Equatorial Mount

EM-200

Temma 2Z

Instruction Manual

TAKAHASHI

Thank you for your purchase of the EM-200 Temma-2Z mount. This highly sophisticated mount is perfectly suited to any number of imaging or visual applications. In order to be able to operate the EM-200 Temma-2Z to the limit of its capabilities, read this manual thoroughly and familiarize yourself with the correct operation of its many features and functions. Properly used the EM-200 Temma-2Z will deliver a lifetime of operation.

The mount has been thoroughly tested and inspected by highly trained factory personnel. If there is a problem with the mount, please contact your local authorized Takahashi distributor for immediate service.

Warning & Caution

⚠ WARNING

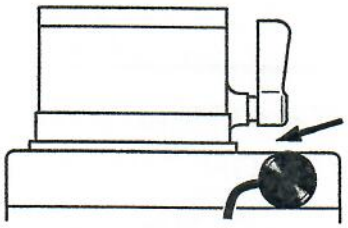
NEVER ATTEMPT TO VIEW THE SUN DIRECTLY THROUGH THE TELESCOPE OR FINDER. DOING SO WILL CAUSE INSTANT BLINDNESS DUE TO THE INTENSE LIGHT AND HEAT OF THE SUN.

⚠ CAUTION

- When the tube is placed in the tube holder use caution to prevent pinched fingers and carefully place the tube into the cradle of the tube holder. Do not overtighten the tube holder clamps which could distort the tube and cause decollimation.
- Place the mount tripod on the flattest ground at the observing site to provide a stable base for the mount.
- Exercise great caution when sliding the counter weights on to the counter weight shaft after the weight has been attached, attach the safety nut which prevents the counter weights from falling on to the ground causing severe damage to anything it falls on.
- When the mount is moved to change the direction where it is pointed, be careful not to pinch a finger.
- Never under any circumstances allow the mount to get wet from rain. Moisture will short circuit the electronics and wash out the mount's 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.

Precautions

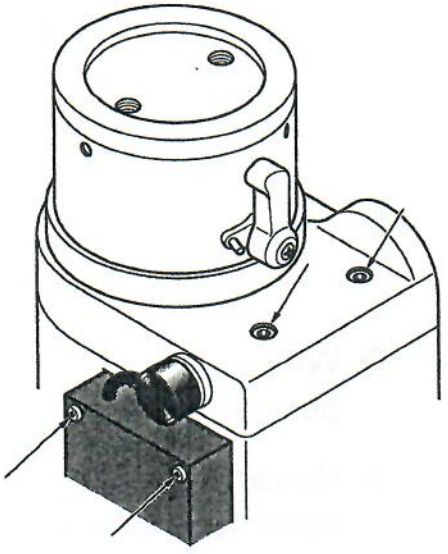
1. Whenever one of the mount clamps is loosened hold the tube assembly with the other hand to keep it steady. If it is unbalanced the tube could run into the mount damaging the telescope or cause injury. Refer to the illustration at the right.



2. Replace the polar telescope covers immediately after the mount is aligned. The covers seal the polar telescope from moisture that could collect inside the mount.

3. A special grease is used to lubricate the mount. Therefore, never use machine oil or any other lubricant for the mount. This grease is designed to last a very long time. Using either of these will cause the mount not to perform properly.

4. The grease used will not need replacing for a long time. If the grease does run out contact your local distributor.



5. The mount has been precisely adjusted at the factory. Never loosen the screws illustrated at the right. Also do not remove the control panel. Doing so will void the warranty.

7. The mount is designed to operate with a 12V DC power source. Using any other voltage will cause damage to the electronics.

Contents

Specifications

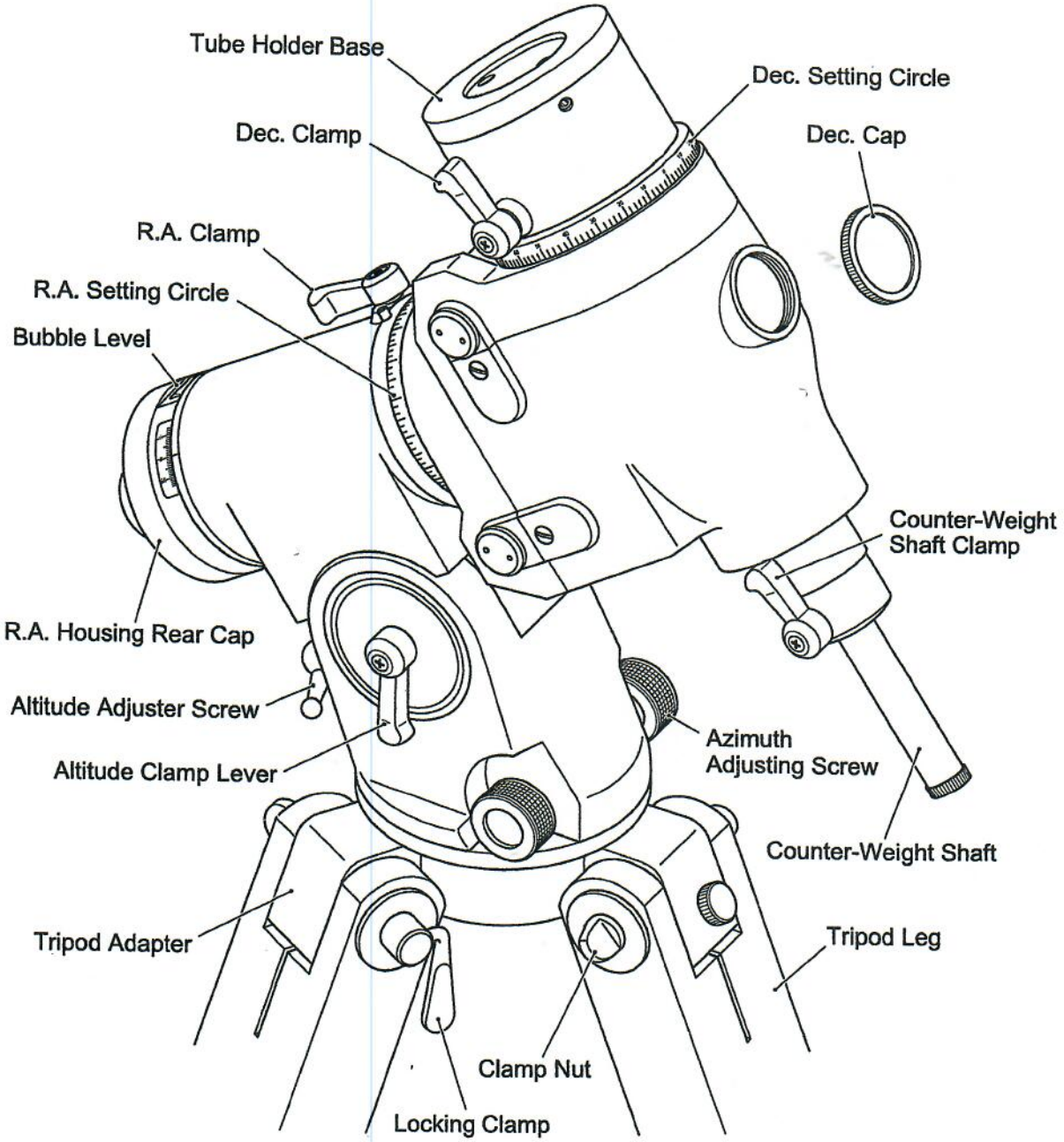
◆ Temma-2Z

Type	Dual Motor driven German Equatorial Mount
R.A.	All round worm wheel, reduction rate: 180:1
	Motor driven by stepping motor (none manual)
	High/Normal speed switching
Declination	All round worm wheel, reduction rate: 180:1
	Motor driven by stepping motor (none manual)
	High/Normal speed switching
Azimuth Slow Motion	By double screw adjustable +/-15 degrees
Altitude Slow Motion	By screw adjustable 0 – 50 degrees
Setting Circle	R.A.: 10 minutes increments
	Dec.: 2 degrees increments
Loading Capacity	About 17kg (34lbs)
Deadweight	16.5kg (33lbs) w/o counter-weight
Polar Telescope	Built-in with 2'setting accuracy
	Reticle Pattern, illuminated
	Quick Reference for hour angle
	Precession adjuster increments for Polaris
	Precession adjuster increments for Sigma in Octans
	Bubble level built-in
Accessories	Counter-weight 5kg x2, Control Box, Power Cable,
	Tools

