STEREOSCOPIC MICROSCOPE

INSTRUCTION MANUAL

MODEL X

OLYMPUS

GREENOUGH BINOCULAR STEREOSCOPIC MICROSCOPE

The Greenough Binocular Stereoscopic Microscope is a multi-purpose instrument with many diverse applications, including: plant classification, entomology, anatomical examination of animals, geology, stamp and coin inspection, gemmology and in the electronic and precision instrument industries.

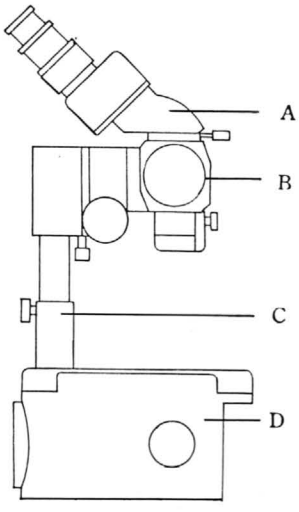
The new Olympus Model X microscope is highly versatile, and can be adapted for use in every field where binocular stereoscopic observation is required.

SPECIFICATIONS:

1. Five different magnifications attainable by magnification-selector drum.
2. Paired objectives and eyepieces.
3. Magnifications (variable): . . . . . 6.3× ~ 160×
4. Inclination of binocular head: . . . . . 45°
   Angle of visual axes: . . . . . 12°
5. Interpupillary distance adjustment: . . . . . 50–80mm(w/G10×)
   46–80mm(w/G20×)
6. Interchangeable objectives: . . . . . 1× or 2×
7. Long working distance: . . . . . 86mm & 45mm
8. Range of body movement (up & down) 83mm
   Rack & pinion (fine adjustment) 36mm
   Pillar (sliding movement of smaller diam tube) 47mm
9. Swinging movement of body (pivoted at pillar) . . . . . 100mm(80°)
10. Detachable sub-stage base with reflecting mirror
11. Stage plates (clear and black-and-white)
12. Widefield eyepieces
13. Interchangeable stands
14. Detachable binocular head
15. Epi-illuminator (attachable)

TABLE OF CONTENTS

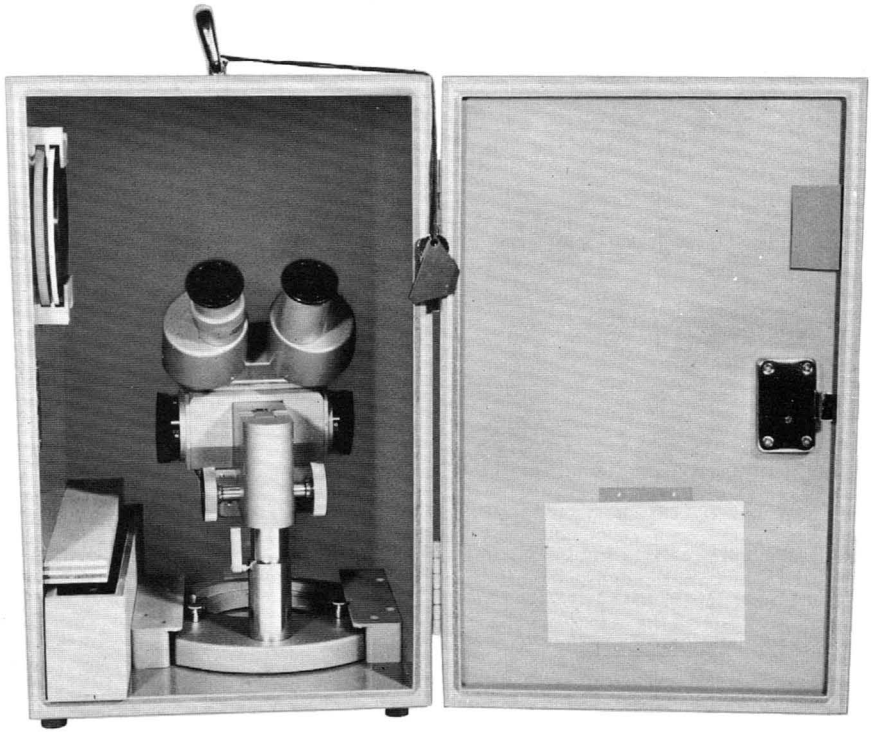
This instruction manual is composed of Parts A through D as follows:



HANDLING INSTRUCTIONS

The Model X consists of the following components:

1. Body
2. Inclined head
3. Stand
4. Eyepieces, 1 pair each of G10× and G20×
5. Objectives, 1 pair of 1× (2× optional)
6. Stage plates, 1 each of clear and black-and-white plates
7. Stage clips
8. Instructions, Certificate of inspection
9. Desiccant
10. Eyepiece caps (large)
11. Eyeshields
12. Wooden carrying case

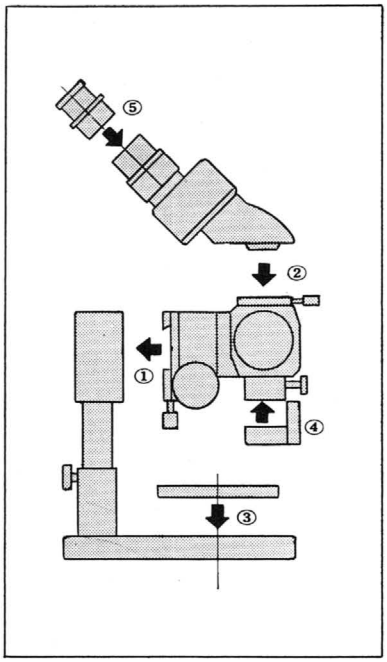


ASSEMBLY

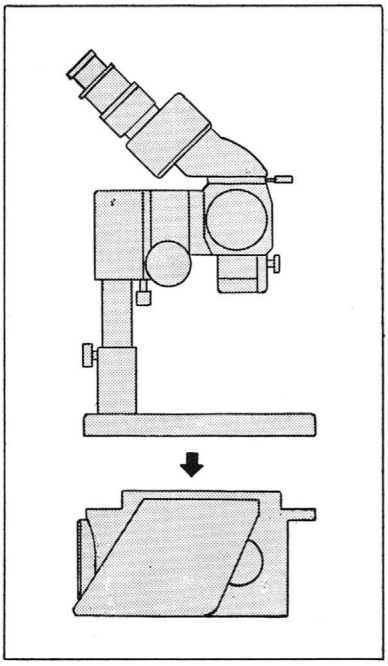
Assemble the instrument in the following order:

1. Place the body onto the yoke at the top of the pillar and clamp it with the screw provided.
2. Set the inclined head on the seat at the top of the body, and clamp it with the screw provided.
3. Place the stage plate of your choice in the receptacle on the stage and clamp it with the screw provided.
4. Attach an objective pair of your choice to the body and clamp it with the screw provided.
5. Insert a pair of eyepieces of your choice into the eyepiece tubes.

The instrument is now ready for observation by natural light.

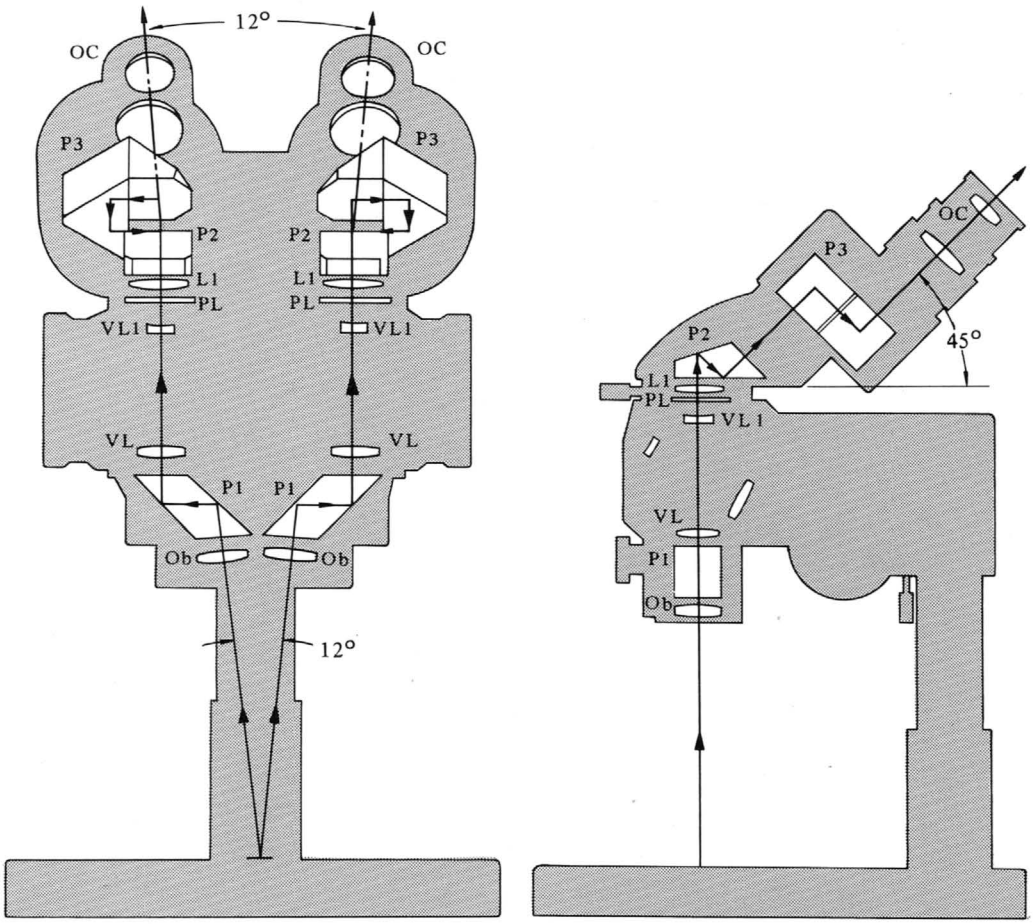


For trans-illuminated observation, the instrument as assembled above is placed on the illuminating stand. Natural or artificial light will be reflected to the specimen by the mirror. If necessary set the iris equipment on the sub-stage base. Now with attachment of armrests to the base, you are ready for prolonged observation under any conditions.



A. OPTICAL SYSTEM

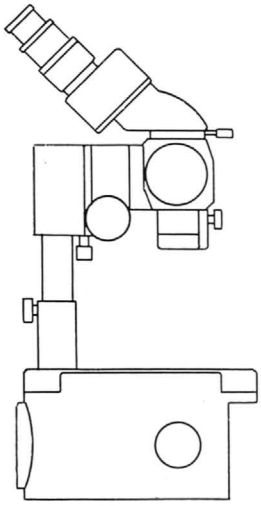
The optical system for Model X consists of paired objectives, magnification-varying tube lenses (hereinafter referred to as variables), and eyepieces, as shown below.



Light bundles from the specimen enter Prism P1 with an angle of visual axis of 12°, where they are turned parallel to each other, then proceed to the variable lens system (VL and VL1), the tube lens system (PL and L1) and to Prism P2. Then, still maintaining parallel position, they enter Porro-prisms at P3, at the last facet of which they again assume a 12° angle of visual axes, forming an image at the eyepiece exit pupil.

As described above, the variables are paired on parallel optical axes. Consequently five magnifications are attainable, i. e. two sets of normal and reverse positions plus a blank position. (See page 6.)

As to the trans-illumination system the sub-stage base contains a reflecting mirror and a 100V, 20W bulb. In addition, special accessories such as an iris diaphragm (for field adjustment) and an epi-illuminator are available.

