COLOR FILTERS

The use of color filters is a great aid to bring out details and contrasts during visual observation and is essential for most types of black-and-white photomicrography. The following table describes the three solid glass filters mounted in color filter turret (6). Average filter factors for photomicrography with "PAN" film (similar to Eastman Kodak Plus X rollfilm) are also indicated:

COLOR	SPECTRAL TRANSMISSION	AVERAGE FILTER FACTOR FOR "PAN" FILM	TURRET DESIGNATION
Daylight	Primarily for visual observation to render true color values of stains in the specimen	2.5X	D
Green	4600A to 6250A, peak at 5300A	8X	G
Red	5750A to red end	3.5X	R
Open		1X	O

At full intensity (light switch (5) away from user), light of approximately 3200°K color temperature is automatically obtained. Such light is properly balanced for photomicrography in natural color with Anscochrome sheet film Tungsten type 3200°K, Kodak Ektachrome sheet film type B and other color films balanced for 3200°K.

Kodak Ektachrome Type F, Anscochrome Flash Type, Kodachrome Type F and other color films balanced for color temperature of 3800°K require the use of light balancing filters. EK filters 82C and/or 82A are suitable for this purpose and available from the Special Products Sales Division, Eastman Kodak Company, 343 State Street, Rochester 4, New York.

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Model 600

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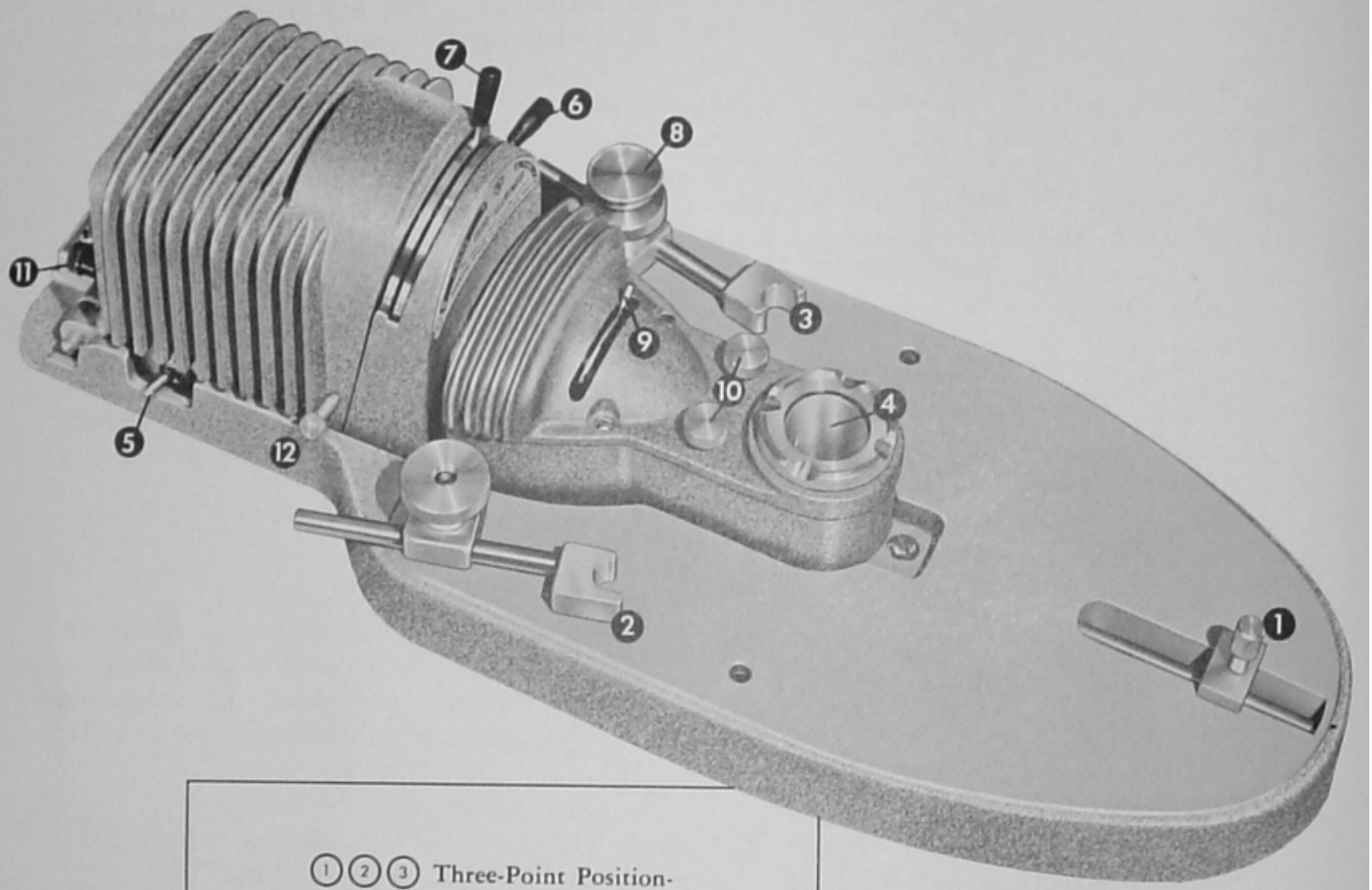

