MODEL N
EYEPIECE CAMERA

REFERENCE MANUAL

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CAT. NO. 42-16-11

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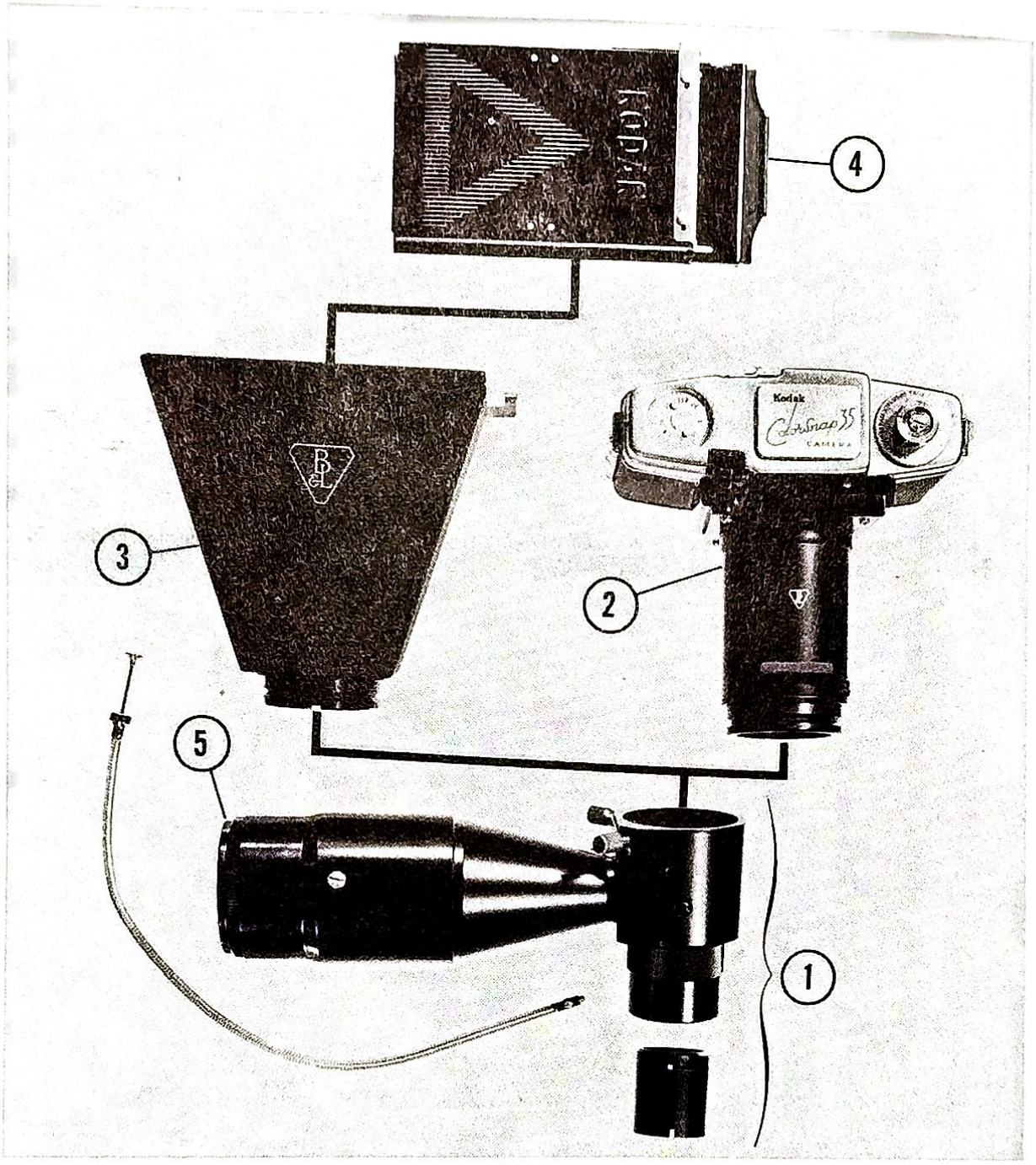

Figure 1—Components of the N Camera

1—Viewing Head
2—35mm Camera
3—Cone Attachment
4—Film Pack Adapter
5—Aerial Image Viewer

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Introduction

Basically the N Camera consists of a small, precision photomicrographic camera which can be attached directly to the standard eyepiece adapter tube of a microscope. The N Camera has been designed to operate on a variety of microscopes, including Laboratory, Polarizing, Metallurgical, and Metallographic models. A Dynoptic Laboratory type microscope has been used in illustrating this manual.

