DSOP Shooter User's Manual

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1. initial setup

Download DSOP Shooter and the following external software as required.
After installing the external software, perform the following initial setup.

- ASCOM drivers for each equipments

- Plate Solver(required for plate solving)

  ASTAP or All Sky Plate Solver

  * After installing,registration of star database is required.
  * ASTAP is recommended(plate solving is faster than other).

- Auto Guider(If auto guider required)

  PHD2

  * After installing,initial setup for guiding,enabling PHD2 server,confirmation of profile name,are required.

- Planetarium Software(If you want to register/view shot target from planetarium software)

  Stellarium or Cartes du Ciel

  * After installing,enabling server function(Stellarium:Remote Control,Cartes du Ciel: TCP/IP server) is required.
  * About other setup(regist site/telescope,telescope control,etc) as planetarium,plase do it as you like.
  * Stellarium is recommended(all functions aveilable).If not Stellarium,aveilable functions are limited.
  * When using Stellarium,you can reduce FPS of Stellarium for saving CPU usage and power consumption of PC.

    1. open "%USERPROFILE%¥AppData¥Roaming¥Stellarium¥config.ini" with text editor
    2. reduce value of "maximum_fps" and "minimum_fps" (ex. maximum_fps = 5,minimum_fps = 2)
    3. save file and launch Stellarium

- Chang mount settings for auto meridian filp

If you use german equatorial mount , mount settings below are required to enable auto meridian flip of DSOP Shooter.
About changing mount setting,please confirm manual of your mount.

[a] Enable tracking over meridian,and set limit value small(1 degree over meridian,etc)
[b] Disable auto meridian flip of mount

* When shotting target , DSOP Shooter execute auto meridian flip as below:

1. If target shotting is over meridian but mount position is telescope-west,pause shotting next image and send slew command to current target.
2. After 1, check whether mount position is telescope-east. If so,melidian filp is finished.
   If not so,wait 1 minutes and try 1 again,until mount position becomes telescope-east.
3. After finishing melidian flip , continue shotting next images.

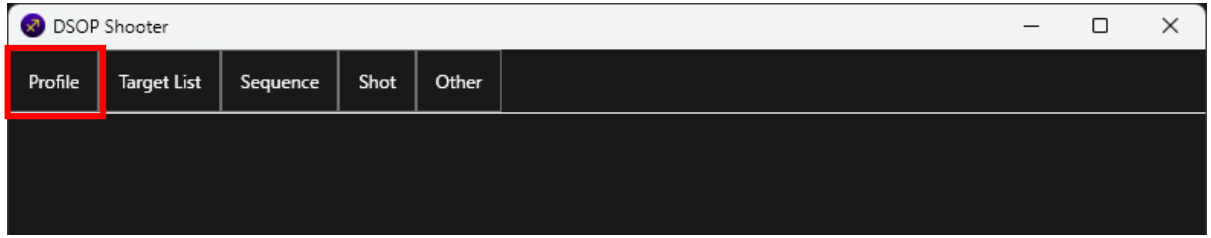
Setting change [a] is required for quickly meridian flip.
If limit value is large(ex. 10 degree),wait time while finishing auto meridian filp is also very large. So wait value should be small.
On the other hand, if you set disable tracking over meridian or wait value is zero, DSOP Shooter may not detect over meridian of target
and cannot auto meridian flip.
So enable tracking over meridian is required.

Setting change [b] is required for controling integrated management of shotting and melidian flip.
If [b] is not done,meridian flip is done by mount even if you are shotting images.

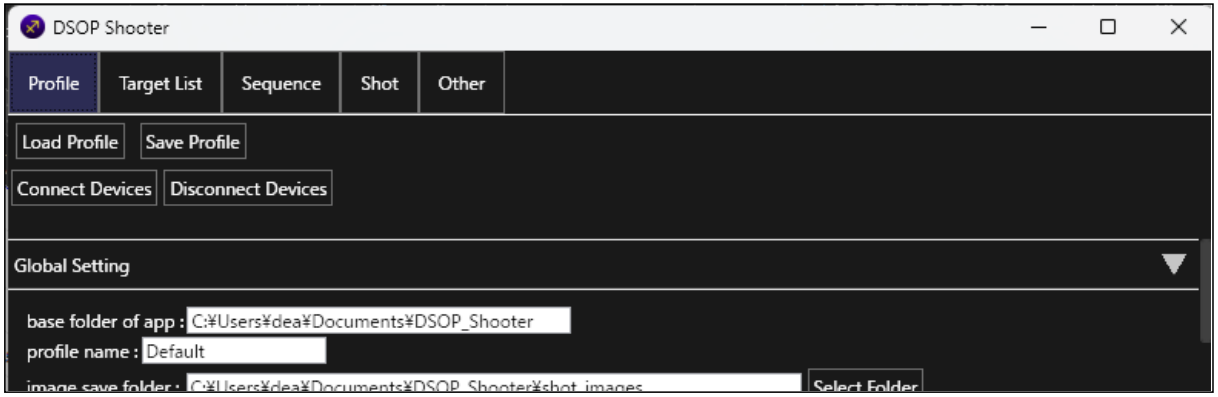
2. make profile

After initial setup,launch DSOP Shooter and regist equipments you want to use for shotting and settings.
The setup steps are as follows.

- Click "Profile" tab from header.



- After clicking,profile input view is shown as below.



- Input each setting as below for equipments you want you use.
  For unuse equipments, no setting is needed.

  - Global Setting

1. If you want to change,input path of DSOP Shooter base folder.
   In base folder , several data of DSOP Shooter(target information,shot plan data,log file,etc) are saved.

2. Input name of this pair of equipments and setting , as profile name.

3. Input or select folder to save images shot.

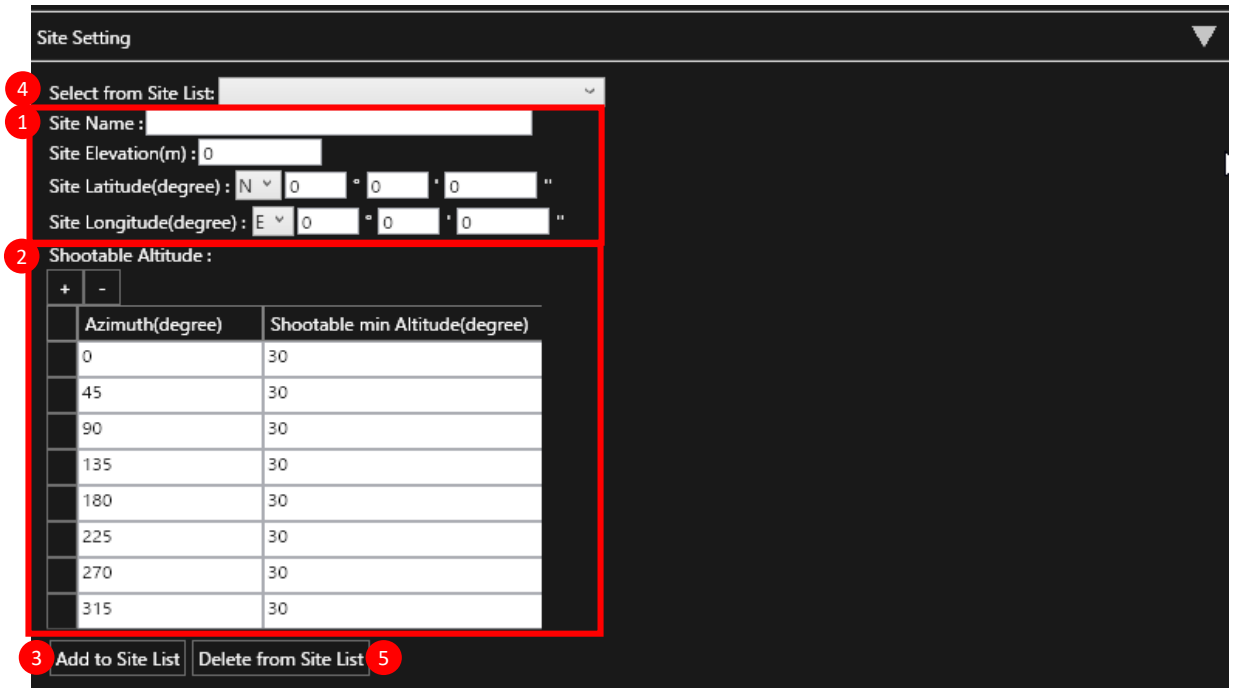
4.[Pro Edition only]
   Input retry count of shot plan , made by "4. make shot plan(sequence list)".
   If DSOP Shooter cannot continue shooting in several reason(weather becomes bad,dome closed,etc),
   execution of shot plan is retried up to counts input here.
   In Free Edition,retry is not executed and shot plan is finished.

- Remider setting

If you want to show confirmation message before starting shot plan,input confirmation message here.
(ex. "Poler alignment and check wait balance" , "Check focus manually and lock focus knob of telescope")
* It may be useful for showing TODO that can only by hand, especially in expedition or be tired.

- Site Setting

Input observation site information.
By inputing here by each observation site where you go,you can change site information of mont only in DSOP Shooter, without touching mount setting itself.



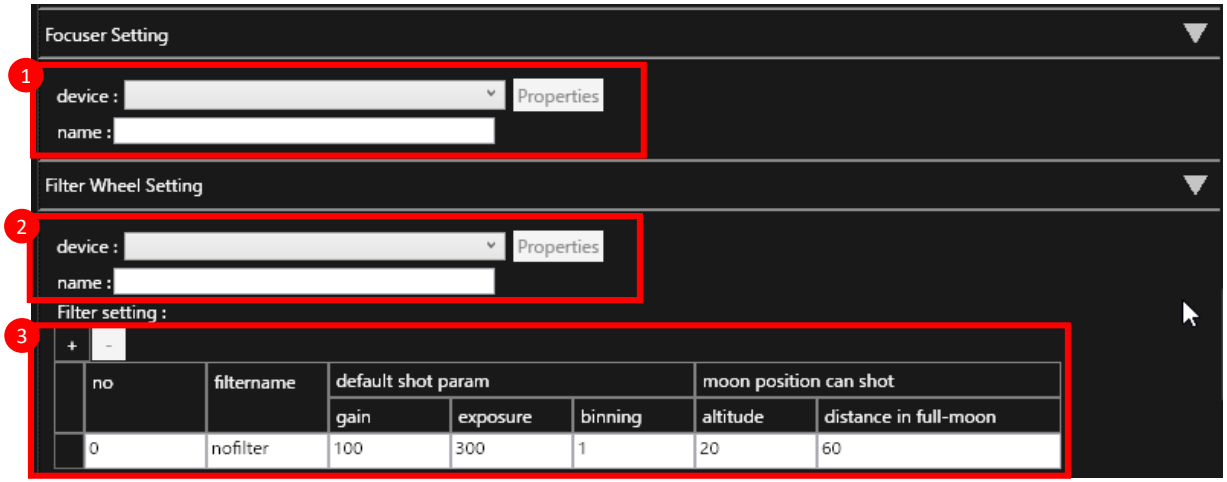
1. Input observation site information(Site name/elevation/altitude/longitude).
   This is used in viewing shot targets , and passed to mount when connecting to it if mount support receiving them.
2. If observation site has obstacles for shot(tree,wall,etc),input shootable altitude by azimuth.
   This is used in viewing shot targets and actually shotting, whether target is shot or not.
3. Click this button for saving inputs.
4. After saving by 3,setting is loaded by selecting name from here.
5. If you want to delete setting showing, click here.

