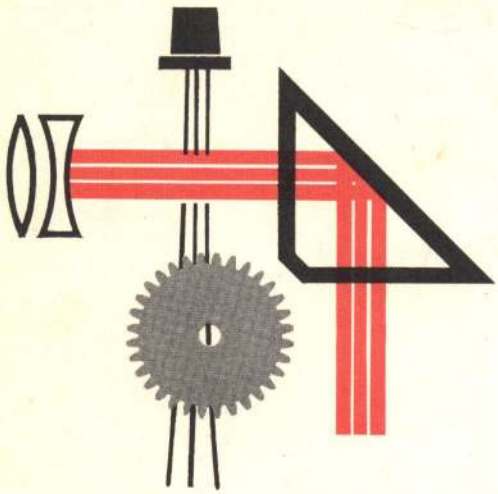


INSTRUCTIONS

INTEGRATED CAMERA

SYSTEM II

BAUSCH & LOMB

INTEGRATED CAMERA SYSTEM II

INSTRUCTIONS

BAUSCH & LOMB ROCHESTER, NEW YORK 14602

Section - 0

TABLE OF CONTENTS

INTRODUCTION

This manual tells how to use the 4 x 5, 3-1/4 x 4-1/4 Polaroid and 35mm Camera units with DynaZoom and Dynoptic Microscopes, or Bench Metallographs and Stereo-Zoom 7 Microscopes. Each unit consists of a Camera Body, Focusing Tube with built-in Shutter and Camera Lens. The Focusing Tube is common to all three camera units. Only the Camera Bodies differ.

Any one of the three Cameras can be used to make photomicrographs in black & white or color. They are classified by size and by the types of film they use. There is no "best" Camera. There is, however, one Camera which should be best suited to your needs.

Sections 1, 2, 3, and 4 of this manual deal with steps in assembling and operating the 4 x 5, 3-1/4 x 4-1/4 Polaroid and 35mm sizes respectively. Sections 5, 6 and 7 will be concerned with operating maintenance information applying generally to all three sizes.

4 x 5 CAMERA (10X MAG.)

The largest unit takes 4 x 5 film or plates. This Body will accommodate any plate or Film Holder or other accessory which will fit a 4 x 5 Graphic or Graflex Back. 4 x 5 sheet films and plates are available in a wide variety of emulsions in both black & white and in color. Polaroid film packets are also available in color or black & white.

3-1/4 x 4-1/4 (POLAROID®) CAMERA (7.5X MAG.)

The intermediate size Camera Body utilizes a Polaroid, series 100, 3-1/4 x 4-1/4 Film Pack Back. Polaroid Film Packs in black & white and in color permit instant photomicrographs of suitable size for normal viewing. Included with this Camera is a Viewfinder Adapter Plate which permits the use of a Standard Eyepiece or a Viewfinder Eyepiece to help in parfocalizing the film plane image.

35mm CAMERA (3X OR 5X MAG.)

The 35mm Camera Body uses standard cartridges (cassettes) of the many emulsions offered in black & white or in color in this universally available size. The useful negative area is 24 x 36mm (about 1 x 1-1/2). As with the 3-1/4 x 4-1/4 Polaroid Camera Back, a Viewfinder Adapter Plate is furnished to aid in parfocalizing. 35mm film is especially suitable in situations where a large number of negatives are required or where color transparencies for projection are desired. In either case, compactness, rapidity of film transport and economy are important advantages.

COLOR COMPENSATED FOCUSING TUBE

Cat. No. 42-12-13 (identified by white stripe)

For optimum sharpness, with DynaZoom Microscope (not Dynoptic), this should be used with any of the following Objective Lenses. It will sharpen both black & white and color photographs, and will improve color rendition. It does not affect the focal setting, nor will it appreciably increase exposure time.

It should be used with:

All Bausch & Lomb Apochromats (bronze finish mounts)

All Bausch & Lomb Flat-Field Objective (bright chrome finish mounts)

Section - 1

FOCUSING TUBE INSTALLATION

FOCUSING TUBE INSTALLATION*

Remove Clamp Screw from Focusing Tube Adapter and screw Focusing Tube Adapter into top of the Microscope or Metallograph Body. Replace Clamp Screw, 1-Fig. 1-1.

Insert Focusing Tube into Focusing Tube Adapter. Rotate the Focusing Tube to desired orientation. Tighten Clamp Screw to secure the Focusing Tube in this position.

Screw Cable Release into its Socket, set Shutter Speed Dial to "T", and open the Shutter.

*Except Stereo 7, see Section 4.

1. Clamp Screw
2. Cable Release
3. Focusing Tube Adapter
4. Shutter Control Dial
5. Focusing Knob

FIG. 1-1 – FOCUSING TUBE

Section - 2

USE OF CAMERAS ON MICROSCOPE

4 x 5 CAMERA

1. Using a 10X Objective, Zoom Knob at 1.0X (if applicable), focus on a thin, high contrast specimen in the right Eyepiece.

2. Turn the Prism Control to "CAM". This will divert the image of the specimen from the Eyepiece to the photographic plane.

3. Lower the Camera Body over the Focusing Tube and rotate it to desired orientation. Secure by tightening Clamp Screw.

4. Darken the room as much as possible. Observe the image of the specimen on the Ground Glass Focusing Screen and focus it sharply by turning the Focusing Tube Focusing Knob.

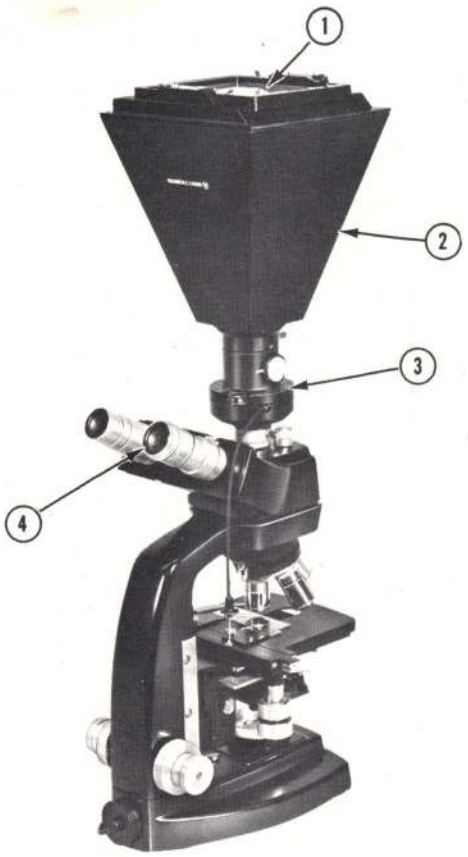
NOTE: For future reference, when using this Camera and Microscope combination, note which graduation on the Focusing Tube Scale is opposite the White Index Mark.

NOTE: Refer to Section 5 on Exposure Theory.

Making The Exposure

1. Prepare the Camera Unit as follows:

   a. Load a Plate or Film Holder with the required type of film.



1. Ground Glass Focusing Screen
2. 4" x 5" Camera Body
3. Focusing Tube
4. Viewfinder Eyepiece

FIG. 2-1 – 4" x 5" CAMERA INSTALLED ON DYNAZOOM MICROSCOPE

b. Consult the Exposure Tables and set the Shutter Control Dial to the recommended exposure for the particular combination of film, filter, objective lens and transformer tap.

c. Insert any necessary filter(s) in optical path.

d. Check the setting of Illumination Transformer Tap.

2. Frame and focus the picture area in this way:

a. If Viewfinder Eyepiece is used, focus it so that its Reticle is sharp.

b. Maneuver the Stage until the area you wish to photograph falls within the frame labeled 3-1/4 x 4-1/4 - 4 x 5 visible in the Viewfinder Eyepiece.

c. If the original Eyepiece is used, position the center of the desired specimen area approximately in the center of the field of view.

d. Using the Fine Focus Knob of the Microscope or Metallograph, bring the image of the specimen into the sharpest possible focus.

3. Expose the film as follows:

a. Turn the Prism Control Knob to the "CAM" position.

b. Pull the dark slide out of the Film Holder (or the outer cover, if you are using a Polaroid Film Packet).

c. Press the Cable Release Plunger to Expose.

d. Replace dark slide or outer cover of the film packet.

e. Remove the Film Holder from the Camera Back for processing.

Suggested Base Exposures (Black and White Film)

DYNAZOOM - DYNOPTIC MICROSCOPES

4 x 5 Camera (equipped with Polaroid 500 or 545 Film Holder).

Film: Polaroid Type 57, ASA speed 3000*

Illumination: Base Illuminator on Tap #4

Filter: 1.7 Neutral Density

Zoom Setting: 1.0

Objective (Achromats)	Illuminated NA	Exposure* Time in Sec.
3.5X or 4X	1	1/60
10X	2/3	1/30
40X or 43X	2/3	1/8
97X or 100X	2/3	1/4

*See Sections 1 and 2 of Note, page 21.

These Base Exposures can also be used with the Cat. No. 31-33-20 Hi-Intensity Illuminator, provided that a 2.3 Neutral Density Filter (1.0 & 1.3) is substituted for the 1.7 Neutral Density Filter.

Suggested Base Exposures (Color Films)

DYNAZOOM - DYNOPTIC MICROSCOPES

4 x 5 Camera (equipped with Polaroid 500 or 545 Camera Backs).

