M-uno

Single Arm Mount
(Made in Italy)

USER'S Manual

Version 1.6.3 November 2015

SAFETY STANDARDS AND WARNINGS

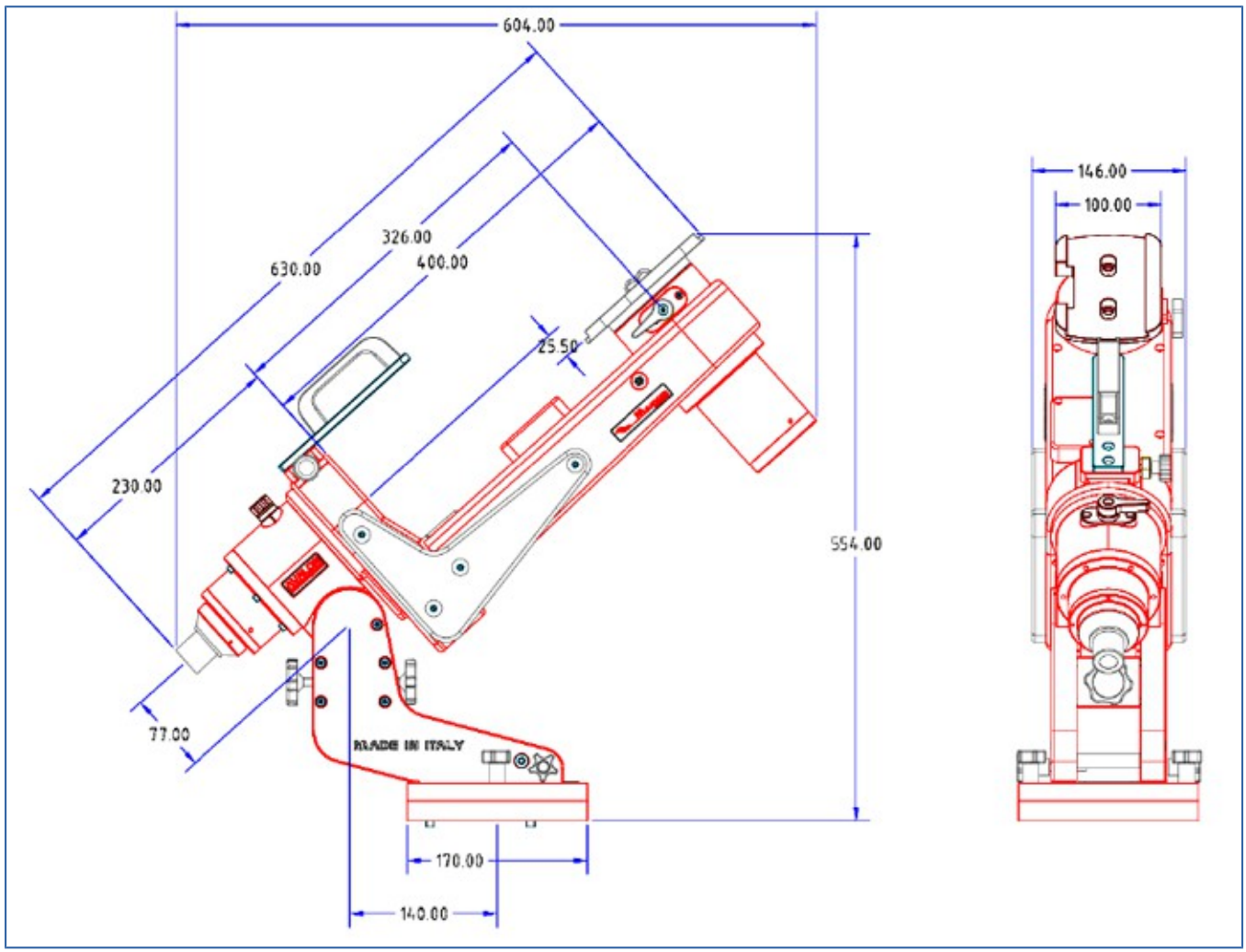
- **Read carefully the manual before installing and using the mount.**
- **Use the power cable supplied with the mount or a 12V- 3A stabilized power supply as suggested in the manual.**
- **Connect the power cable correctly and securely to the power socket.**
- **Do not bend, pull or press the cable as this may damage it.**
- **For any assistance or repair, please contact only the manufacturer.**
- **Be sure to remove the power supply at the end of its use or before any cleaning or maintenance.**
- **This mount must be used exclusively by adults, do not allow use to children or to people with reduced mental capacity.**
- **Avoid to operate the mount except as strictly indicated in the manual.**
- **Modifying or altering in any way the characteristics of the mount, will void the manufacturer's limited warranty.**
- **Never modify the tension of the belts (by dedicated screw), these is set in the factory and any unauthorized change will void the manufacturer's limited warranty.**
- **After using it, avoid to store the mount in areas exposed to sunlight or in wet places.**

