Fluorite Apochromat

FC-100DZ

Instruction Manual

TAKAHASHI

Thank you for purchasing the Takahashi FC-100DZ telescope.

The FC-100DZ is a high-powered telescope with an objective lens that utilizes fluorite, and depending on the implementation of reducers, flatteners, or extenders, it may utilize many focal lengths. In order to use your telescope to its highest potential, please read this instruction manual very carefully, and familiarize yourself with all of the functions this telescope offers. All Takahashi telescopes have been strictly inspected before shipment. If there is anything wrong with your telescope when unpacked, please contact your authorized Takahashi dealer at once.

Warning & Caution

⚠ WARNING

Do not point this telescope at the sun without appropriate solar viewing protection. Using the astronomical telescope to look directly at the sun is terribly dangerous due to the light and heat concentrated on its focal point.



⚠ CAUTION

- When placing the tube assembly onto an equatorial mount, be careful to balance the tube in the tube holder. This will prevent injury to fingers and will prevent it from falling to the ground. When placing the tube assembly in the tube holder, always hold the tube with one hand to keep it from falling off the tube holder onto the ground.
- Always lay the tube assembly on a stable surface that totally supports it to protect it from damage.
- Keep the tube assembly out of the Sun. Otherwise, the tube assembly could heat up, causing lens damage. If the sun light were to reach it directly, the temperature around it would greatly increase and could cause a fire.
- Make focus adjustments very carefully to reduce the risk of injury.
- Make sure children do not swallow the smart parts such as screws, rings or caps. Also, the box contains huge plastic bags which should be kept out of the reach of children.
- Keep all packing materials away from an open flame. These materials are flammable.

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Specifications

Configuration ---------- Doublet Fluorite Apochromat

Effective Aperture ---------- 100mm multi-coated

Focal Length ---------- 800mm

Focal Ratio ---------- 1:8

Resolving Power ---------- 1.16”

Limiting Magnitude ---------- 11.8

Light Gathering Power ---------- 204x

With FC-35 Reducer 0.66x

Focal Length ---------- 530mm

Focal Ratio ---------- 1:5.3

Image Circle ---------- ϕ44mm (60% illuminated)

With FC/FS Multi Flattener 1.04x

Focal Length ---------- 820mm

Focal Ratio ---------- 1:8.2

Image Circle ---------- ϕ44mm (60% illuminated)

Diameter of Main Tube ---------- 95mm

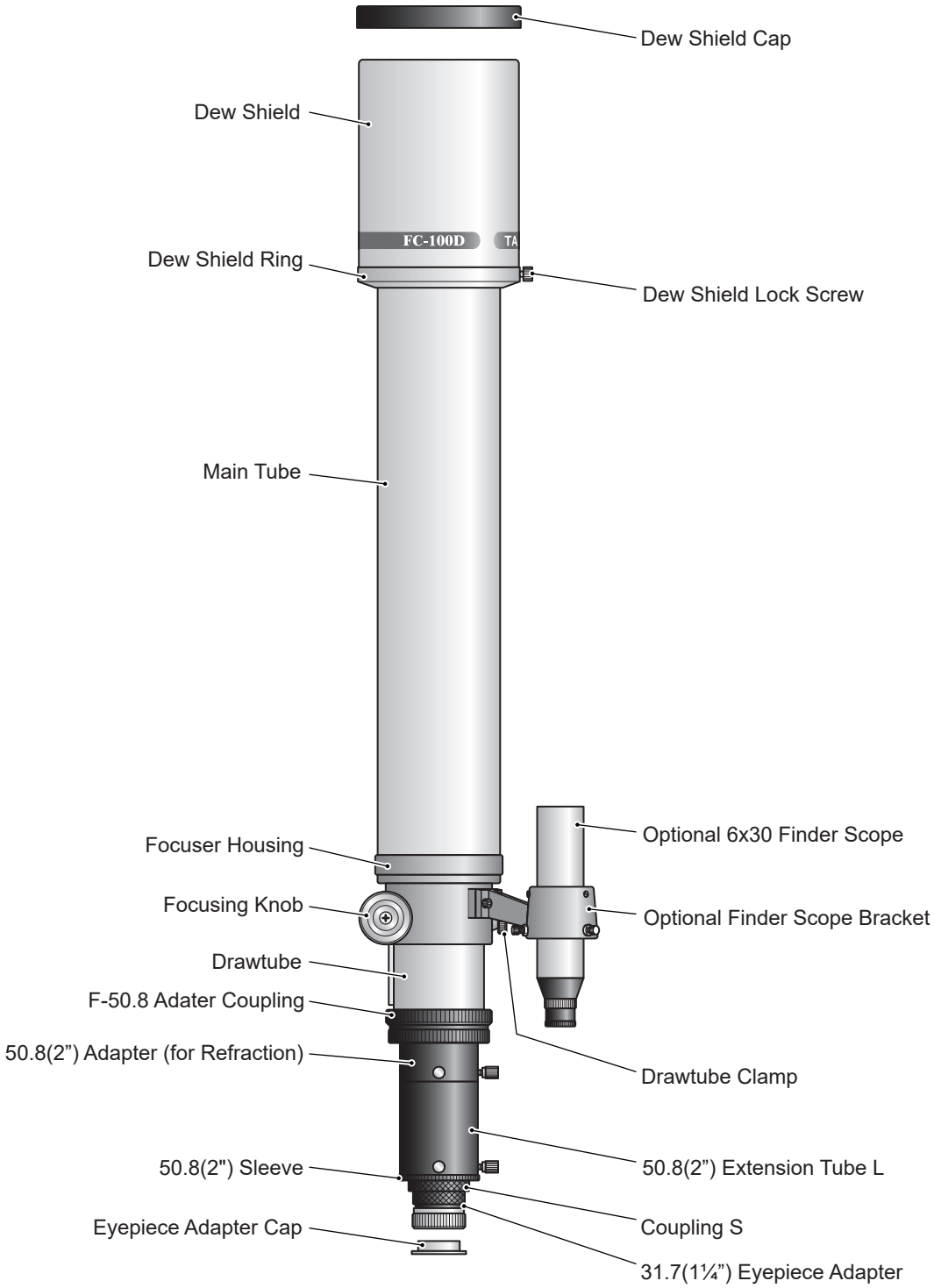
Total Length of Main Tube ---------- 840mm

Weight of Main Tube Assembly ------- 3.9kg

Finder Scope ---------- 6x30 or 7x50 optionally available

Accessories ---------- Warranty Card, Instruction Manual, Hex Wrench (4mm)

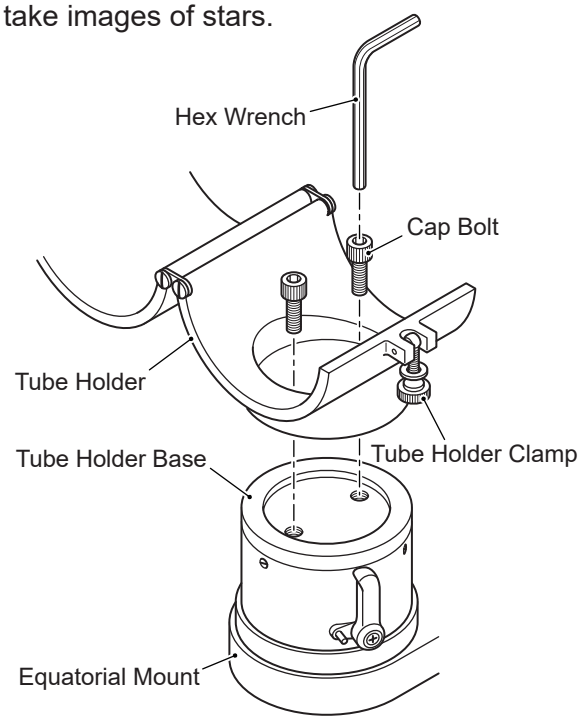
Tube Assembly Layout



Setup

◆ Installation on an Equatorial Mount

As shown in the figure below, the tube holder can be attached with two cap bolts. With the tube holder open, place the telescope inside the tube holder and then close the tube holder. Before tightening the tube holder clamp, carefully adjust the balance of the optical tube assembly (for further explanation see the Equatorial Mount Manual). A dedicated tube holder can be attached to all of our systems and can be changed depending on the desired function. We strongly recommend using a large equatorial mount when attempting to take images of stars.



◆ Balancing

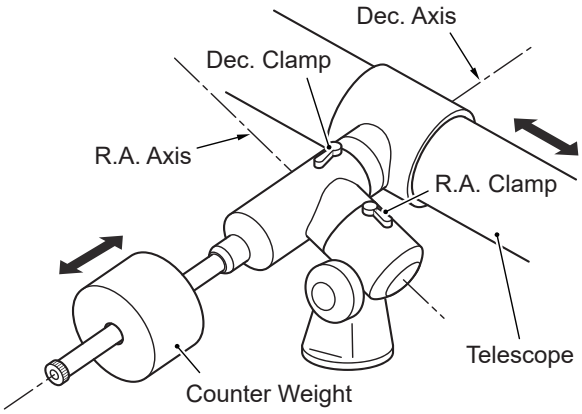
After attaching the telescope to the tube holder, again check to see that the system is properly balanced. Balancing should be performed with all accessories attached to the telescope, such as diagonals, eyepieces or cameras. Proper balance is important to ensure accurate tracking and to minimize wear on the mount.

▼ Balancing the Declination Axis

1. Loosen the right ascension (R.A.) clamp and make sure the declination (Dec.) axis is in a horizontal position. At this time be sure to adjust the balance of the R.A. axis, as after this point it becomes very difficult to rotate.
2. While making sure that the equipment does not move, slowly tighten the Dec. clamp and check the balance around the axis.
3. When you feel that the balance is not right, loosen the tube holder clamp and move the telescope barrel back and forth to find the most balanced position. Determining the appropriate balance is important when using a camera so take your time to carefully balance the system.

