

The **PENTAX** Bellows

Overlooked Underused Elegant



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Murray O'Neill

The Pentax Bellows, “Overlooked, Underused and Elegant”

Murray O’Neill

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Cover Photograph: Variegated Miniature Carnation, Pentax Auto Bellows Unit A, with SMC Pentax Bellows 100mm F4.0 lens, Pentax K3 camera, Pentax Extension Tube K #1, StackShot Macro Focusing Rail.

Back Cover Photograph: White Miniature Carnation, Pentax Auto Bellows Unit A, with SMC Pentax Bellows 100mm F4.0 lens, Pentax K3 camera, Pentax Extension Tube K #1, StackShot Macro Focusing Rail.

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Introduction

Pentax made more bellows models than any other camera manufacturer and judging by the number of used units available today they also produced the greatest number of units. The Pentax Bellows units were made in a number of different models with screw mounts (42mm) and “K” mounts, some models were produced in different versions. Three 100mm F4.0 dedicated lenses were specifically made for them. The Bellows-Takumar 100mm F4.0, the SMC Bellows-Takumar 100mm F4.0, both are manual “pre-set” lenses, and the SMC Pentax Bellows 100mm F4.0 lens which has an automatic diaphragm. These lenses do not have a focusing helicoid and are only usable with a bellows unit. With the bellows units not extended, and no extension tubes, these lenses will focus at infinity.

With the advent of Focus Stacking¹, this provides us a view of subjects that we were never able to record photographically before, we are now able to see macro subjects in a new and incredibly detailed way. Focus stacking software, as discussed below, is the combining of multiple images taken at different focus points and blending them into a single image, providing incredible depth of field (DOF). This is physically impossible with conventional photographic equipment and techniques.

Combining and blending multiple images, with as many as hundreds of images, but more often with less than one hundred and can be less than fifty. This method is not a problem with software such as Adobe Photoshop², Helicon Focus³ and Zerene Stacker⁴ and others.

With the improvement of image quality utilizing focus stacking and advanced software there has been a slow resurgence in macro photography. While macro photography can be accomplished with just a normal macro lens, magnification of subjects at greater than life size requires extension tubes or the sophistication and precision of the bellows unit.

Over the years Pentax have made a number of bellows units, some totally manual and others as “Auto” Bellows, whereby viewing is at open aperture and just prior to exposure the lens is stopped down by a cable release. During the most of the period of their manufacture “auto” focus was beyond the visible horizon and none would be considered “auto” by today’s standards. They did not pass aperture information back and forth between the camera body and lens and therefore did not allow open aperture exposure metering.

¹ https://en.wikipedia.org/?title=Focus_stacking

² <http://www.adobe.com/ca/products/photoshopfamily.html>

³ <http://www.heliconsoft.com/heliconsoft-products/helicon-focus/>

⁴ <http://www.zereneystems.com/cms/stacker>

History

The “35mm” **Pentax Bellows Units** were produced between the 1960 and approximately 1989. There were eight model designations, but there were actually ten different units, with the Bellows Unit II being produced in two completely different variations, and two very similar Auto Bellows K Units with only a slight variation in the lens board cable release connection see Figure 2.1. The Bellows Unit III also had a minor production change as shown in Figures 2.12 and 2.13. The two **Medium Format Pentax Auto Bellows Units** were sold between 1969 and 2009, with the **Asahi Pentax 6x7 Auto Bellows** having the longest run, starting in 1969 and the **Pentax Auto Bellows 645** starting in 1984, with both ending in approximately 2009.

Approximate Production Periods

Screw Mount Bellows Units

Pentax Bellows Unit I, (Screw Mount, M42) w/single round rail	1960 -1973
Pentax Bellows Unit II, First Production, (Screw Mount, M42) with Dual (round) Rails	1960 -1973
Pentax Bellows Unit II, Second Production, (Screw Mount, M42) with single “X” Rail	1974 -1975
Pentax Auto Bellows Unit, (Screw Mount M42)	1960 -1974

K Mount Bellows Units

Pentax Auto Bellows Unit K, First Production, (K mount) w/single function cable release socket	1975 - 1976
Pentax Auto Bellows Unit K, Second Production, (K Mount) w/three function cable release socket	1976 - 1977
Pentax Bellows Unit K (K Mount)	1975 - 1977
Pentax Auto Bellows Unit M (K Mount)	1977 - 1984
Pentax Bellows Unit III (K Mount)	1977 - 1984
Pentax Auto Bellows Unit A (K Mount)	1984 – 1989

Approximate Production Periods

Pentax Medium Format Bellows Units

Pentax Auto Bellows 645 (645 Mount)

1984 -2009

Pentax Auto Bellows 6x7 (6x7, 67 Mount)

1969 -2009

Screw Mount (M42) Bellows Units

There were three screw mount bellows as illustrated in an Asahi Pentax sales brochure circa 1960 (shown below). The Bellows I, the (early) Bellows II and the Auto Bellows were all marketed at the same time as a good, better, best offering.

Figure 1.0

ASAHI PENTAX

ASAHI PENTAX

Lenses & Accessories - Complete System of Photography

AUTO EXTENSION TUBE SET
New extension tube set of 3 rings, 9.5mm (#1), 19mm (#2) and 28.5mm (#3), with coupled automatic diaphragm release pins. Mounted singly or in combination between an Asahi Pentax and a 50mm automatic diaphragm lens, this set of Auto Extension Tubes permits focusing at magnification from 1.17x to 0.17 and operation of the automatic diaphragm.

BELLOWS UNIT I
Extremely flexible for ultra-close-up photography, the Bellows Unit I permits use of the camera's own lens. Provided with a special precision-calibrated gear shaft for reading, continuous magnification from 0.62 to 2.45 with the standard 55mm Super-Takumar lens.

SLIDE COPIER
Here is a real copying ease for duplicating slides. Slide stage raises or lowers for precise positioning, and a separate set of bellows shuts out all light between the slide and the lens, preventing lens flare from the light source. Used with Bellows Unit II.

BELLOWS UNIT II
This dual-track unit provides maximum stability, outstanding design and rugged reliability. With precise, firm control, it may be locked in any position. Has an oversized focusing knob for increased sensitivity and ease of focusing. 3.2x magnification at maximum extension with the standard 55mm Super-Takumar lens.

AUTO-BELLOWS & SLIDE COPIER
The Asahi Pentax Auto-Bellows is a highly flexible close-up and macro-photographic instrument. The bellows extension is longer than the extension of the standard Bellows Unit. The Auto-Bellows is more versatile. With the double cable release supplied with the Auto-Bellows, you release the shutter and activate the automatic diaphragm simultaneously if you use a fully-automatic diaphragm lens. With its lens reverse system, you can use a lens in reversed position for higher macro resolution.

The geared rail of the Auto-Bellows is meticulously engineered with high precision. The freely movable tripod seat underneath the rail rod maintains the whole equipment on tripod in complete balance. Micro-action extension knobs are equipped on the camera body and lens sides for precise bellows extension.

The Slide Copier attaches to the front end of the Auto-Bellows for easy duplication of colour films.

With the Bellows-Takumar 100mm f/4 lens, you can photograph from 1.32x magnification to infinity (∞). You can easily obtain high magnification with a 28mm to 35mm lens. By adding the standard Bellows Unit or Extension Tubes to the front or back of the Auto-Bellows, you can reach 10x to 20x magnification.

The Asahi Pentax Auto-Bellows is a precisely designed close-up and macro equipment for professional photographers, research workers, scientists and specialists in close-up and macro works.

The **Asahi Pentax Bellows I**, or “Honeywell Pentax Bellows Unit”, as the North American packaging is labeled, or sometimes simply called the “Asahi Pentax Bellows Unit I”. It is a simple, basic, very compact bellows unit which can be purchased inexpensively.

It accommodates 42mm screw mount bodies and lenses, or K mount bodies with an adaptor. The scale rod is inscribed with magnification indicators. This bellows allows for a magnification from 0.62 to 2.45 times life size with a 55mm Lens. It does not support automatic diaphragm operation.

This bellows unit is well-made and suitable for casual macro work. While it has a ¼-20 threaded mounting hole on the bottom, the design of the mounting pad does not provide a firm base for tripod mounting, having only a 9.5mm (3/8 inch) wide base. Unless you are using a flash, macro work almost always requires a solid support. Without modification it would be advisable to mount the camera body, rather than the bellows on a tripod.

If you are using an Arca-Swiss⁵ compatible quick release system on your tripod, the addition of a multi-purpose rail with an ant-twist flange, mounted on the bellows would create a stronger mount and will allow you to properly balance your equipment on the tripod head. The MPR-113 (4.45 inches long) and the MPR-C flange, by Really Right Stuff⁶, as shown in Figure 1.3, or a P20 or P30 lens plate by Wimberley⁷ also with an “RRS” MPR-C flange for bracing, on the front side of the mount would be a good choice,

It is important to know that the camera body attachment component of the bellows is not removable, therefore when using a digital body with a **Pentax Mount Adaptor K**; it is not possible to screw the body onto the bellows as the prism housing and the grip protrusion do not have enough clearance to allow this. Deploying a short, non-auto, extension tube solves this, and if left on the bellows, gives you the advantage of a semi-permanent K mount conversion, avoiding the finicky task of having to remove the adaptor when finished.

While not removable, the camera mount can still be rotated within the bellows housing, allowing the body to be changed to vertical orientation, but as indicated above, this would require using an extension tube and tripod mounting combination, using the bellows mounting point on the tripod, again as illustrated in Figure 1.3.

In my opinion the Asahi Pentax Bellows Unit I is too light for heavier lenses and would only be suitable for lenses in the 50mm or shorter range or when using the light weight, 100mm F4.0 Bellows-Takumar. It would be a good “starter” bellows to determine if you want to invest in a more advanced unit.

⁵ <https://photographylife.com/arca-swiss-quick-release-system>

⁶ http://www.reallyrightstuff.com/Shop/Multi-Purpose-Rails-Packages_2/MPR-113-113mm-rail.html

⁷ <http://www.tripodhead.com/products/lens-plates-specs.cfm>

Figure 1.1



Asahi Pentax Bellows Unit I

Figure 1.2



Asahi Pentax Bellows Unit I

Figure 1.3



Asahi Pentax Bellows Unit I with SMC Macro-Takumar 50mm F4.0 lens, Pentax K3 Body, Mount Adaptor K, Extension Tube K (#1), and larger MPR-192 Multi-purpose rail with MPR-C Ant-twist Flange

The **Asahi Pentax Bellows II (First production)**, packaged in the USA and Mexico as the “Honeywell Pentax Bellows Unit II”, is a well built, robust and versatile bellows unit. Unlike the Asahi Bellows Unit I, it can be fitted with the Pentax Slide Copier attachment.

With the two extension rail construction, this bellows unit is ridged, stable and operates smoothly. With the bellows compressed, the lens extension is at 37mm, which is about the same as using a #1 and #3 extension tube. The maximum extension adjustment of the bellows is from 37mm to 180mm, and would give a magnification from 1 to 3 times life size with the “standard” 55mm lens. The front lens mounting board runs out very smoothly with a geared drive knob with a locking knob on the opposite side. The rear body mounting board is also moveable. By releasing a clamping lever, it will move forward and backward manually. This is not geared, with friction providing a smooth and easily adjustable movement. This bellows does not support automatic diaphragm operation.

The Camera Body Connector Ring is removable and is the easiest way to mount the camera body. Note that K mount camera bodies would require a Pentax Mount Adaptor K. The camera mount can be rotated within the rear board, allowing the camera body to be changed to vertical orientation. However the prism and grip protrusion on new digital bodies will not allow this unless a short (#1) extension tube is used to position the body further out to clear the rear board.

Leaving a short, non-auto, extension tube fitted with a **Pentax Mount Adaptor K** on the bellows gives you the advantage of a semi-permanent K mount conversion and avoids the finicky task of removing the adaptor from the body every time when you are finished using the bellows.

The tripod mounting surface is adequate, is attached to the rear (movable) board and is tapped with a single ¼-20 hole. There is also a ¼-20 tapped mounting hole in the forward end of the bellows. When using an Arca-Swiss⁸ compatible quick release on your tripod, there is an advantage to having a longer mounting surface to allow better positioning of the equipment on the tripod for balance. Using the P40 or P30 Wimberley⁹ lens plates with integral anti-twist tabs would be a good choice, as they are long enough to attain good balance.

The dual rails are marked with reference points for the “standard” 55mm Lens, clearly shown in Figure 1.4. There were five 55mm lenses made; the Takumar 55mm F2.2, Auto-Takumar 55mm F2.2, Auto-Takumar 55mm F1.9, SMC Super Auto-Takumar 55mm F2.0 and the more popular SMC Super Auto-Takumar 55mm F1.8.

This bellows can easily handle the extra weight and the longer length of lenses up to 150mm or even a 200mm F4.0.

⁸ <https://photographylife.com/arca-swiss-quick-release-system>

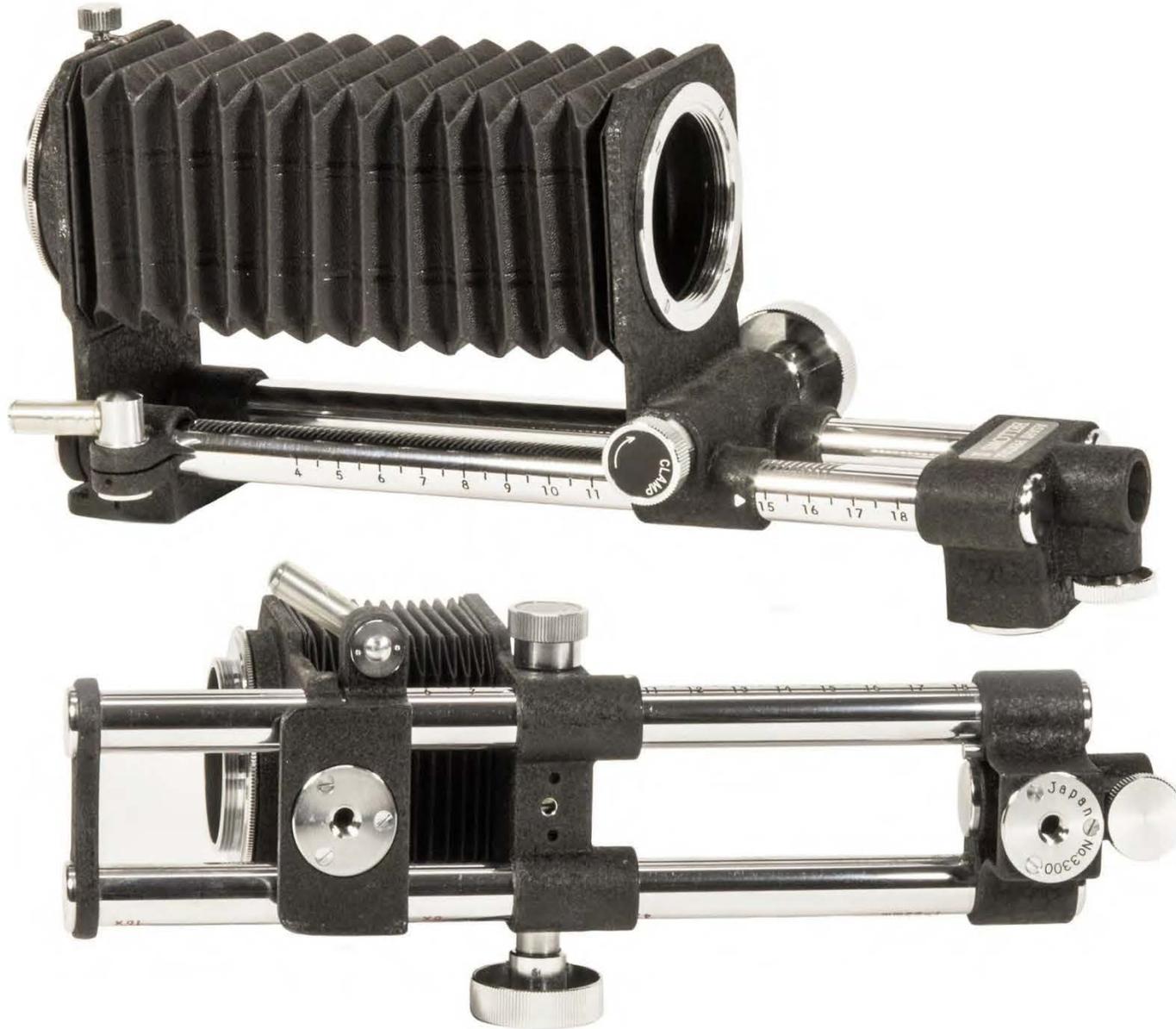
⁹ <http://www.tripodhead.com/products/lens-plates-main.cfm>

Figure 1.4



Asahi Pentax Bellows Unit II (Early Production)

Figure 1.5



Asahi Pentax Bellows Unit II (Early Production)

Figure 1.6



Asahi Pentax Bellows Unit II (Early Production) with an SMC Bellows-Takumar 100mm F4.0 lens, Pentax K3 Body, Mount Adaptor K, Extension Tube K (#1) and a Wimberley P30 lens plate with integral anti-twist tabs

The **Asahi Pentax Bellows II (Late production)**: This bellows is a much different design than the earlier “**Asahi Pentax Bellows Unit II**”, with its’ dual focusing rails. I could not find this model advertised in any sales literature. This is a scaled down, economical, version of the excellent **Asahi Pentax Auto Bellows**¹⁰, but with fewer features. It does not support automatic diaphragm operation, but it is still an excellent piece of macro field equipment. It is well designed and built, compact, light, strong, with nylon (bearing) blocks on moving parts, and it is simple to use. The rear (camera) mounting board does not have nylon bearings, but is movable and locked by a lever as shown in Figure 1.8. All moving parts operate smoothly and are precise.

This bellows unit utilizes the same single, strong “X” rail design as the **Asahi Pentax Auto Bellows** Unit and similarly incorporates a tripod mounting block that can be positioned along the bottom of the X rail to properly balance your camera/bellows/lens combination. This mounting block is not geared, as the Auto Bellows is, but the friction of the nylon bearing provides a smooth and easily adjustable placement along the bottom of the focusing rail, the rear board does not have a nylon bearing block, nor is it geared, but is moveable.

The Camera Body Connector Ring (bellows to camera) is removable and doing so is the easiest way to mount the camera body. K mount camera bodies would require a **Pentax Mount Adaptor K**. The camera mount can be rotated, within the rear board allowing the camera body to be changed to vertical orientation, however the prism and grip protrusion on new digital bodies will not allow this unless a short (#1) extension tube is used to position the body further out to clear the rear board.

Leaving a short, non-auto, extension tube fitted with a **Pentax Mount Adaptor K** on the bellows gives you the advantage of a semi-permanent K mount conversion and avoids the finicky task of removing the adaptor from the body every time when you are finished using the bellows.

The tripod mounting surface is generous, and the single ¼-20 hole is located on the movable mounting block. When using an Arca-Swiss¹¹ compatible quick release on your tripod there is not an advantage to having a mounting plate with a longer mounting surface as the tripod mounting block is moveable for balance. There is an advantage to using a bi-directional mounting plate such as the B6 made by Really Right Stuff¹². This plate has an ant-twist shoulder and allows mounting in a quick release clamp in either front to back, or sideways orientation. This allows some versatility if using an additional focusing rail.

The single X rail is marked in single millimeter increments to 135mm. This bellows can easily handle the extra weight and longer length of lenses up to 150mm, or even a 200mm F4.0. As auto diaphragm is not supported, mating this bellows to the 100mm Bellows-Takumar lens, with its pre-set operation, would be an excellent choice.

¹⁰ See comparison between these two models in **Figure 1.7**

¹¹ <https://photographylife.com/arca-swiss-quick-release-system>

¹² <http://www.reallyrightstuff.com/Shop/Mamiya-6/B6-Bidirectional-plate-with-one-1-4-20-screw.html>

Figure 1.7



Asahi Pentax Auto Bellows

Asahi Pentax Bellows II (Late Production)

Figure 1.8



Asahi Pentax Bellows Unit II (Late Production)

Figure 1.9



Asahi Pentax Bellows Unit II (Late Production)

Figure 1.10



Asahi Pentax Bellows Unit II (Late Production) with SMC Bellows-Takumar 100mm F4.0 Lens and Pentax K3 Body, using Mount Adaptor K and Pentax Extension Tube K (#2) for additional extension.

The **Asahi Pentax Auto Bellows** or “Honeywell Pentax Auto Bellows Unit” is one of the most commonly available of the Pentax bellows units. Most of the packaging in the USA and Mexico is labeled “Honeywell Pentax Auto Bellows Unit”, and this bellows is sometimes referred to as a “Model 7095” because of the prominent catalogue number on the Honeywell packaging. This bellows unit is robust and versatile, highly flexible, well designed and built. It can be used with the **Pentax Slide Copier** attachment, Figure 3.1.

This auto bellows unit utilizes a strong, well-engineered single “X” rail. It also incorporates a geared tripod mounting block that can be positioned along the bottom of the X rail to properly balance your camera/bellows/lens combination. The operation of the bellows unit is smooth, with front lens board, rear camera board, and movable tripod seat gear operated with micro-action control knobs. It uses nylon blocks as bearing surfaces. All three movement operations are precise, allow no creep, and have a locking knob on the opposite side to the control knobs.

