Nikon

BELLOWS FOCUSING ATTACHMENT
AND
SLIDE COPYING ADAPTER
FOR NIKON F

—INSTRUCTIONS—

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BELLOWS FOCUSING ATTACHMENT FOR NIKON F

SLIDE COPYING ADAPTER FOR BELLOWS FOCUSING ATTACHMENT

BELLOWS FOCUSING ATTACHMENT FOR NIKON F

GENERAL

This attachment, fitted between the Nikon F Standard, Nikon F Photomic, Nikon F Photomic-T, Nikkormat FS or FT and the lens, provides the means for continuously varying the lens-to-film distance so that close-ups and micro-photographs may be taken with great convenience.

Interchangeable Nikkor lenses for Nikon F are used with the Bellows, reproduction ratios being determined by the focal length of the lens and by the extension length of the Bellows (see Table 1 on p. 6).

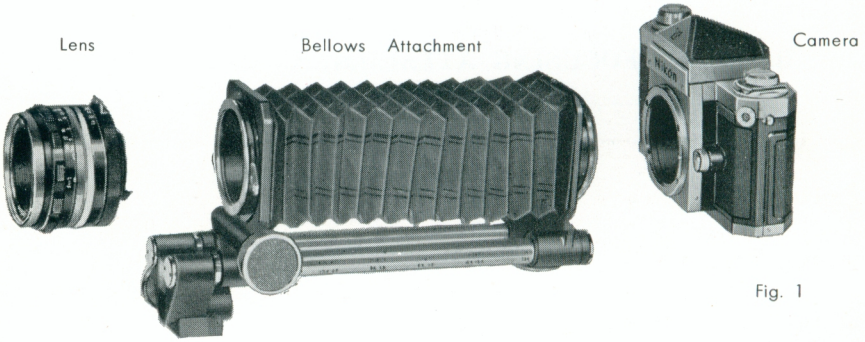


Fig. 1

When using the Nikkor 135 mm f/4 in short mount which has exclusively been designed for taking pictures of subjects at infinity up to of life-size(1×) with the Bellows, an adapter tube BR-1 is required (Fig. 2).

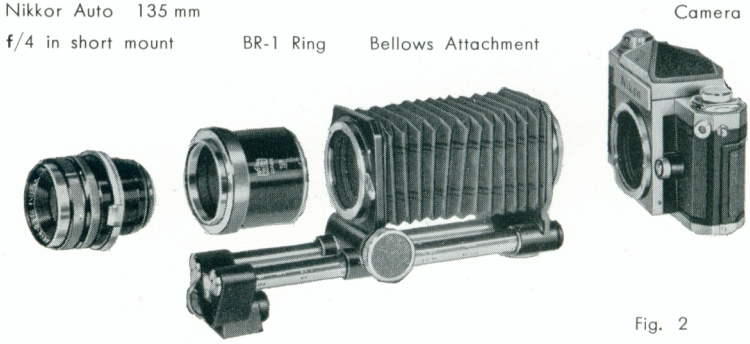


Fig. 2

It is a fundamental rule that any lens primarily designed for general use, when employed for the magnification higher than 1×, is to be used in the reversed

position on the Bellows, that is, with the lens front turned toward the camera body, for which purpose the BR-2 (Macro-Adapter) ring is available (Fig. 3).

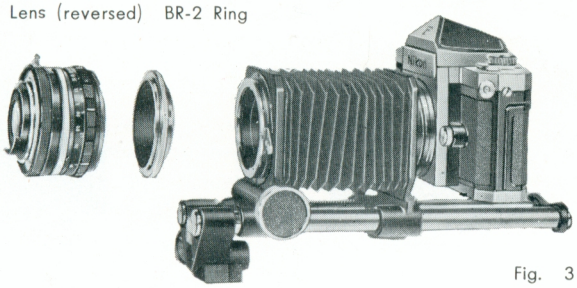


Fig. 3

ATTACHING CAMERA AND LENS

To mount the camera body on the Bellows, line up the black dot on the former with that on the latter, and turn the camera clockwise until it clicks in position (Fig. 4).

The lens is attached in the same way to the front end of the Bellows. The distance scale of the lens is to be set at infinity (∞).

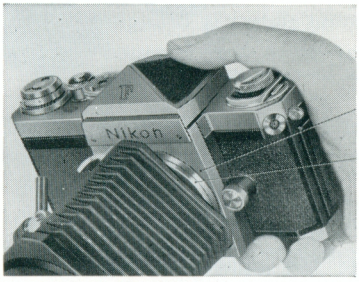


Fig. 4

By depressing the spring catch (Fig. 5) provided on the camera mount, the camera position can be changed from horizontal to vertical (Fig. 6 & 7).