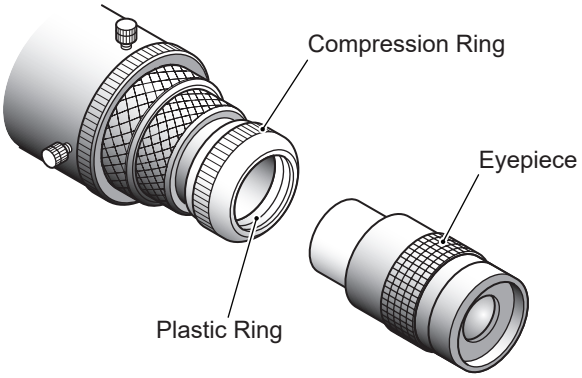
▼Balancing the Right Ascension Axis

1. After the declination axis is well balanced, tighten the Dec. clamp to fix it into place.
2. Loosen the R.A. clamp and check the balance around the R.A. axis.
3. If adjustment is required, move the mount counter weight to find proper balance.
4. If after pulling the weight all the way to the tip of the balance shaft the telescope is still too heavy, an additional weight may be required (sold separately).



◆ Attaching the eyepiece

Loosen the compression ring, remove the cap, then insert an eyepiece into the eyepiece adapter and tighten the compression ring to lock the eyepiece.



◆ Eyepieces

A wide variation of eyepieces are available from Takahashi.

▼ LE Series

These high quality eyepieces possess a wide field of view and come in several models:

- 31.7mm(1¼") barrel
  LE5mm, LE7.5mm, LE10mm, LE12.5mm, LE18mm, LE24mm, LE30mm
- 50.8mm(2") barrel
  LE40mm, LE50mm

▼ TAK-UW Series

Ultra wide angle eyepieces designed to achieve sharpness for observation of celestial bodies:

- 31.7mm(1¼") barrel
  TAK-3.3UW, TAK-5.7UW, TAK-7UW, TAK-10UW

▼ TOE Series

Long eye-relief, most suitable for planetary observation with high magnification. Available in:

- 31.7mm(1¼") barrel
  TOE2.5, TOE3.3, TOE4.0

▼ ABBE Series

Simple 2 group 4-element eyepieces with high contrast; less expensive with high performance:

- 31.7mm(1¼") barrel
  Abbe 4mm, Abbe 6mm, Abbe 9mm, Abbe 12.5mm, Abbe 18mm, Abbe 25mm, Abbe 32mm

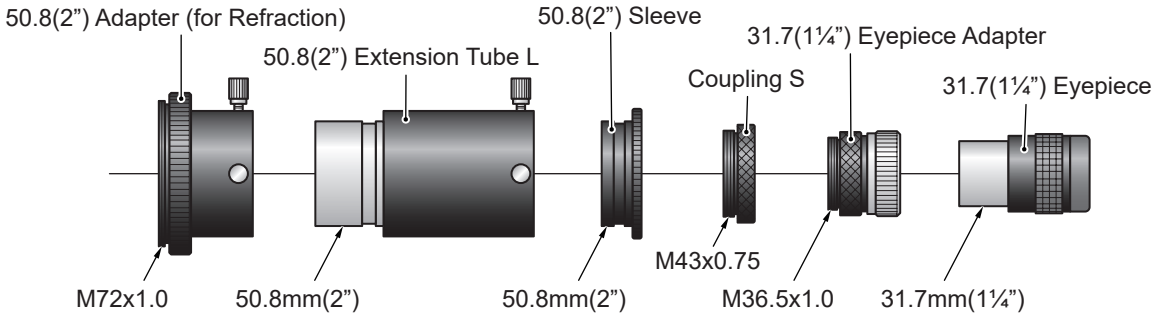
▼ ERFLE

With 3-group 5-element optics, these eyepieces offer 60 degree apparent field of view with almost no flare or ghost:

- 31.7mm(1¼") barrel
  Er-28mm

◆ Installation of additional accessories

There are several adapters and rings that can be used to attach additional accessories. Carefully review the system chart to ensure correct installation. Incorrect installation can result in loss of focus, impeding the true capabilities of the device.



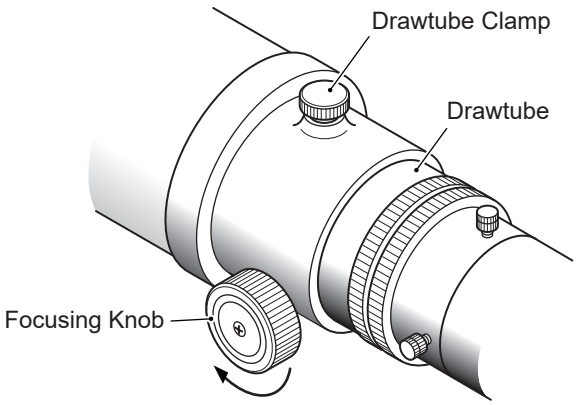
Focusing

After attaching an eyepiece to the telescope, it is necessary to adjust the focus in order to see celestial bodies or scenery clearly. In particular, when using the telescope to view celestial objects, if the focus is off by a large amount, stars will not be visible even when in the field of view of the eyepiece. Furthermore, even a slight error in focus can degrade the image through the telescope. When taking images of celestial bodies, accurate focus is critical.

The atmosphere will limit the highest magnification that can be used on any given night. Begin by using a low power eyepiece, and focus the image. Then progressively increase magnification by using shorter and shorter focal length eyepieces until the desired magnification is reached. This procedure allows the centering of the object at high magnification.

◆ Focusing System

The telescope uses a rack-and-pinion focusing system. This system permits rapid and accurate focus adjustment. By turning the focusing knob clockwise, the drawtube will move out of the telescope tube. By turning the focusing knob counter-clockwise, the drawtube will move into the telescope tube.



Drawtube will move out of the telescope tube by turning the focusing knob clockwise.

◆ Adjusting the focus point

Remove the dew shield cap from the dew shield and insert the eyepiece into the eyepiece adapter or diagonal. After ensuring that the drawtube clamp is loose, turn the focusing knob slowly.

At the time of shipment, the drawtube is fully retracted inside the telescope. When using the telescope for the first time, slowly rotate the focusing knob clockwise and it will eventually adjust to the focusing point. In order to achieve focus on celestial bodies, it is sometimes easier to focus on a distant terrestrial object, such as a radio tower or tall building (the scenery should look upside down) and then marking a line on the drawtube. This marked position on the drawtube can then serve as a reference when observing celestial bodies. Slight adjustments from the marked position can then be made to achieve the best focus. When observing celestial objects at a high magnification, even a slight error in focus can cause them to look blurry or not visible. Therefore it is better to begin with a low magnification eyepiece and then gradually increase magnification, adjusting focus each time.

◆ About the Drawtube Clamp

After achieving proper focus the drawtube clamp can be used to lock the drawtube in position. It is not absolutely necessary when performing visual observations. However, when imaging, the weight of the attached camera could cause the drawtube to move outward and in turn defocus the image. Therefore it is best to use the drawtube clamp to secure the drawtube in place.

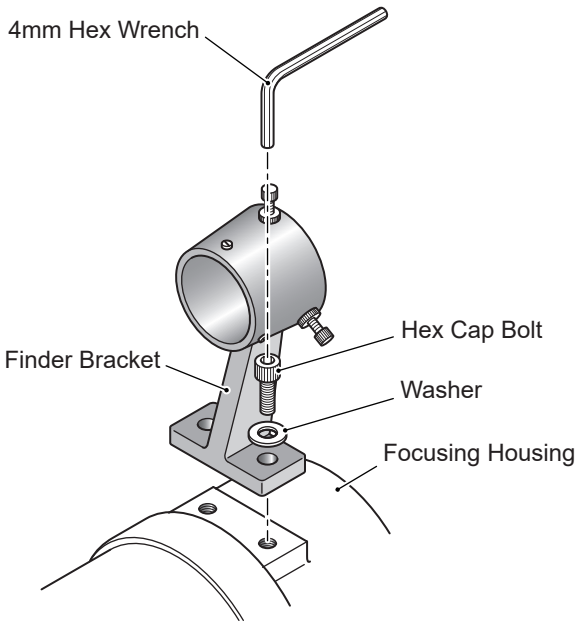
When adjusting focus again, ensure the drawtube clamp is properly loosened. Forcefully turning the focusing knob while the lock is tightened may damage the gear or cause a scratch in the drawtube.

Attaching the Finder

With the FC-100DZ, Takahashi offers a 6x30 or 7x50 finder as an optional accessory. The following instructions provide information on installing the optional finder.

◆ Attaching the Finder Bracket

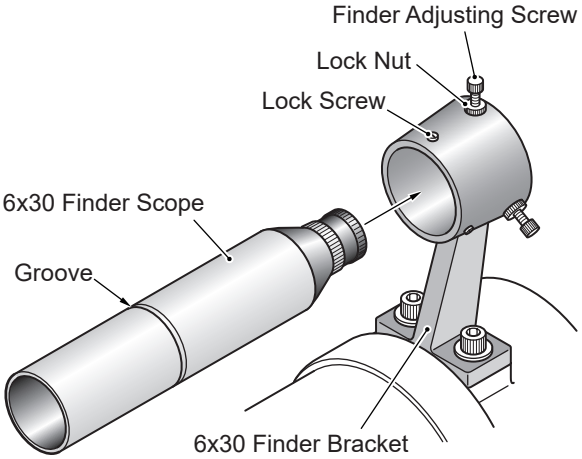
The finder is attached to the telescope using two 4mm cap bolts and washers provided with the finder bracket. The finder attaches to two holes in the telescope focuser casting. When shipped, these holes have two Philips head screws inserted for transport. Please note that if the washers are not used, the ends of the cap bolts may contact the drawtube and cause damage.



