Nikon

BELLOWS FOCUSING ATTACHMENT

AND

SLIDE COPYING ADAPTER

FOR NIKON F

— INSTRUCTIONS —

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◆ — GENERAL —

This attachment, fitted between the Nikon F Standard, Nikon F Photomic or Nikkorex F and the lens, provides the means for continuously varying the lens-to-film distance so that close-ups and microphotographs 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).

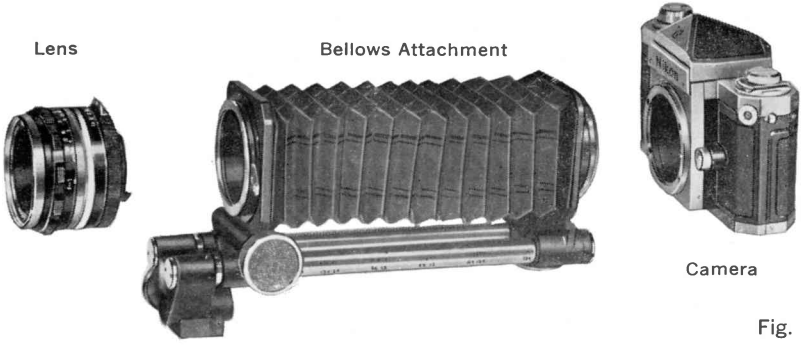


Fig. 1

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

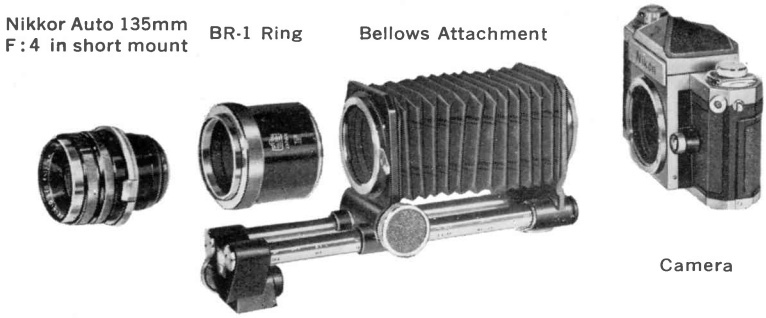


Fig. 2

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

tion 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).

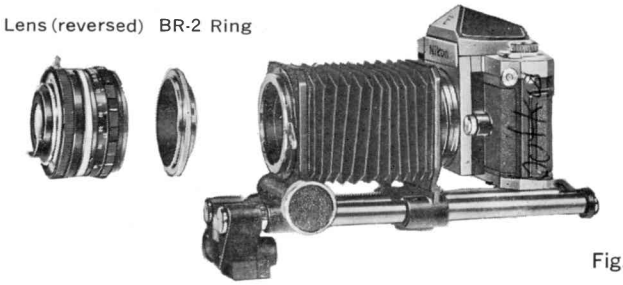


Fig. 3

◆ — 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 this clicks in position (Fig. 4).

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

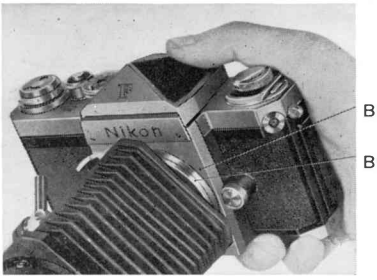


Fig. 4

Note: When attaching or detaching the Nikon F Photomic, the Photomic finder should be removed in advance from the top of the camera.

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).

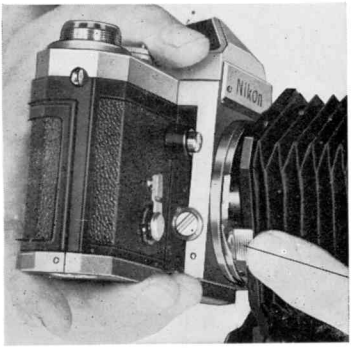


Fig. 5

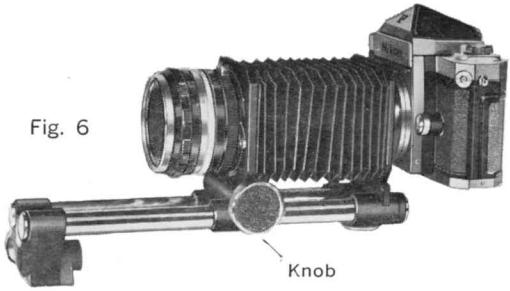


Fig. 6

Horizontal position

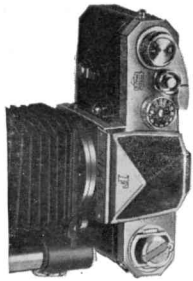


Fig. 7

Vertical position

Note: When turning the Nikon F Photomic for vertical or horizontal position, it may be required to detach beforehand the Photomic 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).

