

USE AND CARE OF SWIFT SERIES M3300D
MICROSCOPE

SWIFT®



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USE AND CARE OF SWIFT M3300D SERIES MICROSCOPE

Your SWIFT M3300D Series microscope is an instrument of precision, both optically and mechanically and will last a lifetime with a minimum of maintenance. It is built to the highest and most rigid optical and mechanical standards and has many built-in features to insure durability and high performance in the hands of both student and professional users. It is designed to withstand the rigors of daily use with only normal care.

Unpacking: Your SWIFT M3300D Series microscope arrived packed in either a fitted cabinet or molded styrofoam container. The objectives may be in sealed plastic vials and care should be taken not to drop them or allow your fingers to contact the lenses. Install the objectives in a clockwise direction from the lowest to the highest power.

Familiarize yourself with the components of the microscope.

- Arm:** The frame that supports all components above the base.
- Body:** The unit comprising the inclined eyetubes and prisms which control the path of light to the eyepiece.
- Objective:** The optical system which does the initial magnifying to form the primary image.
- Nosepiece:** The revolver which carries the objectives.
- Eyepiece:** The upper optical components that further magnify the primary image and bring the light rays to a focus at the eyepoint.
- Condenser:** The optical lens built below the center of the stage.
- Stage:** The table of the microscope on which the specimen is placed.
- Base:** The component which supports the entire instrument. This component includes an illuminator which directs light through the condenser to the specimen.

Important terminology common to the science of microscopy:

Compound microscope: a microscope having a primary magnifier (the objective) and a secondary (the eyepiece) to further magnify the image and bring the light rays to a focal point (the eyes).

Achromatic Objective: an optical system corrected for two colors chromatically and one color (yellow-green) spherically.

Angular Aperture: the angle (or cone) of light rays capable of entering the front lens of the objective from a point in the object. By

increasing the angular aperture of an objective more light rays from the specimen can be taken in by the lens, hence the resolving power is increased.

Numerical Aperture (N.A.): a mathematical formula devised by Ernst Abbe for the direct comparison of dry and all types of immersion objectives for resolving power. Numerical aperture (N.A.) 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.

Condenser: a lens system the purpose of which is to collect light rays in such a way as to converge in the focal plane (or specimen area). The standard condenser of the M3300 series is our part MA324 which has a Numerical aperture of 1.25 with filter carrier and iris diaphragm and is mounted in a sub-stage focusing mounts.

Phase contrast: phase and darkfield options are available with the M3300 series. The two systems available include part MAQM-4B set which includes a phase annulus (under the condenser) with a Quodmaster phase annulus (green triangle) for phase objectives 10x, 40x and a darkfield position (D) for objectives 4x, 10x, 40x; the second phase system offered is our part MAQM100 which offers all of the above options plus phase at 100x. The Swift Quodmaster allows quick conversion from brightfield, darkfield or phase and can be either precentered or centered with centering screw, if provided. Note: if you wish to center your Swift microscope, centering screws may be provided and the centering telescope (part MA960).

Cover Glass: thin glass cut in circles, rectangles or squares, for covering the specimen, usually a thickness of 0.17 to 0.18mm. The majority of specimens should be covered by a cover glass, and this is a necessity when using the 40x and 100x lens.

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.

Eyepiece: the lens near the eye which magnifies the primary image of the objective so as to form a virtual image 10" away from the eyepoint.

Field: 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. Also the size of the diaphragm opening in the eyepiece governs the diameter of the field of view.

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.

Objective: the lens system near the specimen which forms the primary image.

Parfocal: a term applied to objectives and eyepieces when practically no change in focus has to be made when one power is substituted for another. The objectives on your SWIFT M3300D Series microscope are parfocalized at the factory so that only a slight movement

or no movement at all of the fine focus control is required when a change is made from high to lower powers.

Resolving Power: the ability of a lens to clearly separate fine detail. Resolving power is directly proportional to the numerical aperture of the objective. Also the shorter the wavelength of the light used, the greater the resolving power of the optical system.

$$\text{Resolving power} = \frac{\lambda}{\text{N.A.}} \quad \text{when} \quad \frac{\lambda}{\text{N.A.}} \quad \begin{array}{l} = \text{wave length of} \\ \text{light being used.} \\ = \text{numerical aperture.} \end{array}$$

Widefield Eyepiece: is generally an ocular with an achromatic doublet for an eyelens and with the plano side of the lower lens nearest the objective. Such a corrected system does not have to be stopped down with a diaphragm, hence a large, flat field is assured.

Working Distance, Free: the distance between the front lens of the objective and the cover glass when the lens is focused on the specimen.