Summary

Technical Specification

Type of mount	Single Arm Equatorial Fast-Reverse
Head weight	14,9 kg (32.8 lb)
Maximum load	20 kg (44 lb) for photographic use, 25 kg for visual
Motion System	Four-step reducer via pulley-tooth belt system on ball bearing, with no play on both the axes
Periodical Error	Mean +/- 5-7"
Construction Material	Anodized aluminum, worked out from single blocks with high precision CNC machines
Transmission System	Pulleys made with special glass fiber polymer and high precision tooth belts
RA Axis	Heavy duty steel, diam. 35mm; 2 conical roller bearings, diam. 62mm + 1 roller bearing diam. 72mm + 2 roller bearing diam. 45mm – On bearings clatch system
DEC Axis	Heavy duty steel, diam. 35mm; 2 conical roller bearings, diam. 62mm + 1 roller bearing diam. 72mm + 1 roller bearing diam. 45mm – On bearings clutch system
Polar Scope	Skywatcher (optionally Losmandy)
Control System	Avalon StarGO goto system
Dovetail Plate	Losmandy, 3" (75mm), dovetail, single knob with 2 tightening points
Warranty	2 years from the purchase date, extended to 5 years for the transmission system

The following drawing reports the M-Uno mount dimensional characteristics. Dimensions are in mm.



Forewords

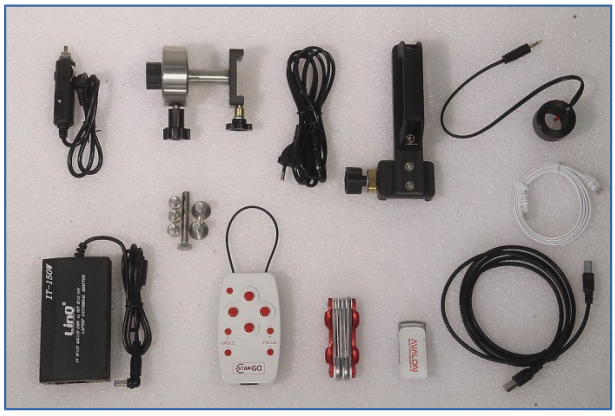
This manual helps to properly setting up the Avalon M-uno equatorial mount on a tripod and the installation of the telescope on the dovetail.

We suggest to read carefully this manual for a safety using of the mount, for having the maximum satisfaction.

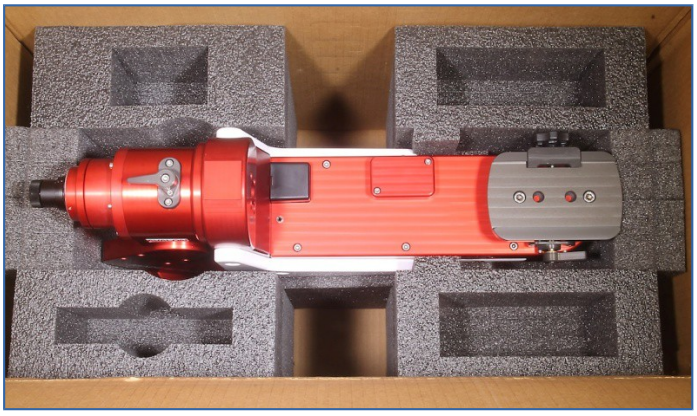
NOTE: The images shown in this manual can refer to an early version of the mount. The product may change without notice, as our goal is always to offer the best product to our customers, constantly considering their feedback and suggestions.

Packing Content

Open the big box containing the mount and take all the components out, putting them on a clean, flat surface..



Containt of the upper part of the box



Containt of the bottom part of the box

Component List

Car lighter power cable
Counterweight with support shaft
125/240 VAC / 12 VDC power supply with related cable
StarGO control Keypad.
Keypad connection cable
Metric Hexagonal key set
Mount Transport Handle
Mount head with tripod plate and dovetail platform, including the StarGO control system
USB pen drive containing all needed software and manuals
Polar finder and illuminator led kit
Mount transport case
Fixing screws
Documentation, warranty certificate

1. M-uno Starting Setup

The M-uno is shipped set in factory to work at latitude values in the range 32° - 55°. To use it outside this standard range, please read point 1.1.

It is strongly recommended to use the M-uno mount with our T-pod tripod that has been designed to guarantee the maximum performances. In case of use of different kind of tripod it must have dimensions and characteristics compatible with the mount weight and with the astronomical load to be installed. At point 1.2 you can find some compatible tripod models.

In the following sections, the operations to set the correct range of latitude of the mount will be described in detail. Furthermore also the operations to mount the M-uno on the tripod and how to install the telescope on the M-uno will be also described together to the criteria to be followed to choose a suitable telescope.

1.1. Latitude range setting

The latitude range setting must be performed before to install the mount on the tripod.

The M-uno can be used in a wide interval of latitude starting from about 15° to 70°. This interval is subdivided into three sub-ranges as follows:

First range	15° --- 40°
Second range	32° --- 55°
Third range	45° --- 70°

As you can note, the three ranges are partially overlapped. The choose shall be done maximizing the distance between the latitude of the observation site and the closed range border. For example, if the site latitude is 53° is better to choose the third range because it as 8° distance whereas the second range closed border distance is only 2°.

