Quick Guide

Software Version 1.6.4

http://www.astrojantools.de

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Many thanks to Owen Gardner for the review of the document

Preface

Hobby photographers and amateur astronomers are always on the lookout for programs to facilitate the ambitious topic of astrophotography or entry therein. I hope my software AstrojanTools (AJT) will assist in this aspect of "collecting photons".

The software is the result of the interest in - after a long break - again at least privately entering into programming because I left this career path for a long time. I hope it is intuitive enough to get started quickly, although the feature set grown considerably over time (and I still get new ideas).

If you like it and it is useful you can voluntarily donate any amount via the Paypal donation button. If you do not wish to use Paypal for this, you can write to me (jan@astrojantools.de). I am pleased, however, of any usage of AstrojanTools.

Please take into account:

- This is not a commercial software and I am constantly working on it when circumstances permit. In the case of errors please to be indulgent.
- You can help me very much if you give me error reports. Either by email (jan@astrojantools.de) or via the contact form on the website. Or sign to the Yahoo group Astrojantools (http://tech.groups.yahoo.com/group/Astrojantools/)
- If you have suggestions for improvement please send also by mail or via the contact form.
- I can test usually only with a 40D. Therefore, your feedback on the different models is very important.

The software is based on the interface library EDSDK Canon (Canon SDK, software development kit). As a development environment I use Microsoft Visual Studio Express C# 2008.

Personally, I have tested the software under Windows XP, Windows Vista and Windows 7 on different performance computers. Because the software works a lot with images, and the resolutions and thus the photos are getting bigger, the following applies: the weaker the computer, the longer the storage and loading times of images. Important is a lot of memory, because the program usually also runs along other software like PHD or a planetarium program. Otherwise Windows swaps memory to disk, which takes a lot of time and nerves, at least at the first photo. Further recordings run through faster, experience shows.

There are some restrictions and notes:

1) After the initial start immediately please fill out the settings (under Settings) and store.
2) It is recommended that if your camera has the B-mode on the rotary ring (such as the 5D), that this mode is used, and not the M mode. Do not switch between the modes, as long as the camera is connected with the program, in the case, the required information is not transmitted from the camera. This is a point that needs to be further analyzed as soon as I have this type of camera available.
3) The user functions (Customer Functions) “Noise Reduction” and “Mirror Locking” can not be set by the program. I have found no way yet, obviously the Canon interface library does not do this directly.
4) A power save mode in the camera seems to close the connection. **Turn off power save mode.**
5) This software version can not recognize an independent off the "Live View" mode on the camera side. Running the Live View mode permanently, it is from the camera automatically terminated after a time (depending on model ?).

So now, have a lot of fun and success with the software. This document provides an overview of the functionality and operation of key functions. Unfortunately in this version not all functions are described. Like asking questions via email or give hints that something is not described understandable.

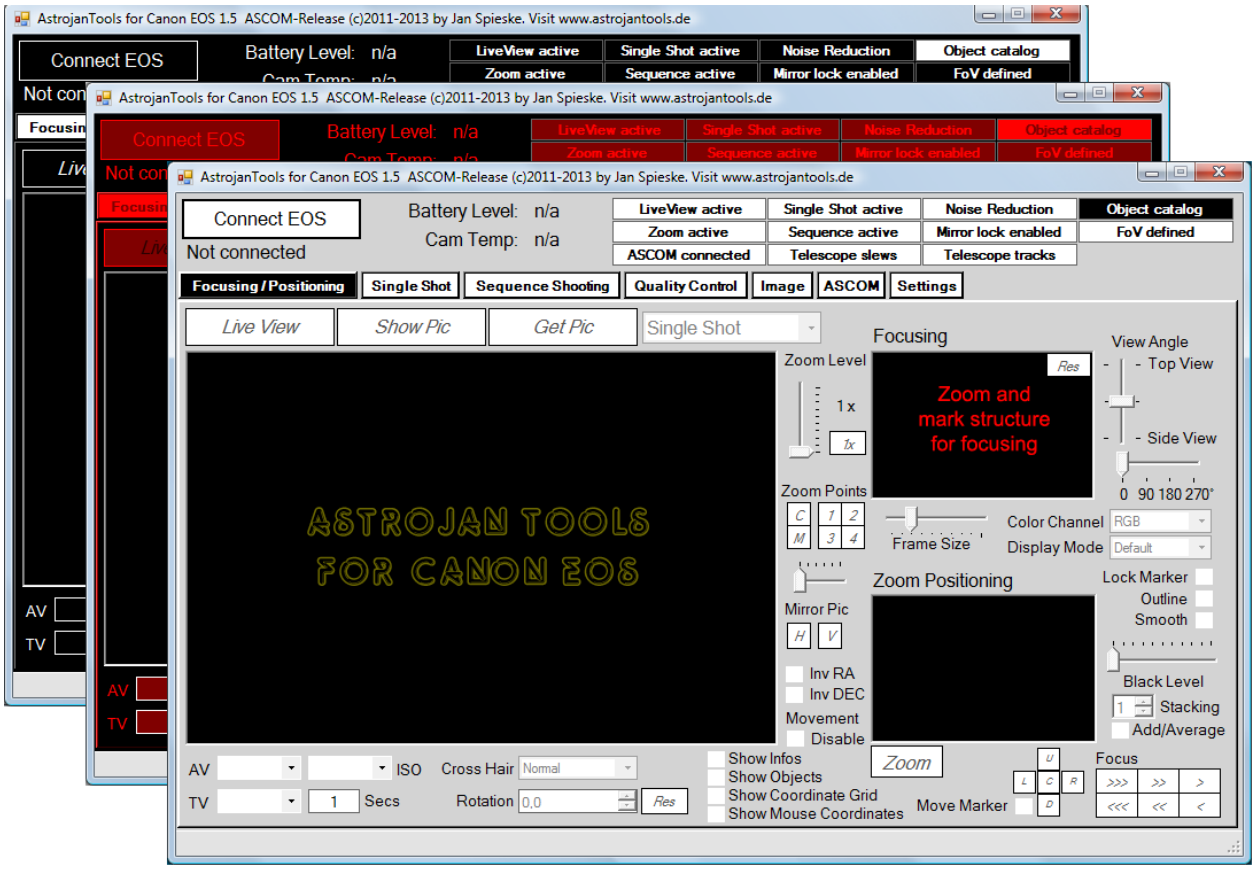
Document History

28.05.2013	Inititial english version for software version 1.6 released (draft, in review)
31.05.2013	Final version of english manual for software version 1.6. released
17.10.2013	Final version of english manual for software version 1.6.2 released. Changes to ASCOM focuser and Sequence Shooting. New Color Channel mode “R/G/B”
03.01.2014	Final version of english manual for software version 1.6.4 released. New chapters for Astrotortilla and Astrometry.NET.

Table of contents

1. Overview

AstrojanTools starts with the following screen in the set under Settings color scheme (standard night design):



The following functions are provided to the user interface:

- the main window with the general operating functions and displays
- the focusing and positioning control ("Focusing / Positioning")
- the single shot control ("Single Shot")
- the sequence shooting control ("Sequence Shooting")
- quality control control ("Quality Control")
- the image display control ("Image")
- the telescope control ("ASCOM")
- and program settings ("Settings")

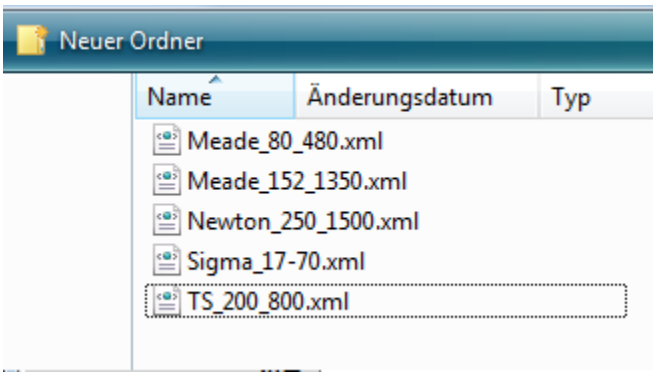
2. Installation and Setup

This is quite easy. Download the zip file of www.astrojantools.de and unzip it into a directory of your choice. Call then from there astrojantools.exe, ideally with a shortcut from the desktop, for example. You can get AstrojanTools with or without ASCOM support. The ASCOM version has some advantages like object catalog and so on.

Must be installed:

- Microsoft .NET Framework >= 3.5 Microsoft. NET Framework> = 3.5
- The Canon RAW Codec from the Canon website or the Microsoft Codec Pack for Win7/Win8 64 Bit
  IMPORTANT: In any case, install, even if other software shows Raw photos correctly. Otherwise, AJT does not contain raw preview. Just search for "Canon RAW Codec".
- Optionally the actual ASCOM platform for the use of AstrojanTools ASCOM version.
- Optionally the Open Source mount control EQMOD
  Actually intended for owners of EQ6 but with the additional tool EQtour and EQMOD simulator you can try the all functions of AJT without clear nights. I use it also to control my mount EQ6 Syncscan.

Under the "Settings" tab at first use, the information should be filled out, at least the focal length (Focal Length), because this is required for the calculation of the "field of view" of the camera (Field of View). The type of camera is set automatically set at connecting to the camera, but it can also be selected manually. I save the settings for each of my telescopes (and lenses) from the profiles in a special folder to make them available when needed.



AJT automatically loads the last used profile at startup.

Explanation of the settings:

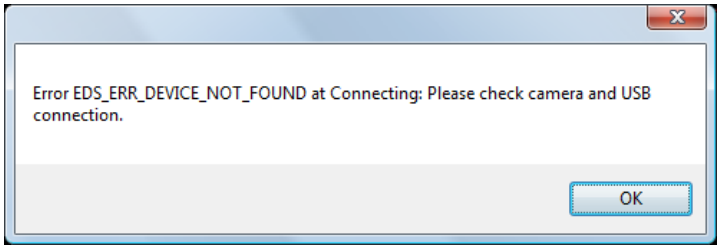
Setting	Function
Photographer	Photographer's name (optional)
Site	Location (optional)
Accessories	Employed accessories like flatteners, filters, etc. (optional)
Telescope	Your name for the telescope (optional)
Diameter	Diameter (optional)
Focal Length	Focal Length (please fill in). **Note:** With lens attached, this value is read out from the last photo, and automatically set when the hook "Read Out Focal Length" is enabled.
Camera	Camera type. Is set automatically when you connect to the camera but can also be manually set without camera connection.
Use Raw for Preview	If checked, the software will use the raw images for the display of photos, otherwise the embedded JPG preview (to relieve the host CPU and memory). **Warning:** High computer strain. In case of problems please disable hook.
Check Low Battery	If the camera is powered by rechargeable batteries, and the hook is set, the user is able to switch to the battery during a sequence. For this purpose, the software checks the battery level between shots, interrupts the sequence, requires the user to change the battery, and then continues with the sequence.
Show Debug Window	If an error occurs, this will let the debug window appear. It displays protocol messages that serve me for troubleshooting. The text can be copied into an email and sent to me.
Processing Time (secs)	AstrojanTools calculates for a sequence in addition to the total exposure time the total time including transmission, storage and break times. Since the transfer and storage times depend strongly on the particular computer, the software requires an estimate or average (default 5 seconds).
Measure Processing Time	As an alternative to manually entering processing time AstrojanTools can calculate this value when two to three pictures are taken (experience shows that the first photo can take longer, particularly with little computer memory for a long time), then set the hook and shoot a photo. The result is then displayed in the Processing Time field.
Colour Scheme	Selecting a colour scheme of Night (red design), Black and White or Gray. Anyone who works with red cellophane should try the

	readability with black / white or gray.
Hide Tabs	If some tabs are not required, these are hereby suppressed.
Load Catalog	Load the Object Browser.
Load at startup	If checked, the Object Browser is loaded automatically each time (recommended).
Bulb 300D/20D	Some old models must be driven for long exposures (bulb exposures) via a separate cable. Via a USB connection only exposures up to 30 seconds will work. Through these settings the program knows which way the camera is triggered.

3. Connecting to the camera

To connect to the camera press the "Connect" button. Press again to disconnect.

If the connection fails the following error message is shown:



Typical reasons are:

- Camera is turned off
- Bad USB cable (I've had this myself. Check this if it fails often with "Connection lost")
- Some other software has a connection with the camera (eg EOS Utilities)

Note: currently, only one program can access the camera at once. This means that for example the EOS Utilities may not be started at the same time. Just close the other program. You might consider uninstalling the EOS Utilities.

Note: Canon unfortunately uses different names in different countries for the same type of camera, such as Rebel. Therefore, it may be that certain foreign cameras are not recognized correctly, because my software does not include foreign names in the list. In this case, the following error message: "Can not assign type camera to camera found with name XYZ. Please set camera type manually in Settings“. It is then under the control of the "Settings" to manually set the camera type, which in principle can be performed during first setup.

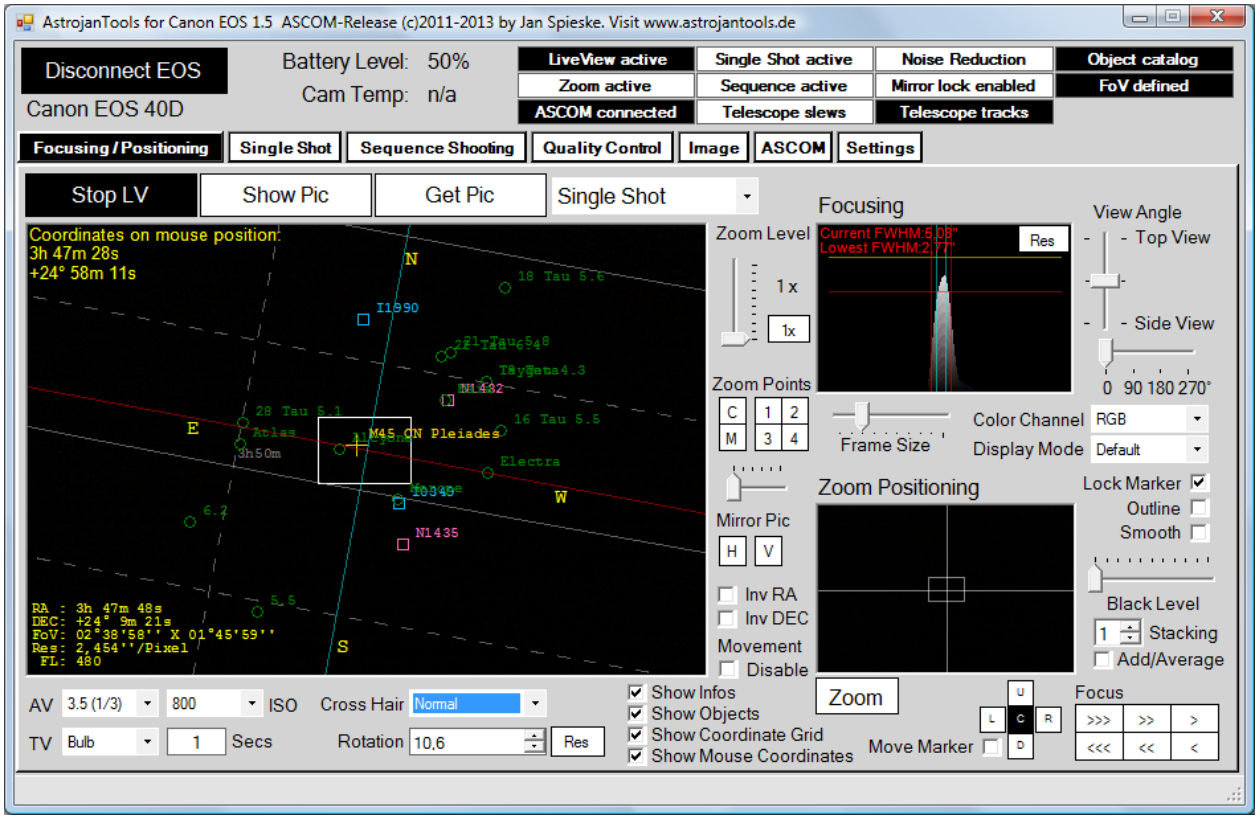
4. General operating and display elements

In the header region, the button to connect to the camera, the display of the battery status and temperature of the camera (is read out from the last photo) are placed along with the following status indicators:

Live View Active	Indicates that Live View is active
Zoom active	Indicates whether the Zoom mode is active
ASCOM connected	Indicates whether the software is connected to the telescope (ASCOM version)
Single Shot active	Indicates whether a single exposure is currently running
Sequence active	Indicates whether a sequence is currently running
Telescope slews	Indicates whether the associated telescope is currently moving (ASCOM version)
Noise reduction	Indicates whether noise reduction is active in the camera. The processing and storage of the image required by the host is normally about 2-5 seconds. If noise reduction is turned on it takes the same time after exposure for processing and storing plus the time for the noise reduction by the camera. Example: recording time 30 seconds. The camera needs for recording 30 seconds plus 2-5 seconds for the storage (depending on the speed of the computer). With Noise Reduction on it takes 30 seconds exposure plus 30 seconds noise reduction processing plus 2-5 seconds for storage.
Mirror lock enabled	Indicates whether mirror locking is switched in the camera. To capture images, mirror locking must be turned off in this software version. If you want to use mirror locking you can achieve this by starting Live View and then a sequence. **Note:** the camera can stop the Live View mode automatically after a certain time (perhaps depending on the model, for example: 10 minutes). According to users, this is probably only for a permanent Live View operation. The interruption does not apparently take place if fotos are being shot.
Telescope tracks	Indicates whether the associated telescope is tracking (ASCOM version)
Object catalog	Indicates whether the object catalog is loaded
FoV defined	Indicates whether the camera field of view has been calculated (Field Of View, FOV)

The program window can be enlarged with the mouse or even maximized. In this case the picture displays in each tab will be highly magnified (aspect ratio 1.5:1).

5. Focusing and positioning control ("Focusing / Positioning")



This control provides functions as follows:

- Start / Stop Live View.
- Start / Stop the Zoom Function.
- Acquisition of individual images, display image files or download a demo image (M45).
- With telescopic movement synchronous image shifting as a positioning aid for faint objects which cannot be recognised with Live View.
- Superposition of picture files on the Live View or single shots, as the reconstruction of previous recording sessions.
- Calculation of the focal length and / or the camera angle relative to the RA / Dec axis based on telescopic movements (not final yet, use a star near the equator).
- Superimpose single, scaled or double crosshairs.
- Display of M / IC / NGC objects as symbols in the field of view (FoV).
- Set up to four zoom points between which can be manually or automatically scheduled to be swapped.
- Zoom 2 - to 10-fold.
- Focusing aid with FWHM calculation and 3D visualization of the star.
- Star will optionally be displayed in the RGB or red, green or blue channel.
- Increasing the sensitivity of the Live View through the addition of Live View images and averaging to calm the seeing during the presentation (motorized focuser recommended due to increased inertia of the display; focussing by hand inevitably causes some shaking, which spoils the result).
- Simple, mouse-driven correction of the coordinates and orientation angle of the camera.

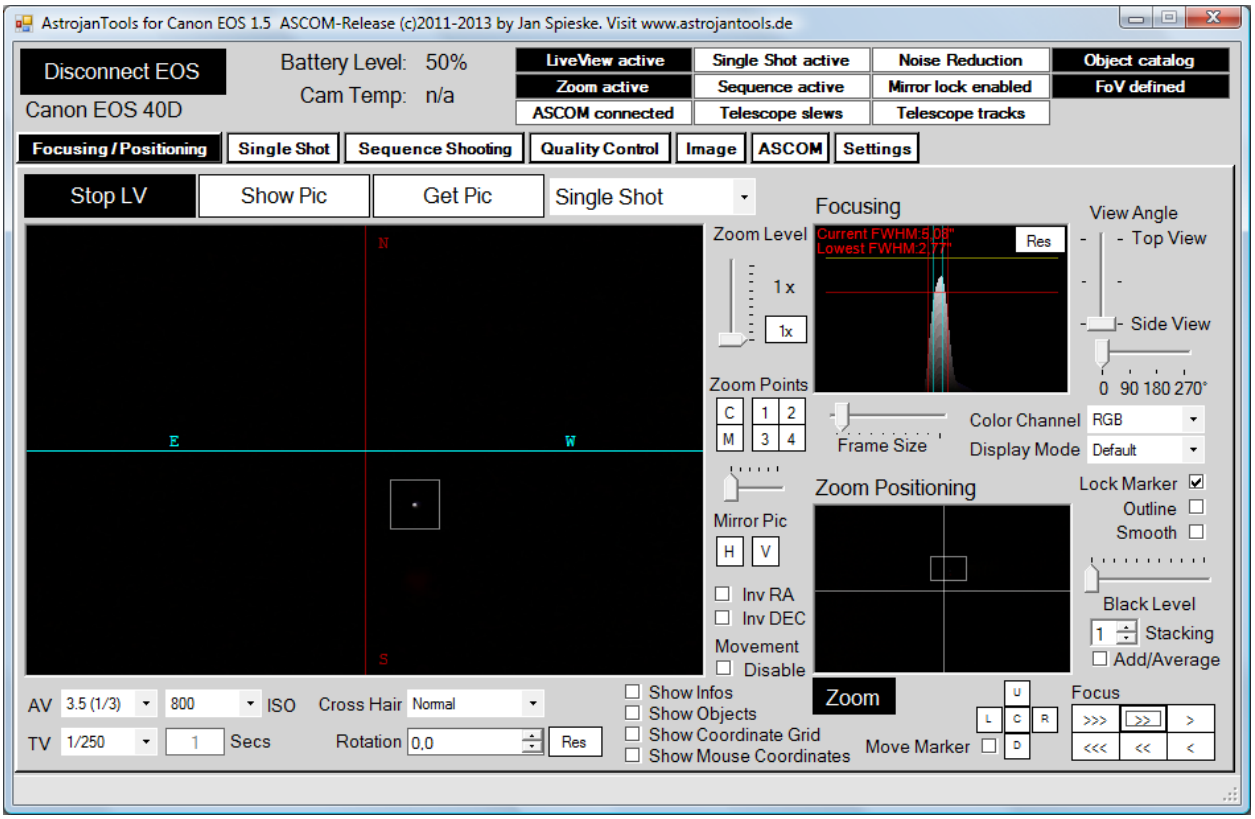
- Centering the desired objects in the FoV in the center of the image as well as synchronization of the telescope control to objects by simply clicking.
- Display a coordinate grid.
- etc. etc.

Focusing

Several tools are available to assist in focusing.

The basic procedure is as follows:

- Move to a star, preferably a medium bright or faint star
- Start LiveView
- Set zoom frame with the left mouse button over the star and push start zoom
- Click with the left mouse button on the star -> the star appears in a 3D view, with the lowest FWHM and the current FWHM measurement. The 3D view can be changed using the slider "View Angle".



- You can activate "Lock marker" if you focus manually. This is a kind of image stabilization and the mark has always focus on the brightness of the selected range, such that the map "Focusing" does not wobble.

You now have the following situation:

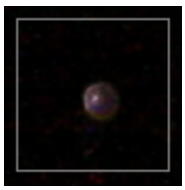
- The two FWHM values agree fairly well (depending on seeing)
- The star pattern is probably vague and shallow
- The correct focus point is unknown

The task now is to find the right focus point.

How to proceed:

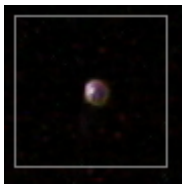
- change the focus so that the "Lowest FWHM" value is lower
- continue until the "Current FWHM" value is significantly larger again -> the focal point has been crossed
- Focus back so far that the "lowest FWHM" - and "Current FWHM" values are as close to each other as possible. That works but with bad seeing it is not perfect, since the star image may be pumped up and down and momentarily very low values are measured; a good focus cannot be achieved. The measurement can be reset at any time using the button "Res" and done again.
- An additional evidence of good focusing: the star image is high and thin. For me, however, it is always a combination of the measurement results and viewing the normal star image.
- Using the slider "View Angle", the viewing angle can be changed. Is the slider pulled all the way down, lines appear to visualize the FWHM values.

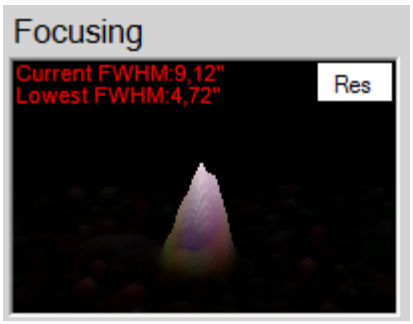
The beginning of the focusing. The star pattern/ FWHM values are in an unclear state



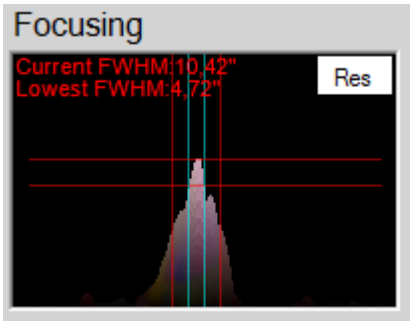
The focal point is scanned. The "Lowest FWHM" value approaches its smallest value

The star image will get worse (flat, broad). Focus now back in the opposite direction.