Film: Polaroid Polacolor Type 58, ASA speed 75

Illumination: Bright Field, Base Illuminator on Tap 5

Filters: 80B+CC50B[2] (add a B&L Didymium Filter, Cat. No. 42-14-98 for best reproduction of some red stains such as eosin and fuchsin)

Zoom Setting: 1.0

Objective (Achromats)	Illuminated NA	Exposure[1] Time in Sec.
3.5X or 4X	1	1
10X	2/3	2
40X or 43X	2/3	7
97X or 100X	2/3	18

[1] See Sections 1 and 2 of Note, page 21.

[2] An alternative filter combination which works well for long exposure times is: 80A + 82B + CC10C.

3-1/4 × 4-1/4 CAMERA

1. Using a 10X Objective, Zoom Knob at 1.0X (if applicable), focus on a thin, high contrast specimen in the right Eyepiece.

2. Turn the Prism Control to "CAM". This will divert the image of the specimen from the Eyepiece to the photographic plane.

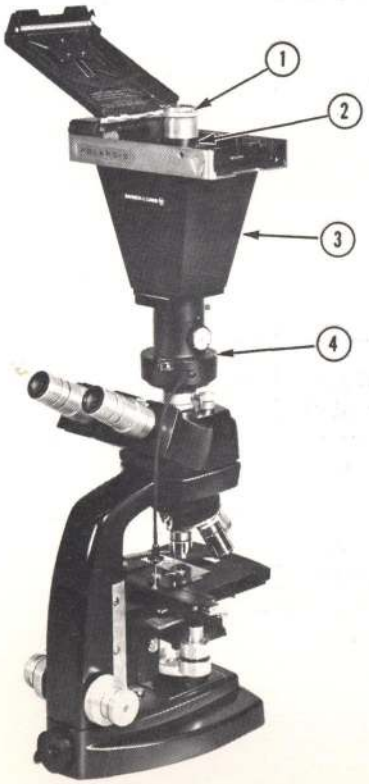
> Focusing Tube must be in lowest position before placing Camera Back on Tube.

3. Lower the Camera Body over the Focusing Tube and rotate it to desired orientation. Secure by tightening Clamp Screw.

4. Pull out Dark Slide.

5. Open the Camera.

6. Place the Viewfinder Adapter Plate on the Film Plane with its cylindrical collar upwards.



1. Eyepiece
2. Viewfinder Adapter Plate
3. Camera Body
4. Focusing Tube

FIG. 2-2 – 3-1/4" x 4-1/4" CAMERA INSTALLED ON DYNAZOOM MICROSCOPE

7. Remove the Eyepiece from the right Eyepiece Tube and insert in the Viewfinder Adapter Plate.

8. Focus the image of the specimen in the Eyepiece by turning the Focusing Tube Focusing Knob. The image as seen through the Viewfinder Eyepiece will not appear crisp because of the additional 10X magnification of the Eyepiece.

NOTE: For future reference when using this Camera and Microscope combination, note which graduation on the Focusing Tube Scale is opposite the White Index Mark.

NOTE: Refer to Section 5 on Exposure Theory.

Making The Exposure

1. Prepare the Camera Unit as follows:

   a. Load a Polaroid Film Pack in the Camera.

   b. Consult the Exposure Tables and set the Shuuer Control Dial to the recommended exposure for the particular combination of film, filter, objective lens and transformer tap.

   c. Insert any necessary filter(s) in optical path.

   d. Check the setting of Illumination Transformer Tap.

2. Frame and focus the picture area in this way:

   a. If Viewfinder Eyepiece is used, focus it so its Reticle is sharp.

   b. Maneuver the stage until the area you wish to photograph falls within the frame labeled 3-1/2 x 4-1/4 - 4 x 5 visible in the Viewfinder Eyepiece.

   c. If the original Eyepiece is used, position the center of the desired specimen

area approximately in the center of the field of view.

d. Using the Fine Focus Knob of the Microscope, bring the image of the specimen into the sharpest possible focus.

3. Expose the film as follows:

a. Turn the Prism Control Knob to the "CAM" position.

b. Pull out the black paper outer cover of the Polaroid Film Pack.

c. Pull out the dark slide in the Camera Body.

d. Press the Cable Release Plunger to expose the film.

e. Follow Polaroid's directions, received with film pack, for processing.

Suggested Base Exposures (Black and White Film)

DYNAZOOM-DYNOPTIC MICROSCOPE

3-1/4 x 4-1/4 Camera (for Polaroid Series 100 Film Packs)

Film: Polaroid Type 107, ASA speed 3000*

Illumination: Base Illuminator on Tap 4

Filter: 1.7 Neutral Density

Zoom Setting: 1.0

Objective (Achromats)	Illuminated NA	Exposure* Time in Sec.
3.5X or 4X	1	1/60
10X	2/3	1/30
40X or 43X	1/3	1/8
97X or 100X	2/3	1/4

*See Sections 1 and 2 of Note, page 21.

Suggested Base Exposures (Color Films)

DYNAZOOM - DYNOPTIC MICROSCOPES

3-1/4 x 4-1/4 Camera (for Polaroid Series 100 Film Packs)

Film: Polaroid Polacolor Type 107, ASA speed 75

Illumination: Bright Field 2, Base Illuminator on Tap 5

Filters: 80B + CC50B[2] (Add a B&L Didymium Filter Cat. No. 42-14-98 for best reproduction of some red stains such as eosin and fuchsin.

Zoom Setting: 1.0

Objective (Achromats)	Illuminated NA	Exposure[1] Time in Sec.
3.5X or 4X	1	1/2
10X	2/3	1
40X or 43X	2/3	4
97X or 100X	2/3	10

1 See Sections 1 and 2 of Note, page 21.

2 An alternative filter combination which works well for long exposure times is: 80A + 82B + CC10C.

35MM CAMERA 3X - 5X

1. Using a 10X Objective, Zoom Knob at 1.0X (if applicable), focus on a thin, high contrast specimen in the right Eyepiece.

2. Turn the Prism Control to "CAM". This will divert the image of the specimen from the Eyepiece to the photographic plane.

3. Lower Camera Body over the Focusing Tube (Fig. 2-4) and rotate to desired orientation. Secure by tightening Clamp Screw. If 5X magnification is desired, insert 5X Adapter between Camera Body and Focusing Tube.

4. Pull out Dark Slide.

5. Open the Camera Back by pushing the Spring Catch.

6. Place the Viewfinder Adapter Plate on the film plane with its cylindrical collar upward.

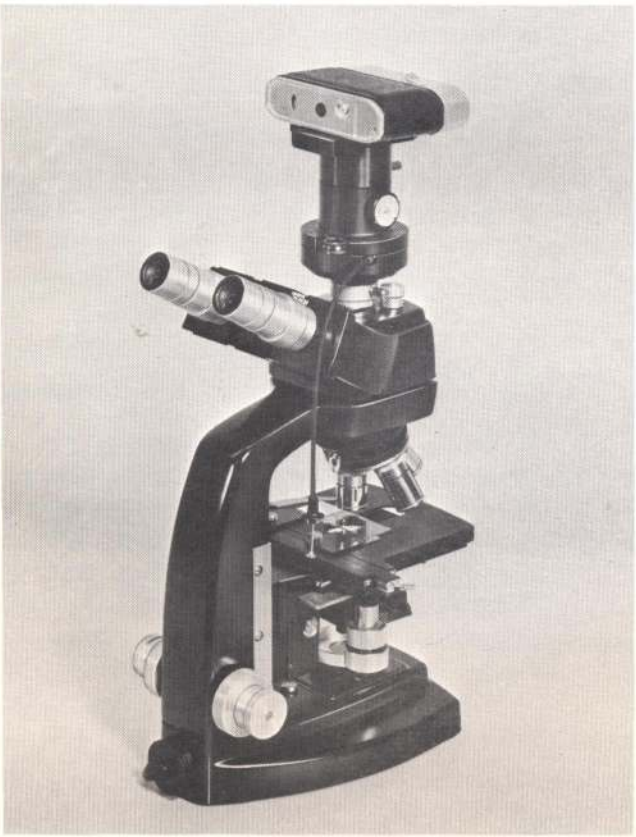


FIG. 2-3 - 35mm CAMERA INSTALLED ON DYNAZOOM MICROSCOPE

7. Remove the Eyepiece from the right Eyepiece Tube and insert it in the Viewfinder Adapter Plate.

8. Focus the image of the specimen in the Eyepiece by turning the Focusing Tube Focusing Knob. The image as seen through the Viewfinder Eyepiece will not appear crisp because of the additional 10X magnification of the Eyepiece.

NOTE: For future reference when using this Camera and Microscope combination, note which graduation on the Focusing Tube Scale is opposite the white Index Mark.

NOTE: Refer to Section 5 on Exposure.

Making The Exposure

1. Load the Camera, using the following procedure as a guide: (For convenience in loading, the Camera Body can be dismounted by loosening the Lock Screw.)

   a. With the Camera Back open, pull out the Rewind Crank.

   b. Place a loaded Film Cartridge in the opening next to the Rewind Crank with the protruding end of the Cartridge away from the Rewind Crank.

   c. Push the Rewind Crank in, turning it slightly if necessary, to engage the Film Spool.

   d. Pull about three inches of film out of the Cartridge.

   e. Turn the Take-up Spool by its serrated edges until the Slot is uppermost.

   f. Insert the Film Leader Tongue in the Slot and engage one of its perforations with the Teeth near one end of the slot.

   g. Turn the Take-up Spool further, by its serrated edges, so that it winds one or two turns of Film Leader around it. The Film should advance far enough so that its full width covers the Drive

Sprockets and that the latter engage perforations in the edge of the film.

h. Turn the Rewind Crank clockwise until a slight resistance is felt. This will remove any slack from the film in the cassette.

i. Close the Camera Back.

j. Make sure the Dark Slide is pushed in.

k. Move the Film Wind Lever through two full strokes maintaining a gentle clockwise pressure on the Rewind Crank. The Exposure Counter Dial will now be at 1. The Rewind Crank should turn counterclockwise as the film is advanced. If the Crank does not turn, the film is not feeding through the Camera properly. Open the Camera and check that the end of the Film Leader is secured properly in the Take-up Reel and that the Teeth of the Drive Sprocket are engaging the film perforations.

