

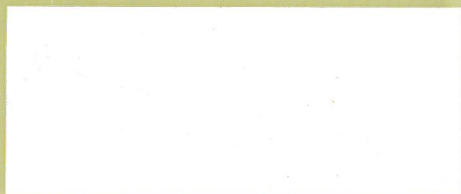
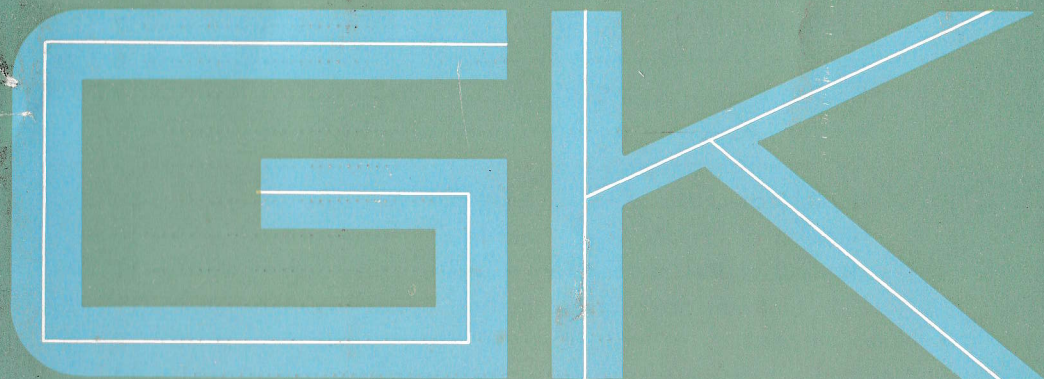
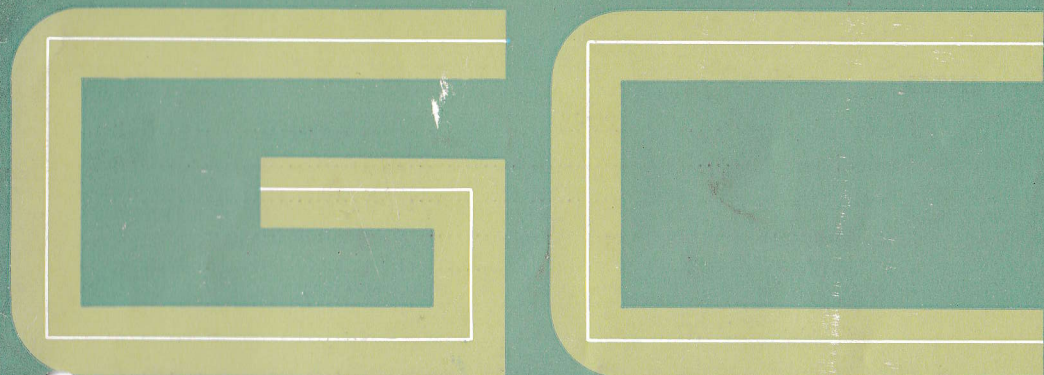
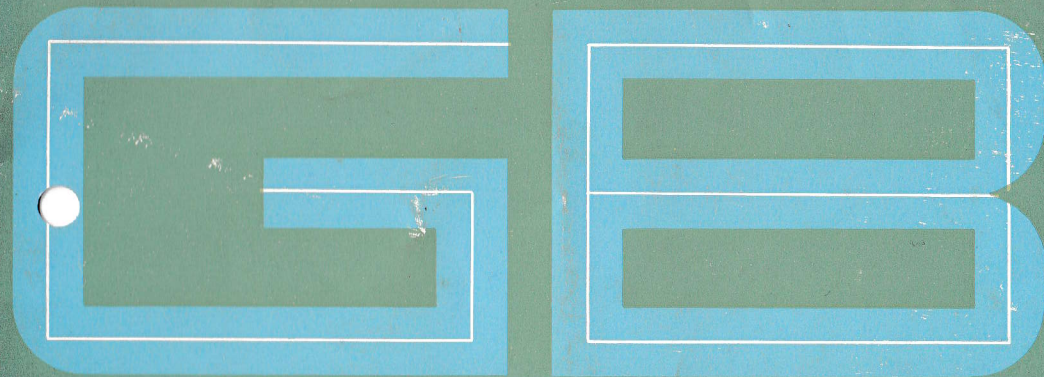


