Equatorial Mount

EM-200

Temma 2M

INSTRUCTION MANUAL

TAKAHASHI

Thank you for your purchase of the EM-200 Temma2M mount. This highly sophisticated mount is perfectly suited to any number of photo/visual applications. In order to be able to operate the EM-200 Temma2M to the limit of its capabilities, thoroughly read this manual and familiarize yourself with the correct operation of its many features and functions. Properly used, the EM-200 Temma2M will deliver a lifetime of operation.

⚠ WARNING

NEVER ATTEMPT TO LOOK AT THE SUN DIRECTLY THROUGH THE TELESCOPE OR FINDER. DOING SO WILL CAUSE INSTANT BLINDNESS DUE TO THE INTENSE LIGHT AND HEAT OF THE SUN.

⚠ CAUTION

- When you place the tube assembly into the tube holder, do not over tighten the tube holder clamps. Doing so could distort the telescope tube and cause the telescope to decollimate.
- Place the mount on the flattest ground at the observing site. It is important that the tripod be set on the flattest ground available to provide a stable base for the mount.
- Exercise great caution when sliding the 8 kg counter weights on to the counter weight shaft and after this has been done attach the safety nut to the bottom of the shaft to keep the counter weights from coming off the shaft. The counter weight could cause severe damage to anything it falls upon.
- Never under any circumstances allow the mount to get wet from rain. Moisture will short circuit the electronics and wash out the lubricant. If rain threatens, immediately take the mount down or cover it with a waterproof cover in the event the onset of the rain is rapid.

CONTENTS

Specifications

Equatorial Mount

Type:	German equatorial with Temma2M go-to system built-in
R.A. slow motion:	Round worm wheel [180:1] by quartz controlled stepping motor
Dec. slow motion:	Round worm wheel [180:1] by quartz controlled stepping motor
Azimuth adjustment:	Adjustable 15° in either direction
Altitude adjustment:	Adjustable 0° to 50°
Setting circles:	R.A. driven - 10' increments Dec. 2° increments
Loading capacity:	16kg (35.2lbs)
Gross weight:	16.5kg (36.3lbs) + 2ea. 5kg wts(22lbs)
Polar alignment scope	Built-in, 9x, 3' setting accuracy Scale pattern, quick reference type, good until 2030 in either Hemisphere with illumination and bubble level
Counter-weight	5kg x2

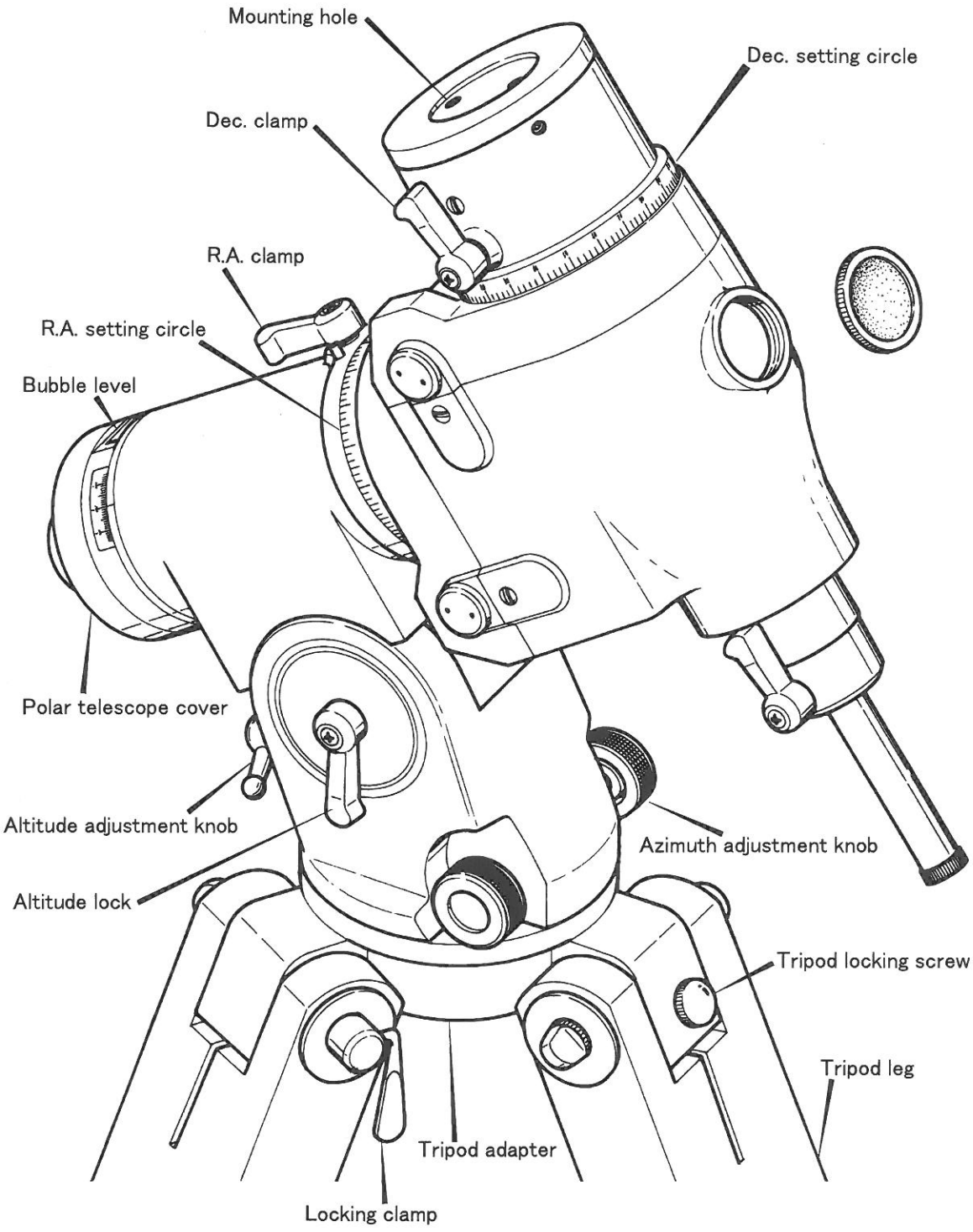
Motor Drive System
【Temma2M】

Drive System :	Dual axes, quartz control, driving frequency: 100pps N/S, Star/Sun switching by hand controller
Usable Area :	World-wide, but high latitude is limited as mentioned in the Equatorial Mount section
High Speed Drive :	Approx. 700x sidereal
Correction Speed :	RA: 0.11 ~ 1.99x Sidereal
(manual operation)	Dec: ± 0.15 ~ 14.65 arc sec/sec by 1.5 arc sec/sec stepless by the speed control provided on the control pad
Mode indicator:	High speed operation - red light Normal operation - green light
Power Source :	DC12V
Power Consumption :	Sidereal rate Approx. 0.8A High speed on both axes 3.5A Start 5.1A
Go-To Operation :	By a PC
"Go-To" Disc:	Pegasus 21 or other compatible software
Accessory :	RS232C cable (Temma2M auto-guider cable for U.S.A.)

Operational temperature: −5 ~ +30°C

These specifications are subject to change without notice.

EM-200 Equatorial Mount



The above is an illustration of the EM-200 mount.
Please familiarize yourself with the location of the various knobs and adjusters.

Layout of the Control Panel

■ Control Panel

Powe[LED] :

When the power switch is slide to the On position the LED turns on and the mount is activated.

P-Light Control :

When the Power Switch is turned on, the illuminator for the polar alignment telescope system is turned on.

The brightness of the illuminator can be change by carefully turning the P-Light control slotted screw very carefully with a plastic screw driver. Once the brightness is set, the set screw should be left alone.

DC 12v :

Connect the power cable supplied with the mount to a power supply 12vDC by attaching the red alligator clip to the + terminal and the black alligator clip to the - terminal. This mount operates on 12v DC only.

Auto Guider :

The terminal is used to connect an auto guider to the mount. There are three cables available with the following terminations: RJ-14, ST-4 and ST-7.

Control Box :

This is the connector for the hand control box. Before inserting the cable into the connector make certain that the pins are aligned.

PC :

This terminal is connected to the computer cable supplied the mount that terminates in an RS232 serial connector.

Note: Serial to USB connectors are available for computer without serial ports.

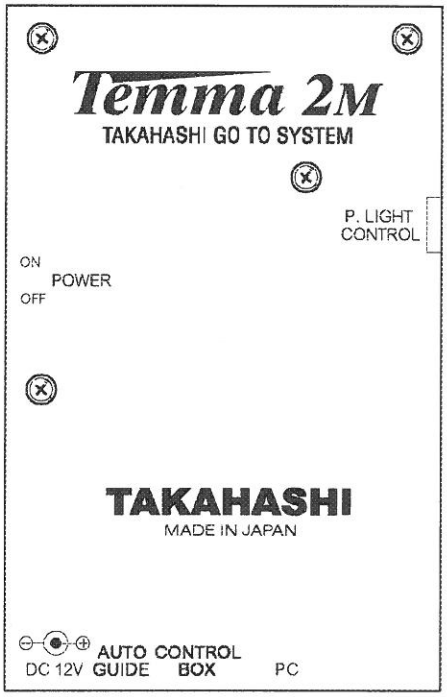


Fig.2

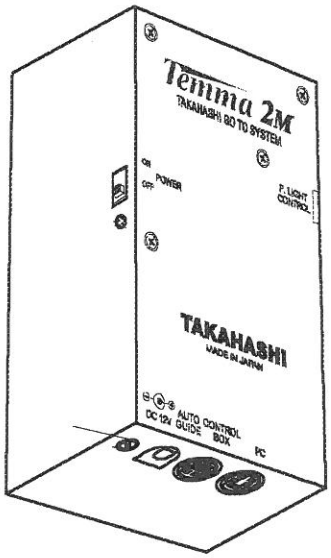


Fig.3

【Caution】

* Insert the power connector carefully into the DC 12v receptacle making certain that it bot toms out to supply a firm connection for the power.

