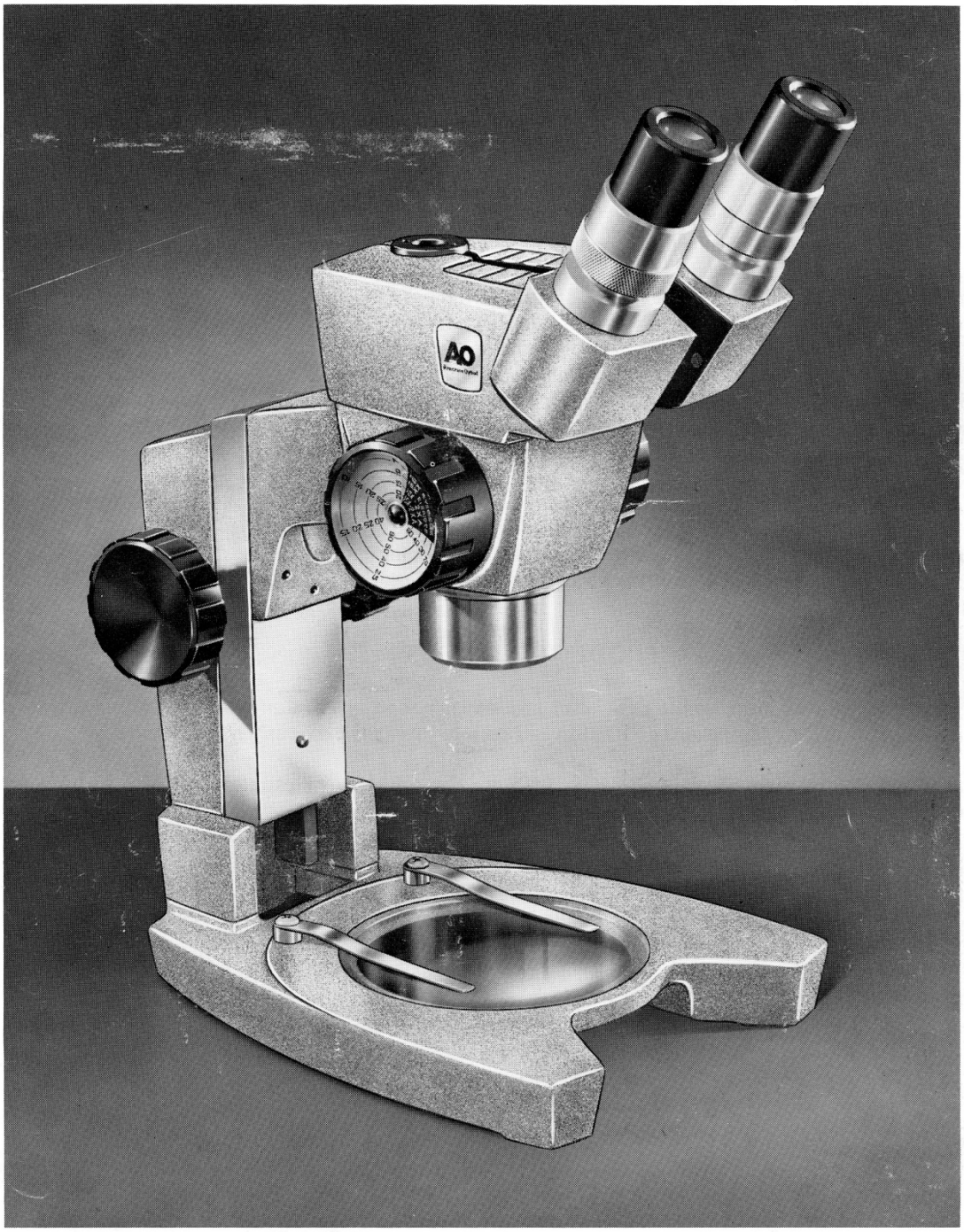
REFERENCE MANUAL

CYCLOPTIC®
Stereoscopic Microscope



AO® American Optical
SCIENTIFIC INSTRUMENT DIVISION
BUFFALO, NY 14215

Price: $1.00

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This American Optical Corporation, Scientific Instrument Division, product is warranted against defective material and workmanship for one year. This warranty applies only to new products that have not been tampered with or misused in any way.

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If, upon delivery, the outside of the packing case shows evidence of rough handling or damage, the transportation company's agent should be requested to make a "Received in Bad Order" notation on the delivery receipt. If there is no exterior evidence of rough handling upon delivery, but concealed damage is evident upon unpacking the shipment within 48 hours of delivery, the transportation company should be requested to make out a "Bad Order" report. This procedure is necessary in order to maintain the right of recovery from the carrier.

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PRODUCT CHANGES

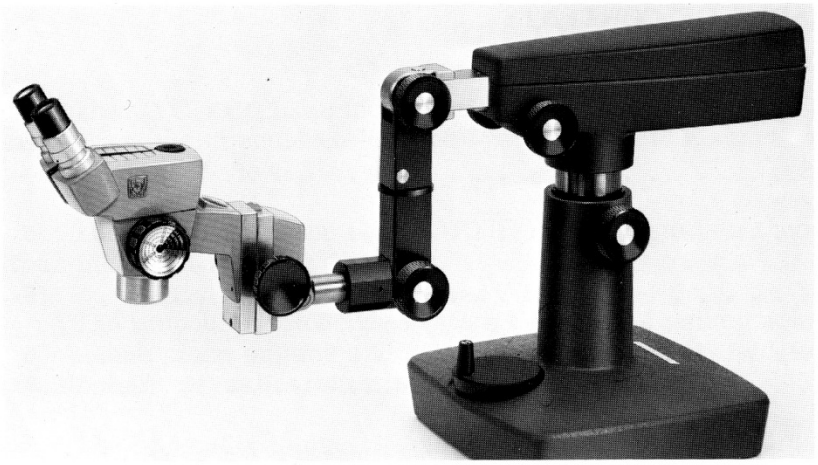
American Optical Corporation reserves the right to change designs or to make additions to or improvements in its products without imposing any obligations on itself to add such to products previously manufactured.

The equipment supplied may not agree in all details with our descriptions or illustrations because instruments are subject to modification and improvement.

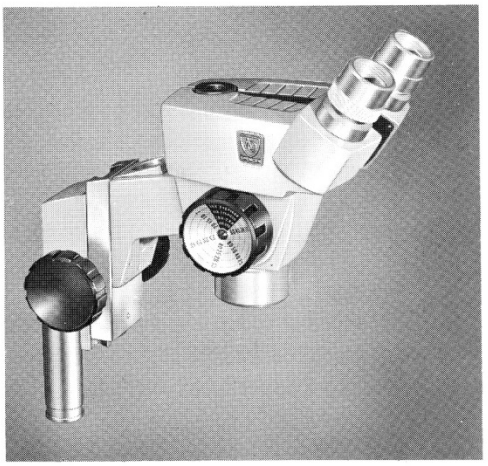
SERVICE

Repairs should be performed only by qualified service personnel. Complete repair facilities are available at many AO authorized dealers, and AO Technical Service Centers in Buffalo, N.Y., Chicago, Ill., Glendale, Calif., Springfield, N.J., and Dallas, Texas.

