

Flat-Field Super Quadruplet

---

# **FSQ-106ED**

## **Instruction Manual**

**TAKAHASHI**

Thank you for your purchasing the TAKAHASHI FSQ-106ED Flat-Field Super Quadruplet Refractor. This is a state-of-the-art four element in four groups astrograph uses 2 ED elements for high order color corrections. In order to use the FSQ-106ED to the limit of its capabilities, please read this manual and familiarize yourself with the parts and their functions before using this instrument.



## WARNING

**NEVER ATTEMPT TO OBSERVE THE SUN THROUGH THIS TELESCOPE WITHOUT A FULL APERTURE SOLAR FILTER DESIGNED FOR THIS PURPOSE. FAILURE TO DO SO COULD CAUSE INSTANT BLINDNESS. COVER THE FINDER WITH AN OPAQUE COVER TO PREVENT ANY LIGHT FROM COMING THROUGH. AN UNCOVERED FINDER CAN ALSO CAUSE SERIOUS DAMAGE TO THE EYE. KEEP CHILDREN AWAY FROM THE TELESCOPE DURING DAYTIME.**



## CAUTION

- When placing the tube assembly on to an equatorial mount, be careful to balance the tube in the saddle. This will prevent injury to fingers and will prevent it from falling to the ground. When placing the tube assembly in the saddle, always hold the tube with one hand to keep it from falling off the saddle on to the ground.
- Always lay the tube assembly on a completely flat 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.
- Great care should be taken to focus the instrument to insure the sharpest possible image.

# Contents

|   |       |
|---|-------|
| Warning & Caution .....                       | 2     |
| Contents .....                                | 3     |
| Specifications .....                          | 4     |
| Tube Assembly Layout .....                    | 5     |
| What is the FSQ-106ED .....                   | 6 - 7 |
| Attaching Finder & Tube Assembly .....        | 8-12  |
| Finder Alignment .....                        | 13-14 |
| Observing .....                               | 15-16 |
| Accessories for Photo/Visual applications ... | 17-22 |
| Care & Maintenance .....                      | 23    |
| Additional Precautions .....                  | 24    |
| System Chart .....                            | 25-27 |

# SPECIFICATIONS

|   |   |
|---|---|
| Optical System .....                    | Flat-Field Advanced Petzval Quadruplet                    |
| Effective Aperture .....                | 106mm   |
| Focal Length .....                      | 530mm   |
| Image Circle .....                      | $\phi$ 88mm   |
| Resolving Power .....                   | 1.09"   |
| Limiting Magnitude .....                | 11.9mag   |
| Light Gathering Power .....             | 229X  |
| When used with Extender-Q 1.6x(50.8/2") |   |
| Effective Focal Length .....            | 850mm   |
| Effective Focal Ratio .....             | 8.0   |
| Image Circle .....                      | $\phi$ 44mm   |
| Photographic Field .....                | 9.4°  |
| When used with Reducer-QE 0.73x         |   |
| Effective Focal Length .....            | 387mm   |
| Effective Focal Ratio .....             | 3.6   |
| Image Circle .....                      | $\phi$ 44mm   |
| Photographic Field .....                | 6°  |
| Diameter of Main Tube .....             | 125mm   |
| Total Length of Main Tube .....         | 675mm(Lens shade extended)<br>580mm(Lens shade retracted) |
| Weight of Main Tube Assembly .....      | 7.0kg (15.4lbs) with finder                               |
| Finder Scope .....                      | 7x50 6.3° (illuminator acceptable)                        |

Specifications are subject to change without notice.

# Tube Assembly Layout

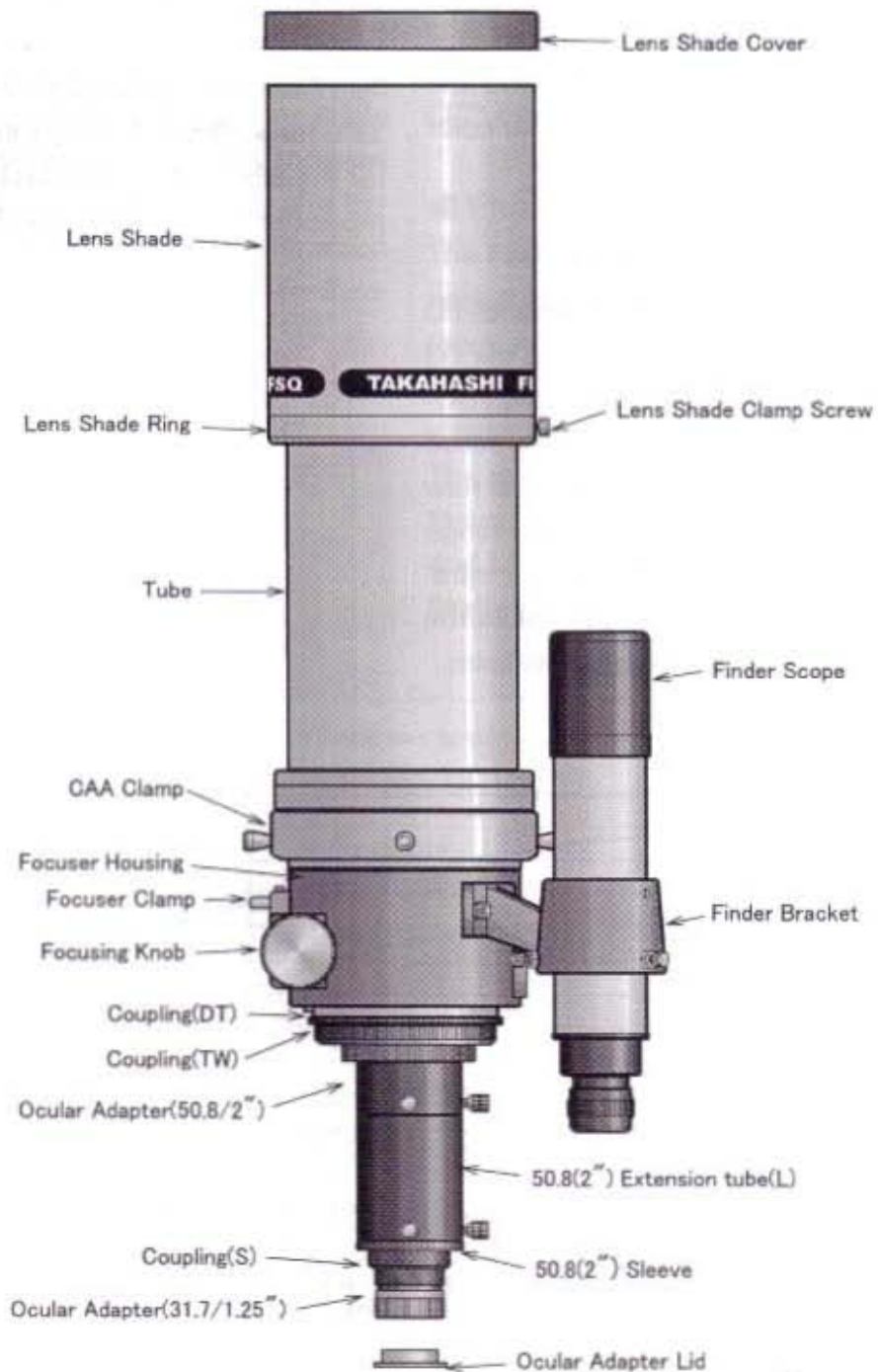


Fig.1



# What is the FSQ-106ED?

The FSQ-106ED is a flat-field f/5 imaging visual astrograph; the successor to the legendary FSQ-106, employs a modified advanced Petzval design of four elements in 4-group, two of which are ED (extra low dispersion) glass to provide superior color correction.

## ■ Improved Color Correction

As a result of using to high performance ED glass elements, and by positioning the G3 element close to the G2 element, the FSQ-106ED has dramatically improved correction for color and spherical aberration. The new design corrects color for over a wide range from the near ultra-violet to the near infrared, 400nm to 1000nm. This makes the FSQ-106ED the perfect imaging platform.

## ■ Improved Illumination

The new design increased the size of the G3 element by 50% and placed it colose to the G2 element. The result in an increase in field illumination of 20% for a 35mm frame, 33% for a 70mm  $\phi$  image circle and 34% for the 88mm  $\phi$  image circle, a great improvement over the standard Petzval design.

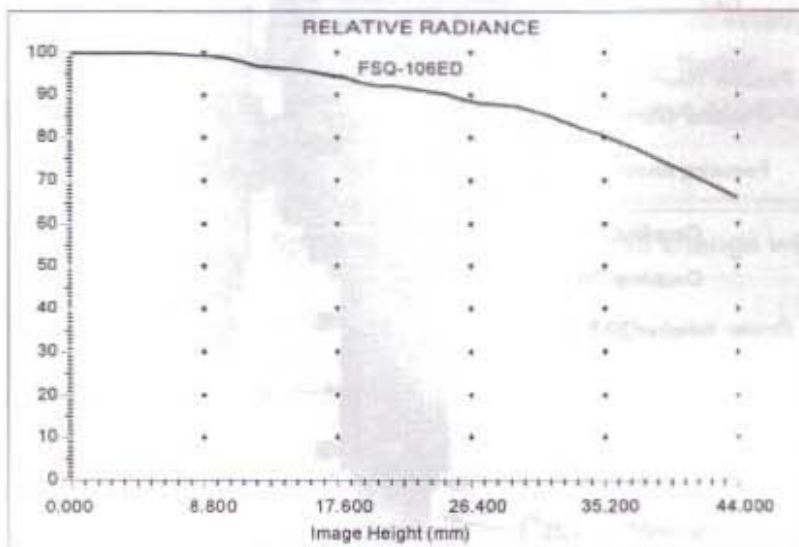


Fig. 2

### ■ Improved High Magnification

The new Extender-Q 1.6X(50.8/2") was designed to take advantage of the new capabilities of the FSQ-106ED design. The new 50.8mm(2") five-element corrector, flattener, and extender increases the focal length from 530mm f/5 to 850mm f/8 flawlessly. The correction provided by the Extender-Q 1.6X(50.8/2") allows the highest possible magnification to be used. The 30% increase in color correction provided by the Extender-Q 1.6X(50.8/2") produces diffraction limited images at high and low magnification.