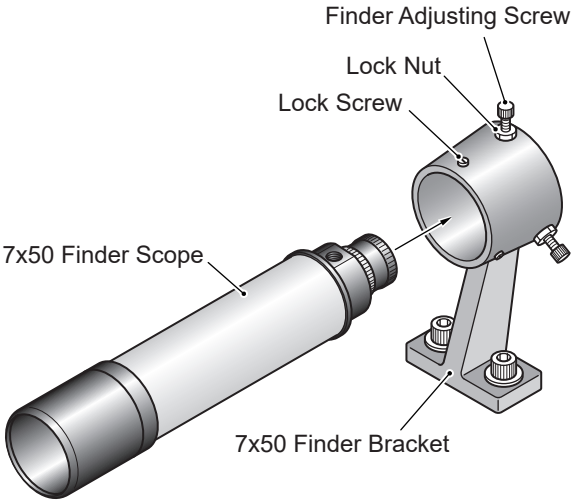
◆ Attaching the Finder Scope

If the finder adjusting screws and lock screw protrude too far into the tube of the finder bracket they may prevent the finder from being fully inserted. If this is the case, unscrew slightly until the finder can be inserted. You can move the lock nut along the adjustment screw by rotating it. In order to adjust the finder lock screw a small screwdriver is necessary. As shown in the right figure insert the finder in the finder bracket and move it back and forth until positioned. Use the small screwdriver to fix the 3 lock screws making sure to tighten them equally and that gap between the finder and the finder bracket is equal. Then adjust the finder adjusting screw with the lock nut to align the finder axis with the axis of the main telescope.

▼ Attaching the 6x30 Finder



▼ Attaching the 7x50 Finder



◆ Adjusting the Finder

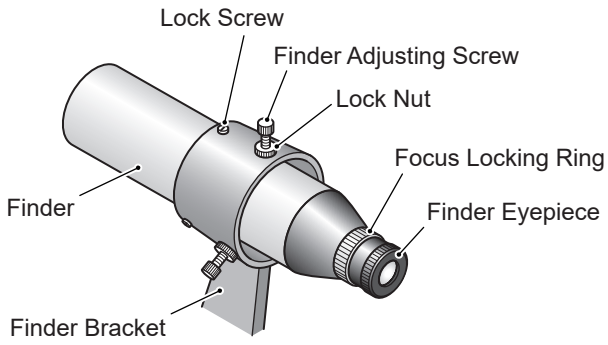
The magnification provided by an eyepiece with the main telescope is often high and its field of view is narrow. Trying to aim the telescope at and locating a celestial body directly through the telescope eyepiece can be difficult. Furthermore, when using a camera to take images of the stars the star image can be difficult to see. Locating a celestial object using a camera can be increasingly difficult.

The finder is a low-magnification telescope with a wide field of view. When properly aligned with the main telescope, objects centered in the finder should also be centered in the telescope eyepiece or camera image.

◆ Adjusting the Finder Focus

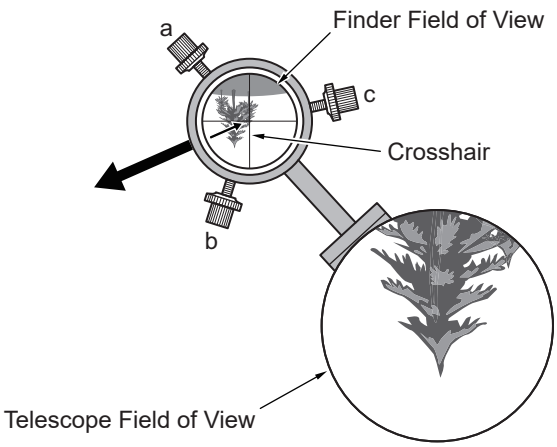
When looking at a distant object with the finder, if the focus is not correct, the finder focus can be adjusted as follows:

1. Loosen the focus locking ring.
2. While looking at the distant object hold the finder eyepiece and turn it clockwise and counter-clockwise to achieve proper focus.
3. Tighten the focus locking ring in a position where the focus point is properly achieved.



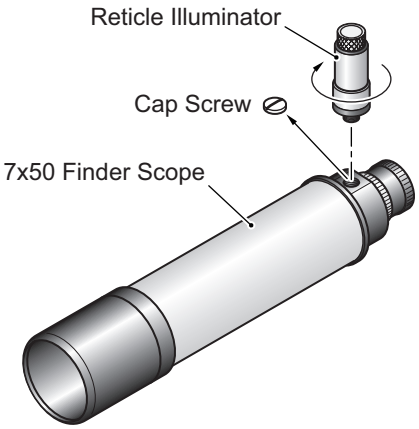
◆ Adjusting the Finder Alignment

1. Set up the telescope for visual use according to the system chart and attach a lower power eyepiece. Then, select a clearly visible distant object and center it in the field of view. This is most easily done during the daytime.
2. Exchange the lower power eyepiece for a higher power eyepiece, and again focus on the distant object.
3. Looking through the finder, move the finder with the following procedure and adjust it so the object is centered in on the crosshair.
4. To adjust the finder, turn all lock nuts until they reach the head of the adjusting screws.
5. Referring to the diagram, in order to move the crosshair in the direction of the arrow, first loosen screw (a) and tighten (push) the finder with screw (c). Next loosen screw (b) and tighten the finder with screw (c). This procedure will move the crosshair in the desired direction. The end of the finder will move in the opposite direction and the object will move in the direction of the small arrow. When the finder is properly aligned, lock the finder by tightening the lock nuts.

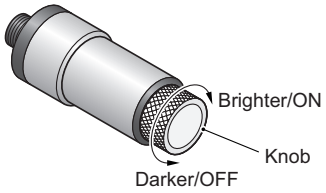


◆ Reticle Illuminator (Optional)

If an illuminator will be installed, remove the cap screw at the end of the 7x50 finder and install the reticle illuminator. The illuminator makes the centering of dim objects easier.

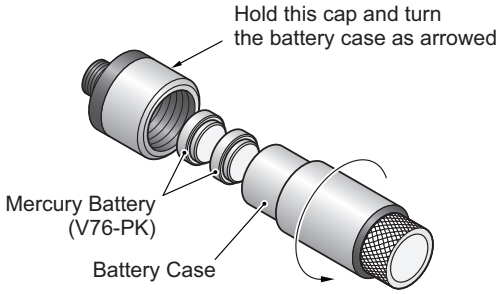


In order to turn the illuminator on, turn the knob clockwise. The knob will click when the illuminator turns on. As the knob is turned, the reticle will brighten. Adjust the knob to the desired brightness. Turn the knob counter-clockwise past the click to turn the illuminator off.



▼ Replacing the Battery

Before changing the batteries in the illuminator, please be certain to turn it off. Unscrew the battery case. Remove the old batteries and insert new ones after they have been wiped with a clean dry cloth. Check the polarity of the batteries before inserting them into the case. Use two silver (V76-PK) or equivalent batteries.



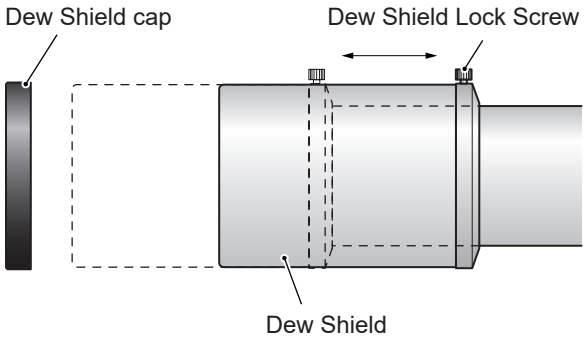
◆ Dew Shield

FC-100DZ has a retractable dew shield. When transporting, it retracts to become more compact, and at the time of observation it can pull out to prevent stray light.

To pull out the dew shield, you need to

1. Remove the dew shield cap
2. Loosen the dew shield lock screw
3. Extend the dew shield
4. Tighten the dew shield lock screw

When retracting it, do so in reverse.



⚠ Caution

When moving the dew shield, please make sure that the dew shield cap has been removed. If the dew shield is made to slide with the cap still attached, it may fall off.

Observation

◆ Preparations Before Observation

Refractive Telescopes like the FC-100DZ, when under low temperatures may take some time to stabilize. Taking the telescope outside an hour before observing begins will allow it to equalize with the colder air.

◆ Visual Applications

▼ Determining Magnification

The magnification of any eyepiece used with the telescope can be calculated by using the following formula:

(Focal Distance of the Telescope) / (Focal Distance of the Eyepiece)
Example: Utilizing the LE-5mm
800mm / 5mm = 160x

Therefore, shorter focal length eyepieces will produce high magnification. However, generally the upper limit of magnification will be 2x of the aperture (measured in mm) of a telescope, and the lowest will be 0.14x of the aperture (measured in mm) of a telescope.

With an aperture of 100mm, the FC-100DZ upper limit becomes 200x and lower limit becomes 14x, making the usable eyepiece focus distance from 4 to 57mm. Takahashi eyepieces, TOE-2.5mm, TOE-3.3mm, and TAK-3.3UW mostly surpass this range, so most are usable within this range on a higher magnification. This telescope is equipped with a high-performance objective lens, as such if the conditions are good it can still be used even if they surpass the maximum magnification.

▼ Diagonal Mirror & Diagonal Prism

When observing objects near the zenith is necessary, it is advisable to use a high quality diagonal prism. The Takahashi 90-degree prism diagonal is a quality multi-coated prism and allows the observer to easily view the zenith by looking down into the prism. The diagonal prism has a 45-degree light pass and produces an erect, reversed (mirror) image. The diagonal prism is designed to be used with 31.7mm(1¼") barrel eyepieces.

The prism's light path length increases the optical path length of the system. In order to ensure proper focus, please connect the prism to the telescope following the appropriate system chart.

The 31.7mm(1¼") diagonal prism is inserted into the compression ring adapter at the end of the focuser and is tightened until it holds the diagonal prism firmly in place. The eyepiece is then inserted into the compression ring adapter of the diagonal prism and held firmly in place by tightening the compression ring.

The Takahashi 50.8mm(2") diagonal mirror is useful for viewing with 50.8mm(2") eyepieces. When used in conjunction with the 50.8(2") to 31.7mm(1¼") adapter, 31.7mm(1¼") eyepieces can also be used. Please refer to the appropriate system chart for proper connections.

