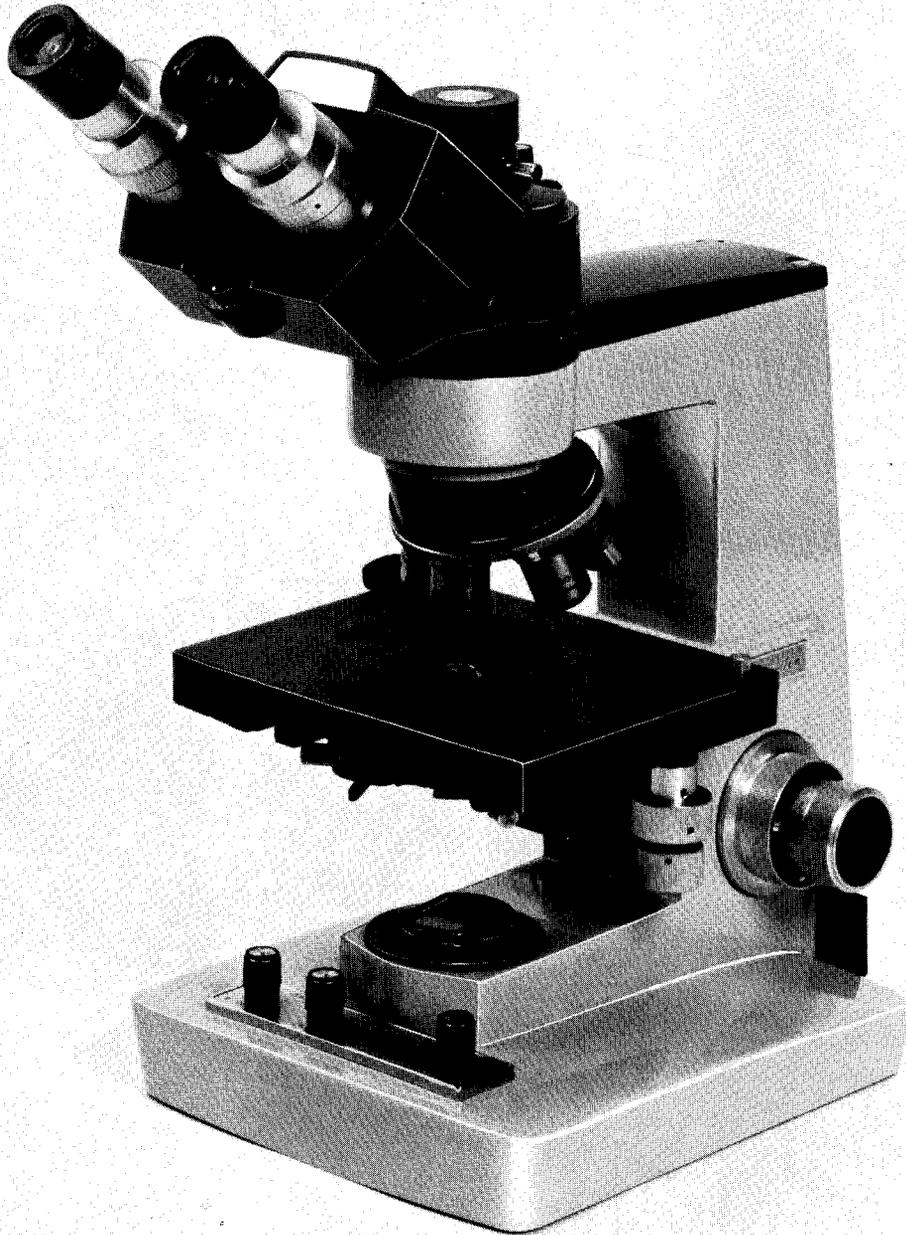


6650-01-158-8014

REFERENCE MANUAL

**Series One-Ten MICROSTAR®
Advanced Laboratory Microscopes**



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Reichert™

Reichert Scientific Instruments
Division of Warner-Lambert Technologies, Inc.
P.O. Box 123, Buffalo, New York 14240 U.S.A.

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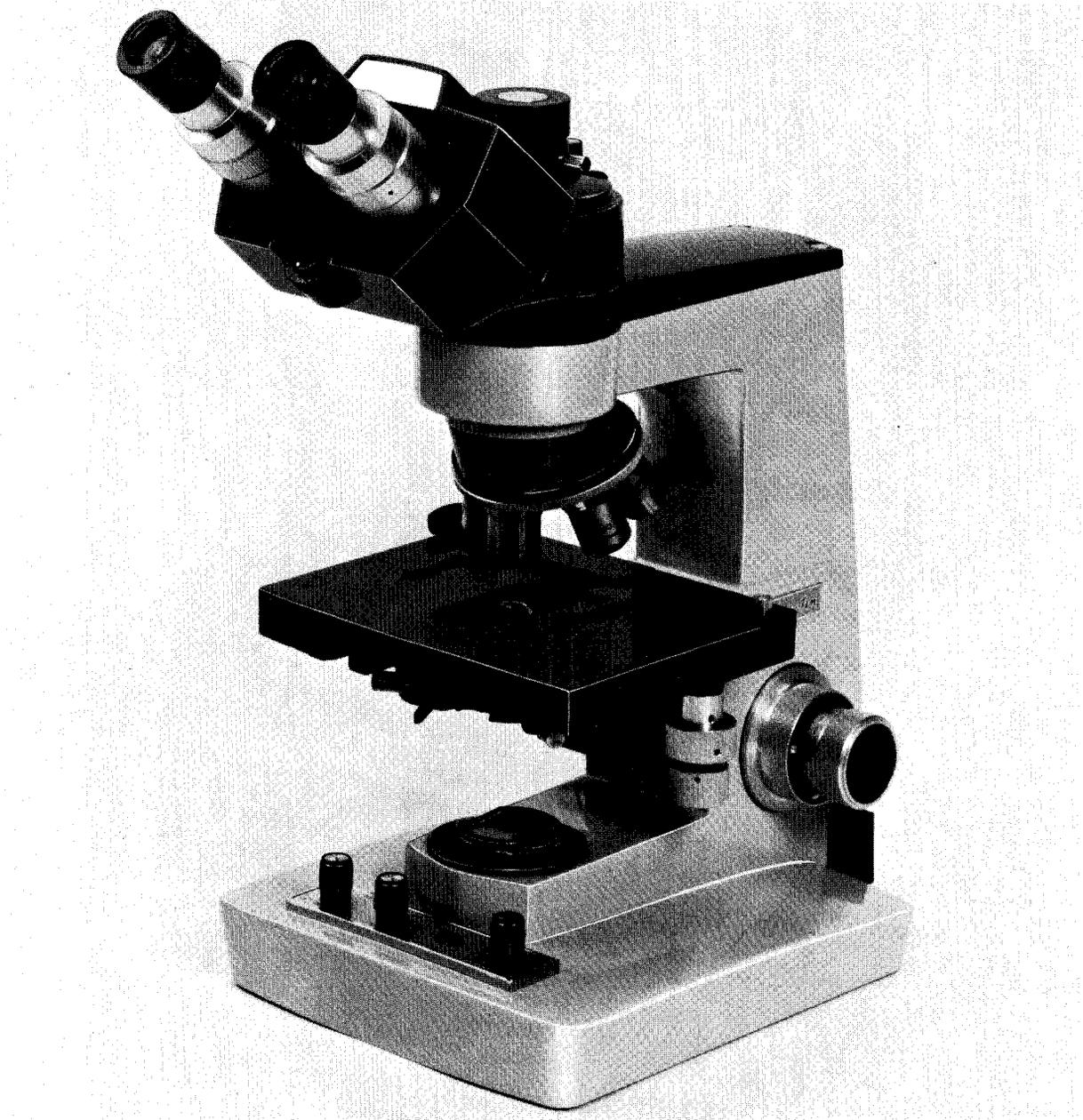


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H110TU-J Series One-Ten Microscope

I. INTRODUCTION

Reichert Scientific Instruments is the oldest major producer of microscopes in the world. Every Series One-Ten MICROSTAR Microscope is the product of nearly a century and a half of microscope manufacturing experience. The Series One-Ten is the finest and most versatile laboratory microscope ever produced. Given proper care, it will provide continued outstanding, dependable service.

II. REFERENCE MANUAL

This Reference Manual is written on the assumption that it is to be used by advanced students and experienced microscopists. No attempt has been made to include fundamentals and basic principles of microscopy. It covers the essential functional adjustments, controls and routine maintenance requirements specific to the MICROSTAR Microscope Series One-Ten.

III. UNPACKING

The method of packaging the new MICROSTAR Microscope takes advantage of modern packaging materials and techniques plus the quick and easy interchange of component assemblies which has been engineered into the design of this modern microscope. Each microscope is fully assembled and thoroughly inspected at the factory. The subsequent removal of component assemblies for convenience and safety in transit in no way impairs the ultimate performance of the microscope. Precise functional alignment is assured by manufacturing techniques and design. Simply follow these instructions for quick assembly of the instrument.

1. Lift out inner styrofoam container using hand cut-out provided.
2. Set container on its side with hand cut-out facing down. Cut tape and carefully lift off top half of container.
3. Lift stand assembly out of container. Remove plastic shipping bag. Remove foam blocks from under nosepiece and stage.

4. Remove body from container. Remove plastic shipping caps.
5. Be sure all small parts (eyepieces, etc.) are removed from container.
6. Saving of shipping materials will allow easy yet effective repackaging should future shipments be desired.

IV. ASSEMBLY

A. Attaching Body to Stand

Attach body to stand by backing off knurled screw, inserting dovetail in body support and tightening the knurled screw firmly without forcing. See Figure 1.

The body is thus precisely located on the optical axis of the microscope, regardless of the orientation selected. The MICROSTAR Microscope may be used in either of two positions; arm toward the observer, or arm away from the observer. It is assumed that microscopes with built-in illuminators will be used with the arm away from observer. After body is attached, install eyepiece(s) in body eyepiece tube(s).



Figure 1. Attaching Body

B. Objectives Factory Assembled to Nosepiece

All objectives have been factory fitted to the nosepiece. Check to see that each is secured firmly. Magnifications are arranged in sequence from lowest to highest. Objectives may be removed for cleaning by manually unscrewing them from the nosepiece.