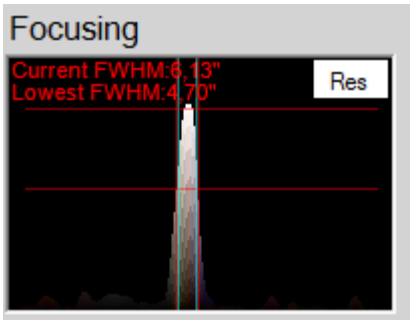




If the slider "View Angle" is pulled down, the lines to visualize the FWHM values appear. Here the goal is to get the smallest distance between similarly colored and best overlapping of the vertical lines . This works more or less well, depending on the seeing. In any event try to set it to the narrowest width. Use "Res" to reset and repeat the measurement at any time.



That should be good enough now. It is always a mixture of measurements and the star image on the left.



Note for working with lenses: see chapter

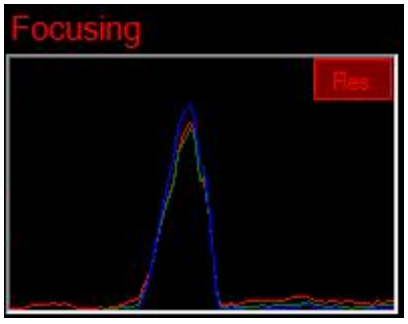
Determination with Plate-Solving based on Astrometry.Net

- see chapter Plate Solving with Astrometry.Net in AstrojanTools

Working with attached lenses .

RGB star profile

New since version 1.6.2 is the star profile of the Red/Green/Blue channel.



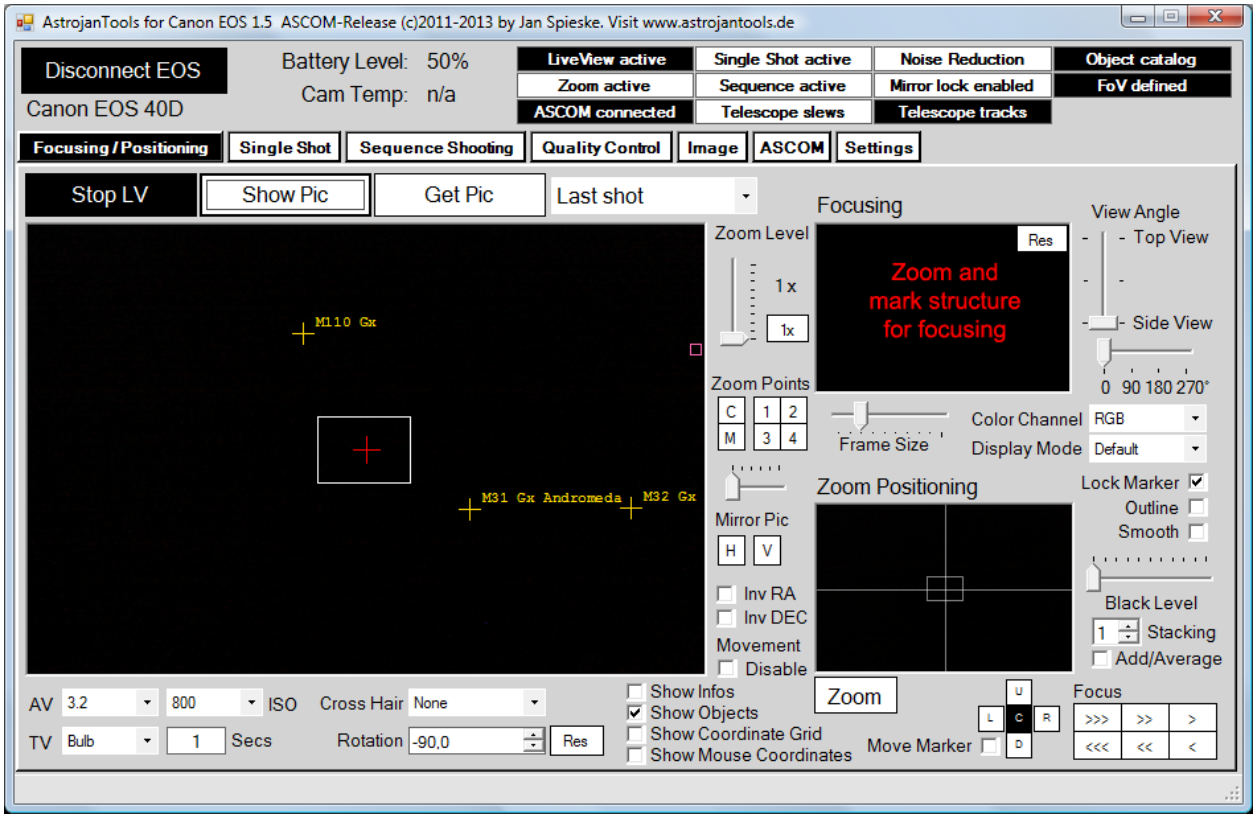
To activate mark a star in zoom mode and choose color channel “R/G/B” .

Positioning (ASCOM version)

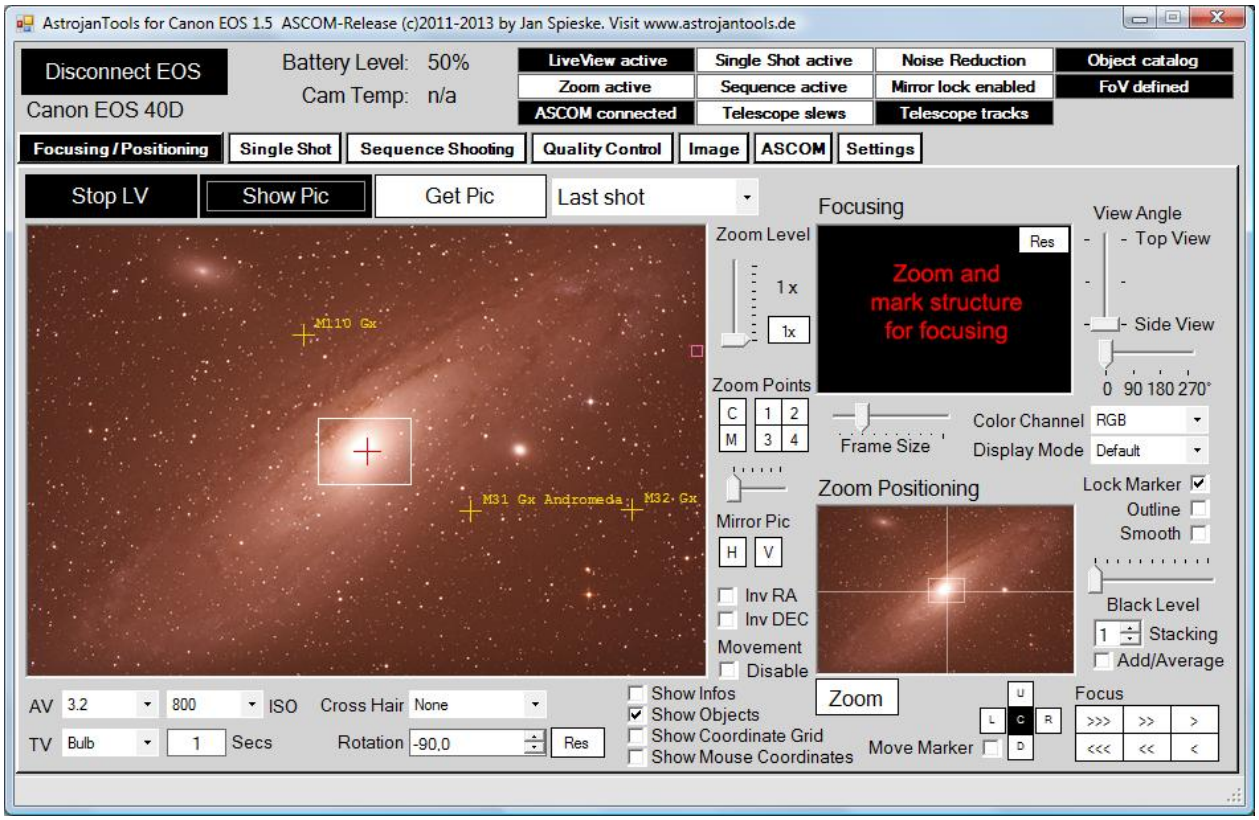
There are (in addition to Live View) two other mechanisms about how to achieve fast positioning or arrangement of the image motif: the target object display and automatic image shifting.

Object display and position correction

Is the object catalog loaded, AJT can, associated with ASCOM and the FoV value (set focal length to calculate), display the objects in the FoV if activated (check "Show Objects"). The more precise the input focal length of the actual real focal length of the telescope (nominal focal length plus for example a reduction by a flattener) corresponds to, and the angle of the camera orientation correct in relation to the DEC- or RA-axis (field rotation), the better this works.

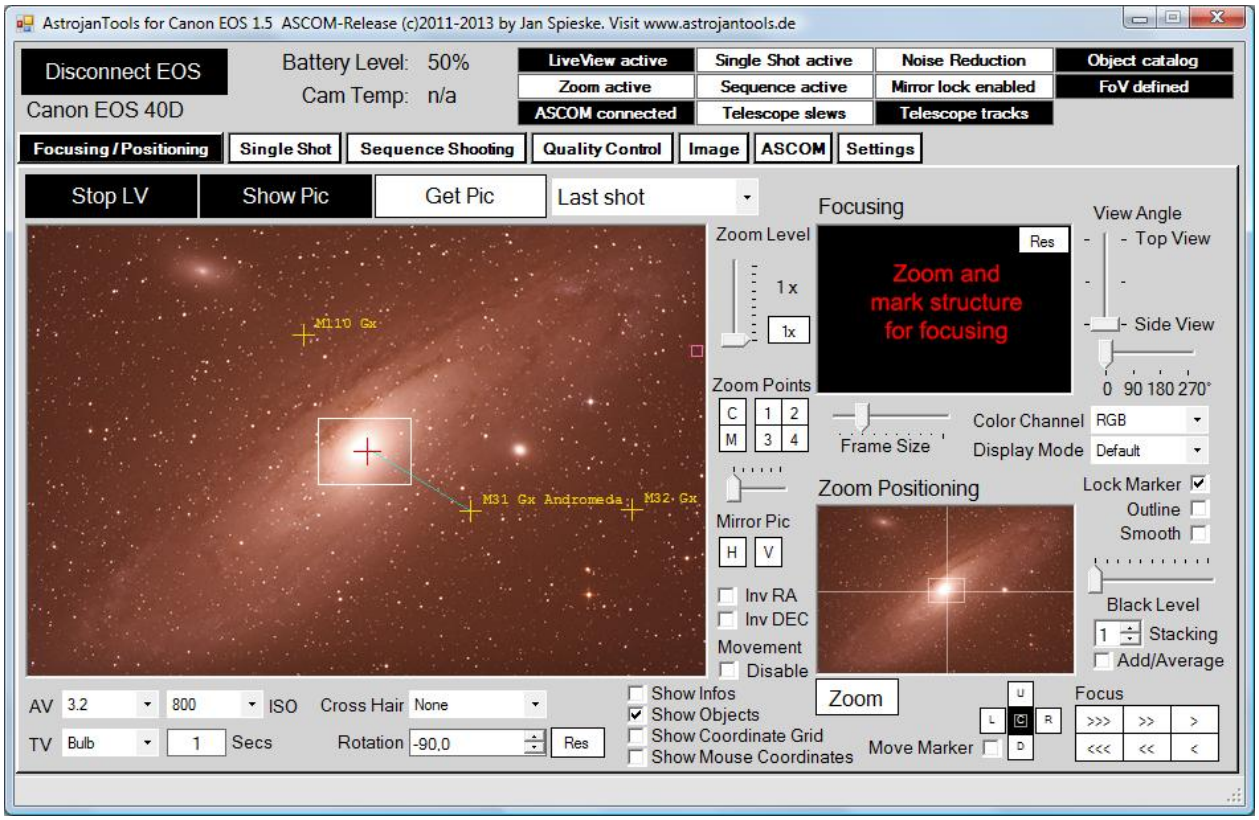


In addition, the alignment of the mount must be accurate. If this is not the case as in the next image (a contrived example. Normally the symbol of the target is in the center and the physical object is different), AJT will also provide a simple solution for correcting this.

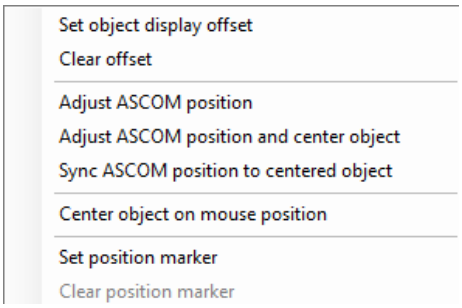


How to proceed with the position correction:

Hold right mouse button on the icon and drag to the corresponding physical object. The line can be drawn from any arbitrary position to any position, not necessarily from/to the center.



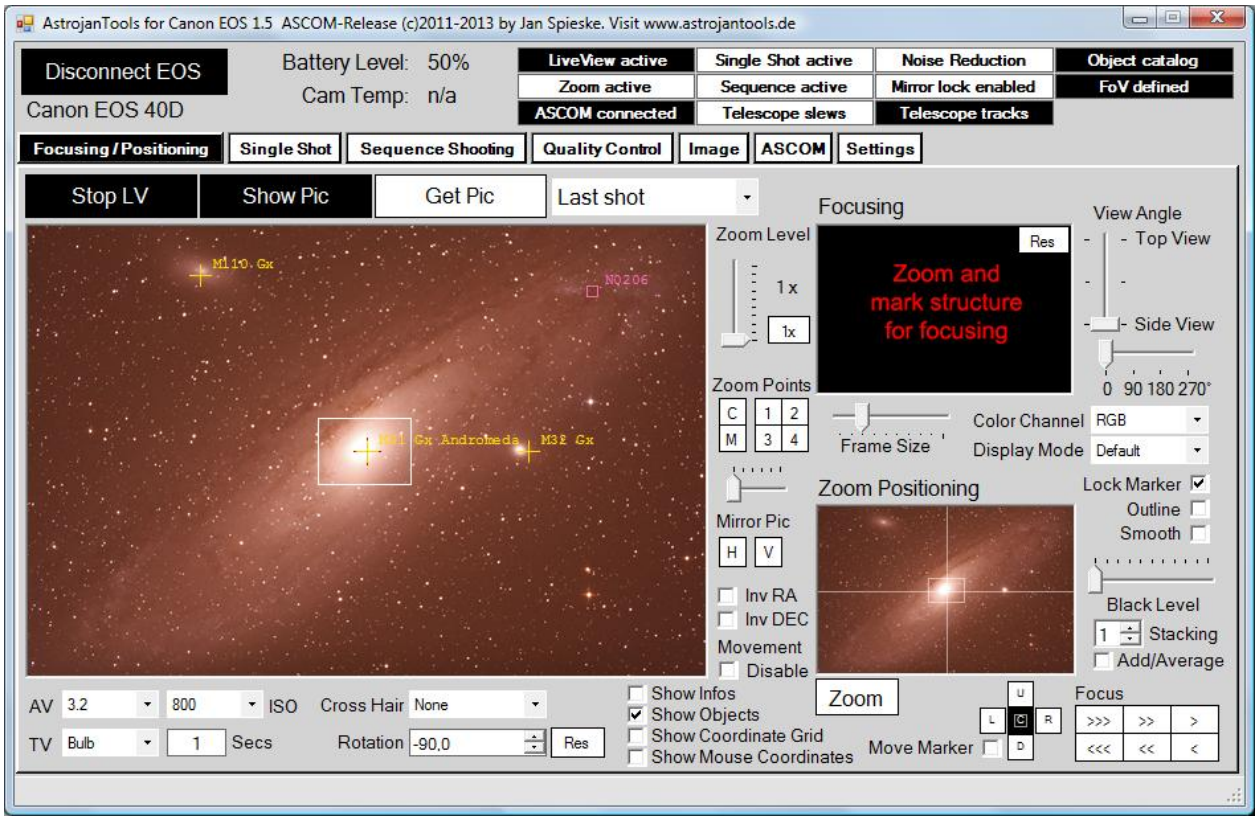
- Release the mouse button. A menu appears:



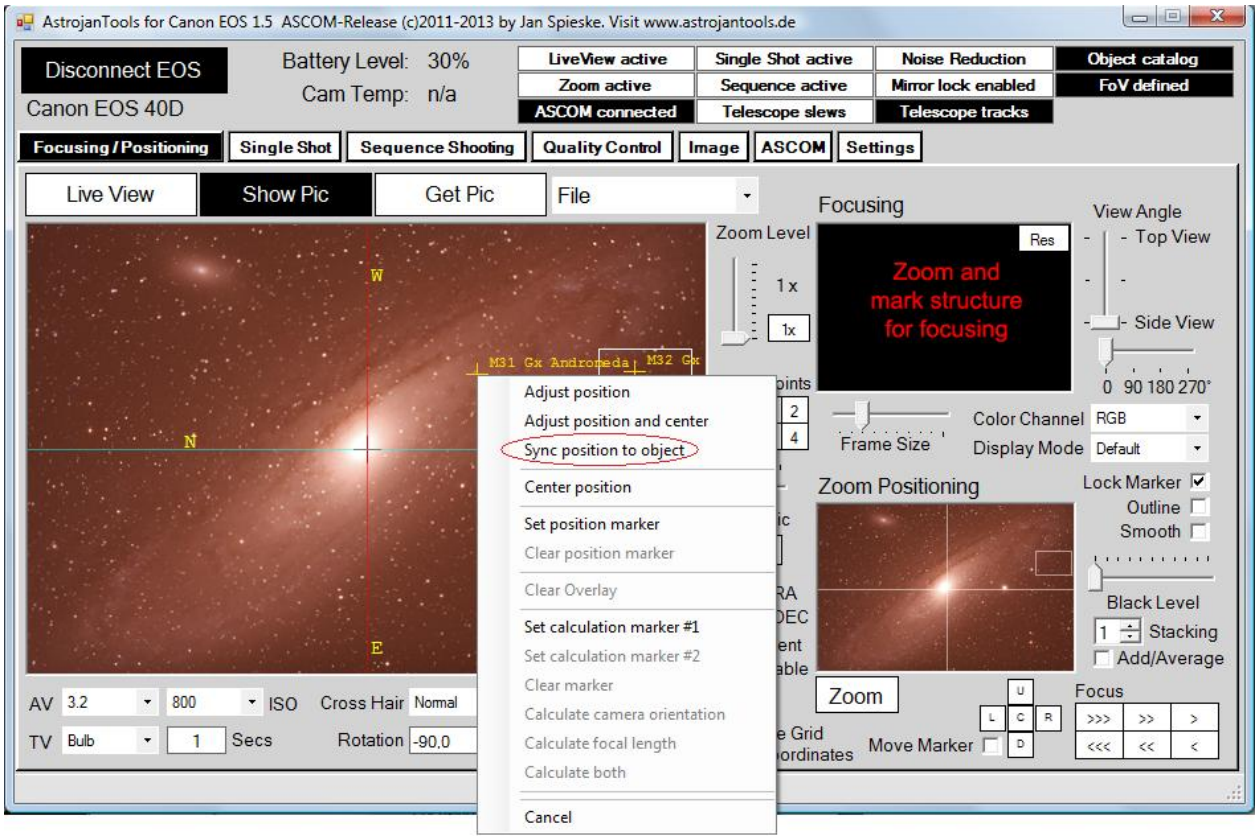
- There are now several ways of proceeding:

Set object display offset	Doesn't modify the ASCOM position, only an internal correction is performed. Can be repeatedly used. "Clear offset" clears the values.
Adjust position ASCOM	**CAUTION:** Set the telescope position in ASCOM to the calculated value. Can corrupt the alignment of the mount.

- "Adjust ASCOM position and center object" would also make a correction and then center the target position.



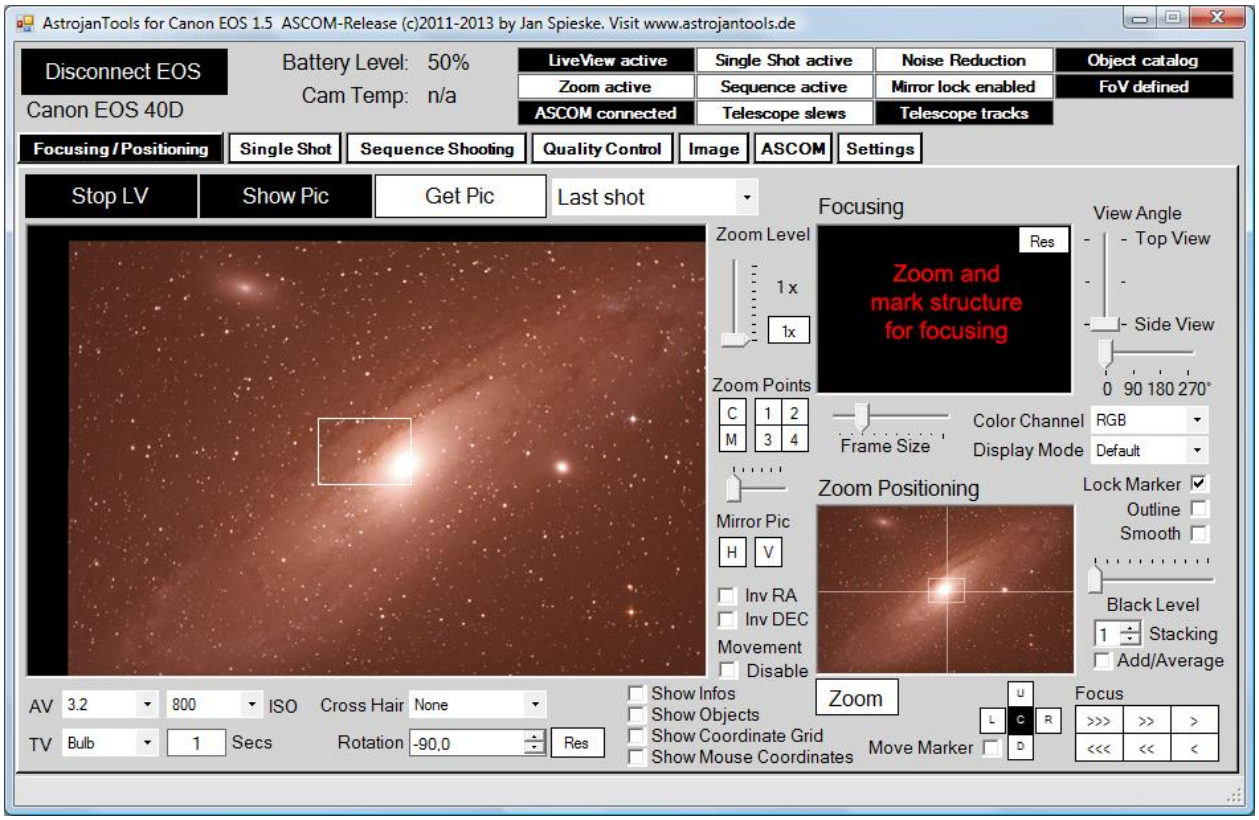
If the physical object is centered and the symbol differs you can use "Sync ASCOM centered position to object," which has the same function as other programs that perform a sync. Simply press the appropriate button on the right mouse button and choose the sync function.



Automatic image shift

The image shift is a good tool to position faint objects by a test shot is taken. This requires AJT associated with ASCOM and the FoV value. The screen image is shifted synchronous to the telescope motion.

The more precise the input focal length of the actual real focal length of the telescope (nominal focal length plus example reduction by flattener) corresponds to, and the angle of the camera orientation correct in relation to the DEC- or RA-axis (field rotation), the more accurately it works .



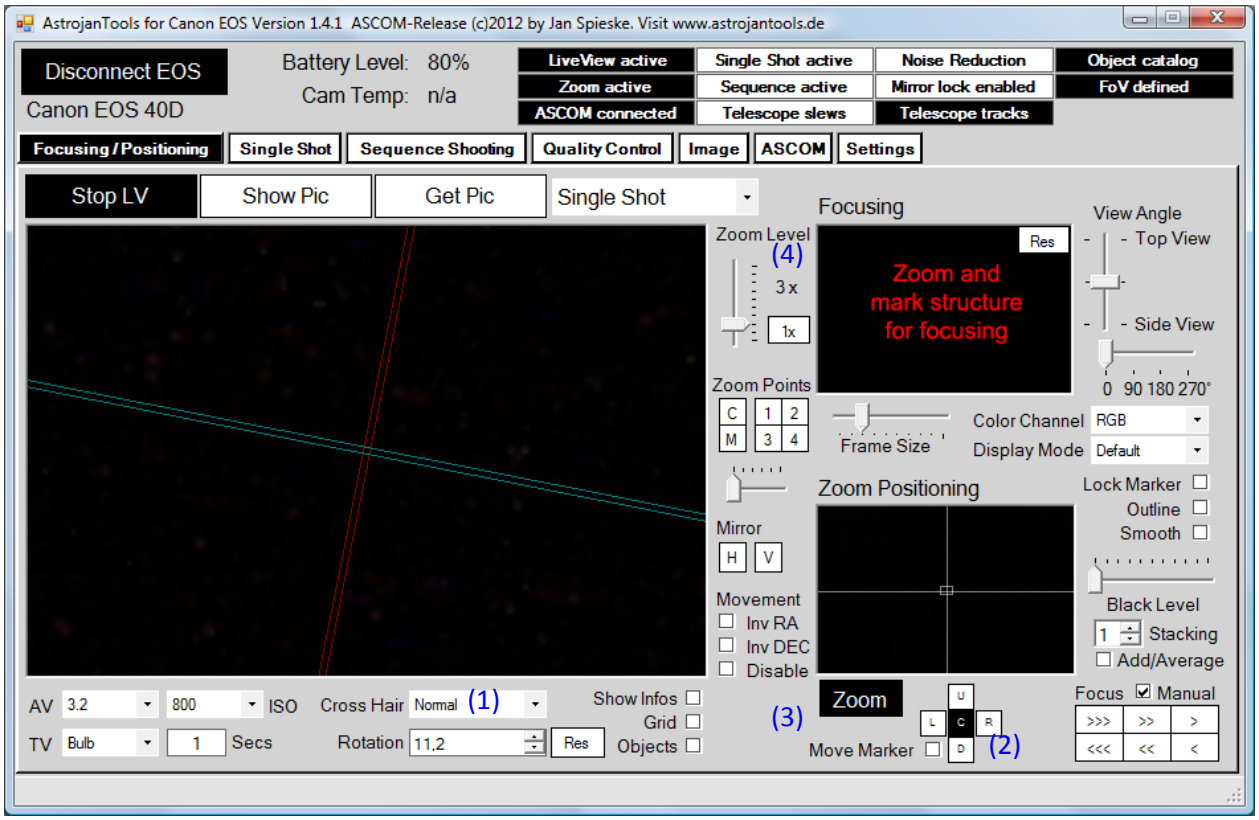
The result should be checked by a new test shot.