OLYMPUS OPTICAL CO., LTD.
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OLYMPUS LABORATORY MICROSCOPE

instruction

model **G**



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Olympus TOKYO

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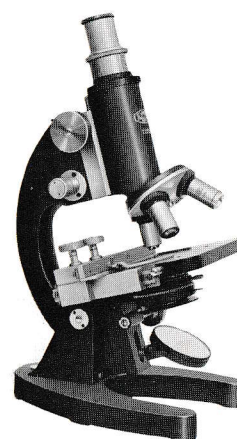
INSTRUCTIONS FOR OLYMPUS MICROSCOPE MODEL G

Olympus Optical Co., Ltd. is a leading Japanese manufacturer of microscopes, cameras, optical measuring apparatus and other optical instruments, as well as medical appliances and office equipments.

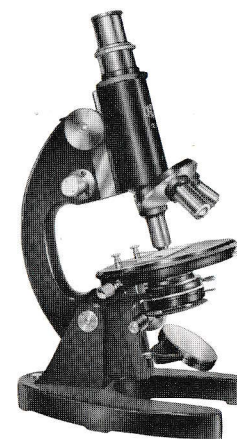
Its optical instruments in particular are of latest design and technique backed by fine old traditions, and known throughout the world for their excellent quality. The company takes special pride in its microscopes known as G Series — a name which has become a synonym for high-standard microscopes in this country. To make the best use of a fine microscope, you must, of course, have a thorough knowledge of its construction, mechanism and maintenance. And this is the reason for the publication of this brochure.

Instructions are given in the following pages in such a way as to serve users of either Model GB, GC or GK, with emphasis on their common characteristics.