Coaxial Focus Control: The M3300 series is equipped with a coaxial coarse and fine adjustment at a convenient position on the stand. The clutch mechanism is equipped with a safety slipping feature (which comes in to play at either end of the excursion) 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.

USING YOUR SWIFT M3300D SERIES MICROSCOPE

The M3300D Series microscope is equipped with widefield 10x eyepieces, objectives 4xD, 10xD, 40xRD, 100xRD and N.A. 1.25 condenser with iris diaphragm and swing out filter holder.

These models are used as follows: -

1. Secure the slide to the stage with spring fingers of the mechanical stage.
2. Revolve the nosepiece to position the lowest power objective.
3. View through the eyepiece and use the coarse focus control to bring the specimen nearly into focus. The fine focus control small knob is now used to complete the focusing of the specimen to produce the sharpest image.

used to complete the focusing of the specimen to produce the sharpest image.

4. The iris diaphragm is not intended to control the brightness of the illumination but induces contrast into the specimen by diffracting light rays. Focusing of the specimen should be done with the iris diaphragm opened 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. Care should be taken not to use an aperture too small to gain high contrast, as the fine structure of the image will be destroyed. Reducing the aperture does increase contrast and depth of focus, but it also reduces resolution and introduces diffraction. The aperture must be selected for each objective; i.e. the aperture for the 10xD (N.A. 0.25) objective will not be the same as for the 40xD (N.A. 0.65), since the angle of light required is determined by the numerical aperture of the objective. Proper adjustment of the diaphragm aperture is easily determined after a little experience with the microscope.

The rule governing condenser numerical apertures is: the numerical aperture of the condenser must be equal to or greater than the numerical aperture of the highest powered objective. In this instance, the 100xD oil immersion objective has an N.A. of 1.25. Thus, the Abbe condenser (N.A. 1.25) is required to utilize the full resolving power of the objective. The iris diaphragm provides a continuously variable increase or reduction of the diameter of the cone of light from the illuminator. Proper focusing of the N.A. 1.25 condenser is important and is accomplished as follows:

1. Raise the condenser to its upper limits of focus. The iris diaphragm should be fully opened.
2. Focus the specimen with the 10xD objective. (The diameter of the cone of light should fill the back lens of the objective. This utilizes the full resolving power of the objective. However, most specimens react better to a cone of light approximately 3/4 the diameter of the back lens of the objective).
3. Remove the eyepiece and view the cone of light visible on the back lens of the objective.
4. Lower the condenser to achieve a cone of light approximately 3/4 the diameter of the lens.
5. Replace the eyepiece and view the specimen.
6. If additional contrast is required to permit study of the specimen, the iris diaphragm may be closed slightly.
7. It is necessary to exclude air from the space between the cover glass over the specimen and the front lens of the 100xD objective. This is accomplished by placing a drop of Immersion Oil, onto the cover glass. The controls are then manipulated to immerse the front lens of the objective into the oil. This forms an air tight connection through

which the specimen may be viewed without interference from the atmosphere. Care must be taken not to come into direct contact between the lens of the objective and the cover glass since this may scratch or otherwise mar the viewing area of the lens itself.

Oil immersion objectives should be cleaned immediately after each use since the oil will dry after a time and prevent satisfactory viewing thereafter.

PROCEDURE FOR ADJUSTING THE SWIFT CO-INCIDENT FOCUS BINOCULAR BODY

1. Adjust interpupillary distance for comfortable viewing. (One field of view).

When your particular interpupillary distance is found note the interpupillary scale reading. (Between eyepiece tubes).

2. Set this reading to each individual eyepiece. (By turning calibrated diopter rings).

3. Focus sharply. If there is a difference in vision (acuity) between eyes, focus sharply to one eye then adjust the opposite diopter ring for acuity.

The microscope will now be adjusted to your particular vision requirements and parfocaled at all powers.

PHASE CONTRAST WITH THE SWIFT M3300D SERIES MICROSCOPE

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.

SWIFT NEW QUODMASTER PHASE MICROSCOPY

The New Quodmaster Phase Contrast Set includes the following: 4xD Achromatic (scanning lens) P10xD & P40xD phase objectives. Substage, mount centerable, N.A. 1.25 condenser. Four aperture rotatable discs containing one phase annulus common to both 10xD & 40xRD phase objectives. One darkfield stop common to 4xD, 10xD Phase and 40xRD Phase objectives. One open aperture in addition to an iris diaphragm for brightfield use at all magnifications.

Note: A 100xRD objective is congruent with the iris diaphragm for brightfield oil immersion microscopy.

