

# TELESTO calibration manual

# When to do a calibration of TELESTO?

- If you ever experience elongated stars during your exposure, it might be a sign that you need to do a calibration



Example of elongated stars during a 60s exposure. Screenshot credits for this manual: Kent Barbey's report

# How to do a calibration?

A calibration can be done with TPoint.

In order to perform a calibration, the startup procedure for TELESTO needs to be done first, as explained in the User Manual available on

<https://plone.unige.ch/astrodome/telesto/usermanual.pdf/view>

Once that TELESTO is setup, a calibration can be done with the following steps.

Additional information about TPoint can be found on

<https://plone.unige.ch/astrodome/telesto/manuels/manuels/tpoint-add-on-user-guide.pdf/view>

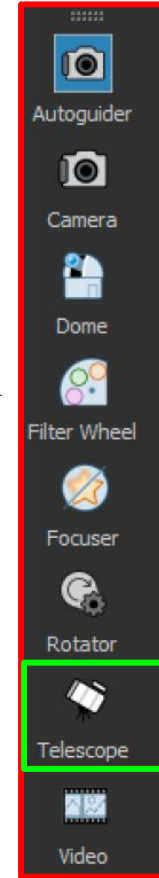
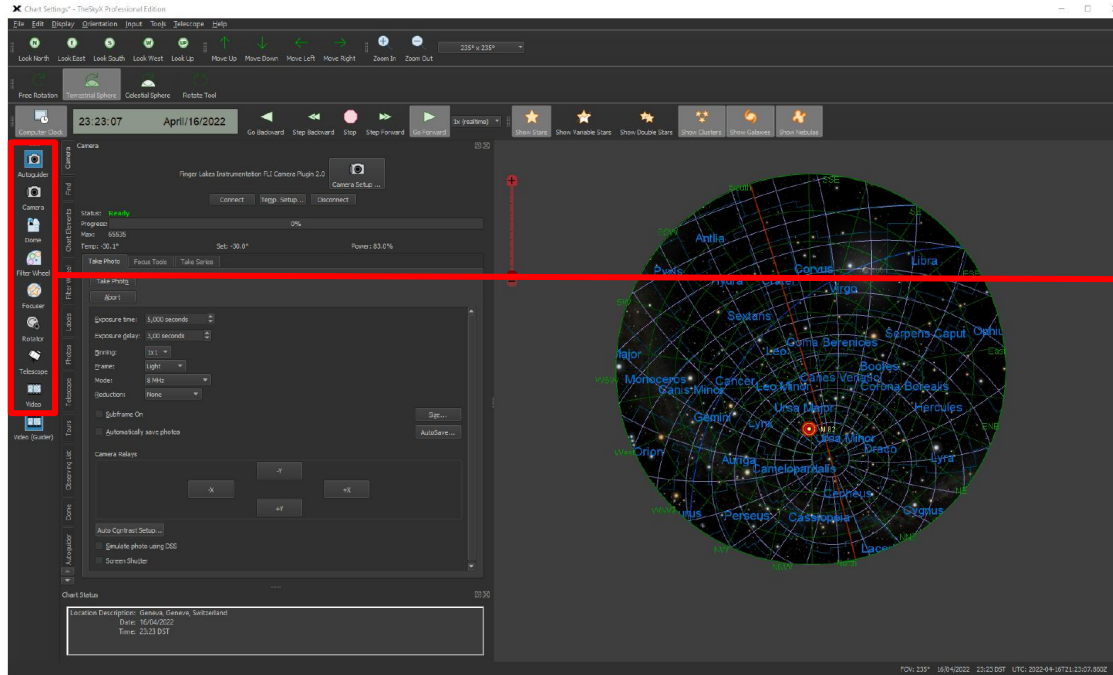
# 1. Open TheSkyX

Then, do the normal procedure to connect the telescope and dome in order to observe. If you do not know how to do it, explanations are provided in the User Manual.

