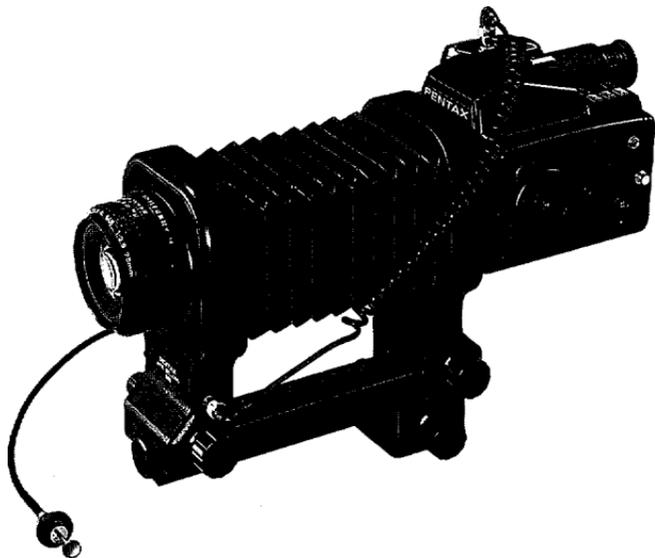


**PENTAX<sup>®</sup>**  
**645**

**AUTO BELLOWS 645**



### **Introduction**

Mounted between the Pentax 645 camera body and one of its 645 lenses, the Auto Bellows 645 is one of the most versatile tools for macrophotography, particularly when you plan to do a large amount of close-ups.

The Reverse Adapter 645 which is optionally available can be employed with this unit to make the 645 lens workable in reverse position. Please read this operating manual carefully so that you may properly operate this accessory and make the most of it.

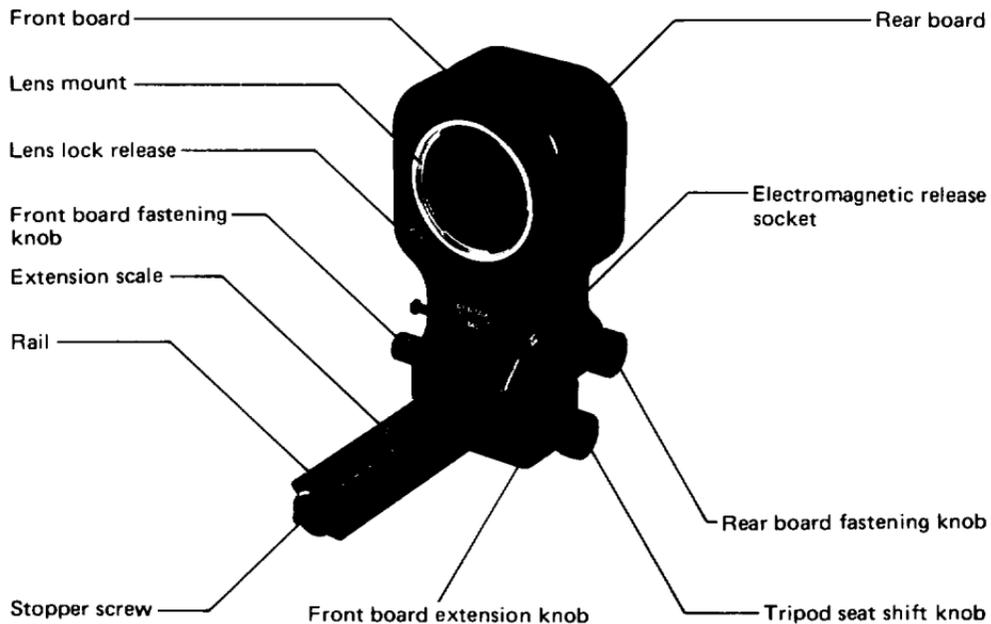
### **Operational Precautions**

- The A-affixed 645 lens cannot be used with the Auto Bellows with the lens aperture set to A. Use any one of the apertures other than A.
- The LS 75mm f/2.8 or 135mm f/4 lens cannot be used with this unit in the leaf-shutter mode.
- In the close-up photography, it is recommended that you stop down the lens to f/8 or smaller.
- The close-up accessories such as Extension Tubes cannot be used with this unit as they may cause troubles such as "vignetting."