The New SWIFT Quodmaster 100 is the same as above with the addition of a 100xRD Phase annulus in the disc and a P100xRD Phase objective affording phase technique with 10xD, 40xRD, & 100xD Objectives; darkfield technique with 4xD, 10xD, 40xRD objectives; brightfield with 4xD, 10xD, 40xRD including 100x RD oil immersion.

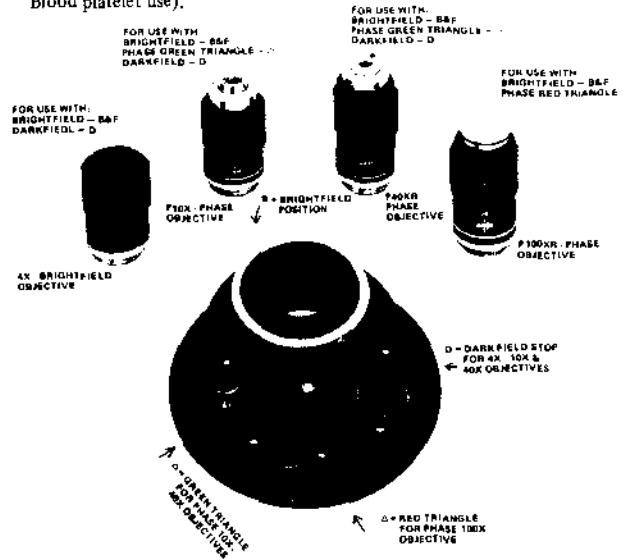
The M3304DP and M3305DP Quodmaster Phase System offer phase contrast techniques in a simple form – yet with phase contrast results comparable to units costing much more.

Its use is simple and effective – just match the objective to the condenser position.

The New Quodmaster for the M3304DP has the following preset optical specifications and markings:

- B = Brightfield (position), which has a N.A. 1.25 Condenser with iris for use with the 4X, 10X, 40X, and 100X (oil) Objectives. The condenser is on a rack & pinion.
- △ = Green Triangle – this position has a phase annulus for use with the Phase 10X and 40X Objectives. Please note: the condenser must be racked to the full up position during this procedure.
- △ = Red Triangle – this position has a phase annulus for use with Phase 100X (oil) Objective. The condenser must be in the full up position.
- D = Darkfield Stop, for low power darkfield with the 4X, 10X, and 40X Objectives only. The condenser must be in the full up position.

Specifications for the M3305DP Quodmaster Model are the same as above, except it is without the 100X phase annulus (Red Triangle position), which allows only brightfield use with the 100X oil Objective, (for Blood platelet use).



PARTS LIST

MAQM4B

Quodmaster

MAQM4B-100

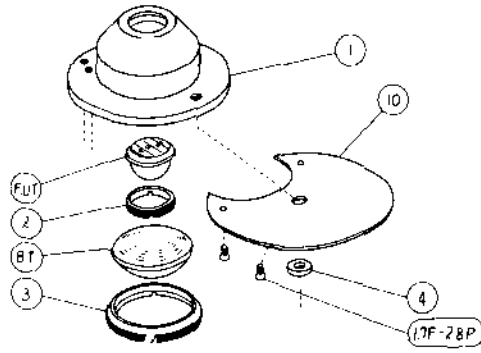
Parts Number	Description	Parts Number	Description
1	Condenser Frame	2M-3SB	Screw
F.UT	Lens	12	Joint Ring
2	Retainer Ring	3	Threaded Ring
BT	Lens	5B	Disc Diaphragm
3	Retainer Ring	6	Screw
4	Washer	7-1	Frame, Darkfield
100	Cover Plate	40DG-1	Filter, Darkfield
1.7F-2BP	Screw	11-1	Frame, Phase 100X
5B	Disc Diaphragm	100PG-1	Phase Annulus 100X
6	Screw	8-1	Frame, Phase 40X
7-1	Frame, Darkfield	40PG-1	Phase Annulus 40X
40DG-1	Darkfield Stop	2B+3BP	Screw
8-1	Frame, Phase 40X	12	Joint Ring
40PG-1	Phase Annulus 40X	2M-3SB	Screw
2B+3BP	Screw	13	Threaded Ring
9	Diaphragm Clip	9	Diaphragm Clip
2.3B+3SB	Screw	2.3B+3SB	Screw

NOTE: Cover glass #1 (0.13 - 0.17mm thick) must be used to focus with 100X objective on this microscope.