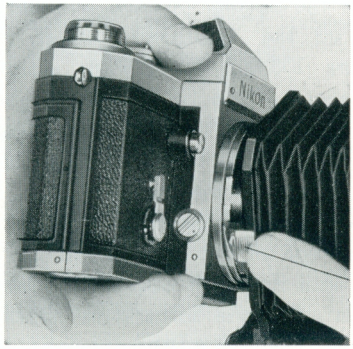
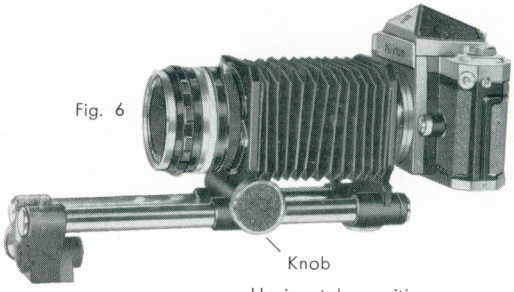


Fig. 5

Fig. 6



Knob

Horizontal position

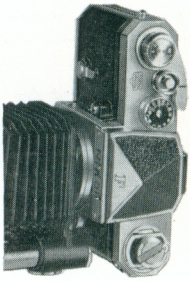


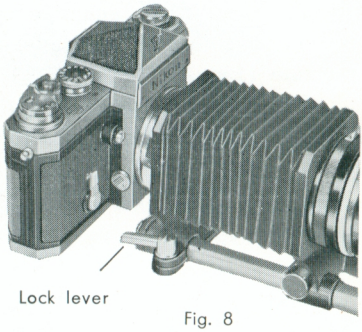
Fig. 7

Vertical position

Note: When using the Nikon F Photomic or Photomic-T, it may be required to once detach the Photomic finder or Photomic-T finder from the top of the camera.

MAGNIFICATION DETERMINATION

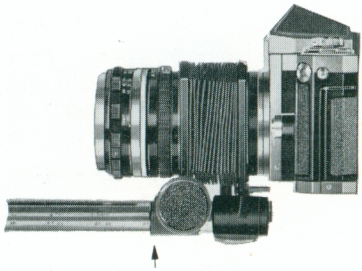
Extension or contraction of the Bellows is performed by rotating the knob (Fig. 6) provided on the lens-mount slider of the Bellows, after the other end (camera-mount slider) is brought into contact with the rear brace and fastened by the lock lever (Fig. 8).



Lock lever

Fig. 8

The scales that are read with the black numerals serve for an approximate magnification, of which the ones engraved on the left-hand rail (viewed from the camera) is for the Nikkor lens 50 mm f/2 attached on the Bellows in the normal position and the others engraved on the righthand rail is for the Nikkor lens 135 mm f/4 in short mount attached by means of the BR-1 adapter tube. The exposure factors for the respective magnifications are indicated by the black numerals with marking × beneath the scale.



Black numerals are read with the front edge

Fig. 9

To set the magnification, the camera-mount slider being locked at the camera-side end of the rails, move the lens-mount slider back and forth along the rails, until the front edge of the lens-mount slider is brought to the desired number on either the lefthand or righthand rail, depending upon which type of lens is being used (Fig. 9).

For other types of lenses, refer to Table 1 (P. 6) in which, along with the magnification ranges and free working distances, the actual magnifications are also given in relation to the scale reading on the lefthand rail.

The Bellows can also be used with the lens-mount slider fixed at the front end, the adjustment of the Bellows extension being done by moving the camera-mount slider. This adjustment may be needed when the front part of the Bellows rails prevents the approach to the subject to be photographed. The red numerals along the black scale lines mark the reproduction ratios and exposure factors in this case with Nikkor 50 mm f/2 in the normal position, the rear edge of the camera-mount slider serving as an index for reading (Fig. 10).

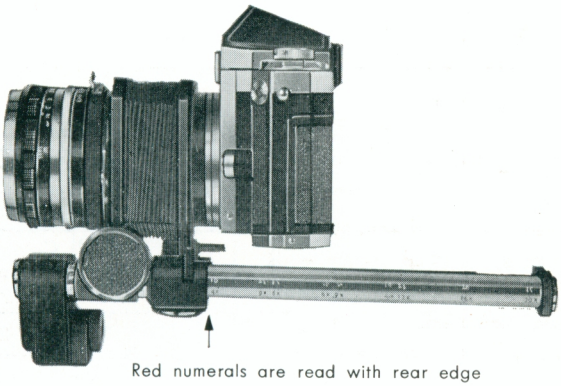


Fig. 10 Red numerals are read with rear edge

Note : If the Nikkor 50 mm f/1.4 or 58 mm f/1.4 is used for close-up photography at a magnification coming near to 1×, no satisfactorily sharp image over the whole picture field will be obtained, because the lens, which has primarily been designed for far distance photography, cannot hold good for photographing closer objects.* Consequently, at such magnifications, it is advisable to use the Nikkor 50 mm f/2 (even in this case, the aperture is to be stopped down at least to f/8) or rather the Micro-Nikkor or the Micro-Nikkor Auto 55 mm f/3.5** (these lenses are specifically designed for precise close-up copying work).

* Even when 50 mm f/1.4 or 58 mm f/1.4 is used in the reversed position at 2× or 1.7× and higher, the aperture should be stopped down as far as possible.

** These lenses, when mounted in the reversed position on the Bellows, cover the magnification range from 4.2× to 1.7×, but not down to 1×. Therefore, the highest resolution over the whole picture area may not be expected for the magnification ranging from 1.7× to 1.2×, because the lens can not be used in the reverse position for this range.