### ■ Reducer-QE 0.73X

This newly designed f/3.6 dedicated reducer for the FSQ-106ED is a 4-element in 3-group 0.73X accessory. The Reducer-QE 0.73X maintains the same high level of color correction and field flatness produced by the FSQ-106ED at its native f/5 focal ratio. It was designed to be used with digital SLR's and CCD cameras.

### ■ Enhanced Back Focus

The FSQ-106ED has been designed with a back focus of 178mm. This enhanced back focus will allow the imager or observer to use any combination of CCD camera, bino viewer or diagonal with their FSQ-106ED. The standard accessories include a prime focus tube, compression ring 50.8mm(2") and 31.7mm(1.25") adapters for maximum flexibility.

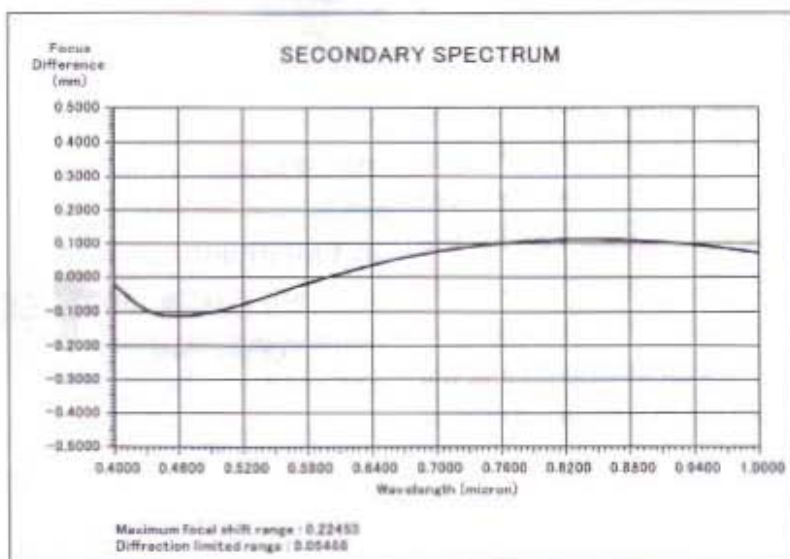


Fig. 3

# Attaching The Finder And Tube Assembly

If you have purchased the FSQ-106ED as a set or purchased the finder and bracket, the finder and bracket have been shipped unattached. Use the following instructions to attach and align the finder.

## ■ Attaching the Finder

Place the finder bracket over the two holes on the left side of the focuser and attach the bracket with the Allen screws supplied with the finder bracket. Make certain that the screws are tightened sufficiently to keep the finder bracket from moving thereby misaligning the finder.

Before inserting the finder into the finder bracket, using standard cellophane tape, place a double layer of this tape around the finder where the three set screws located in the front of the finder bracket will come into contact with the finder. This will help prevent the finder tube from being scratched by the screws. Loosen the front and rear finder bracket screws. Loosen the front and rear finder bracket screws. Carefully insert the finder into the bracket and hold the finder as parallel as possible to the tube assembly when the finder bracket screws are tightened around the finder. This will make alignment easier. Refer to Fig. 4 & 5.

If a finder illuminator will be used, remove the chromed cap screw located in front of eyepiece.

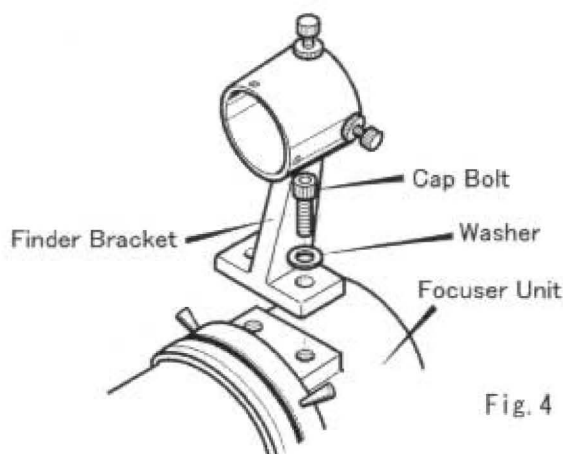


Fig. 4

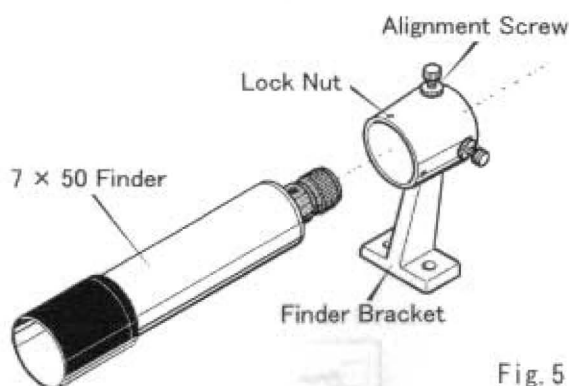


Fig. 5

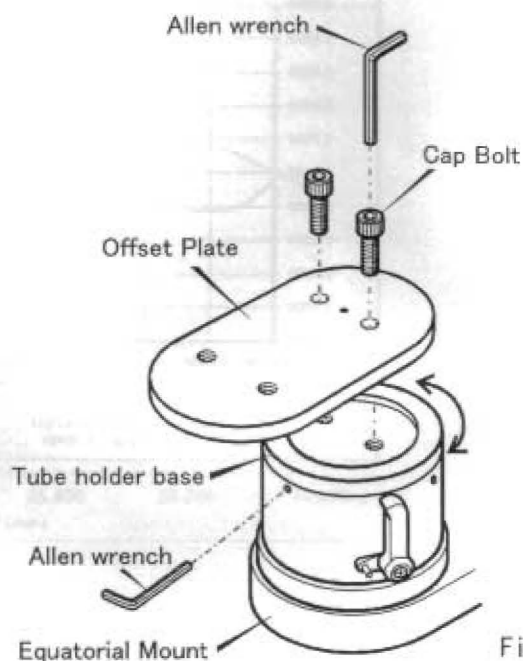


Fig. 6



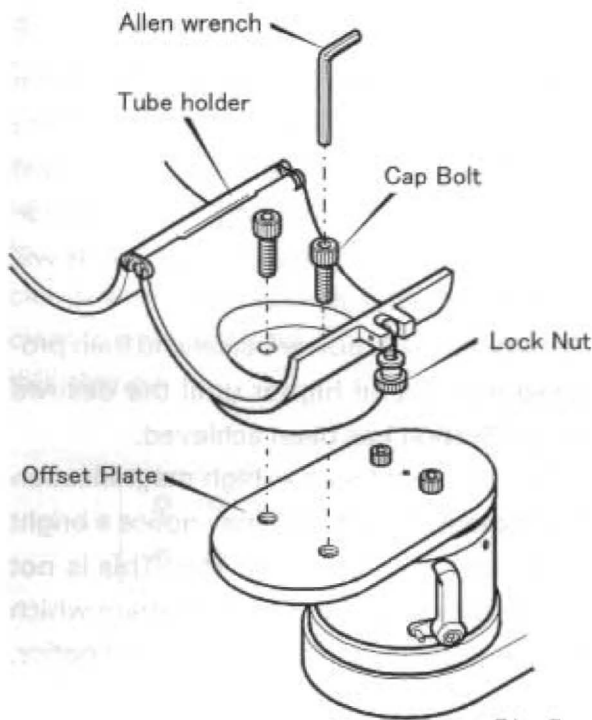


Fig. 7

### ■ Attaching the Tube Assembly to The Equatorial Mount

The FSQ-106ED has been designed with a heavy duty focuser to support heavy imaging packages properly.

In order to accommodate these packages and focuser the tube holder has been offset forward to assure proper balance of the load. Attach the plate on the mount as shown in Fig.6. Then, attach the tube holder on the plate using the 8mm Allen screws supplied with the tube holder. The tube assembly can then be placed into the tube holder and secured with the lock nut after the calm shell has been closed over the tube assembly. This tube holder can be used with all Takahashi mounts. If astro imaging is one of the uses, then the heavier duty the mount, the better. In the case of the FSQ-106ED, this would be Takahashi EM-200 mount.

After placing the tube assembly into the tube holder, the next step is balancing. Refer to Fig.7. Now that the telescope has been attached to the mount, it will be necessary to balance the load in the R.A. and the Dec. The first step is to clamp the R.A. and unclamp the Dec. Hold the tube of the telescope in the event it is out of balance and then loosen the tube clamp slightly so that the tube can be moved in either direction. Move the tube in either direction until it balances. When the tube is balanced, tighten the clamp.

Next, loosen the R.A. clamp and tighten the Dec.clamp. Unclamp the counter-weight(s) and slide them in either direction until the package is balanced.