The minimum extension at 39mm is roughly equivalent to the combination of a number #1 and #3 extension tube, and to a maximum extension of 170mm. With a 50mm standard lens in reverse mount, you can attain from 1.10 to 3.26 times life size. Mounting a lens in reverse requires the front lens board be taken off the X rail and re-installed facing backward or using a reverse adaptor, see Figure 3.15

Seeing that the rear camera board does not pass aperture information back and forth between the lens and the body, additional extension tubes can be used to attain even higher magnifications. The non-auto **Pentax Extension Tube Set K** can be used with the **Mount Adaptor K** on the rear board, while on the screw mount lens board the **Auto Extension Tube Set (M42)** can be used allowing automatic diaphragm operation with the dual cable release.

This bellows unit supports automatic diaphragm operation with a dual cable release, where the first cable stops the lens aperture down before the second triggers the camera. This dual cable operation is not usable with the modern bodies that are electronically activated, unless you are fortunate enough to have an adaptor made by a company named Rowi which is no longer in business. This adaptor combines a male 2.5mm Stereo plug, shown in Figure 3.17, which is actuated with a female cable release socket. Another solution is illustrated starting on page 61.

An additional feature of this bellows is that there are two metal extension scales, one for 50mm lenses and one for 55mm lenses that attach to magnetized pads on the top of the front and rear boards and shows the magnification. See Figure 1.13.

The Camera Body Connector Ring is removable from the bellows, and doing so is the easiest way to mount the camera body. K mount camera bodies require a **Pentax Mount Adaptor K**. The camera mount can be rotated, within the rear board allowing the camera body to be changed to vertical orientation. With modern digital bodies the bulkier body will not allow this unless a short (#1) extension tube is used to position the body further out to clear the rear board.

Leaving a short, non-auto, extension tube fitted with a **Pentax Mount Adaptor K** on the bellows gives you the advantage of a semi-permanent K mount conversion and avoids the finicky task of removing the adaptor from the body every time the bellows is removed.

By filing a small groove in the knurled ring of the Camera Body Extension ring,¹³ you can utilize the locking pin on the extension tube to create a solid connection between the three components. Now the extension tube, with the **Pentax Mount Adaptor K** will not unscrew when rotating the camera body.

The tripod mounting surface is generous, with the single ¼-20 hole is located on the movable mounting block. When using an Arca-Swiss¹⁴ compatible quick release on your tripod there is no advantage to having a mounting plate with a longer mounting surface, as the tripod mounting block is moveable for balance.

There is however an advantage to using a bi-directional mounting plates such as the B6 made by Really Right Stuff¹⁵. This mounting plate has an anti-twist shoulder and allows mounting either front to back in the quick release clamp. Or in a sideways orientation, which is an advantage when using an additional focusing rail. The **Pentax Focusing Rail** is discontinued, but is sometimes available on eBay; Really Right Stuff¹⁶, Kirk Enterprises¹⁷ Novoflex¹⁸ and Hejnar¹⁹ currently supply products for this application. The ultimate solution is a computer operated focussing rail with a stepping motor made by Cognisys²⁰. See Figure 5.4 on page 87

This robust bellows can easily handle the extra weight and longer length of Takumar screw mount lenses up to 150mm, 200mm F4.0 or even the 300mm F4.0.

¹³ See illustration Figure 3.09

¹⁴ <https://photographylife.com/arca-swiss-quick-release-system>

¹⁵ <http://www.reallyrightstuff.com/Shop/Mamiya-6/B6-Bidirectional-plate-with-one-1-4-20-screw.html>

¹⁶ <http://www.reallyrightstuff.com/Be-a-Gear-Expert/Macro-Closeup-Shooting/?search=B150B>

¹⁷ <http://www.kirkphoto.com/search.php?Keyword=focusing+rail&x=0&y=0>

¹⁸ <http://www.novoflex.com/en/products/macro-accessories/focusing-racks/>

¹⁹ <http://stores.ebay.com/Hejnar-Photo?dmd=2&nkw=Macro+stage>

²⁰ <https://www.cognisys-inc.com/products/stackshot/stackshot.php>

Figure 1.11



Asahi Pentax Auto Bellows

Figure 1.12



Asahi Pentax Auto Bellows

Figure 1.13



Asahi Pentax Auto Bellows with SMC Macro-Takumar 50mm F4.0 Lens, using an Auto Extension Tube (M42 #3), Pentax K3 Body, Pentax Mount Adaptor K with Extension Tube K (#1) and Dual Cable Release using Rowi 2.5mm Stereo Plug adaptor

K Mount Bellows Units

In an early sales brochure for Pentax K Series Lenses and Accessories, circa 1976, the new **Pentax Auto Bellows K** is shown with its “little brother” the **Pentax Bellows Unit K**.

Figure 2.0



The **Asahi Pentax Auto Bellows K**: This bellows unit utilizes the same design as the earlier screw mount unit, is well designed and built, highly flexible, and is a robust bellows unit. It can also be used with the **Pentax Slide Copier K**, which is a re-labeled version of the earlier slide copier. While the front lens board is different between the early and late productions, the physical size and function is identical, other than the difference in the cable release socket. This auto bellows unit utilizes a single, well-engineered, strong “X” rail; it also incorporates a geared tripod mounting block that can be positioned along the bottom of the X rail to properly balance your camera/bellows/lens combination.

The operation of the bellows unit is smooth, with the front lens board, the rear camera body board, and the movable tripod seat, gear operated with micro-action control knobs. , All three movement operations are precise, allow no creep, and have a locking knob on the opposite side to the control knob. The movements are quiet as the moving control surfaces utilize nylon bearing blocks.

This bellows unit supports automatic diaphragm operation with a dual cable release; the first cable stops the lens aperture down before the second triggers the camera. This dual cable operation is not usable with the modern bodies that are electronically activated, unless you are fortunate enough to have an adaptor made by a company named Rowi which is no longer in business. This adaptor combines a male 2.5mm Stereo plug which is actuated with a female cable release socket.

There were two versions manufactured, the early production was essentially a “Pentax Auto Bellows Unit” with K mounts instead of instead of screw mounts. The later production has an upgraded, three function, lens board cable release socket. The differences in the cable socket are illustrated below.

Figure 2.1



One is single function similar to the earlier Auto Bellows, where it is a simple cable release socket.



The other is a three function cable release socket, where the cable release can be normally connected, or it can be used as a manual plunger to stop down the lens aperture, and additionally can be pushed in and twisted to lock the stop down of the aperture.

With the later production unit the aperture stop down can be accomplished manually as detailed in the second picture above.

The minimum extension at 38mm, roughly equivalent to a combined number #1 and #3 extension tube. The maximum extension is 170mm. With a 55mm lens in reverse mount you can achieve 2.7 times magnification and the 28mm lens will attain 6.2 times life size. Mounting a lens in reverse requires that the front lens board be taken off the X rail and re-installed facing backward or by using the Pentax Reverse Adaptor K 49mm or 52mm. See Figure 3.15 Additional extension tubes can be used to attain even higher magnifications.

As the rear camera board does not pass aperture information back and forth with the front lens board, the non-auto **Pentax Extension Tube Set K** or the variable **Pentax Helicoid Extension Tube K** can be used on the camera body. Using a **Pentax Auto Extension Tube K** on the lens board will allow stopping down of the aperture using the cable release socket.

Removing the Camera Body Connector Ring is the easiest way to mount the camera body. The camera mount can be rotated, within the rear board allowing the camera body to be changed to vertical orientation, however the physical dimensions on new digital bodies will conflict with the rear board unless a short (#1) extension tube is used to re-position the body back to clear the board.

The tripod mounting surface is generous, with a single ¼-20 hole located on the movable mounting block. When using an Arca-Swiss²¹ compatible quick release, there is no advantage to having a mounting plate with a longer mounting surface, as the tripod mounting block is moveable for balance. Therefore it would be appropriate to use a bi-directional mounting plate such as the B6 by Really Right Stuff²². This mounting plate has an ant-twist shoulder and allows mounting either front to back in a quick release clamp, or sideways orientation, which is an advantage when using an additional focusing rail. The **Pentax Focusing Rail** is discontinued but is sometimes available on eBay, but Really Right Stuff²³, Kirk Enterprises²⁴ Novoflex²⁵ and Hejnar²⁶ currently supply products for this application and the ultimate solution is a computer operated focussing rail with a stepping motor made by Cognisys²⁷. See Figure 5.4 on page 87.

The Pentax Auto Bellows K comes with two metal extension/magnification scales, one for 50mm lenses and one for 55mm lenses that attach to magnetized pads on the top of the front and rear boards and this robust bellows can easily handle the extra weight and longer length of lenses up to 150mm, 200mm or even a 300mm F4.0.

²¹ <https://photographylife.com/arca-swiss-quick-release-system>

²² <http://www.reallyrightstuff.com/Shop/Mamiya-6/B6-Bidirectional-plate-with-one-1-4-20-screw.html>

²³ <http://www.reallyrightstuff.com/Be-a-Gear-Expert/Macro-Closeup-Shooting/?search=B150B>

²⁴ <http://www.kirkphoto.com/search.php?Keyword=focusing+rail&x=0&y=0>

²⁵ <http://www.novoflex.com/en/products/macro-accessories/focusing-racks/>

²⁶ http://stores.ebay.com/Hejnar-Photo?_dmd=2&_nkw=Macro+stage

²⁷ <https://www.cognisys-inc.com/products/stackshot/stackshot.php>

Figure 2.2



Asahi Pentax Auto Bellows K (Late Production)

Figure 2.3



Asahi Pentax Auto Bellows K (Late production)

Figure 2.4



Asahi Pentax Auto Bellows K (Late production) with the SMC Pentax Bellows 100mm F4.0 Lens, K3 Body and Extension Tube K (#1) with Dual Cable Release using Rowi 2.5mm Stereo Plug to Cable Release Adaptor.

The **Asahi Pentax Bellows Unit K**, like the late production **Asahi Pentax Bellows II**, is a scaled down, economy, version of the **Asahi Pentax Auto Bellows K**, with fewer features. It is almost identical in design with the late production Bellows II, but with K mount front and rear boards. It does not support automatic diaphragm operation, nor does it connect to the Slide Copier K. The set screw for the Bellows-to-Camera Mount Ring has been moved to the side of the Rear Camera Mount Board and the removable Camera Mount Ring is not interchangeable between Bellows K and the late production Bellows Unit II, as the diameters are different (Figure 3.7).

During my research I found more than a couple of instances where the inner packaging (fitted box) was stamped Bellows II. This should not be confused as being another name for the **Pentax Bellows Unit K**, as the **Pentax Bellows Unit II** (late production) was completely different being a screw mount bellows. I think it was simply a case of using left over, but usable packaging from the Bellows II.

The **Pentax Bellows unit K** is well designed and built, utilizing the same single, strong “X” rail design as the **Asahi Pentax Bellows Unit II** (late production) and the **Pentax Auto Bellows K**, with nylon bearing blocks. The tripod mounting block is not geared, but can be positioned along the bottom of the X rail to properly balance your camera/bellows/lens combination. The friction of the nylon bearings provides a smooth and easily adjustable placement along the bottom of the focusing rail. The rear board does not have a nylon bearing block, nor is it geared. This is not an essential feature as the rear board is seldom moved, but is moveable and locks with a lever.

The Bellows-to-Camera Mounting Ring is removable, and doing so is the easiest way to mount the camera body. The camera mount can be rotated within the rear board, allowing the camera body to be changed to vertical orientation. Unlike the **Pentax Auto Bellows K**, and the late production **Pentax Bellows Unit II**, this bellows will allow the newer digital bodies, such as the Pentax K3, with the narrowest of margins, to clear the rear board when moved to vertical orientation.

Like the other “X” rail designs the tripod mounting surface is generous, and the single ¼-20 hole is located on the movable mounting block. When using an Arca-Swiss²⁸ compatible quick release on your tripod there is an advantage to using a bi-directional mounting plate such as the B6 by Really Right Stuff²⁹. This plate has an ant-twist shoulder and allows mounting in a quick release clamp in either front to back, or sideways orientation. This allows some versatility if using an additional focusing rail.

The single X rail is marked in single millimeter increments to 135mm and this bellows can easily handle the extra weight and longer length of lenses up to 150mm or even a 200mm F4.0. As auto diaphragm is not supported, mating this bellows to the 100mm Bellows-Takumar lens with a **Pentax Mount Adaptor K**, with its pre-set operation, would be an excellent and economical choice; alternately you could use the harder to find **SMC Pentax Bellows 100mm F4.0**, K mount, or any other appropriate K mount lens.

²⁸ <https://photographylife.com/arca-swiss-quick-release-system>

²⁹ <http://www.reallyrightstuff.com/Shop/Mamiya-6/B6-Bidirectional-plate-with-one-1-4-20-screw.html>

Figure 2.5



Asahi Pentax Bellows Unit K

Figure 2.6



Asahi Pentax Bellows Unit K

Figure 2.7



Asahi Pentax Bellows Unit K with SMC Pentax Bellows 100mm F4.0 Lens, K3 Body and Pentax Helicoid Extension Tube K (variable extension)

During the introduction of the **M** series Pentax lenses, a May 1982 “**Pentax Lenses and Accessories**” brochure listed an **Auto Bellows M** & **Slide Copier M** and a compact, economical bellows unit called the **Pentax Bellows Unit III**, one might have expected it to be called a “Bellows Unit M”. (The illustration of the **Pentax Bellows Unit III** below is slightly inaccurate and is explained on the **Pentax Bellows III** description pages following the **Pentax Auto Bellows M**)

Figure 2.8



The **Pentax Auto Bellows M**: This bellows unit is essentially a re-labeling of the **Asahi Pentax Auto Bellows K** (Late production) and as previously described, it utilizes the same basic design as the earlier screw mount auto bellows, well designed and built, and it is a robust and versatile bellows unit. It can also be used with the Pentax Slide Copier M, which is a re-labeled version of the earlier slide copiers, see Figure 3.1.

Rather than referring the reader back to the **Asahi Pentax Auto Bellow K** write up I am restating the design parameters and features.

This auto bellows unit utilizes a single, strong, well-engineered “X” rail, and also incorporates a geared tripod mounting block that can be positioned along the bottom of the X rail to properly balance your camera/bellows/lens combination. The operation of the bellows unit is smooth, with the front lens board, the rear camera body board, and the movable tripod seat, gear operated with micro-action control knobs, and uses nylon blocks as bearing surfaces. All three movement operations are precise, allow no creep, and have a locking knob on the opposite side to the control knob.

This bellows unit supports automatic diaphragm operation with an adjustable dual cable release, where one cable stops the lens aperture down before the second triggers the camera. With modern bodies that are electronically activated this dual cable operation is not usable unless you are fortunate enough to have an adaptor made by a company named Rowi which is no longer in business. This adaptor combines a male 2.5mm Stereo plug actuated with a female cable release socket. Additionally the lens can be stopped down and locked manually as detailed previously or a short, locking cable release can be used.

The minimum extension at 38mm is roughly equivalent to number #1 and #3 extension tubes combined and the maximum extension is 170mm. With a 55mm lens in reverse mount you can attain 2.7 times magnification and the 28mm lens will attain 6.2 times life size. Mounting a lens in reverse requires that the front lens board be taken off the X rail and re-installed facing backward, or using a **Pentax Reverse Adaptor K** 49mm or 52mm.

Additional extension tubes can be used between the camera and the rear board to attain even higher magnifications. As the rear camera board does not pass aperture information back and forth between the lens and the body, the non-auto **Pentax Extension Tube Set K** or the variable **Pentax Helicoid Extension Tube K** can be used.

Using a **Pentax Auto Extension Tube K** on the lens board will allow stopping down the aperture using the cable release socket. This bellows comes with two metal extension scales, one for 50mm lenses and one for 55mm lenses that attach to magnetized pads on the top of the front and rear boards.

The Camera Body Connector Ring is removable and doing so is the easiest way to mount the camera body. The camera mount can be rotated, within the rear board, allowing the camera body to be changed to vertical orientation, however the physical dimensions on new digital bodies will not allow this unless a short (#1) extension tube is used to position the body further out to clear the rear board.

The tripod mounting surface is generous, and the single ¼-20 hole is located on the movable mounting block. When using an Arca-Swiss³⁰ compatible quick release on your tripod there is not an advantage to having a mounting plate with a longer mounting surface, as the tripod mounting block is moveable for balance.

There is however an advantage to using a bi-directional mounting plate such as the B6 made by Really Right Stuff³¹. This mounting plate has an ant-twist shoulder and allows mounting in a quick release clamp in either front to back, or sideways orientation, which is an advantage when using an additional focusing rail. The **Pentax Focusing Rail** is discontinued but is sometimes available on eBay, or the Pentax Forum Marketplace³², but Really Right Stuff³³, Kirk Enterprises³⁴ Novoflex³⁵ and Hejnar³⁶ currently supply products for this application and the ultimate solution is a computer operated focussing rail with a stepping motor made by Cognisys³⁷. See Figure 5.4 on page 87.

This robust bellows can easily handle the extra weight and longer length of lenses up to 150mm, 200mm or even a 300mm F4.0.

³⁰ <https://photographylife.com/arca-swiss-quick-release-system>

³¹ <http://www.reallyrightstuff.com/Shop/Mamiya-6/B6-Bidirectional-plate-with-one-1-4-20-screw.html>

³² <http://www.pentaxforums.com/forums/>

³³ <http://www.reallyrightstuff.com/Be-a-Gear-Expert/Macro-Closeup-Shooting/?search=B150B>

³⁴ <http://www.kirkphoto.com/search.php?Keyword=focusing+rail&x=0&y=0>

³⁵ <http://www.novoflex.com/en/products/macro-accessories/focusing-racks/>

³⁶ <http://stores.ebay.com/Hejnar-Photo? dmd=2& nkw=Macro+stage>

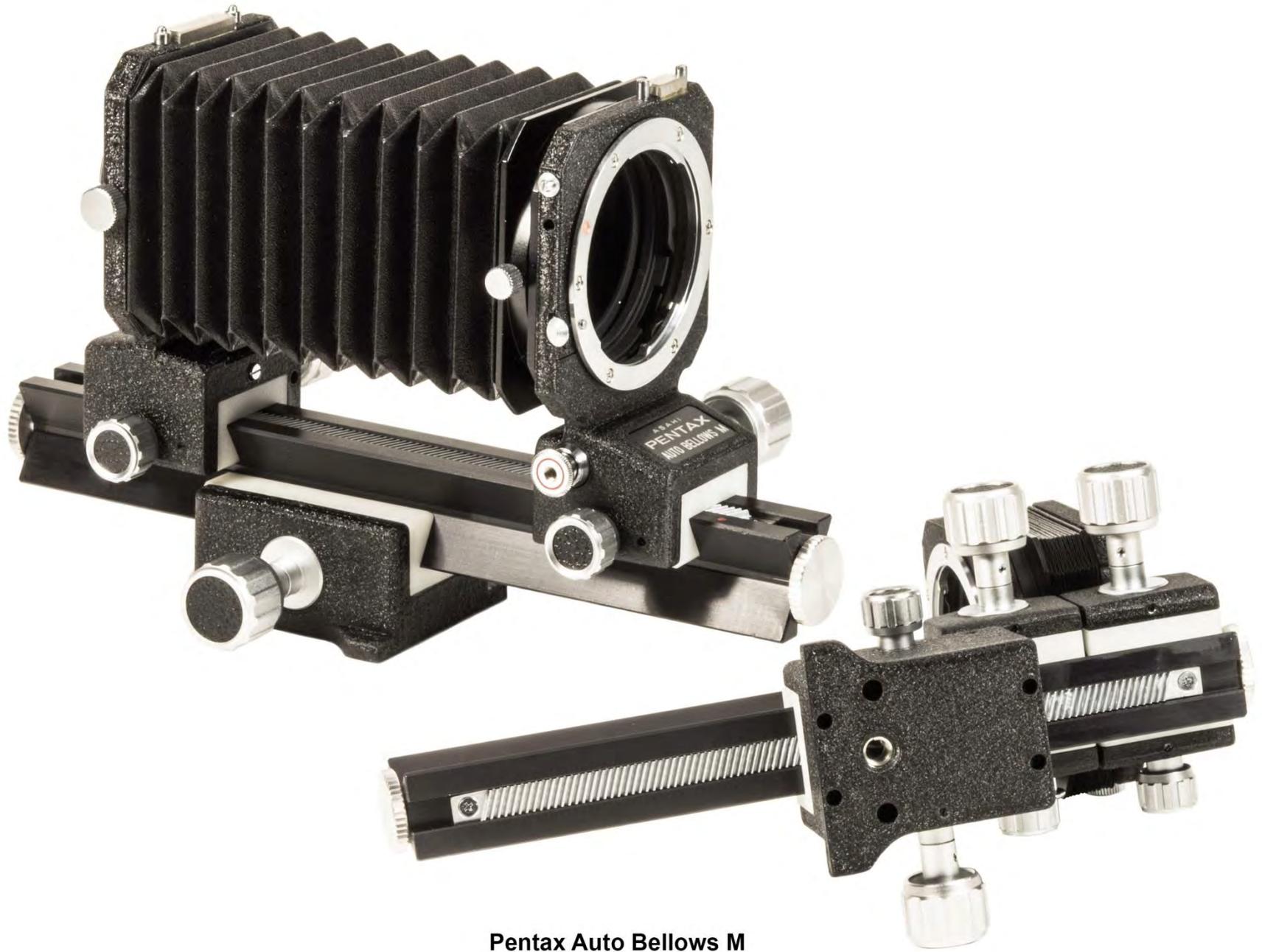
³⁷ <https://www.cognisys-inc.com/products/stackshot/stackshot.php>

Figure 2.9



Pentax Auto Bellows M

Figure 2.10



Pentax Auto Bellows M

Figure 2.11



Pentax Auto Bellows M with SMC Pentax-M Macro 100mm F4.0 lens and Pentax K3 Body using a 50mm Pentax Auto Extension Tube K and a modified Canon T3 Cable Release Adaptor

The **Pentax Bellows Unit III**; One might have thought that the companion, compact bellows announced at the same time as the **Pentax Auto Bellows M** would be a re-badged Pentax Bellows Unit K and called a “Pentax Bellows Unit M”, but that was not the case. This is not a relabeling of the Bellows Unit K, but appears to be a K mount “conversion” of the late production **Asahi Bellows Unit II**. The illustration of this bellows Unit in the May 1982 “Pentax Lenses and Accessories” brochure shows a unit identical to the **Asahi Pentax Bellows K**, where the set screw for the Bellows-to-Camera Mount Ring is moved from the top to the side of the rear board. In fact the illustration in the Operations Manual for the Bellows Unit III shows this configuration as well, with a note that “The position of the clamp screw has been moved to the top of the rear plate”.