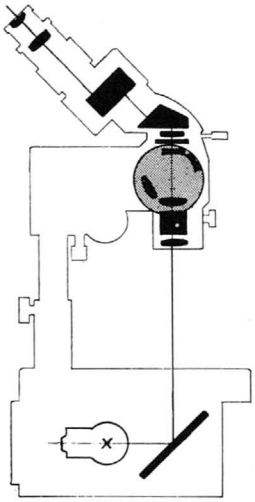


A–1 General Features

Following is a table of optical specifications. When using 1× objectives total magifications will be as indicated on the magnification-selector drum. When using the 2× objectives, numbers on the drum must be doubled. With the 2× objectives, do not use positions marked ☒ in the table.

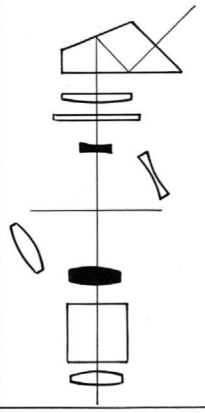
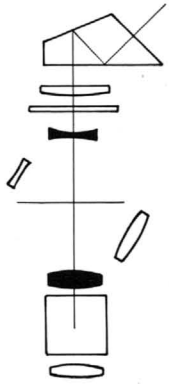
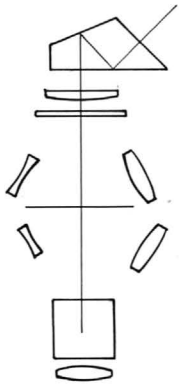
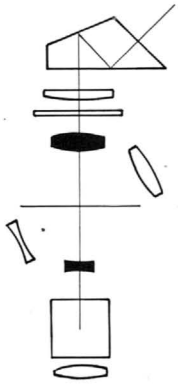
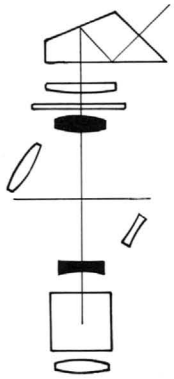
TABLE

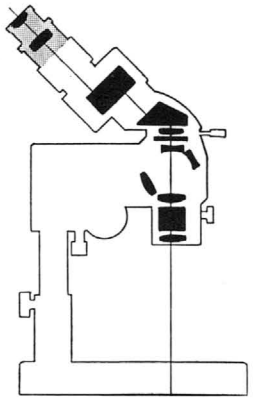
Drum Position	Objectives	Eyepieces	Total Magnification	Field Diameter mm	Working Distance mm
6.3	1× (f=100)	10×	6.3×	32	86
10			10 ×	20	
16			16 ×	12.5	
25			25 ×	8	
40			40 ×	5	
12.5		20×	12.5×	19.4	
20			20 ×	12.2	
31.5			31.5×	7.6	
50			50 ×	4.9	
80			80 ×	3.1	
☒ 6.3	2× (f=50)	10×	——	——	45
☒ 10			——	——	
16			31.5×	6.3	
25			50 ×	4	
40			80 ×	2.5	
☒ 12.5		20×	——	——	
20			40 ×	6.1	
31.5			63 ×	3.9	
50			100 ×	2.4	
80			160 ×	1.5	



A–2 Variable Lens System

This system is composed of two sets of Galilean telescopic lenses and a blank position. Since the axes of Galilean telescopic lenses are parallel to each other, five different variations can be obtained by their reversal plus the use of the blank position as illustrated A through E. When forming a telescopic system, variables in the reversed position give a reciprocal magnification, still within the normal focusing range.

	A	B	C	D	E
Lens Dis-posi-tions					
G10×	40×	25×	16×	6.3×	10×
G20×	80×	50×	31.5×	12.5×	20×



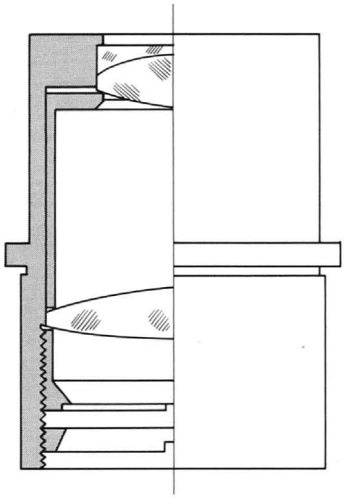
A–3 Eyepieces

Two types of eyepieces are available: G10× and G20×. G10× is composed of three optical elements, and G20× of four elements. The field stop for each eyepiece is positioned just below the field lens.

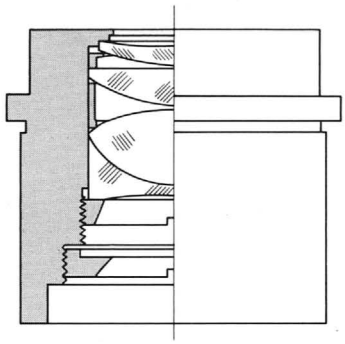
Magnification	Focal Length	Field of View with 1× Objectives
G10×	25mm	20mm
G20 ×	12.5mm	12.2mm

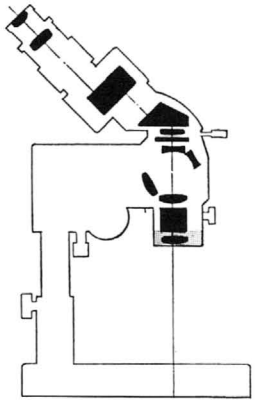
Both eyepieces provide extra-wide field of view, and a crisp image is attained over the full area.

G10× Eyepiece



G20× Eyepiece





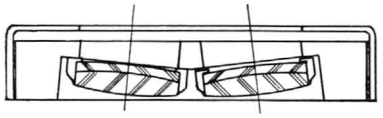
A–4 Objectives

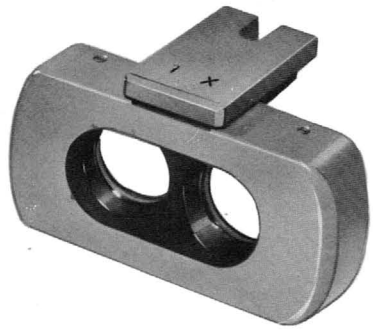
A pair of objectives designed for exclusive use in the Model X is mounted in an interchangeable housing. Available in two types.