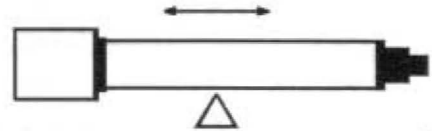


Fig. 8

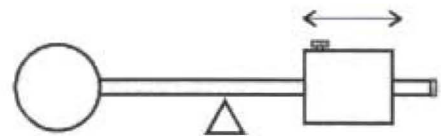


Fig. 9

## ■ Focusing

After inserting the ocular into the telescope, it is necessary to achieve the best possible focus. Remember the atmosphere will limit the highest magnification that can be used on any given night. Using the lowest power ocular, focus the image and then increase the magnification by using shorter and shorter focal length oculars until the desired magnification is reached. This procedure allows the centering of an object at high magnification. Please familiarize yourself with the following.

### ● Focusing System

The FSQ-106ED uses a rack-and-pinion focuser. This focuser enables the observer to focus rapidly. Turning the focuser clockwise will move the drawtube out, while turning it counter-clockwise will move the drawtube in. Refer to Fig. 10.

This focuser has Takahashi original 1/7 micro edge focuser built-in. Turning the small knob clockwise or counter-clockwise can achieve very fine focusing at high magnification or for imaging.

Remove the lens shade cover and the aluminum plug from the 31.7mm(1.25") compression ring adapter. Insert the diagonal prism into the compression ring adapter. Carefully tighten the compression ring until it begins to make contact with the barrel of the diagonal prism. It is not necessary to overtighten the ring to hold the diagonal prisms.

Then insert the ocular into the compression ring of the diagonal prism, repeating previous process. Be careful not to overtighten the compression ring.

Begin the focusing process by choosing a bright star in a convenient position. When you think that you have achieved the best focus, move the focuser inside and outside of what you think is the best focus. This will confirm the critical procedure.

Begin with a low power ocular and then proceed higher and higher until the desired magnification has been achieved.

When the best focus at high magnification has been achieved, you may notice a bright and dim ring around the star. This is not defect but rather a diffraction pattern which is an indication of diffraction limited optics.

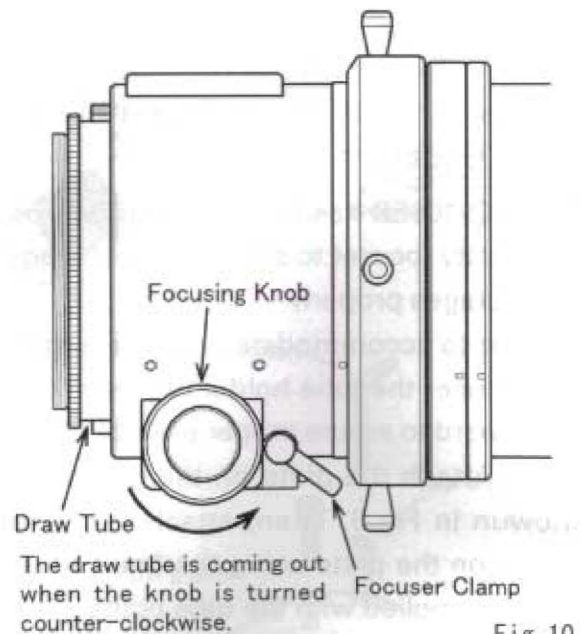


Fig. 10

### ● Focuser Draw Tube Clamp

The focuser clamp is located on the underside of the focuser. It is the handle as shown in Fig.11. Pulling it toward, the focus knob tightens the clamp and pushing it forward loosens it. It is not necessary to pull the clamp with force since a light pull is sufficient to hold any load. Do not over tighten this clamp.

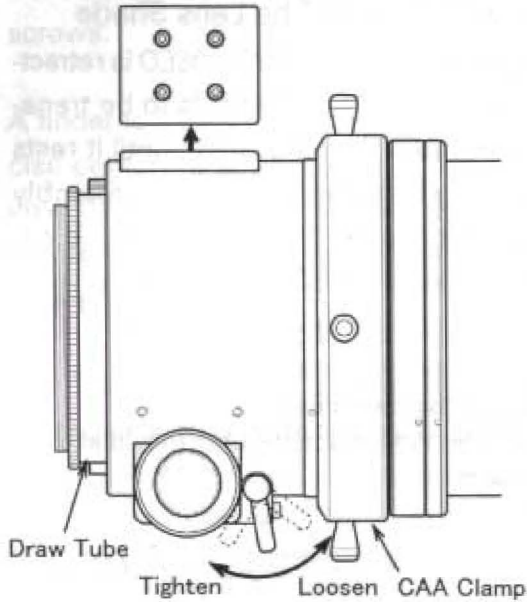


Fig. 11

### ⚠ Caution

Never loosen the four screws (M3 hexagon hole bolts) under any circumstances because these screws hold the flat bearing. If these screws are loosened the focuser will become loose.

### ● Camera Angle Adjuster

The FSQ-106ED uses a newly designed camera angle adjuster allows the focuser to turn 360° to properly position an imaging package or visual device.

When the large locking ring is loosened, the entire focuser can be rotated to accomplish this re-positioning. If a finder is mounted and a quick release bracket is used, the package can be rotated and then the finder reattached. If a quick release bracket is not used, be careful to keep the finder from running into the telescope.

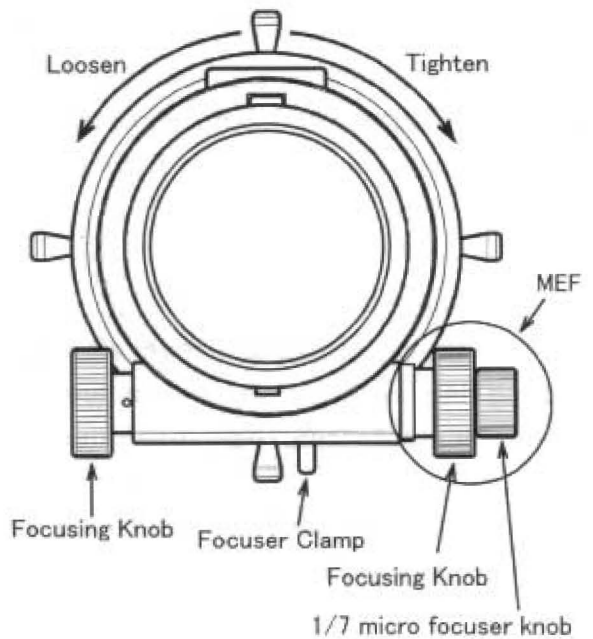


Fig. 12



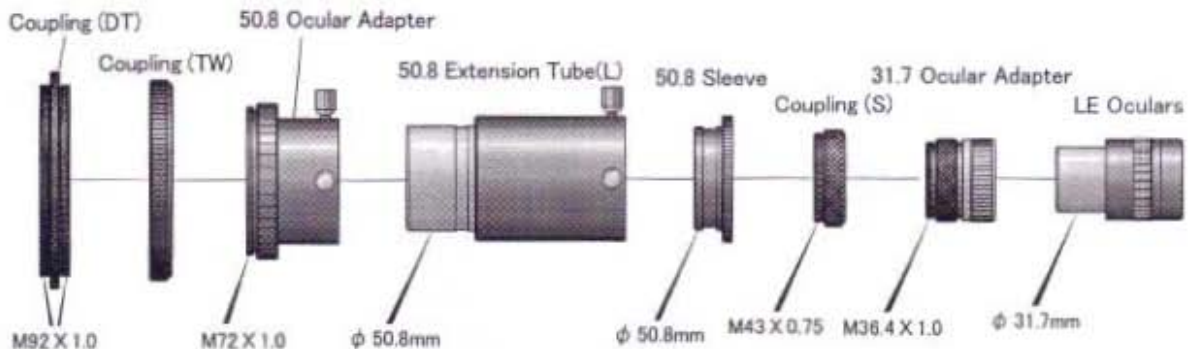


Fig. 13

### ■ Connection the System Parts

The adapters and the rings are provided on the visual back to connect various system parts. Carefully study the system chart in this book before connecting any system parts. Connecting the parts incorrectly may prevent the telescope from coming to a sharp focus or any focus at all. Refer to the Fig. 13 for a standard connection.

### ■ Compression Ring

Remove the ocular adapter cover after the locking ring has been loosened by turning it counter clockwise. Then, insert the desired ocular or 31.7(1.25") diagonal into the adapter and tighten the ocular ring by turning it clockwise.

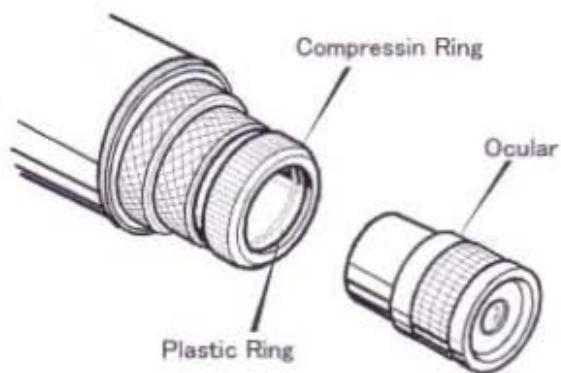


Fig. 14

### ■ How To Retract The Lens Shade

The Lens Shade of the FSQ-106ED is retractable. When the FSQ-106ED is to be transported, retract the lens shade until it rests on the ring installed in the tube assembly for that purpose. The shade can be extended when the FSQ-106ED is used.