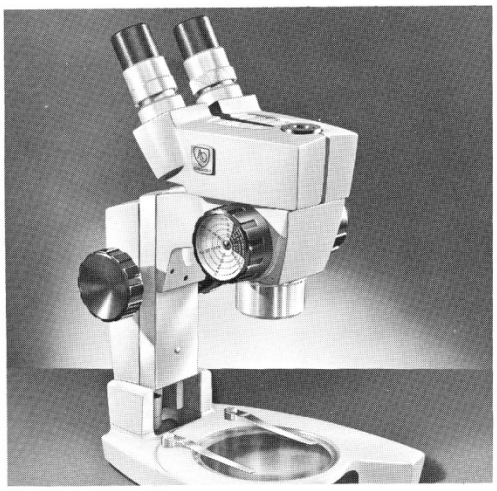
NOTE: The equipment supplied may not agree in all details with the descriptions or illustrations shown, as instruments are subject to modification and improvement.



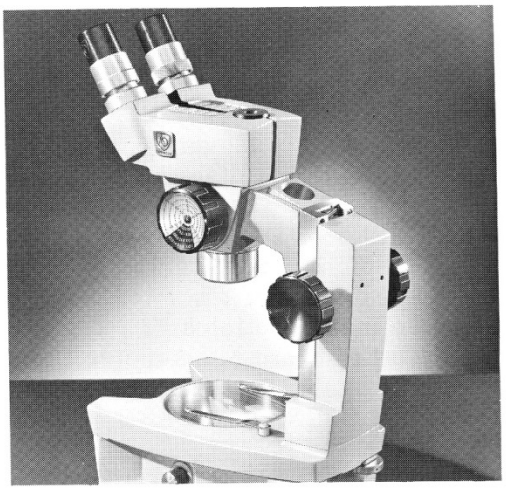
Series 53



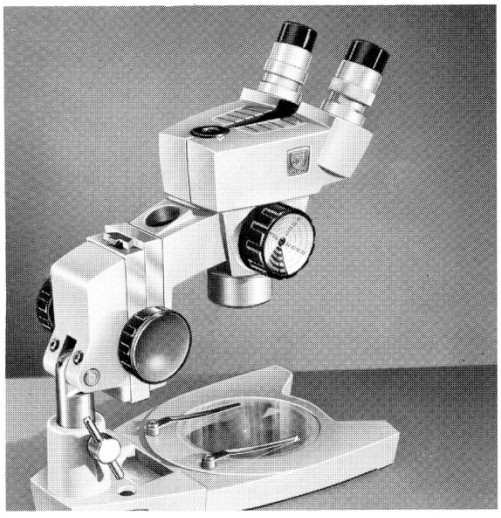
Series 55



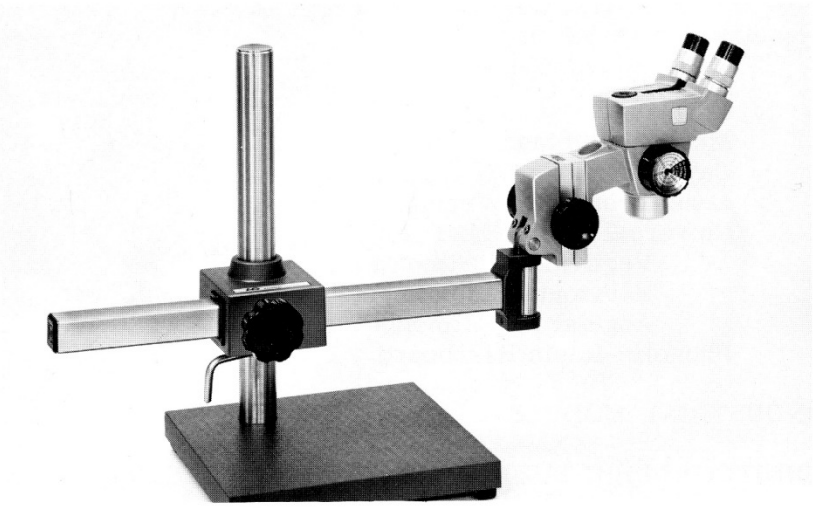
Series 56



Series 58



Series 59



Series 52

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THE CYCLOPTIC PRINCIPLE

The CYCLOPTIC principle utilizes a highly corrected monobjective whose image is examined with a unique binocular telescope system to yield a sharp, clear, enhanced stereoscopic image of the full field of view.

The objective of the CYCLOPTIC microscope is a true apochromatic triplet providing a full four inches of working distance.

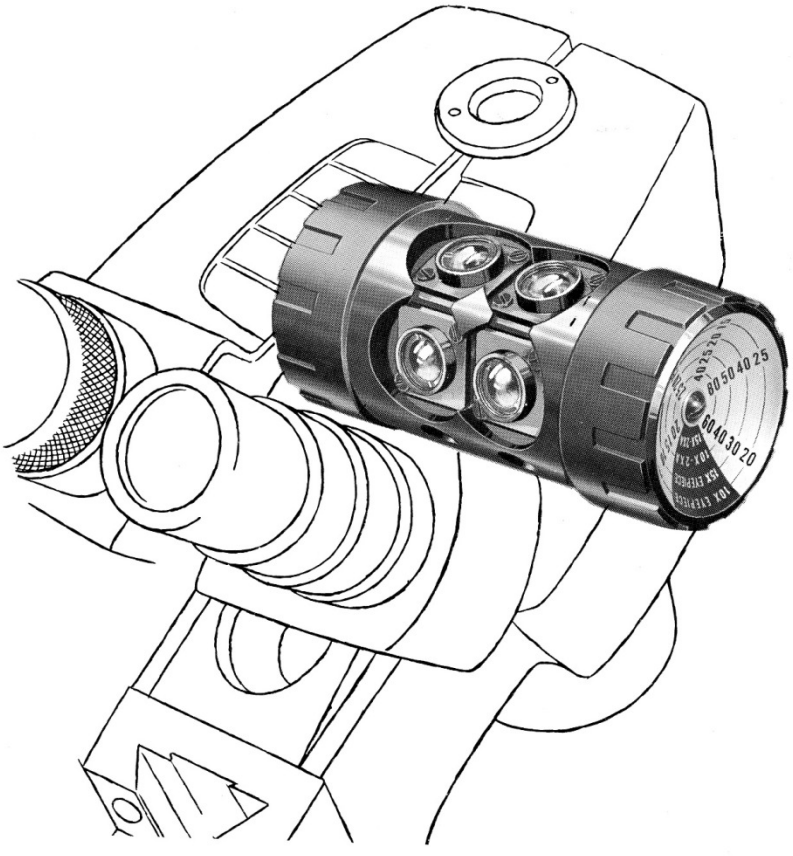
The binocular telescope system consists of paired achromatic telephoto lens combinations, unique one piece prisms and new four element wide field, high eyepoint eyepieces which permit comfortable visualization with or without eyeglasses.

The binocular telescope system is of highest optical performance, compact styling, dust-proof watertight construction and is collimated for permanent alignment.

THE MAGNI-CHANGER™ LENS SYSTEM

"J", "K", and "M" series CYCLOPTIC microscopes feature a built-in unique MAGNI-CHANGER for rapid, easy "dial-in" selection of a wide range of magnifications. Factory aligned...positioned between the apochromatic objective and the binocular body, the MAGNI-CHANGER offers instant, easy magnification selection without encroachment on working space, without accessory change and without focus adjustment.

Desired magnifications are selectively "dialed-in" by simple rotation of the MAGNI-CHANGER dial to indicated values.



