

## TIVOLI ASA DDM85/N12 ASTROGRAPH OBSERVATORY USER MANUAL

The observatory is set up for full remote operation, all parameters are set, and the telescope is collimated, the mount is set up with an all sky-pointing model, which allows an unguided image of 10 minutes.

The observatory automation is controlled by ASA Sequence and will be described later in this manual. It is still possible to do manual imaging by using Maxim DL and the SKY 6 as planetarium software.

The system is fitted with a ZWO ASI 6200 MM Pro CMOS Camera, the FLI CFW 3-12 is fitted with a full set of Astrodon Gen.2 LRGB filters, 3nm Ha,OIII and SII filters and a Astrodon Johnson UBVRi photometric filter set.

The system is currently setup for unguided operation; the low read noise of the ZWO camera keeps the necessary exposure time in the range of 60 to 180 sec. for Luminance and 90 to 240 sec. for RGB and a maximum of 500 sec. for Narrowband.

### STARTING THE OBSERVATORY FROM SWITCHED OFF STATE

Usually the computer in the observatory is running as it also acts as server for the weather data, so except for periods of thunderstorms there is no need to switch off the computer.

On the Desktop you will find the **Expert Power** Icon, switch on the channels: 1, 2,3,4,5. You can also switch the channels manually by pressing **select and OK**, on the Expert Power Device in the Rack.

In principle, you can always leave these channels switched on during your stay.

**The mount must never be switched off!**

The screenshot displays a control interface for the observatory's power system. It features a list of components with their current status and control buttons. The components are: Mains Monitor (ON), DDM85 (ON), CFW ATLAS 12V (ON), Monitor (ON), Camera (ON), Light (OFF), Rack Fan (OFF), and Computer (ON). Each component has 'On', 'Off', and 'Reset' buttons. Below the list, the current current is shown as 'Current Irms=0.6 A 24h min=0 A max=0 A'. A 'Reset Min Max' button is located at the bottom.

<input checked="" type="checkbox"/> ON	<b>Mains Monitor</b>	<input type="button" value="On"/> <input type="button" value="Off"/> <input type="button" value="Reset"/>
<input checked="" type="checkbox"/> ON	<b>DDM85</b>	<input type="button" value="On"/> <input type="button" value="Off"/> <input type="button" value="Reset"/>
<input checked="" type="checkbox"/> ON	<b>CFW ATLAS 12V</b>	<input type="button" value="On"/> <input type="button" value="Off"/> <input type="button" value="Reset"/>
<input checked="" type="checkbox"/> ON	<b>Monitor</b>	<input type="button" value="On"/> <input type="button" value="Off"/> <input type="button" value="Reset"/>
<input checked="" type="checkbox"/> ON	<b>Camera</b>	<input type="button" value="On"/> <input type="button" value="Off"/> <input type="button" value="Reset"/>
<input type="checkbox"/> OFF	<b>Light</b>	<input type="button" value="On"/> <input type="button" value="Off"/> <input type="button" value="Reset"/>
<input type="checkbox"/> OFF	<b>Rack Fan</b>	<input type="button" value="On"/> <input type="button" value="Off"/> <input type="button" value="Reset"/>
<input checked="" type="checkbox"/> ON	<b>Computer</b>	<input type="button" value="On"/> <input type="button" value="Off"/> <input type="button" value="Reset"/>

Current Irms=0.6 A 24h min=0 A max=0 A

## STARTING THE MOUNT (only required after a power failure)

The mount should never be turned off. However, if it has been switched off due to a power failure or other reasons, the following must be done: the telescope is parked in Position 1 (roof):



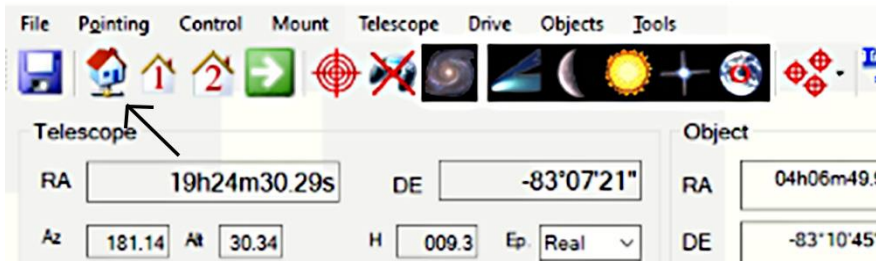
In **Autoslew** press the red 'Motor is OFF' button -> it will start the hall find to complete, which may take a while:

The screenshot shows the Autoslew software interface. The main window is titled 'Axis 2 DE' and contains the following elements:

- Settings:** Measure Time (ms) 40, Stop Size (degree) 12.0, Test Current (A) 1.00. A checkbox for 'Save optimum Test Current' is checked.
- Allowed Range of Move:** Minimum Move (arc mins) 0.10, Maximum Move (arc mins) 15.00, Measured Autofind Quality: 73/45.
- Buttons:** Start, Stop, Optimize.
- Message:** 'Please wait for Autofind'.
- Graph:** A blue graph showing a signal with the text 'Max. move was 0.22 arc min' and 'Measuring... please wait'.
- TestAngle:** 0.
- Measured Autofind Quality:** XX.
- Buttons:** OK and Exit.
- Motor Status:** Motor Stop (orange), Motor is OFF (red), Laser On, Fans.
- Messages:** A log showing system messages such as 'Welcome Autoslew Vers 5.6.0.3', 'CL Servo Vers 5.3.0.3: 2 axes init OK', and 'Synchronized on NTP Server time windows.com with time difference -79.2 ms'.
- Move-Controls:** A panel with a speed slider set to 5.00 7/s, a NumPad, and a 'Small Steps only' checkbox.
- Status Bar:** MLPT left=0m | Configuration \_03-09 cfg in use | Pier:Side West | Time to Limit= OK | 6:33:56 PM | Limits OK.

## Homing the mount (only required after a power failure)

Move DE from  $-83^\circ$  (= Park position roof) to  $-47^\circ$  (=Park position home) and press the home find icon. The mount will move in both axes to find the reference marks and display that both axes are calibrated ok.



After Homefind is finished, press the Park 1 position (=House 1 and green arrow), which is the horizontal position that is the right position to open or close the roof safe.

All limits are set correctly; there is no danger that the mount will hit the pier or any other obstacle.

## PARK POSITIONS

**Park 1 position** (=House 1 and green arrow), which is the horizontal position that is the right position to open or close the roof safe.

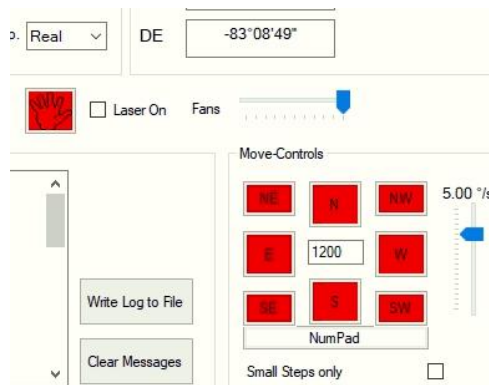
**Park 2 position** (=House 2 and green arrow), which is the location for Homefind described above and only needs to be run after the mount has been powered off.

## CAMERA CONTROL

Maxim DL 6 is used to control the main imaging camera and the FLI filter wheel, the cooler temperature of the ZWO ASI 6200 MM Pro is preset to  $-10$  degrees. DO NOT TURN to a lower temperature! NEVER turn the gain of the camera setting!

## TELESCOPE FAN

The fans must be turned on manually with the slider



## FOCUSING

The telescope is fitted with a FLI Atlas Focuser; you can use FLI Focus to manually move the focuser, beware that it has very high resolution, 105000 steps correspond to 8mm movement.

The Focus position is approximately at 56000.

Sequence is setup for automated focusing. Autofocus is activated; it will do a 'find focus' at the beginning of imaging and a refocus every 30 minutes on the focus star specified in the target file.

Alternatively, if you want to use Maxim DL for your image session, you can either find/check the optimal focus at the start of night, on a bright star with spikes, or start the Sequence autofocus routine on a mag7 or mag8 star of your choice near your target by pressing the Autofocus button in Sequence.

Sequence automatically applies filter offsets- this is already programmed.

## ROOF CONTROL

The remote hand controller can operate the roof

The Telescope does not totally clear the roof, so take care that the scope is in Park position 1 when operating the roof.