Parallel / alternative, of course, the object display can also be used for surface objects such as M31, whereby here the positioning is appropriate.

The image shift can be suppressed by the checkbox Movement / Disable.

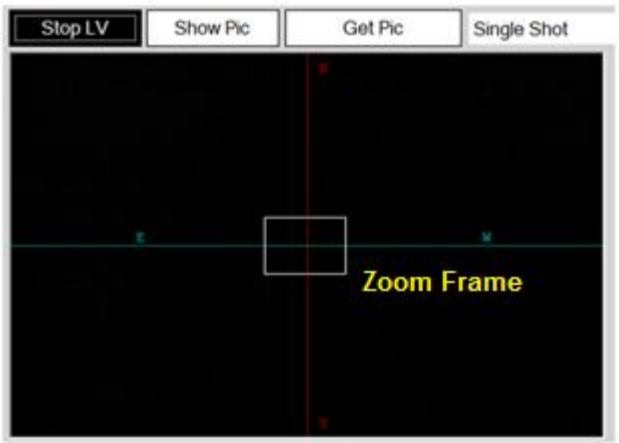
Alignment support

To support the initial alignment of the mount the Live View or photo preview has a double cross display. It will appear every time the cross-hair setting is "Normal" (1), the zoom section is centered (2) and the zoom is active (3). With Zoom Level (4) the magnification level can be increased.



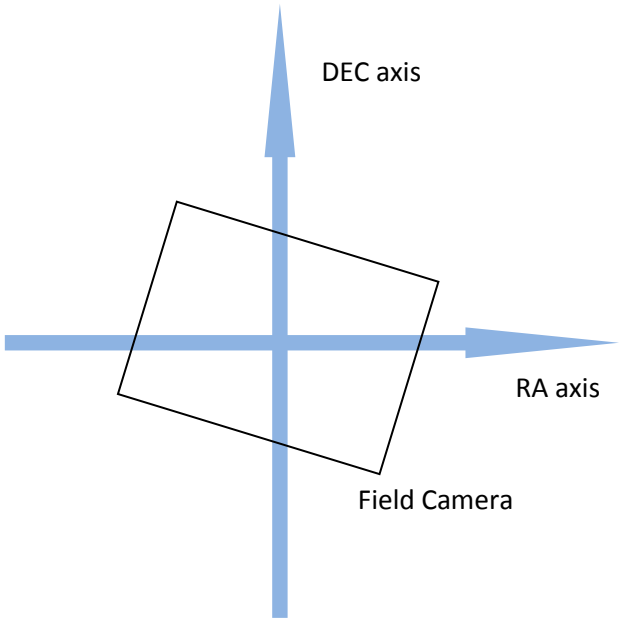
How to proceed:

- Start LiveView
- Set zoom frame to center if necessary (button C in (2))
- Approach alignment star and move into the Zoom Frame
- Start Zoom
- Move star slowly to the center of the double cross
- Confirm alignment star (via planetarium program or control program of the mount)
- procedure with next alignment star



Determine the camera orientation

for the correct function on features like the object display, the mouse coordinates and image shift, is for AJT to know how much the camera is rotated relative to the RA and DEC axis. The value is to be set in the field "Rotation".



There are several ways to determine the rotation value:

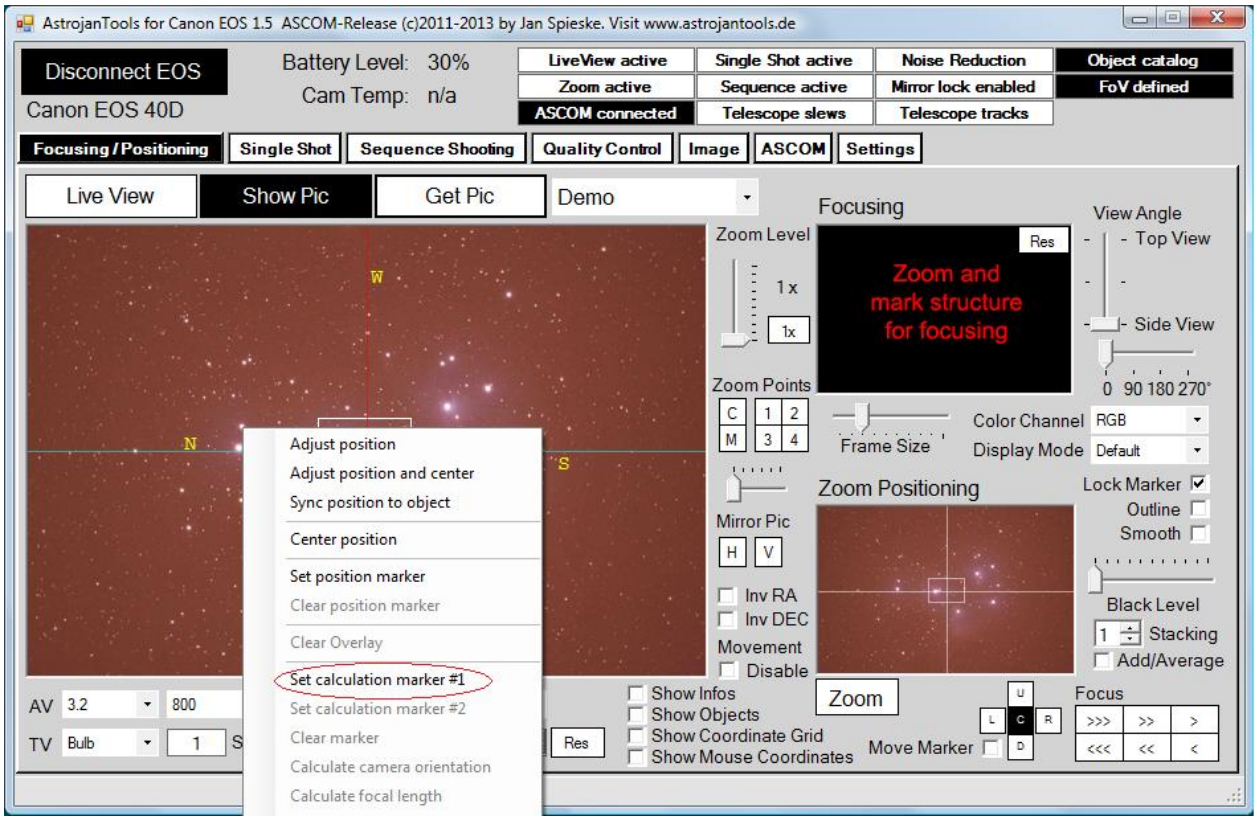
1) manually determination
2) semi-automatic determination without zoom
3) semi-automatic detection with zoom
4) determination with Plate-Solving based on Astrometry.Net

How to proceed: manual determination

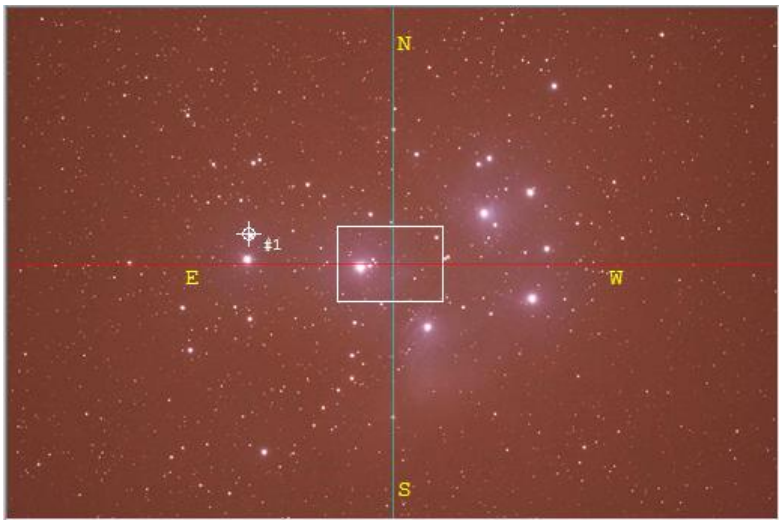
- Move telescope to a bright star
- Center star on the crosshair
- Move the telescope slowly in RA axis (east or west). The star moves from the middle and deviates more and more from the RA axis of the crosshair
- Stop telescope motion
- Set rotate value so that the star turn on the right section of RA axis (east or west)
- Move star in the other direction and adjust if necessary

How to proceed: Semiautomatic determination without zoom

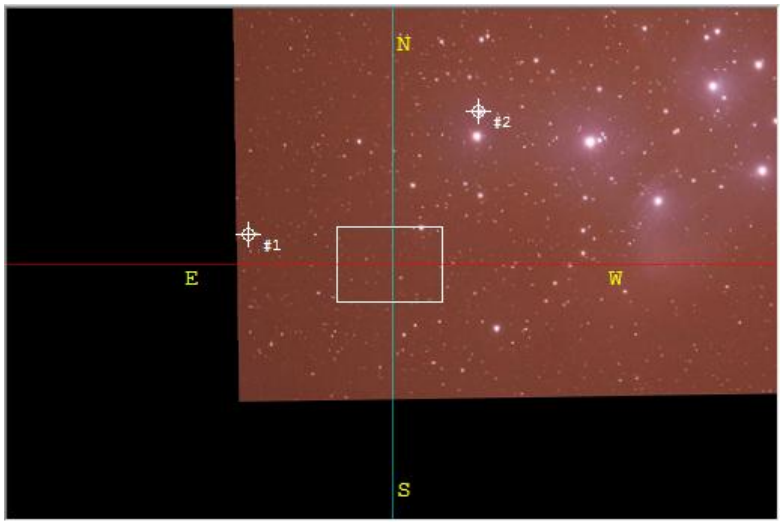
- Stop zoom if necessary
- Move to a bright star
- Press right mouse button on the star
- Call "Set calculation marker # 1"



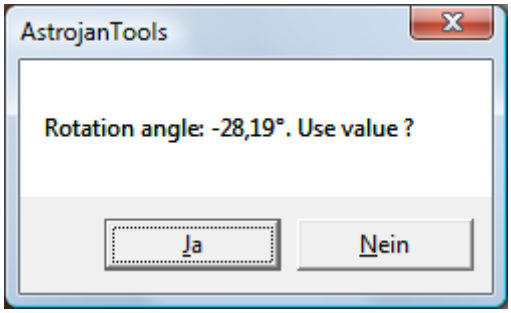
- at the star position a mark “#1”will be shown

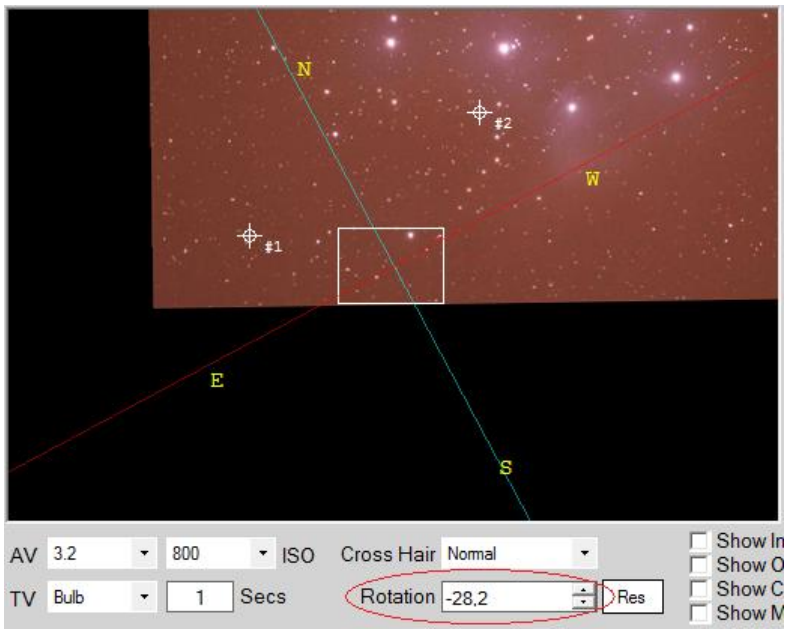


- Move telescope in RA axis, then press right mouse button on the same star and call "Set calculation marker # 2"



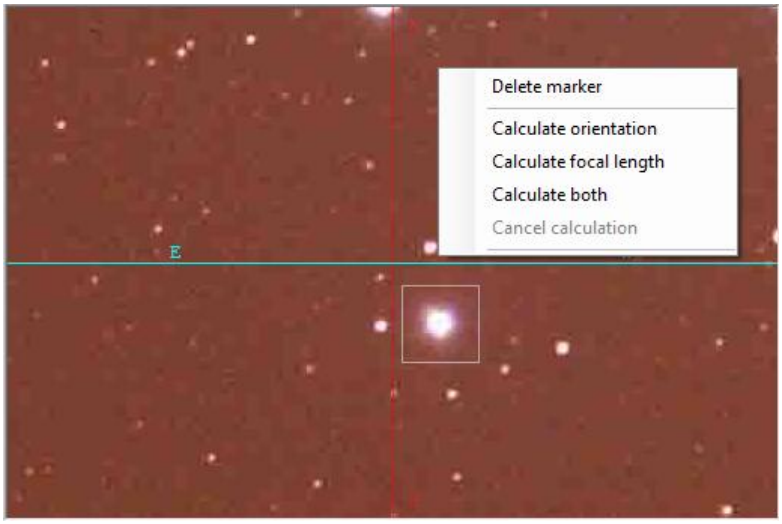
- Press right mouse button on the image display and call "Calculate camera orientation". A dialog box displays the calculated angle. The markers can be deleted with "Clear Markers".



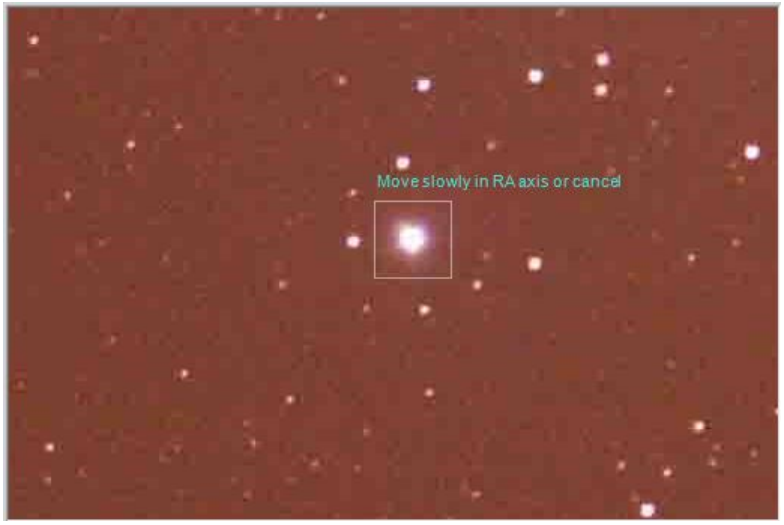


How to proceed: Semiautomatic determination with zoom

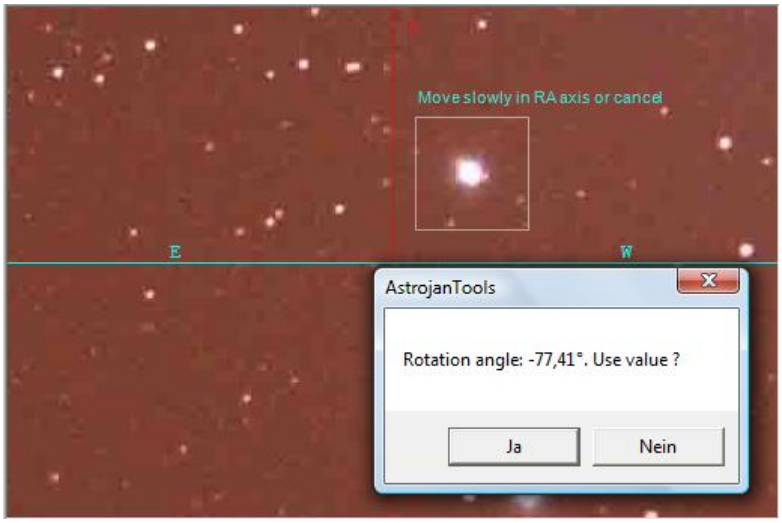
- Move to a right star
- Place the zoom frame over the star
- Start zoom
- Mark star with the left mouse button
- Press right mouse button and call "Calculate orientation"



- AJT prompts you to move the telescope slowly in RA axis.
  IMPORTANT: "Lock marker" must be enabled. Enlarge the frame if necessary.



- If the telescope is moving a certain number of pixels a dialog box appears to accept the calculated angle.



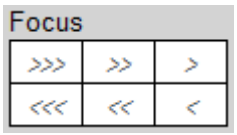
Determination with Plate-Solving based on Astrometry.Net

- see chapter Plate Solving with Astrometry.Net in AstrojanTools

Working with attached lenses

Not working with telescopes, but standard lenses, the following instructions must be observed:

- When a lens is connected and Live View is active the focus can be adjusted using these buttons.

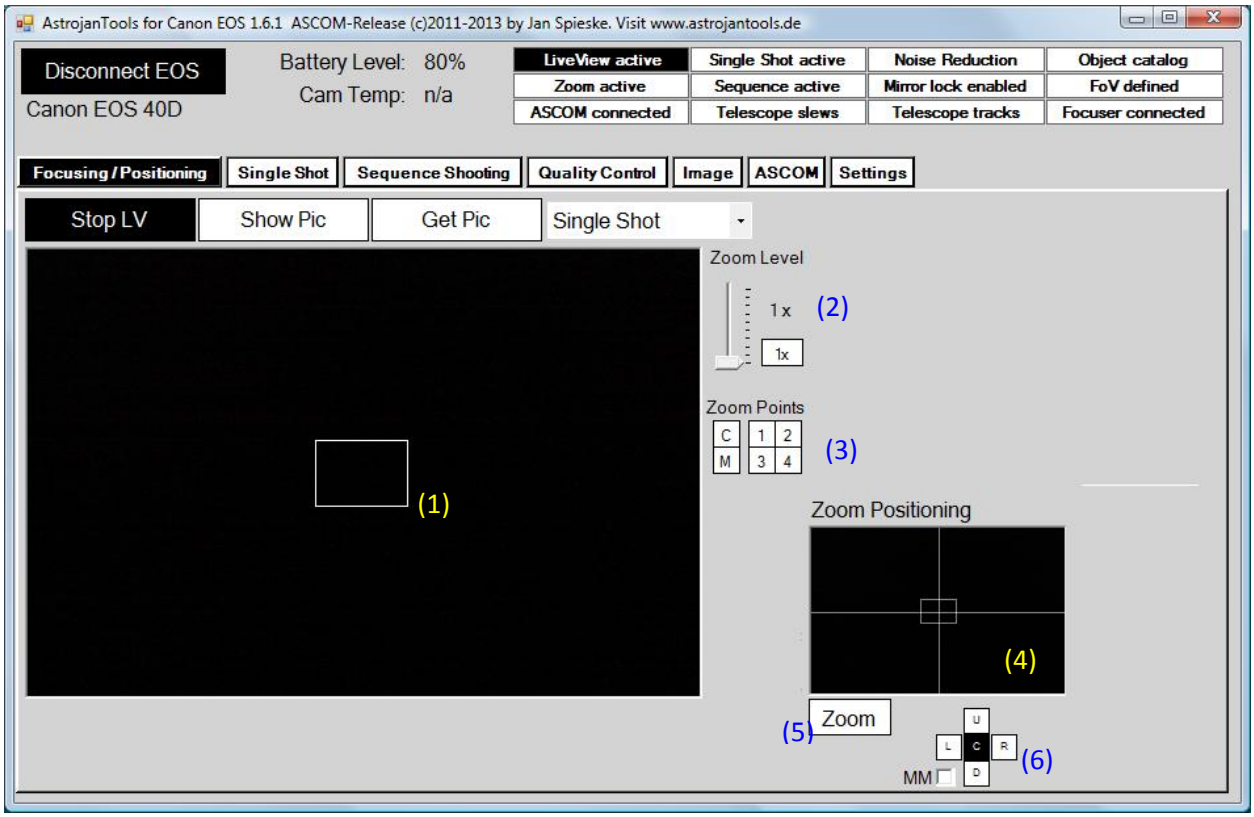


  The number of arrows informs the stride length (large, medium, small). The lens must be on "Auto" (possibly objective dependent).
- **Caution:** In the software please enable in Settings "Turn off Auto Focus", this turns off the autofocus. Otherwise, the camera will attempt to sharpen the image. Since version 1.4 the manual focus is switched back to automatic when the program terminates.
- When the camera is removed before the program ends and the autofocus on your camera will no longer operate, just put the lens switch to "Manual" and back to "Auto".

Note: Tested with Canon and Sigma lenses. Tamrom does not seem to work.

Using the zoom function

Astrojantools includes powerful zoom control functions.



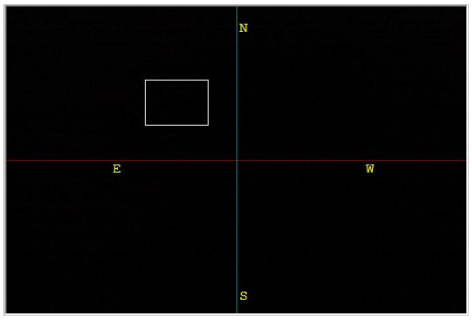
Positioning the zoom frame

- The zoom section can be positioned several ways:
  - before the start of the zoom mode in the main display (1)
  - after starting the zoom mode on the picture display “Zoom Positioning” (4)
  - the buttons L, R, U, D, and C in combination with the switch turned on "Move Marker" (6)
- Displaying the current position and size of the zoom section by a white frame (the main screen while the zoom mode is not activated, and in any case in the image display "Zoom Positioning"). The size of the frame changes with the choice of zoom level.

How to proceed:

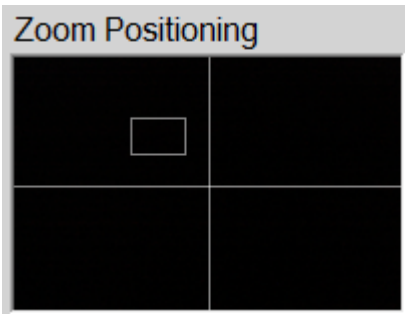
Positioning on the main display

Click with the left mouse button at the desired location in the main display. The frame can be moved with the left mouse button.



Positioning on the image display "Zoom Positioning"

The position can also be set with the left mouse button. Positioning the zoom indicator always shows the live view screen or the last-made single shot. The display is not updated during the zoom, this only occurs again after stopping the zoom.



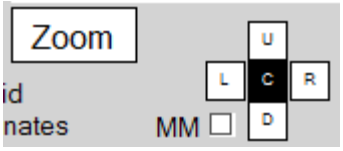
Zoom position switch

Left, **R**ight **U**p, **C**enter and **D**own.

his uttons allows the zoom position to be changed gradually. Pressing one of the buttons L, R, U and D moves either:

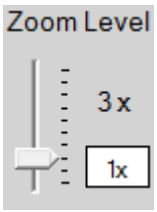
- if the "MM " button (Move Marker) is not activated, the zoom position; or
- if the "MM" button is activated, the star marker frame

When you press "C" the zoom position will be centered and if the zoom is active; the double cross hair will be displayed.



Zoom level

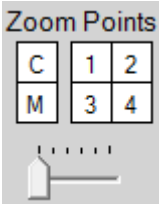
- This slider can adjust the zoom level between level 1 (original size) and a factor of 10



- The button "1x" resets the zoom level.

Zoom points

This control allows you to set up to 4 zoom points and switch between them, timed, or with the buttons. For example, by simultaneously placing a star near the edge and the middle in order to achieve optimum focus.