The components of the N Camera are shown in Figure 1, arranged in respect to their relationship to a complete camera for photomicrographic purposes.

All necessary optical elements are incorporated in the viewing head shown at 1 in Figure 1. The viewing head incorporates the shutter, the cable release (shown extended to the left in the illustration) and the mounting bushing shown at the bottom of the figure. Either of two camera units may be mounted to the viewing head. These are quickly and easily interchanged. The camera 2, in Figure 1 accepts any of the standard 20 or 36 exposure cartridges of 35mm roll film, black and white or color. Cone attachment, 3, accepts the 2-1/4 x 3-1/4 inch film pack adapter, 4. The aerial image viewer, 5, is an integral part of the viewing head. When the image is seen in sharp focus in the viewer it will also be in focus in the camera.

The equipment is shipped complete in one case and will include the viewing head with aerial image viewer attached, cable release and mounting bushing.

The particular camera included will depend upon the equipment ordered.

Assembly

Referring to Figure 2, first turn the knurled collar 7 two or three turns counterclockwise to open the support clamp. With the tip of the fingers withdraw the mounting bushing 8, as indicated.

Figure 2

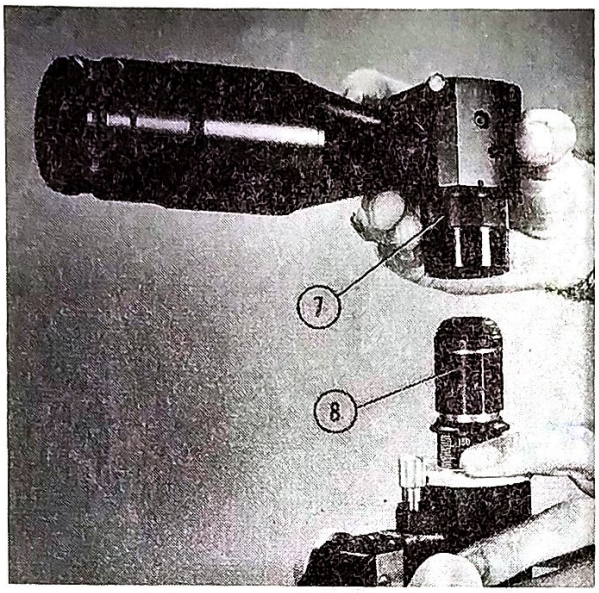


Figure 3

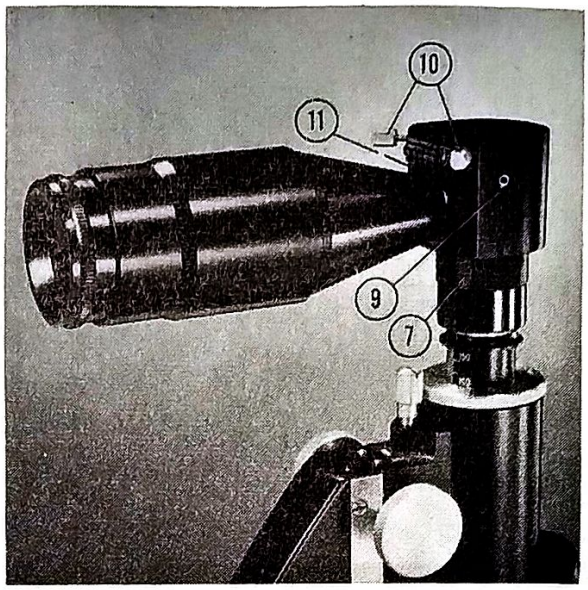


Figure 4

Remove the eyepiece from your microscope and slip the mounting bushing 8 over the eyepiece adapter tube as shown in Figure 3. Replace the microscope eyepiece. Now slide the support clamp of the viewing head down over the mounting bushing. Turn the viewing head about the eyepiece adapter tube to place the image viewer in the direction desired. Lock the viewing head securely to the microscope by turning the knurled collar 7 clockwise, tightening the support clamp.