MAGNI-CHANGERS "J" and "K" contain 8 achromatically corrected optical elements ... offer three different magnifications for each eyepiece - objective combination. MAGNI-CHANGER "M" contains 16 achromatically corrected elements ... offers five different magnifications for each eyepiece-objective combination.

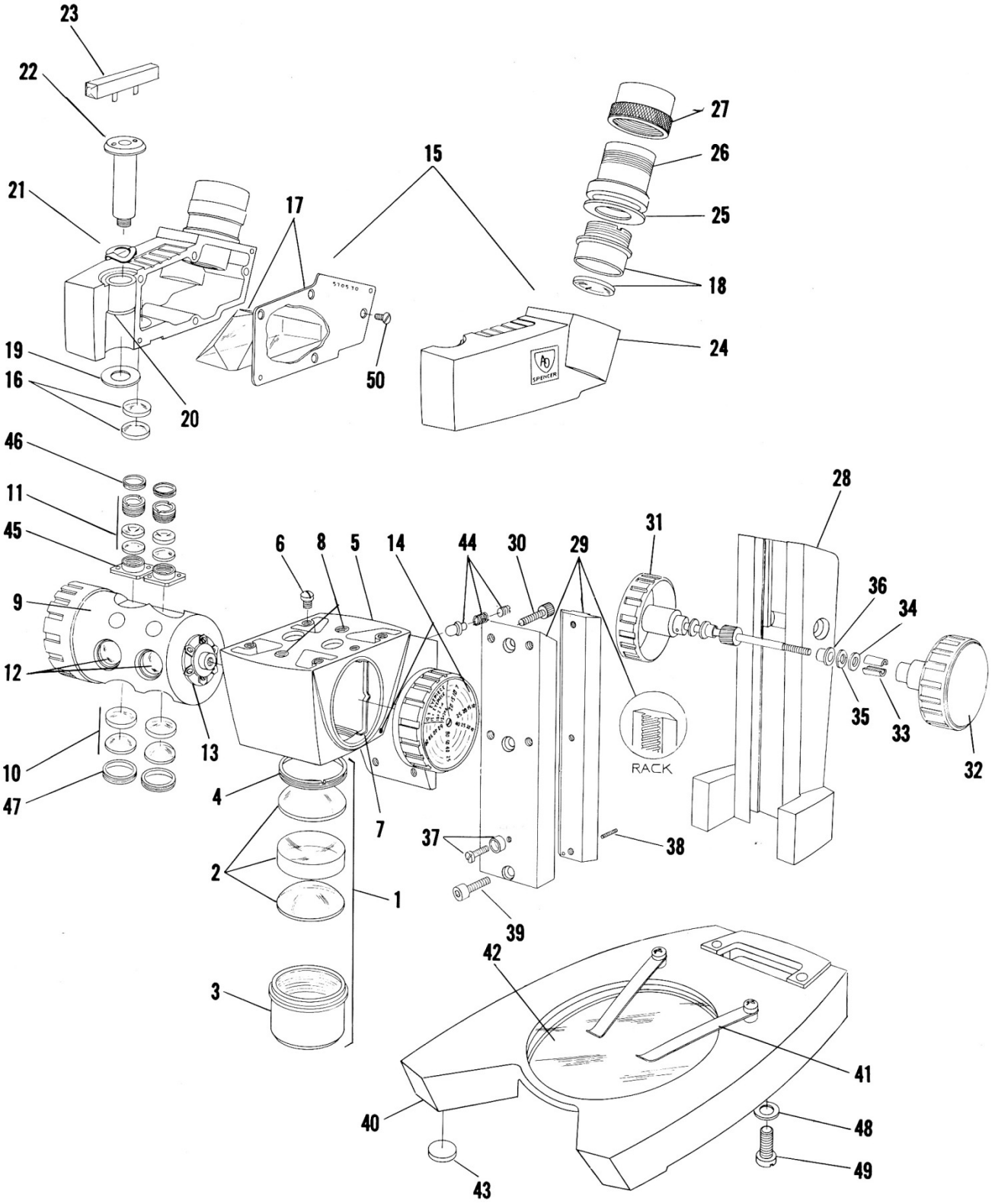


Figure 1. CYCLOPTIC Microscope with MAGNI-CHANGER

PARTS IDENTIFICATION LIST

CYCLOPTIC MICROSCOPE WITH MAGNI–CHANGER

1 APOCHROMATIC OBJECTIVE

- 2 Apochromatic triplet
- 3 Lens cell
- 4 Retainer ring

5 MICROSCOPE BODY

- 6 Stop screws
- 7 Detent spring
- 8 Hinge pin receptacles

9 MAGNI-CHANGER SYSTEM

- 10 Front doublets
- 11 Back doublets
- 12 Alternate magnification system
- 13 Detents
- 14 LEFT MAGNI-CHANGER dial and knob assembly; indicating dot.

15 INCLINED BINOCULAR SYSTEM
(Note serial number in prism plate)

- 16 Binocular body doublet
- 17 Prism, bonded
- 18 Amplifier lens and cell assembly
- 19 Threaded washer
- 20 Thrust washer
- 21 Spring washer
- 22 Hinge pin
- 23 Spanner wrench
- 24 Prism housing
- 25 Moisture seal
- 26 Eyepiece sleeve
- 27 Focusing sleeve

28 MICROSCOPE ARM

- 29 Dovetail and rack assembly
- 30 Body attachment screws (4)
- 31 Knob, bushing, pinion gear and shaft assembly
- 32 Focusing knob
- 33 Tapered, split bearing
- 34 Flat washer
- 35 Spring washer
- 36 Bushing
- 37 Stop screw and nylon collar
- 38 Allen stop screw
- 39 Dovetail and rack attachment screw

40 MICROSCOPE BASE

- 41 Stage clip assembly
- 42 Glass stage
- 43 Protective pads

44 STARLITE ILLUMINATOR SPRING PLUNGER ASSEMBLY

45 Adjustment Cell

46 Retainer

47 Retainer

48 Washer

49 Screw

50 Screw

NOTE: Please cite serial number of Instrument when ordering replacement parts.

CAUTION: Do not disassemble inclined binocular body and MAGNI-CHANGER systems. These systems are factory aligned and sealed.

USE AND CARE

TO FOCUS

With microscope racked UP above good focus, rack DOWN until specimen is in sharp focus. This technique reduces tendency of eye accommodation...lessens eye fatigue.

The CYCLOPTIC Microscope is collimated to assure parfocality at all magnifications. When using the MAGNI-CHANGER, if initial focusing is done at one of the higher magnifications, common focus will be obtained at all magnifications.

TO ADJUST FOR INDIVIDUAL EYE DIFFERENCES

With right eye, focus microscope per above instructions. Turn OUT (counterclockwise) individual eyepiece focusing sleeve (27, Fig. 1) of left eye until the left image is out of focus. Then turn sleeve (27) IN (clockwise) until sharp focus is obtained with left eye. Keep eyepieces seated against focusing sleeve. Both eyes will now be comfortably focused on the specimen.

