Autoslew Software Manual
for mounts with absolute encoders

Autoslew is ASA's software for operating your DDM mount. This manual describes the basic features of Autoslew considering the typical workflow when performing the initial installation of an ASA Direct Drive Mount.

This manual is suitable for all ASA DDM mounts with absolute encoders. (DDM85-A & DDM160-A)

Content

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Installation

- Install the driver for the USB-Serial converter that is shipped with your mount.

  You can find the driver on the USB flash drive that comes with your mount.
  PL2303_Prolific_DriverInstaller
 It might be necessary to restart your computer after the installation.

- Before installing Autoslew be sure that the newest version of the ASCOM platform is installed on your computer. http://ascom-standards.org/
  Also included on the USB flash drive

- Execute the setup file *AutoslewInstallerXXXX.msi* and follow the instructions of the setup wizard.

Entering the Autoslew Serial key

When you start Autoslew the first time you are asked to enter the Autoslew serial key. You can find it on the USB flash drive or on a piece of paper delivered with your mount. Be sure that you are using the serial key that comes with your mount. If you would use another key there might appear malfunctions as the key contains information that is important for operating your specific mount hardware.

Configuring COM-Port

Be sure that all the required cables are connected and the power supply is switched on. Now start Autoslew. Autoslew tries now to communicate with your mount via a specific COM-port. Because the COM-Port number that is configured as default is probably not the right one, the following message appears:
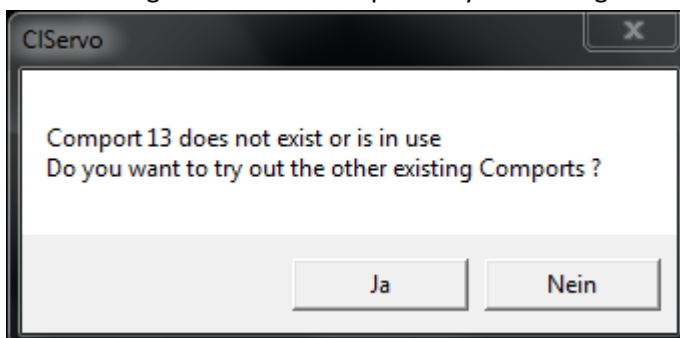
By pressing yes, Autoslew will try to establish a connection by trying out all the available COM-Ports. If this

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works Autoslew will start and save the COM-Port for future sessions automatically.

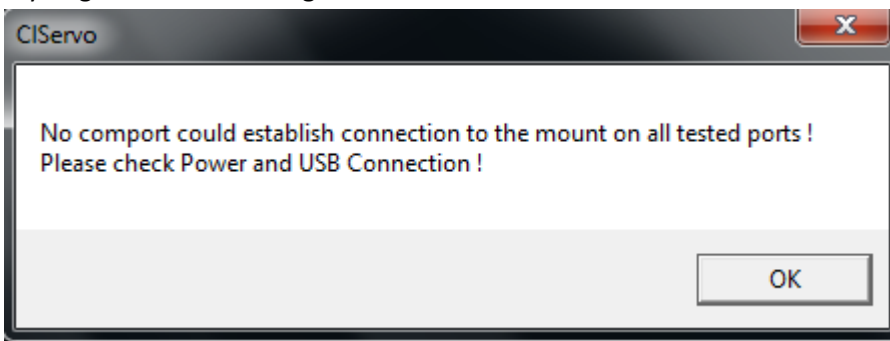If you get an error message like this:
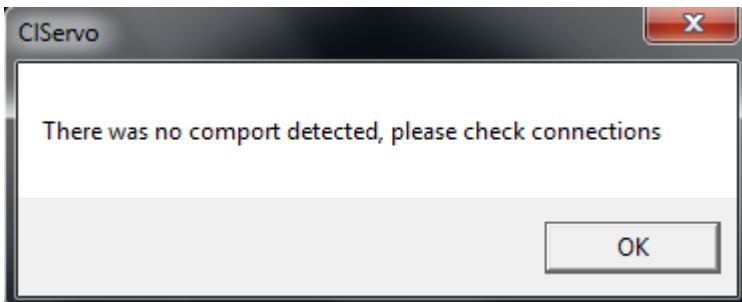
Probably your USB-Serial converter cable is not connected or the driver for the usb-serial converter does not work properly.

If you get an error message like this:

Probably your power supply is not connected or switched off.

Tip: Always use the same USB port to connect your mount to your computer. This ensures that the com-port number does not change.

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Entering Location

Goto *Mount →Location* and enter the coordinates of your observatory location.

Confirm by pressing *OK*.

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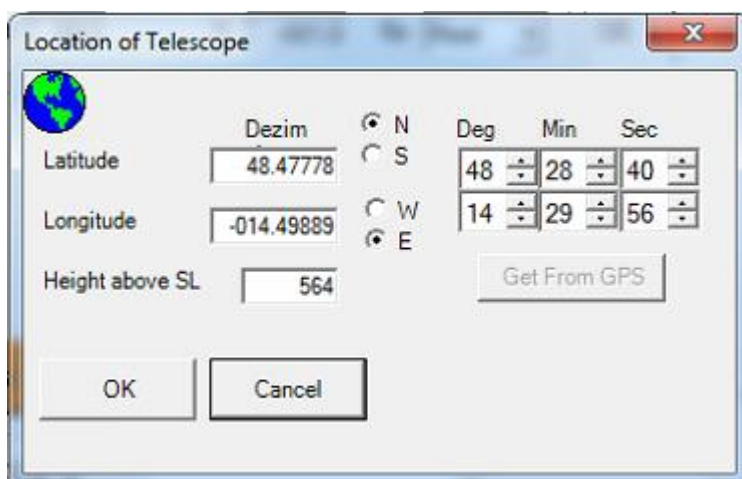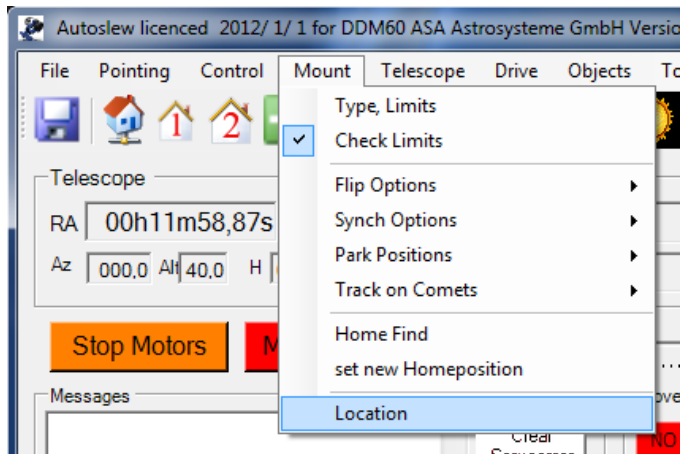
Using a GPS receiver

You can also use a GPS receiver for getting your observatory location. It is particularly recommended because Autoslew can use it to get a very accurate time.
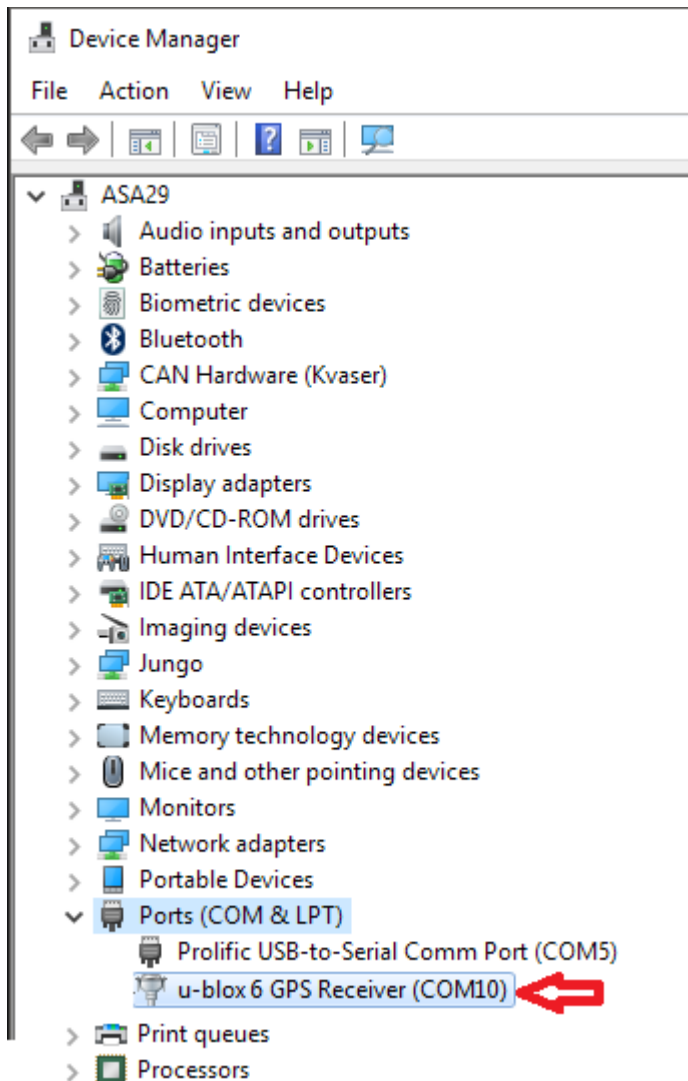
Just connect your USB GPS receiver to your computer and install the required drivers.

Open your windows device manager:

At the ports-section there should appear a GPS receiver with a comport number. Remember this number. (10 in this case)

Switch to Autoslew.

Go to *Control* → *Com Ports*

Now enter the port number in the Autoslew Com-Settings.

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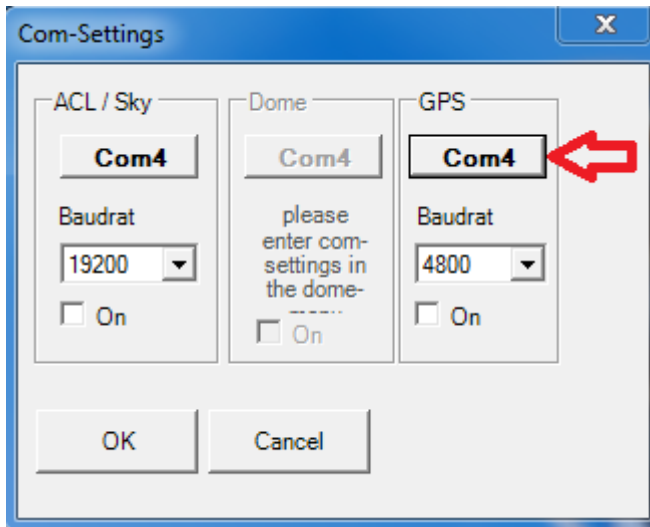
Click on the marked button.

Activate the checkbox „On" and leave this window with „OK".