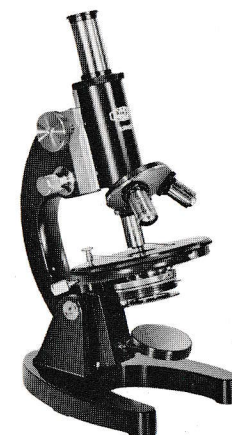
Model GB



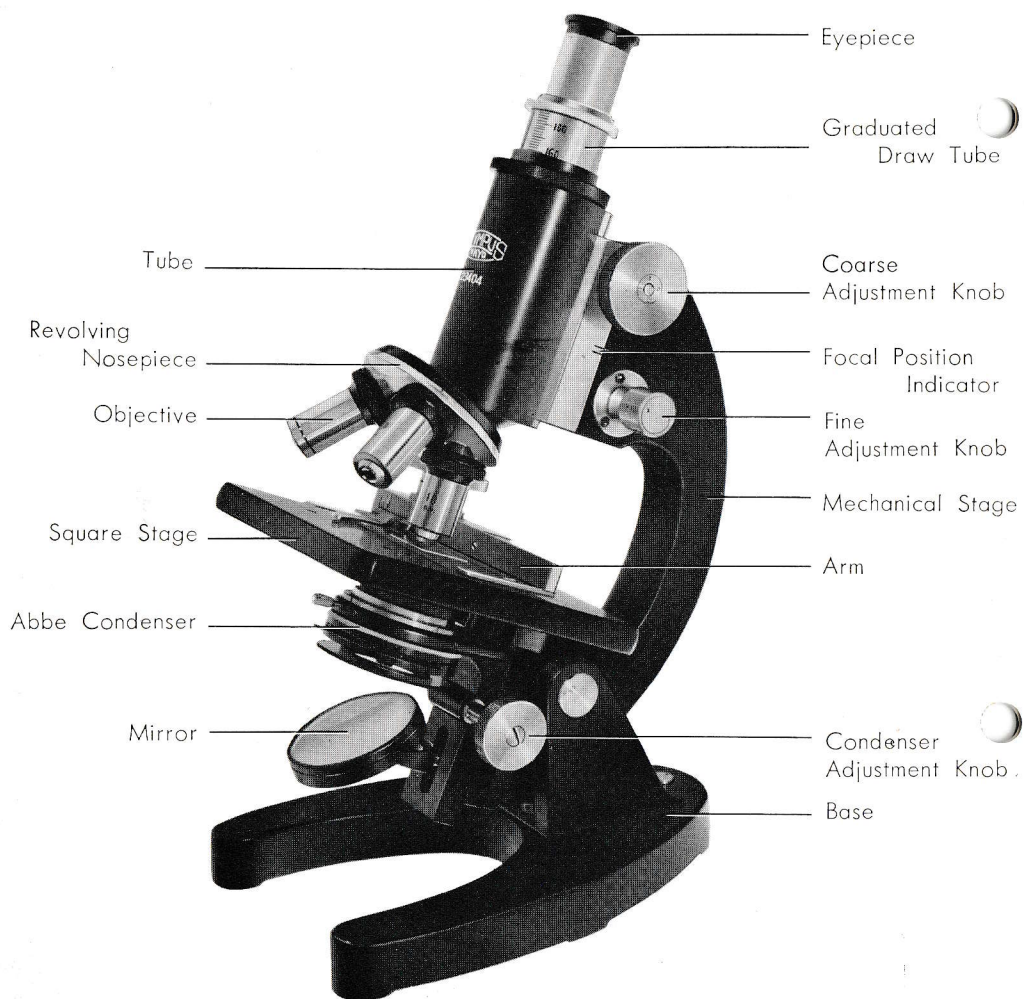
Model GC



Model GK

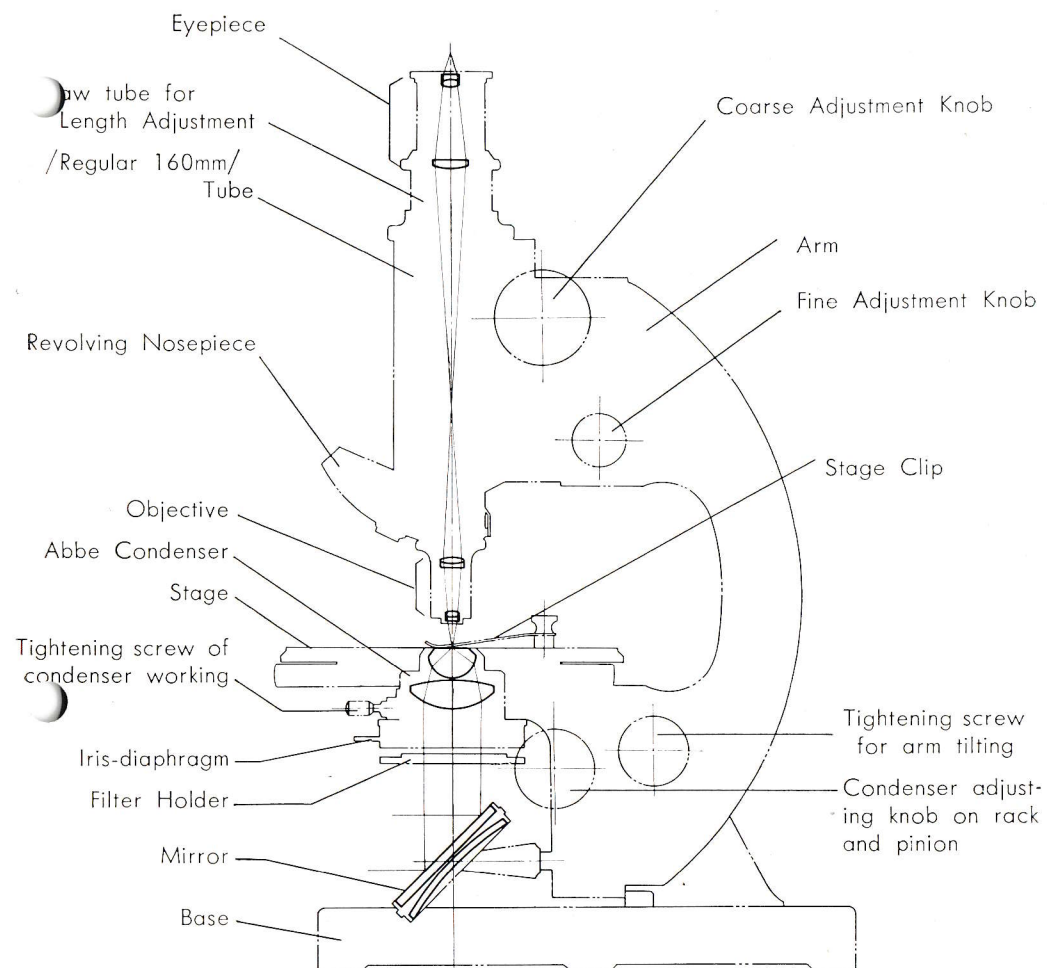


NAME OF PARTS



MODEL GB

OPTICAL PATH



MODEL GC

CONSTRUCTION

1. Tube (Classified according to its shape and function)

Vertical Tube (Optical parts of this tube are vertical to the stage.)	Monocular Tube	Fixed-type	GK
		Adjustable-type	GB and GC
	Binocular Tube	Fixed-type	
		Adjustable type	

Notes: A fixed-type tube means the one, whose mechanical length is fixed. In other words, the eyepiece and objective are always set at a fixed distance, which in Olympus biological microscopes is 160mm. In using the 160mm mechanical tube length microscope, adjust the focus with 10× objective lens first. Then, rotate the revolving nosepiece