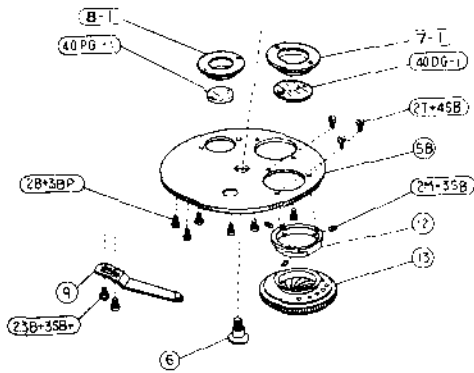
<u>Mag.</u>	<u>N.A.</u>	<u>Working Distance</u>	<u>Field View</u>	<u>Color Code</u>
4X	0.10	15.8MM	4.50MM	Red
10X	0.25	6.5MM	1.80MM	Yellow
40XR	0.65	0.6MM	0.45MM	Blue
100XR	1.25	0.14MM	0.18MM	White
		<u>Field of View</u>	<u>Focal Length</u>	<u>Eye Point</u>
	W10XD	10.8MM	25.0MM	15.5MM
	W15XD	13.0MM	16.7MM	12.6MM

DIN OPTICS "DIN" is an abbreviation of "DEUTSCHE INDUSTRIAL NORMEN," This is an international optic standard used in most quality microscopes. Many DIN optics are interchangeable.

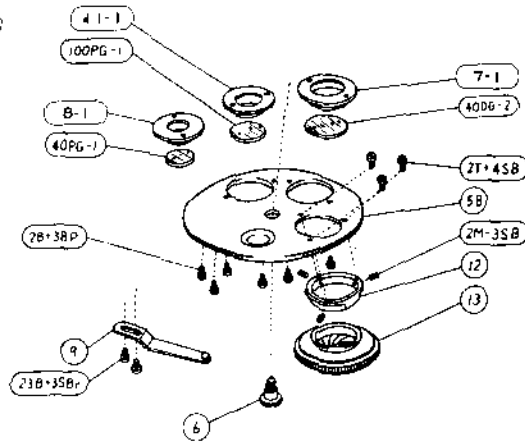
NEW Quodmaster



MAQM4B



MAQM4B-100



To save TIME and Money, before you call for service, check the problem solver.

If you have a problem, you may be able to correct it yourself. Just use this chart to locate your problem and then follow the suggested recommendations.

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 authorized, qualified Swift technicians. The SWIFT WARRANTY would be null and void if disassembled by a nonqualified person.

PROBLEM:	POSSIBLE CAUSE AND REMEDY
No illumination	<ul style="list-style-type: none">• Is the Power Plug connected to an active A.C. outlet.• Check the filament of the bulb and also try a new bulb.• Check FUSE (if system uses low voltage) and also try new FUSE.• Check to see if you have the correct bulb and fuse.• Check contact points of socket and bulb. If all above fails, contact your local authorized dealer.
Illumination "HOT SPOTS" and uneven brightness in the field of view.	<ul style="list-style-type: none">• Is the <u>WHITE DIFFUSING FILTER</u> in the position in your condenser illuminator filter holder?• Is the <u>ABBE Condenser</u> in the right position?• Is the condenser properly centered?• Is your objective and nosepiece in the click stop position.• Is the illuminator and bulb centered to the condenser.
Poor Optical Image	<ul style="list-style-type: none">• Check condition of your Objective frontal lens and clean them if needed. To clean use lens paper folded several times and moistened with approved lens cleaner such as XYLOL or XYLENE.• Check condition of seal of your 100X oil lens. If broken, return objective to San Jose for correction and service.• Check to make sure your retractable objective is in the correct forward position.• Check to see that other optical components such as your eyepieces, condenser, Illuminator lens etc. are clean and in the right position.

PROBLEM	POSSIBLE CAUSE AND REMEDY
Flatness of field and curvature.	<ul style="list-style-type: none"> • All Achromat Objectives have curvature. The correction to achieve a flatter field is to upgrade to a Micro Plan or Plan achromat objective (which are FLAT FIELD OBJECTIVES). • Check and clean objective front lens if necessary.
Broken Finger clip or Mechanical stage service problem.	<ul style="list-style-type: none"> • Remove and return the finger clip assembly on mechanical stage to an authorized Swift Repair Dealer or to Swift, San Jose for correction and repair. DO NOT send microscope or stage plate.
Loose Nosepiece Tight Nosepiece	Contact your Swift Authorized Dealer or Swift, San Jose for correction. A special tool is needed to correct this problem.
Parfocality and Binocular Diopter Body adjustment.	<p>PROCEDURE FOR ADJUSTING THE SWIFT CO-INCIDENT FOCUS BINOCULAR BODY:</p> <ol style="list-style-type: none"> 1. Adjust interpupillary distance for comfortable viewing. (One field of view). When your particular interpupillary distance is found note the interpupillary scale reading. (between eyepiece tubes). 2. Set this reading to each individual eyepiece. (By turning Calibrated Diopter Rings). 3. Focus sharply. If there is a difference in vision (acuity) between eyes, focus sharply to one eye then adjust opposite DIOPTER Ring for acuity. <p>The microscope will now be adjusted to your particular vision requirements and is parfocaled at all powers.</p>
Need Parts?	<p>The following information will be required for ordering parts.</p> <ul style="list-style-type: none"> • Model or Series number of microscope. • Serial Number of Microscope. • Part Number & Parts Name. • If parts drawing is required to identify parts, contact Swift, San Jose.
Where to get Swift authorized Service.	<p>Contact your local Authorized Swift Sales & Service dealer.</p> <p>Contact: Swift Instruments, Inc. 1190 N. 4th St. - shipping San Jose, CA 95112</p> <p>Mailing address: PO Box 562 San Jose, CA 95106</p>