Figure 4 shows the viewing head mounted on the microscope. In this instance it is shown attached to the eyepiece tube of a Research Model Microscope. If a draw tube type microscope is used, the draw-tube bearing should be fitted to provide the proper friction on the tube to support the N Camera. In the case of older microscopes where the draw-tube slides very easily due to wear, the tension of the draw-tube bearing should be increased to prevent the draw-tube from tipping as well as to prevent it from dropping under the weight of the camera. If necessary a band of adhesive tape can be placed around the draw-tube to hold it in position.

Details of the viewing head are shown in Figure 4. The shutter enclosed in the viewing head is operated by means of the cable release which is screwed into the shutter through the opening 9. Two clamp screws 10 serve to hold either of the two cameras to the viewing head. The shutter is set to the exposure desired by means of the lever 11. The scale directly above the lever indicates the proper positions for the various exposure settings. The shutter is of the self-cocking type and may be set for Time, Bulb, 1/200, 1/100, 1/50, 1/25, and 1/10 second.

Attaching the Camera

The following procedure is employed for attaching either of the two camera units to the body:

First turn out the two clamp screws (10, Figure 4) until the tips of these screws are flush with the inside wall of the recess in the top of the viewing head. Now holding the camera unit similar to the manner shown in Figure 5, locate the notch

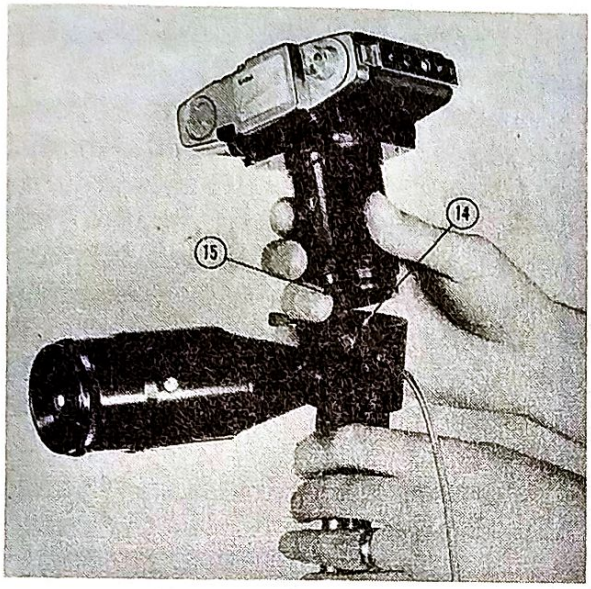


Figure 5

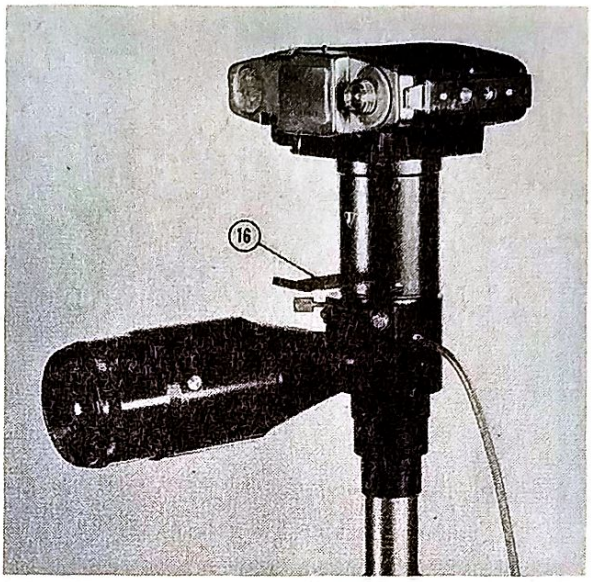


Figure 6

15 in the adapter at the bottom end of the camera, directly over the screw 14. Set the camera down into the viewing head so that the head of the screw 14 engages the slot 15, thus aligning the film frame of the camera to the corresponding frame in the aerial image viewer.