The steps needed for setting the more suitable operating range are the following:

Unscrew the screws (1) and (2) under the base

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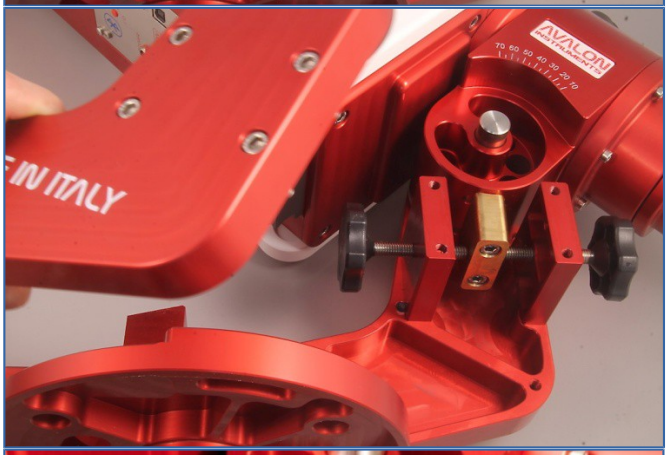
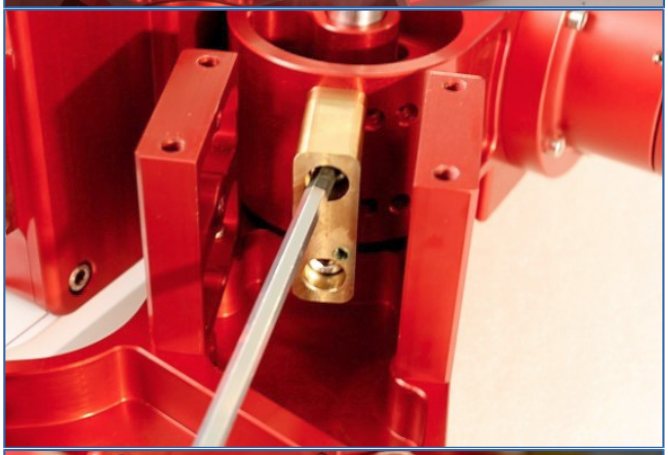
Unscrew the screws from (1) to (4) on the side plate

Remove the plate



Unscrew the two screws on the brass contrast plug.



Screw back the brass plug using the couple of holes 1, 2 or 3 corresponding to the latitude range with the same ordinal (the mount is factory shipped in position 2).

Screw the plate back in position using the four screws previously removed. Screw also back the two screws under the mount base.

1.2 Tripod plate assembling

The plate for fixing the mount on the tripod comes with the mount and must be assembled on the tripod using the following instructions.
The plate comes already provided with the correct holes for most of the tripods available on the market as shown in the following instrucions.

1.2.1 Avalon T-pod

Place the plate on the top of the tripod and rotate it to bring the brass contrast aligned with one of the leg. This leg will be called “North Leg” because it must be pointed to the North. Fix the plate with the 3 screws that comes with the mount.

1.2.2 Geoptik

Before fixing the plate on the tripod it is needed to remove the existing contrast peg letting free the hole for the plate fixing. Place and rotate the plate to make this hole aligned to one of the flaring holes in the plate. Fix the plate by using the two provided flaring screws. Be aware to fix the brass contrast with the North leg.

1.2.3 EQ6

The plate assembling on a EQ6 tripod is very similar to the Geoptic tripod. Before fixing the plate on the tripod it is needed to remove the existing contrast peg. Place and rotate the plate aligning the two flaring holes with the two trhreated holes on the top of the tripod. Screw the provided flaring screws in this holes taking care to align the brass contrast with the North leg.

Avalon Instrument may provide mounting plates for other types of tripod as an optional item.

1.3 Fixing the mount on the tripod

Unscrew few turns the contrast screws by rotating the knobs for the azimuth regulation.

Put the mount on the base plate, so that the brass contrast plug, coming out from the plate, will fit in the proper space between the two contrast screws.

Screw the azimuth regulation knobs until the screws will touch the brass plug.

Firmly screw the three fixing screws provided of plastic knob in three two lateral holes to keep the mount well in position.
Note: *During the azimuth regulation for the polar alignment, these three screws must be not completely screwed to allow the mount rotation against the base and, at the end, firmly screwed again.*

1.4 Telescope installation

The following point after the mount installation on the tripod should be that of the telescope installlation. However, due the M-uno architecture, the polar axis can be obstructed by the tube or by the optional extension cylinder used for mounting longer refractors. A solution to this problem can be provided by an optional accessory to mount the polar scope on the side of the mount making also free the original polar scope hole. This solution allows also to use this hole for the passing through of the several electrical and control cables using especially for the astrophotography.
Therefore, the next step should be the accurate polar alignment but, being it a topic that falls outside the mount mechanical setup, it is postponed to a specific section which will be

particularly deeper.
This section instead will deal with the telescope installation, operation very simple even if very delicate, assuming that the mount has been already precisely aligned to the pole.
To mount the optical assembly on the M-uno it is necessary that it is provided of Losmandy type, 75 mm male dovetail bar.

Remove the mount transport handle (if installed) and bring the mount arm in the position showed on the left picture, unlock the declination knob and rotate the axis until the female dovetail plate will be horizontal. Firmly lock both the axis knobs. Open the mount dovetail clamp by rotating its own knob. Firmly take the OTA and insert its male dovetail plate on the female, putting the side closer to the ground first.

While keeping the telescope with the hands rotate the plastic knob of the mount dovetail clamp, as shown in the right picture, until it is firmly locked. Before to leave the telescope, be sure it has been correctly fixed by examining the contact between the female/male dovetails.

2. Telescope Balancing Operations

To correctly balance the telescope it must be freely moveable in both axis. The M-uno is provided of lock levers on both axis. To manually move the telescope turn the levers in anti-clockwise direction, unlocking the axis.