Caution: If you change the USB-Port or connect any device between computer and GPS-Receiver (e.g. USB-Hub, repeater cable,..), the Com-Port might change. In this case you would have to perform the Com-Port settings again.
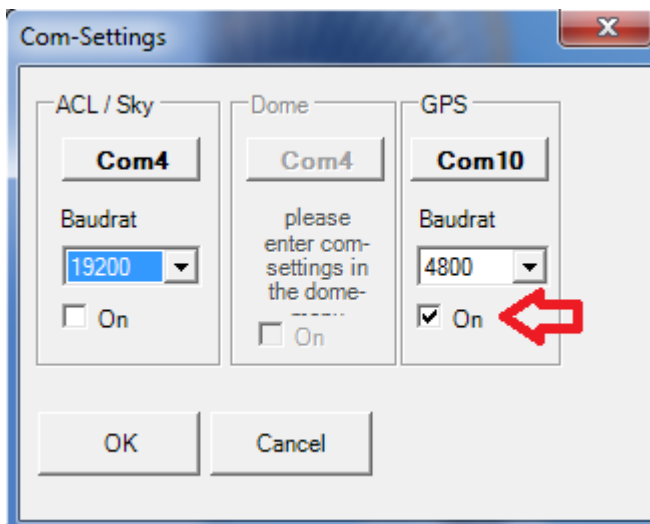
In the Autoslew info bar you can see the number of satellites Autoslew receives signals from.
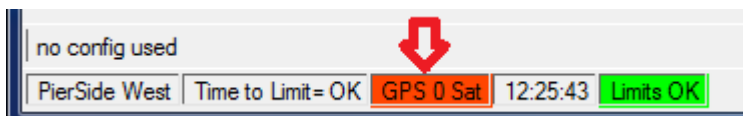
Now choose the feature „Tools"→"SynchTimeToGPS"

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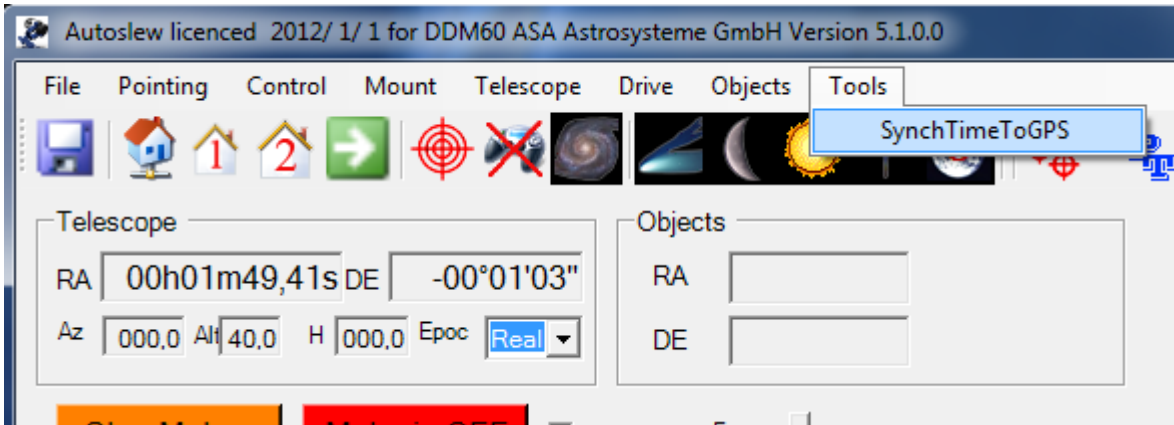
If your GPS-Receiver already receives sufficient signals, the display changes to green. Then the time value in Autoslew gets synchronized with the accurate time value received via satellite.

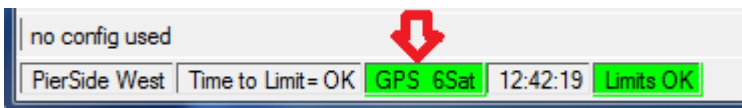**PLEASE NOTE**: It might take up to two minutes until the GPS-receiver receives sufficient signals. Please wait a while and click "SynchTimeToGPS" again. If the display is still red and shows "GPS 0Sat", the position of the receiver is probably not ideal. Make sure that the receiver has a visual connection to the sky. You can use an USB extension cord for that.

Set Location with GPS

To set the location, determined by GPS, go to "Mount"→"Location".

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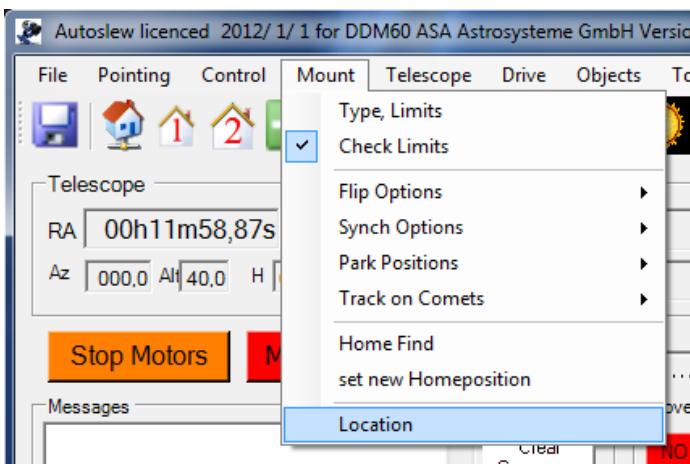
Now the following window appears:
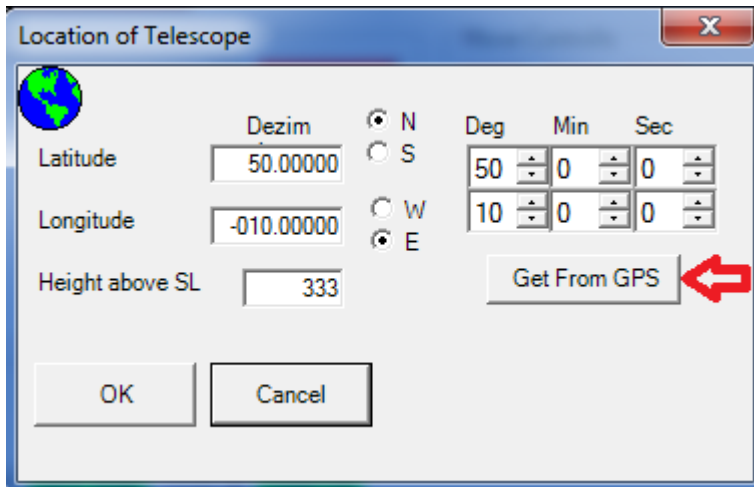
Click „Get From GPS".

After closing the confirmation window, the right location coordinates should be filled in automatically.
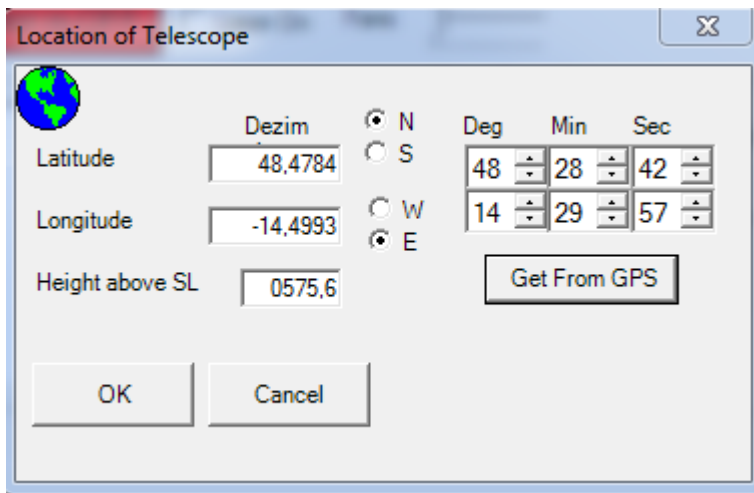
Close this window with „OK".

Save your settings with „File"→"Save Parameter"

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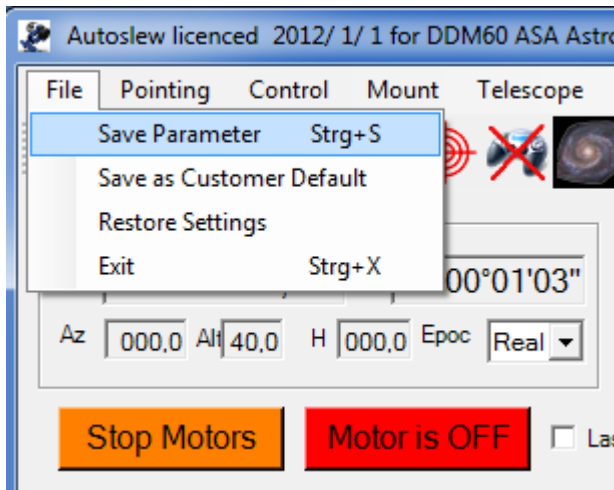
Adjusting the motor parameters

For the mount's flawless operation it is absolutely essential that you optimize the weight balance of your equipment as good as possible.

The motor parameters have to be optimized for every setup, as they depend on a lot of factors, such as weight, length, stability, etc. of your complete setup.

- Before starting the motors put your mount to the following position:

- Start the motors by pressing the button "Motor is off".
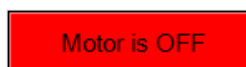
When the button turns green, the motors are in operation. There might be some humming or whistling sounds. Don't worry – nothing will be damaged. That just means that your motor parameters need to be optimized.

- Therefor go to Drive→Servo Setup

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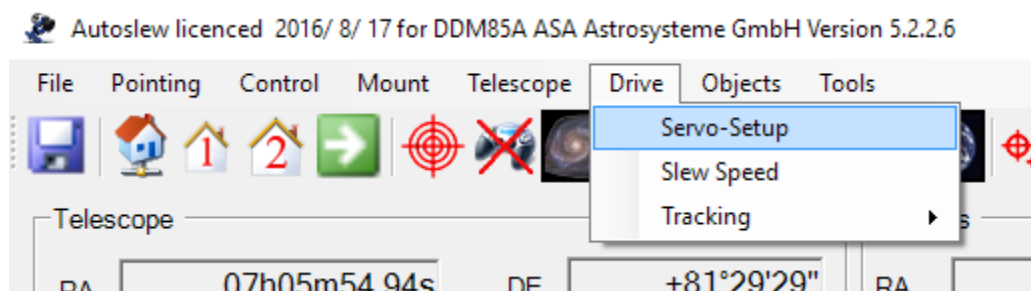
- Press *TUNE Manual*
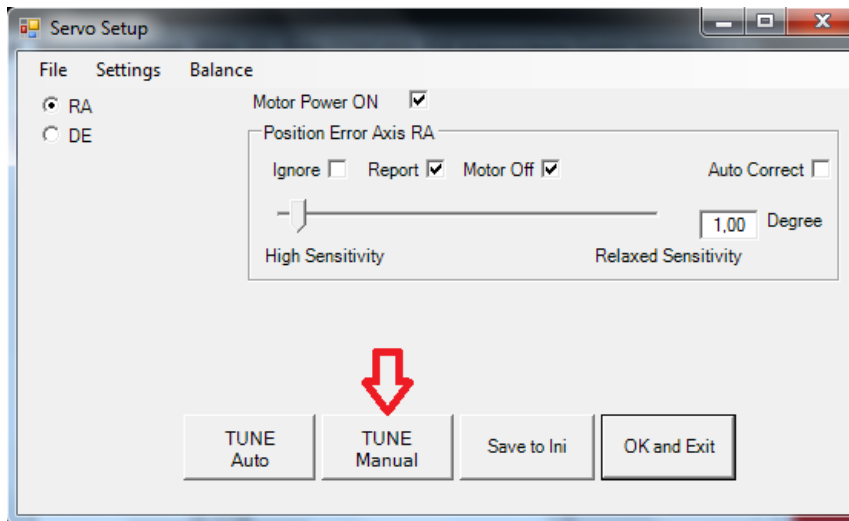
- In this window you can adjust the PID parameters for the direct drives. The red line in the middle of the blue area represents the desired position. The motor controllers try to keep this desired position as good as possible. The PID parameters will influence how fast, accurate and stable this will work. Higher values improve the resistance against wind and other impacts, but make the system more receptive to oscillations. So you need to find a compromise between stiffness and stability.