2. Frame and focus the picture area.

a. If the Camera Body has been removed from the Focusing Tube for loading, replace it and tighten the Camera Body Lock Screw.

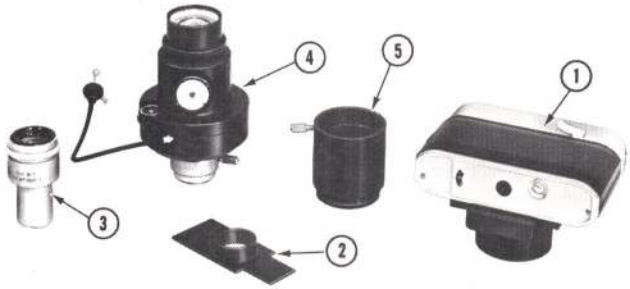
b. Focus the Viewfinder Eyepiece (if you are using one) until its Reticle is in sharp focus.

c. Select the area to be photographed and position it within the appropriate frame (labeled 35mm - 3X or 35mm - 5X) visible in the Eyepiece. If a standard Eyepiece is used, center the desired specimen area in the field of view. Check to be sure that both the specimen and the Reticle are in sharp focus.

d. Rotate the Prism Control Knob to "CAM".

3. Now, expose the film as follows:

a. Consult the Exposure Tables. Insert any necessary filter(s) in the optical path. Set the Shutter Control Dial to the recommended exposure for the particular combination of film, filter(s), objective lens and transformer tap.



1. Camera Body
2. Viewfinder Adapter Plate
3. Viewfinder Eyepiece
4. Focusing Tube
5. 5x Adapter

FIG. 2-4 – COMPONENTS OF 35mm CAMERA

b. Withdraw the Dark Slide.

c. Press the Cable Release to expose.

d. Operate the Film Wind Lever through a full stroke before making the next exposure.

e. If you finish a picture sequence before using up a complete roll of film, replace the Dark Slide before removing the Camera Body from the Focusing Tube.

f. When the complete roll has been exposed, push the Rewind Release Button in and hold it. Turn the Rewind Crank clockwise until a lessening of resistance is felt. This means that the film has come loose from the Take-up Spool. Open the Camera Back and remove the Film Cartridge for processing.

Suggested Base Exposures (Black and White Film)

DYNAZOOM-DYNOPTIC MICROSCOPES

35mm Camera

Film: Kodak Panatomic X, ASA speed 40*

Illumination: Base Illuminator on Tap 4

Filter: 1.0 Neutral Density

Zoom Setting: 1.0

These Base Exposures may also be used with the Research Base Illuminator if a 1.7 Neutral Density Filter is substituted for the 1.0 Neutral Density Filter.

*See Sections 1 and 2 of Note, page 21.

Objective (Achromats)	Illuminated NA	Exposure Time in Sec.*	
		3X Camera	5X Camera
3.5X or 4X	1	1/125	1/30
10X	2/3	1/60	1/15
40X or 43X	2/3	1/30	1/8
97X or 100X	2/3	1/15	1/4

Suggested Base Exposures (Color Films)

DYNAZOOM-DYNOPTIC MICROSCOPES

35mm Camera

Film: Kodak High Speed Ektachrome, Type B, (3200K), ASA speed 125[1]

Illumination: Bright Field, Base Illumination[2] on Switch Tap 4

Filter: 80C[3] (Color Balancing)

Zoom Setting: 1.0

Other: Use a B&L Didymium Filter (Cat. No. 42-14-98) for best reproduction of some red stains such as eosin and fuchsin.

1 See Sections 1 and 2 of Note, page 20.

2 In the case of the 31-33-20 Research Base Illuminator, use approximately 1/5 the exposure indicated in the table. (This may be accomplished by inserting a .7 neutral density filter.)

The base exposures may also be used with the Research Base Illuminator provided that a .7 Neutral Density Filter is inserted.

Objective (Achromats)	Illuminated NA	Exposure Time in Sec.[1]	
		3X Camera	5X Camera
3.5X or 4X	1	1/30	1/15
10X	2/3	1/30	1/15
40X or 43X	2/3	1/30	1/15
97X or 100X	2/3	1/8	1/2

35mm CAMERA

Film: Ektachrome -X, ASA speed 64[1], daylight

Illumination: Bright Field, Base Illumination[2] on Switch Tap 5

Filters: 80B + CC50B[3] B&L Didymium[4]

Zoom Setting: 1.0

[1] See Sections 1 and 2 of Note, page 21.

[2] In the case of the 31-33-20 Research Base Illuminator, use approximately 1/5 the exposure indicated in the table. (This may be accomplished by inserting a .7 neutral density filter.)

[3] Recommendations based on the use of Kodak Wratten Filters.

[4] See page 24, footnote 2.

Objective (Achromats)	Illuminated NA	Exposure Time in Sec.[1]	
		3X Camera	5X Camera
3.5X or 4X	1	1/8	1/2
10X	2/3	1/8	1/2
40X or 43X	2/3	1/4	1/2 to 1
97X or 100X	2/3	1/2 to 1	2

35mm Camera

Film: Kodak Photomicrography Color Film #2483, ASA 16[1], Daylight

Illumination: Bright Field, Base Illumination[2] on Switch Tap 5.

Filters[5]: 80B + CC50B[3] B&L Didymium[4]

[1] See Sections 1 and 2 of Note, page 21.

[2] In the case of the 31-33-20 Research Base Illuminator, use approximately 1/5 the exposure indicated in the table. (This may be accomplished by inserting a .7 neutral density filter.)

[3] Recommendations based on the use of Kodak Wrattan Filters.

[4] See page 24, footnote 2.

[5] Characteristically, this film requires less blue filtration with longer exposures. It may be desirable to replace the CC50B by, for example, a CC 30 B or even a CC 20 B.

Objective (Achromats)	Illuminated NA	Exposure Time in Sec.[1]	
		3X Camera	5X Camera
3.5X or 4X	1	1/2	2
10X	2/3	1/2	2
40X or 43X	2/3	1	4
97X or 100X	2/3	2	8

Section - 3

USE OF INTEGRATED CAMERAS ON BENCH METALLOGRAPH

The procedure for focusing the Cameras on the Bench Metallograph will be the same as for the Microscope with two exceptions. It is necessary, on the Bench Metallograph, to first focus the right Eyepiece on the Micrometer Reticle in the Reticle Turret of the Metallograph. When this is accomplished, the specimen, when focused in the right Eyepiece, will be in focus at the film plane also.

Making The Exposure

The procedure for making the exposure will be the same as for the Cameras on the Microscope.

Suggested Base Exposures

METALLOGRAPHS (4" X 5")

Film: Polaroid Type 52, ASA speed 400*

4" x 5" Camera (Equipped with Polaroid 500 or 545 Film Holder)

Illumination: Bright Field

Illuminator: Tap 3

Illuminated N.A.: 2/3

Filter: Normal Green

Objective (Achromats)	Zoom Knob	Film Plane Magnification	Exposure* Time in Sec.
5X	1.0	50	1/4
5X	2.0	100	1
10X	1.5	150	1/4
10X	2.0	200	1/2
20X	1.25	250	1/2
40X	1.25	500	1
40X	1.88	750	2

METALLOGRAPHS (4" X 5")

Film: Polaroid Polacolor Type 58, ASA speed 75

4" x 5" Camera (Equipped with Polaroid 500 or 545 Film Holder)

