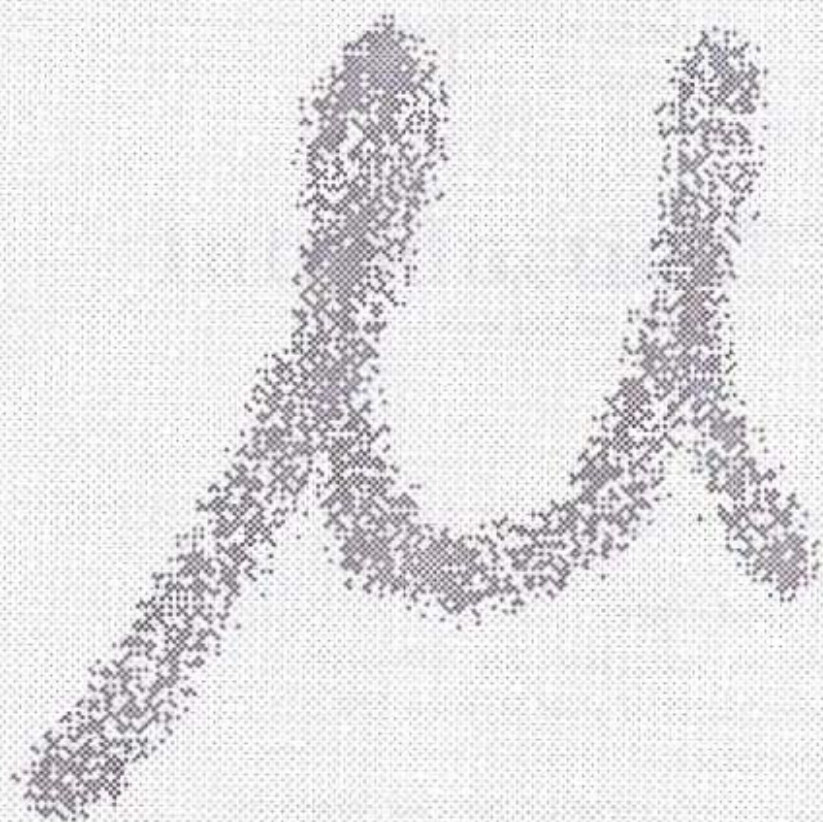


Mewlon - 250

Instruction Manual



TAKAHASHI

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I

Introduction

General Specifications

Optical System (Mewlon optical system)

Configuration	—————	Dall-Kirkham
Effective aperture	—————	250mm
Effective focal length	—————	3000mm
Effective focal ratio	—————	1:12

1. Primary mirror

Configuration	—————	elliptical surface
Aperture	—————	260mm
Focal ratio	—————	1:3.0
Material	—————	Pyrex
Reflecting plane	—————	aluminized multi-coating

2. Secondary mirror

Configuration	—————	Spherical surface
Aperture	—————	72mm
Magnifying ratio	—————	4.0×
Material	—————	Pyrex
Reflecting plane	—————	aluminized multi-coating

