BAADER MAXBRIGHT®
BINOCULAR VIEWER

INSTRUCTION MANUAL

Congratulations on your purchase of the Baader MaxBright Binocular Viewer. This is a very sophisticated optical accessory that, if used in the right way, will offer you amazing views for all your life. To obtain the maximum performance from the viewer, we suggest you spend a little time reading this instruction manual before starting to use it.

Parts List and Name

1	Eyepiece Locking and Fine Collimation Screws
2	Eyepiece Holder 1.25" (31.8mm)
3	Rubber Grip
4	Rotating Threaded Ring and front Optical Window (not visible)
5	Glasspath Corrector (back focus compensator)
6	T2/1.25" (31.8 mm) Barrel/Nosepiece (or T2/2" (50.8mm) Barrel/Nosepiece)

Setup

- Remove the two plastic caps from the eyepiece holders and unscrew the black cap from the optical window of the viewer.
- Screw the six (6) screws provided into the holes of the eyepieces holders.
- Screw the Glasspath Corrector inside the 1.25" (31.8mm) barrel (see page 5 for instructions on using a 2" nosepiece).
- Screw the T2/31.8 barrel onto the front of the viewer, turning the locking ring until tight.
- Insert the Binocular Viewer in the telescope's eyepiece holder and tighten the set screw(s) to hold the binoviewer in place.

Optical distance, Back-Focus and Glasspath compensator

To pass through the binoviewer and reach the eyepieces, the cone of light coming from the telescope covers a path of about 100-110 mm. Therefore the telescope must have a back focus (the travel of the light outside the focuser) of at least 110mm in order to be able to reach focus when used with the binocular viewer. So, several factors must be considered:

1) The majority of the Newtonians present a very short back focus, usually no more than 30-60 mm; as a result, a typical Newton telescope doesn't allow the use of a binoviewer without the use of a back focus compensator.

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2) To use the binocular viewer with telescopes such as refractors, Cassegrain reflectors or catadioptrics, a diagonal prism must be used, inserted between the telescope and the binoviewer. Without the prism it is very uncomfortable or almost impossible to observe celestial objects high in the sky (i.e. more than 30 degrees over the horizon) with the binoviewer. But it must be taken into account that the use of a diagonal prism involves an even farther position of the binoviewer from the telescope, and then increased back focus compensation is needed to reach focus.

Choosing a Glasspath Compensator

The Baader Glasspath Compensator™ serves multiple functions. In addition to correcting the color error caused by the long light-path through the binoviewer glass prisms (glasspath), the compensator also magnifies and extends the focal point of the telescope. This focal extending aspect is key to being able to use a binocular viewer in most telescopes. Due to the basic design of all binocular viewers, the distance that light must travel through the viewer is on the order of 4.5" or more (the Maxbright is the shortest viewer we know of, at 110mm). Many telescopes, especially Newtonians, do not have sufficient back-focus in order to reach focus with such an optically long accessory (ie, not enough focuser in-travel). By using a Baader compensator, the focal point of the telescope can be extended sufficiently to accommodate the length of the binoviewer.

A secondary benefit of the compensator is to provide additional magnification - ahead of the binoviewer. For high magnifications (ie, planetary observation), it is generally preferable to magnify the image before the binoviewer, rather than to use shorter focal length eyepieces. By magnifying prior to the viewer, the effects of any optical tolerances and misalignments in the centering of the eyepieces are reduced. A compensator enables the use of longer focal length eyepieces to achieve high magnifications, which tend to have longer eye relief (greater comfort) than short focal length eyepieces. It is also less expensive to purchase an additional compensator (to provide additional magnifications), rather than to purchase additional sets of eyepieces. In general, for binoviewing use we recommend eyepieces with focal lengths of 8mm or longer.

For these reasons, many users find it is very useful to have more than one compensator. We recommend first choosing the lowest powered compensator that will allow your scope to reach focus. This will permit the widest possible fields of view. In addition, one or more higher powered compensators can be added to give a greater range of magnifications.

The first step in choosing a compensator is to determine how much back-focus your telescope has available (please see the next section on back-focus). Once you have determined the back-focus of your telescope configuration (ie, with any adapters or star diagonals in place), simply use the following table to determine which compensator (s) provide a path-length that is less than your telescope's available back-focus. *Please note:* the distances in the following table are approximate and are measured from the front mounting flange of the binocular viewer or nosepiece, to the top surface of the eyepiece holders. Many eyepieces have their focal points located ahead of, or behind, their shoulder. As a result, the effects of an eyepiece's focal point location are not taken into consideration here, as the distance required to reach focus will usually vary from these values. Users that are near or far-sighted will also find that more or less back-focus is needed to accommodate their needs. For these reasons, we recommend that you allow for at least 5-10mm extra back-focus.

