



## STARGO CONTROL SYSTEM



## INSTRUCTION MANUAL

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## 1. Quick Guide for a ready start

It is recommended that, to make an efficient use of the StarGO system, all users read with attention all sections of this document. However, with the awareness that most users are impatient to use the system as soon as possible, especially in presence of a good seeing, the present section contains the quick guides to make Avalon mounts and StarGO control system operational in the shortest possible time. For every step is given a reference to the manual point where the operation is detailed.

### 1.1 Guide for a photographic use

N.	Operation Description	Reference to users guide
1.	Install tripod, mount, telescope and photographic equipment.	[1] Sections 1.1 through 1.4
2.	Perform telescope balancing and precise polar alignment	[1] Sections 2.1, 2.2
3.	Put the telescope in HOME position (counterweight down – CWD and telescope aiming to NORTH).	N/A
4.	Connect power and USB cables to the StarGO and to the photographic and auxiliary equipment.	[2] Section 1.
5.	Launch StarGO program on the PC, connect the mount and in the ALIGN panel inside the StarGO setting function, press the button “Sync Home Position”..	[2] Section 3.1 and Section 3.1.1, sub <i>ALIGN Panel</i>
6.	On the PC launch the planetary software and initialize telescope.	N/A
7.	Perform the GOTO to a bright and well visible star close to the object we want to capture. Probably the telescope will not center it.	N/A
8.	Using the finderscope (previously aligned with the main tube) and the keypad or StarGO program directional keys, bring the star to the center of finderscope field of view.	N/A
9.	Start the CCD or the DSLR with the capture software to be used.	N/A
10.	Using the keypad bring the star to the center of the CCD field of view and synchronize it in the planetary software in use.	N/A
11.	Perform the GOTO to the object to capture and, using the CCD, center and frame it as desired.	N/A
12.	Launch the autoguiding program and, following the used software (for example PHD) instructions chose a guide star and, after the calibration, start the autoguiding.	N/A
13.	Set name, number, duration and type of pictures and start the capture sequence	N/A
14.	To point other objects, if required, may need additional syncing as described. A much more precise pointing process may be performed using the “Plate Solving” technique.	[3] Section 4.4

[1] Specific Mount Instruction Manual

[2] StarGO Instruction Manual

[3] SW&StarGO Tutorial

## 1.2 Guide for visual observations using Android Smartphones or Tablets

N	Description	Reference to users guide
1.	Install tripod, mount, telescope and all other needed equipment.	[1] Sections 1.1 through 1.4
2.	Perform telescope balancing and precise polar alignment	[1] Sections 2.1 & 2.2
3.	Put the telescope in the HOME position (counterweight down – CWD and telescope aiming to NORTH).	[2] Section 4.3, item 1
4.	Connect power cable to the StarGO.	[2] Section 1.
5.	Launch the SkySafari application and carry out its connection with the StarGO.	[2] Sections 4.2 & 4.3
6.	On SkySafari display select a star on the meridian line and quite close to the South horizon. Perform the synchronization on this star using the “Align” function of SkySafari (without moving the mount from its HOME position).	[2] Section 4.3,
7.	As a result of the previous action, the telescope will result aligned to the pole, where it is really pointing. This operation corresponds to the execution of the “Sync Home Position” using the StarGO software on the PC.	[2] Section 4.3,
8.	Perform a GOTO to a bright and well visible star close to the sky area to observe. If needed the telescope will perform an automatic “meridian flip”.	N/A
9.	Using the StarGO keypad or the SkySafari direction commands, bring the star in the center of the finder field of view. Precisely center the star in the telescope eyepiece and perform the final sync function with the SkySafari “Align” button.	N/A
10.	At this point the telescope will be able to point whatever visible object of the celestial sphere. If, during the observation session a pointing precision refinement would be necessary, it is possible to repeat the above steps 8 and 9.	N/A

[1] Specific mount Instruction Manual

[2] StarGO Instruction Manual

## 2. System Description and Technical Specifications

The Avalon Mounts are well known for their capability to drive the carried telescopes with extreme precision. This is due to two factors: the first is the use of toothed belts for the motion transmission combined, with the precision and strength of CNC machined components; the second is the use of a proprietary control system, called StarGO, fully developed by Avalon Instruments, capable to supply the mounts with the needed intelligence to perform all the required operations for a very successful use in visual observations but, mainly, in long exposure astrophotography field.

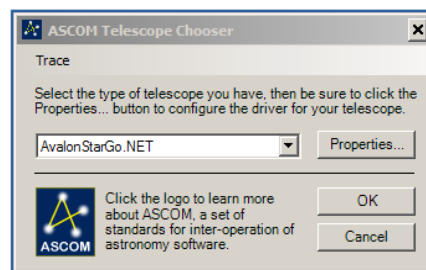
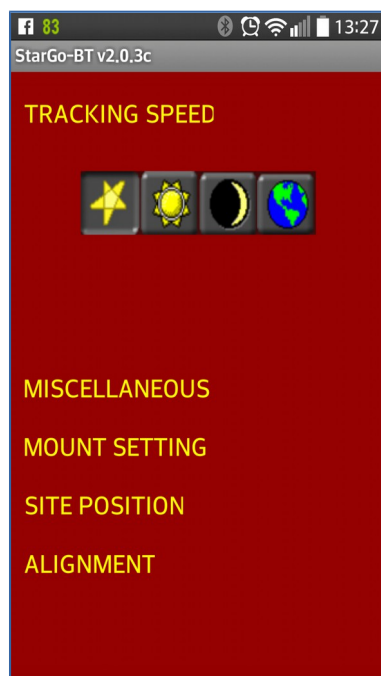
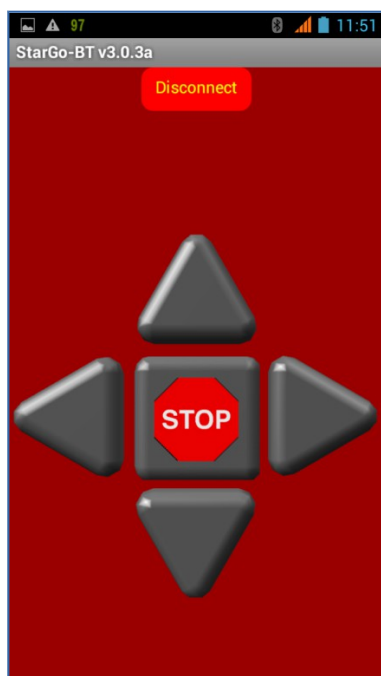
The StarGO Control System (SCS) is composed by five main components:

1. **The StarGO Control Box** that can be embedded in the mount as for the Avalon Linear and M-Uno, or in a separate control box for the M-Zero (and for its use with all other compatible third part 's mounts). It has the duty to provide the smart interface between the internal motors and the external world. It performs all the communications with specific components (Focuser, CCD rotator, DSRL camera, and other auxiliary devices) using direct connections and with Windows and Macintosh computers via USB. The wireless Bluetooth capability is also integrated in the control box to interact with intelligent devices such smartphones, tablets and, again with Windows and Mac computers.
2. **The StarGO Keypad** to physically command the mounts and perform almost all the available and most needed operations on it.
3. **The StarGO software**, entirely written inside Avalon Instruments, allowing the performing, with a computer, all the setup and management operations, included the control of the numerous external equipment that can be connected to the control box, in addition to the same control operations performed by the StarGO keypad.





4. **The StarGO-BT application** for Android devices that allows to interface them with the StarGO control box via Bluetooth connection. With this application the Android devices become perfect intelligent control pads. This application, as well as the PC StarGO, is under continuous development to add new functionalities.
5. **The AvalonStargo ASCOM driver** that makes possible the interaction between the StarGO Control Box and the vast majority of third part software applications such as Cart du Ciel, Stellarium, etc. In addition, thanks to the compatibility with the LX200 standard, the StarGO can work with almost all other available software.





## 2.1 Technical Specifications:

General	Computerized control system based on stepper motor technology and dual serial communication (USB and Bluetooth).
Operational Mode	<ul style="list-style-type: none"><li>• Equatorial or Alt-Azimuthal (for the compatible mounts)</li></ul>
System Speeds:	<ul style="list-style-type: none"><li>• “Guide”: From 0,05 to 0,95x with 0,05x increments.</li><li>• “Center”: From 2 to 10x</li><li>• “Find”: From 10 to 150x.</li><li>• “Slew”: N. 4 speeds ranges depending on the mount “gear ratio” and, for the maximum speed “Ultra”, on the power supply (at least 15 VDC).</li></ul>
Tracking Speeds	<ul style="list-style-type: none"><li>• Sidereal</li><li>• Solar</li><li>• Lunar</li><li>• Terrestrial</li></ul>
Autoguide Speeds	<ul style="list-style-type: none"><li>• RA: From 0,05 to 0,95x with 0,05x increments.</li><li>• DEC: From 0,05 to 0,95x with 0,05x increments</li></ul>
RA – DEC Motor Currents	Typical currents are 0.3 A for tracking and 0.7 A (adjustable) for slewing.
Data Base	14000 Default objects. The database may be easily editable by the user using a simple text editor. This database is part of the StarGO software and it is available using a PC.
Input/Output Ports	<ul style="list-style-type: none"><li>• USB</li><li>• Bluetooth</li><li>• ST4</li></ul>
Output Ports	<ul style="list-style-type: none"><li>• Baader Steeldrive (AUX0)</li></ul>

	<ul style="list-style-type: none"> <li>• AUX1: Hybrid Step Motor with a max current of 1 A.</li> <li>• AUX2: Hybrid Step Motor with a max current of 1 A.</li> </ul>
Electrical Characteristics	<ul style="list-style-type: none"> <li>• Power Supply: 12 – 15 VDC stabilized.</li> <li>• Current: from 0.3 to 1 A (adjustable) in all operating conditions</li> </ul>
Control Operations	<ul style="list-style-type: none"> <li>• Goto e Sync to the celestial objects</li> <li>• Automatic Meridian Flip</li> <li>• User definable parking and homing functions</li> <li>• Programmable Custom Gear Ratio.</li> </ul>
Updating FW	Via USB by the User
Environment Operating Temperature	-20 $\approx$ +40 °C

The SCS has been designed mainly for the M-zero, M-uno e Linear mounts but, thanks to the programmable Gear Ratio and the special motor kit, it may be easily used also in different mounts from other companies.

Its design follows the most recent technological developments in this field, consisting in realising a very simple hardware characterised by a large field of applications such as the management of focusers, filter wheels, DSLR cameras, etc. without the need of frequent modifications to be adapted to new devices but maintaining the possibility to be controlled by a PC and even by smartphones and tablets.

To make these characteristics possible, the SGS intelligence has been moved to the external software that can be easily and quickly updated or modified to be adapted even to different operating systems such as Windows, MacOSX, Android and others.

This manual, describing the new Avalon SCS to control astronomical mounts, is part of a set including also the manuals of the single mounts produced by Avalon Instruments as well as a tutorial–manual related to the use of third part software with the StarGO hardware.

This manual is in continuous improvement process and therefore it is suggested to often consult the web support page of the [Avalon Instruments](http://Avalon Instruments) site to verify the availability of newer updated versions.

Any report of errors or imprecisions as well as new suggestion for improvement can be freely sent by email to [info@avalon-instruments.com](mailto:info@avalon-instruments.com).

The scheme of the logical interactions of the StarGO Control System with all hardware software devices is reported in the following figure.



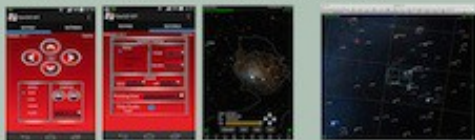
## BLUETOOTH Connections:

### Devices:

Enabled Mac & Win PC  
Android Smartphones & Tablets

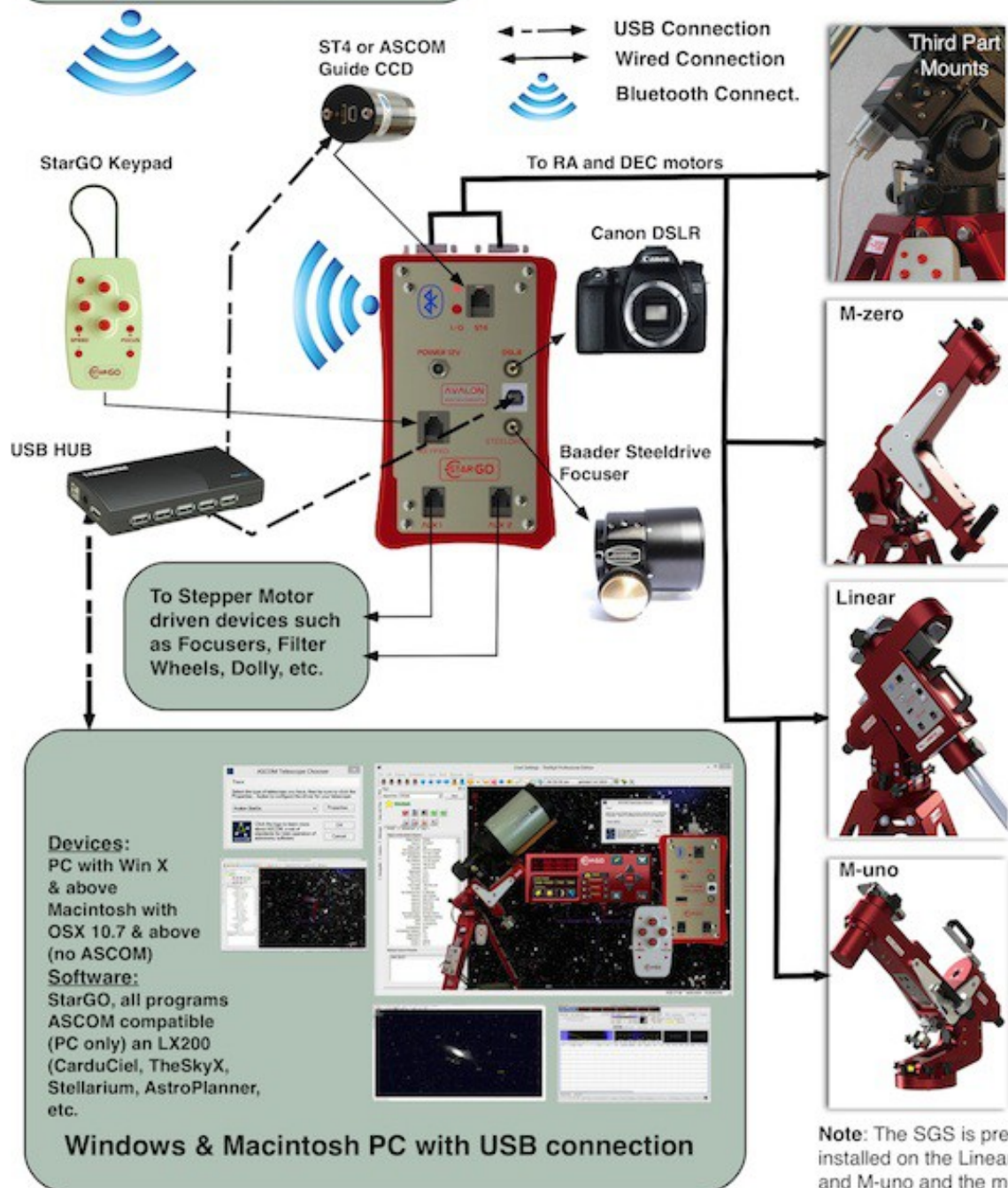
### Software:

Android StarGO, StarGO PC,  
SkySafari Pro Mac & Android, etc.