*The blank connector is currently not used and is provided for future expansion.

■ Control Box

① R. A. Centering Buttons [red]

When these buttons are pressed the mount moves in R.A. speed up or slow down.

②Dec. Centering Buttons [white]

When these buttons are pressed the mount moves either up or down in Dec.

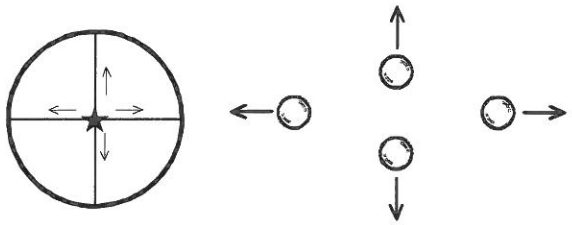


Fig.4

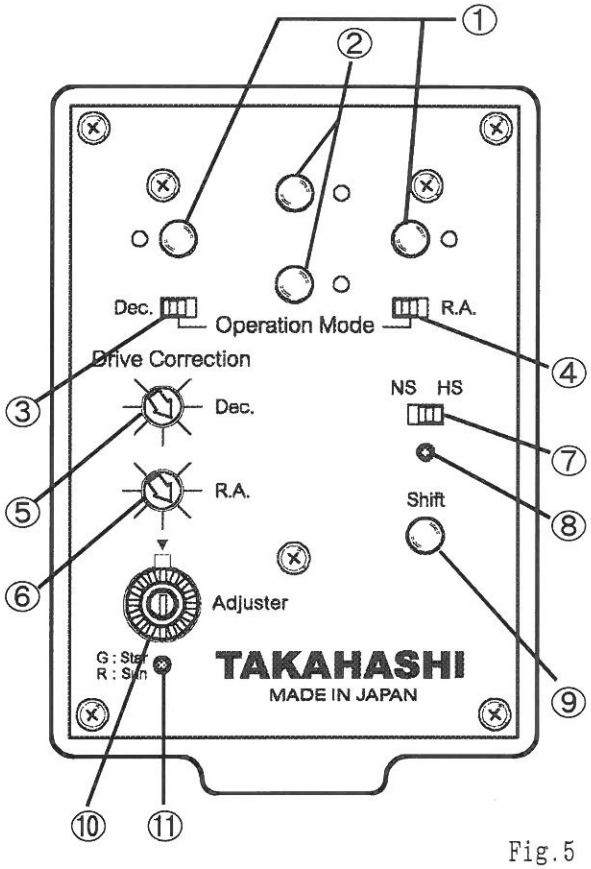


Fig.5

③Dec. Mode Operation Switch

This switch is used to reverse the direction in which a star is moved when either Dec. button is pressed. Using this control enables the observer to move the star in the direction that coincides with the position of the button on the hand control either up or down or right or left. This control allows the observer to more easily center an object in the field of view.

④RA Mode Reversal Switch

As with the Dec switch, this is used to reverse the direction in which a star is moved to match the position of the R.A. button so that when the left button is pressed the star moves to the left in the field, etc.

⑤Dec Speed Dial

In the Normal Speed Mode this dial adjusts the speed at which a star is centered in the Dec. direction fro 0.15 to 14.85 arc seconds per second when the Dec buttons are pressed in either direction.

⑥R.A. Speed Dial

In the Normal Speed Mode this dial adjusts the speed at which an object is centered in R.A. from -1% to 99% of the sidereal rate in either direction.

⑦Drive Mode Switch

This switch is used to change the motor speed range from normal to high speed or vice versa.

HS = High Speed

NS = Normal Speed

⑧ Motor Speed Light

When the motor speed light turn green the drive motors operate at the normal speed ranges for centering or driving and turns red when the motors are set to run in the high speed slew mode of 500x sidereal rate.

⑨ Sync Shift Key

This button allows the user to correct any pointing errors when a slew is made. The shift key is pressed and held. Then the user can center the object in the field and release the shift button which will resynchronize the coordinates of the object to the mount. [This works only with the object of the slew.]

⑩ Drive Rate Selector

This dial is used to select the drive rate either sidereal or solar. The 1 position on the dial is the sidereal rate and the 2 position is solar. For the Southern Hemisphere A is sidereal and B is the solar rate. All other settings are inactive.

⑪ Indicator

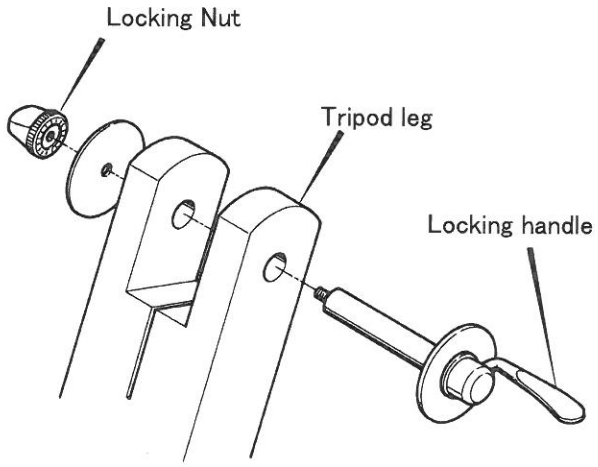
【Caution】

The cable from the hand control will be locked in position. Avoid pulling on the hand control cable.

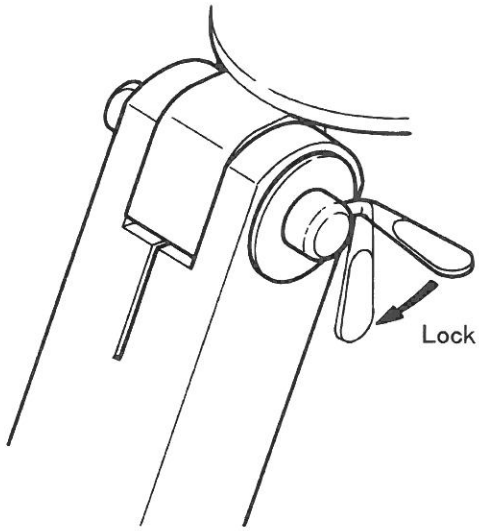
Assembling the Tripod

1. Set the tripod adapter in the slot of the leg and assemble the bolt and lock nut as shown below. When tightening the lock nut, leave enough space for the locking handle to pull the assembly together.

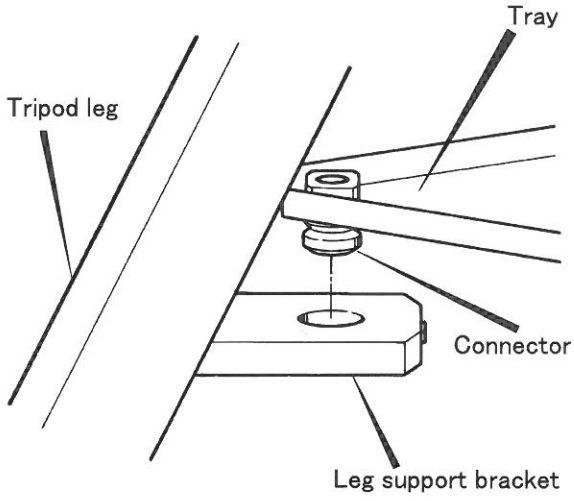
*Repeat the process with the other legs.



2. After assembling the bolt etc., the leg is locked by pulling the locking handle towards the leg as shown.



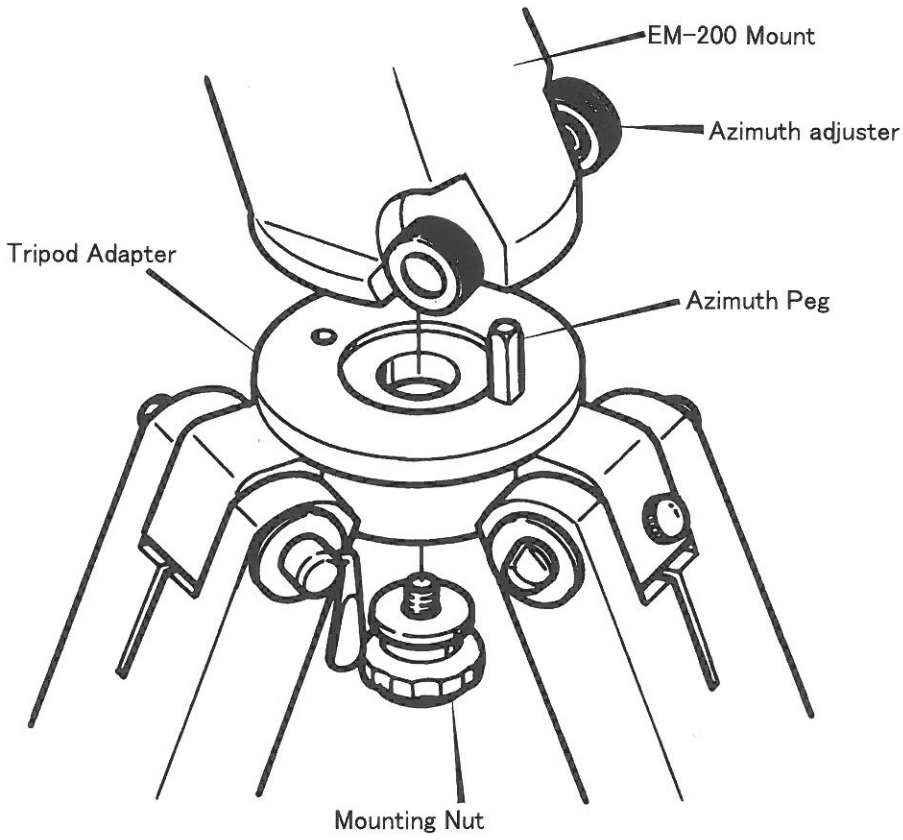
3. The final step in the assembly of the tripod is attaching the tripod tray onto the legs. Insert the round connector into the hole of the bracket on the tripod leg. It will pop in. Now the tripod will provide steady support for the mount.