## SPECIFICATIONS

Usable camera	Pentax 645
Usable lenses	Pentax 645 lenses from 55mm to 200mm (except a zoom lens)
Bellows extension	54mm — 180mm
Metering method	Stop-down
Automatic-diaphragm system	Possible through the use of the Cable Release 30 and the Infrared Remote Release Cord (used to connect the Bellows with the camera).
Reverse photography	Possible through the combination with Reverse Adapter 645 and Reverse Attachment for 645 Lenses (automatic diaphragm not workable)
Others	Stop-down knob provided; two sizes of tripod sockets (U1/4 and U3/8 inches)
Dimensions	100(W) x 197(H) x 213(D)mm (3.9" x 7.8" x 8.4")
Weight	1.44 kg (3.2 lb.)
Accessories	Infrared Remote Release Cord 2P; Cable Release 30.

## NOMENCLATURE



Camera body connector ring

Bellows

Cable release socket

Stop-down knob

Tripod seat

Infrared remote release cord 2P

Fixing screw

Tripod seat fastening knob

Cable release 30

Rear board extension knob

Tripod socket

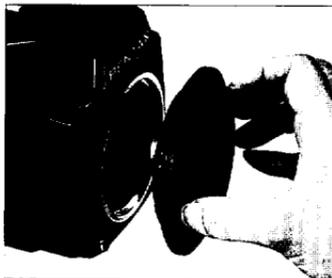
## INSTALLING AUTO BELLOWS

1



1. As illustrated above, loosen the fixing screw on the rear board, and remove the camera body connector ring.

2



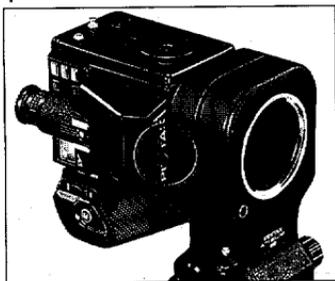
2. Mount the removed ring onto the 645 camera body in the same way as you do a 645 lens.
3. As illustrated, insert the camera body connector ring attached to the camera body into the rear board of the Auto Bellows, and secure it in place by fastening the fixing screw.

3



Caution: When you change the auto bellows to use a tripod, do not be careless not to drag it.

4



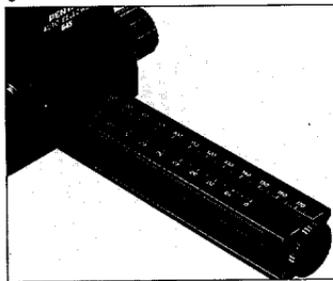
4. To position the camera vertically or horizontally, first remove the camera body from the Bellows, then replace it in the position you desire. If you turn the camera body with the Bellows attached, the grip may hit the rail.

5

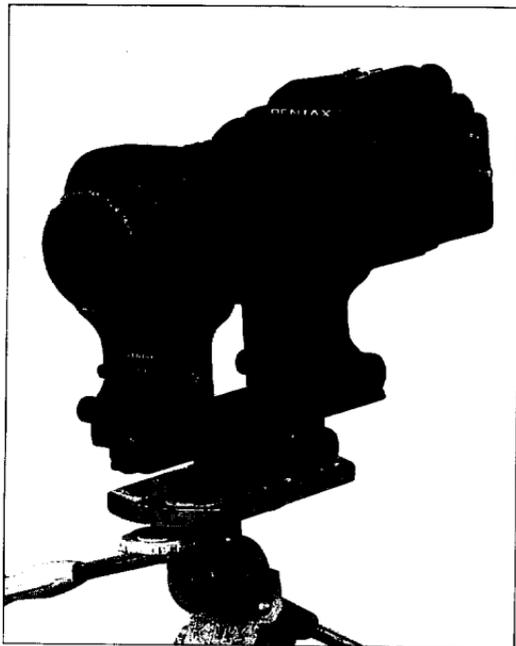


5. Attach the lens to the lens mount on the front board. To remove it, turn the lens counter-clockwise while pressing the lens lock release.
6. There are two scales (0 ~ 180mm) on the rail, one for adjusting the front board and the other for adjusting the rear board. Adjust the position of each board according to the respective scale.