1. Remove the cap of the dew shield.
2. Loosen the two lock screws.
3. Extend the dew shield.
4. Turn the locking screws until they make contact.

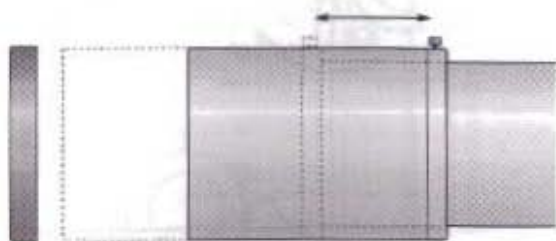


Fig. 15

### [Caution]

Remove the lens shade cap before moving the Lens shade. The fit is tight enough to blow the lens shade cap off of the Lens shade and it allows the lens shade to move easier.



# Finder Alignment



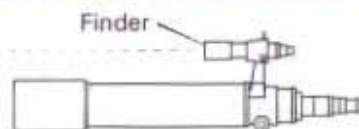
Before the finder is placed in the finder holder, use plastic clear tape and tape the finder with two layers to prevent the tube from being scratched by the front finder set screws.

A finder is a useful tool. It permits the precise centering of an object in the field of view. The 6.3° field of view allows the easy centering of an object to be viewed or photographed.

The Takahashi finder uses an interrupted crosshair which is designed to allow the easy centering of an object to be photographed or observed. The wide field of the finder makes the finding of an object easier, therefore, it is important that the finder and the telescope be in alignment. The following procedure can be used to align the finder.

## ◆ Alignment Procedure

1. Place a low power eyepiece in the telescope and center a bright star in a convenient part of the sky. Do not forget to engage the motor drive to keep the star centered. If this procedure is done in daylight, use an object that is at least one mile away. Loosen the lock nuts on the finder bracket and slightly move the star to the center of the field using the adjusting alignment screws.



2. Then use a higher magnification eyepiece and repeat the procedure by centering the object in the field of view of the telescope and then the finder. Continue this process until the highest possible magnification has been used.

## ◆ Adjusting Screw Procedure

1. Turn all the lock nuts until they reach the head of the alignment screws.

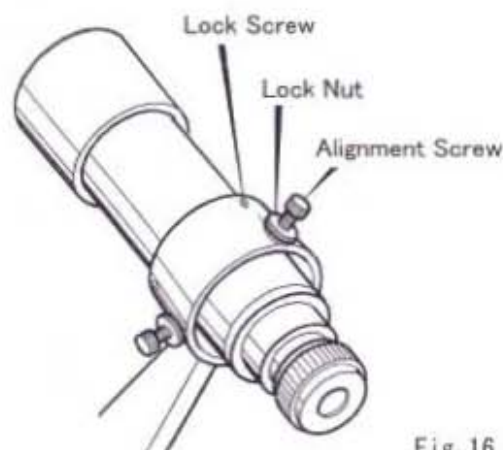


Fig. 16

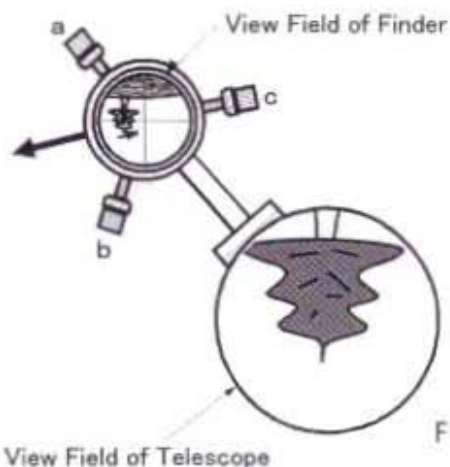


Fig. 17

2. In order to move the crosshair in the direction of the arrow, first loosen screw (a) and tighten (push) the finder with screw (c). This procedure will move the crosshair in the desired direction. The top of the finder will move in the opposite direction and the object will move in the direction of the smaller arrow. Refer to Fig.17.

3. In a similar fashion the direction of the movement of the finder is made by adjusting the three screws.

Learn the relationship between the movement of the three adjusting screws. If the finder cannot be moved in the desired direction, loosen the locking nuts.

#### ◆ Reticle Illuminator [Optional]

The 7x50 finder has provision for an optional reticle illuminator.

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

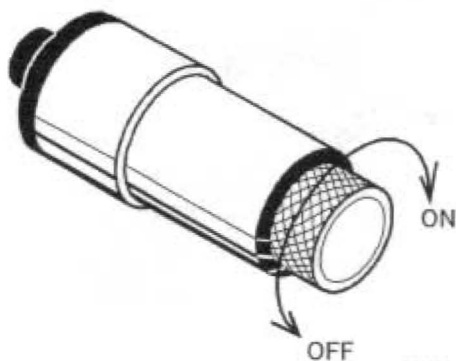


Fig. 18

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. Refer to Fig.18.

#### ◆ Replacing The Battery

Before changing the batteries in the illuminator, please be certain to turn it off. Unscrew the battery holder as shown in Fig.19. Remove the old batteries and insert new one after they have been wiped with a clean dry cloth. Check the polarity of the batteries before inserting them into the holder. Use two silver [V76-PK] or equivalent batteries.

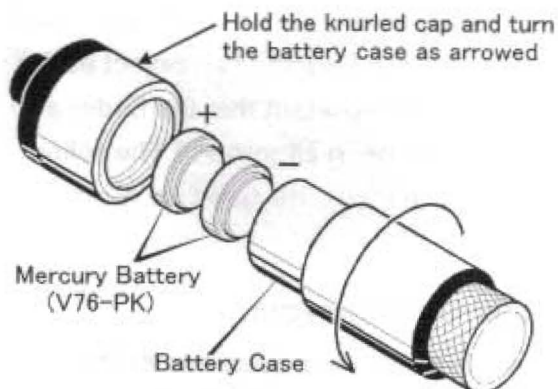


Fig. 19

# Observation

## ■ Visual Applications

### ◆ Determining Magnification

The magnification of any ocular used with the telescope can be calculated by using the following formula.

$$\frac{(\text{focal length of a telescope})}{(\text{focal length of an ocular})}$$

Therefore, shorter focal length eyepieces will produce the higher magnification. On a night of very good seeing, the FSQ-106ED telescopes can be used at 100X per inch of aperture, and on some nights of exceptional seeing, 120X more. These rare nights of exceptional seeing will reveal fine planetary filaments and small craterlets on the moon. At the lower end, about 10X per inch or so will produce breathtaking wide field view of nebulae and comets.

### ◆ Compression Ring Star Diagonal

The 31.7(1.25") diagonal prism is inserted into the compression ring adapter at the end of the focuser and tighten it until it holds the diagonal prism in place. Then the ocular can be inserted into the compression ring adapter of the diagonal prism and holded firmly by tightening the compression ring.

### ◆ Lunar observation

The moon is an excellent object for beginners and advanced amateur astronomers as well. The entire Moon can be viewed at about 50X, but on a clear night near full

Moon, it is best to use a 58 green, 3N5 or variable polarizing filter to view the entire disk.

Using higher magnification on the Moon in any phase to see detail will allow the observer to see smaller and smaller detail, ray structures, and rilles. For this type of observation the filter is normally removed because as the magnification goes up, the image brightness decreases. The ultra high contrast images produced by the FSQ-106ED will amaze the observer.

### ◆ Planetary observation

The FSQ-106ED is particularly suited for planetary observation by using the Extender-Q 1.6X(50.8/2"). The high contrast, very sharp images will reveal a wealth of planetary detail.

In order to see this fine detail, the night should be very steady. If the stars at the zenith twinkle a good bit, the planets will look sharp at low magnification. When the star at the zenith is steady, then high magnification can be used to reveal a wealth of the detail. Magnifications of 100X per inch can be used. These nights of steady seeing will also produce fine images using a digital SLR or a CCD camera.

### ◆ Observation of deep sky objects

In general, observing deep sky objects requires a low power, wide field ocular which produces the maximum brightness. On the other hand, observing globular clusters and small nebulae requires high magnification. This is particularly true in cities with high sky brightness. High magnification will help reduce the sky background and hence improve the contrast necessary to view the object(s).

### ■ Astro Imaging

Focusing is the most critical element of making great astro images. Once critical focus has been achieved, then outstanding images can be made. It is a good practice to recheck critical focus before the image is made.

### ◆ Eyepiece Projection Imaging

When you want to make lunar or planetary images the TCA-4 is designed to make eyepiece projection images easier. The TCA-4 will accept any Takahashi LE 31.7(1.25") ocular and variable feature sliding tube gives the imager latitude in determining the size of the final image.

### ◆ Seeing

It is important that high magnification images of the Moon and planets require good seeing. The method for determining the quality of seeing on a scale of 1 to 10, with 10 being perfectly steady seeing is to look to the zenith at a bright star. If it is twinkling rapidly, the seeing is between 1 to 4. If the twinkling is moderate this is 5-6. If the star twinkles slowly to no twinkling, we have the 7 to 10 night. The less twinkle the better.



### Cautions

When taking high magnification photographs of the Moon and planets, pay careful attention to balance. Rebalance the telescope when the object is placed in the center of the camera.

If the telescope is moved to another object, then rebalance it in the position in which the photos will be taken. Do not use the camera shutter; use the "hat trick" a black card place over the lens shade before the shutter is set on bulb. After the vibration has stopped, remove the black card for the duration of the photo, which will normally be in seconds.