Setting up the Mount

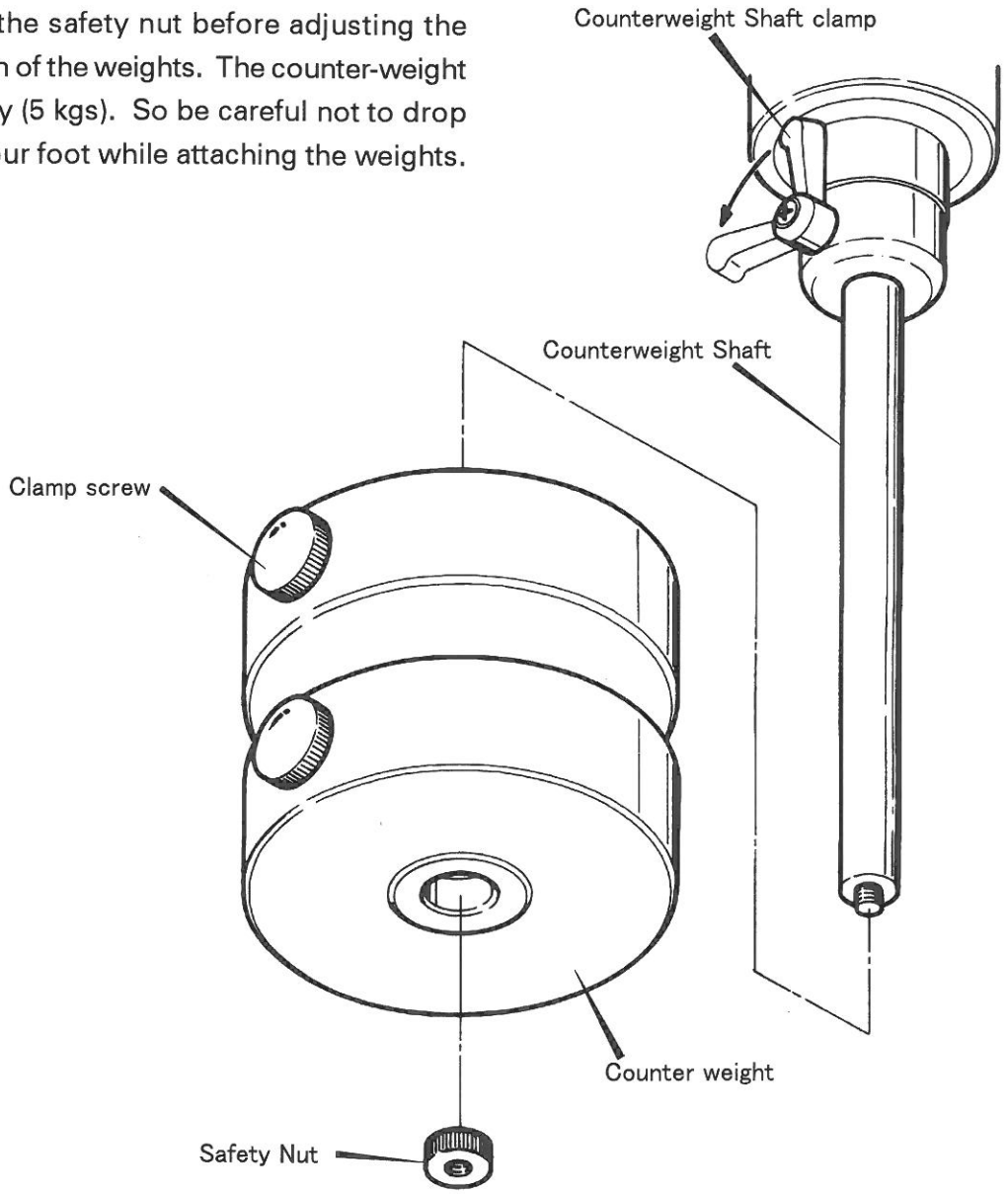
Now that the tripod legs and tripod tray have been assembled, the EM-200 Temma2M mount can be set onto the tripod adapter. Set the mount on the adapter so that the azimuth peg is set between the azimuth adjusters. Be certain the azimuth adjusters have been unscrewed to allow the peg to be set in between them. The azimuth adjusters are set into the azimuth housing. See the illustration below. Then, insert the attaching nut into the base of the mount and tighten it until the mount is held in place. Nonetheless, do not tighten the nut too much. Leave it loose enough to permit the mount to pivot as the azimuth screws push against the azimuth peg. This is absolutely necessary in order to polar align the EM-200 Temma2M mount. As soon as the mount has been polar aligned, the nut can be snugged up.

When the mount is taken down, then the nut can be removed.



Attaching the counter weight

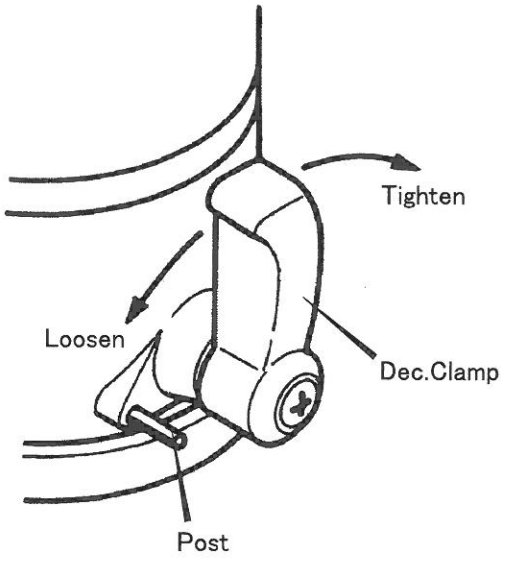
Loosen the clamp and draw the shaft until it goes. Then, tighten the clamp and lock the shaft firmly. Unscrew the safety nut from the end of the shaft. Then, attach the counter-weights on the shaft properly and lock them with lock screw. Be certain to attach the safety nut before adjusting the position of the weights. The counter-weight is heavy (5 kgs). So be careful not to drop it on your foot while attaching the weights.

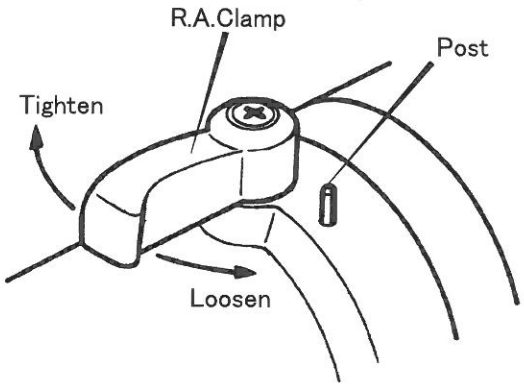


Functions for the R.A. and the Dec. clamps

Below illustrates the proper use of the clamps for the R.A. and Dec. axes. When it is turned in the direction toward the chrome post, the R.A. or the Dec. axis is loosened and ready to move the axis manually to any desired position. When turned in the reverse direction, the R.A. or the Dec. axis is tightened and ready to engage motor drive operation.

When you want to place an object in the field of view of the finder, manually move the mount. Loosen the R.A. and the Dec. clamps. Then the mount can be moved in both axes manually to the desired location in the sky.

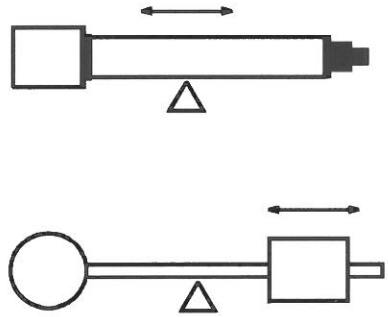


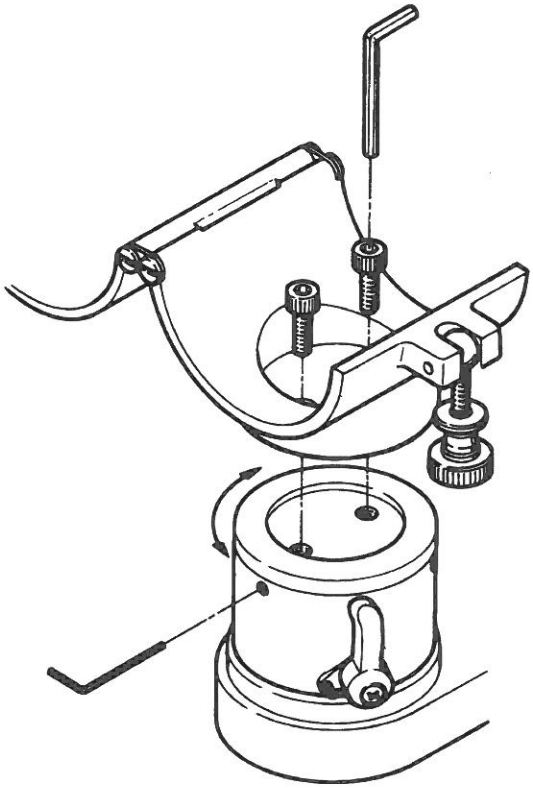


【Note】
Tightening engages the drives,while loosening allows the axes to be moved manually to any desired position. Be careful that your finger will be not pinched by the clamp while tightening or loosening.