- Telescope/Camera/Mount Setting

1. Input telescope name,focal length, focal ratio
2. Select camera device you want to use.If ASCOM configration is required,click "Properties" button.
   "name" is set automatically according to device selected.
3. Input cooler templature,cooling speed(cooling step in degree,wait seconds between cooling step),
   If you want to cool camera.
4. Select mount device you want to use.If ASCOM configration is required,click "Properties" button.
   "name" is set automatically according to device selected.
5. Input wait seconds after moving mount , for settle equipments on mount and shot without problem.
6. Normally not check. If you only shot dark,bias,flat in observation room,check here.

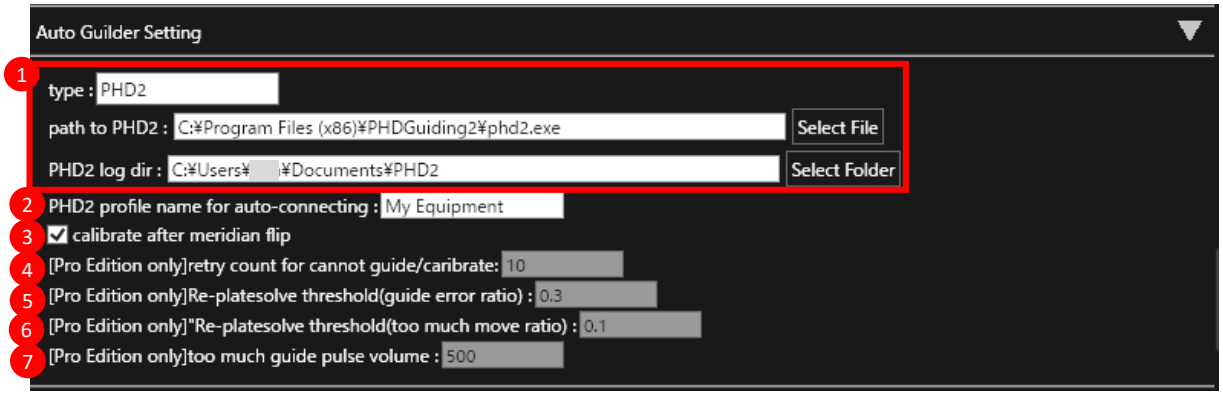
* if you have same telescope or camera,changing "name" malually for each physical device is recommended.
  (if you do so,stacking using DSOP Stacker will quite easy.Stacker can search flat/dark/bias automatically by name)

- Focuser/FilterWheel Setting



1. Select focuser device you want to use.If ASCOM configration is required,click "Properties" button.
   "name" is set automatically according to device selected.
   If you don't use this device,select blank from selection items.
2. Select filter wheel device you want to use.If ASCOM configration is required,click "Properties" button.
   "name" is set automatically according to device selected.
   If you don't use this device,select blank from selection items.
3. After selecting filter wheel,input area for setting each filter is shown in this table.
   Input filter name and , and moon altitude and distance degree from target that can shot.
   * default gain/exposure/binning size is used in making shot target,for reducing input by each targets
   * moon altitude and distance is used in making shot target,to show target can be shot or not.
   (Just only showing.In actual,target can be shot if moon altitude is hieher than here and moon distance is closer than here.)

- Auto Guider Setting



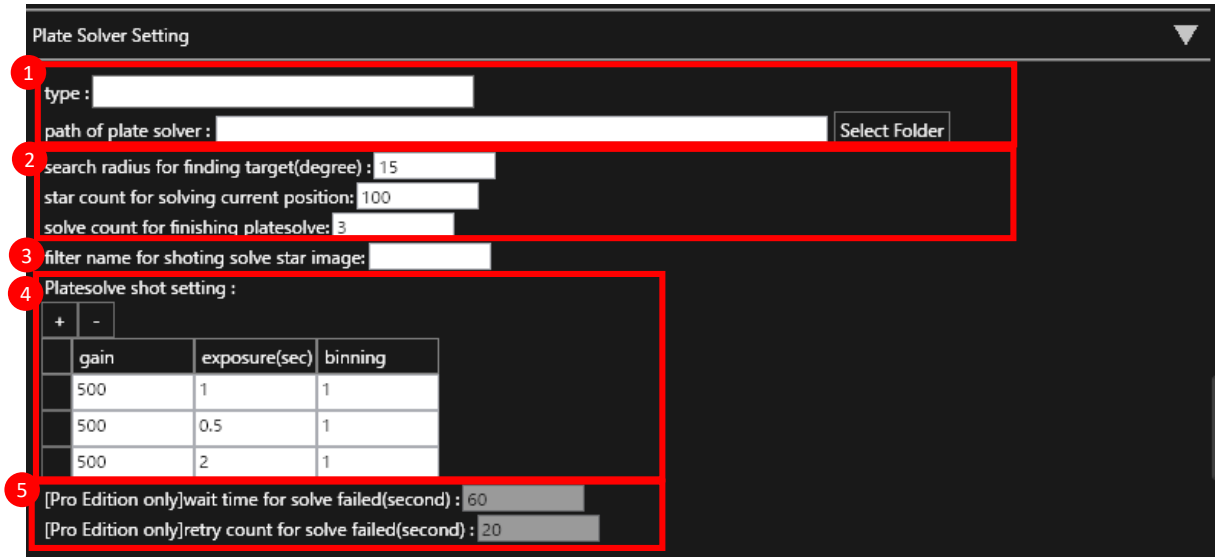
1. If auto guider is needed,select "PHD2" from type.
   "path to PHS2" and "PHD2 log dir" is automatically set if PHD2 is already installed.
   If auto guider is not needed,select blank from type.
2. If you change profile name from default or not in English,input PHD2 profile name.
   (written in Connect Equipment dialog of PHD2)
3. If calibration after auto meridian flip is not equired,check it off.If required check it on.

[Pro Edition only]

For recovering incorrect guiding by worsening weather,change default values below.

4. Input retry count when auto guider caribrate or start guiding failed.
5. Input auto guider error ratio in shotting one image.If ratio is over,platesolve again and retry shotting image.
6. Input too much move ratio of auto guider in shotting one image.If ratio is over,platesolve again and retry shotting image.
7. Input threshold move volume of auto guider for calculating 6.

- Plate Solver Setting



1. If plate solver is needed,select plate solver name from type.
   Path of plate solver is set automatically if selected plate solver is already installed.
   If plate solver is not needed,select blank from type.
2. Change search radius and star count of plate solver , and plate solve execution count if you need.
   In most case , it should be no probrem if default value.
3. Input filter name for shotting image used by plate solver.
   Filter name must be included in names that you wrote in FilterWheel setting.
4. Change gain,exposure,binning size for shotting image used by plate solver.
   Values are used in order from top to bottom in plate solving.
   (If plate solve failed in 1st value 2nd value is used -> if 2nd is failed 3rd is used)

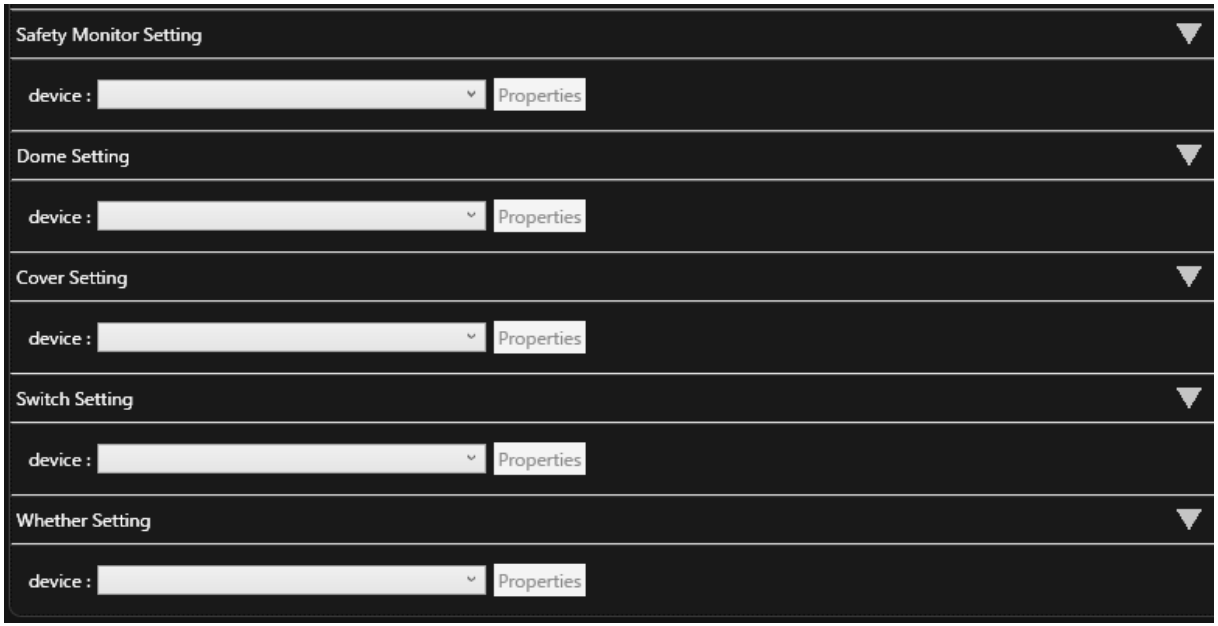
[Pro Edition only]

5. For recovering incorrect guiding by worsening weather,change wait time and retry count when plate solve failed.

- Planetarium/Rotator Setting

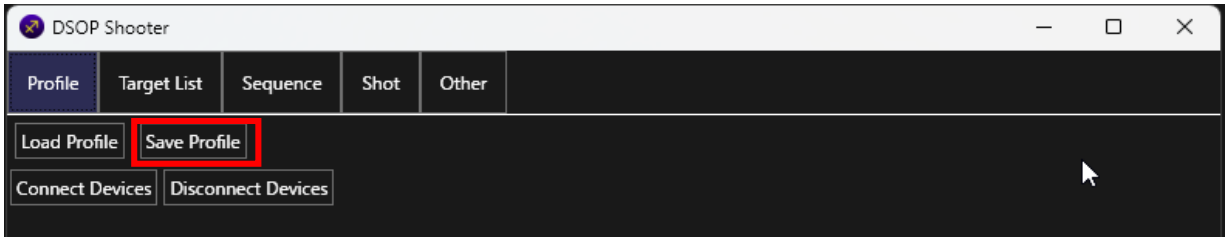
1. If you want to planetarium soft for making shot target list and shot plan,select name of planetarium from type.
   Port No is set automatically in default value of planetarium.If you change port no from default,please input value changed.
   If planetarium is not needed,select blank from type.
2. Select rotator device you want to use.If ASCOM configration is required,click "Properties" button.
   "name" is set automatically according to device selected.
   If you don't use this device,select blank from selection items.
3. input rotate degree from 0 degree of rotator , for rotating until top of FOV becomes north automatically in shotting.