Illumination: Bright Field

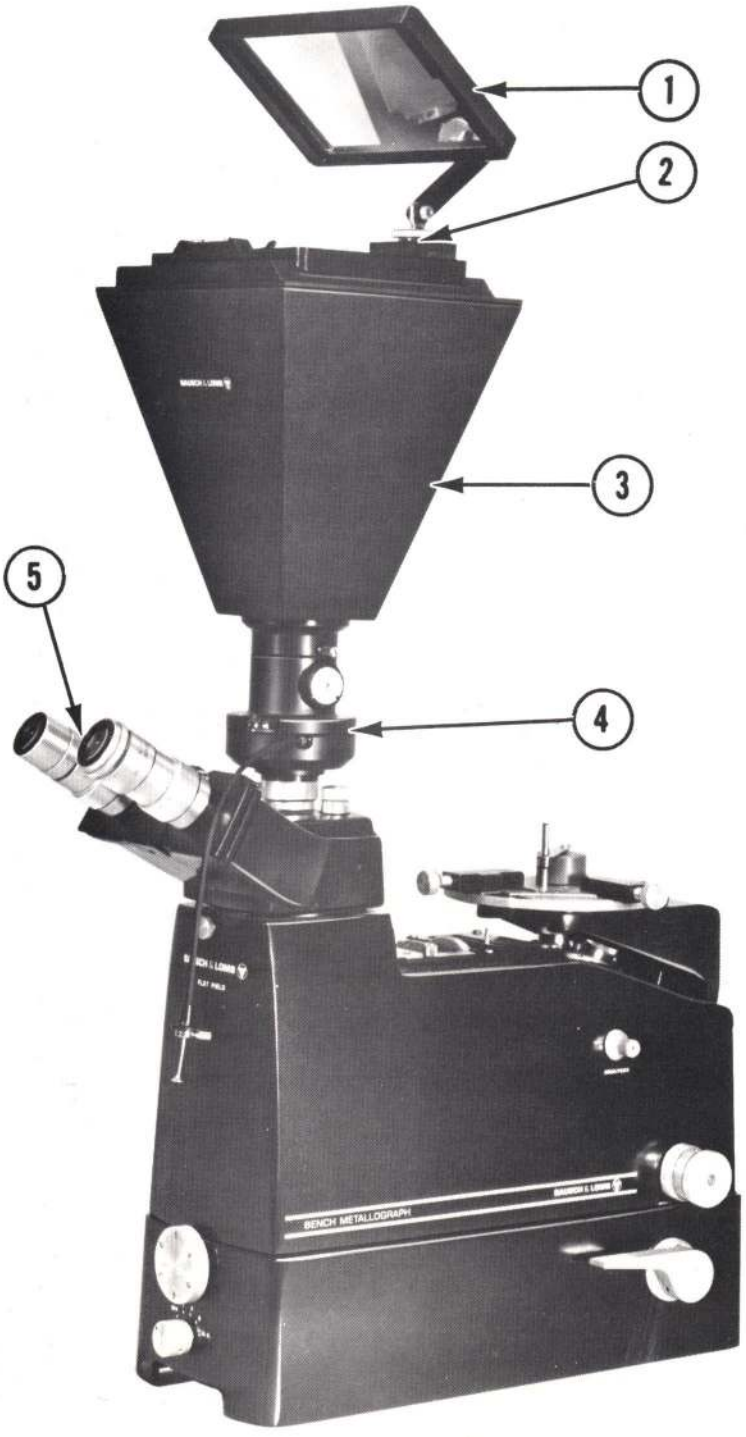
Illuminator: Tap 3

Illuminated N.A.: 2/3

Filters: Blue, Cat. No. 42-36-10

Objective	Zoom Knob	Film Plane Magnification	Exposure* Time in Sec.
5X	1.0	50	1/2 to 1
10X	1.0	100	1
20X	1.25	250	3
40X	1.25	500	3
50X	1.50	750	8
75X	1.33	1000	10

*See Sections 1 and 2 of Note, page 21.



1. Mirror Attachment
2. Ground Glass Focusing Screen
3. 4" x 5" Camera Body
4. Focusing Tube
5. Viewfinder Eyepiece

FIG. 3-1 – 4" x 5" CAMERA INSTALLED ON BENCH METALLOGRAPH

METALLOGRAPHS (3-1/4 X 4-1/4)

Film: Polaroid Polacolor Type 108, ASA speed 75

3-1/4 x 4-1/4 Camera (for Polaroid Series 100 Film Packs)

Illumination: Bright Field, 2/3 Aperture Illumination

Illuminator: Tap 3

Filters: Blue, Cat. No. 42-36-10

Objective	Zoom Knob	Film Plane Magnification	Exposure* Time in Sec.
5X	1.33	50	1/2 to 1
10X	1.33	100	1
20X	1.67	250	3
40X	1.70	500	3
50X	2.00	750	8
75X	1.80	1000	10

*See Sections 1 and 2 of Note, page 21.

METALLOGRAPHS (3-1/4 X 4-1/4)

Film: Polaroid Type 107, ASA speed 3000*

3-1/4 x 4-1/4 Camera (for Polaroid Series 100 Film Packs)

Illumination: Bright Field

Illuminator: Tap 3

Illuminated N.A.: 2/3

Filter: Normal Green

*See Sections 1 and 2 of Note, page 21.

Objective (Achromats)	Zoom Knob	Film Plane Magnification	Exposure* Time in Sec.
5X	1.33	50	1/30
10X	1.33	100	1/30
20X	1.33	200	1/30
40X	1.70	500	1/30

METALLOGRAPHS

35mm Camera

Film: Kodak Panatomic X, ASA speed 40*

Illumination: Bright Field

Illuminated N.A.: 2/3

Illuminator: Tap 3

Filter: Normal Green

*See Sections 1 and 2 of Note, page 21.

35MM CAMERA - 5X

Objective	Zoom Knob	Film Plane Magnification	Exposure* Time in Sec.
5X	1.0	25	1/8
10X	1.0	50	1/8
20X	1.0	100	1/8
40X	1.25	250	1/2
50X	2.0	500	1.0
75X	2.0	750	1.0

35MM CAMERA - 3X

Objective	Zoom Knob	Film Plane Magnification	Exposure* Time in Sec.
5X	1.67	25	1/8
10X	1.67	50	1/8
20X	1.67	100	1/8
40X	1.67	200	1/4
50X	2.0	300	1/4 to 1/2
75X	1.78	400	1/4 to 1/2

METALLOGRAPHS

35mm Camera

Film: Kodak High Speed Ektachrome, Type B, ASA speed 125

Illumination: Bright Field

Illuminator: Tap 3

Filters: .5 Neutral Density + CC+05M.

35MM CAMERA - 3X

Objective	Zoom Knob	Film Plane Magnification	Exposure* Time in Sec.
5X	1.67	25	1/8
10X	1.67	50	1/8
20X	1.67	100	1/8
40X	1.67	200	1/4
50X	2.0	300	1/4 to 1/2
75X	1.78	400	1/4 to 1/2

35MM CAMERA - 5X

Objective	Zoom Knob	Film Plane Magnification	Exposure* Time in Sec.
5X	1.0	25	1/8
10X	1.0	50	1/8
20X	1.0	100	1/8
40X	1.25	250	1/2
50X	2.0	500	1/2 to 1
75X	2.0	750	1/2 to 1

Section - 4

USE OF INTEGRATED CAMERAS ON STEREOZOOM 7

Install and carefully align the 31-27-07 Camera Adapter to the StereoZoom 7 Body according to the directions supplied with that unit.

Remove Clamp Screw from Focusing Tube Adapter and screw Focusing Tube Adapter into top of the Camera Adapter. Replace Clamp Screw, Fig. 4-1.

Insert Focusing Tube into Focusing Tube Adapter. Rotate the Focusing Tube to desired orientation. Tighten Clamp Screw to secure the Focusing Tube in this position.

Screw Cable Release into its socket, set Shutter Speed Dial to "T" and open the Shutter.

1. Clamp Screw
2. Cable Release
3. Focusing Tube Adapter
4. Shutter Control Dial
5. Focusing Knob

FIG. 4-1 – FOCUSING TUBE

1. Place a crossline or grid type specimen (ruled paper will do) on the Stage and orient it so it is parallel (or perpendicular) to the North-South axis of the Microscope, when viewed visually. Using a Ground Glass, or Viewfinder Adapter Plate and Viewfinder Eyepiece, in the film plane, check the orientation of the grid in the film plane. If it is not square with respect to the edge of the film gate, loosen the Clamp Screws of the Camera Body and rotate the Camera Body. When the image is square, tighten the Clamp Screw.

2. To focus the Camera to the Microscope, zoom to 7X and focus the Microscope using the right Eyepiece (Viewfinder). Zoom to 1X and turn the Focusing Tube Focusing Knob to focus the image sharply on the film plane, using the Ground Glass or the Viewfinder Adapter Plate and Viewfinder Eyepiece. The image as seen through the Viewfinder Eyepiece will not appear crisp because of the additional 10X magnification of the Eyepiece. Do not adjust Microscope Focus Setting.

   NOTE: The Focusing Tube is properly adjusted when an image in focus and centered in the right Eyepiece at 7X is in focus and centered in the film plane at 1X.

Making The Exposure

NOTE: Refer to Section 5 on Exposure Theory.

The procedure for making the exposure will be the same for "The Use of Cameras On The Microscope."

Fig. 4-2 – 3-1/4" X 4-1/4" CAMERA INSTALLED ON STEREOZOOM 7 MICROSCOPE

Suggested Base Exposures

The following data are based on use of the following equipment:

Equal Light Base

StereoZoom 7 Microscope, with 4X Zoom Setting

General Purpose Illuminator

Plano Substage Mirror

Integrated Cameras with Photographic Amplifier

Camera Adapter.

These data are intended to be used as a guide only; variations in zoom power, line voltage, lamp life, thin film coatings, specimen materials, etc., will require that some changes be made in filtering and exposure in order to produce good photomicrographs. The final adjustments must therefore be made by the photomicrographer using the equipment.

When pictures are taken using incident illumination, an exposure of 1/10 second will usually result in a picture from which the correct exposure may be determined.

