User Manual

Thai Robotic Telescope Control System 1M & 0.7M

National Astronomical Research Institute of Thailand (Public Organization)

1. Telescope Control System
    - Run TRT Interface
    - Mount Controlling
    - Rotator Controlling
    - Focuser Controlling
    - Auto Focus
    - M3 Controlling
    - Display status and Tracking object
2. Dome Control
3. Weather Report
4. CCTV Camera
5. Electrical Control System
6. Tools
7. Conditions for closing and opening dome
8. Connecting CCD with MaximDL
9. Operation after you completed jobs
10. Available CCD and Filter Wheel

1. Telescope Control System

User clicks on the icon to run TRT interface.

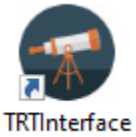

Fig 1.1 TRT Interface Icon

TRT interface will open, shown in figure 1.2.

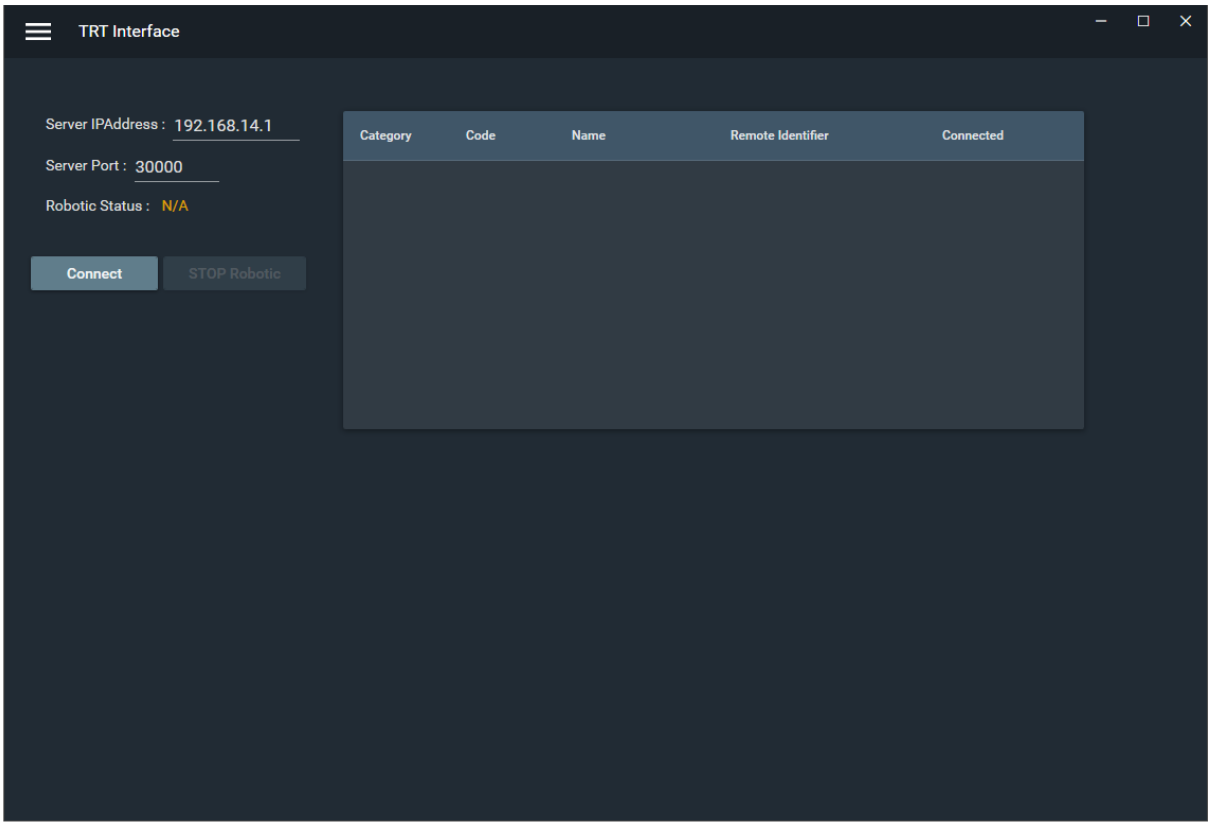

Fig 1.2 TRT Interface

Click the “Connect” button to list all available connected instruments such as telescope, CCTV and weather report shown in figures 1.3.

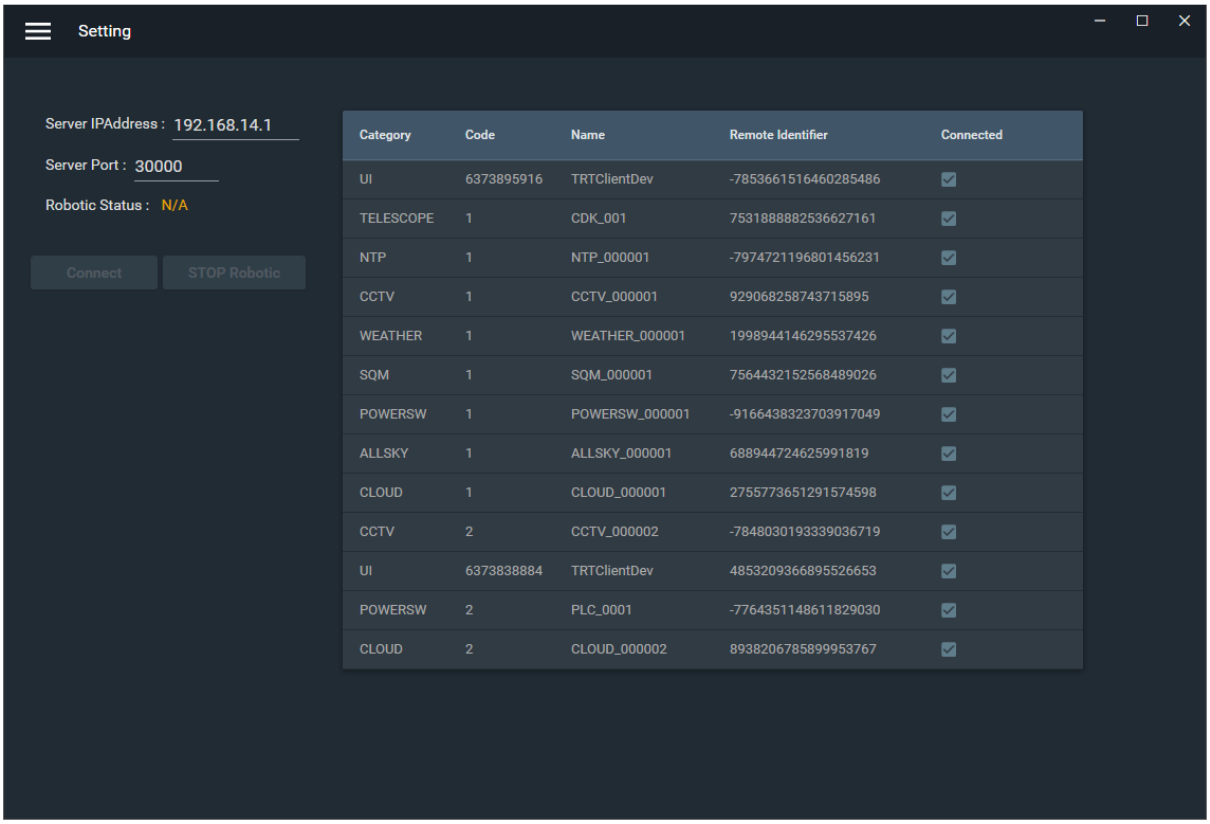

Fig 1.3 display all connected instruments.

* If the application is the Robotic Mode, the “STOP Robotic” button will appear. You can control telescope manually by clicking the button to stop robotic mode.

Main Menu

To display main menu shown in the left window as figure 1.4, click the top left bar icon.