◆ Astro Imaging

▼ Prime Focus Imaging

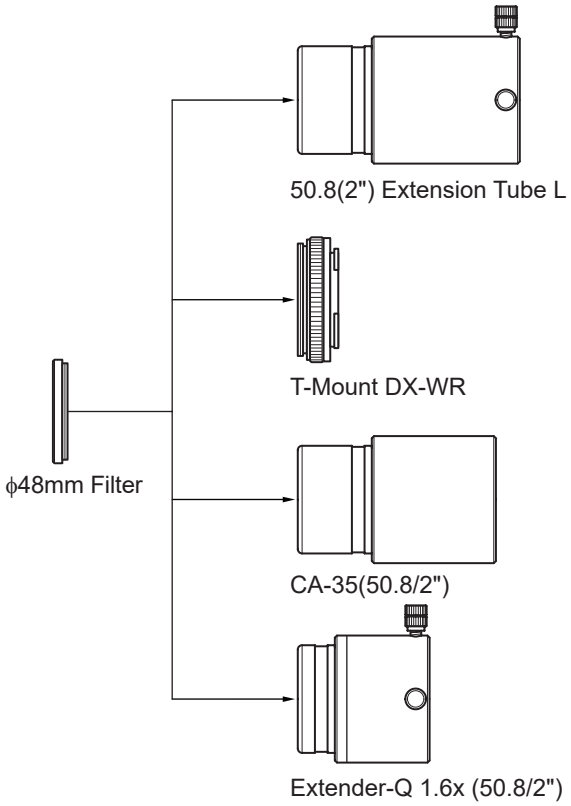
When imaging with a telescope, focusing is one of the most critical elements of making great astro images. To achieve proper focus, it is important to place the camera sensor at the focal point of the telescope. Because the focal length of the telescope is large, it is also important to use a high quality equatorial mount. Any unwanted movement or error in tracking can ruin an imaging session.

To produce images using the telescope, one can use either a digital SLR, or a

specialized CCD or CMOS camera. Takahashi system charts show the adapters and connections needed to attach a DSLR. Standard adapters are generally available for Nikon and Canon. These cameras utilize the CA-35 and a DX-WR camera ring for the specific camera. To attach dedicated astrophotography cameras, some specialized adapters are needed. Please consult with your Takahashi dealer for further details.

▼ Enlarged Shooting

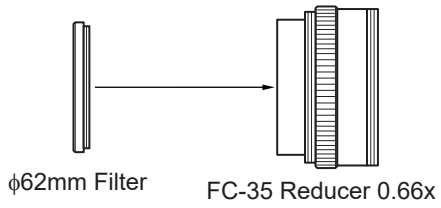
When taking images of the moon's craters or the planets, the image scale available when attaching a camera directly to the telescope can often be too small. To obtain higher magnification images, a method known as eyepiece projection may be useful. Eyepiece projection can be accomplished using the TCA-4 (sold separately). The TCA-4 will accept any Takahashi 31.7mm(1¼") eyepiece and has a tube that can slide along the optical axis, thereby giving the imager control of the size of the final image.



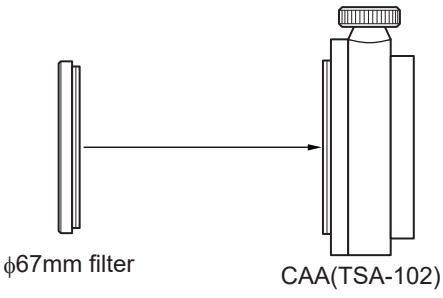
◆ Utilizing Filters

Some FC-100DZ accessories enable the user to attach filters to enhance their viewing or imaging of astronomical objects. However, filters come in many different sizes, with different thicknesses, so not all filters can be attached to all accessories. When utilizing filters, there is also the chance of ghosting due to internal reflections. Some places where a filter can be utilized include:

- A 48mm filter can be attached to the DX-WR camera mount. In this case, if filter body thickness is to large, it may not attach to the DX-WR camera mount.
- A 48mm filter can be attached to a CA-35 (50.8/2") or a 50.8(2") extension tube L.
- The FC-35 reducer 0.66x has a 62mm filter attached to it. If the aperture is too big, it cannot be attached to the camera angle adjuster (TSA-102), and as such, cannot be used.



- A 67mm filter can be attached to the camera angle adjuster (TSA-102).



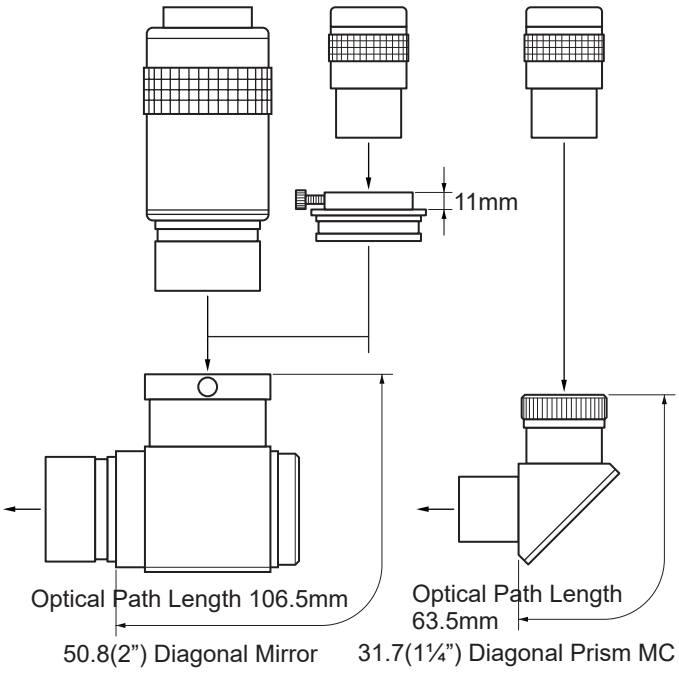
About the Accessories

The FC-100DZ utilizes many accessories to bring about a better performance.

◆ 50.8(2”) Diagonal Mirror

◆ 31.7(1¼”) Diagonal Prism MC

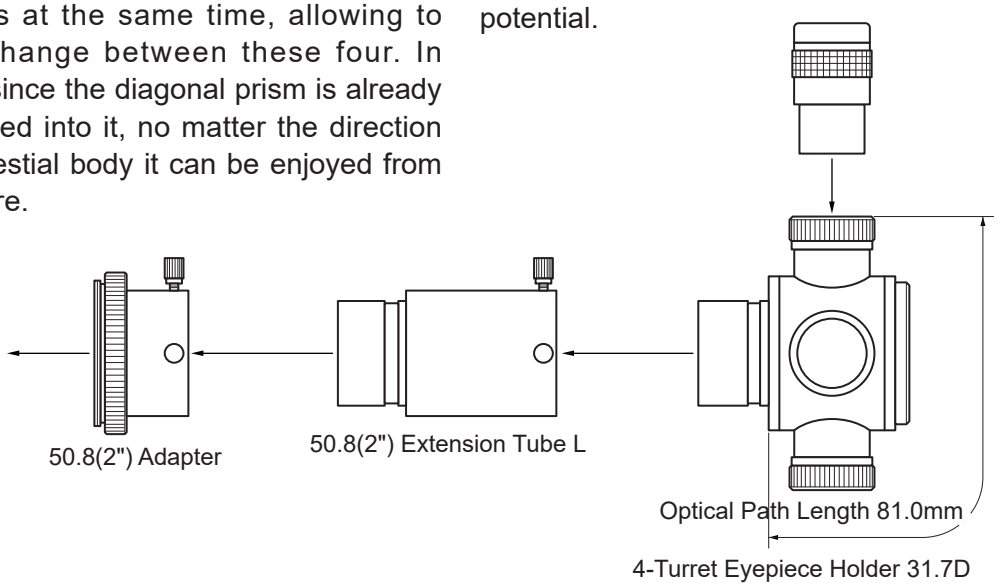
When using these accessories, the distance light must travel becomes longer, so if installed without following the system chart focusing may be problematic. When using the FC-100DZ together with the 31.7(1¼”) diagonal prism, a separate 50.8(2") extension tube S is necessary. The image on the right shows the required optical path length, and may be used as a reference for connecting them. In addition, when the 50.8(2") diagonal mirror is attached to 50.8 diameter eyepiece other than Takahashi’s, depending on the eyepiece, focusing may be problematic.



◆ 4-Turret Eyepiece Holder 31.7D

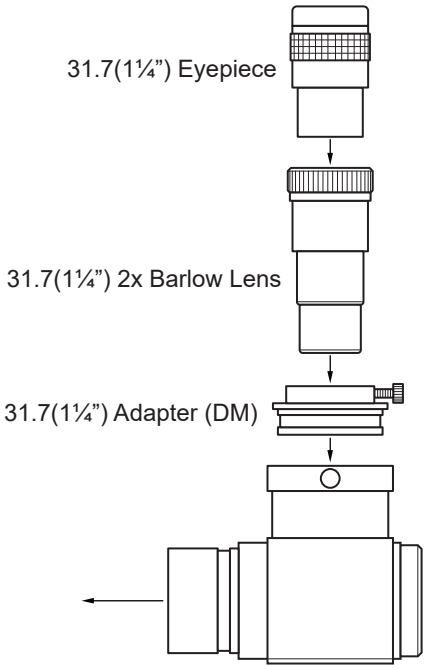
For those frequently changing from low to high resolution eyepieces, the 4-Turret Eyepiece Holder 31.7D becomes very useful. This revolver can be equipped with up to four 31.7mm(1¼”) diameter sleeve eyepieces at the same time, allowing to quickly change between these four. In addition, since the diagonal prism is already incorporated into it, no matter the direction of the celestial body it can be enjoyed from any posture.

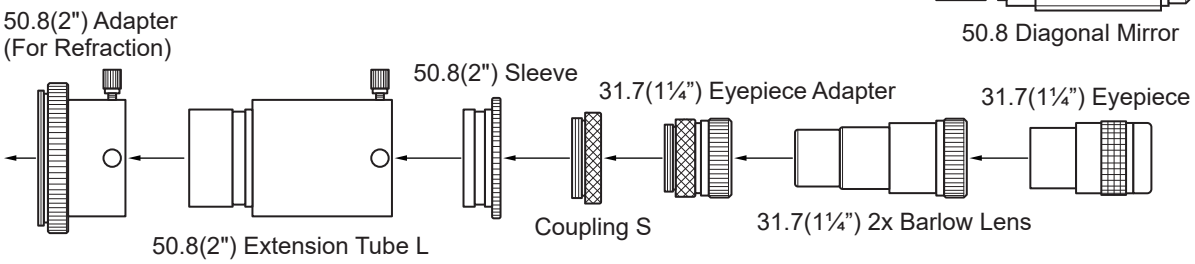
When used in conjunction with the extender-Q 1.6x (50.8/2”) if not used together with a 50.8(2") extension tube S as specified by the system chart, there is a chance that the focus point won’t properly focus or that it may not display its full potential.