# AVALON INSTRUMENTS

## STARGO CONTROL SYSTEM



Note: The SGS is pre-installed on the Linear and M-uno and the motor connections are internal

## 2.2 The StarGO Control System (SCS) hardware interface

The SCS scope of supply is the following:

1. Main Board and Aluminium case.
2. StarGO control keypad.
3. Keypad connection cable (RJ45 Standard)
4. USB cable
5. 12-24 VDC power supply with 110-240 VAC and 12 VDC inputs + cigarette lighter 12V power cable.
6. An USB flash pen containing the StarGO software and other utilities needed for its management, in addition to the complete documentation, including this and other manuals.

The Main Board for the Linear and the M-uno mount types comes already mounted in factory whereas for the M-zero mount and for the Stand Alone Kit, to be installed on other brand mounts, the Main Board is supplied in an Aluminium case with the motor output using an external connector (item 1 above).

This section describes the Main Board interface and of the related keypad.

The figure 1.1 represents the physical interface of the control system of the mount.

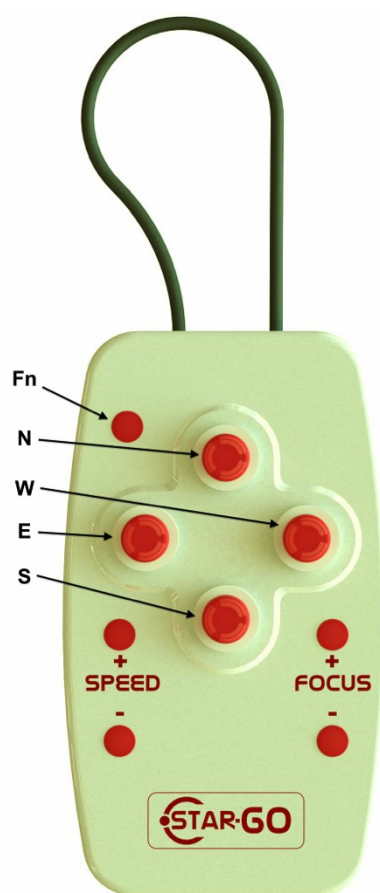


1. On/Off Power button
2. ST4 autoguide port
3. 12-18 VDC power supply plug
4. "Wireless" capability symbol
5. DSLR Canon exposure management port
6. USB2 I/O Port
7. Baader SteelDrive focuser control port
8. Handheld keypad RJ45 plug
9. Stepper Motor Auxiliary Output Port (Aux 1)
10. Stepper Motor Auxiliary Output Port (Aux 2)

Figure 1.1 StarGO Front Panel

Once the 12VDC has been provided to the StarGO, the red LED above the On/Off button 1 start to blink to indicate that the StarGO is powered but the two motors of RA and DEC are stopped, i.e. the mount is not tracking the sidereal movement. To activate the tracking it is sufficient to briefly push: a) the button 1 of the StarGO, b) one of the directional buttons (W – E – N – S) of the keypad or c) one of the directional buttons of the main panel (see figure 4.1) of the StarGO software GUI. To interrupt the motor movement still leaving the StarGO powered, it is sufficient to push again the button 1 for at least 5 seconds. The red LED will return to blink.

The figure 2.2 represents the manual keypad to be connected, through the dedicated RJ45 cable, to plug N. 8.



W / E Decrease/Increase the Right Ascension

N / S Increase / Decrease the Declination

Fn Function Key

SPEED+/- Increases / Decreases the manual movement speed

Fn&SPEED+/- Increases / Decreases the Polarscope LED light intensity

FOCUS+/- Move in/out the SteelDriver motor or that connected to the selected AUX port

Fn&FOCUS+/- Select the output port to which the focusing commands are sent. (1)

Fn&N / S Select system speed (Star, Sun, Moon, Earth) (2)

Figure 2.2 Keypad

(1) By keeping pressed the key Fn and the Key FOCUS+ the output port to which FOCUS+ and – are sent is selected (in the order: Steeldrive, correspondent to AUX0, AUX1 and

- AUX2 at each pressure of FOCUS+). By keeping pressed the key Fn and the Key FOCUS- the selection order is inverted (AUX2, AUX1, Steeldrive).*
- (2) By keeping pressed the key Fn with the key S, the system speed varies in the order: Star, Sun, Moon, Earth whereas with the key N the system speed varies in the inverse order. The system does not memorize the system speed as modified and to the following power on of the system it returns automatically to Star.*

### 3. Software Installation

#### 3.1. StarGo, StarGoLoader application (see sec. 7) and FTDI driver installation.

To get the maximum by the StarGO features and to obtain a complete mount control, it is necessary to install the supplied applications.

However the mount is capable to track of the objects, both in equatorial and Alt-azimuthal configurations, even without any PC or other device connection.

The StarGO software is provided of an ASCOM driver making it manageable by most astronomical applications. During the software installation process, as described below, the Avalon ASCOM driver, the serial-USB FTDI drivers, the StarGO application and its firmware and related update utility are installed.

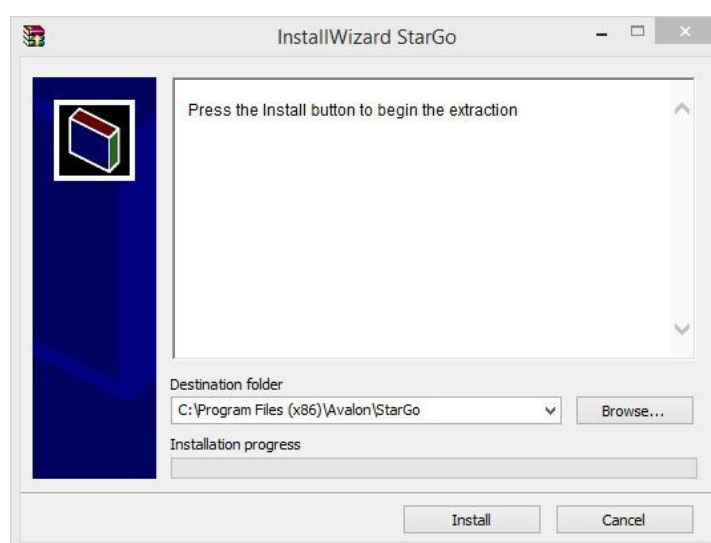
The use of StarGO in ASCOM environment with the more popular of compatible software is described in detail in a specific document (StarGO – Third Part Software Use – Instruction Manual).

**Note: Before launching StarGO be sure that the ASCOM platform is installed in the PC (<http://download.ascom-standards.org/ASCOMPlatform61.exe>). If not, the program will abort and the Run-Time error “429” will be generated. If requested a version of StarGO not needing the ASCOM platform may be supplied.**

The software is provided in a USB Pendrive. The software installer is called “Install StarGo.exe”.

The step by step operation to install the software on a Windows 8 computer are the following:

1. Launch the “Install StarGo.exe” application. The “InstallWizard StarGo” windows will appear:



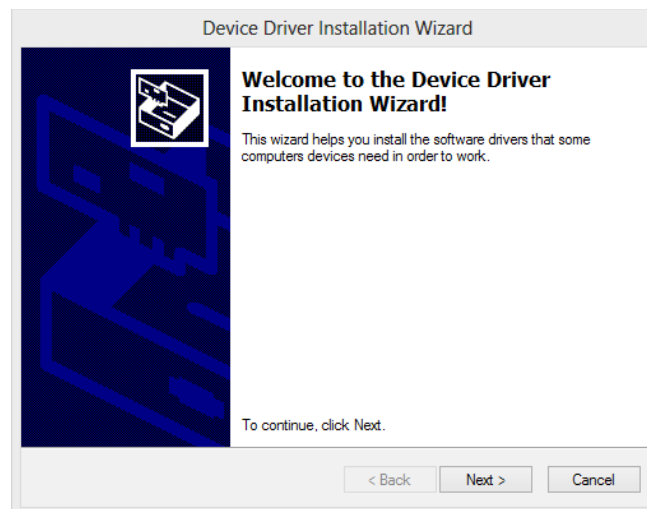


2. Choose the installation directory. We warmly recommend to use the proposed default directory. Press “Install”. At the end the FTDIChip CDM Driver installation window will appear.



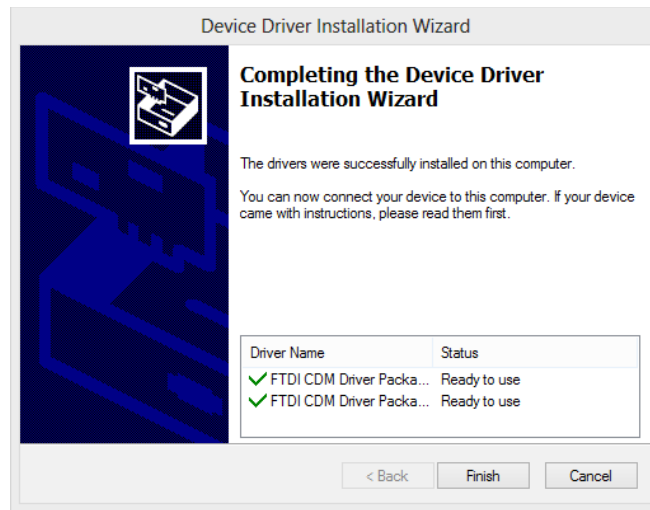
**NOTE:** If the FTDI serial-USB driver installation window should not start, repeat the installation process or manually install the drivers using the files contained in the folder *C:\Program Files (x86)\Avalon\StarGO\FTDI\_Driver*.

3. Press “Extract”. The “Device Driver Installation Wizard” will appear.

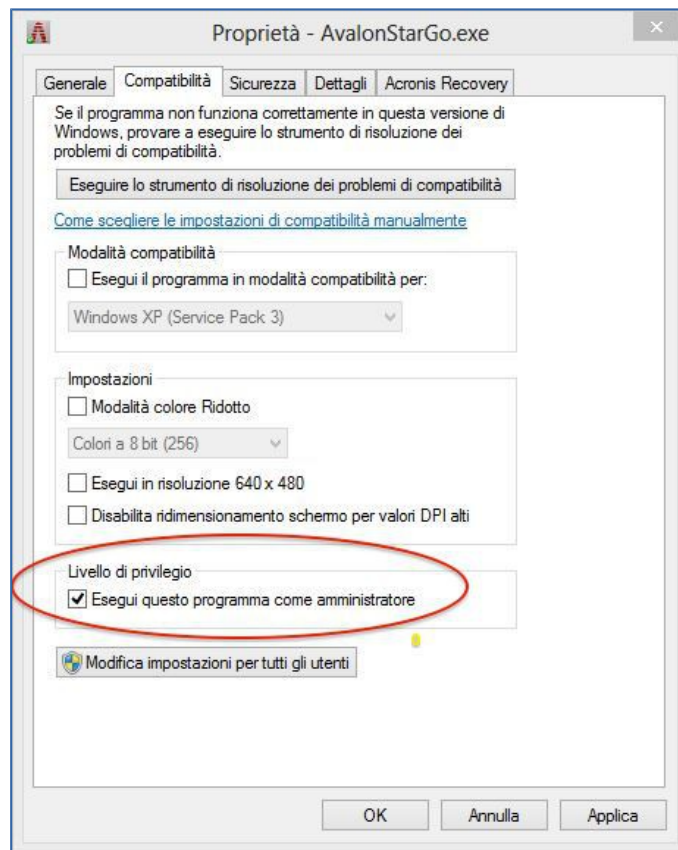




4. Press “Next”. The windows announcing the correct driver installation will appear. Press “End” to exit. The new drivers are ready for the USB connection.



**NOTE1:** At the end of the installation, in case of software troubles, especially with the more recent operating systems, it is needed to select the option “Execute this program as Administrator” from the panel “Compatibility” related the the “Properties” of the executable files inside the folder Programs\Avalon\StarGo. To guarantee a perfect compatibility it is also necessary that all other applications used (such as planetary programs, autoguide and CCD management software, plate solving applications, etc.) are run under the administrator privileges.

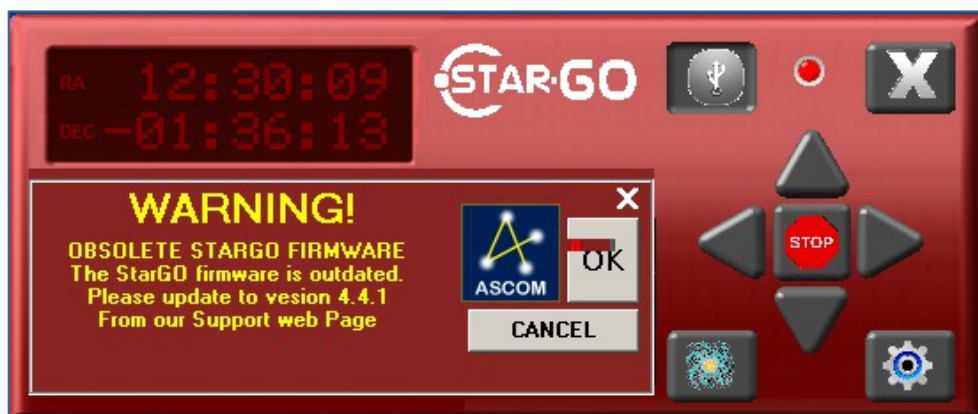


### 3.2 Software Updating

The StarGO software is subject to a continuous improvement and function addition process and it is therefore advised to frequently consult the Avalon Instruments site [Support](#) page to verify the presence of newer software versions.

