

Prepointing for Occultation Observing

IOTA

September 11, 2023

Notes

- This is an update and extension of “Prepoint Charts with Guide 9”, presented to IOTA Aug 14, 2022

What is Prepointing

- Prepointing is positioning an undriven telescope to observe an event at some later time
 - Usually within 12 hours, i.e., on the same night
 - Often well before the target has risen
- Prepointing allows a single observer to record from multiple scopes in different locations
- Prepointing allows an observer to set a scope out at a “reasonable” time in the evening to record an event hours later

Explanations

- Prepoint line of apparent declination – the line traced through the stars that a point at the altitude and azimuth of the target star at the time of the occultation traces through the celestial sphere.
- Prepoint line charts can be prepared with Guide or C2A. Occult4 will create a list of stars in its catalog near the prepoint line.
- Derek Breit publishes lists of stars along the prepoint line extending to 24 hours before the event. See poyntsource.com and select Current Worldwide Asteroid Occultations or Future Worldwide Asteroid Occultations for the star lists.

Derek Breit's Prepoint Stars List

- poyntsource.com has two pages, Current Worldwide Asteroid Occultations and Future Worldwide Asteroid Occultations

- Table of stars
 - Time offset is time before the predicted time
 - Dec offset is distance from prepoint line

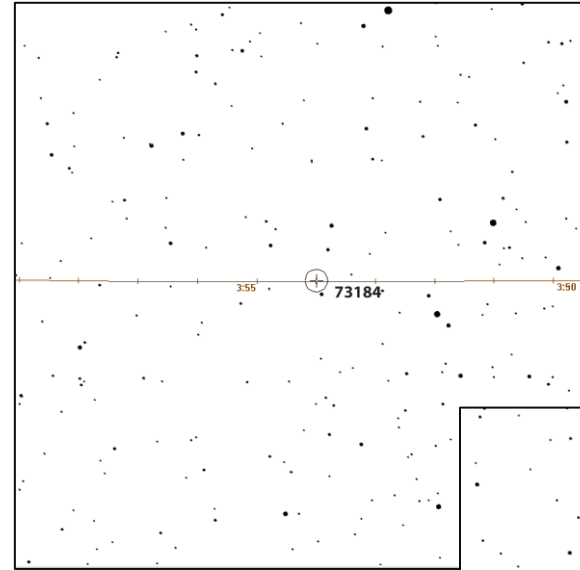
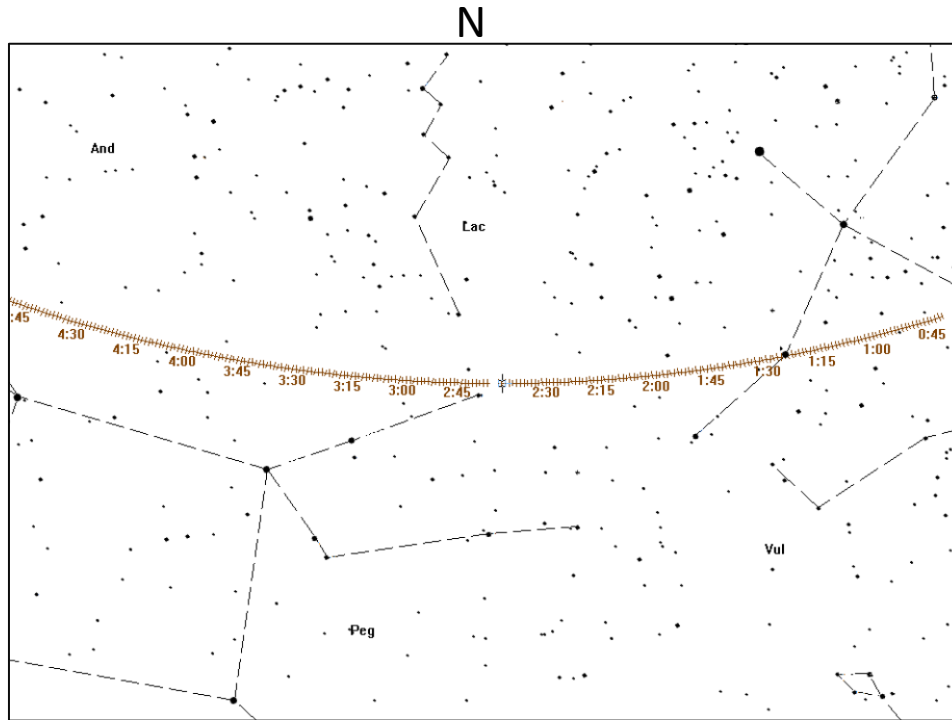
- Table of stars near prepoint line