Optical performance

1. Resolving power	—————	0.46"
2. Light gathering power	—————	1275×
3. Limiting magnitude	—————	13.8

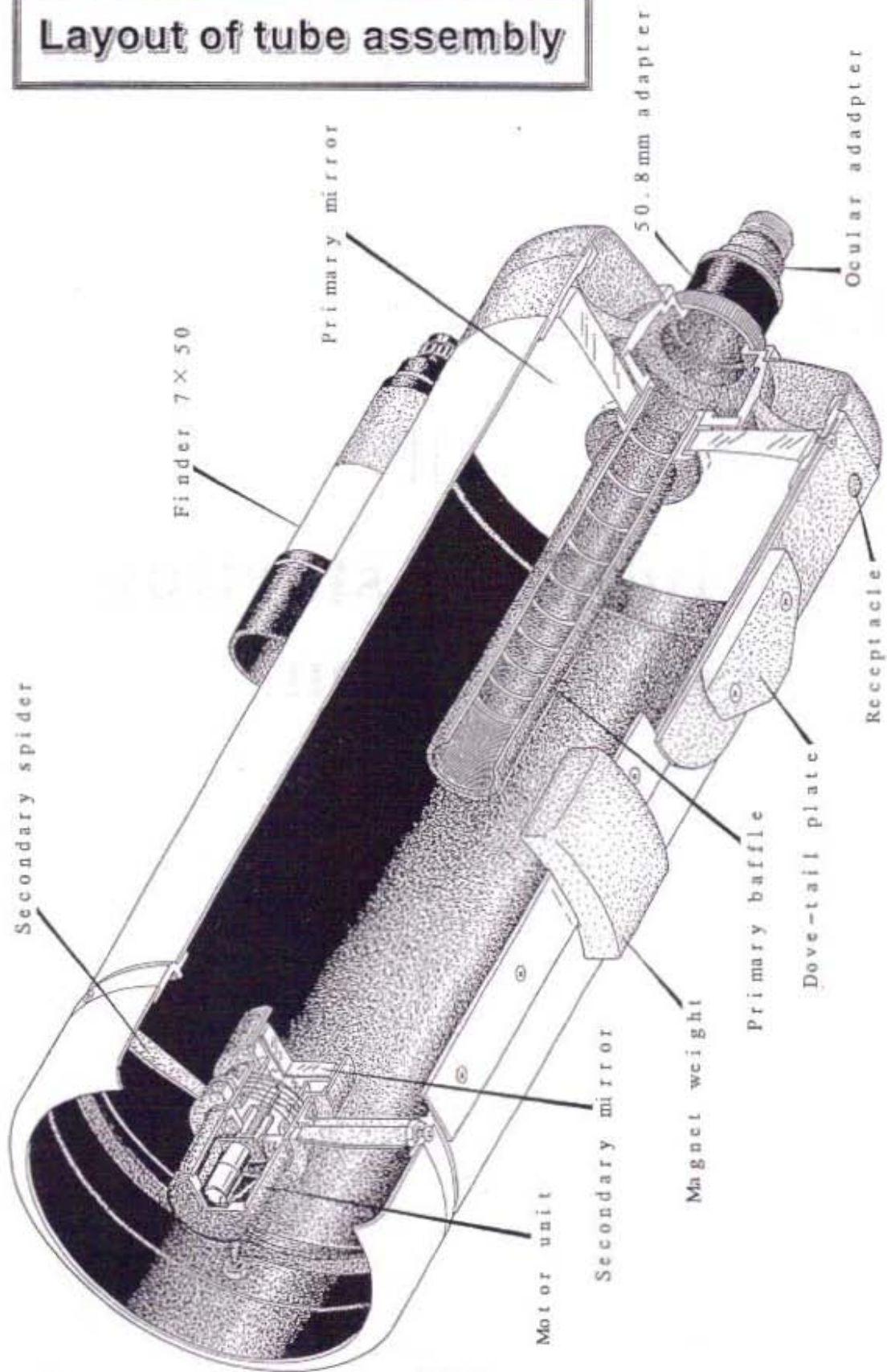
Measurement and weight

1. Diameter of main tube	—————	280mm
2. Total length of main tube	—————	850mm
3. Weight of main tube	—————	abt. 15kgs

Accessories

Finder	—————	7×50 6.3" with reticle illuminator
Magnet weight	—————	450gs
Dove-tail adapter	—————	with M8×20 cap-bolt
Setting tools	—————	hex-lench (1.5mm & 2.5mm)
Instruction manual		
Warrantee certificate		

Layout of tube assembly



II

Before starting observation

Mounting your Mewlon-250

1. In order to set the main tube on the equatorial mount, set the dove-tail adapter firmly on the mount with two M8 × 20 bolts provided with the adapter.
2. Loosen the clamp of the Declination and turn the dove-tail adapter as shown in the fig.1.
3. The main tube is so designed that it can be carried at ease, holding its finder. Hold the tube with one hand and grip the finder with the other hand as shown in the fig.1. Set the tube in place, mating the dove-tail adapter and the dove-tail plate attached on the tube. Then, lock the tube firmly by the locking handle.

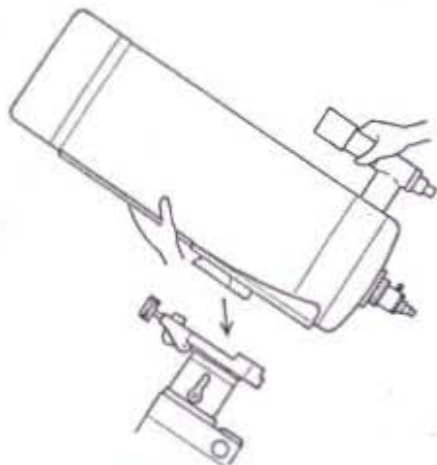


fig.1

In normal visual observation, the main tube will be well balanced by the magnet weight only, when the camera and its adapter are used for astrophotography, another 1kg magnet weight will be needed for balancing the tube.

When the magnet weight is attached on the rail, set it in place correctly as shown in the fig.2. Otherwise, it may drop out.

Keep away magnetized cards such as a telephone card, a floppy disk, and so on from the magnet weight.

4. Check the balancing of the tube at its horizontal position, making the Declination clamp free and make the balancing of the tube with the magnet weight, sliding it on the rail.

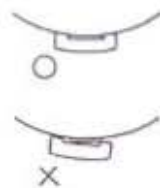
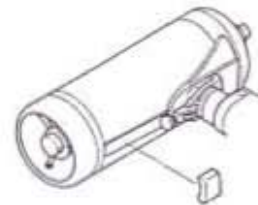
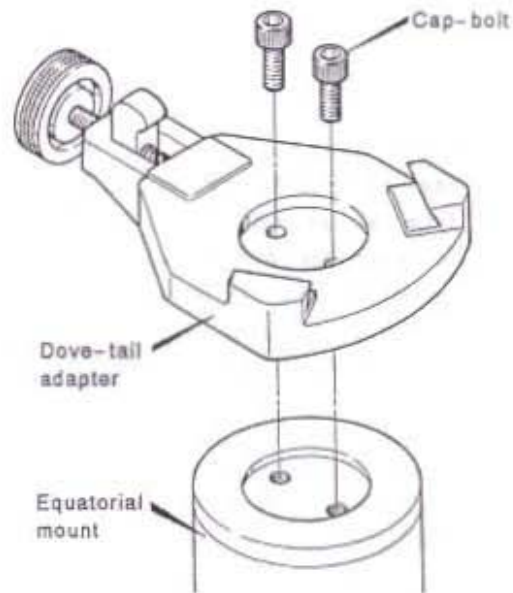


fig.2



Hex wrench



Focusing

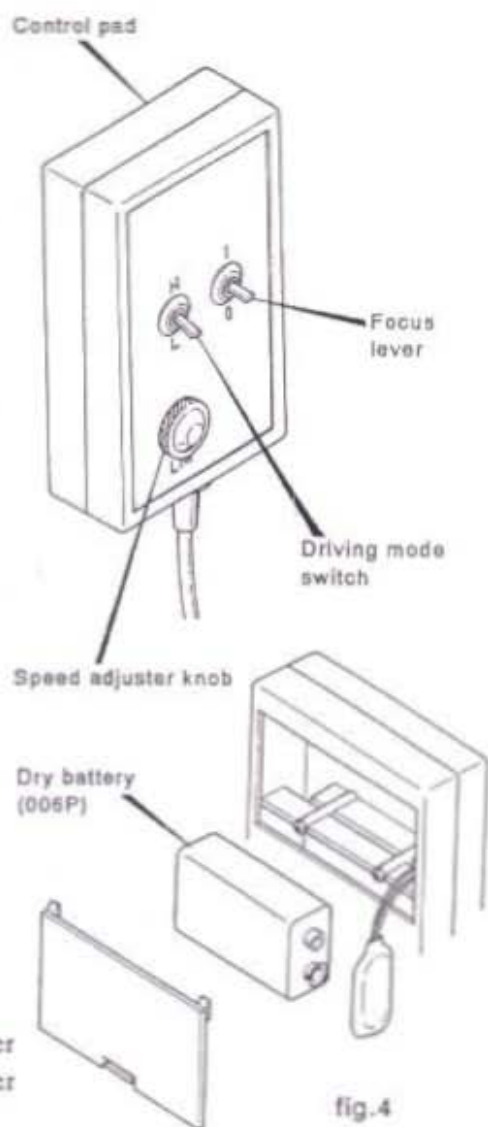
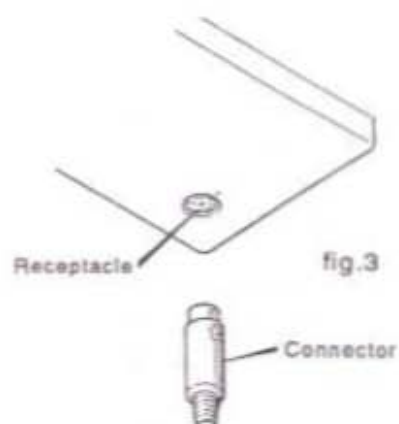
Focusing can be made by moving the secondary mirror electrically by the motor, which is controlled by a hand-held control pad.