If the instrument is not yet balanced, especially in the DEC axis, be very careful and be sure to have the control of your telescope before to release the locking levers. A tube very unbalanced can move very quickly causing potential damages to the mount or to the tube itself.

2.1 Declination axis balancing

To obtain the best tracking performances from the mount, the telescope must be balanced on both axes.

Even if the telescope does not track in Declination, it must be balanced on this axis too, to avoid sudden movements when the declination knob is unlocked and, especially, to provide no vibrations and a quick response while guiding. In M-uno mount it is better to start balancing the CED axis rather than the AR, since the latter is almost auto-balanced with any telescope.

Telescope balancing in DEC:

Move the arm of the mount in the equilibrium position, as seen in the left image, and lock the RA axis knob.

Loosen the DEC knob and move the telescope parallel to the ground as seen in left picture.

Release the tube SLOWLY and CAREFULLY – to see in which direction it will possibly move around the DEC axis.

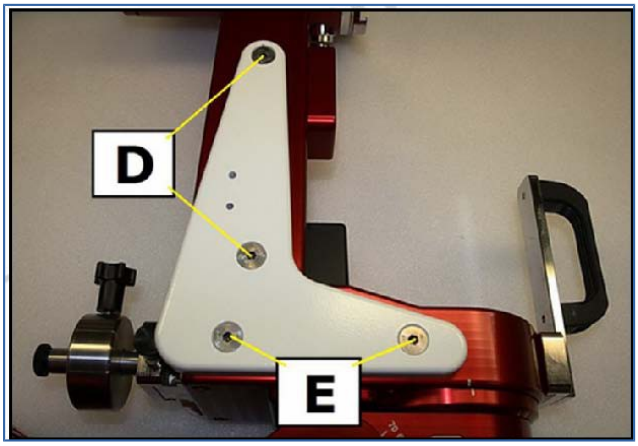
Loose the clamp keeping the OTA and move the tube back or forth, depending on its movement, in order to balance it. When the tube will not move, with the DEC knob unlocked, the balancing will be done. Do NOT leave the telescope while the dovetail clamp is loose, always lock the clamp before checking the balance with the new tube position!

Tighten the dovetail clamp to firmly lock the telescope tube in its new position.

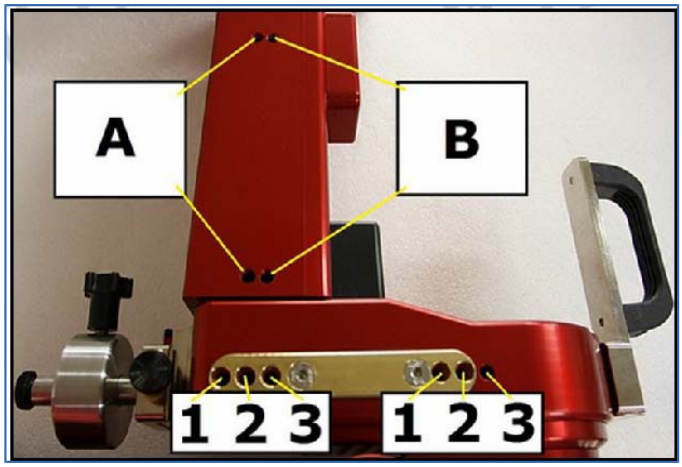
2.2 *Right Ascention Balancing*

The balance system of M-uno mount is different respect the other German Equatorial Mounts, but it is quite easy to set.
The balance is performed in two phases, one approximated and the other refined.

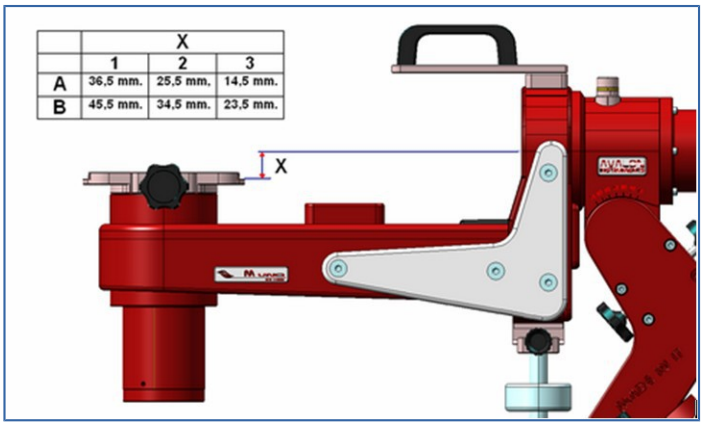
Approximate Balancing



To approximate balancing must be performed without the telescope on the mount.
Put the arm of the mount parallel to the ground as seen on the left picture
Unscrew the “E” screws on both lateral flanges and loosen the D screws just on the upper side to allow the sliding of the arm.



The picture on the right reveals the holes that allow to change the position of the arm, and then change the balancing of the system (despite what showed in the picture, you don’t need to remove the lateral flange in order to achieve the balancing).
The position 1 identifies the greatest distance of the axis and it is used for greater diameter optics, while position 3 is suitable for small (and therefore lighter) OTAs.



	X		
	1	2	3
A	36,5 mm.	25,5 mm.	14,5 mm.
B	45,5 mm.	34,5 mm.	23,5 mm.