to bring 40× and 100× objectives into focus. In this way you can get the right focus with 40× and 100× objectives simply by adjusting the fine adjustment knob. If the mechanical tube length of the microscope deviates from 160mm, the prescribed magnifications, resolving power and Par-focality cannot be obtained.

2. Revolving nosepiece

GB quadruple revolving nosepiece

GC, GK triple revolving nosepiece

Notes: Objectives are usually so fixed that magnification will increase as the user turns the revolving nosepiece clockwise with his right hand.

3. Stage

Square Stage	Fixed-type GB	(with a built-in mechanical stage)
	Revolving-type	
Round Stage	Fixed-type	
	Revolving-type	GC and GK

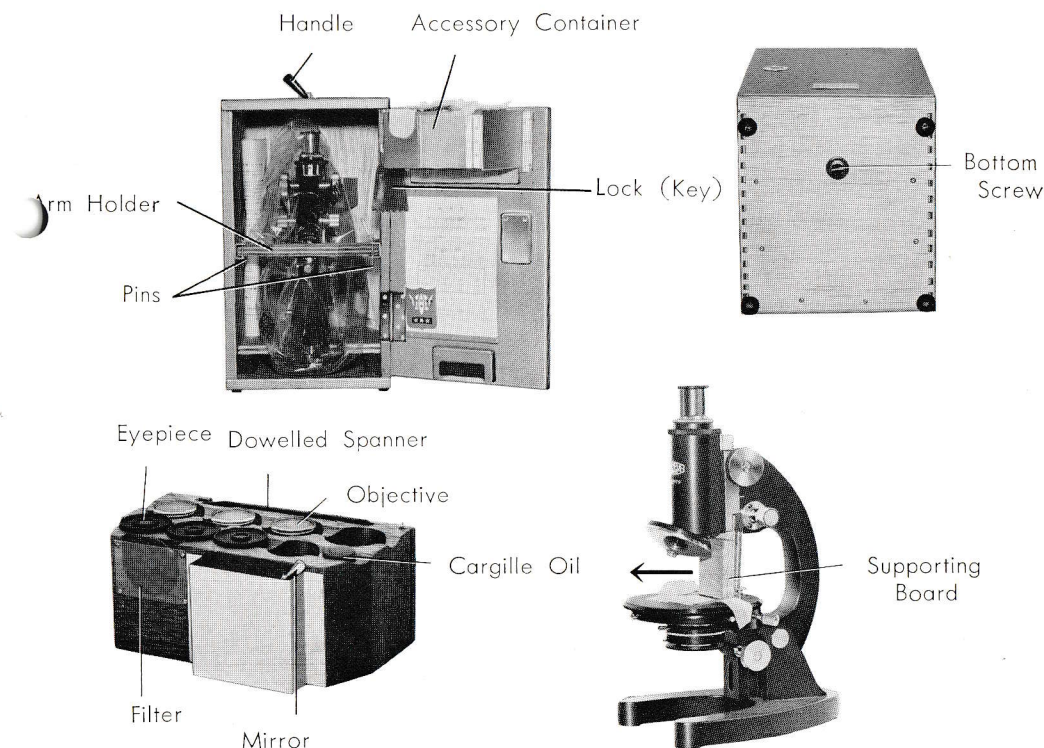
A complex mechanical stage can be attached to either GC or GK