◆ Motor Drive

Driving System	Dual axes, quartz control, rotating error +/-0.05% (to the sidereal rate)
Usable Area	Global area (limited in latitude)
Highest Speed	700x sidereal rate
Speed for correction	R.A.: 0.01 – 1.99x (stepless to the sidereal rate) Dec.: +/-0.15 – 14.85 sec/arc sec (stepless) Speed controlled by the controller
Power Source	Rated DC 12V
Power Consumption	Sidereal Rate : about 0.8A Dual Axes Input (Max) : about 3.5A (5.1A)
Go-To Soft	Super Star V etc
Optional Parts	Auto-Guider Cable (ST-4, -7, STV, Star Shoot)

Layout of the EM-200 T-2Z Equatorial Mount



Control Panel

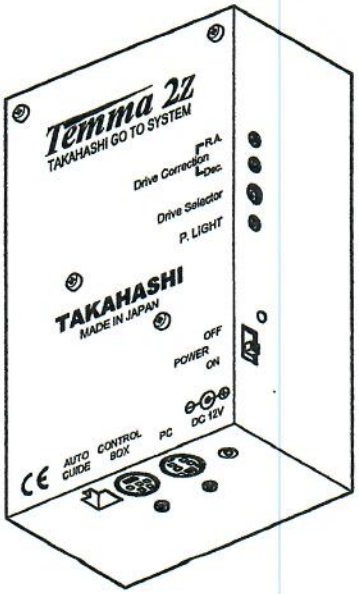
◆ POWER [LED synchronize]
When the POWER switch is ON, the LED lights and the power for the system is on.

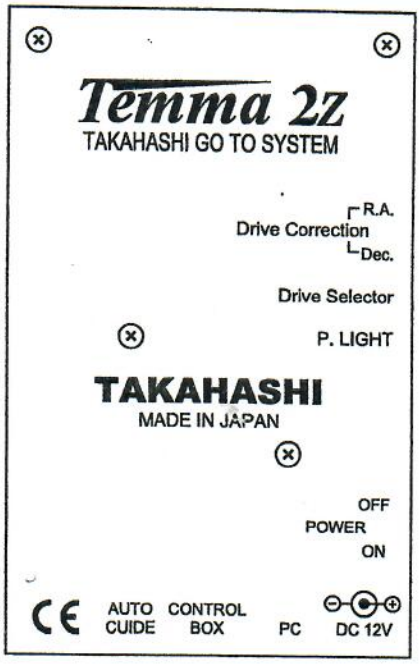
◆ Drive Correction R.A.
In NS (normal speed) operation, when the R.A. drive button is pressed, the speed variation can be set at 1% – 99% to the sidereal rate.

◆ Drive Correction Dec.
In NS(normal speed) operation, when the Dec. drive button is pressed, the speed variation can be set at +/-0.15 – 14.85 sec/ arc sec to the sidereal rate.

◆ Drive Selector
The switch can reverse the rotation direction of the drive motor.

◆ P-LIGHT
Brightness can be adjusted by turning the slotted screw inside the P-light Control with the provided screw driver. When the brightness control screw is turned, do so carefully to insure proper control of the illuminator.





◆ DC 12V
When the power is connected, the power is supplied to the mount. Connect the red alligator clip for + (plus) and the black alligator clip for – (minus). The T-2Z mount is operated at the rated DC 12V only.
Be sure to use the rated power source.

◆ AUTO GUIDER
This is the connector for an auto-guider cable.

◆ CONTROL BOX
This is the terminal for connecting the control box.

◆ PC
This can connect the mount to a PC with the RS232C cable.

(Note)
A lose connection for any cable to the control panel could cause failure. Make certain that each connector is firmly connected.

◆ Control Box

1. R.A. Drive Button [red]
   When pressed will drive the mount in the R.A. axis.

2. Dec. Drive Button [blue]
   When pressed will drive the Dec. axis in either direction.

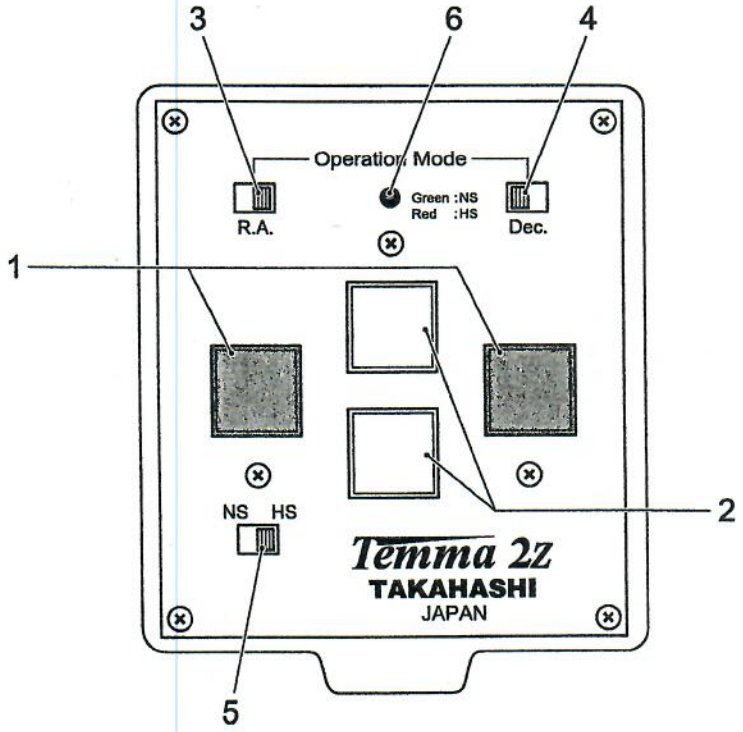
3. Mode Operation Switch [R.A.]
   This switch is used to synchronize the movement of the star with the when the R.A. buttons are pressed to move the R.A. axis speed up or slow down.

4. Mode Operation Switch [Dec.]
   The button can synchronize the movement of a star in the field of view when one of the Dec. buttons is pressed. When done properly the movement of the star in the field of view will coincide with the button on the hand control pushed: R.A. speed up or slow down or Dec. up or down. This is a convenient feature to enable guiding.

5. Driving Mode Switch
   This switch determines the drive weight between NS Normal Speed to HS High Speed used for drive correction.

6. Driving Mode Indicator
   The indicator is lit in red at the High Speed Mode and in green at the Normal Speed Mode (Guiding Correction).

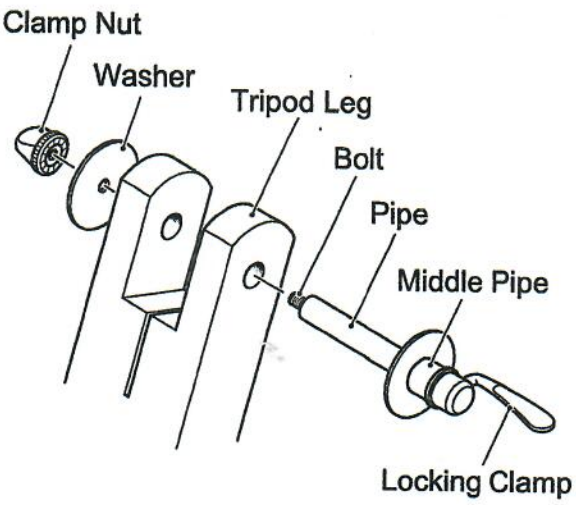
(Note)
The cable connected to the control box is not detachable. Do not pull it out.



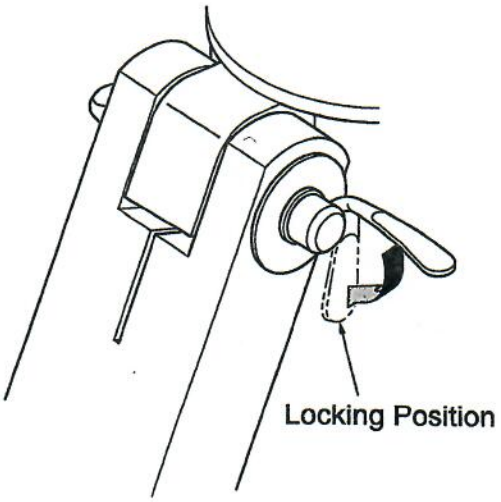
Assembling the Equatorial Mount

◆ **Tripod**

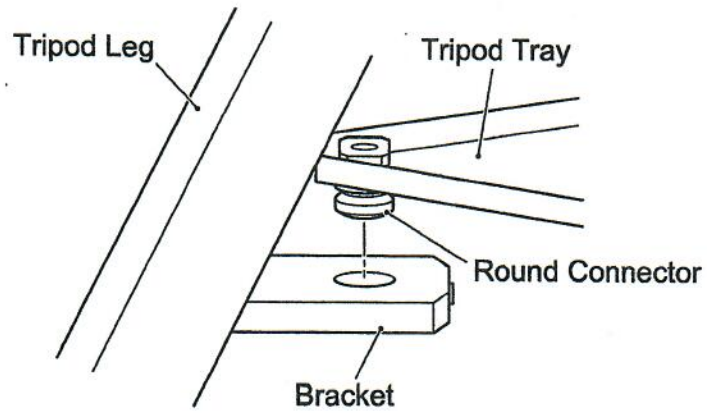
1. Set the tripod adapter in the slot of the leg and assemble the bolt and lock nut as shown at the right. When tightening the lock nut, leave enough space for the locking clamp to pull the assembly together. Repeat the process with the other legs.