- Other devices



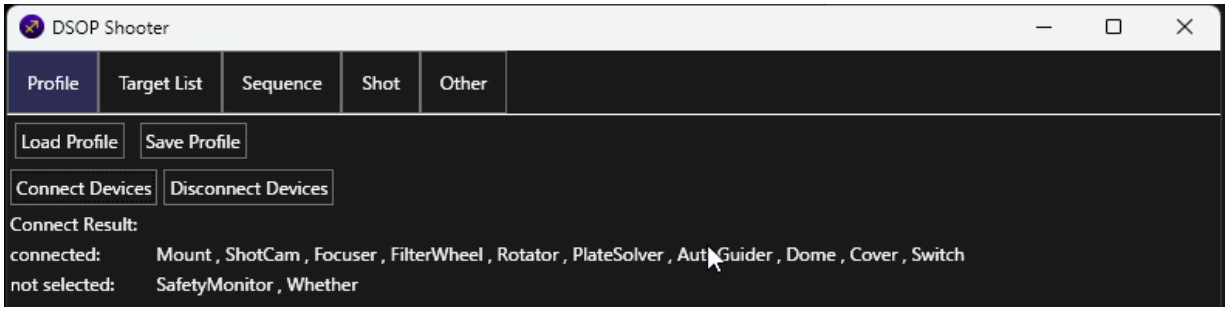
2. Select each device you want to use.If ASCOM configration is required,click "Properties" button.
   If you don't use this device,select blank from selection items.

- Once input above is complete, click "Save Profile" button for saving profile.
  Plofile saved can be loaded from "Load Profile" button. And when DSOP Shooter is starting,profile recentry used is loaded.



- Click "Connect Devices" button for connecting all devices.

  After connection finished,connection result is shown as below.
  If connection error found,please confirm device connection of PC ,etc.



[Note]

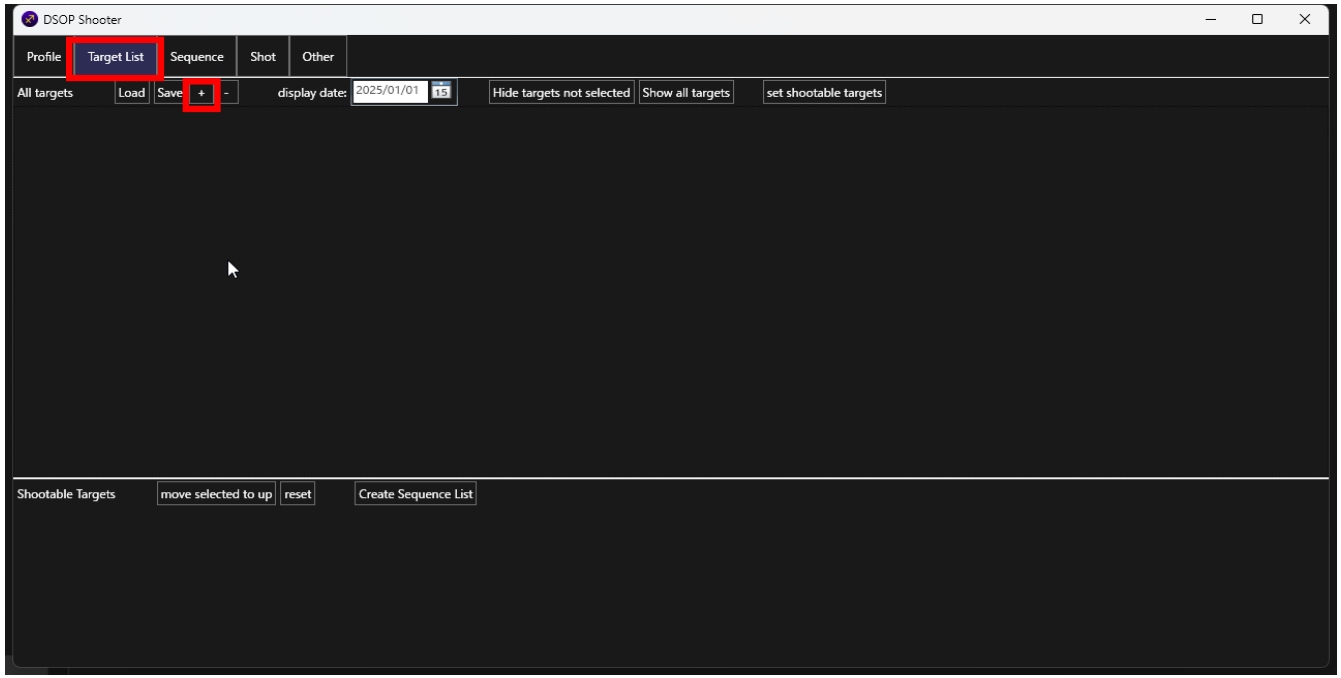
- If you change setting of each devices , you have to click "Disconnect Devices" and "Connect Devices" for activating changes.

3. regist shot target list

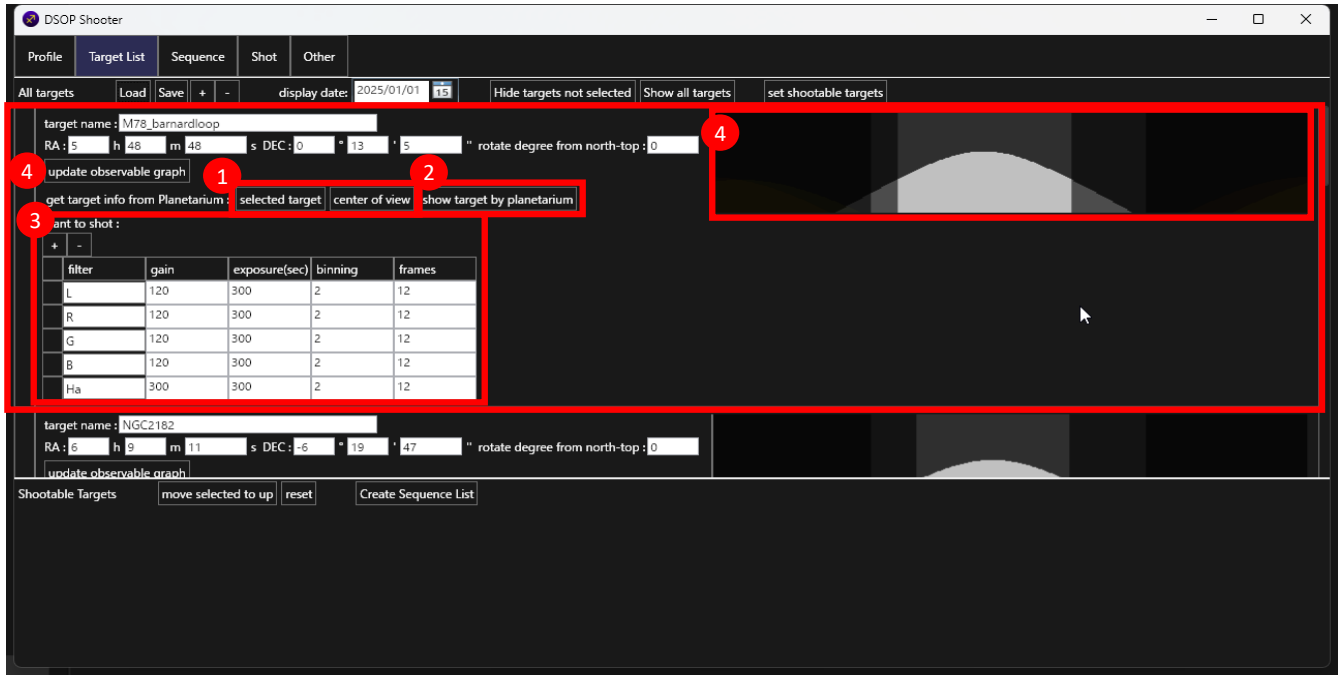
Here are the steps to register the shot target.

- If profile is not made of loaded,make or load profile before doing below.
  * Registing "Site Setting" is required for operations below.

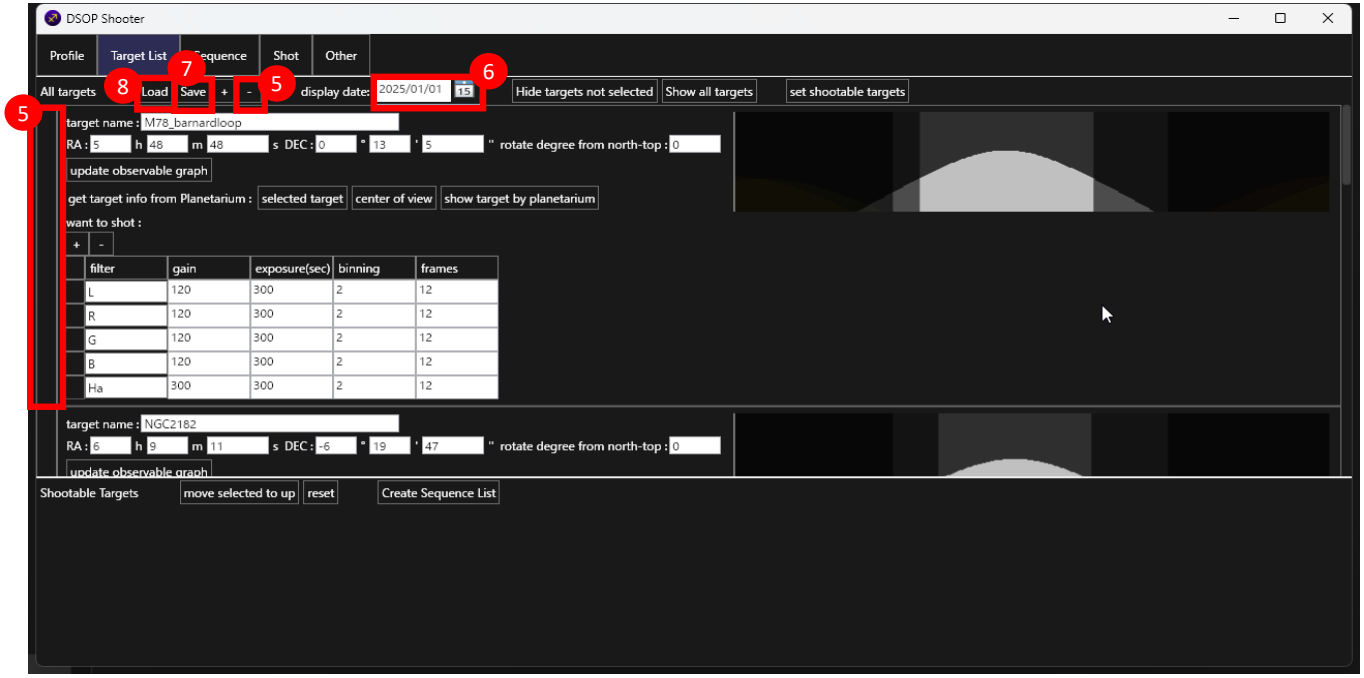
- Click "Target List" tab for opening target input panel , and click "+" button for adding new target to shot.