After finishing to set the tube on the mount, insert the connector of the control pad into the receptacle provided on the base of the tube as shown in the fig.3. When the focus lever on the pad is pulled down to the 'I' position, the secondary mirror moves toward the opening of the tube and the focal point comes in. On the contrary, when the focus lever is pulled down to the 'O' position, the secondary mirror moves toward the primary mirror and the focal point goes out. When the focusing lever is returned to the original position, the motor will stop.

The motor speed can be changed by the driving mode switch. When the switch is on at the 'H' position, the motor runs at high speed to use for moving the focal point at length. At the 'L' position, the motor runs at low speed to use for finely adjusting the focal point. The adjusting speed at low speed mode can be controlled by the speed adjuster knob so that you can set the speed as you like, actually seeing the focal point.

When focused, the effective focal length may be altered by possible change the distance between the primary mirror and the secondary one. In normal use, however, there will be little chance to move the focal point widely. In case you want to know of the magnification, count the effective focal length of 3000mm. If you like to know of it exactly, refer to "How to calculate the effective focal length".

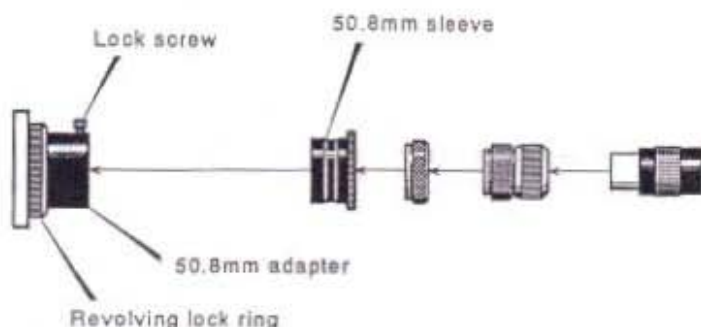
A dry battery, 006P 9V DC, is used for the power source. It can be replaced, opening the rear cover of the control pad as shown in the fig.4.



How to use the 50.8mm adapter

The inner diameter of the 50.8mm adapter is 50.8mm (2") so that you can use a 2" ocular for your telescope. Loosen the lock screw of the adapter and take out the visual back at the 50.8mm sleeve. Then insert a 2" ocular into the adapter and lock it with the lock screw.

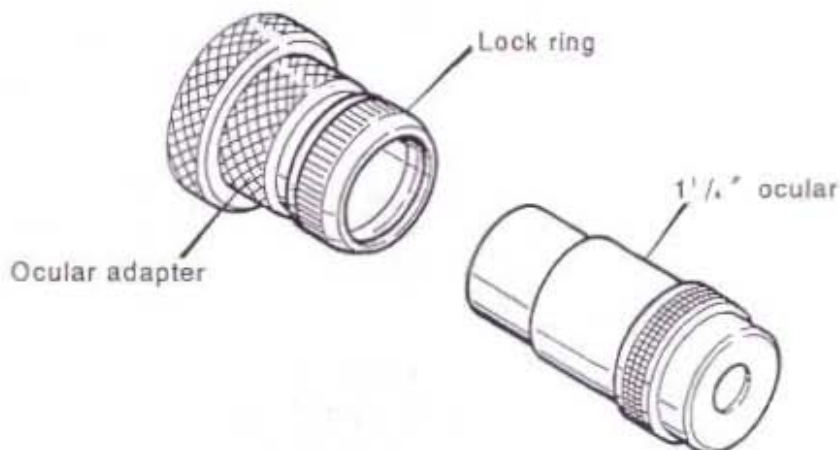
[Diagram of the visual back]



A revolving lock ring is provided with the 50.8mm adapter. When loosened, the adapter can be rotated freely. This is very convenient when the angle of your camera and star diagonal prism are set as you like.

How to set your 1 1/4" ocular into the ocular adapter

Turn the lock ring counter-clockwise and insert the sleeve of your 1 1/4" ocular into the ocular adapter and turn the lock ring clockwise firmly. When you like to take out your ocular, turn the lock ring counter-clockwise.

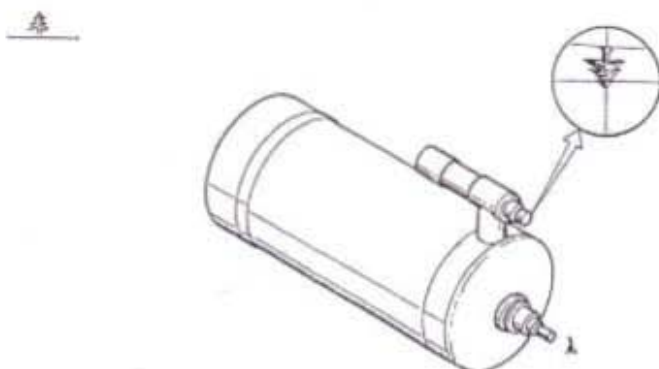


Let's view landscapes

After set-up your telescope, let's start to view landscapes in the daytime before you see some of astronomical objects. This will teach you basically how to use your telescope and equatorial mount and then, you will be able to do actual observation without any trouble in the night.


1. Take out the caps of the main tube, of the finder scope, and of the visual back.
2. Make balancing both in the R.A. and Declination. For further details for balancing, refer to the explanation for the equatorial mount.
3. Set the tube to move freely, loosening the clamps for the R.A. and the Declination. Center clearly visible object in the distance (at least 130m away) at the cross point of the finder reticle, looking at the finder view field and lock the clamps.