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

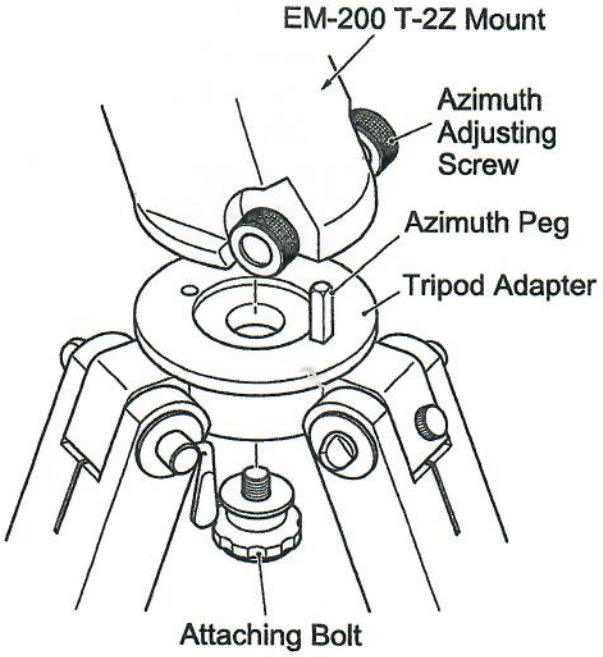


3. The final step in the assembly of the tripod is attaching the tripod tray onto the legs. Insert the round connector into the hole of the bracket on the tripod leg. It will pop in. Now the tripod will provide steady support for the mount.



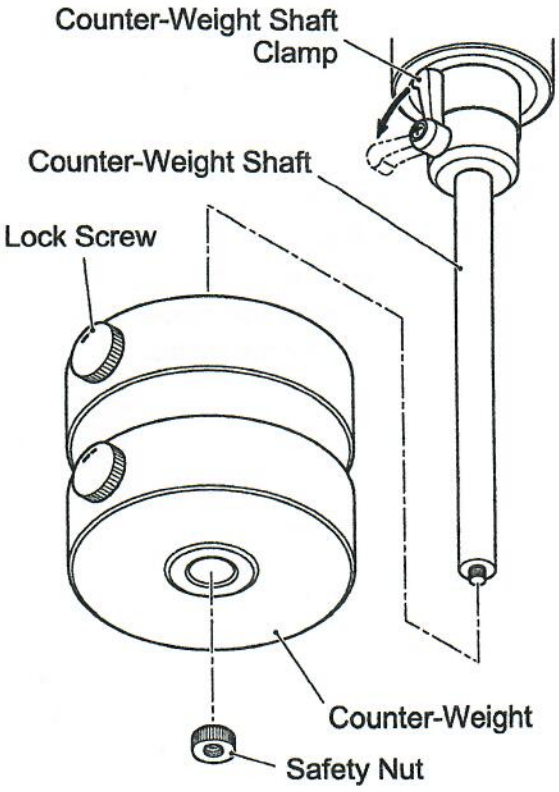
◆ Setting up the Mount

Now that the tripod legs and tripod tray have been assembled, the EM-200 T-2Z Mount can be set onto the tripod adapter. Set the mount on the adapter so that the azimuth peg is set between the azimuth adjusting screws. Be certain the azimuth adjusting screws have been unscrewed to allow the peg to be set in between them. The azimuth adjusting screws are set into the azimuth housing. See the illustration at the right.
Then, insert the attaching bolt into the base of the mount and tighten it until the mount is held in place. Nonetheless, do not tighten the bolt too much. Leave it loose enough to permit the mount to pivot as the azimuth adjusting screws push against the azimuth peg. This is absolutely necessary in order to polar align the EM-200 T-2Z Mount. As soon as the mount has been polar aligned the attaching bolt can be properly tightened.



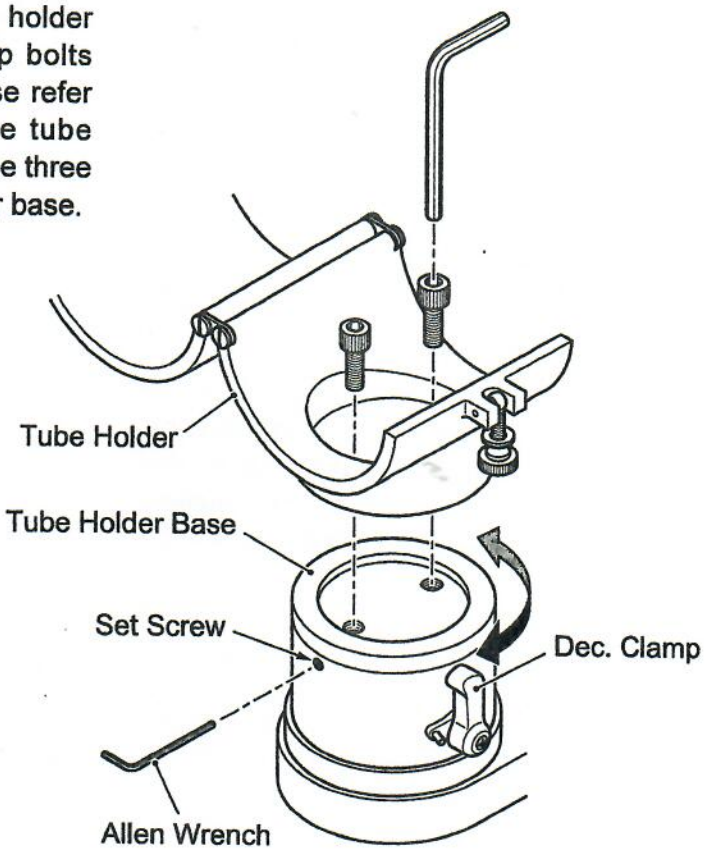
◆ Attaching the Counter-Weight

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 (5kg). So be careful not to drop it on your foot while attaching the weights.



◆ Attaching the Tube Holder

The correct way to attach the tube holder to the mount is to use the two cap bolts provided with the tube holder. Please refer to the illustration at the right. The tube holder base can be turned, loosing the three set screws which lock the tube holder base.



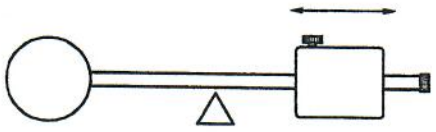
Balancing

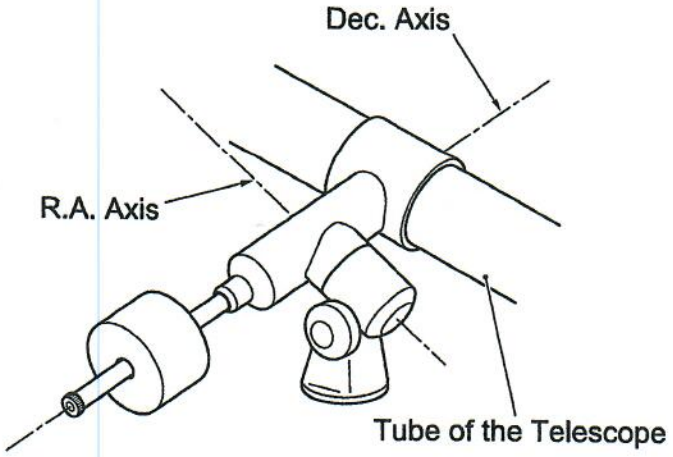
After a telescope has been set into the tube holder, the next step is balancing.

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 even 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 counter-weight(s) and slide them in either direction until the package is balanced.