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- If you press *Go*, the RA axis will start to move with sidereal speed. Now a yellow line will appear. This represents the actual position of the axis measured by its encoders.
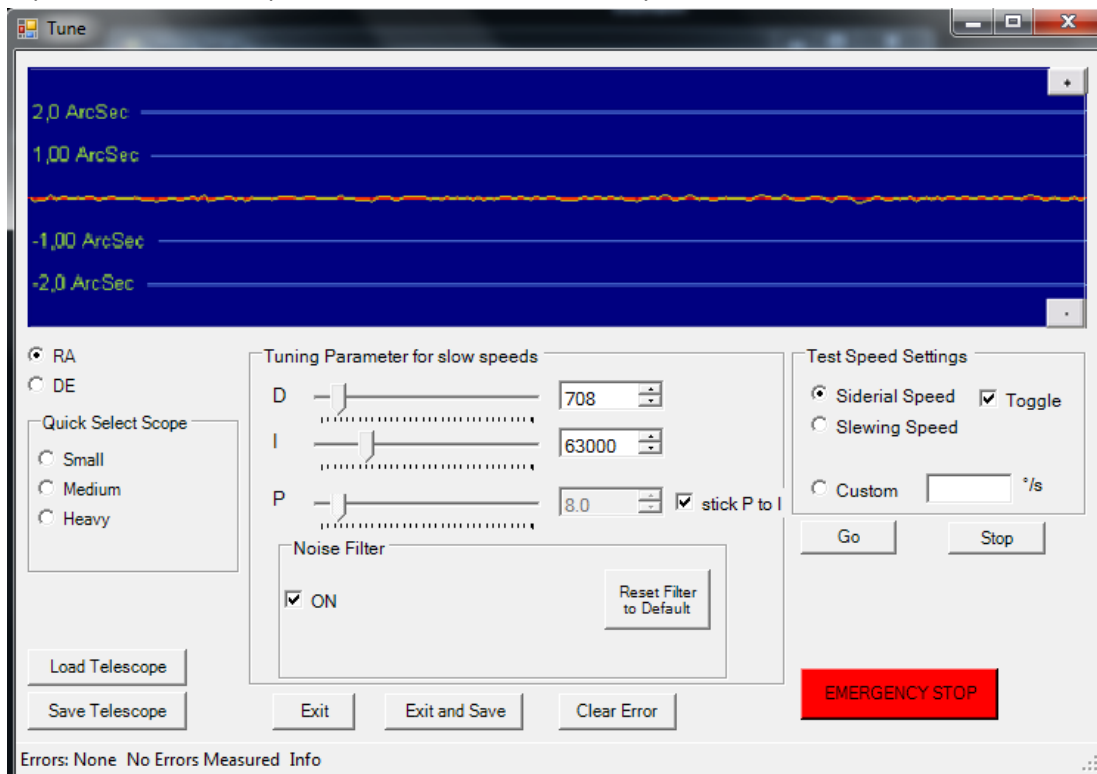
In this case the motor parameters are already pretty good, as the yellow line follows the red line very accurately.

You can now try to tap your scope with your fingers and watch the yellow line moving away from the desired position and coming back. (to simulate wind)

If you increase the PID values your mount will react more aggressive to compensate such impacts, but if you are using too high parameters it might happen that the mount will start oscillating.

Here are some examples of situations with non-ideal parameters:

- Oscillation with low frequency:
  try to increase your D value or decrease your I and P value

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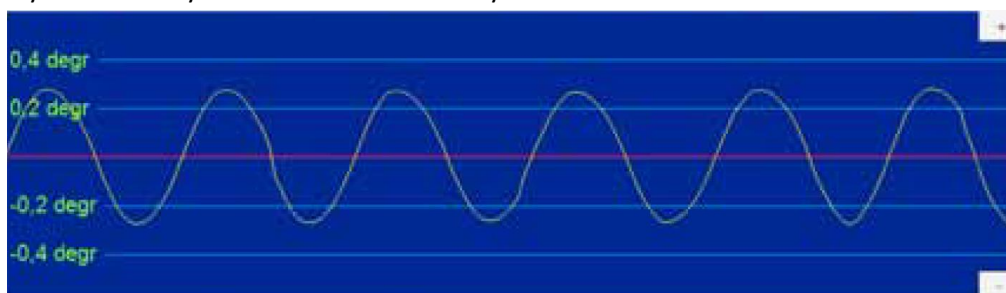
- Oscillation with high frequency:

  try to decrease your D value or increase your I and P value
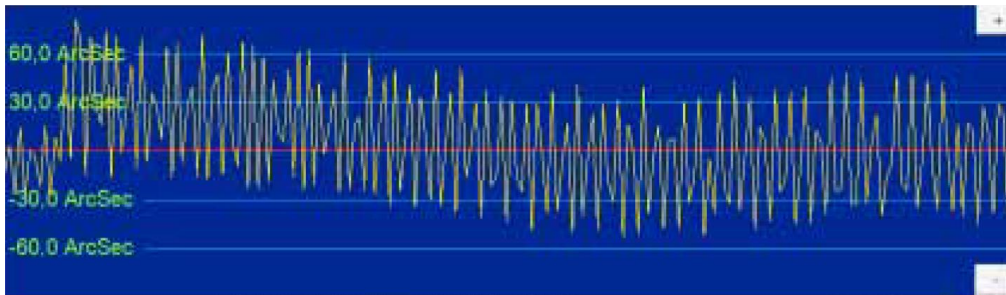
- If you are satisfied with your settings, press the Stop button.

  Now switch to the DE axis and repeat the procedure.
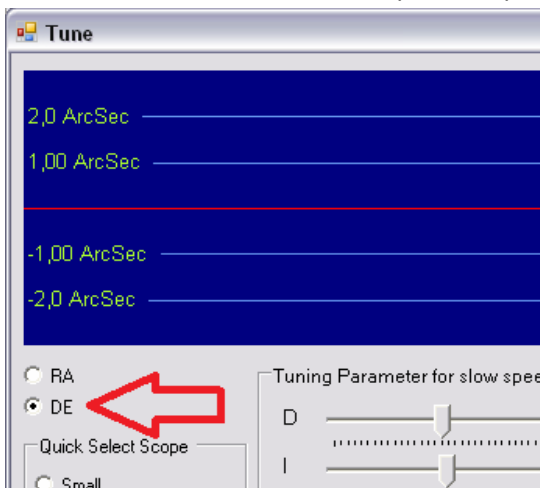
Autoslew uses 2 different sets of parameters for each axis. We already adjusted the parameter sets for sidereal speeds. If we move the mount with speeds higher than 0,05°/s Autoslew will switch to another set of parameters that needs to be adjusted too.

- Therefor switch to Slewing Speed and press Go.
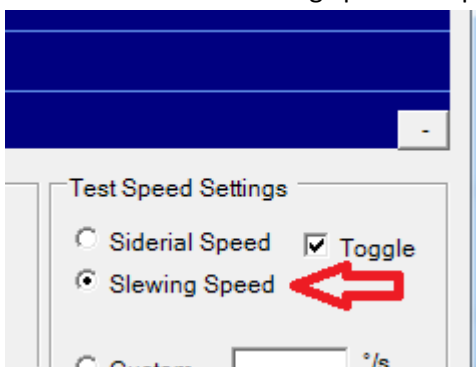
  Your mount will now move a few degrees in one direction and then reverse.

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These PID values can be much lower as we do not need as much stiffness as for tracking. Do not spend too much time to get the yellow line fitting to the red one. For this set of parameters (used for slewing) it is absolutely sufficient that your mount moves without noise and without obvious oscillations.

- Do not forget to adjust the parameters for Slewing Speed for the other axis too.

After adjusting all these parameters press *Save and exit*. Your motors are now ready for operation.

Additional features of the tuning window

Noise Filter

In some cases mounts work better without using the default noise filter. If you have problems with the motor tuning, try to disable it by unchecking the checkbox *ON*.

Custom speed
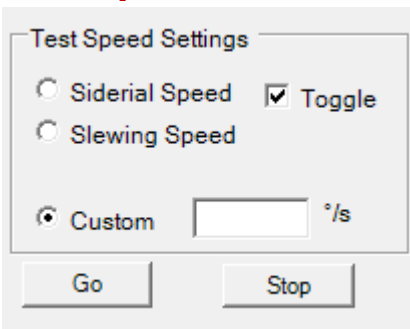
You can use Custom speed to use a user defined speed for motor tuning – not necessary for most users.

Save/Load Telescope
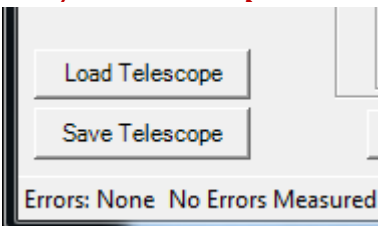
Here you can save your motor setup to a file on your hard disk. This can be practicable if you switch between different setups/telescopes.

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Optimizing weight balance with Autoslew

This step is particularly important if you are using a heavy setup and operate the mount near its maximum loading capacity. Bad weight balance means additional work for the motors and decreases stability and resistance against wind or other impacts.

Autoslew can help you improving your weight balance, by moving every single axis forward and backwards and measuring the power consumption for each moving direction.

We recommend putting your mount in a position like on the following picture because bad weight balance has the biggest influence when both axes are horizontal.

- Go to *Drive→Servo Setup→Balance*

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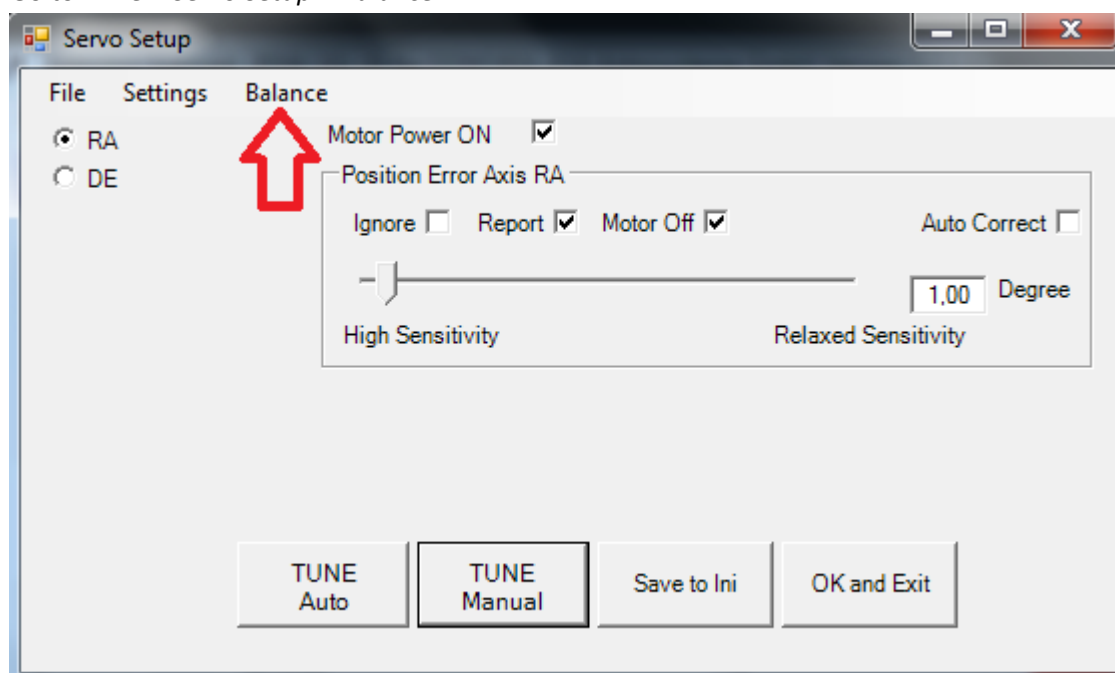
- Start with the Declination Axis (choose DE)
- Change the speed to 2 and press Start