For example, our own Takahashi Sky90 SV has 160mm of back-focus as measured from the rear surface of its stock 2"eyepiece clamp to the focal point. From Table 1, you can see that the Sky90 will be able to reach focus without a glasspath compensator at all, even with our Deluxe Amici correct-image star diagonal. In this case, we would choose either the 1.7X or 2.6X compensator. This would give us the ability to use the Maxbright with no compensator (for low-power wide field viewing), and the higher powered compensator provides us with the optimum image quality for higher magnification planetary observations.

Configuration	**None**	**1.25X**	**1.7X**	**2.6X**	**1.7X Newtonian**
Straight Through (w/ nosepiece only)	110mm	92	77	44	31
with T2 #1C Prism 32 Diagonal	148	131	116	83	na
with T2 #1B Deluxe Zeiss Prism Diagonal	151	134	119	86	na
with T2 #2 Deluxe Amici Diagonal , 90º (for correct image orientation)	158	141	126	93	na

Table 1: Maxbright Binocular Viewer Path-Lengths

Back-Focus

Sometimes referred to as In-Focus or In-Travel. Back-focus is an important factor to consider when choosing a binocular viewer, or any other long accessory (cameras, Herschel Wedge, etc). Back-focus is simply the distance from your telescope's focal point to the surface of its focuser (when fully retracted). Any accessory inserted into the focuser consumes some of this back-focus (star diagonals, eyepiece adapters or reducers, cameras, eyepieces, etc). In order to reach focus, the focal plane of an eyepiece (or camera) must be able to be positioned at the telescope's focus. If the stackup of parts is longer than the telescope's back-focus, then it will not be possible to reach focus. Unfortunately, telescope manufacturers do not follow any consistent guidelines for the amount of back-focus a telescope should

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provide. *Further, few manufacturers even provide the back-focus specification for their scopes.* As a result, it is left up to the user to find out for themselves.
Newtonians typically have the least amount of back-focus. In order to extend the focal point well past the focuser surface, a larger secondary mirror is required. This increases the central obstruction (loss of contrast) and increases cost. As a result, many Newtonians have only a small amount of back-focus. For this reason, we offer a very special 1.7X glasspath compensator that is designed for Newtonians. This compensator also corrects the off-axis coma that affects fast Newtonians.
Schmidt-Cassegrain and Maksutov telescopes can typically provide large amounts of back-focus, owing to their movable primary mirrors. This allows many of them to accommodate binoviewers even without any glasspath compensator (also, depending on the size of star diagonal used). SCT users will find the 1.25X compensator is likely to be the best match to their scopes, providing all of the glasspath compensating benefits at moderate magnifications.
Refractors vary considerably in the amount of back-focus they provide, sometimes within the same model.

How do I determine how much back-focus my telescope has?

The best way to determine your telescope's back-focus is to measure it yourself. If you are intending to use a binoviewer with your scope, you will want to measure the back-focus using any adapters or star diagonals that will be present when using the binoviewer.
The easiest way to measure back focus is to point your scope at the Moon (with accessories, but *No Eyepiece*) and project its image onto a flat sheet of paper. The focuser should be fully retracted. Hold a white sheet of paper behind the empty focuser or above the star diagonal and find the position where the image of the moon comes to sharp focus. This position is your telescope's focal plane. Using a scale, measure the distance from the paper to the end of the focuser or star diagonal. This is the amount of available back-focus for additional accessories (ie, Binoviewer plus eyepieces). It is possible to make a more accurate measurement with the actual eyepieces to be used with the binoviewer, but for most purposes this white paper projection method should be adequate to help select the necessary glasspath compensator.
In some cases, you may find that your scope does not have sufficient back-focus to work with any of the glasspath compensators we provide. If you are using a 2" star diagonal in your system, you may want to consider using a shorter 1.25" star diagonal. The Maxbright Binocular Viewer has been especially designed to directly close-couple to our T-2 Diagonals, in order to provide the minimum path length possible. Newtonian users may want to consider shifting their primary mirror forward (or shortening their truss tube poles) in order to increase their telescope's amount of back-focus.

Configurations

The Baader Maxbright Binocular Viewer is able to be configured many different ways. The front rotating ring of the Maxbright has an internal T-thread (M42 x 0.75mm), which allows it to be directly coupled to any externally T-threaded accessory. The rotating feature allows the binoviewer to be oriented as desired, and securely locked in place. The accessories shown below are just some of the more popular combinations. Of course, you are free to invent your own, using any of our Astro T-2 System components. For instance, a T2 #6,7 Quick Changer may be added to enable quick attachment and removal of any T-threaded accessory (such as the Maxbright binoviewer).