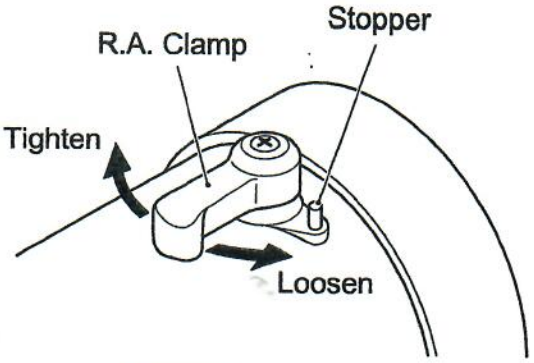


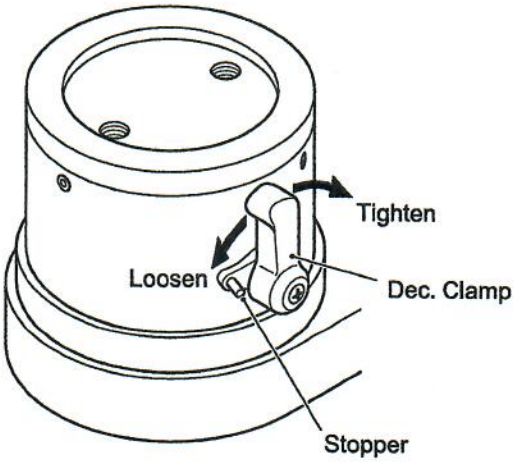
Coarse and Slow Motion

The coarse and slow motion functions are provided with the mount to point a telescope to a desired object in the sky. Correct use of these functions allows you to locate and observe the desired object rapidly.

◆ Coarse Motion

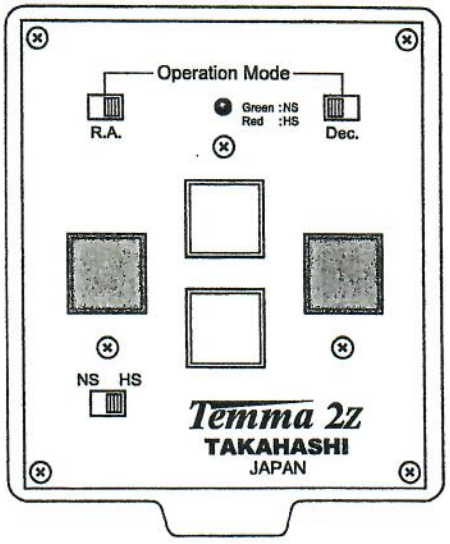
This function is used to bring quickly a desired object into the view field of a finder scope. Loosen the R.A. and Dec. clamps to move the mount freely. Then, you can point your telescope freely to a desired object quickly, looking into the view field of the finder scope. As soon as the desired object has been guided into the view field, lock the clamps. This is Coarse Motion.





◆ Slow Motion

After the clamps are locked, engage the motor drive to keep the desired object in the view field. Then you can guide the object on to the crosshair of the finder scope attached on your telescope, using the motor drive function. The magnification of a telescope is too high to guide the desired object in the center of the view field, while the one of a finder scope is moderate to guide the desired object at the crosshair of the finder. When you want to guide the object on to the crosshair of the finder scope, use the 4 button operation at high speed mode of the motor drive.



Azimuth and Altitude Adjustments

When polar aligning, point the polar telescope at the north or the south celestial pole. However, since the azimuth adjusting screws has a narrow range, it is best to point R.A. axis as close as possible to the pole star of Polaris and Sigma in Octans before making adjustments with the altitude and azimuth adjusters.

◆ Azimuth Adjustments

The azimuth adjusting screws are provided to allow the R.A. axis to be moved left and right in the field of view of the polar telescope using the azimuth adjusting screws. In case the R.A. axis is moved in the direction indicated by the thick arrows: Use the following procedure.

1. Turn the azimuth screws in the direction indicated leaving the screws a bit loose.
2. Looking into the polar telescope, turn the azimuth screw little by little in the same direction as screw #2.
3. When Polaris is set in the correct position, turn the screws in opposite directions against each other to lock the adjustment.

(Note)

When the R.A. axis is moved in the opposite direction indicated by the thick arrow, first loosen screw #1 and the loosen screw #2.

In the event that the adjustment cannot be made with the range of the azimuth adjusting screws, reset the screws to their original position and start again.

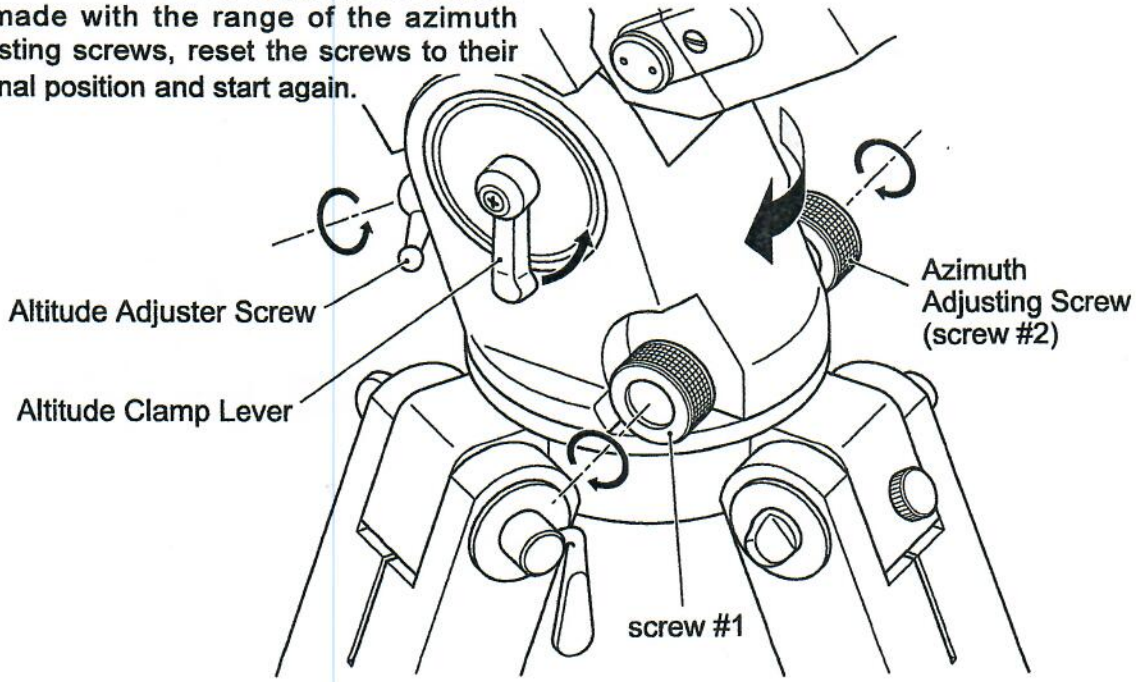
◆ Altitude Adjustments

Altitude adjustments move the reticle up and down in the field of view of the polar telescope.

1. Loosen the altitude clamp a little bit.
2. Turning the altitude adjuster screw in the direction shown will cause the axis to rise to a higher latitude and conversely turning it in the opposite direction will cause the axis to go down to a lower latitude.
3. When Polaris is set in the correct position tighten the altitude clamp.