- Now you will see that the declination axis will move up and down.
  The yellow and red bars show the axis' power consumption for each moving direction. Optimize the position of your telescope so that the red bars get in one line (as good as possible).
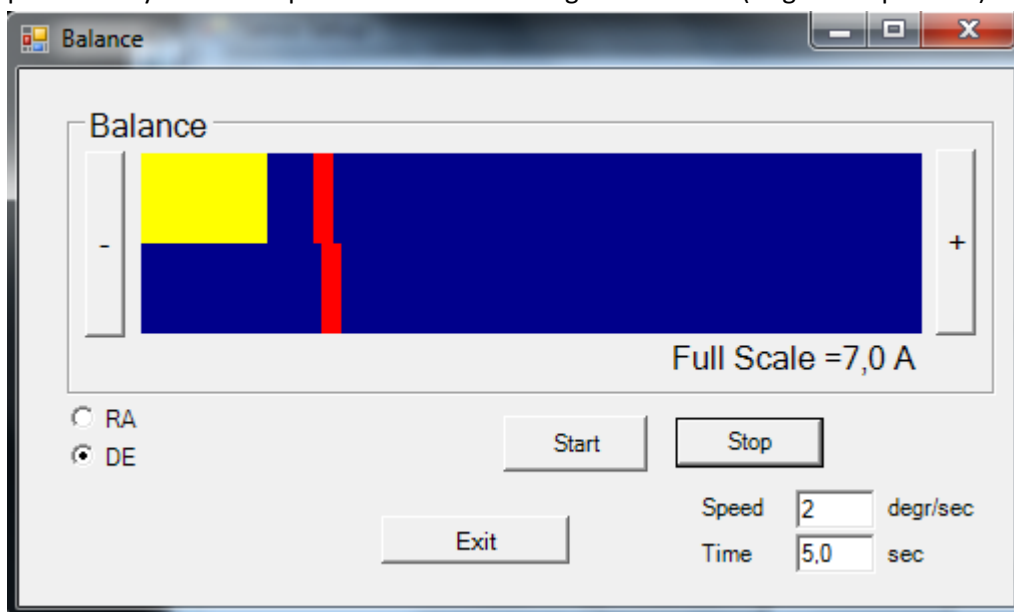
- Repeat this procedure for the RA axis.

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First mount movements

You can use the Move Controls – buttons to move your telescope.
Adjust the movement speed with the slider next to the buttons.
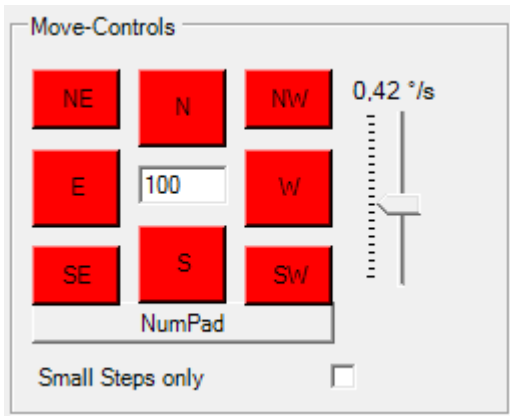
If you want to use a gamepad for movement, please refer to the chapter Using a Gamepad / Joystick

In some positions the mount might not move because it is next to a software limit. In this case the limit area in the status bar of Autoslew turns red.
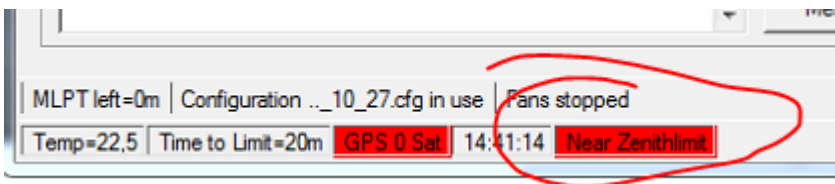
These limits do not work correctly until we tell the mount what its current position is, by synchronizing on a certain object. You can disable the limits by pressing *Mount → Check Limits*

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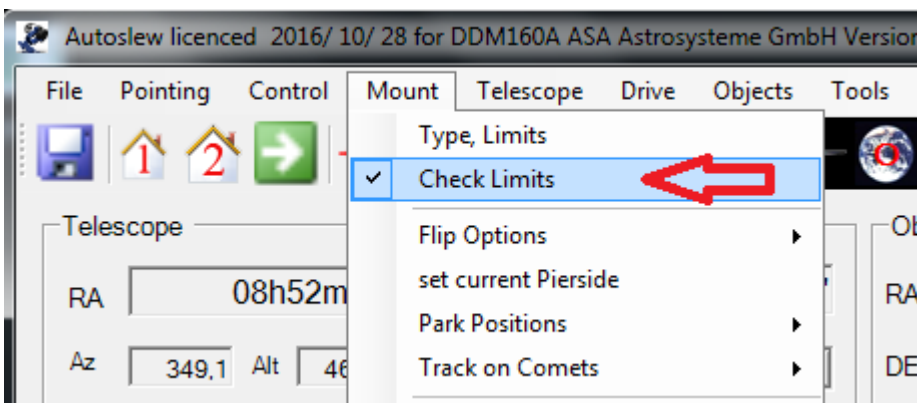
Synchronizing your telescope position for practicing

For training and testing purposes it is sufficient to synchronize the telescope roughly on a position.

The zenith position is pretty suitable for that, as we know it without the need of visible stars. Just move your telescope to the following position:
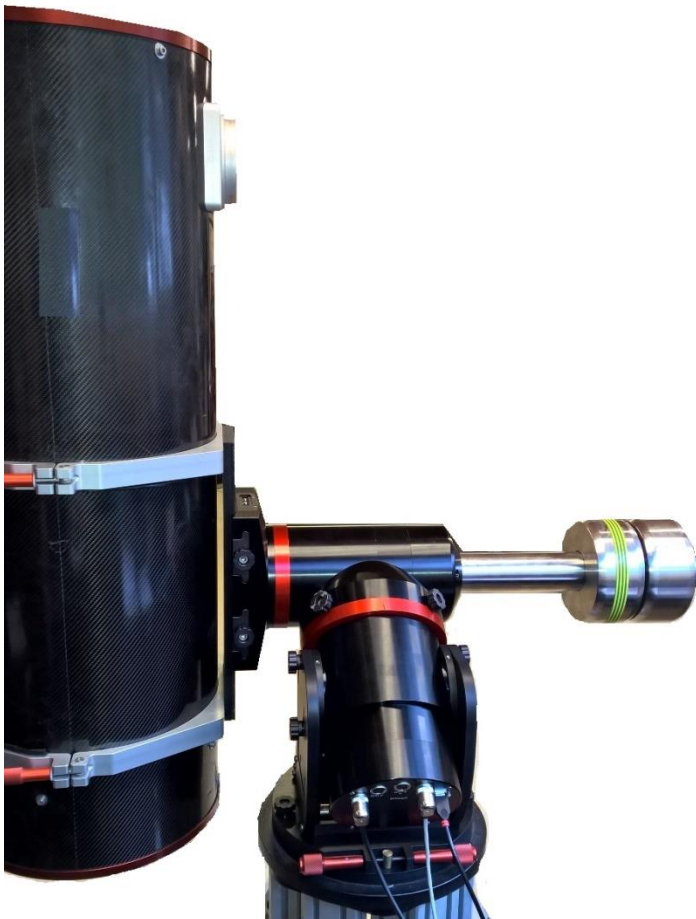
As default, Park Position 1 is predefined as zenith east, so exactly this position.

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Now we can synchronize the telescope position to Park Position 1 by pressing the button for Park1 and then pressing the synch-button:
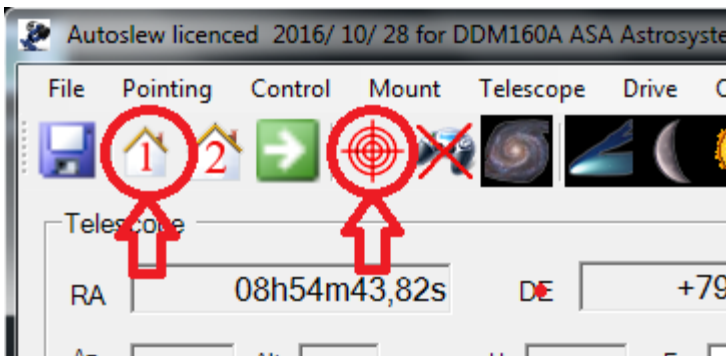
If you want to save this Synchronization for the next start, just press *Mount→Set new Homeposition*.
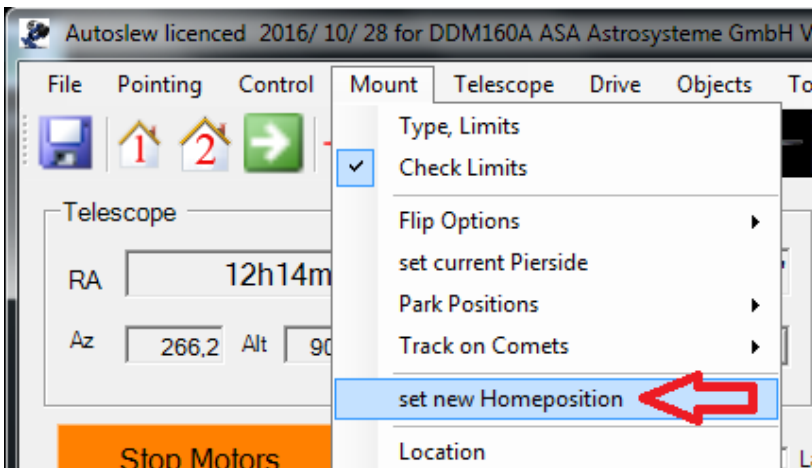
Now you can enable the limits again:
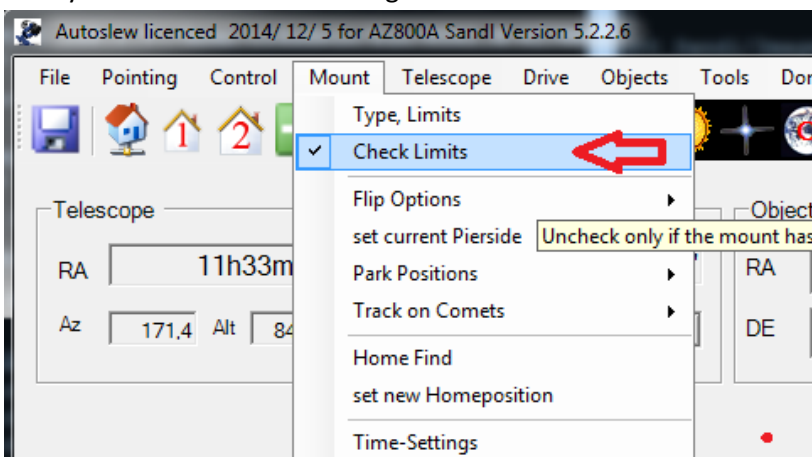
You should now be able to move your telescope across the normal range of the sky without getting into a software limit.

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Connecting Autoslew to a planetary software

Autoslew can be connected to many different planetary programs via ASCOM.

Always ensure that time and location settings are correct in your planetary software and are equal to the settings in Autoslew.

In this manual we describe how to connect Autoslew to Cartes du Ciel (freeware).