- Input area of target information is appeared,so input target information
  (name,RA/DEC,rotate degree of rotator,shot gain/exposure/binning/frames by each filter)

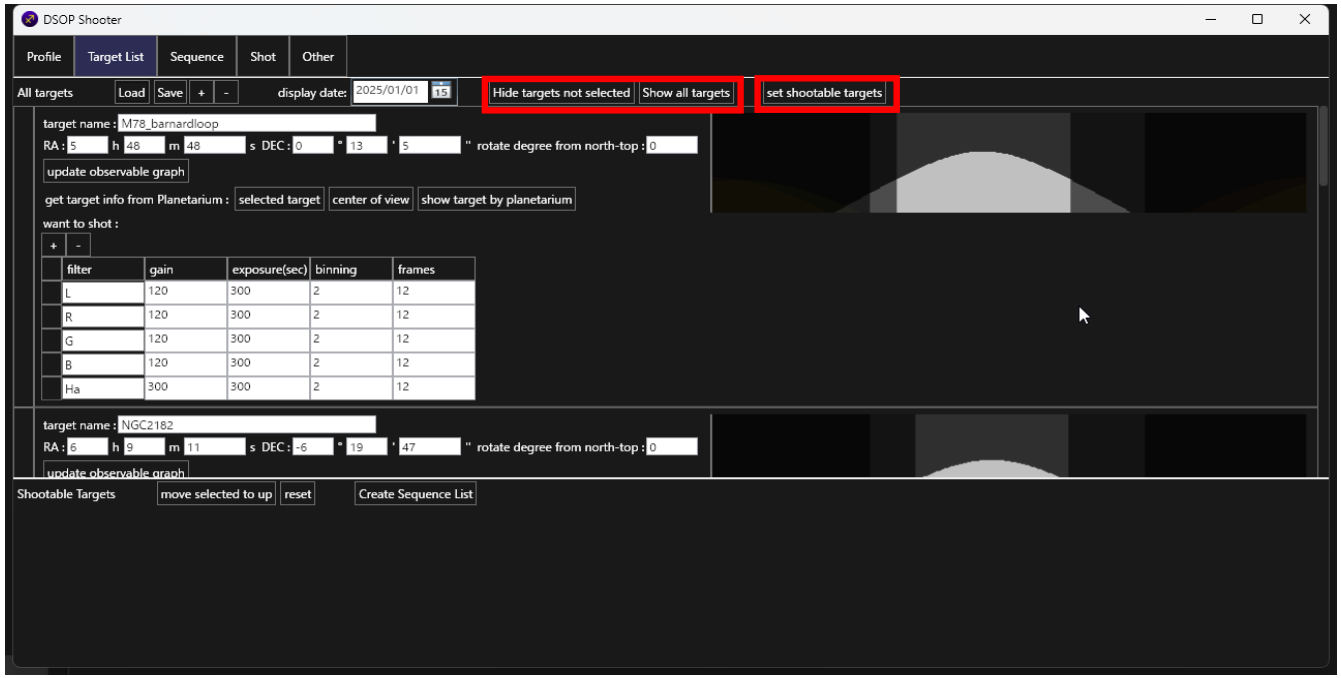


1. If planetarium soft is launched,get target name,RA/DEC,rotation degree can be set from planetarium by clicking button.
   *Stellarium is full function supported.Cartes du Ciel is partial("selected target" only and rotation degree can't get).
   *If you just want to locate target in center of FOV,select target into planetarium from and click "selected target".
   If you want to adjust framing(target is not located in center,etc),show center if FOV into planetarium and click "center of view".
2. If Stellarium is launched,target is shown in Stellarium by clicking this button.
3. Filter names and shot setting is shown configured in filter wheel setting of profile.
   You can also change values by hand, and delete unshot filters by selecting row and click "-" button.
4. After target RA/DEC is inputed you can display observable graph , that shootable or not,altitude of target and moon is displayed.
   By moving mouse on observable graph,you can show information above of each time.

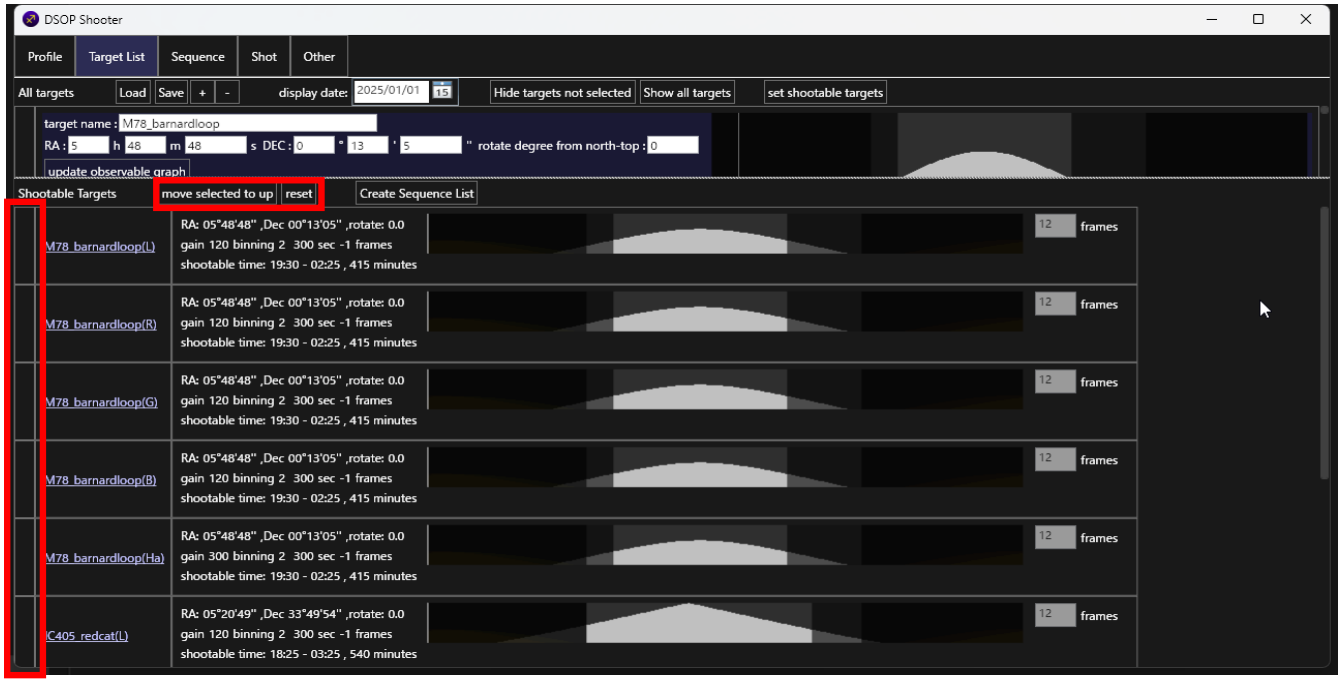


5. When deleting target information,select row by clicking left side square of target row,and click "-" button.
6. By changing date of here, you can show observable graph without today.
7. Save target information inputed.
8. Target information saved can be loaded from here.

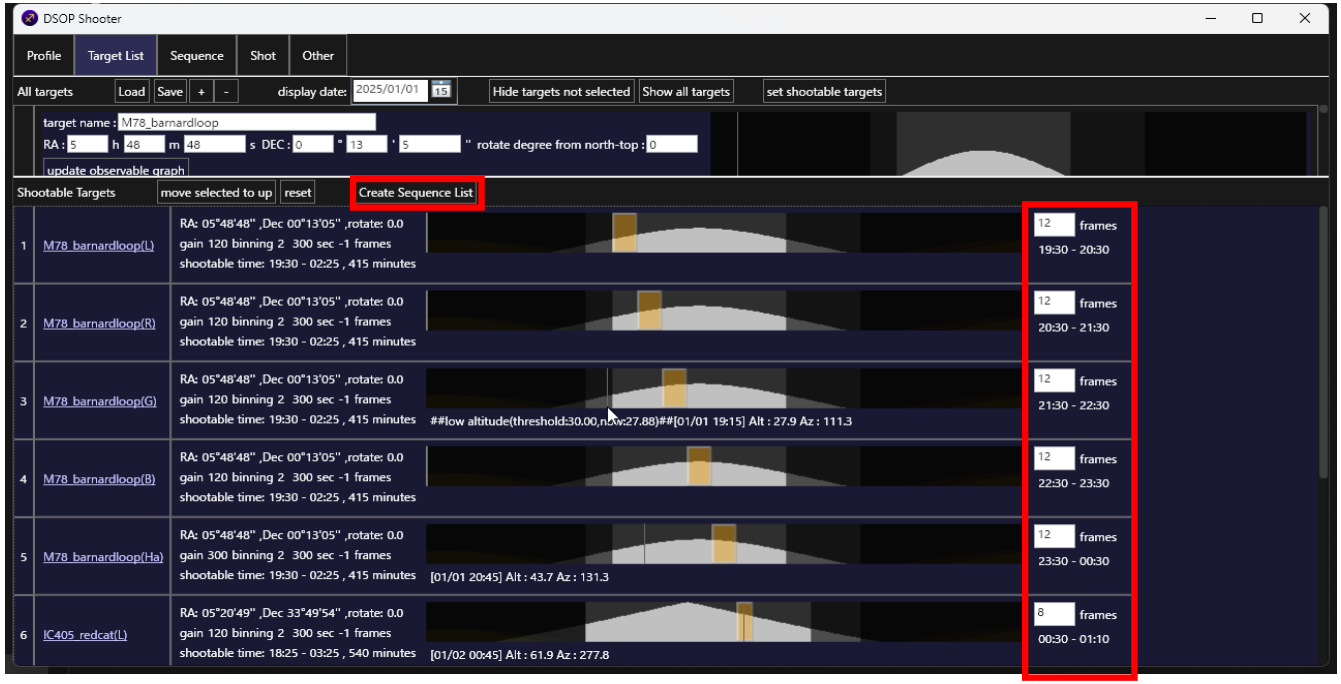
- Click "shot shootable targets" button by showing shootable target & filter pair into "Shootable Targets" area.
  All of shootable targets & filters are displayed into "Shootable Targets" area.
  If you have targets you don't want to shot,**select targets "You want to shot"** and click "Hide targets not selected",
  before clicking "shot shootable targets" button.
  By clicking "Show all targets",hiding targets is canceled.