6



## TRIPOD MOUNTING



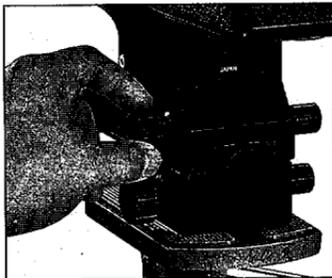
This Auto Bellows has two tripod sockets, one (U1/4 inches) for a bigger tripod and the other (U3/8 inches) for a regular-size tripod. The tripod seat should be positioned closer to the camera body, rather than in the center, to avoid camera movement.

## OPERATING EACH EXTENSION KNOB

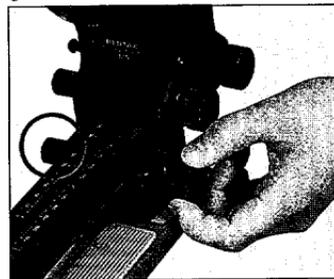
1



2



3



1. To adjust the bellows extension, first loosen the front board fastening knob on the left, then turn the front board extension knob on the right. After the adjustment, tighten the fastening knob.

2. The rear board can be moved in the same way as the front board.

3. As you loosen the tripod seat fastening knob and turn the tripod seat shift knob, the whole Auto Bellows moves back and forth. After moving it, be sure to tighten the fastening knob.

## CABLE RELEASE 30 AND INFRARED REMOTE RELEASE CORD 2P

1



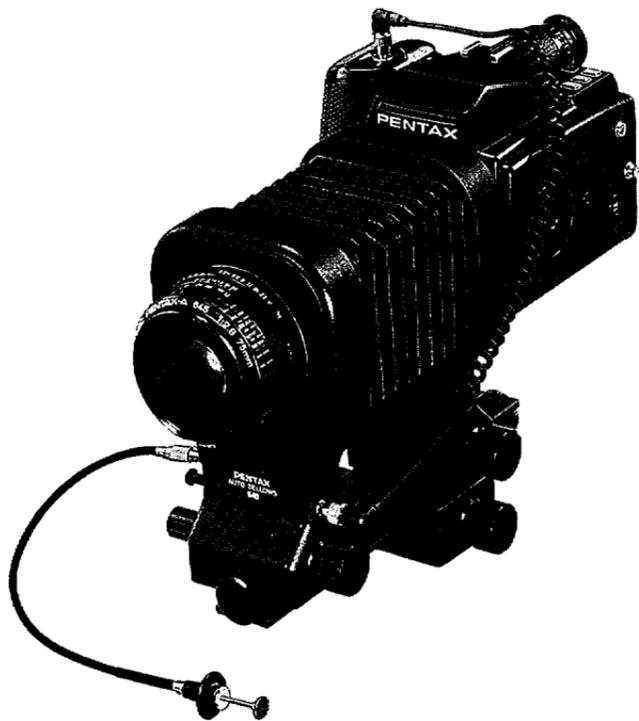
Using the Auto Bellows with the cable release and the infrared remote release cord combined enables the lens to stop down automatically in the instant of exposure.

1. The cable release is inserted into the socket with a red ring in the lower part of the front board. When shooting, keep depressing it until the shutter is completely released. When shooting at a slow shutter speed, it is advisable to use the locking device.

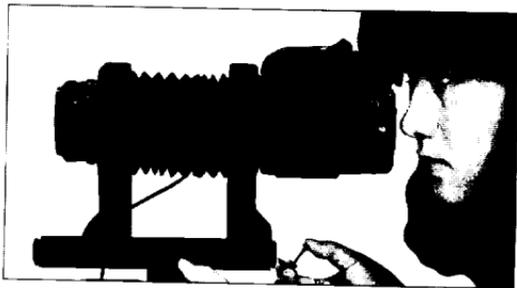
2



2. The infrared remote release cord is inserted into the electromagnetic release socket on the other lower part of the front board. The other end of the cord is inserted into the shutter button's cable release socket on the 645 camera. If the infrared remote release cord is disconnected, you cannot release the shutter with the cable release.



## FOCUSING



Focusing with the Auto Bellows can be done by first determining the magnification with the front board extension knob and then turning the tripod seat shift knob. It is also done by turning the front board extension knob or rear board extension knob, although the magnification varies. Which knob to use depends on the magnification. When the magnification is relatively low, it is better to use the front board

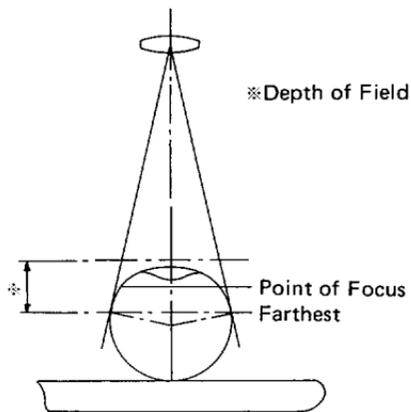
extension knob, and as the magnification becomes higher, it is convenient to use the tripod seat shift knob or the rear board extension knob.