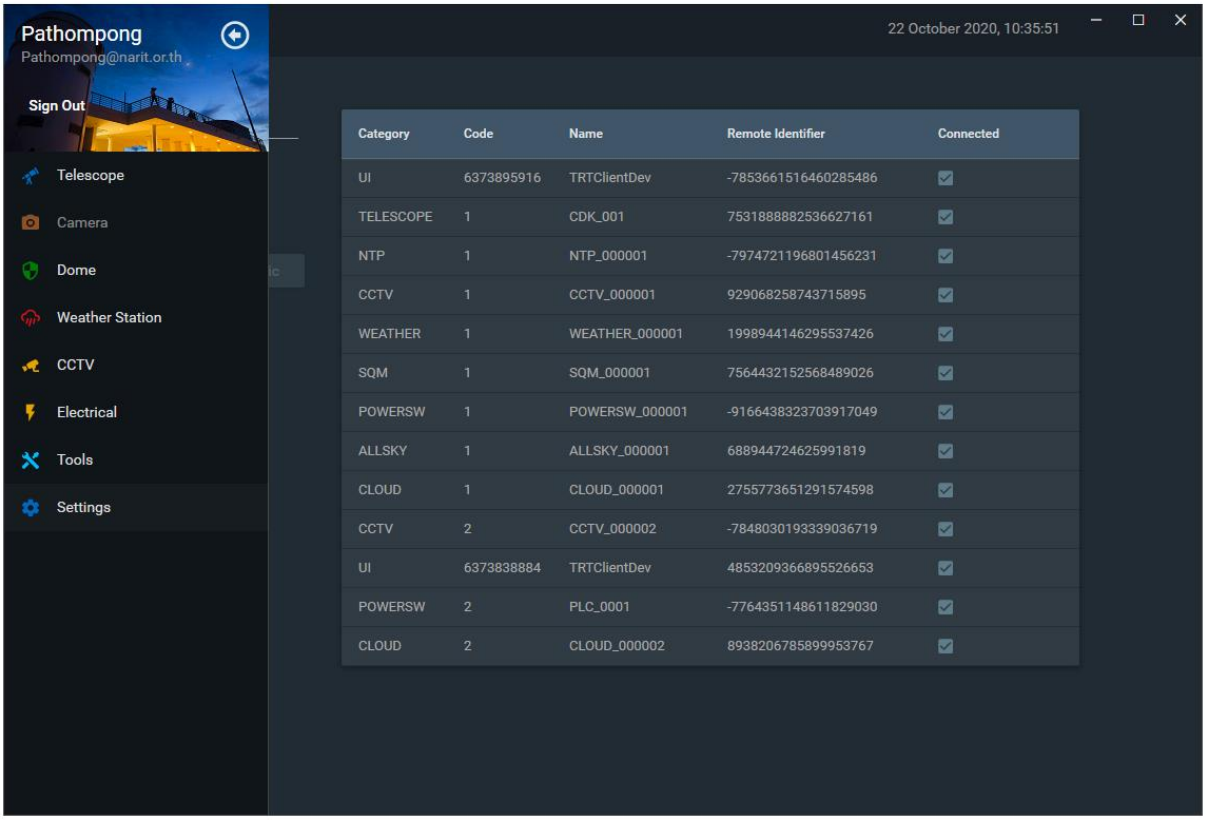

Fig 1.4 The display main menu shows on the left.

Telescope Control Window

When you selected “TELESCOPE” from the main menu, the interactive sky chart window will appear.

Fig 1.5 Main telescope control window with interactive sky chart feature.

Instrument connection and status

Green text indicates the current connection if it is activated. To enable and disable the instrument, click the button.

Fig 1.6 Display connection and status for each instrument.

- **Connect**: connection between telescope and controlling computer.
- **Enable**: enable an application to control the telescope.
- **Focuser**: focuser's connection status.
- **Rotator**: rotator's connection status.

* Normally, they always connected and there is no need to turn them off. But you can click to turn it on if it is deactivated. The green color indicates enable status.

Mount Tab

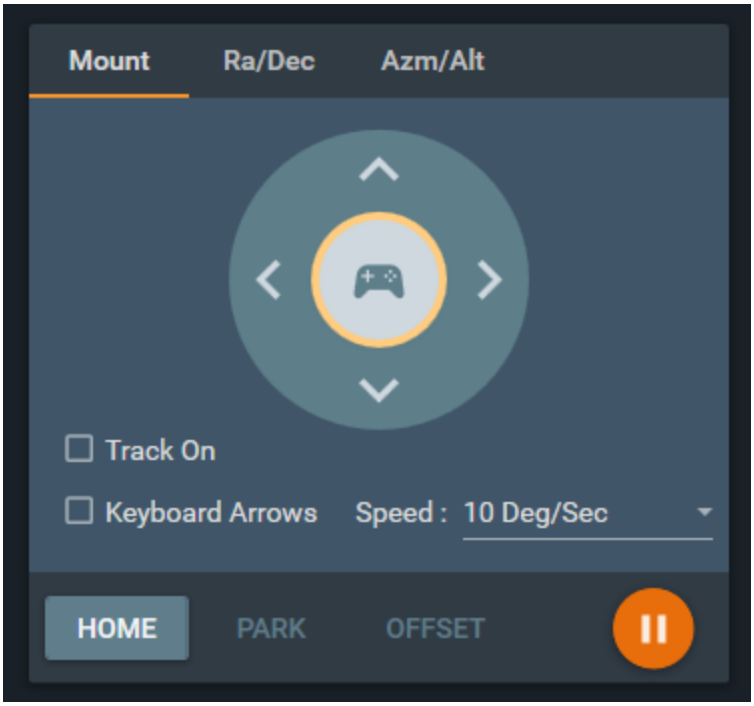

Fig 1.7 Mount control tab.

In this tab it displays about:

- Arrow button to jog & offset telescope
- Track on/off status
- Enable Keyboard Arrow keys
- Jog & Offset Speed (In Additional details, please use Offset Tool)
- Home / Park / Offset and Stop Button

Ra/Dec & Az/Alt Tab

You can use this tab to move telescope to specific target by changing Ra/Dec or Azimuth/Altitude value. If the telescope can not move to your coordinate, the alert message will prompt to notify you.

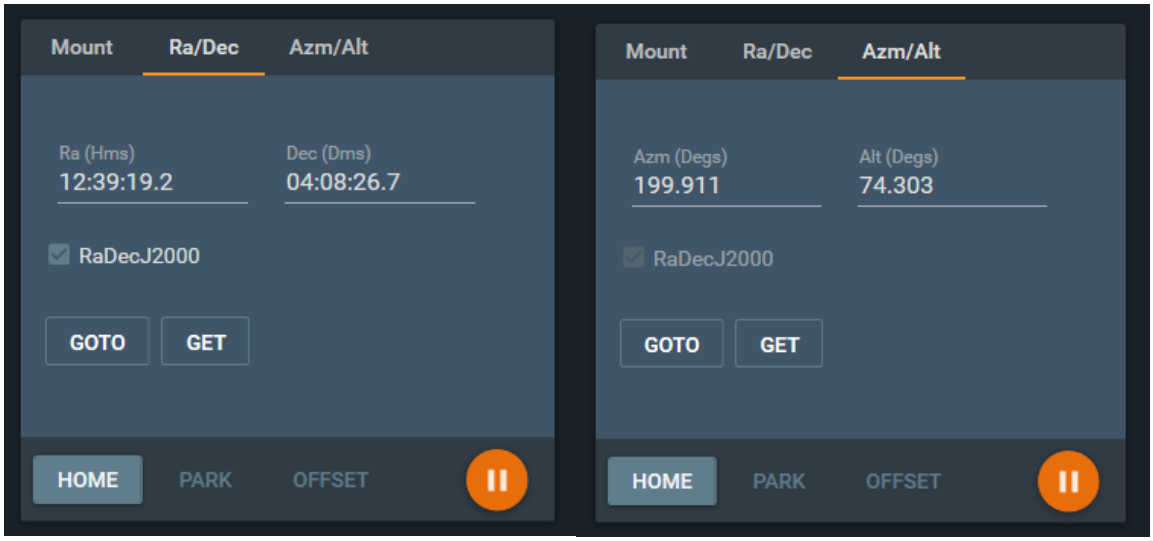

Fig 1.8 Ra/Dec input tab

You can click “GET” button to obtain the current telescope position.