FILM TYPE	ASA SPEED	CAMERA BODY	FILTER(S)	TRANS. TAP	EXPOSURE (SEC.)
Polacolor Type 58	75	4 x 5	80A + 82 + 82C Didymium *	3	1/4
Polacolor Type 58	75	4 x 5	80B + 82C Didymium*	OV	1/8
Polacolor Type 108	75	3¼ x 4¼	80A + 82 + 82C Didymium*	3	1/8
Polacolor Type 108	75	3¼ x 4¼	80B + 82C Didymium*	OV	1/15
Polapan Type 57	3000	4 x 5	Diffuser Gray	3	1/15
Polapan Type 52	400	4 x 5	Diffuser Gray	3	1/4
Polaroid Type 107	3000	3¼ x 4¼	Diffuser Gray	2	1/15
Polaroid Type 55 PN	50	4 x 5	Diffuser	3	1/15
Ektachrome X (Daylight)	64	35mm	Diffuser 80B + 82A Didymium*	OV	1/8
High Speed Ektachrome Type B (Tungsten)	125	35mm	Diffuser 82B Didymium*	3	1/30
Kodachrome II Professional Type A (Tungsten)	40	35mm	82C Didymium*	3	1/8
Panatomic - X	32	35mm	Diffuser	3	1/60
Plus X	125	35mm	Diffuser Gray	3	1/30
High Contrast Copy	64	35mm	Diffuser	3	1/30
LS Pan	50	4 x 5	Diffuser	3	1/4
LS Pan	50	4 x 5	Gray	3	1/8
Plus X Pan	125	4 x 5	Diffuser	3	1/30
Plus X Pan	125	4 x 5	Gray	3	1/30
Contrast Process Pan	80	4 x 5	Diffuser	3	1/15
Contrast Process Pan	80	4 x 5	Gray	3	1/15
Contrast Process Ortho	50	4 x 5	Diffuser	3	1/4
Contrast Process Ortho	50	4 x 5	Gray	3	1/8
Metallographic Plate	6	4 x 5	Diffuser	3	1½
Metallographic Plate	6	4 x 5	Gray	3	1

** B&L Cat. No. 42-14-97 or 42-14-98 Didymium Filter used to enhance reproduction of Red Biological stains when required.*

Section - 5

EXPOSURE

EXPOSURE CONSIDERATIONS

General Considerations

Making a photomicrograph is similar to taking a snap shot. In each case, film must be exposed to light of the right intensity for the right amount of time. The two types of photography differ mainly in the means used to control exposure. Conventional Cameras use two mechanical devices, an Iris Diaphragm to control light intensity and a Shutter to control the time factor. Photomicrographic Cameras also use a mechanical Shutter to control the time factor, but use an optical device (Neutral Density Filters) instead of an Iris Diaphragm to control light intensity.

It is necessary to control light intensity optically instead of mechanically in photomicrographic Cameras because of the differences in design between a conventional Camera's Objective or taking lens and a Microscope Objective, which serves as the taking lens of a photomicrographic Camera.

Conventional Camera lenses are designed to take good pictures over a wide range of apertures (f stops). In some cases the lens' performance is actually improved when it is used at a smaller aperture (large f/no.). Microscope Objectives are designed to give maximum resolution when working at full aperture (N.A.) and excessive reduction in N.A. degrades the image.

Because of their optical design and size, it is impractical to install a mechanical Iris Diaphragm in most Microscope Objectives. Control of the working N.A. of the Microscope is accomplished in the illuminating beam.

Objective-Subjective Considerations

The exposure time required to make a photomicrograph is affected by both objective and subjective considerations.

Objectively, exposure time depends upon: the light transmitting qualities (speed, a function of magnification and N.A.) of the Microscope Objective being used as the taking lens, the quality and intensity of light illuminating the specimen; the light transmitting and/or reflecting characteristics of the specimen itself; and the sensitivity (speed) and spectral sensitivity of the film.

Subjectively, exposure time is influenced by personal preferences in regards to the lightness or darkness (density) of the negative or positive transparency, its contrast, and in the case of color negatives or positives, the intensity (saturation) of the color.

The purpose for which a photograph or slide is to be used can also affect exposure. For example, a slide which is to be projected should be darker (given less exposure) than one which is to be viewed hand held. A black and white print which is to be viewed hand held will generally require less contrast than a print which is to be reproduced by some offset printing process or hung on a wall for display.

Because of the number of combinations of objective and subjective factors possible (each requiring a different exposure time) and the unknowns of personal preference, it is not possible or practical to devise specific Exposure Tables for making photomicrographs. Instead, exposure times are best determined experimentally. This experimental procedure is known as Bracketing. It is not difficult and within a short time you will be able to make good photomicrographs quickly.

Bracketing

Bracketing provides a reliable means for determining unknown exposure times.

It involves first estimating (on the basis of Exposure Tables herein, or from your

records and experience) what the approximate exposure time should be for a particular specimen-illumination-equipment-film setup and then making one exposure for that amount of time, a second exposure for half that amount of time and a third for twice the time.

Generally, one of these exposures will provide a negative or positive of satisfactory quality.

If, however, none of these exposures is satisfactory, a second bracketed series of exposures must be made. This second bracketed series should be based on that exposure of the first series which was closest to desired results. For example, if the best exposure of the first series was underexposed (thin-appearing negative or dark appearing positive) then more exposure is needed and the second series should be based on 2,4, and 8 times the exposure time used for the "best" of the first series. If the best of the first series was overexposed (dark-appearing negative or thin-appearing positive) then less exposure is needed and the second series would then be based on 1/8, 1/4, and 1/2 the exposure time used for the "best" of the first series.

NOTE: 1. The exposure time thus obtained is valid only for that particular combination of equipment, illumination, film and specimen. If the values of the objective lens, light intensity, film speed or specimen's transmission-reflectance are changed, the required exposure will be changed and a new series of test exposures must be made to determine the new exposure time.

2. In a given setup, for which the required exposure time has been determined, a color or black and white film of a different ASA speed (but of the same type) can be substituted and the resultant new required exposure time determined - without bracketing again - by applying the following formula:

$$\frac{\text{old ASA film speed}}{\text{new ASA film speed}} = \frac{\text{new exposure time}}{\text{old exposure time}}$$

Thus, substituting an ASA 320 film in a setup where using an ASA 80 film had resulted in an exposure of 1/25 second, the new required exposure would be:

$$\frac{80}{320} = \frac{x}{1/25} \text{ or } x = 1/100 \text{ second.}$$

3. Initially, the tables which follow will provide a point of departure in estimating your Base Exposure times. Subsequently, your experience and records will provide an even better and more accurate means of estimating Base Exposure.

4. When Bracketing to determine exposure times, gross logarithmic increments (such as 2, 4, 8 or 1/8, 1/4, and 1/2) should be used for the first series, enabling you to explore as wide a range of your film's response characteristics as possible. Subsequently, if slight improvement in the quality of a picture is desired, after a generally satisfactory exposure time has been determined, further experimentation - using smaller logarithmic or even arithmetic increments - can be performed. The smaller the increment, the slighter (more subtle) the change produced, particularly with black and white films which have more exposure latitude than color films.

5. The Substage Iris should not be used as an illumination control to adjust exposure times. To do so will jeopardize its effectiveness in optimizing other important aspects of image quality. For example: while closing the iris down reduces brightness, it also reduces resolution (sharpness) and increases contrast and depth of focus. Conversely, while opening the iris increases brightness, it also increases resolution and decreases contrast and depth of focus.

6. As a rule, for best over-all image quality, the iris should not be opened wider than necessary to fill the Objective with light; determined by removing the Eyepiece and looking at the back of the Objective lens. Generally, it is advisable to start with only two-thirds of the back lens filled. Then, the iris should be opened and closed until the best compromise between resolution and contrast is obtained.

7. Repeatability of results depends on the consistency with which objective factors are maintained. The aging of lamps, variation in line voltage to your light source, variations in film processing techniques, the age of the film, and variations in temperature and humidity can all effect results.

8. Indescriminate use of the various transformer taps to compensate for overexposure or underexposure is not recommended for black and white photography. Whenever possible, the time-light intensity product is best controlled by introducing neutral density filters and/or changing shutter speed.

   In the case of color photography, it is important that the user follow the recommended transformer tap settings indicated by the chart on pages to insure proper color balance.

Dark Field and Polarized Light Photomicrography with the Bench Metallograph

Because of the many possible variations in specimen characteristics, filter properties and Polarizer-Analyzer angles, it is not possible or practical to provide specific exposure recommendations for photographing metal specimens with Dark Field illumination or Polarized light. As in other phases of photomicrography, exposures must be determined experimentally by Bracketing. The following examples of actual exposure times determined for three common equipment-specimen situations will serve as a guide to your further experimentation.

DARK FIELD EXPOSURE EXAMPLE:

Subject: Pearlitic structure in steel

Illumination: Dark Field

Illuminator: On Tap #3

Filter: Normal Green

Objective: 40X

Photographic Magnification: 600X

Zoom Setting: 2X

Camera: 3-1/4 x 4-1/4 for Polaroid

Film: Polaroid Type 107, black and white, ASA speed 3000

In this setup, an exposure of 1/10 second was required in normal Bright Field Illumination. In Dark Field Illumination, required exposure (with the Green Filter removed) increased to 1/2 second.

Under Dark Field Illumination, when a specimen of martensite was submitted for the steel specimen, an exposure of 1 second adequately revealed general structural characteristics of the martensite specimen but an exposure of 2 seconds was required to show fine detail.

POLARIZED LIGHT EXPOSURE EXAMPLES:

1. Subject: Inclusion in mineral specimen.

   Illumination: Analyzer in, 42-34-57 Polarizer in Filter Slot, rotated 10^{o} off the crossed position. No Sensitive Tint Plate used.