Attaching the tube holder and Balancing

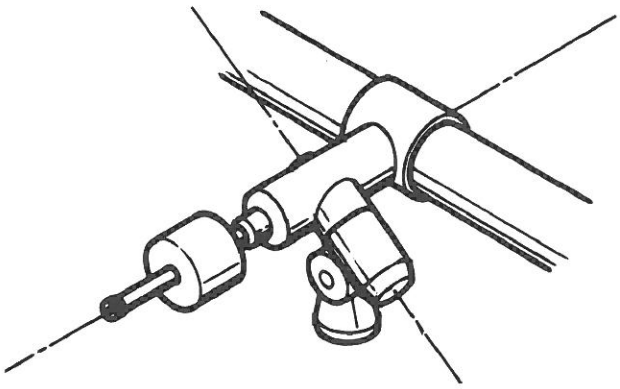
The correct way to attach the tube holder to the mount is to use the two cap bolts provided. After an optical tube has been set into the tube holder. The next step is balancing.





Now that the instrument has been attached to the mount, it will be necessary to balance the load in the R.A. and the Dec.

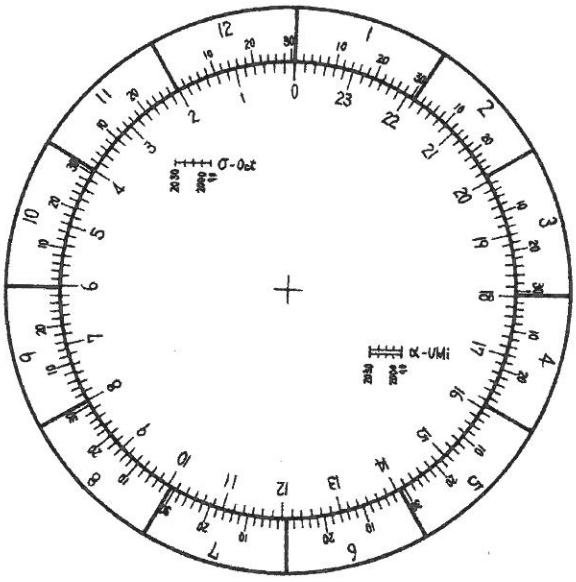
The first step is to clamp the R.A. and unclamp the Dec. Hold the tube of the telescope in the event it is out of balance. Then, loosen the tube clamp slightly so that the tube can be moved in either direction. Move the tube in either direction until it balances. When the tube is balanced, tighten the clamp.



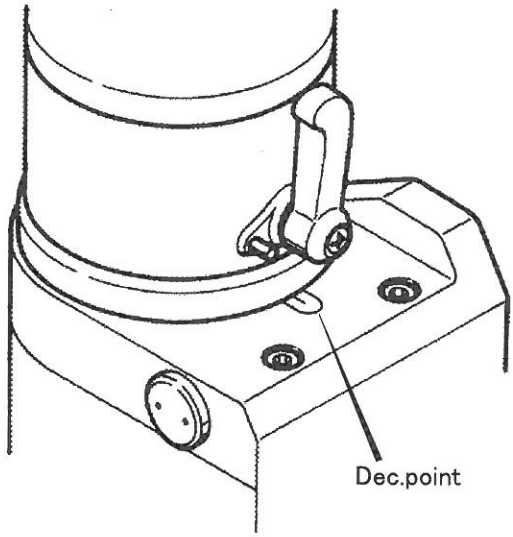
Next, loosen the R.A. clamp, and tighten the Dec.clamp. Unclamp the counterweight(s) and slide them in either direc tion until the package is balanced.

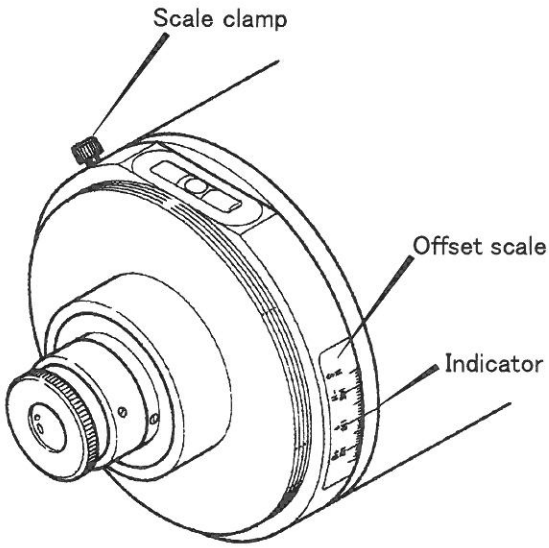
The EM-200 Temma2M mount is equipped with a highly accurate polar alignment reticle. This reticle permits alignment to within 2 arc minutes of the celestial pole in either Hemisphere until the year of 2030 from latitude 0° .

The reticle is illustrated below. The outer circle is the date scale and the inner scale is the time scale. Towards the center are the scales for the Polaris (Northern Hemisphere), and Sigma Octans (Southern Hemisphere).



Remove the cover from the polar alignment telescope. Unclamp the Dec. clamp and look down the polar telescope from the mount until the hole on the counter-weight shaft permits the objective of the polar telescope to be totally seen, when the position of the Dec. clamp is set just above the Dec. pointer.





Polar Alignment in Northern Hemisphere

In order to use the reticle, three factors must be known.

1. The standard time for the observer's time zone
2. The longitude of the observer's location
3. The mid longitude of the observer's time zone

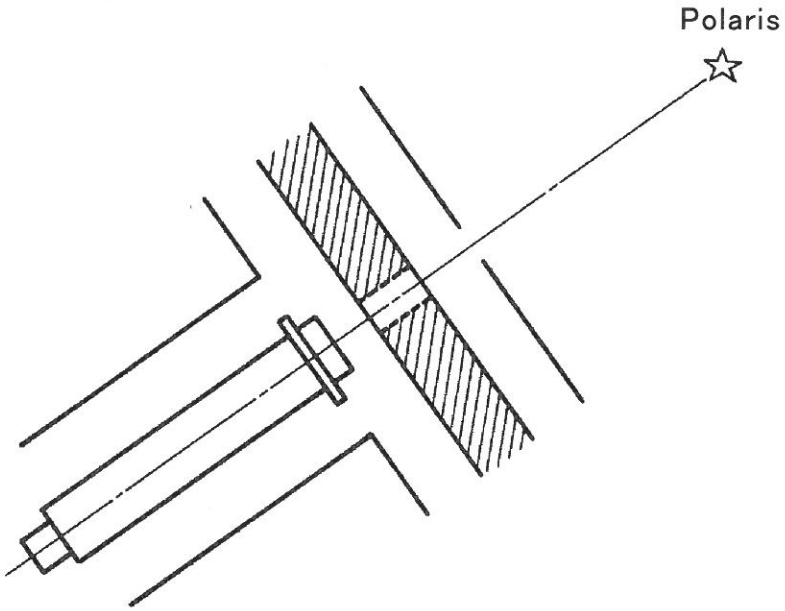
Charts and maps will assist in the determination of the latitude and mid longitude of the observing site's time zone.

The time zone mid longitudes for North America are:

ATLANTIC STANDARD (AST)	60°
EASTERN STANDARD (EST)	75°
CENTRAL STANDARD (CST)	90°
MOUNTAIN STANDARD (MST)	105°
PACIFIC STANDARD (pst)	120°

In other time zone, keep adding or subtracting 15° to approximate the longitude of the obvserving site.

Once the three factors are known, then you can proceed polar alignment. Turn the Dec. shaft until the hole on the counter-weight shaft is lined up with the polar alignment telescope and turn on the computer stand-by switch located on the control panel. Set the brightness so that the reticle pattern can be barely seen against the stars.

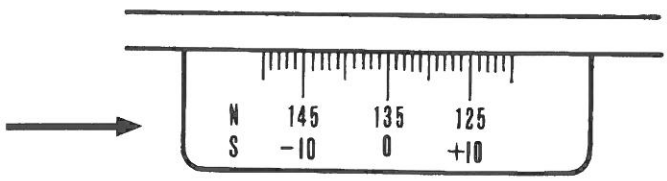


Setting the Reticle Offset (1)

As mentioned previously, the EM-200 Temma2M can be set up anywhere in the world due to the design of its reticle. The offset scale located at the rear of the R.A. housing. See the illustration facilitates the precise setting of the reticle for 2 arc minutes polar alignment. Study the upper scale, which is the one used for Northern Hemisphere operation. While the lower scale is used for Southern Hemisphere operation. The offset scale inscribed represents the longitude for observing in Japan. Substitute the appropriate longitude for observing sites in North America.