	Focal Length	Working Distance	Numerical Aperture
1×	100mm	86mm	0.08
2×	50mm	45mm	0.08

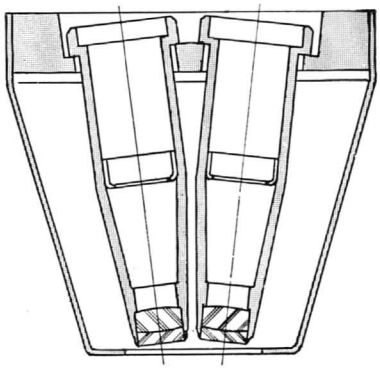
Using the high magnification objectives (2×) the edge of the field may be darkened at magnification-dial positions 6.3, 10, 12.5 and 20. This is caused by the fact that both 2× and 1× objectives are made to focus at the same point. If you want these magnifications, use the 1× objectives. The image will be brighter and of the desired magnifications.

1× Objectives

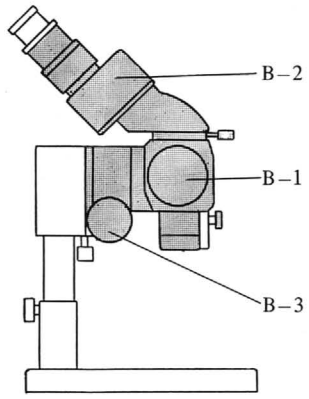




2× Objectives



B. BINOCULAR BODY

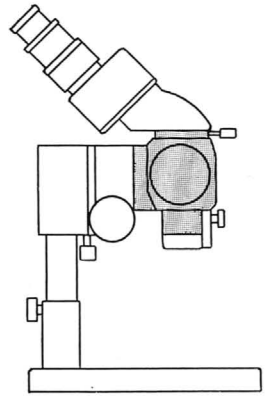


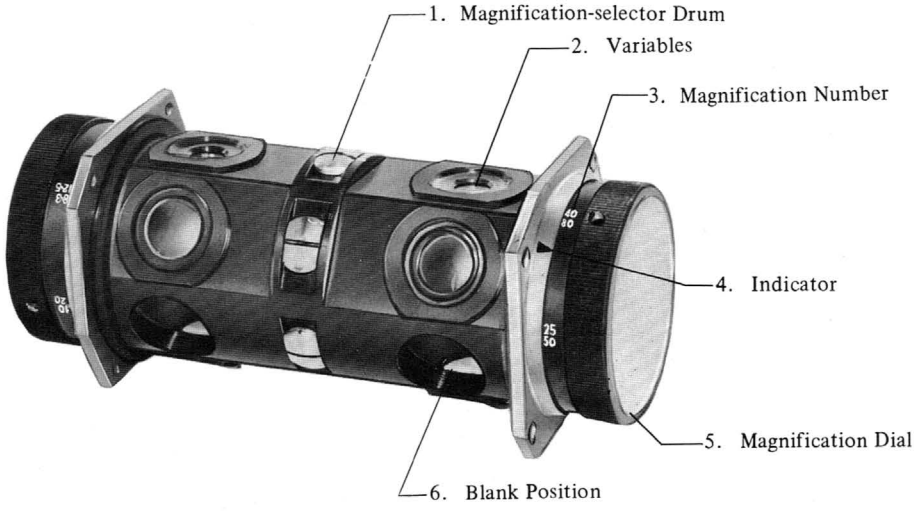
The binocular body, the major part of this microscope, contains the optical system. It is composed of body (B–1), inclined head (B–2), and focusing mechanism (B–3).

B–1 Body

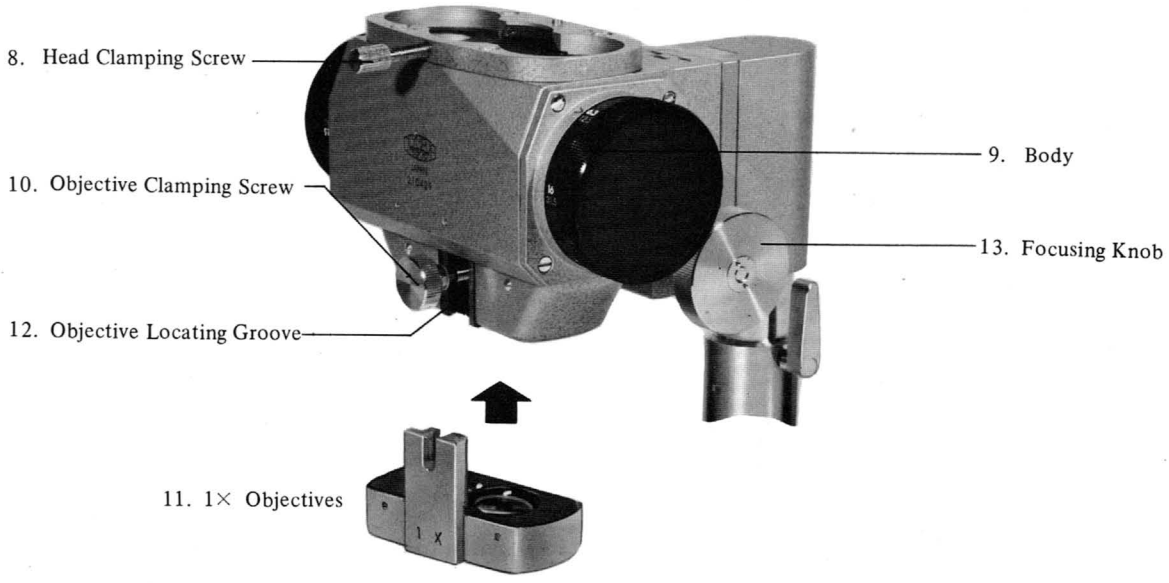
The body is the major part of the instrument, containing a pair of objectives, prisms and a magnification-selector drum (1). This drum is a characteristic feature of the Model X. By rotating the drum (which holds two paired variables (2) and a blank position (6), perpendicular to the parallel axes, the desired magnification is attained.