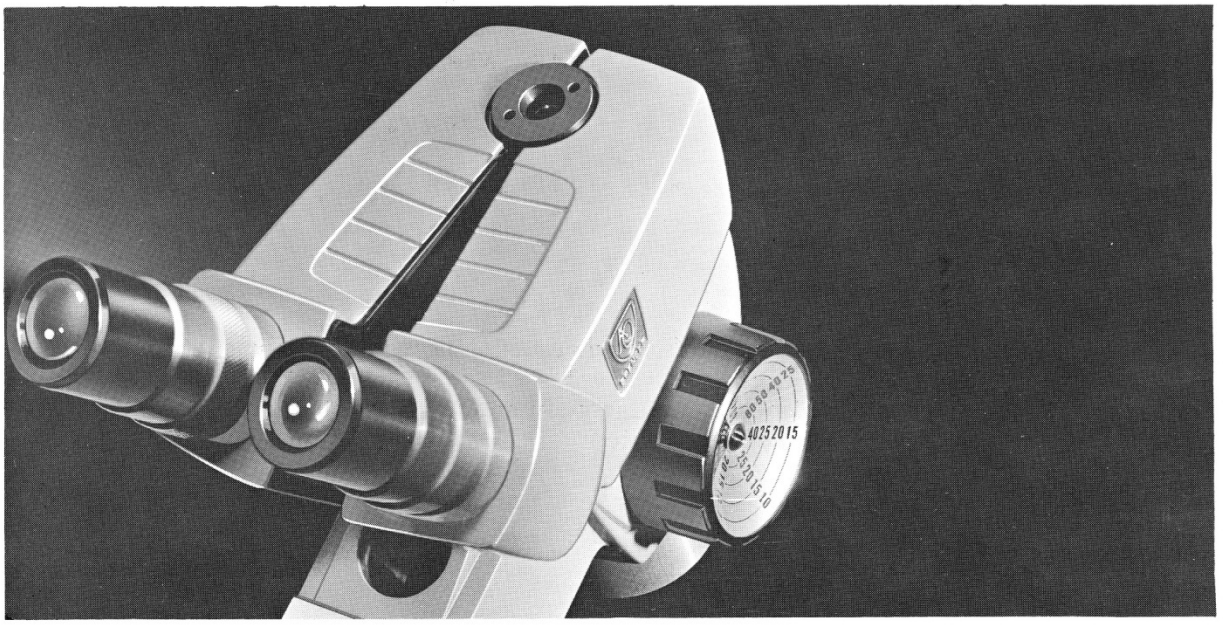
TO ADJUST INTERPUPILLARY DISTANCE

Grasp both prism housings (24). Adjust inter-ocular spacing until comfortable viewing of a full single field is obtained for both eyes.

TO USE MAGNI-CHANGER

Rotate MAGNI-CHANGER drum (9) to select desired magnification. MAGNI-CHANGER automatically indexes for proper alignment of optical system. Magnification values may be read at the indicating dot (14). From the observer's viewing angle reference to the dot is unnecessary since only the proper values can be readily viewed on the dial.

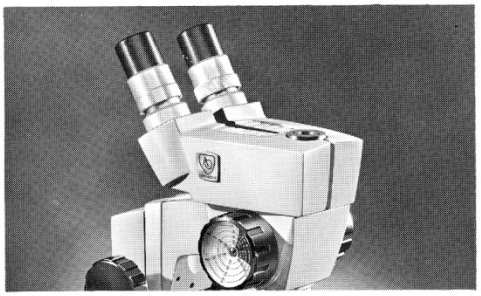
Dial reads from right hand side to accommodate conventional and reverse position use. Magnification values for four different sets of accessory equipment may be read from the dial.

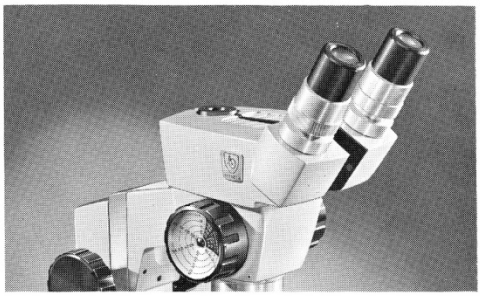


TO REVERSE BINOCULAR BODY

Using Spanner wrench (23) unscrew the hinge pin (22) so that the binocular body may be removed, rotated and fitted into the alternate tapped hole (8).

CAUTION: Do not remove the threaded washer (19) which should remain captive beyond the threaded portion of the hinge pin. Use moderate care when reversing the body; avoid fingerprinting lenses of binocular body and MAGNI-CHANGER.





TO CLEAN EXPOSED OPTICAL SURFACES

Do not attempt to disassemble inclined binocular body and MAGNI-CHANGER systems. These have been factory aligned and sealed. Only exposed surfaces may be cleaned.

The exposed outer surfaces of the apochromatic objective (1), accessory lens attachments, binocular body lenses (16), binocular body amplifier lens (18), MAGNI-CHANGER optical system (9), and eyepieces may be examined for smears and dust particles and carefully cleaned. Dust particles on eyepiece lenses may be readily detected by rotating the eyepiece while viewing.

CLEANING PROCEDURE

1 Blow dust particles from surface with an ear syringe.
2 Brush surface with a clean camel hair brush.
3 With the aid of a cotton swab (Q-tip) moisten the lens surface with weak detergent solution.
4 Wipe carefully with a well laundered lint-free soft cloth or a cotton tuft.

The above technique may be used to remove oily smears and fingerprints. Such smears detract from the image quality of a microscope. Clean lens surfaces very carefully and only when necessary.

TO ADJUST TENSION ON FOCUSING KNOBS

Tension on the focusing mechanism may be regulated conveniently to suit individual touch. To increase tension, hold one knob firmly and turn opposite knob clockwise...counterclockwise turn loosens tension.

LUBRICATION

All moving parts and threads of the CYCLOPTIC Microscope are lubricated with permanent type special purpose lubricants recently developed by the American Chemical industry. Replacement of these "lifetime" lubricants will be required only under the most severe field uses. Note that slides and bearings of the CYCLOPTIC are better protected from and less accessible to the elements than older type microscopes.

In the event that relubrication is required, any high quality #1 or #2 grease will be acceptable for normal use.

SELECTION OF MAGNIFICATION

Magnification to be selected depends on detail size, area of field to be scanned, working distance, type of illumination available and personal preference.

In general, use the lowest magnification which allows easy accomplishment of the presented task.

Where specimen character is varied and complex, try out several adjacent magnifications ... often a single task will require different magnifications.

The following table is offered as a guide to select the optimum magnification:

SIZE OF DETAIL	RECOMMENDED MAGNIFICATION RANGE
to .010"	3.5X - 15X
.010 to .005	5.0X - 15X
.005 to .002	7.0X - 15X
.002 to .001	15X - 25X
.001 to .0005	20X - 40X
.0005 to .0002	40X - 80X
.0002 to .0001	80X

TABLE OF RESULTANT MAGNIFICATIONS, FIELDS OF VIEW AND WORKING DISTANCES

FIXED BODY "F" AND MAGNI-CHANGER "J", "K", "M".
VARIABLE BODY MAGNIFICATIONS - with Standard Objective.

Eyepiece	Auxiliary Lens-Attachment	Magnification "F"	Magnification "J"	Magnification "K"	Magnification "M"	Field of View*	Working Distance*
10X	-	-	7X	-	7X	1.20"	4.0"
	-	-	-	10X	10X	0.90	
	-	15X	15X	15X	15X	0.60	
	-	-	-	20X	20X	0.40	
	-	-	25X	-	25X	0.30	
15X	-	-	10X	-	10X	1.00"	4.0"
	-	-	-	15X	15X	0.75	
	-	20X	20X	20X	20X	0.50	
	-	-	-	30X	30X	0.33	
	-	-	40X	-	40X	0.25	

NOTE: #1157 20X wide field eyepieces are also available.
Resultant magnifications and field coverages essentially proportionate to 10X and 15X combinations appearing in above and adjoining tables.