1. Be sure that Autoslew is running.
2. Start Cartes du Ciel
3. Choose *Telescope → control panel*
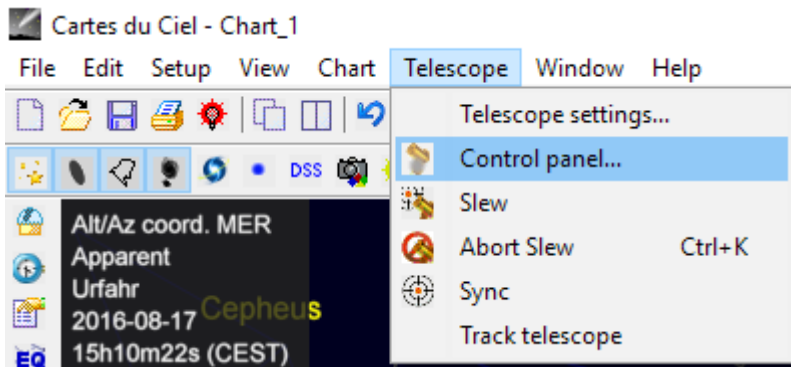
4. Press *Select*
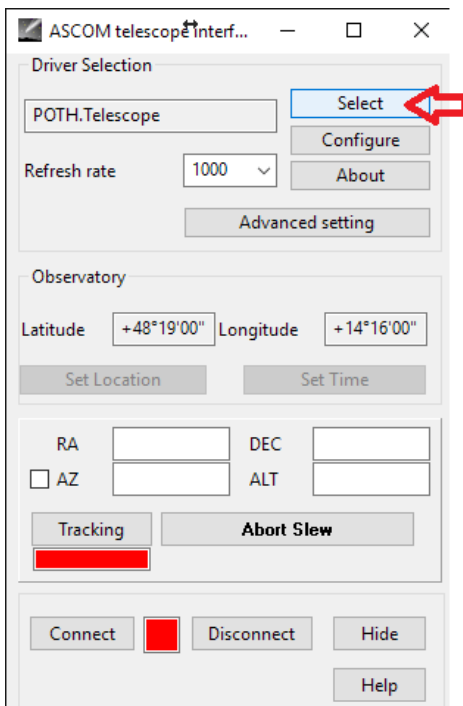
5. Choose "Astrooptik Server Telescope" and Press *Properties*
6. Switch to Autoslew as you need to quit the window "Nothing to setup here"
7. Switch back to the ASCOM Telescope Chooser and press *OK*

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8. Press *Connect*
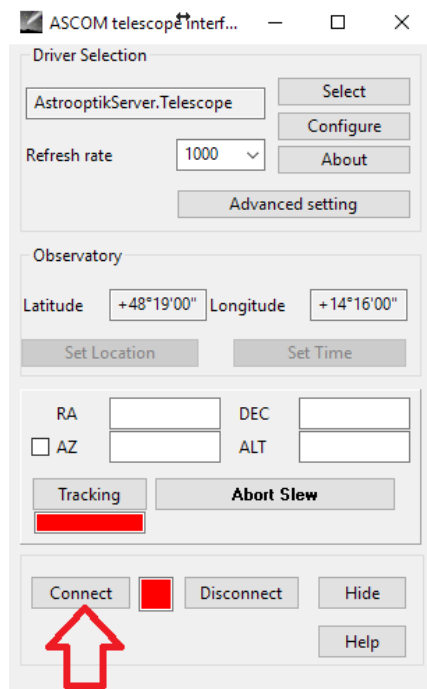
The square next to the connect button will turn green and your connection is established.

Now your current telescope position will be displayed on the sky chart with white concentric circles.

If you have problems connecting your planetary software with Autoslew, it might be necessary to run the programs as administrator.
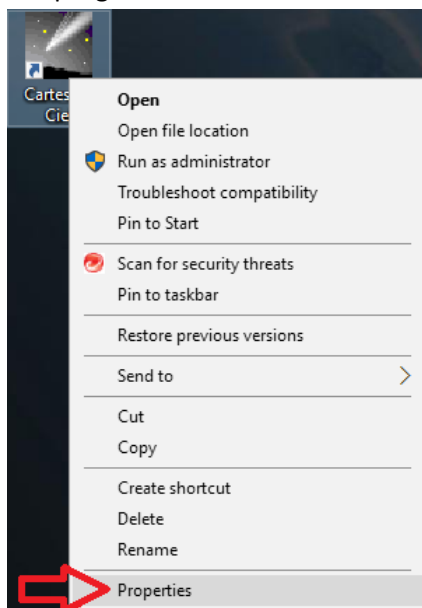
Right-click on the desktop icon and press *Properties*.

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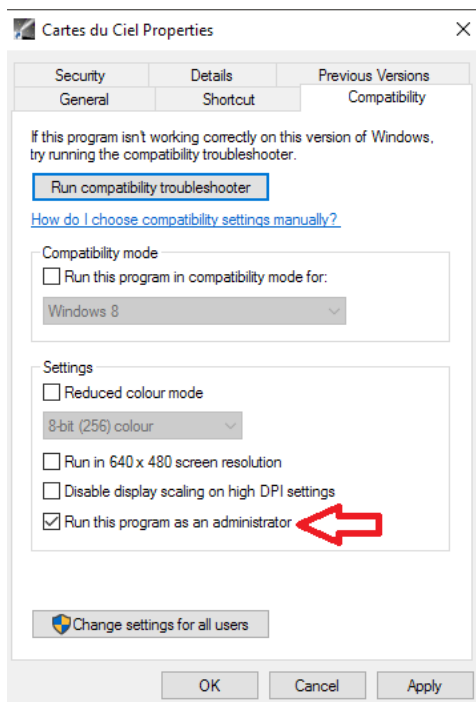
Choose the tab *Compatibility* and check the box *Run this program as an administrator*.
Press *Apply* and *OK*.

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Synchronizing your telescope position with a planetary software

To tell Autoslew where the telescope is currently pointing at you need to synchronize the telescope position. Therefor you need to move the telescope manually to an object on the sky (for example a bright star). Centre the object on your camera chip or eyepiece by slowly moving the mount with the move controls. When the object is centred you need to choose this certain object in your planetary software and press the Sync-command.

In Cartes du Ciel it looks like this:
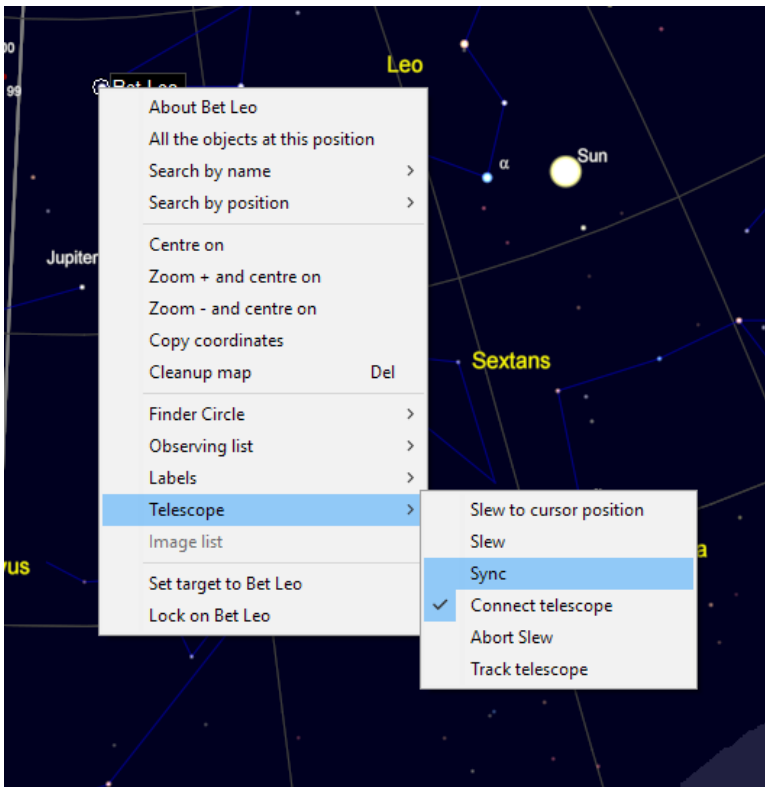
When you confirm the Sync, the current telescope position will appear at the chosen object by white concentric circles.

If you want to save this Synchronization for the next start, press Mount → Set new Homeposition

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Performing Slew-commands with your planetary software

Slew commands only work correctly if your mount is properly synchronized on the sky (see previous pages).

To move your telescope to a certain object on the sky, just select the object in your planetary software and choose the Slew-command.
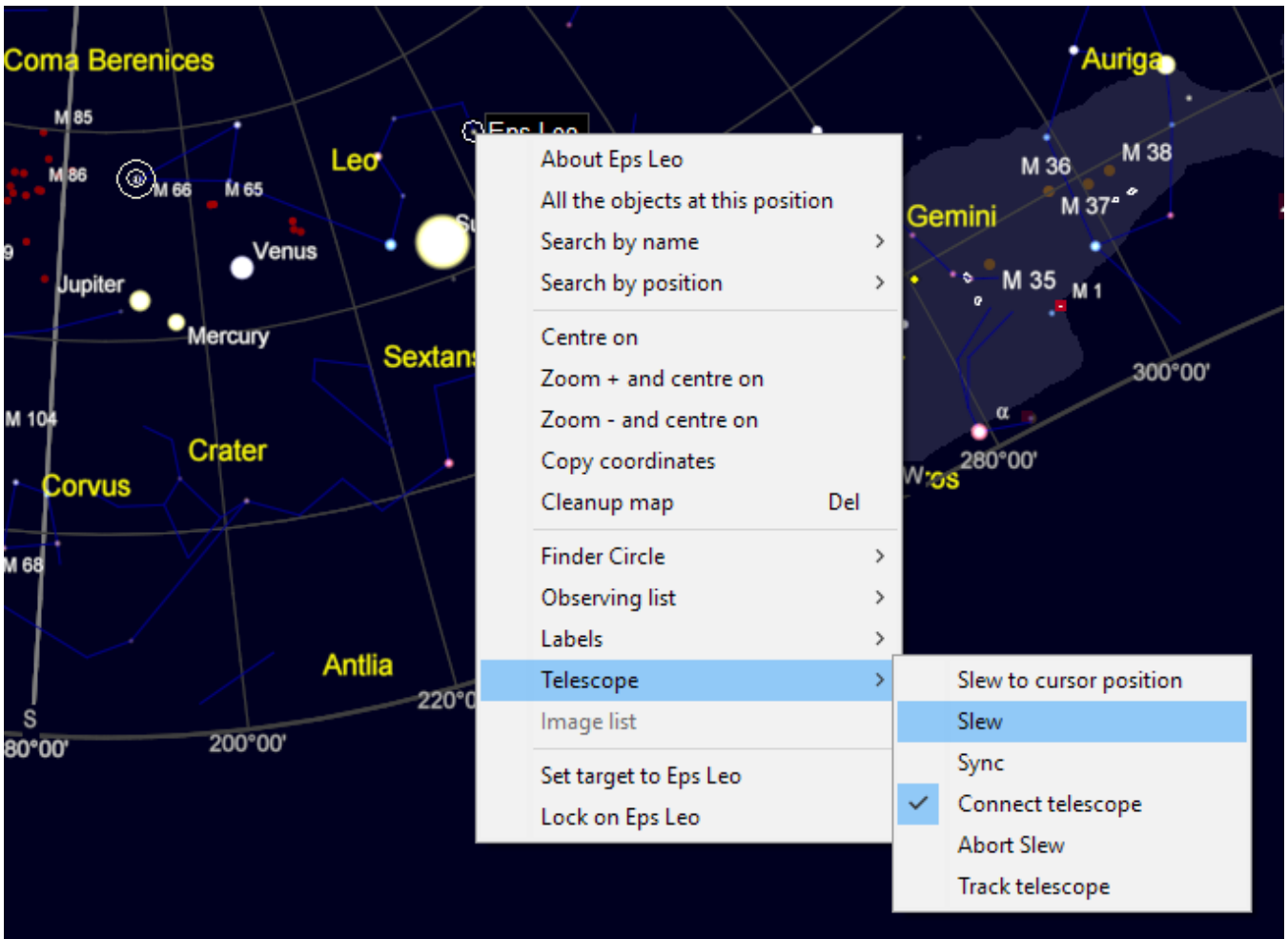
Your mount will move to the object automatically.