And “GOTO” button to move to the target.

M1 Cover Tab

This tab will be available for **only 1M Telescope**.

Just make sure that it is open before starting your observation.

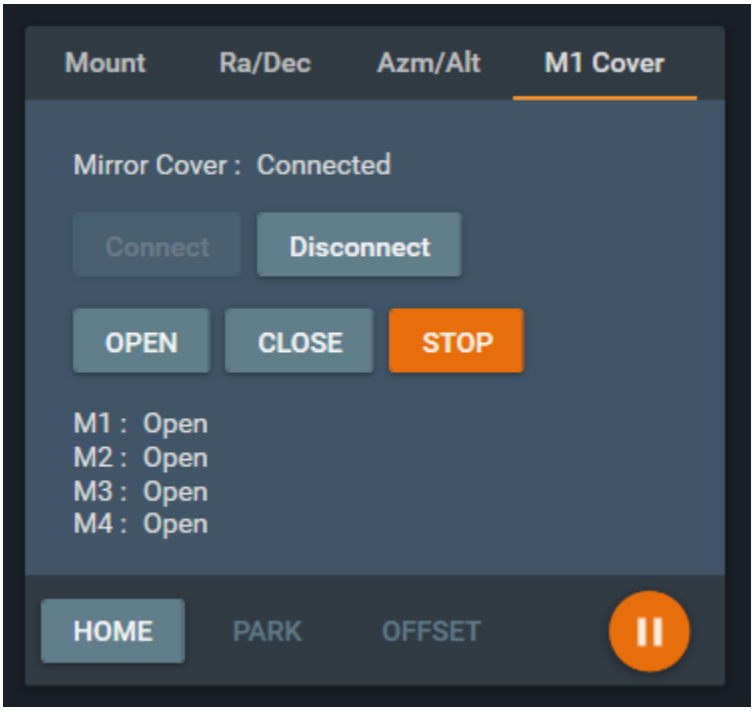

Fig 1.9 Mirror Cover control tab

Offset Panel

When you click “OFFSET” button, the offset window will display as figure.

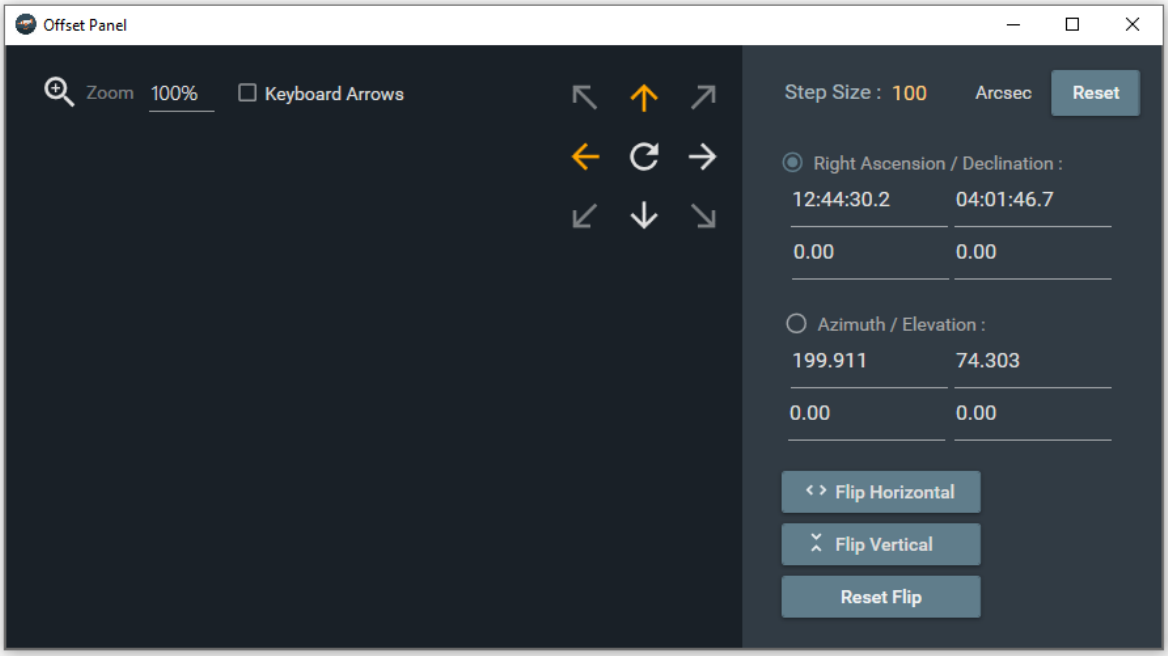

Fig 1.10 Offset panel window.

You can use two mode of offset, Ra/Dec or Azm/Alt.

And a tool to flip offset direction to match your picture.

* offset value will ~~be~~ contain in the application. Whatever object you move after this, it will be affected. If you want to reset to original value, just click the “Reset” button on the right.

Rotator Tab

First tab in second box is the Rotator control tab.

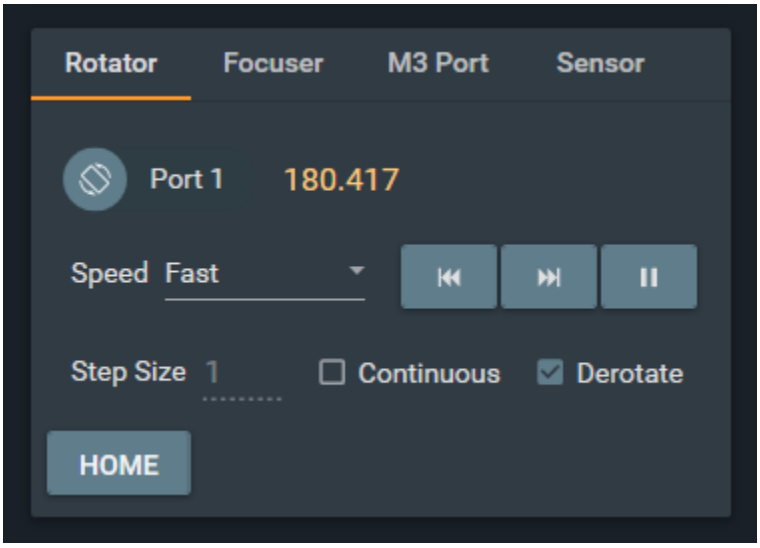

Fig 1.11 Rotator control tab.

This tab shows information about rotator status such as a current port and

Rotator position.

*Normally, we will home rotator before making ~~a~~ the first observation.

You can click on the rotator position value to get a pop-up input dialog, then you can set a position to move.

* Usually, we start at 0 for 1M Telescope and 180 for 0.7M Telescope.

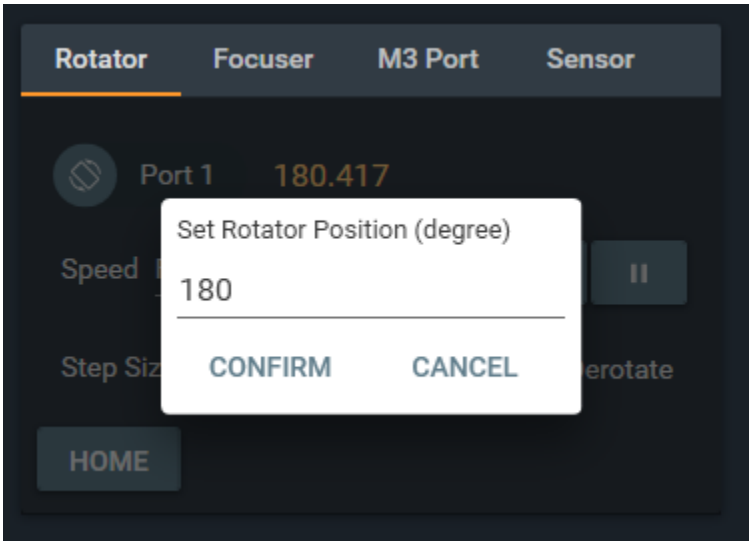

Fig 1.12 Rotator input dialog.