When you take a view of land, it is not necessary for you to make polar alignment for your telescope and to use the motor driving.



4. Try to view with a low power ocular (an ocular with a long focal length), setting it into the ocular adapter. At first, images in the view field may be vague because of being out of focus. So operate the focussing lever of the control pad. In case you could not get the images clearly focused, pull down the lever to the other side. Then, the images will be gradually focused.

Now, you make it sure that the image centered to the cross point of the finder reticle is the same one as caught in the center of the view field of the main scope. If either of the image is out of the center, make the alignment again according to "How to align the finder scope".

 **Caution** : Never attempt to look at the sun through your Mewlon-250 or its finder scope. Your eyes can be instantly and permanently damaged by the focused sun light.

See-Through Cell

About the air current in the tube

When your telescope, taking it out from your room, is set in the outside where the temperature is lower than in your room, the air in the tube will be moved by radiant heat from the tube and the primary mirror. At the result, images in the view field will be distorted by the air current in the tube, until the primary mirror is adapted itself to the air in the outside. The primary mirror of your Mewlon-250 is so large and thick that it takes a considerable length of time to be adapted itself to the outside temperature.

In order to have the mirror adapted to the outside temperature as quickly as possible, the primary mirror cell is made in construction of "see-through" so that the primary mirror is exposed directly to the outside air. When you like to do your observation with your Mewlon-250, take out the lock ring and the cell cap first as shown in the fig.5 and leave your telescope in the site of your observation at least one hour to make the primary mirror adapted to the temperature in the site. Check if the image in the view field is stabilized before you start to look at the object you like to observe.

If there remains the air current in the tube, images in and out of focus look like airy discs with pillar as shown in the fig.6. In the airy discs of images in and out of focus, the pillar in the disc appears respectively at the other side and it forms always vertically to the main tube as shown in the fig.6.

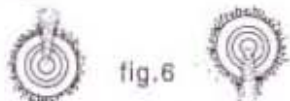


fig.6

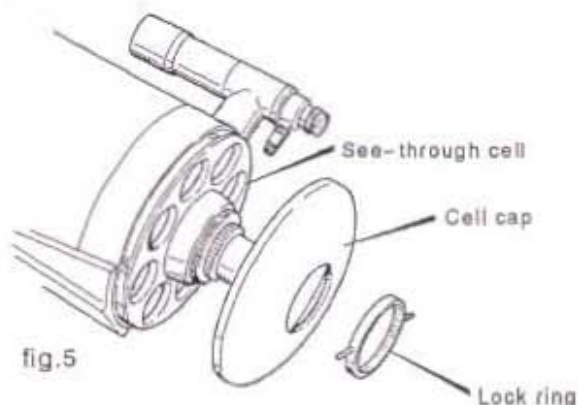


fig.5

*The time necessary to make images stabilized in the view field varies on seasons.

*Owing to the weather conditions, images are hardly stabilized by restless air current. Such a night is not suited for star watching.

When the air current is out of order, the images in and out of focus look like images seen in the water, flickering all over.

*When the mirror is adapted itself to the temperature in the outside, set the cell cap again onto the see-through cell before you start to watch astronomical objects. If the see-through cell is kept open after the mirror has been adapted itself to the outside temperature, the air current would rise again in the tube possibly by the radiant heat from observer's body temperature in a cold night, especially in the winter.

III

Adjustment

To align the finder scope

The view field of a telescope is so highly magnified and narrow that you can hardly catch, in the view field, the object you like to see. To help you to find the object at ease in the view field of your telescope, the finder scope with wide view field is provided with your telescope.

To see the same object in the view fields of the main scope and the finder scope, you must align the optical axes of the main scope and of the finder scope. They must be parallel each other as shown in the fig.7.

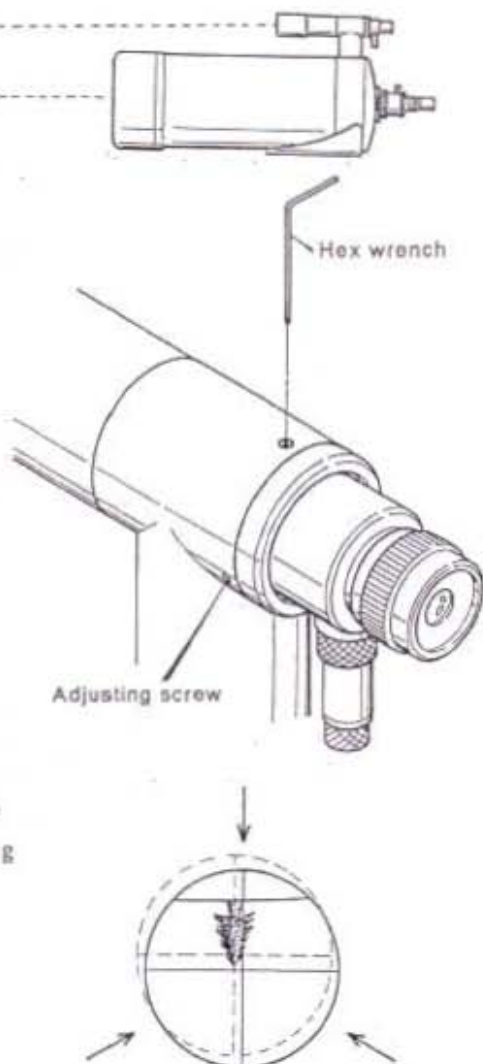
The finder of your Mewlon-250 is so made that it can be used for carrying handle permanently fixed on the main tube. Because of this structure, the optical alignment of the finder can be made by shifting the visual back of the finder with the adjusting screws. Once aligned, the optical axis of the finder will not become out of order.

The process for alignment

1. Set a low power ocular into the ocular adapter of the telescope and catch, in the center of the view field, the object in the distance of at least 130m away (otherwise not focused).
2. At first, loosen the lock ring and then loosen all three adjusting screws well enough so as to move the visual back freely.
3. Hold the visual back with one hand and adjust the position of the visual back roughly so as to see the object, caught in the center of the view field of the main scope, at cross point of the reticle. Then, fasten the lock ring in half way with other hand.
4. With a hex wrench provided, turn the three adjusting screws and place the object exactly at the cross point. Then, fasten the lock ring firmly to set the visual back in place.