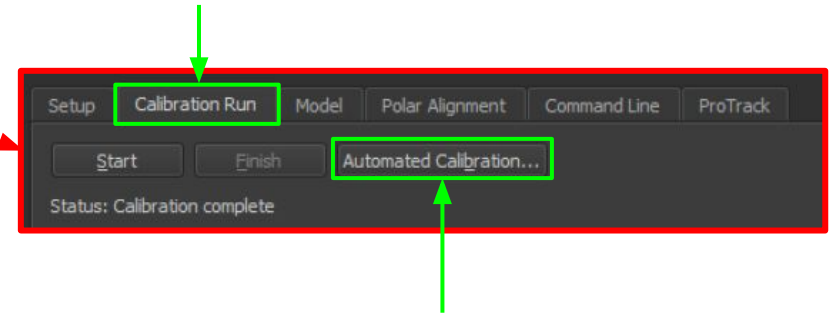
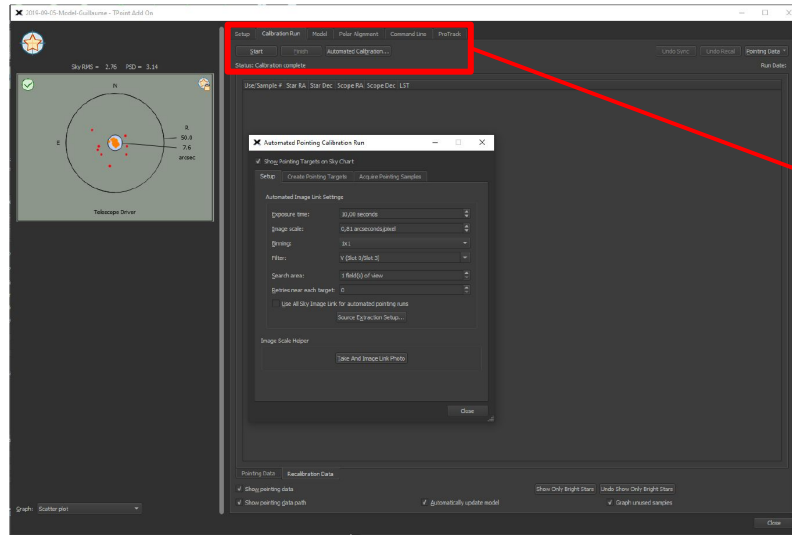
<https://plone.unige.ch/astrodome/telesto/observations/usermanual.pdf/view>