Simply rotate the magnification dial (5) to the desired value. At each number (3) it will click firmly in place, permitting observation at a fixed magnification. The drum may be rotated in either direction, but it is preferable for the user to form the habit of moving it in one direction only.





7. Inclined Head



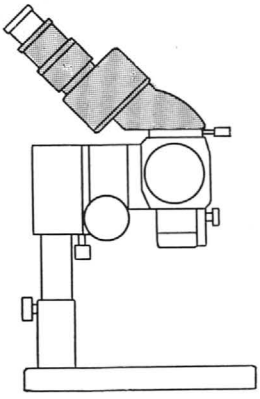
At the top of the body is the seat (17) for the inclined head (7), in which the head can be mouned and tightened with the head clampring screw (8).

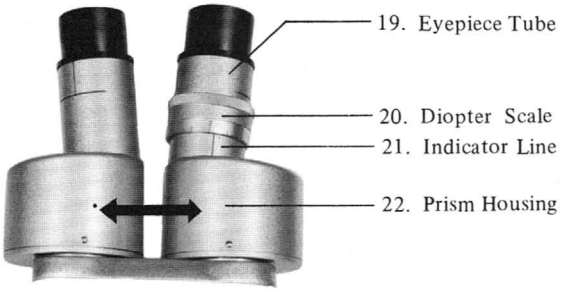
At the lower part of the body is a groove (12) into which the desired objective pair (11) is inserted and secured with the objective clamping screw (10). Prisms for variation of the angle of visual axes are located in the inclined head, inside the prism housing (22).

B–2 Inclined Head

The head is inclined at an optimum angle of 45° from the horizontal, and at a 12° angle of visual axes for viewing comfort, so that the user can maintain a natural position during prolonged observation, thus avoiding fatigue. Also, the 12° angle of visual axes facilitates coincidence of the two images into one.

When mounting it, be sure the locating stud (18) is seated in the appropriate locating hole (14) then tighten the head clamping screw (8).





Adjustment of Interpupillary Distance

The range of adjustment, when using the G10× eyepieces, is 50–80mm. Rotate only one of the prism housing tubes (22), since the other will synchronize and adjust to the desired distance.

Do not force the adjustment beyond the maximum or minimum distance, nor turn each tube (19) in a different direction, or damage may result.

Eye-Refraction Difference Adjustment

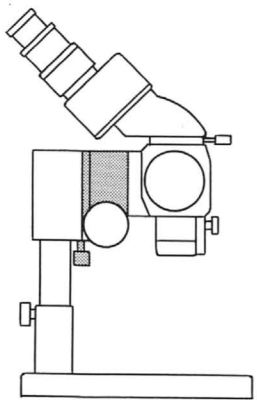
Focus correctly on the specimen through the right eyepiece then turn the diopter ring to focus the left eyepiece. The setting on the diopter scale (20) will be constant, with any specimen, for the individual.

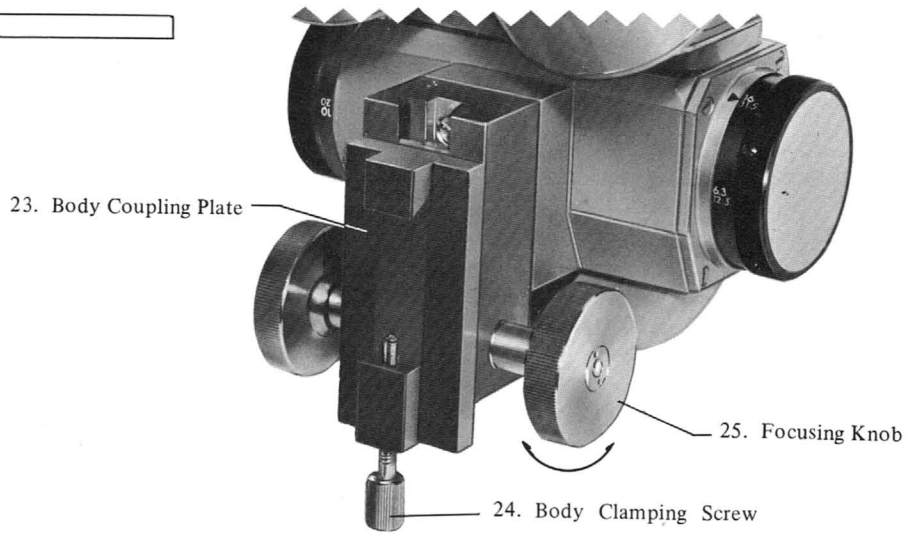
B–3 Focusing Mechanism

To focus on a given specimen, first loosen the pillar clamping lever (30) sliding the body on the spring-tension pillar until rough focus is attained. Fine adjustment is then made with the rack and pinion focusing knobs (25).

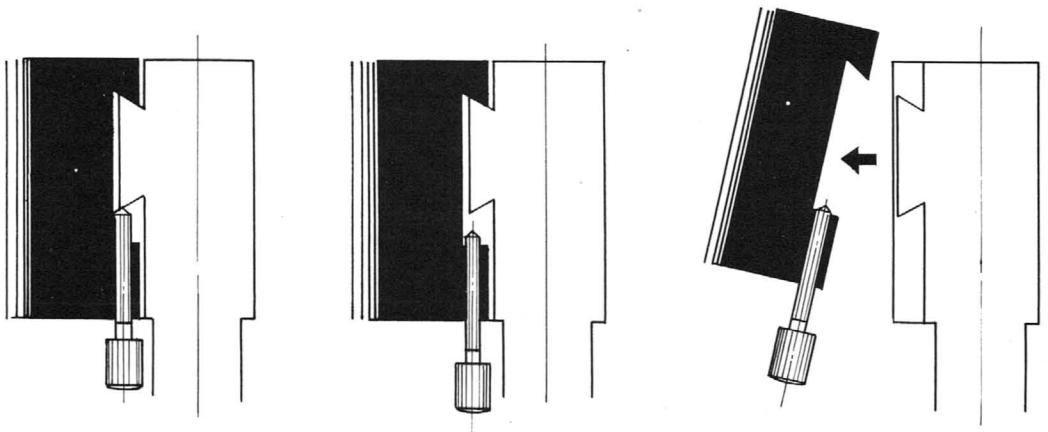
The focusing knobs provide a maximum range of vertical movement of 36mm.