# Accessories for Photo/Visual Application

## ■ 31.7[1.25"] Compression Ring Diagonal and Mirror Diagonal

Both of these diagonals take up different back focus. This is noted on the diagram. The 31.7(1.25") prism diagonal will require the focuser to be racked out further.

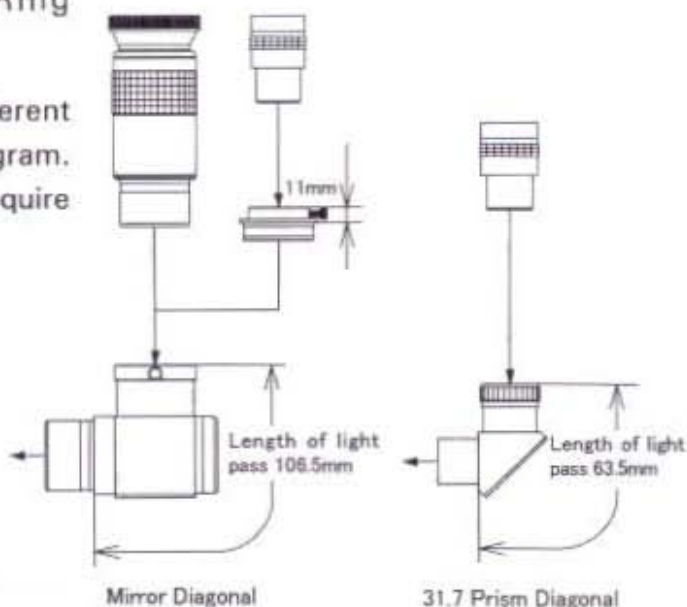


Fig. 20

Fig. 21

## ■ Extender-Q 1.6X(50.8/2")

The FSQ-106ED is a short focus photo/visual astrograph. Nonetheless, due to the very high quality of the optics, the instrument can be used for high magnification lunar and planetary observations. The Extender-Q 1.6X(50.8/2") is designed to increase the focal length sufficiently to produce the higher magnifications necessary for this type of observing.

|              |        |
|--------------|--------|
| Focal length | 850mm  |
| Focal ratio  | f/8    |
| Image circle | φ 44mm |

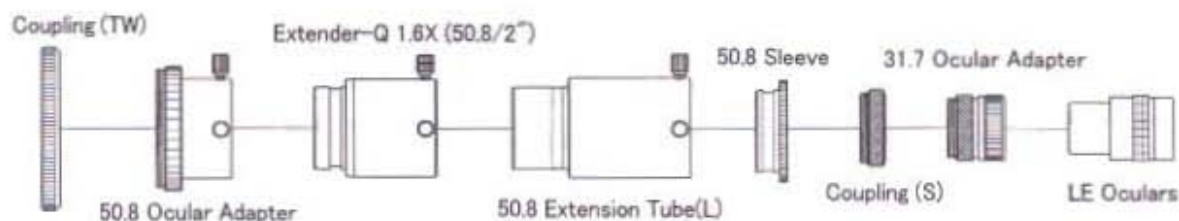
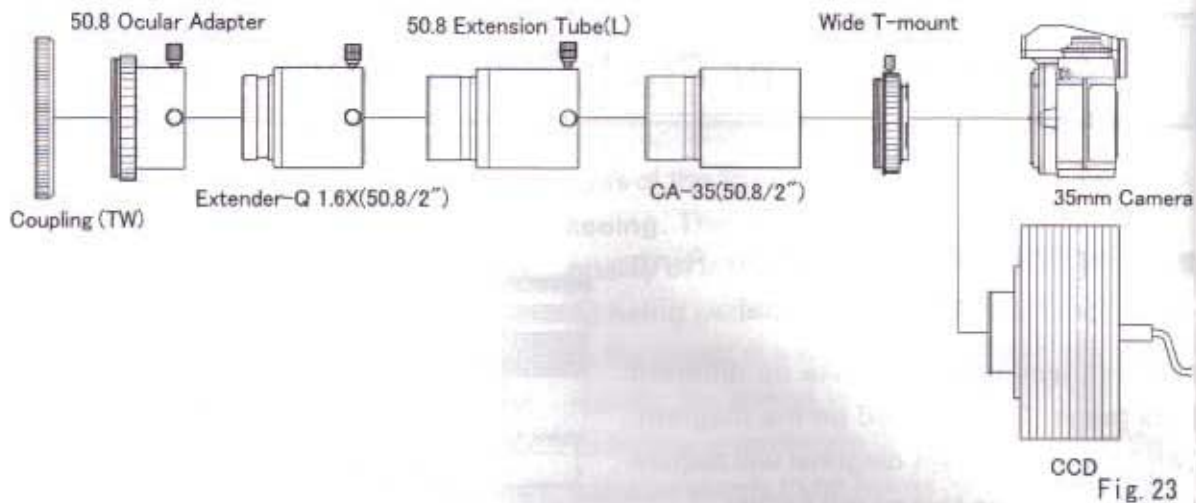
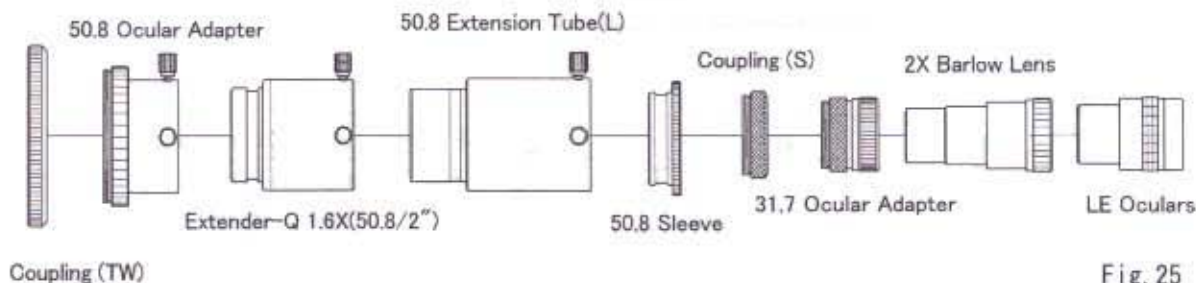
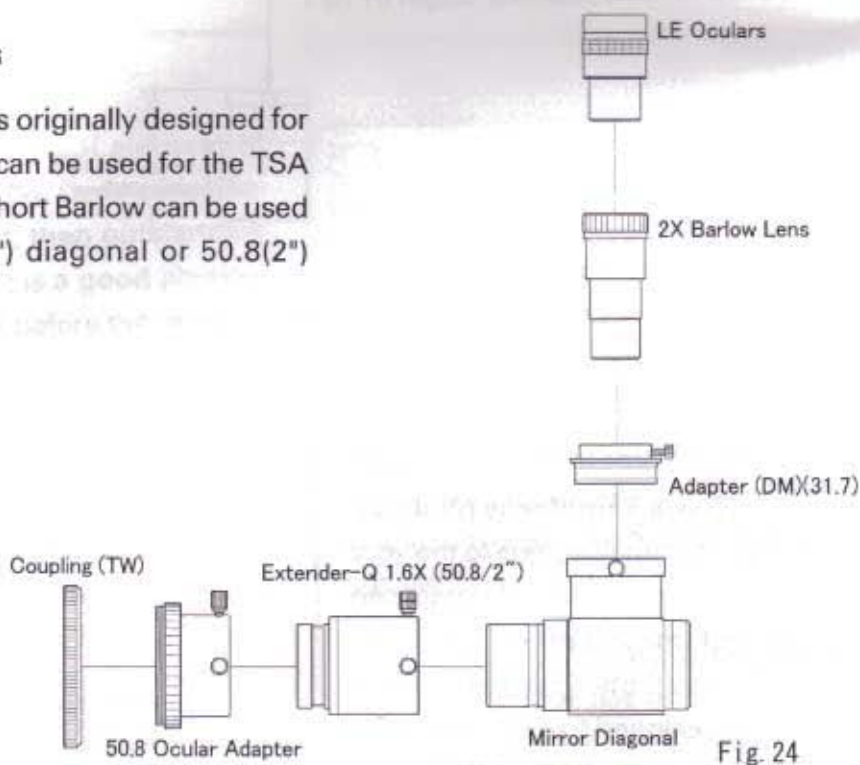


Fig. 22



### ■ 2X Barlow Lens

This Barlow lens was originally designed for the FS Series and it can be used for the TSA for visual use. This short Barlow can be used with the 31.7(1.25'') diagonal or 50.8(2'') mirror diagonal.



## ■ Reducer-QE 0.73X

This newly developed reducer uses 4 multi-coated elements to produce a flat field with a faster focal ratio. The stars still remain as small as useful for CCD cameras with smaller chips.