The updating consists on repeating the installation operations described in section 3.1 (possibly skipping the items 3 and 4 related to the serial/USB driver installation).

At the first updated StarGO application launch and connection (see next section 4.1) it may occur the a warning pops up to inform that the StarGO hardware firmware is obsolete in comparison with the newly installed software.



In this case it will be necessary to update the firmware following the instructions given in Section 7. The file containing the newest firmware to chose will be the most recent among those available in the StarGO folder. When the firmware updating has been completed it is needed to restart the StarGO application and verify that the “Obsolete StarGO Firmware” warning is not appearing.

## 4. StarGO program description

### 4.1 Graphical User Interface (GUI)



The StarGO GUI may be activated clicking the icon created on the desktop during the program installation. The user interface aspect is reported in Figure 3.1a.

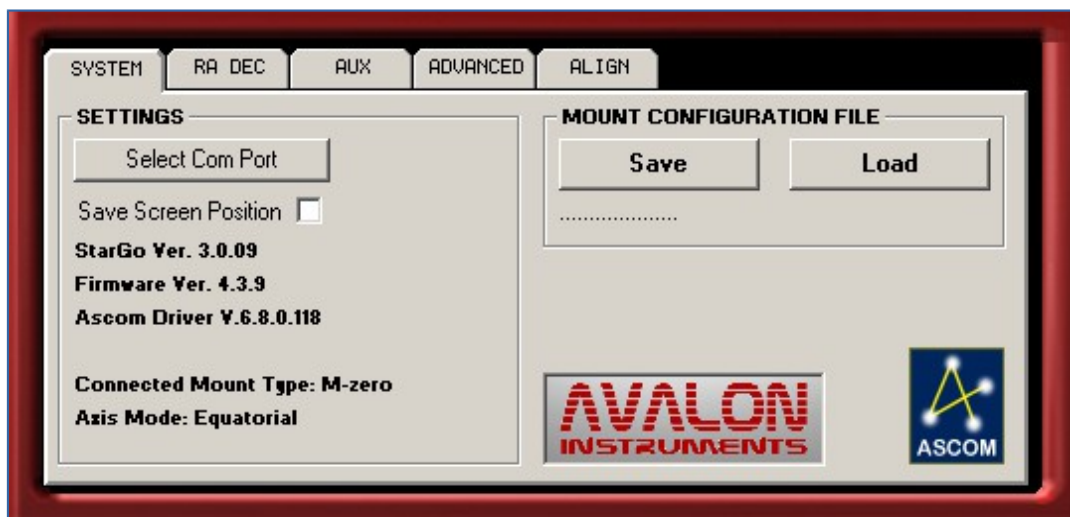


*Figure 4.1a – StarGO Main Panel before connection*

To animate the GUI it is necessary to perform the connection with the StarGO hardware. After powering the StarGO and after its connection to the PC via USB cable, press the






button with the symbol and the serial port selection window will appear.



*Figure 4.1b – Serial Communication Port setting*



Figure 4.1c – Main Panel


The replacement of the  icon with the  icon will prove, together with the sudden appearance of a blinking red LED , will inform that correct connection is established. The red LED has the same function of that installed on the StarGO hardware (item (19 of Fig. 2.1).

Doing a quick click on the LED or on one of the directional buttons below it, the same result of brief pressure of the mentioned physical button (1) is obtained: the sidereal tracking is activated.

A double click over the LED symbol has the same result of pressing, for more then 5 seconds, the physical button on the StarGO. The red LED restart to blink (in both StarGO software and hardware) and the tracking stops. This action requires a confirmation by the user through a warning windows.



## 4.2 Parameter setting

By pressing the setup button on the bottom right , the GUI extends to show the mount parameter setting windows. In the upper left side of this windows the StarGo version number is shown. As seen in Figure 4.2, this windows contains five tabs for setting different parameter types.

### System Panel

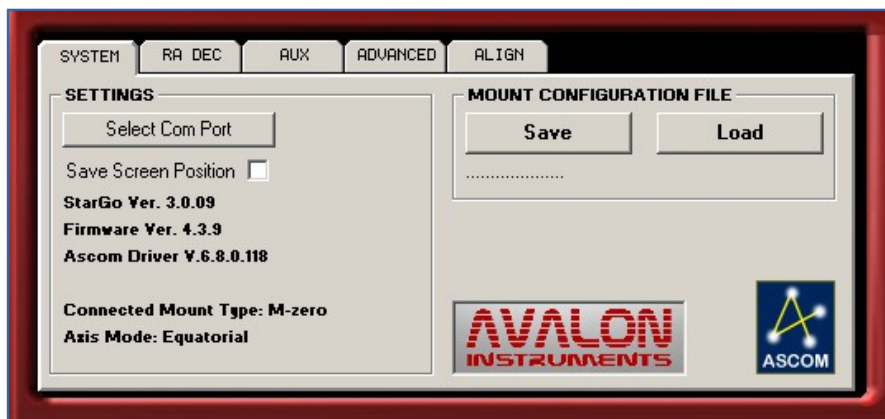


Figure 4.2 – “SYSTEM” Panel

The first tab **SYSTEM** opens a panel that allows the selection of the StarGO connection COM port number, as previously seen, whereas the “Save Screen Position” check allows to save the defined StarGO GUI preferred position on the screen.

In the lower part of the frame, the pieces of information related to the StarGO firmware and software are reported together with the type of mount selected in the ADVANCED panel. In particular the StarGO software and firmware and the installed ASCOM versions are reported. The connected mount type and the related operating mode (equatorial or alt-azimutal), are reported below.

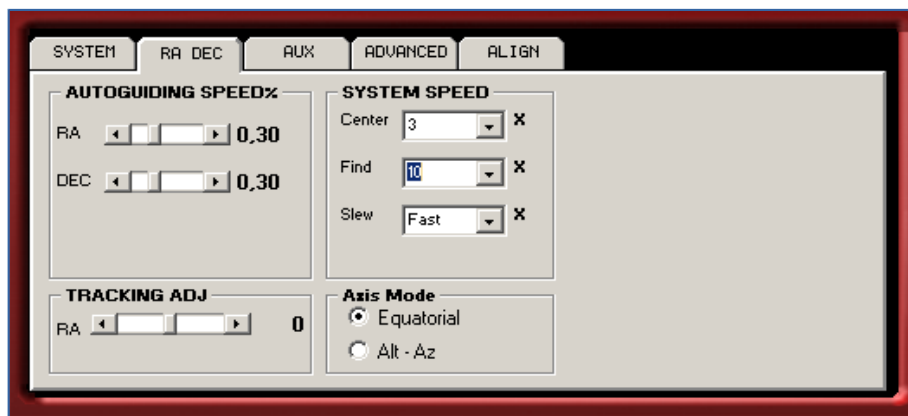
The adequacy of the given versions of firmware and software is evaluated by the software itself and, in case of inadequacy, the user is warned and suggestion is given to update (see the following section 4.3).

On the top right there are the two buttons to Save and Load mount parameter (see following tabs) which are contained in configuration files having the .mcf extension. Below these buttons the name of the parameter file possibly loaded is shown.



## **RA DEC Panel**

Through this panel (Figure 4.3) it is possible to access to the guiding settings of the mount.



*Figure 4.3 – “RA-DEC” Panel*

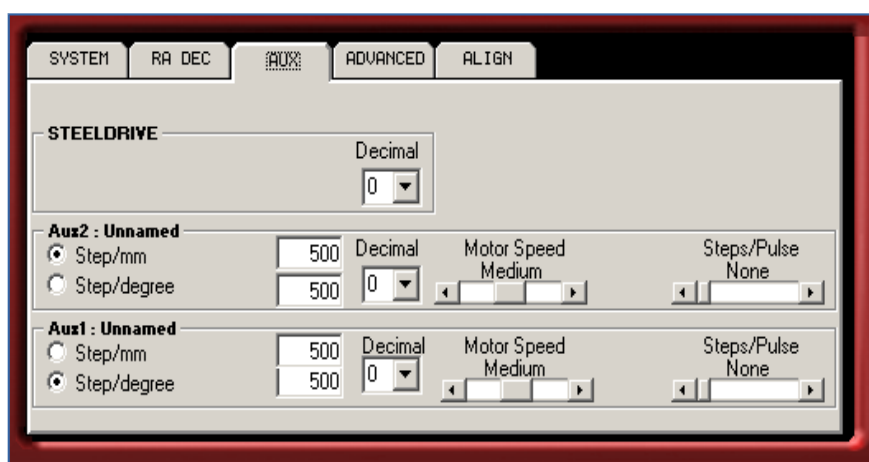
The “AUTOGUIDING SPEED%” frame allows to regulate the auto-guiding speed, with increments of 0.05x the sidereal speed. This regulation can be performed independently for the two axes. It has effect for the signal coming from the ST4 port and the pulse guiding signals coming from the USB ports.

The “SYSTEM SPEED” frame allows to modify the values of speed associated with the Center Find e Slew buttons of the main panel of StarGO.

The allowed slew speed are: “Low”, “Medium”, “Fast” and “Ultra” (the latter requires at least 15 VDC supply which is directly selectable on the provided power supply. This is possible also using the 12 VDC input if the use of a battery is essential).

The AXIS MODE frame allows to select the mount working mode: Equatorial or Alt-Azimuthal (when the latter operating mode is possible, i.e. the M-zero mount)

## **AUX Panel**



*Figure 4.4 – “AUX” Panel*

The third panel (Figure 4.4) is related to the setting of the auxiliary port to control a Baader Steeldrive focuser and the two AUX port controlled by the StarGO.

In particular the AUX 1 and 2 ports can drive step motors dedicated to specialized functions such as motor driven focuser of other brands, filter wheels, CCD rotators, etc.

**NOTE: The motors driven by the AUX 1 and 2 ports are disconnected from the power once they reach the due position. It means that in this state they do not absorb any current but are not able to keep mechanical loads requiring an active effort.**

The frame STEELDRIVE allows only the number of decimal settings (see note below) because all other parameters are fixed and internally set by the constructor.

In the following two frames related to the auxiliary devices, (AUX1 e AUX2) it is possible to setup the motion resolution unit in Step/mm or Step/degree depending by the device movement type (linear or angular).

**NOTE: In all three frames of this panel it is possible to define the number of decimal digits that will be visualised in the main panel or in the separate windows (see section 3.1.2). Furthermore, making double click over the frame title it will be possible to change the Aux port denomination.**

Four sliders are located in the right side of the panel. They allow the regulation of the speeds of the motors connect to the two AUX ports and the related values of the Step/Pulse ratios.

### **ADVANCED Panel**

Some base parameters, to be modified during the installation phase, and rarely used, are set in this panel (Figure 4.5)



Figure 4.5 – “ADVANCED” Panel

The frame “REVERSE MOTOR DIRECTION” allows the inversion of the motor rotation direction for both RA and DEC axes. This function is useful in the case that the polarity of the motor cables of the StarGO is inverted.

The frame “POLAR FINDER LED” set the intensity of the red LED of the Polarscope during the polar alignment operations.

**NOTE: The LED is set to 0 (off) at the system powering on. It is possible to vary the LED intensity also by pressing together the keys Fn and SPEED+ or SPEED- on the keypad.**

The hemisphere in which the telescope is located is set through the frame “HEMISPHERE”.

The last two frames of the present tab are related to the choose of the mount on which the StarGo system will be used and to the setting of both the RA and DEC motor torque (in percentage of the maximum value). In the “MOUNT GEAR RATIO RA/DEC” frame the type of mount is selected, on the base of its Gear Ratio, In particular the Avalon mounts Linear, M-uno and M-zero are nominally indicated.

Starting from firmware version 4.0.0, the motor torque management system has become dynamic. For the regulation of the RA-DEC Torque value, please refer to the following table:

Mount (Voltage)	Linear / M-uno (12 V)	Linear / M-uno (15 V)	M-zero (12 V)	M-zero (15 V)
Max Slew Speed	Fast	Ultra	Fast	Ultra
Torque	70%	70%	50%	50%

### **ALIGN Panel**

The last panel is related to the setting of the geographical observation site parameters and to the mount parking operations in specific positions such as Park, Home, etc.



Figure 4.6 – “ALIGN” Panel

The left frame of the ALIGN panel (“OBSERVATORY LOCATION”) allows to set and save up to eight observation sites by inserting their geographical coordinates (Latitude and Longitude).

**NOTE:** To operate the mount in Alt-Azimuthal mode is normally sufficient the use of the smartphone or tablet provided of suitable software such as SkySafari (see the following sections 5 and 6), in addition to the control keypad. The mount retains in memory the choosen operational mode.

The right frame “PARKING” allows to manage the park positions that the mount shall use after the observing of photographic sessions or when it is necessary to restart the mount operations at a well defined position to align it, if necessary, during an active session.

The **Park** button performs the mount parking in the positions beforehand memorised by means of the **Set Park** button.

The **Find Home** buttons allows to bring back the mount to the **Home** position, corresponding to the starting position in which the **Sync Home Position** has been performed.

**Realign** permits to re-align the mount in the position beforehand set using the **Set Park** button (this function may be usefull in the case the alignment is accidentally lost and in this case it will be sufficient to position the mount to the known park position and pressing this button).

The **Backup** and **Restore** buttons permit to save to and load from the PC the park position in the case the **Set Park** button has been used by error.

The use of the **Park** function permits to switch off the mount and its restarting, even after many days, without losing the sky alignment.

When the mount will stop at the parking position, the StarGO GUI will suddenly change by closing the setup panel and the replacement, in the main panel, of the directional button set with the information related to the new current status “Parked” and with a new push button to perform the mount “Unparking” as is well seen in the figure 4.7.



Figure 4.7 – Main Panel with a parked mount

Finally, the “Sync Home Position” button allow to synchronize the HOME position item with the mount home position, which is traditionally that with the counterweight bar down (CWD position) and the telescope looking North.

In the Avalon mount this position can be easily reached, even remotely, referring to the reference signs on the mounts. The “Sync Home Position” function allows also to reset all the alignment corrections previously performed, restarting the alignment from scratch.

### 4.3 Warning Description

The StarGO is provided of a warning system that alert the user when setting functions that require more attention or that can jeopardize the correct mount operation.

The first of such alarms is presented when there is a significant disagreement between the version of the firmware installed in the Hardware StarGO and the software used. This can occur quite frequently because both these elements are continuously improved by Avalon Instruments and new versions are regularly distributed throughout the [Support](#) page of the Avalon site.