(Note)

Using the altitude and azimuth adjusters Polaris can be positioned precisely in the field of the polar alignment telescope. For further details, please refer to "Polar Alignment"

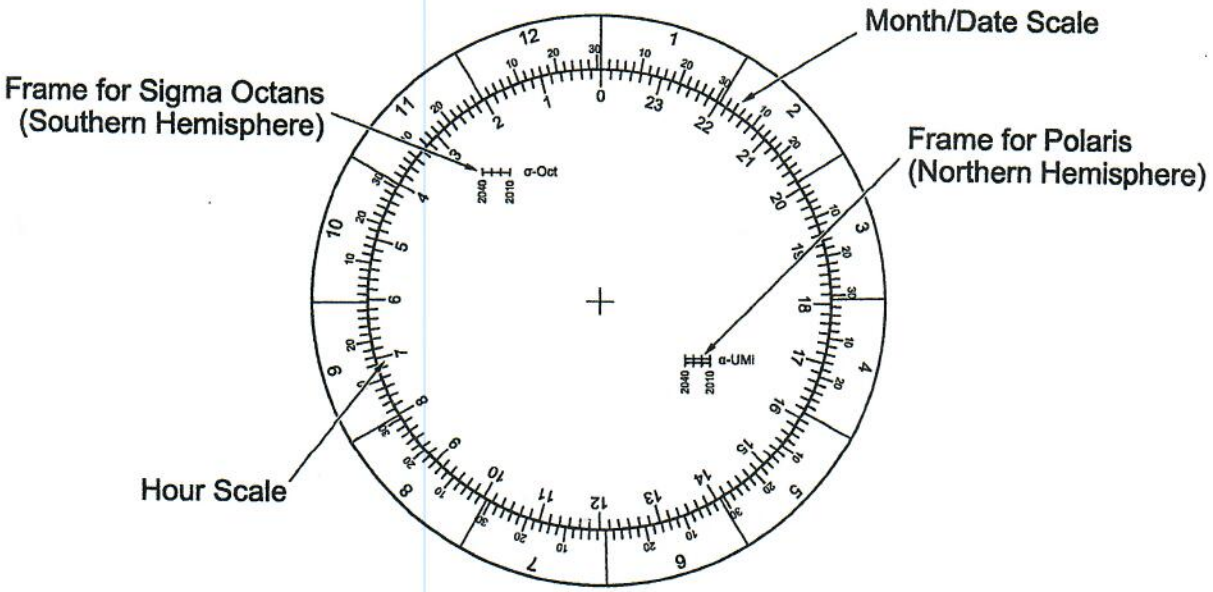


Polar Alignment Telescope

In order to track accurately, it is necessary to precisely polar align the axis to the North or the South Pole. The simples method for alignment is to use Polaris in the Northern Hemisphere and Sigma in Octans in the Southern Hemisphere using the built in polar alignment telescope. The built-in polar alignment reticle used for the EM-200 T-2Z with the rotatable reticle allows for easy and precise polar alignment.

◆ Reticle Pattern

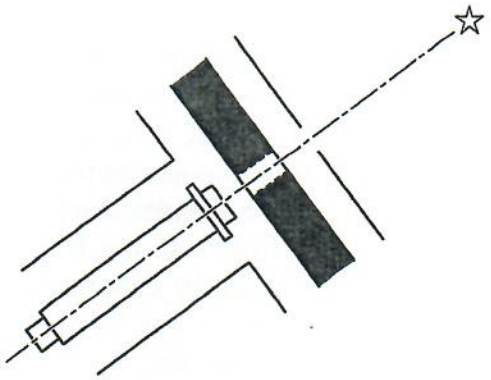
First remove the covers from the polar alignment telescope and extend the Dec. shaft and turn it until the hole in the shaft lines up with the reticle in the end of the polar telescope. Now the reticle can be seen when the polar telescope is viewed through. When the polar telescope is turned the outer reticle inscribed with the months 1-12 and days, the polar star reticles and the cross in the center turn to allow the correct position for the pole stars to be set.

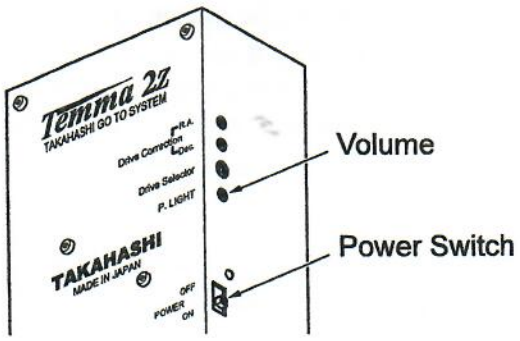


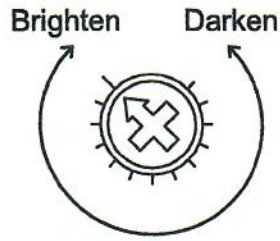
◆ Reticle Illuminator [P-LIGHT]

In order to see the polar alignment reticle an illuminator is set in front of the polar telescope to illuminate the reticle.

1. Remove the Dec. cap and the R.A. cap.
2. Pull out the counter-weight shaft to clear the polar axis hole. Then, loosen the Dec, clamp and turn the Dec. housing to see the hole provided near the objective lens of the polar telescope. The polar alignment is made through this hole.
3. Turn the power switch ON and then the reticle illuminator is lit. Brightness can be adjusted by the volume knob with the driver provided.
   Refer to the illustration at the right.
4. Adjust the brightness so that you can easily see Polaris or Sigma in Octans.
   Refer to the illustration at the right.



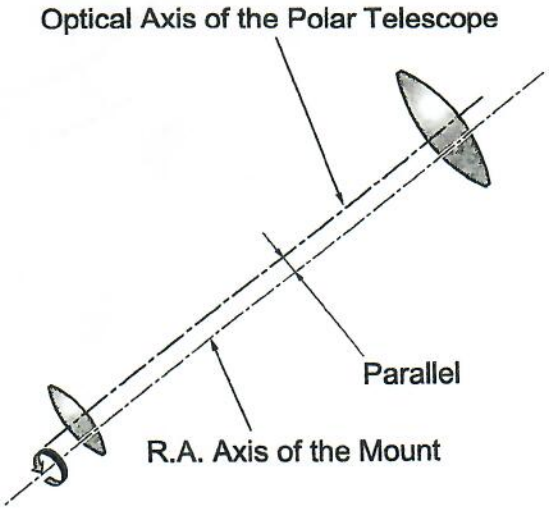




> **⚠ Caution**
>
> If the brightness control must be turned, be very careful to prevent it from breaking.

(Note)

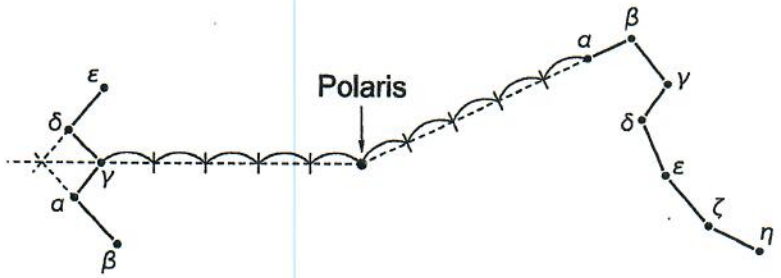
When the mount is turned coarsely after loosening the clamp, the center of the reticle pattern is turning as if it is turning off from the axis of rotation. This is not off axis of the polar telescope, but the rotation axis is off in parallel from the optical axis of the polar telescope. This is caused by looking at Polaris at infinity and does not affect polar alignment.



Polar Alignment

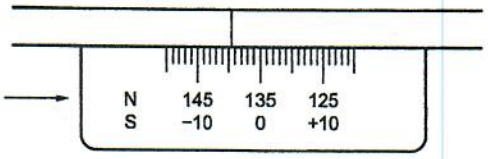
◆ Polar Alignment in the Northern Hemisphere

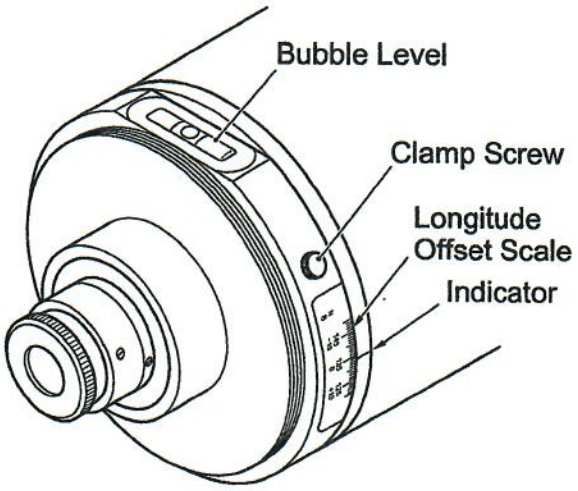
Polar Alignment in the Northern Hemisphere uses Polaris as the alignment star. Make an imaginary line between the pointer stars in the cup of the Big Dipper and middle star gamma In Cassiopeia. Since Polaris is a second magnitude star it will be easier to spot.



◆ Polar Alignment Procedures

1. Check the latitude of the observing site.
2. The numerals written on the N line of the offset scale represents the longitude. Loosen the clamp screw of the bubble level and adjust it so as it shows the longitude of the observing site and then lock the clamp.





▼ When the mount is used in overseas observing site, use the S line.

a. (Longitude of the observing site) – (Longitude of the local standard time)

b. Apply the below-mentioned table, up to the adjusting direction (+) or (-).

c. The resulted value is the adjusted one.