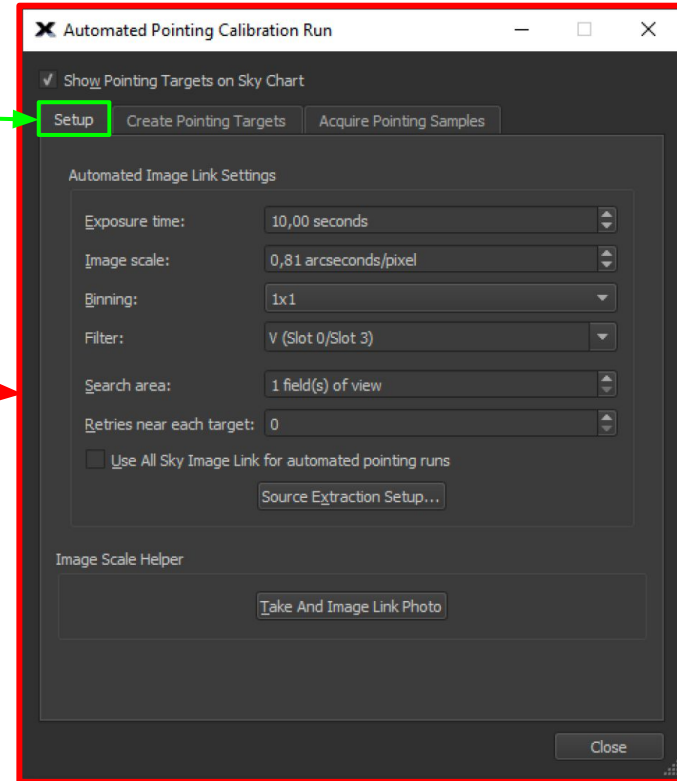
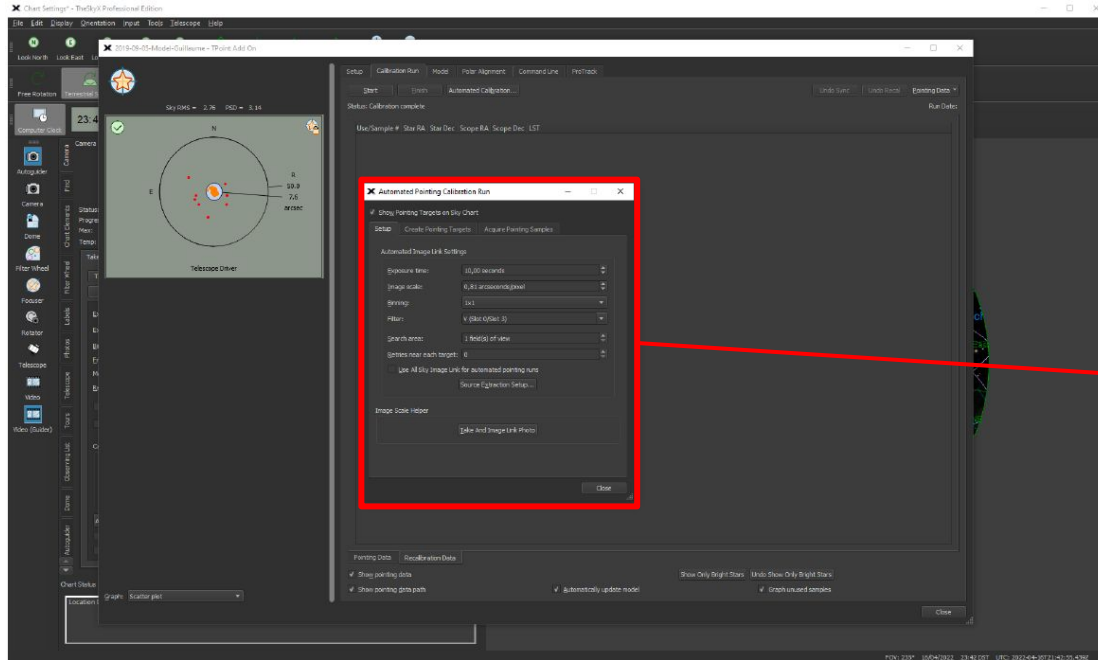
## 2. In the *Telescope* tab, open *TPoint* addon