C. Connection of Illuminator

On instruments equipped with Cat. No. 1130A Tungsten Halogen Illuminator the lamp and lamp socket are shipped in the inner carton. Install this assembly into the receptacle on the right rear of the stand, being sure that the word "LAMP" embossed on the socket is upright.

Illuminator 1130A plugs directly into 115V AC outlet. Illuminator 1130E plugs directly into 230V AC outlet.

V. FOCUSING

A. New Focusing Concept

The MICROSTAR Microscope incorporates a new focusing concept of unprecedented convenience and effectiveness in which only the nosepiece moves in focusing. The basic construction is shown in Figure 2. The nosepiece is raised and lowered by the concentric coarse and fine adjustment knobs. The entire internal focusing mechanism is totally enclosed and sealed against entry of dirt. Movement of the nosepiece on a ball bearing slide-way ensures smooth, positive action, free of backlash.

B. Coarse Adjustment

Positive stops are provided for both the upper and lower position of the coarse adjustment control

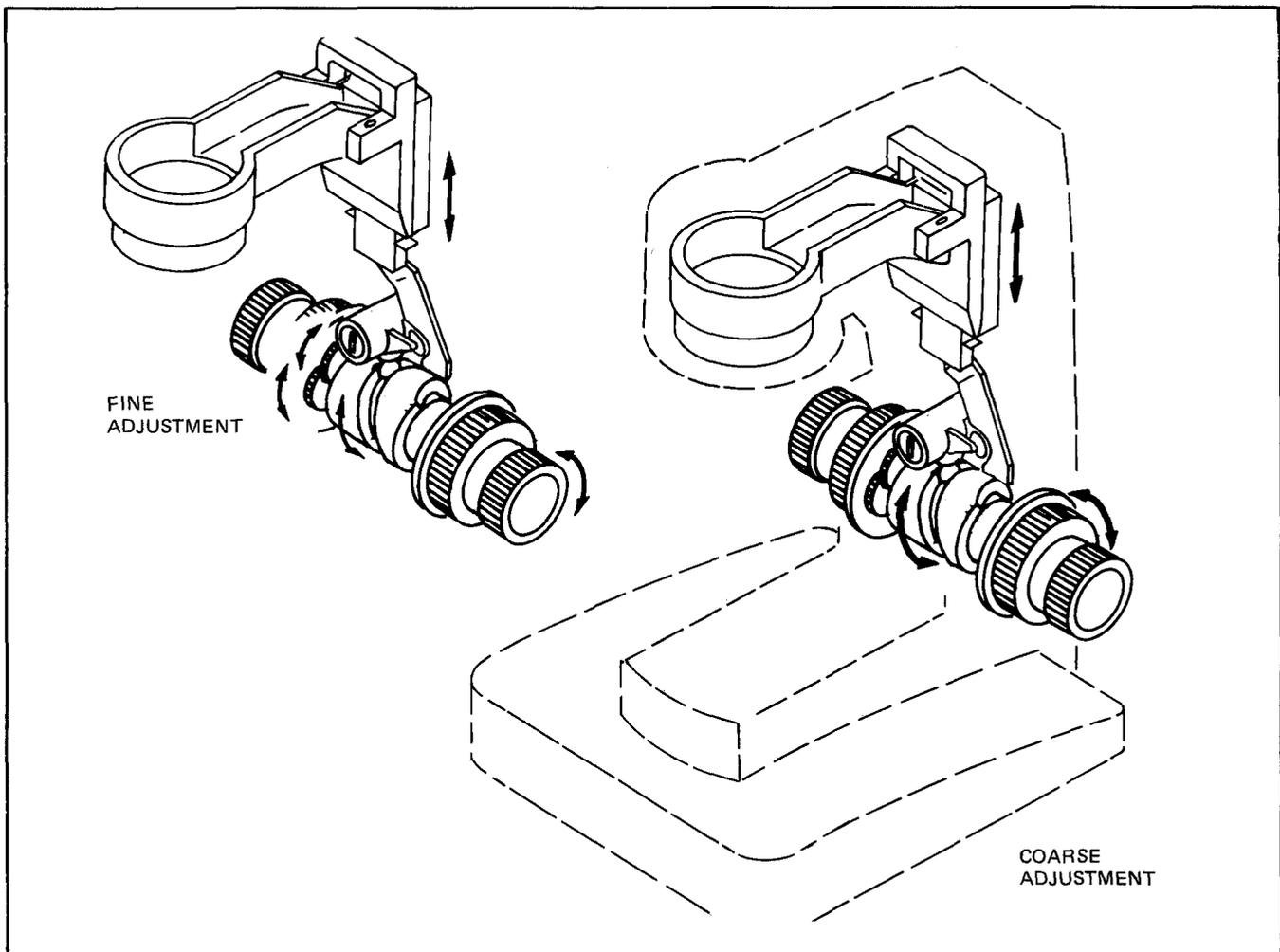


Figure 2. Coarse and Fine Adjustment Construction

knob. Excursion provided is ample for slides or chambers. For use with tissue culture bottles, etc., where greater clearance is required, the stage can be immediately lowered and locked to the desired position. Relubrication and tension readjustment of coarse adjustment are not required.

C. Fine Adjustment

The fine adjustment knob, graduated in microns, has a total excursion of 2mm, or 10 complete revolutions. Four reference lines, 90° apart, are provided on the coarse adjustment knob so that at least one is always in convenient working position (Figure 3).

The fine adjustment mechanism moves on the same ball bearing slideway as the coarse adjustment. Relubrication and tension readjustment are not required.

D. Focusing Procedure

The stage height is preset at the factory for normal thickness slides (approximately 1.0mm). To focus:

- (1) Place slide on stage.
- (2) Rotate nosepiece to 10X objective.
- (3) Lower the nosepiece with coarse adjustment to its lowest limit.
- (4) Bring the image of the slide into focus with the fine adjustment control knob. If a sharp image cannot be obtained, see paragraph F.

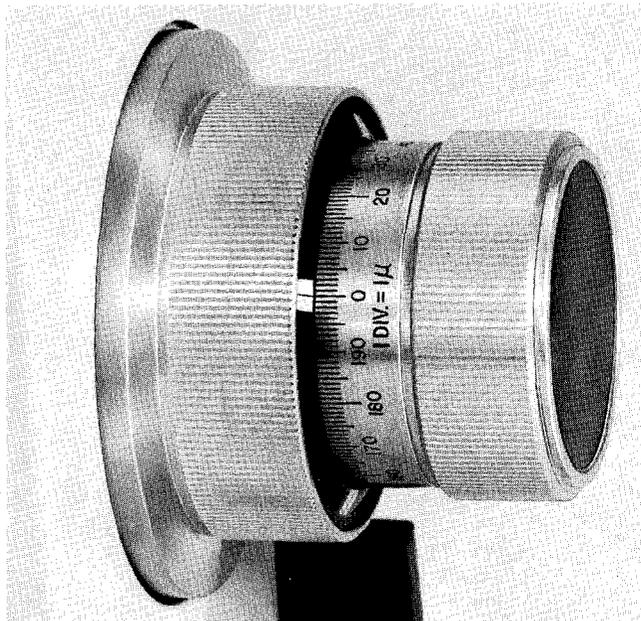


Figure 3. Coarse and Fine Adjustment Knobs

Because of the highly precise tolerance held in the manufacture of the objectives (affecting both parcentration and parfocality), it is possible to search the slide with 10X or high dry objectives, find the field required for study under oil immersion, raise the coarse adjustment, swing to the oil immersion objective, apply oil to the slide, and lower the coarse adjustment rapidly to its positive stop. The specimen will be in focus with absolutely no danger of touching the slide.

E. Thick Specimens

For thick specimens such as tissue culture bottles, hemacytometers, etc., the stage can be lowered. To do so:

On mechanical stages, make sure stage plate is racked forward enough to permit lowering of stage assembly.

- (1) Locate socket head screw on left side of stage (Figure 4).
- (2) Support stage with hand and loosen screw.
- (3) Lower stage to desired level.
- (4) Tighten screw.

F. Adjustment of Stage to Original Height

The following steps should be taken to return the stage to correct height for normal slides (approximately 1.0mm):

- (1) Place slide on stage.