10X	2X	-	15X	-	15X	0.60"	1.5"
		-	-	20X	20X	0.45	
		25X	25X	25X	25X	0.30	
		-	-	40X	40X	0.20	
		-	50X	-	50X	0.15	
15X	2X	-	20X	-	20X	0.50"	1.5"
		-	-	25X	25X	0.37	
		40X	40X	40X	40X	0.25	
		-	-	60X	60X	0.17	
		-	80X	-	80X	0.13	
10X	2/3X	-	4.5X	-	4.5X	1.75"	4.4"
		-	-	6X	6X	1.33	
		10X	10X	10X	10X	0.90	
10X	2/3X	-	-	15X	15X	0.60"	4.4"
		-	18X	-	18X	0.45	
15X	2/3X	-	7X	-	7X	1.50"	4.4"
		-	-	10X	10X	1.12	
		15X	15X	15X	15X	.75	
		-	-	20X	20X	.50	
		-	25X	-	25X	.37	

SPECIAL LONG WORKING DISTANCE COMBINATIONS FOR CYCLOPTIC SERIES 52, 53, 55, 59 ONLY

FIXED BODY "F" AND "J", "K", "M".
VARIABLE BODY MAGNIFICATIONS - Special 1/2X Objective

Eyepiece	Auxiliary Lens-Attachment	Magnification "FL"	Magnification "JL"	Magnification "KL"	Magnification "ML"	Field of View*	Working Distance*
10X	-	-	3.5X	-	3.5X	2.40"	8.0"
	-	-	-	5X	5X	1.80	
	-	7X	7X	7X	7X	1.20	
	-	-	-	10X	10X	0.80	
	-	-	15X	-	15X	0.60	
15X	-	-	5X	-	5X	2.00"	8.0"
	-	-	-	7X	7X	1.50	
	-	10X	10X	10X	10X	1.00	
	-	-	-	15X	15X	0.66	
	-	-	20X	-	20X	0.50	

*To convert inch values to millimeters: multiply by 25.4

4-ELEMENT WIDE FIELD EYEPIECES

These completely new four optical element, high eyepoint, wide field 10X and 15X eyepieces offer superior image quality... wide field of view...full chromatic, curvature and distortion correction... comfortable eye relief even for eyeglass wearers.

Magnifications are accurately held to standard values...all eyepieces are machine parfocalized...complete eyepiece interchangeability is assured, and pairing is unnecessary.

No. 146, 10X

No. 147, 15X

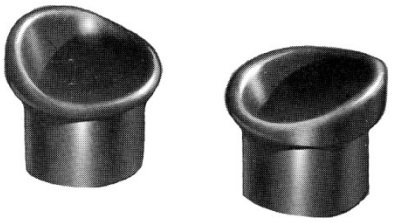
EYEPIECE CHARACTERISTICS

Magnification	Field Size	Eye Relief
10X	20.0 mm	19.0 mm
15X	16.8	17.0

Mounting shoulder to focal plane: 11.28 mm

EYESHIELDS

Eyeshields are available at extra charge, to reduce stray light annoyance during microscopic examination and may be instantly removed to accommodate the wearer of eyeglasses.



No. 149 Eyeshield

TO INSERT RETICLES

The following diagrams indicate the methods for inserting reticles or micrometer discs in the 10X (Catalog No. 146) and 15X (Catalog No. 147) eyepieces.

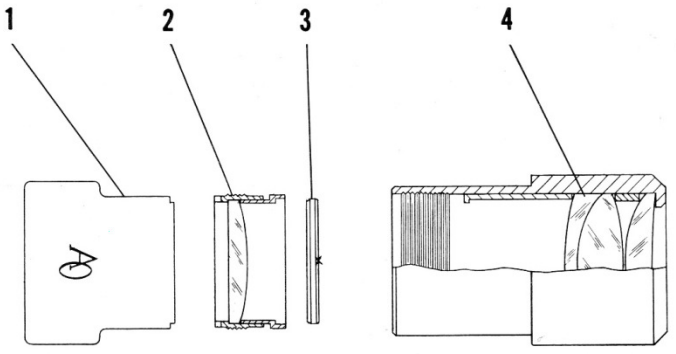


Figure 2. 10X Eyepiece - Catalog No. 146

1. Wrench (Catalog No. 469)
2. Field Lens Assembly
3. Reticle - "X" indicates ruled surface
4. Eyepiece

To insert a reticle into 10X eyepiece, remove field lens assembly (2, Fig. 2) as indicated in the above diagram. Do not completely disassemble the eyepiece. Insert reticles (3) ruling "up", into reticle retaining cell of the field lens assembly (2) and reassemble. Use care to keep lenses clean. Should cleaning become necessary, see "Use and Care" section for cleaning instructions.

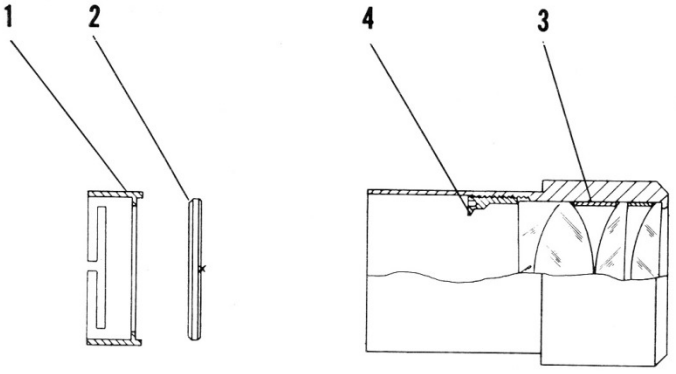


Figure 3. 15X Eyepiece - Catalog No. 147
20X Eyepiece - Catalog No. 157

1. Reticle Mount (Catalog No. 148)
2. Reticle - "X" indicates ruled surface
3. Eyepiece
4. Field Diaphragm

To insert a reticle into 15X eyepiece, simply place reticle (2, Fig. 3) (ruling "up"), into reticle mount (1). Now slide mounted reticle into eyepiece tube until reticle seats against the field diaphragm.

TO CALIBRATE MICROMETER DISCS

The value of the eyepiece micrometer scale varies with the optical combination used. Consequently, the scale must be calibrated before accurate measurements can be made. To calibrate, focus on a stage micrometer and move it until one of the principal graduations corresponds exactly with one of the divisions of the eyepiece scale. (See Figure 4.) The true distance (X) seen on the stage micrometer, which corresponds to the number of divisions (Y) of the eyepiece scale, is then read. Divide this true distance by the number of divisions of the eyepiece scale to find the distance each division subtends ($C = X/Y$). The number of divisions covered by the specimen multiplied by the calibration constant (C) gives the length of the specimen.

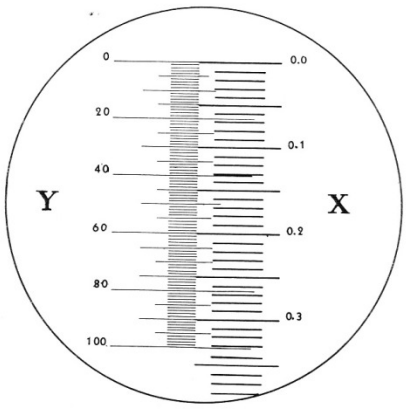


Figure 4

TRANSILLUMINATOR BASE

The TRANSILLUMINATOR BASE provides the CYCLOPTIC microscope with an easily attached base for versatile transillumination.