When physically examining the actual Bellows Unit III I found that the sales brochure illustration is not correct and I noted that the rear board for the camera mount is identical with the late production **Pentax Bellows II**, with the set screw on top, and the Bellows-to-Camera Mount Ring is smaller in diameter than the one used on the **Pentax Bellows Unit K**. This mounting ring will interchange with the screw mount Bellows-to-Camera Mount Ring from the late production **Pentax Bellows Unit II**.

The front lens board also appears to be the same as the earlier Bellows Unit II, but with the addition of a 5.5mm (7/32 inch) protruding adaptor plate to house the lens lock pin components and mount for the K mount flange. This moves the lens further forward and the extension scale on the X rail has also been repositioned. The accompanying Operation Manual with the Pentax Bellows III states an extension of 38mm to 137mm, not 32mm to 137mm as stated in the sales brochure, but is actually 38mm to 135mm. But this does not mean that the extension is longer, or shorter, as the X rail itself is the same length on all three of the “compact” bellows units, including the Bellows II (late production), Bellows K and Bellows III.

The screw mount, late production **Pentax Bellows II** was not on the market long before the K mount was announced and it was discontinued. It would appear that some left over; already manufactured components from the late production Bellows Unit II were used in the manufacture of the **Pentax Bellows Unit III**. This may be why it was called a Bellows Unit III rather than a Bellows Unit M.

Figure 2.12



Figure 2.13



There was also a production variation with this unit where the locking lever used to secure the rear board was changed to a locking knob, similar to the other controls.

Having pointed out and explained these differences does not mean that this is an inferior bellows unit to the **Pentax Bellows Unit K**, it is still an excellent compact bellows unit, just different than the previous compact **Pentax Bellows Unit K**.

As with the previous compact bellows units it is a scaled down, economy, version of the **Pentax Auto Bellows M**, with fewer features. It also does not support automatic diaphragm operation nor does it connect to the **Pentax Slide Copier K** or **M**. Also like the earlier units it utilizes the same single, strong “X” rail design, with nylon bearing blocks. The tripod mounting block is not geared, but can be positioned along the bottom of the X rail to properly balance your camera/bellows/lens combination, friction of the nylon bearings providing a smooth and easily adjustable placement along the bottom of the focusing rail. The rear camera mounting board, also is not geared and does not have a nylon bearing block, but is moveable and is locked by either a lever or knob.

The Bellows-to-Camera Mounting Ring is removable, and doing so is the easiest way to mount the camera body. The camera mount can be rotated, within the rear board, allowing the camera body to be changed to vertical orientation. Using one of the newer digital bodies allows clearance by the narrowest of margins, but it may still be advisable to use a short extension tube to allow ample clearance from the rear board when moving the camera body to a vertical orientation.

Like the other “X” rail designs the tripod mounting surface is generous, and the single ¼-20 hole is located on the movable mounting block. When using an Arca-Swiss³⁸ compatible quick release on your tripod there is not an advantage to having a mounting plate with a longer mounting surface as the tripod mounting block is moveable for balance. There is, however, an advantage to using a bi-directional mounting plate such as the B6 by Really Right Stuff³⁹. This plate has an ant-twist shoulder and allows mounting in a quick release clamp in either front to back, or sideways orientation. This allows some versatility if using an additional focusing rail.

The X rail is marked in single millimeter increments to 135mm and this bellows can easily handle the extra weight and longer length of lenses up to 150mm or even a 200mm F4.0. As auto diaphragm operation is not supported, mating this bellows to the **100mm Bellows-Takumar** lens with a Mount Adaptor K, with its pre-set operation, would be an excellent and economical choice, or the **SMC Pentax Bellows 100mm F4.0** (K mount) but it is a bit harder to find. Alternately you could use any other appropriate K mount lens.

³⁸ <https://photographylife.com/arca-swiss-quick-release-system>

³⁹ <http://www.reallyrightstuff.com/Shop/Mamiya-6/B6-Bidirectional-plate-with-one-1-4-20-screw.html>

Figure 2.14



Pentax Bellows Unit III

Figure 2.15



Pentax Bellows Unit III

Figure 2.16



Pentax Bellows Unit III with SMC Pentax-M Macro 50mm F4.0 and Pentax K3 Body

With the introduction of the Pentax "A" series lenses, a sales brochure dated September 1982 listed a **Pentax Auto Bellows A** and a **Pentax Slide Copier A**, but no longer offered a compact, economical version similar to the **Pentax Bellows Unit K** or **Pentax Bellows Unit III**. The **Pentax Auto Bellows A** is also the last of the "35mm" line of **Pentax Bellows Units** manufactured, and this is the last Pentax sales brochure that I could find where any 35mm bellows unit was offered for sale.

Figure 2.17



The **Pentax Auto Bellows A**: While looking identical to the **Pentax Auto Bellows M**, it would appear to be a relabeling of the **K** and **M** models, but it has a significant production variation. The earlier auto bellows units, including the **Asahi Pentax Auto Bellows (M42)**, all had the same size X rail. The X rail on this bellows is approximately 3/64 narrower (.820 to .772). While the camera connector ring will interchange between all three units, any other components from the **Pentax Auto Bellows A** will not. As the specifications and operation of the **Pentax Auto Bellows A** are identical to the **K** and **M** models, please refer back to the write-ups on the **Asahi Auto Bellows K** or the **Pentax Auto Bellows M** on pages 27 and 37 respectively.

Figure 2.18



Pentax Auto Bellows A

Figure 2.19



Pentax Auto Bellows A

Figure 2.20



Pentax Auto Bellows A with SMC Pentax Bellows 100mm F4.0 Lens, & K3 Body, using 100mm Auto Extension Tube K, with Dual Cable Release using Rowi 2.5mm Stereo Plug to Cable Release Adaptor.

Pentax Dedicated Bellows Lenses

Figure 2.21



Super Multi Coated Bellows-Takumar 100mm F4.0

Figure 2.22



Super Multi Coated Pentax Bellows 100mm F4.0

The screw mount (M42) **Bellows Takumar 100mm F4.0** lens, shown above with its matching metal hood, was produced from 1964 until 1970 and is optically identical to the later version, the **SMC Bellows Takumar 100mm F4.0** lens which was produced from 1971 until 1975, the later version has Super Multi Coating. Both have eight aperture blades with a minimum aperture of F22.0 and a maximum aperture of F4.0 and accept a 49mm filter. They are “pre-set” lenses utilizing two aperture rings, one pre-sets the aperture and the other is manually rotated to the pre-set point which stops the lens down before the exposure. As they have no focusing helicoid they must be used on a bellows to enable focusing. With no focusing mechanism they are light weight at only 140 grams. They are sharp with excellent optical correction, and used ones are frequently found for sale on the internet and eBay. When used with the **Pentax Auto Bellows**, the maximum magnification is 1.62X life size. Without extension tubes both lenses focus to infinity on all bellows units.

The K mount **SMC Pentax Bellows 100mm F4.0** lens was made from 1975 until 1998; it has six aperture blades and accepts a 52mm filter. It has a minimum aperture of F32 and a maximum aperture of F4.0. Like the earlier Takumar bellows lenses it has no focusing mechanism and can only be used with a bellows. Unlike the earlier bellows lenses it is not a pre-set lens and the aperture can be stopped down with a cable release at the time of exposure. It is sharp, compact, and light weight at 185 grams, and without extension tubes focuses to infinity.

When the **SMC Pentax Bellows 100mm F4.0** is used with a **Pentax Auto Bellows K, M or A**, the maximum magnification without using extension tubes is 1.32X life size. Used copies of this K mount lens are not usually seen for sale as often as the **Bellows Takumar 100mm F4.0** or **SMC Bellows-Takumar 100mm F4.0**.

The dedicated bellows lenses are not the only lenses suitable for bellows use. The various **Pentax Macro Lenses** are also good choices because they are optimized for close-up work, have very sharp optics and are optimized for “flat field” focus (less curvature). For magnification higher than 4X life size, the 24mm, 30mm, 35mm and 40mm lenses are commonly used in reverse configuration⁴⁰

Many photographic enlarger lenses are also good choices. However not all darkroom enlarger lenses make a good choice for bellows use, and there is a dizzying array of them available for sale as photographic darkrooms become less prevalent. Choosing a good enlarging lens for bellows work can involve some research. One of the most comprehensive sources for data on these lenses is a website called Coinimaging⁴¹. They have done extensive testing on macro, bellows and enlarger lenses, their results are outlined in an easy to understand format. Another good reference for choosing an enlarger lens is the Extreme Macro⁴² website.

The better enlarger lenses usually have at least six aperture blades, although some excellent ones have five. While the number of blades can be indicative of the quality of a lens, and definitely have an effect on bokeh⁴³, the actual construction, glass and coatings are the real definitive factors. Most mount using a 39mm thread and will require an adaptor for mounting, and many are best used in reverse configuration; therefore the filter size would be the consideration. A Pentax, or third party, reverse adaptor must be used for attachment to the bellows. See Figure 3.15 Page 60.

Enlarging lenses are typically mounted on a lens board and some utilize the enlarger lamp as light source to illuminate the aperture dial. When using the lens mounted conventionally this “light path” could cause stray light to enter the bellows, mounting the lens reversed would avoid this potential problem. One enlarger lens which is highly regarded and continuously offered for sale is the **EL-Nikkor 50mm F2.8N**. There are many others as good or perhaps slightly better, made by Schneider, Rodenstock, Fuji, and some others. But the **EL Nikkor 50mm F2.8N** or the less expensive, older, **EL Nikkor 50mm F2.8**, seems to be a good choice considering quality and price.

⁴⁰ <http://www.digitalcameraworld.com/2012/03/15/reverse-lens-technique-for-extreme-macro-photography/>

⁴¹ http://coinimaging.com/macro_lens_tests.html

⁴² <http://extreme-macro.co.uk/reversed-enlarger-lenses/>

⁴³ <https://en.wikipedia.org/wiki/Bokeh>

Note: The **EL Nikkor 50mm F4.0** lens not an achromatic lens and would be a poorer choice than either of the **Nikkor 50mm F2.8s**. Another choice, with good quality and reasonable pricing, is the **Schneider Componon-S 50mm F2.8**, but it has a protruding aperture lever which may make operation a bit awkward for some photographers.

Typical Enlarger Lens Configurations

The **EL Nikkor 50mm F2.8N** has a light path window shown by the arrow in Figure 2.23, used to illuminate the aperture numbers in the darkroom and if mounted conventionally it could allow light to pass through and enter the bellows. Mounting the lens in reverse eliminates this potential problem. The lens filter size is 40.5mm and an appropriate step-up ring must be used depending on the thread of the reverse adaptor. In this case a **Pentax 49mm Reverse Adaptor K** is used on a **Pentax Bellows Unit K**.

The earlier **EL Nikkor 50mm F2.8** does not have a “light path window” to illuminate the aperture dial and can be mounted conventionally using a 39mm to 42mm adaptor, but from a performance standpoint, reverse mounting is the most optimal configuration. The filter size on this Nikon lens is 40.5mm and a custom reverse adaptor made by Custom Photo Tools makes a tidy, one piece mount on **Pentax Bellows Unit II (M42)** bellows unit. You could also use the **Asahi Pentax 49mm Reverse Adaptor** with a 40.5mm to 49mm step-up ring.



Custom Photo Tools⁴⁴ is a small company in Portugal who make a wide variety of custom adaptors for enlarging lenses and is a useful resource for mounting enlarger lenses for purposes other than darkroom use.

⁴⁴ <http://www.customphototools.com/macro/enlarging-lenses-reverse-adapters>

Slide Copier

The **Asahi Pentax Slide Copier** is used with all the compatible bellows units, including the **Asahi Pentax Auto Bellows**, **Asahi Pentax Bellows Unit II** (early production) and the **Auto Bellows K, M and A**. The **Pentax Slide Copier**, **Slide Copier K, M and A** are all the same.

Figure 3.1



Pentax Slide Copier, K, M, A

Using the Pentax Auto Bellows and Pentax Bellows Units

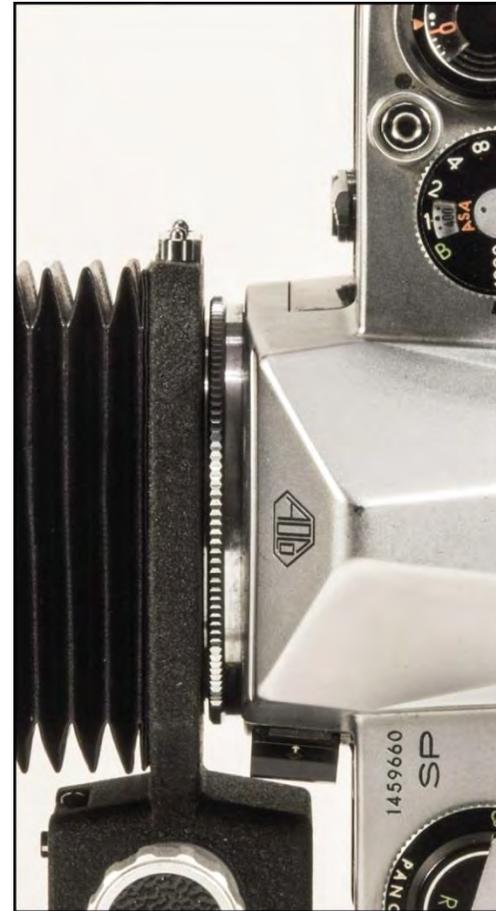
Pentax Auto Bellows units were designed and built for use with 35mm film camera bodies such as the Spotmatic and K mount series film bodies. The lens mounting plates on these bodies protrudes forward and the body itself is quite slim allowing the camera body to be turned from a horizontal position to a vertical position, easily clearing the bellows rear board as shown in the following illustrations. If the camera mounting board is positioned too far forward the body will contact the bellows rail.

Figure 3.2



Pentax Spotmatic with Auto Bellows M42 (Horizontal)

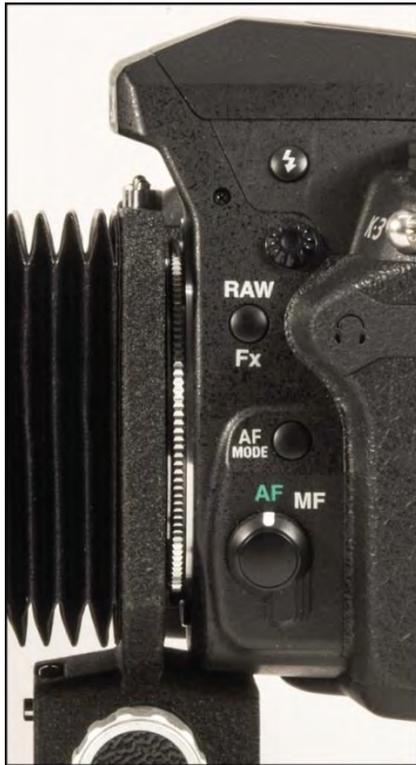
Figure 3.3



Pentax Spotmatic with Auto Bellows M42 (Vertical)

The modern digital camera bodies such as the K3 are much bulkier near the lens mount and do not have sufficient clearance, even when mounted horizontally as shown in Figure 3.4 below.

Figure 3.4



**Auto Bellows (M42) with K3 Body
using the K Mount Adaptor only**

Figure 3.5



**Auto Bellows (M42) with K3 Body
using the K mount Adaptor and Extension
Tube K #1 (9.5mm) Horizontal**

Figure 3.6



**Auto Bellows (M42) with K3 Body
using the K mount Adaptor and Extension
Tube K #1 (9.5mm) Vertical**

The same clearance problem exists with the Auto Bellows K, M and A when using digital bodies such as the K3, but it can easily be solved by using the Extension Tube K #1 (9.5mm). The Auto Extension Tube K #1 can also be used and at 12mm gives slightly more clearance, but there is no need for the automatic aperture linkage on the camera mount. The non-auto Bellows Unit K and the Bellows Unit III do have sufficient clearance, but only marginally.

Converting Screw Mount Bellows Units to K Mount Camera Connection

The 42mm screw mount bellows units such as the dual rail, **Asahi Pentax Bellows II** (early production), the single X rail, **Asahi Pentax Bellows II (late production)**, and the **Asahi Pentax Auto Bellows Unit** are extremely versatile as they can easily be converted to K Mount bodies while still using the world class, and relatively inexpensive, Pentax Takumar screw mount lenses. Additionally enlarger lenses and third party 42mm and 39mm lenses (with an adaptor) can also be used.

These bellows units can easily be adapted to other makes of camera bodies and there are many makers of adaptors that allow the fitting of Canon, Nikon, Sony and a host of other brands to the 42mm screw thread.

For Pentax users you simply use a Pentax Mount Adaptor K, which will mount any of the Pentax K mount film or digital cameras to a bellows unit. Note, with digital bodies there are clearance problems as shown previously, in Figures 3.4 to 3.6, and it would then be necessary to use an extension tube. Note that 3rd party extension tubes do not always provide a secure and proper fit of the **Pentax Mount Adaptor K**. Care must be used with 3rd party Mount Adaptor K adaptors (Figure 3.8) to ensure that the screw used to mount the spring lock does not protrude into the screw land far enough to damage the lens thread, which was the case with one I examined.

Figure 3.7



Camera Body
Connector Ring

Figure 3.8



Pentax Mount
Adaptor K

Figure 3.9



Extension Tube K (#1)
Body Mount Adaptor K
Body Connector Ring

Figure 3.10



Detail of groove for Extension Tube K
Locking Pin

Note that by placing a groove in the Camera Body Connector Ring to accommodate the lens locking pin, that the three components are securely locked together and will not unscrew, creating a semi-permanent K mount conversion as shown in Figure 3.10. This is only possible with the **Pentax Auto Bellows Unit** as the body connector rings on the other screw mount bellows are smaller in diameter and do not line up with this pin.

Custom Fabricated Bellows-to-Camera Adaptors

While collecting all the Pentax bellows units to study during the production on this E-Book, I acquired a couple of units where the Bellows-to-Camera connector was missing. As most of the Pentax bellows units are either approaching forty years of age, or more, parts are obviously no longer available. Most of these components were made from anodized aluminum and some from stainless steel and can obviously be fabricated by a competent machine shop. Unfortunately, small jobs are not cost effective, and it would probably cost many times the value of the bellows to have one machined.

The process of making a Bellows-to-Camera connector ring, machining the body of the ring, and acquiring a flange plate and then drilling and taping the ring to attach the flange, can be a costly project unless you are lucky enough to have a lathe and the necessary skills to do it yourself. However there is a less costly solution. See Figure 3.13 and 3.14

The **T Mount**⁴⁵ adaptor, also known as **T2**, or **Tamron Mount**, was used to mount different camera bodies on their lenses by various 3rd party lens makers, such as Tamron, Rokinon and Soligor. At first look, it might appear to be a solution for converting a 42mm screw mount Bellows-to-Camera adaptor to K mount, but the thread is a different pitch. The adaptor will start to thread on but will jam, the Pentax 42mm thread is 1.0 pitch and the T Mount Adaptor is 0.75 pitch. The T Mount Adaptor is however, because of its two piece construction, an excellent platform for facilitating the fabrication of a complete Bellows-to-Camera connector (ring).

The T Mount adaptor is in two parts, a flanged and knurled, housing containing the camera specific mount, and an insert containing the 42mm x 0.75 thread that attaches the adaptor to 3rd party the lenses, this insert is held in place by three set screws.

By replacing the screw mount (M42x0.75) insert with a component made possible by the “magic” of 3D printing, and using a resin that is suitable for low torsion gearing, a complete bellows-to-camera attachment can be made for the Pentax K mount. Using a suitable T Mount adaptor for Canon, Nikon, Sony, or many other camera makes, these cameras can also be adapted to the (M42) **Pentax Bellows Units**. I fabricated this insert to include a “stand-off” to move the bulkier digital camera bodies further back so they will clear the rear bellows plate in vertical orientation. T Mount adaptors are still available new and are readily available, used and new, on eBay at inexpensive prices.

The “Bellows-to-Camera Mounting Ring” cannot always be interchanged between units as the holes in the rear plate are different. Of the screw mount (M42) units; the **Bellows II** (early Production), the **Bellows II** (late production) and the **Auto Bellows** are all different. Of the K mount units; the **Auto Bellows K** (early production), the **Auto Bellows K** (late production), the **Bellows Unit K**,

⁴⁵ http://camera-wiki.org/wiki/T_mount

the **Auto Bellows M** and the **Auto Bellows A** are all the same. The **Bellows Unit III** (K mount), is different from the other K mount units, but the dimension of the opening is the same size as the **Pentax Bellows II** (M42) late production.