◆ 31.7(1¼") 2x Barlow Lens

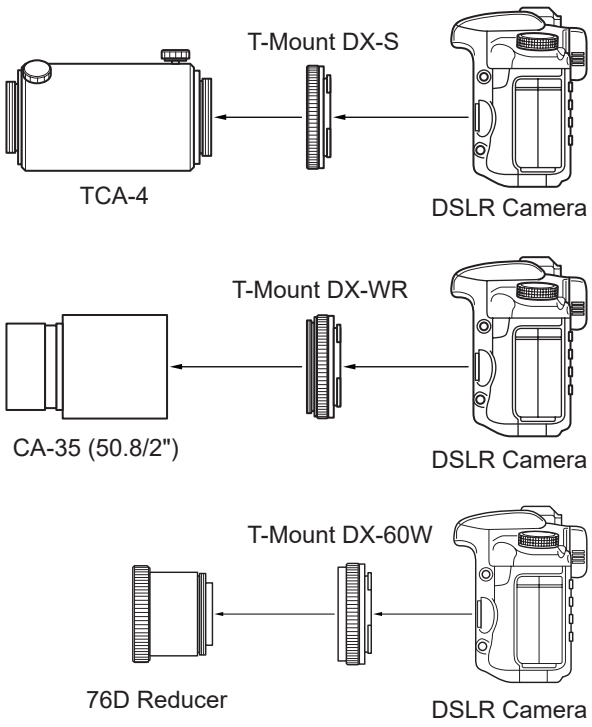
For doubling the focal length while keeping the FC-100DZ from producing any aberrations in the images, there is the 31.7(1¼") 2x barlow lens. It can also be used in conjunction with the 50.8(2") diagonal mirror.





◆ T-Mount DX

To install a digital SLR camera, in the case of a TCA-4 utilize the T-Mount DS-X for enlarged shooting and for focused shooting utilize the FC-35 reducer 0.66x, the FC/FS Multi flattener 1.04x and the extender-Q 1.6x (50.8/2") together with the T-Mount DX-WR, and for shoots that use the 76D reducer use the T-Mount DX-60W. The T-Mount DX can be utilized with many CANON EOS and NIKON models.



⚠ Caution

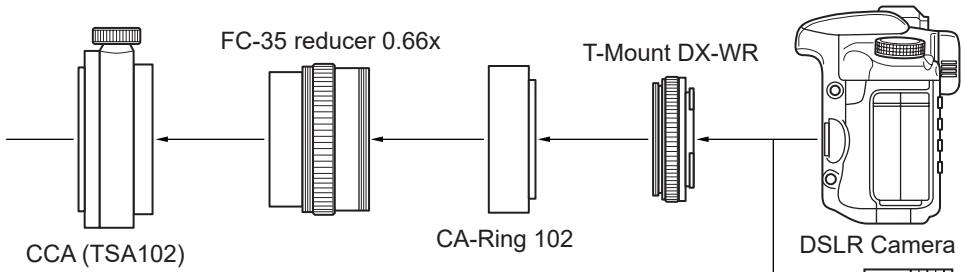
If there is any tilt at all in your camera mount, even from scratches or dirt on the connections, star images could suffer (particularly in the corners or at the edges).

◆ FC-35 Reducer 0.66x

4-element FC-35 reducer 0.66x can be used with FC-100DZ. This reducer is specially designed for deep sky imaging, reducing the focal length to 530mm f/5.3 and reducing exposure time. To attach a DSLR camera, use CA ring 102 and DX-WR or equivalent up to a DSLR camera.

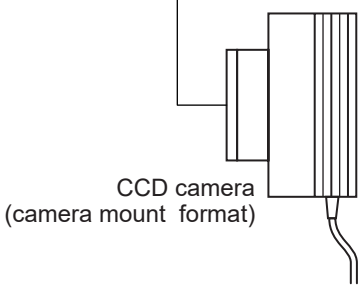
▼ Taking photos with the FC-35 Reducer 0.66x

Focal Length ----- 530mm
Focal Ratio -------- f/5.3
Image Circle ------ ϕ44mm
(60% illuminated)



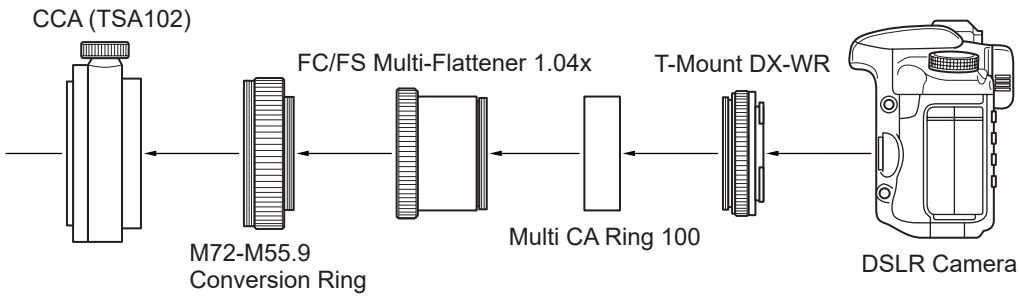
◆ FC/FS Multi-Flattener 1.04x

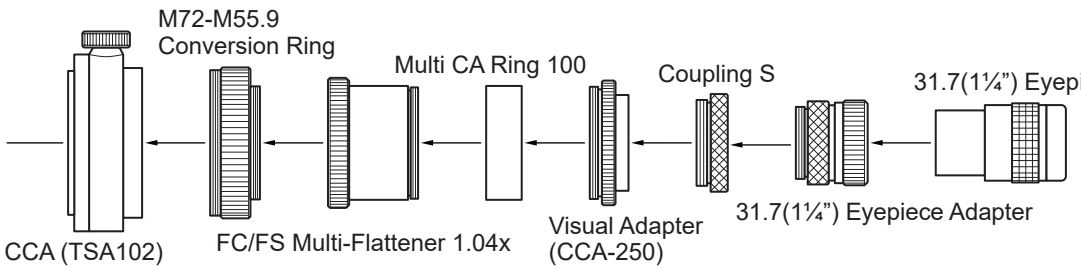
▼ The FC/FS Multi-Flattener design is comprised of two elements, which allows for correction across a larger image circle in most FC/FS telescopes. The flattener increases the focal ratio slightly by a factor of 1.04, resulting in an f/8.2 system. To attach a DSLR camera, use the CA ring 100 and the appropriate DX-WR for your camera. It can also be used for visual observation per the system diagram below.



▼ Taking photos with the FC/FS Multi-Flattener 1.04x

Focal Length ----- 820mm
Focal Ratio -------- f/8.2
Image Circle ------ ϕ44mm
(60% illuminated)



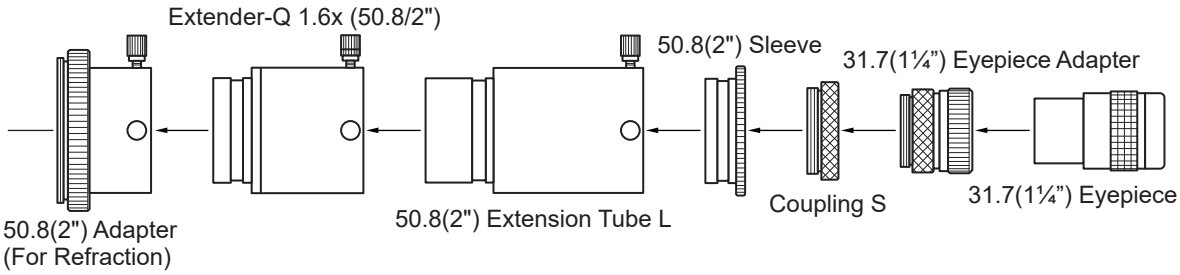


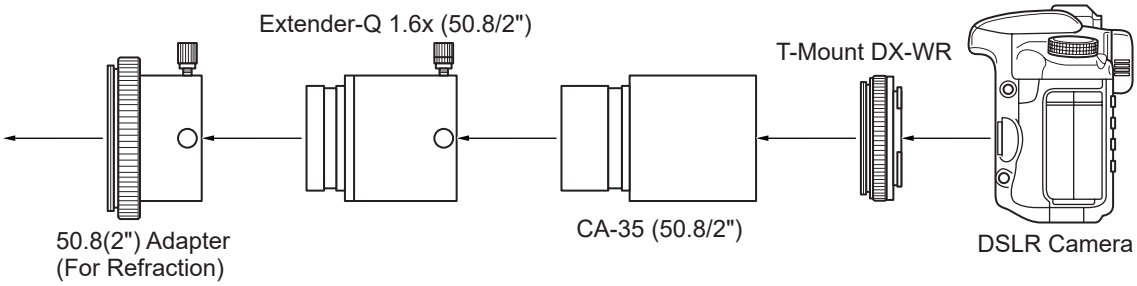
◆ Extender-Q 1.6x (50.8/2")

Short focal length eyepieces with general eye relief tend to tire the user easily. The extender-Q 1.6x (50.8/2") is capable of extending the visual length to 1.6x 1280mm (f/12.8), with visual performance being its main focus, making it perfect for viewing the moon and planets at high resolutions. When using the effective maximum and minimum magnifications to select an eyepiece they can vary from 6.4mm to 9.1mm, allowing a person to use long eye relief pieces without much effort.