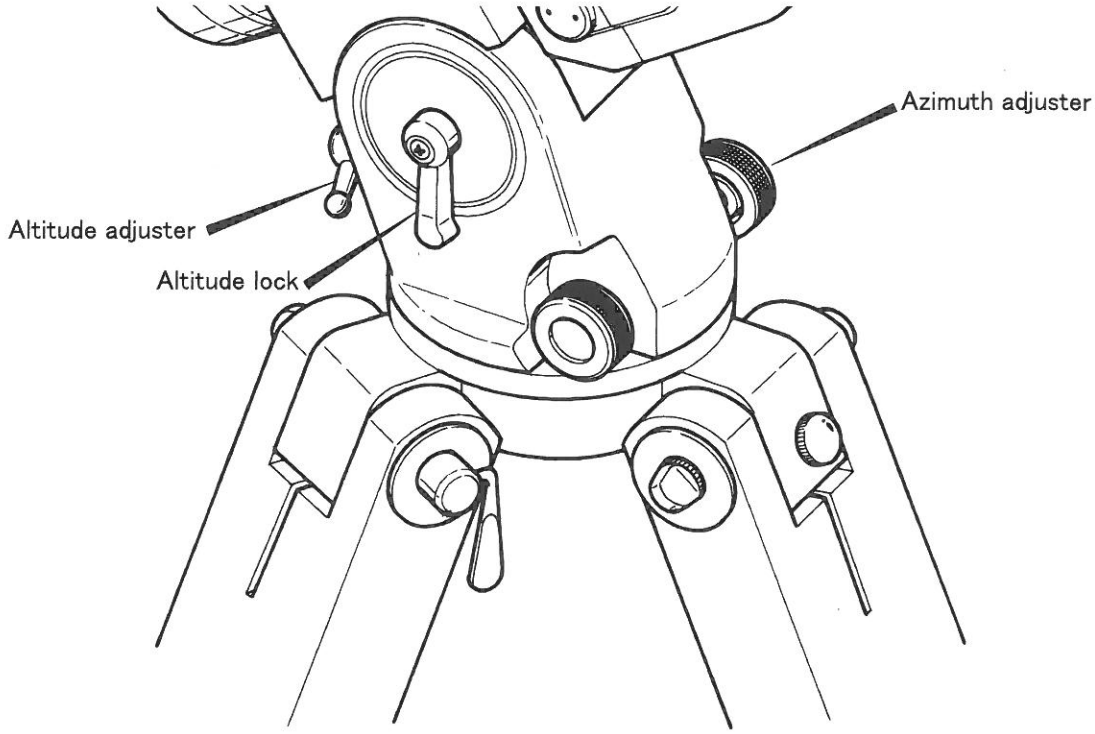
Use the chart on this page to determine the time zone of the observing site. In order to achieve the highest possible accuracy, the time used must be the standard time for the site. If the observing takes place during daylight saving time, subtract 1 hour from the time to convert back to standard time.

TIME ZONE	LONGITUDE MARKING(EQUIVALENTS)		
TOKYO,JAPAN (SCALE ON MOUNT)	145°	135°	125°
ATRANTIC STANDARD	50°	60°	70°
EASTERN STANDARD	65°	75°	85°
CENTRAL STANDARD	80°	90°	100°
MOUNTAIN STANDARD	95°	105°	115°
PACIFIC STANDARD	105°	120°	130°



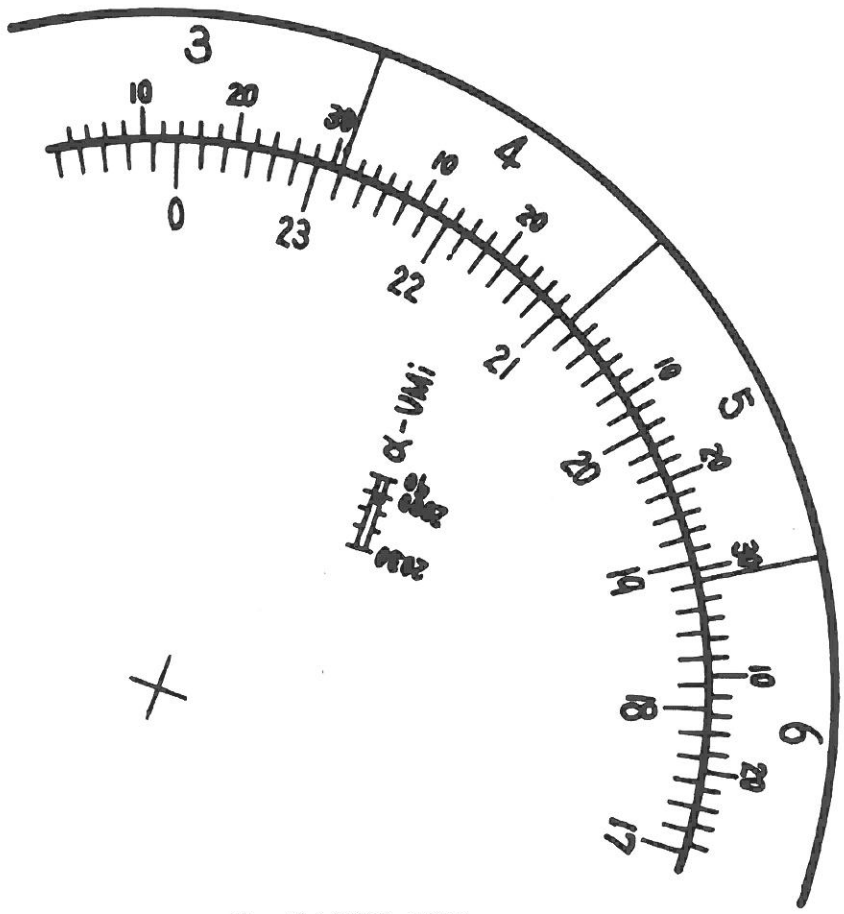
The following is an example of setting the offset scale. The city for our example is Houston, Texas at a longitude of approximately 95° west longitude. 5/14 at 8:00PM (20:00),2001.

1. Set the offset scale. (Houston-CENTRAL TIME ZONE) Central longitude of time zone from chart = 90° .
   Longitude of Houston = 95° difference +5°
2. Determine the local standard time for the observing location, (20:00), and note the date (5/14).
3. Turn the R.A. axis until the bubble level is centered between the lines on the level. It is not necessary for the mount to be leveled.
   In fact, due to the fact that centering the bubble levels the reticle, the mount can be set up on the side of a hill.
4. Turn on the reticle illuminator and set the brightness so that the stars can be seen.
5. Using the altitude and azimuth adjusters on the mount, move the Polaris to the 2001 mark in the reticle, and lock the adjustments. See the illustration below.



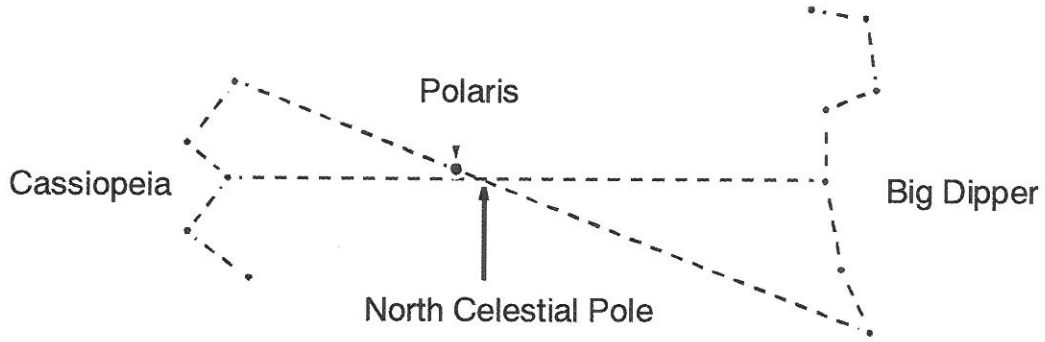
Please study the reticle below. This is exactly how the reticle would be set after it is levelled, and the Polairs has been placed on the 2001 mark. The Polaris would not cover the center portion of the reticle.
Be certain that it is placed between the lines, as close to the center as possible on the "90" mark.

Now the EM-200 Temma2M is polar aligned.



May/14/2001 20:00

Setting the Reticle Offset (2)



The polar aligment will be made with the aid of the Polaris. At first, you must find the location of the Polaris in the northern sky. A well- known method to find the Polaris is to use the Big Dipper and the Cassiopeia as illustrated above.

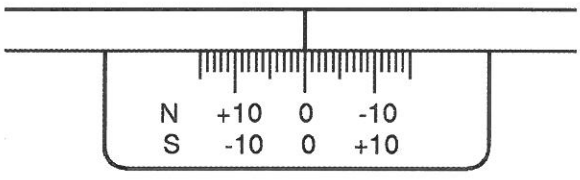
The formation of the Big Dipper and Cassiopeia are to be seen very easily. They are nearly in the opposite position each other with the Polaris being in their center.

Follow the instructions mentioned below.

Cities	LATITUDE	LONGITUDE
Paris	48°50' N	02°20' E
Colmar	48°10' N	07°20' E
Lyon	45°40' N	04°50' E
Marseille	43°20' N	05°20' E
Munchen	48°10' N	11°40' E
Koln	51° N	07° E
Berlin	52°30' N	13°30' E
Hamburg	53°40' N	10° E

1. In order to use the reticle for the polar alignment, you must know of the longitude of your observing site. Charts and maps will help you to determine the latitude and the longitude of your observing site. Listed below are the latitude and the longitude of the major cities in France and Germany.

2. The numbers printed on the offset scale at the line of the "N" represent the longitude east or west. Loosen the clamp screw for the bubble level and adjust the scale so that the indicator shows the longitude of your observing site and tighten the clamp screw. You are recommended to finish the above setting before you go to your observing site.



Polar Alignment for Southern Hemisphere

Polar alignment in the Southern Hemisphere is done in a similar fashion to the Northern Hemisphere method.

1. Set the mount for Southern Hemisphere operation by hand controler.
2. Since the stars in the Southern Hemisphere move in the opposite direction, the reference scales for the time and date on the reticle must be reversed. Use the chart below to make the coversion.
3. Use the lower scale marked S on the longitude offset scale.