Keys:

C = Clear (erase all zoom points)

1,2,3,4 = zoom point 1 to 4

M = the zoom toggles through points at the speed of the slider

How to proceed:

Set zoom points:

- Start LiveView or make a single shot with button “Get Picture”
- Place zoom frame to select zoom range
- Start zoom mode
- Mark the zoom position target (star) with the left mouse button (delete selection with right mouse button, menu item "Delete Marker")
- Press the desired zoom point memory 1 to 4 (also for reassigning a zoom point to a used zoom point memory)
- Stop zoom and repeat for next zoom point if wanted

Calling a zoom point:

- Press the desired zoom point memory

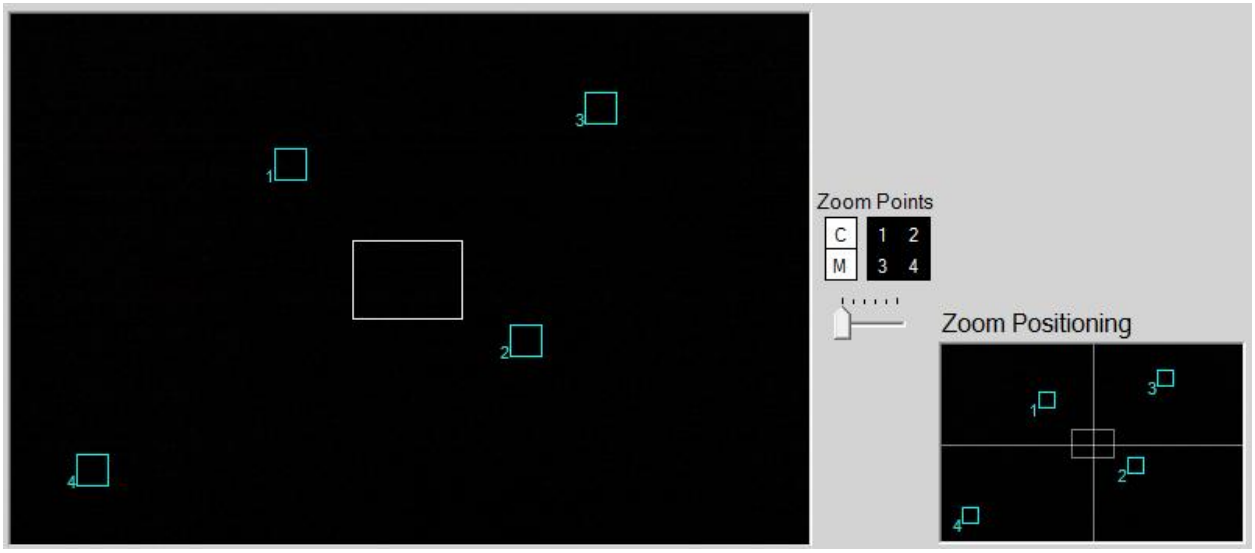
Delete all zoom points:

- press button "C"

Delete a certain zoom point:

- Press the desired zoom point memory
  The zoom point is displayed in the main display as a frame
- Press right mouse button in the main display and select the menu item "Delete Marker"

Defined zoom points appear in the main display as numbered frames (not in zoom mode) and as small frames in the “Zoom Positioning” display.

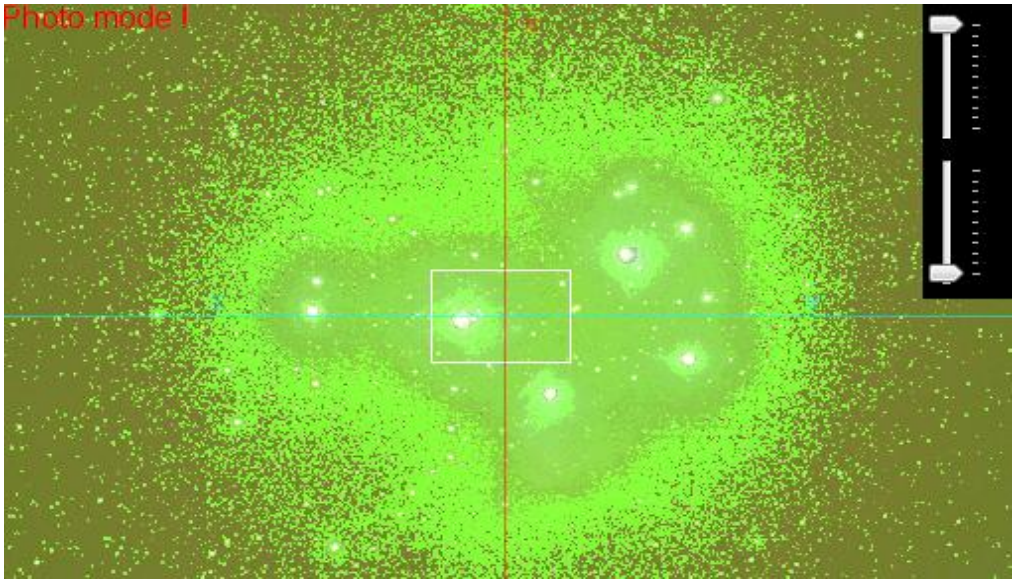


Working with layered images (only ASCOM version)

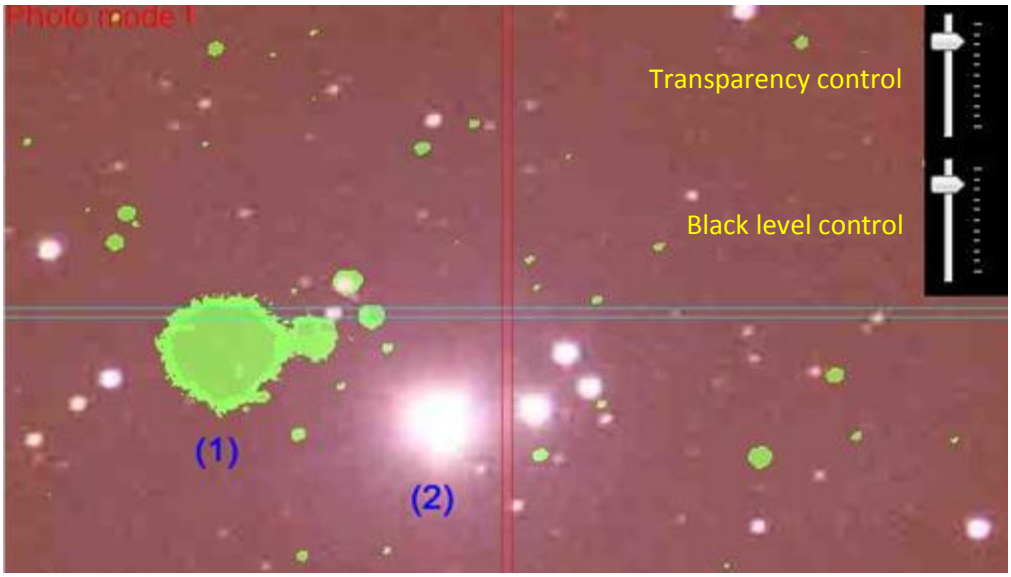
With image overlays it is possible to restore object positioning from older recordings. For that an old photo has to be loaded from a directory which will be superimposed to the current image.

How to proceed:

- Choose control tab Focusing/Positioning
- Make a single shot
- Choose mode “Overlay” and press button “Get Pic”
- Choose older photo of the object from disk. The picture will be loaded as a green overlay.
- The upper knob controls the transparency of the overlay, the lower the black level of the overlaid image.
- After loading an override is expected:

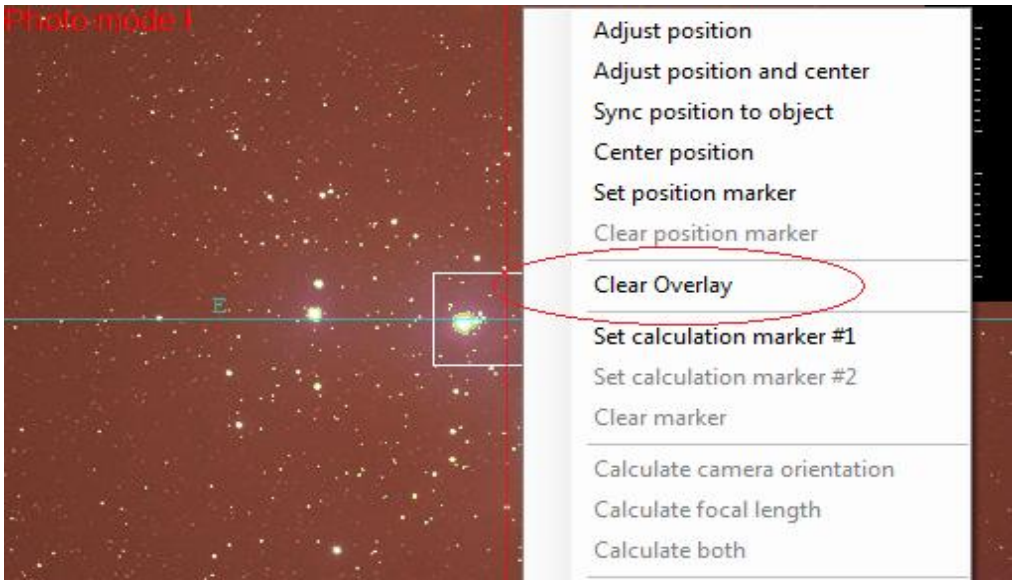


- Operation of the transparency and black level control enables the representation of the overlay image to be adapted to, for example, the brightness of the stars or bright objects in the overlay image.



- Now, through telescope movement and camera rotation, adjust the position of the old recording (here in the above example, the superposition of (1) and (2)).

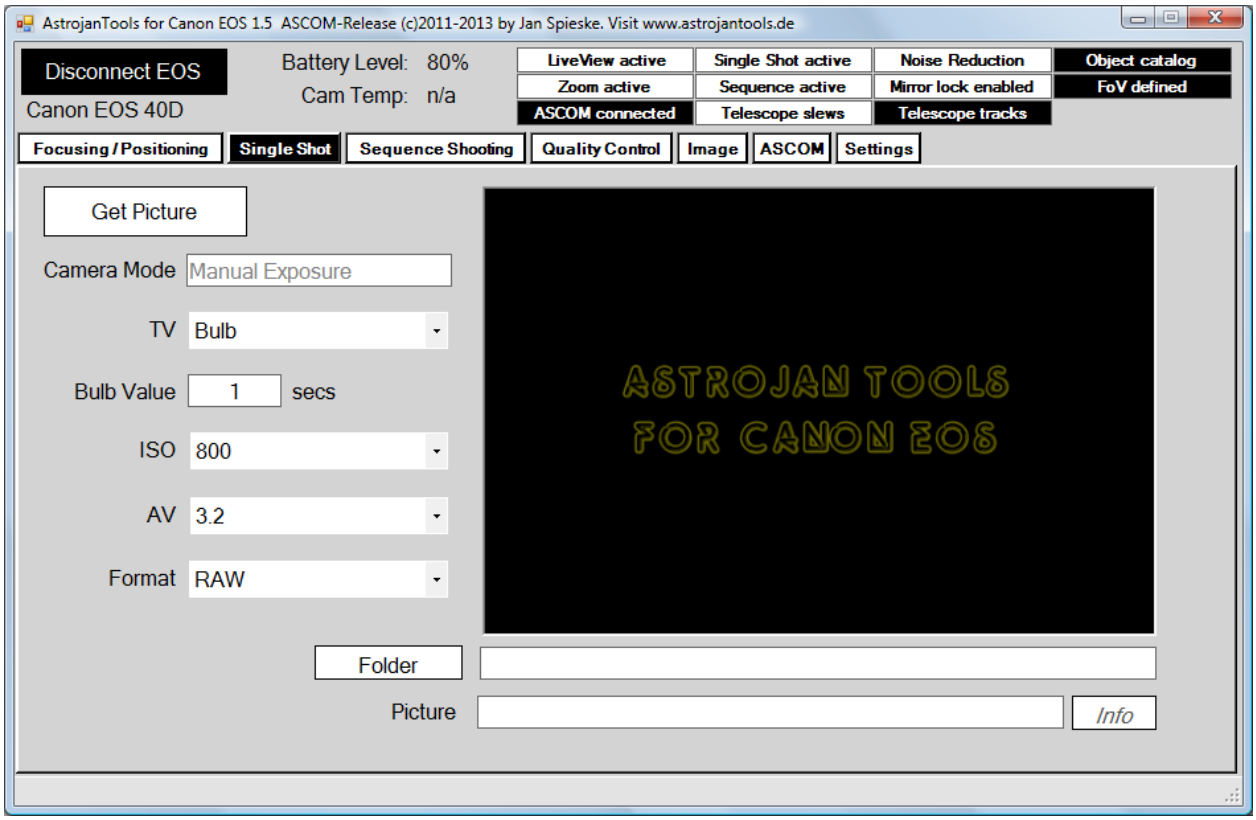
- By clicking the right mouse button and "Clear Overlay", the overlay image will be deleted:



- To check make a new photo and compare it to the superposition

Note: Of course, the focal length of the old and new shooting must match.

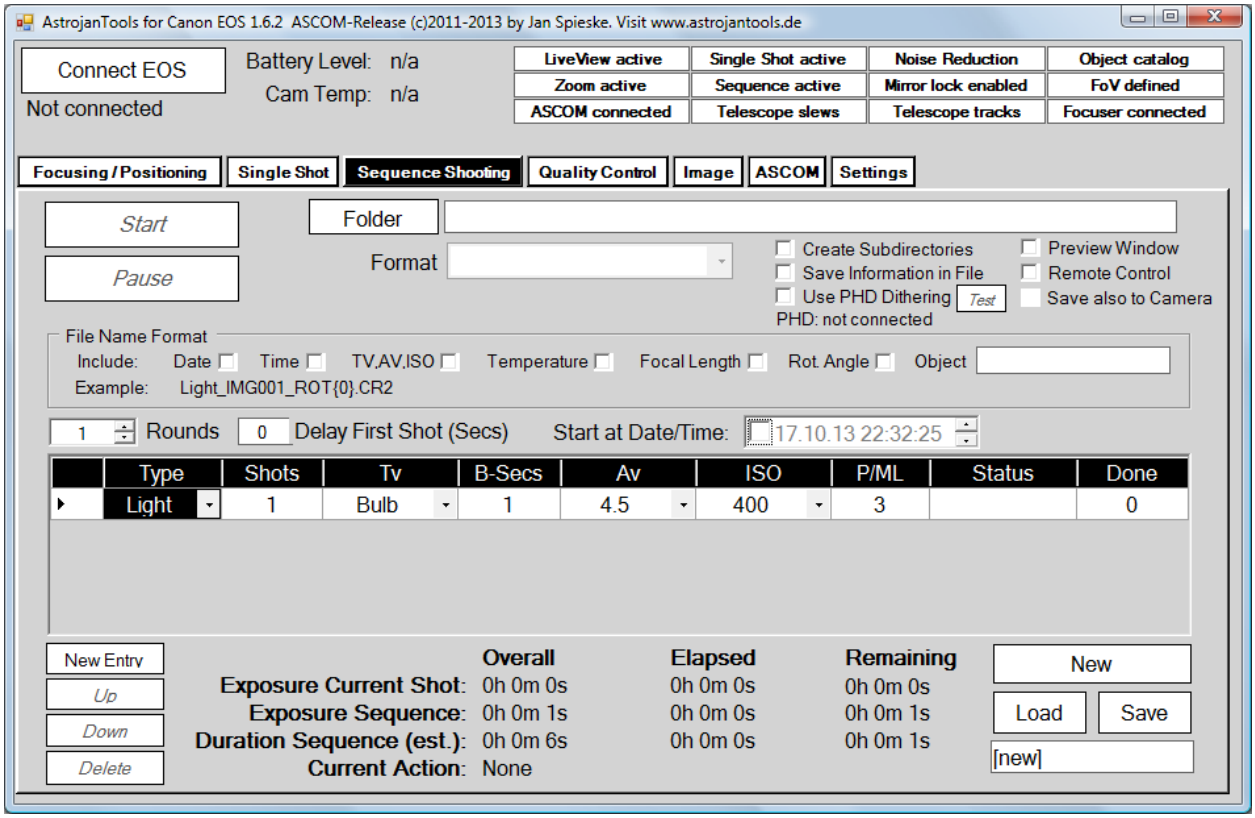
6. Single Shot control



The Single shot control allows the production of sample shots, for example. Exposure, aperture and ISO values can be set directly as well as the image format.

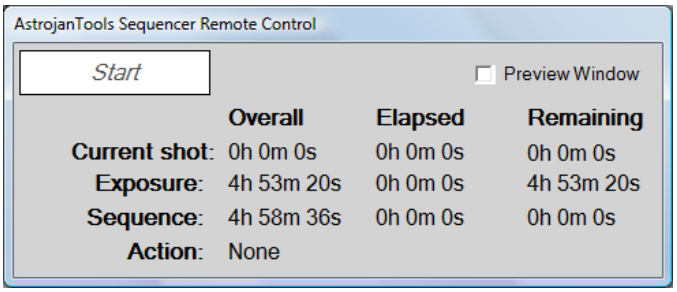
7. Sequence Shooting control

With this control sequences can be comfortably defined and executed.



The following options are available:

- Start / stop / pause the execution sequence
- Dithering with PHD
- Load / Save of sequences
- Automatic creation of subdirectories for image types Lights, Darks, Flats and Bias
- Adding the optional information Date, Time, TV, AV, ISO, temperature, focal length, rotation angle and object name in the file name of each photo
- Automatic creation of an information file for the sequence
- Displays the current recording exposure time, elapsed and remaining total exposure time and the estimated total cycle time of the sequence (including pauses as well as transmission and storage times of shots)



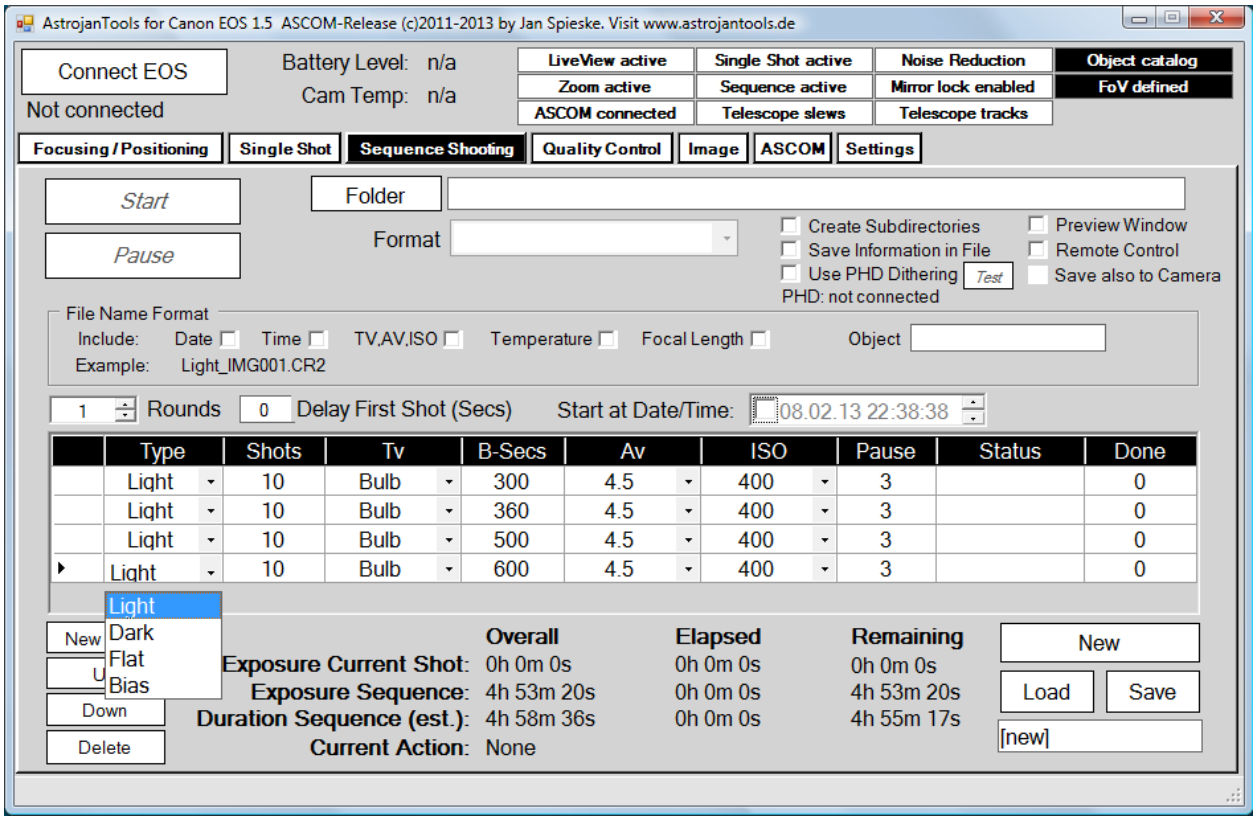
- Optional battery check with pause function to change the battery
- Optional delay the first shot
- Optional starting on a certain date / time
- Pause function with user confirmation when switching between two image types (eg Light or Dark), enabling the user actions

Image types Light, Dark, Flat and Bias

The definition of image types Light, dark, flat and bias to facilitate the user's organization and storage of images. Thus the type is integrated with the file name and creates subdirectories accordingly if the box "Create subdirectories" is checked, and sorts the pictures there.

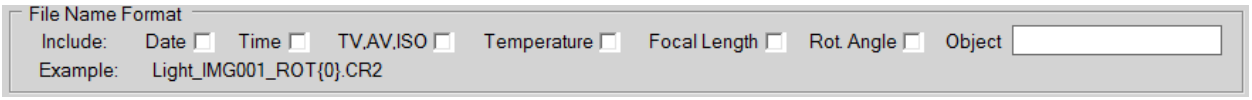
Recording sequences

With this control sequences can be comfortably defined and saved.



How to proceed:

- Select storage directory ("folder")
- Select format. The RAW format is best. With the mixed format RAW + JPG users have some problems
- Should subdirectories for the types of images (lights, darks, flats, bias) be created? Then select "Create subdirectories"
- The images are by default not stored on the camera. Should this be required, then activate "Save to Camera also"
- If an information file for the sequence is to be created in the storage directory then "Save Information to File" must be activated
- "Preview Window" enables an independent small preview window, "Remote Control" is a small independent control. Practical, when the main window is minimized. The remote control always remains in the foreground
- Now the file name format can be defined according to your own needs. By activating the check mark the information (date, time, exposure time, aperture, camera temperature, focal length, rotation angle and object name) is integrated or omitted in the file name



- In the table, the individual rows of pictures are now defined and sorted if necessary. Here, the total exposure time ("Exposure Sequence") and estimated total duration ("Duration Sequence") of the sequence are calculated in the "Overall" column

	Overall	Elapsed	Remaining
Exposure Current Shot:	0h 0m 0s	0h 0m 0s	0h 0m 0s
Exposure Sequence:	2h 30m 0s	0h 0m 0s	2h 30m 0s
Duration Sequence (est.):	2h 32m 37s	0h 0m 0s	2h 32m 37s
Current Action:	None		

- "Exposure Current Shot" shows, during the execution of the exposure, data for the current record
- "First Shot Delay" delays the first recording by the specified number of seconds
- "Rounds" repeats the entire sequence in the specified number
- Press "Start" to start the sequence, pressing it again stops
- Pressing "Pause": the current shot works to the end and waits for user input. The user then has the choice to continue or cancel the sequence

Dithering with PHD Guiding

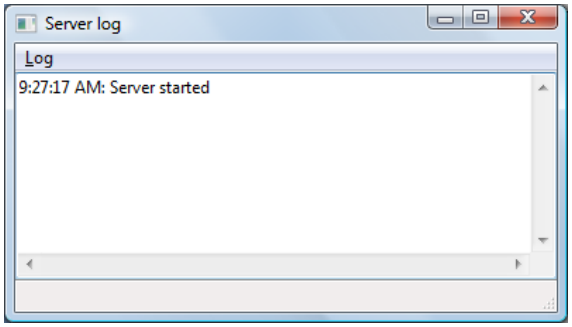
AstrojanTools has implemented an interface to PHD Guiding. PHD is open source. The source code for the interface can be found in the Internet, which I used as basis for the realization (the source code, however, is old and contains errors).

Third-party software communicates with PHD using a TCP / IP connection on port 4300.

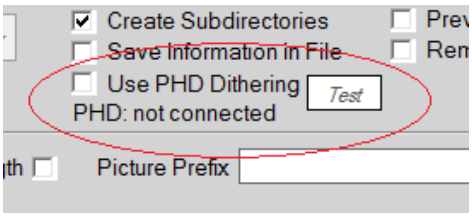
How to proceed:

Assumption: the shooting situation is so far prepared, the sequence ready and PHD is already guiding

- In PHD call in the Tools menu and select "Enable Server". Should the personal firewall display a message about access to port 4300, please accept.
- Should PHD make outputs in the debug window (the first time recommended), activate the menu item "Enable debug logging" BEFORE you enable "Enable Server"! Otherwise, the debug window of PHD window does not open.