This unit (Catalog No. 58S) is supplied with Series 58 CYCLOPTIC MICROSCOPE . . . may be attached to any series 56 CYCLOPTIC Microscope.

The TRANSILLUMINATOR BASE accepts the STARLITE™ Illuminator to give a built-in illumination system for the CYCLOPTIC Microscope.

At the turn of a knob, one may select either a matte-ground opal mirror or specular aluminized mirror.

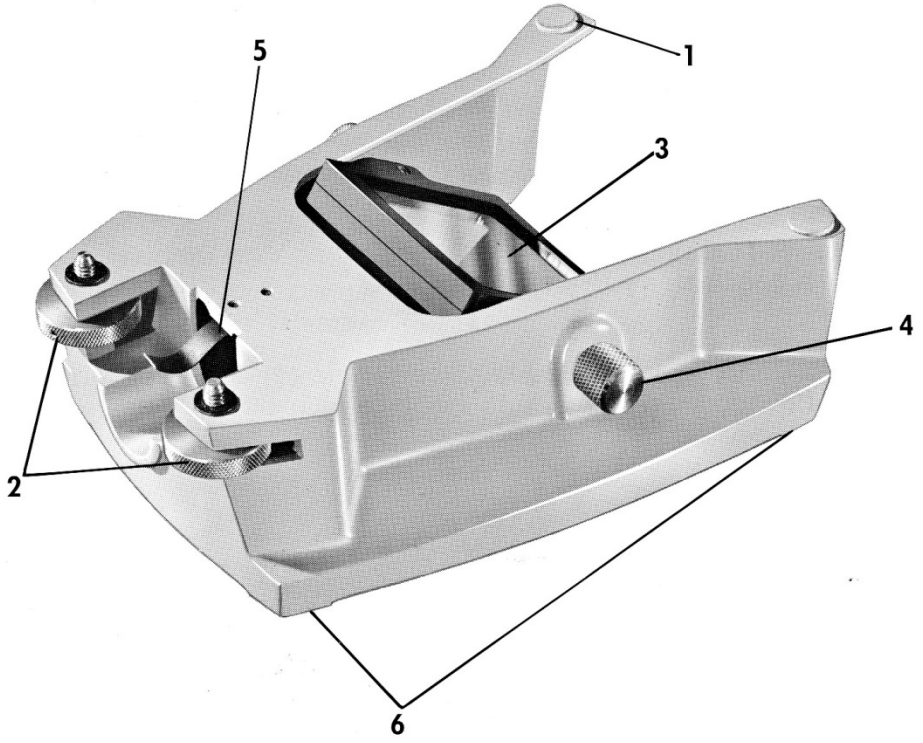


Figure 6. Transilluminator Base

1. Locating Bosses
2. Lock Screws
3. Mirror Assembly
4. Mirror Inclination Knobs
5. STARLITE Retaining Clip
6. Cork Pads

To attach the TRANSILLUMINATOR BASE (58S) to the 56 Series CYCLOPTIC Microscope:

1. Remove cork pads (43, Fig. 1) from base of microscope.
2. Engage locating bosses (1, Fig. 6) into pad recesses of microscope base.
3. Tighten lock screws (2) by rotation to the right.

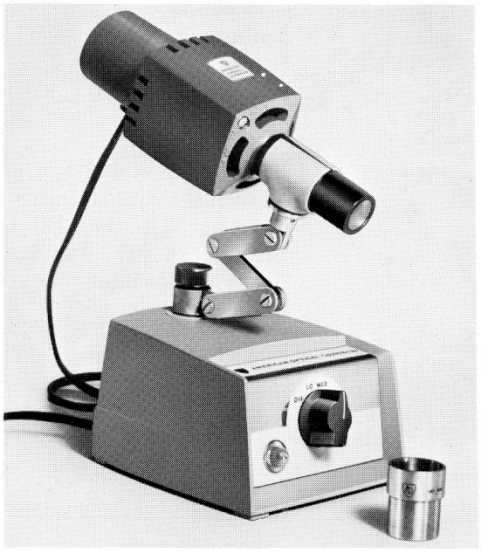
STARLITE™ ILLUMINATOR

Your STARLITE Illuminator has been carefully designed to provide bright, uniform illumination for macro or microscopic work.

It combines efficient Kohler-type illumination . . . assures optimum intensity . . . uniform brightness . . . longer lamp life. Mounted on its transformer base or used directly in your CYCLOPTIC Microscope armport or in the transilluminator base, the STARLITE Illuminator provides maximum versatility.

STARLITE features include:

BRILLIANT ILLUMINATION
UNIFORM, ILLUMINATED FIELD
LONG LAMP LIFE
LOW HEAT CONDUCTIVITY
FIXED PREFOCUS CONDENSER LENS ELEMENTS
EASY LAMP REPLACEMENT
REMOVABLE ILLUMINATOR UNIT
UNIVERSAL POSITIONING ARM
AMAZING VERSATILITY
VARIABLE OR FIXED 115V TRANSFORMER



STARLITE ILLUMINATOR — USE AND CARE

To replace lamp (8), remove screws (33), and separate rear lamp housing (3) from front lamp housing (15). Replace with new lamp (GE1460) and reassemble.

Outer surfaces of the lens system may be cleaned with cotton swab or soft cloth and mild detergent solution.

AO No. 364 Starlite Illuminator

Index No.	Part Number	Description	Qty
1	652-9	Cord, lamp	1
2	X-50109	Strain, relief	1
3	582-1	Housing, lamp, rear	1
4	582-26	Clip	1
5	582-17	Contact	2
6	582-4	Socket	1
7	X-30734	Screw	2
8	1033	Lamp (GE1460)	1
9	582-9	Shield	1
10	582-24	Shield	1
	364-852	Front Lamphouse Assembly consisting of Index Nos. 11, 12, 13, 15, 16, 17, 18, 19	
11	582-23	Ring, retaining	1
12	582-609	Lens, aspheric	1
13	582-13	Diaphragm	1
14	582-20	Plate, name	1
15	582-12	Housing, lamp, front	1
16	582-608	H. A. Filter	1
17	582-25	Spacer	1
18	582-607	Lens	1
19	582-8	Retainer	1
20	581-5	Screw	1
21	01229-1	Washer	1
22	581-15	Adapter	1
23	581-7	Washer	1
24	581-6	Pivot	1
25	01016-2	Washer	8
26	X-20591	Screw, set	1
27	581-18	Screw	4
28	581-20	Arm, outer	2
29	581-19	Arm, inner	1
30	581-502	Bushing Assembly	1
31	581-9	Screw	1
32	X-36473-2	Nut	4
33	582-6	Screw	2
34	X-50733	Ring, retaining	2
35	Cat. No. 369	Adapter	1

AO No. 365 Variable Voltage Transformer

Index No.	Part Number	Description	Qty
1	X-51376	Knob and Screw Assembly	1
2		Nut (Part of item 12)	1
3		Washer (Part of item 12)	1
4	365-14	Plate, name	1
5	365-7	Case Assembly	1
6	651-8	Cord	1
7	651-5	Receptacle	1
8	X-30238	Screw	4
9	11201-77	Pad, base	1
10	X-30237	Screw	4
11	365-10	Plate, bottom	1
12	651-16	Switch	1
13	X-50282	Nut, wire	2
14	11144-7	Light, pilot	1
15	365-1	Transformer	1
16	X-50130-407C	Wire	1
17	X-50129-103K	Wire	1