4. Illuminators

Removable mirror: GB, GC and GK

Condenser: Vertical-motion type on rack and pinion (equipped with an iris-diaphragm), N. A. 1.25, GB, GC and GK

HOW TO TAKE OUT THE MICROSCOPE FROM CONTAINER



1. First, open the front lid of the container with the key attached to its handle.
2. Take out the dowelled spinner from the accessory container, loosen the bottom screw, and remove the microscope.
3. Turn the coarse adjustment knob to raise the tube only as much as necessary to free the block. Then pull the bottom of the supporting board down, following the direction of the arrow, until it comes off.

Notes: The supporting board is not necessary unless the microscope is shipped or carried for a long distance.

It must be attached or removed with great care so as not to damage the stopper of the revolving nosepiece.

4. Attach the objective lenses to the revolving nosepiece, in such a way that magnification increases as the revolving nosepiece is turned to the right.
5. Insert the eyepiece to be used.

Total magnification = magnification of objectives × magnification of eyepiece

$$/1.000 = 100 \times 10/$$

HOW TO USE G SERIES MICROSCOPE

ILLUMINATION (Lighting mechanism)

Illumination mechanism (lighting mechanism) is most essential in handling microscopes. The resolving power of the lens is influenced largely by the light source and the condenser.

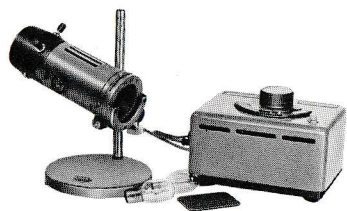
For the light source either natural or artificial light may be used; in most cases, however, natural light is sufficient. For photomicrography or phase examination, however, special microscopic illumination is required.

1. Illumination by natural light

Avoid direct rays of the sun, and try to handle the microscope by a window facing north. Usually a plane mirror is used. If the field of vision is disturbed by trees or window frames, however, a concave mirror may be used.

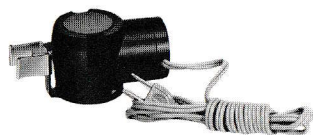
2. Illumination by use of illuminators (Light source illumination)

a. LSD



Low-voltage electric bulbs are used for this purpose. Especially prepared by Olympus the LSD is equipped with a 6V, 5A transformer and a 30W bulb. When you use this bulb, adjust the beams by shifting the position of the bulb. Use the plane part of the mirror. Use the attached day-light filter (cobalt color) after putting it into its holder.

b. LSK (Simplified illuminator)



Just replace the mirror with this device, and it is ready for use. Simply by connecting its socket directly to the electric power available at any ordinary home the necessary light for microscopic examination is obtained through the fixed blue filter. The lamp used for this device is of 100V and 15W. Two spare lamps are attached.

c. Adjustment

When an illuminator is used, first adjust the optical axis to coincide with the center of the mirror. Next, adjust the microscope to the proper height by shifting the tube either up or down.