When you go to an object far away from the object you used for synchronizing you will probably hit it not very accurately.

You need to perform the polar alignment and create a pointing file to improve pointing accuracy.

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Polar Alignment and Pointing files

Ensure that your mount is aligned to the pole as accurate as possible by using a compass, laser, or other tools.

Creating a Pointing file for polar alignment

To improve the polar alignment you need to create a pointing model in Autoslew with at least 3 stars. **Choose the stars on one pierside only, so either all stars on West side or all on East side.**

1. Synchronize on an object on the sky as described on the previous pages
2. Press *Start/Add Pointingfile*
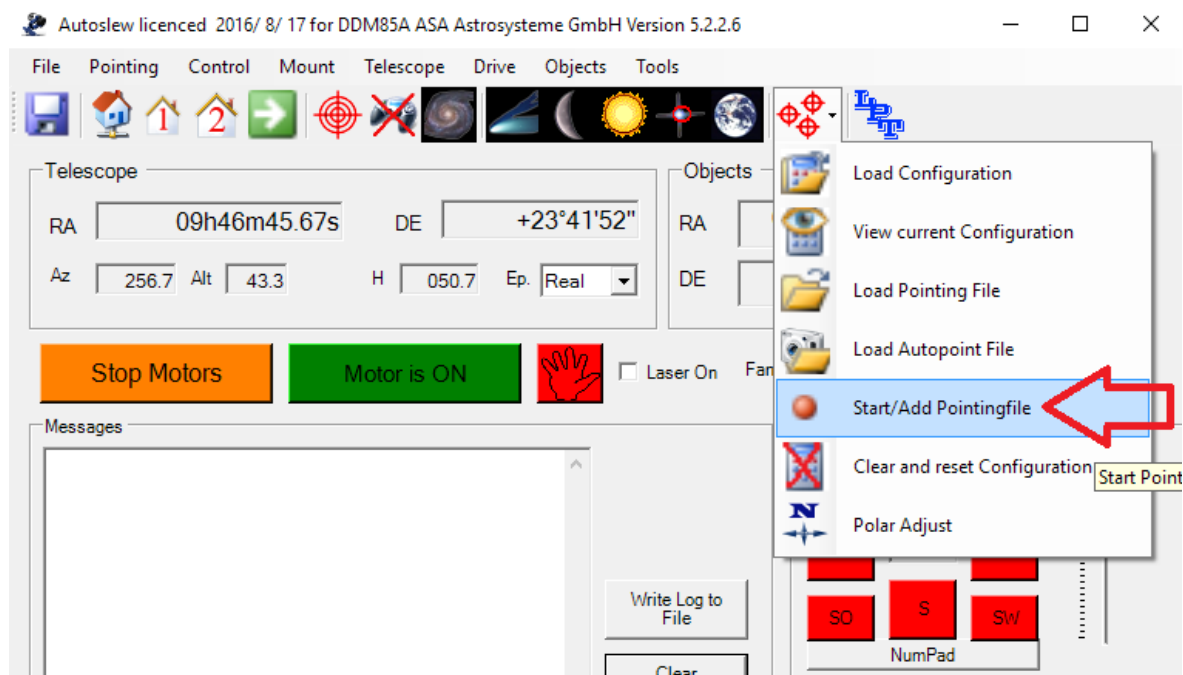
3. Confirm this message with *OK*, as you already synced before
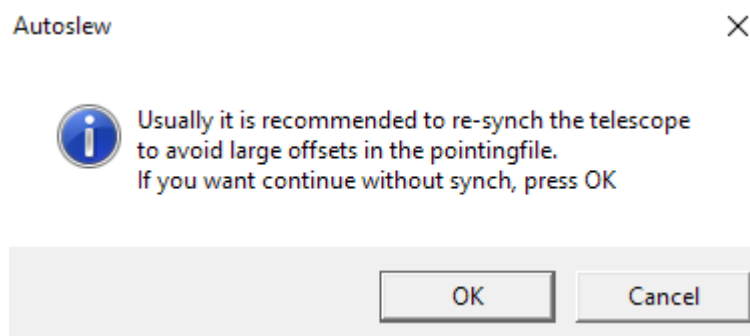
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4. Now Autoslew asks you to enter a name for the pointingfile and the directory where it should be saved at. We keep the default location, call the file "polar1" and press the save button.

5. Autoslew will tell you what to do in the status bar in the lower left corner

6. Autoslew wants us to slew to the first star of our pointing model. As we are still pointing to the star we used for synchronization we can use this star as the first star of our pointing model.
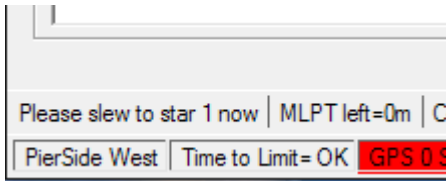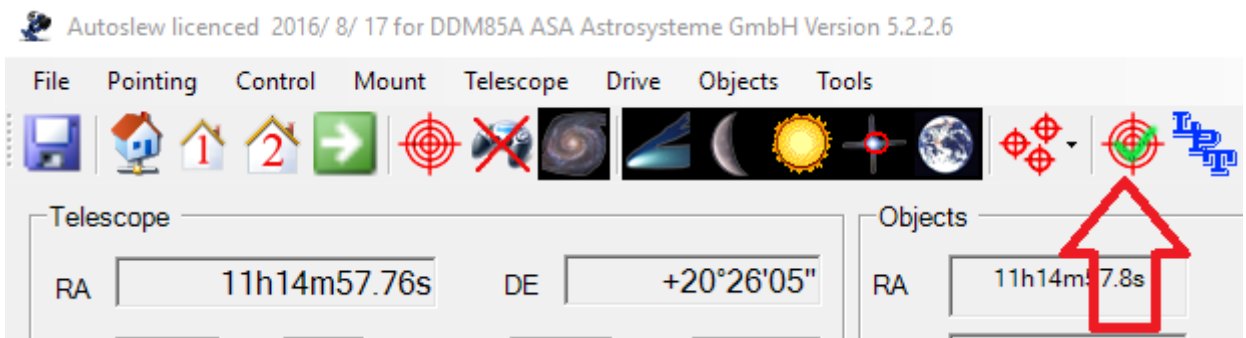   Select this star again and press the slew button in your planetary software. The star should still be centred on our camera chip/eyepiece. So we do not need to centre it, as Autoslew wants us to, in the status bar.

7. Confirm that the star is centred on your camera chip/eyepiece by pressing the crosshair button

8. Now slew to the next star
9. It will probably not appear in the middle of your camera chip/eyepiece. So centre the star by moving the mount with the move controls. (Caution: reduce the speed to 0.02-0.06°/sec)
10. When it is centred, confirm again by pressing the crosshair button.
11. Repeat these steps for at least one more star.

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12. When you have enough stars, stop the pointing file

13. Press *Calculate Configuration*

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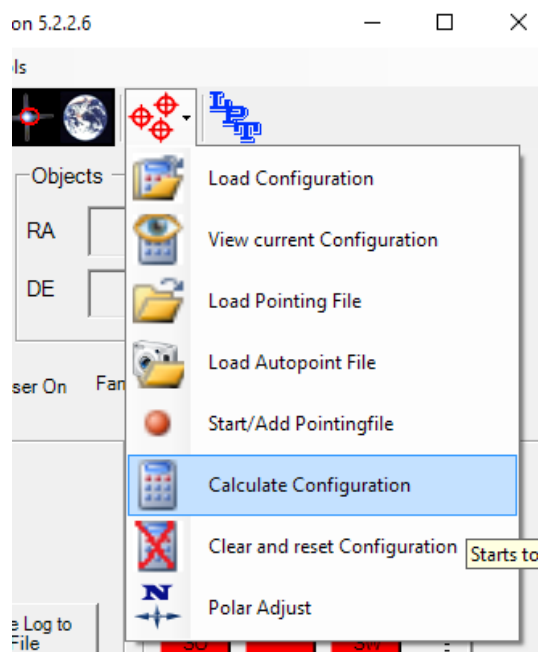
14. Choose *normal Optimization* and press *START*
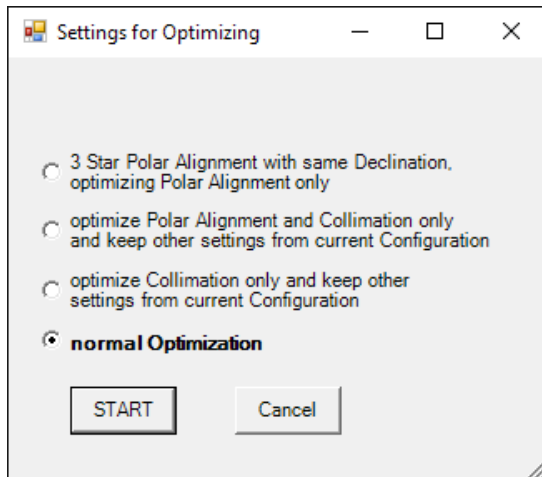
15. Now have a look at the Polar Alignment Error
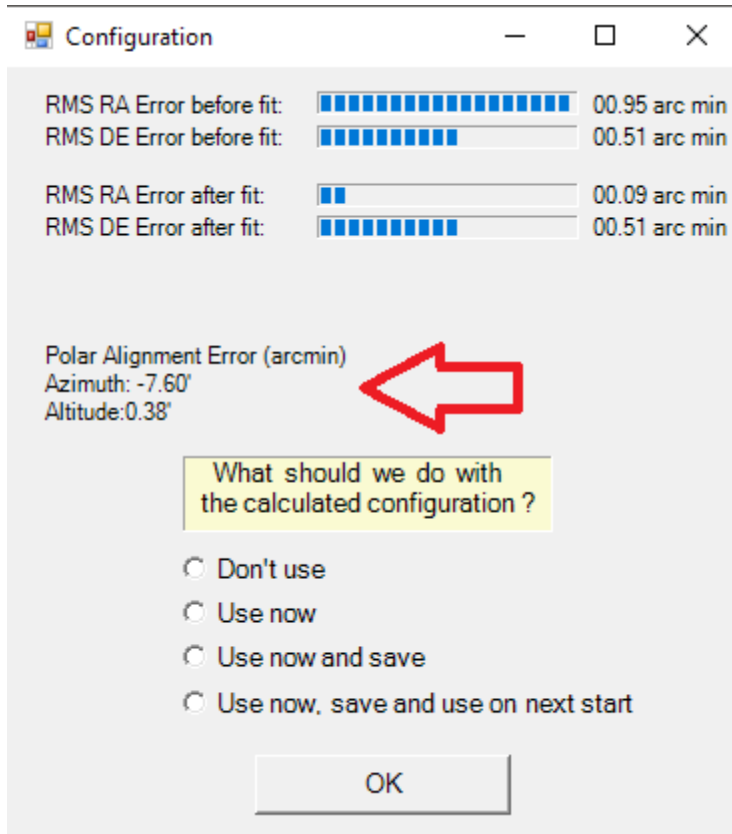
For a permanent setup we should seek for a maximum error of 5arcmins in both axes. So that means that we need to change the mechanical adjustment of Alt and Az of the mount.

The software will tell us how to align the axes.