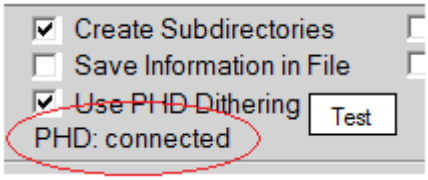


- Enable "Use PHD dithering" "Sequence Shooting" tab of AJT

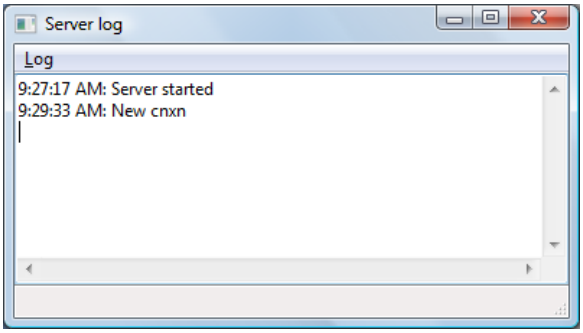


- AJT and PHD now show a successful connection:

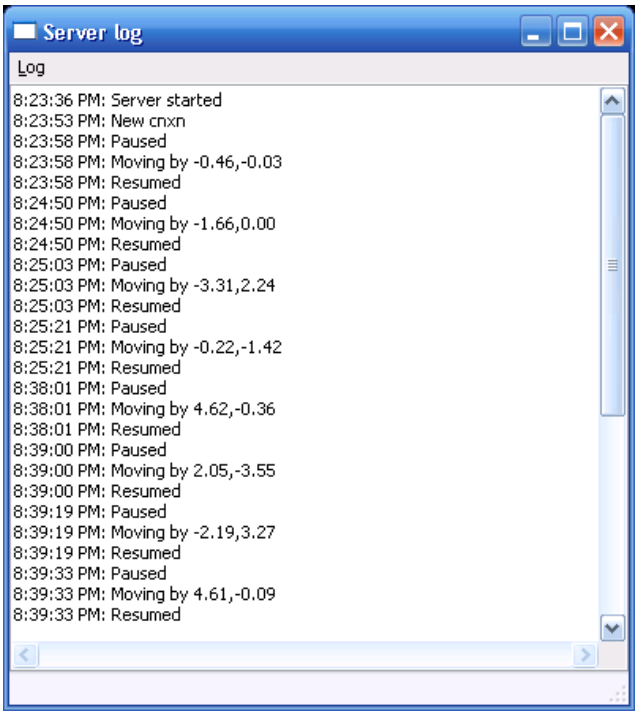
AJT:



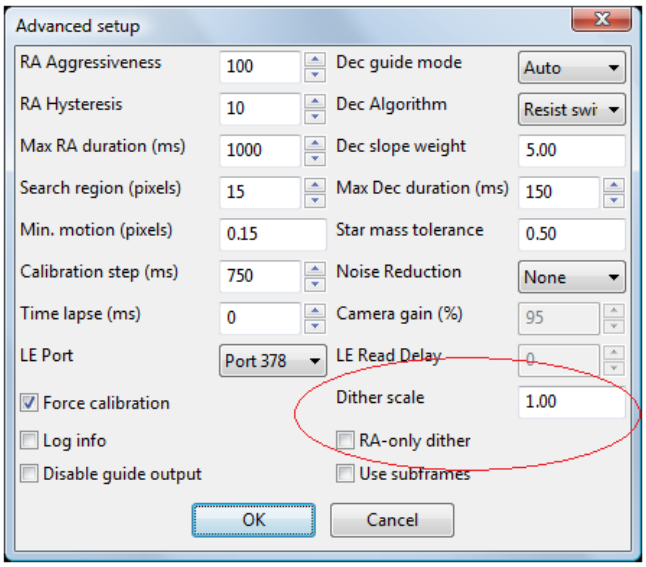
PHD:



- With the button “Test” you can send one or more dither commands to PHD. PHD reports the reception of the commands and the values of the displacement in the X-and Y-direction.



- The dither command leads to a shift of the marker frame in PHD, and the guiding star readjusts to the new position. The effective pixel count can be adjusted in the settings in PHD dither scale value. A value of 1 should lead, in my view, to a shift of up to 1 pixel. Depending on the focal length of the telescope you should try different values.



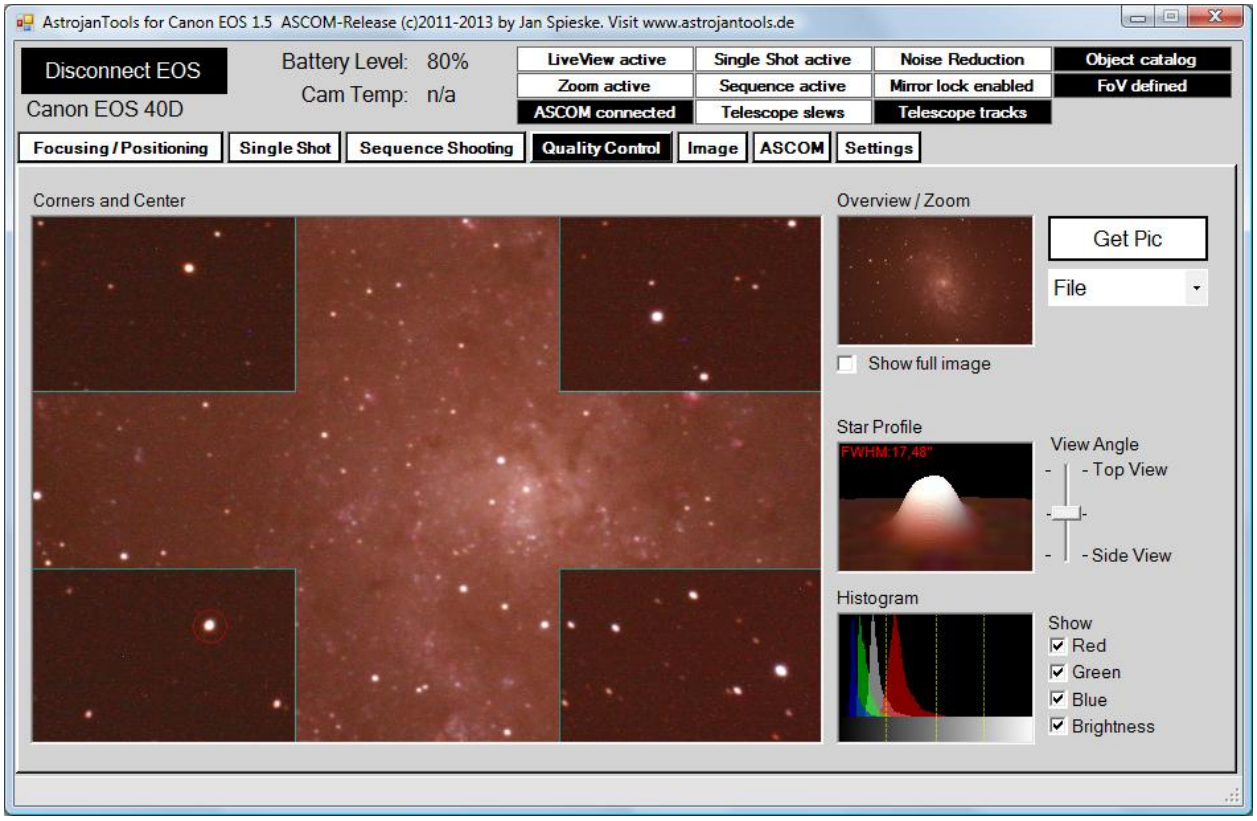
- After starting the sequence AJT sends, directly before downloading the photos, a dither command to PHD. This way the time needed for loading and storage is used, so that PHD can adjust to the new position. Is this not enough time, please increase the pause value between two images.

Note:

- If PHD is stopped or the server disabled, AJT shows "connection lost". The sequence continues, however. Should this happen again, unfortunately AJT can no longer connect with PHD (AJT still shows "connected" to, but is not responding to requests PHD). AJT has to be restarted to connect to PHD again.

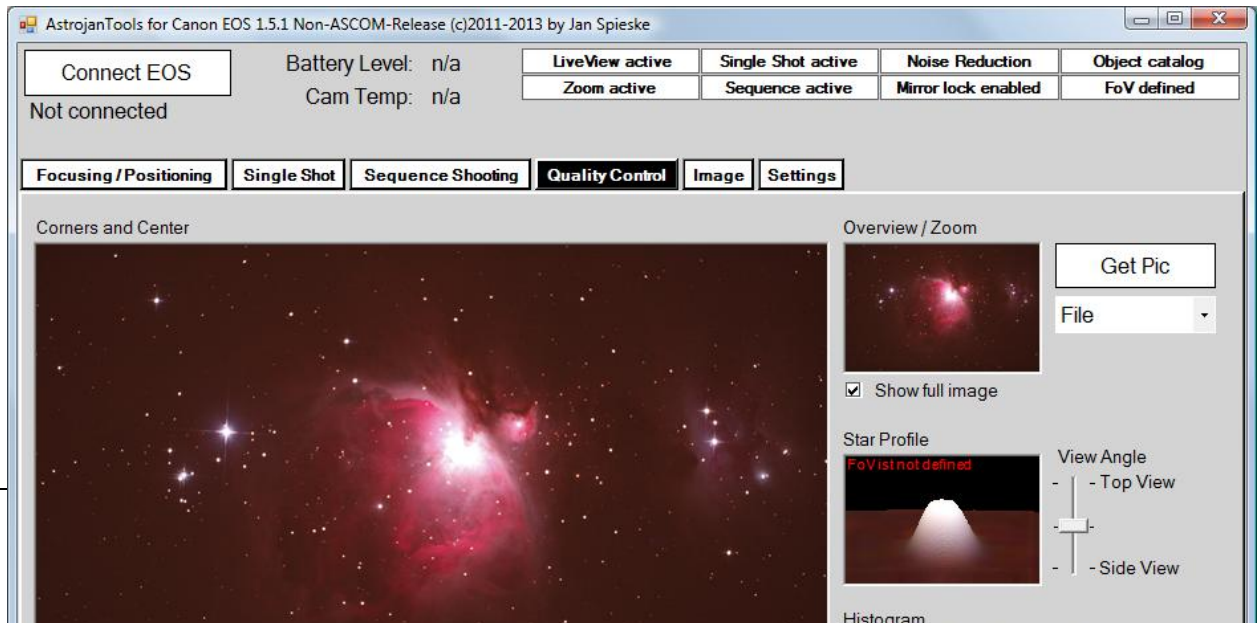
8. Quality Control

The Quality Control tab allows you to review the photos.

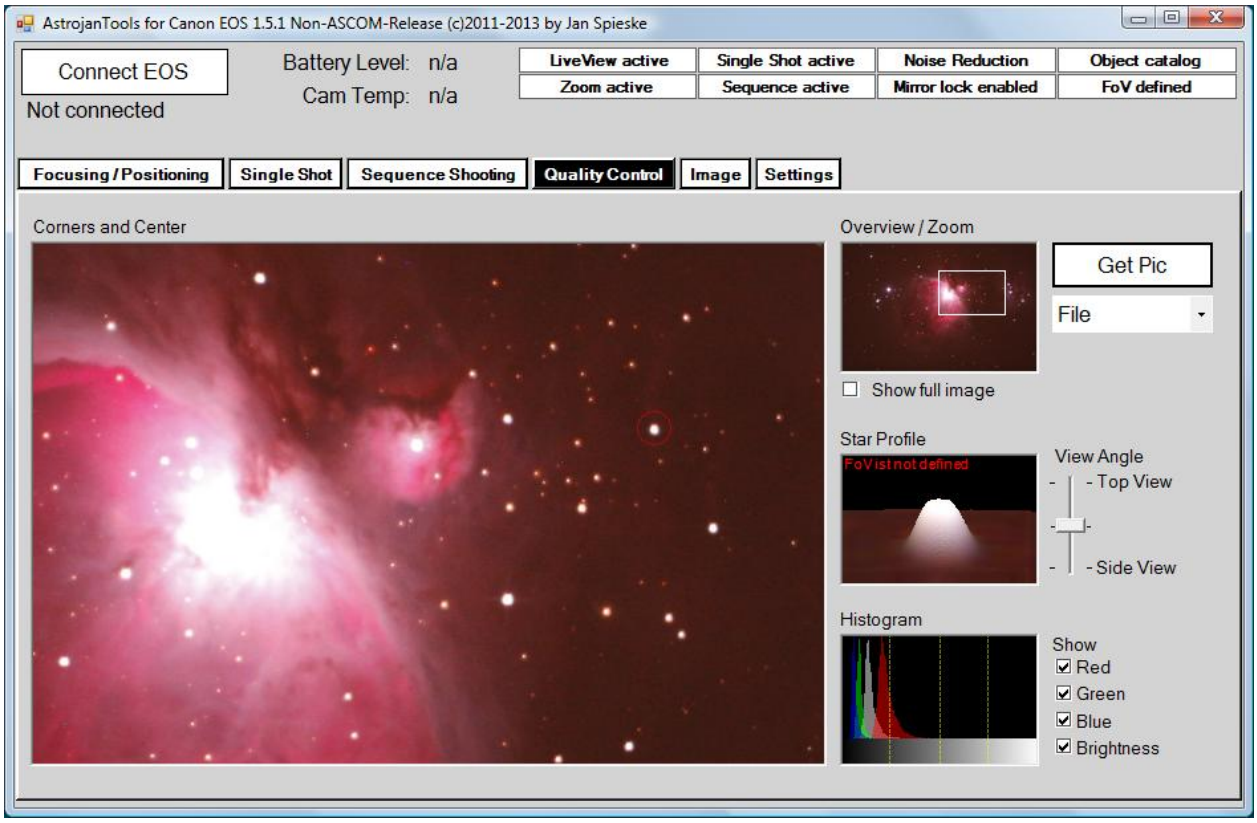


The following options are available:

- Manual loading of the last recording, a file from hard disk, automatic loading of the last recording of a sequence or a demo picture to try
- 3D view of the star with indication of the FWHM (Full Width at Half Maximum) value
- Display of a histogram of the overall picture
- Display of the image corners and center of the image
- Alternatively, the entire image in the main display (check "show full image")

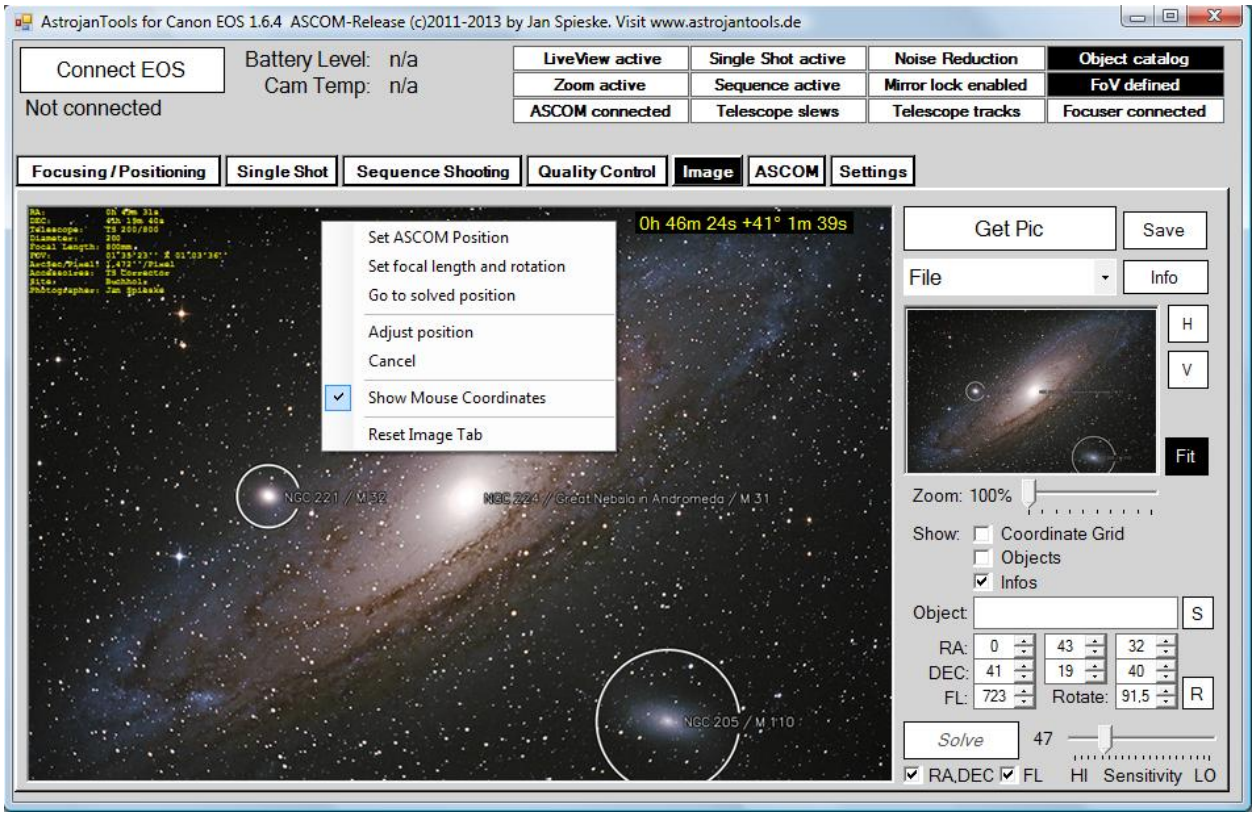


- Zooming (press left mouse button in overview image, right mouse button resets)



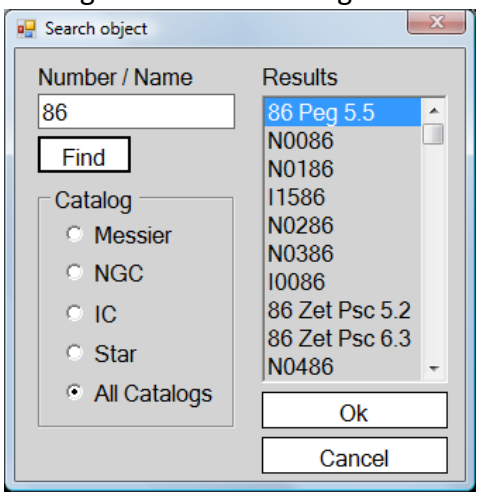
9. Image display control ("Image")

The Image tab provides, like the Quality Control tab, load and zoom functions, furthermore an object display and a save function for an annotated image.



The following options are available:

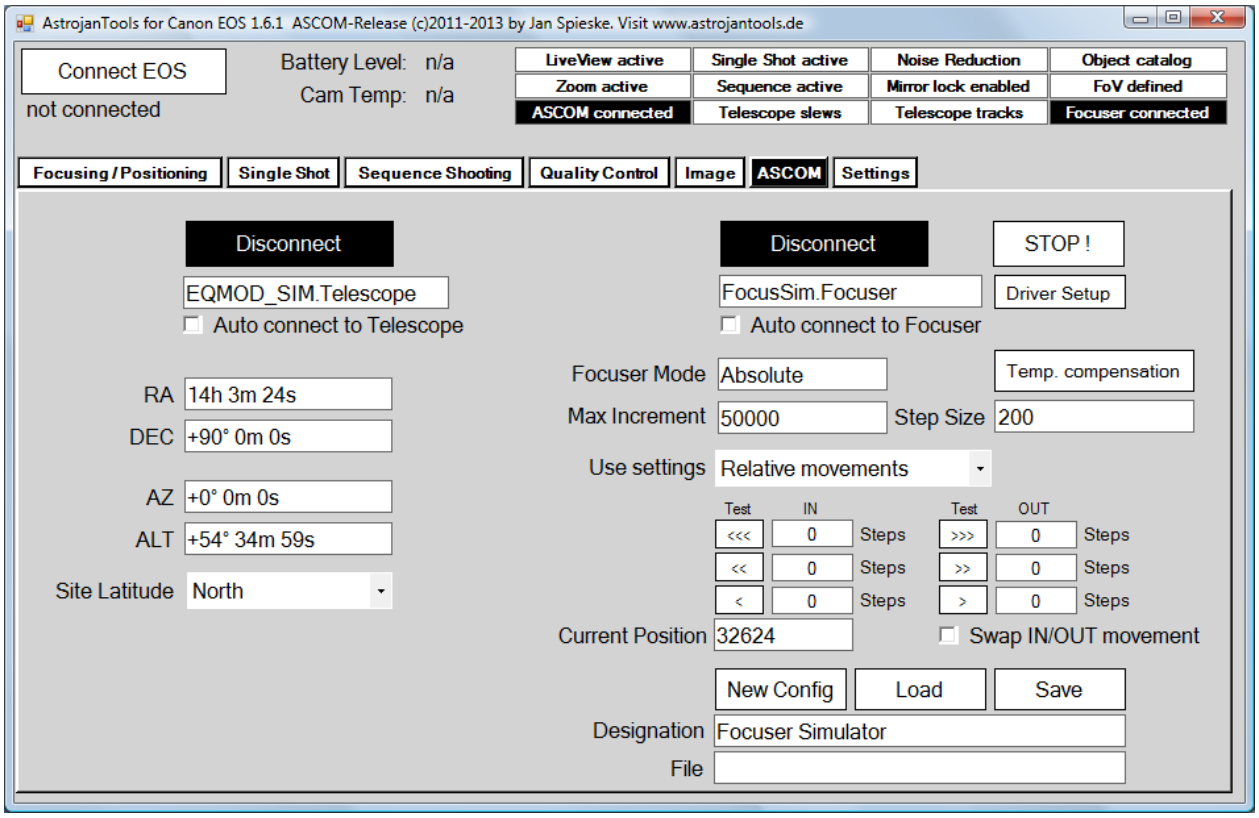
- Manual loading of the last recording, a file from hard disk, automatic loading of the last recording of a sequence and a demo to try out image (M45, including representation of objects)
- Zoom function
- Display the coordinates of the image center and a coordinate grid
- Simple, mouse-driven correction of the coordinates and setting the orientation angle of the camera
- Display the M / IC / NGC objects as symbols in the Field of View (FoV)
- Save the annotated file in JPG format
- Access to the object catalog for object search:



10.

11. ASCOM control ("ASCOM")

This tab is to connect to the ASCOM interface, which among other things is used for the object and synchronous display image shift.

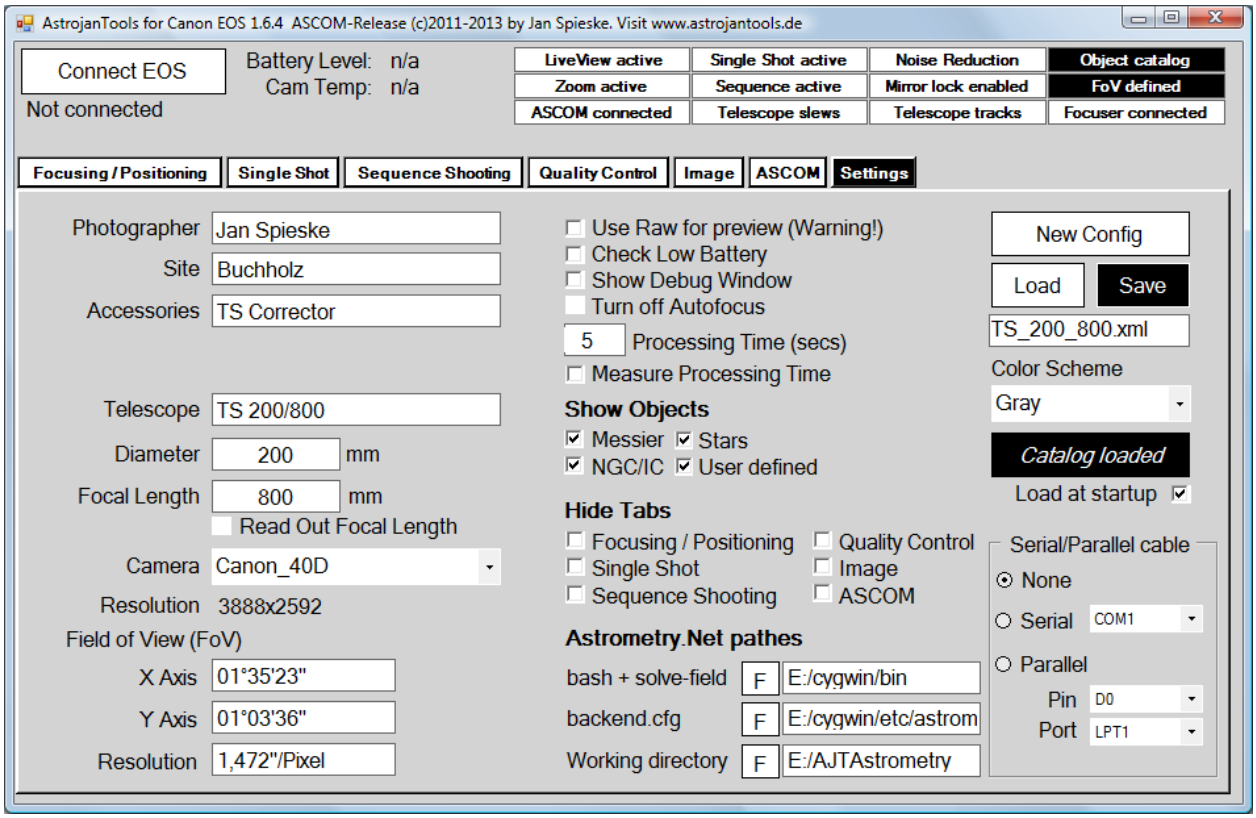


The following options are available:

- Telescope and Focuser support (see chapter “Ascom Focuser”)
- Manually connection to telescope and focuser ("Auto connect to ..." disabled)
- Auto connect when the program starts with the last selected telescope and/or focuser ("Auto connect to ..." enabled)
- Display the RA, DEC, and AZ and ALT values of the telescope

12.Settings

Here are the basic settings for the software, and profiles created for telescopes.