You are now recommended to do these process in the daytime so that you can start your sky watching quickly in the night.

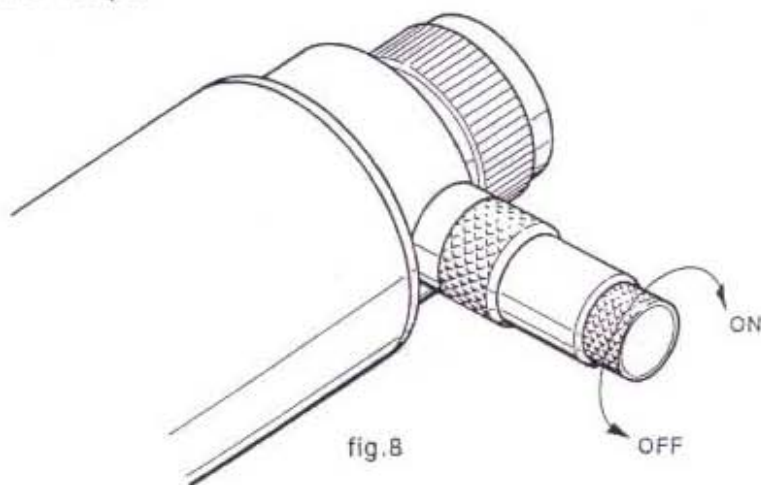
fig.7



Reticle Illuminator

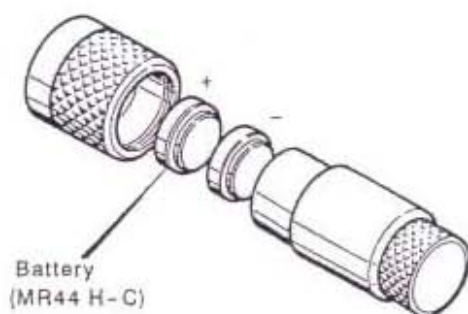
A reticle illuminator is provided with the 7×50 finder scope so that you can easily center the object, seeing the reticle illuminated brightly in red against the dark sky.

Turn the volume knob clockwise and then switch on with a click sound. Turn further and the illumination becomes brighter. Turn the volume knob reversely counter-clockwise and the illumination is getting dimmer and switched off with a click sound. Refer to the fig.8. Adjust the brightness of the illumination so as to see the star and the reticle together at ease, looking into the finder scope.



Replacing the battery in the illuminator

In case the battery must be replaced, take out the case, turning it counter-clockwise as shown fig.9. Before replacing the battery, clean the surface of the battery well and put them into the case, checking its polarity. Use two pieces of the mercury cell MR44 H-C (or equivalent). Refer to the fig.9.



Collimating the optical axis

Collimating the optical axis of your Mewlon-250 can be made only at the place of the secondary mirror. Therefore, you will have no such troublesome works as in the Newtonian telescope. The secondary mirror is an expanding optical system so that it is so sensitive to the collimation that a slight movement of the adjusting screw can make the optical axis out of order, resulting in the images degraded greatly.

Your Mewlon-250 was well checked, at the assembly stage in the factory, with the collimator, using the simulation star image. Its optical axis has been completely adjusted before shipment. The optical axis of your telescope is very hard to be out of order, once collimated, but it might be out of order during transportation. Therefore, in order to use your telescope in its best condition, you have to keep always its optical axis well collimated. Before you start to do your astronomical observation, never fail to check if the optical axis is in order. If it should be found out of order, do the collimation mentioned as follows. You should make the collimation after your telescope is left in the outside for more than one hour, actually seeing the star.

1. Select a star brighter(mag.2 ~3) and higher in the sky and center it at the view field. When defocused in and out from the focal point, the inner and outer images are seen such the diffraction rings as shown in the fig.10. If the optical axis is correctly adjusted, the center dot, the inner ring, the intermediate ring, and the outer ring, all form a concentric circle in the inner and outer images. In case the optical axis is out of order, the center of the circle is seen off. Then, correction is required. (When the focusing lever is pulled down to 'O' position from the focal point, you can see the inner image. Toward '1' position, you can see the outer image.)

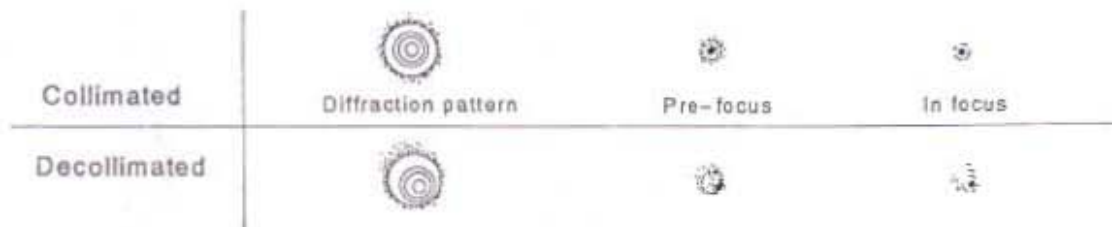


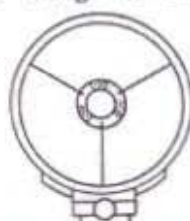
fig.10

2. To collimate the optical axis, adjust 3 sets of the correcting screws by 2.5mm hex wrench provided.

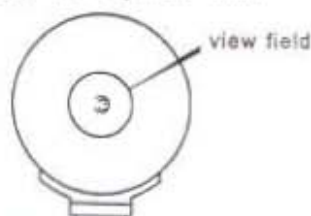
The three correcting screws, paired with a pushing screw and pulling screw, are provided on the secondary mirror holder plate. When the optical axis is out of order as shown below, adjust the paired screws at the right (fig.11), slightly loosening the pushing screw first and then tightening the pulling screw. When the adjusting screws are positioned like in the fig.12, adjust the two pairs of the screws at the right side with the same procedure.

If the optical axis is corrected too much to the other side, slightly loosen the pulling screw and then tighten the pushing screw. Repeat this corrective works until the optical axis is centered. When the center dot, the inner, the intermediate, and the outer rings are all seen in a concentric circle even when a star image is defocused largely, the optical axis is perfectly collimated.