Figure 3.11



T Mount Adaptor: K Flange View T Mount Adaptor: Insert View

Figure 3.12



T Mount Adaptor: Insert Removed

Figure 3.13



Pentax "K" T Mount Adaptor with a 3D model of an Ultra High Resolution Stereolithography (SLA) 3D printed Bellows-to-Camera Insert, for the Asahi Pentax Auto Bellows (M42)

Figure 3.14



Actual Fabricated Assembly

On screw mount (M42) bellows units, using the camera specific part of the **T Mount Adaptor**, and a custom **Ultra High Resolution Stereolithography (SLA) 3D printed insert**, creates a solid, one piece, Bellows-to-Camera Connector (conversion) assembly. This is less expensive than using a **Pentax Mount Adaptor K** and the number one extension tube from a **Pentax Extension Tube Set K**. This approach with a properly sized insert would also provide a replacement for a missing or damaged Bellows-to-Camera Connector Ring for any of the K mount series Pentax Bellows Units.

Mounting Lenses in Reverse

All the **Pentax Auto Bellows Units**, including the screw mount units, allow the front lens mounting board to be removed and re-installed backwards, putting the lens in reverse mounting position. Note, the non-auto bellows units do not have this feature and require a reversing adaptor to facilitate mounting the lens in a reverse position. There are three Pentax Reverse Adaptors; a 49mm to 42mm Reverse Adaptor for the screw mount bellows units, a 49mm to K Reverse adaptor and a 52mm to K Reverse Adaptor for the K mount bellows units as shown in **Figure 3.15**. All of these reverse adaptors can also be used on the Auto Bellows Units if you do not wish to reverse the lens board, and this is actually a quicker way to reverse the lens on those units. However doing so will not allow the dual cable release to actuate the lens diaphragm and the lens would have to be stopped down manually.

Figure 3.15



49mm to 42mm Reverse Adaptor

49mm to K Reverse Adaptor

52mm to K Reverse Adaptor

Figure 3.16



The genuine Pentax adaptors are not easy to find as they are no longer made and not always available on eBay, but there are many inexpensive 3rd party reverse adaptors available in sizes 49mm, 52mm, 55mm, 58mm, 62mm, 72mm, and 77mm to K Mount. The major Photographic retailers like B & H Photo, New York, also have new 3rd party reverse adaptors listed.

Using a Pentax 52mm-K Reversing Adaptor along with a 49mm to 52mm Step-up ring as shown in **Figure 3.16** is an economical way to accommodate a wider range of Pentax lenses on a K mount bellows unit, using only one reverse adaptor.

Mounting lenses in reverse allows you to attain much higher magnification values than mounting them conventionally. Retrofocus, wide-angle lenses with maximum apertures of F2.8 or less are most effective. Lenses such as the 28mm and 35mm really shine producing as high as 6.6 time life size for the A28mm F2.8. Lenses faster than f2.0 or telephoto lenses are not suitable in reverse mode.

As the rear lens element is quite exposed and susceptible to damage, or “fogging” caused by stray light entering the lens, it may be prudent to use a lens hood. Pentax made a **Reverse Attachment K** for its 35mm lenses that attaches with a female bayonet mount and provides a 49mm thread for either filter or lens hood mounting. While I acquired a **Reverse Attachment K** attached to some used equipment, I have never seen one listed in a Pentax brochure or for sale. However there are third party makers who provide them for Pentax, Canon, Nikon and Sony and a search for “rear lens reverse mount protection ring” will turn up some eBay vendors.

Figure 3.17 below shows a typical reversed lens installation on a (non-auto) **Pentax Bellows Unit K**. Without a reverse attachment a #2 Extension tube will also serve as an impromptu lens hood.

Figure 3.17



49mm Lens Hood, Reverse Attachment K, SMC Pentax 28mm F3.5 Lens, 52mm Reverse Adaptor K and a Pentax Bellows Unit K

Converting the Pentax Auto Bellows Double Cable Release (for Digital Camera Bodies)

When using the **Pentax Auto Bellows Units** the Double Cable Release is a valuable tool as it allows you to focus wide open and then stop down the lens and to trigger the camera body from a single control. There is mechanical adjustable delay so that the lens is stopped down before the shutter is released. Missing the double cable release in used bellows sets is common and the Pentax ones can be hard to find and purchase, the Nikon AR-7 cable release is similar to the Pentax one and does the same job and is available new and used. Canon and Olympus also made a similar double cable release, and the Mamiya RZ67/RB67 used a similar double cable release for mirror lock-up and shutter release, but even their used ones tend to be pricy.

Using older film cameras with the Double Cable Release is not a problem, but some of the later film cameras use proprietary electrical remote shutter connections, and all the Pentax digital bodies use an electronic release connected through a 2.5mm Stereo Jack, using two circuits, one for focus and one for activating the shutter (**Figure 3.21**).

During the transition from manual cable to electrical cable release there was a photographic accessory manufacturer named **Rowi** who made a small cable release adaptor, see **Figure 3.18**. This adaptor activates the shutter only, which is not a problem in macro photography as manual focus is usually used. Rowi is no longer in business and these adaptors are very difficult to find. However, Canon made a **T3 Cable Release Adaptor** for their T90 and various earlier EOS Series cameras, which is a short dangle having a cable release connection on one end and a proprietary camera connection, called a T3 connector, on the other, see **Figure 3.19**. This adaptor has now been discontinued, but there are many new and used ones still available on eBay and at various camera dealers and retailers. By replacing the Canon T3 proprietary connection with a 2.5mm stereo plug, an adaptor for the double cable release on the **Pentax Auto Bellows** is easily made as in **Figure 3.22**. It is a simple soldering job for a handy DIY⁴⁶, or easily handled by any electronics repair shop.

Figure 3.18



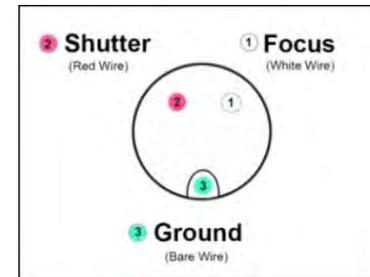
ROWI Cable Release Adaptor (shutter only)

Figure 3.19



Canon T3 Cable Release Adaptor

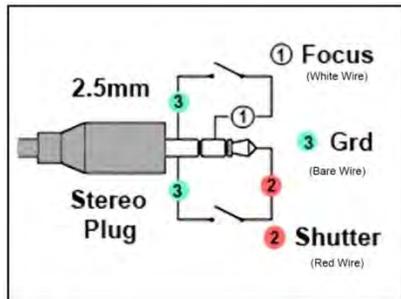
Figure 3.20



Canon T3 Pin-out (wiring diagram)

⁴⁶ https://en.wikipedia.org/wiki/Do_it_yourself

Figure 3.21



Pentax Release Plug Pin-out (wiring diagram)

Figure 3.22



Canon T3 Cable Release Adaptor modified for Pentax Digital Bodies

As Canon EOS bodies can easily be adapted to the **Pentax Auto Bellows** (M42), this modification allows many of the newer Canon bodies, using a Canon E3 connection (2.5mm electronic release); to be activated with the **Pentax Double Cable Release** provided with the **Pentax Auto Bellows** units. The Canon professional bodies such as the 1D and 5D use a different proprietary remote connection called an N3 connection and using the **Canon T3 Cable Release Adaptor** and a **Canon RA-N3 Remote Switch Adaptor** (Figure 3.23) will allow these bodies to be activated with a manual cable release without modification.

Figure 3.23



Figure 3.24



Canon also made an **RA-E3 Remote Controller Adaptor** cable (Figure 3.24) that accepts an N3 female connection and provides a male E3 connection. While it works, using a three cable daisy-chain, is a little pricy and bit cumbersome, but may be convenient if you already have the adaptors.

Note: Pin-out⁴⁷ data for Pentax, Canon and Nikon cameras referenced from www.doc-diy.net

⁴⁷ <https://en.wikipedia.org/wiki/Pinout>

Nikon cameras use three different proprietary remote control connectors, shown in the following Triggertrap⁴⁸ illustrations with pin-out diagrams below. Triggertrap cables have a **male** 2.5mm stereo plug on one end, requiring a **female** jack on the **Canon T3 Adaptor**.

Figure 3.25



Figure 3.26



Figure 3.27



These cables are part of an excellent multi-application remote control system, controlled by an App for iPhone, iPad or Android devices and may be purchased separately, or if part of a complete Triggertrap remote control kit can have a dual purpose.

Figure 3.28

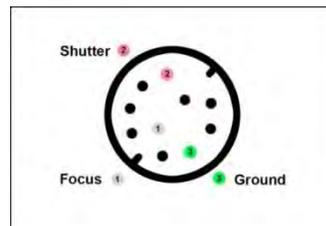


Figure 3.29

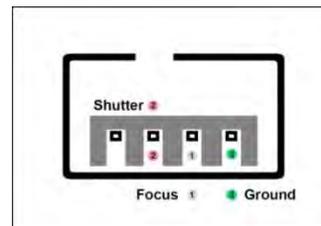
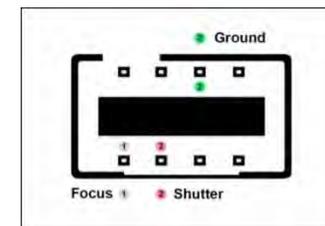


Figure 3.30



Nikon apparently did not make cable release adaptors as Canon did, but these separate cables, or others made by some eBay sellers (e.g. search “Canon RS-60E3 jack to Nikon MC-DC2 plug converter adapter”) along with the modified **Canon T3 Cable Release Adaptor** with a **female** 2.5mm connection, will easily adapt Nikon bodies to a manual double cable release.

Far fewer **Canon** and **Nikon** bellows units were made than **Pentax Bellows Units**, and used **Pentax** units are a viable alternative for users of other makes, including **Sony**, **Olympus**, and many others. Even the **Pentax K** mount bellows units are usable with appropriate lens mount adaptors, however the **Pentax Auto Bellows (M42)** is particularly desirable as they are easily adaptable and there are many thousands of excellent quality used **Pentax** screw mount (M42), and lenses from other camera makers, at very reasonable prices, once the bellows is adapted to the camera. Photographic enlarger lenses can also be used, some requiring a 42mm to 39mm step-down adaptor.

⁴⁸ <https://www.triggertrap.com/#products/triggertrapmobile1>

Medium Format Auto Bellows Units

In a combined sales brochure, circa 1994, **Pentax Corporation** commemorated seventy-five years in business and showcased both of the **Pentax Medium Format Cameras**. In this publication the accessory components for both the 67 (6cm x 7cm) and the 645 (6cm x 4.5cm) camera systems are illustrated, including the two dedicated auto bellows units.

Figure 4.0



The medium format bellows are more specialized, much larger and are more difficult to adapt to other camera bodies. As such, I have not bothered to mention their accessories and use in the previous text. Pentax made two medium format bellows units simultaneously, for the 645 and the 6x7 (67) cameras, which was an ambitious and comprehensive undertaking for any camera manufacturer.

The **Pentax Auto Bellows 645**: This bellows unit is similar in basic design to the other auto bellows units, utilizing the strong, well-engineered, single "X" rail configuration. It also incorporates a geared tripod mounting block. This block can be positioned along the bottom of the X rail to properly balance your camera/bellows/lens combination. The operation of the bellows unit is smooth, with front lens board, rear camera board, and movable tripod seat gear operated with micro-action control knobs. The movement of all three components are precise, allowing no creep, and has a locking knob on the opposite side to the control knobs.

The bellows is sleek; round cornered, with a satin black finished, a more modern looking design than the earlier "35mm" bellows units. With the front lens board and the rear mount board completely closed, the pleated bellows is inside the mounting boards, which protects it and keeps it dust free. The bottom plate has a generous mounting surface and includes a threaded 1/4 -20 (UNC) mounting hole as well as a 3/8-16 (UNC) threaded hole to accommodate larger tripod studs. There was no slide copier made for this auto bellows.

This bellows allows Aperture-Priority AE and Metered Manual operation with an extension range from 54mm to 180mm. This medium format auto bellows does not have as wide a magnification range as the "35mm" auto bellows units. The attainable magnification range it allows is only from 1.0x to 4.3x with the 55mm f2.8 lens. **The Pentax Auto Bellows 645** is usable with all 645 lenses below 300mm, with the exception of the zoom lenses. In an early brochure it states that it is not usable with the leaf-shutter lenses, but in the bellows operating manual it includes these lenses and their accompanying magnification tables.

In reviewing the lens tables in the bellows manual it would appear that the most optimal lens would be the **SMC Pentax-A 645 55mm F2.8**, or the **SMC-D FA 55mm F2.8** in that it achieves 1.0x to 3.2 times life size in normal mode to a magnification of 4.3x in reverse position. The **SMC Pentax-A 645 Macro 120mm F4.0**, or **SMC Pentax-FA Macro 120mm F4.0** would also be good choices. As well as achieving slightly more working distance from your subject, this lens can be used in two different modes with the bellows unit. One by using the bellows set at the minimum 54mm and then setting the lens to the various lens extension scales, and the other by setting the lens to its minimum setting and then extending the bellows to reach 2.7 times life size. This gives a moderately wide range of magnification from 0.44x to 2.7x while allowing a comfortable working distance.

Unlike the other **Pentax Auto Bellows Units**, the front lens board is not reversible and requires a reverse adaptor to enable the lenses to be mounted in reverse position. When doing so, keep in mind that the 645 series lenses do not have a manual, or non-automatic aperture setting and cannot be stopped down without externally engaging the aperture mechanism. The lens is reversed by using a set comprised of two components, a **Reverse Adaptor 645 (58mm)** for mounting the lens using the filter thread, and a **Reverse Attachment 645** which mounts on the exposed lens flange, engaging the aperture components and allowing the lens aperture to be operated manually. **The Reverse Adaptor 645 (58mm)** has a locking set screw that allows the lens to be rotated after mounting to orientate the aperture control markings so that they are clearly visible, from any viewing position.

The bellows has a cable release socket on the front board, connecting to a stop down mechanism for the lens. On the other side of the front lens board there is an optional, manual, lockable plunger for stopping the lens down. As well there is an electro-magnetic release

socket that was designed to connect to the electro-magnetic shutter on the on the 645 film camera bodies. This requires the **Infrared Remote Release Cord 2P**, which is included with the bellows. This cable is shown in Figure 5.1 (Page 83) in the illustration of the operating manual. Also included is a single mechanical cable release.

Either the **Pentax 645D** or **645Z** digital camera bodies can be used with this bellows. To coordinate the synchronized release of the camera shutter and the lens stop down, a **Pentax Double Cable Release A** must be used with a modified **Canon T3 Cable Release Adaptor** to connect to the body, see Figure 3.21. Another alternative would be to modify the **Infrared Remote Release Cord 2P** with a 2.5mm Stereo plug on the camera connection end.

When mounting the camera body, it is advisable to mount the bellows unit securely on a tripod before attaching the camera body; otherwise the weight of both units can make this operation awkward and accident prone. To mount the camera body you simply line up and engage the mounting flange, or remove the camera mounting ring and connect it to the camera body first. To remove the camera body from the bellows, loosen the fixing screw on the rear board and remove the camera body and camera connecting ring as one piece and then remove the camera connecting ring. The lens release button is not accessible with the body mounted on the bellows.

As the maximum extension is only 10mm longer than the 35mm bellows units more lens extension may be needed for additional magnification. This bellows can be used with both the **Auto Extension Tube-A 645 Set** and the **Helicoid Extension Tube 645** for extensions beyond the maximum allowed by the bellows. Keep in mind that the **Auto Extension tubes** are better mounted between the lens and the bellows to allow the lens to stop down automatically. On the camera mounting board there is no auto aperture connection and the **Helicoid Extension Tube 645**, which has no aperture components, may be used.

The **Pentax Auto Bellows 645** retailed for \$ 999.95 US in 1999 and they are not commonly seen for sale on eBay, in fact over the past few years I have not seen even one. I was fortunate enough to find a new unit for sale in The Camera Store⁴⁹ in Calgary, Alberta more than five years after it had been discontinued.

Additional Notes:

The **Asahi Pentax Auto Bellows 6x7**, shown in pages 73 through 80 (following the **Auto Bellows 645** illustrations) is a viable alternative to the **Auto Bellows 645** for 645 camera users, given the scarce availability of the **Auto Bellows 645** (see Figure 4.13).

The **Pentax Auto Bellows 6x7** is frequently available on the internet and its use with the **Pentax 645D** and **Pentax 645Z** bodies is explained at the end of the **Asahi Pentax Auto Bellows 6x7** review.

Of course **Pentax SMC Takumar 6x7** and **SMC Pentax 67** lenses can also be used on the **Pentax Auto Bellows 645** with the **Pentax Adaptor 645 for 67 Systems** and maintain auto diaphragm operation.

⁴⁹ <http://www.thecamerastore.com/>

Figure 4.1



Pentax Auto Bellows 645

Figure 4.2



Pentax Auto Bellows 645

Figure 4.3



Pentax Auto Bellows 645 with SMC Pentax-A 645 55mm F2.8 Lens using a Pentax 645D body and a Pentax Double cable release connected with a modified Canon T3 Cable Release Adaptor

Figure 4.4



Pentax Auto Bellows 645 with SMC Pentax-A 645 55mm F2.8 Lens (reversed) using Reverse Adaptor 645 and Reverse Attachment 645, and 645D Body with Helicoid Extension Tube 645

Mounting Pentax 645 Lenses in Reverse

Figure 4.5



Reverse Adaptor 645 & Reverse Attachment 645

Figure 4.6



Detail of Reversed A645 55mm F2.8 Lens

When mounting 645 lenses in reverse, the **Reverse Attachment 645** must be used to allow the aperture to be set manually. Without engaging the aperture linkage on the rear of the lens, the aperture will remain open with no way to stop it down. While the **Reverse Adaptor 645 Set** appears to limit the reversed use of lenses to only those with a 58mm filter thread, by using an appropriately sized step-down ring other lenses can also be used. Step-down rings are not as popular as step-up rings and are sometimes hard to find, but Heliopan and Sensei are two established manufacturers and there are others on eBay.

The **Asahi Pentax Auto Bellows 6x7**: Part way through the production history of the 6x7 system, (6cm x 7cm film image) Pentax renamed the newest and redesigned camera bodies as 67 instead of 6x7, and they also redesigned and brought out a number of new lenses, replacing older units of the same sizes and apertures, and differentiated these by calling the newer ones “67” lenses and accessories. This could cause confusion for some readers as in this review I tried to use the “proper names” as used by Pentax, thereby mixing the terms 6x7 and 67. In effect the terms 6x7 and 67 are synonymous, and both refer to the same system of photographic components, but do differentiate between similar, but redesigned items, within Pentax’s largest medium format system.

The **Asahi Pentax Auto Bellows 6x7** looks very much like the “35mm” auto bellows units K, M and A, but it is not until you actually hold one in your hands do you truly appreciate the size. This bellows is a huge, magnificent beast! It retains similar design features as the “35mm” auto bellows units, the well-engineered “X” rail, independently moveable front and rear mounting boards, with the front lens board being reversible, a geared rail mount and tripod seat, for balance and focus assist, and all operated by micro-action control knobs with integral locking knobs. The bottom mounting plate has a generous surface and includes a threaded 1/4 -20 (UNC) mounting hole as well as a 3/8-16 (UNC) threaded hole to accommodate larger tripod studs. Unlike the **Auto Bellows 645** this medium format bellows does have a dedicated “slide” copier for transparencies and negatives from 35mm to 6cm x 7cm. See Figure 4.14 (page 81).

A magnetically attached magnification scale is included, and with the also included **Pentax Double Cable Release A**, automatic diaphragm operation is retained, allowing open aperture focusing with automatic aperture stop down at time of exposure. The minimum extension distance at 54mm is almost the same as a #3 Auto Extension Tube. The bellows unit is extendable from 54mm to 352mm with normal setting, and from 100mm to 353mm with the front board reversed. Although the front board turns around to mount a lens in reverse, you can also mount a lens in reverse configuration using the **Reverse Adaptor 67mm** or the **Reverse Adaptor 49mm** accessories, which is a slightly quicker method.

Unlike all the other **Pentax Auto Bellows Units** the Camera Body Connector Ring is not removable for ease of mounting the camera, and the camera mount of this bellows utilizes the 6x7 **outer** bayonet mount with a lever operated “breach” locking mechanism. Mounting the camera body is a little awkward and is definitely a two handed operation. During the camera attachment the bellows needs to be securely mounted on a substantial tripod to avoid accidents.

With the **SMC Pentax 67 105mm f2.4** lens magnifications from 0.51X to 2.0X are available, and 0.73X to 3.02X with the same lens reversed. Lenses from 90mm to 300mm are usable with the exception of the LS 165mm f4.0. Using the **Reverse Adaptor 49mm** allows the mounting of some “35mm” lenses. The instructions for the reverse adaptors lists a number of 35mm lenses, and two lenses seem particularly interesting. The 28mm f3.5 and the 35mm F2 and F3.5 will attain significantly higher magnification values than can be achieved by 6x7 and 67 lenses. Depending on the particular lens chosen a 52 to 49mm step-down ring may be required to attach to the **Reverse Adaptor 49mm**. The instruction sheet only shows these 35mm lenses in combination with the **Pentax Helicoid Extension Tube 67**, which extends from 32mm to 52mm, and at maximum magnifications of 4.92 and 3.88 times life size respectively. With the longer extension of the **Pentax Auto Bellows 6x7** the magnification could be increased. **Pentax 645** lenses can also be used in reverse mode.