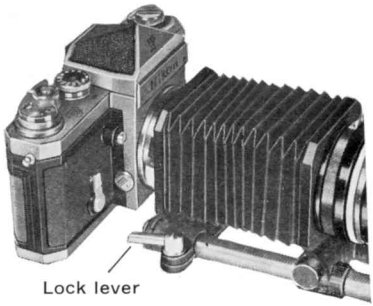
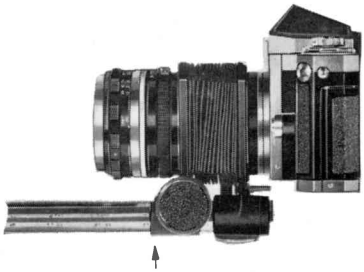


Fig. 8

The scales that are read with the black numbers serve for approximate determination of the desired magnification, of which the one engraved on the lefthand rail (viewed from the camera) are for the Nikkor lens 50 mm f : 2 attached onto the Bellows in the normal position and the other engraved on the righthand rail are 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 numbers with marking X beneath the scale.



Black numbers 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 the lens is being used (Fig. 9).

For other types of lens, 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 numbers 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).

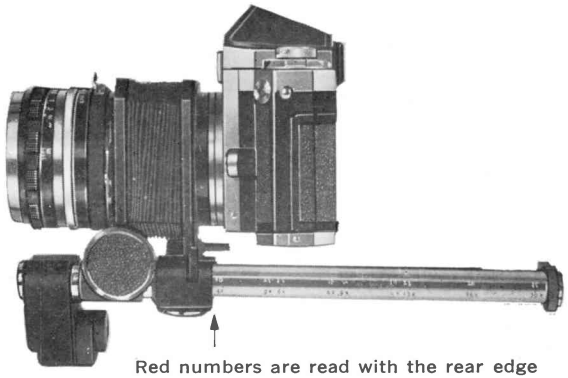


Fig. 10 Red numbers are read with the rear edge

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 1x, 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 55 mm f : 3.5** (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 2x or 1.7x and higher, the aperture should be stopped down as far as possible.

** The Micro-Nikkor, when mounted in the reversed position on the Bellows, covers the magnification range from 4.2x to 1.7x, but not down to 1x. Therefore, the highest resolution over the whole picture area may not be expected for the magnification ranging from 1.7x to 1.2x because the lens must be used in the normal position for this range.

TABLE 1

Magnification Ranges, Free Working Distances and Relations of Actual Magnification to Bellows Rail Scale (Focusing ring of lens being set at infinity)

Type of Lens	Position of Lens Attached	Magnification Range (Working Distance) Max.	Min.	Actual Magnification in Relation to Rail Markings						
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)	Mag. / Rail	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)	Mag. / Rail	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	2.32	.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/∞×	Mag. / Rail	Coincide with each other Use the figures on the right-side rail			
Nikkor 105 mm 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 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× (242 mm)	Mag.	0.5	1	1.5	
				Rail	1	2.1	3.1	

◆ NOTE ON TABLE 1

- "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 ring of lens fully extended.
- If the same magnification is obtained in whichever position of the lens, the reverse 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 above Table. If two extension rings (Model E) are used between BR-2 Ring and Bellows, the magnification will be 10x.
- 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 we encounter in the specimen 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 stop down manually 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 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 Bellow 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).

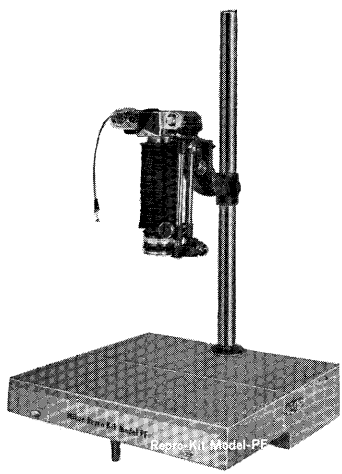


Fig. 11

◆ — 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 1x is 4 for all lenses.

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.

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 Stop	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 3/4	6 3/4	7

Magnification	∞	1×			2×			3×			4×		
Exposure factors on the basis of the exposure at ∞	1×	2×	3×	4×	6×	8×	12×	16×	20×	24×	28×		
Exposure factors on the basis of the magnification 1x	1/4×1/2	×	1×	1.5×2×		3×		4×	5×	6×	7×		

Note: In practice, elongation 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 impossible.

In determining the correct exposure, still other circumstances must sometimes be considered. 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.

◆ — INCIDENT LIGHT MEASUREMENT —

First, read the value in the exposure meter following the usual way of incident light measurement. Multiply the result thus obtained by the exposure factor needed for the magnification, and you will have the correct exposure, so far as no extremely white or black photographing subject 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 1x will be given by elongating 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.