Tension on the focusing knobs may be adjusted to the user's preference. Tension is adjusted by turning both focusing knobs securely and simultaneously clockwise to tighten, counter-clockwise to loosen. If set too loosely, the body may slip down by its own weight; reasonably firm tension will avoid this.





The entire binocular body can be freely attached to or detached from the stand with the body coupling plate (23) at the sliding section of the rack. To secure the body to the stand, tighten the body clamping screw (24).

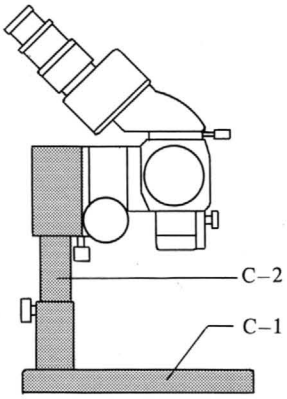


Tighten the Screw Firmly.
(Attachment)

Loosen the Screw.
(Ready for Removal)

Tilt upwards.
(Removal)

C. STAND



The stand maintains the body at a set position and holds the specimen in a suitable manner for observation. It is composed of a stage and a pillar (C–1 and C–2).

C–1 Stage

The stage is composed of a base (28) and a stage plate. The base supports the binocular body assuring stability whether the head is mounted in the normal or reversed position.

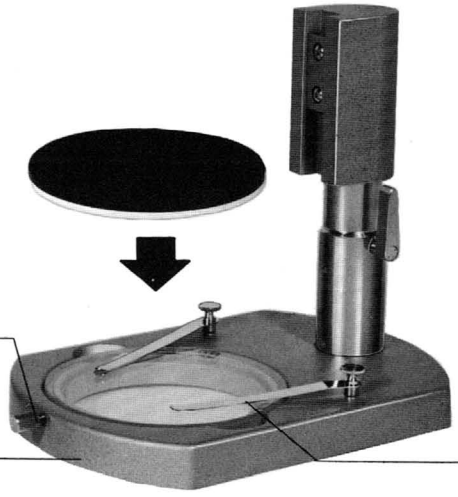
On the underside of the base, leather pads are located at three points of contact to prevent marking the desk. A tapped hole is provided on the underside, into which a screw fits to secure the stand to the carrying case.

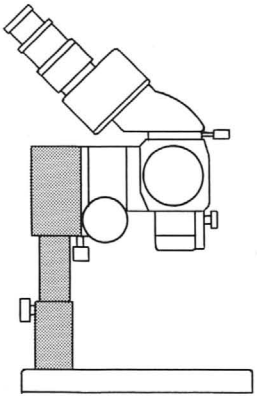
The stage plate is mounted in the circular receptacle in the base. A prepared specimen can be examined on this plate. The specimen can also be dissected, disassembled or assembled on the plate. Interchangeable plates of clear glass (for trans-illumination), black-and-white plate (for epi-illumination) or a metal non-transparent plate (optional accessory), are available. The plates are secured by the stageplate clamping screw (26).

Slides and small specimens can be held with the stage clips (27).

If the size of the specimen does not allow placement on the stage plate, the entire instrument can be set on the surface of the specimen to be examined.

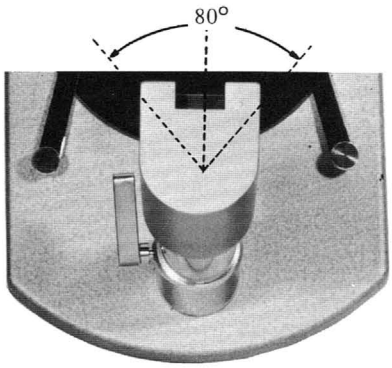
In this case, it must be focused on the lower plane of the stage.