   Illuminator: Set on Tap OV

   Filter: None

   Objective: 10X, 0.25 N.A., full aperture

Photographic Magnification: 75X

Zoom: 1X

Camera: 3-1/4 x 4-1/4 for Polaroid

Film: Polaroid Polacolor Type 108, ASA speed 75

Exposure Time: 6 minutes

2. Subject: Pearlitic structure in steel

Illumination: Polarizer in Filter Slot and rotated to full extinction (full crossed) position. 42-34-07 Sensitive Tint Plate added with its handle rotated 45° from the vertical position.

Illuminator: Set on Tap #3

Filter: None

Objective: 10X, 0.25 N.A., full aperture

Photographic Magnification: 75X

Zoom: 1X

Camera: 3-1/4 x 4-1/4 for Polaroid

Film: Polaroid Polacolor Type 108, ASA speed 75

Exposure Time: 10 seconds - 30 seconds when the handle of the Sensitive Tint Plate was rotated to the vertical position to emphasize the red colors in a certain specimen area.

NOTE: 1. Long exposures may alter the color balance of Polacolor film, causing a shift to red-yellow in the colors it reproduces.

2. Cat. No. 42-36-10, Blue Filter, used to adjust the color balance of Tungsten Lamps to daylight, was employed in the exposure examples given, since the purpose of this type of photograph is simply to record color contrasts, rather than to reproduce characteristic specimen colors which might be detrimental to interpretations.

Filters

Three types of filters are commonly used in photomicrography. They are: Neutral Density Filters for use with black and white or color film; Color Contrast Filters for use with black and white film only; and Color Balancing Filters for use with color film only.

NEUTRAL DENSITY FILTERS

Neutral Density Filters are used to reduce the intensity of light illuminating a specimen without altering its color balance. Visually, they are used to reduce image brightness for more comfortable viewing. Photographically, they provide a means of adjusting the intensity of light to required levels and in this way take the place of a Diaphragm Control on a conventional Camera.

Neutral Density Filters are available in a wide range of densities, each being identified by a numerical symbol (.1, .3, .6, .9, 1, 2 etc.) derived from the filter's density-transmission-absorption characteristics.

Mathematically, these numerical symbols are the base 10 logarithm of the filter's transmission or filter factor. A filter with a neutral density value of 1 (No. 1 N.D. Filter) has a filter factor of 10 and transmits 10% of the light it receives while absorbing 90%. A filter with a neutral density value of 2 (No. 2 N.D. Filter) has a filter factor of 100 and transmits 1% and absorbs 99% of the light it receives.

Filter factors also serve to indicate how much the intensity of the light a filter receives must be increased, or, if the intensity of the incident light remains the same, how much additional time will be required for the filter to transmit a given amount of light. This increase in intensity or time is directly proportional to the value of the filter factor.

Thus, if a filter with a factor of 10 is introduced into a system, the intensity of light incident upon the filter would have to be increased 10 times if the intensity of the light transmitted by the filter in the system were to equal the intensity of light transmitted in the system before the filter was introduced. Or, if the intensity of incident light remained the same, 10 times the amount of time would be required for the system to transmit a given amount of light.

If a Neutral Density Filter of a desired value is not available, two or more N.D. Filters of lower values can be combined to obtain the desired value. Thus, No. 1.0 and a No. 0.7 can be combined to provide a 1.7 N.D. Filter.

An example of the practical application of Neutral Density Filters in photomicrography would be as follows:

You are using a Camera equipped with a Shutter whose fastest speed is 1/125 second. Experimentation indicates that at 1/125 second negatives obtained appear to be four times overexposed. You wish to reduce exposure without altering the Substage Iris setting (which has been optimized for best definition and contrast) and without changing the voltage on the lamp so that the color balance of the light is not altered. The time-light intensity product must be reduced at least by a factor of four to within the limits of the Shutter. Therefore, it is necessary to introduce a Neutral Density Filter having a factor of four (a .6 Neutral Density Filter).

COLOR CONTRAST FILTERS

Colored (red, yellow, green, blue) filters are used with black and white film to increase or decrease the contrast of adjacent areas of metallic or stained biological specimens to emphasize important detail. The filters lighten the tone of supplementary (like) colors and darken the tone of complimentary (unlike) colors. Color filter factors range from about 2 for the yellow filter to 10 for the blue filter. The factors will vary somewhat however depending upon the type (panchromatic or orthochromatic), speed and brand of film being used.

DIDYMIUM FILTERS

Certain stains used in the preparation of biological sections (such as eosin and fuchsin) will not be recorded properly on some color films. This is caused by differences in the spectral transmission and response characteristics of the stain and film. With such films (which must be identified by experimentation) color reproduction of these stains can be improved by the use of filters made from certain types of Didymium Glass. Didymium Filters are available from Bausch & Lomb in the form of 2-inch squares (Cat. No. 42-14-97) or 2-inch circles (Cat. No. 42-14-98).

NOTE: These Didymium Filters should not be confused with Color Balancing Filters. They are generally used in addition to Color Balancing Filters and are intended only to improve the reproduction of the colors of certain types of stains.

COLOR BALANCING FILTERS

Color Balancing Filters are used to improve the reproduction of colors when film is exposed under lighting conditions other than for which it is intended. They are essential for making color photomicrographs with good color fidelity whenever the color balance of the film and light source being used do not match.

Color Balancing Filters, and more detailed technical data on their use, can be obtained through most photographic supply dealers.

The following table indicates the filters required for use with several popular types of film when exposed by the Base and Research Base Illuminators.

Color Film Type	Recommended Filters[1] to obtain Illumination of the required color temperature when using:			
	The Cat. No. 31-33-69 Base Illuminator set on Transformer Tap:		The Cat. No. 31-33-20 Research Base Illuminator set on Transformer Tap:	
	No. 4	No. 5	No. 4	No. 5
Type A[3]	80D	82 + 82A	82C + 80D	80D
Type B[4] or L	80C	80D	80D	82B
Kodak and[5] Ansco Daylight	Not Recomm'd	80B + CC50B +B&L Didymium[2]	80B + CC50B +B&L Didymium[2]	80C + CC50B +B&L Didymium[2]
Polaroid Polacolor Daylight	Not Recomm'd	80B + CC50B[6] +B&L Didymium[2]	80B + CC50B[6] +B&L Didymium[2]	80C + CC50B[6] +B&L Didymium[2]

[1] Based on the use of Kodak Wratten Filters.

[2] Cat. No. 42-14-97 or 42-14-98. Note: When photographing specimens stained with iron hematoxylin and orange, or reduced silver stains, it is recommended that the Didymium Filter be removed.

[3] Example: 35mm Kodachrome II Professional (photoflood Illuminator 3400°K).

[4] Examples: Ektacolor, Type L, sheet film, high speed Ektachrome, Type B, 35mm Film (for 3200°K lamp quality)

[5] Examples: Kodachrome II, Kodachrome X, Ektachrome-X, high speed Ektachrome, Anscochrome 50, 100, 200 and 500 daylight films (Approx. 5500°K), Kodak Photomicrography Color Film #2483.

[6] An alternative filter combination which works well for long exposure times is: 80A + 82B + CC10C

Section - 6

ACCESSORIES

EXPOSURE METER

Cat. No. 42-12-40

The Exposure Meter consists of a Light Sensor permanently connected to a Metering Unit by means of a flexible cord. The Metering Unit has been factory-calibrated to provide readings within the range of .02 to 100 foot-candles. A circular Exposure Computer is supplied to convert from meter reading to exposure setting relative to Film Speed and Camera Magnification being used.

The unit is designed principally to be used in conjunction with the Bausch & Lomb Integrated Camera System II which has an accessory slot for insertion of the Sensor. However, an auxiliary Sensor Holder is available permitting usage of the Sensor either at the Microscope Eyepiece position or at a Film Plane location.

VIEWFINDER RETICLE

Cat. No. 31-16-49

While the 42-12-02 Viewfinder Eyepiece can be used with the StereoZoom 7 Microscope and Camera Adapter, it is not compatible with the StereoZoom Eyepieces for binocular use, and therefore not recommended. Instead, this Viewfinder Reticle can be installed in any Wide Field Eyepiece supplied with the Microscope. Installation instructions will be found in the Camera Adapter Manual.

10X VIEWFINDER EYEPIECE

Cat. No. 42-12-02

This Eyepiece offers great convenience in framing the image area to be photographed through a Microscope or Metallograph. In the center of its field is a crossline to aid in centering the image area. Three rectangular frames are visible in the Eyepiece. One frame represents the areas covered by the 3-1/4 x 4-1/4 and the 4 x 5 Cameras. The other two frames represent the areas covered by the 35mm - 3X and the 35mm - 5X Cameras. Each frame is identified as such.

GROUND GLASS FOCUSING SCREEN WITH CLEAR AREAS

Cat. No. 42-12-33

This Focusing Screen is a fine-ground Glass Screen with a clear center and clear rectangular area along each diagonal. The clear areas allow the operator to observe the image directly with a magnifier in a more critical focus.

4x5 MIRROR VIEWING ATTACHMENT

Cat. No. 42-12-31

The 4 x 5 Mirror Viewing Attachment is an adjustable Mirror that can be mounted on the top of the 4 x 5 Camera Body. The Mirror can be positioned such that the operator is able to focus and frame the image, on the ground glass, from a normal viewing position.

The Viewing Attachment is mounted on the Camera as follows:

Remove the two Screws, holding one of the two Spring Clips.

Place Viewing Attachment Bracket on top of the Spring Clip and attach to the Camera Body, using the two Screws supplied with the attachment.