With the camera properly seated, turn in the clamp screws 10, to secure the camera in place.

Now attach the cable release by screwing the threaded end into the opening 9, Figure 4.

Focusing with the Aerial Image Viewer

The aerial image viewer permits you to observe the specimen image at all times. It provides a brilliant image, and accurate focus at the film plane is assured if you adhere to the following procedure.

Place the desired specimen on the microscope stage and select the appropriate objective and eyepiece. Adjust the illuminator and substage condenser for optimum conditions of illumination. Assemble the N Camera to the microscope as described in the preceding pages. Now position your head so as to place one eye about three inches outward from the lens of the aerial image viewer. This will be the position for which the focusing screen will be filled with light and evenly illuminated.

While looking squarely into the viewer lens, rotate the lens tube, by means of the knurled rim at the outer end, until the central crossline on the focusing screen is seen most distinctly. During this adjustment it is best to have the specimen image completely out of focus or the specimen moved aside so as to give a clear field.

Having set the viewer lens in focus on the crosslines of the focusing screen to suit your vision, now focus the microscope until the specimen image is seen sharply defined. It is essential that both the specimen image and the crosslines of the focusing screen be seen in sharp focus simultaneously. When this condition is met the specimen image will be in precise focus at the film plane in the camera.

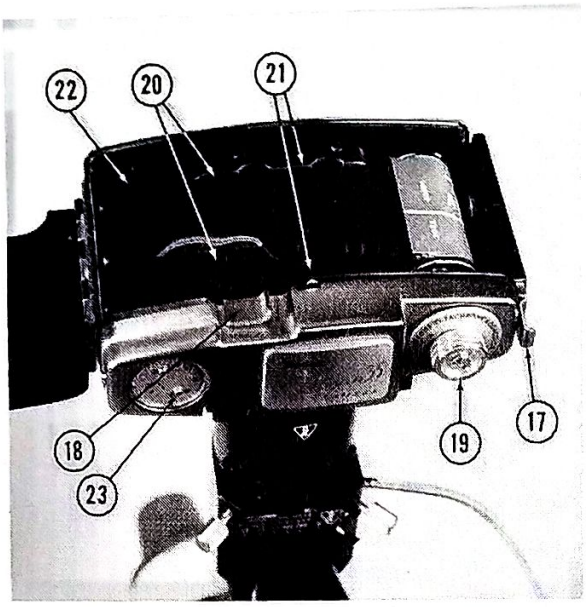


Figure 7

Operation of the 35mm Camera

The photomicrographic attachment, completely assembled with the 35mm camera ready for use, is illustrated in Figure 6. A dark slide 16 is incorporated in the camera tube. The slide 16 must be drawn out as shown in this figure prior to making exposures. If it is desired to remove the camera from the body while it is loaded with film, push the dark slide in before taking the camera off. This will prevent light entering the camera which would otherwise fog the film, causing the loss of at least one frame and possibly adjacent frames.

Loading the Camera

The camera may be loaded with any of the standard 35mm film cartridges holding 20 to 36 exposures. While the camera can be loaded in room light, it is best to protect the film from direct light. It is also advisable to remove the camera from the body for loading to prevent undue strain on the microscope during the loading operation.

Turn out the clamp screws holding the camera to the body, (10, Figure 4) and lift the camera away. Slide the dark slide (16, Figure 6) in to close off the camera tube. Press in the button on the end of the camera and pull out the tab (17, Figure 7) to release the back. Swing the back open.