- Shootable targets & filters are shown as below.
  Next,click targets & filters rows you want to shot by clicking left side square of each row,in order you want to shot.
  If you want to sort clicked rows in order you clicked,click "move selected to up" button.
  By clicking "reset" button,sort order is restored by default.



- Targets and filters you want to shot are displayed as below.
  Next , adjust shot frames,shot targets and filters as you like,with reference to shootable times displayed in observable graph.
  After edit is finished,click "Create Sequence List" button by making shot plan(sequence list).

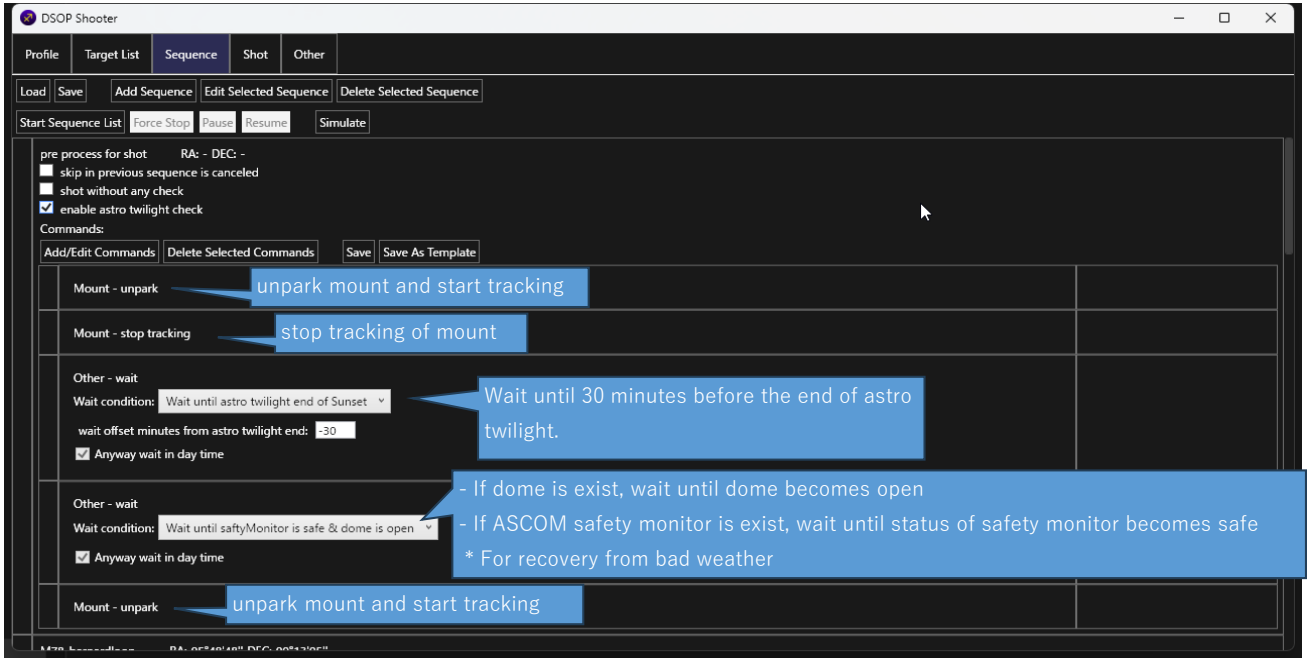


4. make shot plan(sequence list)

By operations of "3. regist shot target list" , shot plan(sequence list) is made into "Sequence" tab.
This section describes the contents of the generated sequence list , and how to manually maintain the sequence list.

- Pre process for shot

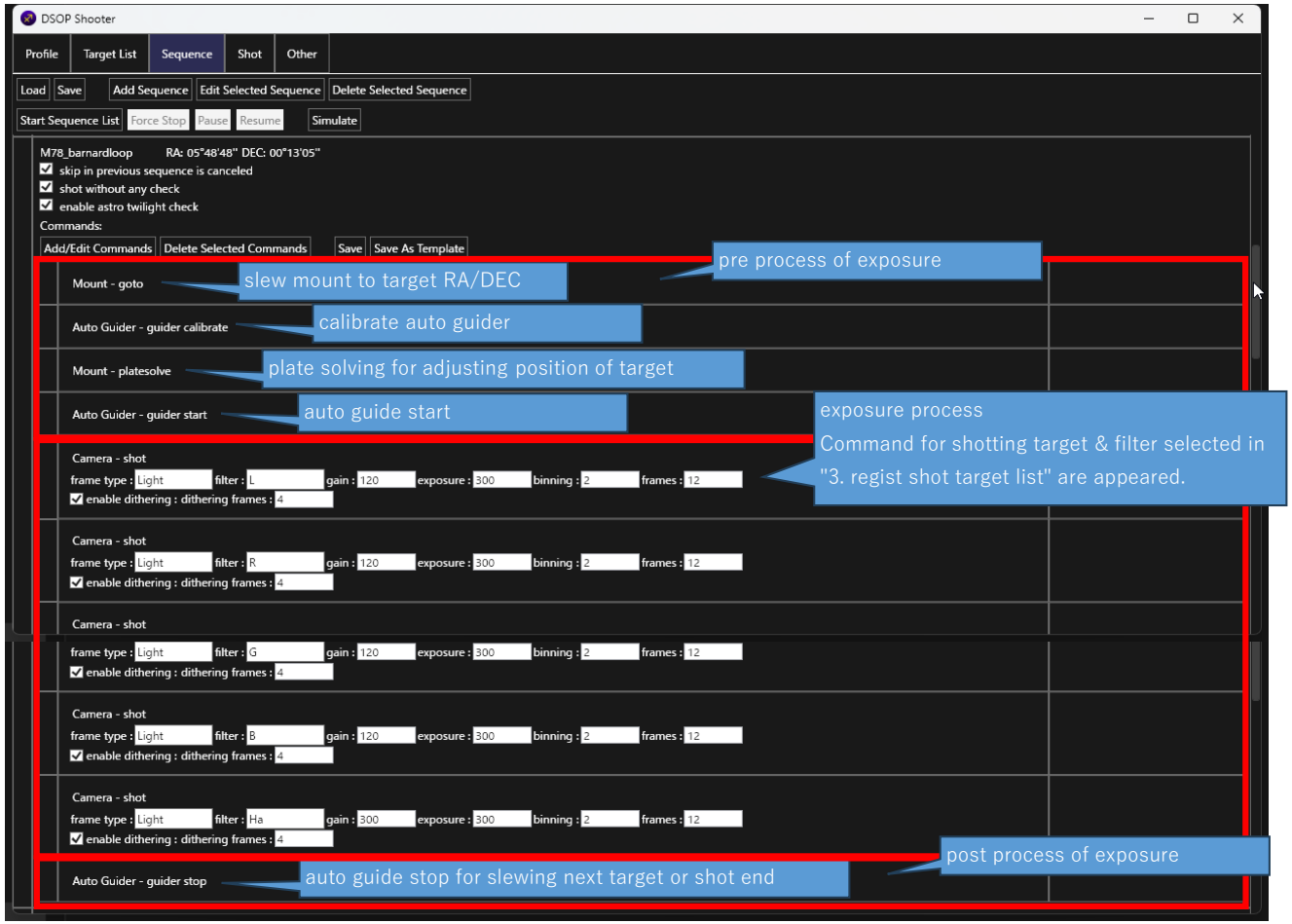
Pre process before shotting targets are described here.
* You can add/delete/edit commands executed by hand , and override execution commands of pre process for shot.
Procedure for edit and override is written in "Make sequence list by hand" and "Override template process".



- For shotting targets

Shotting targets are described here.

* You can add/delete/edit commands executed by hand , and override execution commands of shotting targets.
  Procedure for edit and override is written in "Make sequence list by hand" and "Override template process".



* This block is generated so that you can shot the same target as consecutively as possible, by changing filters.

ex) If you select

"M31(filter:L)" -> "M31(filter:R)" -> "M31(filter:G)" -> "M31(filter:B)" -> "M33(filter:L)"

in "3. regist shot target list", blocks are made as below.

Block1 : target=M31、shot commands = [L -> R -> G -> B]

Block2 : target=M33、shot commands = [L]

ex) If you select

"M31(filter:L)" -> "M31(filter:R)" -> **"M33(filter:L)"** -> "M31(filter:G)" -> "M31(filter:B)"

in "3. regist shot target list", blocks are made as below.

Block1 : target=M31、shot commands = [L -> R]

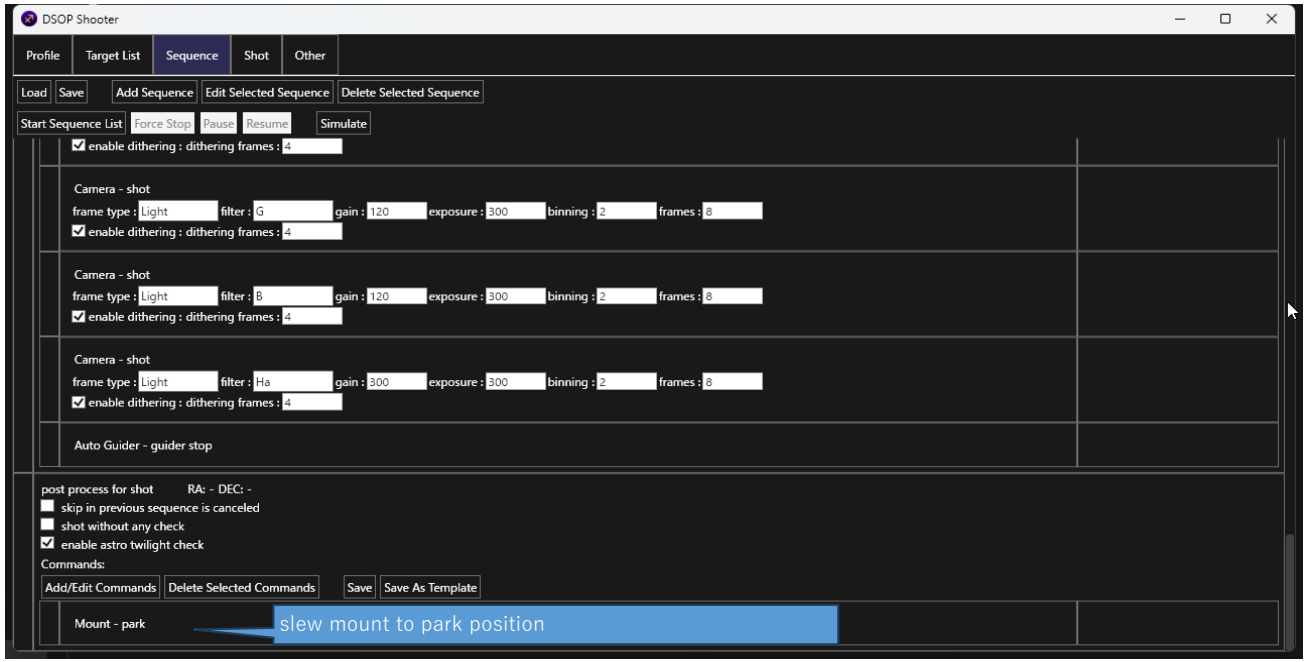
Block2 : target=M33、shot commands = [L] * RA/DEC is changed, so other block is made to slew

Block3 : target=M31、shot commands = [G -> B] * RA/DEC is changed, so other block is made to slew

- Post process for shot

Post process after all targets shot are described here.