MAGNIFICATION RANGES, FREE WORKING DISTANCES AND RELATIONS OF ACTUAL MAGNIFICATION TO BELLOWS RAIL SCALE

(Focusing Ring of Lens Being Set at Infinity)

〔Table 1〕

Type of lens	Position of lens attached	Magnification range (Working distance)		Actual magnification in relation to rail marking						
		Max.	Min.							
Nikkor-H Auto 28 mm f/3.5	Reverse	8.8× (37 mm)	3.8× (42 mm)	Mag.	4	5	6	7	8	8.8
				Rail	1.0	1.5	2.1	2.6	3.2	3.5
Nikkor-S Auto 35 mm f/2.8	Reverse	6.8× (41 mm)	2.9× (48 mm)	Mag.	3	4	5	6	6.5	
				Rail	1.0	1.7	2.4	3.1	3.5	
Nikkor-S Auto 50 mm f/1.4	Reverse	4.7× (49 mm)	2× (64 mm)	Mag.	2	2.5	3	3.5	4	4.5
				Rail	0.9	1.4	1.9	2.4	2.9	3.4
Nikkor-S Auto 50 mm f/2	Normal	3.6× (31 mm)	0.9× (77 mm)	Coincide with each other. Use the figures on the left-side rail.						
	Reverse	4.2× (47 mm)	1.6× (69 mm)	Mag.	2	2.5	3	3.5	4	
				Rail	1.4	1.9	2.4	2.9	3.4	
Nikkor-H Auto 50 mm f/2	Normal	3.7× (26 mm)	0.9× (72 mm)	Coincide with each other. Use the figures on the left-side rail.						
	Reverse	4.3× (50 mm)	1.7× (70 mm)	Mag.	2	2.5	3	3.5	4	
				Rail	1.3	1.8	2.3	2.8	3.3	
Nikkor-S Auto 58 mm f/1.4	Reverse	4× (50 mm)	1.6× (73 mm)	Mag.	2	2.5	3	3.5		
				Rail	1.4	2	2.5	3.1		
Micro-Nikkor 55 mm f/3.5	Normal	4.4× (18 mm)	0.8× (73 mm)	Mag.	1	1.5	2	2.5	3	
				Rail	1.1	1.6	2.2	2.7	3.2	
	Reverse	4.2× (50 mm)	1.7× (70 mm)	Mag.	2	2.5	3	3.5	4	
				Rail	1.2	1.7	2.3	2.8	3.3	
Micro-Nikkor Auto 55 mm f/3.5	Normal	3.8× (17 mm)	0.8× (71 mm)	Mag.	1	1.5	2	2.5	3	
				Rail	1.1	1.6	2.2	2.7	3.2	
	Reverse	4.2× (50 mm)	1.7× (70 mm)	Mag.	2	2.5	3	3.5	4	
				Rail	1.2	1.7	2.3	2.8	3.3	

Type of Lens	Position of lens attached	Magnification range (Working distance)		Actual magnification in relation to rail marking				
		Max.	Min.					
Nikkor in short mount 135 mm f/4	Normal	1× (230 mm)	1/∞×	Coincide with each other. Use the figures on the right-side rail.				
Nikkor 105 mm f/2.5	Normal	1.9× (162 mm)	0.4× (355 mm)	Mag.	0.5	1		
				Rail	1.2	2.6		
	Reverse	1.3× (123 mm)	1/∞×	Mag.	1/∞	0.5		
				Rail	1.5	2.8		
Nikkor 105 mm f/4	Normal	2× (125 mm)	0.4× (319 mm)	Mag.	0.3	0.5	0.7	0.9
				Rail	1.2	2	2.7	3.5
Nikkor-Q Auto 135 mm f/3.5	Normal	1.5× (261 mm)	0.3× (552 mm)	Mag.	0.5	1	1.5	
				Rail	1.1	2.1	3.1	
	Reverse	0.7× (246 mm)	1/∞×	Mag.	1/∞	0.5	1	
				Rail	1.1	2.1	3.1	
Nikkor-Q Auto 200 mm f/4	Normal	1× (546 mm)	0.25× (1140 mm)	Mag.	0.5	1	1.5	
				Rail	1	2.1	3.1	

Note :

- "Working distance" is a distance from the subject plane focused to the lens barrel edge facing toward the subject.
- In the above table, the maximum magnifications in the normal position of the lens are given with the focusing barrel of lens fully extended.
- If the same magnification is obtained in either position, reverse lens position is preferable.
- 28 mm f/3.5, when attached in the reversed position, gives good images at the high magnifications as shown in the Table. If two extension rings (Model E_2) are used between BR-2 Ring and Bellows, the magnification will be 10×.
- 35 mm f/2.8 may not practically be used in the normal position on the Bellows because of too short or deep free working distance, which makes it difficult or impossible to illuminate the subject, except when the object to be photographed is transparent such as in the case of specimens for microscopy.
- 200 mm f/4 is to be used with the aperture stopped down to smaller than f/11.

CAUTION !

- For close-up photography of three-dimensional subjects, the lens aperture is to be stopped down sufficiently to ensure great depth-of-field.

- When using the Bellows, the aperture diaphragm in the Nikkor Auto lens does not operate automatically, since the lens is not coupled directly to the camera. Therefore, don't forget to manually stop down the aperture diaphragm after viewing and focusing have been done with the diaphragm fully opened. It may be convenient to apply the Extension Ring Model E_2 between the lens and the Bellows which permits the aperture diaphragm of the lens to open as long as the plunger on the ring is depressed with the finger.

- Although the Bellows Focusing Attachment may be held by hand, the use on a tripod is recommended.

- The Bellows Focusing Attachment may be used on the Repro-Kit Model PF (Fig. 11).