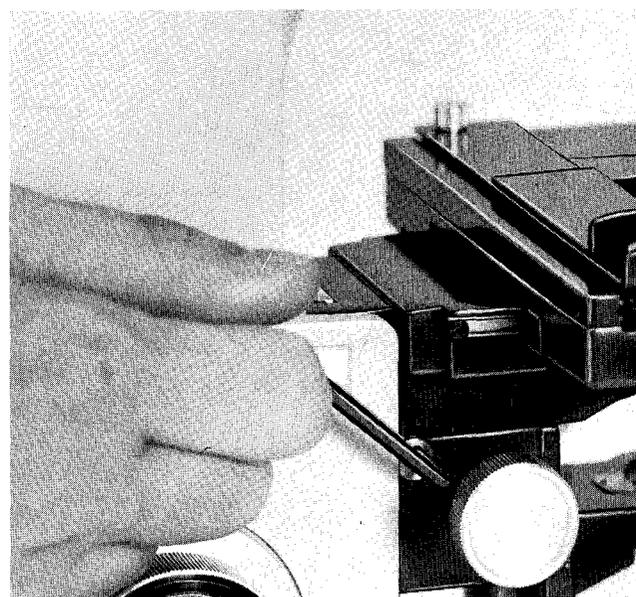


Figure 4. Stage Locking Screw

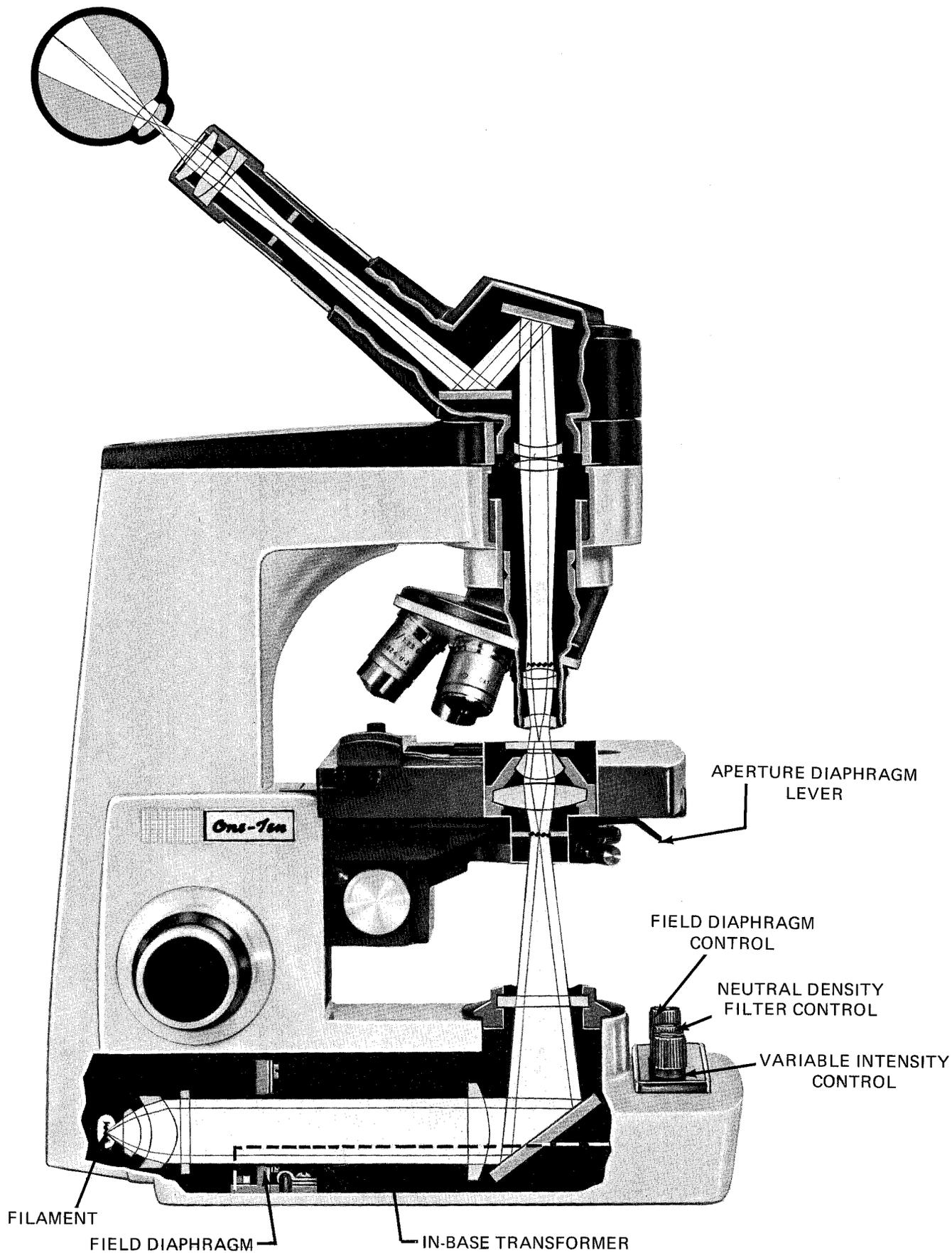


Figure 5. Infinity Corrected Optical System

- (2) Rotate nosepiece to 10X objective.
- (3) Lower nosepiece with coarse adjustment to lower limit.
- (4) Turn fine adjustment so that it is approximately in the middle of its excursion (five turns from either stop).
- (5) Support stage with hand and loosen socket head locking screw on left side of stage (Figure 4) using 9/64" wrench provided.
- (6) Raise stage until stage and stand dovetails are at the same level. Specimen should be in approximate focus. If not, adjust stage height accordingly while looking through microscope.
- (7) Tighten socket screw.
- (8) Bring specimen into sharp focus with fine adjustment.

NOTE: It is recommended that the coarse adjustment always be lowered all the way down against its stop when specimen is about to be viewed. If specimen cannot then be brought into sharp focus within excursion of fine focus, readjust stage as described in paragraph F.

VI. COMPONENTS

A. Infinity Corrected Objectives

1. Description

Most microscopes have been constructed with a fixed distance between eyepiece and objective. The infinity corrected system (Figure 5) makes it possible to change the objective to eyepiece distance without affecting optical performance. The concept of infinity corrected objectives makes possible a breakthrough in optical performance and, at the same time, simplifies the focusing mechanism. This is achieved by focusing the nosepiece only, and not the heavy stage assembly or body tube.

Parallel light rays emerging from the objective are picked up by a lens in the microscope body tube which brings the rays to focus at the correct position

in the eyepiece. Optical performance is in no way impaired by varying the distance from objective to the lens assembly since this merely extends the length of the parallel beam.

2. Table of Objective Characteristics

The pertinent characteristics of this new series of infinity corrected objectives, in combination with recommended eyepieces, are given in Table 1.

3. Parfocality and Parcentration

All objectives in this series are parfocal. This means that the specimen is essentially in focus when the nosepiece is rotated to change from one magnification to another. With stained slides of normal density, it should always be possible to see an image when going to the next highest power and it is normal to expect a slight touch-up with the fine adjustment.

Parfocality will not be adversely affected by any random selection or arrangement of objectives on the nosepiece.

This series of objectives is also parcentered. When an area is selected in the center of the field for a given magnification, it will remain well within the field of view for the next highest magnification.

4. Immersion Oil

In addition to a suitable refractive index and dispersion, a satisfactory immersion oil must possess the following physical properties: It should be chemically inert; it should be free from a tendency to spread or creep; it should remain fluid and not harden rapidly when exposed to air; and its optical properties should be stable and not change with age.

Reichert recommends standard immersion fluids such as Cargille Type A, which is available from Reichert and most scientific supply houses. Oils of low viscosity, such as mineral oil, will cause damage by seeping up around the mounts and into the objective.

B. Eyepieces

The Series One-Ten MICROSTAR Microscope is equipped with 10X Wide Field Eyepieces (Cat. No. 176A or 180). Wide Field eyepieces of 15X and 20X or Huygenian eyepieces of 5X and 10X are optional.

TABLE 1
CHARACTERISTICS OF REICHERT INFINITY CORRECTED
OBJECTIVES AND EYEPIECES

OBJECTIVES					EYEPIECES											
Catalog Number	Initial Magnification	Type	Numerical Aperture N.A.	Working Distance in MM	1. FIELD OF VIEW and 2. EYE RELIEF IN MM											
					5X Huygenian Cat. 133		10X Huygenian Cat. 177		10X Wide Field Cat. 176A		10X Wide Field Cat. 180		15X Wide Field Cat. 184		20X Wide Field Cat. 157	
					1.	2.	1.	2.	1.	2.	1.	2.	1.	2.	1.	2.
1028	2.5X	plan-achromat	0.07	9.2	1.2.	7.5 9.6	5.9 8.2	7.4 19.6	8.0 19.6	6.7 14.0	4.9 10.0					
1017	4X	plan-achromat	0.12	7.2	1.2.	4.7 9.5	3.7 8.1	4.6 19.6	5.0 19.6	4.2 14.0	3.1 10.0					
1026	10X	achromat	0.25	9.1	1.2.	1.9 8.6	1.5 7.9	1.9 19.6	2.0 19.6	1.7 14.0	1.2 10.0					
1021	10X	plan-achromat	0.25	4.3	1.2.	1.9 8.6	1.5 7.9	1.9 19.6	2.0 19.6	1.7 14.0	1.2 10.0					
1022	20X	plan-achromat	0.50	1.4	1.2.	0.95 7.9	0.74 7.7	0.92 19.6	1.0 19.6	0.84 14.0	0.61 10.0					
1128	40X	plan-achromat	0.66	0.5	1.2.	0.48 7.86	0.36 7.7	0.46 19.6	0.50 19.6	0.42 14.0	0.31 10.0					
1309	40X	plan-achromat	0.66	0.2	1.2.	0.48 7.86	0.36 7.7	0.46 19.6	0.50 19.6	0.42 14.0	0.31 10.0					
1116	45X	achromat	0.66	0.7	1.2.	0.42 7.7	0.33 7.6	0.41 19.6	0.44 19.6	0.37 14.0	0.27 10.0					
1016*	50X	plan-achromat	0.85	0.3	1.2.	0.38 7.7	0.29 7.6	0.37 19.6	0.40 19.6	0.33 14.0	0.24 10.0					
1014*	100X	plan-achromat	1.25	0.1	1.2.	0.19 7.0	0.15 7.5	0.18 19.6	0.20 19.6	0.17 14.0	0.12 10.0					
1311	100X	plan-achromat	1.25	0.1	1.2.	0.19 7.0	0.15 7.5	0.18 19.6	0.20 19.6	0.17 14.0	0.12 10.0					
1079	100X	achromat	1.25	0.1	1.2.	0.19 7.0	0.15 7.5	0.18 19.6	0.20 19.6	0.17 14.0	0.12 10.0					

NOTES: All working distances in air above a 0.18MM coverglass — from coverglass to mount.

Eye relief is distance from exit pupil (ideal position of eye) to top of eyepiece lens.

* With built-in iris diaphragm for darkfield and fluorescence antibody techniques.

1. Wide Field Eyepieces

As the name implies, this type of eyepiece offers a larger field of view than a Huygenian eyepiece of equal magnification. In fact, as Table 1 shows, the 10X Wide Field eyepiece has a larger field of view than even a 5X Huygenian eyepiece. It also provides a higher eyepoint and for this reason is definitely recommended for observers wearing eyeglasses.

This series is available in three different magnifications:

- 10X Wide Field — Cat. No. 176A, 180
- 15X Wide Field — Cat. No. 184
- 20X Wide Field — Cat. No. 157

2. Huygenian Eyepieces

This eyepiece is simpler in construction. As shown in Table 1, it has smaller field size and lower

eye relief than the wide field type. For this reason, it is not recommended for use by observers wearing eyeglasses.

3. Reticle Installation

The method of installing a reticle varies with the type of eyepiece.

(a) Cat. No. 176A and 180 10X Wide Field Eyepieces. These eyepieces take the 475 through 481 series of reticles, 21.90mm in diameter. As shown in Figure 6, the reticle should be placed in the eyepiece with the ruled side up. It is held in place against the field diaphragm by the retaining ring included with the reticle (Figure 6).