* You can add/delete/edit commands executed by hand , and override execution commands of post process for shot.
  Procedure for edit and override is written in "Make sequence list by hand" and "Override template process".



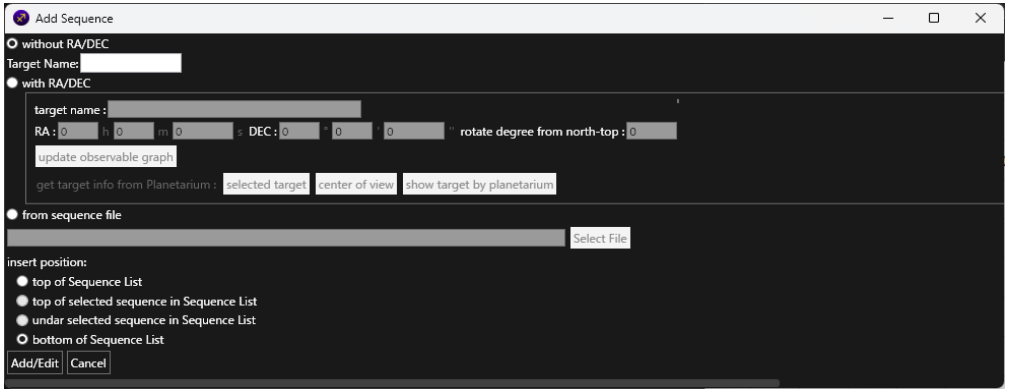
- Make sequence list by hand

You can make and edit sequence list by hand , with and without using sequence list from target list.
Procedure is written as below.

1. add sequence

- Click "Add Sequence" button

- "Add Sequence" window appears, so select sequence addition method and input parameters



Addition method is as below :

- without RA/DEC

This is used for making command groups that is not necessary slewing to target by RA/DEC.
(ex: pre/process process for shotting all targets,shotting flat/dark/bias, etc.)
Input of target name(=sequence name) is required.

- with RA/DEC

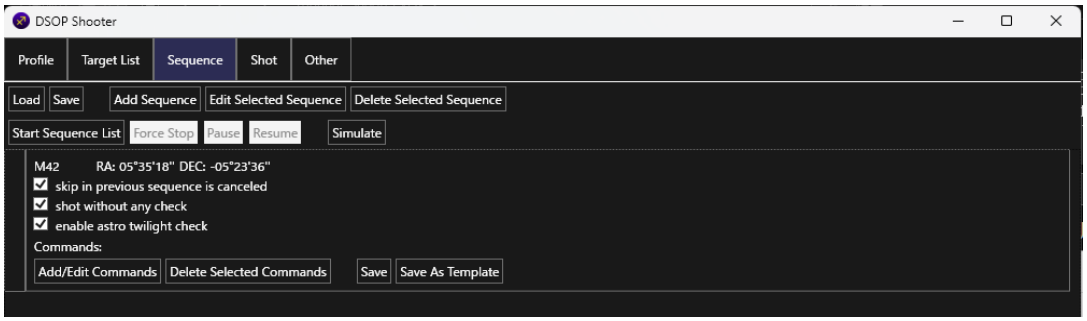
This is used for making command groups that is slewing to target by RA/DEC.
(for shotting targets)
Input of target information to shot is required,same as "3. regist shot target list".

- from sequence file

If you want to use sequence already made and saved,select this and input sequence file path to use.

By selecting "insert position",you select insert position of this sequence.

- After input finished,click "Add/Edit" to add sequence, or click "Cancel" to cancel addition.
After addition, empty sequence is appended as below.



If you need, change sequence configuration below.

- slip in previus sequence is canceled :

  If check on , all commands of this sequence are canceled when cancel of sequence list execution is occurred in any previous sequences.
  Cancel of sequence list occurs when DSOP Shooter determines that it is difficult to continue shoting (bad weather,etc.),or execution of sequence list has been canceled by hand.

- shot without any check :

  Usually, DSOP Shooter check whether target can be shot before exposure of each frame.
  (Too low altitude,astro twilight has been started,etc)
  By checking this option,all checks in shoting each frame are invalid.
  * This option should be off in most case. This is almost for shotting dark/bias/flat.

- enable astro twilight check :

  In DSOP Shooter,commands for shotting real stars(shot target,platesolve,auto guider calibrate,etc) check astro twilight status as below :

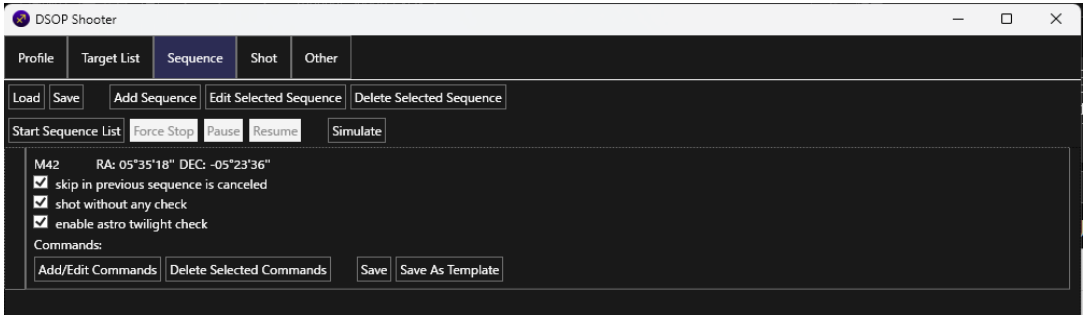
  - Command execution wait until astro twilight of sunset has been finished with offset minutes:
    auto guider and platesoleve : offset = before 30 minute of astro twilight end
    shot : no offset before astro twilight end

  - Command execution canceled in astro twilight of sunrise started

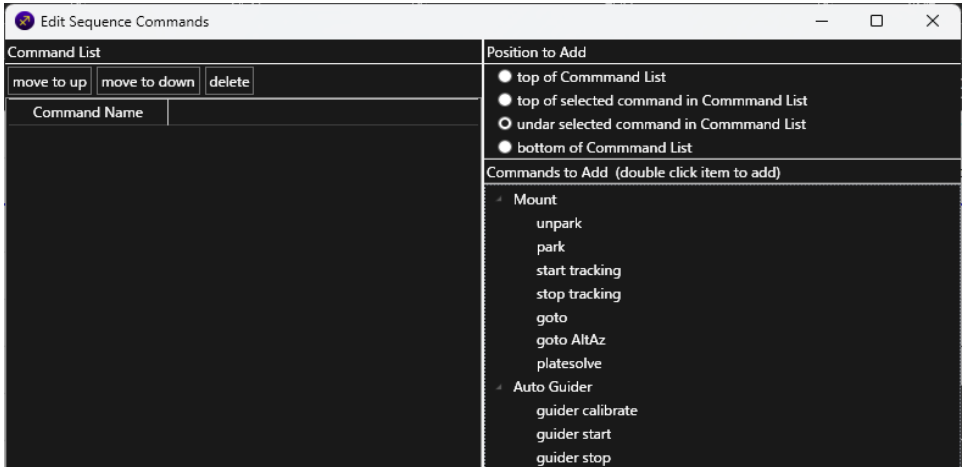
  By checking this option,checking astro twilight above is invalid.
  * This option should be on in most case. This is almost for shotting dark/bias/flat.

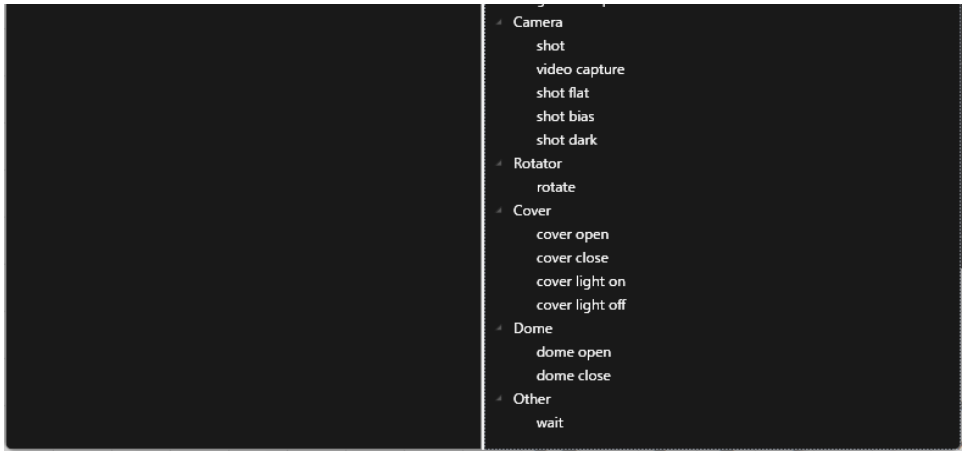
2. Add commands into sequence

- Click "Add/Edit Commands" to add execution commands you want to execute in this sequence.



- Window for adding commands appears as below.
  Select "Position to Add" and double click command you want to add from "Commands to Add",
  so clicked commands is added into "Command List".





[explanation of command]

Function of almost commands is "as command name".
So please download free edition and try it.
Explanation of commands that has notes is only written below.

- Mount - goto AltAz

    * If using this command , it's better to use "Mount - stop tracking" after this command.
    * This function may be used only shotting sky-flat , with "Camera - shot flat" command.