16. Choose *use now* and press *OK*

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17. Choose Polar Adjust
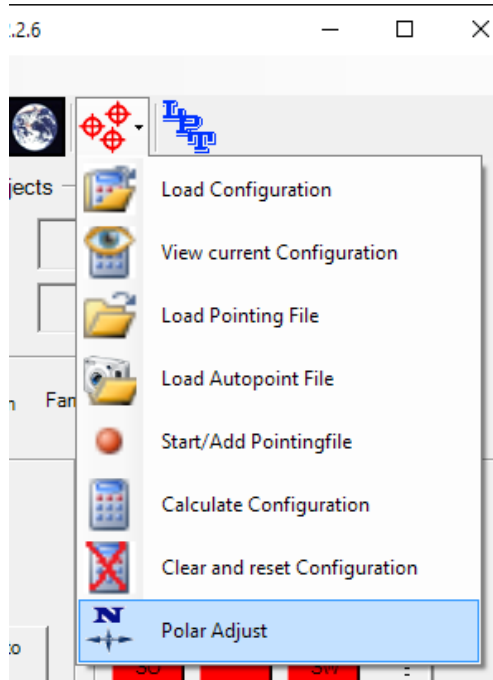
18. Now Autoslew wants you to choose your Adjustment type. For DDM85 choose the horizontal type, for DDM60 choose tilt type. The only exception is DDM85 Basic – for this one you should choose tilt type.
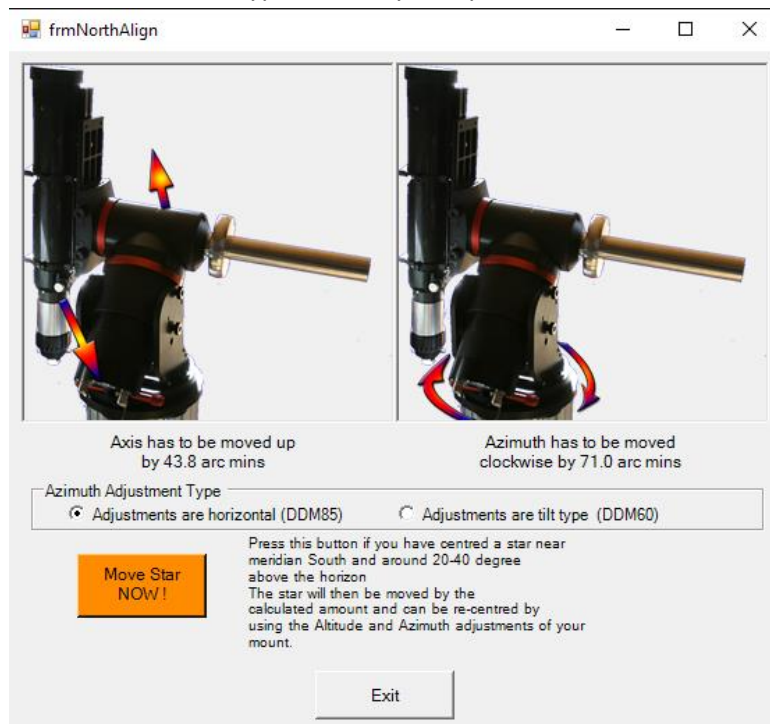
19. As described in the text below the pictures you should now switch to your planetary software and slew to a star near meridian south at about 20-40°(horizontal type) or about 33-63° (tilt type) altitude (leave this current window open).

20. Centre the star on your camera chip/eyepiece

21. Then press the button "Move Star NOW!"
    Now Autoslew will move the mount, so that the star will leave the centre of the camera chip/eyepiece.

22. Now you need to recentre the star by using the alignment knobs of your mounts base.

23. After that your mount is polar-aligned.

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24. **Before using the mount for further pointing files it is absolutely essential that you delete the current configuration that was used for polar alignment. It does not work anymore as we changed the mechanical alignment of the mount.**
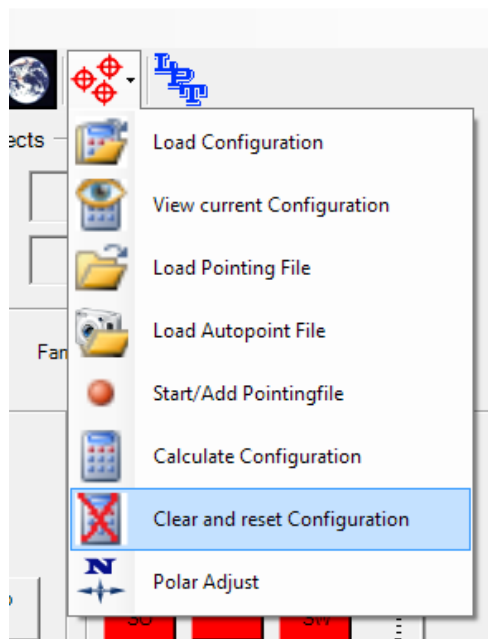
It might be possible that you need to repeat the complete polar alignment procedure to achieve a polar error below 5 arcmins.

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Creating a Pointing file for normal operation

Creating a pointing file for normal operation is pretty much the same as making one for the polar alignment. The only difference is, that we need a lot more stars. How many depends on your telescope, focal length and exposure times you want to achieve. The more stars you are using, the more information has Autoslew for optimizing pointing-and tracking accuracy. You can also make a small pointing model with few stars in the beginning and extend it by adding stars in the future.

For pointing files with more than 20 stars, we recommend to use Autopointing (see Sequence manual) as it works much faster and much more accurate.

Procedure:

Before creating a new pointing file, make sure that you cleared the previous configuration that was used for polar alignment.

1. Press *Clear and reset Configuration*
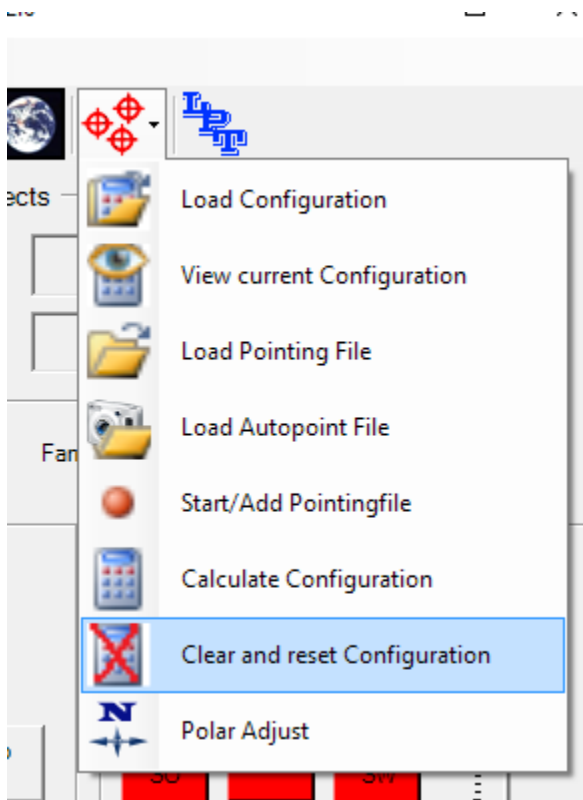
2. Synchronize on an object on the sky as described on the previous pages (see Synchronizing your telescope position with a planetary software

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3. Press *Start/Add Pointingfile*

4. Confirm this message with *OK*, as you already synced before
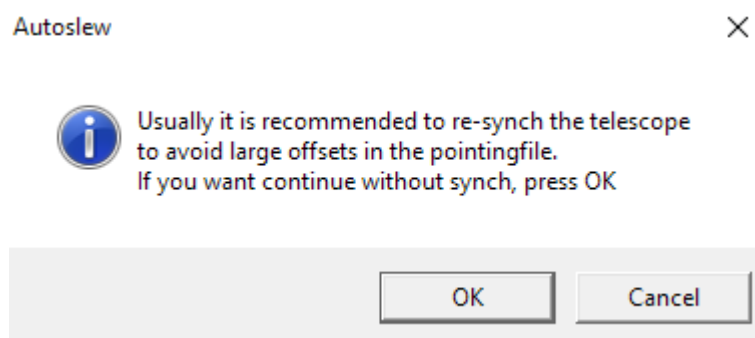
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5. Now Autoslew asks you to enter a name for the pointingfile and the directory where it should be saved at. We keep the default directory, call the file "pointing1" and press the save button.

6. Autoslew will tell you what to do in the status bar in the lower left corner

7. Autoslew wants us to slew to the first star of our pointing model. As we are still pointing to the star we used for synchronization we can use this star as the first star of our pointing model.
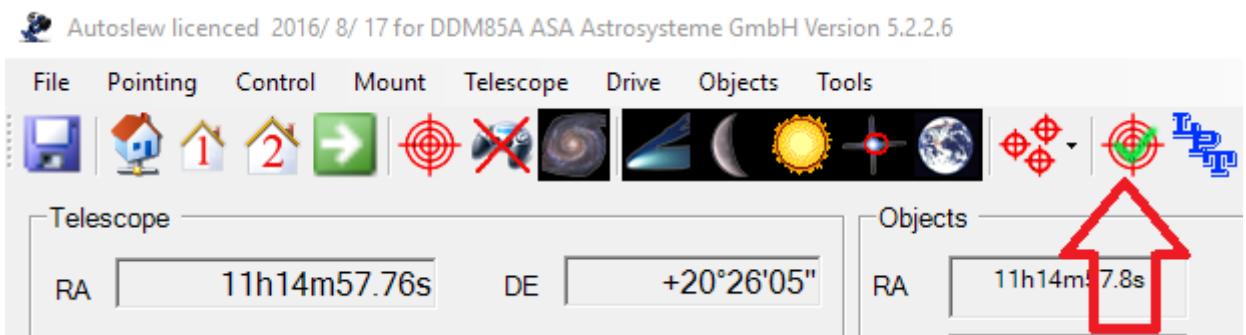Select this star again and press the slew button in your planetary software. The star should still be centred on our camera chip/eyepiece. So we do not need to centre it, as Autoslew wants us to, in the status bar.

8. Confirm that the star is centred on your camera chip/eyepiece by pressing the crosshair button

9. Now slew to the next star

10. It will probably not appear in the middle of your camera chip/eyepiece. So centre the star by moving the mount with the move controls. (Caution: reduce the speed to 0.02-0.06°/sec)

11. When it is centred, confirm again by pressing the crosshair button.

12. Repeat these steps for at least one more star.

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13. When you have enough stars, stop the pointing file

14. Press *Calculate Configuration*

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15. Choose *normal Optimization* and press *START*

Settings for Optimizing — ☐ ✕

○ 3 Star Polar Alignment with same Declination, optimizing Polar Alignment only

○ optimize Polar Alignment and Collimation only and keep other settings from current Configuration

○ optimize Collimation only and keep other settings from current Configuration

⦿ **normal Optimization**

[START]   [Cancel]

16.

Configuration — ☐ ✕

| RMS RA Error before fit: | | 00.95 arc min |
| RMS DE Error before fit: | | 00.51 arc min |

| RMS RA Error after fit: | | 00.09 arc min |
| RMS DE Error after fit: | | 00.51 arc min |

Polar Alignment Error (arcmin)
Azimuth: -1.60'
Altitude:0.38'

What should we do with the calculated configuration ?

○ Don't use
○ Use now
○ Use now and save
○ Use now, save and use on next start

[OK]

Choose *Use now, save and use on next start*

Now you can save this Configuration on your hard disk. It will be used automatically when you start Autoslew. Autoslew will now use this configuration to optimize pointing and tracking accuracy.

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Defining Park Positions

At the end of a session you should park your mount in a certain park position. You can define 2 different positions.

- Move your telescope to the desired parkpositon manually (with move controls or gamepad).
- Press *Mount →Park Positions →Set new Parkpositions*

Park-Positions   ✕

Zenith
Azimuth 180.00
Altitude 90.00
○ West ⦿ East
use current telescope position as future park 1
enter new name

P2
Azimuth 180.00
Altitude 70.00
○ West ⦿ East
use current telescope position as future park 2
enter new name

OK   Cancel

We recommend to leave Parkposition 1, as it is predefined as zenith position, which can be useful for rough syncing.