(b) Cat. No. 184 15X and 157 20X Wide Field Eyepieces. These eyepieces take the 1400 series of reticles. To insert a reticle into

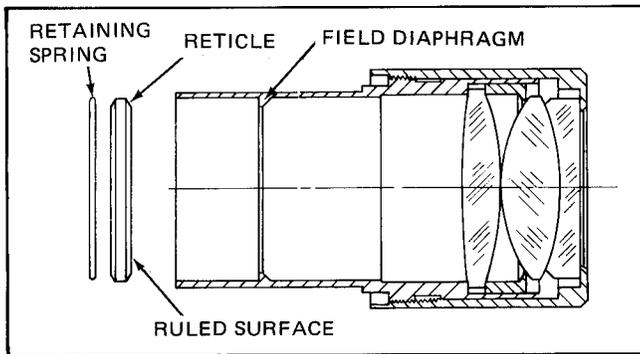


Figure 6. Catalog 176A, 180 Wide Field Eyepieces

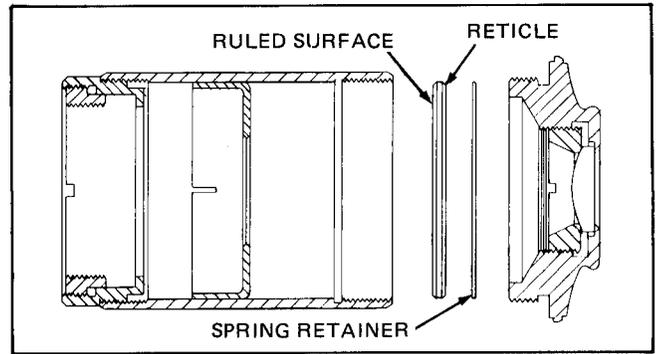


Figure 8. 10X Huygenian Eyepiece

the eyepiece, place the reticle in the reticle mount with the ruled side facing outward. Slide the mounted reticle into the eyepiece tube with the ruled side of the reticle upwards until the reticle seats against the field diaphragm. (Refer to Figure 7.)

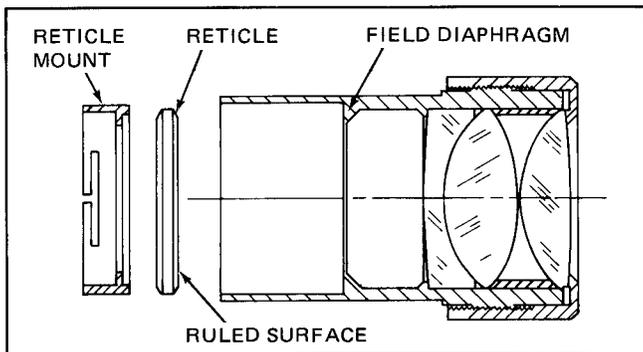


Figure 7. Catalog 184, 157 Wide Field

(c) Huygenian Eyepieces. A cross section of the 10X Huygenian eyepiece is shown in Figure 8.

Both the 5X eyepiece Cat. No. 133 and the 10X Cat. No. 177 accept reticle series 405 through 427; 21mm in diameter. To install a reticle in the Huygenian eyepiece, the reticle must be inserted in the eyepiece from the top with the ruled side of the reticle facing down, and secured with a circular spring retainer.

4. Calibration of Micrometer Disc

The projected values of reticle graduations vary with the optical combination used and, consequently, should be precalibrated before accurate measurements can be made.

To calibrate, focus on a stage micrometer and move it until the zero graduations on it and on the reticle line up exactly. Pick a graduation as far (numerically) up the reticle scale as possible that corresponds exactly with a line on the micrometer scale. The calibration factor is this distance on the micrometer scale divided by the distance on the reticle scale. The calibration factor is actually the true distance subtended by one unit on the reticle scale. The calibration factor should be computed for each objective used.

Example: We have chosen for an example Cat. No. 400 Stage Micrometer (2mm scale/200 divisions) and Cat. No. 475 Reticle (10mm scale/100 divisions), corresponding to X and Y respectively in Figure 9. Note that the zero graduations line up exactly. We can see that the highest reticle graduation that lines up exactly with a micrometer graduation is at 90. This corresponds with 0.3 on the micrometer scale.

Our calibration factor is:

$$\begin{aligned}
 C &= \frac{x}{y} \\
 &= \frac{0.3\text{mm}}{90} \\
 &= .0033\text{mm}
 \end{aligned}$$

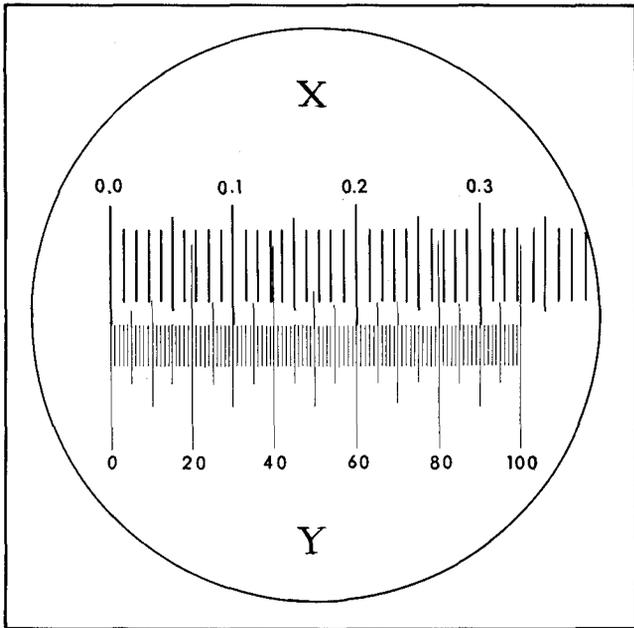


Figure 9. Calibration of Micrometer Discs

The number of divisions covered by the specimen multiplied by the calibration factor C gives the length of the specimen. For example, if a particular specimen covered 67 reticle units, its true length would be $67 \times .0033\text{mm} = 0.22\text{mm}$.

C. Stages

1. Types

The Series One-Ten is supplied with either a simple or mechanical stage.

- (a) Simple Stage: This stage is equipped with two stage clips (Figure 10).
- (b) Mechanical Stage: This type of stage is available in graduated or ungraduated configurations, with a choice of right- or left-hand controls. (Figure 11) Unless ordered otherwise, all Series One-Ten MICROSTAR Microscopes supplied with mechanical stages are equipped with right hand controls.

2. Attachment

The stage is attached to the stand by means of a dovetail slideway. In use, the stage assembly is locked at a fixed position on the slideway. This height is preset at the factory for slides of normal

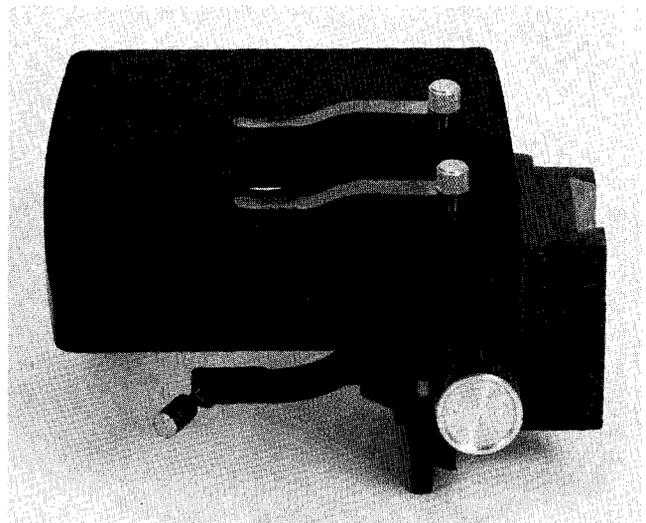


Figure 10. Simple Stage

thickness (approximately 1.0mm), and provides, with the excursion of the fine adjustment, satisfactory use for slides up to a thickness of 2.0mm. For thick vessels the stage can be lowered as per paragraph V F.

3. Operation

- (a) Simple Stage: To avoid bending clips, slide should always be inserted under the raised rear portion of the clips and then slid forward over stage aperture.
- (b) Mechanical Stage: The slide carrier is easily removed by unscrewing the two knurled

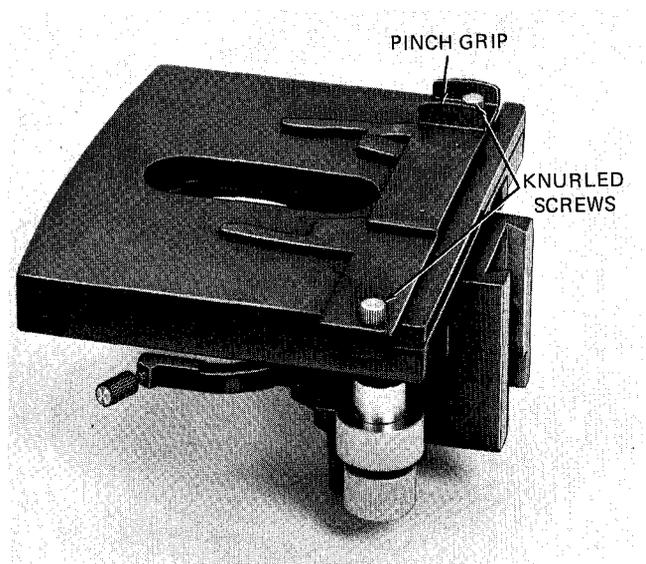


Figure 11. Mechanical Stage

screws. See Figure 11. The lateral movement of the finger is actuated by the pinch grip.

The forward and lateral motions of the stage are on prelubricated bearing ways. The mechanical stage mechanism, including the slide carrier, is permanently lubricated at time of manufacture.

D. Changing Stages

1. Removal

- (a) Raise nosepiece to upper limit with coarse adjustment.
- (b) Remove all objectives from nosepiece.
- (c) With mechanical stages, center the elongated hole in the top stage plate to the hub of the nosepiece by moving the stage top in a north-south direction.
- (d) While supporting the stage in one hand, loosen locking screw (Figure 4) and raise the entire assembly from the dovetail slide, tilting it forward at the top of the slide to clear the nosepiece. (Figure 12)

2. Replacement

- (a) Be sure the top stage plate is centered to the hub in a north-south direction so that the nosepiece hub will not interfere.

- (b) Be sure the locking plate will not interfere. (Figure 13)
- (c) Tilt stage assembly forward to carefully engage the slideway. Lower stage onto slideway and tighten socket head screw enough to hold stage in place temporarily.
- (d) Replace objectives on nosepiece.
- (e) Follow paragraph F under FOCUSING, Section V, to set stage at proper level.