### 3. Click on *Automated calibration* in the *Calibration Run* tab



## 4. Choose the settings in *Setup* or leave as default



## 5. Choose the number of recalibration targets

In *Create Pointing Targets*, choose the number of targets that you want to use for the recalibration (minimum is 16). Choose targets that are high enough in the sky, as the top of the trees can sometimes get in the way

Adjust number of targets with this slider

Automated Pointing Calibration Run

Show Pointing Targets on Sky Chart

Setup Create Pointing Targets Acquire Pointing Samples

Number: 55  
Azimuth start: 18.2  
Azimuth end: 342.7  
Altitude start: 35.2  
Altitude end: 88.8

Randomize  
 Clip at horizon  
 Sort for dome  
 Interactive grid

Commands Fewer targets More targets

Drag the orange circles on the above map to define the calibration region.

Close



## 6. In *Acquire Pointing Samples*, click on *Run*

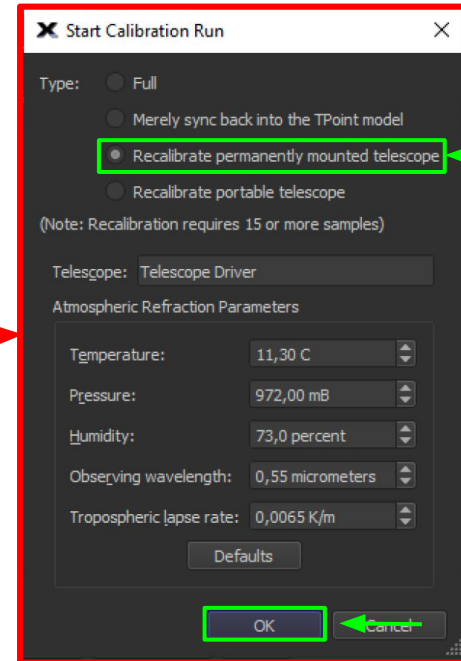
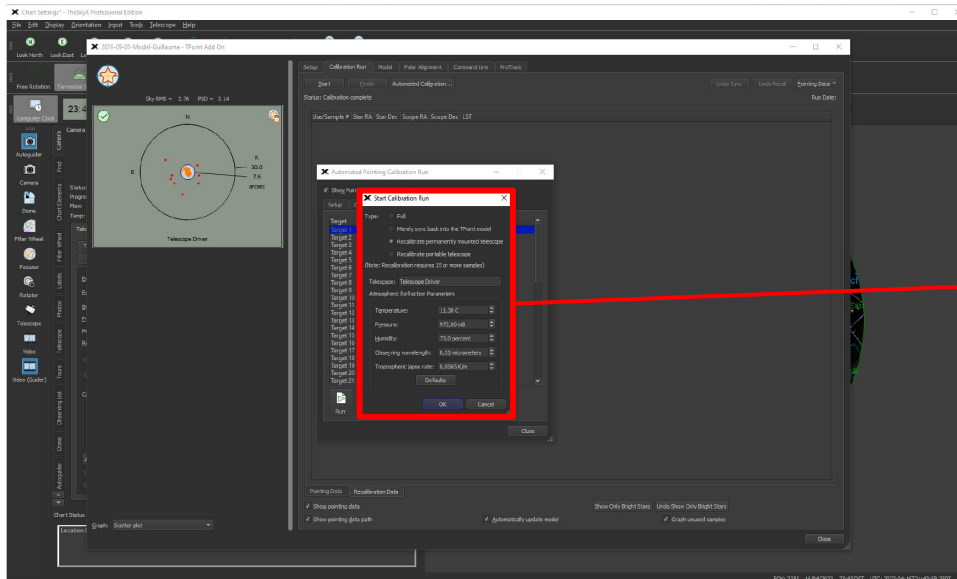
The image shows a screenshot of the 'Automated Pointing Calibration Run' dialog box. The dialog box is titled 'Automated Pointing Calibration Run' and has a close button (X) in the top right corner. It contains a tabbed interface with three tabs: 'Setup', 'Create Pointing Targets', and 'Acquire Pointing Samples'. The 'Acquire Pointing Samples' tab is selected and highlighted with a green box. A green arrow points to this tab. Below the tabs is a list of 21 targets, each with a 'Target' name and a 'Status' column. The list is as follows:

Target	Status
Target 1	
Target 2	
Target 3	
Target 4	
Target 5	
Target 6	
Target 7	
Target 8	
Target 9	
Target 10	
Target 11	
Target 12	
Target 13	
Target 14	
Target 15	
Target 16	
Target 17	
Target 18	
Target 19	
Target 20	
Target 21	

At the bottom of the dialog box, there are four buttons: 'Run', 'Step', 'Run At Selection', and 'Stop'. The 'Run' button is highlighted with a green box, and a green arrow points to it. The 'Run' button icon is a play button. The 'Step' button icon is a right-pointing arrow. The 'Run At Selection' button icon is a play button with a document icon. The 'Stop' button icon is a square with a diagonal line. A red arrow points from the 'Run' button in the dialog box to the 'Run' button in the main software interface window shown on the left.

# 7. Recalibrate permanently mounted telescope

On the new window, in *Type*, click on *Recalibrate permanently mounted telescope* and then *OK*