The Arm supporting the Mirror allows adjustment in one plane and by loosening the Knurled Lock Nut, the Mirror can be rotated. A combination of these two adjustments will allow the Mirror to be positioned for comfortable viewing.

4 x 5 FILM HOLDERS

Cat. No. 42-16-20

Polaroid No. 545 4" x 5" Film Holder takes Polaroid Film Packets in black and white and color.

4 X 5 CUT FILM HOLDER

Cat. No. 42-15-40

This Holder accepts a wide variety of color and black and white sheet films.

VIEWING SCREEN

Cat. No. 42-12-20

The Viewing Screen is designed for use on the DynaZoom and Dynoptic Microscopes, Bench Metallograph and the StereoZoom 7 Microscope with Camera Adapter. It may be purchased as a complete unit consisting of a Viewing Screen (42-12-20), Optics Tube (42-12-21) and Screw Adapter (42-12-23) or the Viewing Screen may be purchased separately for use with the Focusing Tube of the New Integrated Camera Series.

The unit has a magnification factor of 7.5X so Total Magnification at the Screen = Objective Mag. x Zoom Setting (if applicable) x 7.5.

The lens system is focusable thus allowing the image on the Screen to be parfocaled to the image in the right Eyepiece of the instrument it is being used on.

31-34-11-04	Set of 2" Round Filters (3 Neutral Density; 1 Daylight Blue)
31-34-38-01	Set of 2" Square Filters (3 Neutral Density; 1 Daylight Blue)
31-34-66-01	Set of 3" Round Filters (4 Neutral Density; 1 Daylight Blue)
31-34-71	Daylight Filter, 2" round, thin
31-34-73	Neutral Filter, 0.7 Density, 2" round
31-34-74	Neutral Filter, 1.0 Density, 2" round
31-34-75	Neutral Filter, 1.3 Density, 2" round
31-34-88	Daylight Filter, 2" round, thick
31-35-61	2" Ø B2-58 Green Filter
42-14-97	Didymium Filter, 2 x 2 inch
42-14-98	Didymium Filter, 2-inch diameter
42-34-07	Sensitive Tint Plate
42-34-51	Neutral Density Filter, 0.3 Density
42-34-56	Green Filter
42-34-57	Polarizer
42-34-59	Neutral Density Filter, 0.5 Density
42-34-64	Neutral Density Filter, 1.0 Density
42-47-55	Blue Interference Filter, 450nm, 2 x 2 inch
42-47-56	Blue-Green Interference Filter, 500nm, 2 x 2 inch
42-47-57	Green Interference Filter, 550nm, 2 x 2 inch
42-47-58	Orange Interference Filter, 680nm, 2 x 2 inch
42-47-59	Red Interference Filter, 650nm, 2 x 2 inch

Section - 7

MAINTENANCE AND PARTS LIST

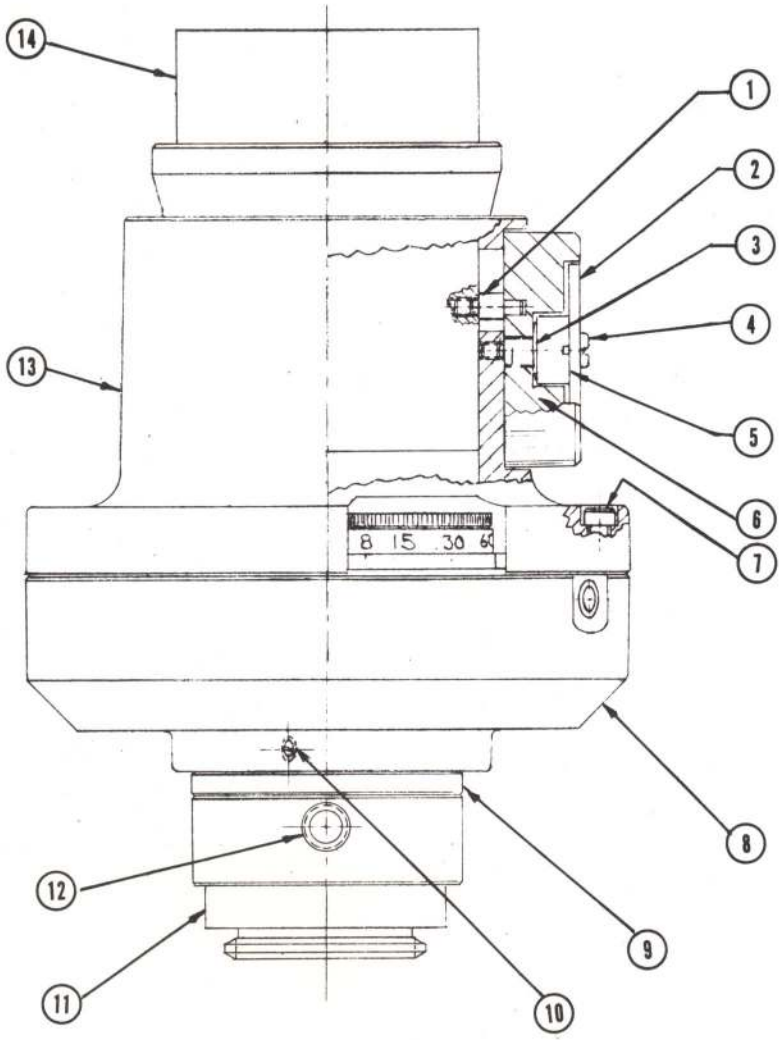
Maintenance of B&L Camera Units is quite simple. Since only a few parts are subject to light wearing action, years of use can be expected without need for attention.

It is, however, essential to be a good "housekeeper" in using any optical equipment. Avoid touching lens surfaces. Remove accidental fingerprints by lightly wiping the lens surface with a soft, lint-free cloth, moistened with alcohol or xylol. Keep all Camera Backs and other openings closed except when they are in use, to avoid dust settling in them. Dust is the enemy of clean, sharp pictures.

Purchase an inexpensive rubber ear syringe and use it frequently to blow dust from the recesses of your Camera Back and Focusing Tube.

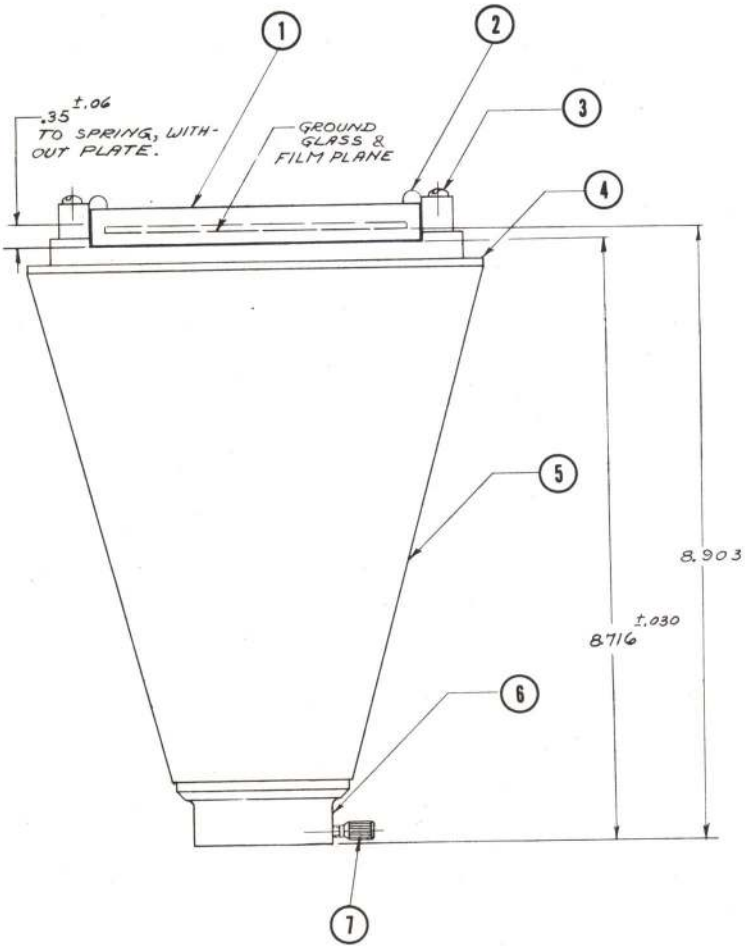
After several years service, the Shutter in the Focusing Tube may need cleaning and/or adjustment. This can be done by any competent camera repair specialist.