E. Substage Equipment

1. Rack and Pinion Focus

The fork mount which supports the substage condenser is actuated by rack and pinion. The maxi-

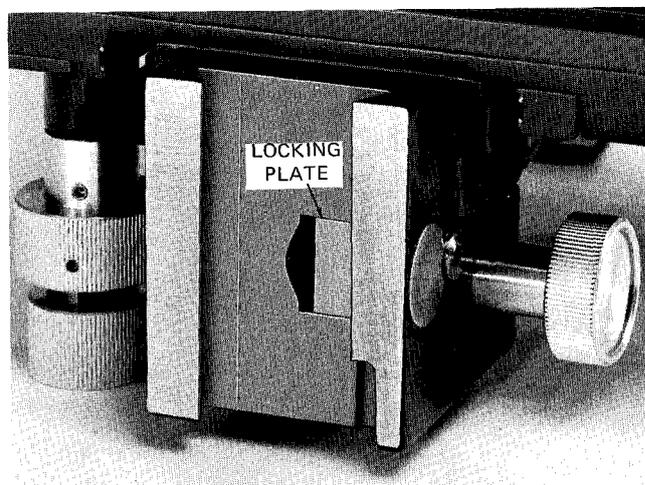


Figure 13. Rear View of Stage Assembly

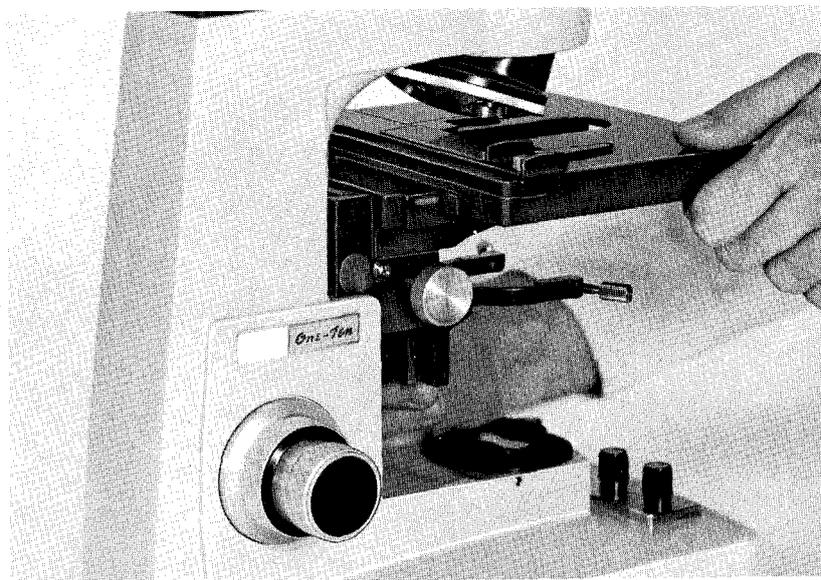


Figure 12. Removing Stage

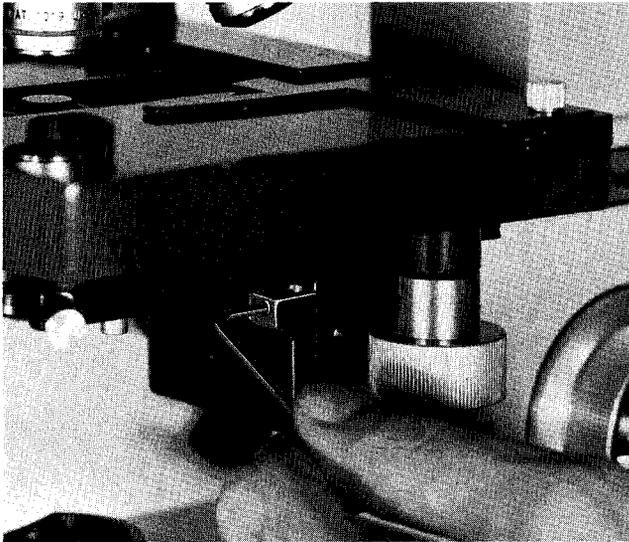


Figure 14. Condenser Stop Retaining Screw

mum height of the condenser has been properly adjusted at the factory to just below stage level. If it becomes necessary to readjust the height of the condenser, do so as follows:

- (a) Loosen condenser stop retaining screw (Figure 14), using 5/64" wrench provided.
- (b) Adjust condenser to desired height.
- (c) Retighten screw.

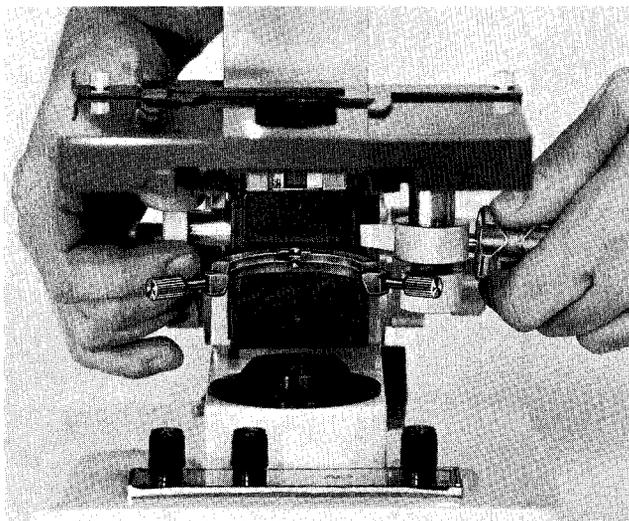


Figure 15. Condenser Focusing Tension Adjustment

Now any time condenser is lowered it can be quickly returned to this height by merely racking it up until stop touches stage.

2. Adjustment of Focusing Tension

Adjust the focusing tension by turning knob while holding slotted nut on the opposite side stationary with a screwdriver or coin. (See Figure 15.)

3. Fork Mount

The condenser mount is precentered at the factory. However, two knurled centering screws are included so that proper Koehler illumination can always be set up. (Figure 17) To remove the condenser mount, merely back off these screws and pull condenser mount forward. When installing the condenser mount in the fork, be sure that the screw head on the mount engages in the slot in the fork. (Figure 16)

Each condenser mount is furnished with an iris diaphragm which controls the effective numerical aperture of the objective, Figure 18.

A filter holder ring is attached to the condenser mount. It accepts filters of 34.5mm diameter, such as blue daylight filters, special colored filters, ground glass filters, etc.

4. Condenser

- (a) Most Series One-Ten MICROSTAR Microscopes (except those equipped with 2.5X objective) are supplied with Catalog No. 1087, N.A. 1.25 Abbe Aspheric Condenser.
- (b) Auxiliary Swing-in Condenser Catalog No. 1091. This condenser (Figure 18) permits

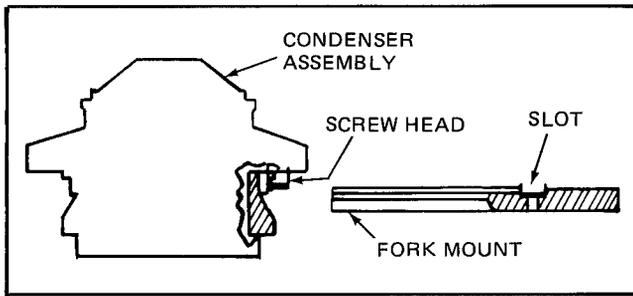


Figure 16. Fork Mount

filling the entire field of the 4X scanning objective. It is not required when the microscope is equipped with Condensers Catalog No. 1094A and 1099.

If ordered later, the auxiliary swing-in condenser and stop pin can be readily attached to the bottom of the condenser mount in the threaded holes provided.

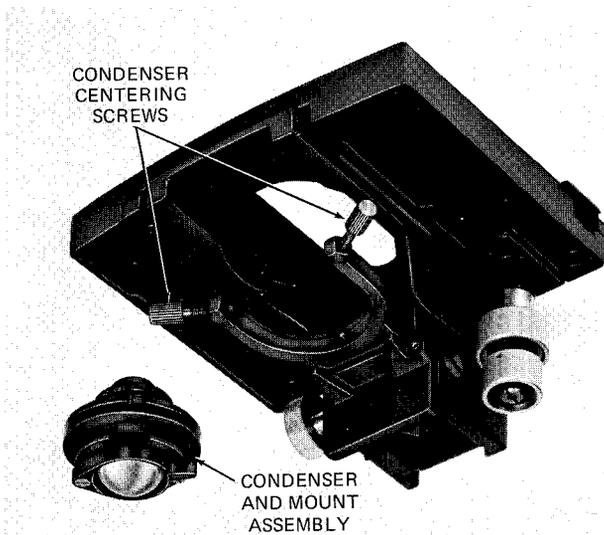


Figure 17. Condenser Centering Screws

(c) Flip-top Condenser Catalog No. 1094A N.A. 1.25 is supplied with all Series One-Ten MICROSTAR Microscopes having a 2.5X objective. The flip-top part of the condenser should be in the light path for all objectives of 10X or greater magnification. Flipping out this portion allows the field of the 2.5X scanning objective to be properly filled (Figure 18A).