## 8. Exporting the pointing model

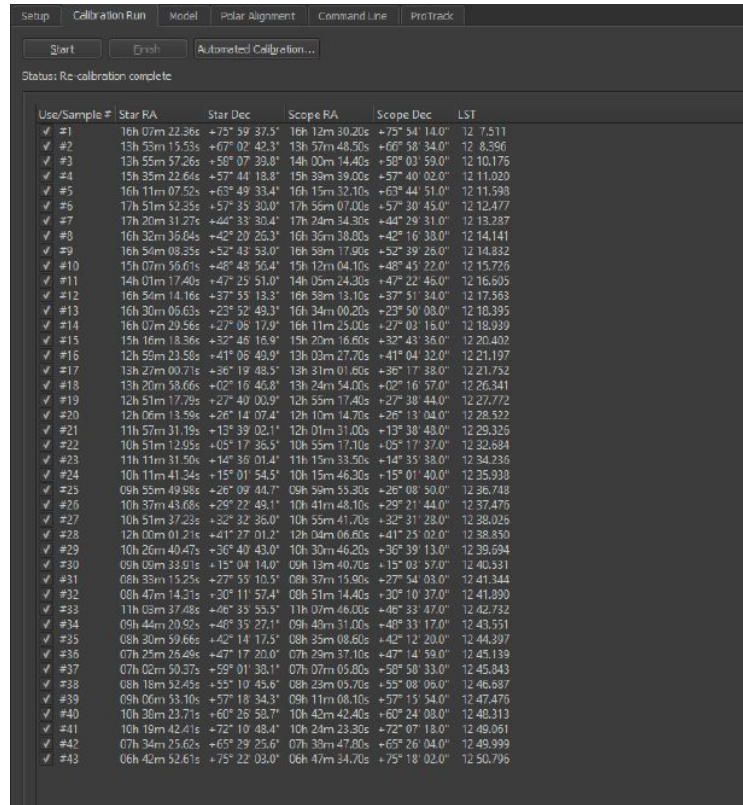
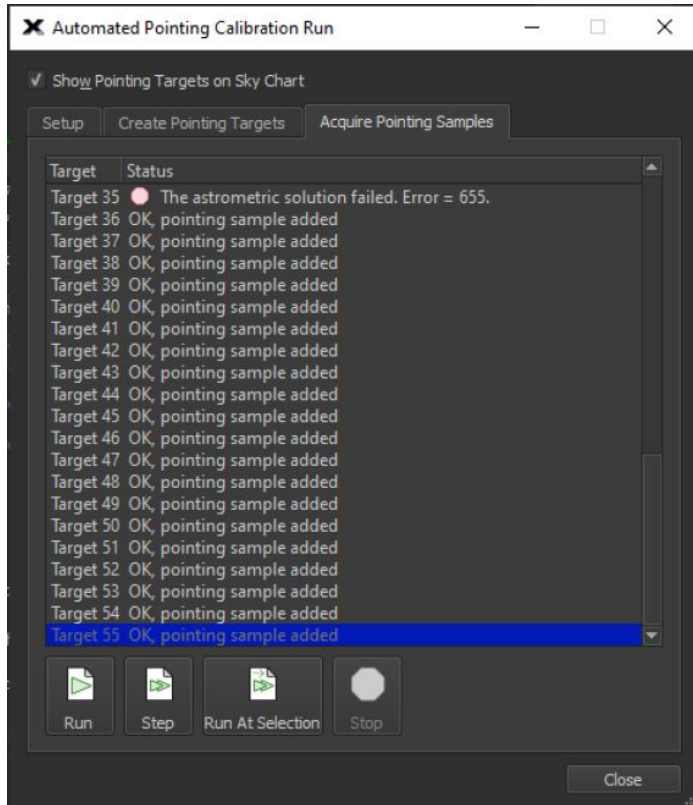
Calibration on TheSkyX is not the final step. SkyX will create a pointing model, which needs to be imported to Maestro. This can be done using an Excel spreadsheet available on the plone at the following url :

[https://plone.unige.ch/astrodome/telesto/manuels/manuels/tpointtodynacorr.xls/view](https://plone.unige.ch/astrodome/telesto/manuels/manuels/tpointtodynacorr.xls/vie<u>w</u>)

This spreadsheet also contains information on how to proceed with the importation of the pointing model in Maestro.