- If the image magnification is higher than you desire, shorten the bellows. If, on the contrary, you extend the bellows, the magnification will become higher.

At higher magnifications, the microprism and split-image tend to become dark, making it difficult to focus. In this case, focus in the matte field.

Setting the film-to-subject distance beforehand by referring to the close-up tables (pages 19 through 29) will make it easier to focus.

- When shooting with the Auto Bellows, the distance scale and the depth-of-field scale on the lens cannot be used.

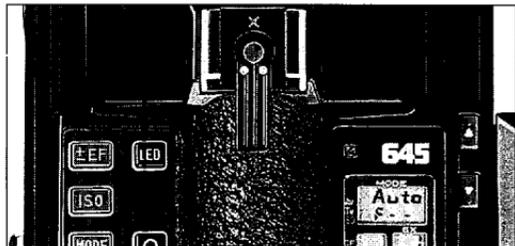


#### Depth-of-Field in Close-Up Photography

Depth-of-field becomes shallower as the lens-to-subject distance decreases. Even if the aperture of your standard lens is stopped down to the minimum  $f/22$ , sometimes it may not be possible to obtain the desired depth of field; it is necessary to be extremely careful in focusing. In close-up photography, the depth-of-field is the same in the foreground (lens side of the subject) and background (in back of the subject away from the lens). Therefore, it is advisable to focus on the intermediate point between the furthest and closest possible points of focus on your subject, as illustrated in the drawing on the left.

#### Position of Film Plane

There is no film plane indication on the Pentax 645 camera body. You can locate it approximately at the red mark on the top cover. If you know film-to-subject distance from the close-up tables, you can easily set this distance by measuring from the above-mentioned red mark to the subject, using a ruler.



## EXPOSURE MEASUREMENT

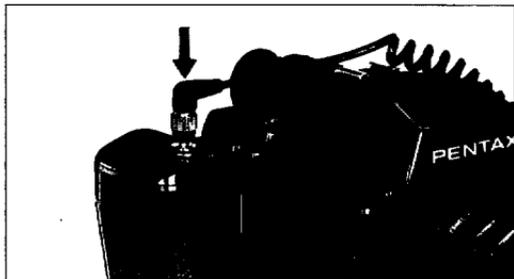
1



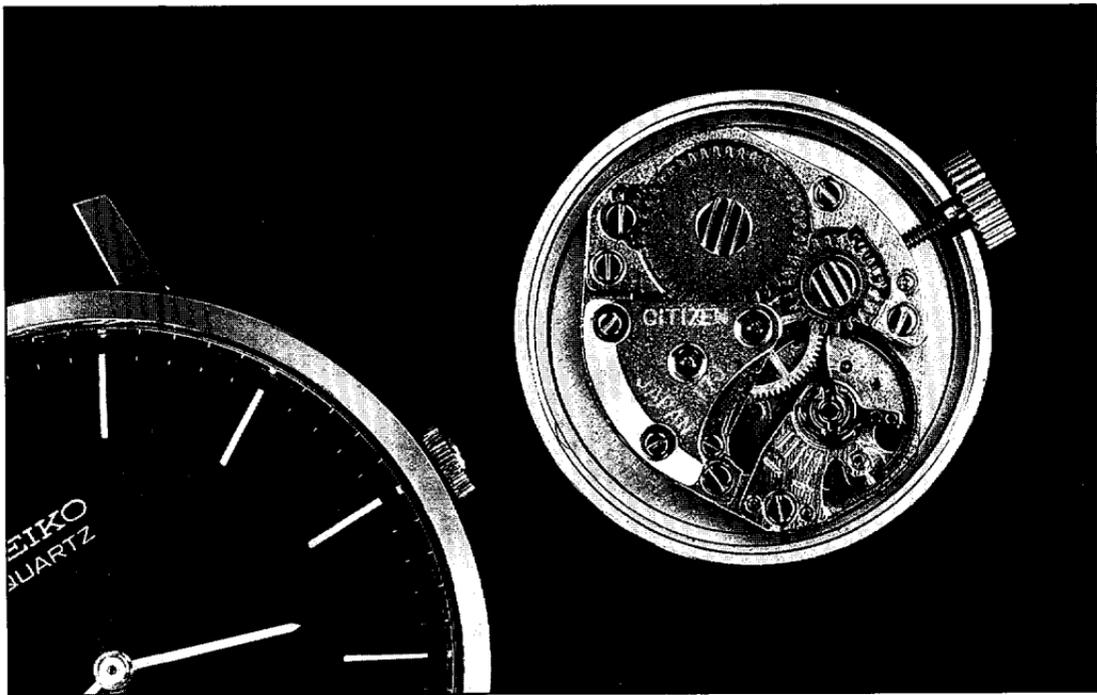
Measure the exposure by stop-down metering, and take close-up pictures with the camera set in the Aperture-Priority AE or Metered Manual mode.