The **TTL Pentaprism Finder** on the **Pentax 67 II** camera body, with its built-in exposure meter would allow stop-down metering, but this finder protrudes slightly past the body mounting flange on the camera body and will not allow the body to be mounted on the bellows with this finder installed. Using the Extension Tube #1 or #2 from the less common two piece **6x7 Extension Tube Set** (non-auto, external bayonet) will facilitate the mounting without changing the viewfinder, however using the optional **Rigid Magnifying Hood** or the **Folding Focusing Hood** is actually a better choice for macro work and their use does not require an extension tube.

The lenses mount on an internal bayonet mount, as they do on the camera body. The **Auto Extension Tubes** and the **Helicoid Extension Tube 67** cannot be used on the camera end, because of the breech lock mount, but can be used on the lens board, with the **Auto Extension Tubes** retaining automatic diaphragm operation while the **Helicoid Extension Tube** does not.

The **Asahi Pentax Auto Bellows 6x7** retailed for \$1,349.95 US in 1999 and today (2016) they are commonly seen on eBay at prices between \$350 and \$500 US. The maximum magnifications using the 6x7 bellows are moderate compared to those achieved with the smaller “35mm” bellows units. The **Asahi Pentax Auto Bellows 6x7** is a viable option for those medium format photographers using digital cameras such as the **Pentax 645D** and **Pentax 645Z**, given the scarce availability of the **Pentax Auto Bellows 645**.

Using the Asahi Pentax Auto Bellows 6x7 with Pentax 645D and 645Z Camera Bodies:

Using the **Pentax Adaptor 645 for 67 Systems** allows for mounting the 645 camera body on the **Auto Bellows 6x7** as it has both internal and external bayonet components. There are also third party 6x7 to 645 adaptors available, but keep in mind that for bellows use the adaptor must also have external flange components to accommodate the “breach lock” of the **Pentax 6x7 Auto Bellows**. Detail of the **Pentax 645D** mounted on the **Asahi Pentax 6x7 Auto Bellows** is shown in Figure 4.13 (Inset).

The **Pentax Adaptor 645 for 67 Systems** also provides for aperture linkage on the **Pentax 6x7** and **67** lenses when used on 645 cameras without the bellows, making 6x7 and 67 lenses attractive to 645 photographers as they provide excellent performance and their used equipment pricing is attractive. While these lenses will function in auto diaphragm/open aperture mode, they will not show the aperture settings on the LCD screens of the **Pentax 645D** and **Pentax 645Z** cameras and the aperture must be set manually, and of course cannot be set using the rear thumb wheel on the camera body.

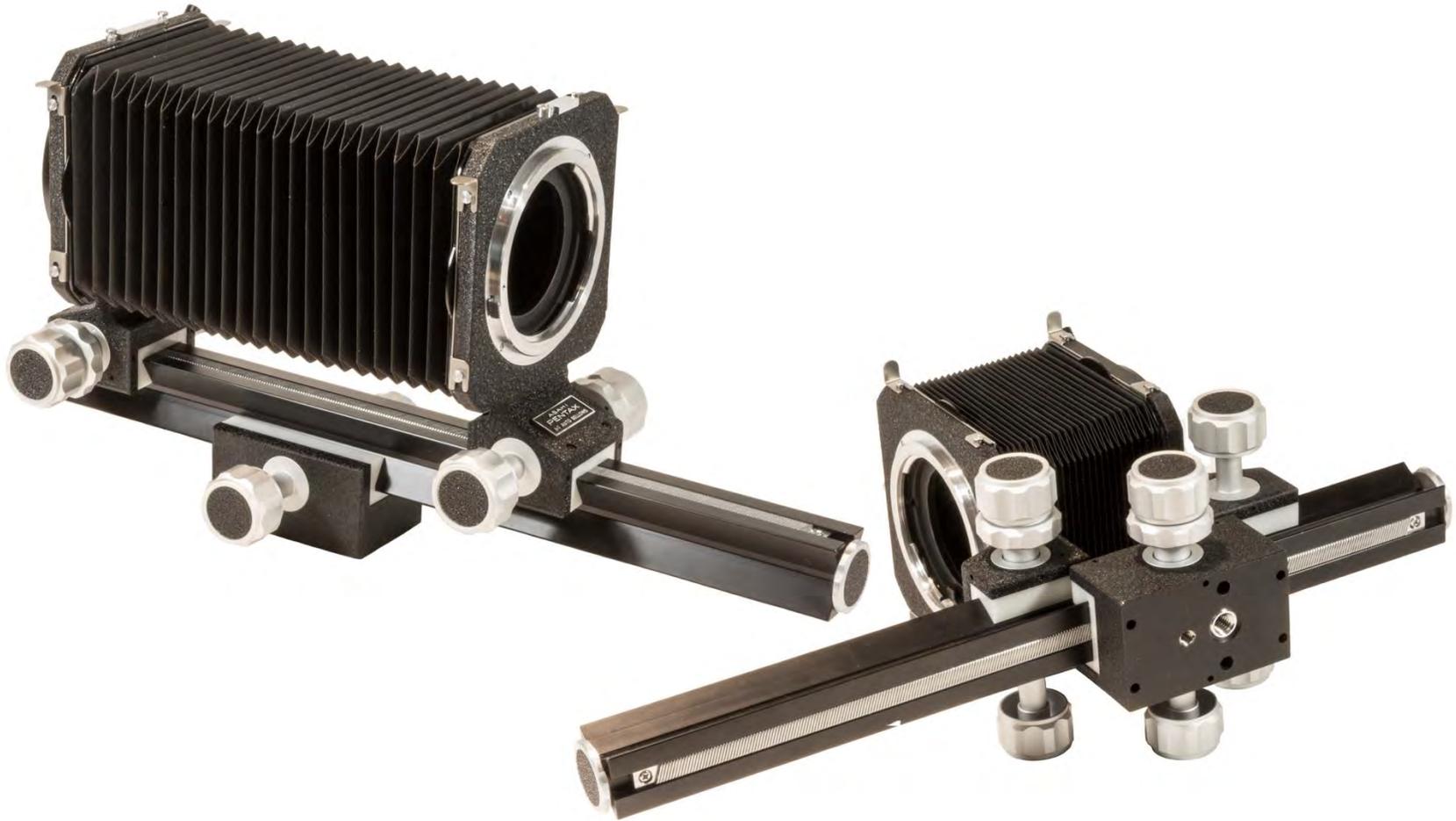
There are some excellent **SMC Pentax 67** lenses that can be utilized with the 645 cameras. The **SMC Pentax 67 105mm F2.4**, which performs well on and off the bellows, and fills a gap in the 645 prime lens offering. Another lens worth considering is the superb **SMC Pentax 67 55mm F4.0**. This lens will give higher magnification values when used with the **Asahi Pentax 6x7 Auto Bellows**, but it must be used in reverse mode as the protruding rear element does not allow it to mount directly on the lens board. This would require a 77mm to 67mm step-down ring with the **Pentax Reverse Adaptor 67mm**. The **SMC Pentax 67 200mm F4.0** performs well on camera, and on the bellows, while this medium telephoto allows a greater subject to lens distance, is not suitable for reverse mounting.

Figure 4.7



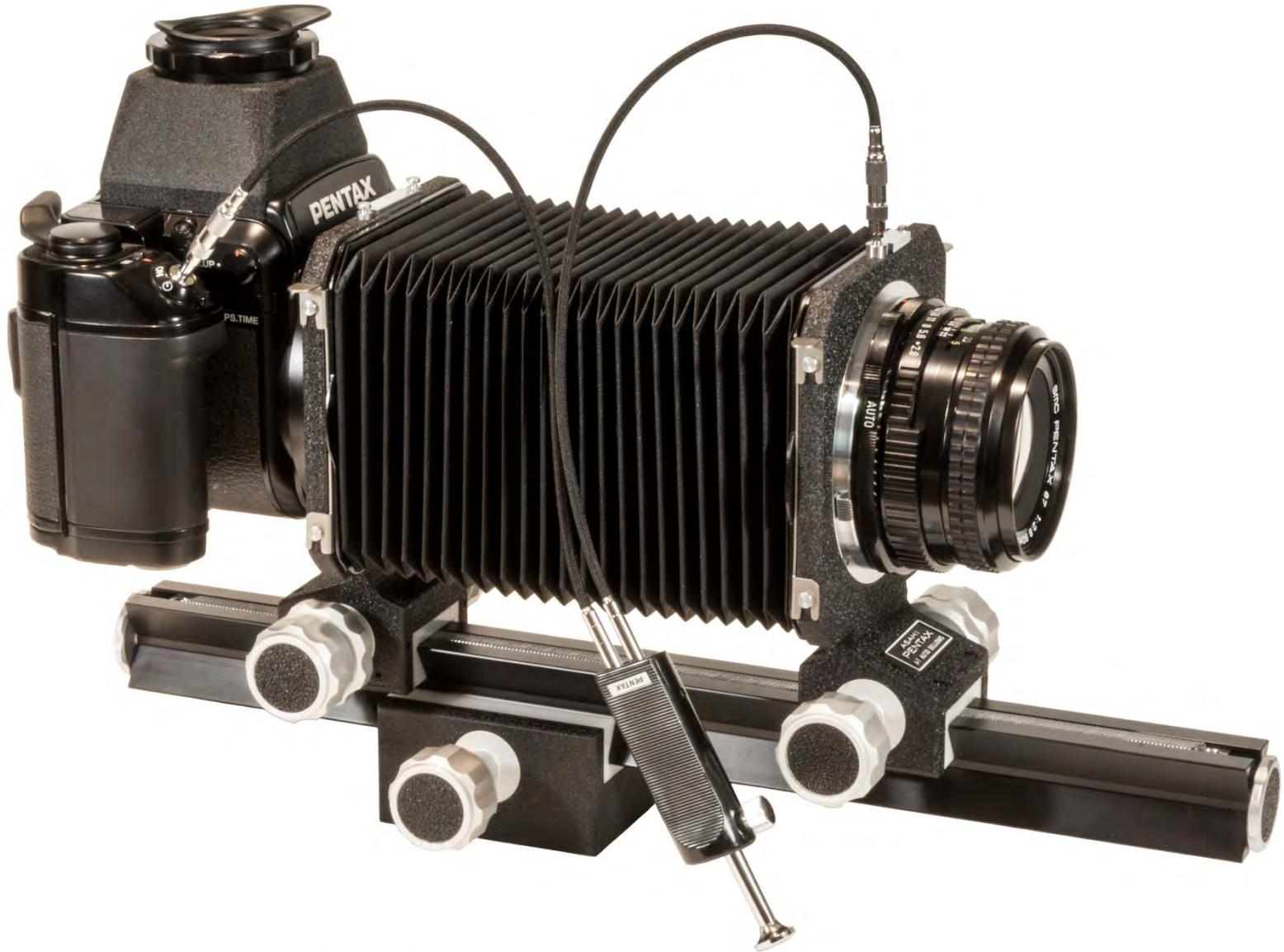
Asahi Pentax 6x7 Auto Bellows

Figure 4.8



Asahi Pentax 6x7 Auto Bellows

Figure 4.9



Asahi Pentax 6x7 Auto Bellows with SMC 67 90mm F2.8 Lens with 67 II Body and Rigid Magnifying Hood

Figure 4.10



Asahi Pentax 6x7 Auto Bellows with SMC Pentax 67 105mm F2.4 lens (Reversed), Reverse Adaptor (67mm), Double Cable Release, Extension Scale and Asahi Pentax 6x7 Body

Mounting Pentax 6x7 and 67 Lenses in Reverse

Figure 4.11



Figure 4.12

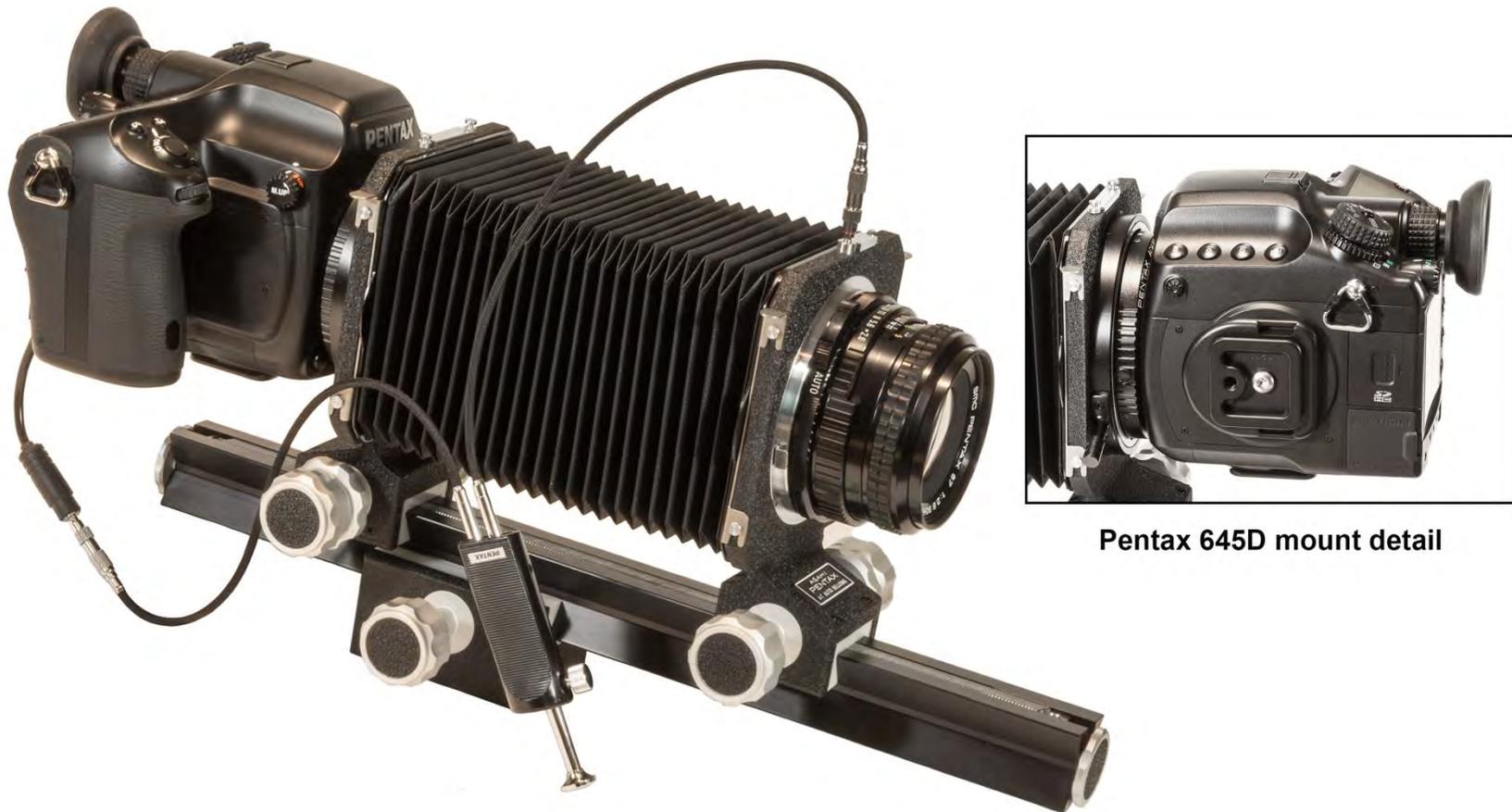


Reverse Adaptor 67mm & Reverse Adaptor 49mm

Detail of Reversed SMC Pentax 67 105mm F2.4 Lens

When mounting 6x7 and 67 lenses in reverse using a Reverse Adaptor the Auto/Manual, or depth of field preview lever, shown above in “Auto” must be moved to “Man.” This will allow the aperture to remain closed after setting it prior to taking an exposure. The lens can be rotated after mounting by loosening the knob shown above (in Figure 4.11) to move the aperture markings to an appropriate position for viewing. While the reverse adaptors appear to limit the reversed use of lenses only with a 67 or 49mm filter thread, by using an appropriately sized step-down ring other lenses can also be used. Step-down rings are not as popular as step-up rings and are sometimes hard to find, but Heliopan and Sensei are two established manufacturers and there are others on eBay.

Figure 4.13



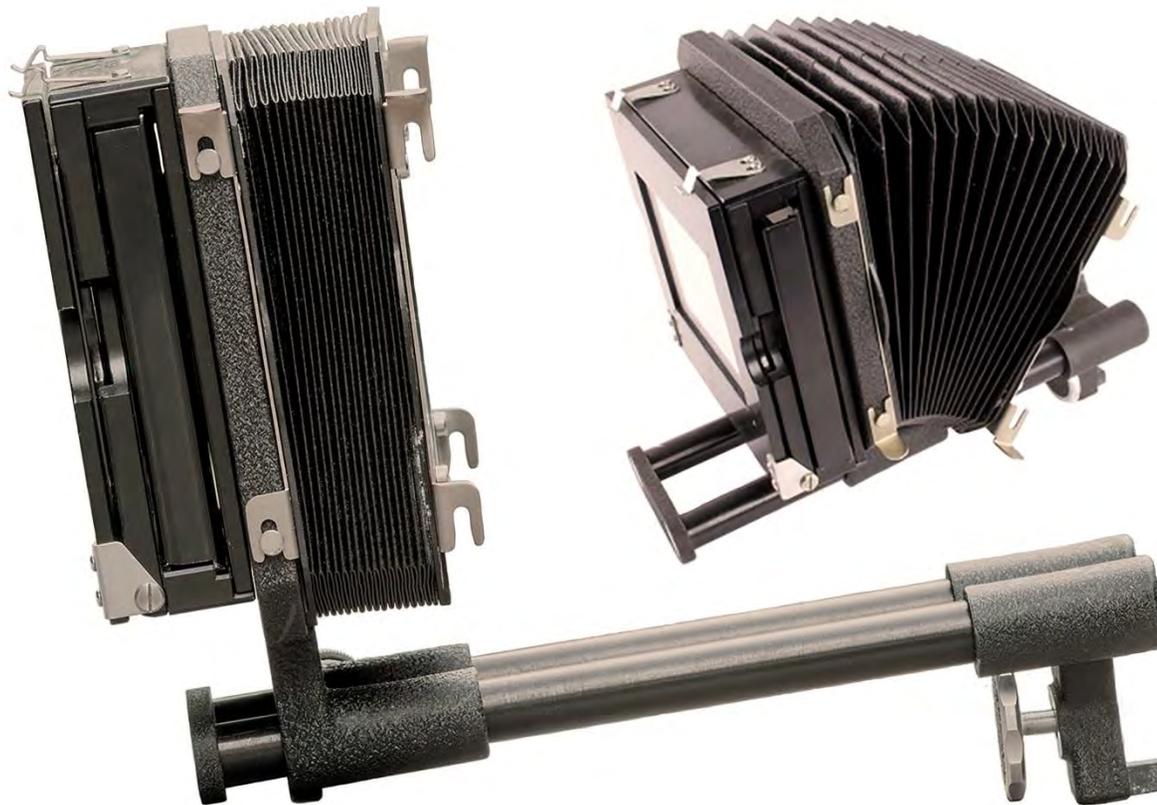
Pentax 645D mount detail

Asahi Pentax 6x7 Auto Bellows with SMC Pentax 67 90mm F2.8 Lens and 645D Camera Body using Adaptor 645 for 67 and Double Cable Release with Modified Canon T3 Cable Release Adaptor

Asahi Pentax 6x7 Slide Copier

The **Asahi Pentax 6x7 Slide Copier** can only be used only with the **Asahi Pentax 6x7 Auto Bellows**. The **Pentax Auto Bellows 645** does not have a slide copier attachment.

Figure 4.14



Pentax Bellows User Manuals

There are some inaccurate illustration plates in some of the hard copy user manuals and sales brochures, the K Series Auto Bellows Manual, and the sales brochure for the Bellows III in particular. There are seven incorrect illustrations, including the covers in each of the Bellows Unit K and the Bellows Unit III User manuals. These show the wrong position of the locking screw for the camera connector. Pentax reprinted the manual for the Bellows Unit III in February of 1981 and all the corrections were made for that manual. I have endeavored to make the necessary corrections in the other full colour, “photoshopped”⁵⁰ scans and PDF copies I have made of all the various bellows user manuals.

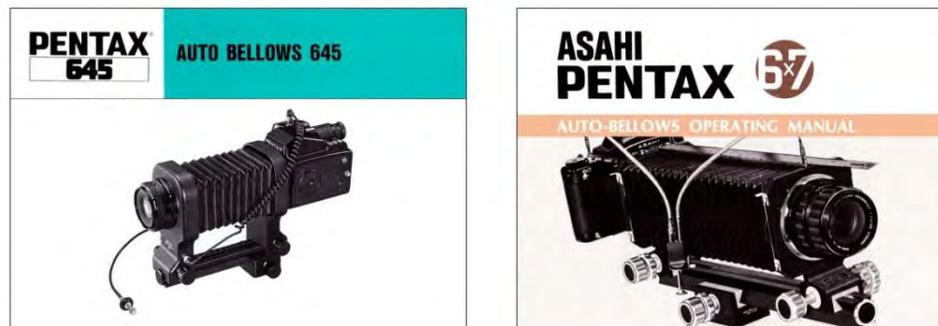
Figure 5.0



⁵⁰ <https://en.wiktionary.org/wiki/photoshopped>

Medium Format Pentax Auto Bellows User Manuals

Figure 5.1



Macro Specification Tables

The User Manuals for the all the bellows units contain tables that show the photographic data for various lenses available at that time. These tables contain Magnification data, Bellows Extensions, Working Distance, Photographing Area, Film-to-Object Distances and Exposure factors, which can be very helpful depending on your subject and purpose.