The following options are available:

- Create / Save / Load of telescope profiles
- Setting the color scheme
- Calculation of the camera field of view (field of view, FOV)
- Loading the object catalog, optionally automated at startup
- Optional hiding of unwanted control tabs
- Setting the interface parameters for bulb exposures of non-live-view models and mirror lockup
- Setting of further parameters

13.Mirror locking

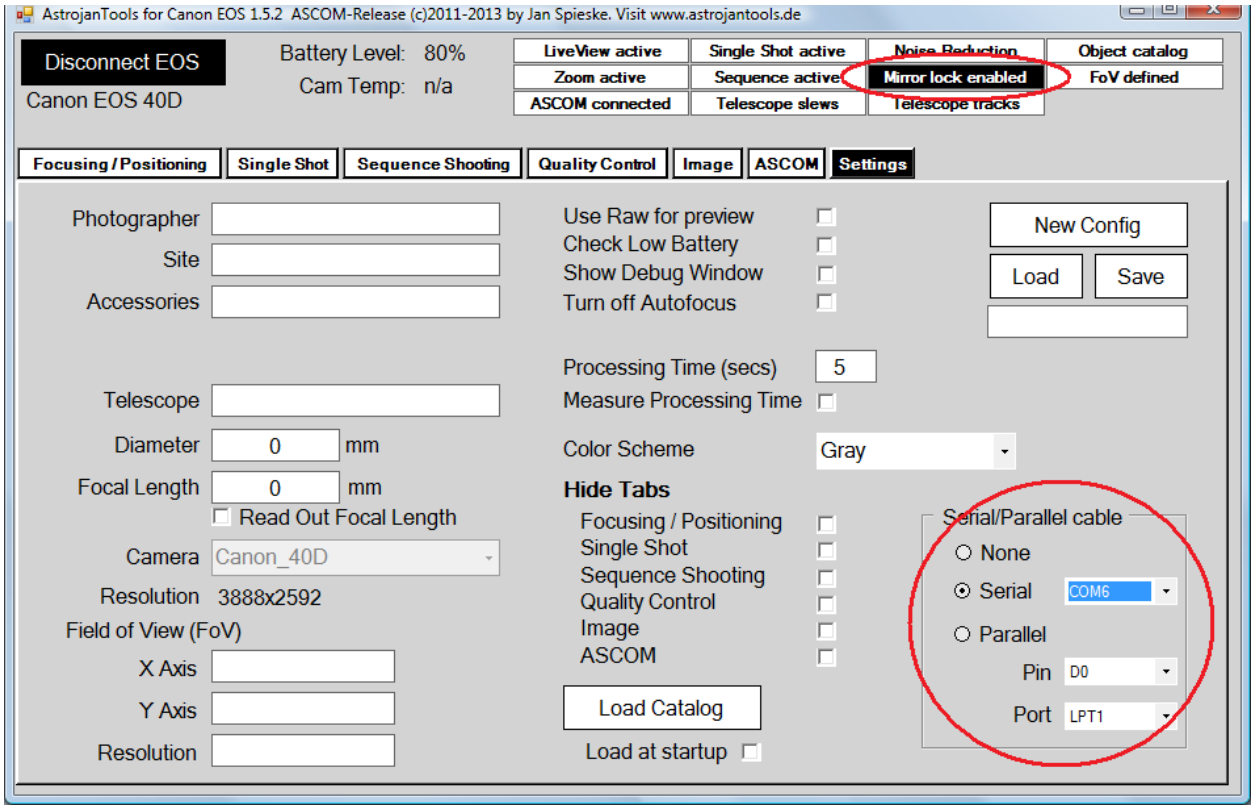
Since version 1.5.2 it is possible to use a serial or parallel cable for mirror locking function. Bulb exposures in non-Live View models like 350D, 20D and 5D work via an extra cable. For all other models a serial / parallel cable can be used for mirror lock-up.

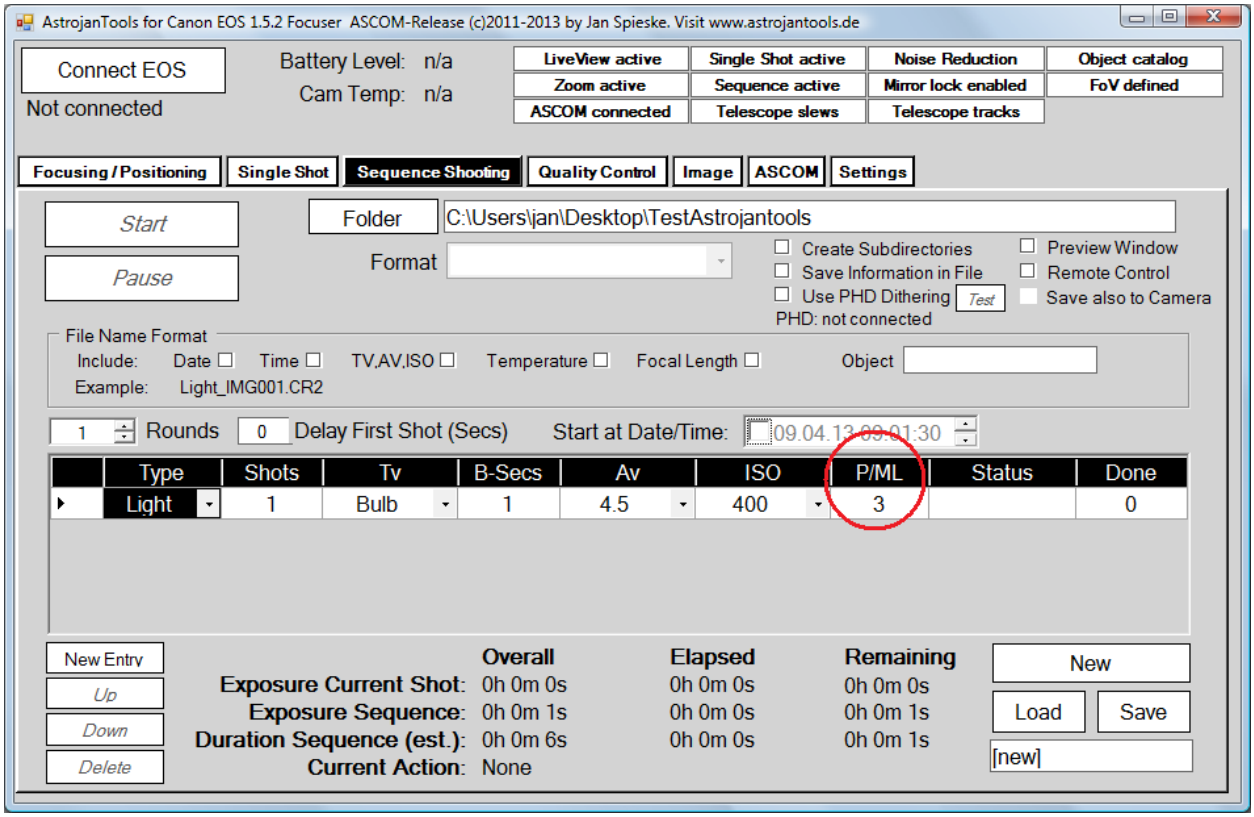
Mirror lock only works

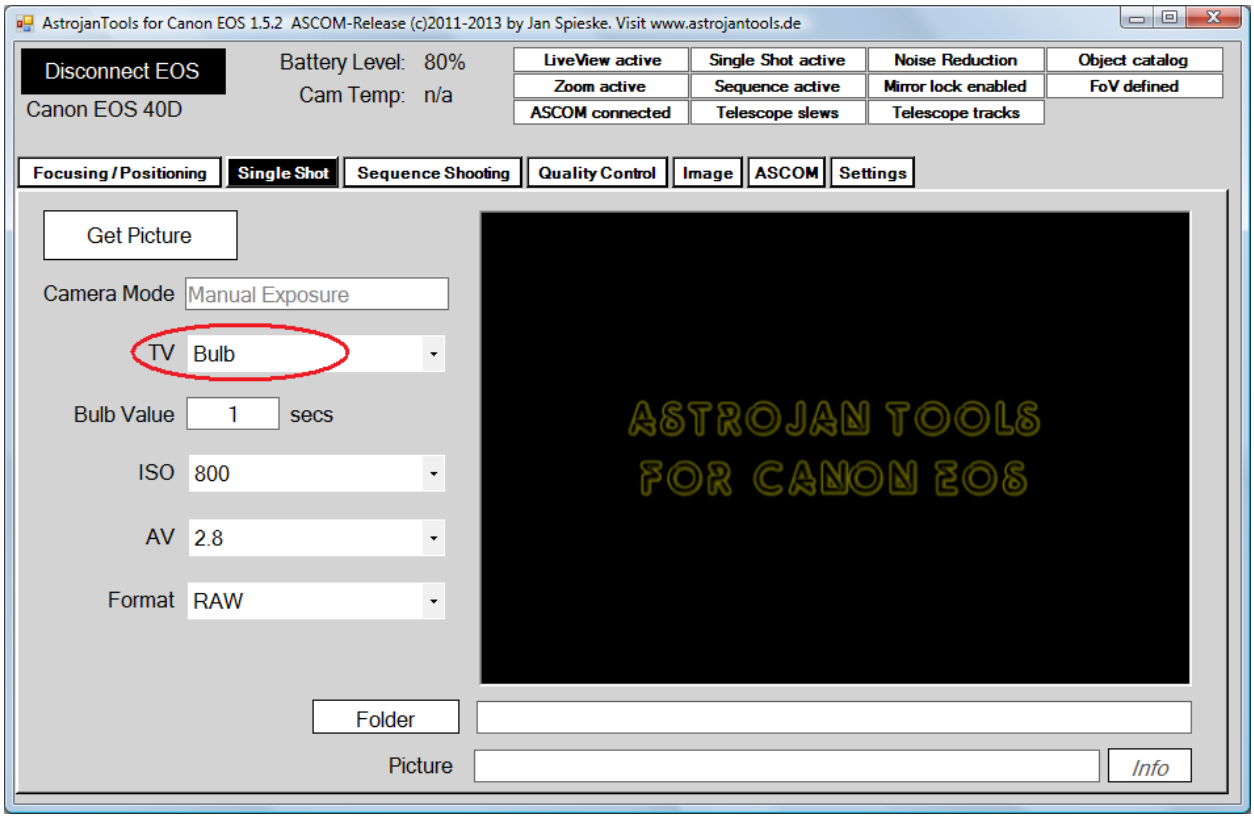
- if mirror locking is enabled in the camera customer function menu
  In newer models, the mirror lockup can be switched on / off AT THE CAMERA when AJT is connected, the camera signals this to AJT. The "mirror lock enabled" indicates that AJT has recognized the switched mode. In older models, the connection may have to be re-established if the "mirror lock enabled" does not change accordingly
- if the camera is connected via a special serial or parallel cable (depending on model 2.5 mm jack or proprietary Canon N3 connector)
- if under Settings the serial port or parallel port an pin is set correctly
- if the exposure time is set to Bulb

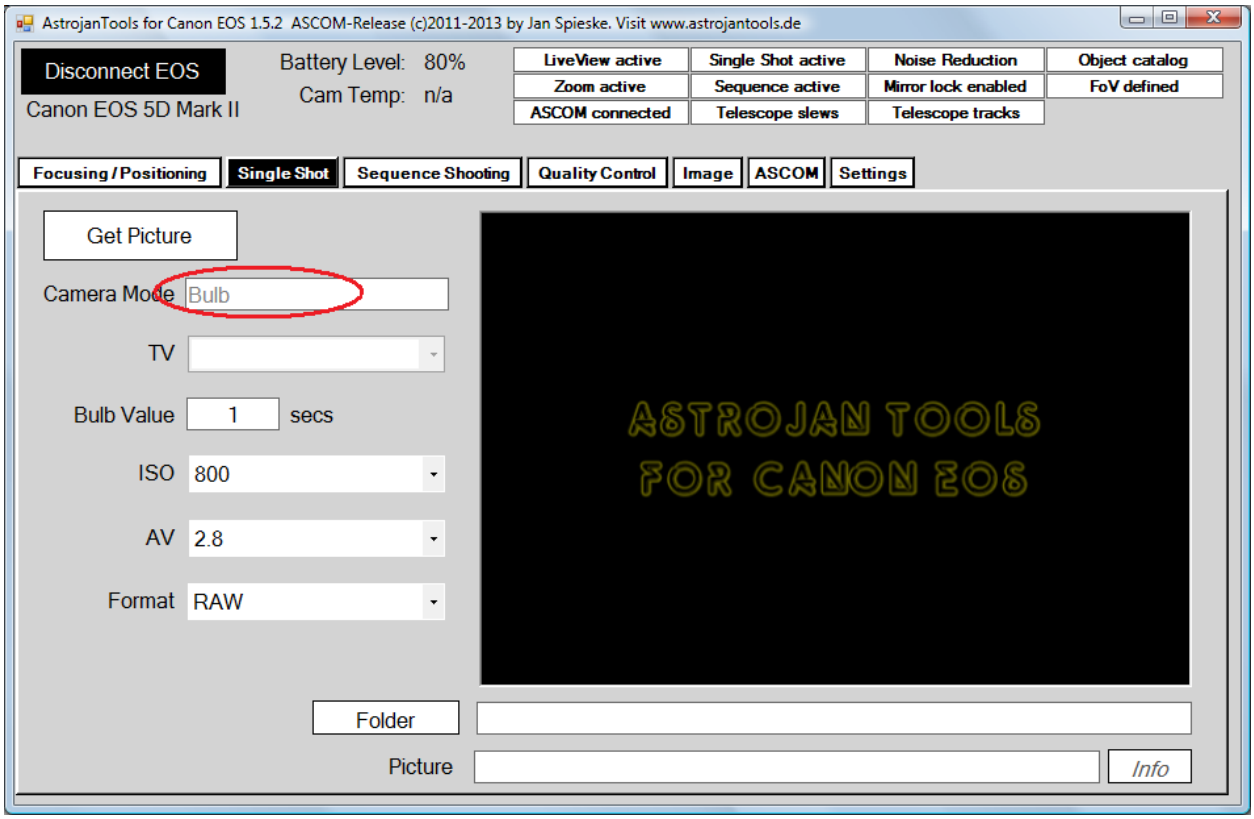
Hints:

- In control tab Single shot the mirror locking duration is fixed at three seconds
- In the Sequence Shooting tab each cell “P / ML” (= pause / Mirror Locking) determines the mirror locking duration
- The mirror lock-up is carried out only with the entries of the type "Light"


AstrojanTools for Canon EOS 1.5.2 ASCOM-Release (c)2011-2013 by Jan Spieske. Visit www.astrojantools.de
Disconnect EOS
Canon EOS 40D
Battery Level: 80%
Cam Temp: n/a
LiveView active
Single Shot active
Noise Reduction
Object catalog
Zoom active
Sequence active
Mirror lock enabled
FoV defined
ASCOM connected
Telescope slews
Telescope tracks
Focusing / Positioning
Single Shot
Sequence Shooting
Quality Control
Image
ASCOM
Settings
Photographer
Site
Accessories
Telescope
Diameter 0 mm
Focal Length 0 mm
Read Out Focal Length
Camera Canon_40D
Resolution 3888x2592
Field of View (FoV)
X Axis
Y Axis
Resolution
Use Raw for preview
Check Low Battery
Show Debug Window
Turn off Autofocus
Processing Time (secs) 5
Measure Processing Time
Color Scheme Gray
Hide Tabs
Focusing / Positioning
Single Shot
Sequence Shooting
Quality Control
Image
ASCOM
Load Catalog
Load at startup
New Config
Load
Save
Serial/Parallel cable
None
Serial COM6
Parallel
Pin D0
Port LPT1


AstrojanTools for Canon EOS 1.5.2 Focuser ASCOM-Release (c)2011-2013 by Jan Spieske. Visit www.astrojantools.de
Connect EOS
Not connected
Battery Level: n/a
Cam Temp: n/a
LiveView active
Single Shot active
Noise Reduction
Object catalog
Zoom active
Sequence active
Mirror lock enabled
FoV defined
ASCOM connected
Telescope slews
Telescope tracks
Focusing / Positioning
Single Shot
Sequence Shooting
Quality Control
Image
ASCOM
Settings
Start
Pause
Folder C:\Users\jan\Desktop\TestAstrojantools
Format
Create Subdirectories
Save Information in File
Use PHD Dithering
Test
PHD: not connected
Preview Window
Remote Control
Save also to Camera
File Name Format
Include: Date Time TV,AV,ISO Temperature Focal Length Object
Example: Light_IMG001.CR2
1 Rounds 0 Delay First Shot (Secs) Start at Date/Time: 09.04.13 09:01:30
Type Shots Tv B-Secs Av ISO P/ML Status Done
Light 1 Bulb 1 4.5 400 3 0
New Entry
Up
Down
Delete
Overall Elapsed Remaining
Exposure Current Shot: 0h 0m 0s 0h 0m 0s 0h 0m 0s
Exposure Sequence: 0h 0m 1s 0h 0m 0s 0h 0m 1s
Duration Sequence (est.): 0h 0m 6s 0h 0m 0s 0h 0m 1s
Current Action: None
New
Load
Save
[new]


AstrojanTools for Canon EOS 1.5.2 ASCOM-Release (c)2011-2013 by Jan Spieske. Visit www.astrojantools.de
Disconnect EOS
Canon EOS 40D
Battery Level: 80%
Cam Temp: n/a
LiveView active
Single Shot active
Noise Reduction
Object catalog
Zoom active
Sequence active
Mirror lock enabled
FoV defined
ASCOM connected
Telescope slews
Telescope tracks
Focusing / Positioning
Single Shot
Sequence Shooting
Quality Control
Image
ASCOM
Settings
Get Picture
Camera Mode Manual Exposure
TV Bulb
Bulb Value 1 secs
ISO 800
AV 2.8
Format RAW
ASTROJAN TOOLS FOR CANON EOS
Folder
Picture
Info

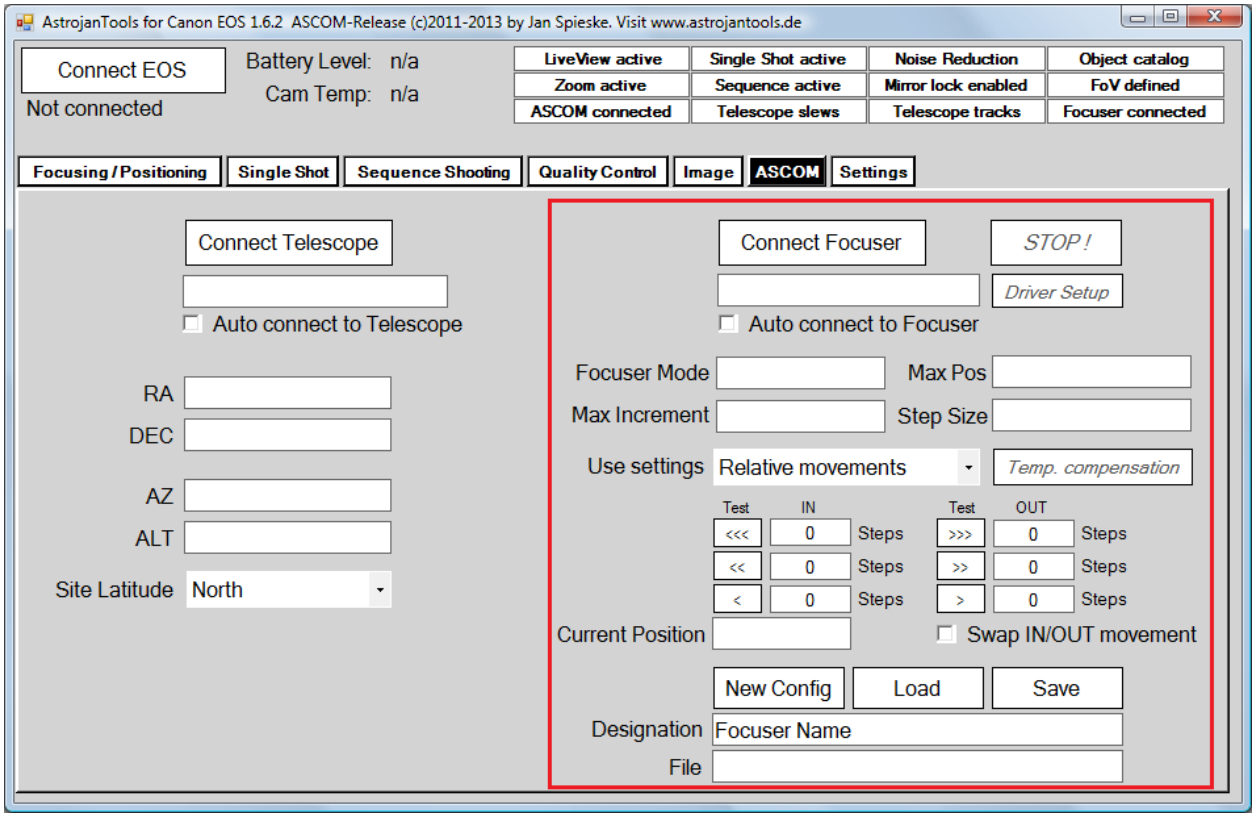

AstrojanTools for Canon EOS 1.5.2 ASCOM-Release (c)2011-2013 by Jan Spieske. Visit www.astrojantools.de
Disconnect EOS
Canon EOS 5D Mark II
Battery Level: 80%
Cam Temp: n/a
LiveView active
Single Shot active
Noise Reduction
Object catalog
Zoom active
Sequence active
Mirror lock enabled
FoV defined
ASCOM connected
Telescope slews
Telescope tracks
Focusing / Positioning
Single Shot
Sequence Shooting
Quality Control
Image
ASCOM
Settings
Get Picture
Camera Mode Bulb
TV
Bulb Value 1 secs
ISO 800
AV 2.8
Format RAW
ASTROJAN TOOLS FOR CANON EOS
Folder
Picture
Info

14. ASCOM Focuser

WARNING: Use at your own risk. Depending on the kind of power transmission (fixed connection or slip clutch) this can cause damage. Test carefully with small movements of the direction in / out and change if necessary (switch "Swap IN/OUT movement"). Highest functionality is met with the ASCOM focuser simulator in the first step.