Pull out the film rewind knob (19, Figure 7) on top of the camera and place the film cartridge in the cavity. Push the knob back in, turning it to right or left if necessary to engage the film spool in the slot of the spindle. Now rotate the winding spool (22, Figure 7) on the other side of the camera with the thumb to expose the film slot in the spool. Draw the film across the picture aperture in the camera and insert the film end in the winding spool slot, engaging either the second or third film perforation on the hook provided on the slot edge. Actuate the quick wind film lever (18, Figure 7) one or two times to firmly engage the film on the spool. At the same time make sure the teeth of the two sprocket wheels (20, Figure 7) engage the film perforation and that the film lies straight between the guide shoulders (21, Figure 7) on either side of the picture aperture.

Swing the camera back closed and push the tab (17, Figure 7) back in. This locks the back in place. Actuate the quick wind film lever (18, Figure 7) two times to make sure a full frame of unexposed film is in position across the picture aperture.

By means of the raised button on the exposure counter (23, Figure 7), rotate the dial in the direction indicated by the arrow. If 20 ex-

posure film cartridges are used, set the number 20 under the index mark located at the edge of the dial recess. In the case of 36 exposure cartridges, set the number 36 under the index mark. Properly set, the dial indicator will show, at any time, the number of exposures remaining on the roll of film in the camera. You are now ready to make the first exposure on the film.

Exposing and Changing the Film

Attach the loaded camera to the viewing head (refer to pages 4 and 5). See that the shutter is closed. Pull out the dark slide (16, Figure 6) to its stop. With the microscope properly adjusted for illumination and the specimen focused in the aerial image viewer, set the exposure lever (11, Figure 4) to the desired time and press the plunger of the cable release. After each exposure actuate the quick wind film lever to advance the film to the next frame. After each film advance, the exposure counter dial will show the number of exposures remaining on the film.

When the entire roll of film has been exposed, the exposed film must be re-wound to the light-proof cartridge for removal from the camera. For the sake of convenience it is best to push the dark slide in and remove the camera from the viewing head during the rewind and film changing operations.

To rewind the film, press the film rewind button on the bottom of the camera and rotate the film rewind knob (19, Figure 7) in the direction of the arrow until the end of the film is heard to disengage the wind spool. Remove the camera back and pull out on the rewind knob to release the film cartridge for removal from the camera.

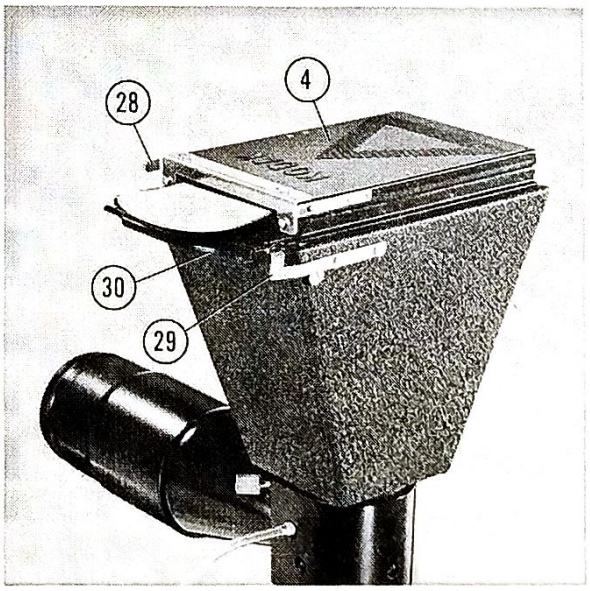
Framing the Picture 35mm Camera

When focusing, consider that portion of the image which falls within the engraved rectangle on the focusing screen. The rectangle represents the 35mm film frame size and the image within the rectangle will be included on the film.

Operation of the 2¼x3¼ Camera

With respect to the manner of loading and changing film, this camera is similar to the conventional focusing back camera. However, since focusing is accomplished by a reflex system, it is not necessary to employ a focusing screen at the camera back. The camera is left attached to the body on the microscope and loading is accomplished by inserting the film pack adapter in the camera.

Figure 8



Film Pack Adapter

The adapter for film pack 4 is shown inserted in the 2-1/4x3-1/4 camera in Figure 9. Film pack may be loaded in the adapter in open light though it is best to avoid strong direct light. Instructions for manipulating the film pack are included with the film by the manufacturer.