- Camera - shot
- Camera - video capture

    * "Camera - shot" is for shotting deep sky objects,longer exposure(over 30 seconds).
      On the other hand, "Camera - video capture" is for high-speed shutter required,
      such as shotting dark/bias/flat(usualy lower than 2 seconds).
    * So, "Camera - shot" do several checks for long-time shotting(too low altitude,out of astro twilight,

need auto meridian flip).
But "Camera - video capture", any checks as "Camera - shot" is not done, because this function is for almost "shotting dark/bias/flat"

- Camera - shot flat
- Camera - shot dark
- Camera - shot bias

* If shotting flat/dark/bias,it's more easy than using "Camera - shot" and "Camera - video capture".
(Selection of frame type is not needed,write frame type(FLAT/DARK/BIAS) automatcally
in "FRAMETYP" header of fits file.
when shotting sky flat,DSOP Shooter can determine better exposure automatically)
If you use both DSOP Shooter and DSOP Stacker,selection of light frames and flat/dark/bias frames is done automatically by DSOP Stacker,by checking "FRAMETYP" header of fits file.

- Rotator - rotate

*Origin of rotate degree is "north-top"(north = 0 degree).
Please configure "rotate degree for north upside" from "Profile" tab

- Other - wait

*Selectable wait conditions are as belows:

Wait until saftyMonitor is safe & dome is open :

- If dome is exist, wait until dome becomes open
- If ASCOM safety monitor is exist, wait until status of safety monitor becomes safe
* For recovery from bad weather

Wait until astro twilight end of Sunset :

- Wait until astro twilight end of Sunset , with offset minutes

Wait until astro twilight start of Sunrise :

- Wait until astro twilight start of Sunrise , with offset minutes

Wait until input minutes over :

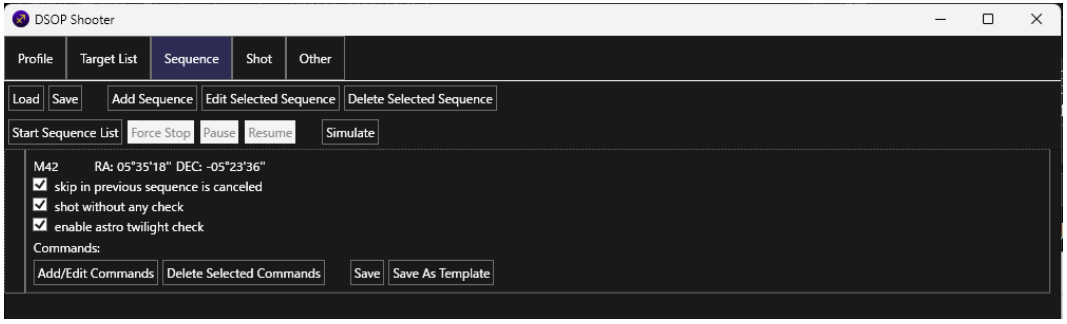
- Wait until input minutes over , after reaching execution of this command.

By hand :

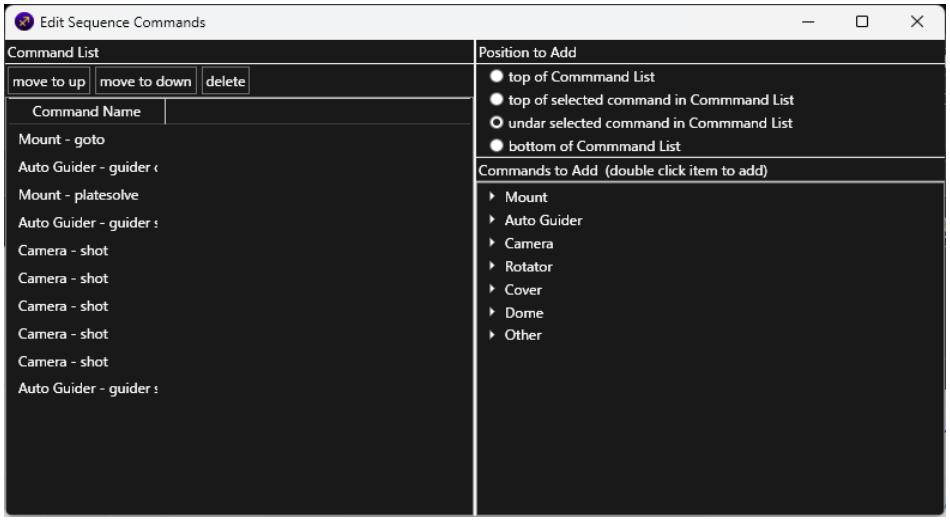
- In running sequence list, this command show small window to pause execution.
  This may be used for checking equipment state and fix it from "6. operate equipment by hand".

3.Change order of commands

- Click "Add/Edit Commands" in sequence.



- Window for editing commands appears as below.
  Click commands to changing order and click "move to up" or "move to down" button.

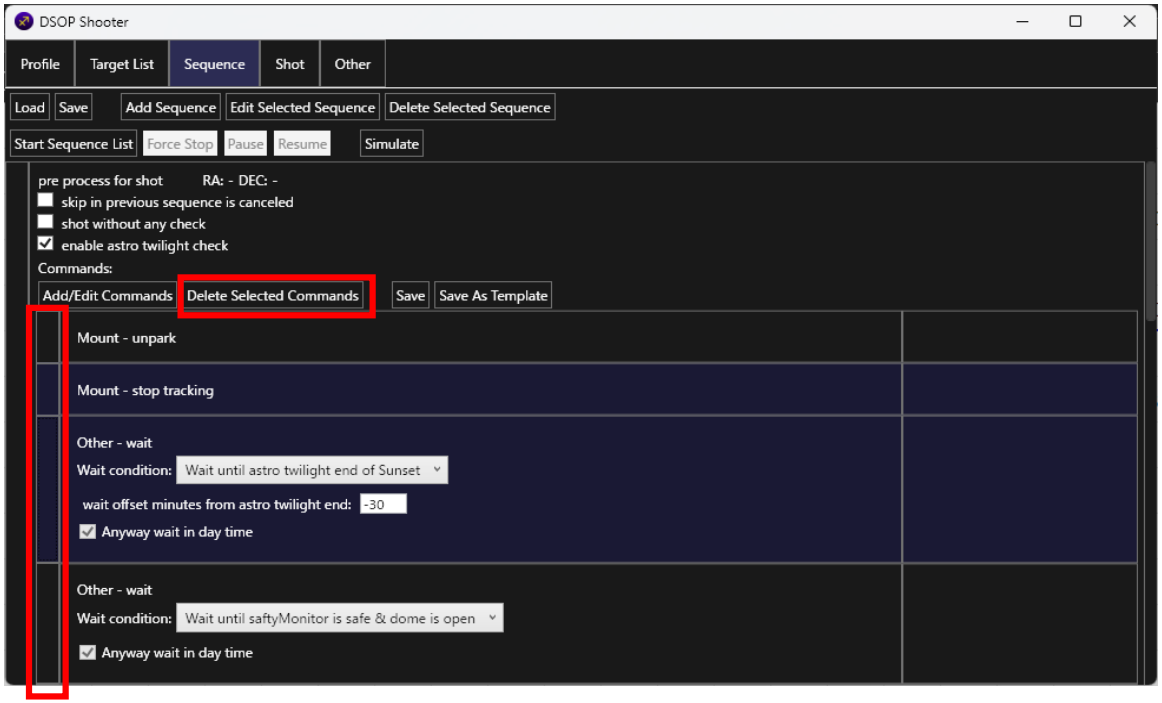


4. Edit sequence

   Select sequence row to change and click "Edit Selected Sequence" ,
   and input values to change & operate same as adding.

5. Delete command in sequence

   Select commands to delete and "Delete Selected Commands" button in sequence.



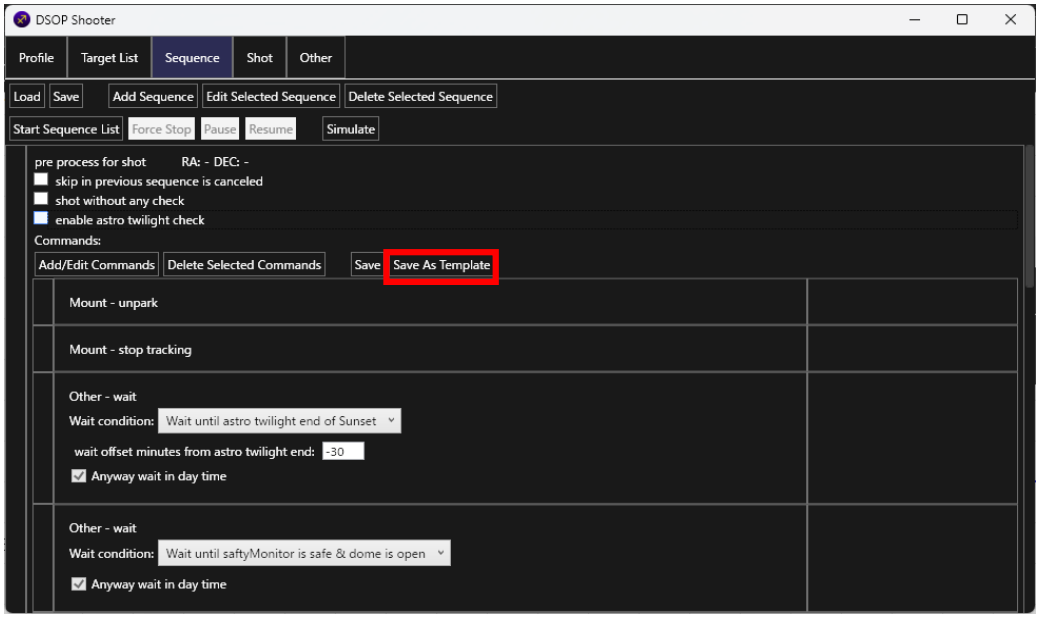
6. Delete sequence

Select sequence row to delete and click "Delete Selected Sequence".

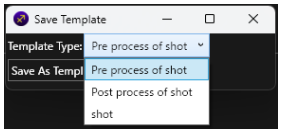
- Override template process

If you want to override template process for making sequence list from target list,please operate below.

1.After finished edit of sequence,click "Save As Template" button in sequence you want to save as template.



2. Small window is shown. Select template type as click "Save As Template" button.
Template process is saved per profile made in "2. make profile",
so you can save templates per pair of equipments and configs separately.