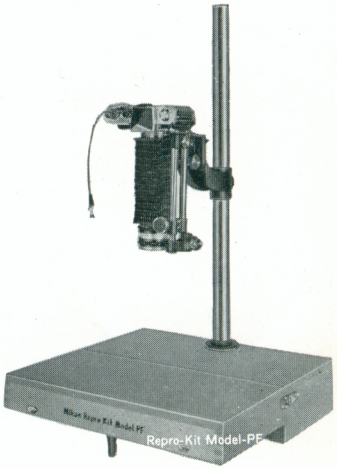


Fig. 11

DETERMINING EXPOSURE IN CLOSE-UP PHOTOGRAPHY

Whichever lens may be used, the exposure factor for a particular magnification is the same (see Table 2). For example, the exposure factor for the magnification 1× is 4 for all lenses.

〔Table 2〕

Reproduction ratio	1/10	1/6	1/4	1/2	3/4	1	2	3	4	5	6	7	8	9	10
Exposure factor	1.2	1.4	1.6	2.3	3	4	9	16	25	36	49	64	81	100	121
Increase in stops	1/4	1/2	3/4	1 1/4	1 1/2	2	3 1/4	4	4 3/4	5 1/4	5 1/2	6	6 1/4	6 3/4	7

Note: In practice, prolonging of shutter time may be needed, as the close-up photography should usually be performed with the lens sufficiently stopped down (at least to f/8), whereby opening of the aperture to a large extent may be impossible.

In determining the exact exposure, still other circumstances may have influence. Therefore, we had better take three test pictures, the first one exactly with the measured value and the second with 1/2 and the third with 2 times as much as the measured value. Collecting and comparing the consequences of such tests will permit us to bring about better results.

Although either of the incident or reflecting light measurement may be applied to the close-up photography, the former will be preferable in most cases.

Incident Light Measurement

First, read the value in exposure meter following the usual way of incident light measurement. Multiply the result obtained by the exposure factor needed for the magnification, and you will have the correct exposure, as long as no extremely white or black subject matter is concerned. For example, provided that the result with exposure meter be attained as f/8 for 1/4 sec., shutter speed, the correct exposure at a magnification of 1× will be given by prolonging the shutter speed by 4 times or enlarging the aperture diaphragm by 2 stops, that is, f/8 at 1 sec. or f/4 at 1/4 sec.

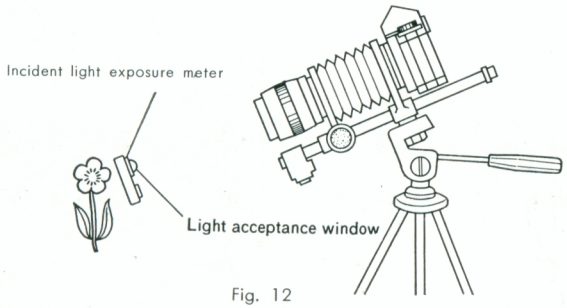


Fig. 12

Reflecting Light Measurement

Placing a standard reflecting plate at the position of the subject to be photographed (Fig. 13), find a value using a reflecting light exposure meter. In substitution for the standard plate, you can use your palm faced to the meter and increase the value by a half or one stop. The correct exposure will be

obtained now by the result multiplied by the exposure factor corresponding to the magnification in the same way as in the incident light measurement.

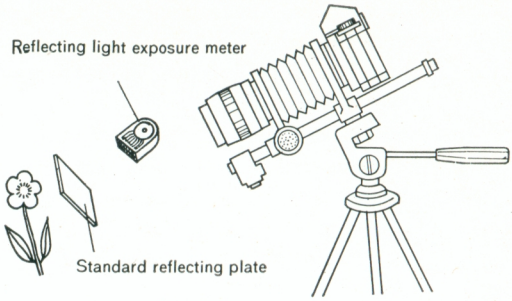


Fig. 13

BELLOWS ON TRIPOD

The Bellows Focusing Attachment is provided with two tripod sockets, one at the bottom of the front and the other at the rear brace. Various convenient positions may be obtained as shown by the following examples (Fig. 14), depending upon whether the camera position is vertical or horizontal, the Bellows is extended or contracted, or a lens of long or short focal length is used, etc.