How to select the most suitable diagonal prism

When the MaxBright binocular viewer is used with refractors and Cassegrain telescopes, it is much more comfortable to use a diagonal between the telescope and the binoviewer. But it's not advisable to use a normal, commercially available 1.25" (31.8mm) diagonal prism, since these accessories often (almost always) have a plastic body, and so they are not able to adequately support the weight of the binoviewer, especially when it is paired with two heavy widefield eyepieces like the Baader Hyperions. This is compounded by the extra distance needed to support the binoviewer on top of the diagonal's existing eyepiece clamp (which also consumes a large amount of additional precious back-focus). Furthermore these normal diagonal prisms typically use small screws to lock the eyepieces in place, which may be sufficient to support lightweight eyepieces, but are totally inadequate to safely hold heavy accessories like a binoviewer. In fact it's quite common, in the astronomical community, to hear about heavy and expensive eyepieces being dropped to ground (and broken) because of the poor locking system of these cheap diagonals.
The perfect solution for this problem consists of using the Baader T2 diagonals, equipped with male-female T2 threads and perfectly able to be attached directly and closely to the MaxBright binocular viewer (requiring the minimum amount of back-focus possible). These diagonals feature Right Angle or Amici prisms (and mirror, in the T2 Maxbright mirror version) of the absolute best optical quality, incorporating a solid one-piece precision machined metal body which is perfectly suited to hold the heaviest accessories.
Also offered is a 45degree terrestrial version (using an Amici Prism) which offers correctly oriented images, and is the ideal choice for observers fond of terrestrial and nature viewing.

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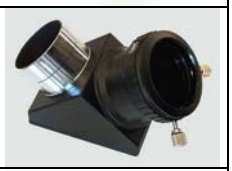
Baader Diagonals	Optical Distance	
T2 #1C (32mm prism)	37mm	
T2 #1B Zeiss (44mm prism)	41mm	
T2 #2 Deluxe Amici (90º)	48mm	
T2 #1A Maxbright (dielectric mirror)	53mm	
T2 terrestrial (45° Amici prism)	n.d. (2x built-in compensator)	
MaxBright 2" (dielectric mirror)	68mm (using T2 #27, with 2" Holder removed)	
2" Herschel Prism	77mm (using T2 #27, with 2"holder removed)	

How to screw-in the glass path compensator into the Baader T2 diagonals

The MaxBright Binoviewer with T2 #1B Zeiss diagonal and 2" barrel (both options)

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Use of the BinoViewer with 2" nosepiece adapter

This picture shows how to insert the glasspath compensator into the optional T2 #16 2" nosepiece. The included white plastic ring must be pressed onto the compensator threads in order to center the compensator in the nosepiece adapter.

After placement of the glasspath compensator into the 2" nosepiece, it is then threaded onto the rotating ring of the MaxBright Binoviewer.

If your telescope has a 2" eyepiece holder, it is possible to use the MaxBright Binocular Viewer with 2 inch nosepiece adapter (optional), either attaching it directly to the binoviewer or to an optional T2 diagonal. When used with the T2 Diagonal plus 2" (or 1.25") Nosepiece, the Glasspath Compensator must be installed into the diagonal body as shown.
When directly attaching the 2" nosepiece to the Binoviewer for straight-through viewing, the glasspath compensator does NOT thread in the 2"/T2 barrel, but is simply placed inside it, using the white plastic spacer (provided) to fit the compensator mount into the barrel (see photo above for reference).

Choosing the most suitable eyepieces for binoviewing

The MaxBright Binoviewer features an optical window with a clear diameter of 23mm, which can be used without vignetting (light drop-off at the edge of the field of view), with eyepieces featuring a field stop of the same diameter. This means, typically, that it can be used with standard eyepieces up to 25-30mm in focal length. If you use longer focal length eyepieces, you could notice a drop in light at the very edge of the field. By using two special extension tubes (future option) to insert into the eyepiece holders of the binoviewer, it is possible to use eyepieces of longer focal lengths without vignetting.
The maximum outside body diameter of eyepieces that can be used with the MaxBright binocular viewer is about 58 mm. If the binoviewer is used with eyepiece having a larger diameter, (i.e. the Pentax XW), you may have problems reaching the correct separation between the two eyepieces if the interpupillary distance between your eyes is less than 60 mm.
It's extremely important to choose pairs of identical eyepieces, made by the same manufacturer in the same period of time. In fact it's quite common to find significant differences (optically and mechanically) in eyepieces of the same brand and type, but built at different periods of time. If you do not use identical eyepieces, you may experience problems in merging of the two images.
We suggest that you use, for high resolution observations, the Baader Genuine Ortho eyepieces. For general observing, we suggest the Baader Hyperion superwide eyepieces. Both have been optimized for use with the Maxbright binoviewer.