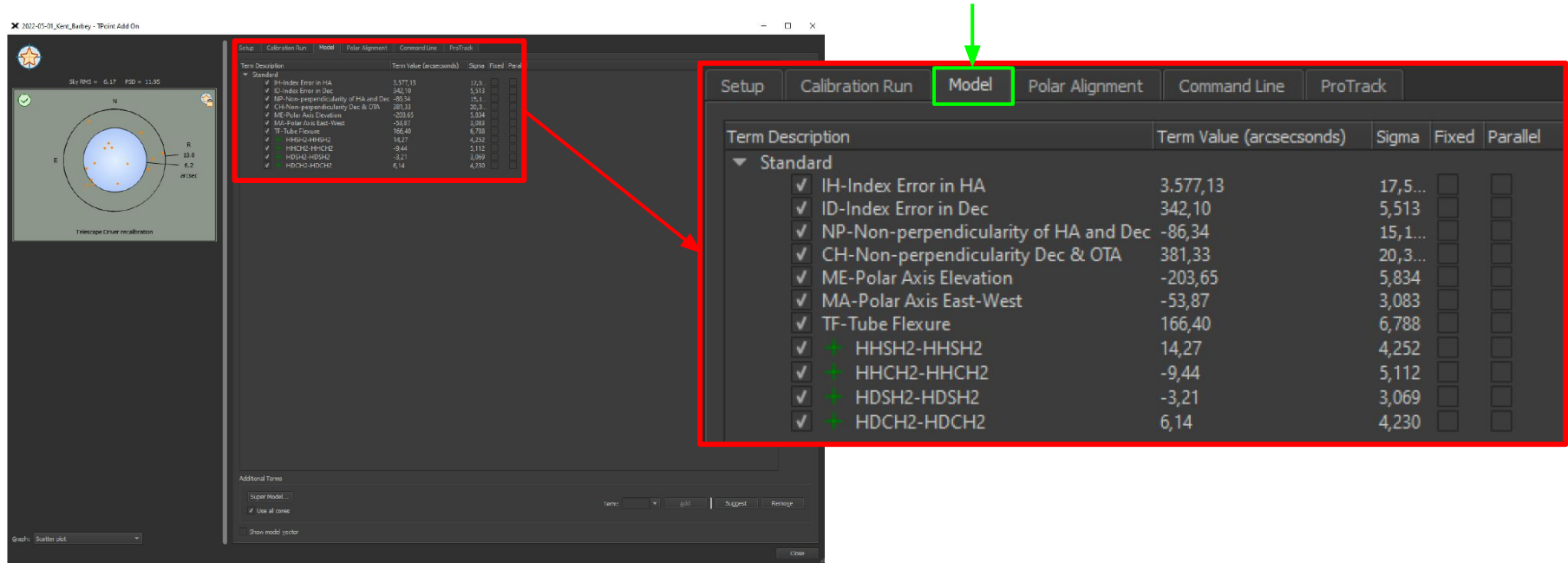
Basically, SkyX will output some values that one needs to fill in the spreadsheet, which will then generate a file that can be imported into Maestro to update the pointing model.

# 9. Calibration should start



# 10. Converting the pointing model

Once the previous step is done, go to the *Model* tab and open the Excel sheet



The screenshot shows the software interface with the **Model** tab selected. A green arrow points to the **Model** tab, and a red box highlights the table of calibration terms. A red arrow points from the table in the background to the table in the foreground.

Term Description	Term Value (arcseconds)	Sigma	Fixed	Parallel
Standard				
✓ IH-Index Error in HA	3,577,13	17,5...	<input type="checkbox"/>	<input type="checkbox"/>
✓ ID-Index Error in Dec	342,10	5,513	<input type="checkbox"/>	<input type="checkbox"/>
✓ NP-Non-perpendicularity of HA and Dec	-86,34	15,1...	<input type="checkbox"/>	<input type="checkbox"/>
✓ CH-Non-perpendicularity Dec & OTA	381,33	20,3...	<input type="checkbox"/>	<input type="checkbox"/>
✓ ME-Polar Axis Elevation	-203,65	5,834	<input type="checkbox"/>	<input type="checkbox"/>
✓ MA-Polar Axis East-West	-53,87	3,083	<input type="checkbox"/>	<input type="checkbox"/>
✓ TF-Tube Flexure	166,40	6,788	<input type="checkbox"/>	<input type="checkbox"/>
✓ HSH2-HSH2	14,27	4,252	<input type="checkbox"/>	<input type="checkbox"/>
✓ HHCH2-HHCH2	-9,44	5,112	<input type="checkbox"/>	<input type="checkbox"/>
✓ HDSH2-HDSH2	-3,21	3,069	<input type="checkbox"/>	<input type="checkbox"/>
✓ HDCH2-HDCH2	6,14	4,230	<input type="checkbox"/>	<input type="checkbox"/>

# 11. Filling TPointToDynaCorr.xls

Fill in the Excel spreadsheet using the corresponding values produced by *TheSkyX* and generate the .txt file. Then, move it to \Program Files \* \Astrometric \Maestro

description	Term Value (arcseconds)
standard	
✓ IH-Index Error in HA	3.577,13
✓ ID-Index Error in Dec	342,10
✓ NP-Non-perpendicularity of HA and Dec	-86,34
✓ CH-Non-perpendicularity Dec & OTA	381,33
✓ ME-Polar Axis Elevation	-203,65
✓ MA-Polar Axis East-West	-53,87
✓ TF-Tube Flexure	166,40
✓ ✚ HSH2-HSH2	14,27
✓ ✚ HHCH2-HHCH2	-9,44
✓ ✚ HDSH2-HDSH2	-3,21
✓ ✚ HDCH2-HDCH2	6,14