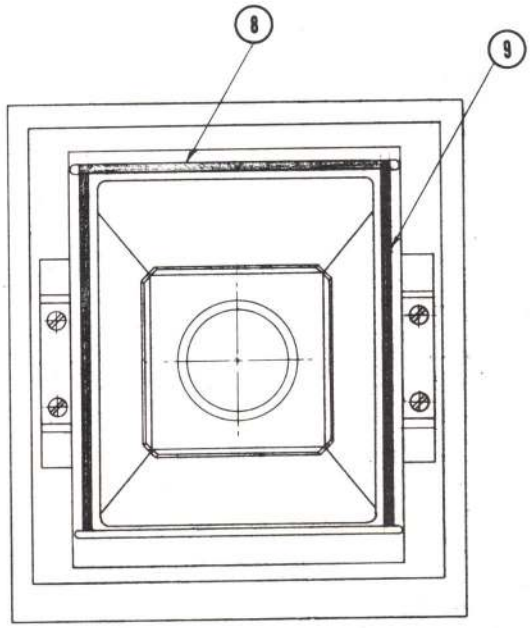
42-12-10 FOCUSING TUBE LAB. 2



Legend	Description	Parts No.
1.	Pin	421215-109
2.	Scale	421210-103
3.	Washer F-246	90008-314
4.	Screw, 2-56 x 1/8 Pan Hd.	421215-119ND
5.	Screw	421215-108
6.	Cam	421215-106
7.	Screw, 2-56 x 3/8 Soc. Hd. Cap	421215-120ND
8.	Assembly, Shutter	421215-117
9.	Mount	421210-101
10.	Screw, 4-40 x 1/4 Socket Set	421215-125ND
11.	Adapter	421210-102
12.	Screw	421228-114
13.	Assembly, Support	421215-114
14.	Assembly, Lens Tube	421215-111

42-12-28 4 x 5 CAMERA BACK

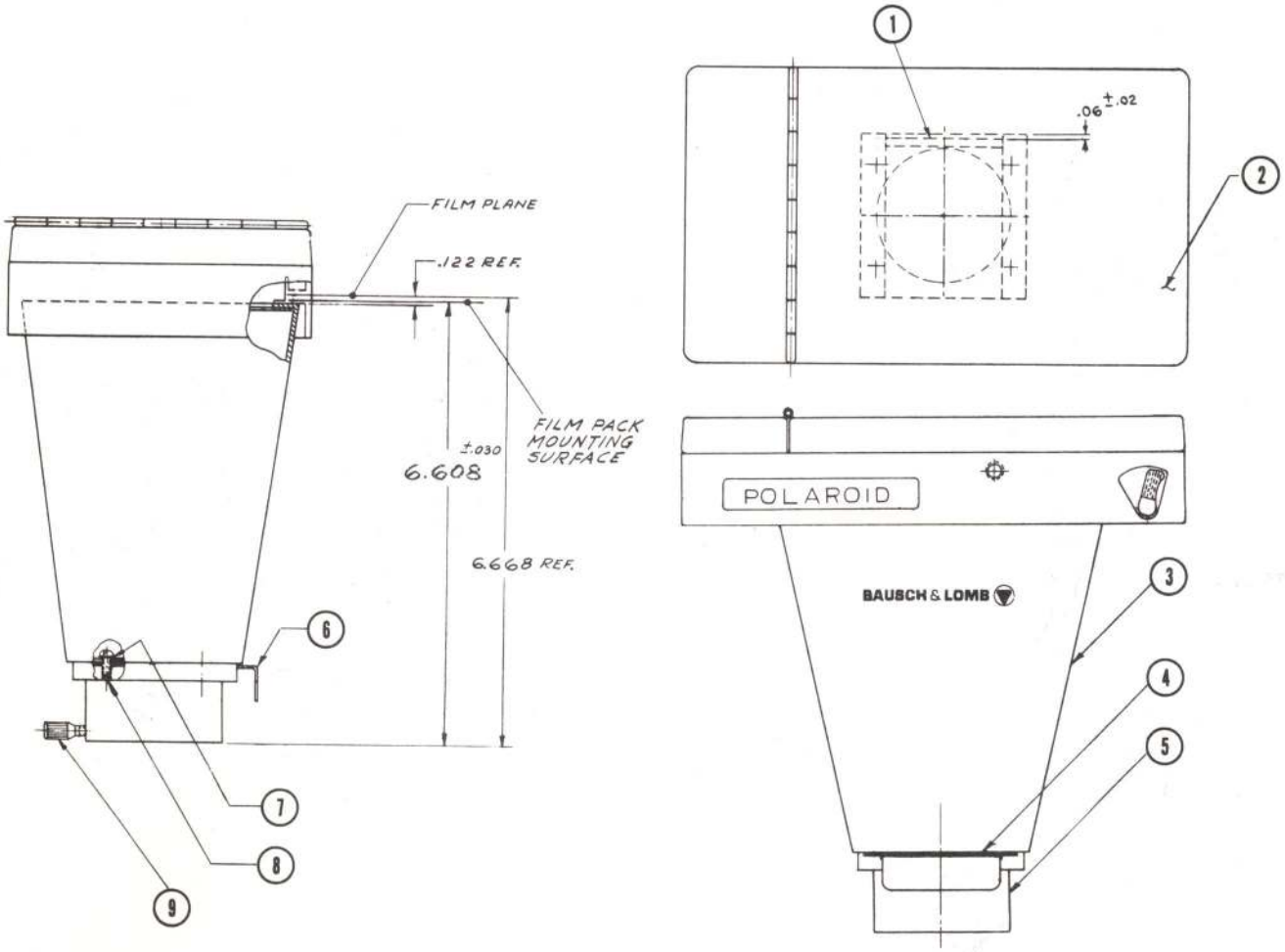




TOP VIEW WITH 1 and 6 REMOVED

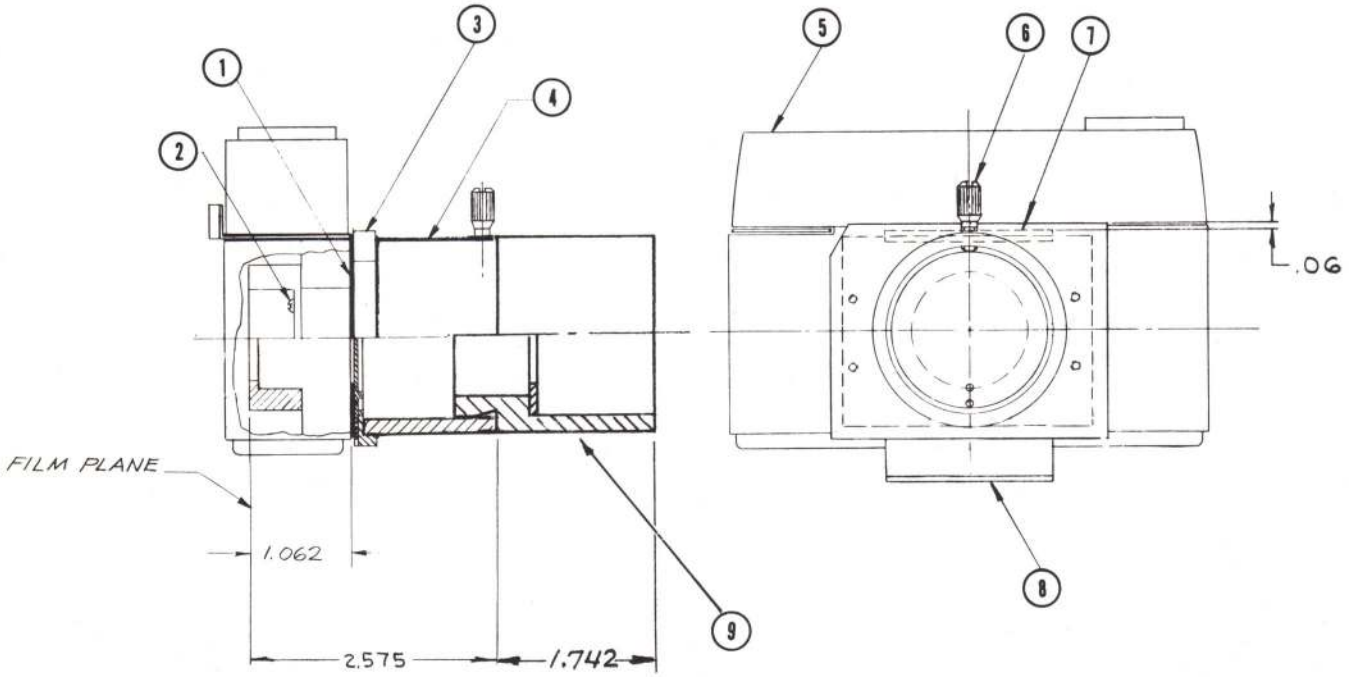
Legend	Description	Drawing No.
1.	Assembly, Ground Glass	421228-105
2.	Hold Down Spring	421228-106
3.	Screw, 8-32 x 1/4 Pan Hd.	214325-369ND
4.	4 x 5 Camera Mount	421228-107
5.	Assembly, Adapter	421228-108
6.	Adapter, Support	421228-109
7.	Adapter, Slide	421268-114
8.	Pile, Rayon Velvet 1/16 Thk.	421228-111ND
9.	Pile, Rayon Velvet 1/16 Thk.	421228-112ND

42-12-27 3-1/4 X 4-1/4 CAMERA BACK



Legend	Description	Drawing No.
1.	Light Seal	421227-110
2.	Camera Back Polaroid	421439-101ND
3.	Assembly, Adapter	421227-105
4.	Gasket	421227-106
5.	Slide Mount	421227-112
6.	Slide	421227-108
7.	Washer, Shakeproof 1104-00	332650-1661
8.	Screw, 4-40 x 1/4 Pan Hd.	421227-113ND
9.	Screw	421228-114

42-12-29 35mm CAMERA



Legend	Description	Drawing No.
1.	Gasket	421229-106
2.	Screw, 2-56 x 7/8 Round Hd.	421229-107ND
3.	Adapter	421229-103
4.	Collar	421229-104
5.	Camera Body	421229-101
6.	Screw	421228-114
7.	Light Seal	421227-110
8.	Slide	421229-102
9.	Spacer - Diaphragm Ass'y, 5X	421229-113

Section - 8

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Additional pads of "Exposure Record for Photomicrography" are available at no charge. Order Form No. 42 - 2403 or (421227-120).

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