M3300D Series Arm

PARTS LIST

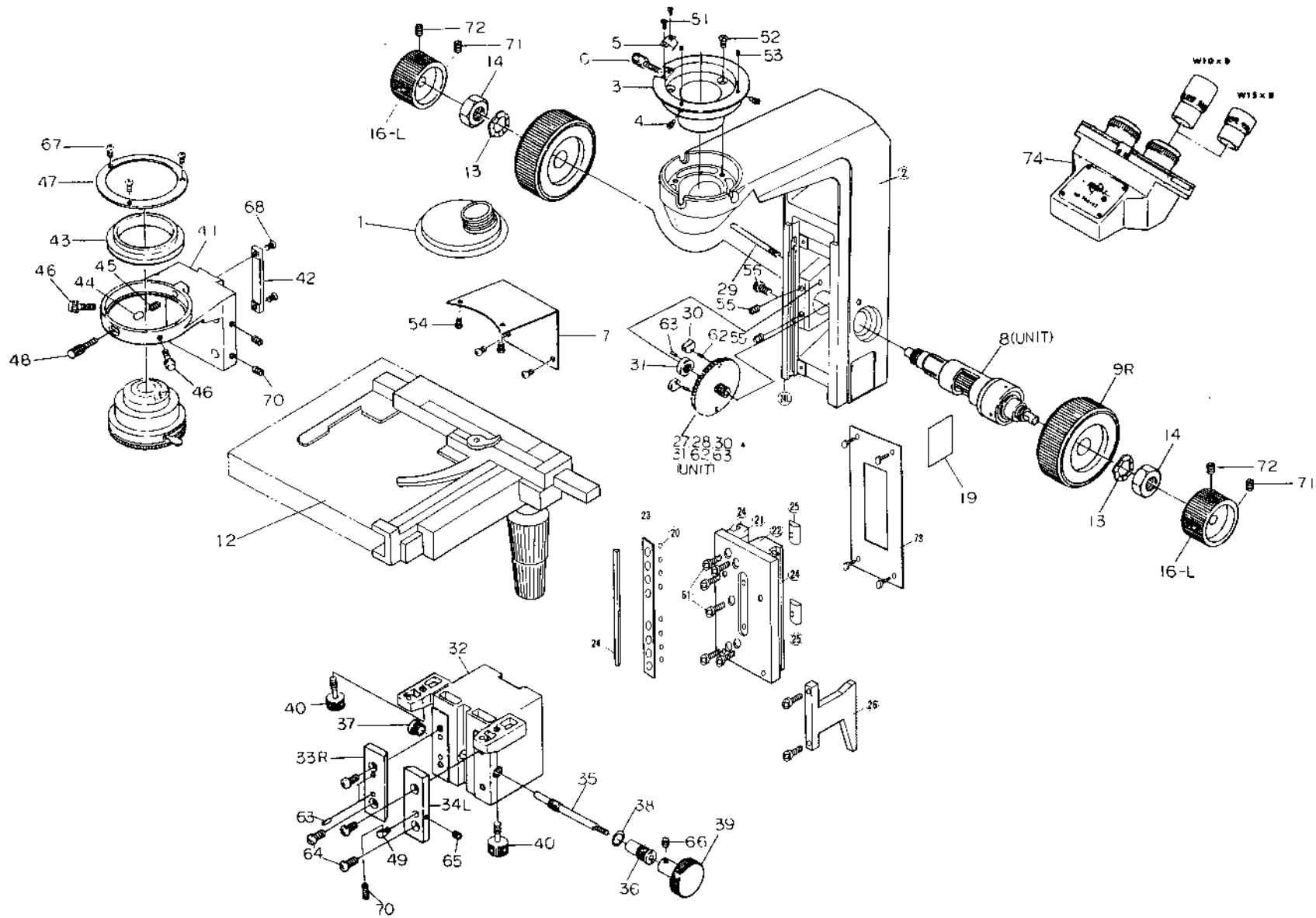
Part Number	Description	Part Number	Description
1	Nosepiece	31	Nut
2	Arm	32	Stage Holder
3	Nosepiece Seat	33	Slide, right
4	Centering Screw	34	Slide, left
5	Spring	35	Pinion
6	Set Screw	36	Bushing
7	Arm Cover	37	Screw
8	Pinion Assembly	38	Washer
9R	Coarse Adj. Knob	39	Knob
10L	Coarse Adj. Knob	40	Screw
11	Tension Knob	41	Condenser Holder
12	Graduated Plate	42	Rack
13	Spring Washer	43	Sleeve
14	Nut	44	Metal
15	Fine Adj. Knob (R)	45	Spring
16	Fine Adj. Knob (L)	46	Screw
19	Marking Plate	47	Sleeve Ring
20	Holder Block	48	Screw
21	Liner	49	Adjusting Screw
22	Slider	51	2F + 3SP Screw
23	Cross Roller	52	3F + 6SP Screw
24	Triangular Rail	53	1.7MC-3SG Screw
25	Joint Plate	54	2T + 4SP Screw
26	Rack	55	4S6 Screw
27	Gear	56	3C6 Screw
28	Gear	57	4P + 10SP Screw
29	Shaft	58	4P + 8 SP Screw
30	Metal		