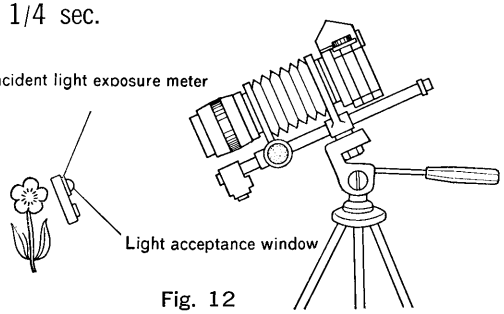


Fig. 12

◆ — REFLECTING LIGHT MEASUREMENT —

Placing a standard reflecting plate at the position of the subject to be photographed (Fig. 13), find out 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.

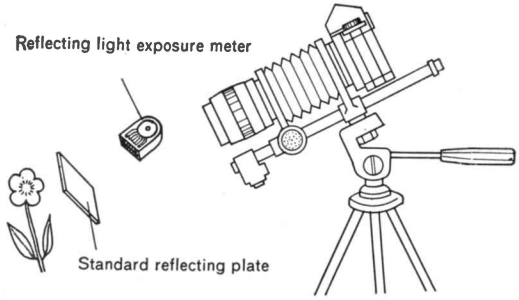


Fig. 13

◆ — BELLOWS ON TRIPOD —

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

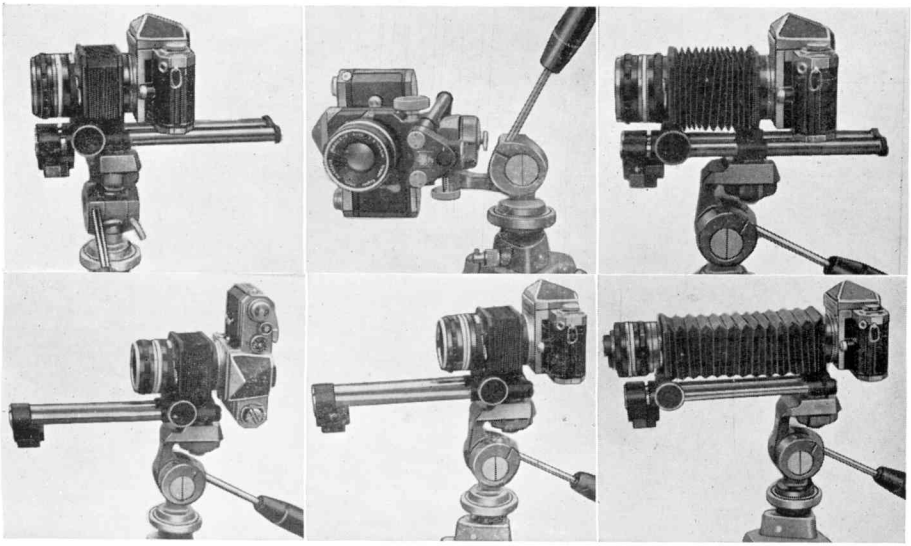


Fig. 14

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 2. The emulsion surface of the transparency is to be faced toward the opal acryl diffuser.

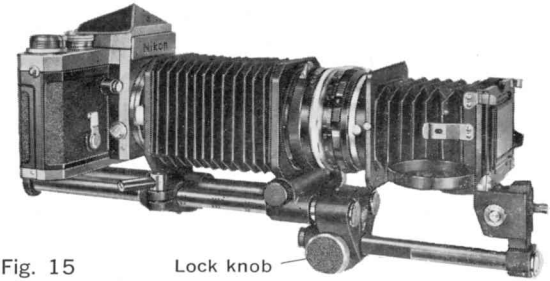


Fig. 15

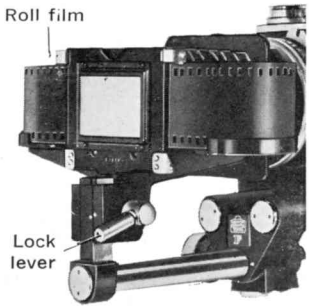


Fig. 16

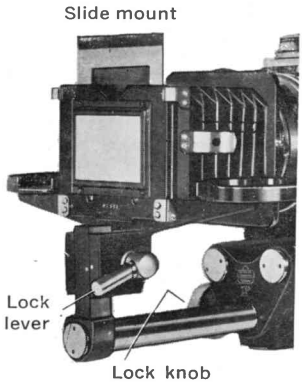


Fig. 17

◆ — ATTACHING TO BELLOWS FOCUSING ATTACHMENT —

To attach the Adapter onto the Bellows Focusing Attachment, releasing the lock knob (Fig. 15) found at the bottom socket of the Bellows, insert the Adapter's rod 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).