Figure 5.2

Table 3: M-85mm f/2 and 85mm f/1.8 (Distance scale set to ∞)				
Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor
0.45	38 mm	53.8 × 80.7 mm	378 mm	× 2.3
0.59	50	40.9 × 61.4	345	× 2.9
0.82	70	29.2 × 43.8	323	× 3.9
1.06	90	22.7 × 34.1	320	× 5.1

Table 4: M-100mm f/2.8 (Distance scale set to ∞)				
Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor
0.38	38 mm	63 × 95 mm	499 mm	× 2.4
0.50	50	48 × 72	448	× 3.0
0.70	70	34 × 51	411	× 4.0
0.90	90	27 × 40	399	× 5.3
1.10	110	22 × 33	398	× 6.7

34

These tables are an important reference for doing precise macro work and in determining what lens will most easily accomplish the magnification you desire, and working distance you require. Unfortunately a number of used bellows units are sold and change hands without the operating manual being available. While the operation of the bellows units is fairly straight forward, the technical information from these tables is a valuable resource.

Note, that the individual operating manual tables only list the lenses that were available at the time that particular bellows unit was manufactured. As all of the four “35mm” series **Pentax Auto Bellows Units** have the same extension capabilities I have attached composite tables, using all four user manuals, as an appendix to this eBook, starting on page 88. This includes the Auto Bellows (M42), Auto Bellows K, Auto Bellows M, and the Auto Bellows A, and includes screw mount Takumar lenses as well as K mount lenses up to and including the “A” series. For the two medium format **Pentax Auto Bellows Units** I have included their entire specification tables. Some of the lens tables list extensions longer than the bellows are capable of, these were provided on the assumption that extension tubes will be used in addition to the bellows to attain the listed extension.

As the “35mm” tables were compiled for “full frame” bodies, it is sometimes thought that they are no longer accurate when using a “crop factor” body such as the Pentax K3 due to the “magnification” of the APS-C sensor. This “magnification” is a common misconception, continually being reinforced by camera manufacturers, and in some cases used as a somewhat misleading sales tool. It is said that with a 1 ½ crop factor sensor that a 100mm lens becomes a 150mm lens, a 200mm lens is now a 300mm, and so on, this is not true⁵¹.

There is **NO** magical, free, increase of magnification for **ANY** lens when using an APS-C sensor there is only a **CROP** of the area you are viewing, or a change in the viewing angle. The view is still a 100mm, or 200mm magnification, respectively, but it has the **APPEARANCE** of what you would see through a 150mm lens, or a 300mm lens, but **NOT** an increase in the magnification of the lens or subject.

The “Photographing Area” is the only data in the various lens tables which is inaccurate when used with a crop sensor camera body, and this can be “factored” to provide a reasonably accurate reference, if this is necessary to your photographic purpose. Of course with the new full frame **Pentax K-1** all the lens table data is accurate.

⁵¹ <https://photographylife.com/what-is-crop-factor>

Epilogue

Some Pentax bellows units were only manufactured for a short time and I suspect a few were made in limited quantities. It was quite challenging collecting all the bellows units made by Pentax and their User Manuals, as these were not always available with the units. eBay makes global shopping easy, but there were some interesting stories and situations as items came from worldwide; the Russian Federation, Poland, United Kingdom, Netherlands, Spain, Australia, Japan, Portugal, Austria and of course Canada and the USA.

The most unusual, and somewhat comical, situation was when I was looking at a Polish language only auction site on the Internet (not eBay), trying to bid on a rare bellows unit that I had not been able to find anywhere. Not being able to understand the language, and unable to translate “pop-up” boxes in my Web browser, I was on the telephone with a Polish speaking friend and making “screen shots” of my computer screen and e-mailing them to him so that he could tell me the next “button” to push. It brings to mind some of the situations of the Mr. Bean character!

There are still manufacturers making bellows units, but in my opinion the build quality of the **Pentax Bellows II (dual rail)**, and all the **X rail versions** of the **Pentax Bellows Units** are far superior to products currently manufactured. They are marvellously well-engineered, precision pieces of photographic equipment, with longevity, and capabilities beyond macro lenses alone.

What I found amazing was that of the more than twenty bellows units I have, or have handled, was the longevity and condition of the actual pleated bellows considering that some were half a century old. They can be repaired using Liquid Stitch, Elmer’s Fabric Glue and Black Fabric Paint and instructions can be found on the **Extreme Macro**⁵² website which is an excellent resource for macro information. One exception in bellows condition was my **Pentax Auto Bellows 6x7** which had considerable deterioration. Rather than try to repair it I opted to have a new pleated bellows made by **Custom Bellows Ltd.**⁵³ in the UK and now have a “like new” **Pentax Auto Bellows 6x7**. Custom Bellows Ltd. was established more than one hundred and twenty years ago and interestingly designed and manufactured the bellows for one of the **Kodak Brownie Cameras** in 1936.

With a little judicious shopping used **Pentax Bellows Units** can be purchased at reasonable prices, considering the value, and are well worth adding to your camera bag.

⁵² <http://extreme-macro.co.uk/>

⁵³ <http://www.custombellows.co.uk/>

Figure 5.3



A Graphic Comparison of Size of the Various Pentax Bellows Units

Figure 5.4



Pentax Auto Bellows A with SMC Pentax Bellows 100mm F4.0 Lens, K3 Body with Extension Tube K #1, and Stackshot Macro Rail Kit



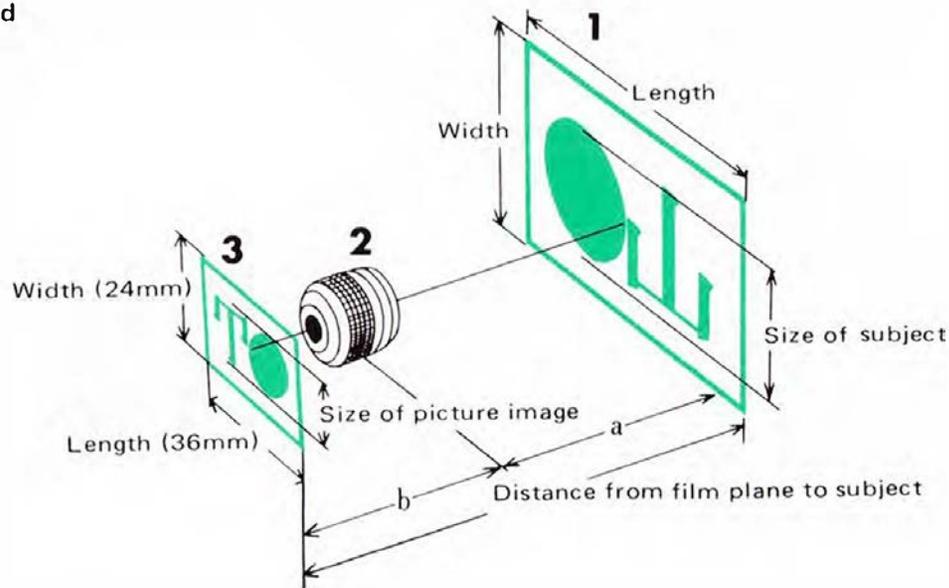
Murray O'Neill is a Stock Photographer specializing in wildlife images. His work has appeared in publications of National Geographic, Canadian Geographic, National Wildlife Federation, tourism brochures of British Columbia, Yukon Territories and Alaska and his images have graced the covers of more than forty magazines.

www.pentaxphotogallery.com/artists/murrayo'neill
oneill@nucleus.com

Appendix: Close-up Tables

HOW TO USE THE CLOSE-UP TABLES

1. Area to be photographed
2. Lens
3. Picture area of film



Magnification

$$\text{Magnification} = \frac{\text{Size of image}}{\text{Size of subject}} \text{ or}$$

$$\frac{\text{Height/length of picture area}}{\text{Height/length of subject}}$$

The size of the picture area for Pentax Bayonet Mount cameras is 24mm x 36mm. Therefore, magnification can be expressed as

$$\frac{24\text{mm}}{\text{Height of area to be photographed}} \text{ or}$$

$$\frac{36\text{mm}}{\text{Length of area to be photographed}}$$

Area to be Photographed

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

Exposure Factors

The Pentax Bayonet Mount cameras have a built-in through-the-lens exposure meter which measures the amount of light actually passing through the lens. Therefore, these exposure factors will not be required. But bear in mind that close-up work requires longer exposure times than when photographing subjects of the same brightness from normal distances.

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 film-to-subject distance.

Film-to-Subject Distance

The Pentax K Series cameras have no markings to show the exact position of the



film plane, but the rear edge of the pentaprism housing (see Fig. 34) is almost in the same plane as the film. The desired distance is first determined from the close-up tables, and then the scales are used to measure the distance between the subject and the rear edge of the pentaprism more precisely.

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 40mm in size so that its size on the film will be 32mm, when using a 50mm f/1.7 lens, the magnification will be $32/40 = 0.8$. Table

1 shows that the bellows in this case should be extended to somewhere in between 40 and 50mm. To find the exact extension, use the following simple formulae:

$$m = \frac{f}{a - f} \quad \text{and} \quad b = \frac{af}{a - f}$$

where m = magnification
 a = distance from the subject to the first nodal point (shown in Fig. 32 on page 28)
 b = distance from film to second nodal point.
and f = real focal length of the lens.
 $b - f$ is the required bellows extension.

Measure this distance with the scales (shown in Fig. 9 page 8 and Fig. 24 on page 16) when adjusting the position of the front plate. Focus

by turning the tripod position shift knob as in Fig. 27 on page 19. Be careful not to touch the rear plate extension knob, since this may alter the bellows extension and the magnification. Depending on the lens, the real focal length f , may differ slightly from the quoted focal length. See your local Pentax dealer or Service Center for further details.

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 30 x 45mm to completely fill the picture area of the film when using a 50mm f/1.7 lens, Table 1 shows that the bellows extension will have to be about 40 to 50mm. Again, use the scales to adjust the bellows position, and the tripod

position 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 plate (by turning the rear plate extension knob) are possible.

The minimum magnification obtained when using a 200mm lens with the Auto Bellows K unit is 0.19 (Table 10); and 0.13 (Table 11) when using a 300mm lens. Consequently, the front plate will hardly ever be used for focusing purposes.

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

When Starting With the Film-to-Subject Distance

When the subject cannot be approached too closely, first measure the distance to the subject. For example, if you would like a magnification of 0.2x when more than 1.5m distant from the subject, you will find by checking through the different tables, that this can only be achieved by using a 200mm lens (Table 10), or a 300mm lens (Table 11).

Focusing Problems and Aperture

In general, focusing becomes rather difficult when you approach magnifications of 1x when using any of the faster lenses, or the single lens reflex wide-angle lenses of shorter focal length, or telephoto lenses whose lens barrel lengths are relatively short in comparison with their focal lengths.

And where the lens is reversed for magnifications of over 1x, the same focusing problem will be encountered as the magnification approaches 1x. Lenses not included in the tables have been omitted because they are not suitable for close-up work with the Auto Bellows K unit. The 50mm f/1.2 and the 50mm f/1.4 lenses are more suitable for photographing three dimensional subjects where sharp focusing in all four corners is not necessary. The 50mm f/1.4 lens can only be used for photographing subjects in flat planes if the small apertures (f/11 and f/16) are employed. On the other hand, if the aperture is set at stops smaller than f/11 in ordinary photography, sharpness deteriorates due to diffraction. When the 50mm f/1.4 and f/1.2 lenses are set to f/16 or beyond for magnifications of 1x and less in NORMAL, or 1x and more in REVERSE,

the sharpness will deteriorate somewhat due to diffraction, but the improvement due to loss of peripheral aberration is greater.

The close-up tables 1, 2, and 19-21 (standard lenses) also list the apertures which will still give satisfactory sharpness over the complete picture area when photographing subjects in a flat plane.

Lenses Best for Close-Ups

The SMC Pentax Macro 50mm f/4 and 100mm f/4 lenses are designed for maximum performance at magnifications of 1/5 ~ 1/10x. Hence they are particularly suitable for close-up work requiring critical focusing. Distortion (a kind of aberration where straight lines do not come out as straight lines in the photograph) has been reduced to a minimum. So the macro lenses are very good for close-up work requiring highly accurate dimensions.

CLOSE-UP TABLES (use of Lenses in Normal Position)

SPECIAL NOTES

1. The wide-angle lenses up to 35mm and the 40mm f/2.8 lens are excluded from the close-up tables. For such wide-angle lenses with short focal length and high-speed lenses are not suited for close-up work of high magnification, unless they are used in reverse.

The extension of the Auto Bellows K is 38mm or more. Therefore, if a wide-angle lens, 35mm or less, is used with the bellows, the magnification exceeds 1X. The lens should be reversed at such a time.

The 40mm f/2.8 lens, which provides a magnification of about 1X, should be used with the Auto Extension Tube K for close-up work.

2. Also excluded from the close-up tables are fast lenses such as the 50mm f/1.2 and 50mm f/1.4, which provide a magnification of about 1X and have unsatisfactory sharpness for flat subjects.

3. Magnification for the normal position has only been listed up to a little over 1X. For greater magnification, use the lens in reverse.

4. The SMC Pentax Macro 50mm f/4 lens can attain magnification of 1X by employing the Auto Extension Tube K No. 3, while the Macro 100mm f/4 attains magnification of over 1X with the Auto Extension Tube K50. Diaphragm automation and full-aperture metering are also retained. The use of the extension tubes is highly recommended.

SMC TAKUMAR 35mm f/3.5 (42mm Screw mount)

Normal Lens Position

Distance scale set at ∞

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
1.09	38 mm	33.2 × 22.1 mm	14.9 cm	× 3.3
1.14	40	31.5 × 21.0	15.0	× 3.5
1.43	50	25.2 × 16.8	15.3	× 4.4
1.71	60	21.0 × 14.0	15.9	× 5.3
2.00	70	18.0 × 12.0	16.6	× 6.4
2.29	80	15.8 × 10.5	17.4	× 7.5
2.57	90	14.0 × 9.3	18.2	× 8.7
2.86	100	12.6 × 8.4	19.1	× 10.1
3.14	110	11.5 × 7.6	20.0	× 11.5
3.43	120	10.5 × 7.0	20.9	× 13.0
3.71	130	9.7 × 6.4	21.8	× 14.6

Since high speed lenses, such as f/1.4, in normal position are not suitable for macrophotography, no close-up table for the 50mm f/1.4 lens in normal position is provided in this manual. The Macro-Takumar and Bellows-Takumar lenses are especially designed for close-up and macrophotography, and can be used in normal position for optimum results. Other lenses, however, should be used in reversed position for macrophotography (over 1× magnification).

Some of the close-up tables of this manual contain extra data for beyond the maximum lens extension permissible with Auto-Bellows. These extra data are for application when using additional bellows or extension tubes.

A- or M-50mm f/1.7 (Normal) (Distance scale set to ∞)

Magnification	Bellows Extension	Working Distance	Photographing Area	Film-to-Object Distance	Exposure Factor
0.8	42	93	45 x 30	207	3.0
0.9	47	86	40 x 27	205	3.3
1.0	52	80	36 x 24	204	3.7

A- or M-50mm f/2 (Normal) (Distance scale set to ∞)

Magnification	Bellows Extension	Working Distance	Photographing Area	Film-to-Object Distance	Exposure Factor
0.8	42	98	45 x 30	207	3.2
0.9	47	90	40 x 27	205	3.6
1.0	52	85	36 x 24	204	3.9

A-Macro 50mm f/2.8 (Normal) (Distance scale set to ∞)

Magnification	Bellows Extension	Working Distance	Photographing Area	Film-to-Object Distance	Exposure Factor
0.8	42	98	45 x 30	210	2.9
0.9	47	91	40 x 27	208	3.2
1.0	52	85	36 x 24	208	3.5

M-Macro 50mm f/4 (Normal) (Distance scale set to ∞)

Magnification	Bellows Extension	Working Distance	Photographing Area	Film-to-Object Distance	Exposure Factor
0.8	41	109	45 x 30	210	3.5
0.9	46	102	40 x 27	208	3.9
1.0	52	96	36 x 24	208	4.3

SMC MACRO-TAKUMAR 50mm f/4 (42mm Screw mount) Normal Lens Position

Specially computed for close-up and macrophotography, this special lens focuses from life-size (1× magnification) to infinity. The data in the close-up table for this lens are computed on the basis of its closest focusing distance.

(At Shortest Distance scale)

MAGNIFICATION	LENS EXTENSION		PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
	Macro	Super-Macro			
1.74	38 mm		20.7 × 13.8 mm	22.4 cm	× 8.3
1.78	40	65 mm	20.3 × 13.5	22.5	× 8.6
1.97	50	75	18.3 × 12.2	23.2	× 9.9
2.16	60	85	16.6 × 11.1	24.0	× 11.2
2.36	70	95	15.3 × 10.2	24.8	× 12.7
2.55	80	105	14.1 × 9.4	25.6	× 14.2
2.74	90	115	13.1 × 8.7	26.5	× 15.9
2.94	100	125	12.3 × 8.2	27.3	× 17.6
3.13	110	135	11.5 × 7.7	28.2	× 19.4
3.33	120	145	10.8 × 7.2	29.1	× 21.3
3.52	130	155	10.2 × 6.8	30.1	× 23.3
3.71	140	165	9.7 × 6.5	31.0	× 25.4
3.91	150	175	9.2 × 6.1	31.9	× 27.6
4.10	160	185	8.8 × 5.9	32.8	× 29.8
4.29	170	195	8.4 × 5.6	33.8	× 32.2
4.49	180	205	8.0 × 5.3	34.7	× 34.6
4.68	190	215	7.7 × 5.1	35.7	× 37.1
4.88	200	225	7.4 × 4.9	36.6	× 39.8

55mm f/1.8**(Normal)**(Distance scale set to ∞)

Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor
0.67	38 mm	35.9 × 53.8 mm	233 mm	× 2.7
0.70	40	34.1 × 51.1	230	× 2.8
0.88 ***	50	27.3 × 40.9	224	× 3.4
1.06 **	60	22.7 × 34.1	223	× 4.1

SMC TAKUMAR 55mm f/1.8 (42mm Screw mount)**Normal Lens Position**Distance scale set at ∞

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.67	38 mm	53.8 × 35.9 mm	23.3 cm	× 2.7
0.70	40	51.1 × 34.1	23.0	× 2.8
0.88	50	40.9 × 27.3	22.4	× 3.4
1.06	60	34.1 × 22.7	22.3	× 4.1
1.23	70	29.2 × 19.5	22.6	× 4.8
1.41	80	25.6 × 17.0	23.0	× 5.6
1.58	90	22.7 × 15.1	23.6	× 6.4
1.76	100	20.4 × 13.6	24.2	× 7.3
1.94	110	18.6 × 12.4	24.9	× 8.3
2.11	120	17.0 × 11.4	25.7	× 9.3
2.29	130	15.7 × 10.5	26.4	× 10.4

M-85mm f/2 and 85mm f/1.8**(Normal)**

(Distance scale set to ∞)

Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor
0.45	38 mm	53.8 × 80.7 mm	378 mm	× 2.3
0.59	50	40.9 × 61.4	345	× 2.9
0.82	70	29.2 × 43.8	323	× 3.9
1.06	90	22.7 × 34.1	320	× 5.1

SMC TAKUMAR 85mm f/1.9**(42mm Screw mount)****Normal Lens Position**

Distance scale set at ∞

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.45	38 mm	80.4 × 53.6 mm	39.3 cm	× 2.5
0.47	40	76.4 × 50.9	38.5	× 2.6
0.59	50	61.1 × 40.7	35.9	× 3.1
0.71	60	50.9 × 33.9	34.5	× 3.7
0.82	70	43.6 × 29.1	33.8	× 4.3
0.94	80	38.2 × 25.5	33.5	× 5.0
1.06	90	33.9 × 22.6	33.5	× 5.7
1.18	100	30.6 × 20.4	33.7	× 6.4
1.30	110	27.8 × 18.5	34.1	× 7.2
1.41	120	25.5 × 17.0	34.5	× 8.1
1.53	130	23.5 × 15.7	35.1	× 9.0

SMC PENTAX-M 100mm f/2.8**(Normal)**

(Distance scale set to ∞)

Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor
0.38	38 mm	63 × 95 mm	499 mm	× 2.4
0.50	50	48 × 72	448	× 3.0
0.70	70	34 × 51	411	× 4.0
0.90	90	27 × 40	399	× 5.3
1.10	110	22 × 33	398	× 6.7

Bellows 100mm f/4

(Normal)

(Distance scale set to ∞)

Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor
0.02	40 mm	1198 × 1797 mm	5187 mm	× 1.0
0.12	50	199.7 × 299.5	1044	× 1.3
0.22	60	108.9 × 163.4	676	× 1.6
0.32	70	74.9 × 112.3	545	× 1.9
0.42	80	57.1 × 85.6	481	× 2.2
0.52	90	46.1 × 69.1	445	× 2.6
0.72	110	33.3 × 49.9	412	× 3.4
0.92	130	26 × 39	402	× 4.3
1.12	150	21.4 × 32.1	402	× 5.3
1.32	170	18.2 × 27.2	409	× 6.4