Position B allow to further increase the distance, but this is advisable only for large diameter OTAs (for instance: Celestron C11) because it is necessary to remove completely the lateral shafts.
The table on the left shows the change in vertical distance in millimeters between the dovetail and the polar axis as a function of the clams choosen (position A2 = 25.5 mm is set by standard, suitable for many catadioptric OTAs)

Warning: do not use different screws than those supplied or a serious damage of the gear system may occur!!

Fine balancing

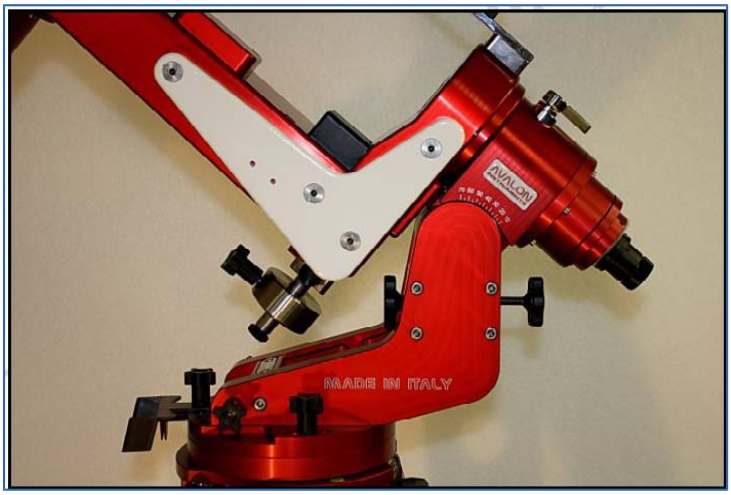
Once the mount arm has been set in the correct position for an approximate balancing, fix all screws an, if deemed necessary, perform the fine balancing. This is performed by mounting the provided small shaft with a female dovetail in the specific male dovetail as shown in the previous pictures. Insert the counterweight in the shaft and sliding it in the equilibrium position. At the end firmly screws the counterweigth locking knob and the shaft end knob. Of course all the fine balancing operations shall be performed with the telescope installed.

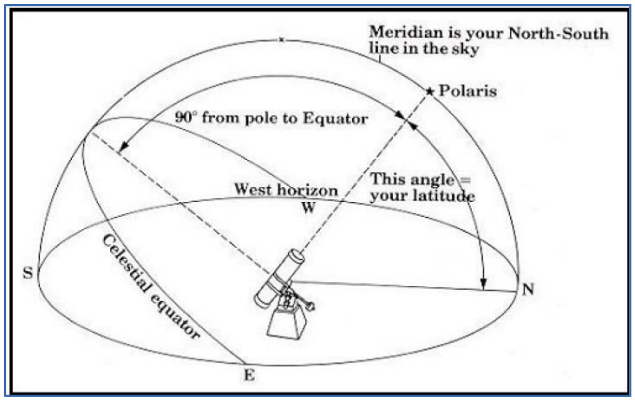
NOTE: *It must be underlined that the M-uno does not need the small unbalance, as done with traditional mounts based on gear-worm technology that need to be slightly unbalanced to avoid any unwanted, pendulum-like behaviour, while crossing the meridian. This difference, due to the tooth-belt transmission technology, is a big benefit because, once the M-uno is balanced, the counterweights do not need to be moved anymore and this can be appreciated during long exposures and remote observing sessions.*

2.3 M-uno mount stationing

2.3.1 Latitude Fine Adjustment

Before to use the M-uno it is needed to make its polar axis parallel to the earth rotation axis. The first operation to be performed – after a good leveling of the mount base – consist on approximately setting the polar axis at an angle equivalent to the latitude of the observation site (for example Rome is about 42°, Milan and Venice 45° and Palermo 38°) using the two latitude regulation knobs, using the scale on the side of the mount.
During this operation the mount arm must be kept in its equilibrium position with the counterweight down as shown on the right.





The latitude regulation must be performed using both hands: while screwing the front knob the other one shall be unscrewed and vice-versa.
To increase the latitude (i.e. rise the polar axis) the rear knob must be screwed in clockwise direction while the front one is rotated in counter-clockwise direction. The contrary to lower the axis.
NOTE: *it is generally better to perform the fine latitude operations in contrast to the gravity force, i. e. raising the mount.*

2.3.2 Azimuth Regulation

Even the azimuth regulation is performed using other two regulation screws contrasting the brass pin.
The regulation is done using both hands: when a knob is rotated in one direction the other is rotated in the opposite direction. This results that both knobs are rotated *simultaneously* toward the operator or vice-versa. The azimuth regulation knobs are those positioned on both sides of the mount as seen in the right picture.
Remember that the mount setup in both Latitude and Azimuth must be performed only before to start the observation of photographs session, during the important phase of the precise polar alignment. Once the polar alignment has been reached, THE MOUNT MUST NOT BE MOVED FOR ANY REASON USING ALTITUDE OR AZIMUTH KNOBS. The telescope pointing will be performed only moving the mount in Right Ascension and Declination, using the keypad or the software commands.