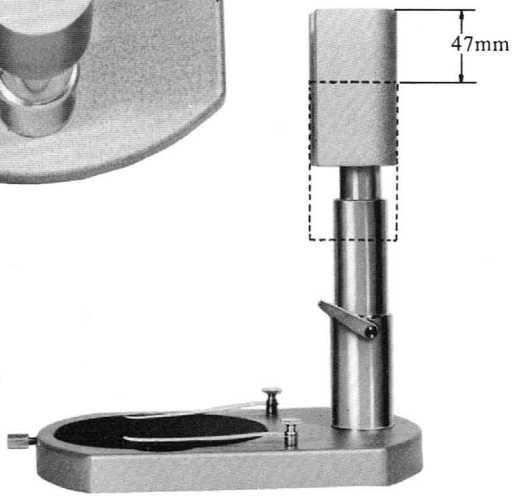


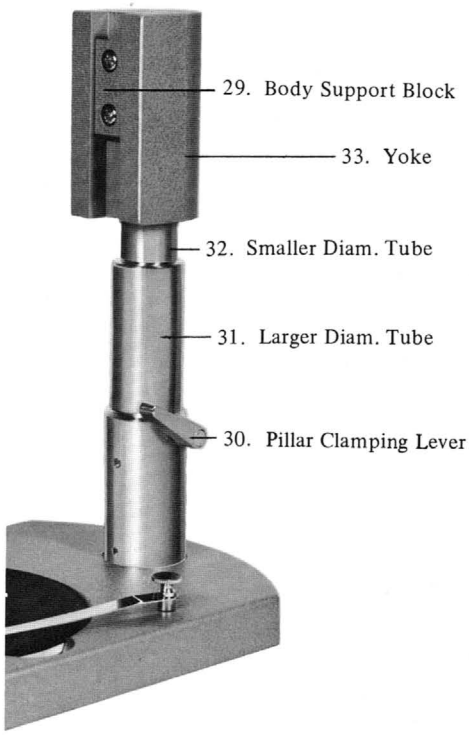


C–2 Pillar

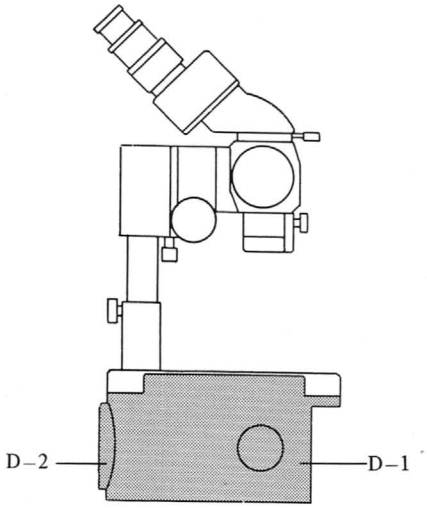
This part holds the binocular body. The pillar can be moved within a maximum range of 47mm vertically, and can be rotated within an angle of 80°. The supporting section is composed of the pillar and the yoke (33). The pillar consists of two telescoping tubes. Assisted by a built-in balancing spring, the smaller diameter tube (32) firmly holds the yoke and the binocular body affixed to it and slides up and down within the larger diameter tube (31) and can be stabilized at a desired position with the pillar clamping lever (30). The smaller diameter tube can swing horizontally as much as 80°; enabling the body to move to the fullest extent over the stage plate, for examining large specimens.







D. TRANS-ILLUMINATING STAND

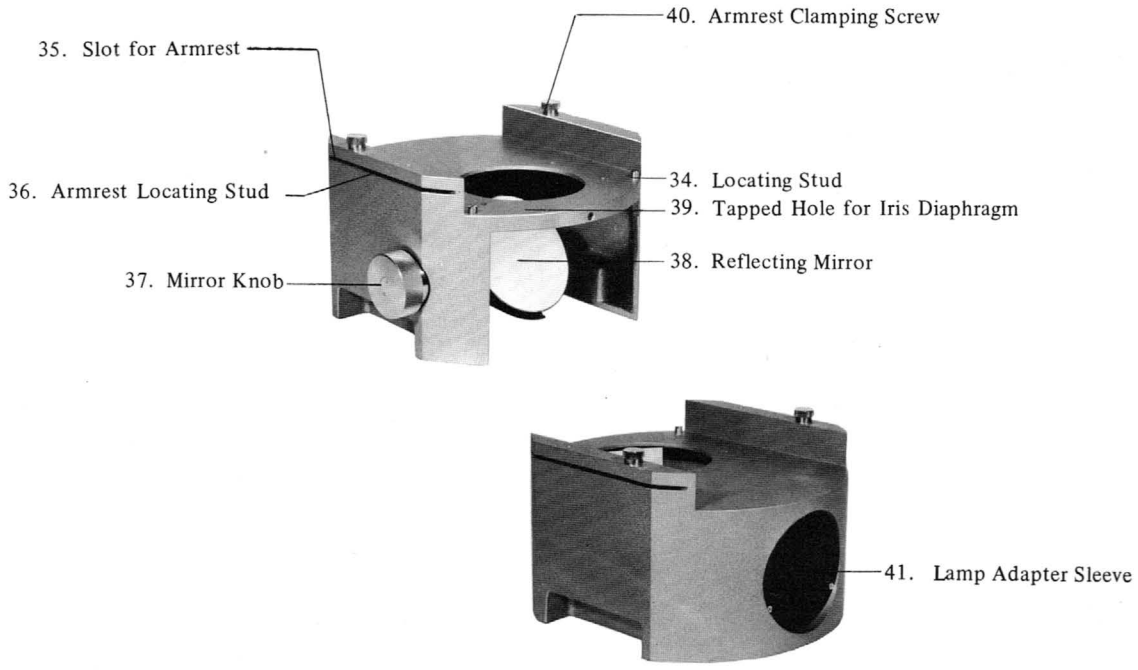


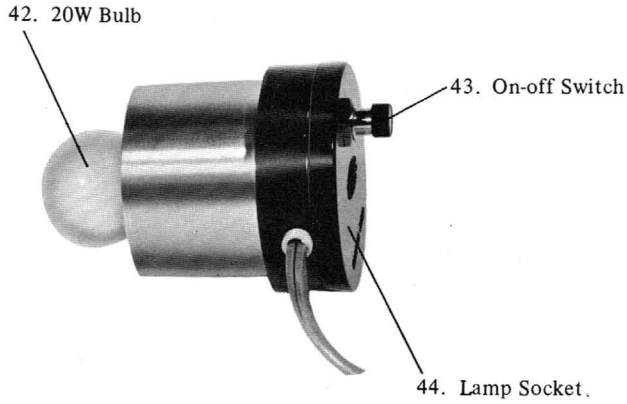
This device provides trans-illumination from below the specimen, when positioned under the stage. It comprises a sub-stage base (D–1), a light source (D–2), and a pair of armrests. An iris diaphragm is also available as a special accessory.

D–1 Sub-Stage Base

Inside the base is a reflecting mirror (38) and at the back a lamp adapter sleeve (41). Turn the mirror knob (37) as required to reflect natural or artificial light to the desired portion of the specimen. One side of the mirror is silvered and the other side is white. The silvered side is used for contrasty and intense lighting and the white side for soft lighting.