	Northern Hemisphere	Southern Hemisphere
Longitude East	Change the mark	No change
Longitude West	No change	Change the mark

3. After the mount is assembled, turn the Dec. axis so that Polaris can be seen through the polar telescope.

4. Adjust the azimuth and the latitude adjusters so that Polaris is placed at the view field.

5. Loosen the R.A. clamp and turn the R.A. axis so as to make bubble level horizontal and then tighten the R.A. clamp. It is a good idea to make the bubble level horizontal, turning the motor drive after adjusting the bubble level roughly.

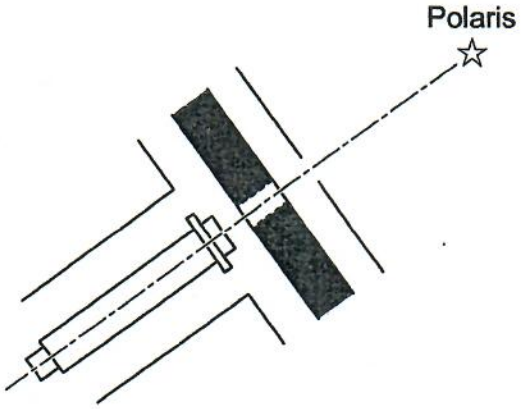
6. Turn the eyepiece of the polar telescope and adjust the month/date scale to the month/date of the observing day.

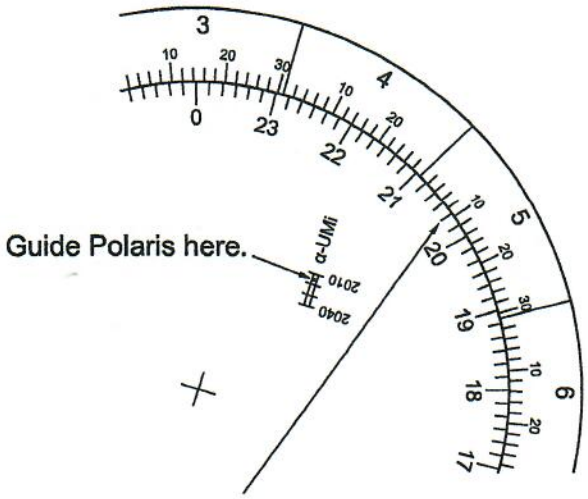
7. Bring Polaris to the frame with α-UMi, adjusting the azimuth and the latitude adjusters. The guiding position will be the one with the date of observation, estimated position with the Christian Era scale.

8. When Polaris is guided in place, tighten the latitude adjuster clamp to lock.

(Example)
In case of May 9, 2015 at 8:20PM, set the dial as illustrated at the right. To make it certain, advance the date increment up to the time. For example, since 8:20PM, May 9 is near May 10, it will be good to set the increment nearer May 10.

In case of 2015, using the frame with α-UMi, Polaris is placed in between the precession scale of 2010 and 2020.





Guiding position at 20:20PM, May 9, 2015

Motor Drive

The EM-200 T-2Z mount includes a dual axis motor drive controlled by a detachable hand control which allows for precision centering of an object in the field of view of the telescope. There is also a built-in RJ-14 auto guider terminal for use with optionally available auto guider cables.

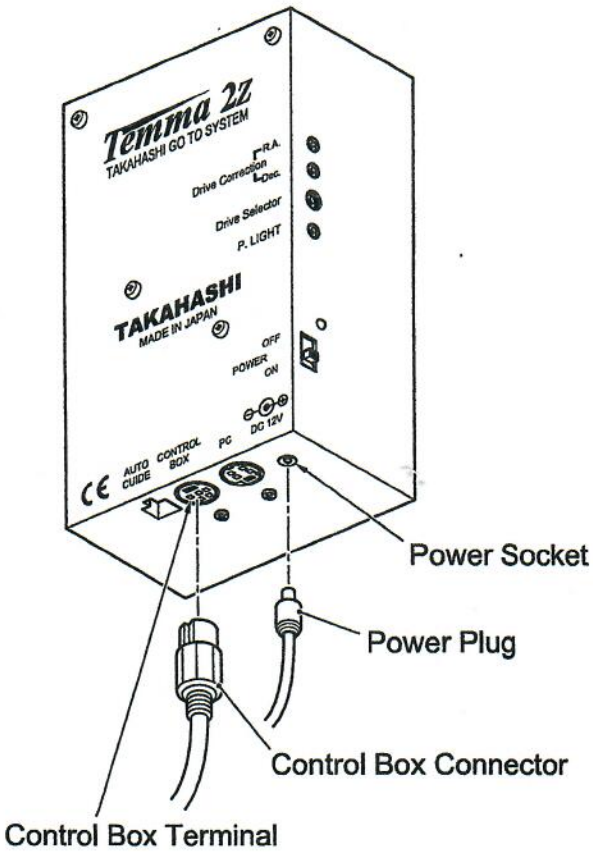
◆ Connecting the Control Box

Carefully insert the control box connector into the control box terminal. Note the pin arrangement before carefully inserting the connector into the terminal. Do not insert the cable forcedly to avoid damages on the connector.

◆ Connecting the 12V DC Power Source

Be certain that the power switch is at the OFF position before connecting the power source. When the alligator clips are connected with the power source, connect the red clip to the red (+) terminal and the black one to the black (-) terminal. Use the power source available in the market.

Then carefully insert the power plug into the DC 12V socket, making certain the plug is totally contacted without forcing it. Finally, after the power plug has been properly connected, then the power switch can be turned on. When the power source of a motor car, use it after the engine has been turned off.



(Note)

The polarity of the EM-200 T-2Z is [+] center. [All Takahashi current mounts use center [+].] [Check the illustration of the control panel shows center +.]

Whenever the power source is connected to the mount be certain that the power switch is in the off position.

◆ Turning on the Power

Connect the control box connector and the power plug and then turn on "POWER" switch. Then, the POWER indicator is lit in red and the R.A. motor will start to run.

◆ Motor Drive Selection

▼Star/Sun & S/N Switching

The Motor Drive Selector Switch set the drive rate for the motor. By turning the dial of the Drive Selector, the Star and the Sun speeds can be selected.
Set the dial at the desired speed.

1. Star speed in the Northern Hemisphere
2. Sun speed in the Northern Hemisphere

A. Star speed in the Southern Hemisphere
B. Sun speed in the Southern Hemisphere

(Note)
In any other position the drive motor will stop and the hand control will not operate.

▼Sidereal Rate

Set the dial at 1 and make sure of connections of the control box and the power cables. When the power switch is on, the motor starts to run at the sidereal speed in the Northern Hemisphere. Make certain the power indicator is lit.
When the mount is used in the Southern Hemisphere the motor drive will run in reverse. So, set the Drive Selector 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 T-2Z Mount is designed to include a high speed set motion for both axes. This can be used to move the mount to a desired location without the "go-to" operation or fast motion to move an object to the center of a field of view of a finder or a telescope. When the Drive Mode Switch is flipped at HS, the Drive Mode Indicator on the hand control box is lit in red showing the current mode is the high speed.

Now the 4 buttons on the hand control box will work for high speed control buttons.

Among the 4 buttons, inner two buttons are for the R.A. driving. The driving direction will be changed up to the setting of the operation mode switch. When the buttons are released, the motor will run again at the sidereal rate. Another two buttons at the up and down positions are used to drive the Dec. The driving direction will be changed up to the setting of the operation mode switch or up to the position of the telescope. When these buttons are released, the Dec. motor will stop.

When the R.A. and the Dec. driving buttons are pressed at the same time, the both axes motors will run together. So, you can do more speedy guiding and slewing. Note that the high speed can not be adjusted.

(Note)
Just after switching the driving direction, there will be a little time lug until the motor restarts to run at the sidereal rate because of a backlash of gearing. Operate your mount being aware of this fact with your mount.

In case the battery is used for the power source, the motor will not run as the voltage is getting lower. Recharge the battery.

▼Guide Correction Speed [Normal Mode]

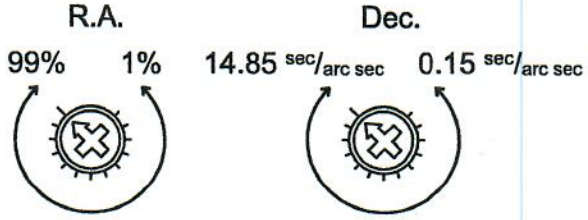
The accuracy of the polar alignment will determine the accuracy of tracking, as well as the mechanical accuracy of the mount and atmospheric refraction. A comet is difficult to track due to its differential motion. Since it does not move at the sidereal rate it will require small corrections in each axis. High speed is too fast so the NS mode can be used to make such corrections Moving the mode switch to NS turns the indicator light green. Then the four buttons will work at the correction speed set.