▼ Photos Utilizing the Extender-Q 1.6x (50.8)

Focal length -------- 1280mm
Focal ratio ---------- f/12.8



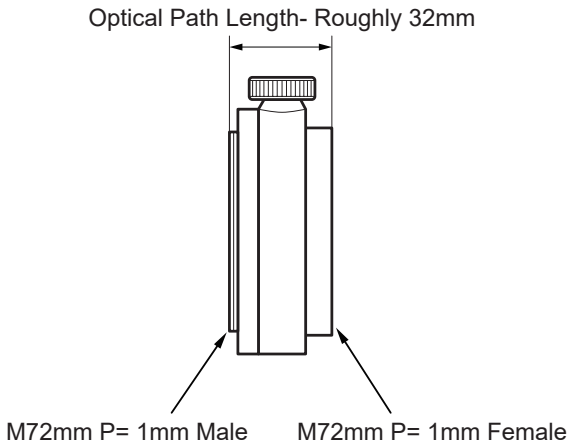


⚠ Caution

When connecting the 50.8(2") extension tube L or otherwise the CA-35 (50.8/2") behind the extender-Q 1.6x (50.8/2"), please attach this part to the filter. Take care to prevent it from colliding with the extender-Q 1.6x (50.8/2").

◆ Camera Angle Adjuster (TSA-120)

Necessary when using the FC-35 reducer 0.66x, FC/FS Multi-Flattener 1.04x and the 76D reducer. By rotating the camera at the moment of shooting, it allows a person to adjust the composition.

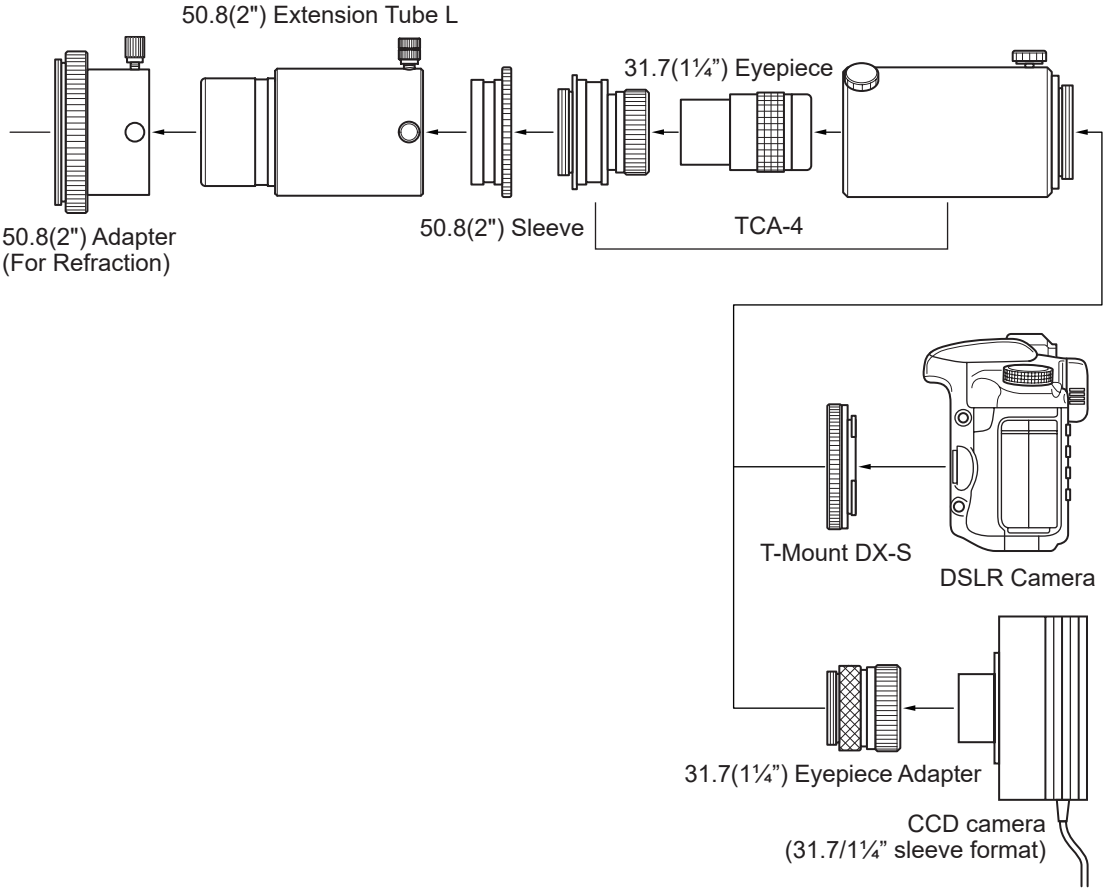


◆ TCA-4

This is a high-functioning adapter that can change between visual and enlarged photo shooting with just one touch. The magnification lens can be changed quickly, and by plugging and unplugging the magnification tube one can change its magnification ratio. The magnification lens utilizes a 31.7mm(1¼") diameter sleeve eyepiece. Depending on the camera used for photo shooting, an optional T-mount DX-S must be installed, as well as a digital single-lens reflex camera. Furthermore, together with a 31.7(1¼") eyepiece adapter, a 31.7(1¼") sleeve PC camera or CCD camera can be installed behind the main body of the TCA-4.

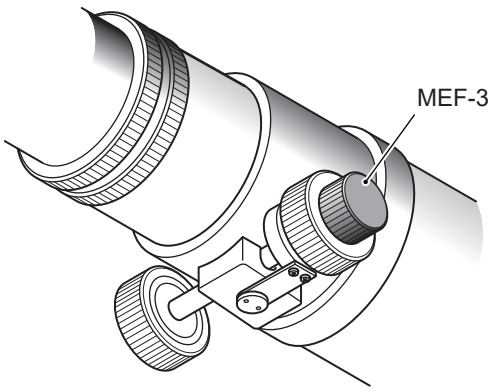
⚠Caution

When taking high magnification lunar and planetary images, pay careful attention to balance. Rebalance the telescope when the object is placed in the center of the camera, to prevent the telescope from turning abruptly and dangerously.



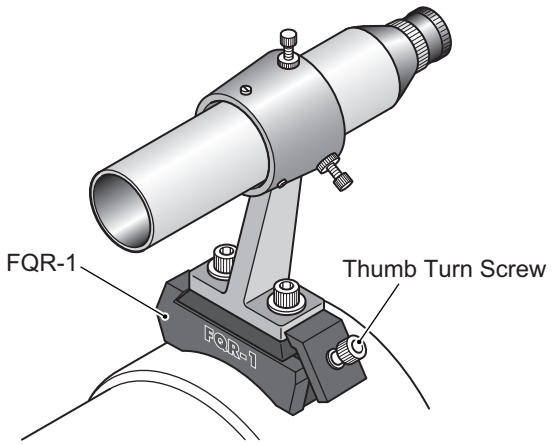
◆ MEF-3

The optional MEF-3, Micro Edge Focuser, is designed to move the focuser at a fine speed of 8 to 1 (smaller knob) while the larger knob moves the focuser at 1 to 1.



◆ FQR-1

The FQR-1 is an optional accessory that can be attached and detached with just one touch. After the adapter is set with the cap bolt to the finder on the telescope in where the finder goes, you can attach or detach it without any tools. This eliminates the need to align the finder each time the telescope is used. We recommend folding the telescope to make it more compact.



◆ Astro Imaging

▼ Sharp Image

Use a 3-4 magnitude star in order to achieve sharpest focus of an image. Make trial shots with a DSLR camera to determine the best focus of the image. You can use the “live view” function of the camera to focus on a star.

▼ Trial Shots

Consider beginning on a night of dark, clear skies, doing test images in your back yard. Practice with short, one minute exposures in order to learn the process of getting best possible focus.

▼ Guided Imaging

In devices with a sharp star image like this unit, even a small guiding error will cause errors to also appear in the image. Please note that the longer ratio of this telescope will require longer exposures. Play or misalignment can ruin long exposures. The Takahashi GT-40 provides a very rigid guide scope system for imaging.

◆ Observing the Sun

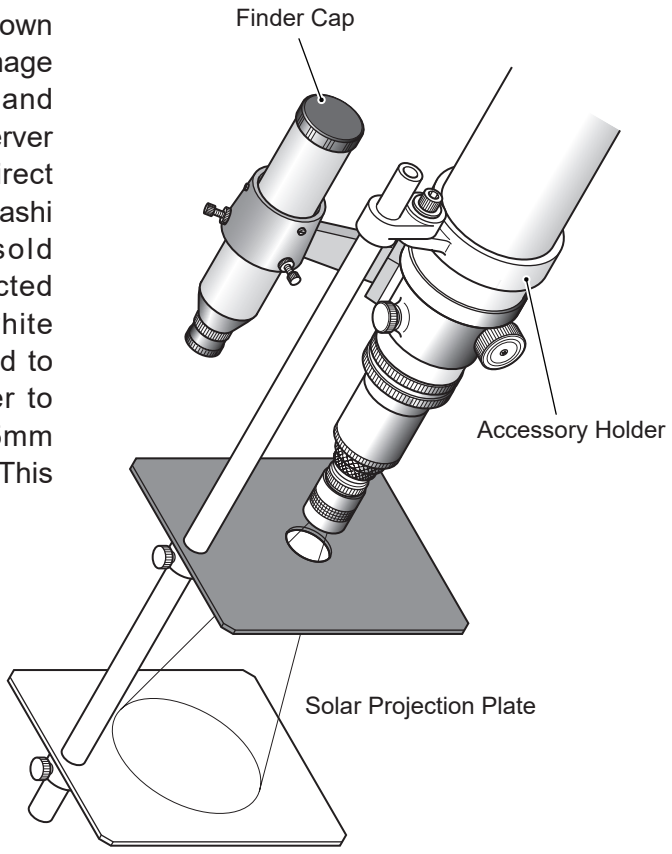
Never observe the Sun directly. This will cause instant and permanent damage to the eye. There are several options for solar viewing. The first is a high quality glass solar filter that blocks out 99.999% of light across the infrared, visible and ultraviolet spectrum. This filter should be secured over the lens shade with nylon set screws to prevent the filter from falling off the telescope during use. One should also use the finder cap over the finder to prevent accidental eye damage from looking through the finder. Using this technique allows for direct view of the solar disc, showing any visible sun spots and other solar phenomenon.



Never view the Sun directly. Full aperture solar filters are required for safe solar viewing through this telescope. Also, be sure to cover the finder scope with the finder cap.

Another method of solar observation is the dedicated sub angstrom solar filter system which allows prominences and great detail to be seen on the solar surface.