SMC BELLOWS-TAKUMAR 100mm f/4 (42mm Screw mount) Normal Lens Position

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.02	40 mm	1797.1 × 1198.1 mm	518.7 cm	× 1.0
0.12	50	299.5 × 199.7	104.4	× 1.3
0.22	60	163.4 × 108.9	67.6	× 1.6
0.32	70	112.3 × 74.9	54.5	× 1.9
0.42	80	85.6 × 57.1	48.1	× 2.2
0.52	90	69.1 × 46.1	44.5	× 2.6
0.62	100	58.0 × 38.6	42.4	× 2.9
0.72	110	49.9 × 33.3	41.2	× 3.4
0.82	120	43.8 × 29.2	40.5	× 3.8
0.92	130	39.1 × 26.0	40.2	× 4.3
1.02	140	35.2 × 23.5	40.1	× 4.8
1.12	150	32.1 × 21.4	40.2	× 5.3
1.22	160	29.5 × 19.6	40.5	× 5.8
1.32	170	27.2 × 18.2	40.9	× 6.4
1.42	180	25.3 × 16.9	41.4	× 7.0
1.52	190	23.6 × 15.8	41.9	× 7.6
1.62	200	22.2 × 14.8	42.5	× 8.3

A or M-Macro 100mm f/4**(Normal)**

(Distance scale set to ∞)

Magnification	Bellows Extension	Working Distance	Photographic Area	Film-to-Object Distance	Exposure Factor
0.4	40	340	90 × 60	491	2.1
0.5	50	290	72 × 48	451	2.5
0.6	60	256	60 × 40	428	2.8
0.7	70	233	51 × 34	414	3.2
0.8	80	215	45 × 30	406	3.6
0.9	90	201	40 × 27	402	4.1
1.0	100	190	36 × 24	401	4.6

105mm f/2.8**(Normal)**

(Distance scale set to ∞)

Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor
0.36	38 mm	66.3 × 99.5 mm	548 mm	× 2.4
0.48	50	50.4 × 75.6	491	× 2.9
0.67	70	36.0 × 54.0	448	× 4.0
0.86	90	28.0 × 42.0	433	× 5.2
1.05	110	22.9 × 34.4	431	× 6.6

SMC TAKUMAR 105mm f/2.8 (42mm Screw mount)**Normal Lens Position**

Distance scale set at ∞

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.36	38 mm	99.5 × 66.3 mm	54.8 cm	× 2.4
0.38	40	94.5 × 63.0	53.6	× 2.5
0.48	50	75.6 × 50.4	49.1	× 2.9
0.57	60	63.0 × 42.0	46.4	× 3.4
0.67	70	54.0 × 36.0	44.8	× 4.0
0.76	80	47.3 × 31.5	43.8	× 4.5
0.86	90	42.0 × 28.0	43.3	× 5.2
0.95	100	37.8 × 25.2	43.1	× 5.8
1.05	110	34.4 × 22.9	43.1	× 6.5
1.14	120	31.5 × 21.0	43.2	× 7.3
1.24	130	29.1 × 19.4	43.5	× 8.0

M-120mm f/2.8**(Normal)**

(Distance scale set to ∞)

Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor	
0.32	38 mm	75.8 × 113.7 mm	713 mm	×	2.7
0.42	50	57.6 × 86.4	634	×	3.4
0.58	70	41.2 × 61.7	572	×	4.7
0.75	90	32.0 × 48.0	546	×	6.3
0.92	110	26.2 × 39.3	537	×	8.0
1.08	130	22.2 × 33.2	537	×	10.0

135mm f/2.5 and f/3.5**(Normal)**

(Figures in brackets for f/3.5 lens)(Distance scale set to ∞)

Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor	
				f/2.5	f/3.5
0.28	38 mm	84.9 × 127.3 (85.3 × 127.9) mm	801 (795) mm	×	2.2 × 2.1
0.37	50	64.5 × 96.7 (64.8 × 97.2)	699 (692)	×	2.7 × 2.5
0.45	60	53.7 × 80.6 (54 × 81)	649 (641)	×	3.1 × 2.9
0.52	70	46.1 × 69.1 (46.3 × 69.4)	616 (607)	×	3.6 × 3.4
0.59	80	40.3 × 60.5 (40.5 × 60.8)	594 (585)	×	4.1 × 3.8
0.67	90	35.8 × 53.7 (36 × 54)	579 (570)	×	4.6 × 4.3
0.74	100	32.2 × 48.4 (32.4 × 48.6)	569 (559)	×	5.2 × 4.8
0.82	110	29.3 × 44.0 (29.5 × 44.2)	562 (553)	×	5.8 × 5.3
0.97	130	24.8 × 37.2 (24.9 × 37.4)	557 (547)	×	7.1 × 6.5
1.04	140	23.0 × 34.5 (23.1 × 34.7)	557 (547)	×	7.8 × 7.1

M-135mm f/3.5**(Normal)**(Distance scale set to ∞)

Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor
0.28	38 mm	85 × 128 mm	845 mm	× 2.4
0.37	50	65 × 97	742	× 3.0
0.44	60	54 × 81	691	× 3.5
0.52	70	46 × 69	657	× 4.1
0.59	80	40 × 60	635	× 4.7
0.67	90	36 × 54	620	× 5.4
0.74	100	32 × 48	609	× 6.1
0.82	110	29 × 44	603	× 6.9
0.96	130	25 × 37	597	× 8.5
1.04	140	23 × 34	597	× 9.4

SMC TAKUMAR 135mm f/3.5 (42mm Screw mount)**Normal Lens Position**Distance scale set at ∞

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.28	38 mm	127.9 × 85.3 mm	79.9 cm	× 2.1
0.30	40	121.5 × 81.0	77.7	× 2.2
0.37	50	97.2 × 64.8	69.6	× 2.6
0.44	60	81.0 × 54.0	64.5	× 3.0
0.52	70	69.4 × 46.3	61.2	× 3.4
0.59	80	60.8 × 40.5	58.9	× 3.9
0.67	90	54.0 × 36.0	57.4	× 4.4
0.74	100	48.6 × 32.4	56.4	× 4.9
0.81	110	44.2 × 29.5	55.7	× 5.5
0.89	120	40.5 × 27.0	55.3	× 6.0
0.96	130	37.4 × 24.9	55.2	× 6.6
1.04	140	34.7 × 23.1	55.2	× 7.3
1.11	150	32.4 × 21.6	55.3	× 8.0
1.19	160	30.4 × 20.3	55.5	× 8.6
1.26	170	28.6 × 19.1	55.9	× 9.4
1.33	180	27.0 × 18.0	56.3	× 10.1
1.41	190	25.6 × 17.1	56.7	× 10.9
1.48	200	24.3 × 16.2	57.2	× 11.7

M-150mm f/3.5 and 150mm f/4 (Normal)

(Distance scale set to ∞)

Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor
0.25	38 mm	94.7 × 142.1 mm	983 mm	× 2.3
0.33	50	72.0 × 108.0	853	× 2.8
0.40	60	60 × 90	788	× 3.3
0.47	70	51.4 × 77.1	745	× 3.8
0.53	80	45.0 × 67.5	714	× 4.4
0.60	90	40 × 60	693	× 5.0
0.73	110	32.7 × 49.1	668	× 6.3
0.87	130	27.7 × 41.5	656	× 7.7
1.00	150	24. × 36	653	× 9.3
1.07	160	22.5 × 33.8	654	× 10.2

SMC TAKUMAR 150mm f/4 (42mm Screw mount)

Normal Lens Position

Distance scale set at ∞

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.25	38 mm	142.1 × 94.7 mm	98.3 cm	× 2.3
0.27	40	135.0 × 90.0	95.6	× 2.4
0.33	50	108.0 × 72.0	85.3	× 2.9
0.40	60	90.0 × 60.0	78.8	× 3.4
0.47	70	77.1 × 51.4	74.5	× 3.9
0.53	80	67.5 × 45.0	71.4	× 4.5
0.60	90	60.0 × 40.0	69.3	× 5.1
0.67	100	54.0 × 36.0	67.8	× 5.7
0.73	110	49.1 × 32.7	66.8	× 6.4
0.80	120	45.0 × 30.0	66.1	× 7.1
0.87	130	41.5 × 27.7	65.6	× 7.9
0.93	140	38.6 × 25.7	65.4	× 8.7
1.00	150	36.0 × 24.0	65.3	× 9.5
1.07	160	33.8 × 22.5	65.4	× 10.4
1.13	170	31.8 × 21.2	65.5	× 11.3
1.20	180	30.0 × 20.0	65.8	× 12.2
1.27	190	28.4 × 18.9	66.2	× 13.2
1.33	200	27.0 × 18.0	66.6	× 14.2

M-200mm f/4, 200mm f/4 and 200mm f/2.5 (Normal)

(Distance scale set to ∞)

Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor
0.19	38 mm	126.3 × 189.5 mm	1561 mm	× 2.0
0.25	50	96 × 144	1321	× 2.4
0.30	60	80 × 120	1197	× 2.8
0.35	70	68.6 × 102.9	1112	× 3.2
0.40	80	60 × 90	1051	× 3.6
0.45	90	53.3 × 80.0	1005	× 4.0
0.55	110	43.6 × 65.5	944	× 5.0
0.65	130	36.9 × 55.4	908	× 6.0
0.75	150	32 × 48	887	× 7.2
0.85	170	28.2 × 42.4	876	× 8.4

SMC TAKUMAR 200mm f/4 (42mm Screw mount)

Normal Lens Position

Distance scale set at ∞

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.19	38 mm	189.5 × 126.3 mm	156.5 cm	× 2.0
0.20	40	180.0 × 120.0	151.1	× 2.1
0.25	50	144.0 × 96.0	132.1	× 2.4
0.30	60	120.0 × 80.0	119.7	× 2.8
0.35	70	102.9 × 68.6	111.2	× 3.2
0.40	80	90.0 × 60.0	105.1	× 3.6
0.45	90	80.0 × 53.3	100.5	× 4.0
0.50	100	72.0 × 48.0	97.1	× 4.5
0.55	110	65.5 × 43.6	94.4	× 5.0
0.60	120	60.0 × 40.0	92.4	× 5.5
0.65	130	55.4 × 36.9	90.9	× 6.0
0.70	140	51.4 × 34.3	89.7	× 6.6
0.75	150	48.0 × 32.0	88.7	× 7.2
0.80	160	45.0 × 30.0	88.1	× 7.8
0.85	170	42.4 × 28.2	87.6	× 8.4
0.90	180	40.0 × 26.7	87.3	× 9.1
0.95	190	37.9 × 25.3	87.1	× 9.7
1.00	200	36.0 × 24.0	87.1	× 10.5

TELE-TAKUMAR 200mm f/5.6 (42mm Screw mount)

Normal Lens Position

Distance scale set at ∞

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.19	38 mm	189.6 × 126.4 mm	156.5 cm	× 1.7
0.20	40	180.1 × 120.1	151.4	× 1.8
0.25	50	144.1 × 96.0	132.4	× 2.0
0.30	60	120.1 × 80.0	120.0	× 2.2
0.35	70	102.9 × 68.6	111.5	× 2.5
0.40	80	90.4 × 60.0	105.3	× 2.8
0.45	90	80.0 × 53.4	100.8	× 3.0
0.50	100	72.0 × 48.0	97.3	× 3.3
0.55	110	65.5 × 43.7	94.7	× 3.7
0.60	120	60.0 × 40.0	92.7	× 4.0
0.65	130	55.4 × 36.9	91.1	× 4.3
0.70	140	51.5 × 34.3	89.9	× 4.7
0.75	150	48.0 × 32.0	89.0	× 5.0
0.80	160	45.0 × 30.0	88.3	× 5.4
0.85	170	42.4 × 28.2	87.9	× 6.0
0.90	180	40.0 × 26.7	87.5	× 6.2
0.95	190	37.9 × 25.3	87.4	× 6.6
1.00	200	36.0 × 24.0	87.3	× 7.1

300mm f/4 (Normal)

(Distance scale set to ∞)

Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor
0.13	38 mm	182.9 × 274.4 mm	3141 mm	× 2.0
0.17	50	139.0 × 208.6	2623	× 2.3
0.21	60	115.9 × 173.8	2354	× 2.7
0.24	70	99.3 × 149.0	2164	× 3.0
0.28	80	86.9 × 130.3	2024	× 3.4
0.31	90	77.2 × 115.9	1918	× 3.8
0.38	110	63.2 × 94.8	1768	× 4.7
0.45	130	53.5 × 80.2	1671	× 5.6
0.52	150	46.3 × 69.5	1605	× 6.7
0.59	170	40.9 × 61.3	1559	× 7.8

SUPER-TAKUMAR 300mm f/4 (42mm Screw mount)**Normal Lens Position**Distance scale set at ∞

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.13	38 mm	284.2 × 189.5 mm	313.0 cm	× 1.4
0.13	40	270.0 × 180.0	301.3	× 1.5
0.17	50	216.0 × 144.0	257.3	× 1.6
0.20	60	180.0 × 120.0	228.3	× 1.8
0.23	70	154.3 × 102.9	207.8	× 1.9
0.27	80	135.0 × 90.0	192.8	× 2.0
0.30	90	120.0 × 80.0	181.3	× 2.2
0.33	100	108.0 × 72.0	172.3	× 2.4
0.37	110	98.2 × 65.5	165.1	× 2.5
0.40	120	90.0 × 60.0	159.3	× 2.7
0.43	130	83.1 × 55.4	154.5	× 2.9
0.47	140	77.1 × 51.4	150.6	× 3.1
0.50	150	72.0 × 48.0	147.3	× 3.3
0.53	160	67.5 × 45.0	144.5	× 3.5
0.57	170	63.5 × 42.4	142.2	× 3.7
0.60	180	60.0 × 40.0	140.3	× 3.9
0.63	190	56.8 × 37.9	138.6	× 4.1
0.67	200	54.0 × 36.0	137.3	× 4.3

TELE-TAKUMAR 300mm f/6.3 (42mm Screw mount)**Normal Lens Position**Distance scale set at ∞

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.13	38 mm	284.4 × 189.6 mm	315.3 cm	× 1.5
0.13	40	270.2 × 180.1	303.6	× 1.5
0.17	50	216.2 × 144.1	259.5	× 1.7
0.20	60	180.1 × 120.1	230.5	× 1.9
0.23	70	154.4 × 102.9	210.0	× 2.0
0.27	80	135.1 × 90.1	194.9	× 2.2
0.30	90	120.1 × 80.1	183.4	× 2.4
0.33	100	108.1 × 72.1	174.4	× 2.6
0.37	110	98.3 × 65.5	167.2	× 2.8
0.40	120	90.1 × 60.0	161.4	× 3.0
0.43	130	83.1 × 55.4	156.6	× 3.2
0.47	140	77.2 × 51.5	152.6	× 3.4
0.50	150	72.1 × 48.0	149.4	× 3.6
0.53	160	67.6 × 45.0	146.6	× 3.9
0.57	170	63.6 × 42.4	144.3	× 4.1
0.60	180	60.0 × 40.0	142.3	× 4.4
0.63	190	56.9 × 37.9	140.7	× 4.6
0.67	200	54.0 × 36.0	139.3	× 4.9

USE OF LENSES IN REVERSE POSITION

1. For producing high magnifications in excess of life size, the lens must be mounted in reverse position with Auto Bellows.

This type of close-up work is most effective with retrofocus wide-angle lenses with a maximum aperture of f/2.8 or slower and with standard lenses that are f/1.4 or slower. When reversed, automatic diaphragm action is retained and the highest magnifications range from 6.2X ~ 6.6X with 28mm lenses, 6.1X with the 30mm lens and 5X ~ 5.2X with the 35mm lenses. Fast f/2 wide-angle lenses and f/1.2 standard lenses are not suited for bellows photography with the lens reversed.

2. Telephoto lenses are also not suited for reversed-lens photography. While magnification with the 85mm lens reversed runs from 0.3X~1.35X, it has been excluded from the reversed lens table because of its limitations.

3. It is pointless to reverse the Macro 100mm lens and other lenses with a longer focal length as magnification will not exceed 1X, even with the maximum bellows extension.

4. As exposure factor increase is also very high with reversed-lens photography exposure times become very long and it is necessary to bear in mind the reciprocity characteristics of the film in use.

5. When shooting highly magnified subjects on a level surface or at specified angles, greater framing precision will be obtained if the Macrophoto Stand is used.

6. At high magnifications, the effective f-number also becomes very high; consequently, focal sharpness drops off in proportion to the degree that the lens is stopped down.

A-28mm f/2.8		(Lens Reversed)		(Distance scale set to ∞)	
Magnification	Bellows Extension	Working Distance	Photographing Area	Film-to-Object Distance	Exposure Factor
2.6	63	48	9.2 × 13.8	165	9.6
3.0	74	46	8.0 × 12.0	175	12.2
3.3	83	46	7.3 × 10.9	183	14.4
3.6	92	45	6.7 × 10.0	191	16.8
4.0	103	44	6.0 × 9.0	201	20.2
4.3	112	44	5.6 × 8.4	210	23.0
4.6	121	43	5.2 × 7.8	218	26.0
5.0	132	43	4.8 × 7.2	229	30.2
5.3	141	42	4.5 × 6.8	237	33.6
5.6	149	42	4.3 × 6.4	245	37.2
6.0	161	42	4.0 × 6.0	257	42.2
6.3	169	41	3.8 × 5.7	265	46.2
6.6	178	41	3.6 × 5.5	273	50.4

M-28mm f/2.8		(Lens Reversed)		(Distance scale set to ∞)	
Magnification	Bellows Extension	Working Distance	Photographing Area	Film-to-Object Distance	Exposure Factor
2.6	56	48	9.2 x 13.8	158	10.1
3.0	67	46	8.0 x 12.0	167	12.8
3.3	75	45	7.3 x 10.9	175	15.1
3.6	84	45	6.7 x 10.0	183	17.5
4.0	95	44	6.0 x 9.0	193	21.0
4.3	104	43	5.6 x 8.4	202	23.8
4.6	112	43	5.2 x 7.8	210	26.9
5.0	124	42	4.8 x 7.2	220	31.2
5.3	132	42	4.5 x 6.8	229	34.6
5.6	141	42	4.3 x 6.4	237	38.2
6.0	152	41	4.0 x 6.0	248	43.3
6.3	161	41	3.8 x 5.7	256	47.4
6.6	169	41	3.6 x 5.5	265	51.6

M-28mm f/3.5 and 28mm f/3.5		LENS REVERSED		(Distance scale set to ∞)	
Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor	
2.66	70 mm	9.0 x 13.5 mm	172 mm	x 10.8	
3.36	90	7.1 x 10.7	189	x 15.9	
4.07	110	5.9 x 8.9	208	x 22.0	
5.12	130	5.0 x 7.5	227	x 29.1	
5.47	150	4.4 x 6.6	246	x 37.2	
6.18	170	3.9 x 5.8	266	x 46.3	

SMC TAKUMAR 28mm f/3.5 (Reversed)**(42mm Screw mount)**Distance scale set at ∞

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
2.64	65 mm	13.6 × 9.1 mm	16.7 cm	× 10.4
2.82	70	12.8 × 8.5	17.1	× 11.6
3.17	80	11.4 × 7.6	18.0	× 14.1
3.52	90	10.2 × 6.8	18.9	× 16.9
3.88	100	9.3 × 6.2	19.8	× 19.9
4.23	110	8.5 × 5.7	20.8	× 23.2
4.58	120	7.9 × 5.3	21.7	× 26.7
4.94	130	7.3 × 4.9	22.7	× 30.5
5.29	140	6.8 × 4.6	23.6	× 34.5
5.64	150	6.4 × 4.3	24.6	× 38.8
6.00	160	6.0 × 4.0	25.6	× 43.3
6.35	170	5.7 × 3.8	26.5	× 48.1

30mm f/2.8**(Lens Reversed)**(Distance scale set to ∞)

Magnification	Bellows Extension	Working Distance	Photographing Area	Film-to-Object Distance	Exposure Factor
2.6	64	49	9.2 × 13.8	166	10.0
3.0	76	48	8.0 × 12.0	177	12.7
3.3	85	47	7.3 × 10.9	185	14.9
3.6	94	46	6.7 × 10.0	193	17.4
4.0	106	45	6.0 × 9.0	205	20.9
4.3	115	45	5.6 × 8.4	213	23.7
4.6	124	44	5.2 × 7.8	222	26.7
5.0	136	44	4.8 × 7.2	233	31.0
5.3	145	43	4.5 × 6.8	242	34.4
5.6	155	43	4.3 × 6.4	251	38.0
6.0	167	43	4.0 × 6.0	263	43.1

A-35mm f/2.8		(Lens Reversed)		(Distance scale set to ∞)	
Magnification	Bellows Extension	Working Distance	Photographing Area	Film-to-Object Distance	Exposure Factor
1.8	59	57	13.3 x 20.0	170	6.2
2.0	66	55	12.0 x 18.0	175	7.2
2.3	77	53	10.4 x 15.7	183	8.9
2.6	87	51	9.2 x 13.8	192	10.8
3.0	101	49	8.0 x 12.0	204	13.6
3.3	112	48	7.3 x 10.9	213	15.9
3.6	122	47	6.7 x 10.0	223	18.4
4.0	136	46	6.0 x 9.0	236	21.9
4.3	147	46	5.6 x 8.4	246	24.8
4.6	157	45	5.2 x 7.8	256	27.9
5.0	172	44	4.8 x 7.2	270	32.3