(1)(2)(3) Three-Point Positioning Device for Microscope

(4) Auxiliary Lens

(5) Light Switch

(6) Color Filter Turret

(7) Intensity Filter Turret

(8) Pinhole Eyepiece

(9) Field Diaphragm

(10) Field Diaphragm Centering Screws

(11) Filament Centering Screws

(12) Lamp Housing Lock Screw

INTRODUCTION

Successful microscopy and photomicrography are dependent upon an efficient... controllable...and convenient source of illumination. The AO SPENCER ORTHO-ILLUMINATOR is specifically designed to satisfy these requirements...permits you to reveal most minute details with maximum clarity to the very limits of the resolving power of your microscope...eye fatigue is reduced and your work made easier.

The ORTHO-ILLUMINATOR follows the highly-recognized Koehler principle of illumination which consists essentially of imaging the light source at the lower focal plane of the microscope substage condenser and back focal plane of the microscope objective as well as the imaging of the field-of-view diaphragm at the specimen plane.

You are urged to faithfully observe the following instructions in a step by step fashion so that you can justifiably obtain the full benefits of your investment.

A. TO ALIGN MICROSCOPE WITH AO ORTHO-ILLUMINATOR

1. Move three point positioning devices (1, 2, 3) out of the way.
2. Place microscope (mirror and fork removed) on baseplate...straddle toes of microscope base equally around light well casting...line up heel with positioning device (1). Under these conditions sub-stage condenser of microscope should be approximately centered above auxiliary lens (4).
3. Switch on illuminator with handle (5) toward you.
4. Position handle of light intensity filter turret (7) to the extreme left, "3". Position handle of color filter turret (6) to position "D" or "G".
5. Position handle of field diaphragm (9) to extreme left.
6. Focus microscope on specimen using combination of 10X objective and 10X eyepiece; adjust condenser to proper height.
7. Unscrew pinhole eyepiece (8) from post on right...place its largest diameter, face down, onto auxiliary lens (4).
8. Focus microscope on pinhole until a small circle of light appears fairly well defined in the field of view.
9. Your microscope is correctly positioned if the circle of light appears to be in the center of the field of view. If not centered, move the microscope on the baseplate until reasonably well centered.
10. Move the three positioning devices (1, 2, 3) against toes and heel of microscope base and tighten clamp screws firmly.
11. Remove pinhole eyepiece (8) from auxiliary lens (4) and refocus microscope on specimen.
12. Close field of view diaphragm (9) by moving handle to the right. This will reduce the illuminated area of the specimen to a small circle of light somewhere in the field of view. Disregard any off-center condition for the moment.
13. Focus substage condenser, up or down, until the borderline of the illuminated area is as sharply defined as possible and at its smallest diameter.

14. Turn field diaphragm centering screws (10) simultaneously left and/or right until illuminated area is centered to the total field of view.
15. Open field of view diaphragm (9) by moving handle to the left until illuminated area almost coincides with the total field of view...refocus substage condenser slightly until color fringes bordering the illuminated area are as narrow as possible and the diameter of the illuminated area itself is at its smallest possible diameter. (This is usually so when the substage condenser is near its uppermost position.) If your microscope is equipped with a regular Abbe or Achromatic-Aplanatic Condenser, such color fringes are quite common and conspicuous... they are inherent characteristics and have nothing to do with the illuminator.

The alignment of your microscope with the ORTHO-ILLUMINATOR has now been completed...microscope may be removed from the base and repositioned without repeating the above steps - provided positioning devices (2) and (3) are not disturbed and positioning device (1) is securely locked.

B. TO CENTER LAMP FILAMENT

16. Focus microscope on specimen using 43X (4mm) objective and 10X eyepiece.
17. Open microscope substage condenser and ORTHO-ILLUMINATOR field diaphragm (9) to widest extent.
18. Move specimen slide to a clear area...one unobstructed by specimen ...do not change focus.
19. Position handle of light intensity filer turret (7) to extreme right, position"O".
20. Position handle of color filter turret (6) to position "G", green filter.
21. Remove eyepiece and substitute pinhole eyepiece (8). Viewing through it, the rear lens of the microscope objective will be seen with an image of the bulb filament. Center the filament image to the rear lens by regulating filament centering screws (11).
22. Remove pinhole eyepiece and reinsert regular eyepiece.
23. Position handle of light intensity filter turret (7) to left, position "3".
24. Position handle of color filter turret (6) to left, position "D".