To load the adapter, press sidewise on the latch 28, and swing the hinged back open. Lay the unwrapped pack of film, open side toward the dark slide 30 of the adapter. Close the adapter back securing it with the latch 28. Make sure the paper film tabs are free and that they all extend out through the end slot as shown in the figure. With the dark slide 30 inserted in the adapter, hold paper tabs 1 to 12 securely. Pull out and tear off the safety cover tab. You are now ready to place the loaded adapter in the camera and make the first exposure. After making exposure number 1 with the film pack be sure to pull out and tear off tab number 1. The remaining numbered tabs are pulled in sequence as subsequent exposures are made. Individual films may be removed for processing before exposing the entire pack by following the instructions supplied by the film manufacturer.

Inserting Film Holders In 2¼x3¼ Cameras

See that the hook at the outer end of the spring engages the notch in the edge of the film pack adapter, before pulling the dark slide preparatory to making an exposure.

The film pack adapter attaches to the 2-1/4x3-1/4 camera by sliding between the gibs along the rear opening of the camera. See Figure 9. When inserting the holder press outward on the spring 29 to clear the edge of the film holder.

Framing the Picture 2¼x3¼ Camera

The full rectangular area of the focusing screen represents the frame size of the 2-1/4x3-1/4 inch film. The image seen within the boundaries of the focusing screen frame will therefore be included on the film.

SOME GENERAL NOTES ON PHOTOMICROGRAPHY WITH THIS CAMERA

The Microscope

The photographic image obtained with any photomicrographic camera is dependent to a large extent on the microscope and its manipulation. The microscope stand should be in good mechanical condition and the focusing adjustments in good order without looseness and tendency to drift.

The microscope optics should be clean. Dust particles on the front and rear surfaces of the objective lenses and eyepiece lens surfaces frequently are responsible for dark spots appearing in a finished positive. Fingerprints on the eyepiece lenses or the front lens of the objective may be responsible for an uneven distribution of light in the image and a loss of sharpness.

Achromatic objectives are capable of producing excellent results in black and white photomicrographs, particularly if color filters are employed. Restricting the light to a narrow band of the spectrum in this manner tends to improve the sharpness of the image regardless of the type of objective.

When it is necessary to photograph with "white" light, as in the case of color films, the apochromatic objectives are most desirable because of their better color correction.

The camera can only be used with the type of eyepieces employed for visual observation — Huygens, Hyperplane, Compensating and the like. Lenses of the amplifier type — Ampliplan, Ultraplan, etc. — are not suitable.

The magnification obtained on the film with this camera is equal to one-half the visual magnification provided by the microscope optics. For example: a 10X eyepiece and 10X objective would afford a total magnification of 100X if the image is examined by looking into the eyepiece. When the camera is attached to the microscope, the image projected to the film plane by the same objective and eyepiece combination is magnified 50X.

The field seen through the microscope always demonstrates some degree of curvature which is unavoidable. The outer part of the field is always slightly out of focus with respect to the center. It is hardly worthwhile to include this outer part of the field in a negative, therefore, it is better to select an eyepiece which will give sufficient magnification to fill the picture area of the negative with the central, in-focus portion of the field.

Illumination

The microscope illuminator may be of most any type. However, one incorporating a high efficiency, concentrated source, such as a compact, multiple coil, single coil or ribbon filament lamp, with a focusable condenser lens, is recommended. For transmitted light the Bausch & Lomb Professional Illuminators, types 26 or 27, are recommended. For opaque specimens, the vertical illuminators with integral light sources are adequate for most work. Where the very maximum light is required, the carbon arc illuminator with automatic feed mechanism is

recommended for both transparent and opaque specimens.

Alignment of the microscope and camera is automatically obtained when the camera is attached to the microscope. It is only necessary then to adjust the relative positions of microscope and illuminator and make the appropriate settings of the illuminator condenser and the mirror and substage condenser of the microscope to complete the alignment of the system and to establish correct illumination.