Adjusting the interpupillary distance

Since the distance between the eyes (the distance between the centers of the eyes' pupils) change from person to person, the distance between the two eyepieces must be adjusted accordingly. This distance is called interpupillary distance. To adjust this distance, hold the body of the binoviewer like a pair of binoculars (using both hands). Position your eyes above both eyepieces so that you can see the edges of the field stops of the eyepieces, while you look a distant object. Rotate the two halves of the binocular body about the central pivot until you see the field as a single sharp circle with both eyes.

Adjusting the focus differences

Many individuals require a different focus adjustment between their eyes, so when using a binocular they must adjust the focus of the two eyepieces differently. Follow these steps to adjust the focus:

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(1) With the telescope aimed at a distant object, close the right eye and look into the left eyepiece. Rotate the main focus mechanism of the telescope until the image is sharp.
(2) Close the left eye and with the right eye look inside the right eyepiece. Since the two eyepiece holders of the MaxBright binoviewer can both be focused independently by rotating them, rotate the right eyepiece holder until you see a sharp image; (3) now look into the binoviewer with both eyes. Since you have already adjusted the right eyepiece to match the left one, use only the main focus mechanism of the telescope to adjust the focus on new objects.

Note: It is possible that either the left eyepiece holder of the binoviewer must be totally screwed in or out, or that the dioptric difference between your eyes is very large (more than 5-6 diopters). If this is the case you may not be able to reach the focus when individually adjusting the right eyepiece. To solve this possible problem, generally it's enough to turn (clockwise or counter clockwise) the left eyepiece holder several turns in the opposite direction, and then try to again focus the telescope using only the left eye; after that, try again to adjust the focus with the right eyepiece. If you are unable to reach focus, it may be necessary to unlock one of the two eyepieces and lift it a few millimeters to compensate for the strong difference between the two eyes' sight. With some patience you'll obtain a sharp focus and a perfect match of the two images.

Use of the Maxbright Binoviewer with Zoom eyepieces

The owners of pairs of identical Zoom eyepieces may wish to use them with the MaxBright binoviewer. However, generally zoom eyepieces are convenient but they don't offer good optical quality and typically have a quite narrow field of view, which varies when you vary the focal length (magnification). To increase or decrease the power, rotate the zoom ring (to adjust the focal lengths) of each of the eyepieces. To adjust the focus you should zoom the two eyepieces to their highest available power, and then adjust the focus using the main focuser of the telescope. After this main adjustment, if you change the power of the two zoom eyepieces, the subjects should stay focused. Baader Planetarium is going to offer a new 8-24mm Hyperion Zoom Eyepiece with very good quality across all focal lengths. The new Hyperion zoom eyepiece is optimized for use with the Maxbright binoviewer. Please ask for more details on this new eyepiece.

Fine adjustment of the superposition (merging) of the images

If, after normal adjustments, you are not able to attain a perfect superposition of the two images, you will need to adjust the fine collimation (optical alignment) of the two eyepieces.
First, try to improve the merging of the images by rotating one eyepiece in its holder. Often we find that eyepieces vary in their optical centering. By simply rotating the eyepieces relative to each other, we find that it is possible to find positions that correct most merging difficulties.
If eyepiece rotation does not correct the merging problem, you can use the six collimation screws (three for each eyepiece holder of the binoviewer) to adjust the relative centering/position of the eyepieces, partially screwing or unscrewing them strategically, until you obtain a perfect superposition/merging of the two images.

Use of rubber eyecups

If your eyepieces have rubber eyecups, (for example, like the Baader Hyperions), leave them in the “up” position if you don't wear eyeglasses but fold them down if you observe with eyeglasses to obtain a full field of view. For best viewing with Baader Genuine Orthos, we recommend the use of Baader winged eye guards When you have finished your observing session, raise the eyecups again in the "up" position. If your eyepieces offer adjustable eyecups like the Pentax XL or Meade Series 5000 or of the lift-up type like the TeleVue Radians, then rotate or lift up the eyecups if you observe without eyeglasses, or leave them in the lowest position if you use eyeglasses to observe at the telescope. In this way you'll have the full field of view of the telescope.
Useful Tip: If you are strongly near-sighted, you should observe the sky with eyeglasses when you use the binoviewer, in order to reach focus. The same could happen if you are astigmatic, as it's better to observe with correcting eyeglasses or contact lenses because the simple dioptric adjustment of the telescope isn't able to compensate for astigmatism.