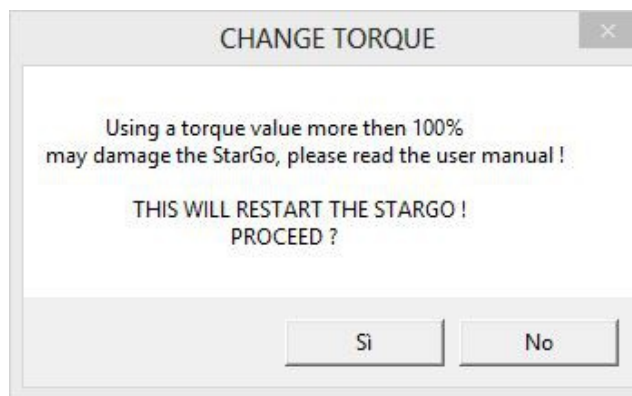
This warning appears when software and hardware are being connected trough this window:



Pressing OK the operation will continue normally but, if any important change or improvement has been included in the last version of the software, possible malfunctions can occur. It is therefore import to follow the warning suggestion to contact the dealer and to obtain the last firmware version.

A similar warning is generated if it is the software to be obsolete in comparison to the StarGO firmware. Even in this case the suggestions given should be followed.

Another warning, important for the correct mount operation and for its safeguard, appears when the user attempts to increase the motor RA.DEC Torque over the 100% threshold in the ADVANCED panel:



The increasing of the motor torque implies a greater correct absorption potentially causing a dangerous over-heating of the hardware and of the motors themselves. It is advise, therefore, to remain below of this threshold. Pressing the button “Yes” the StarGO will be restarted losing all the operation in progress.

The last alarm is generated when, in the panel SYSTEM, a setup file, implying a change of the mount type, of gear ratio or of other import parameters, is loaded. This alarm warns only the operator that a restarting of the StarGO is needed to complete the action.



#### 4.4 Main Graphical Area Description

This section contains the description of all other items of the Main Control Panel of the GUI not described in the previous sections.

The large window on the upper left angle shows the current values of Right Ascension RA and Declination DEC coordinates of the telescope.



The directional buttons on the middle right allow the movements of the telescope in RA and DEC. The central STOP button suddenly ends all movements in progress whatever is the telescope operation or position.



The bottom left window contains the buttons to chose the telescope movement speeds.



“Tracking” speed is the speed of the stars already described, defined as the sidereal speed used by the telescope (Solar, Lunar and Terrestrial). The tracking speed is reported in the top right side of the screen, in the same position as the tracking speed.



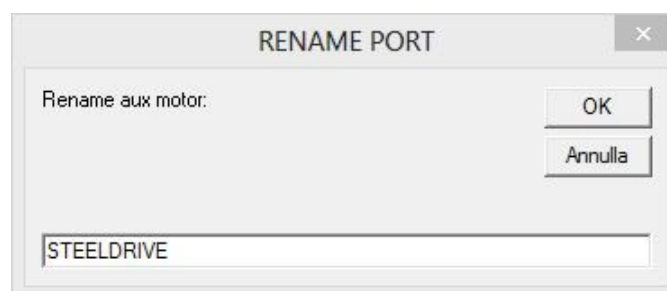
the directional “System Speed” (Sideral, Lunar, Solar, Terrestrial) is not yet been implemented and will appear.

During the tracking at sidereal speed, the tracking speed values remain obviously fixed whereas the tracking speed values change when other tracking speeds are selected (the other three buttons of the *Tracking* row). In particular, if the terrestrial speed is selected, the mount stops and remain motionless in comparison with the sky and the display shows the RA changes due to the sidereal motion.

The matrix of buttons under the DSLR buttons allows to control the devices connected to the three AUX ports of the StarGO (ports N. 7, 9, 10 of Figure 2.1).

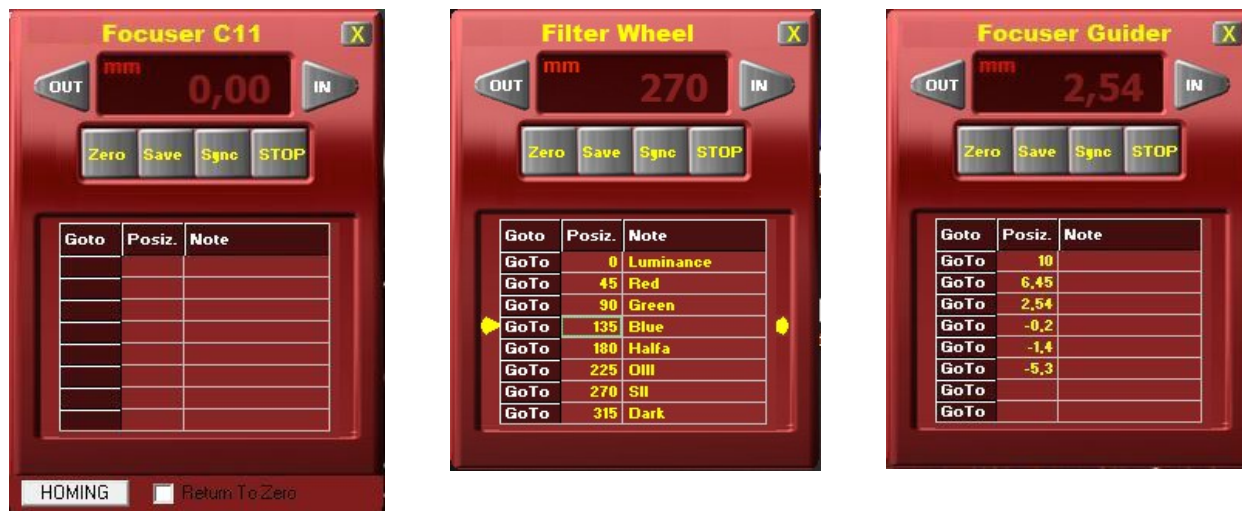


The setup of the AUX ports parameters is performed by the user as described in the AUX Tab (Figure 4.4). Clicking over the name of the device in the frames of the AUX Tab, a new auxiliary window will appear as follows.



Through this windows is possible the insertion of a new name for the device connected to each of the Aux port. This name will appear in the above mentioned matrix. Also the gauge units defined in the AUX Tab will be reported in the matrix for each device (in our example the AUX2 a Steeldrive focuser is mounted in a C11 tube, a Filter wheel in the aux1 port and another focuser in the guiding tube).

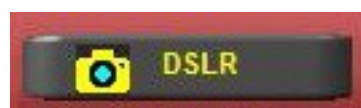
Double clicking over the name of the device in the matrix, a new auxiliary window will appear to allow the insertion of the needed parameter for motor control of the given device. The three windows, very similar among them, are the following (only one has been populated as an example):




Each row of the small table can be filled with the positional values that will be recalled in case of need and, if needed, related annotations. The positional values may be linear as, for example, focuser extraction or angular as rotation degrees of a filter wheel. The four buttons allow an easy management of the parameters. The Zero button is for zeroing the display value, Save will allow the saving of the introduced parameters (otherwise these will be lost at the StarGO exit), Sync will enable the synchronization of the device position with the value reported in the selected row of the table and, finally, STOP will halt all the device motor movements in case of need. The display will show the current value of the parameters, including the measurement units and the two triangular button enable the manual movement in the two directions of the related device.

Doing a double click over the small GoTo buttons corresponding to a given position, the motor will go in that position.

The button **DSLR** allows the access to the windows for the control of the digital DSLR connected to the StarGO via the input plug N. 5 of Figure 2.1. The detailed description of this feature is reported in paragraph 4.2.



The button with the galaxy icon  allows to access to the StarGo celestial object database.

### Celestial DataBase

The StarGo system is provided of a Data Base of about 14000 objects, including practically all the astronomical objects which are interesting for the astrophotography or for the telescope managements such as the reference stars. See Figure 4.8.

**StarGo Ver. 1.0.35**

Object	Constellat.	Type	RA	Dec	Mag
alpha	Ari	Hamal	02h 07m 23.3s	+23° 28' 59"	2
beta	Cyg	Albireo	02h 30m 50.9s	+27° 57' 57"	3.1
alpha 3	Cas	Schedar	00h 40m 42.5s	+56° 33' 46"	2.2
alpha 22	Boorr	Arcturus	14h 15m 49.8s	+19° 09' 33"	-0.1
alpha	Cas	Schedar	00h 40m 42.5s	+56° 33' 46"	2.2
betax	Casx	Caphx	11h 11m 11.7s	+11° 11' 11"	2.3
alpha	CMa	Sirius	06h 45m 20.4s	-16° 43' 16"	-1.4
beta	CMa	Mirzam	06h 22m 53.4s	-17° 57' 27"	2
alpha	CMi	Procyon	07h 39m 31.4s	+05° 12' 56"	0.4
beta	CMi	Gomeisa	07h 27m 22.9s	+08° 16' 56"	2.9

*Figure 4.8 – Celestial Object Database*

The Database window is subdivided in several sections that may be accessed through related tabs, as visible in the figure.

The DB organisation is very simple. Each tab corresponds to a specific astronomical catalogue as follows:

ALIGN_STAR	72 objects
DOUBLE_STAR	39 objects
Herschel 400	400 objects
IC Catalog	5383 objects
MESSIER Catalog	110 objects
NGC Catalog	7840 objects

It is possible to sort in alphabetic or numeric order the objects of each catalog by simply clicking on the chosen column heading.

The catalog are simple textual files of a well defined format, located in the StarGO main directory. It is possible to create new catalogs or to edit the existing ones simply using a text editor following the specified format.

#### 4.5 Use of StarGO application for telescope control

**NOTE: The instructions reported in this section are applicable only to the Equatorial operating mode. The corresponding operations to be performed in Alt-Azimuthal mode are reported in section 4.4.**

To perform telescope pointing operation, it is necessary to start from a condition with a polar alignment that, for the visual session, can be approximated whereas for the photographic sessions must be very precise to guarantee an optimal tracking. The operation needed for a good polar alignment are described in the mount manual.

#### 4.5.1 Alignment (SYNC) and Goto Operations

The *Sync Home Position*, i.e. the operation needed to align the mount to the sky, is the first to be performed to execute the correct pointing of the celestial objects to observe or photograph.

For the correct execution of this operation it is needed to position the mount with the telescope pointing to the North toward the Polaris and counterweight bar pointing down toward the terrain (for the M-zero and the M-uno is the DEC arm that must point toward the terrain. The M-uno is provided of suitable references to do this).

At this point, once the mount has been switched on and after the check that the site and date parameters in the software are correct, the "Sync Home Position" button in the StarGO Align Control Panel must be pressed (see also fig. 3.6). The StarGO coordinate display will show  $90^{\circ} 00' 00''$  in DEC and a value of RA corresponding to the East meridian transiting position at the actual time.

The second operation is the telescope synchronization with a star, which is close to the target object. This action has the scope to refine the pointing precision. To perform it a GOTO to the selected star shall be executed. The StarGO will bring the telescope close to the star that will need to be exactly centred in the FOV using the keypad or the directional buttons of the StarGO software. Once the star is perfectly centred a Sync shall be performed with it. After that it will be possible to center the required object.

To point other objects it will be sufficient to select them using the internal catalogues of the StarGO software or, much more conveniently, through the used planetary program performing also with it the GOTO command.

In the case the object to mount is located in the other side of the Meridian the GOTO will cause a Meridian Flip to avoid mechanical interferences between the telescope and the tripod or the column.

The StarGO has a special function for the improvement of the telescope pointing capability, especially after a Meridian flip, allowing to store two different offsets, one for each side of the Meridian. To use this function it is sufficient to perform a second Sync on side of the Meridian opposite to that of the first sync. This allow to obtain a good pointing precision on both Meridian sides (in facts we perform a double one star alignment).

A method that makes very easy the pointing of objects and the execution of all the needed syncing operation is the "Plate Solving", suitable only during astrophotography sessions. This method permits to determine with extreme precision the celestial coordinates of the FOV center to be used for an exact syncing. The software Astrotortilla allows to perform plate solving operations in a very quick and efficient manner without the need of an external internet connection as other software's require. It provides also an automatic synchronization function and one additional centring function of whatever celestial object with a pre-defined precision (up to a fraction of arcmin). The adoption of Astrotortilla allows the easy and precise centring of any object without the need to adopt sophisticated and boring pointing model, using even several tens of stars, that, for external and uncontrollable reasons require to be often corrected and updated.

**Note:** It is also possible to perform, with more simplicity, the Sync Home Position directly inside the planetarium software used (for example Sky Chart or even from Android tablet and Skysafari) starting from the home position and after the mount activation, making a sync on a star on the south meridian and close to the horizon.

#### 4.5.2 DSLR Camera Control

The StarGo application is capable to better manage photographic pictures (for example with a Canon DSLR camera). To use this feature it will be necessary to connect the camera to the port N. 5 of the StarGO hardware using the suitable cable

Pressing the DSLR button a new window appears, with the same name DSLR (Figure 4.9), allowing to setup all photographic parameters for astrophotography.



*Fig. 4.9 – DSLR Control*

The following parameters are set in the three dropdown menus on the left side:

**Exposure** – Length in seconds of each exposition

**Wait** – The length in seconds of the time gap between successive expositions

**N. Shot** – Total number of expositions to perform.

The button “Start” initiates the sequence of the expositions whereas the button “Stop” interrupts it before the total number of shots is carried out.



The button “Test” allows the execution of single shots of variable exposition time. At the first pressure of “Test” the exposition starts, at the second it is interrupted. The elapsed time in seconds is reported in the “Exp. Time” window.

On the right side of the DSLR windows there are the commands to move the mount (“Move AR” and “Move DEC”) and to operate the Auxiliary devices (“Move Aux”). The movement duration, set in seconds, will be performed at the speed chosen in the “System Speed” area of the Main Panel (See Figure 4.1).

The axis movement direction is determined by the pressing of the related triangular button.

Using this function with the mount in Alt-Azimuth mode, it will be possible to easily perform panoramas or dynamic time lapses.

Finally, in the bottom of the DSLR windows there is the chose of the action to perform at the end of the photographic sequence: “Do nothing”, “Turn off motors” and “Park mount on observatory”, which are all self explaining.

#### 4.5.3 Mount control using ASCOM driver

As already explained in section 3.1, the StarGO system is compatible with the ASCOM astronomical standard via the Avalon ASCOM driver that Avalon Instruments has developed and distributed with its StarGO system.

