It is desirable to use immersion oil with the 100XRD objective. Oil generates a fine resolution and brightness of the image 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 Optics or your authorized Swift dealer for the appropriate immersion oil to use.

IMPORTANT: The focal distance of the 100XRD and 40XRD objective to the slide surface is very close and although the 40XRD objective on the M5 Series is sealed to prevent immersion oil contamination, it is a good practice to avoid dragging the 40XRD objective through an oiled slide.



PHASE CONTRAST

The phase contrast microscope reveals fine detail in transparent objects which possess very little contrast. Unstained living organisms and cells can be studied without danger of artifacts produced by killing, fixing or staining reagents. Before the advent of phase contrast such specimens could only be examined in transmitted light by closing down the substage condenser diaphragm to a small aperture. The narrow cone of illumination produced

diffraction with destruction of detail. The Swift M5 can be outfitted with a multi-phase system (MA10050) that includes a set of Plan Phase objectives and special pre-centered phase condenser carousel. This multi-phase system is also capable of darkfield. Please refer to the detailed instruction sheet enclosed with each phase kit for proper installation and use.

PARTS AND ACCESSORIES

Your Swift M5 microscope is designed and constructed for long term durability. Accessories are available to further enhance its use, and others are under development.

OCULAR HEAD REPLACEMENTS

MA11006	Binocular
MA11008	Trinocular

EYEPIECE REPLACEMENTS

MA10505	W10XD, 20mm Eyepieces (pair)
MA10500	W10XD, 20mm Eyepiece (single)
MA10501	W10XD, 20mm Eyepiece with micrometer scale (single)

OBJECTIVE REPLACEMENTS

MA10021	4XD Semi-Plan
MA10031	4XD Plan
MA10022	10XD Semi-Plan
MA10032	10XD Plan
MA10052	10XD Phase Plan
MA10025	20XD Semi-Plan (M5-5)
MA10026	20XD Oil Plan (M5-5)
MA10023	40XRD Semi-Plan
MA10033	40XRD Plan
MA10053	40XRD Phase Plan
MA10036	50XD Oil Plan (M5-5)
MA10024	100XRD Semi-Plan
MA10034	100XRD Plan
MA10054	100XRD Phase Plan
MA10050	Complete Phase System includes: 4X Plan, 10XRD Phase Plan, 40XRD Phase Plan and 100XRD Phase Plan Objectives; Multi Phase Disc Carousel; and Green Contrast Filter

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 disassembled by a non-Swift dealer.

A. **PROBLEM** - Illumination "hot spots" and uneven brightness in the field of view

CORRECTION

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

B. **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.

C. **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.

D. **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.

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

CORRECTION - Tighten the collar found on the spindle of the right focus knob using the tension wrench (included with the M5 Series).

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

CORRECTION - Microscope should be disassembled by qualified, authorized repairman, cleaned and re-lubricated.

CARE AND CLEANING

The M5 Series of microscopes are 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 blown off with air pressure from a rubber syringe, 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 qualified, authorized repairman.

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 repairman.

DUST COVER AND STORAGE - All microscopes should be protected from dust by a dust cover when not in use or in storage. 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

Your Swift M5 Series microscope is equipped with a 6 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.

Each microscope comes equipped with a factory installed, pre-centered bulb and a spare. When purchasing new bulbs it is important that you use only the Swift approved bulb (OSRAM 6v 20w #HLX64250, Swift #MA780). This bulb has been tested and approved for both life span, color temperature and brightness.

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. **NOTE: use a piece of lens paper instead of your bare hand because Halogen bulbs should never be handled.** The oils from your hand will contaminate the bulb's glass envelope and cause it to fail almost immediately. The bulb should need no further alignment. Close the port door and secure firmly.

Further information on your M5 Series microscope may be obtained from your authorized Swift dealer or by contacting Swift Optics directly:

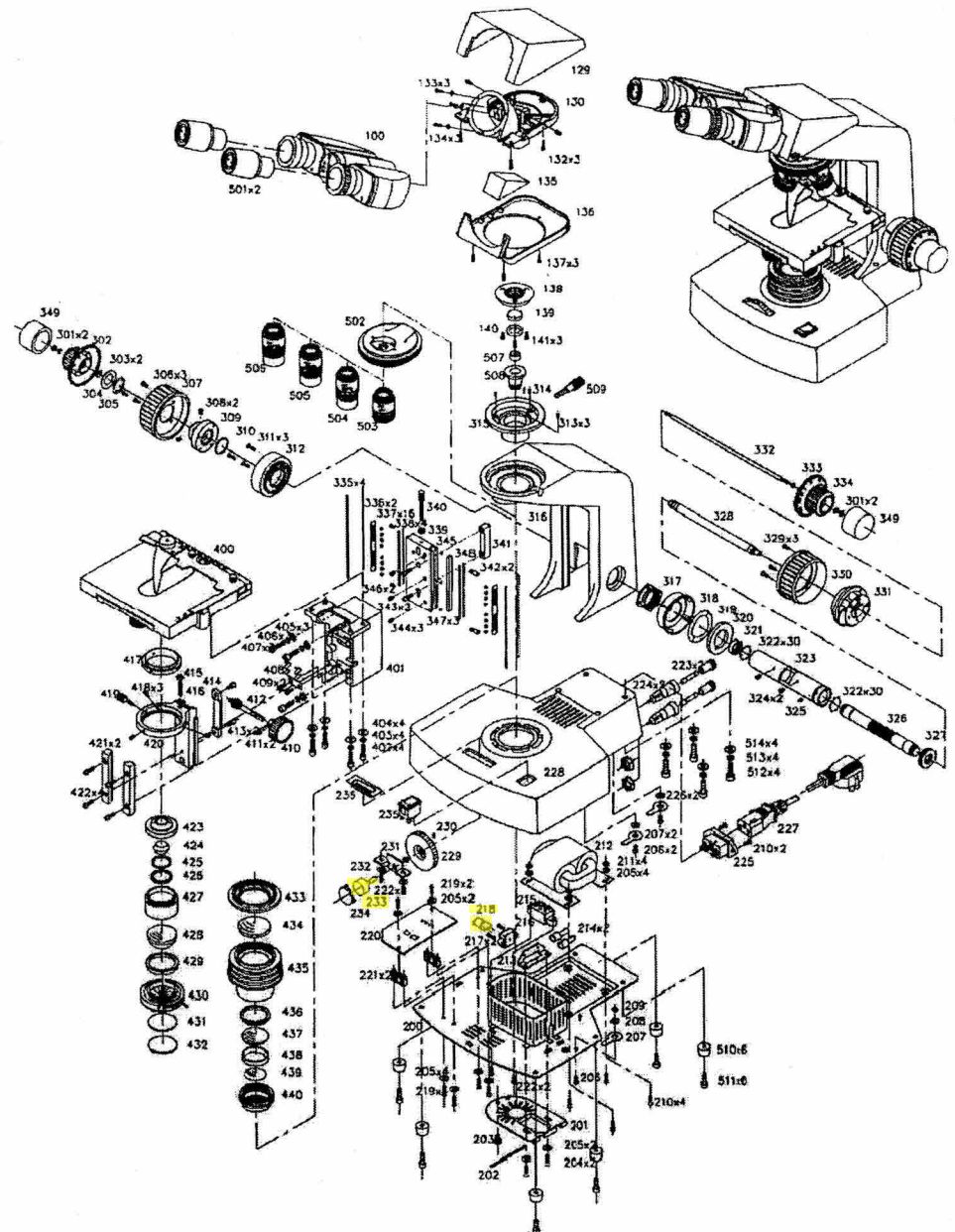
Swift Optics, 800.523.4544 or www.swiftoptics.com

SWIFT LIMITED LIFETIME WARRANTY

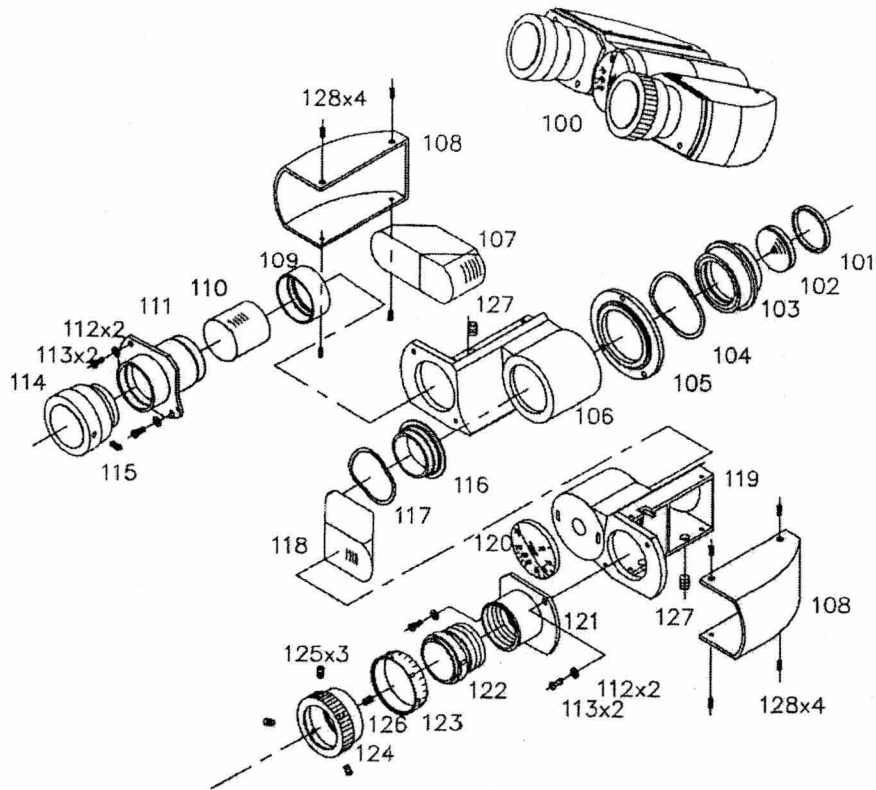
The Swift Optics Limited Lifetime Warranty assures that the microscope is guaranteed against defects in material and workmanship for the life of the product. Electrical components are covered for five years; video components are covered for three years. Normal wear, routine maintenance, light bulbs or damage resulting from repair by unauthorized parties, accident, alteration, shipping, misuse or abuse is not covered. Warranty service is provided by Swift Optics 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 Optics. For all warranty repairs or service requests, please call Customer Service at 800.523.4544 to receive a Return Authorization Number (RA). Returns will not be accepted without an RA. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Limited to USA.