- Press the button *use current telescope position as future park 2*and confirm with *OK*

- Save this settings by pressing the save-button

- If you want to move your telescope to this park position in future you only need to choose Park2

  and press the Goto button

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Using a Gamepad / Joystick

We made good experience with Xbox one and Xbox 360 controllers. Also Logitech gamepads work well. In general all windows compatible game pads should work.

- Connect a Gamepad to your computer and install the required drivers.

- To activate the Gamepad in Autoslew you only need to press the following button
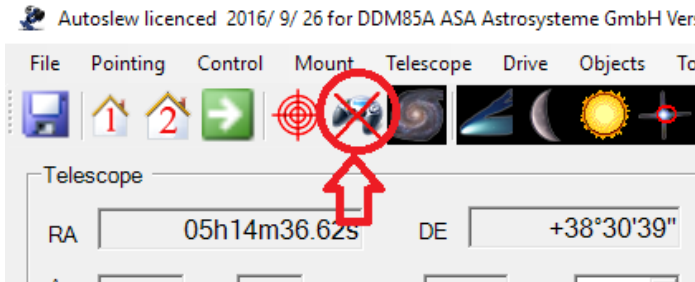
- To change the button layout press *Control → Joystick Settings*
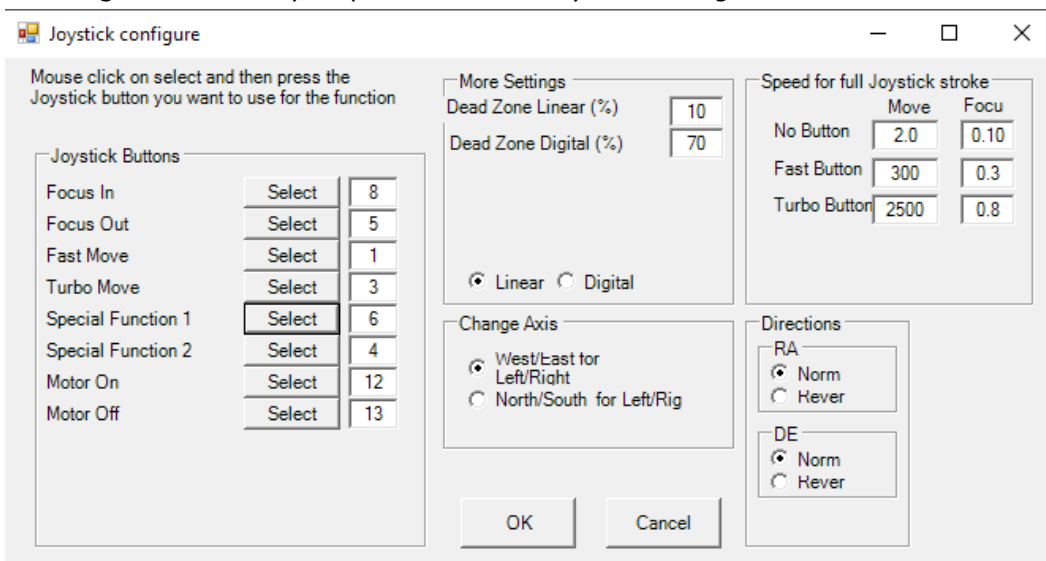
If you want to change the button for a certain function, press *Select* at this function and then press the desired button on your gamepad.

Your mount can be moved by using the left analogue stick of your gamepad. If you are not pressing any button while actuating the analogue stick the mount will move very slowly. (2x sidereal speed as default)

If you want to move it faster you need to hold the Fast Button or the Turbo Button. You can define these speeds in the upper right corner of this window.

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In our case we use the Xbox One controller. We use The A-button (button 1) for fast move (300x sidereal speed) and the X-Button (button 3) for turbo move (2500x sidereal speed).

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Autoguiding

For Autoguiding you need to connect Autoslew to the program that reads out the autoguider CCD and measures the deviation with the telescope via ASCOM.
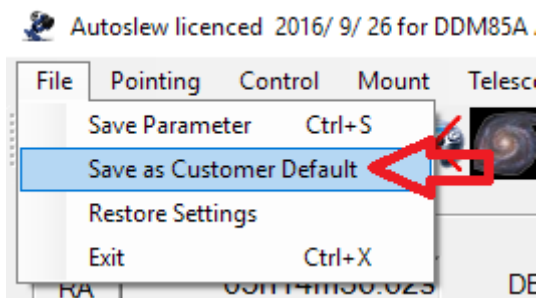
If you are using MaximDL, connect to "Astrooptik Server Telescope". Then set the autoguider options to "Telescope" instead of "Relays". Now MaximDL will use ASCOM commands to direct the telescope to the corrugated positions.

This procedure is much more accurate than using relays in dual loop encoder systems, because when Autoslew receives a command via ASCOM it will execute it with 0.1" accuracy with all backlash etc. involved, since it can measure this on the encoder.
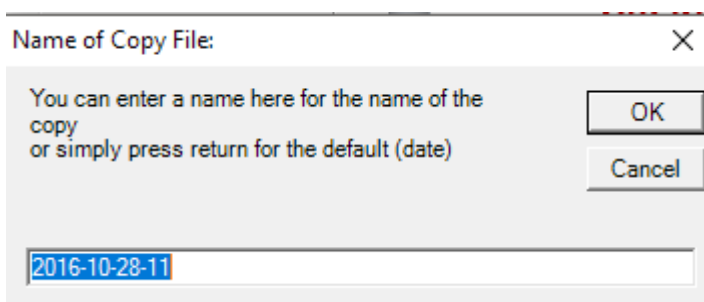
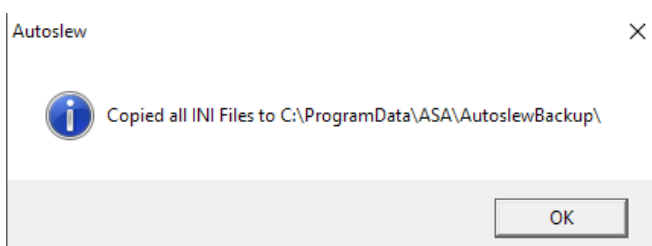# Backup and restore settings

Save your personal settings

You can save all your settings to a file on your hard disk. Therefor press *File* → *Save as Customer Default*.

Here you can enter the name of the backup file.

The backup files will be saved to C:\ProgramData\ASA\AutoslewBackup

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Restoring personal settings

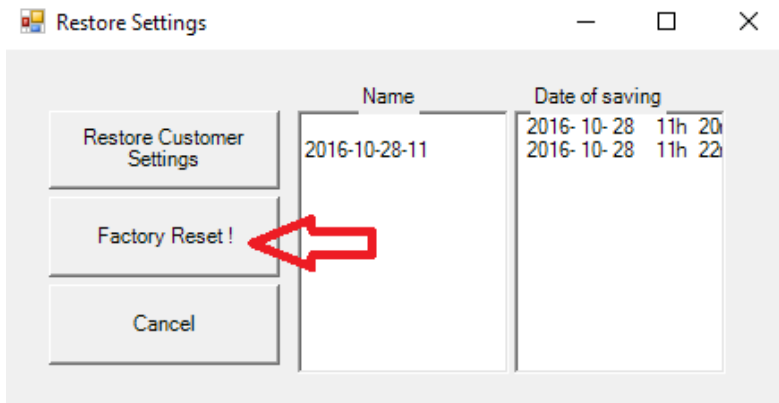For restoring these settings press *File* → *Restore Settings.*
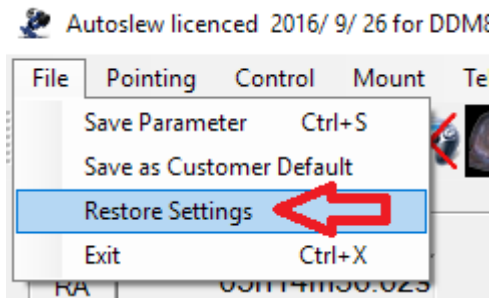
Choose the desired file and press Restore Customer Settings.

Restoring factory settings

In case you have changed any settings by mistake or struggle with malfunctions, you can restore the factory settings and configure everything (motor settings, location,..) from scratch.

Therefor press *File* → *Restore Settings*
and choose *Factory Reset!*

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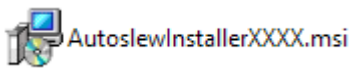## Updating Autoslew

To update Autoslew to a newer version you need to uninstall the current version from your windows control panel.
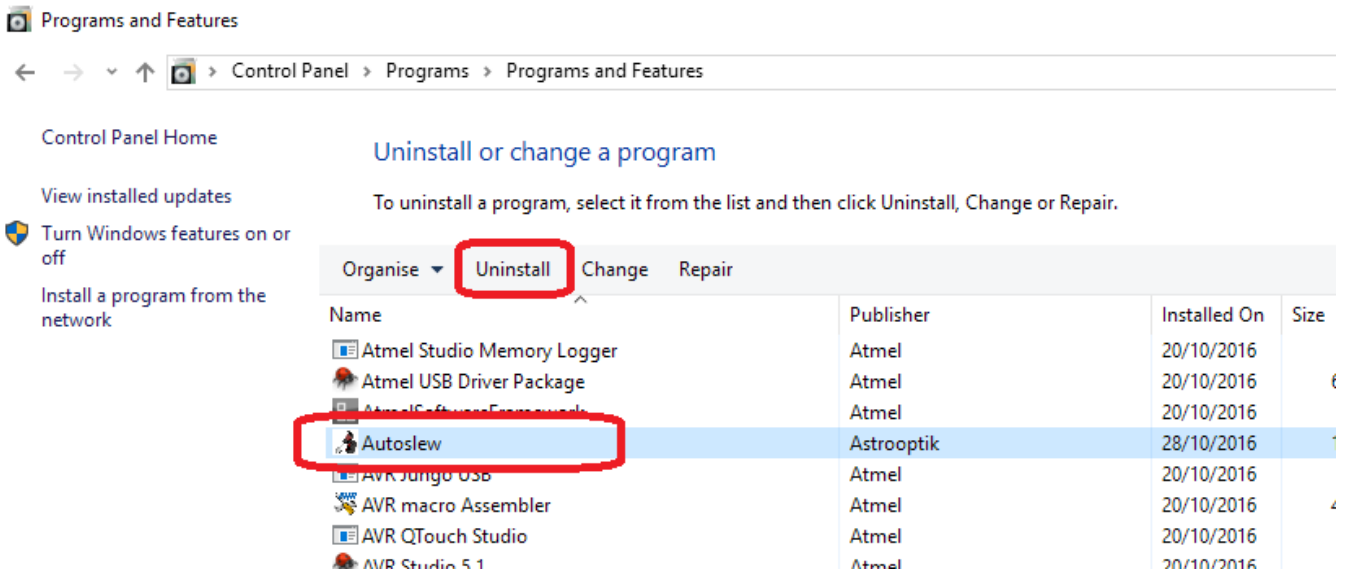
After that you just need to run the latest Autoslew Installer.

 AutoslewInstallerXXXX.msi

If you follow this procedure all the settings of Autoslew persist. If you want to remove your settings, you need to delete the Settings folder after uninstalling → described in the next chapter.

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Remove Autoslew completely

This chapter describes how to remove Autoslew completely from your computer, including all the software settings. **Caution: This is also the default folder for pointing files. Backup those in a separate directory if you want to keep them.**

- Uninstall Autoslew in your windows control panel.
- Autoslew saves all its settings in the following directory
  C:\ProgramData\ASA\Autoslew

  Delete this folder.

  Note: The *ProgramData* folder is hidden in Windows. So activate to view hidden folders or copy the path to your explorer address bar.

If you install Autoslew the next time it will ask for your Autoslew serial key and start with default software settings.

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