AO No. 367 Fixed Voltage Transformer

Index No.	Part Number	Description	Qty
1	X-51376	Knob and Screw Assembly	1
2		Nut (Part of item 12)	1
3		Washer (Part of item 12)	1
4	367-8	Plate, name	1
5	365-7	Case Assembly	1
6	651-8	Cord	1
7	651-5	Receptacle	1
8	X-30238	Screw	4
9	11201-77	Pad, base	1
10	X-30237	Screw	4
11	367-6	Plate, bottom	1
12	367-4	Switch	1
13	X-50282	Nut, wire	2
14	11144-7	Light, pilot	1
15	367-1	Transformer	1
16	X-50130-407C	Wire	1
17	X-50129-103K	Wire	1

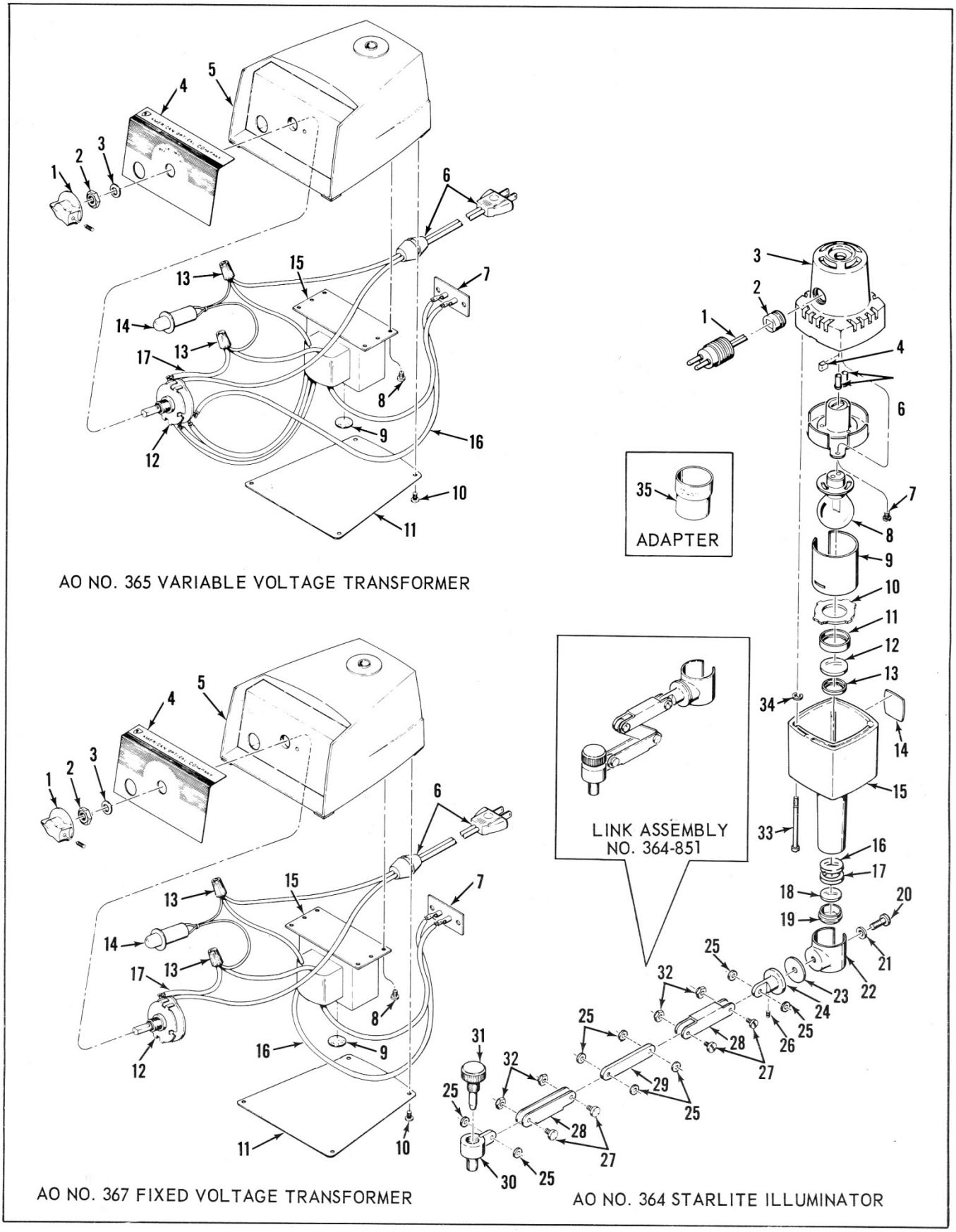

AO NO. 365 VARIABLE VOLTAGE TRANSFORMER
AO NO. 367 FIXED VOLTAGE TRANSFORMER
ADAPTER
LINK ASSEMBLY NO. 364-851
AO NO. 364 STARLITE ILLUMINATOR

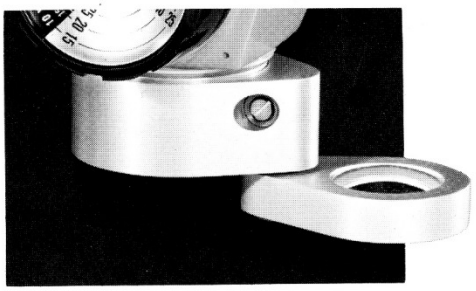
Figure 5

2X AND 2/3X AUXILIARY LENS–ATTACHMENTS

The 2X and 2/3X Auxiliary Lens-Attachments are fully corrected optical systems...readily screwed onto or attached to standard apochromatic microscope objective to extend the useful range of magnifications.

The 2X attachments (available as Nos. 264, 265) double the magnification of the basic CYCLOPTIC Microscope. Working distance is 1.5 inches...high level of illumination is maintained.

The 2/3X attachment provides magnification 2/3 that of the basic microscope. Working distance is 4.4 inches.



No. 264

No. 265

No. 267

1/2X OBJECTIVE

CYCLOPTIC Microscope Series 53, 55, and 59 obtain still further versatility when equipped with the special long working distance wide field 1/2X apochromatic objective. This objective - specifically designed for use when a large working space is required - provides a full 8-inch working distance and an extremely wide field of view.

No. 266

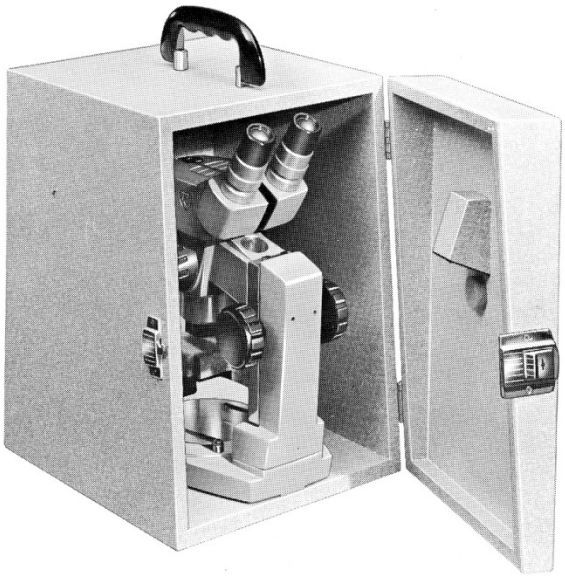
MECHANICAL STAGE

The mechanical stage accessory provides a full travel mechanical stage for the examination of microscope slides.