## AUTOMATION

The system is set up for automated operation with ASA Sequence and Maxim DL.  
You can use whatever package you are familiar with.

## SEQUENCE

Start **Sequence** – press **Connect**. This will connect Sequence to telescope, focuser, camera, plate solving tool.

Autofocus is activated; it will do a 'find focus' at the beginning of imaging and a refocus every 30 minutes on the focus star specified in the target file. Sequence automatically applies filter offsets- this is already programmed.

Alternatively, if you want to use Maxim DL for your image session, you can either find/check the optimal focus at the start of night, on a bright star with spikes, or start the Sequence autofocus routine on a mag7 or mag8 star of your choice near your target by pressing the **Autofocus** button in Sequence.

If you want to start imaging with Sequence at a certain time, go into **Settings/Sequence**, insert the desired start time in the Sequence Start Time (UTC) field, and press the **Apply** button. You also can set the save location of your images in the 'File preferences' field.

Press **Sequence Run** button – **Set Targets** – fill in ‘Object Coordinates’ and ‘Focus Star Coordinates’.

Save the target file, the file name will be used as image file name by Sequence.

**Set exposures** – click Do – insert Nr (of exposures) – choose Filter – choose a Suffix – choose Exposure(s) – Binning – Dither

For Luminance an exposure time of max. 180 sec. is recommended. For RGB a max. of 240 sec. For narrow band imaging an exposure time of 500sec is a better fit. To maintain round stars with exposures longer than 180 seconds it is recommended to check the **MLPT** field. Sequence will take several pointing pictures along the path of the target object over the course of the chosen total exposure time and adjust tracking accordingly. Save the exposure file with the name of your choice.

By double clicking into the empty ‘Name of Target’ field a list of target files pops up to choose from. The same applies to the ‘Exposure Settings’ field, where a list of exposure settings files pops up.

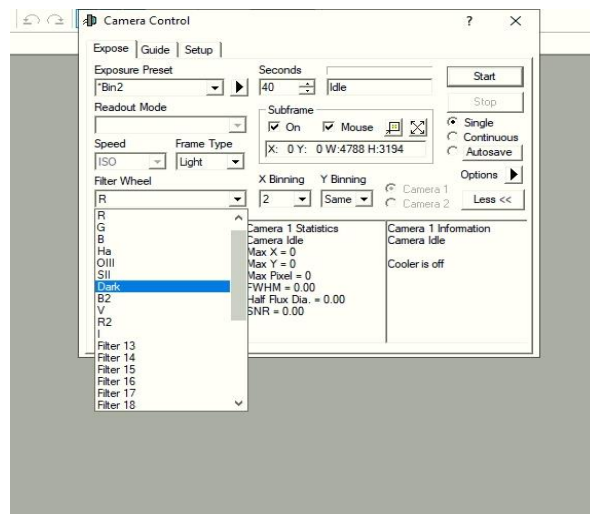
You will find your created files there, or just choose an already existing one from previous nights.

Pressing **Start@Time** will start imaging at the chosen time (see above), **RunNOW** will start imaging immediately. Sequence will park the telescope after finishing imaging.

At the end of the imaging night disconnect Sequence and and power off the cooler of the camera if it is not done by Sequence and turn off the telescope fan and don’t forget to close the roof.

## CALIBRATION FILES

There is a slot in the filter wheel with a black filter inside to do bias and darks:



## PERFORMANCE NOTES

As mentioned earlier the system is fully setup, the mount runs with an all sky pointing model and unguided performance should be ok for exposure times up to 3 min. If you need longer exposure times, you can use the MLPT function in Sequence.

The RGB ratio of the filters is close to 1:1:1.3 you will achieve good color balance with very little scaling.

## IMPORTANT

Please do not change any mechanical or software settings of the system without the permission of the administrator, an automated system relies on the function of all components and might be rendered useless by changing any of the settings. Camera and filter wheel must not be rotated.

Do not attempt to collimate the telescope, the telescope is well collimated and some effects that can be misinterpreted as decollimation are related to seeing or tube currents and will usually go away once the telescope has reached ambient temperature.

You will occasionally see some ftp upload messages in the taskbar of the pc, no need to worry about that, it is the upload of the weather data to the status website.

Never open the flap at the wall to the south!



**We wish you a pleasant stay and productive imaging session**