Occultation of TYC 2413-01480-1 by
704 Interamnia on 2023 Sep 13
Pre-point stars

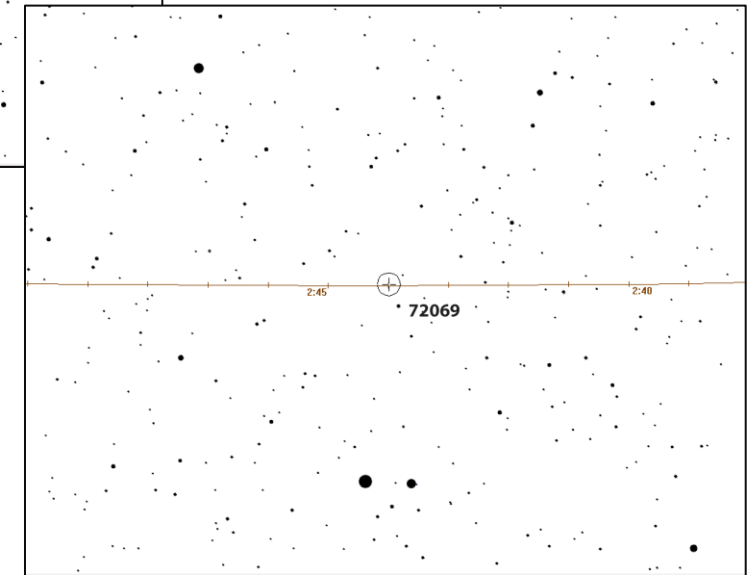
Prediction of 2023 Aug 6.7

| Time Offset | | | Star mag | J2000 RA | | Dec | | Dec Offset ArcMin | SAO |
|----------------|----|----|-------------|-------------|------|-----|----|-------------------------|-------|
| h | m | s | | h | m | o | ' | | |
| 0 | 0 | 0 | 9.1 | 5 | 44.3 | 33 | 58 | star | |
| 0 | 1 | 36 | 9.6 | 5 | 42.7 | 33 | 58 | 0.0 | |
| 0 | 2 | 7 | 9.8 | 5 | 42.2 | 33 | 56 | 1.3 | |
| 0 | 3 | 4 | 6.9 | 5 | 41.3 | 33 | 55 | 2.6 | 58329 |
| 0 | 3 | 19 | 9.5 | 5 | 41.0 | 33 | 57 | 0.2 | |
| 0 | 4 | 42 | 9.9 | 5 | 39.6 | 33 | 59 | -1.7 | |
| 0 | 6 | 27 | 8.4 | 5 | 37.8 | 33 | 58 | -0.4 | 58264 |
| 0 | 7 | 28 | 9.6 | 5 | 36.8 | 33 | 55 | 2.5 | 58250 |
| 0 | 8 | 34 | 9.1 | 5 | 35.7 | 34 | 0 | -2.2 | 58217 |
| 0 | 9 | 3 | 8.9 | 5 | 35.2 | 33 | 58 | -0.3 | 58206 |
| 0 | 9 | 3 | 9.6 | 5 | 35.2 | 33 | 58 | -0.3 | 58206 |
| 0 | 10 | 12 | 9.7 | 5 | 34.1 | 33 | 58 | -0.6 | |

Prepoint Line Example



Narrower field finder charts
for two SAO stars located
near the prepoint line.