SWIFT M5 SERIES BODY



SWIFT M5 SERIES BINOCULAR HEAD



Part Number	Description	Part Number	Description
100	Binocular Head	110	Columnar Lens
101	Retaining Ring	111	Tube
102	Auxiliary Lens	112	Washer
103	Lens Holder	113	Screw
104	Wave Washer	114	Set Drawtube
105	Lens Base	115	Screw
106	Prism Holder	116	Screw(2)
107	Glued Prism	117	Ripple Washer(2)
108	Cover	118	Wide Rhombus Prism
109	Retaining Ring	119	Prism Stand(L)

Part Number	Description	Part Number	Description
120	Dial	220	Circuit Board
121	Drawtube (L)	221	Connector
122	Inner Diopter Tube	222	Screw
123	Diopter Adjustment Ring	223	Safety Tube
124	Diopter	224	Safety Tube Holder
125	Screw	225	Jack
126	Screw	227	Link
127	Screw	228	Base
128	Screw	229	Volume Control Wheel
129	Cover	230	Screw
130	Prism Holder	231	Potentiometer Bracket
131	Screw	232	Washer
132	Screw	233	Potentiometer Parts
133	Screw	234	Potentiometer Jacket
134	Washer	235	On/Off Switch
135	Prism	236	Switch Frame
136	Binocular Head Base	301	Nut
137	Screw	302	Fine Focusing Knob (R)
138	Retaining Ring	303	Revise Washer
139	Auxiliary Lens	304	Washer
140	Retaining Ring	305	Ripple Washer
141	Screw	306	Screw
200	Base Plate	307	Coarse Focusing Knob (R)
201	Bulb Housing Cover	308	Screw
202	Cover Hinge	309	Axis Stand
203	Screw	310	Washer
204	Screw	311	Screw
205	Washer	312	Inside Tube
206	Screw	313	Screw
207	Washer	314	Pin
208	Welding Piece	315	Head Connector
209	Nut	316	Arm
210	Screw	317	Partition Plate
211	Nut	318	Hardwheel Lock
212	Transformer	319	Ripple Washer
213	Bracket	320	Pinion Washer
214	Wire Cap	321	Nut
215	110V/220V Switch	322	Steel Ball
216	Ceramic Socket	323	Pin on Metal
217	Screw	324	Screw
218	Halogen Lamp (MA780)	325	Screw
219	Screw	326	Pin on

Part Number	Description	Part Number	Description
327	Gear	417	Holder
328	Pinion Shaft	418	Screw
329	Screw	419	Set Screw
330	Coarse Focusing Knob (L)	420	Stage Holder
331	Gear Change Mechanism	421	Fine Adj. Guide
332	Fine Axis	422	Screw
333	Washer	423	Spiral Mount
334	Fine Focusing Knob (L)	424	Illum. Condenser Lens (A)
335	Steel Wire	425	Washer
336	Clapboard	426	Retaining Ring
337	Steel Ball	427	Condenser Lens Cover
338	Steel Wire	428	Illum. Condenser Lens (B)
339	Nut	429	Retainer
340	Screw	430	Diaphragm
341	Rack	431	Blue Filter
342	Screw	432	Green Filter (Phase)
343	Screw	433	Cover
344	Screw	434	Collector
345	Guide	435	Field Condenser
346	Screw	436	Spacer Ring
347	Steel Ball	437	Illuminator Lens
348	Guide Plate	438	Spacer Ring
349	Rubber Cover	439	Collector
400	Stage	440	Field Condenser Base
401	Bracket	501	Eyepiece
402	Screw	502	Nosepiece
403	Washer	503	Objective
404	Washer	504	Objective
405	Washer	505	Objective
406	Washer	506	Objective
407	Screw	507	Mirror
408	Shim	508	Connector Screw
409	Screw	509	Screw
410	Condenser Knob	510	Rubber Foot
411	Screw	511	Screw
412	Pinion	512	Screw
413	Screw	513	Washer
414	Rack	514	Washer
415	Nut	515	Washer
416	Screw	516	Screw