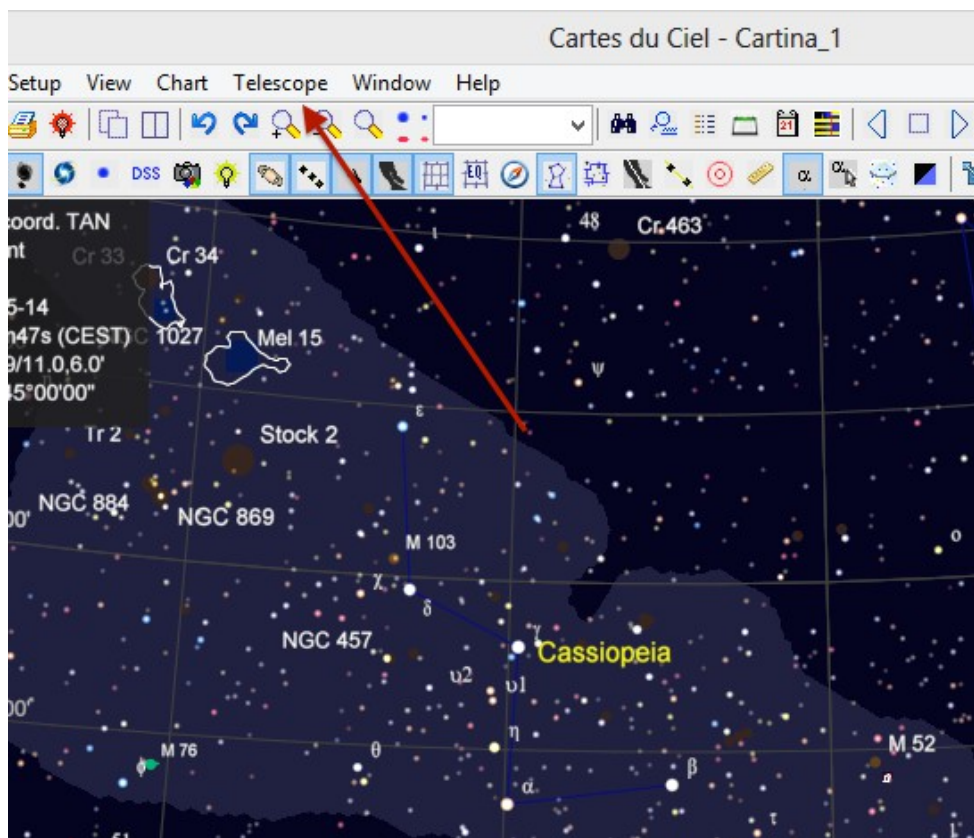
This capability yield possible to manage the mount using third part software (i.e. planetarium programs) cooperating with StarGO software. This section does not intend to make a deep discussion of the Avalon mount use with ASCOM software.

**NOTE: For a more detailed review review of this topic, please read the document describing the use of third part software with Avalon mounts (StarGO – Third Part Software Use), which is in the scope of the StarGO supply. To use the Avalon mounts under ASCOM it is of course necessary that this environment has been installed already in the computer.**

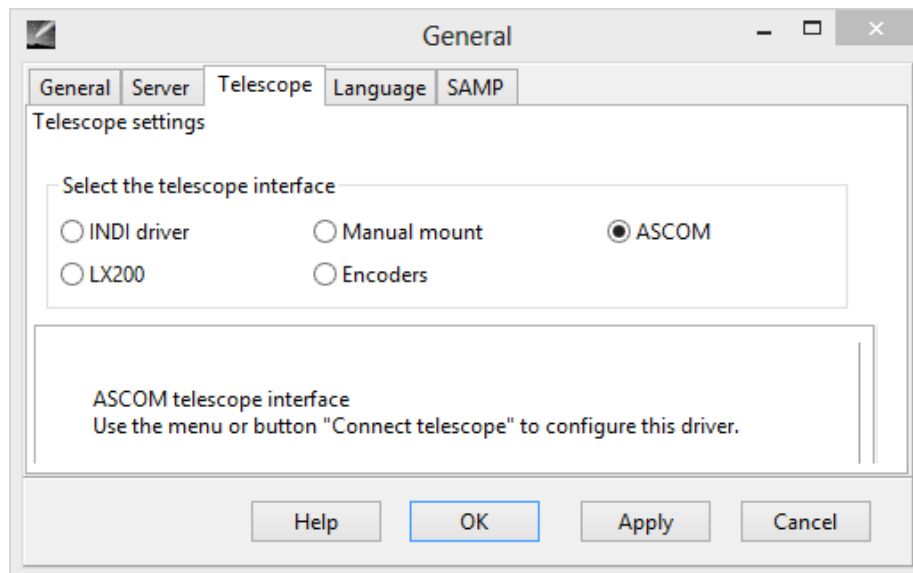
The system starting under ASCOM is executed inside the used software (in the following description it has been used, as an example, the Cart du Ciel planetary program (Sky Chart <http://sourceforge.net/projects/skychart/files/latest/download> ). With other software the starting procedure, that could be slightly different, is described in more detail in the afore mentioned document).

First of all select the “Telescope” menu, as in the following figure:

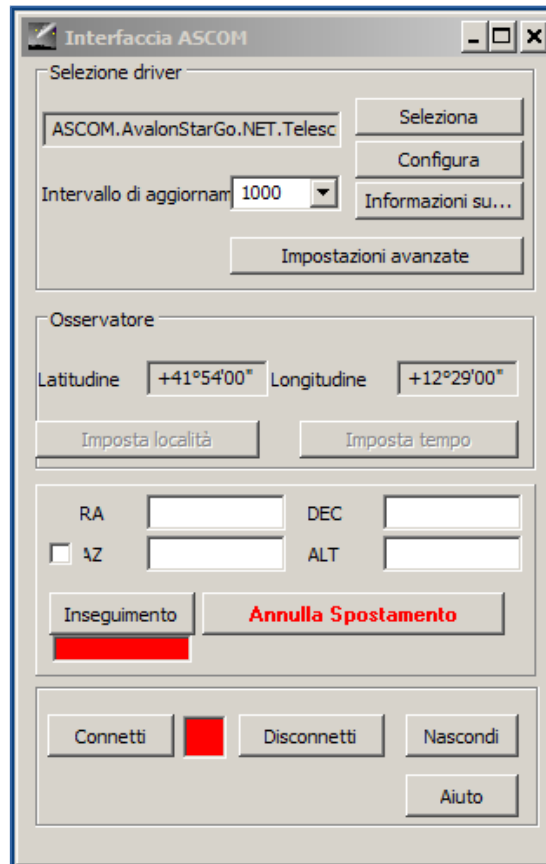




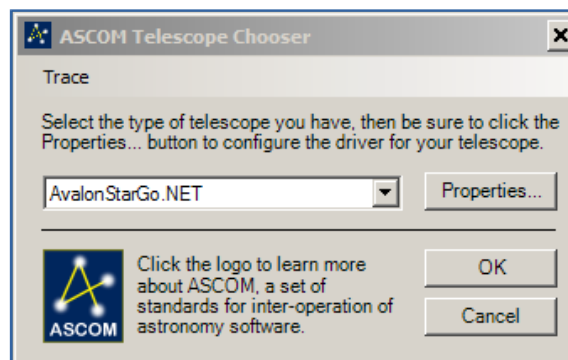
and then select the “Telescope Setting” function that will open the following window in which the ASCOM interface shall be chosen:



At this point it is necessary to select the ASCOM driver before to connect the telescope to system. This selection will be done through the ASCOM configuration panel that will be opened with the voice “Control Panel” under the “Telescope” menu.



The classic “ASCOM Telescope Chooser” window is opened by clicking over the “Select” button. The Avalon ASCOM driver is selected in the dropdown menu.



**NOTE: It is important to select the new driver “AvalonStarGo.Net” because the old one “AvalonStarGo” is not more compatible starting from version 4.0.0.**

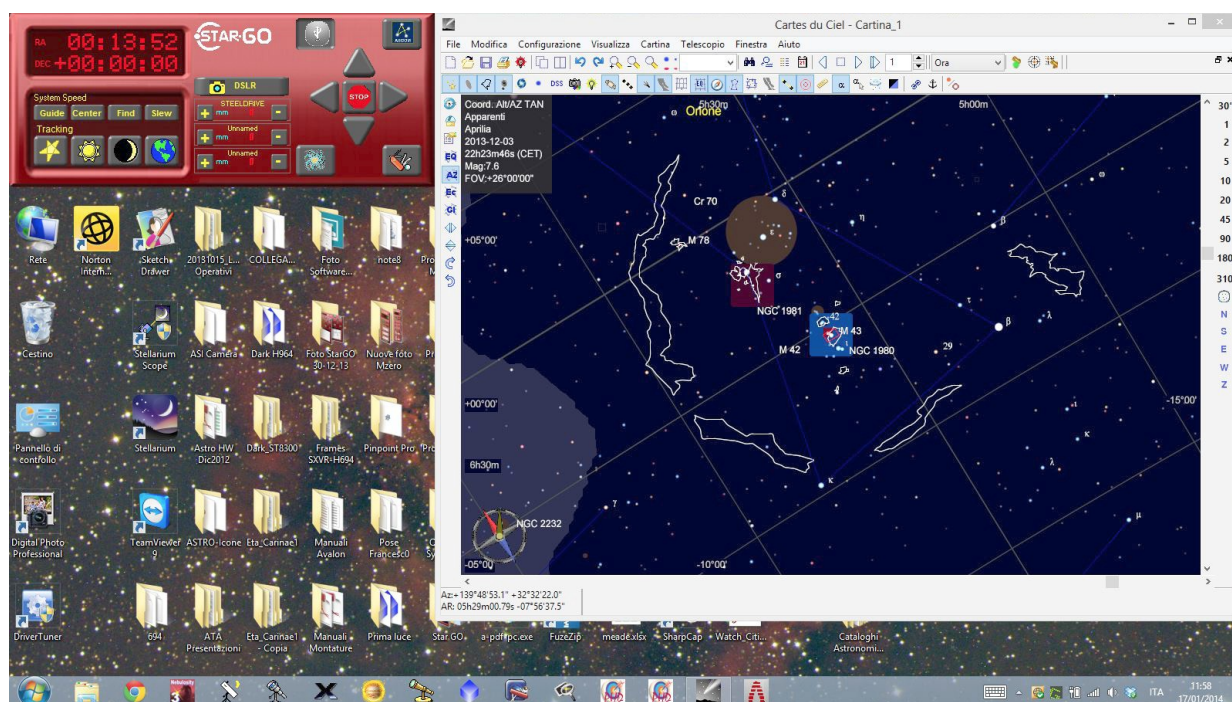
By pressing the OK button this window will close and the control will return to the previous ASCOM Interface window in which, pressing the button “Connect” the logical connection between the StarGO and the ASCOM software will be actuated. It must be noted that the occurred connection will cause also the StarGO software opening that will be available to completely manage the mount in collaboration with the ASCOM software. The fact that we are now operating in ASCOM environment is shown by the StarGO connection button that



have now the following aspect:

The movements of the mount executed through the planetarium will be transmitted and shown in StarGO and those done in StarGO will have a feedback, also graphical, on the planetarium display.

The integrated control ambient will have therefore the following aspect:



## 4.6 StarGo Bluetooth Control

One of the more innovative feature of of the Avalon Mount is the capability of the new StarGO control system to manage the connection with the user devices in a “wireless” manner, using the Bluetooth standard.

To benefit of this function is necessary to use a device (computer, smartphone, tablet) provided of bluetooth capability and a software suitable to interact with the mount using this technology.

At the moment the following combinations of Device/Software have been tested:

1. PC Windows (XP, 7 e 8) / TheSkyX Pro
2. MACOSX (10.9.4) / TheSkyX Pro
3. MACOSX (10.9.4) / SkySafari Pro
4. Samsung Galaxy Tab S (Android) / SkySafari Pro
5. Samsung Galaxy Note 2 and 8 (Android) / SkySafari Pro
6. Samsung Galaxy 5S (Android) / SkySafari Pro

Other Device/Software combinations will be added once further tests will be successfully performed.


The use of TheSkyX Pro and Pro SkySafari makes the Avalon mounts operable also on the Mac Operating System (MACOSX). The possibility to use of a portable device of the combinations 4 to 6 makes these mounts operable even without the use of a PC (or a Mac).

In this section the operation needed to control the Avalon mounts via Bluetooth using the StarGO control software will be described. A Quick Guide on StarGO and SkySafari containing also the use of StarGO and SkySafari on Mac computers via Bluetooth will be reported in a specific document.

#### 4.6.1 Bluetooth pairing of the StarGO with a computer

The use of the Bluetooth link for the data transmission requires the "pairing" with the used device. On a PC with Windows operating system the Bluetooth module is recognized as "StarGO" using the PIN "1234". Once the association PC / StarGo is done and the connection is established via Bluetooth, it will be possible to modify the pairing parameters using the ADVANCED panel as described in paragraph 3.1.1. , the only difference between managing the mount via USB and Bluetooth is the selection, in the used program setting, the type of link you want.

When the successful pairing is occurred, it is necessary to detect what COM port has been assigned to Bluetooth. In this case two COM ports will result assigned. Before the launch of the connection it is needed to insert the number of one of the ports in the "DEFAULT SETTING" frame of the "SYSTEM" panel.

The launch of the Bluetooth connection is done by pressing the button  of the main panel.

The correct connection is proven by the icon change from the above to that shown in the following figure with the Bluetooth logo.



whereas, previously, with the normal USB connection established, the icon was modified as follows:



After the connection is performed all other control operations are absolutely identical to those performed with a USB connection.

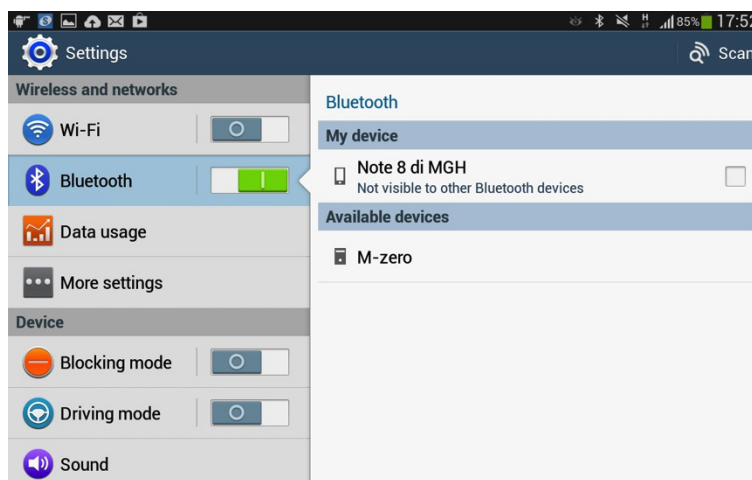


## 5. StarGO and SkySafari

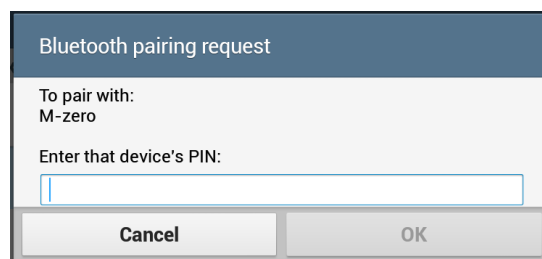
### 5.1 Bluetooth pairing the StarGO with an Android tablet or smartphone.