Remove the eyepiece and look down into the tube, and you will see the rear part of the objective. Shift the mirror until the rear part of the objective is illuminated evenly and brightly. If the magnification of the objective lenses is low, shift the upper and lower knobs of the condenser to adjust its height and minimize uneven illumination. The same technique applies to the illumination by natural light.

d. Slide glass and cover glass

The standard thickness of the slide glass and cover glass of the Olympus microscopes are 0.8 — 1.0mm. and 0.16 — 0.18mm, respectively.

Try to use the standard glass whenever possible.

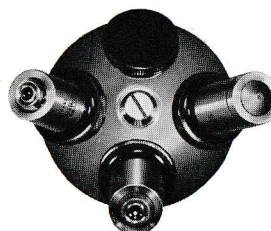
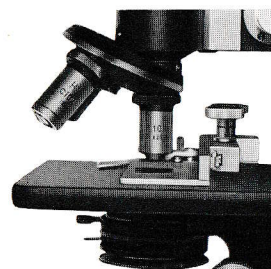
FOCUSING

When the illumination is adjusted properly, place the specimen on the stage and bring it into focus. In this case, if you move the tube up and down while looking into the microscope, you may strike the specimen with the objective lens. To avoid this, use the low magnification objective lens, and first lower the tube

towards the specimen by moving the coarse adjustment knob.

Next, raise the tube to bring the specimen roughly into focus while looking into the microscope by the eyepiece. Then, turn the revolving nosepiece to obtain the desired magnification for the objective lenses, and move the fine adjustment knob to bring the specimen into a finer focus.

Finally, move the specimen directly with your hands or by use of the complex mechanical stage to bring the particular part of the specimen to be examined nearer to the center of the visual field. When the magnification of the objectives is changed from 10X to 40X, the specimen will be brought into focus by turning the fine adjustment knob less than 1/2 round; and when changed from 40X to 100X, by turning it less than 2 rounds downward.



HOW TO CHANGE MAGNIFICATIONS

To change magnifications, either the eyepiece or the objective is changed.

1. In case eyepiece is changed

Replace the eyepiece with one with desired magnifications. Although the specimen has been brought roughly into a focus, adjust it by manipulating the fine adjustment knob, if necessary.

2. In case objective is changed

After focusing roughly by the low-magnification objective, replace it with one of higher magnification. Manipulate the fine adjustment device to obtain a finer focus.

RESOLVING POWER

Only objectives have the resolving power. The eyepiece serves only to enlarge the image resolved by objectives. In other words, no matter what high total magnifications are obtained by use of a high-magnification eyepiece, any image except produced by the objectives will never come into the field of vision. For instance, the total magnifications of the objective of 40 $\times$ and the eyepiece of 20 $\times$ and that of the objective lens of 100 $\times$ and the eyepiece of 8 $\times$ are both 800 $\times$. However, the resolving power of the latter is twice that of the former, and, therefore, finer details of the specimen can be examined in the latter combination.

OIL IMMERSION OBJECTIVE LENS

When you use the oil immersion objective lens, first locate the specimen by 10 $\times$ objective lens. Then apply a drop of cargille oil or (anisol), and turn the revolver so as to change it into an oil immersion lens. Next, lower the tube of the microscope until the edge of the lens touches the cargille oil (anisol). Further, lower the tube slowly with caution while looking into the microscope by the fine adjustment device, and the specimen will come into focus. Then the part of the specimen present in the center of your visual field through the 10 $\times$ objective will again come into view. If you also put some cargille oil (anisol) on the oil immersion objective before turning the revolver, no air will come in between the oil on the specimen and the edge of the lens. For extremely fine microscope work it is necessary to use the full numerical aperture of the condenser. Therefore sometimes it is necessary to put a drop of cargille oil between the bottom of the specimen and the top of the condenser, as well as between the 100 $\times$ oil immersion objective and the specimen.

After examination, the edge of the objective lens and condenser must be wiped clean with a piece of gauze dipped in xylene. Be careful not to leave any oil on the lenses used.

In case anisol has been used, wipe the lenses with a piece of clean gauze.