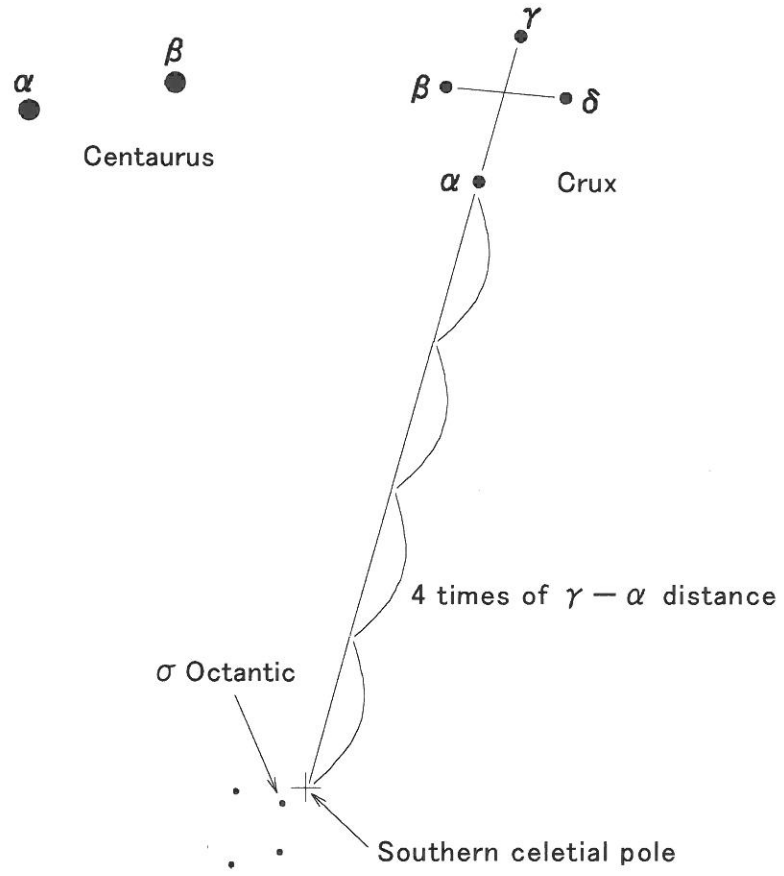
N	S
18	6
19	5
20	4
21	3
22	2
23	1
0	0
1	23
2	22
3	21
4	20
5	19
6	18

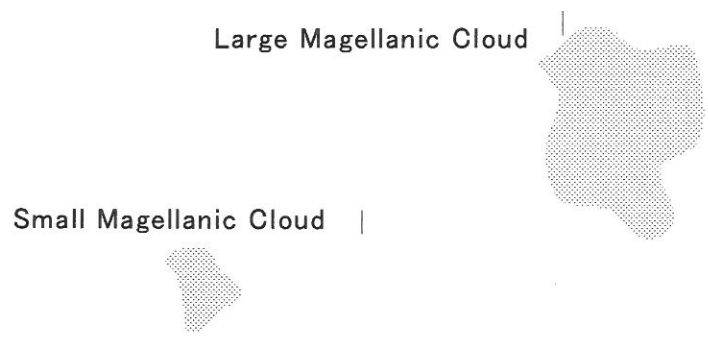
N	S	N	S	N	S
12/31	12/31	5/10	8/22	9/10	4/22
1/10	12/21	5/20	8/12	9/23	4/12
1/20	12/11	5/31	8/1	9/30	4/2
1/31	11/30	6/10	7/23	10/10	3/23
2/10	11/20	6/20	7/13	10/20	3/13
2/28	11/2	6/30	7/3	10/31	3/2
3/10	10/23	7/10	6/23	11/10	2/20
3/20	10/13	7/20	6/13	11/20	2/10
3/31	10/2	7/31	6/2	11/30	1/31
4/10	9/22	8/10	5/23	12/10	1/21
4/20	9/12	8/20	5/13	12/20	1/11
4/30	9/2	8/31	5/2	12/31	12/31

Polar alignment in the Southern Hemisphere follows the same procedure as the Northern Hemisphere, except that due to the fact that the stars move in the opposite direction the reticle and offset scale are reversed.

On the previous page the chart for the time and date scale of values marked S must be used. With this in mind, the polar alignment process is as follows.

1. Set the motor drive in Southern Hemisphere operation mode by hand controler.
2. Locate the star Sigma in the constellation Octans. See the finder chart below.



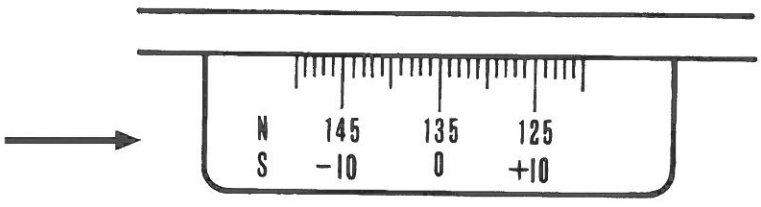


The star Sigma forms a trapezoid with the stars Chi, Tau, and Upsilon.
Study the diagram on the previous page.

1. Locate the star Sigma Octans.
2. Determine the longitude of the observing site and subtract it from the mid longitude of the time zone. If the longitude is greater, then it will be a plus value, and if the longitude is less, the difference will be minus.
3. Set the longitude differntial scale to the + or - value. See scale illustrated below.
4. Level the head by rotating the polar axis until the bubble in the level is in between the red lines.
5. Using the conversion table, match the time to the date.
6. Move the Sigma on the line that forms a right angle with the line marked "90" which is the position for the Sigma for 2001.

Polar alignment is now completed.

As a final note for polar alignment, once polar alignment has been achieved in either Hemisphere, lock the position of the pole stars with the locking handle. Remember to unlock the handle for subsequent polar alignment.

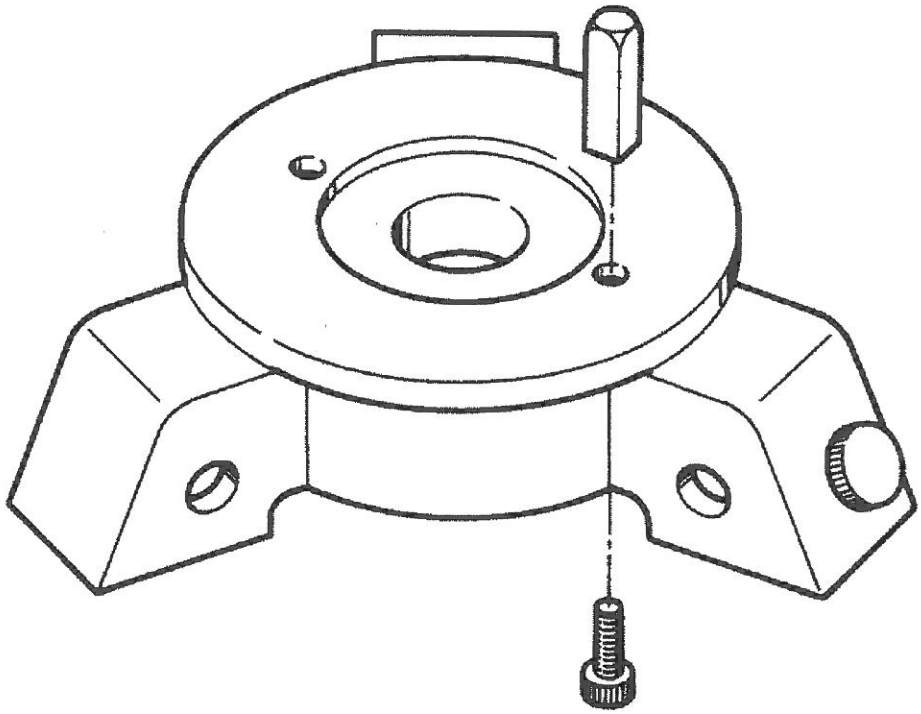


Polar Alignment below 20° Latitude

The EM-200 Temma2M mount will permit accurate polar alignment down to a latitude of 0° . If the EM-200USD3 will be polar aligned at latitude of 20° or less, provision has been made to permit the counterweight shaft to be depressed until it is perpendicular to the ground.

1. Remove the mount from the tripod adapter.
2. Remove the azimuth peg from the hole directly above one the tripod leg, and place it in the hole between the two remaining legs.
   See the illustration below.

For polar alignment below 20° latitude, move the pin from the primary to the secondary position.



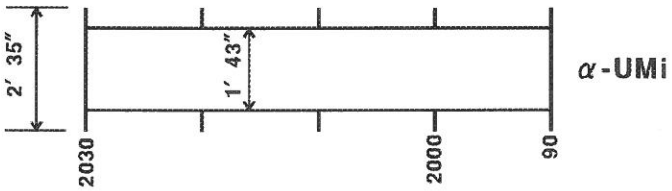
Polar Alignment near the Equator

When the EM-200 Temma2M mount will be used at latitudes below 20° , the atmosphere will refract the image sufficiently to make accurate polar alignment almost impossible. Provisions have been made with the reticle, and with the chart below to permit accurate polaralignment at these low latitudes.

When polar alignment is attempted:

1. Consult the chart below to see the amount that the Polaris is re fracted by the atmosphere.
2. Understanding the size of the reticle, see the diagram below and offset the image of the Polaris the desired distance below the reticle. Now the EM-200USD3 can be accurately polar aligned at these lower latitudes.

10°	0° 5′ 17″
20°	0° 2′ 38″
30°	0° 1′ 40″
40°	0° 1′ 09″



Astrophotography

The EM-200 Temma2M has been designed to provide a stable and highly accurate platform for astrophotography. The following is the procedure to be used to set and precisely align the mount.