Focal length 610mm  
 Focal ratio f/3.6  
 Image circle  $\phi$  44mm

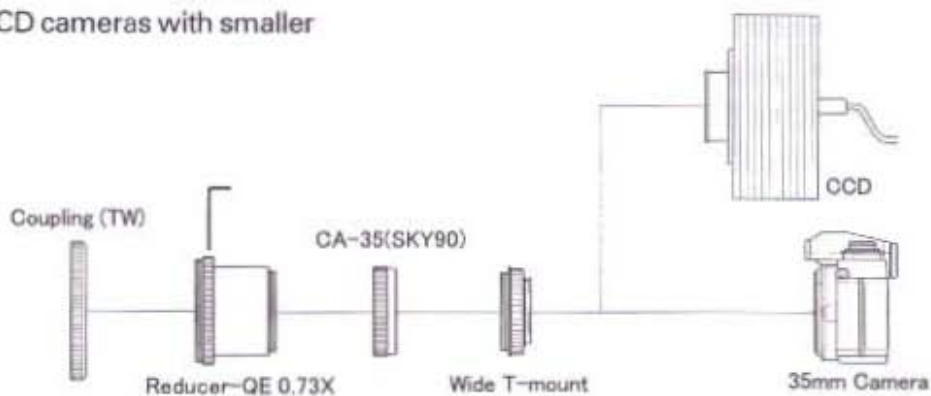


Fig. 26

## ■ CA-35

There are three different 35mm camera adapters (CA-35) available that will allow an SLR/DSLR and CCD camera to be attached to the FSQ-106ED.

a. Prime focus

→ CA-35 (50.8/2") or CA-35 (TSA-102)

b. With the Reducer-QE 0.73X

→ CA-35 (SKY90)

c. With the Extender-Q 1.6X(50.8/2")

→ CA-35 (50.8/2")

Refer to Fig. 27-29.

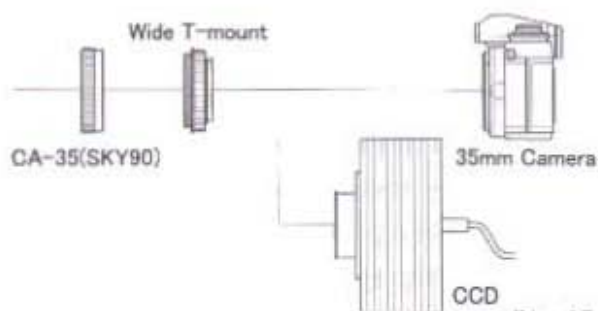


Fig. 27

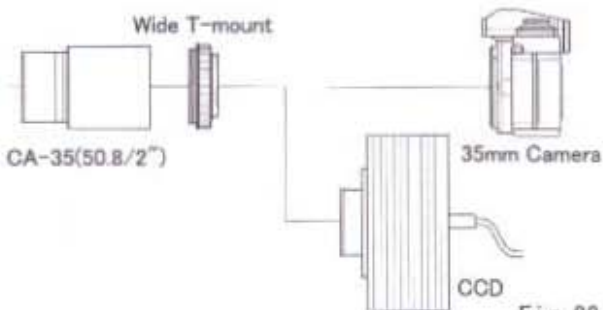


Fig. 28

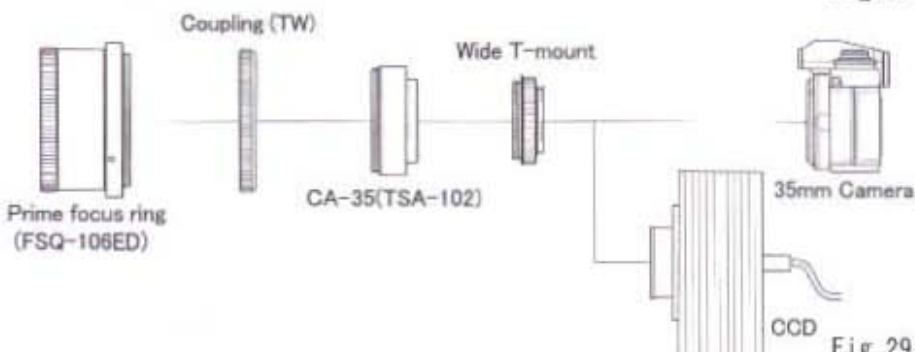


Fig. 29

## ■ T-mount & Wide T-mount

The T-mount is used to connect to the TCA-4 eyepiece projection adapter for high magnification photography and CCD images of the Moon and planets. Refer to Fig. 30.

The Wide T-mount can be used for prime focus imaging as well as with the Reducer-QE 0.73X and Extender-Q 1.6X(50.8/2"). Refer to Fig. 31.

### Caution

If the connecting part of wide T-mount, wide T-ring, and T-mount have scratches or dirt, a camera may not be attached correctly. This will cause star images worse. If the star images are taken unevenly or shifted, it is caused by those mentioned in the above. Take a good care before attaching a photographic set-up.

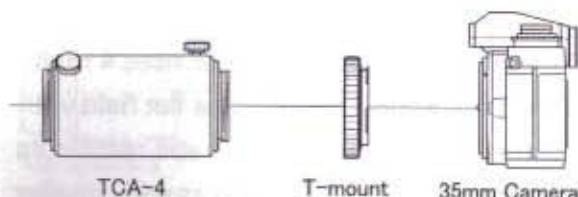


Fig. 30

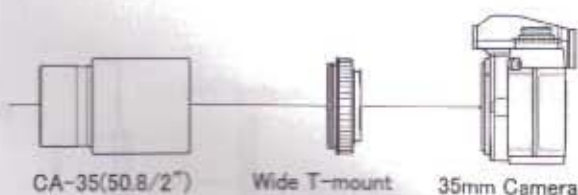


Fig. 31

## ■ Prime Focus Aux. Ring

Prime Focus Aux. Ring, optionally available, will be used when the Pentax 67 camera or the mamiya 645 camera is attached. This ring is more rigid than a CA-35(50.8/2"). So when a heavy camera such as a digital SLR camera or a CCD is attached, this ring is useful. Refer to the photo/visual system chart. When you like to turn your camera attached to the ring, loosen the set the screws by an Allen wrench.

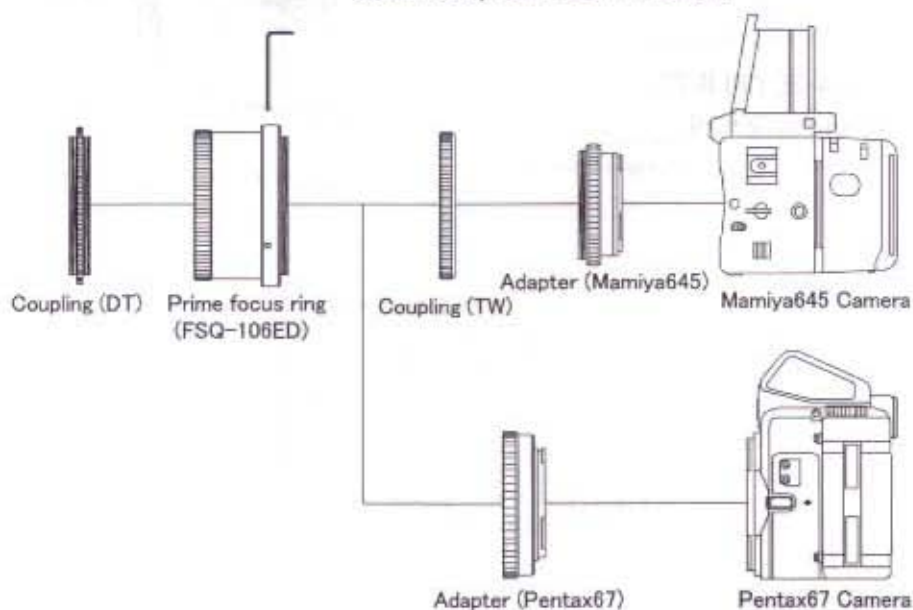


Fig. 32



## ■ TCA-4

This variable eyepiece device attaches easily to the FSQ-106ED for high quality and high magnification photography of the surface of the Moon and planets. It can be used with a film, digital and CCD camera. Refer to Fig. 33.

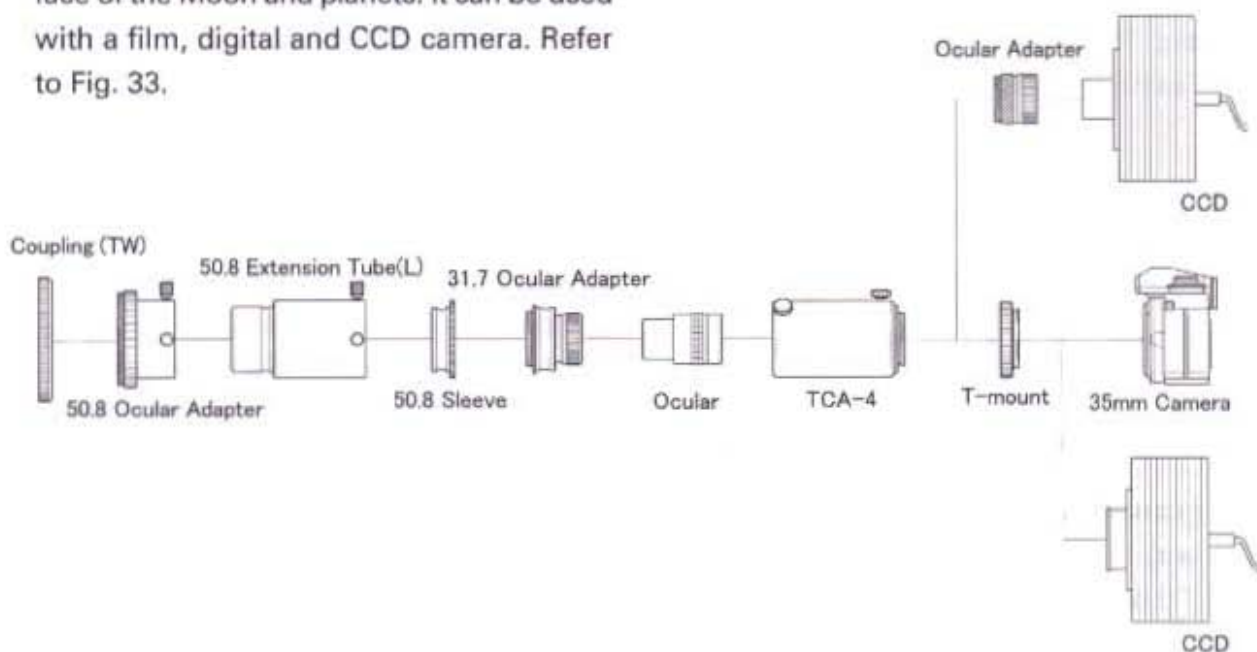


Fig. 33

## ■ Digital camera Adapter

LE-DCA is an adapter to attach your digital SLR camera to FSQ-106ED. With the collimating method you can take lunar and planetary images with your camera, using Takahashi LE oculars except LE-50mm.