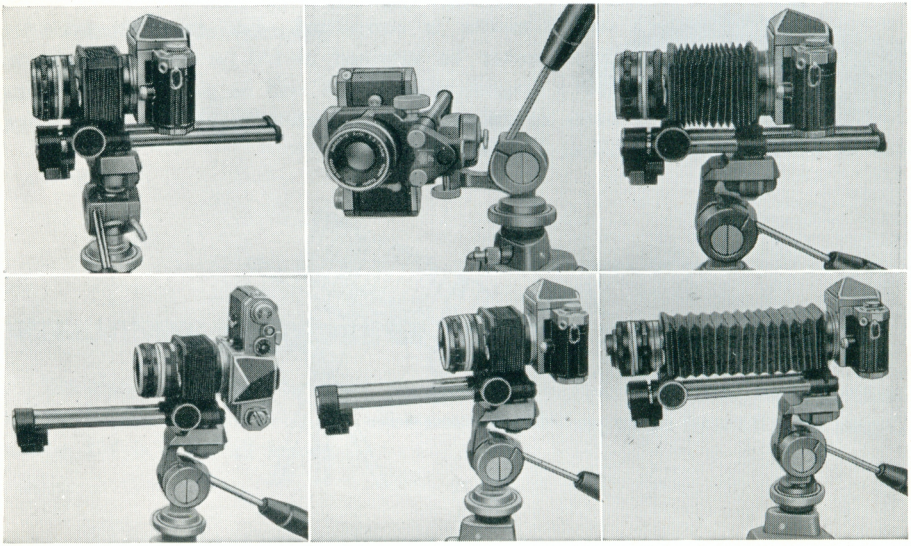


Fig. 14

SLIDE COPYING ADAPTER
FOR BELLOWS FOCUSING ATTACHMENT

GENERAL

The Adapter is conveniently used in combination with the Bellows Focusing Attachment for Nikon F. to make duplicates of 35 mm color or black-and-white transparencies in the form of film strips or in 2″×2″ frame slide mounts at reproduction ratios given in Table 3. The emulsion surface of the transparency is to be faced toward the light source.

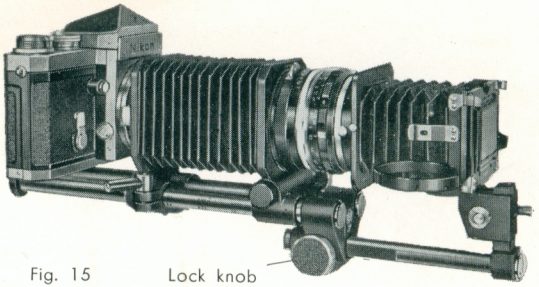


Fig. 15

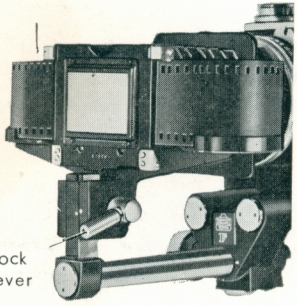


Fig. 16

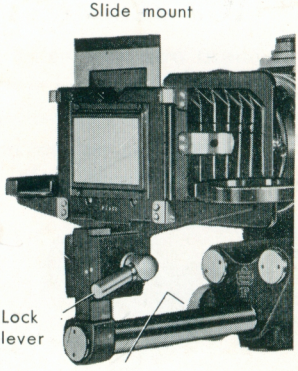


Fig. 17

ATTACHING TO BELLOWS FOCUSING ATTACHMENT

To attach the Adapter onto the Bellows Focusing Attachment, release the lock knob (Fig. 15) found at the bottom socket of the Bellows, and insert the rod of the adapter through the socket hole. The engraved graduation lines on the rod show the reproduction ratios when the 50 mm f/2 is used on the Bellows in normal position. Read this scale with the front outer end of the Bellows' front brace (Fig. 18). The height of the Slide Copying Adapter can be adjusted upward and downward from the central position where the white dots on the front are aligned. Secure the position by the lock lever (Fig. 16, 17).

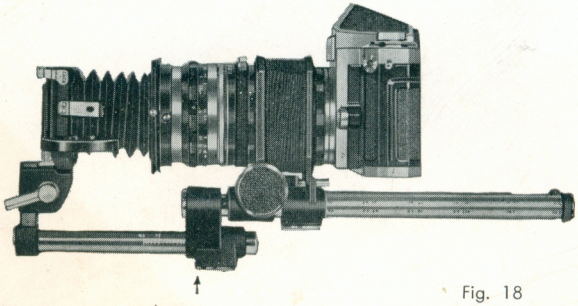


Fig. 18

Connect the Bellows between the Slide Copying Adapter and the lens. Then, by rotating the knob on the lens mount slider of the Bellows Focusing Attachment, advance the slider to the front brace as far as it will go (but not in contact with the brace).

With the lens attached in the reverse position, however, some precaution should be taken to prevent extraneous light from entering from the side.

MAGNIFICATION DETERMINATION

Focusing and magnification setting, when using the Slide Copying Adapter on the Bellows, proceed as follows:

Bring the lens mount slider of the Bellows to the front end of the rail, the focusing ring being set on the lens at infinity. After releasing the lock lever on the camera mount slider of the Bellows, move this slider along the rails, until the rear edge of the camera mount slider comes to the black graduation lines indicated by the reproduction ratios and exposure factors engraved in red, referring to the Table 2. Then, focusing is done by sliding back and forth the rod at the bottom of the Slide Copying Adapter. Tighten the lock knob.

The markings on the rod of the Adapter are engraved only for using the Nikkor 50 mm f/2 attached on the Bellows in the normal position. However, any lens is attached preferably in the reverse position when used for magnifications higher than 1×.

When at the magnification 1× or so the focusing ring of the lens is revolved, the magnification will change largely but the focusing slightly. Therefore, the focusing ring can be used for magnification adjustment.

The most accurate magnification will be determined in the following way: On a disused slide, mark a horizontal line as long as the length obtained by dividing 36 mm by the desired magnification. Then, mount this slide and move back and forth the Slide Copying Adapter and the camera mount slider on the Bellows, until the image of the horizontal line previously drawn on the slide fully extends from end to end on the camera finder screen.

Magnification Ranges by use of Various Nikkor Lenses on Slide Copying Adapter

See Table 3 on the next page.