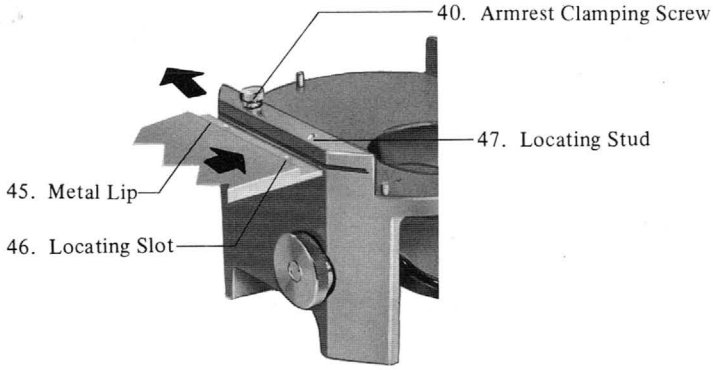
When placing the instrument on the sub-stage base, the locating studs (34) of the base are engaged in the locating holes under the stage. At the outer sides of the base are slots (35) into which the armrests are inserted and secured with the armrest clamping screws (40) provided.





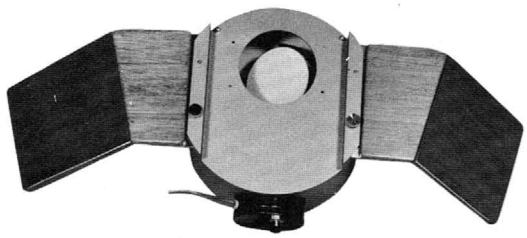
D–2 Light Source

A 100V, 20W lamp designed especially for the Model X is supplied in a socket (44), with on-off switch (43). The lamp is attached by inserting it in the sleeve (41) on the base. A push-button switch alternately turns the bulb on or off.



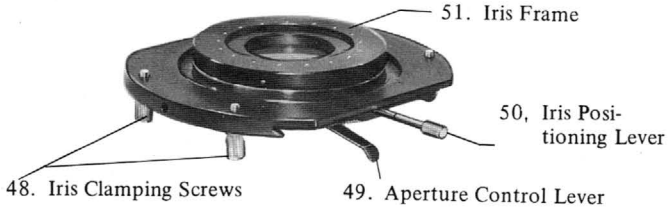
D–3 Armrests

This device is essential for fatigue-free operation during prolonged observation. Loosen the armrest clamping screws (40) on the base. Insert the metal lip (45) of the armrest into the slot (35), so that the locating slot (46) on the metal lip engages the locating stud (47) on the base. Now push the armrest in the direction of the clamping screw (40), and tighten the screw. Reverse the procedure above to detach. When storing, the armrest can be folded.



D–4 Iris Diaphragm (Optional Accessory)

The iris diaphragm is an accessory to control the beam of trans-illumination or to provide oblique illumination. It is placed underneath the top of the sub-stage base. First set the slide rail and the iris sleeve at the appropriate position, insert the iris frame from below, then tighten the iris clamping screws (48). The iris may be opened or closed by horizontal movement of the aperture control lever (49) producing an aperture adjustable from 2mm to 40mm in diameter. By pulling and pushing (not rotating) the iris positioning lever (50), oblique illumination of varying degree can be obtained.



OPERATING INSTRUCTIONS

In actual observation, two methods are employed: Reflected illumination or transmitted-illumination. The appropriate stage plate must be selected in each case i. e. a black-and-white plate for natural reflected light and a clear glass for transmitted light.
For natural reflected light it is not always necessary to use the sub-stage base.
Following is the sequence of microscope adjustments for observation:

1. Place a specimen on the stage plate and hold it with clips if necessary.
2. Loosen the pillar clamping lever.
3. Set the magnification-selector dial temporarily at 16.
4. Looking through the eyepieces, move the body vertically or swing horizontally to focus roughly and determine the point of observation on the specimen.
5. Firmly tighten the pillar clamping lever.
6. Rotate the magnification selector drum until the engraving 40/80 is aligned to the indicator triangle.
7. Looking through the right eyepiece rotate the focusing knob to obtain precise focus.
8. Turn the prism box to adjust the interpupillary distance.
9. Adjust eye-refraction difference by rotating the diopter adjustment on the left eyepiece tube until the image is sharp.
10. Rotate the magnification-selector dial to achieve the desired magnification.

By following the above method, a correct image of the specimen will be obtained.
To further improve the image, various illuminating methods may be used.

ILLUMINATION

For optimum observation, different methods of illumination are available as follows:

(1) Epi-Illumination

1. In order to attain a crisp and stereoscopic image of opaque specimens in particulary, concentrated light at an angle of 30–60° to the objective axis is appropriate. The Olympus Epi-Illuminator (LSG) is ideal for this purpose. The LSG utilizes a 6V, 1.7A bulb and a 6V, 5A transformer.
2. By soft lighting (natural light, a frosted electric bulb, etc.) an image of low contrast is attainable.
3. When observing a specimen in white or bright colors, use the black-and-white stage plate with the black side upward so that the background will be darkened, thus increasing image contrast.

On the contrary, to observe a specimen in black or dark colors, reverse the stage plate with the black side downward.
The epi-illuminator (LSG) is conveniently mounted on the front of the body by two clamping screws.

(2) Trans-Illumination

Also available in this series is:
Model VT– A new model with a revolving nosepiece for multi-objectives.

1. Adjust the angle of the reflecting mirror so that both eyepiece fields will be equally bright.
2. To obtain an image of the interior of a specimen, use the silvered side of the mirror. If only the external surface of the specimen is required, use the white side of the mirror.
3. When observing the rim of a specimen or a cilium, it is desirable to employ lighting slightly off the optical axis by closing down the iris-oblique illumination (optional accessory).

OLYMPUS OPTICAL CO., LTD. OLYMPUS TOKYO 43-2 HATAGAYA 2-CHOME, SHIBUYA-KU,
TOKYO, JAPAN

Printed in Japan 8105S10