Or you can move by manually with << / >> button for speed level that you want at speed dropdown menu.

Focuser Tab

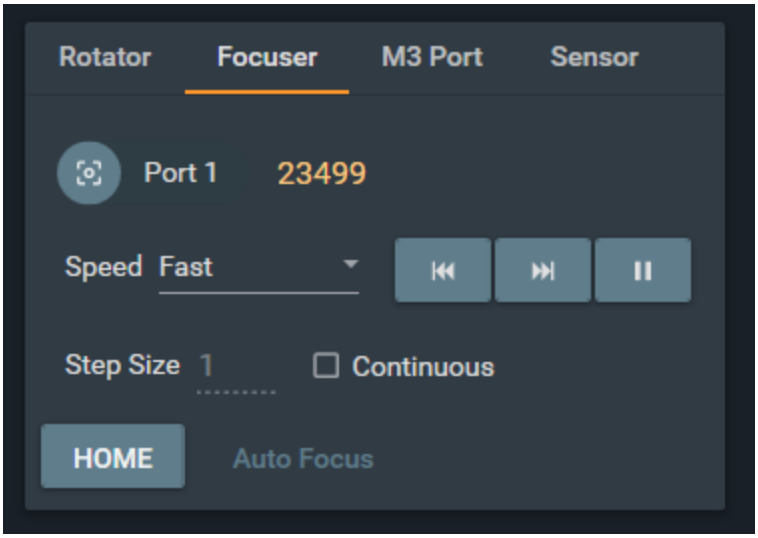

Fig 1.13 Focuser control tab.

This tab shows information about focuser status such as a current port,

Focuser position.

* No need to home.

You can click on the focus position value to get a pop-up input dialog, then you can set a position to move.

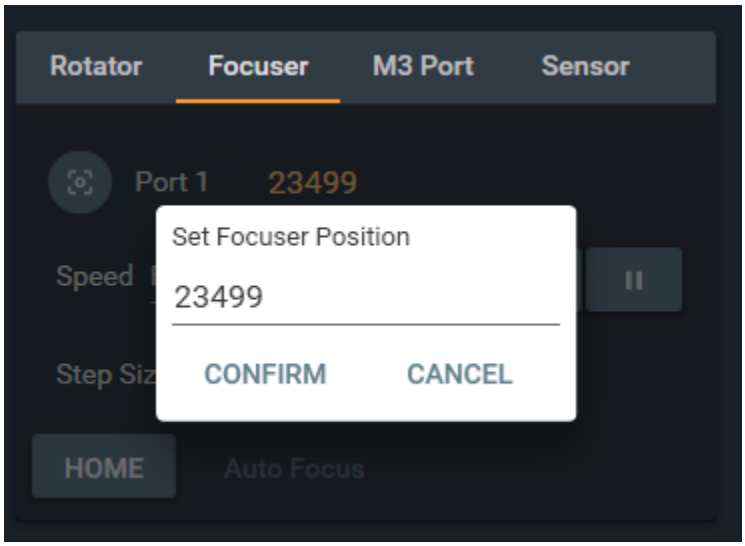

Fig 1.14 Focuser input dialog.

Or you can move by manually with << / >> button for speed level that you want at speed dropdown menu.

Auto Focus

When you click “Auto Focus” button, the Auto Focus window will be appeared.

* You must connect to Maxim DL first in Tools Menu before using Auto Focus system.

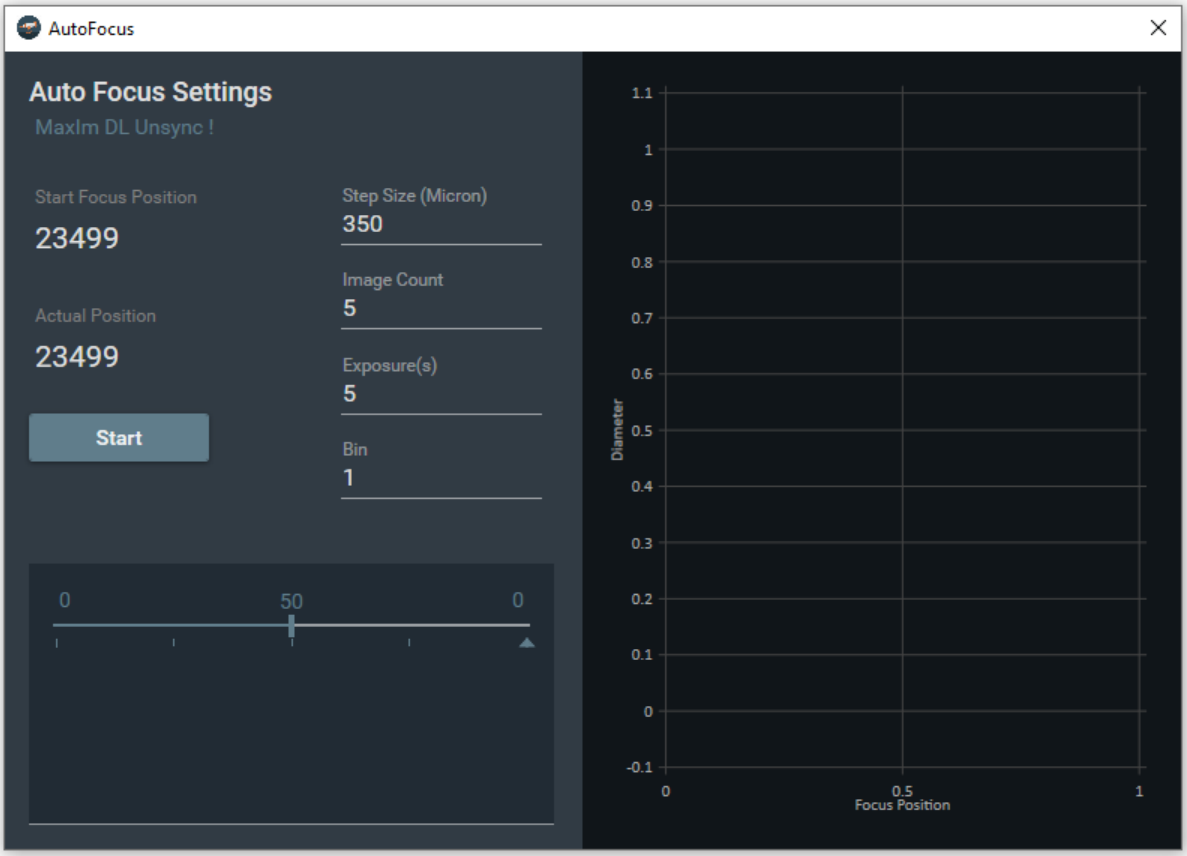

Fig 1.15 Auto Focus Window

This window will provide you an optimal focus position.

- Step Size: move focus position step for each exposure.
- Image Count: number of images for making an exposure.
- Exposure: exposure time for each image. (sec)
- Bin: image bin size.

After you fill an input then you click start to make an auto focus.

If the system fine the optimal value, it will ask you to confirm to move immediately or not.

M3 Port Tab

When you click M3 Port Tab, it will display information about M3 such as a current port, Pointing Model Name.

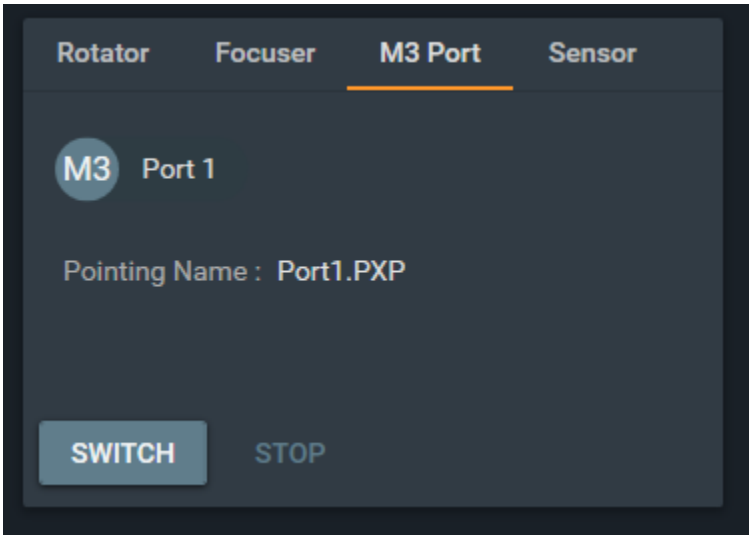

Fig 1.16 M3 Port status.