Use of the MaxBright bino with the Baader Herschel Solar Prism (solar observation)

The MaxBright binoviewer is uniquely suited to provide outstanding views with the 2" Baader Herschel Safety Wedge Solar Prism, an optical accessory designed for safe high resolution observation and imaging of the solar photosphere with refractor telescopes. The binoviewer should be attached to the Herschel using a T2 #27 photo adapter ring (optional), not inserted into the 2" eyepiece holder of the Herschel, since in this configuration it may not be possible to reach focus due to the long stackup of parts.
CAUTION: To safely observe the sun with the binoviewer coupled to the Herschel Prism you ***MUST*** always use the ND=3.0 Filter securely attached to the T2 #27 (the ND=3.0 Filter must be transferred to the T2 #27 from the stock 2” threaded coupler that attaches the 2” eyepiece holder).

MaxBright Binoviewer, attached directly to Herschel Safety Wedge Solar Prism.

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Herschel Use (continued)

You will likely need the use of a Glasspath compensator to reach focus with most telescopes. In this case, you must also use a T2 #25C 7.5mm Extension Tube between the T2 #27 and Maxbright (slip the glasspath compensator w/ plastic ring into the top of the extension tube prior to attaching the Maxbright).

The Baader Solar Continuum filter provided with the Herschel prism is also suggested in combination with the required ND=3.0 to enhance the contrast of faculae and granulation. Simply screw the Continuum filter to the front of the ND=3.0.

Care and Cleaning of your MaxBright binoviewer

Your Baader MaxBright binoviewer does NOT need any special or periodic maintenance. If the binoviewer should need servicing, please return it to the shop where you purchased it, directly to Baader Planetarium or to specialized facilities authorized by the distributor of Baader products in your country.

Please do not attempt to open the viewer, or to loosen the eyepiece holder attachment screws. The optical collimation (alignment) of the internal prisms is the most important technical aspect of a binocular viewer. Baader Planetarium has gone to great lengths to produce the most accurately collimated binoviewer possible. If your binoviewer has been accidentally dropped or otherwise physically damaged, it is possible for it to loose its optical alignment and require servicing to restore the collimation of its prisms.

While not in use, you should cover the apertures with the provided caps and store the binoviewer in its padded case.

If the eyepieces are dirty they will perform worse than normal, resulting in light scatter or less sharp images. Therefore you should clean the eyepieces' lenses when they are dirty. Avoid touching the lenses or prisms with your fingers, but if you don't clean fingerprints immediately, since the natural grease of the fingerprints contain weak acids, they can cause corrosion of the optical coatings of the lens/prism. Before cleaning fingerprints or other dirty spots, first remove the dust with a soft brush or with a blow of clean air. To achieve the best cleaning of optics, we suggest you use a few drops of Baader Optical Wonder Fluid in combination with the Baader Optical Wonder Cloth supermicrofiber cloth. This combination of products doesn't scratch and won't cause any damage to your optics, and won't leave halos, films, chemical residuals, or tissue fibers. Furthermore, the Optical Wonder Cloth is antistatic, and won't generate static electricity when used, preventing the attraction of dust onto the freshly cleaned optical surfaces.

	
The Baader Optical Wonder Cloth is ideal for cleaning optical surfaces. It won't scratch and cleans very well without leaving any residuals.	Baader Optical Wonder Fluid is the ideal cleaning solution for delicate optical surfaces. Cleans and removes dirt and oils from today's high performance multi-coated lenses without leaving any residuals.

If you use the MaxBright binoviewer on a damp night, moisture may enter inside the binocular viewer, fogging the internal surfaces of the prisms. In this case, don't try to remove the dew, but instead carry the binoviewer into a protected warm and dry ambient environment, leaving it without caps until it dries naturally in the air. When the binoviewer is completely dry, it may be used again, or capped and returned to its case for storage.

<u>IMPORTANT WARNING!</u> Do NOT try to take apart the Maxbright binocular viewer and do NOT try to clean it!

Troubles, Servicing, and Warranty

If you should happen to notice problems or defects in your Maxbright binoviewer, NEVER try to fix it by yourself and do not give it to any technical personnel not authorized by Baader Planetarium. Doing so will void the warranty. If you have any kind of problem, technical request or questions about the use of the binoviewer or its optional accessories, please contact Baader Planetarium or their distributor.

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