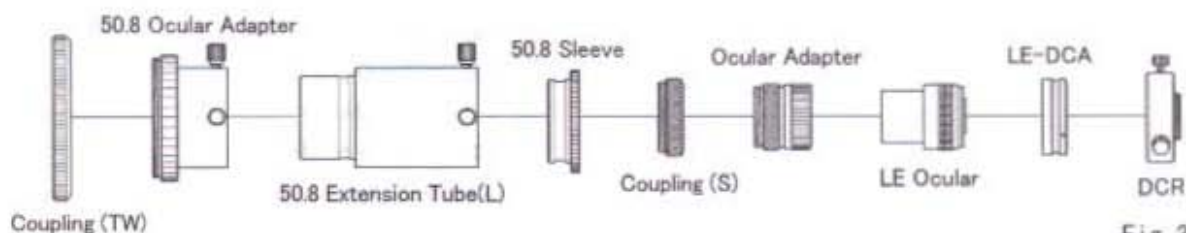


Fig. 34

## ■ FQR-1

FQR-1 is very convenient device to attach and detach the finder quickly. Once it is set on the focuser housing, you can attach and detach the finder quickly by thumb turn screw. The finder alignment remains almost the same in doing so.

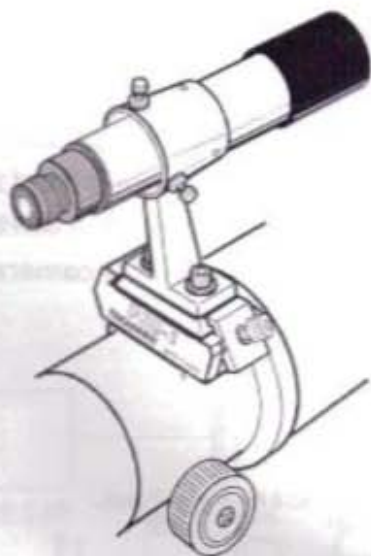
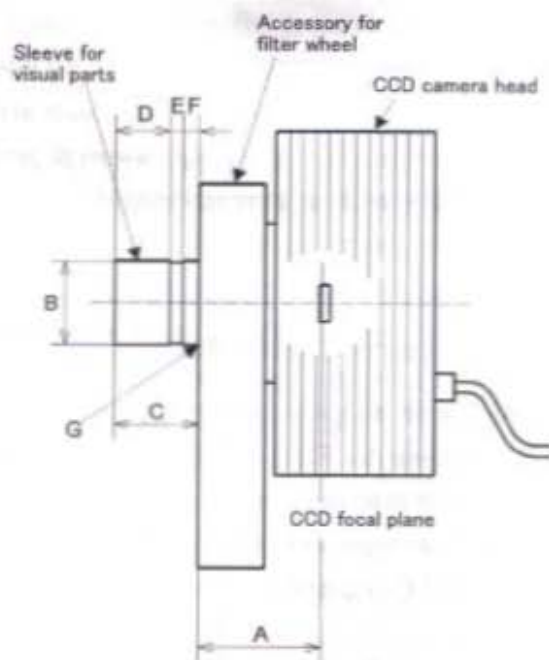


Fig. 35

## ■ CCD Camera

In general, a CCD camera can be attached by way of 31.7mm(1.25")/50.8mm(2") sleeve or T-thread (42mm P=0.75). A CCD camera which can be attached by T-mount can be attached to FSQ-106ED with a combination of CA-35 and Wide T-mount as same manner for 35mm SLR/DSLR.

The FSQ-106ED has a long back focus (178mm), which will allow to attach various photo set-ups.



- A. Plane sleeve connector  
[CCD's focal plane (1mm)]
- B. Outer diameter of the sleeve  
[ 31.7(1.25") or 50.8(2") ]
- C. Full length of sleeve
- D. ]
- E. ] Position of sleeve's groove
- F. ]
- G. Diameter and pitch of sleeve's thread

Fig. 36

## Care & Maintenance

- ◆ Before attempting to clean your optics, contact your local distributor for precise instructions on the procedure.
- ◆ If the front lens of the objective has dust or dirt particles on it, use a large hand powered blower to remove the particles. Under no circumstances should dust be removed by any other means. Rubbing the surface will cause scratches. If the lens must be cleaned, be certain that all dust and dirt particles have been removed by using a blower. Then, using cotton swabs slightly moistened with lens cleaner, gently clean the particles off.

◆ **REMEMBER, DO NOT USE ANY FORM OF CANNED AIR TO REMOVE THE PARTICLES.**

This product is very cold and could harm the front lens of the objective. Be certain that the dew cap is removed before attempting to clean the objective. Use the following procedure, if the front and rear surfaces of the objective must be cleaned. Fig. 37.

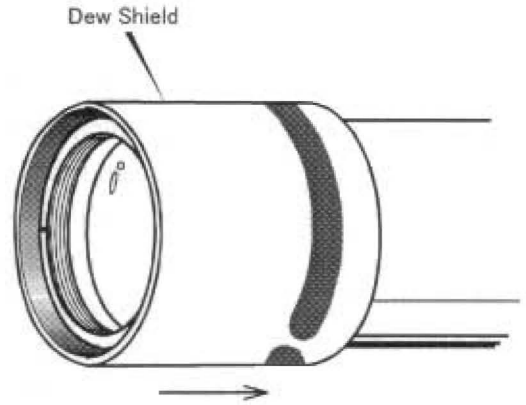


Fig. 37

- ◆ The collimation device is provided at the cell, but it is very difficult for a user to collimate the optical axis because of quadruplet design.

Under no circumstances should it be touched. The optical axis is perfectly collimated at the factory before shipment and there will little chance to be decollimated in normal use. Should it be decollimated by a strong shock during transport, ask your local distributor.

Photo/Visual System Chart

Extender-Q 1.6X(50.8/2") System Chart

Reducer-QE 0.73X System Chart

## Additional Precautions

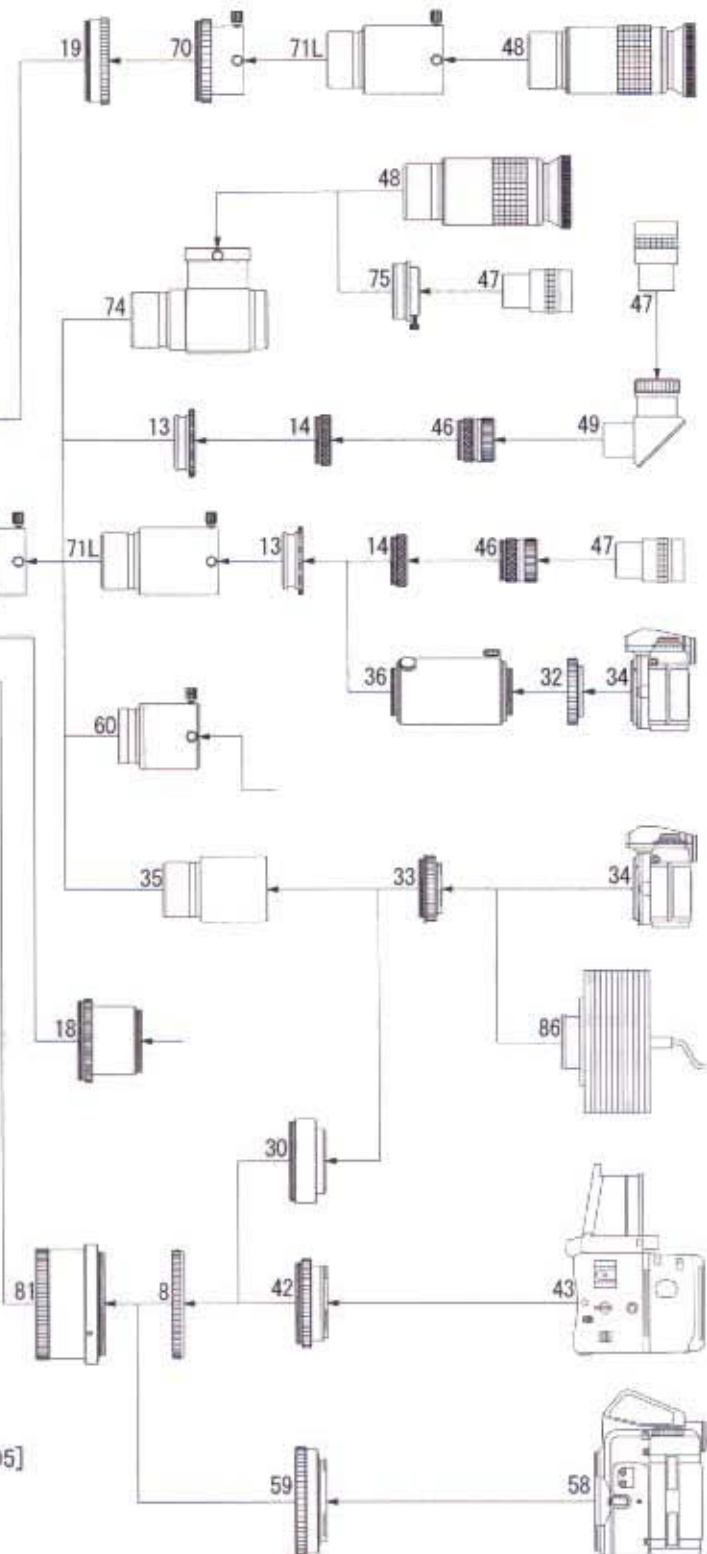
- ◆ Keep the telescope away from large fluctuations in temperature. When the instrument is brought out from a warm room to colder air, dew may form.
- ◆ Store the telescope in a cool dry environment. Any dew should be removed by blowing it with a hair dryer with the heating element turned off, which means the air will be at room temperature. This flow of cool, room temperature air, will dry the dew and not leave a residue. Additionally, it is a good idea to store the telescope with a desiccant [drying agent] near the objective to keep any moisture away from the objective.
- ◆ As mentioned previously, never use canned air due to the fact that the propellant is a refrigerant which could cause damage to the front element. If the element must be cleaned, make certain it is done in a cool room.
- ◆ Under no circumstances should the lenses be disassembled. The lenses have been properly aligned and set in place by skilled optical technician with special tools. Doing so will void any warranty on the tube assembly.