You can click “SWITCH” button to change M3 between Port 1 and Port 2.

Sensor Tab

Sensor Tab will display ~~an~~ information about telescope temperature.

* Warning it is for engineer only, there is no need to do anything with that.

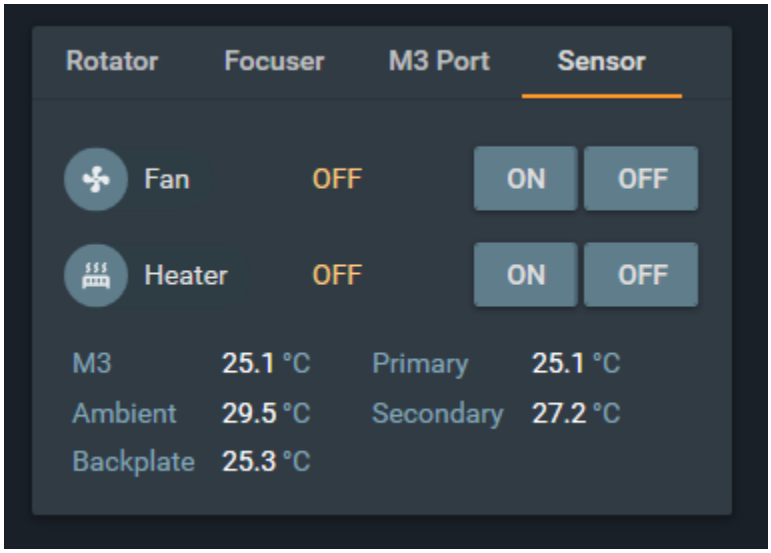

Fig 1.17 Telescope temp sensor info.

Star Map

Fig 1.18 Star Map window.

Star Map Section 1. Start Map

The Star Map displays currently present sky and visible object. You can choose whatever you need to display by using button menu tab.

When you click on an object in the star map, the dialog will appear on the bottom right. If it can move to the position, track button will be enable.

Fig 1.19 Dialog displays current selected object.

Star Map Section 2. Find Target Tool

This tool will help you to find the target that you want to make an observation.

Just type in search box and find it, sort it.

White text means the object is higher altitude than the telescope limit.

Gray text means the object is lower altitude than the telescope limit.

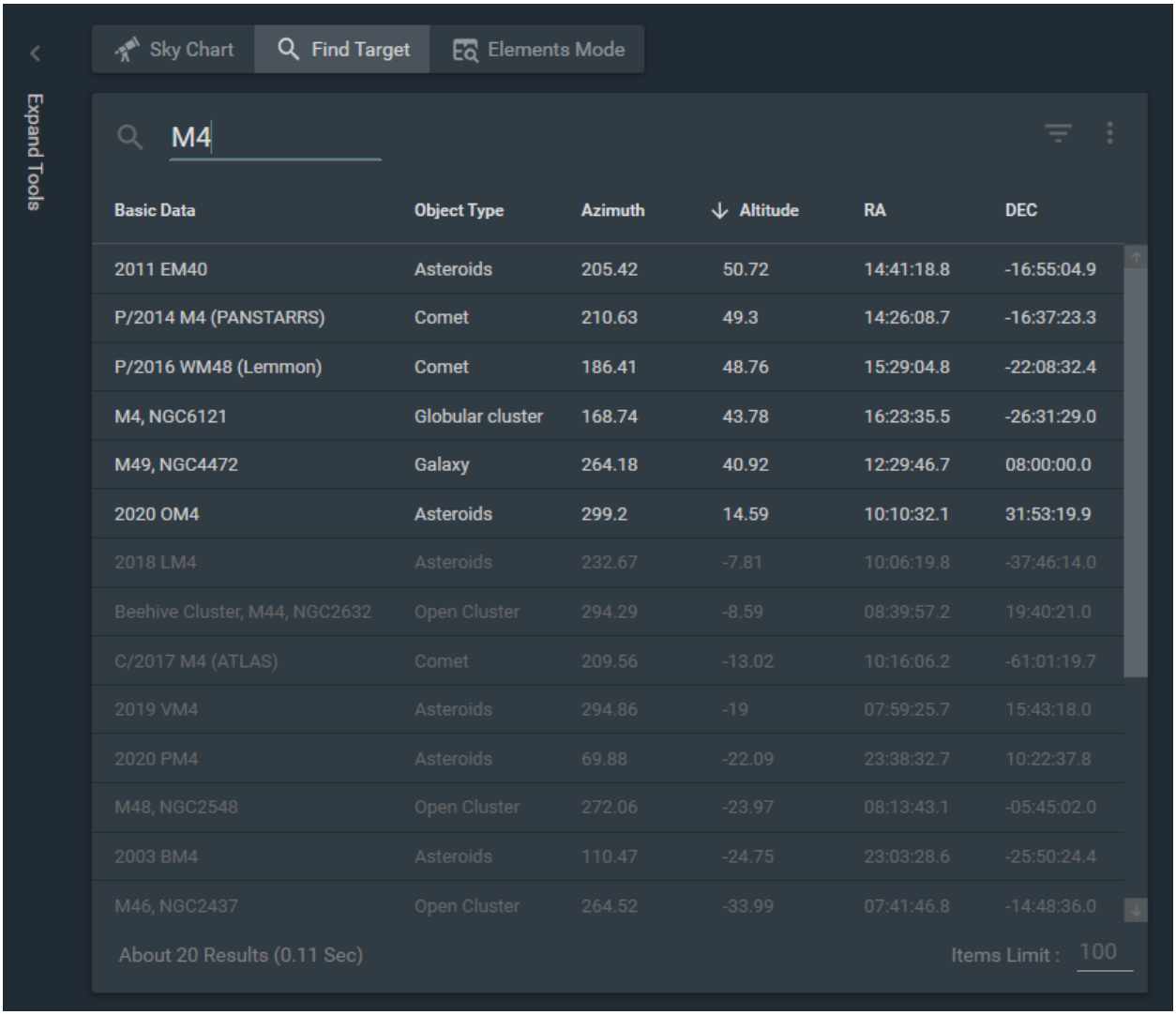

Fig 1.20 Object Search tool

Star Map Section 3. Element Mode

This tool provides you to track non celestial object like satellite by Two-Line Element (TLE) included tracking algorithms that you can choose.

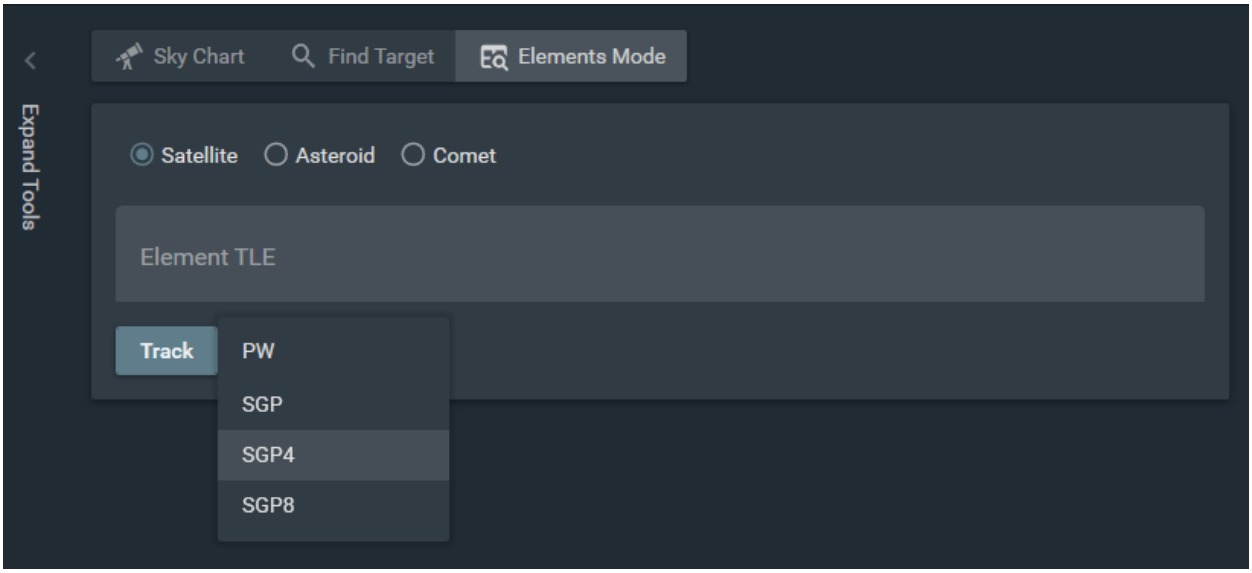

Fig 1.21 Two-Line Element input textbox.