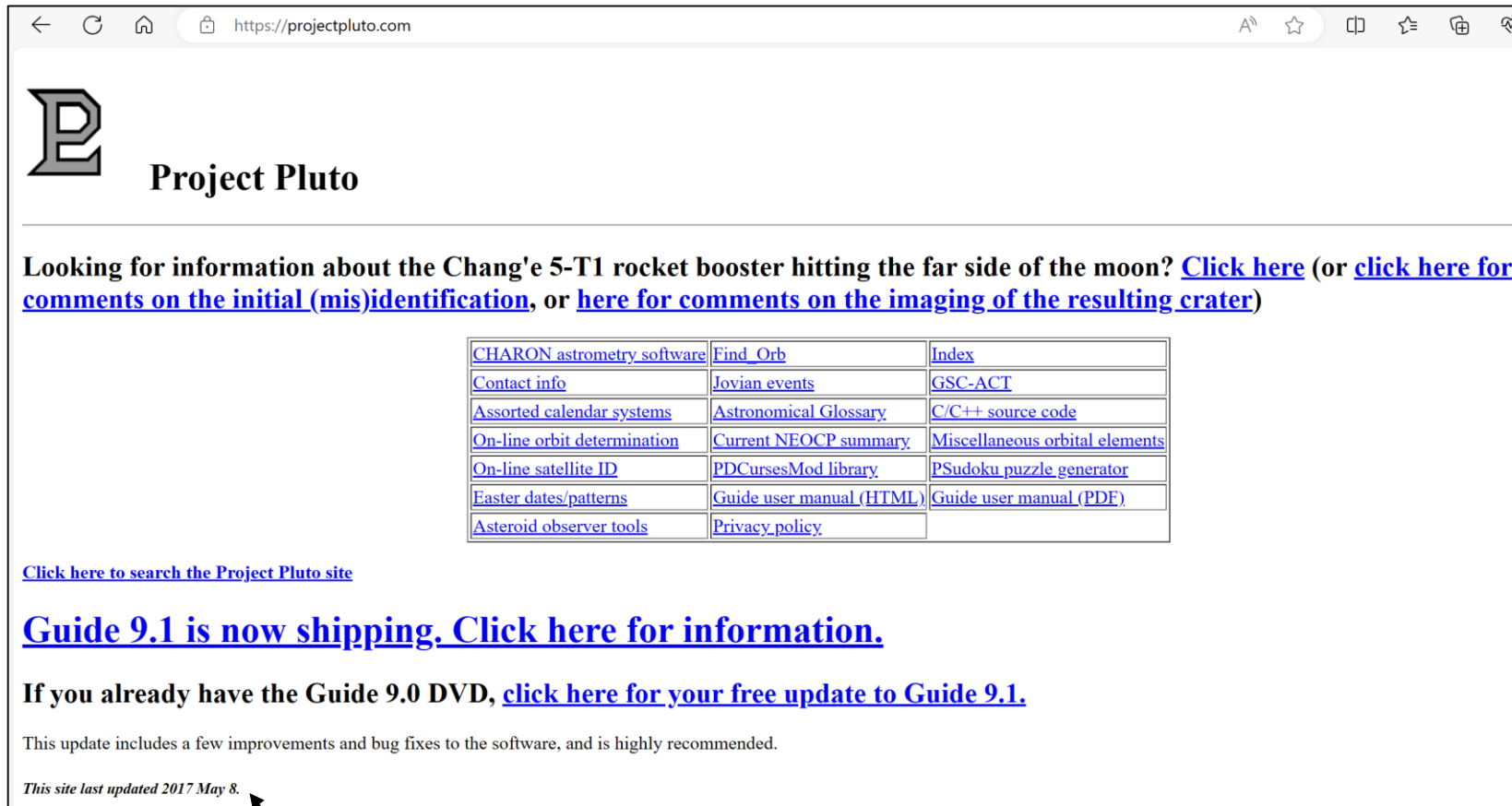


A wide field view of the star field at location 90W
41°19'44"N. This is centered on 2:40 UT, which is 21:40 EDT.

Using Guide 9.1 to Provide Prepoint Charts

Example is for (704) Interamnia occultation of SAO 58382 on September 13 as seen from Fountain Hills, AZ. *Note that our recommendations may not agree with the information in the Guide User Guide, but it is what we have found works.*

Project Pluto Website



The screenshot shows the Project Pluto website in a web browser. The browser's address bar displays 'https://projectpluto.com'. The website has a logo consisting of a stylized 'P' and the text 'Project Pluto'. Below the logo, there is a paragraph of text with several blue hyperlinks. A table with three columns and six rows of links is centered on the page. Below the table, there is another line of text with a blue hyperlink. At the bottom of the page, there is a line of text about a software update, followed by a line of text stating the last update date. An arrow points from the text 'Note this date.' to the date '2017 May 8'.

← ↻ 🏠 🔒 https://projectpluto.com 🔍 ☆ 📄 ⌵ 🗺 🌐

P Project Pluto

Looking for information about the Chang'e 5-T1 rocket booster hitting the far side of the moon? [Click here](#) (or [click here for comments on the initial \(mis\)identification](#), or [here for comments on the imaging of the resulting crater](#))

| | | |
|---|--|--|
| CHARON astrometry software | Find_Orb | Index |
| Contact info | Jovian events | GSC-ACT |
| Assorted calendar systems | Astronomical Glossary | C/C++ source code |
| On-line orbit determination | Current NEOCP summary | Miscellaneous orbital elements |
| On-line satellite ID | PDCursesMod library | PSudoku puzzle generator |
| Easter dates/patterns | Guide user manual (HTML) | Guide user manual (PDF) |
| Asteroid observer tools | Privacy policy | |

[Click here to search the Project Pluto site](#)

[Guide 9.1 is now shipping. Click here for information.](#)

If you already have the Guide 9.0 DVD, [click here for your free update to Guide 9.1](#).

This update includes a few improvements and bug fixes to the software, and is highly recommended.

This site last updated 2017 May 8.