The wireless control of Avalon mounts with Android devices using Bluetooth running management software such as SkySafari, requires the pairing of the StarGO with that device. This is easily done following these simple steps (the figures can be slightly different in different Android devices):

1. Select Setting in the device main screen and, in the arising window, select Bluetooth in “*Wireless and network*” section. The screen will be as follows:

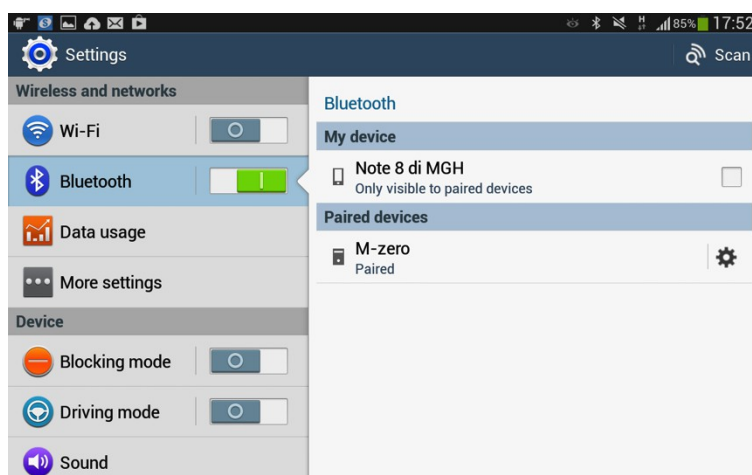


2. Press “M-zero” (or any other Avalon mount name detected) under “*Available devices*”. After few seconds a small window arises requiring the pairing pin:



3. Enter the pin provided by Avalon (usually 1234) and press OK. After few seconds the device will be paired (see next screenshot) with the StarGO. The mount will be ready to be controlled by the device.



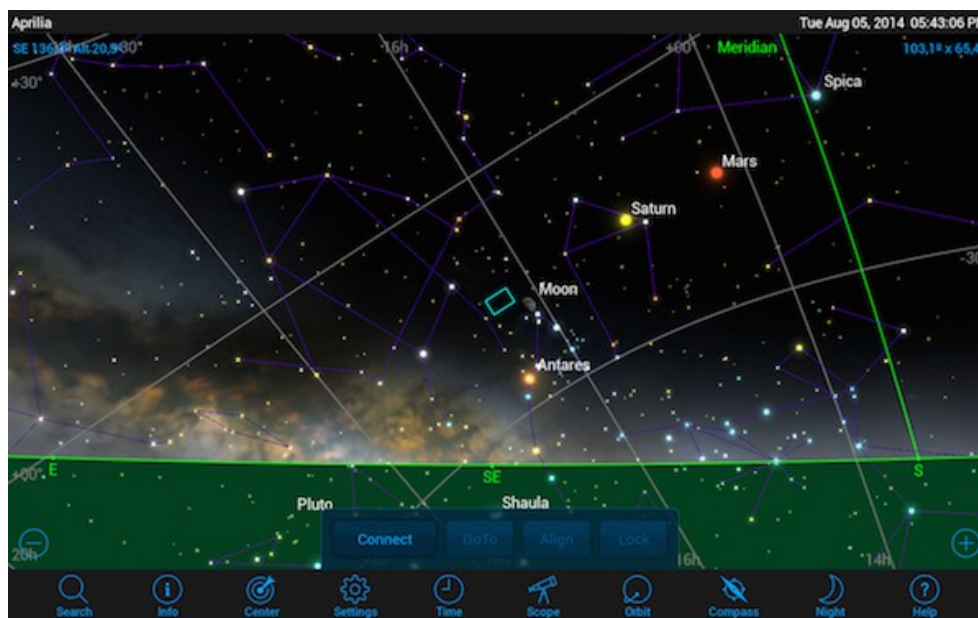


## 5.2 SkySafari setup

Before using SkySafari with Avalon mounts it is necessary to set some important parameters in the program setup page. SkySafari is provided of plenty of parameters to set, most dedicated to the program display characteristics. This section will deal only with those parameters which are necessary for the Avalon mount control. Read the SkySafari manual to set all other parameters

( <http://www.southernstars.com/support/manual/index.htm> ).

1. Launch the SkySafari (version 4) on the Android device. The program will open with the following screen:



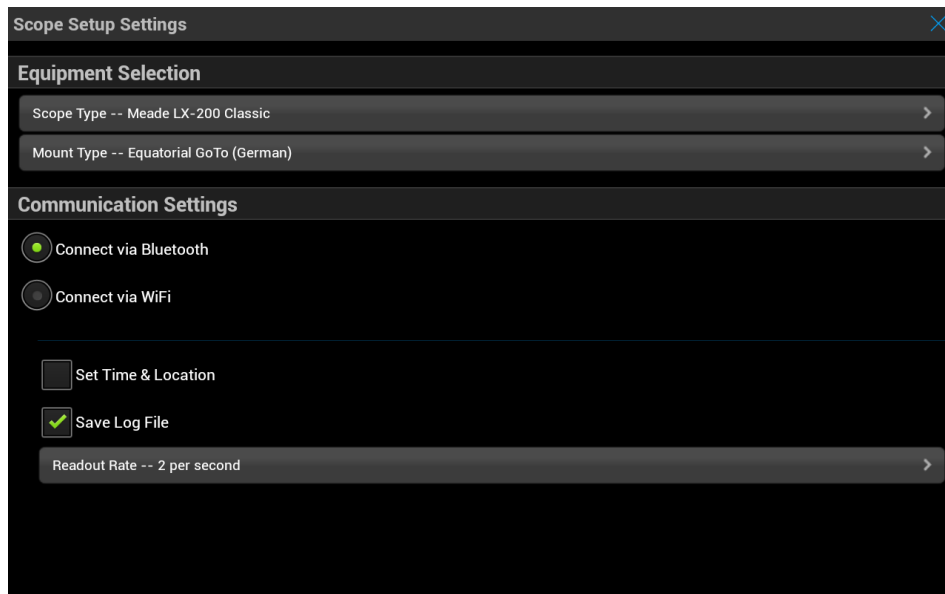
2. Press the Settings icon on the bottom bar. A screen will appear with a long list of all parameters to set. First of all open the “Time and Date Setting” obtaining the

following screen. If the device date and time are correct simply check the “*Use current Time*”. Otherwise set the current date and time as required. When done click over the X in the upper right corner for saving and exit the current page.

3. Open the “*Location Settings*” page. In this page insert the name and the geographical coordinates of the site. Insert also the approximate elevation and the Standard Time Zone as required. At the end press “*Save User-defined Location*” for future use.

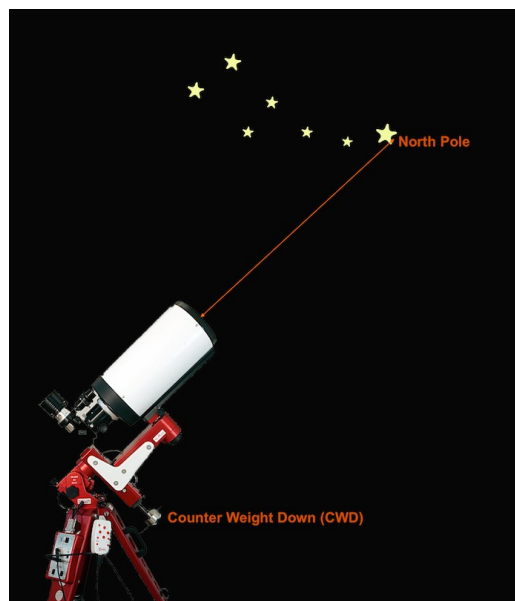
4. The last but very important set of parameters is the “*Scope Setup Settings*”. This page will allow to insert the telescope and mount type (Meade LX-200 Classic and Equatorial GOTO, respectively, for the Avalon mounts), the Bluetooth as

communication standard and the “*Readout Rate*”. Insert the data exactly as reported in the following screenshot.



### 5.3 SkySafari Connection and alignment

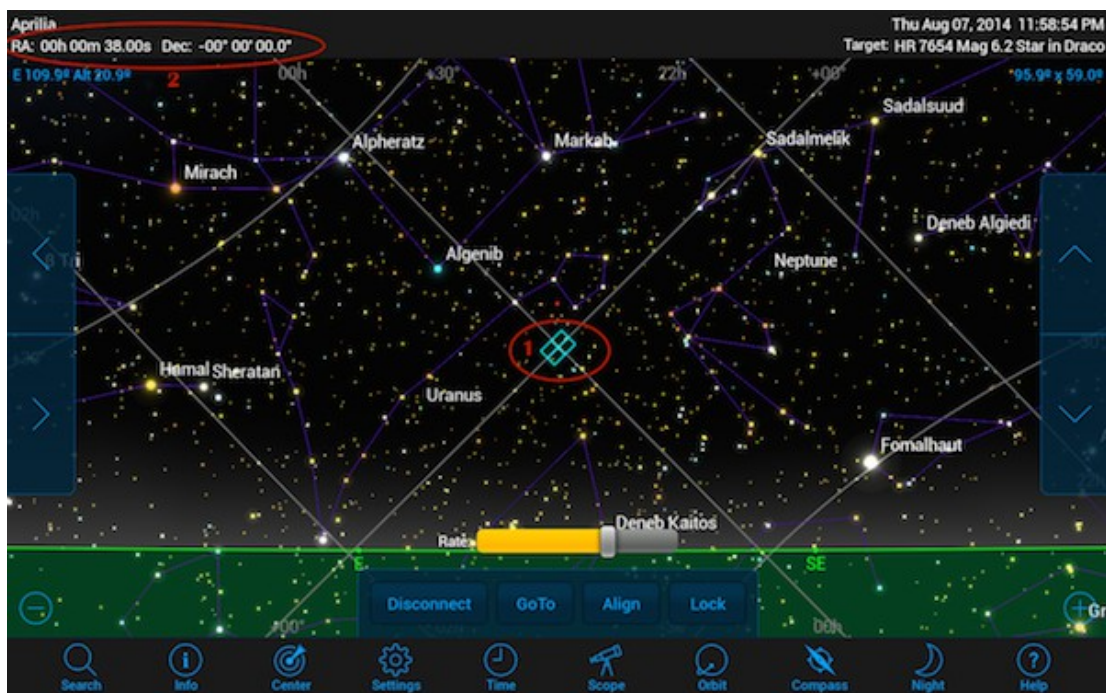
1. Once all the operations described in the previous sections have been completed, it is possible to start moving the telescope using SkySafari. The first action to perform is to manually put the telescope in “Home” position, i.e. with the counterweights pointing the down (CWD) direction and the telescope pointing the North Pole (see next figure). Then connect the mount to the device by pressing the button “*Connect*” at the bottom of the application screen.



2. The previous command will result in the “*Connect*” button, after few seconds will turn to “*Disconnect*” after a chime, the telescope FOV pointer position (CCD or eyepiece) on the SkySafari screen will appear exactly at coordinates RA=0, DEC=0 and the commands “*GoTo*”, “*Align*” and “*Lock*” on the right of “*Disconnect*” will become active .
3. To correctly start the navigation operations, it is necessary to transmit to the mount the coordinates related to the “Home” position because, at the mount power on, StarGo is unaware of these coordinates.

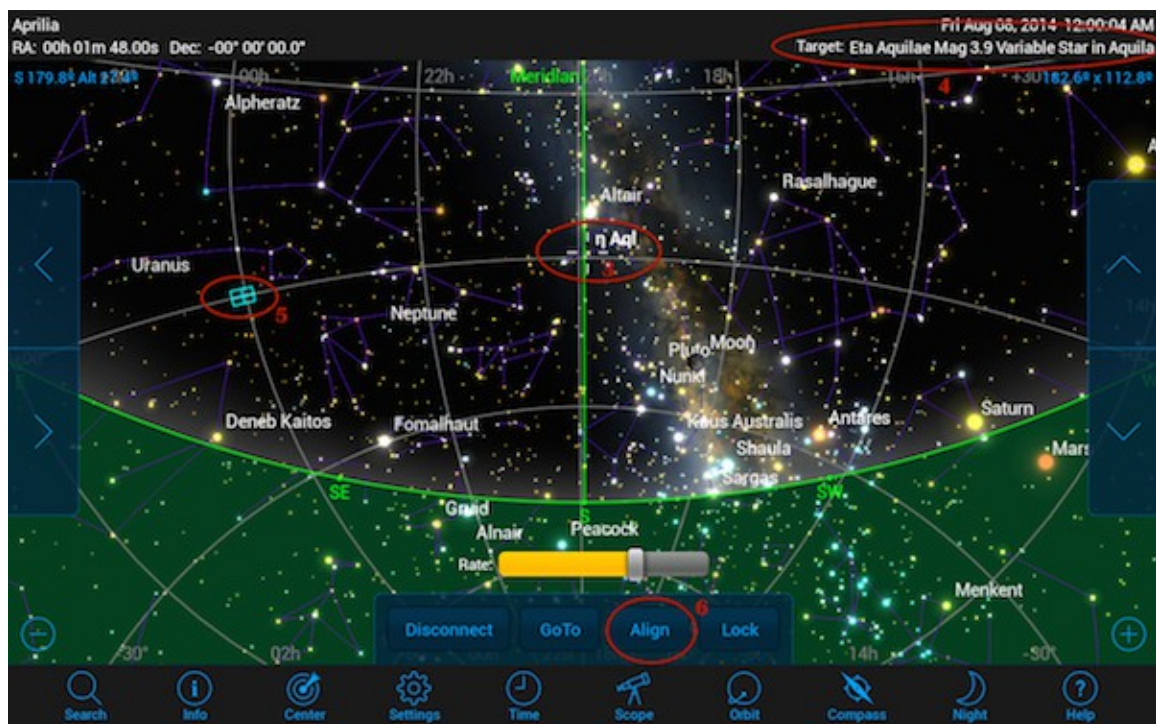
The very first sync action to be performed in SkySafari, after its connection, is to transmit to the StarGO the point where the mount is really pointing at that moment . This operation consists in performing an initial sync, using the “*Align*” function of SkySafari, on a star on the meridian and close to the southern horizon, without moving the mount from its Home position. It is equivalent to perform the “*Sync Home Position*” using the StarGO software as described at page 20.