1. Polar align.

2. Then, using the drift method which will follow to precisely align the polar axis, proceed with Step No.3.

3. Drift method for precise polar alignment

   A. Insert the Vari-Extender or Barlow lens and use an illuminated reticle ocular. The higher the magnification, the more pricise the alignment will be.

   B. Locate a bright star near the meridian and within 5° of the celestial equator. The celestial equator is 0° Dec..

   C. Place the star at the center of the crosshair of the reticle.
   Change the motor control to the High Speed mode, and press one of the Dec. buttons. Note the direction in which it moves.
   Turn the reticle until the movement of the star is parallel to one of the crosshairs. Then move the star until it moves along the crosshair when the Dec. button is pressed.

   D. Monitor the Dec. drift along the crosshair, and using the azi muth adjusters, keep centering the guide star until all of the Dec. drift stops. Ignore any drift in the R.A. axis.

   E. Repeat the same procedure with a bright star 20° above the Eastern within 5° of the celestial equator. Monitor the Dec. drift only, and make corrections for the centering corrections with the altitude adjuster. Remember continue the corrections until all of the Dec. drift stops. This will eliminate Dec. corrections during any astrophoto session.

How to use the motor drive system

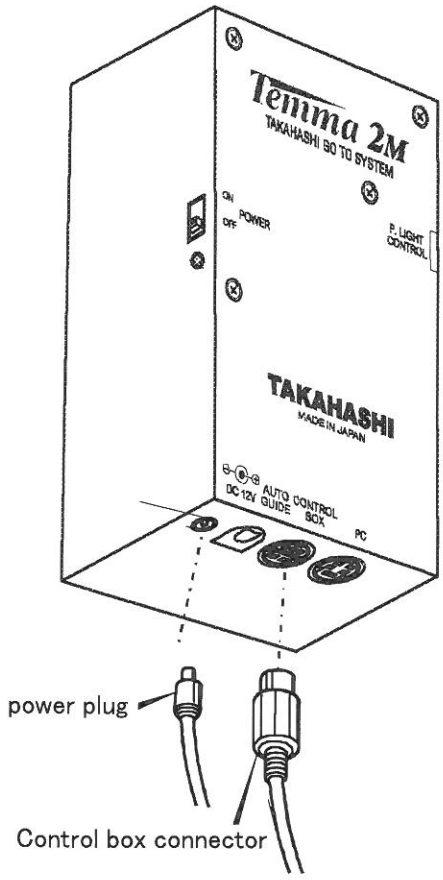
The EM-200 Temma2M mount is a dual axis mount that is controlled by an attachable hand control that allows any object to be placed in the center of the field of the telescope or for precise centering.
Study the layout of the connectors located on the underside of the Dec. assembly to properly use the mount. Refer to the Fig. 36.

■ Connecting the control box

Carefully insert the control box cable into the control box socket. Note the pin arrangement before carefully inserting the cable into the connector. Fig. 36 illustrates the pin arrangement. It is a good idea to paint the arrow on the plug with white out so that it can be easily seen in the dark.

■ Connecting the 12v DC power source

Be certain that the power switch is in the OFF position before connecting the power source. If alligator clips are used, clip the red clip to the red terminal and the black alligator clip to the black terminal.
Then carefully insert the power plug into the DC 12V plug making certain the plug makes total contact without forcing it.
Finally, after the power cable has been properly connected then the power switch can be turned on.



■ Turning on the power

Connect the control box and the power cable and then turn on "POWER" switch. Then, the POWER indicater is lit in red. Turn MOTOR switch on.

Motor Drive Selection

■ Star/Sun & S/N switching

The Motor Drive Selector Switch set the drive rate for the motor. By turning the selector switch and looking into the window at the top you can choose:

1: Northern Hemisphere sidereal rate
2: Northern Hemisphere solar rate
A: Southern Hemisphere sidereal rate
B: Southern Hemisphere solar rate

[Note] Be careful to set the drive at the desired rate. The mount will only operate on these four settings. Set the rate in daylight.

■ Sidereal Rate

Set the dial at 1 and make sure of connections of the control box and the power cables. When the power swtich is on, the motor starts to run at the sidereal rate in the Northern Hemisphere. Make certain the power indicator is lit. When this mount is used in the Southern Hemisphere, its polar axis is aligned to the South pole. So, set the dial at A to drive the motor at the sidereal rate in the Southern Hemisphere. The dial operation will be necessary to use the mount either in the Northern Hemisphere or in the Southern Hemisphere. Be careful to use it to avoid any possible wrong operation of the motor drive.

■ High Speed Mode

The EM-200 Temma2M is designed to include a high speed set motion for both axes. The can be used to move the mount to a desired location without using the "go to" operation or fast motion to move an object to the center of a field of view of the finder or telescope.

Flip the switch to the NS/ HS mode to the HS [High Speed] position. The drive light will change from green NS [Normal Speed] to red for high speed operation. Look into the eyepiece and press the red RA up button and see if the star moves to the right. If it does not, flip the RA mode reversal switch and press the same button. Now the star will move to the right. Repeat the same process with the Dec. up switch and move the Dec Mode Reversal switch so that the star movement moves up when the Dec up button is pressed.

When this has been done hand guiding and slewing of the mount will become easier. [Note: Both the RA and Dec buttons may be pressed at the same time to speed up the slew time.]

※LED located by each button will be lit when the mount is moving to the direction instructed by the button. The R.A. drive button can instruct speed-up or slow-down to the sidereal rate so one of the LED will be lit because the moving direction of the mount is same, high or low in speed.

■ Centering

Due to errors in polar alignment and atmospheric refractor it may become necessary to re-center an object in the field of view or move the object to another part of the field. This is especially true with cometary motion.

The EM-200 Temma2M has been designed to include centering buttons for RA and Dec. The centering speed is set turning the R.A. and Dec. centering speed dials.

1. R.A. Centering Speed

This dial adjusts the R.A. centering speed form 1% to 99% of the sidereal rate in either direction.

Looking into the eyepiece and monitoring the motion will allow the observer to properly adjust the speed to fill the need.

* These rates have no affect on auto guiding rates set by the customer's computer.

2. Dec. Centering Speed

This dial adjusts the Dec. centering speed from .15" arc/sec per second to 14.85" arc/sec per second in either direction. Observing the motion of a star looking through the eyepiece, with the Dec correction button pressed will allow the observer to adjust to the situation.

* Note this centering speed adjust has no affect on the Dec. auto guiding speed set by the customer's computer.

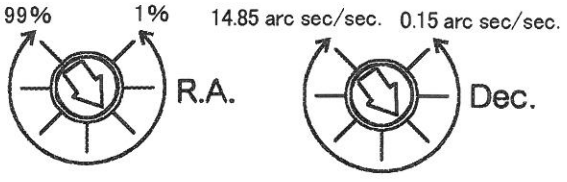


Fig.37

■ Mode Reversal Switches

During and observing session the observer may note that the motion of a star in the field when the centering buttons are pressed does not coincide with the position of the button on the hand control.

For example, if the Dec. up button is pressed the star moves down in the field and if the RA down [left] button is pressed, the star moves towards the center rather that to the right in the field.

This can be corrected by moving the mode reversal switches on the hand control. Moving the switch of either control reverses the motion of the star in the field.

So, by looking through the ocular and noting the motion of the star when the centering buttons are pressed, the observer can make the motion of the star as it is center match the position of the button on the hand control: so that when the Dec. up button is pressed the star moves up in the field and when the RA down button is pressed the star moves to the left side of the field and the observer has complete control of the centering motion of the star in the field of view.

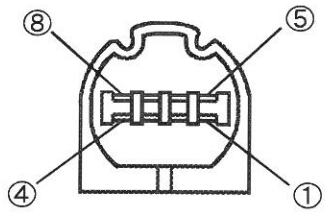
Note: When the observer presses any of the centering buttons the indicator next to that button will illuminate.

■ Auto Guide Connector

The EM-200 Temma2M is provided with a new style auto guider connector input. The EM-200 Temma2M is supplied with the standard RJ-14 connector common to most auto guider cameras.

> **⚠ Warning**
>
> Under no circumstances should the mechanical of electrical components be modified by the user. any repair or adjustment must be made by the Takahashi service center to maintain the warranty. Failure to comply with this requirement will void the warrnaty.