If the optical axis is out of order at the right, correct it with the correcting screw at the right.



(from the tube opening)



(from the eyepiece)

- *If all three paired screws are loosened too much in a time, the secondary mirror might come out. So, loosen these screws little by little with care. Before you finish your correcting works, make sure of all the pulling screws being well tightened, keeping the secondary mirror attached firmly in place.

- *Sometimes a star image goes out of view field, if the screws are moved. When a star image goes out of the center during your corrective works, continue your works, replacing the star image at the center.

- *The center of the diffraction ring might hardly be seen by the center obstruction of the secondary mirror.

- *The correcting screws are not always positioned at the direction of off-centering of the optical axis. Refer to the diagram below, where the examples how to adjust the correcting screws are shown. Keep in mind "push" means that the pushing screw must be tightened after the pulling screw is loosened, and "pull" means that the pulling screw must be tightened after the pushing screw is loosened.

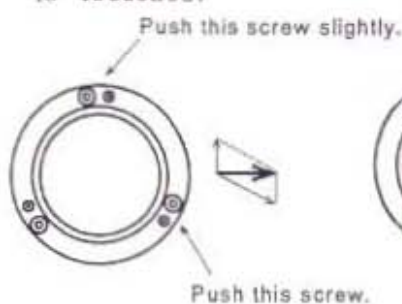


fig.11

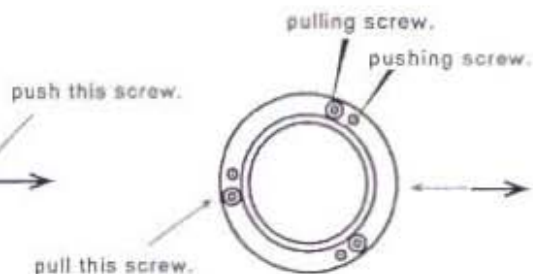


fig.12

IV

Observation

Visual Observation

Your Mewlon-250 is highly capable for a wide range of observing the moon, planets, star clusters, and nebulae, but NOT suited for solar observation.

In order for you to use your telescope at its best performance, you are recommended to operate your telescope in the nights when seeing is fine and after your telescope is well adapted to the outside temperature.

1. Magnification

Magnification can be calculated with the following formula.

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

Therefore, the shorter the focal length of an ocular is used, the higher the magnification becomes. Reversely, the longer the focal length of an ocular is used, the lower the magnification can be obtained. It is said in general that the upper limit of the magnification is $20 \times$ to the aperture in 'cm' of a telescope and the lower limit is $1.4 \times$ to it. The former is the highest effective magnification and the later the lowest effective magnification. Therefore, the highest effective magnification of your Mewlon-250 will be $500 \times$ and the lowest $35 \times$.

2. Lunar Observation

The moon is an ideal target to observe by beginners to well-experienced amateur astronomers. When you see the whole of the moon, it is suitable for you to see it at $50 \times$ magnification.

The moon near its full phase has a considerable amount of the light, which might harm your eye, if you will continue your observation for a long time. Be careful not to see such moon for a long time through your telescope.

There are a lot of craters and valleys on the moon. To view these complicate lays of the moon land will give you a pleasure. To observe it in detail, you are going to do it at higher magnification of $10 \times$ to the aperture(cm) of your telescope. With your Mewlon-250, the ideal magnification to observe the moon will be $250 \times$. When the "seeing" is fine, try to view the moon at the highest effective magnification. Then, you will be able to see more in details of the craters and the lays which you have not noticed yet.

3. Planetary Observation

It must be necessary for you to observe planets only when the seeing is fine, because you must see the very small images of the planets at the highest effective magnification by your telescope.

When the seeing is extra fine, try to observe the planets at the higher magnification than the highest effective magnification. Then, you will find something different of the planets. On the contrary when the seeing is no good, you had better try to view the planets at lower magnification, which sometimes give you better images of the planets.

4. Observation for nebulae and star clusters

When you like to observe nebulae and star clusters, use low power oculars, which make the view field wider and brighter suitable for your observation for nebulae and star clusters. To observe globular clusters and galaxies with very small view-diameter, use high power oculars. Under the light-polluted sky, observe these faint objects at higher magnification, which sometimes give you better images.

Astrophotography

Besides visual observation, your Mewlon-250 will give you another pleasure to take the photos of various objects in the sky. To make the best use of your Mewlon-250, read the following instructions very carefully, referring to the photo/visual system chart illustrated in the later page.

1. Photographing with the prime focus

This is a method to take the photo of star images on the film placed at the focal point. In other words, your telescope can be used like a tele-photo lens.

When you take a deep-sky photo with the prime focus, you need a long time exposure for 30 to 60 minutes because of the long focal length and dark focal ratio. Therefore, you have to use a heavy duty and highly accuracy mount. Moreover, a super sensitive film may be required to shorten the exposure time. Then, you will be able to obtain a good result in your astrophotography.

As the image of the moon can be taken on the film as large as 1/10th of the focal length, the image of the half moon will be just taken vertically on the 35mm film. Taking astrophotograph with the prime focus, use a 35mm camera which can be set to the visual back of your telescope with TSC Prime Focus Ring and a T-mount.

2. Magnified Astrophotography with oculars for the moon and the planets

When you like to take the photo of the craters on the moon and the planets, you need to use the optical parts mentioned below because the scale of the image to be taken with the prime focus is too small.

When the seeing is no good, you can not expect to take a good photo either of the moon or the planets. Before starting to take the astrophotos, make sure of the seeing condition by your eyes. Recently, various kinds of films are available in the markets. So try to use as many of them as possible to obtain the best result of your astrophotographing.

In case of the planets, you must determine the magnification to have the image of the planets as large as 1mm on the film. If the amount of light of a planet is large enough, make magnification as high as possible. The exposure time must be set for less than 5 seconds for less failure of your taking photos. In case of the moon, you can enjoy a wide variation of your photographing with a wide selection of the magnification.