Star Map Section 4. Telescope Status

This section displays an important information of telescope such as, mount status, tracking object, offset value, etc.

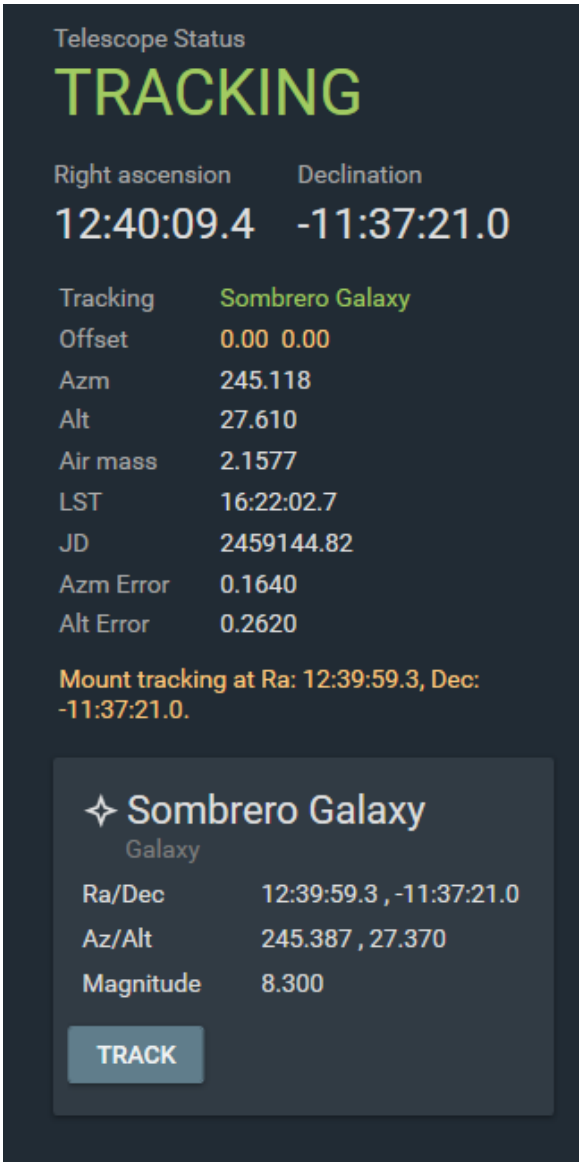

Fig 1.22 Main Telescope Status

2. Dome Control

You can access dome control by click on “Dome” menu from Sidebar.

There is two sides of shutter that you can control them separately; Shutter A and Shutter B, or you can control both of them at the same time.

Click “Enable” checkbox first for safety and then the button will be enabled to be clicked.

* Please open CCTV Camera while you open the dome.

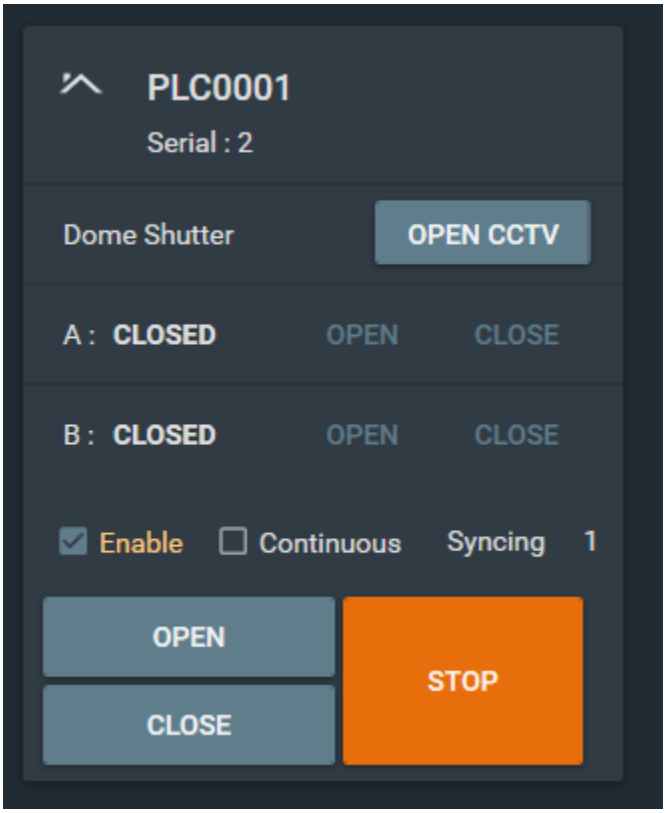

Fig 2.1 Dome Control System.

3. Weather Report

You can access from “Weather Station” menu on Sidebar.

This window displays about weather information such as humidity, temperature.

Fig 3.1 Weather Report

4. CCTV Camera

You can access from “CCTV” menu on Sidebar.

For each camera, you can separate from the main application, it is easy to switch to other window such as telescope control window.

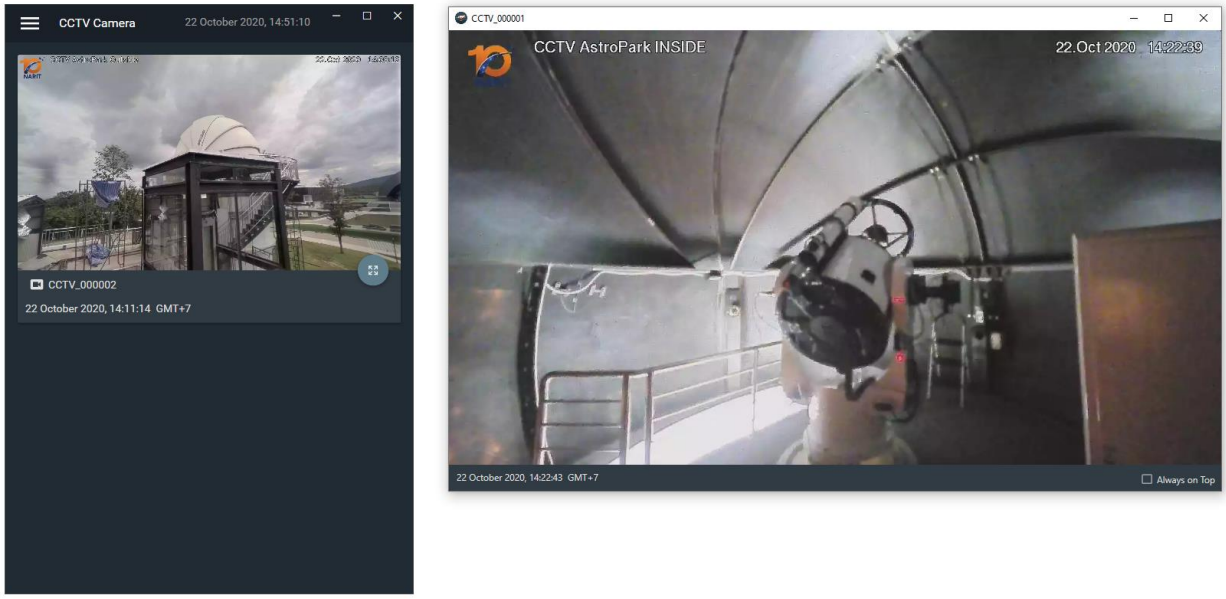

Fig 4.1 CCTV Camera.