- In the Aperture-Priority AE mode, you can take pictures after stopping down the lens with the cable release.
- In the Metered Manual mode, shoot after determining the exposure.
- If the cable release and the release cord are not near at hand, depress the shutter button with the lens closed down by pushing the stop-down knob.

2

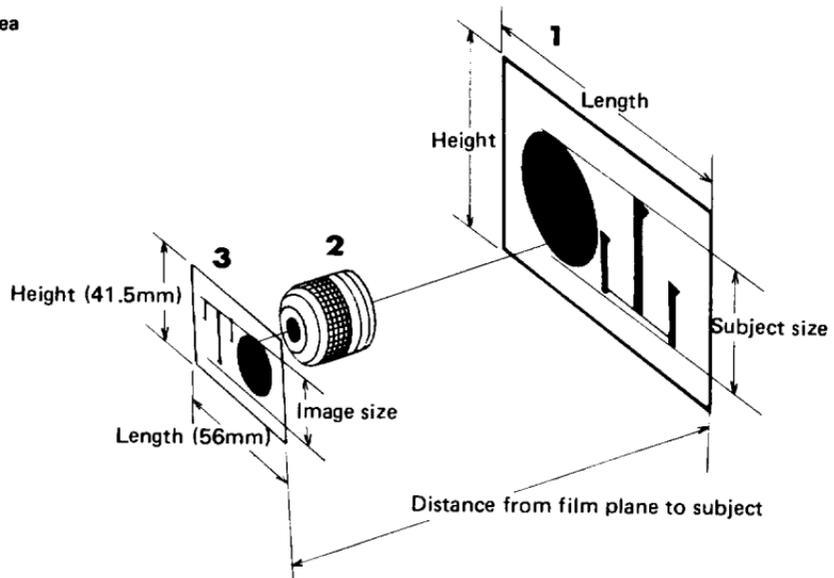


1. When measuring the light, stop down the lens after depressing the stop-down knob on the lower left of the front board and turning it to the right.
2. As illustrated above, slightly depress the shutter button by the plug to measure the light, and when the aperture and shutter speed are determined, return the lens to full aperture by turning the stop-down knob to the left. Then release the shutter with the cable release to take a picture.



# EXPLANATION OF CLOSEUP TABLES

1. Picture area
2. Lens
3. Film



### Magnifications

Magnifications =  $\frac{\text{Image size}}{\text{Subject size}} = \frac{\text{Height or length of film}}{\text{Height or length of picture area}}$ . Since film size is 41.5mm x

56mm, the above will be equal to:  $\frac{41.5\text{mm}}{\text{Height of picture area}}$  or  $\frac{56\text{mm}}{\text{Length of picture area}}$

### Exposure Factor

The farther the lens moves forward, the greater the distance between lens and film plane, and the less the amount of light reaching the film. This amount of light lost in normal photography is negligible, but it becomes a very important factor when using the Auto Bellows. The intensity of light is inversely proportional to the square of the distance, therefore exposure must be increased to compensate for the loss of light. This is called "exposure factor."

The Pentax 645 measures the intensity of light reaching the film, so it is no necessary to compensate for the exposure. But if there is extreme imbalance between black and white in a subject, do not forget to compensate for the exposure.

### Area to be Photographed

This is the subject area (measured as height x length) which completely fills the picture area on the film.