- a. **NCA** is an adapter for taking magnified photographs with 24.5mm oculars and it can be attached to the visual back as illustrated. Magnification can be changed with a combination use of its vari-tube and an ocular. It can be attached to a 35mm SLR camera with a T-mount.
- b. **Camera adapter** is also an adapter for magnified photograph taking with 24.5mm oculars. You can change your visual set-up to the photo set-up equickly with this adapter. Also you can change the ocular in the adapter quickly to another one. Magnification can be altered as you like by sliding the magnification tube. This adapter can be attached to a 35mm SLR camera with a T-mount.
- c. **Vari-Extender** is also used for magnified photograph. This is an optical system that can extend the focal length of your telescope and can change the magnification with its vari-tube. It is suitable for use to take the moon with middle magnification. It can be attached to a 35mm SLR camera with a T-mount.

V

For good usage

How to calculate the effective focal length of your Mewlon-250

The focusing of your Mewlon-250 is made electrically by a motor, which moves the secondary mirror forward and backward with a control pad. The focal point will be moved according to the photo/visual parts to be attached to the visual back. Eventually, the distance between the primary mirror and the secondary one will be varied so that the effective focal length will be also be changed. The effective focal length to be changed by **TAKAHASHI** major system parts are listed as follows.

SYSTEM	EFFECTIVE FOCAL LENGTH
LE30	2908mm
Or7	2888mm
Or7 + diagonal prism(DP)	3050mm
Er32(62°)	2882mm
Or40	2873mm
Er32(62°) + diagonal prism, large(LDP)	3003mm
Or40 + LDP	2993mm
LE30 + LDP with coupling	3097mm
Or7 + LDP with coupling	3077mm
Quintuple turret + Or7	3050mm
Quintuple turret with LDP + Or7	3150mm
T-mount + 35mm SLR camera	2942mm
*Or7 + NCA + 35mm SLR camera	2888mm
*Or7 + camera adapter + 35mm SLR camera	2878mm
**Vari-Extender + 35mm SLR camera	4918mm
**Vari-Extender + vari-tube(1) + 35mm SLR camera	6280mm
**Vari-Extender + vari-tube(2) + 35mm SLR camera	6280mm

* When the NCA and the Camera Adapter are used, the effective focal length at the film plane will be the value that the listed value is multiplied by magnification.

**In case of the Extender, the effective focal length listed in the table represents that of the whole system so that the listed values are of no concern with the focal point.

Accessories

For a wide variation of the photo/visual applications, you can use a number of **TAKAHASHI** accessories with your Mewlon-250.

◆ Star Diagonal Prisms

When you see some objects overhead in the sky, with an ocular setting it directly to the adapter, you have to look into your telescope at awkward pose. These prisms, available in three types, permit you to observe at comfortable pose, bending the light pass at 90° .

1. Small size for 24.5mm oculars
2. Middle size for 1.25" oculars
3. Large size for **TAKAHASHI** Or40mm and Er32mm oculars

Ocular adapters are available in two types.

1. For 24.5mm oculars
2. For 1.25" oculars

No.2 adapter is provided with your Mewlon-250.

◆ **T-mount** is necessary to connect your camera to the visual back of your Mewlon-250, when you are going to take an astro-photo. A number of the T-mounts are available for Canon, Canon EOS, Nikon, Olympus OM, Minolta, Minolta α , Pentax-K. When you need a T-mount for your camera, specify the name of your camera.

◆ **NCA** is a simple adapter for a camera to take a magnified photo. Refer to the section of the astrophotography and to the photo/visual system chart.

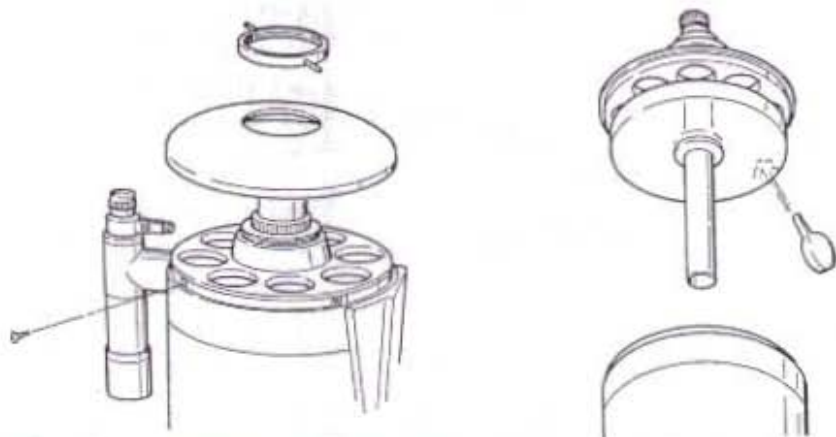
◆ **Camera adapter** is another adapter for a camera convenient to take a magnified astrophoto. Refer to the section of the astrophotography on how to use it.

◆ **Vari-Extender** is an optional system to be used for extending the focal length of a telescope. It is suitable for middle range of magnification to take astrophotograph as well as visual observation.

◆ **Prime Focus Ring** is used for taking a photo of images focused at prime focal point.

Care and Maintenance for your telescope

The primary mirror of your Mewlon-250 is exposed directly to the open air. If the surface of the mirror is left covered with dusts and dew, it will become dim and make the contrast of images worse. With the following procedures, clean up dusts from the surface of the mirror by a blower at the regular interval. When you set the tube back on to the mirror, set it precisely in place with the cell. Then, the optical axis will be hardly out of order.



1. Stand the tube assembly with its opening to the bottom on the level place.
2. Holding the visual back to stand the tube safely, take out the cell cap and four screws fixing the primary mirror cell.
3. Pull up the primary mirror slowly with great care not to touch the mirror on the inside wall of the tube. Especially watch these screw heads on the lower ring of the tube. And make sure of the long baffle tube coming out completely from the tube. When the cell is tightly set, draw it very slowly with great care.