Tpoint term	description	value	units
IH	hour angle index error	395.9	arcseconds
ID	declination index error	342.9	arcseconds
PHH	polynomial term producing hour angle shift proportional to hour angle	0.0	arcseconds/radian
PDD	polynomial term producing declination shift proportional to declination	0.0	arcseconds/radian
NP or NPL	H.A./dec non-perpendicularity	0.0	arcseconds
DNP	dynamic H.A./dec non-perpendicularity	0.0	arcseconds
CH or CHL	east-west collimation error	-541.1	arcseconds
ME	polar-axis misalignment altitude	-128.2	arcseconds
MA	polar-axis misalignment left-right	110.9	arcseconds
TF	tube flexure (sine)	49.9	arcseconds
TX	tube flexure (tangent)	0.0	arcseconds
FO	fork flexure	38.9	arcseconds
FLOP	vertical sag	0.0	arcseconds
HSHn	harmonic term producing hour angle shift proportional to sin(HA)	0.0	arcseconds
HHCHn	harmonic term producing hour angle shift proportional to cos(HA)	0.0	arcseconds
Frequency	frequency of above harmonic	1	
HSHn	ditto	0.0	arcseconds
HHCHn	ditto	0.0	arcseconds
Frequency	ditto	2	
HSDn	harmonic term producing declination shift proportional to sin(dec)	0.0	arcseconds
HDCDn	harmonic term producing declination shift proportional to cos(dec)	0.0	arcseconds
Frequency	frequency of above harmonic	1	
HSDn	ditto	0.0	arcseconds
HDCDn	ditto	0.0	arcseconds
Frequency	ditto	6	

# 12. Open *Maestro* and import the pointing model



Maestro

Objects | Status | Actions | Settings | Windows | Messages

Diagnostics | Motors & Gearing | Encoders & Limits | High Drives | **Dynamic Correction**

### Standard Coefficients

IX - Index Error Axial X	+0.1	arcsec
IY - Index Error Axial Y	-69.9	arcsec
SX - Scale Error Axial X	+0.0	arcsec/rev
SY - Scale Error Axial Y	+0.0	arcsec/rev
YX - Y/X non-perp.	-0.5	arcsec
YXD - Y/X non-perp. Dynamic	+0.0	arcsec
OY - OTA/Y non-perp.	+147.9	arcsec
SA - Scope Pole Error Vert.	+57.4	arcsec
SH - Scope Pole Error Horiz.	+162.6	arcsec
FS - Tube Flexure Sin-Law	+235.9	arcsec
FT - Tube Flexure Tan-Law	+0.0	arcsec
FF - Fork Flexure	-64.5	arcsec
FL - Optical Flop	+0.0	arcsec

### Harmonic Coefficients

	Frequency (cyc/rev)	Magnitude (arcsec)	Phase (deg)
Harmonic 1 Axial X	1.00	0.0	+0.0
Harmonic 1 Axial Y	1.00	0.0	+0.0
Harmonic 2 Axial X	2.00	0.0	+0.0
Harmonic 2 Axial Y	4.00	16.5	+45.0

### Dynamic Corrections

**Import from** maestroSavedDCsettings.txt  Enable Dynamic Corrections  
 Block Calibrations and Client "sync"

### Refraction Correction

Enabled Refraction Correction

Atmospheric pressure	1000mB	<input checked="" type="radio"/> Use
Barometric pressure	1000mB	<input type="radio"/> Use
Temp	20degC	
Site Elevation	0m	

29/05/22 18:42:51 : Maestro: version 3.00.111 initialization complete  
29/05/22 18:43:15 : Maestro: loaded sky object database  
29/05/22 18:43:21 : Status: Local standard date has been set.  
29/05/22 18:43:21 : Status: Local standard time has been set.  
29/05/22 18:43:27 : Status: Alignment completed.

ATCS connection: UP | Maestro v3.00.111 © 2004-2018 Astrometric Instruments, Inc. | 18:44:40

**Congratulations!**  
**You have calibrated TELESTO**