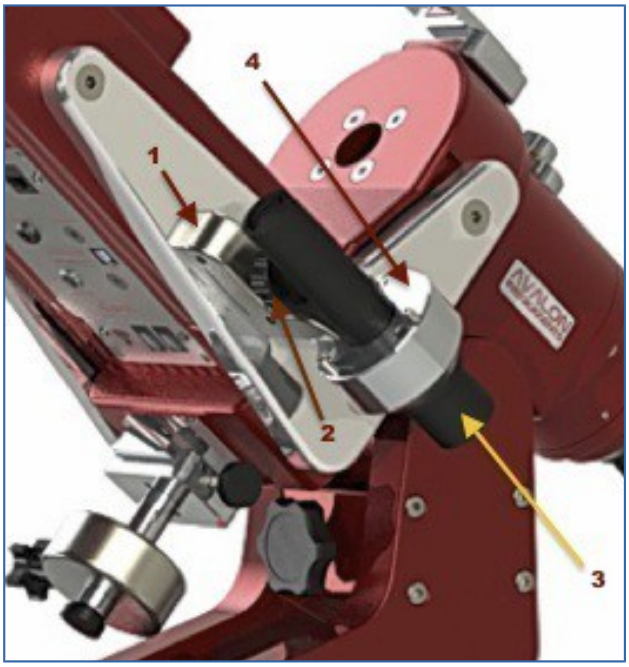
3 Accurate Polar Alignment

3.1 Polar Alignment kit installation

The mount precise polar alignment should be performed using the polar scope.
As previously highlighted, to perform a precise polar alignment it is needed to install the provided polar kit, which is composed by:

- Polar scope support with fixing knobs and dovetail bar.
- Polar scope with circular graduated scale

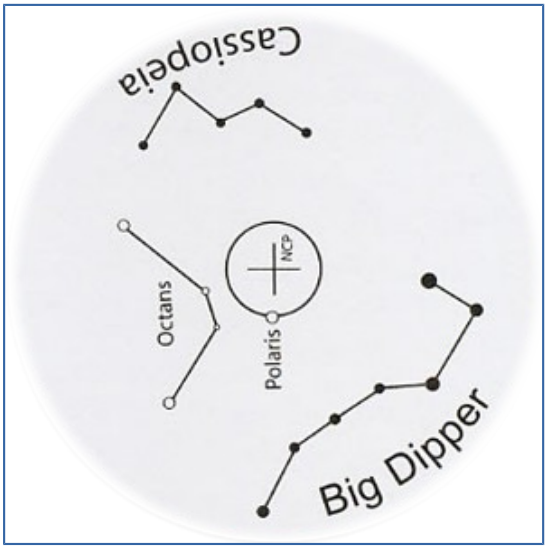
The M-zero mount is shipped with a Skywatcher type polar scope (however it is possible for the user to choose a Losmandy polar telescope as an option).
To use the polar scope it is necessary to install it on the lateral dovetail bar.
To mount and adjust the polar cope perform the following operations:



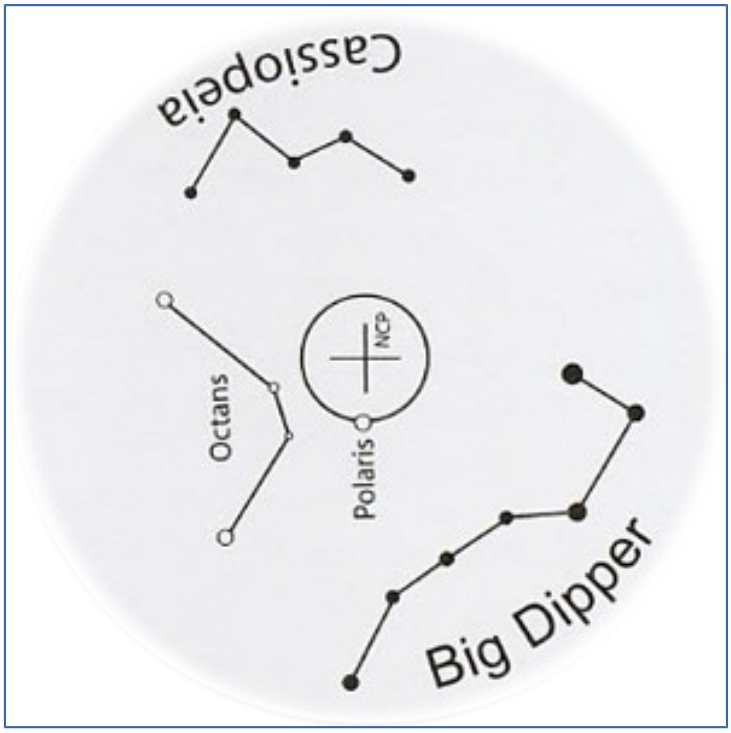
- Mount the polar scope support (1) on the dovetail bar and tight the fixing knob (2).
- Insert the polar scope (3) in the support hole.
- Adjust the polar scope centering using the regulation and centering knobs (4) by rotating the mount arm around the DEC axis and verifying the cross remain pointed on a fixed terrestrial object (pole, TV antenna, etc). Regulate until the centering is reached.

3.2 Polar alignment with a Skywatcher polar scope

Looking through this scope, with the reticle well lighted internally, it is possible to see a reticle layout similar to that on the right.