A third method is to use a technique known as solar projection. In this method, an image of the sun is projected onto a plate, and the projected image allows for the observer to safely view the solar disc in an indirect manner. This method requires the Takahashi Solar Projection Plate, which is sold separately. The solar image is projected through an eyepiece onto a small white screen. This method is primarily limited to the observation of sun spots. In order to use the solar projection plate, the 95mm accessory holder will also be required. This item is sold separately.



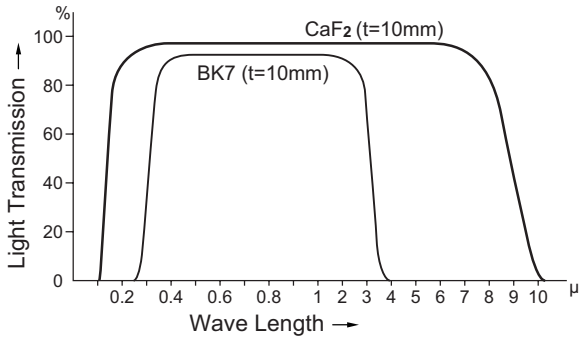
About Fluorite

Takahashi made its first fluorite lens in 1970 and it proved to be superior to lenses made with other materials. After further development, Takahashi released a 90mm Fluorite telescope in 1977, receiving high acclaim from users. The FC-100DZ is a fluorite Doublet Apochromat refractor that utilizes the properties of fluorite to provide a high quality, low curvature image. Its optical system allows the focal length to be changed freely using a dedicated reducer or flattener. As shown below, its transmission area and ratio are outstandingly large. In addition, multi-coated elements produce rich illumination from short wavelengths to long wavelengths. When compared to reflectors, there is no light loss due to the secondary mirror. The FC-100DZ produces very bright images for an f/8.0 optical system. Due to these features it is perfect for both visually observing celestial bodies and taking images, obtaining great results in both applications.

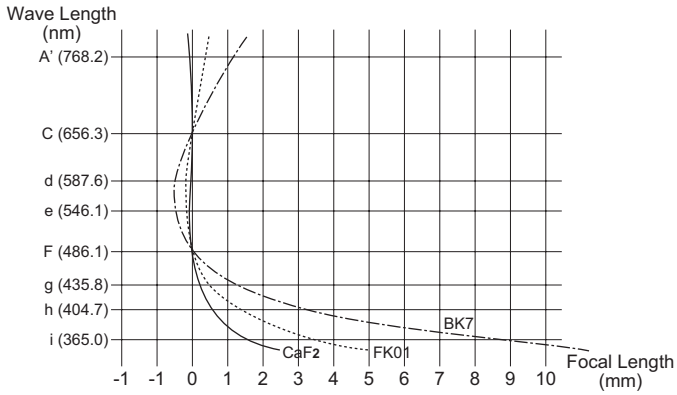
The fluorite element with its excellent performance is used in various high quality objectives. Chemically, fluorite is as hard as optical glass and can be multi-coated for a long lifetime. The focal length of the system can change with fluctuating temperature. It is advisable to take the telescope outside at least 30 minutes prior to use to allow it to equalize with the ambient temperature. It is also advisable to refocus images with every 3 degrees C of temperature change.

Occasionally, if you look carefully at the surface of the element you may be able to see small scratches. This occurs in very few cases to the coatings surface, and be assured that all of the products having been thuroughly exanimated and approved by Takahashi, guaranteeing that these won't affect the function of the telescope.

Comparative Diagram (non-coated)



Comparative Color Aberration Curves



Care & Maintenance

▼ About the Optical Tube Assembly

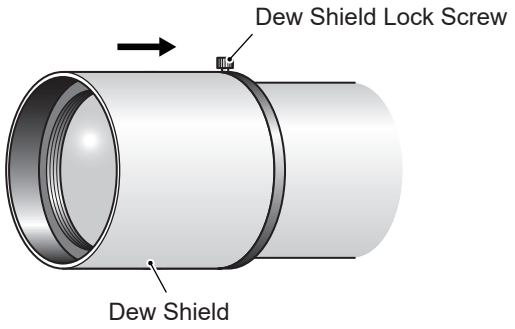
Your FC-100DZ has been precisely collimated at the factory by skilled optical technicians. In the event, as a result of a heavy blow, that collimation is lost, please contact your local distributor. They can provide any necessary service and repair.

▼ Lens Maintenance

If dust and particles collect on the front element, blow them off the surface using a simple hand blower. If any particles remain, it may be necessary to carefully clean them off. In this event, contact your local distributor for cleaning instructions. Under no circumstances should canned air be used to remove particles. Canned air contains a refrigerant that is very cold and could damage the front element.

The front surface of the objective should never be rubbed as this could permanently damage the surface and is not covered under warranty.

Pure cotton swabs, slight moistened with lens cleaner, can be used to gently remove dirt. For further instructions, please contact your local distributor.



Additional Precautions

▼ Avoid sudden temperature changes whenever possible, as dew may form on the lens. Allow the telescope to fully dry before storing it in a cool, dry environment. Storing the telescope with a desiccant (dying agent) near the objective may help to prevent moisture problems.

▼ As mentioned previously, never use canned air due to the refrigerated propellant which can damage optical surfaces.

▼ Under no circumstances should the lenses be disassembled. The lenses have been properly aligned and set in place by skilled optical technicians with special tools. Doing so will void any warranty on the tube assembly.

System Charts

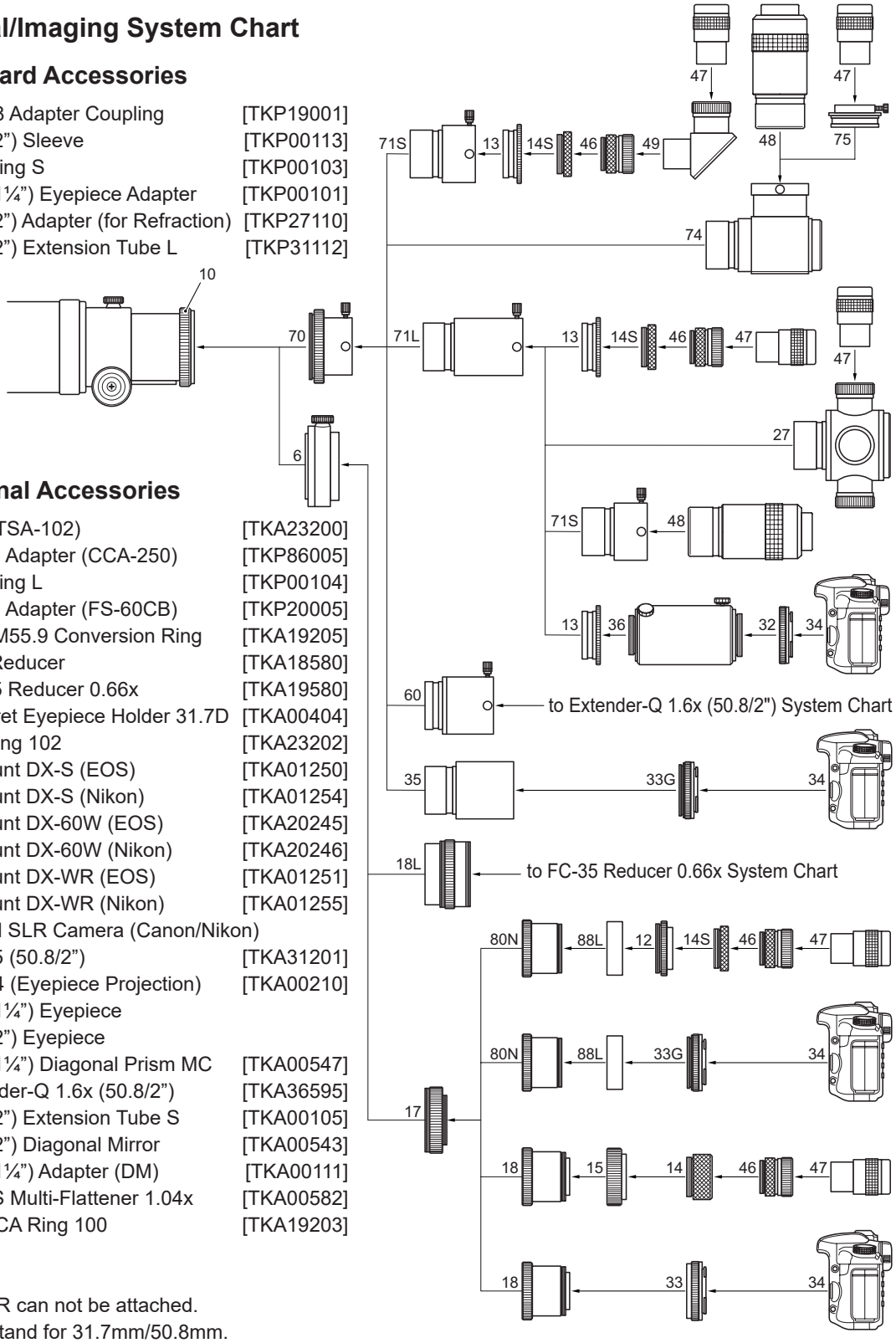
◆ Visual/Imaging System Chart

▼ Standard Accessories

10. F-50.8 Adapter Coupling [TKP19001]
13. 50.8(2") Sleeve [TKP00113]
14S. Coupling S [TKP00103]
46. 31.7(1¼") Eyepiece Adapter [TKP00101]
70. 50.8(2") Adapter (for Refraction) [TKP27110]
71L. 50.8(2") Extension Tube L [TKP31112]