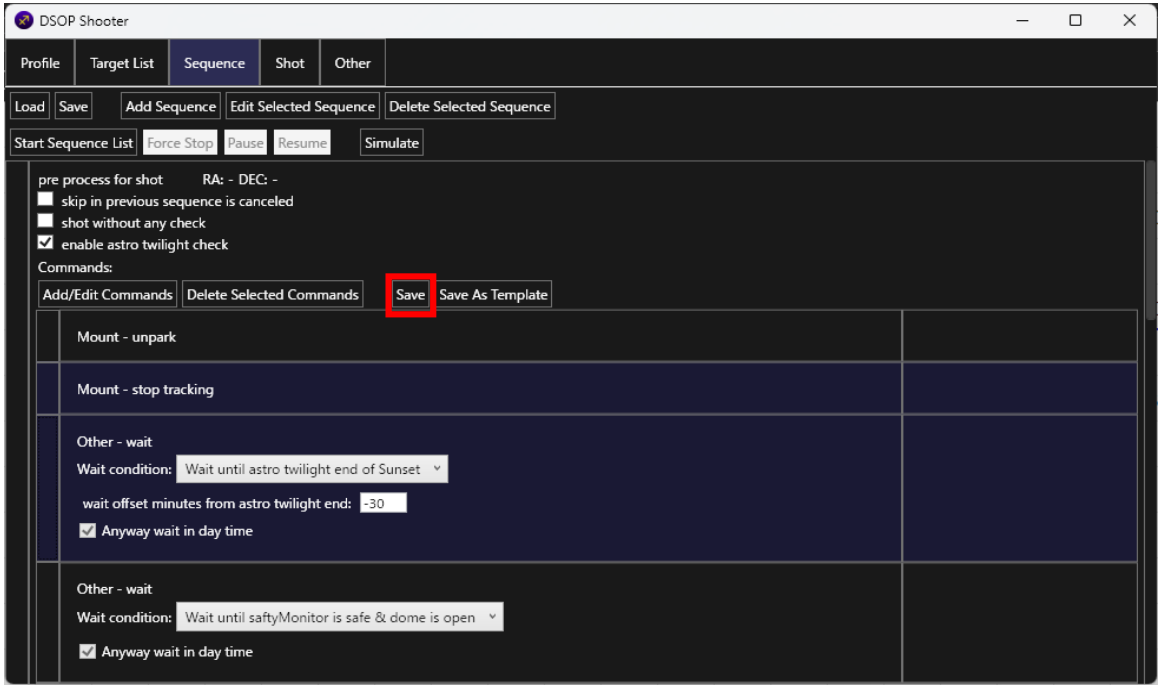


- Save/Load sequence list

After editing sequence and commands in sequence, click "Save" button if you want to save sequense list.
You can load sequence list saved by clicking "Load" button.

- Save each sequence

If you want to save each sequence, click "Save" button for saving it.
Sequence saved can be used in adding new sequence.



5. shot targets with sequence list

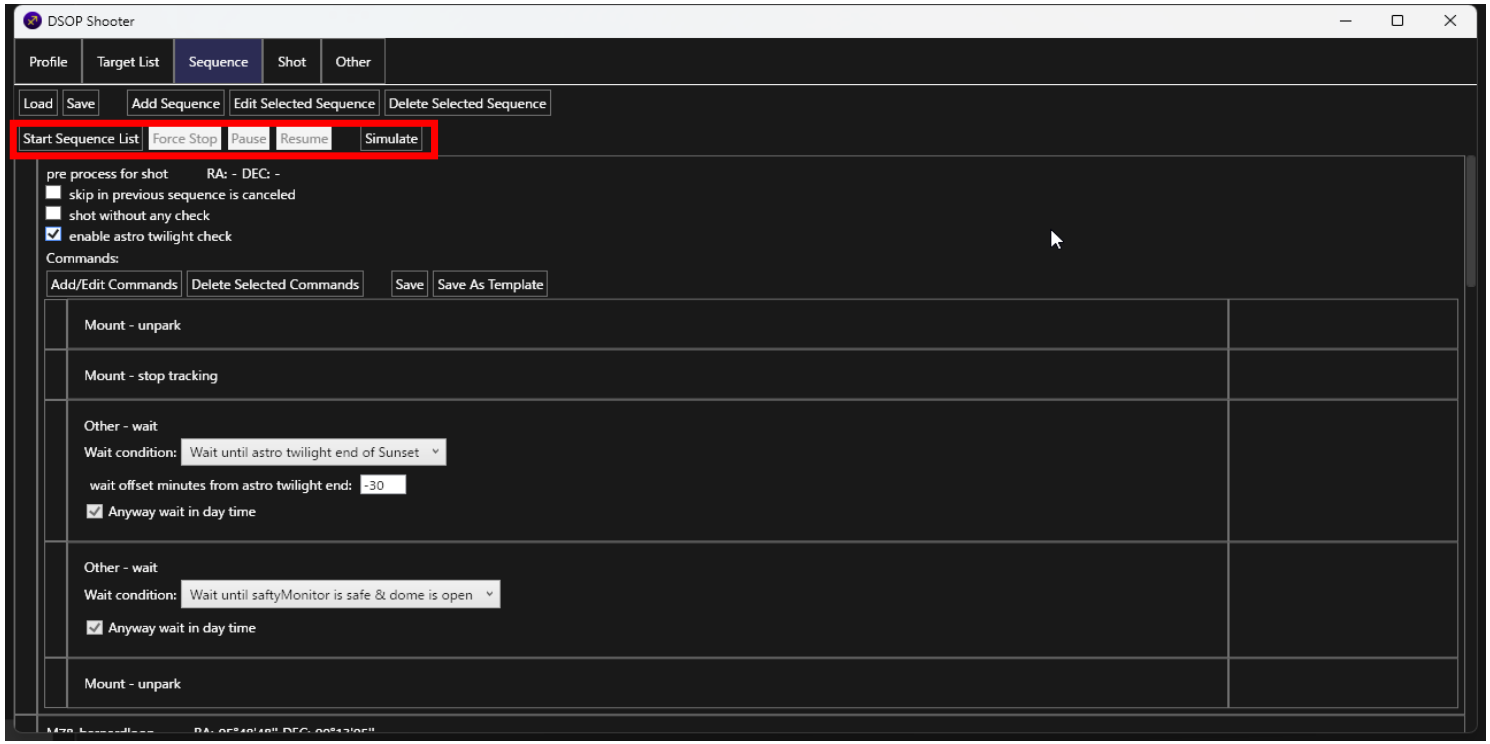
After making sequence list,you can start shotting by clicking "Start Sequence List" button.

After starting sequense list,

- by clicking "Pause" button,pause execution of sequence list temporary and resume pausing by clicking "Resume".
- If you want to stop sequense list, click "Force Stop" button.

* Pause and force stop can make some time,for controlling systems and equipments in safe.

You can also simulate sequence list by clicking "Simulate" button, for getting estimate result of sequence list.



When shot of each frames finished , shot image is saved in

[image save folder of profile]¥[shot date folder(YYYY-MM-DD)]¥[target name folder]

If PHD2 is used , guide log during shotting each frame is also saved in same location ,
for DSOP Stacker checks image can stack or not.

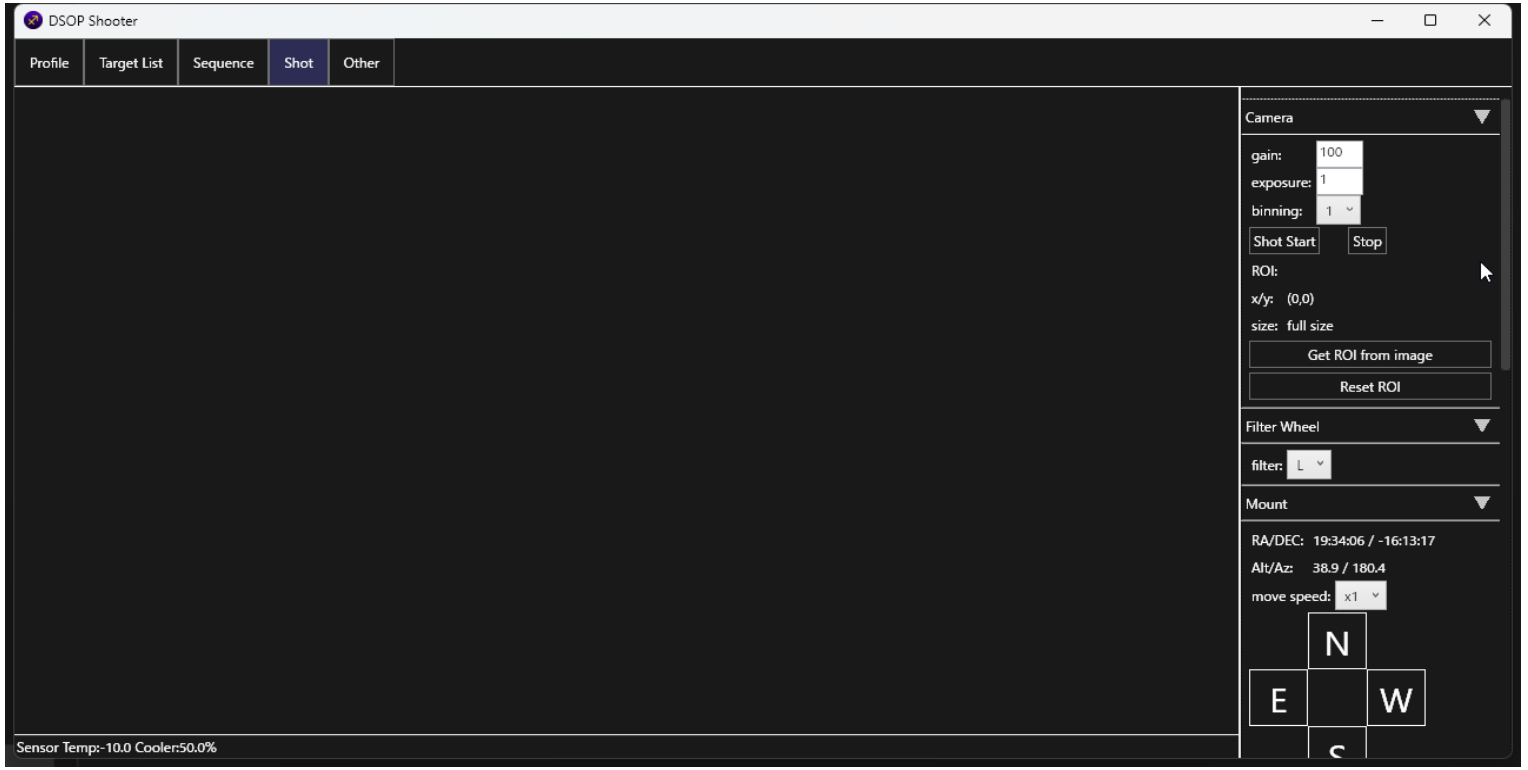
Sequence list file is automatically saved in

[image save folder of profile]¥[shot date folder(YYYY-MM-DD)]

when starting sequence list.

6. operate equipment by hand

After loading profile and connecting all devices,you can operate equipments by hand from "Shot" tab.
Please control each equipments from right area,and confirm image that is shot from left area.
(For checking focus,position of target,movement of equipment ,etc.)
Auto/Manual brightness configration is enable from histgram in right area.



7. others

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