〔Table 3〕

Type of lens	Position of lens attached	Magnification range
Nikkor-H Auto 28 mm f/3.5	Reverse	3.9× — 8.8×
Nikkor-S Auto 35 mm f/2.8	Reverse	2.9× — 6.8×
Nikkor-S Auto 50 mm f/1.4	Reverse	2 × — 4.7×
Nikkor-S Auto 50 mm f/2	Normal Reverse	0.9× — 3.6× 1.6× — 4.2×
Nikkor-H Auto 50 mm f/2	Normal Reverse	0.9× — 2.5× 1.7× — 4.3×
Nikkor-S Auto 58 mm f/1.4	Reverse	1.6× — 4 ×
Micro-Nikkor 55 mm f/3.5	Normal Reverse	0.8× — 2.1× 1.7× — 4 ×
Micro-Nikkor Auto 55 mm f/3.5	Normal Reverse	0.8× — 1.9× 1.7× — 4.2×

EXPOSURE DETERMINATION IN SLIDE COPYING

As magnification increases, exposure time should be increased. However, it is recommended rather to increase brightness of illumination, thus enabling the use of higher shutter speeds to avoid camera movement as much as possible.

When using 50 mm f/1.4 or 58 mm f/1.4 the aperture is to be stopped down sufficiently.

Reproduction of the slide on daylight color film requires the use of a flood lamp as illuminating light source. If the color temperature of the light source does not coincide with that of the film, a color temperature compensating filter should be used. As the light source, natural light from the sky may also be employed with the Slide Copying Adapter being faced toward the northern sky.

Measurement by Means of Photomic-T or Nikkormat FT

The exposure will be determined also by the use of the Through-The-Lens system exposure meter in the Nikon F Photomic-T or Nikkormat FT camera. Exposure measurement may be different depending upon whether originals are

Class 1. Photographs, pictures and continuous tone materials, all with some tonal gradations, or

Class 2. Documents or line drawings with little or no gradation and therefore of strong contrast.

• For Class 1, originals with gradations, determine exposure the same as in general photography.

• For Class 2, originals of strong contrast, make measurement at all times by a material with the white area larger than the dark, i. e. a material with black figures or letters on the white ground, and make compensation by increasing the exposure as shown in the table.

It is convenient to bring the max. aperture figure (when the full aperture measuring method is used) or the red dot (when the stop-down measuring method is used) on the max. aperture scale to a film speed number (ASA) decreased by as many marks as shown in the parentheses, before determining exposure.
Should this range of compensation extend beyond that of the ASA dial scale, use an alternative means, i. e. to enlarge the aperture of the lens or lower the shutter speed by as many stops as shown below:

Film	Color reversal, Color negative or generally used Panchromatic
Increase of exposure (Decrease of film speed (ASA))	Increase 1 1/2 stops (Decrease 4 marks)

For example, when a film of ASA 100 is used, the figure 32, i. e. 4 marks smaller, is to be set. Then, center the meter needle to determine exposure.

Remarks :

When using color reveral film which generally has a narrow latitude, take another picture in addition to the one exposed according to the previous description, with one stop more exposure for the subject of somewhat brighter impression, and with one stop less exposure for the subject of darker nature.

The micro-copying film (not cited in the previous description) gives in general various results depending upon the emulsion number and other variable factors such as type of developer, time, temperature of development, etc. Therefore, it is advisable to make trial exposures.

Incident Light Measurement

Place an incident light type exposure meter in front of the opal screen of the Slide Copying Adapter (Fig. 19). When using natural light as a light source, take caution not to expose the opal screen to direct sunlight.

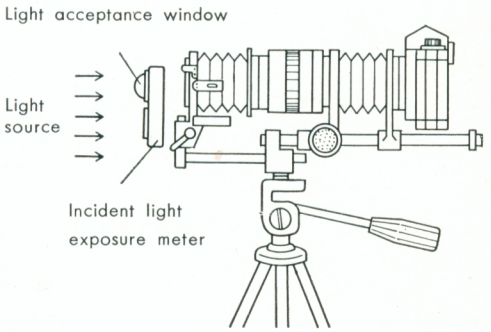


Fig. 19

The resultant value multiplied by the exposure factor which is required for the magnification being used will give the correct exposure for film of average density.

Reflecting Light Measurement

Using a standard reflecting plate or your palm faced toward the opal screen of the Slide Copying Adapter (Fig. 20), find a value using a reflecting light type exposure meter.

Multiply the result thus obtained by the exposure factor for the desired magnification. (With your palm instead of the plate, a half or one stop increase of the value may be necessary.)

Be careful in this measurement not to let direct, intense light enter the meter cell.

Applying the sky light as a light source, turn the reflecting light meter simply toward the sky to which the Slide Copying Adapter is also being directed. The resultant value is to be increased by 4 times in terms of the shutter speed. Then, multiply this value by the exposure factor.

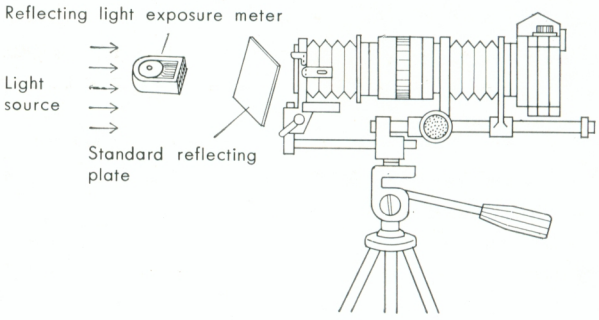


Fig. 20

USING PHOTOMIC FINDER

If the camera is provided with the Photomic Finder (this combines in one housing an exposure meter and a prism viewfinder for the Nikon F), the measurement of exposure is conveniently carried out in the following way:

The light acceptance angle converter is not used. For color film, set the film speed figure on the ASA dial to the black triangular index. For black-and-white film, set the film speed to the filter factor figure 4× in yellow.