5. Electrical Control System

You can access from “Electrical” menu on Sidebar. User can only turn off/on spotlight in this window, the password is requested for the extra usage to make a change.

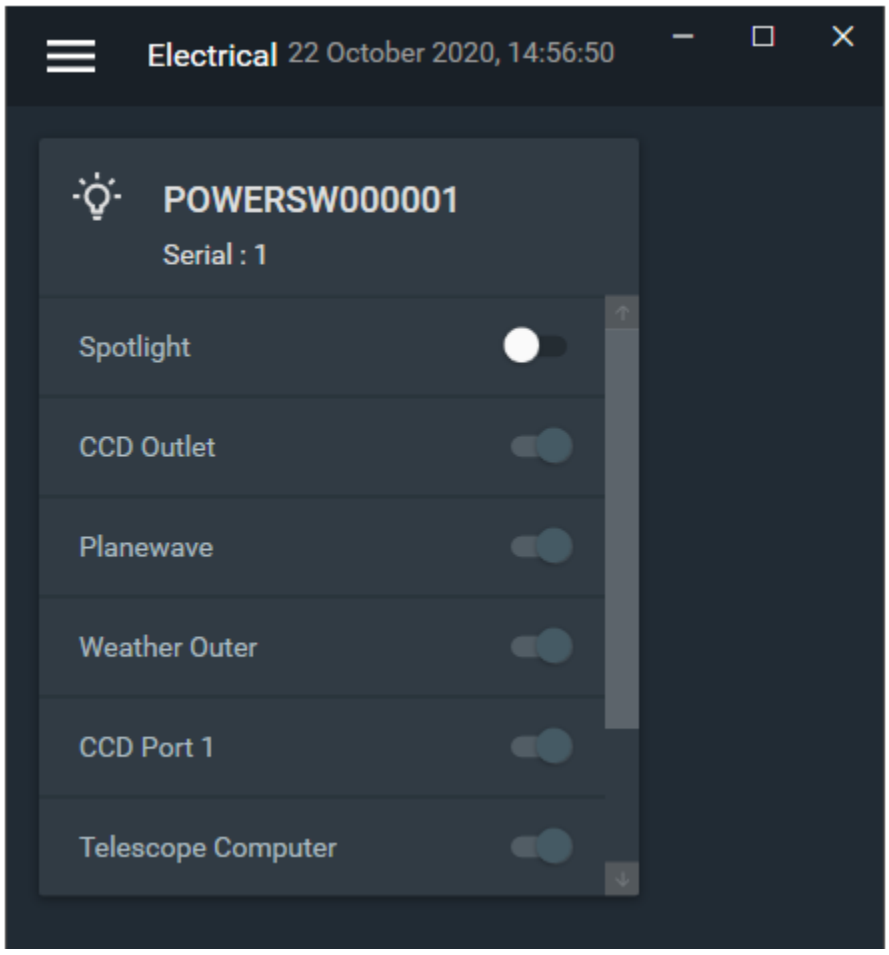

Fig 5.1 Electrical Control System.

6. Tools

In case that you use MaximDL for taking an image. If you need telescope information in FIT Header like Ra/Dec, station name, date time, ~~etc.~~ for instance, first you need to connect the application to MaximDL including Autofocus Tool

When you click “Sync”, the application will be connected to MaximDL automatically.

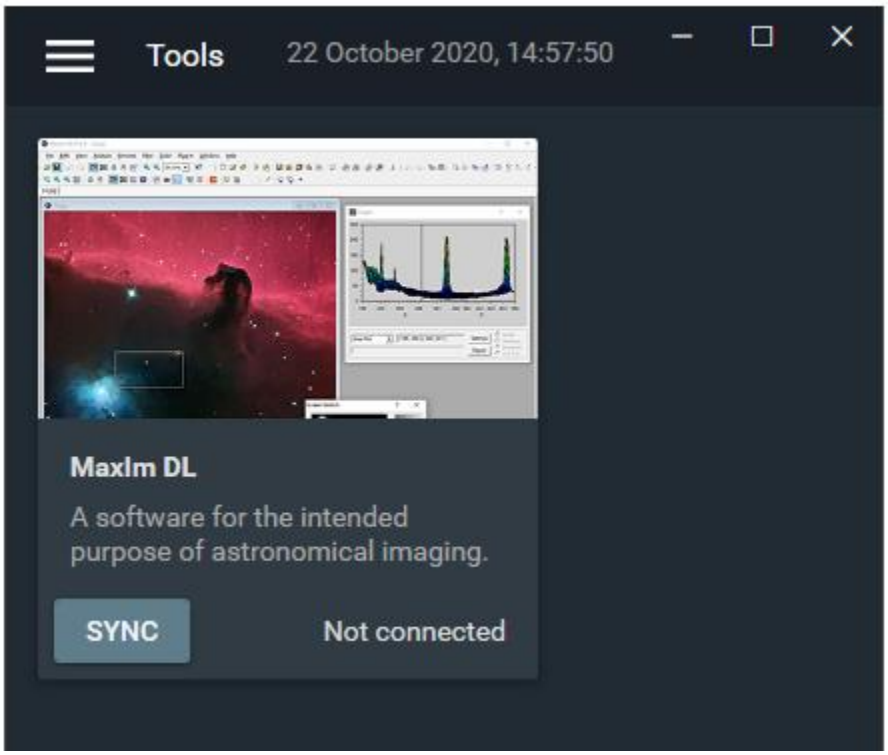

Fig 6.1 MaximDL Sync Tools.

7. Conditions for closing and opening dome

When users want to close and open the dome. Users must check the weather around the observatory with all following conditions and it must be met before opening the dome.

- Humidity is less than 90 %
- Temperature outside and Dew point is more than 2 Celsius apart
- Rain Rate is equal to 0

Users can ~~be~~ check for the weather at “Weather Station” menu.

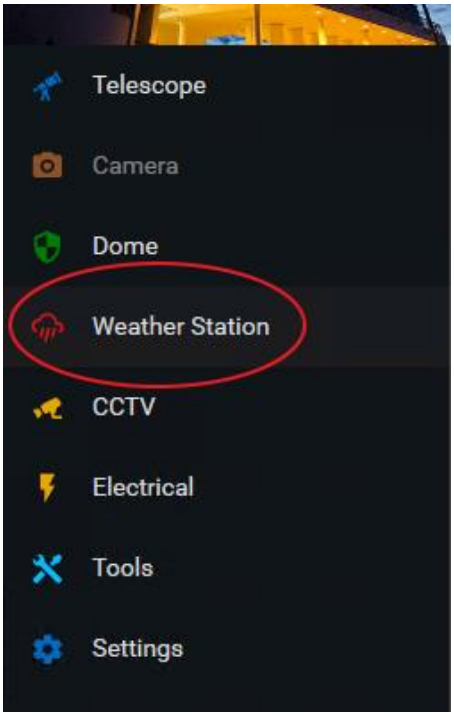

Fig 7.1 Weather station menu

In Weather station interface users can check a current value of weather

(Fig 7.2) with:

- Dew Point
- Rain Rate
- Humidity
- Temperature

Fig 7.2 Weather Station Interface

If all conditions are met, User can open the dome at “Dome” menu.