The better forms of microscope illuminator are designed to permit setting up the Koehler form of illumination. This method of illumination insures an even distribution of light in the field of view with convenient control of field size and aperture.

For purposes of color photomicrography, specific requirements are placed on the quality of light in the photomicrographic system. The color temperature requirements of the particular film employed are stated by the manufacturers. The sources incorporated in most microscope illuminators require the insertion of photometric filters to adjust the color temperature to suit the film requirements. The film manufacturer's literature should be consulted for information concerning the filters required with various light sources.

Filters

The microscope slide preparations most commonly encountered require the introduction of color filters in the illuminating system to enhance contrasts in black and white photography. The stains used in most preparations range through the reds, to blue and violet. In photomicrography a green filter is probably the most generally useful, since it produces good differentiation in preparations treated with both red and blue stains. Furthermore, microscope objectives of the achromatic type perform best in green light. The use of such a filter will be found helpful in obtaining good sharp negatives.

It is recognized of course, that filters of other colors are frequently necessary to effect desired contrast conditions. It is not, however, within the scope of this text to cover the subject of filters completely.

In addition to the photometric type of filters encountered for photomicrography with color film—(See under Illumination)—additional filters of the Color Compensating type may be required to counteract color effects introduced by the optical system or the specimen preparation.

The book Photomicrography, a publication of the Eastman Kodak Co., covers the subject of filters as they are applied for both purposes mentioned. This book will also be found as excellent reference on the general subject of photomicrography.

Films (Negative Materials)

The development of fine-grained photographic emulsions, with contrasts and sensitivity to suit practically all conditions, makes the "miniature" camera useful in many applications where only the larger negative sizes were previously considered practical.

Almost any of the black and white sheet films may be employed in the 2-1/4x3-1/4 camera particularly if the full negative area is filled with sharply focused image, and the positives are to be made

by contact printing. In general, however, it will be found advisable to use negative materials having medium to high contrast with fine grain. Resolution of fine structures and crisp images are obtained with these materials permitting subsequent enlargement by projection printing. Lantern slides made by contact from such negatives also show better in projection.

The professional type color films in 2-1/4-3-1/4 inch size afford adequate picture area for binding between standard 3-1/4x4 inch lantern slide cover glasses. This provides an economical method of making color slides when the 35mm picture area is considered inadequate or it is undesirable to mix both 2x2 and 3-1/4x4 inch slides during the course of a presentation.

In the case of the 35mm camera the black and white films will be enlarged for viewing in most cases, either by projection printing or by projection from 35mm film transparencies. The advantages of the fine grain negative emulsions are easily recognized.

Both the type of developer used and the technique of processing the film have an effect on the granularity of the ultimate image. The recommendations of the film manufacturer should be followed closely for optimum results.

There is actually no particular advantage to be realized by the use of a panchromatic emulsion in photomicrography in black and white unless a red filter is used. The red sensitivity of a film may be a disadvantage if the light required for taking the picture lies in the green region of the spectrum. The image in the negative may be lacking in sharpness due to the out-of-focus red light acting on the film during the exposure. It is suggested that the orthochromatic emulsions be used for best contrast and sharpness where the red sensitivity is not required.

Exposure

Systems can be worked out in several different ways for measuring or determining the exposure time required for various conditions. It is not possible to discuss them here. Experience still remains one of the very best guides to correct exposure, and exposure trials, with the film processed under the individual's own conditions and to his preference must be carried out in any case. The 35mm camera provides convenient means for doing this since one roll of film allows sufficient takes to permit adjusting the exposure time so as to obtain one that is correct out of a series. In this way the correct exposure for different conditions can be quickly determined for future reference.

The image projected to the film plane of the camera is appreciably brighter than in the case of larger cameras where the field is photographed at higher magnification. This means that the exposures encountered are on the whole, much shorter. Exposures sufficiently short to photograph some of the living organisms—plankton bodies, paramecium, etc.,—at the lower powers, at least, are quite possible.

THESE DIRECTIONS or instructions do not presume to cover all details, variations, or changes in this equipment; nor to provide for all possible contingencies to be met in connection with installation or use. We would be glad to help on any problems not covered in this manual.