No xylene is necessary in this case.

DRY OBJECTIVE LENS

When a dry lens is used, the air of refractive-index "1" exists between the lens and the specimen. When an oil immersion lens with cargille oil is used, the refractive indexes of the edge of the lens, the medium with which the specimen is wrapped and the cover glass become identical with one another. This can minimize the loss caused by the refraction or reflection of light, and, therefore, can greatly increase the efficiency of the objective. Since the working distance of oil immersion lenses is generally shorter than that of dry lenses, caution must be taken not to bring the edge of the lens in touch with the cover glass. If you have been using the 100 $\times$ objective with oil and switch back to the 40 $\times$ dry objective it is important to remove the oil from the top of the specimen to avoid getting it on the front lens of the 40 $\times$ objective. Since on the high magnification the working distance is very short even a small drop of oil might spoil the image.

HANDLING OF THE GRADUATED DRAW TUBE

The graduation found at the lower part of the graduated draw tube indicates the distance between the lower part of the revolving nosepiece and the upper edge of that tube when the eyepiece is removed. Known as "mechanical tube length", this length differs in the objective lenses of different devices. In Olympus biological microscopes the distance is set at 160mm. Since the figure regulates the location of the objective and the eyepiece, any deviation from this figure will cause failure in obtaining the specified magnifications, resolving power and focus. Therefore, when you use a regular Olympus objec-

tive on an Olympus microscope, be sure to adjust the upper edge of the outer tube to the graduation of 160mm.

When a different objective lens is used, adjust it to the tube at the proper point of its graduation as specified in the instructions attached to it.

Olympus Microscope Model GK (equipped with oil immersion objective lenses) has no graduated draw tube, but its mechanical tube length is fixed at 160mm.

In the microscopic examination based on the specified mechanical tube length, the total magnifications are the magni-



fications of the single objective lens multiplied by the magnifications of the single eyepiece.

Total magnifications = Magnifications of objective $\times$ Magnifications of eyepiece
 $/ 1000 = 100 \times 10 /$

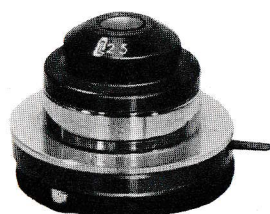
In case an objective micrometer and an eyepiece micrometer are used, and if there is any difficulty in adjusting the graduations of the both lenses, move up and down this graduated draw tube a little to bring them into the position of easier reading. This tube is also used when the cover glass does not have the standard thickness. When it is too thick, decrease the mechanical length of the tube, and when it is too thin, increase the length, so as to adjust and improve the resolving power, etc.

HANDLING OF THE CONDENSER

The oil immersion microscope is equipped at the bottom of its stage with a condenser, which can be shifted up and down by the handle or by the helioid. When the objectives of less than $10\times$ is used, lower the condenser properly so as to remove any illumination irregularity and so obtain good results. The upper part of the condenser can be unscrewed to obtain even

better results than those obtained merely by lowering the condenser. The Olympus microscope is so designed as to be manipulated with its condenser raised to the maximum height when equipped with oil immersion objectives.

So adjust the lens properly by the adjusting knob and examine the specimen at this position.



HOW TO ADJUST THE COARSE ADJUSTMENT DEVICE



The axis of the coarse adjustment device of the tube tapers, so, if you hold the knobs of the right and left sides, and turn them reversely, you can either loosen or tighten the device properly.

When a photomicrographic apparatus or an inclined binocular body tube is to be attached to this device, screw it up properly so that the body tube may not slip down by itself.

NOTES ON HANDLING

Microscopes are extremely allergic to moisture. This is especially true of such vital optical parts as objectives and eyepieces. These parts, therefore, should be kept in desiccators together with such desiccant as calcium chloride or silica gel.