M-35mm f/2.8		(Lens Reversed)		(Distance scale set to ∞)	
Magnification	Bellows Extension	Working Distance	Photographing Area	Film-to-Object Distance	Exposure Factor
1.8	59	57	13.3 x 20.0	170	6.2
2.0	66	55	12.0 x 18.0	175	7.2
2.3	77	53	10.4 x 15.7	183	8.9
2.6	87	51	9.2 x 13.8	192	10.8
3.0	101	49	8.0 x 12.0	204	13.6
3.3	112	48	7.3 x 10.9	213	15.9
3.6	122	47	6.7 x 10.0	223	18.4
4.0	136	46	6.0 x 9.0	236	21.9
4.3	147	46	5.6 x 8.4	246	24.8
4.6	157	45	5.2 x 7.8	256	27.9
5.0	172	44	4.8 x 7.2	270	32.3

35mm f/3.5**LENS REVERSED**
(Distance scale set to ∞)

Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor
2.01	58 mm	12.0 × 18.0 mm	166 mm	× 7.6
2.34	70	10.2 × 15.4	176	× 9.6
2.63	80	9.1 × 13.7	184	× 11.5
2.92	90	8.2 × 12.4	193	× 13.5
3.20	100	7.5 × 11.2	202	× 15.7
3.49	110	6.9 × 10.3	211	× 18.1
4.06	130	5.9 × 8.9	230	× 23.2
4.63	150	5.2 × 7.8	248	× 29.1
5.20	170	4.6 × 6.9	268	× 35.6

SMC TAKUMAR 35mm f/3.5 (Reversed)**(42mm Screw mount)**
Distance scale set at ∞

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
1.99	57.5 mm	18.6 × 12.1 mm	16.6 cm	× 7.6
2.06	60	17.5 × 11.7	16.8	× 8.0
2.34	70	15.4 × 10.2	17.6	× 9.6
2.63	80	13.7 × 9.1	18.4	× 11.5
2.91	90	12.4 × 8.2	19.3	× 13.5
3.20	100	11.2 × 7.5	20.2	× 15.7
3.49	110	10.3 × 6.9	21.1	× 18.1
3.77	120	9.5 × 6.4	22.0	× 20.6
4.06	130	8.9 × 5.9	23.0	× 23.3
4.34	140	8.3 × 5.5	23.9	× 26.1
4.63	150	7.8 × 5.2	24.8	× 29.1
4.91	160	7.3 × 4.9	25.8	× 32.3
5.20	170	6.9 × 4.6	26.8	× 35.6

M-40mm f/2.8**LENS REVERSED**
(Distance scale set to ∞)

Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor
1.32	45 mm	20.0×30.0 mm	170 mm	× 4.1
1.34	50	18.0×27.0	172	× 4.6
1.58	60	15.0×23.0	177	× 5.7
1.82	70	13.0×20.0	184	× 6.9
2.06	80	11.6×17.4	191	× 8.2
2.30	90	10.4×15.6	199	× 9.7
2.78	110	8.6×12.9	216	× 12.9
3.27	130	7.3×11.0	233	× 16.6
3.75	150	6.4× 9.6	252	× 20.8
4.23	170	5.7× 8.5	271	× 25.4

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M-50mm f/1.4, 50mm f/1.4**LENS REVERSED**
(Distance scale set to ∞)

Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor
1.10 ·	60 mm	21.7×32.6 mm	197 mm	× 3.3
1.18 ·	64	20.3×30.5	198	× 3.6
1.30 **	70	18.5×27.7	200	× 4.1
1.50 ***	80	16.0×24.0	205	× 4.9
1.69	90	14.2×21.3	211	× 5.9
1.89	100	12.7×19.1	218	× 6.8
2.09	110	11.5×17.3	225	× 7.9
2.48	130	9.7×14.5	242	× 10.3
2.87	150	8.4×12.5	259	× 12.9
3.26	170	7.4×11.0	276	× 15.9

A-50mm f/1.4**(Lens Reversed)**(Distance scale set to ∞)

Magnification	Bellows Extension	Working Distance	Photographing Area	Film-to-Object Distance	Exposure Factor
1.0	57	90	24 x 36	200	3.2
1.2	68	82	20 x 30	202	3.9
1.4	78	75	17 x 26	206	4.7
1.6	88	71	15 x 23	212	5.6
1.8	99	67	13 x 20	219	6.6
2.0	109	64	12 x 18	226	7.7
2.2	120	62	11 x 16	234	8.9
2.4	130	60	10 x 15	243	10.1
2.6	141	58	9 x 14	252	11.4
2.8	151	57	9 x 13	261	12.8
3.0	161	56	8 x 12	270	14.3
3.2	172	54	8 x 11	279	15.8

SMC TAKUMAR 50mm f/1.4 (Reversed)**(42mm Screw mount)**Distance scale set at ∞

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
1.15	62 mm	31.2 x 20.8 mm	19.7 cm	x 3.7
1.31	70	27.5 x 18.3	20.0	x 4.3
1.51	80	23.9 x 15.9	20.5	x 5.1
1.70	90	21.1 x 14.1	21.1	x 6.1
1.90	100	19.0 x 12.6	21.8	x 7.1
2.10	110	17.2 x 11.4	22.5	x 8.2
2.29	120	15.7 x 10.5	23.3	x 9.3
2.49	130	14.5 x 9.6	24.1	x 10.6
2.69	140	13.4 x 8.9	25.0	x 11.9
2.88	150	12.5 x 8.3	25.8	x 13.3
3.08	160	11.7 x 7.8	26.7	x 14.8
3.26	170	11.0 x 7.3	27.6	x 16.3

M-50mm f/1.7 and A-50mm f/1.7 (Lens Reversed) (Distance scale set to ∞)

Magnification	Bellows Extension	Working Distance	Photographing Area	Film-to-Object Distance	Exposure Factor
1.0	61	90	24 x 36	204	3.7
1.2	72	82	20 x 30	206	4.5
1.4	82	76	17 x 26	210	5.4
1.6	92	71	15 x 23	216	6.3
1.8	103	67	13 x 20	223	7.4
2.0	113	64	12 x 18	230	8.5
2.2	124	62	11 x 16	238	9.7
2.4	134	60	10 x 15	247	11.0
2.6	144	58	9 x 14	255	12.4
2.8	155	57	9 x 13	264	13.8
3.0	165	56	8 x 12	274	15.4

A- or M-50mm f/2 (Lens Reversed) (Distance scale set to ∞)

Magnification	Bellows Extension	Working Distance	Photographing Area	Film-to-Object Distance	Exposure Factor
1.0	61	91	24 x 36	204	3.9
1.2	72	83	20 x 30	206	4.8
1.4	82	76	17 x 26	210	5.7
1.6	93	72	15 x 23	216	6.7
1.8	103	68	13 x 20	223	7.8
2.0	113	65	12 x 18	230	8.9
2.2	124	63	11 x 16	238	10.2
2.4	134	61	10 x 15	247	11.5
2.6	145	59	9 x 14	256	12.9
2.8	155	58	9 x 13	265	14.3
3.0	165	57	8 x 12	274	15.9

A-Macro 50mm f/2.8		(Lens Reversed)		(Distance scale set to ∞)	
Magnification	Bellows Extension	Working Distance	Photographing Area	Film-to-Object Distance	Exposure Factor
1.2	75	82	20 x 30	209	4.3
1.4	86	75	17 x 26	214	5.2
1.6	96	71	15 x 23	219	6.2
1.8	106	67	13 x 20	226	7.2
2.0	117	64	12 x 18	234	8.3
2.2	127	62	11 x 16	242	9.5
2.4	138	60	10 x 15	250	10.8
2.6	148	58	9 x 14	259	12.1
2.8	158	57	9 x 13	268	13.6
3.0	169	56	8 x 12	277	15.1

M-Macro 50mm f/4 and Macro 50mm f/4		LENS REVERSED		(Distance scale set to ∞)	
Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor	
1.23	77 mm	19.5 x 29.2 mm	210 mm	× 5.3	
1.49	90	16.2 x 24.2	216	× 6.5	
1.87	110	12.8 x 19.2	229	× 8.7	
2.26	130	10.6 x 15.9	244	× 11.1	
2.65	150	9.1 x 12.5	261	× 13.9	
3.04	170	7.9 x 11.9	278	× 16.9	

55mm f/1.8**LENS REVERSED**

(Distance scale set to ∞)

Magnification	Bellows Extension	Area to be Photographed	Film-Plane-to-Subject Distance	Exposure Factor
1.08	80 mm	22.2 × 33.3 mm	224 mm	× 4.2
1.26	90	19.1 × 28.7	226	× 5.0
1.61	110	14.9 × 22.4	236	× 6.6
1.96	130	12.2 × 18.4	250	× 8.6
2.31	150	10.4 × 15.6	266	× 10.8
2.67	170	9.0 × 13.5	282	× 13.2

SMC TAKUMAR 55mm f/1.8 (Reversed)**(42mm Screw mount)**

Distance scale set at ∞

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.74	61 mm	48.4 × 32.2 mm	22.8 cm	× 3.0
0.90	70	39.9 × 26.6	22.4	× 3.5
1.08	80	33.4 × 22.3	22.4	× 4.2
1.25	90	28.7 × 19.1	22.6	× 5.0
1.43	100	25.2 × 16.8	23.1	× 5.8
1.61	110	22.4 × 14.9	23.6	× 6.7
1.78	120	20.2 × 13.5	24.3	× 7.6
1.96	130	18.4 × 12.3	25.0	× 8.6
2.13	140	16.9 × 11.2	25.8	× 9.7
2.31	150	15.4 × 10.4	26.5	× 10.8
2.49	160	14.5 × 9.7	27.4	× 12.0
2.66	170	13.5 × 9.0	28.2	× 13.2

SMC TAKUMAR 105mm f/2.8 (Reversed)**(42mm Screw mount)**

Distance scale set at ∞

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.006	130 mm	5211.8 × 3474.5 mm	1542.2 cm	× 2.2
0.10	140	352.4 × 234.9	125.9	× 2.5
0.20	150	182.4 × 121.6	77.3	× 2.8
0.29	160	123.0 × 82.0	61.0	× 3.1
0.39	170	92.8 × 61.9	53.2	× 3.5

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.

Auto Bellows 645

Table 1 A645 55mm F2.8

(Distance scale set at ∞)

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 A645 75mm F2.8 · 645 LS 75mm F2.8

(Distance scale set at ∞)

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

Table 3 645 LS 135mm F4

(Distance scale set at ∞)

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 ∞)

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 ∞)

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 ∞)

Magnification	Lens Extension	Lens-to-Subject Distance	Film-to-Subject Distance	Picture Area (Height x Length)	Exposure Factor
0.44	60	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	61mm	132mm	416mm	26 x 35mm	x 6.8
1.7	71	129	422	24 x 33	x 7.4
1.8	81	125	429	23 x 31	x 8.0
1.9	92	122	436	22 x 29	x 8.6
2.0	102	120	444	21 x 28	x 9.3
2.1	112	117	452	20 x 27	x 10.0
2.2	122	115	460	19 x 25	x 10.7
2.3	132	113	468	18 x 24	x 11.5
2.4	142	111	476	17 x 23	x 12.2
2.5	153	110	485	17 x 22	x 13.0
2.6	163	108	493	16 x 22	x 13.8
2.7	173	106	502	15 x 21	x 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.

Auto Bellows 645

Table 8 A645 55mm F2.8 (In Reverse Position)

(Distance scale set at ∞)

Magnification	Bellows Extension	Lens-to-Subject Distance	Film-to-Subject Distance	Picture Area (HeightxLength)	Exposure Factor
2.2	59mm	92mm	290mm	19 × 25mm	× 8.2
2.4	70	89	299	17 × 23	× 9.4
2.6	82	88	308	16 × 22	× 10.6
2.8	93	86	318	15 × 20	× 12.0
3.0	104	85	328	14 × 19	× 13.4
3.2	115	84	338	13 × 18	× 14.9
3.4	126	83	348	12 × 16	× 16.5
3.6	138	82	358	12 × 16	× 18.2
3.8	149	81	369	11 × 15	× 19.9
4.0	160	80	379	10 × 14	× 21.7
4.2	171	79	390	10 × 13	× 23.6
4.3	177	79	395	10 × 13	× 24.6

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

(Distance scale set at ∞)

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 ∞)

Magnification	Bellows Extension	Lens-to-Subject Distance	Film-to-Subject Distance	Picture Area (HeightxLength)	Exposure Factor
1.3	55mm	125mm	308mm	32 × 43mm	× 4.7
1.4	63	121	312	30 × 40	× 5.1
1.5	71	117	316	28 × 37	× 5.6
1.6	78	114	320	26 × 35	× 6.1
1.7	86	111	325	24 × 33	× 6.6
1.8	94	109	330	23 × 31	× 7.1
1.9	101	106	336	22 × 29	× 7.6
2.0	109	104	341	21 × 28	× 8.2
2.1	117	103	347	20 × 27	× 8.8
2.2	124	101	353	19 × 25	× 9.4
2.3	132	99	359	18 × 24	× 10.0
2.4	140	98	366	17 × 23	× 10.7
2.5	147	97	372	17 × 22	× 11.3
2.6	155	96	379	16 × 22	× 12.0
2.7	163	94	385	15 × 21	× 12.7
2.8	170	93	392	15 × 20	× 13.4
2.9	178	93	399	14 × 19	× 14.2

Asahi Pentax 6x7 Auto Bellows (Normal and Reversed)



Special Notes

- The Auto Bellows extends from 54mm to 352mm. The 6x7 lenses with the focal lengths from 90mm to 300mm 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.
- To obtain higher-than-life-size magnifications, mount the reversed lens to the Auto Bellows with the Reverse Adapter 67mm, Reverse Adapter 49mm, or reverse the front lens board.
- The Bellows User Manual states: "Only lenses with a filter size of 67mm are usable in reverse mode. This is true when reversing the front lens board, but when using one of the Reverse Adaptors with an appropriate step-down adaptor, other lenses can be used in reverse mode, including some 35mm lenses."

Usable lenses not included in the following Close-Up Tables:

SMC Pentax 67 55mm F4.0:	This lens is only usable in reverse mode as it will not mount on the front lens board. This would require the addition of a 77mm to 67mm step-down ring on the Reverse Adaptor 67mm.
SMC Pentax 67 75mm F4.0	This lens is only usable in reverse mode as, like the SMC 67 55mm F4.0, it has a protruding rear element and will not mount on the front lens board.
SMC Pentax 67 90mm F2.8	The 90mm lens will mount in normal or reverse mode and would give a slightly higher magnification value over the 6x7 or 67 105mm F2.4.
SMC Pentax 67 165mm F2.8	This short telephoto replaces the SMC Takumar 150mm F2.8 that is listed in these tables and would give similar performance. Medium Telephotos will give more lens-to-subject working distance, but are not suitable in reverse mode.

Note: As the thread on the Reverse Adaptor 67mm stands well out from the flange plate there is ample room to use a step-down ring to adapt lenses that have larger than a 67mm filter thread.

Table 1 SMC Takumar 6x7/ SMC Pentax 67 105mm f/2.4 lens

(Distance scale set at ∞)

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.51	54mm	106.9×134.2mm	46.1cm	×2.3
0.57	60	96.2×120.7	44.7	×2.5
0.67	70	82.5×103.5	43.1	×2.8
0.76	80	72.2×90.6	42.1	×3.1
0.86	90	64.2×80.5	41.6	×3.4
0.95	100	57.7×72.4	41.3	×3.8
1.05	110	52.5×65.9	41.3	×4.2
1.14	120	48.1×60.4	41.5	×4.6
1.24	130	44.4×55.7	41.8	×5.0
1.33	140	41.2×51.7	42.2	×5.4
1.43	150	38.5×48.3	42.7	×5.9
1.52	160	36.1×45.3	43.2	×6.4
1.62	170	34.0×42.6	43.8	×6.9
1.71	180	32.1×40.2	44.4	×7.4
1.81	190	30.4×38.1	45.1	×7.9
1.90	200	28.9×36.2	45.8	×8.4
2.00	210	27.8×34.8	46.4	×8.9

Table 2 SMC Takumar / 6x7 150mm f/2.8 lens

(Distance scale set at ∞)

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.36	54mm	152.8×191.7mm	74.7cm	×1.9
0.40	60	137.5×172.5	71.2	×2.0
0.47	70	117.9×147.9	66.8	×2.2
0.53	80	103.1×129.4	63.8	×2.4
0.60	90	91.7×115.0	61.7	×2.6
0.67	100	82.5×103.5	60.2	×2.8
0.73	110	75.0×94.1	59.1	×3.0
0.80	120	68.7×86.2	58.4	×3.2
0.87	130	63.5×79.6	58.0	×3.4
0.93	140	58.9×73.9	57.7	×3.7
1.00	150	55.0×69.0	57.6	×4.0
1.07	160	51.6×64.7	57.7	×4.3
1.13	170	48.5×60.9	57.9	×4.6
1.20	180	45.8×57.5	58.2	×4.9

Table 3 SMC Takumar 6x7/ SMC Pentax 67 200mm f/4 lens(Distance scale set at ∞)

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.27	54mm	203.7 × 255.6mm	120.1cm	× 1.6
0.30	60	183.3 × 230.0	113.3	× 1.7
0.35	70	157.1 × 197.1	104.8	× 1.8
0.40	80	137.5 × 172.5	98.6	× 2.0
0.45	90	122.2 × 153.3	94.1	× 2.1
0.50	100	110.0 × 138.0	90.6	× 2.3
0.55	110	100.0 × 125.5	88.0	× 2.4
0.60	120	91.7 × 115.0	86.0	× 2.6
0.65	130	84.6 × 106.2	84.4	× 2.7
0.70	140	78.6 × 98.6	83.2	× 2.9
0.75	150	73.3 × 92.0	82.3	× 3.1
0.80	160	68.8 × 86.3	81.6	× 3.2
0.85	170	64.7 × 81.2	81.2	× 3.4
0.90	180	61.1 × 76.7	80.9	× 3.6
0.95	190	57.9 × 72.6	80.7	× 3.8
1.00	200	55.0 × 69.0	80.6	× 4.0

Table 4 SMC Takumar 6x7/ SMC Pentax 67 300mm f/4 lens(Distance scale set at ∞)

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.18	54mm	305.6 × 383.3mm	244.9cm	× 1.4
0.20	60	275.0 × 345.0	228.9	× 1.4
0.23	70	235.7 × 295.7	208.4	× 1.5
0.27	80	206.3 × 258.8	193.4	× 1.6
0.30	90	183.3 × 230.0	181.9	× 1.7
0.33	100	165.0 × 207.0	172.9	× 1.8
0.37	110	150.0 × 188.2	165.7	× 1.9
0.40	120	137.5 × 172.5	159.9	× 2.0
0.43	130	126.9 × 159.2	155.1	× 2.1
0.47	140	117.8 × 147.9	151.2	× 2.2
0.50	150	110.0 × 138.0	147.9	× 2.3
0.53	160	103.1 × 129.4	145.1	× 2.4
0.57	170	97.1 × 121.8	142.8	× 2.5
0.60	180	91.7 × 115.0	140.9	× 2.6
0.63	190	86.8 × 108.9	139.2	× 2.7
0.67	200	82.5 × 103.5	137.9	× 2.8

Bellows extension for reversed lens position means the distance from the camera mount to the lens mount in the reversed position on the scale.

Reversed Lens Position

Table 5 SMC Takumar 6x7/ SMC Pentax 67 105mm f/2.4 lens

(Distance scale set at ∞)

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
0.73	110mm	75.4 × 94.6mm	42.4cm	× 3.0
0.82	120	66.7 × 83.7	41.7	× 3.3
0.92	130	59.8 × 75.0	41.4	× 3.7
1.02	140	54.2 × 68.0	41.3	× 4.1
1.11	150	49.5 × 62.2	41.4	× 4.5
1.21	160	45.6 × 57.2	41.7	× 4.9
1.30	170	42.3 × 53.1	42.1	× 5.3
1.39	180	39.4 × 49.4	42.5	× 5.7
1.49	190	36.9 × 46.3	43.0	× 6.2
1.59	200	34.7 × 43.5	43.6	× 6.7
1.68	210	32.7 × 41.0	44.2	× 7.2
1.78	220	31.0 × 38.8	44.9	× 7.7

MAGNIFICATION	LENS EXTENSION	PICTURE AREA	FILM-TO-SUBJECT DISTANCE	EXPOSURE FACTOR
1.87	230mm	29.4 × 36.9mm	45.6cm	× 8.2
1.97	240	28.0 × 35.1	46.3	× 8.8
2.06	250	26.7 × 33.5	47.1	× 9.4
2.16	260	25.5 × 32.0	47.8	× 10.0
2.25	270	24.4 × 30.6	48.6	× 10.6
2.35	280	23.4 × 29.4	49.5	× 11.2
2.44	290	22.5 × 28.2	50.3	× 11.9
2.54	300	21.7 × 27.2	51.1	× 12.5
2.63	310	20.9 × 26.2	52.0	× 13.2
2.73	320	20.2 × 25.3	52.8	× 13.9
2.83	330	19.5 × 24.4	53.7	× 14.6
2.92	340	18.8 × 23.6	54.6	× 15.4
3.02	350	18.2 × 22.9	55.5	× 16.1



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