▼ Optional Accessories

6. CAA(TSA-102) [TKA23200]
12. Visual Adapter (CCA-250) [TKP86005]
14. Coupling L [TKP00104]
15. Visual Adapter (FS-60CB) [TKP20005]
17. M72-M55.9 Conversion Ring [TKA19205]
18. 76D Reducer [TKA18580]
18L. FC-35 Reducer 0.66x [TKA19580]
27. 4-Turret Eyepiece Holder 31.7D [TKA00404]
30M. CA-Ring 102 [TKA23202]
32. T-Mount DX-S (EOS) [TKA01250]
T-Mount DX-S (Nikon) [TKA01254]
33. T-Mount DX-60W (EOS) [TKA20245]
T-Mount DX-60W (Nikon) [TKA20246]
33G. T-Mount DX-WR (EOS) [TKA01251]
T-Mount DX-WR (Nikon) [TKA01255]
34. Digital SLR Camera (Canon/Nikon)
35. CA-35 (50.8/2") [TKA31201]
36. TCA-4 (Eyepiece Projection) [TKA00210]
47. 31.7(1¼") Eyepiece
48. 50.8(2") Eyepiece
49. 31.7(1¼") Diagonal Prism MC [TKA00547]
60. Extender-Q 1.6x (50.8/2") [TKA36595]
71S. 50.8(2") Extension Tube S [TKA00105]
74. 50.8(2") Diagonal Mirror [TKA00543]
75. 31.7(1¼") Adapter (DM) [TKA00111]
80N. FC/FS Multi-Flattener 1.04x [TKA00582]
88L. Multi CA Ring 100 [TKA19203]

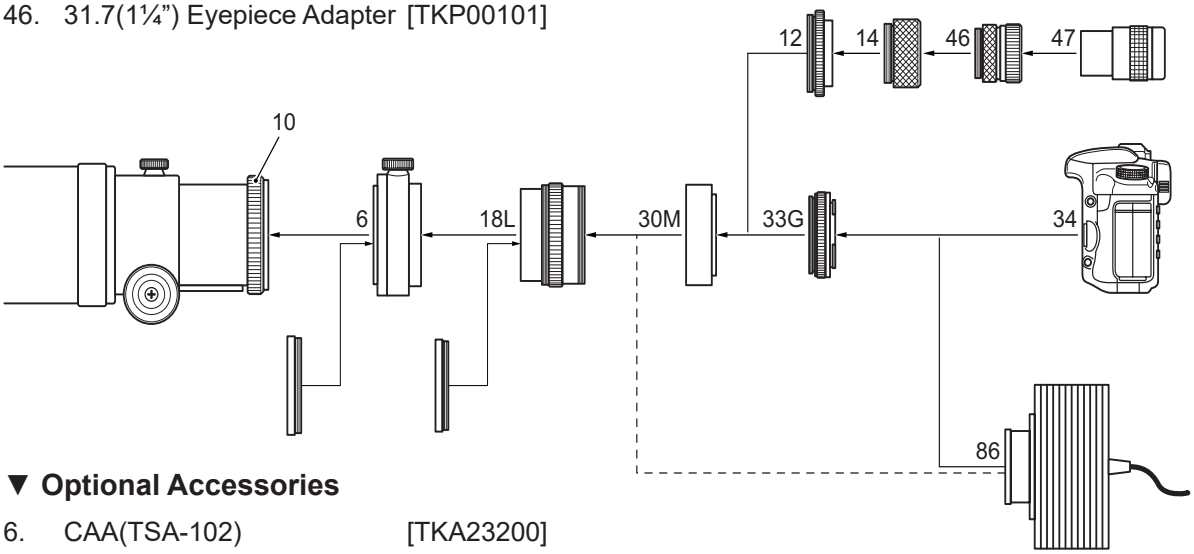


(Note)
Some DSLR can not be attached.
31.7/50.8 stand for 31.7mm/50.8mm.

◆ FC-35 Reducer 0.66x System Chart

▼ Standard Accessories

10. F-50.8 Adapter Coupling [TKP19001]
14. Coupling L [TKP00104]
46. 31.7(1¼") Eyepiece Adapter [TKP00101]



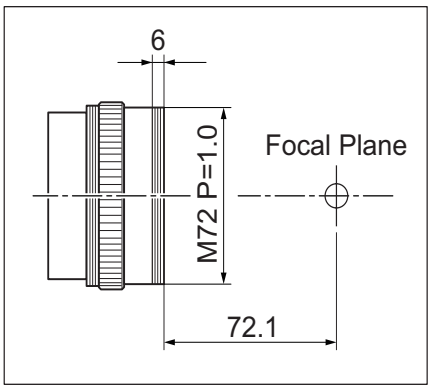
▼ Optional Accessories

6. CAA(TSA-102) [TKA23200]
12. Visual Adapter(CCA-250) [TKP86005]
18L. FC-35 Reducer 0.66x [TKA19580]
30M. CA-Ring 102 [TKA23202]
33G. T-Mount DX-WR (EOS) [TKA01251]
T-Mount DX-WR (Nikon) [TKA01255]
34. Digital SLR Camera (Canon/Nikon)
47. 31.7(1¼") Eyepiece
86. CCD Camera (camera mount format)

(Note)

Some DSLR can not be attached.

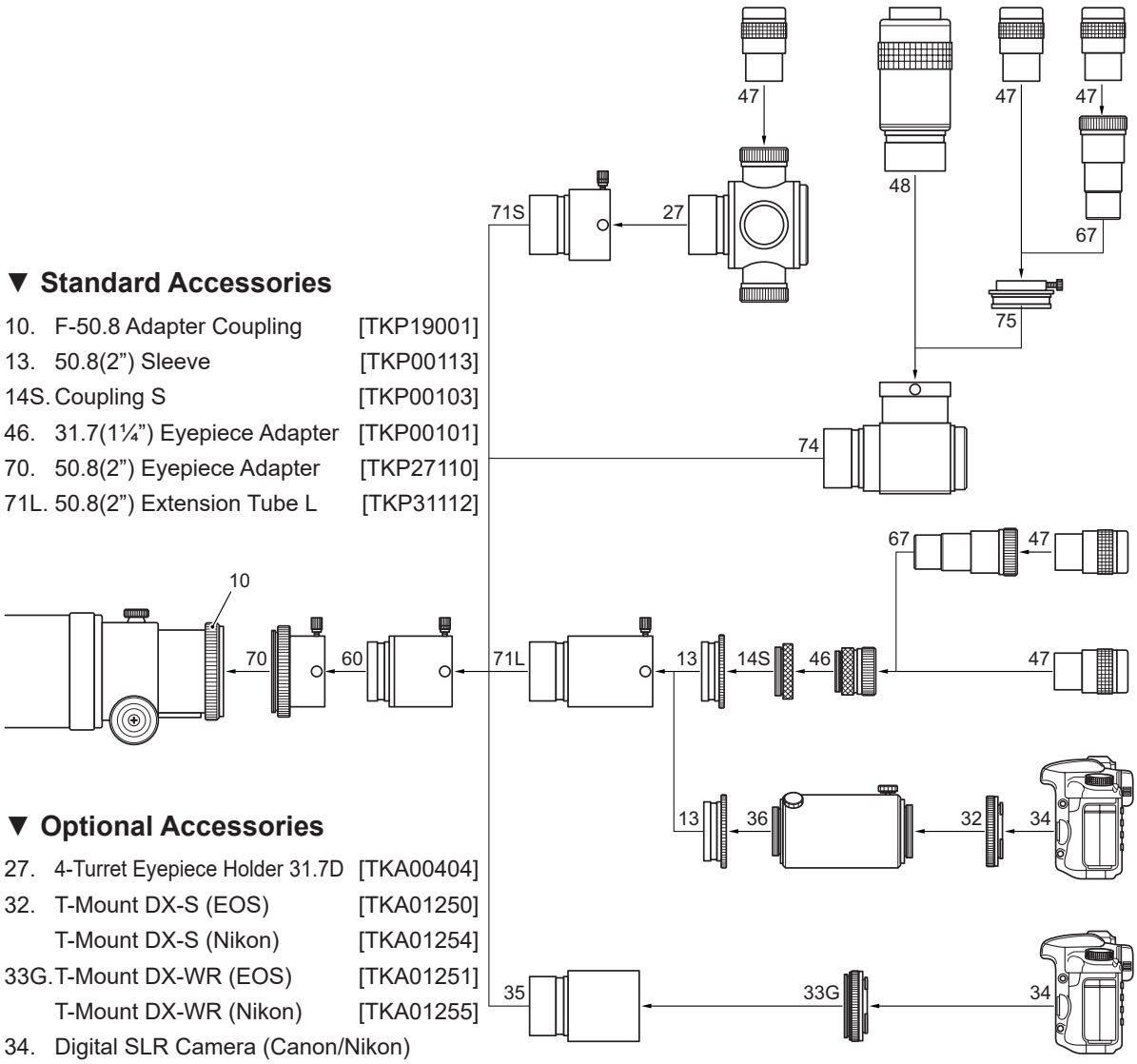
31.7 stand for 31.7mm.



▼ Back Focus Drawing for FC-35 Reducer 0.66x

CCD coupling between the FC-35 Reducer and your CCD must be made based on the drawing.

◆ Extender-Q 1.6x(50.8/2”) System Chart



▼ Standard Accessories

10. F-50.8 Adapter Coupling [TKP19001]
13. 50.8(2”) Sleeve [TKP00113]
14S. Coupling S [TKP00103]
46. 31.7(1¼”) Eyepiece Adapter [TKP00101]
70. 50.8(2”) Eyepiece Adapter [TKP27110]
71L. 50.8(2”) Extension Tube L [TKP31112]

▼ Optional Accessories

27. 4-Turret Eyepiece Holder 31.7D [TKA00404]
32. T-Mount DX-S (EOS) [TKA01250]
T-Mount DX-S (Nikon) [TKA01254]
33G. T-Mount DX-WR (EOS) [TKA01251]
T-Mount DX-WR (Nikon) [TKA01255]
34. Digital SLR Camera (Canon/Nikon)
35. CA-35 (50.8/2”) [TKA31201]
36. TCA-4 (Eyepiece Projection) [TKA00210]
47. 31.7(1¼”) Eyepiece
48. 50.8(2”) Eyepiece
60. Extender-Q 1.6x (50.8/2”) [TKA36595]
67. 31.7(1¼”) 2x Barlow Lens [TKA00597]
71S. 50.8(2”) Extension Tube S [TKA00105]
74. 50.8(2”) Diagonal Mirror [TKA00543]
75. Adapter DM (31.7/1¼”) [TKA00111]

(Note)
Some DSLR can not be attached.
31.7/50.8 stand for 31.7mm/50.8mm.

MEMO

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