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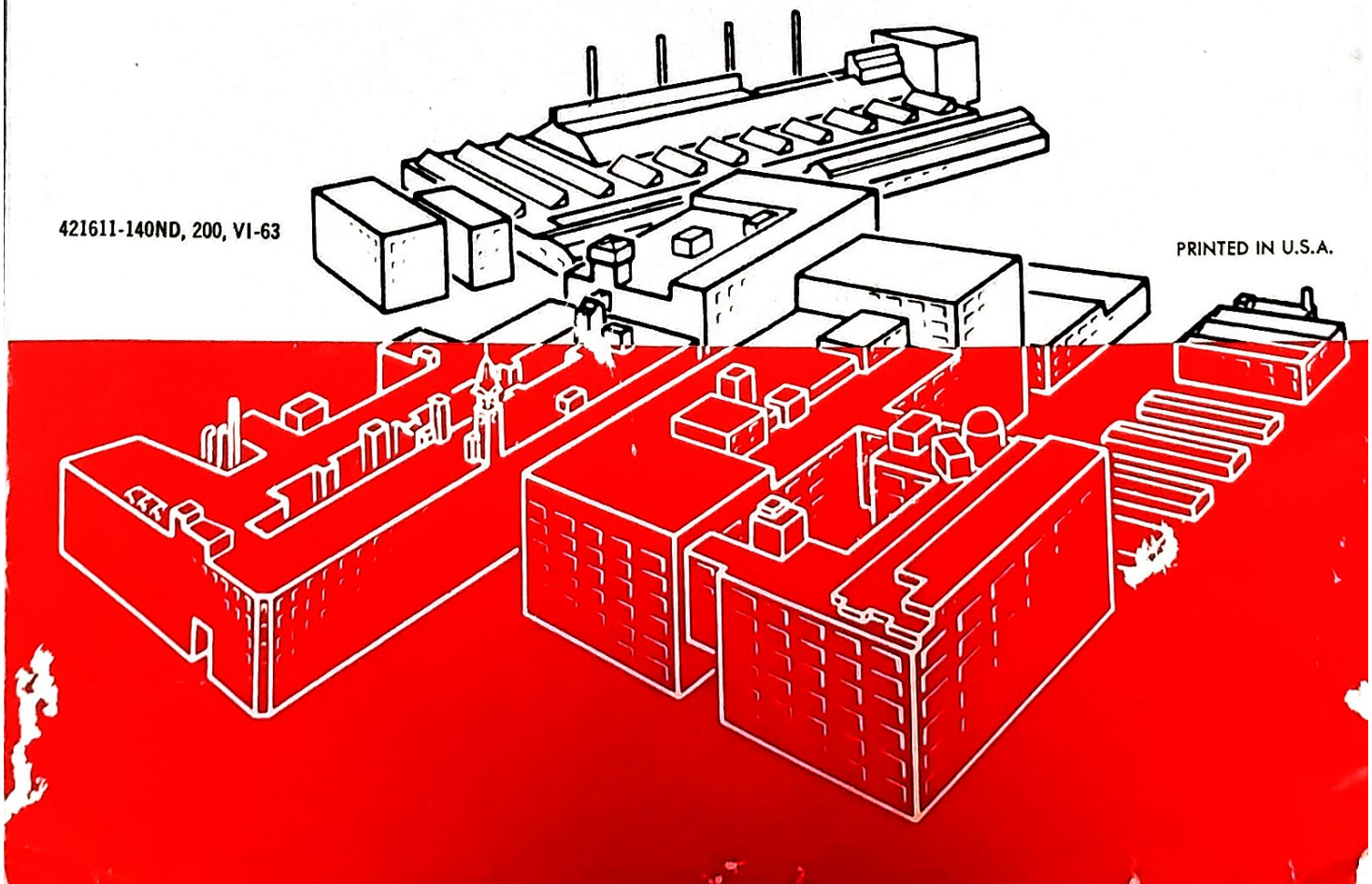

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