M3300D Series Arm

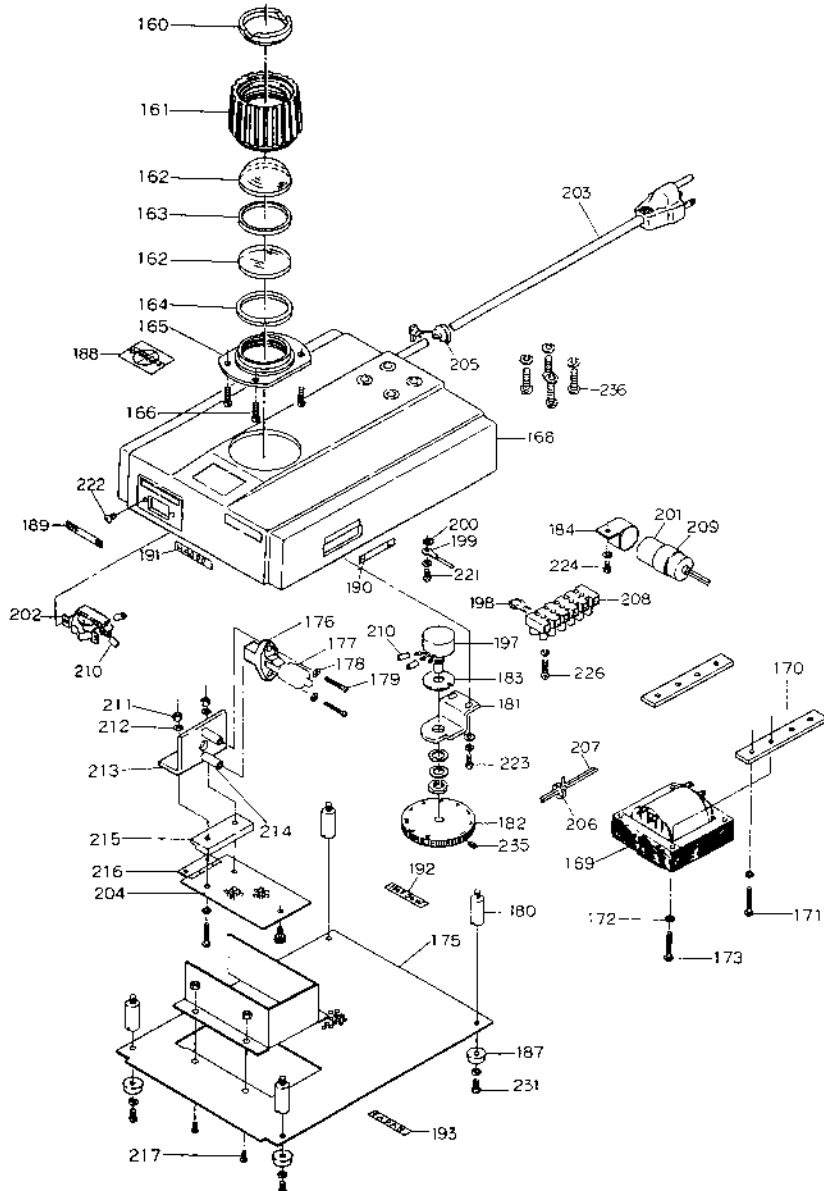
PARTS LIST

Part Number	Description	Part Number	Description
59	1.7P + 4SP Screw		
60	4P + 8SP Screw		
61	3P + 6SG Screw		
62	1.5K5SG Pin		
63	ZK5SG Screw		
64	3P + 6SG Screw		
65	3S6 Screw		
66	2.6MC-3.5SG Screw		
67	1.7P(0) + 4SG Screw		
68	2.6F + 6SP Screw		
69	3S4 Screw		
70	Screw		
71	4S6 Screw		
72	4S8 Screw		
73	Arm Cover		
74	B Body		