Steps 16 through 24 must be repeated if bulb is changed or displaced. Alignment of lamp filament, microscope and ORTHO-ILLUMINATOR has been completed...the equipment is now ready for use.

C. TO USE SCANNING OBJECTIVES

Scanning objectives are in a class of their own...designed for extra large field of view coverage...and generally 3.5X or 5X initial magnifications. A standard microscope condenser cannot completely illuminate such a large field of view unless the microscope condenser is equipped with a swing-in auxiliary lens...swing-out top element...or variable focus condenser. As an alternate, the top element of most standard condensers may be unscrewed

to enlarge the illuminated area . . . this method is not considered practical, however, because it is awkward and time consuming.

When using low power scanning objectives in combination with substage condensers modified as above:

1. Open microscope substage condenser iris diaphragm and ORTHO-ILLUMINATOR field of view diaphragm (9) to widest extent.
2. Position handle of intensity control turret (7) to suit your preferred eye comfort.

Koehler's principle of illumination, in this instance, is not applicable and is of no consequence at the very low magnifications obtained with scanning objectives.

D. TO SERVICE ORTHO-ILLUMINATOR

Your AO SPENCER ORTHO-ILLUMINATOR has been designed to give you the best possible service with minimum maintenance. The bulb supplied is a high efficiency projection bulb and, if burned continuously at high intensity and rated voltage, has an average life of 30 to 50 hours. Over-voltage shortens its life considerably; if burned at low intensity (switch (5) toward user) the life is increased ten to twenty times. Do not use a bulb to the point of complete exhaustion. Change it when it starts to blacken. . . otherwise faithful color rendition in color photomicrography is jeopardized.

1. To inspect or replace bulb

(a) Unscrew lamp housing lock screw (12).
(b) Swing back hinged lamp housing.
(c) Inspect or replace bulb.
(d) If bulb must be replaced, use same type of bulb GE PH100S11/3SC and repeat steps 16 to 24 of section B. This alignment is necessary to overcome slight differences in filament placement.

2. To clean optical parts

(a) Auxiliary lens (4)
Remove auxiliary lens assembly . . . use camels hair brush, lens paper or soft, clean lint-free cloth. . . smudges can be removed with clean alcohol or other suitable solvent.

(b) Mirror
The mirror located beneath the auxiliary lens is a first surface mirror and must be cleaned with a fine camels hair brush. . . not with a cloth or lens paper. Residual dust can be removed with a blow bulb or ear syringe.

(c) Lamp condenser lens and mirror assembly

1. Remove two light well cover screws.
2. Lift entire light well cover and attached assembly straight up.
3. Open iris diaphragm and carefully clean both sides of lamp condenser lens. Clean mirror as instructed in step (b). It is extremely important to keep the condenser dust free because such dust will, under certain conditions, appear in the field of view and specimen plane.

E. TO OBTAIN MAXIMUM PERFORMANCE OF ORTHO-ILLUMINATOR AND MICROSCOPE

1. Focus microscope on specimen...adjust field of view diaphragm (9) so that it just clears the circular edge of the field as seen in the eyepiece. This adjustment must be made for every objective and/or eyepiece change. If necessary, center image of field diaphragm using centering screws (10).

2. Select suitable light intensity by rotation of turret (7)...Remember with switch in "toward-you" position, bulb burns at reduced intensity for visual observation; in "away-from-you" position, it burns at full intensity (color temperature 3200°K)...required for color photomicrography, darkfield, polarizing, phase, interference microscopy and oil immersion brightfield.

3. Select suitable color filter by rotation of turret (6). Make certain to always rotate turrets until a distinct click is felt. For most visual microscopy position "D" will be preferred because its light simulates that of a white cloud. Color filter turret (6) must be rotated to position "O" for highest intensity levels and color photomicrography. Additional information on color filters below.

4. Close the iris diaphragm of the microscope substage condenser to a point where the illumination in the microscope just begins to dim. A more precise method of adjusting this aperture diaphragm consists of removing the eyepiece...looking into the microscope tube with the naked eye or through a pinhole eyepiece...and adjusting the iris diaphragm aperture so that it appears to completely fill the back lens of the objective with light.

   In most cases, however, it is better to close the diaphragm to about 2/3 to 4/5 the total aperture...only in exceptional cases is it desirable to open the diaphragm to the full aperture of the rear objective lens...the setting varies with the nature of the specimen and, actually, no cut and dried rule can be given. Viewing the specimen while operating the microscope aperture diaphragm will soon show in which position maximum crispness and detail is revealed.