#### How to Read the Close-Up Tables

These tables may be used in three different ways, depending on whether you start with the magnification, picture area, or the lens-to-subject distance.

2 shows that the bellows in this case should be extended to 69mm.

Measure this distance with the scales when adjusting the position of the front board. Focus by turning the tripod seat shift knob.

#### When Starting with Magnification

When you want to photograph a subject of a certain size so that the image will be a particular size on the film, start by determining the magnification.

For example, if you want to take a photograph of a subject 50mm in size so that its size on the film will be 45mm, using a 75mm f/2.8 lens, the magnification will be  $45/50 = 0.9$ . Table

#### When Starting With Picture Area

When you want to photograph a particular subject area, first measure the size of the area. For example, if you want a subject measuring 52 x 70mm to completely fill the picture area of the film, using a 75mm f/2.8 lens, Table 2 shows that the bellows extension will have to be 61mm.

Again, use the scales to adjust the bellows extension, and the tripod seat shift knob for the focusing. If small changes in the size of the area to be photographed are permissible, focusing may also be achieved by shifting the camera and tripod back and forth a little, or the subject itself may be moved. Even adjustments to the rear board (by turning the rear board extension knob) are possible.

Remember that ordinary focusing (with the Focusing Ring of the lens) is rarely adopted when using bellows units.

#### Distance from Lens's Front End to Subject

Because the lens is brought closer to the subject when taking close-ups with higher magnifications, there is a danger of the shadows of the camera, bellows or lens falling on the subject, or of the front end of the lens hitting the subject. It is also necessary to know in advance if there is enough space between the lens and the subject. In such cases, refer to "Lens-to-Subject Distance" in the tables.

## CLOSE-UP TABLES (In Normal Position)



### Special Notes

- The Auto Bellows extends from 54mm to 180mm. The 645 lenses with the focal lengths from 55mm to 200mm are suitable for use with this Bellows.
- When taking close-ups, always set the aperture to  $f/8$  or a smaller  $f$ -stop. If an  $f$ -stop faster than  $f/8$  is used, image quality at the corners may deteriorate or slight vignetting may be caused.
- The "front end" of the lens in normal position means the "front end" or "surface" of the front lens element.  
When measuring the distance with a rule, be careful not to damage the surface of the lens element.

Table 1 A 645 55mm F2.8

(Distance scale set at  $\infty$ )

Magnification	Bellows Extension	Lens-to-Subject Distance	Film-to-Subject Distance	Picture Area (HeightxLength)	Exposure Factor
1.0	56mm	67mm	253mm	42 × 56mm	× 2.8
1.1	62	62	253	38 × 51	× 3.0
1.2	67	57	255	35 × 47	× 3.2
1.3	73	54	257	32 × 43	× 3.5
1.4	78	51	259	30 × 40	× 3.7
1.5	84	48	262	28 × 37	× 4.0
1.6	90	46	266	26 × 35	× 4.2
1.7	95	44	269	24 × 33	× 4.5
1.8	101	42	273	23 × 31	× 4.8
1.9	106	40	277	22 × 29	× 5.1
2.0	112	39	281	21 × 28	× 5.4
2.2	123	36	290	19 × 25	× 6.0
2.4	135	34	299	17 × 23	× 6.7
2.6	146	32	308	16 × 22	× 7.4
2.8	157	31	318	15 × 20	× 8.1
3.0	168	29	328	14 × 19	× 8.9
3.2	179	28	338	13 × 18	× 9.7

Table 2 A 645 75mm F2.8 · 645 LS 75mm F2.8

(Distance scale set at  $\infty$ )

Magnification	Bellows Extension	Lens-to-Subject Distance	Film-to-Subject Distance	Picture Area (Height x Length)	Exposure Factor
0.8	61mm	141mm	307mm	52 x 70mm	x 2.9
0.9	69	131	304	46 x 62	x 3.2
1.0	77	122	303	42 x 56	x 3.5
1.1	84	115	304	38 x 51	x 3.8
1.2	92	109	306	35 x 47	x 4.2
1.3	100	105	308	32 x 43	x 4.5
1.4	107	100	312	30 x 40	x 4.9
1.5	115	97	316	28 x 37	x 5.3
1.6	123	94	320	26 x 35	x 5.7
1.7	130	91	325	24 x 33	x 6.1
1.8	138	88	330	23 x 31	x 6.5
1.9	146	86	336	22 x 29	x 7.0
2.0	153	84	341	21 x 28	x 7.4
2.1	161	82	347	20 x 27	x 7.9
2.2	169	80	353	19 x 25	x 8.4
2.3	176	79	359	18 x 24	x 8.9