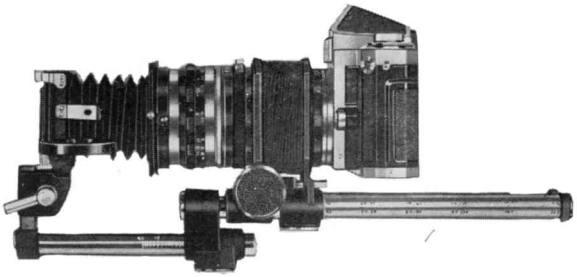


Fig. 18

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, as the above-mentioned connection cannot be performed.

◆ — 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, slide 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 Apapter. 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 1x.

When at the magnification 1x or so the focusing ring of the camera 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: Put on a disused slide 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.

TABLE 3

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

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

◆ — EXPOSURE DETERMINATION IN SLIDE COPYING —

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

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

Reproduction of the slide on the daylight color film requires the use of a flood lamp as a 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 northern sky.

◆ — INCIDENT LIGHT MEASUREMENT —

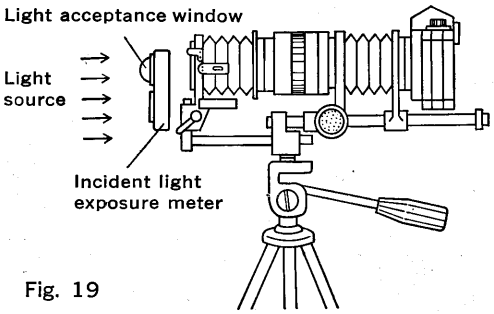


Fig. 19

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

The resultant value multiplied by the exposure factor which is required for the magnification being used will give the correct exposure for the 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 out 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, an increase of the value one step or a half is necessary.)

Take caution in this measurement not to let the direct, intense light enter the meter.

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.

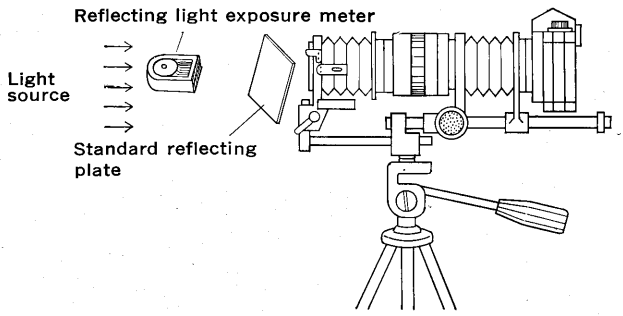


Fig. 20

◆ — USING NIKON PHOTOMIC METER FINDER —

If the camera is provided with the Photomic Meter 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 4x in yellow.

Detaching the Photomic finder from the camera, set the F-number of the photomic at f : 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 meter'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.

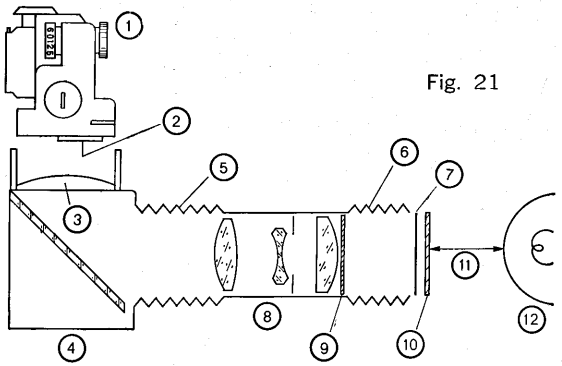


Fig. 21

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 the 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 meter, 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.

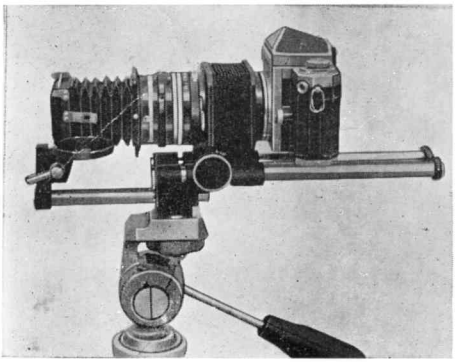


Fig. 22

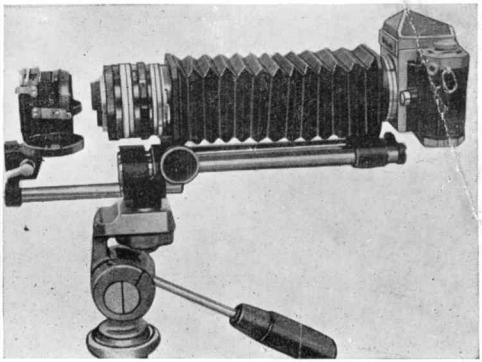


Fig. 23