Configuration

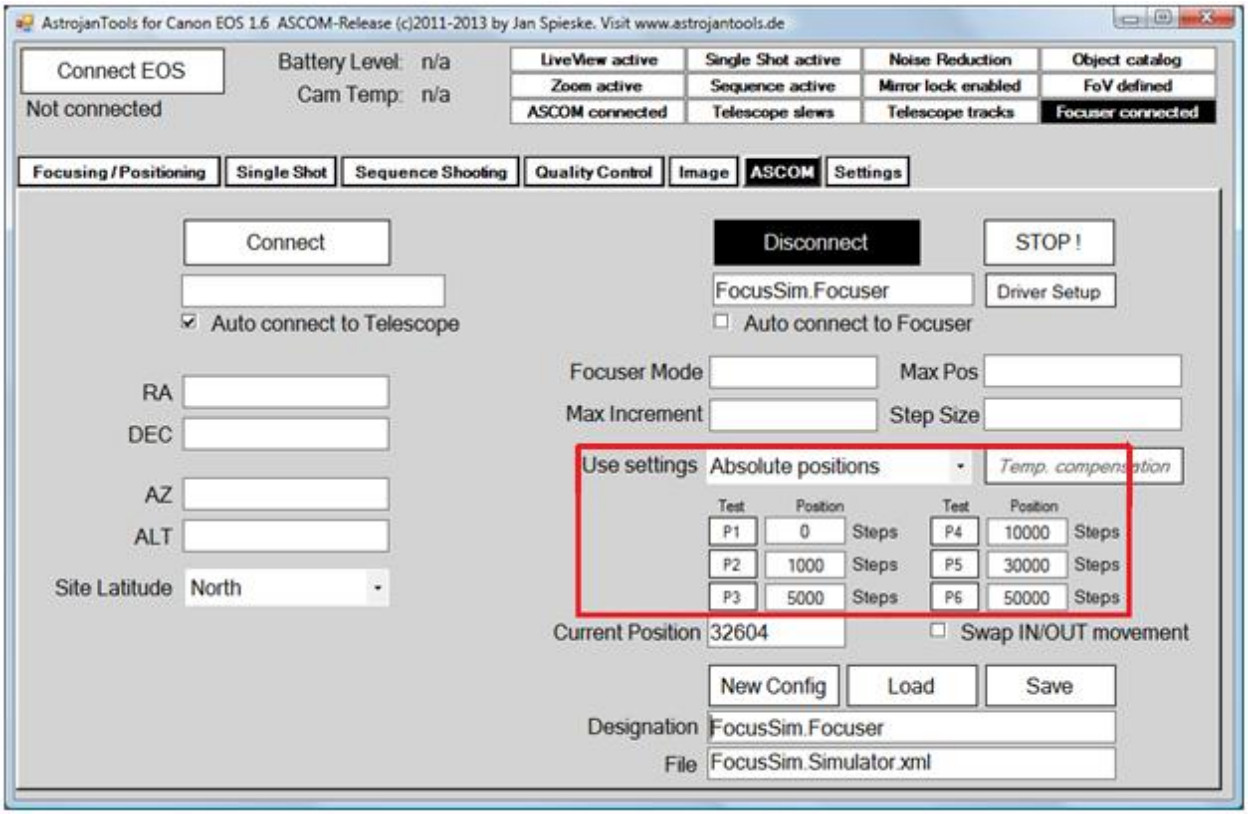
Since version 1.6 AJT supports ASCOM focuser. For this purpose, the mask ASCOM has been extended:



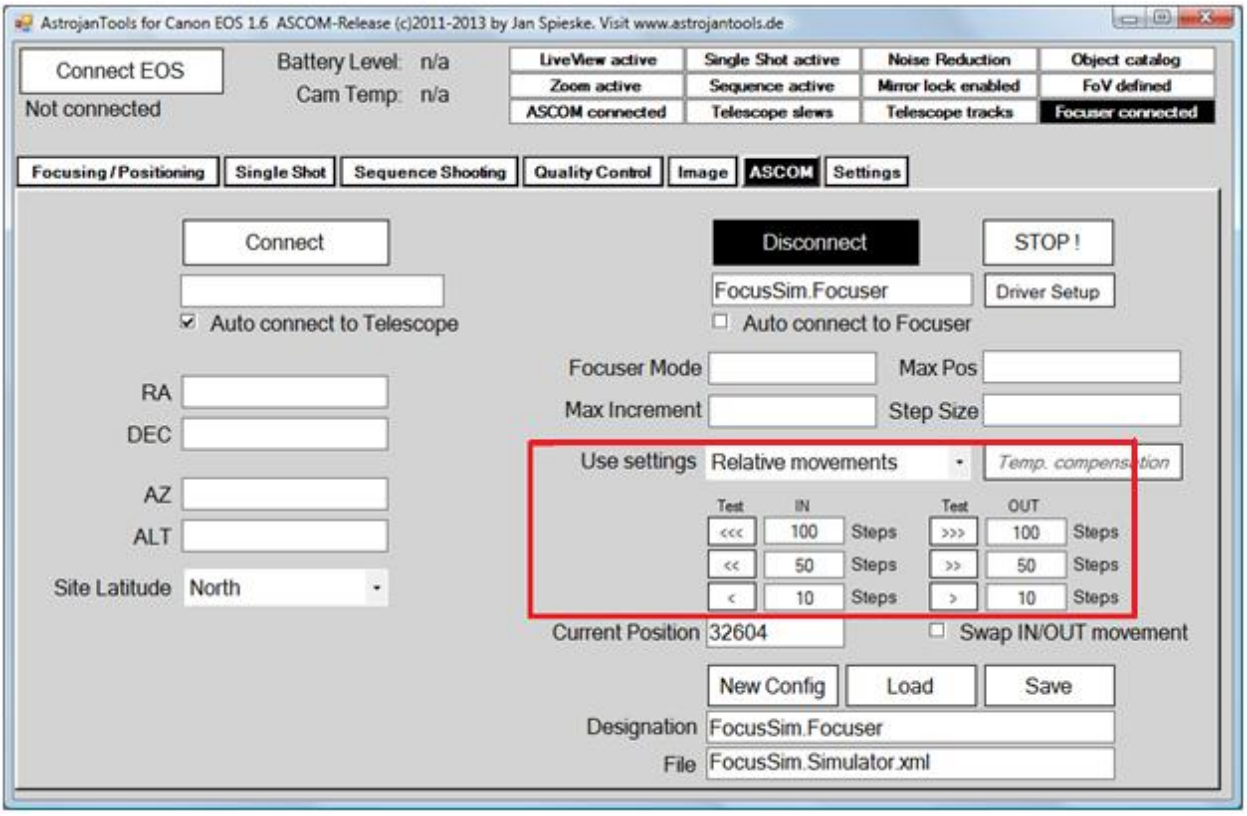
Connect / Disconnect	Connects to or disconnects from the focuser
Driver Setup	Gets the settings dialog of the driver
Auto connect to focuser	Connects automatically (at startup or on pressing the switch button) with the last used focuser
Focuser Mode	Indicates whether the focuser connected supports absolute or relative positioning
Max Pos	From the ASCOM driver information about the maximum position value
Max Increment	From the ASCOM driver information about the maximum steps within one move command
Step Size	From the ASCOM driver information about the longitudinal movement of each single step of the stepper motor (in micrometers)
STOP!	Stops the movement of the focuser (emergency). This button is disabled if

	the focuser does not support the function **NOTE:** Some drivers report an implemented stop function, but nothing happens when triggered. Please test. Although the button is usable for this reason, I take no responsibility for the stop function
Temp compensation	Enables / disables the temperature compensation. The button is disabled if the focuser does not support this function. **Note:** No manual movements can be made with temperature compensation activated. The buttons are disabled in this case.
Use settings	Here the absolute positions (in steps) or the relative step numbers are defined. At focusers that only support the relative mode is "Absolute positions" disabled.
Current position	Displays the driver-supplied current position
Swap IN/OUT movement	The moving direction of the focuser can be swapped here to set the in/out buttons correctly
New Config/Load/Save	For each each telescope or focuser (e.g. if the focuser controller is used for multiple telescopes), configuration files can be created. AJT automatically loads the last configuration file used

If "Use settings" is set to "Absolute positions" values for absolute positions (measured in increments) can be defined here. The buttons then have the name of position P1 to P6. Pressing the corresponding button triggers the positioning for test purposes.



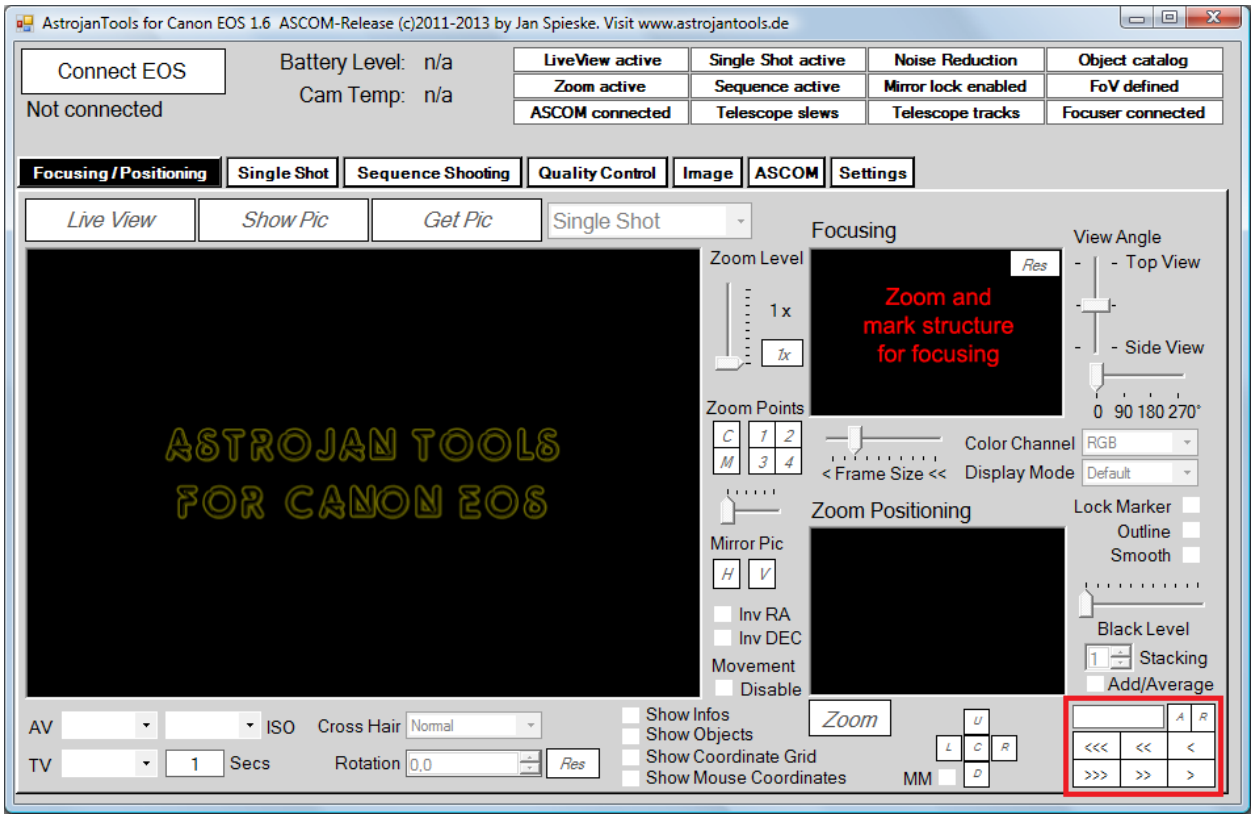
If "Use settings" is set to "Relative movements", values for relative movements (measured in steps) can be defined here, e.g. "go 100 steps IN" or "go 500 steps OUT". The buttons then have the names <<<, <<, <, and >>>, >>,>. Pressing the corresponding button triggers the positioning for test purposes.



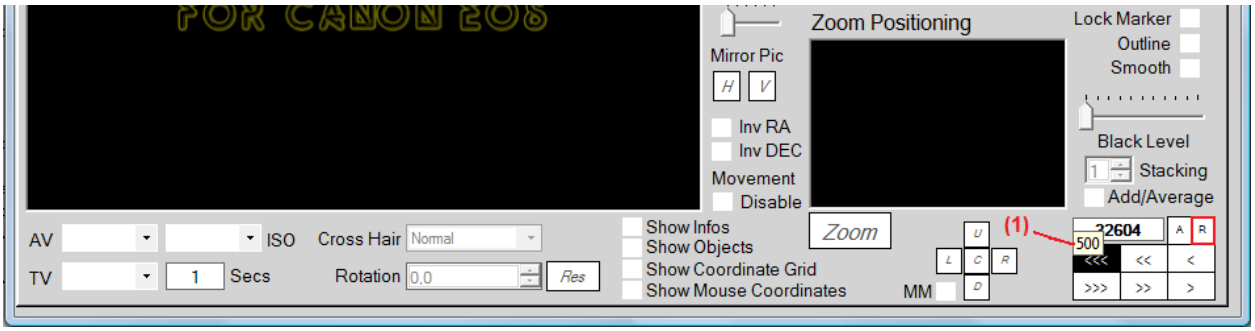
The configuration can then be saved to a named file. AJT loads the last used file at startup.

Usage

For focusing buttons are available in the control tab “Focusing / Positioning” (see figure):



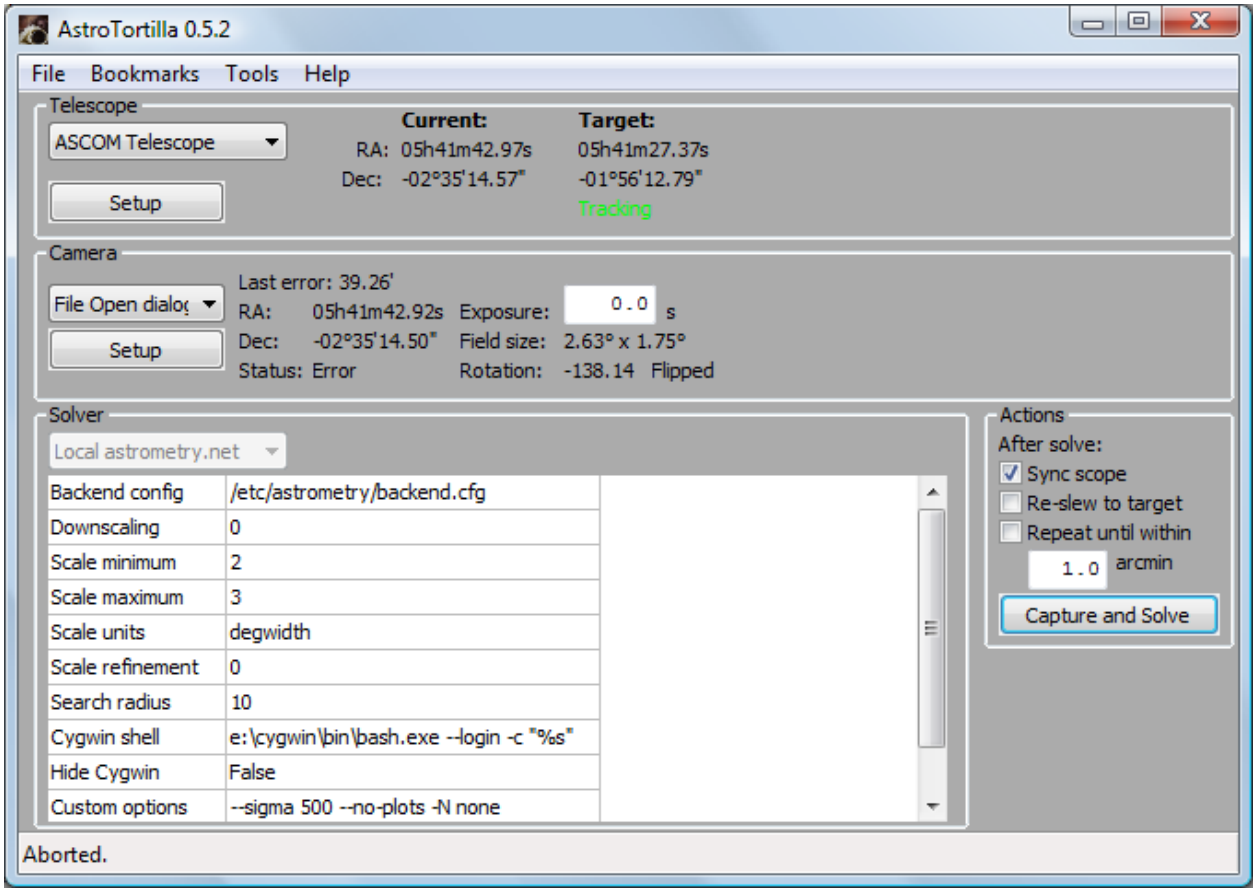
The two buttons A and R switch between "Absolute positions" and "Relative movements". The control buttons are then marked analog with P1 to P6 and up <<< >>>. As a help, the stored values are displayed if you move the mouse over a button (see (1) in the following figures). In addition to the switches there is a display of the current count of the focuser.



Note: No manual movements can be performed with activated temperature compensation. The buttons are disabled in this case.

15. Using Astrotortilla with AJT

Astro tortilla is an open source project and provides "Plate-Solving" with the help of Astrometry.Net (http://astrometry.net/). This means, the exact position of the telescope as well as the rotation angle of the camera to RA/DEC is determined based on a photo. Based on the determined position Astrotortilla can perform other automated actions like a resync of the mount and subsequent proper positioning to the target object, etc.



Excerpt from the website (http://sourceforge.net/projects/astrotortilla/)

- Integrates existing solutions without reinventing the wheel
- Automated plate-solved GoTo correction
- Fully automatic blind GoTo calibration
- Fast, quantitative polar alignment by plate-solving
- Automatic slew to to existing astrophotgraphy location
- Automated drift alignment shot

Some programs are already supported natively as Nebulosity, MaximDL, APT, etc.

For use with AJT, there are two options:

FileOpenDialog

Astrotortilla can be set to the camera option "File Open dialog" and when pressing the "Capture and Solve" the last incurred photo must be selected manually (preferably via a temp directory and the mask single shot).

Direct triggering

Alternatively Astrotortilla can be set to the camera option APT. AJT supports the same interface (communication via IP port 27001).

The camera must be connected to AJT and ready to fire (Bulb exposure). The exposure time is set in Astro tortilla.

16. Plate Solving with Astrometry.Net in AstrojanTools

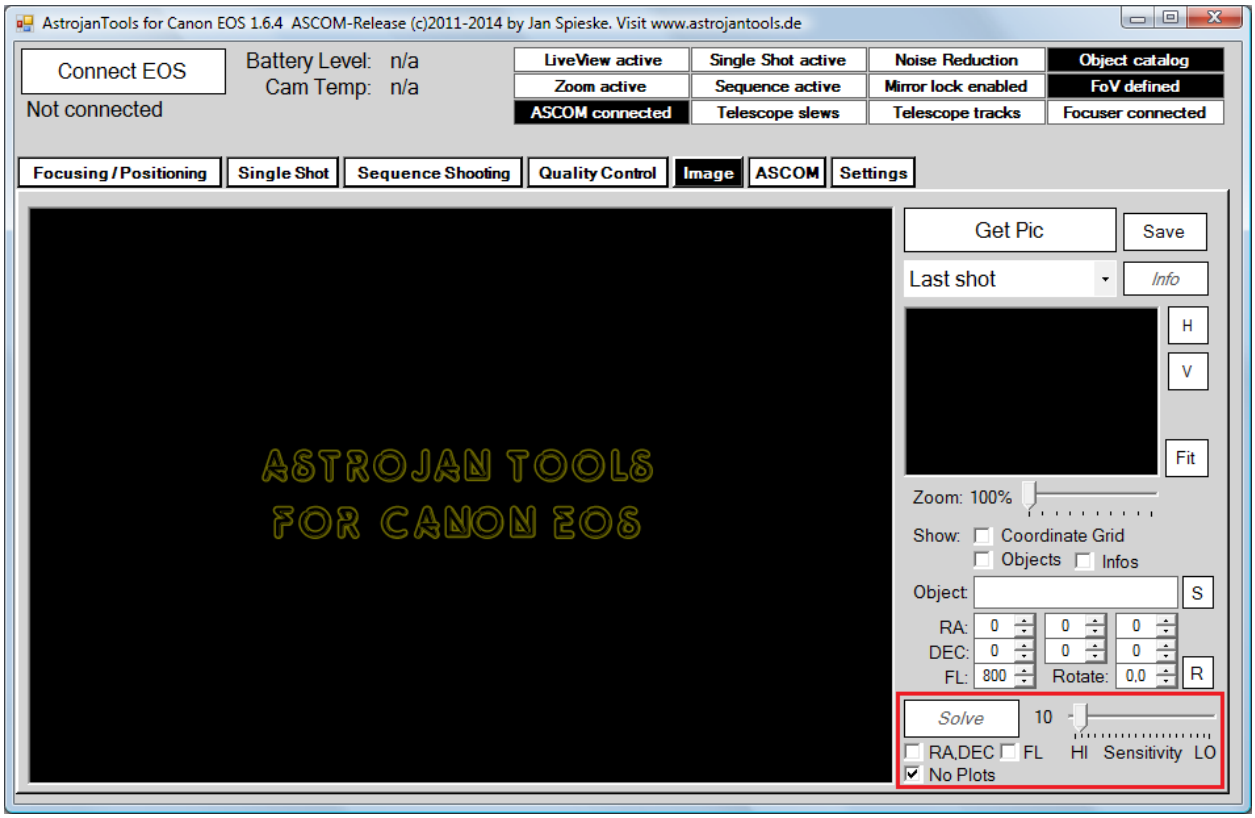
Astro tortilla provides a complete Astrometry.net installation (http://astrometry.net/). Astrometry.Net is actually a Unix-based solution and can not be performed easily on Windows. For this purpose, the software is operated by Cygwin (http://www.cygwin.com/) that enables this function.

Astrometry.Net, more specifically the software solve-field.exe and other utilities, the configuration file backend.cfg as well as the data files (so called index files) are from Astrotortilla installed under the folder [drive:]/cygwin/bin, [drive:]/cygwin/etc/astrometry and [drive:]/cygwin/usr/share/astrometry/data.

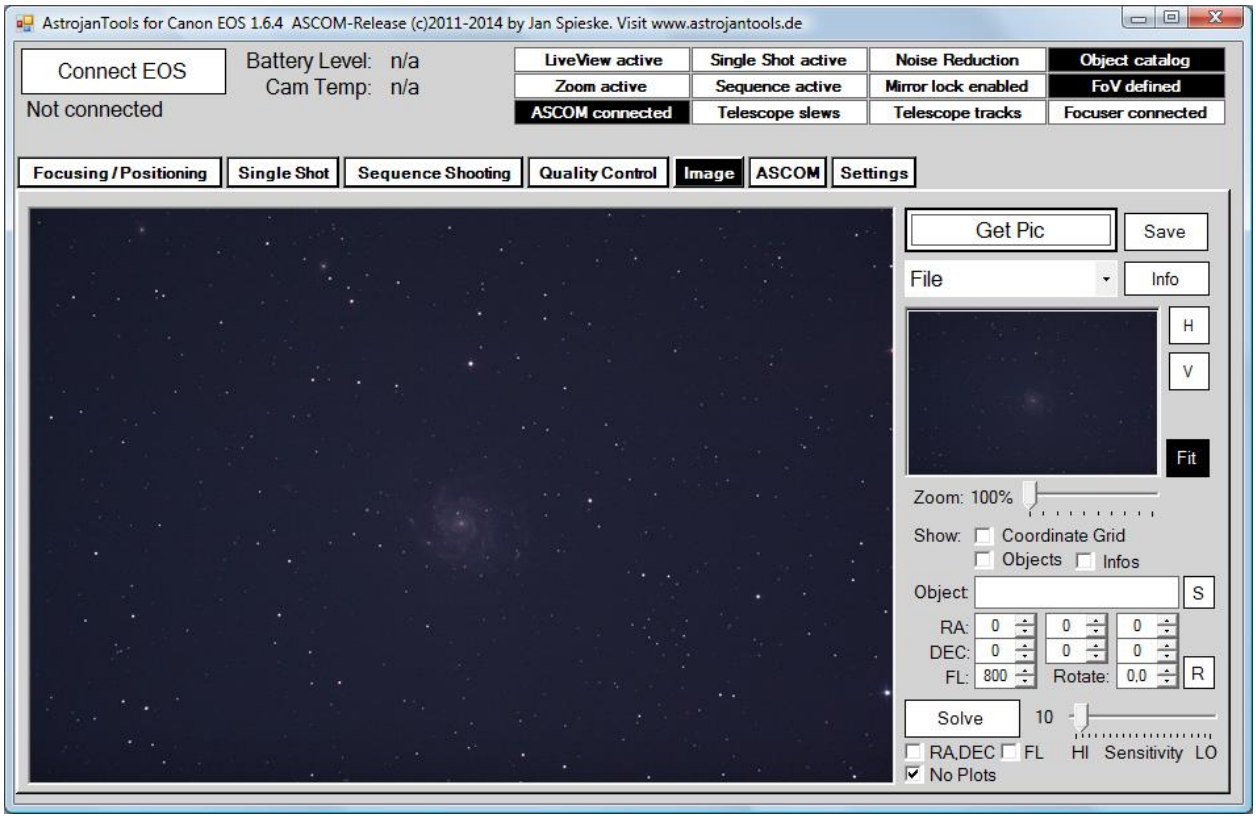
The team of Astrotortilla also provides the Cygwin/Astrometry installer separately, but my anti-virus program / SmartScreen defends stubbornly to download this (virus found on the source forge website)

Astrotortilla as well AstrojanTools then call on Cygwin and enter the command to start Astrometry.Net including the corresponding parameters.

The functionality is placed in the Image tab (red box):



The button **Solve** triggers an analysis. However, with either load the last shot or a file from harddisk needs to be charged.



Here a photo of M101 was loaded. The button **Solve** could now be pressed immediately and Astrometry.Net analyzed the entire sky area, which usually takes a very long time.

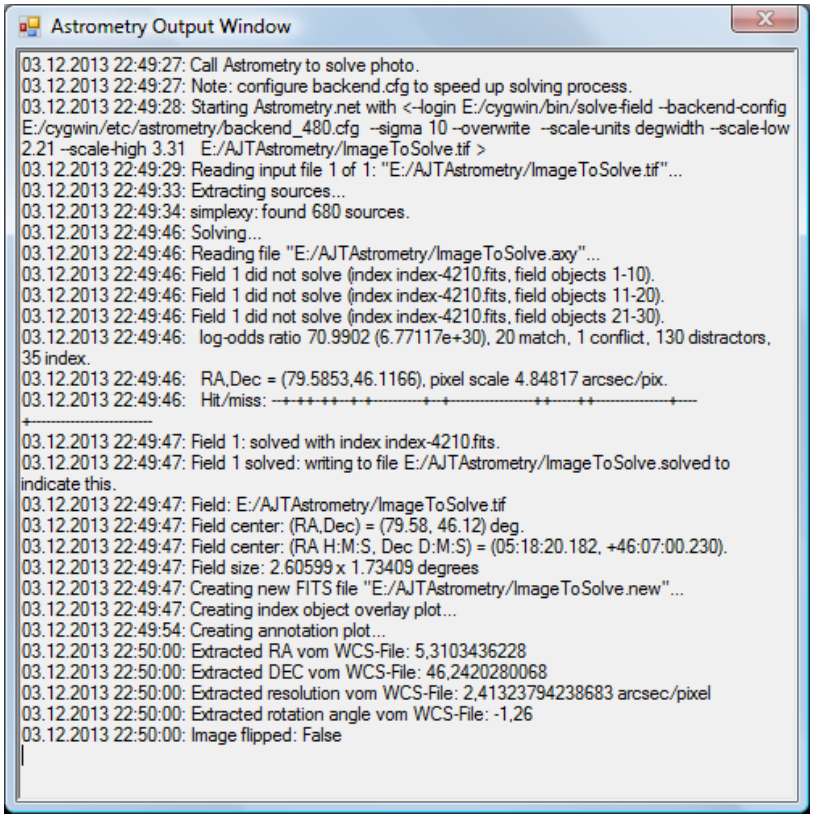
Accelerate the process can be quite useful if the focal length is known and the camera type is set under Settings. For this the focal length has to be entered in the FL field and the checkbox **FL** must be activated. AJT calculates Field of View Parameters that are transferred to Astrometry.Net. The consideration of the chapter *optimize backend.cfg* can bring a big improvement.