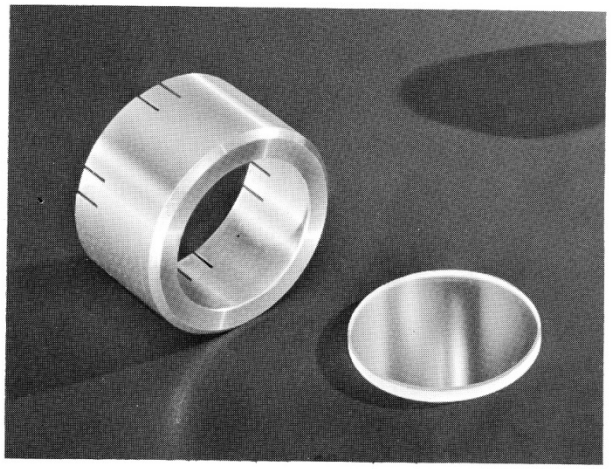
The mechanical stage for the CYCLOPTIC Microscope includes the mechanical unit, a circular glass stage and supporting base...for use in conventional or reverse position...for right or left hand operation. To attach mechanical stage to Series 56, 58, or 59 Microscopes:

Remove stage clips from microscope stage. Fasten in place with the 2 supplied screws or with stage clip screws.

No. 1556



No. 1656, for Series 56



No. 585 Lens Protecting Window

CABINETS

Cabinets are available for Series 56, 58, 59 CYCLOPTIC MICROSCOPES. They are designed for safe and convenient storage of microscopes and accessories.

LENS PROTECTING WINDOW

For industrial use where the CYCLOPTIC Microscope objective may be in danger of damage from chips, oil, etc., a lens protecting window with mount is available.

STANDARD TABLE STAND

Series 52 standard table stand provides manual adjustments of vertical pillar and horizontal arm instead of rack-and-pinion adjustments. A supporting ring is provided on the vertical post to permit a full 360° rotation of the arm. For further information see Reference Manual 52-101.

UNIVERSAL TABLE STAND

The UNIVERSAL TABLE STAND 53S incorporates maximum flexibility and adaptability.

The microscope head may be readily focused, translated in two linear coordinates and rotated about five separate axes...rotates to view objects in a circle greater than 4 feet in diameter. A counter balance permits stable operation in any position. A safety device protects the head against accidental removal. The distance from objective mount to table level may be varied from 2-1/4 inches to 20 inches.

All adjustments are equipped with adjustable tension springs or friction loading for safety and easy manipulation...may be tightened or locked for stability under severe operating conditions. Rack and pinion knobs are of durable nylon.

Provision has been made for attaching the base to bench or laboratory table with standard 1/4-20 machine screws.

VERTICAL ADJUSTMENTS

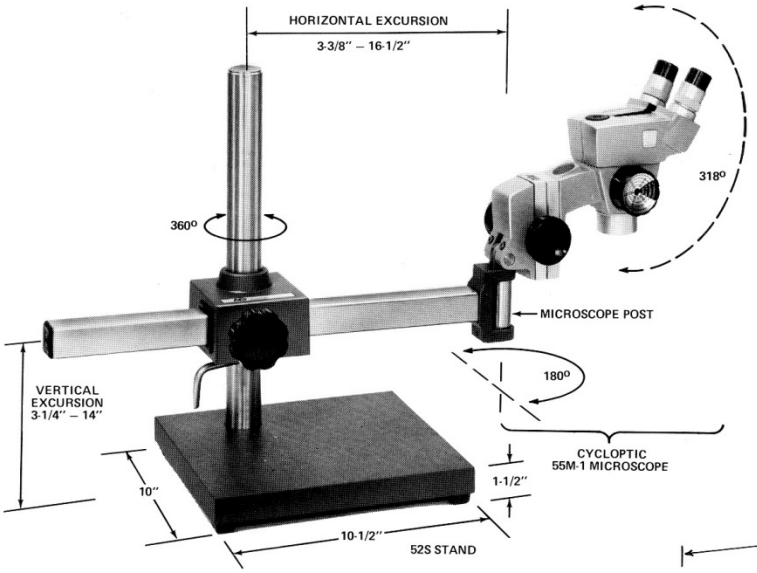
ADJUSTMENT	TRAVEL PROVIDED
Rack and pinion	2.5"
Center post rack and pinion	3.5
Swing (360°) about horizontal axis	10.75
Invert focusing slide	1.75
Total excursion	18.5

HORIZONTAL ADJUSTMENTS

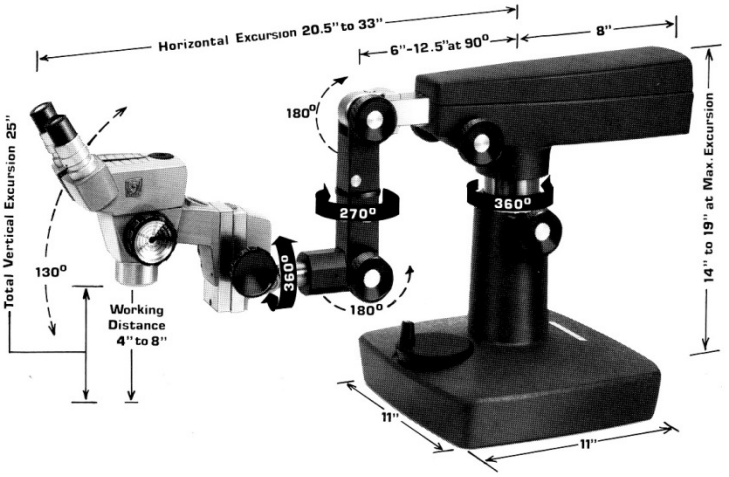
ADJUSTMENTS	TRAVEL PROVIDED
Horizontal arm rack and pinion	4.9"
Horizontal draw tubes	9.3
Total excursion	14.2

ANGULAR ADJUSTMENTS

Rotation 360° about vertical post
Rotation 360° about horizontal arm
Rotation 360° about body post
Rotation 140° about inclination joint
Rotation 270° about offset arm



Series 52

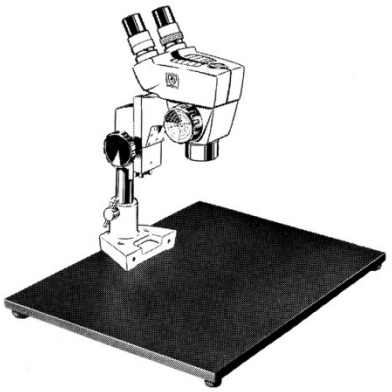


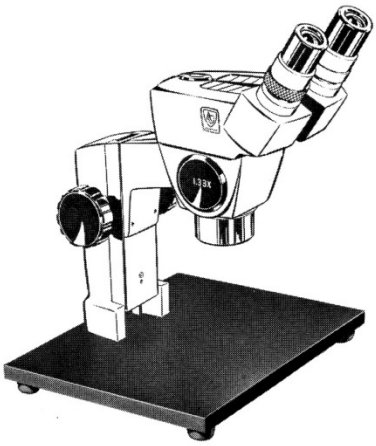
Series 53

PHENOLIC-RESIN BASEBOARD

7-1/2" x 9-1/2" (Cat. 30A) and 12" x 17" (Cat. 30B) phenolic-resin baseboards may be substituted for the standard microscope stage of the 56 series.

These bases may also be directly used as an accessory base for the 59 series microscopes.





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