· R.A. Direction

Correcting in R.A. is controlled by the red buttons on the right and left side of the hand control.Either button can speed or slow down the drive depending upon the position of the mode reversal switch. The rate can be set at ±1% to 99% of the sidereal rate by turning volume control knob on the side of the control box. The motor will run at the set rate up or down when the buttons are pressed and run the mount will run at the sidereal rate when the button released.

· Dec. Direction

Dec. corrections are made and move the mount north [up] or south [down]. These motions are controlled by the red buttons located at the center of the hand control. Depending upon the position of the mode reversal switch either button can move the mount up or down. The correction speed can be set by turning the volume control knob on the side of the hand control adjusting from a rate of 0.15 to 14.85 sec/arc sec. the Dec. motor will run until the button is released.



(Note)

The corrective speed can be set for the R.A. and the Dec. independently.

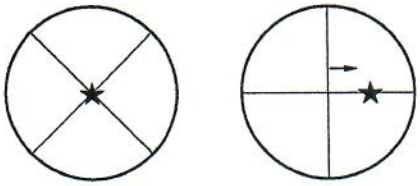
▼Operation Mode

During an observing session, the observer may note that the motion of a star in the view field when the control 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 R.A. down 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 eyepiece and noting the motion of the star when the control 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. button is pressed, the star moves up in the field.

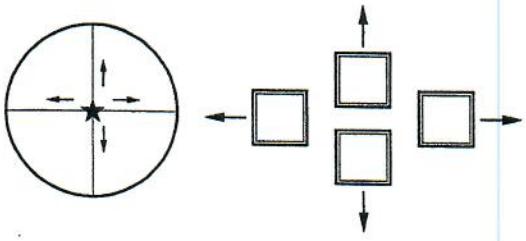
When the R.A down button is pressed, the star moves to the left side of the field and the observer has perfect control of the corrective motion of the star in the field of view. Specifically do the following procedures.

1. Insert the Takahashi guiding eyepiece LG-4 [optional] and center the guide star in the crosshair.
2. Stop the motor drive and watch the guide star drift to the west. This is the R.A. direction and the crosshair perpendicular to the R.A. motion direction is Dec. up or down.



3. Switch on the motor drive keeping the star in the center, then set the crosshair to match the direction of the star.
4. Push the buttons on the hand control to see if the direction that star moves matches the position of the button on the hand control.

a. If the star moves correctly in R.A. but not in Dec., flip the Dec. mode operation switch.
b. If the star moves correctly in Dec. but not in R.A., flip the R.A. mode reversal switch to change the direction of the R.A. movement.
c. If the star moves in the opposite direction in both axes, flip both mode reversal switches.

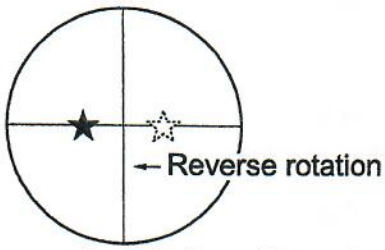


▼How to Use the Driving Button

Gearing of the motor drive has some play [backlash]. A small amount of back lash is present but it can be overcome with correct guiding. Usually this will not affect to the sidereal operation, but in reverse or delicate corrective drive, this will appear as the time lag until the telescope starts moving after the drive button is pressed. This will make it difficult to place a guiding star at the crosshair as you like. In order to avoid the effects by the backlash, a method to overcome this follows.

A. Centering the Guide Star In the Field of View

As to the R.A. direction, there is no problem, but to the Dec. direction, the following case will become a problem. In case an object is centered at the center of the view field by the reverse driving (reverse rotation to the sidereal drive), the object will keep going for a while when the operation button is released and be off from the center. In order to avoid this, overrun the object to a bit excess place and then return it at the center by the speed-up operation [the same rotation to the sidereal drive]. Finally center the object at the center of the view field by the normal mode. After the moment when the button is released, the motor will run again at the sidereal speed, but due to the backlash, the object in the view field will move at the diurnal motion during the time lug until the the mount starts to move.



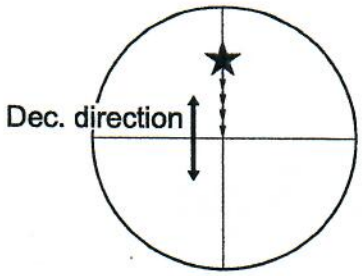
Speed-up passed a little from the center

Correct by the normal speed near the center

B. Correcting the Guiding Star by the Normal Mode

There is no problem with the R.A. direction, but in the Dec. direction, the following case will become a problem.

While the shifting of the guiding star is being corrected in the Dec. direction, the star happens to overrun from the center of the view field and due to the backlash it will not return to the center instantly by the corrective button. In this case, do the correction bit by bit by the corrective operation. If the amount of the overrun is within allowance of the guiding, do not try correction and let the motor drive go.



Correction drive bit by bit to avoid overrun

◆ Auto Guider Connector

An auto guider jack is installed on the control panel uses an RJ-14 connector to make connection to an auto guider easy. A wide variety of auto guider cables are optionally available from Takahashi. An auto guider will precisely hold a guide star in the center of the field and make all necessary connections to keep the stellar images as small as possible.

▼Pin Arrangement

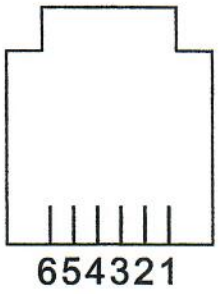


Diagram of Pin Arrangement

1. No connection
2. Common
3. R.A. (Slow-Down)
4. Dec.
   (View from the tube holder base: CW)
5. Dec.
   (View from the tube holder base:CCW)
6. R.A.

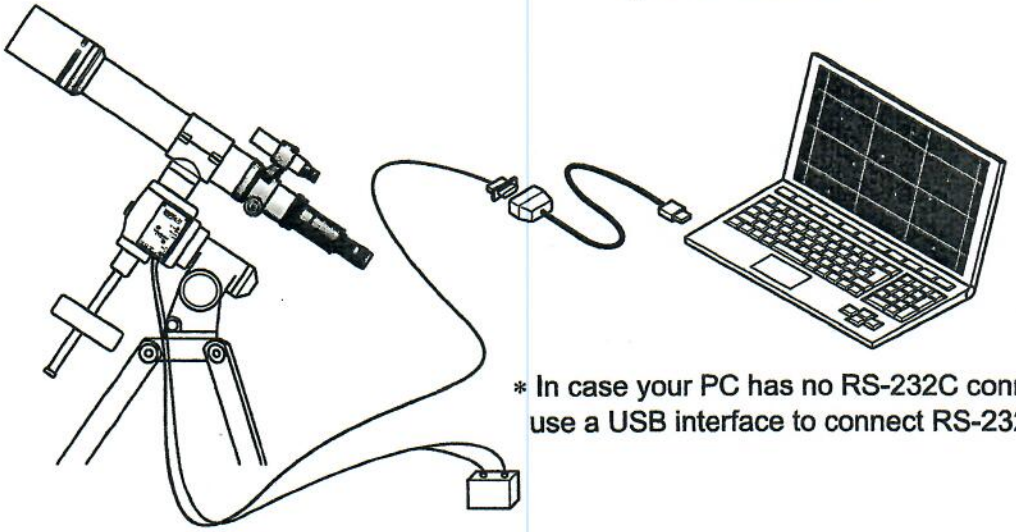
Go-To-Operation

◆ **How to Do Go-To Operation by Temma-2Z Mount**

1. Install the Pegusus-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 with the mount.
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 or conformed go-to disc.

(Note)

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 synchronize each other.



* In case your PC has no RS-232C connector, use a USB interface to connect RS-232C to your PC.