Detaching the Photomic Finder from the camera, set the f-number of the Photomic at 1.4 and face its light acceptance window toward the focusing screen of the camera (Fig. 21). The aperture of the lens being set in position, rotate the finder's shutter speed selector until the meter needle on the top back comes to the center. Then, the shutter speed thus determined will give the correct exposure.

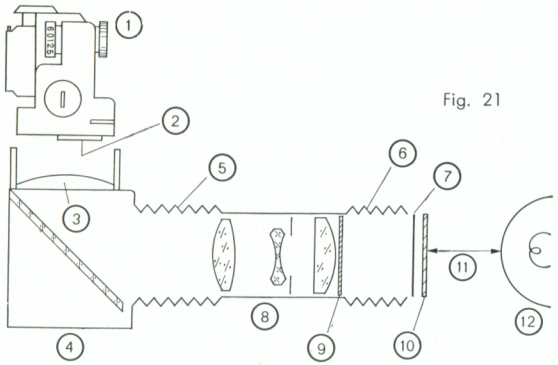


Fig. 21

1 Photomic Finder
2 Light acceptance window
3 Focusing screen
4 Nikon F camera
5 Bellows Attachment
6 Slide Copying Adapter
7 Film
8 Lens
9 Filter (in color photography)
10 Opal plate
11 Distance between light source and opal plate
12 Light source

A color filter, if required, can be placed between the lens and light source. As in this case the measurement is accomplished directly by the brightness of the viewfield, the obtained value is by itself the correct exposure, without any need of taking into account filter factor or exposure factor corresponding to the magnification. This procedure, therefore, can also be applied to general close-up photography.

Of course, the incident and reflecting light measurements described previously can be applied to the Photomic Finder, as this is used in both ways.

USE ON TRIPOD

With the Slide Copying Adapter attached to the Bellows, the front tripod socket may be used as shown in Fig. 22 and 23 for more stability. Fig. 22 shows the lens mounted to the Bellows in the normal position, while Fig. 23 in the reverse position.

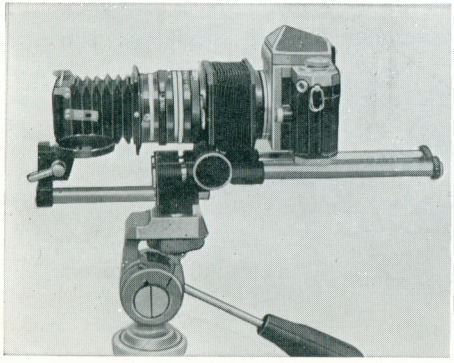


Fig. 22

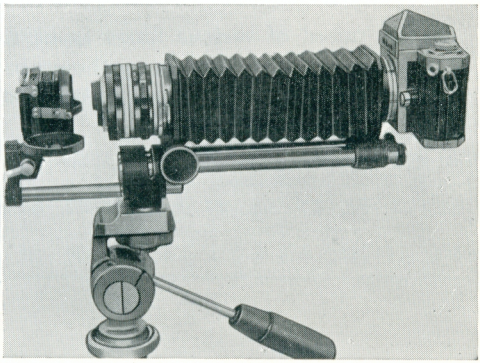


Fig. 23

FILTERS FOR COLOR SLIDE COPYING WITH SLIDE COPYING ADAPTER

1. Color Temperature and Mired

It is a well-known fact that in color photography using a reversal color film, the type of illuminating light should be of a color temperature the same as that of the film in use. If there is a difference between them, a suitable color balancing filter should be used (placed over the lens or over the illuminating light) whose mired value, that is, a color temperature expressed by its reciprocal multiplied by one million, corresponds to the difference of the mireds between the light and the film being used.

Therefore, the mired of the filter to be used will be formulated as below:

Mired of filter = Mired of illuminating light − Mired of film

If the difference is positive (plus), bluish filters are to be used and if negative (minus), yellowish filters, since the bluish filter decreases and the yellowish filter increases the mired of the light.

It is advantageous to choose an illuminating light whose color temperature differs as little as possible, because it permits the use of filters of lower mired or density, i. e. of more reduced filter factor.

When using the Nikon Slide Copying Adapter attached to the Bellows, however, since the equipment is provided with an opal acryl plate diffuser which causes lowering of the color temperature of the light source being used, the use of a filter of 30 mireds will be necessary, even when the color temperature of the film is exactly the same as that of the light source.

Now, in this case, it is evident that the above formula is to be modified as:

Mired of filter = Mired of illuminating light − Mired of film + 30 Mireds

The mired of various filters to be used under different conditions (the type of light source and film) is as shown in Table 4.

It is recommended to select filters of the mired as near as possible to those given in this Table.