Table 3 645 LS 135mm F4

(Distance scale set at  $\infty$ )

Magnification	Bellows Extension	Lens-to-Subject Distance	Film-to-Subject Distance	Picture Area (HeightxLength)	Exposure Factor
0.5	67mm	398mm	602mm	83 × 112mm	× 2.7
0.6	81	353	571	69 × 93	× 3.1
0.7	94	321	552	59 × 80	× 3.6
0.8	108	297	541	52 × 70	× 4.0
0.9	121	278	536	46 × 62	× 4.6
1.0	135	263	535	42 × 56	× 5.1
1.1	148	251	536	38 × 51	× 5.7
1.2	162	240	539	35 × 47	× 6.3
1.3	175	232	544	32 × 43	× 7.0

Table 4 A645 150mm F3.5

(Distance scale set at  $\infty$ )

Magnification	Bellows Extension	Lens-to-Subject Distance	Film-to-Subject Distance	Picture Area (HeightxLength)	Exposure Factor
0.4	60mm	533mm	733mm	104 × 140mm	× 2.4
0.5	75	458	673	83 × 112	× 2.9
0.6	90	408	638	69 × 93	× 3.4
0.7	105	372	617	59 × 80	× 3.9
0.8	120	345	606	52 × 70	× 4.5
0.9	135	324	600	46 × 62	× 5.1
1.0	150	308	598	42 × 56	× 5.7
1.1	165	294	599	38 × 51	× 6.4
1.2	180	283	603	35 × 47	× 7.2

Table 5 A645 200mm F4

(Distance scale set at  $\infty$ )

Magnification	Bellows Extension	Lens-to-Subject Distance	Film-to-Subject Distance	Picture Area (HeightxLength)	Exposure Factor
0.3	60mm	879mm	1123mm	138 × 187mm	× 2.1
0.4	80	712	976	104 × 140	× 2.6
0.5	100	612	896	83 × 112	× 3.1
0.6	120	545	850	69 × 93	× 3.7
0.7	140	498	822	59 × 80	× 4.3
0.8	160	462	806	52 × 70	× 5.0
0.9	180	434	799	46 × 62	× 5.7

- For reasons of lens construction, the macro lens provides better close-up results as it is extended closer to the minimum focusing distance. When a close-up picture can be taken within the lens extension range, extend the lens as long as necessary.
- The table below indicates the data obtained when the lens is extended to each of its magnification scales with the Auto Bellows set at 54mm.

Table 6 A645 MACRO 120mm F4

(Distance scale set at  $\infty$ )

Magnification	Lens Extension	Lens-to-Subject Distance	Film-to-Subject Distance	Picture Area (Height x Length)	Exposure Factor
0.44	.	354mm	568mm	95 x 128mm	x 2.3
0.48	25	327	543	86 x 116	x 2.4
0.55	10	293	513	76 x 102	x 2.6
0.66	5	252	479	63 x 85	x 2.9
0.71	4	237	466	58 x 79	x 3.1
0.80	3	215	450	52 x 70	x 3.4
0.88	2.5	201	440	47 x 64	x 3.7
0.99	2	184	430	42 x 57	x 4.1
1.17	1.5	163	419	36 x 48	x 4.8
1.35	1.2	147	413	31 x 42	x 5.6
1.53	1	135	412	27 x 37	x 6.4

- The table below indicates the data obtained by extending the Auto Bellows with the lens distance scale set to a minimum (0.39m).
- When the lens is set to a wider opening, slight vignetting is caused, but when set to f/8, it is almost eliminated. When the bellows is extended to or near the maximum length, stop down the lens by another step.