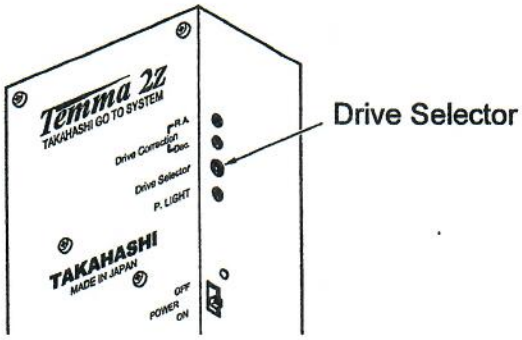
⚠ WARNING

- **When an object near the zenith is to be viewed, set the tube assembly and the equipment so that the instrument or any accessory will not 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 check to see if everything will clear the mount. Doing so will insure no trouble of "go-to" operation of the EM-200 Temma-2Z Mount.**
- **Be certain, before operation, that go-to can be done safely. You must be always ready for an emergency.**
- **The go-to mount will give out emission, which may affect medical instruments.**

How to Polar Align In the Southern Hemisphere

◆ Motor Drive

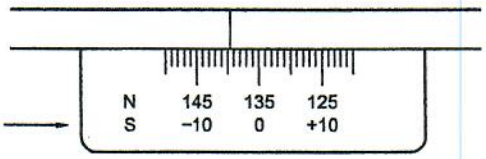
When the mount is used in the Southern Hemisphere the drive motor must be reversed to allow for proper tracking. Turn the drive selector to A which will change reverse the rotation of the mount to allow Southern Hemisphere tracking.



◆ Polar Alignment

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

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



Conversion Table for the Time Scale

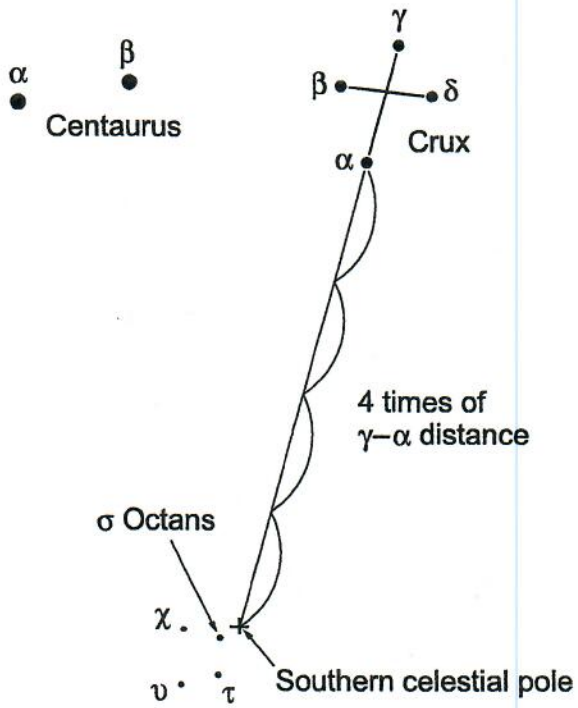
Local Time	Scale Time
18	6
19	5
20	4
21	3
22	2
23	1
0	0
1	23
2	22
3	21
4	20
5	19
6	18

Conversion Table for the Date Scale

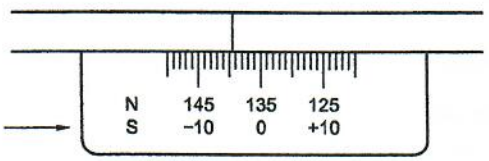
Local Date	Date Scale	Local Date	Date Scale	Local Date	Date Scale
12/31	12/31	5/10	8/22	9/10	4/22
1/10	12/21	5/20	8/12	9/23	4/12
1/20	12/11	5/31	8/1	9/30	4/2
1/31	11/30	6/10	7/23	10/10	3/23
2/10	11/20	6/20	7/13	10/20	3/13
2/28	11/2	6/30	7/3	10/31	3/2
3/10	10/23	7/10	6/23	11/10	2/20
3/20	10/13	7/20	6/13	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.

Locate the star Sigma in the constellation Octans the star Sigmas forms a trapezoid with the star Chi, Tau, and Upsilon.
See the finder chart below.

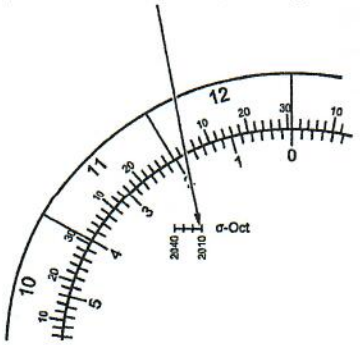


1. Locate the star Sigma Octans.
2. Determine the longitude of the observing site and subtract it from the mid longitude of the time zone. If the longitude is greater, then it will be a plus value, and if the longitude is less, the difference will be minus.
3. Set the longitude differential scale to the + or – value. See the 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 S on the scale marked σ-Oct above the scale marked 2010 within the parallel line towards the second perpendicular line between 2010 and 2040 scale.

Frame for Sigma Octans
(Southern Hemisphere)



Polar Alignment is now completed.

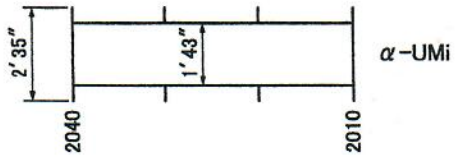
How to Use the Mount in Low Latitudes

When the EM-200 Temma-2Z Mount will be used at the low latitude below 20 degrees, the atmosphere will refract the image sufficiently to make accurate polar alignment by the polar telescope almost impossible because both the north and the south poles will be not visible.

When the polar alignment is attempted:

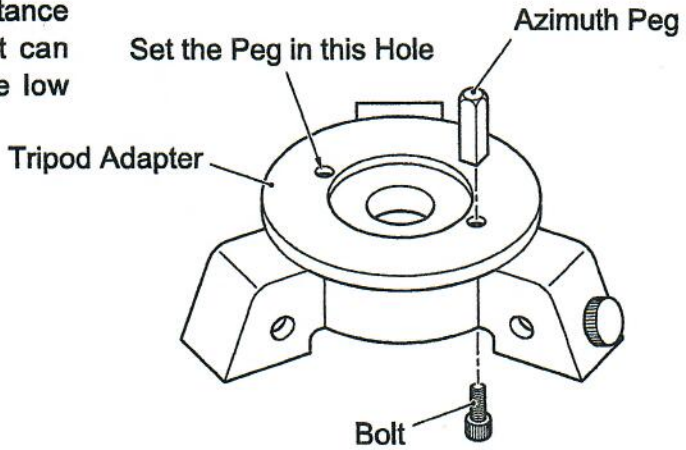
1. Consult the chart below to see the amount that Polaris is refracted by the atmosphere.
2. Understanding the size of the reticle, see the diagram below and offset the image of Polaris in the desired distance below the reticle. Now the mount can be accurately polar aligned at the low latitude.

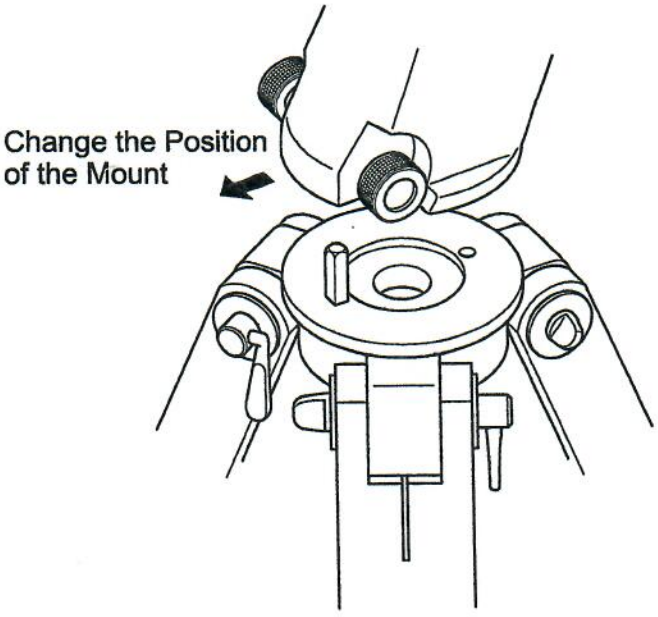
10°	0° 5′ 17″
20°	0° 2′ 38″
30°	0° 1′ 40″
40°	0° 1′ 09″



◆ Azimuth Peg

The altitude angle of the polar axis can be adjusted as low as 0 degree. In this case, the position of the azimuth peg must be changed at the opposite side to clear the counter-weight from the tripod. Remove the peg by removing the bolt locked the peg and then set it at the hole provided on the opposite side. This allows the counter-weight to clear in between the tripods.





Setting Circles

If you want to locate a faint object, the following procedure are used to locate the object [nebula] plotted at the right, 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 crosshair.
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 onto the next object.
Remember that since the R.A. circle is not driven, it is always necessary to reset the R.A. circle to read the R.A. of the object being observed in order to properly locate the next object to be viewed.