■ Auto Guide Connector Chart



Terminal arrangement on the mount

Fig.39

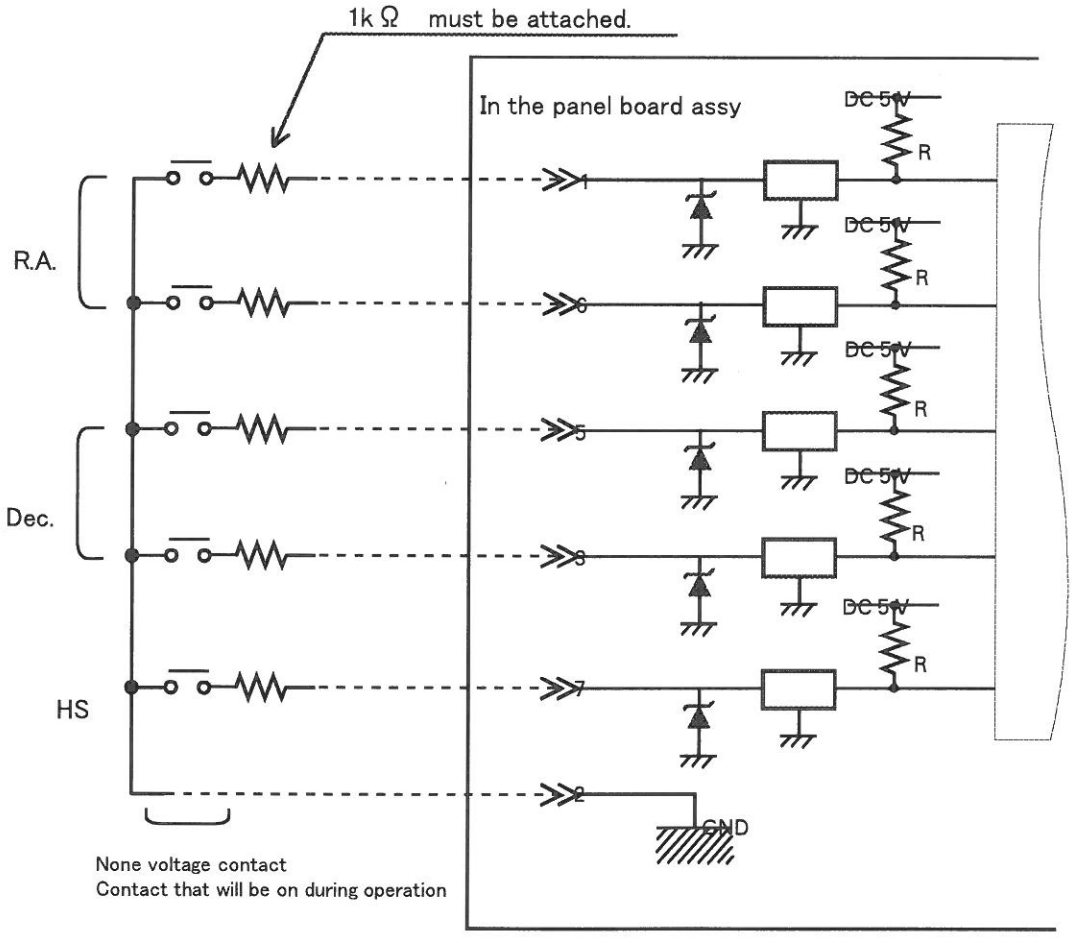


Fig.40

Procedures for Go-To Operation

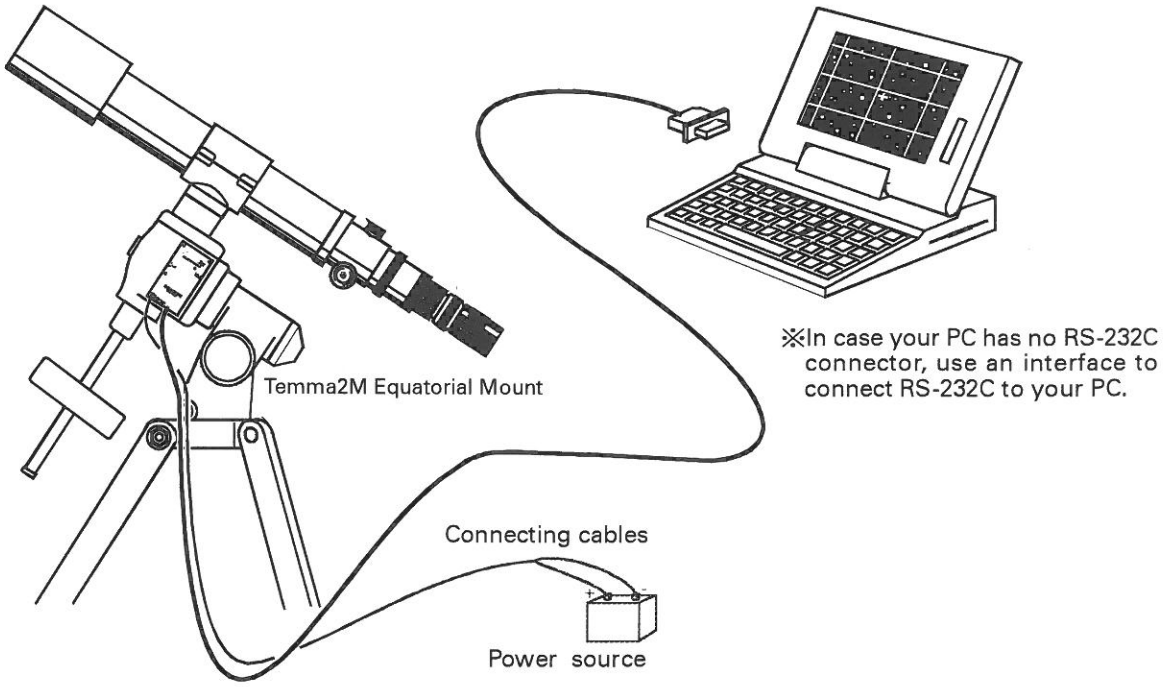
■How to do go–to operation by Temma2M

1. Install the Pegasus-21 disc into a PC or a conformed go-to soft.
2. Align the go-to mount precisely. When the highly accurate alignment is required, do it as precisely as possible. Go-to accuracy is entirely up to the polar alignment.
3. Connect the go-to mount to a PC with the RS-232C cable provided.
4. First, turn on the go-to mount and then turn a PC switch on. Then, actuate the go-to disc.
5. Now follow the instructions described in the Pegasus-21 manual or conformed go-to soft.

■ Shift button

When the direction buttons are pressed while pressing the Shift button, the encoder signals for the direction given by the direction buttons are cancelled and then the correction drive can be done. This is useful to correct the position of the object brought off the center of the view field by go-to operation, without modifying the coordinate of the object.

* In the R.A. direction, the coordinate of the object can vary due to the backlash of the gearing. In this case, reset the position so that the pointer and the coordinate syncronize each other.



⚠ Warning

- When an object near the zenith is to be viewed, set the tube assembly and the equipment so that that instrument or any accessory will hot hit the mount when the instrument is turned towards the zenith. This can accomplished when the instrument and packing are being balanced. It is then easy to move the instrument to any position and chech to see if everything will clear the mount. Doing so will insure no trouble of "go to" operation of the EM-200 mount.

- Be certain, before operation, that go-to can be done safely. Youmust be always ready for an emergency.

- The go-to mount will give out emission, which may affect medical instruments.

How to use the setting circle

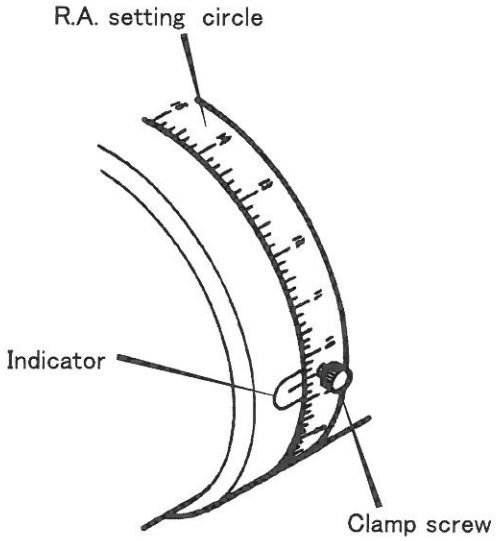
If you would like to locate a faint object that cannot be seen in the finder, then setting circles can be used to locate a faint nebula. The following procedures are to catch the object(a nebula) plotted at the below, for example.

1. Align the polar axis precisely.

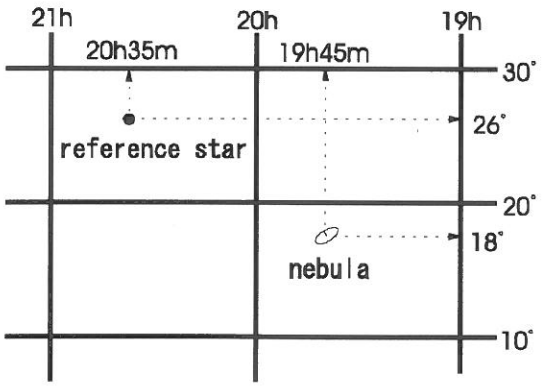
2. Read out, from the sky chart or the star catalogue, the R.A. and the Dec. of the nebula and the reference star(a bright star near the nebula) .

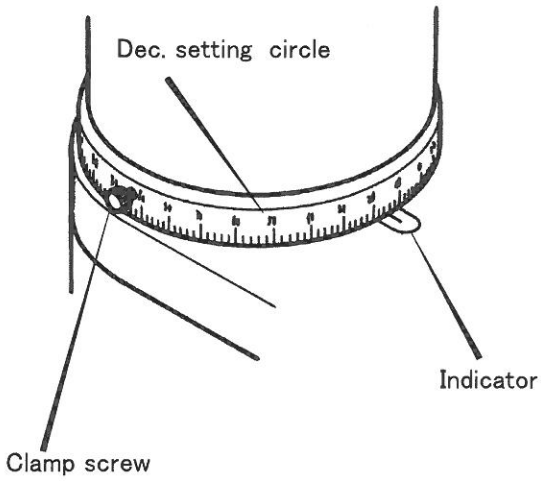
3. Guide the reference star into the view field of the finder scope and fix it at the center of the crosshairs.

4. Loosen the clamp screws of the both axes and set the indicator at 26° on the Dec. and at 20h35m on the R.A., turning the setting circle.



5 .Loosen the clamps and move the both axes until indicator is set at 18° on the Dec. and 19h45m on the R.A.





Now that the nebula has been observed, if another object is to be viewed, reset the R.A. circle to the original setting and move on to the next object. Remember that since the R.A. circle is not driven, it is always necessary to reset the R.A. circle to the read the R.A. of the object being observed in order to properly locate the next object to be viewed.

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