# System Chart

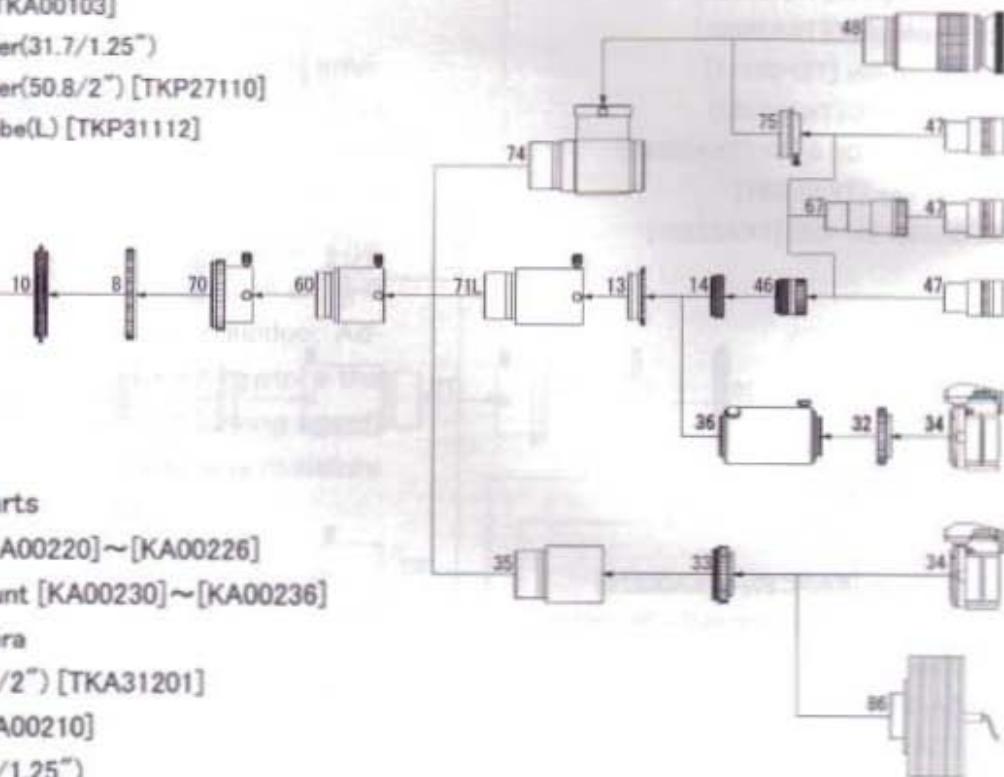
## Photo/ Visual System Chart

- 8. Coupling(TW)[TKA30003]
- 10. Coupling(DT)[TKA36001]
- 13. 50.8 sleeve [TKP00113]
- 14. Coupling(S)[TKA00103]
- 18. Reducer-QE 0.73X [TKA36580]
- 19. Vari ring [TKA31581]
- 30. CA35(TSA-102) [TKA23201]
- 32. T-mount [KA00220]~[KA00226]
- 33. Wide T-mount [KA00230]~[KA00236]
- 34. 35mm camera
- 35. CA-35(50.8/2") [TKA31201]
- 36. TCA-4 [TKA00210]
- 42. Adapter(Mamiya645)
- 43. Mamiya645 camera
- 46. Ocular adapter(31.7/1.25")
- 47. Ocular(31.7/1.25")
- 48. Ocular(50.8/2")
- 49. Diagonal prism(31.7/1.25")[TKP00541]
- 58. Pentax67 camera
- 59. Adapter(Pentax67)
- 60. Extender-Q 1.6X(50.8/2") [TKA00595]
- 70. Ocular adapter(50.8/2") [TKP27110]
- 71L. Extension tube(L) [TKP31112]
- 74. Mirror Diagonal(50.8/2") [TKA00543]
- 75. Adapter(DM)(31.7/1.25") [TKA00111]
- 81. Prime focus ring(FSQ-106ED) [TKA36205]
- 86. CCD camera



## ■ Extender-Q 1.6X(50.8/2") System Chart

- 8. Coupling(TW)[TKA30003]
- 10. Coupling(DT)[TKA36001]
- 13. 50.8 sleeve [TKP00113]
- 14. Coupling(S)[TKA00103]
- 46. Ocular adapter(31.7/1.25")
- 70. Ocular adapter(50.8/2") [TKP27110]
- 71L.Extension tube(L) [TKP31112]

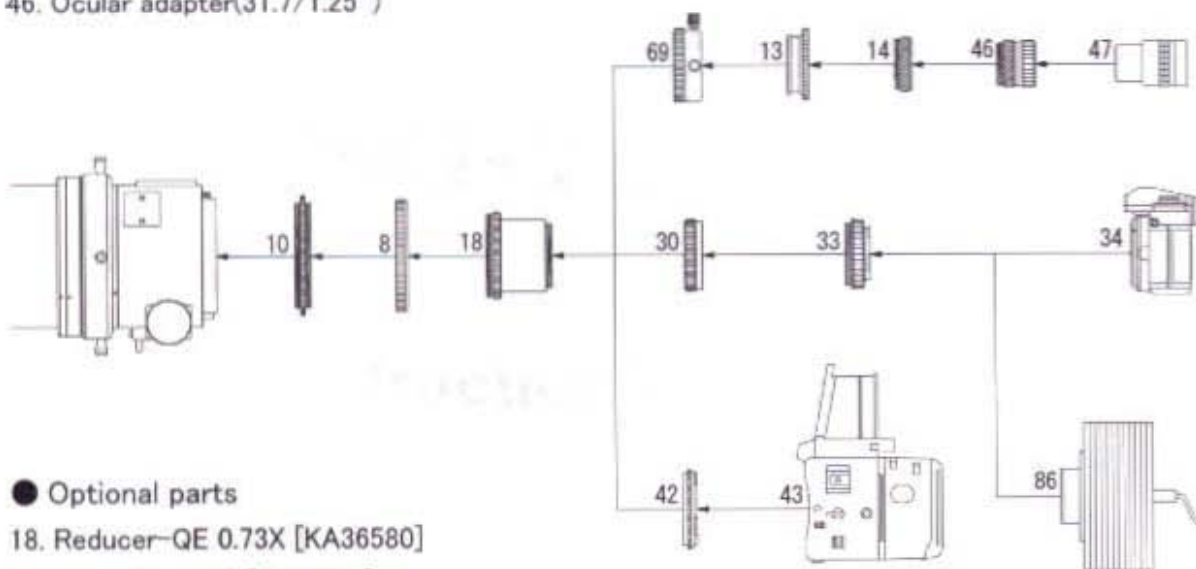


### ● Optional parts

- 32. T-mount [KA00220]~[KA00226]
- 33. Wide T-mount [KA00230]~[KA00236]
- 34. 35mm camera
- 35. CA-35(50.8/2") [TKA31201]
- 36. TCA-4 [TKA00210]
- 47. Ocular(31.7/1.25")
- 48. Ocular(50.8/2")
- 60. Extender-Q 1.6X(50.8/2") [TKA00595]
- 67. 31.7 2X Barlow Lens [KA00597]
- 74. Diagonal mirror(50.8/2") [TKA00543]
- 75. Adapter(DM)(31.7/1.25") [TKA00111]
- 86. CCD camera

## ■ Reducer-QE 0.73X System Chart

- 8. Coupling(TW)[TKA30003]
- 10. Coupling(DT)[TKA36001]
- 13. 50.8 sleeve [TKP00113]
- 14. Coupling(S)[TKA00103]
- 46. Ocular adapter(31.7/1.25")



### ● Optional parts

- 18. Reducer-QE 0.73X [KA36580]
- 30. CA-35(SKY90) [KA35201]
- 33. Wide T-mount [KA00230]~[KA00236]
- 34. 35mm camera
- 42. Adapter(Mamiya645)
- 43. Mamiya645 camera
- 47. Ocular(31.7/1.25")
- 70. Ocular adapter(SKY90)(50.8/2") [KP35110]
- 86. CCD camera