Table 7 A645 MACRO 120mm F4

(Distance scale set to a minimum)

Magnification	Bellows Extension	Lens-to-Subject Distance	Film-to-Subject Distance	Picture Area (Height x Length)	Exposure Factor
1.6	61 mm	132 mm	416 mm	26 × 35 mm	× 6.8
1.7	71	129	422	24 × 33	× 7.4
1.8	81	125	429	23 × 31	× 8.0
1.9	92	122	436	22 × 29	× 8.6
2.0	102	120	444	21 × 28	× 9.3
2.1	112	117	452	20 × 27	× 10.0
2.2	122	115	460	19 × 25	× 10.7
2.3	132	113	468	18 × 24	× 11.5
2.4	142	111	476	17 × 23	× 12.2
2.5	153	110	485	17 × 22	× 13.0
2.6	163	108	493	16 × 22	× 13.8
2.7	173	106	502	15 × 21	× 14.7

## LENS-REVERSED MACROPHOTOGRAPHY



To obtain higher-than-life-size magnifications, mount the reversed lens to the Auto Bellows with the Reverse Adapter 645 and the Reverse Attachment 645 combined.

- Lenses, the close-up tables of which are not shown in this manual, are unsuitable for use in reverse position.

The Reverse Adapter 645 is the auxiliary ring which enables you to use a 645 lens (58mm filter size) in reverse position – on the Auto Bellows in this case.

The Reverse Attachment 645 is attached to the reversed lens mount to make the stop-down mechanism workable, and its 58mm front thread accepts a filter. It also serves as a lens hood.

Table 8 A 645 55mm F2.8 (In Reverse Position)

(Distance scale set at  $\infty$ )

Magnification	Bellows Extension	Lens-to-Subject Distance	Film-to-Subject Distance	Picture Area (HeightxLength)	Exposure Factor
2.2	59mm	92mm	290mm	19x25mm	x 8.2
2.4	70	89	299	17x23	x 9.4
2.6	82	88	308	16x22	x 10.6
2.8	93	86	318	15x20	x 12.0
3.0	104	85	328	14x19	x 13.4
3.2	115	84	338	13x18	x 14.9
3.4	126	83	348	12x16	x 16.5
3.6	138	82	358	12x16	x 18.2
3.8	149	81	369	11x15	x 19.9
4.0	160	80	379	10x14	x 21.7
4.2	171	79	390	10x13	x 23.6
4.3	177	79	395	10x13	x 24.6

Table 9 A645 75mm F2.8 (In Reverse Position)

(Distance scale set at  $\infty$ )

Magnification	Bellows Extension	Lens-to-Subject Distance	Film-to-Subject Distance	Picture Area (HeightxLength)	Exposure Factor
1.2	60mm	130mm	306mm	35 × 47mm	× 4.3
1.3	67	125	308	32 × 43	× 4.7
1.4	75	121	312	30 × 40	× 5.1
1.5	83	117	316	28 × 37	× 5.6
1.6	90	114	320	26 × 35	× 6.1
1.7	98	111	325	24 × 33	× 6.6
1.8	106	109	330	23 × 31	× 7.1
1.9	113	106	336	22 × 29	× 7.6
2.0	121	104	341	21 × 28	× 8.2
2.1	129	103	347	20 × 27	× 8.8
2.2	136	101	353	19 × 25	× 9.4
2.3	144	99	359	18 × 24	× 10.0
2.4	152	98	366	17 × 23	× 10.7
2.5	159	97	372	17 × 22	× 11.3
2.6	167	96	379	16 × 22	× 12.0
2.7	175	94	385	15 × 21	× 12.7

Table 10 645 LS 75mm F2.8 (In Reverse Position)

(Distance scale set at  $\infty$ )

Magnification	Bellows Extension	Lens-to-Subject Distance	Film-to-Subject Distance	Picture Area (HeightxLength)	Exposure Factor
1.3	55mm	125mm	308mm	32x43mm	x 4.7
1.4	63	121	312	30x40	x 5.1
1.5	71	117	316	28x37	x 5.6
1.6	78	114	320	26x35	x 6.1
1.7	86	111	325	24x33	x 6.6
1.8	94	109	330	23x31	x 7.1
1.9	101	106	336	22x29	x 7.6
2.0	109	104	341	21x28	x 8.2
2.1	117	103	347	20x27	x 8.8
2.2	124	101	353	19x25	x 9.4
2.3	132	99	359	18x24	x 10.0
2.4	140	98	366	17x23	x 10.7
2.5	147	97	372	17x22	x 11.3
2.6	155	96	379	16x22	x 12.0
2.7	163	94	385	15x21	x 12.7
2.8	170	93	392	15x20	x 13.4
2.9	178	93	399	14x19	x 14.2



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