8. Connecting CCD in MaximDL

8.1. Run MaxImDL by clicking MaxIm_DL icon at Desktop

Fig 8.1 MaxIm DL icon

8.2. Toggle camera control by the icon in figure 8.2

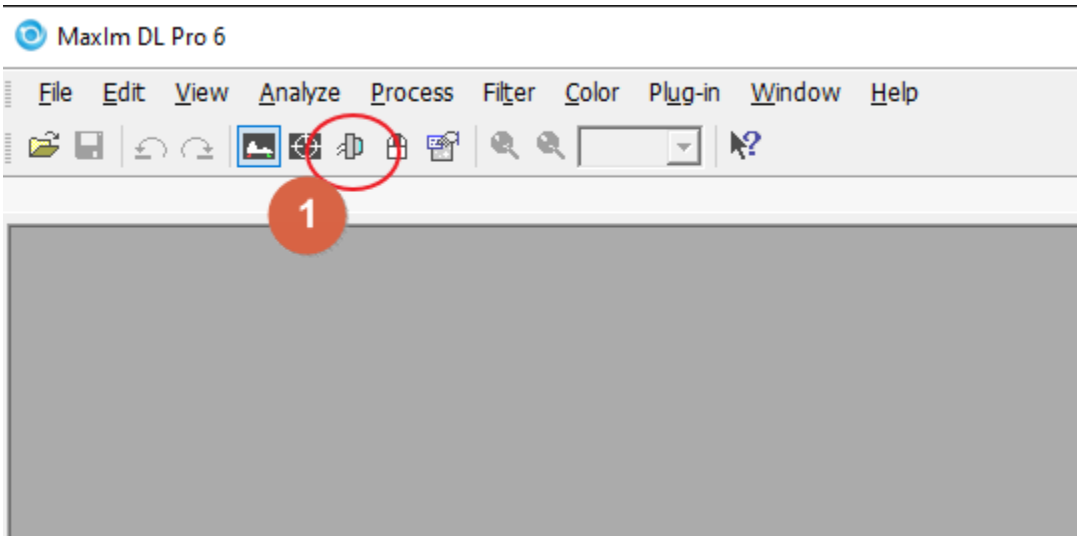

Fig 8.2 Toggle Camera Control Box

8.3. Click Connect button and Coolers to “**On**” for cooling a CCD

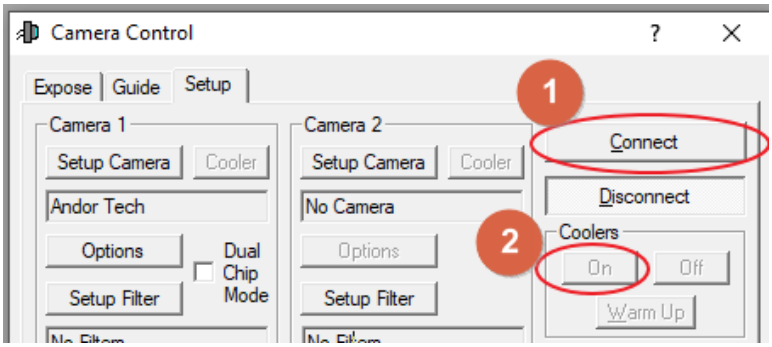

Fig 8.3 Connect and Coolers to On

8.4. Click “Expose” tab for exposing CCD for Andor CCD, you must change Subframe by checking Subframe to On and change W (Width) and H (Height) to 2048 x 2048 pixel

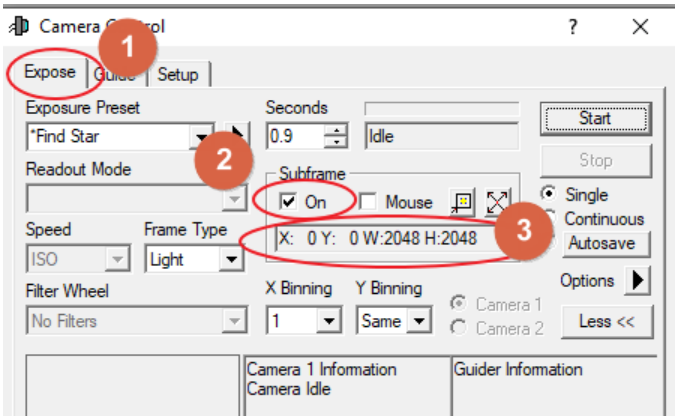

Fig 8.4 Expose tab and setting Subframe

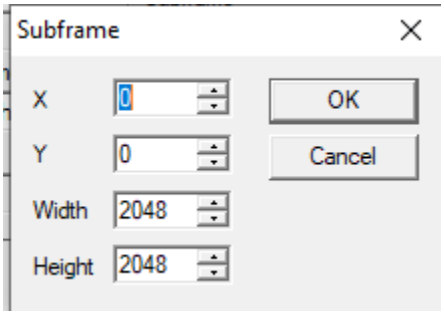

Fig 8.5 Setting Width and Height to 2048 x 2048

9. Operation after you completed jobs.

When you want to stop using the telescope, you must follow these processes

9.1. Park telescope

Go to Telescope interface click “PARK” button

Fig 9.1 PARK button in Telescope interface.

9.2. Close mirror cover

In telescope interface you will see M1 Cover tab click “CLOSE” to close mirror cover.

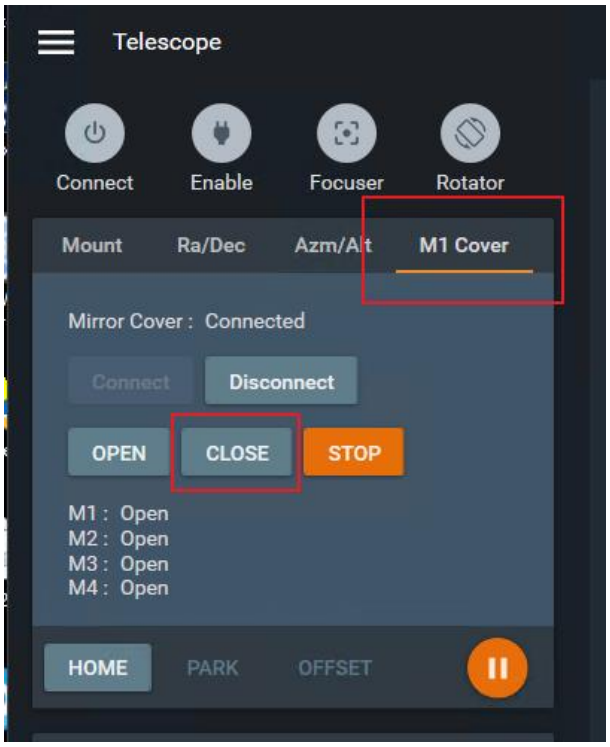

Fig 9.2 Mirror cover close button

9.3. Disconnect a CCD

If you connect a CCD with MaximDL you must Disconnect CCD. However, for warming up CCD, Click “Warm Up” and Disconnect at Camera Control box.

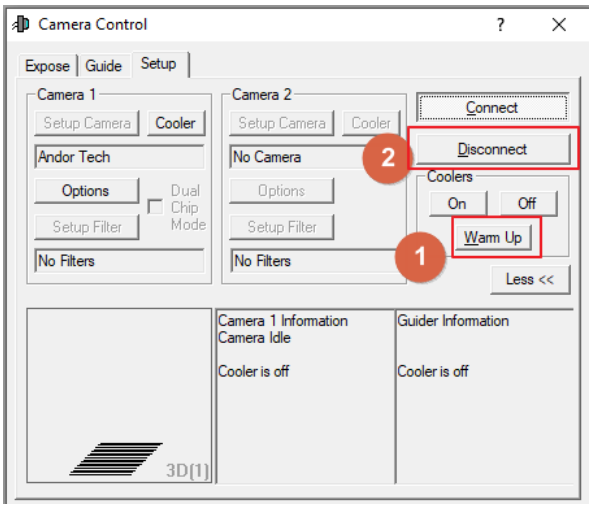

Fig 9.3 Camera Control Interface

10. 1 Meters Telescope Available CCD and Filter Wheel

M3 Port	Instruments	Model
1	CCD	Andor DZ936_BV
	Filter Wheel	FLI Center Line (CFW-3-12) 1. No Filter 2. U 3. B 4. V 5. R 6. I 7. Lum 8. No Filter 9. Red 10. Green 11. Blue
2	CCD	ZWO ASI290 MM
	Filter Wheel	Atik EFW Driver 1. R 2. G 3. B 4. L 5. CH4 6. UV 7. IR 8. No Filter 9. No Filter

Table 10.1 Available CCD and Filter Wheel