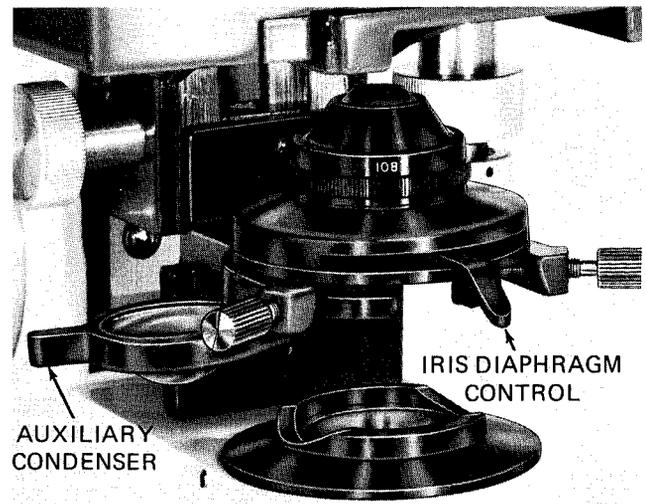


Figure 18. Substage Equipment

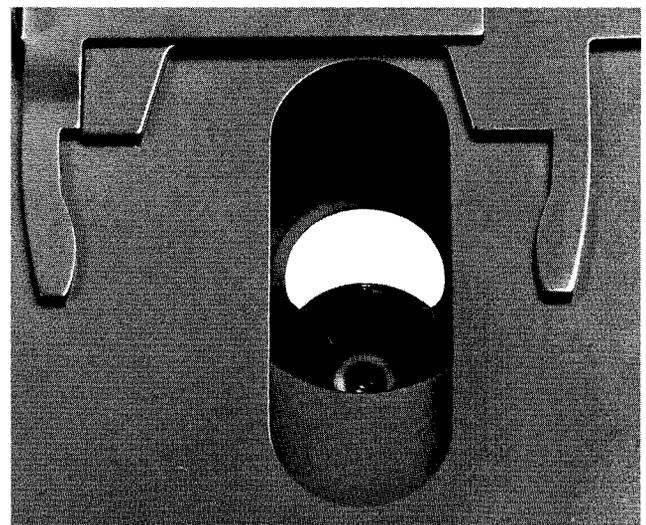
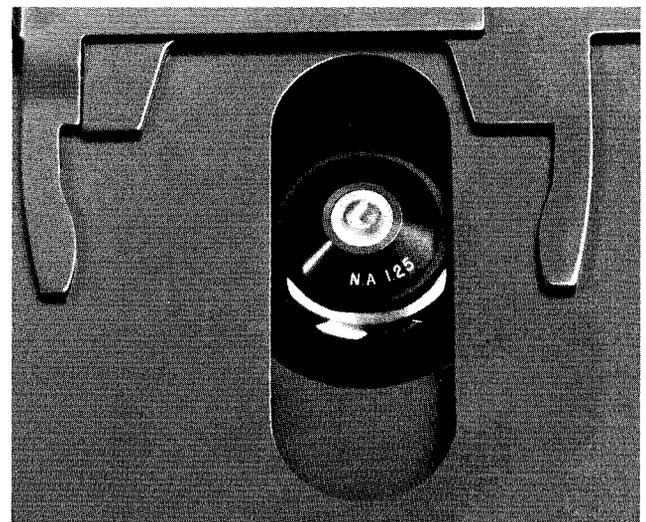


Figure 18A. Flip-Top Condenser

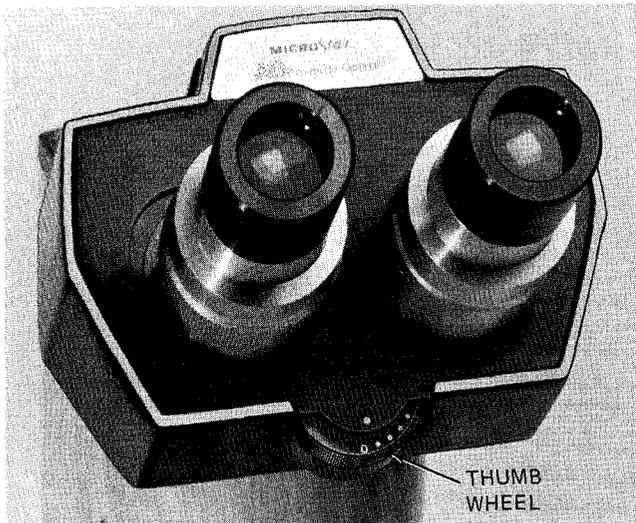


Figure 19. Interpupillary Distance Adjustment

- (d) Cat. No. 1099 Wide Field Condenser is designed for use with objectives of 2.5X to 45X inclusive. It does not require use of an auxiliary condenser or flip-top apparatus when scanning objective is being employed.
- (e) Cat. No. 1201 Aplanatic/Achromatic Condenser (N.A. 0.90) is available as an option. Use is identical to Cat. No. 1087 described above.

For instructions on the use of darkfield condenser or phase condenser, see reference manuals furnished with these units.

F. Bodies

1. Attaching and Removing Body

All bodies attach interchangeably to the upper arm support. See Figure 1. The dovetail is accurately located by firmly tightening the knurled screw. Rotation of 180° does not impair centration. All bodies incorporate an optical system designed specifically for the MICROSTAR Microscope infinity corrected objectives. All air-glass surfaces have a low reflection coating (AMERICOTE) for maximum light transmission and image contrast.

2. Monocular Body, Cat. No. 1041A

The monocular body is inclined for maximum viewing comfort.

3. Binocular Body, Cat. No. 1102

The binocular body maintains constant tube length for all interpupillary settings. This means that a

change of interpupillary distance does not affect parfocality, magnification, or calibrations which depend on magnification.

Interpupillary distance is changed by means of the thumb wheel provided (Figure 19). Always use the thumb wheel for this adjustment. Do not attempt to pull the tubes apart. To return to correct interpupillary setting simply reset to scale on thumb wheel.

The left eyepiece tube is focusable to compensate for refraction differences of the eyes. The correct procedure is to focus on the specimen through the right eyepiece only, using the fine adjustment of the microscope, while covering the left eyepiece. Then focus the specimen through the left eyepiece by turning the eyetube while covering the right eyepiece, but without disturbing the fine adjustment. This is better practice than alternately opening and closing the eyes.

4. Trinocular Body, Cat. No. 1103

Construction of the trinocular body (Figure 20) is very similar to that of the binocular. Instead of a fixed reflecting prism, this component is in a swing-

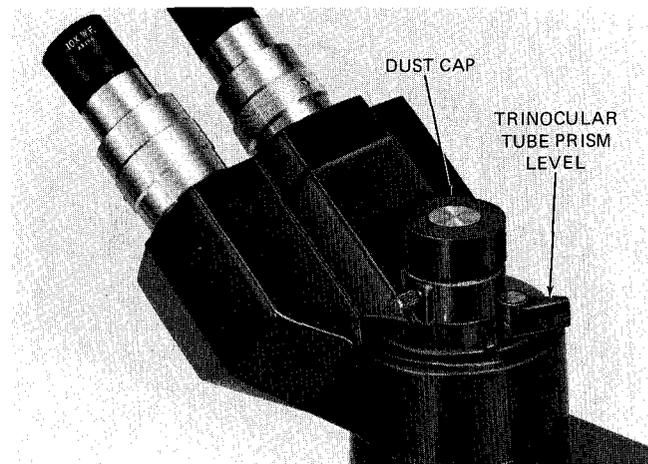


Figure 20. Trinocular Body

out mount actuated by an external lever. With the prism swung out, all of the light is directed to the third tube for photography or screen viewing.

The dust cap should always be installed when the viewing screen or camera system is not mounted on the body.

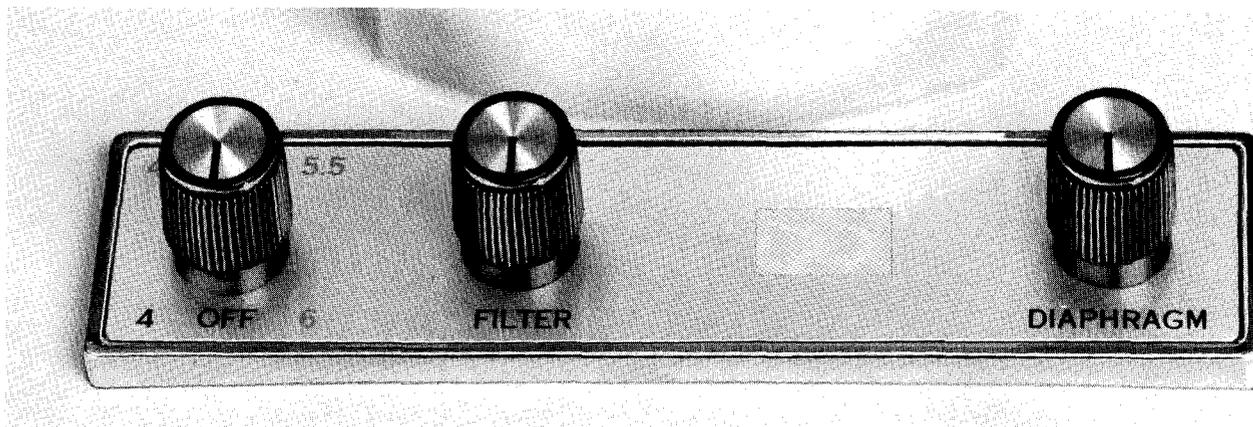


Figure 21. Controls for Tungsten Halogen Illuminator 1130A

G. In-Base Illuminator and Variable Transformer

1. Cat. No. 1130A (Figure 21). This Illuminator contains a high intensity 6V, 20W Tungsten Halogen lamp (Cat. No. 1120) that provides uniform intensity throughout its life at a consistent desirable color temperature of 3200°K (at 6V setting). This, coupled with a built-in iris field diaphragm, makes the 1130A Illuminator ideal for advanced laboratory work, darkfield, phase contrast, photomicrography and viewing screen use. Built-in continuously variable transformer allows exact adjustment of intensity levels for all situations. Swing-in neutral density filter conveniently controlled by external knob eliminates need for loose density filters. A dual viewing receptacle for #1111 or #1112 Dual Viewing Adapters or #1115 Multi-Viewing Adapter is incorporated in the base. The well corrected, pre-focused optical system of the 1130A Illuminator allows full and even illumination of all fields of view. Satisfies Koehler-type illumination requirements.
2. Blue Filter. The blue filter (supplied) should be placed over the light well for normal brightfield viewing. It can be removed when more illumination is necessary, such as for multi-viewing or phase contrast work. It should also be removed to obtain the proper color temperature (3200°K) for photomicrography.
3. Transformer Settings. The 1130A Illuminator has a continuously variable transformer with voltage markings for 4, 4.5, 5 and 6 volts. While the 4.5 volt setting is recommended for most brightfield work, the red 5 and 6 volt set-

tings are usually required for photomicrography, phase contrast and darkfield applications.

Since lamp life increases significantly at lower voltages, it is generally advisable to reduce voltage rather than use the neutral density filter at higher intensity.

A separate 34.5mm diameter blue filter is supplied which fits into top of light well of Illuminator or into condenser filter slot. It provides a quality of light approximating daylight and is preferred for most visual uses.

4. Neutral Density Filter. The neutral density filter, incorporated in the 1130A Illuminator, has a transmission value of 10% and is controlled by a knob so marked on the front of the base. When using higher voltage settings for brightfield work, it is more comfortable to use this filter. For phase, darkfield, photomicrography or viewing screen use, this filter should not be used.