〔Table 4〕 **Mired of Filters for Nikon Slide Copying Adapter**

Film / Color temperature / Mired — Light source / Color temperature / Mired		Daylight type color film 5400°K 185 Mireds	Type A color film 3400°K 294 Mireds	Type B color film 3200°K 313 Mireds
Daylight	5400°K 185 Mireds	30 Mireds	−79 Mireds	−98 Mireds
Blue flash bulb Blue photoflood lamp		30 Mireds	Not recommended	Not recommended
Clear flash bulb	3800°K 263 Mireds	108 Mireds	No filter needed	−20 Mireds
Photoflood lamp	3400°K 294 Mireds	139 Mireds	30 Mireds	11 Mireds
Flood lamp	3200°K 313 Mireds	158 Mireds	48 Mireds	30 Mireds

2. Mired of Various Filters

Filters reduce the amount of light transmitted. Therefore, when using them, an increase in exposure is needed which is expressed as an exposure factor in the following tables.

Exposure increase in the tables means a ratio of the aperture opening of the lens to be opened more for each exposure factor.

Since the shutter speed of camera does not give an intermediate speed, a fractional value of the exposure increase in stops may conveniently be obtained by changing the aperture stop; for example, when the filter whose factor is 2.7 or exposure increase in stops is 1½ is used, change the shutter speed, say, from 1/4 to 1/2 second and open the aperture opening more by 1/2 of one stop.

〔Table 5〕 **Waltz Color Conversion Filters**

Amber

Filter number	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
Mired	−10	−19	−35	−50	−63	−75	−86	−100	−113	−128	−146	−159	−180
Exposure factor	1.1	1.1	1.2	1.5	1.6	1.7	1.8	1.9	2.1	2.2	2.5	2.7	2.8
Exposure increase in stops	0	0	⅓	⅔	⅔	⅔	1	1	1	1	1⅓	1½	1½

Blue

Filter number	B 0	B 1	B 2	B 3	B 4	B 5	B 6	B 7	B 8	B 9	B 10	B 11	B 12
Mired	8	18	33	46	60	71	83	96	111	127	136	156	178
Exposure factor	1.2	1.4	1.6	1.9	2	2.3	2.4	2.7	2.9	3.1	3.2	3.9	4.3
Exposure increase in stops	½	½	⅔	1	1	1⅓	1⅓	1½	1½	1⅔	1⅔	2	2

〔Table 6〕 **Kodak Light Balancing Filters**

Yellowish (Series 81)

Wratten number	81	81 A	81 B	81 C	81 D	81 EF
Mired	−10	−18	−27	−35	−42	−53
Exposure factor	1.25	1.25	1.25	1.25	1.6	1.6
Exposure increase in stop	⅓	⅓	⅓	⅓	⅔	⅔

Bluish (Series 82)

Wratten number	82	82 A	82 B	82 C	82 C +82	82 C +82B	82 C +82B	82 C +82B
Mired	10	18	32	45	55	62	77	89
Exposure factor	1.25	1.25	1.6	1.6	2	2	2.5	2.5
Exposure increase in stop	⅓	⅓	⅔	⅔	1	1	1¾	1⅓

Yellowish (Series 85)

Wratten number	85 C	85	85 B
Mired	−99	−130	−149
Exposure factor	1.25	1.6	1.6
Exposure increase in stop	⅓	⅔	⅔

Bluish (Series 80)

80 B	80 C
130	99
2	2.5
1	1⅓

〔Table 7〕 **Kodak Wratten Filters for Nikon Slide Copying Adapter**

Film / Light source	Kodachrome & Kodak-Ektachrome Daylight type	Kodachrome Professional Type A	Kodak-Ektachrome Type B
Daylight	No. 82 B	No. 81D+No. 81C	No. 85C
Blue flash bulb	No. 82 B	Not recommended	Not recommended
Blue photoflood lamp	Not recommended	Not recommended	Not recommended
Clear flash bulb	No. 80C+No. 82	No filter needed	No. 81A
Photoflood lamp	No. 80B+No. 82	No. 82B	No. 82
3200°K lamp	No. 80B+No. 82B	No. 82C	No. 82B

3. Example

For example, for color slide copying using the daylight type color film and a photoflood lamp of 3400° K as a light source, a filter needed for color balancing will be known by means of the formula previously given or directly from Table 4.

Thus, the Mired of the filter will be:

294 Mireds−185 Mireds+30 Mireds=139 Mireds

As this result is positive, the blue filter is to be used which corresponds to No. 80B+No. 82 of Wratten or B10 of Waltz.

4. Distance of Illuminating Light

Using the diffuser of opal acryl plate* in the Slide Copying Adapter, the illuminating light source can be placed at any distance (the brighter the lamp, the greater the distance): for example, 500W photoflood lamp at about 30 cm.

* If your Slide Copying Adapter is equipped with a mat glass, it is recommended to exchange it with an opal acryl plate diffuser which is available on order.

5. Note on Exposure

Exposure in color film slide copying varies not only with make and emulsion number of the film used, but also with the total length of time the lamp has been used (by aging, the color temperature of the lamp decreases), even though the same developing process will be taken later. Therefore, it is difficult to get the desirable color rendition, even when a regular combination of the film and lamp is selected. We had better examine the actual results, and if the picture is tinged with red or blue, the additional use of a bluish or yellowish filter will respectively be needed for compensation (for example, Kodak Light Balancing Filter Series 82 Bluish or Series 81 Yellowish).

The best way may be to take three pictures, first with exactly the measured value, second with 1/2 and third 2 times of that value.

It is recommended to collect and compare the results of exposure test obtained under a variety of conditions.

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