The following sequence of three SkySafari screenshots, taken a) just after the connection occurred, b) at the moment of syncing to a near South Meridian star and c) after the “*Align*” function is carried out (representing the North Pole area), is useful to understand the event sequence and its results:

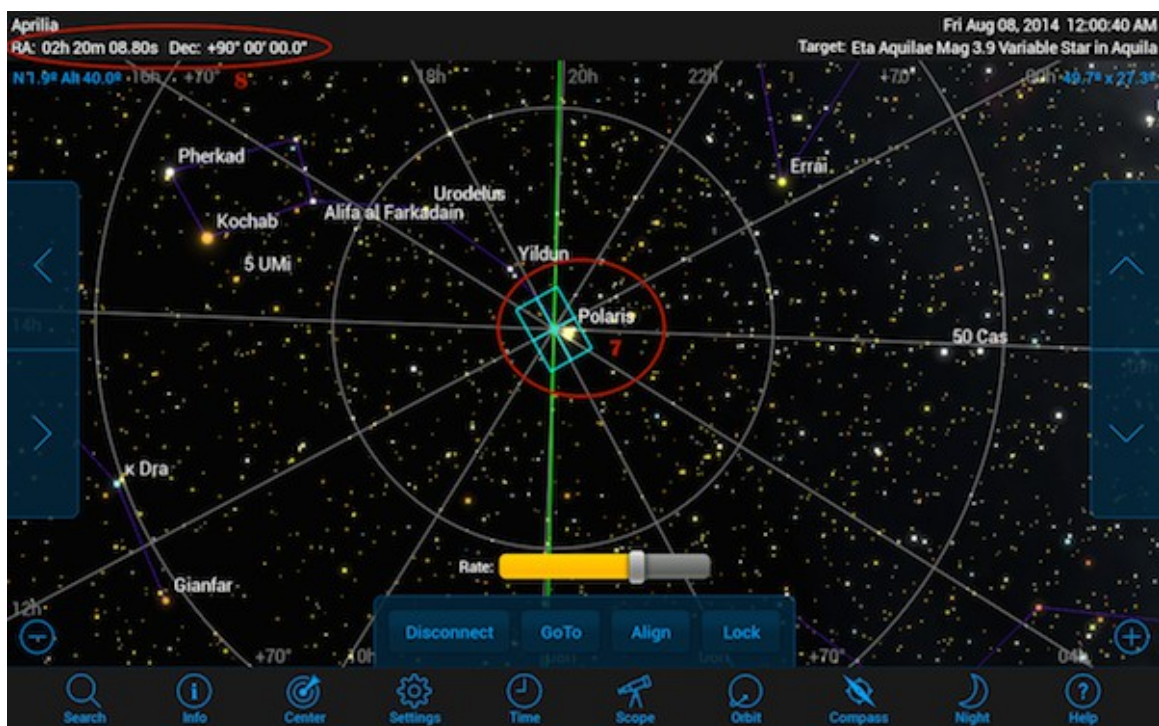


As already said, just after the connection the telescope pointer is put exactly on the celestial coordinates origins, (RA=0 e DEC=0), as seen in the ovals 1 and 2.



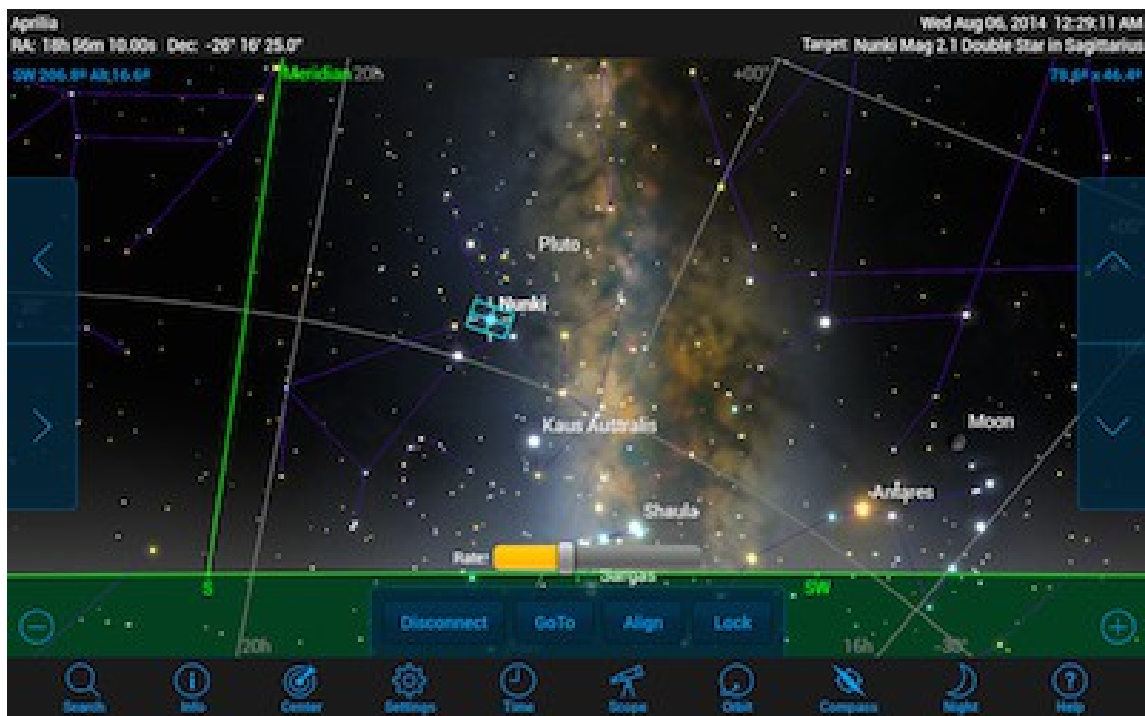


The second phase of this step is the choice of a star very near to the Meridian and to the Southern horizon. In this case the star is  $\eta$  Aql (see ovals 3 and 4). Note that the telescope is still in the initial position (oval 5). Again it is possible to see a small distance in RA from the point 0,0 due to the time lapse. At this point is possible to tap the “Align” command on the “Telescope Bar”.



The issuing of the Align command causes the movement of the telescope pointer to the North Pole (see oval 7) at the correct RA and DEC “Home” position (see oval 8) where the mount is indeed pointing. These information are sent to the StarGO. From this moment the movement of the telescope, driven by the StarGO, is synchronous with that of SkySafari.

4. At this point the telescope can be operated using the commands on the “Telescope Bar” and the direction control on the side of SkySafari screen below. On the left the RA direction controls and on the right the DEC controls. The telescope movement rate can be setted using the yellow slide “Rate” above the telescope controls.



## 5.4 StarGO and SkySafari in Alt-Azimuthal mode via Bluetooth

The changing from equatorial to Alt-Azimuthal mode can be done by using the Miscellaneous menu in the StarGO-BT Android application (see instructions page 50/51), or by using the Advanced menu in the Avalonstargo.exe setting area.

When the mount is used in Alt-Azimuthal mode, almost exclusively for visual observations, it is possible to operate it using only an Android Tablet (or Smartphone) provided with the SkySafari application.



As described in section 4, it is first of all needed to setup the Alt-Azimuthal operation mode using the StarGO software. This choice is done only a time and repeated only in case of another change of operating mode.

All the Bluetooth pairing operations and SkySafari setup as described in the sections from 5.1 to 5.3, with the only difference that, at the moment of the choice of the mount, the Alt-Azimuth mode shall be chosen instead of the Equatorial.

The first operation to be performed is to bring the telescope in the Home position after having scrupulously levelled the tripod. The “Home” position, for the Alt-Azimuthal mode, correspond to point the telescope in the direction of the Celestial North Pole. Since the polarscope is not available in this mode, this operation is not trivial. Accepting a certain degree of error, that will be compensated in the following alignment, it will be sufficient to centre the telescope on the Polaris star. With the telescope in this position is necessary to perform a Goto to a well known bright star, centring it in the eyepiece field of view using the StarGO keypad or the directional commands of SkySafari.

When the star is well centred (to obtain a better result, it could be preferable to use an eyepiece provided of cross hair) the sync command to this star will be issued using the “Align” button of SkySafari. At this point the telescope will be “One Star” aligned. The precision of the following Goto will be determined by the precision of the performed operation and, especially, by the perfect horizontality of tripod plate.

## 6. Mount Control with StarGO-BT for Android

Avalon Instruments has developed an application, called StarGO-BT, capable to control its own mounts by means of Android based smartphones and tablets with Bluetooth connection capability.

The purpose of this application is to provide a mean, alternative to the keypad, for the mount control with the advantage of a wireless connection and of a more user friendly interface. Moreover the application allows to set a certain number of mount parameters that are not settable (or are settable a more simplified manner) with the keypad. These settings, as for the Keypad, are unidirectional.

This application is part of the software package provided with the StarGO control system. At the moment, this application cannot be downloaded from the usual Google Play Store, but it must be directly installed in the device by the user. In the following sections all the instructions for the app installation and use are described.

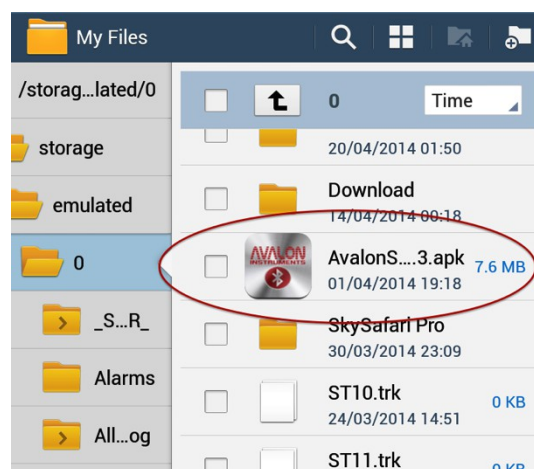
The starting point for the installation is the establishment of the Android device and StarGO hardware communication. This operation has been already described in section 4.3.

### 6.1 Application Installation

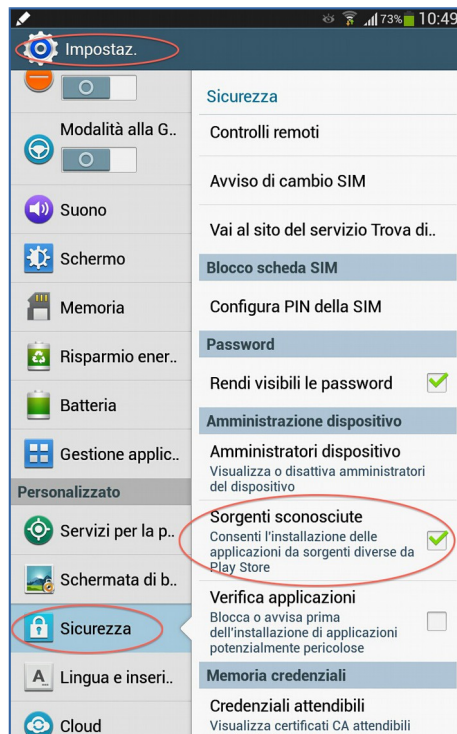
The app is contained in a single file named StarGo-BT.x.y.z.apk, dove x.y.z represent the software version. This program, like all other Avalon Instruments programs and driver and related manuals, are improved and increased in functionality in a continuous manner and the versio number will vary very often.

To install the application it is needed to upload the mentioned file in the device. This can be done in several manners, depending on the type and brand of the device. For example, the Samsung device can use the Kies application to copy the file in whatever position of the main memory or external memory (if available).

Once the files is in the device it is sufficient to reach it with file browser application (for example “Archive” of the Samsung devices) and to launch it.



The process of app installation in the device will start. It is very probable that, at the start of this process, the installer will inform you that it is not possible to continue because the installation of applications not coming from the Play Store is not allowed. To continue it will be needed to enter in the Setup Windows of the device and (at least temporarily) enable the installation of application from unknown sources under the voice “Unknown Sources” under the menu “Security”.

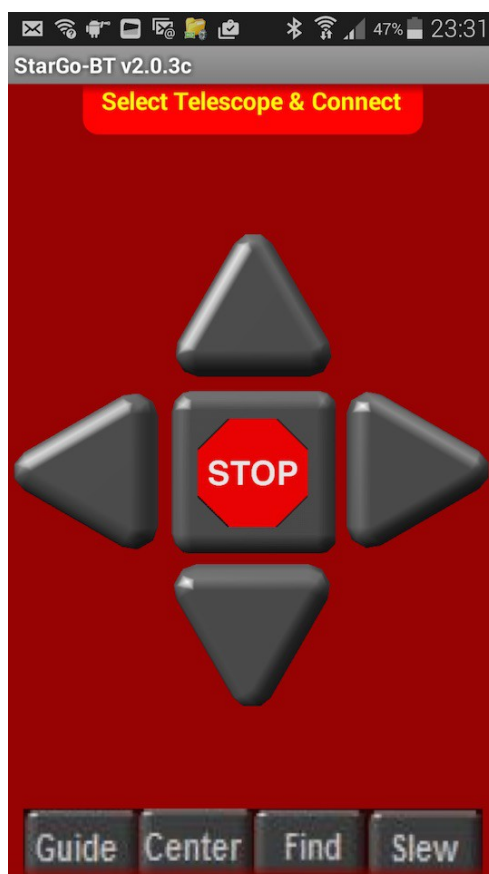


## 6.2 Application Use



Like all Android apps, StarGO-BT is launched by touching the icon created during the installation process. The initial screen will show the list of all external devices, capable of Bluetooth connectivity, associated to our Android device. To establish a logical connection between the app and the StarGO hardware please select the correct voice from the list, in our case StarGO. This action will show the button “Connect” through which the connection is established.