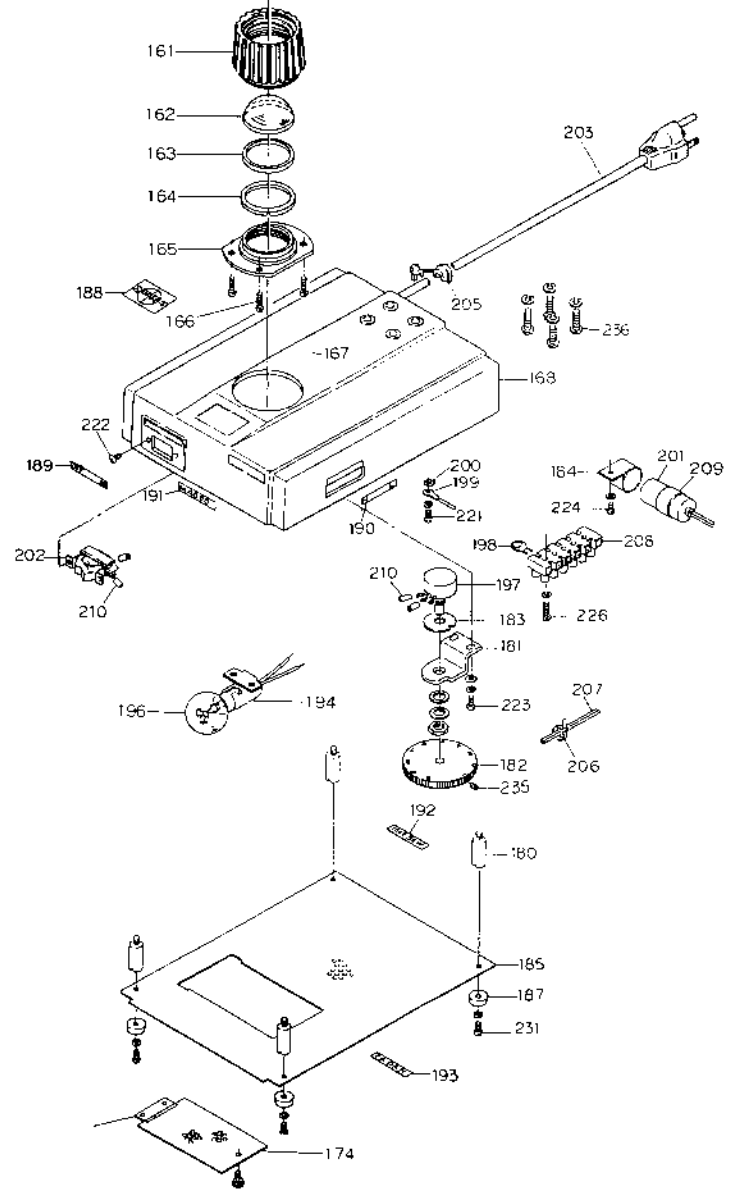
#3300D Arm



M3302D Base



M3301D Base

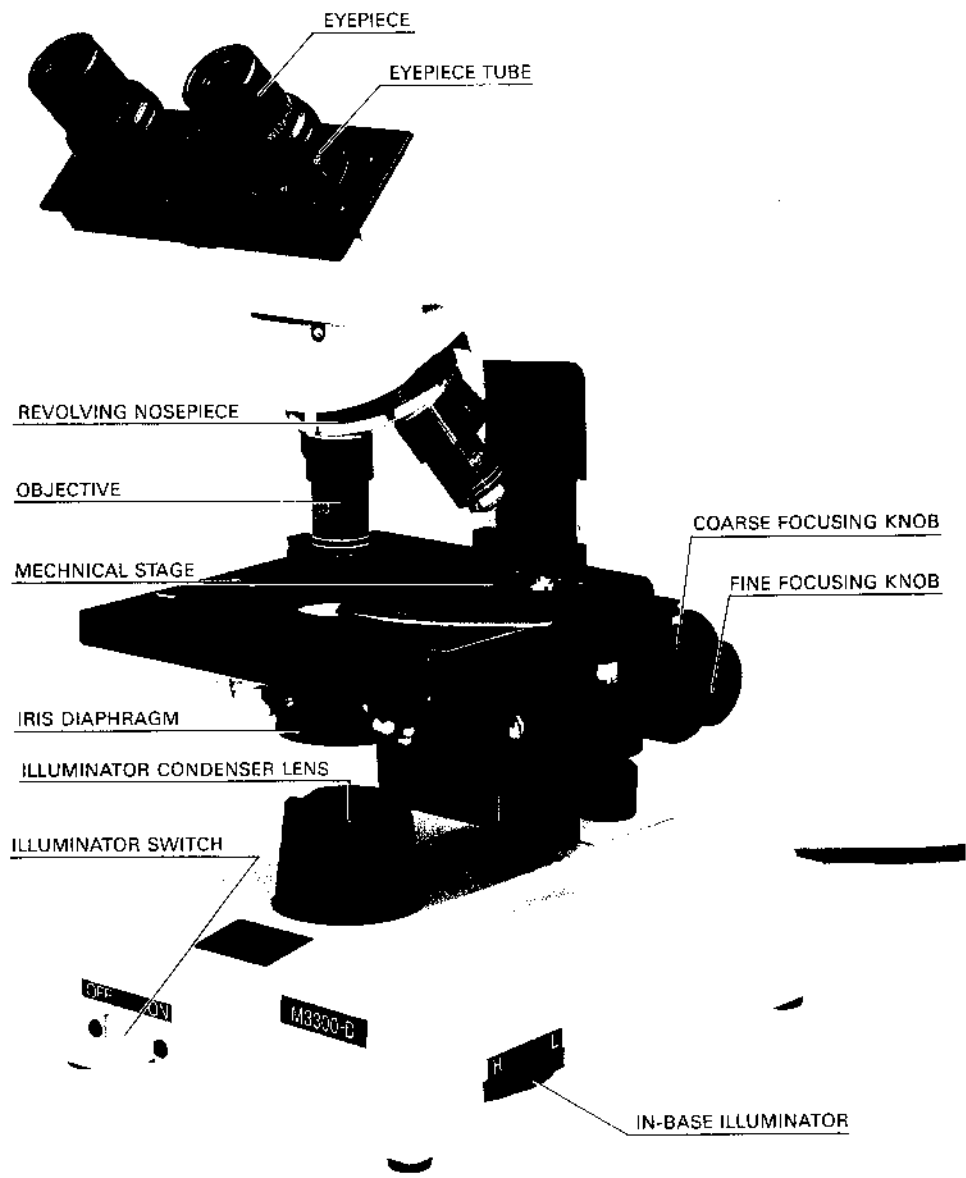


M3300D Base

Parts Number	Description	Parts Number	Description
160	Filter Carrier	189	On-Off Plate
161	Field Condenser Mount	190	H-L Seal
162	Lens	191	Marking Plate
163	Retaining Ring	192	Voltage Seal
164	Spacer Ring	193	Japan Seal
165	Adapter Ring	194	Socket
166	Screw	196	Bulb
168	Base	197	Volume Control
169	Transformer	198	Variable Registor
170	Holder Plate	199	Earth Lug
171	Screw	200	Washer
172	Washer	201	Series Regulator
173	Screw	202	On-Off Switch
175	Bottom Plate	203	Cord
176	Socket	204	Cover Plate
177	Halogen Bulb	205	Grommet
178	Washer	206	Cord Band
179	Screw	207	No. 18 Wire
180	Rod	208	6P Terminal
181	L type Plate	209	Insulator Tape
182	Disc	210	No. 8 Tube
183	Washer	211	Screw
184	Regulator Band	212	Washer
185	Bottom Plate	213	Support
186	Safety Cover	214	Pin
187	Rubber Shoes	215	Holder
188	Marking Plate	216	Hinge
		217	Screw

M3300D Base

Parts Number	Description	Parts Number	Description
221	4P + 6 SW Screw		
222	3T + 6SG Screw		
223	SW. W 3P+8SG Screw		
224	SW 3P+6SG Screw		
226	SW 3P+14SG Screw		
231	3P+10SG Screw		
233	2.6F+8SP Screw		
234	4F+8SNI Screw		
235	3S4 Screw		
236	SW 5P+1-SG Screw		



CONDENSER N. A. 1.25