If the ASCOM version is used the Last Shot function writes the current position in the fields RA and DEC . If checkbox **RA, DEC** is set Astrometry.Net searches within a radius of 10 degrees.

The slider **Sensitivity** controls the sensitivity of the star detection. The value of 10 is quite good for most cases.

Astrometry.Net normally produces image files that make the statement contained on NGC / IC objects, or show which stars have been used to solve (see. PNG files in the working directory set under Settings). This costs, especially on slower machines, time and is not necessarily required for a normal alignment. With the checkbox **No plots** the generation of graphic files can be suppressed.

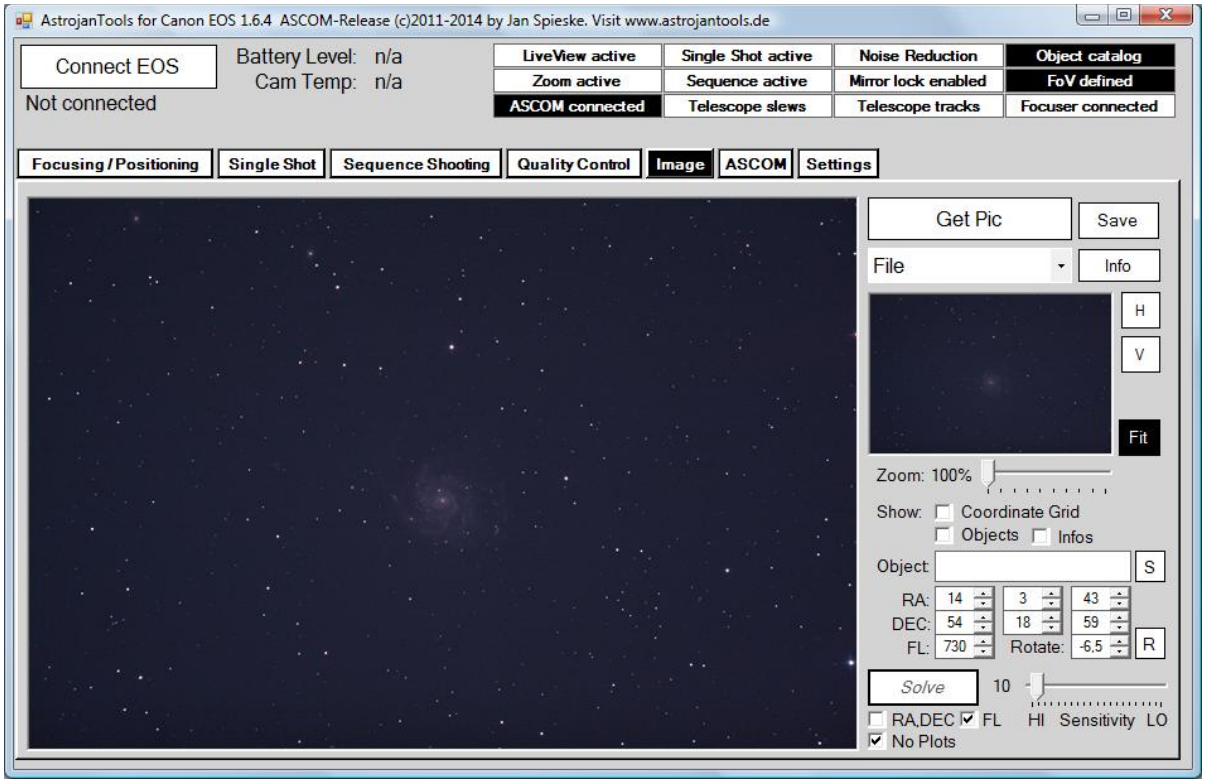
By pressing Solve opens a log window and the analysis begins. In the next screenshot the associated log window is shown. It is shown in the log that 769 sources are used for analysis ("simplexy: found 769 sources"). The success of the analysis depends heavily on the assumption that this number is not too large (several thousand) or too small. If a picture is not resolved, the controller sensitivity must be adjusted, either (find fewer sources) to LO or (find more sources) to HI. Over time, the users of AstrojanTools developes a feel for the right attitude, which also depends on the image content. Very stubborn cases (eg very many stars in the Milky Way) can not seem to solve, in this case another part of the sky should be used. The analysis process can be stopped (eg if the detected number of sources is not likely) by pressing the Solve button.



The log window can be closed after completion of the analysis.

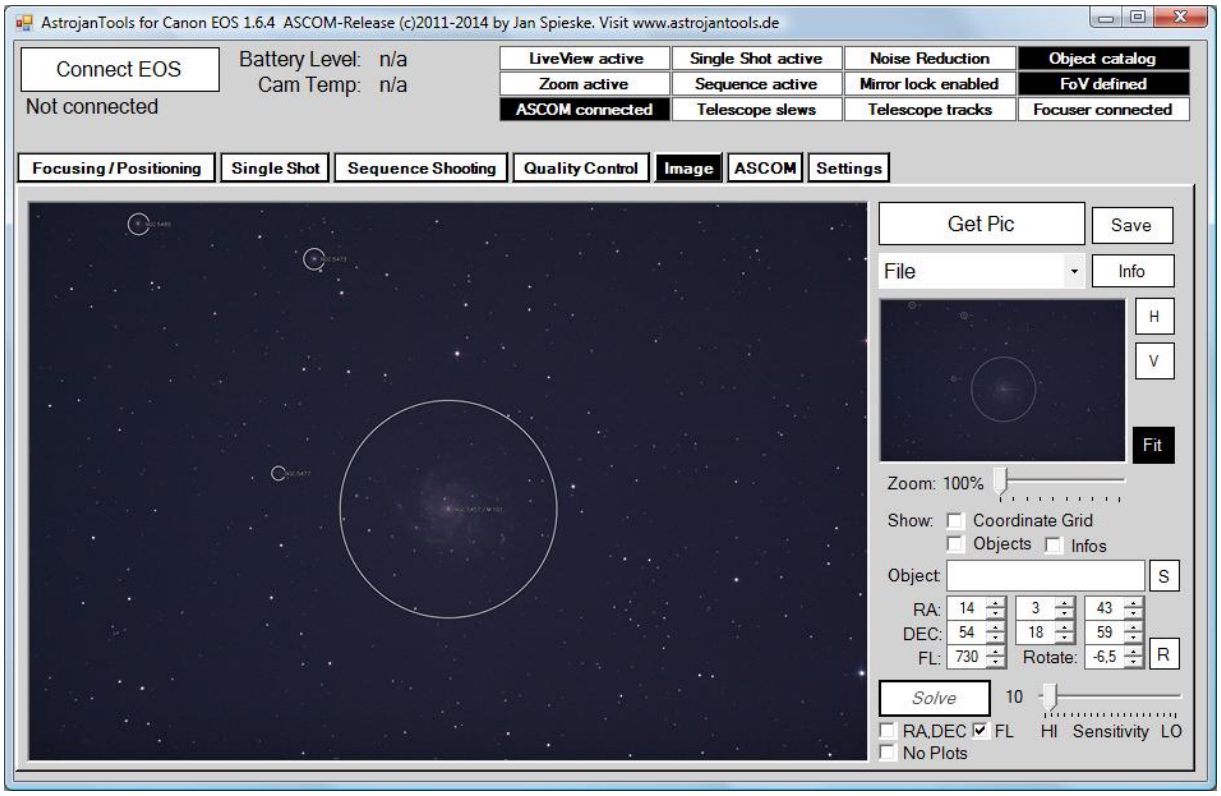
The result looks like this:

Checkbox No Plots is set:



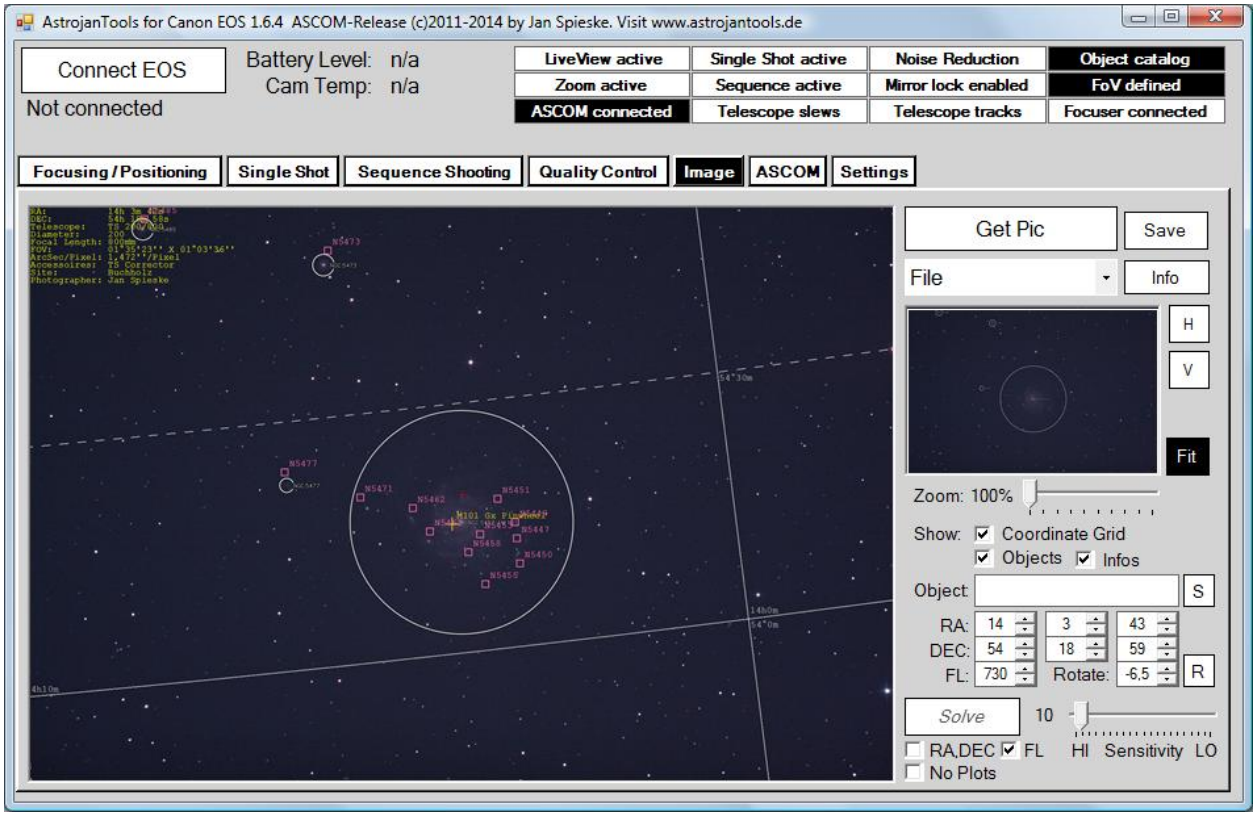
Result: Only the RA, DEC, FL and Rotate fields have been filled.

Checkbox No Plots is not set:



Result: The RA, DEC, FL and Rotate fields have been filled. In addition, the annotated image file created by Astrometry is loaded.

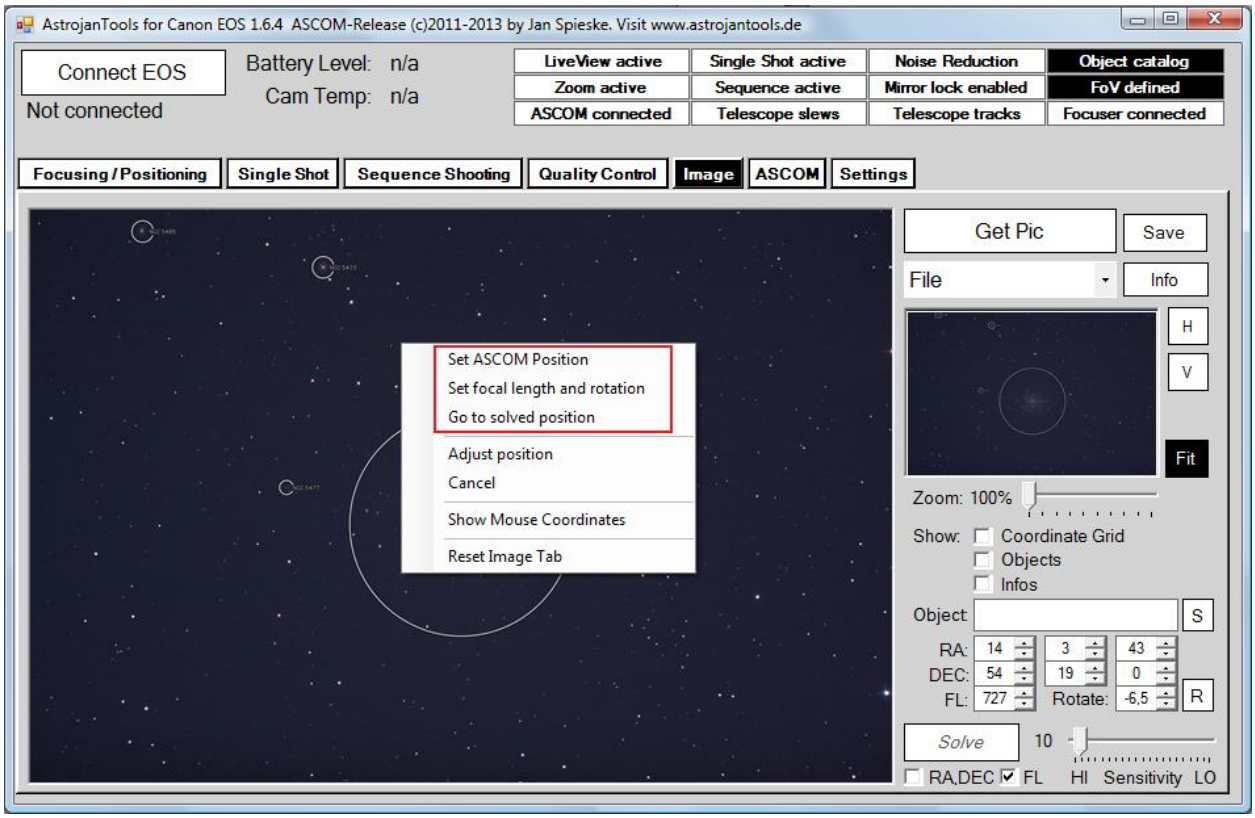
The image can be saved with the save function as a TIF, PNG or JPG file. In the example below, the information generated by AJT were still displayed.



Note to calculate the focal length

Astrometry.Net determines the telescope resolution from the image in arcsecs per pixel. AstrojanTools calculates from this value and by means of the set type of camera (or the associated pixel size), the focal length. This is for AstrojanTools important because the focal length is used for the correct image shifting in Tab Focusing/Positioning. AstrojanTools simply assumes that no images of other camera types are analyzed. If so, the focal length you specify is true not likely (unless the pixel sizes are the same).

With these values, further actions can now be performed (red box):



Note: the context menu appears when you press the right mouse button only when zoom is at 100%.

Set position ASCOM (ASCOM version only)

Corrects the current ASCOM telescope position with the determined position. Can be used very well for the alignment:

Approach 1 or 2 positions in the West or East, each photo via single shot with eq 10 seconds to make, analyze and execute Set ASCOM Position on success. EQMOD for example must be set to the alignment/sync mode *Append on Sync.*

Approach 1 or 2 positions on the opposite hemisphere and repeat (total should be at least three positions have been analyzed). Ready is the 3-star alignment.

Notes

- The feature is available only, for security, if by Last Shot the current photo is loaded (assuming that the position has not changed since the last recording.
- The sync works only if the telescope has previously performed a GoTo. In other case there should be no effect to the ASCOM position

Set focal length and rotation

Sets the focal length under Settings (with recalculation of the field of view) and the field Rotation in the tab Focusing/Positioning. After that the automatic image shift (see chapter *automatic image shift*) works very closely.

NOTE: After a meridian flip, if necessary, re-execute analysis, otherwise the rotation angle is rotated by 180 °. This means that the final analysis should take place on the side (east or west) on which to be photographed.

Go to solved position

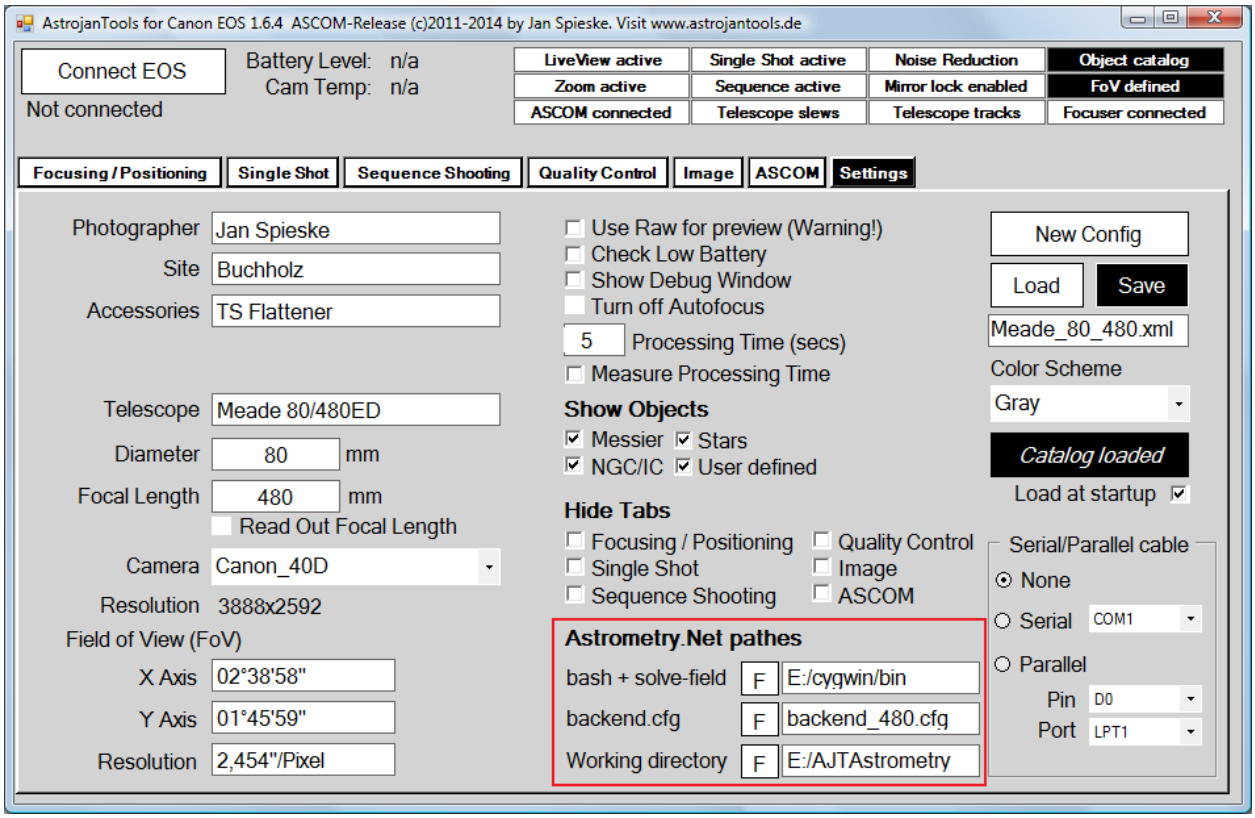
NOTE: at your own risk

This is convenient to carry on a session. Load an image from previous session, analyze and perform a GoTo. If necessary set analyzed camera angle as accurately as possible readjust.

Requirements and Preparation

To use this function, the following conditions must be met:

- Cygwin must be installed (if necessary via Astrotortilla installation)
- Astrometry.Net with index files must be installed (if necessary via Astrotortilla installation)
- Under Settings tab, the following paths must be set (red outline)



bash + solve-field

bash.exe is the executable from Cygwin, solve-field (a batch file) the one of Astrometry.Net. Button F calls up the selection dialog for the directory path. Its selection filter is set to bash.exe to facilitate the search. bash.exe (as well as solve-field) is normally found in [drive:][/path]/cygwin/bin.

backend.cfg

backend.cfg is the configuration file for solve-field of the Astrometry.Net. Additional parameters can be specified (see Section parameters). Button F opens the selection dialog. Its selection filter is set to *.cfg to facilitate the search. backend.cfg is usually to find in path [drive:]/cygwin/etc/astrometry.
NOTE: See Chapter *optimization of backend.cfg* to speed up the analysis process.

Working directory

A directory of your choice. Herein AstrojanTools passes the image file for analysis and Astrometry.Net saves there the generated files. Button F calls up the selection dialog.

Parameter

AstrojanTools passes at the start of bash.exe following parameters on Cygwin:

--login - Login

[Path in textbox bash + solve-field] / solve-field

AstrojanTools passes the following parameters to solve-field:

--backend-config [path in textbox backend.cfg] / backend.cfg

--sigma [value from slider Sensitivity]

--overwrite

if focal length and checkbox FL are set:

--scale-units degwidth

--scale-low [lower value of Field of View in degrees]

--scale-high [upper value of Field of View in degrees]

if position and checkbox RA,DEC are set:

--ra [RA value]

--dec[DEC value]

--radius 10

and the image file

[Working directory path] / ImageToSolve.tif

At least one other value should be set by the user in the backend.cfg (remove comment character):

„#depths 10 20 30 40 50 60 70 80 90 100“ change to „depths 10 20 30 40 50 60 70 80 90 100“

NOTE: see the next section regarding the editing of backend.cfg

Important note for editing the file backend.cfg

backend.cfg **must not** be edited and saved using Notepad or Wordpad (or other purely Windows editors), as this will be lost certain control characters from the Unix world and the analysis process is no longer working (error message in log like "Can not access/usr/share/astrometry/data" etc. and crash). You have to use an editor such as Notepad + + (to get for free on the Internet).

Make a master copy before editing.

Optimization of backend.cfg

backend.cfg contains a path to the index files of Astrometry.Net that are needed for the analysis. These have the following names and cover relevant resolutions of sky areas

(Source: http://astrometry.net/doc/readme.html)

Index Filename	Range of skymark diameters (arcminutes)
index-4219.fits	1400 - 2000
index-4218.fits	1000 - 1400
index-4217.fits	680 - 1000
index-4216.fits	480 - 680
index-4215.fits	340 - 480
index-4214.fits	240 - 340
index-4213.fits	170 - 240
index-4212.fits	120 - 170
index-4211.fits	85 - 120
index-4210.fits	60 - 85
index-4209.fits	42 - 60
index-4208.fits	30 - 42
index-4207-*.fits	22 - 30
index-4206-*.fits	16 - 22
index-4205-*.fits	11 - 16
index-4204-*.fits	8 - 11
index-4203-*.fits	5.6 - 8.0
index-4202-*.fits	4.0 - 5.6
index-4201-*.fits	2.8 - 4.0
index-4200-*.fits	2.0 - 2.8

For different focal lengths, different index files are needed. Since I have telescopes between 480 and 1500mm focal length, I have many index files installed (is queried at the Astrotortilla installation). The standard backend.cfg provides that all index files found in the directory will be used for analysis. However, I have found for my 480mm telescope with 40D as camera that all solutions are found in the index 4210.fits file.

This allows the backend.cfg optimize as follows:

- backend.cfg copy and rename (for the 480mm telescope eg backend_480.cfg)
- Open backend.cfg with Notepad + + or other Unix compatible editor
- Make the following changes (red notes):

```
# This is a config file for the 'backend' program - it contains information about
# where indices are stored, and "site policy" items.

# Check the indices in parallel?
#
# -if the indices you are using take less than 2 GB of space, and you have at least
#  as much physical memory as indices, then you want this enabled.
#
# -if you are using a 64-bit machine and you have enough physical memory to contain
#  the indices you are using, then you want this enabled.
#
# -otherwise, leave it commented-out.

#inparallel

# If no scale estimate is given, use these limits on field width.
# minwidth 0.1
# maxwidth 180

# If no depths are given, use these:
depths 10 20 30 40 50 60 70 80 90 100  <- remove "#"

# Maximum CPU time to spend on a field, in seconds:
# default is 600 (ten minutes), which is probably way overkill.
cpulimit 300

# In which directories should we search for indices?
add_path /usr/share/astrometry/data

# Load any indices found in the directories listed above.
#autoindex <- insert " #" (makes the line to comment)

## Or... explicitly list the indices to load.
#index index-219
#index index-218
#index index-217
#index index-216
#index index-215
#index index-214
#index index-213
#index index-212
#index index-211
index index-4210 <- remove „#" and rename "index-210" to  „index-4210" (right name of index file in the directory)
#index index-209
:
:
```

If a picture can not to be solved with this setting, it can be changed to the default backend.cfg and a new run can be made. If the solution based on another index file, the comment character can also here in the specially tailored backend.cfg file are removed (also rename 2xx 42xx).

The same procedure also applies to the first use of telescopes: first determined by the log standard backend.cfg which index files take place on the basis of the solutions, then as described above tailored for the respective telescopic backend.cfg generate (or the standard customize file).