Once the connection is established, the app will show the main screen through which all the control operations on the StarGO can be performed. The screen slides vertically to allow the access to the various setup functions

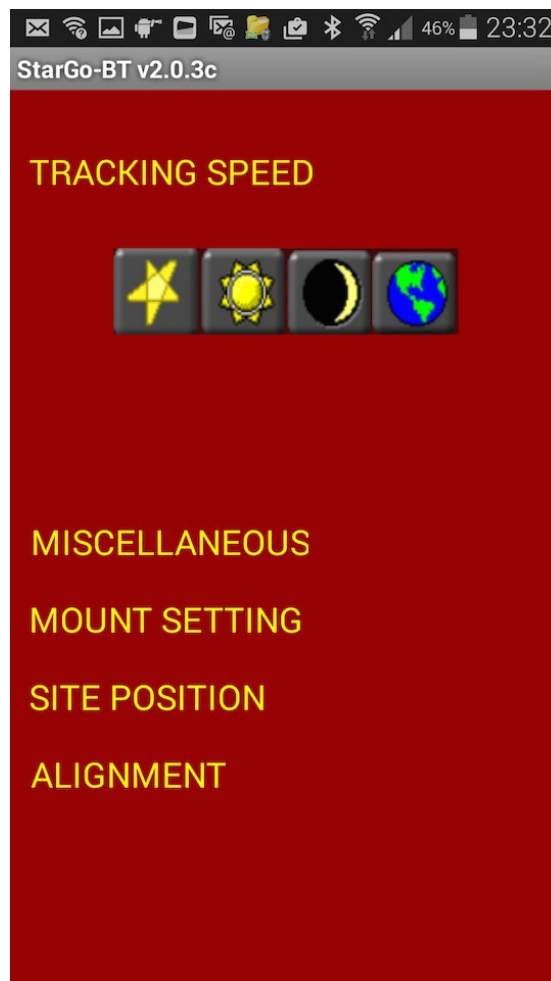


The top application screen looks quite familiar because it is dominated by the cross of directional keys and the internal STOP key that have the same functions of the StarGO software keys, i.e. moving the telescope in the four directions and stop it when necessary.

The movements speed will be set with the four speed setting keys correspondent to those of the StarGO PC software (Guide, Center, Find and Slew).

### 6.3 Application setup

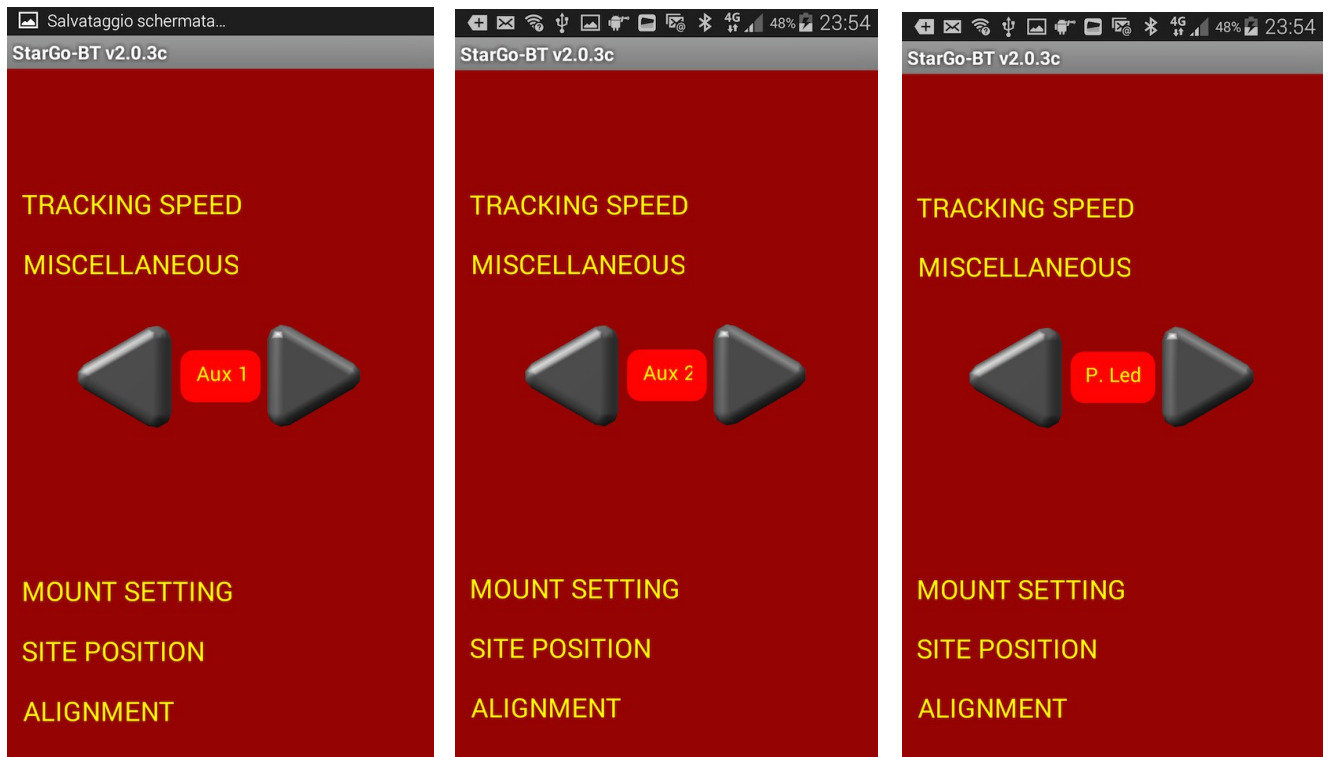
Sliding down the screen will be replaced with a set of commands labels for setting the mount:



The first of the available command correspond to the “TRACKING SPEED” label. Touching the label opens the string of the buttons to select the wanted tracking speed: Sidereal, Solar, Moon and Earth (needed to take terrestrial time lapse pictures).

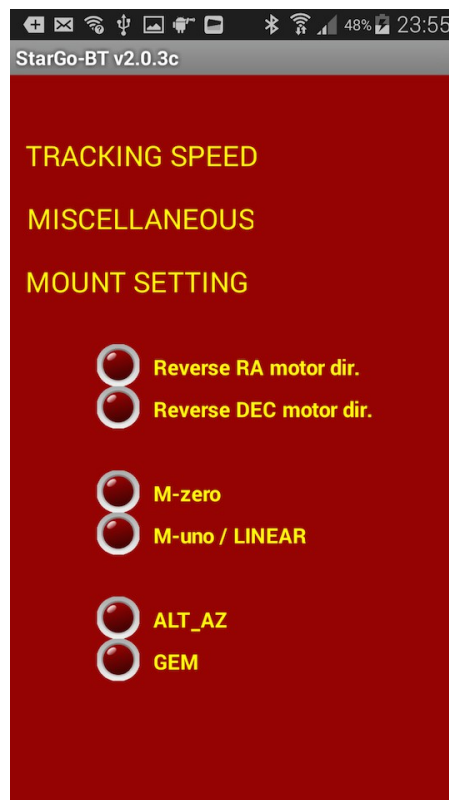
By touching the MISCELLANEOUS label the controls for the auxiliary functions (i.e. focuser or others) will pop up. There will be two opposite arrows to move the connected device in the opposite direction and a center button to select Aux 1 and Aux 2 devices or the Polarscope led intensity.

The changing of the parameter to be set can be done by touching the label between the two arrows.





By touching the “MOUNT SETTING” label a set of commands appears to reverse the motion direction of the RA and/or the DEC motors, to chose among the M-zero, Muno and Linear mounts, and to select the operational mode between AltAzimuthal and Equatorial (GEM).

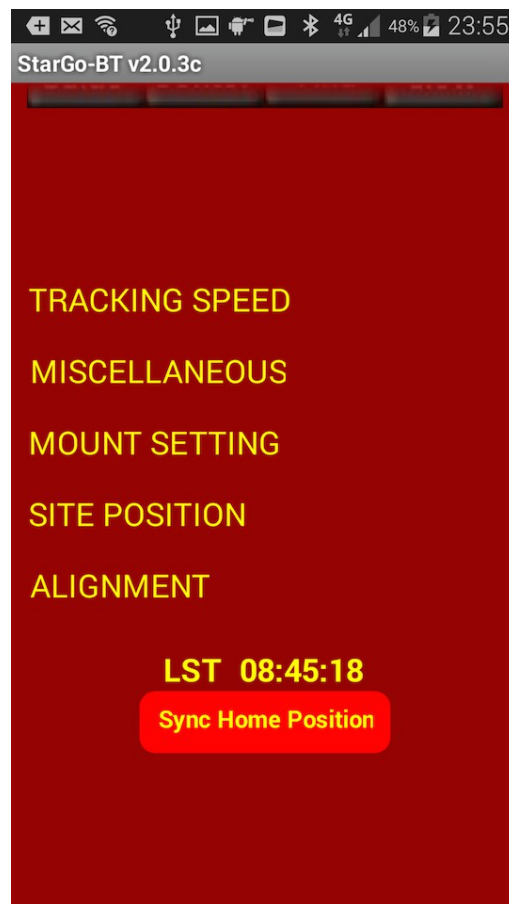


The next label, "SITE POSITION" will pop up the set of commands to introduce the observation site coordinates and to show their values. The commands are self explicative. Other commands allows to get the site position from the tablet or smartphone internal GPS, if any and to send the acquired coordinates to the StarGO if active.



**Note:** In case of use associated with the SkySafari application, to avoid undue behaviours, it is necessary that both applications (StarGO-BT and SkySafari) have identical geographic coordinates. This is automatically obtained when on both the applications the Latitude and Longitude coming from the GPS internal to the Android device, are used. If, for any reason, in one of the two applications, custom values of coordinates are used, exactly the same values must be manually inserted in the other application.

The last label “ALIGNMENT” provides the possibility to read the actual LST value and to perform the syncing to Home Position . The button “Sync Home Position” allows to synchronize the mount with the home position as done with the PC StarGO software (see section 4.1, Page 19). However, to speed up the synchronization operations it is advisable to perform the “Sync Home Position” directly in SkySafari, as explained at pages 38 and 39 if this application is used.



## 7. Firmware Updating – StarGoLoader

During the software installation process described in section 2.1, the application “StarGoLoader\_xy.exe”, for the management of the firmware updating, has been installed in the default directory “C:\Programs(X86)\Avalon\Stargo\StargoUploader” and the correspondent link in the computer desktop.

Using this application, the updating of the firmware in the StarGo hardware is extremely simple.

**NOTE:** *Since the firmware to be installed is provided by Avalon Instruments pre-set with generic parameters, with the purpose not to lose the existing settings, it is recommended to save the “Mount Configuration File” before the updating operation, as explained in section 4.1 and, at the end of the updating, re-load the saved file as explained in the same section.*

The following are the illustrated step by step operation to be performed for the firmware updating:

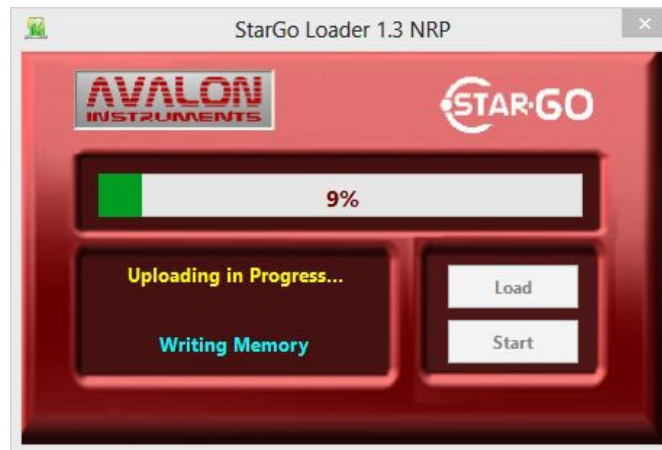
1. Connect the StarGo hardware to the PC via USB and power it. **Don't launch the StarGo control application.**
2. Launch the StarGoLoader application with the Administrator option. The application window will open. Leave it to detect the correct COM port assigned to the hardware.
3. Once the connection is established the the program will ask for loading the firmware file:



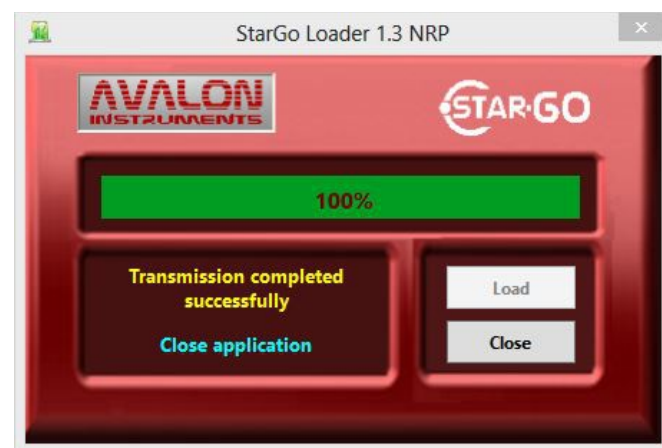
4. Press the button “Load” and in the loading windows that appears select the right file (with extension .afw). Once the file is selected the program will ask to transmit it to the hardware.



5. Press the button “Start” to initialize the firmware uploading.



6. At the end of the uploading process the successfully uploading is announced:



7. Pressing “Close” to end the application.

The hardware is now ready to work with the newly installed firmware.

The new firmware come with some predefined parameters that could be different with those related to a specific mount. Therefore, after the new firmware upload, it is necessary to restore the correct parameters of the mount by loading the mount configuration file saved before the firmware updating startup, as advised in the Note at page 46. If the configuration file has not been saved or it is unavailable, verify the correct behaviour of the mount with the new firmware performing the following procedure:

- a) Turn on the mount and carry out the Home Syncing operation as described in section 4.1 – Align Panel.
- b) Using a Planetary program (such as CdC) connected to the mount, perform a Goto to a star at about 45 degrees above the East horizon.
- c) Verify that the mount has pointed approximately to the choosen star.
- d) In case one or both axis point in the wrong direction, carry out the following actions:
  - Return to the Home position via StarGO.
  - Check the checkbox (one or both) of the Reverse Motor Direction frame in the AUX Panel, as described in the related part of section 4.1.
  - Repeat a new Sync Home Position
  - Repeat the goto as in step b) above to verify the correct pointing direction.

**NOTE 1:** The uploader is capable to restart its function even after an accidental interruption of the uploading process, without any risk of StarGO hardware damage. In this case simply restart the operations from the step 1 above.

**NOTE 2:** Verify that the Torque value reported in the “RA-DEC Torque” frame of the ADVANCED setup panel corresponds to the value given in the table of page 18 for the used mount.