As the Polaris is several tens of seconds far away from the Celestial Pole and therefore it appears to orbit around the pole at a given distance, making a full orbit, every 24 hours. The bigger circle in the reticle shows the Polaris orbit and the small one, with the name of the star, represents the position of the Polaris. The problem here is to turn the reticle around the small cross in the center, to put the small circle in the position where the Polaris is seen from a given observation site, at a specified date and time. In the past this position was obtained using several types of graduated circular scales. The Avalon mounts are not provided of these scales.



Presently the most suitable method to get the exact Polaris position is the use of one of the several computer programs or mobile devices applications, both for Apple iOS or Android as, for example, “Scope Help” for iOS or “Polar Finder” for Android. These programs, that provide the Polaris position both visually and in the hour form, are briefly described in section 3.3.3.

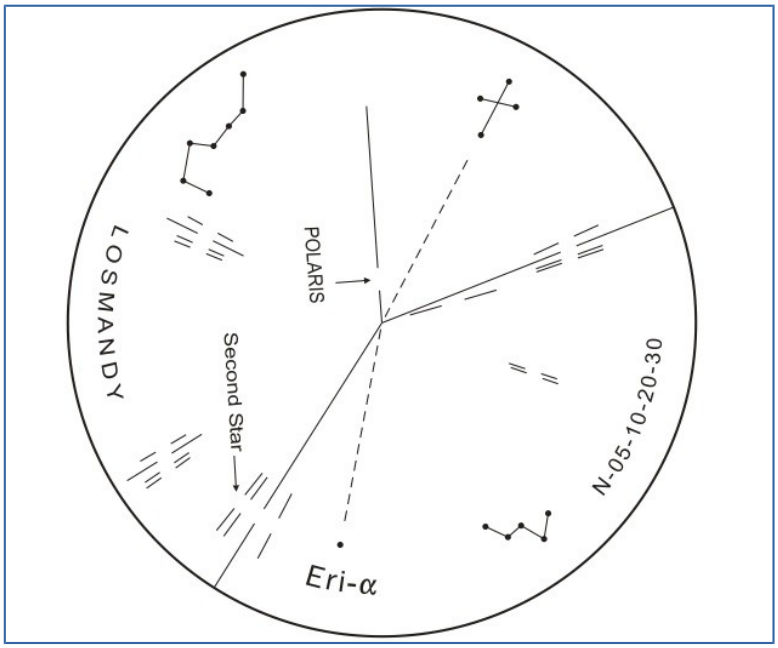
Once the Polaris position has been determined and the telescope has been mounted with the contrast blocks oriented to the North (see section 2.1) the following operation are needed:

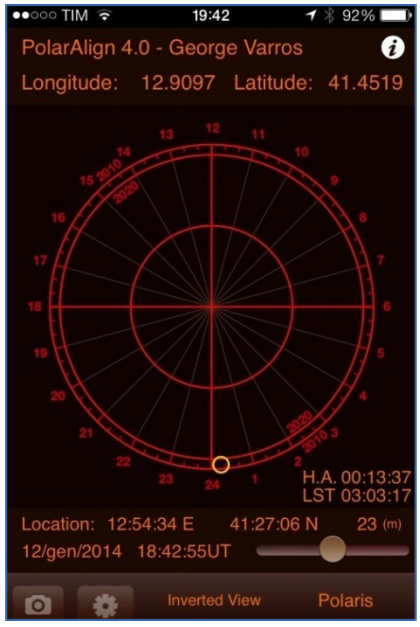
- Untight the DEC latch and rotate the axis until the hole in the axis is in the front of the polar scope, allowing it to see the sky and the Polaris in the field of view. Tight the DEC latch in this position.
- Untight the RA latch and consequently the polar scope until the small circle in the reticle is in the position indicated by the used application. Tight the RA latch in this position. It is possible to have a small help verifying that the position of the figures of the Big Dipper and Cassiopeia roughly correspond to the real position in the sky.
- Untight slightly the two screws that fix the mount to the tripod to allow the mount base to rotate respect to the tripod mounting plate.
- Acting on the two azimuth regulation knobs bring the Polaris under or over the small circle. Acting on the two altitude regulation knobs bring the Polaris inside the small circle.
- Repeat this operation until the Polaris is centered in the circle.
- Tight the Azimuth and Altitude knobs against the contrast blocks.
- Firmly tight the screw that lock the mount movement respect to the tripod.

3.3 Polar Alignment with the Losmandy polar scope

The Losmandy polar scope allows a more precise alignment because it is based upon the coincidence of three stars (Polaris, UMi e OV Cep) position with the correspondent locations in the scope reticle which has the following aspect:
The dotted axes shall be neglected because they belong to the Southern Hemisphere.
The alignment operations with this kind of polar scope are the following:
Untight the DEC latch and rotate the axis until the hole in the axis is in the front of the polar scope, allowing it to see the sky. Tight the DEC latch in this position.
Untight the RA latch and consequently the polar scope until the axis in the reticle with the slot for the Polaris (well indicated in the reticle) is roughly oriented in the position indicated by the used application.
Act alternatively on the Azimuth and Altitude regulation knobs and on the reticle rotation until the three stars are exactly located in the respective slots. In the three axes. Take into consideration that the position in the slots varies depending on the year. The four slots for two of the axes are related to the observation years reported in the border of the reticle.
When the three star are correctly positioned in the slots tight the Altitude and Azimuth knobs against the respective contrast blocks and, at the end, firmly tight the screw that lock the mount movement respect to the tripod.
Note: In case of difficulty to correct orientate the constellation in the right position it is possible to have the help of the PC, smartphone or tablet applications to perform the initial orientation of the Polaris axis.