Note:

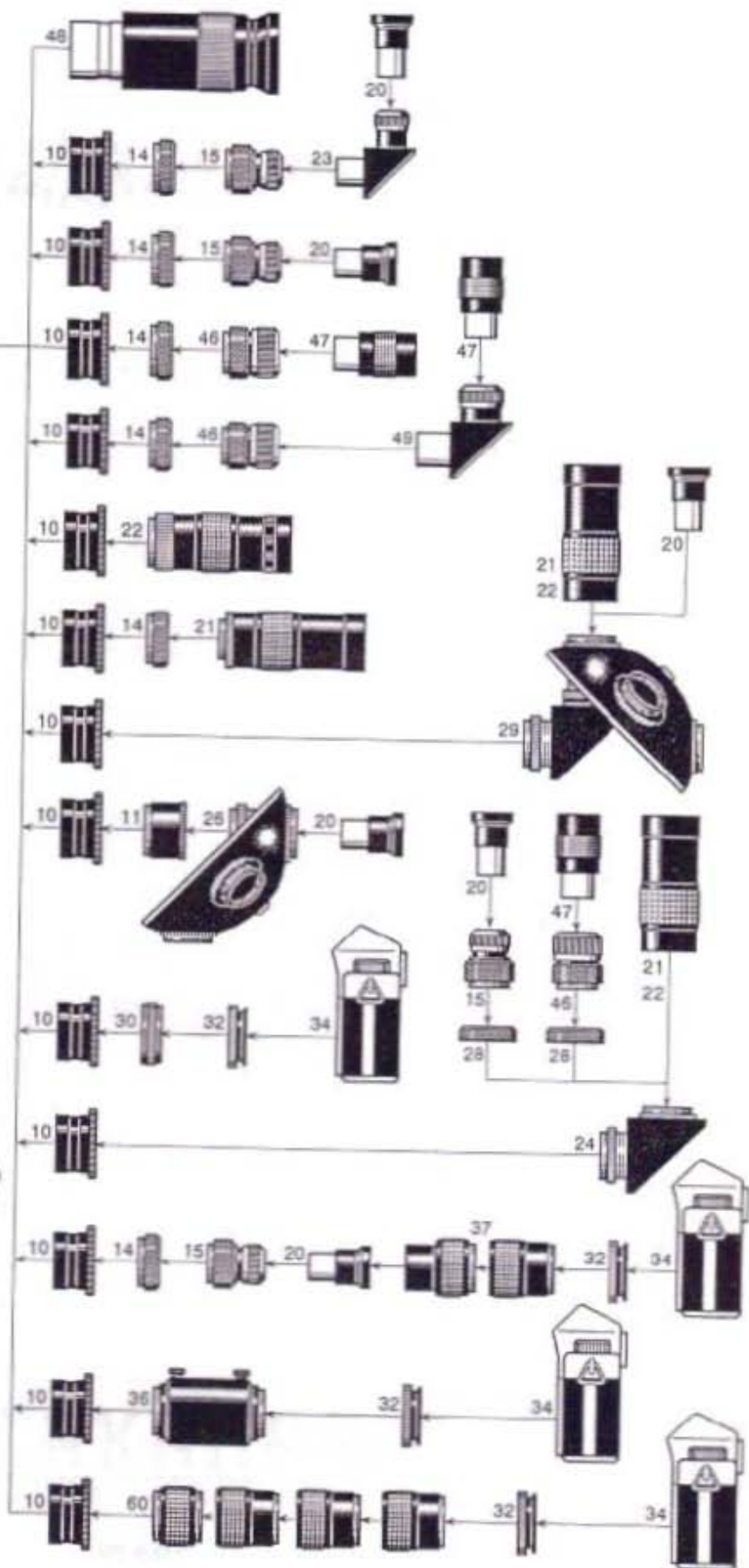
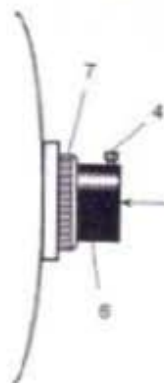
1. After used, put the caps on to the opening of the tube and the visual back to shut dusts out.
2. When the tube well cooled in the outside is brought into the warm room, dew will sometimes forms on the inside wall of the tube. Therefore, bring the tube into the room after it is closed up tightly with the cap.
3. Dirt on the tube can be cleaned with car wax.
4. When the primary and the secondary mirrors became cloudy in white, they must be cleaned up or plated again. Ask the dealer for repair.

Trouble Shooting

Symptoms	Check	Action
Nothing can be seen.	Is the cap taken out?	Take out the cap.
	Is the ocular set in?	Nothing can be seen without the ocular. Set the ocular in the ocular adapter.
	Is not dew formed cloudy on the surface of the mirror or the ocular lens?	Do not try your observation in such places as grassy area and liver side where there may exist high humidity. If could not, make anti-dewing inside of the tube.
	Is the finder aligned?	If the finder is not aligned with the main scope, the desired object will not be caught in the view field. Do alignment at first.
	Is the telescope focused?	Focus with the focusing lever of the hand-held control pad.
The telescope can not be focused.	Is the focusing control pad out of power?	Replace a fresh cell.
	Is not the cable of the control pad disconnected?	Insert the connector firmly.
Star images are seen fuzzy.	Is not dew formed on the surface of the mirror or the ocular?	Dry out the dew, sending the wind with a fan and the like. Do not use hot air.
	Do you use your telescope in good combination?	Check the system chart and use the parts correctly as shown.
Star images are seen deformed.	Have your telescope adapted well enough to the outside air?	Use your telescope after it has been adapted to the air for at least one hour.
	Is the optical axis well collimated?	Collimate the optical axis correctly.
	Is the atmosphere stable?	Do not try your observation in such a night when scintillation and seeing are not good.

μ -250

Photo/Visual System Chart



- 4. Locking screw
- 6. 50.8mm adapter
- 7. Locking ring
- 10. 50.8mm (2") sleeve
- 14. Coupling
- 15. Ocular adapter (24.5mm)
- 20. Ocular
- 21. Or40mm
- 22. Er32mm (62°)
- 23. Diagonal prism (DP)
- 24. Diagonal prism, large (LDP)
- 26. Quintuple turret
- 28. Coupling for LDP
- 29. Quintuple turret w/LDP
- 30. TSC prime focus ring
- 32. T-mount
- 34. 35mm SLR camera
- 36. Camera adapter (24.5mm)
- 37. NCA camera adapter (24.5mm)
- 46. Ocular adapter for 1 1/4" ocular
- 47. Ocular, 1 1/4" sleeve
- 48. Ocular, 2" sleeve
- 49. Diagonal prism for 1 1/4" ocular
- 60. Vari-Extender