Microscopes should also be kept free of dust. Since dust tends to gather on the lens surface, stage, condenser and mirror, these parts should be regularly cleaned with a soft clean brush. Whenever the eyepiece is removed from the microscope, be sure to put a dust plug into eyepiece tube. Otherwise, dust may deposit on the back of the objectives and greatly decrease its efficiency. Special grease is applied to the upper and lower moving sides of the coarse adjustment knob and condenser, as well as to the graduated mechanical stage. Therefore, by all means, avoid applying machine oil or watch lubricating oil to these parts. Since the microscope is a precision instrument and the construction of its parts including lenses is extremely delicate and complex, it should never be taken apart at random. When its efficiency decreases, repair work should be left to specialists.

Lenses may be cleaned if care is taken not to damage their surface. Either an air blower or a clean feather should be used for removing dust from the inside of the objectives.

ACCESSORIES

The following accessories will be found quite convenient for your microscopes, serving diversified purposes:

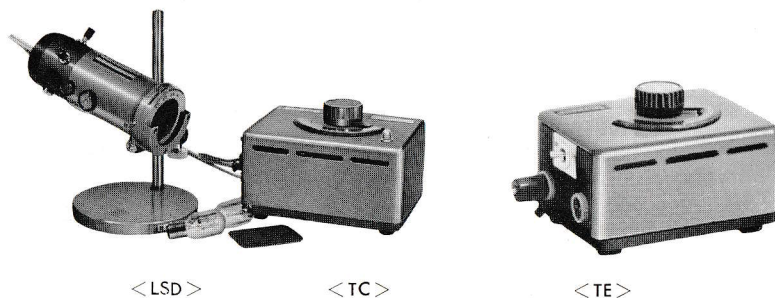
Small Photomicrographic Apparatus, PM-6



With this small apparatus you can take full-size photographs on a 35mm film, without any fear of shutter-blurs. The magnification on the film plane is about $1/3$ of the total magnifications of the microscope.

Light Source LSD with Transformer TC or TE with Ammeter

Since the parallel and convergent beams can be obtained by this lamp of standard 6V, 5A, it is one of the indispensable accessories not only for ordinary microscopic examination but also for photomicrography. This lamp is equipped with a day-light color compensation filter and adjustable condenser device.

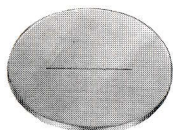


Photomicrographic Exposuremeter, EMM-V



This equipment is used for photomicrography in which proper exposure is hard to determine. Exposure failures are especially frequent in color film photomicrography; so use EMM-V.

Eyepiece Micrometer and Objective Micrometer



(1) eyepiece micrometer

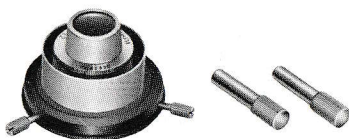


(2) objective micrometer

These are used to measure the size of specimens.

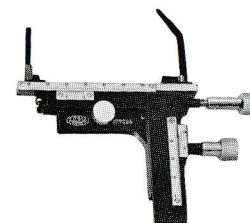
- (1) **Eyepiece Micrometer:** A round glass plate, 10mm/100, 19mm in diameter.
- (2) **Objective Micrometer:** A slide glass — 1 mm/100, 26 × 76 mm.

Dark Field Condenser, DC



This is a Kardioid-type dark field condenser equipped with the slide glass of 1.3 mm in thickness.

Graduated Mechanical Stage



The position of the specimen can be shifted about smoothly on this stage.

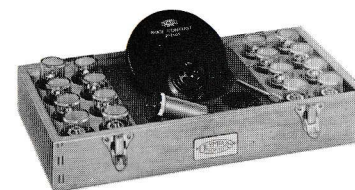
The degree of shift can be seen on the attached graduation (vernier, 0.1 mm).

This vernier is not intended as a measuring device, but only as an indication of where particular points of interest may be relocated. That is if the vernier reading is noted it may be returned after examining other portions of the specimen.

Phase Contrast Equipment, PA and PB

These are used for the microscopic examination of transparent and unstained specimens. Four different contrasts are available by Model PA and one by Model PB. Objectives particularly designed for this purpose are used in both models.

The Olympus Phase Contrast objectives can be used for bright field work if the condenser is switched to position "O"



PA



PB