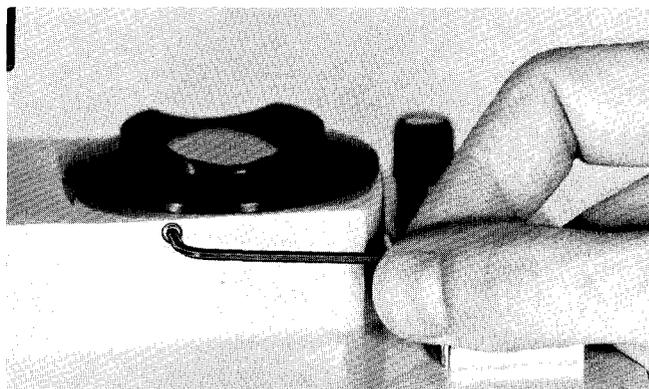


Figure 22. Removal of Window Assembly

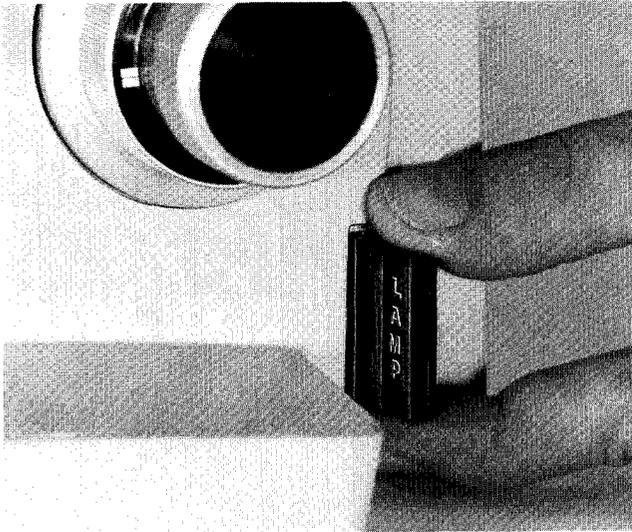


Figure 23. Removal of Lamp Socket

5. Removal of Window Assembly. The window assembly is easily removed for cleaning. Loosen the socket head screw on the microscope base with wrench provided (Figure 22) and lift off window assembly.

6. Changing Lamps. **CAUTION: UNPLUG POWER CORD BEFORE PROCEEDING.**

The 1130A Illuminator has been designed so that lamp changing is remarkably simple. Merely pull out the lamp socket located on the right rear side of the microscope stand. (Figure 23) The old lamp can now be easily removed from the socket, Figure 24. When installing new lamp, avoid getting fingerprints on the envelope.

NOTE: Initially, the Cat. No. 1120 Lamp may fit tightly into lamp socket due to residual burrs on lamp pins.

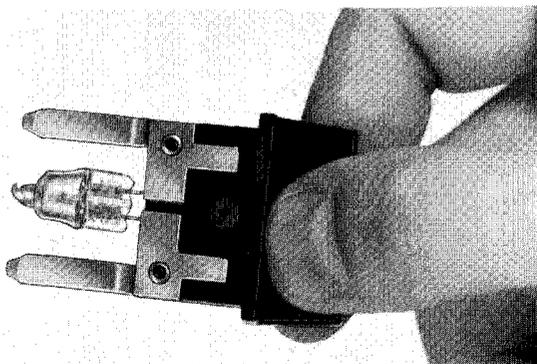


Figure 24. Lamp Socket and Lamp

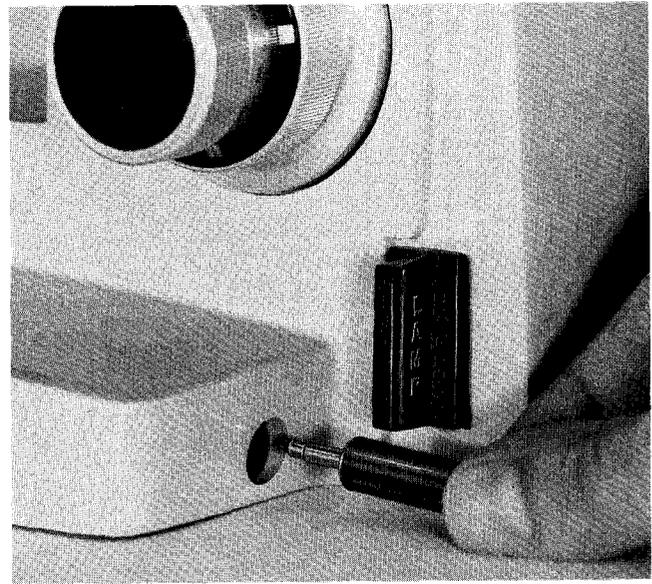


Figure 25. Dual Viewing Receptacle

Push lamp into socket until lamp contact pins reach a positive stop.

When reinserting lamp socket into stand, be sure the word "LAMP" embossed on the socket is right side up.

7. Dual Viewing Receptacle. On Series One-Ten Microscopes equipped with the 1130A Illuminator a dual viewing receptacle is provided. This is located on the right rear of the base, Figure 25. The plug from the Dual and Multi-Viewing Adapters should be inserted here to provide illumination of the arrow.

VII. OPERATING PROCEDURE

A. Adjusting the Light Source

1. Turn on the transformer to the 5 volt setting.
2. Fully open the field diaphragm of the illuminator by means of the knob indicated.
3. Depending upon the specimen and application involved, light intensity can be increased or reduced at the transformer, or by means of the built-in neutral density filter.

B. Fully open the aperture diaphragm of the condenser (Figure 26).

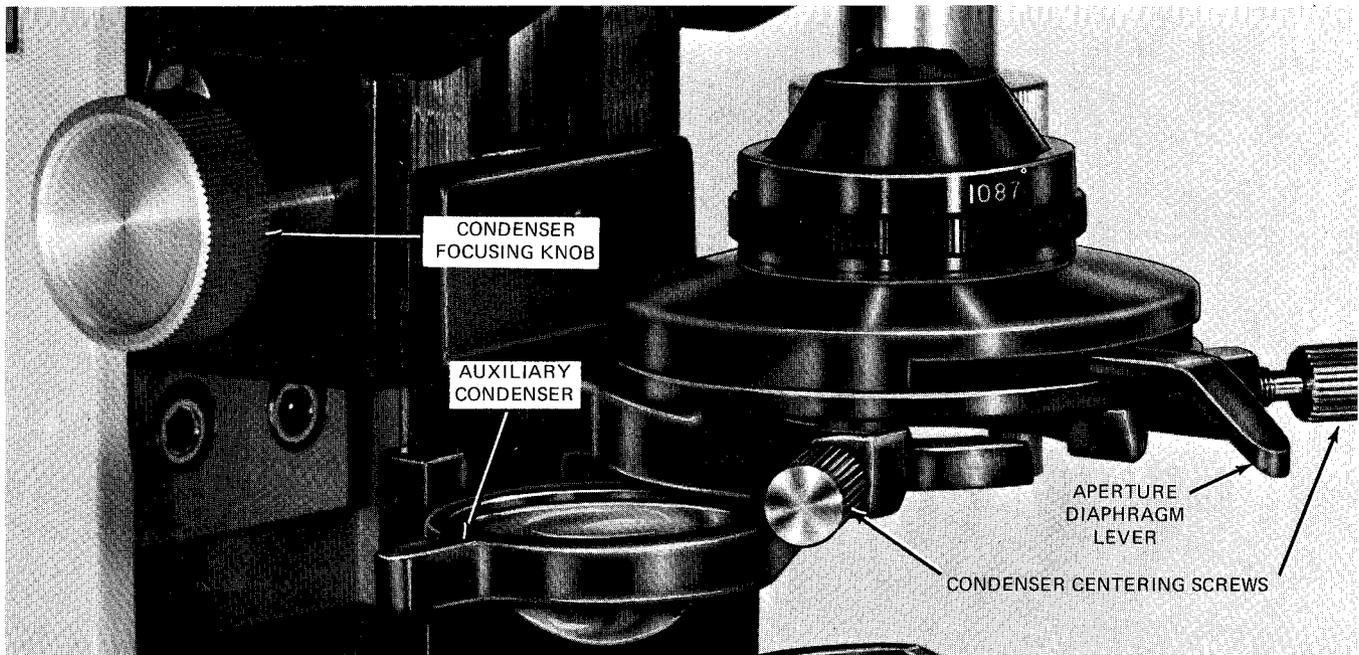


Figure 26. Substage Structure

- C. Place a stained specimen slide on the stage.
- D. Rotate the microscope objective nosepiece to move the 10X objective into working position.
- E. If using the No. 1091 Auxiliary Swing-in Condenser (Figure 26) make sure it is out of the light path. This swing-in lens should be used only with objectives under 10X.

If using the 1094A Flip-top Condenser (Figure 18A) make sure the top element is in the light path for all objectives 10X and higher. It should be flipped out of the path only for objectives under 10X.

If using No. 1099 Wide Field Condenser, swing frosted glass assembly out of light path.

- F. Raise the microscope condenser with the condenser rack and pinion knob, Figure 26, to its factory-set fixed stop.

Lower the 10X objective by rotating a coarse adjustment knob to its positive stop. Use the fine adjustment knob to bring the specimen into sharp focus.

- G. Adjust the microscope body for interpupillary setting and eye difference (Binocular and Trinocular Models) as described in Section VI F 3.
- H. While viewing through the microscope, partially close the field diaphragm (Figure 21) so that the iris diaphragm leaves are imaged within the field of view. The leaves should be in sharp

focus. If not, loosen condenser stop retaining screw (Figure 14), focus iris leaves using condenser focusing knob as shown in Figure 27, and retighten screw.

- I. Using the two centering screws on the condenser fork, (Figure 26), simultaneously center the image of the field diaphragm to the periphery of the field of view. After centering, open the field diaphragm until the iris leaves "just" disappear from the field of view. (If your instrument is equipped with No.1099 Wide Field Condenser, field diaphragm should be opened completely; then swing frosted glass into light path.)



Figure 27. Focusing Condenser



Figure 28. Viewing Back Aperture

- J. Remove an eyepiece and view the back aperture of the objective (Figure 28). Close the condenser aperture diaphragm (Figure 29), then re-open until the iris diaphragm leaves "just" disappear from view to obtain the full resolving power of the microscope. If desired, the condenser aperture diaphragm may be closed as required, depending upon the specimen, to enhance contrast and depth of focus.