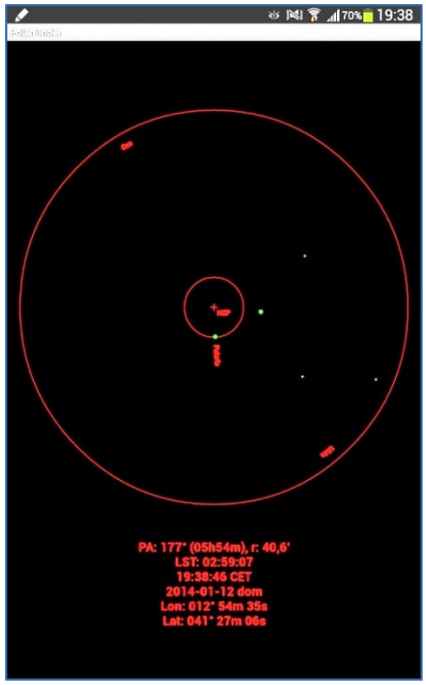
3.4 External programs for Polar Finding

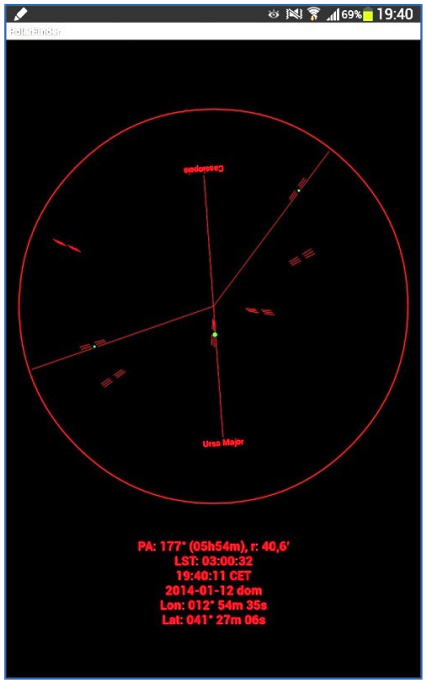




"Polar Align" Ver. 4.0 is a iOS app running on Apple's iPhones and iPADs. This program uses the internal GPS to evaluate the geographical coordinates of the observation site to calculate the exact position of the Polaris Star around the celestial North Pole. It provides also some additional information that can be useful for a correct telescope setup.
The Polaris position is represented by a yellow small circle on a larger circular reticulum. To effectively use this app it is needed to evaluate the angle under which is the Polaris and rotate the polar scope reticle of the same angle to bring the Polaris circle in the correct position. It

should be noted that the reticle reproduce exactly the type of optical inversion caused by the polar scope optics.
For the Android environment, for both smartphone and tablet of different brands, it is available, among others, the “Polar Finder” app that, on the contrary of the iOS app, reproduce with a good fidelity the reticula of the polar scope (provided with the M-zero and of the Losmandy available as an option. This app is characterized by a particularly complete setup form to define the Northern or Southern Hemisphere, the type of reticle to use among the more commons, including those available for the M-zero.
The three following figures represent the setup, Polarscope and Losmandy reticle screenshots.





This app also takes the observation site geographical coordinates from the internal GPS if available, otherwise it is needed to manually insert them, for the Android devices not provided of GPS. The additional information provided by the app are similar to those provided by the iOS app but the reticula are more easily usable being them similar tho those available for the M-zero.

APPENDIX A

Astrophotography Tips

This is a fast step by step guide which requires about 20-30 minutes of operation and is dedicated to the imagers which already have some skill with telescope imaging. It allows to take astronomical images easily with your telescope setup, particularly if you use a color ccd camera (also a DRLs camera).

For those who have no skill at all in astronomical telescope imaging we suggest to purchase some dedicated books and also subscribe to the several forum available on the web.

Mount and Tripod Assembly

1. Setup the tripod and using a compass make sure it is well placed on the ground.
2. Set the mount head on the tripod and fix it using the three supplied knobs.
3. Level the tripod using the level enclosed on the mount base.
4. Insert the counterweight kit
5. Set with safety the OTA and the guide scope (if available) on the mount.
6. Insert the imaging and guiding ccd into the telescope.
7. Connect all cables (CCD cable, usb cable & power cable without powering on).
8. Balance carefully both RA and Declination axis.

System Startup

1. Setup a table with the laptop.
2. Connect the cables to your laptop and power it on.
3. Power on the StarGo System.
4. Perform the polar alignment as previously described.
5. Execute the alignment on a star next to the target object.

Pointing and images parameter setting

1. Set the correct focus of both the imaging and guiding systems.
2. Point the object you to want to image using the telescope keypad or PC software.
3. Center the object inside the CCD camera field according to the frame you want to acquire.
4. Make sure that at least one star of adequate brightness appears into the guiding CCD field.
5. NOTE: set the "AUTOGUIDING SPEED" to a low value (suggested 0,10 / 0,20x).
6. Perform the guiding CCD system calibration.
7. Activate the guiding system and optimize the parameters while observing the trend of the graph.
8. Set the final parameters for sensitivity, exposure, binning, file name, number of exposures etc. etc.
9. Start the session.