VIII. CARE OF THE MICROSCOPE

A. General

Cleanness of all optical components of the microscope is important for good optical performance.

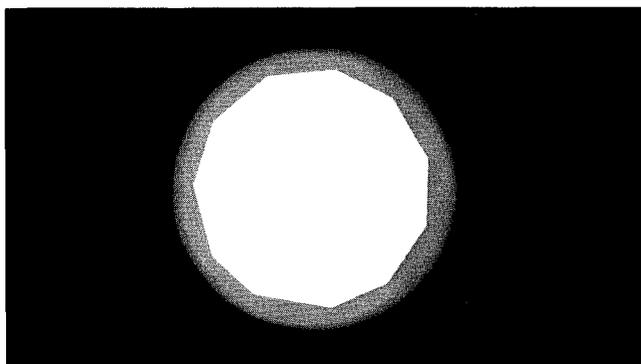


Figure 29. Setting the Aperture Diaphragm

Therefore, the microscope, when not in use, should always be covered with the plastic cover provided. If any optical surface becomes badly coated with dust or dirt, all such loose dust or dirt should be blown off with a syringe or removed with a camel's hair brush before attempting to wipe the surface clean.

Optical surfaces should be cleaned with a lint-free cloth, lens tissue, or a Q-tip moistened with xylene or alcohol. It is very important to avoid the use of excessive solvent. The cloth, lens tissue, or Q-tip should be just moistened with solvent, and not wet enough for the solvent to run down in around the lens with the resultant danger of loosening cement on interior surfaces.

B. Cleaning Objectives

No part of the microscope is quite so vulnerable to lack of complete cleanness as the front lens of the objective. Fingerprints and oil smears on the front lens will greatly impair the performance of a fine objective. Whenever lack of contrast, cloudiness, or poor definition is encountered, carefully check the condition of the front lens with a magnifier. Subtle loss of contrast and definition due to a slight smear on the front lens is often overlooked and can be avoided with routine inspection and cleaning.

The lower magnification objectives with fairly large plano front lenses can be cleaned with a cloth or lens tissue wrapped around the finger and moistened with xylene or alcohol. The 40X, 45X, and 100X oil immersion objectives require a little more care, and examination with a magnifier is recommended; the 10X Wide Field eyepiece, reversed, is an excellent magnifier for this purpose. See Figure 30.

To achieve the high degree of flatness obtained with the 40X planachromatic objective, it was necessary to utilize a small concave front lens of fairly short radius of curvature. The surface of this front lens can be readily cleaned as illustrated in Figure 31 with a toothpick covered with cotton at the tip, or with a small Q-tip. Moisten the cotton with xylene or alcohol, and squeeze almost dry. Wipe the front lens lightly without applying any undue force or scrubbing action. Make sure that the cotton tip contacts the concave lens surface. Check with the magnifier after cleaning.

C. Cleaning Monocular Body

The reflecting mirrors within the inclined monocular body are protected from loose dust and dirt by



Figure 30. Checking for Cleanness

the lens assembly at the bottom of the body and by a protective window at the bottom of the eyepiece tube. Remove and clean the protective window as illustrated in Figures 32 and 33. Before removing the two small socket head screws, mark with a pencil the position of the eyepiece tube with respect to the body assembly so that it can be reinstalled at the same height. If the eyepiece tube is removed without marking, it can be returned to the proper height as follows:

Remove the body assembly, insert an eyepiece in the eyepiece tube, and insert the eyepiece tube in body assembly. View a distant object through this assembly, and focus by adjusting the height of the eyepiece tube. When the distant object is in sharp focus, the height of the eyepiece tube is correct. Lock the eyepiece tube in this position with the two socket head screws.

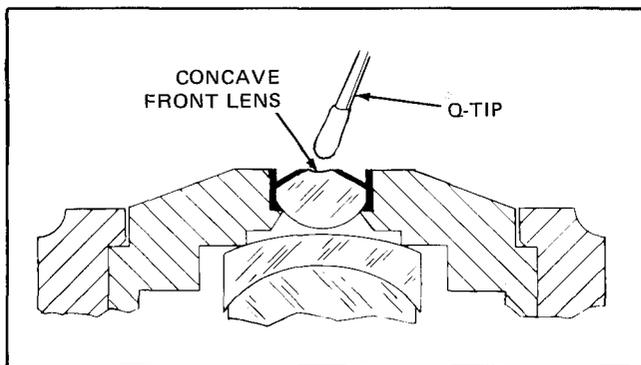


Figure 31. Cleaning Front Lens of 40X Objective

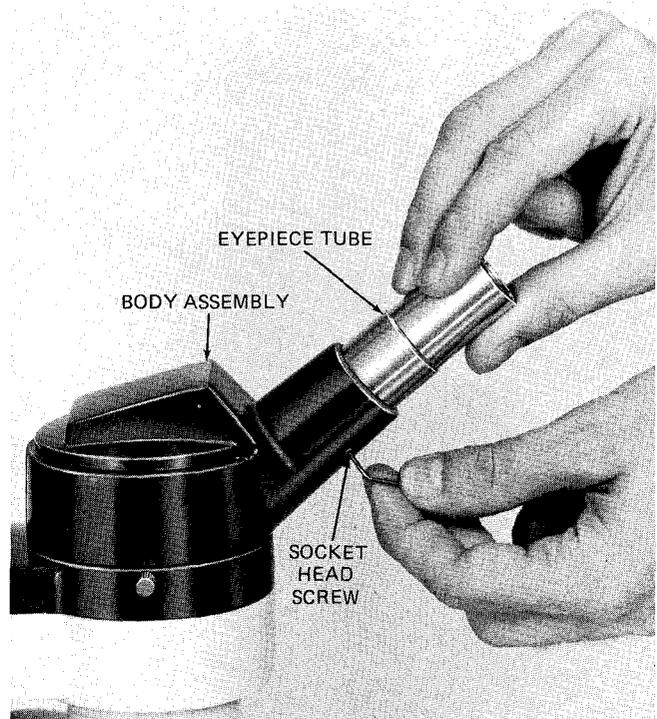


Figure 32. Removing Eyepiece Tube

D. Cleaning Binocular Body

The internal optical surfaces of the binocular body are sealed against entry of dust and dirt by the lens assembly at the bottom of the body, and by the eyepieces. The external surface of the lens assembly seldom needs cleaning because it is protected when the body is in place.

CAUTION: When removing the binocular body, be careful not to leave fingerprints on the lower lens surface.

Whenever eyepieces are removed from the instrument, be sure protective caps (supplied) are used.

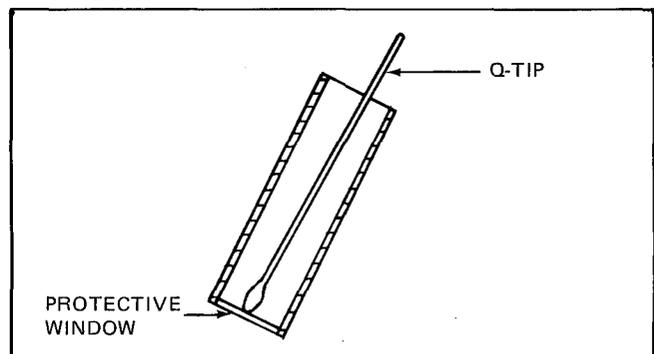


Figure 33. Cleaning Protective Window

E. Cleaning Trinocular Body

The procedure used for cleaning the binocular body also applies for cleaning the trinocular body except that one additional surface may require cleaning. This surface is the swing-out prism which may collect dust and dirt when the vertical tube, camera, or viewing screen is removed. The prism can be cleaned with a moistened Q-tip. Always keep the protective cap over the third tube opening when accessories are not attached.

F. Mechanical Maintenance

Faithful use of the dust cover is also advantageous in keeping the microscope in good mechanical condition and appearance.

The MICROSTAR Microscope has a durable finish which is impervious to most commonly used laboratory reagents. It may be cleaned with a cloth dampened with a mild soap solution or xylene. The same precaution of not using too much solvent should also be followed.

There is very little lubrication or routine maintenance required on the MICROSTAR Microscope. As pointed out previously, the focusing mechanism does not require lubrication, nor does the mechanical stage. The only mechanism which requires periodic lubrication and cleaning is the substage condenser slide. This should be kept clean by wiping away old lubricant with xylene and lubricating with Vaseline or a light grease.

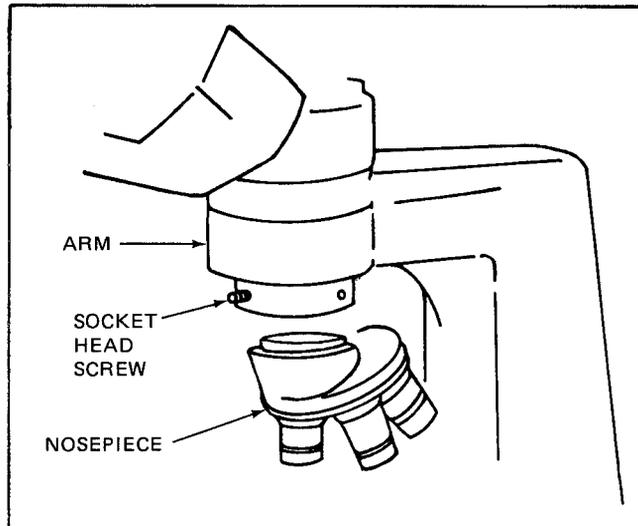


Figure 34. Removing Nosepiece

G. Removing Nosepiece

To remove the nosepiece (see Figure 34), lower the nosepiece with the coarse adjustment until the front socket head screw becomes accessible. Back off the screw, and remove the nosepiece. Do not alter the position of the two screws on the sides of the arm; these are a factory set adjustment.

Complete repair facilities are available at many Reichert authorized dealers, the Reichert Scientific Instruments plant at Buffalo, NY, and Reichert Technical Service Centers in Rosemont, IL, Chatsworth, CA, Edison, NJ, and Dallas, TX.

PARTS MANUAL

PARTS LISTINGS AND ILLUSTRATIONS OF SERIES ONE-TEN MICROSTAR MICROSCOPES ARE CONTAINED IN SEPARATE PARTS MANUAL, 110 PM. AVAILABLE ON REQUEST.



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