Note this date.

Project Pluto is the developer and distributor of Guide. It is no longer maintained and may be freely copied and shared. Copies on CD are available from Project Pluto for \$40.

While Guide is no longer maintained, we like it for its simplicity and ease of use. Lack of maintenance does mean it uses an older star catalog and problems we note do not get fixed.

Using Guide

- Install – *We find it installs easily on Windows 10 and 11, do not know its status on other systems.*
- Prepare for generating star charts
 - Coordinates of proposed observing site
 - Time of occultation – *from Occultwatcher or Occult*
 - Altitude and azimuth of the star at the time of occultation – *from Occultwatcher or Occult*
 - Star identification or coordinates

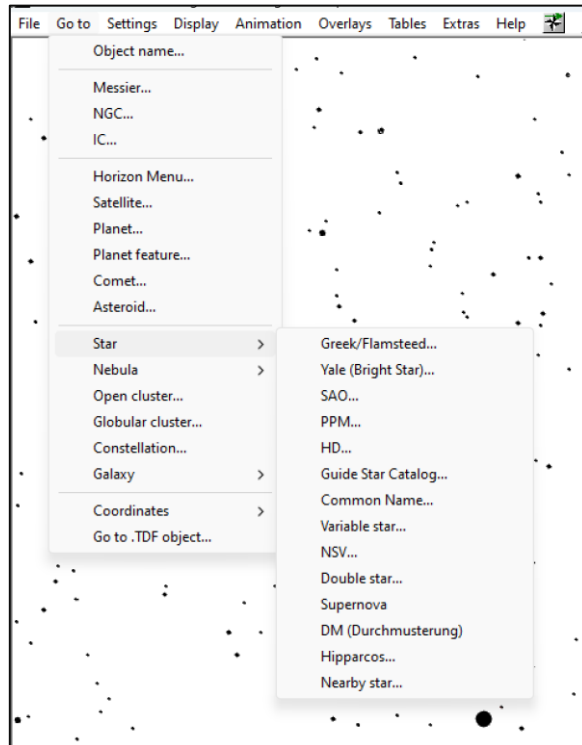
Occultation Details

- Location:
 - 111.72724W, 33.62447N, 520M
 - Guide only accepts location in degrees and decimals of a degree
- Time - Sept 13 10:15:30 UTC
- Event from viewers perspective, as provided from Occultwatcher:
 - Altitude – 47 deg
 - Azimuth – 74 deg, measured East from North

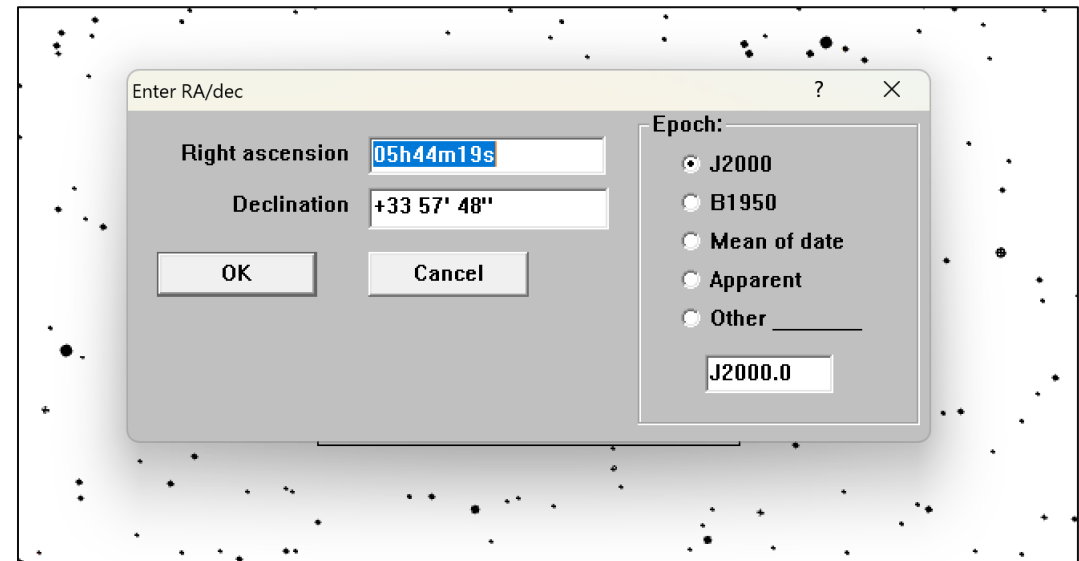
How accurate this information needs to be to provide useful prepoint data depends on the scope field of view and how far in advance it will need to be pre-pointed.

Target Star Entry

- GoTo Menu



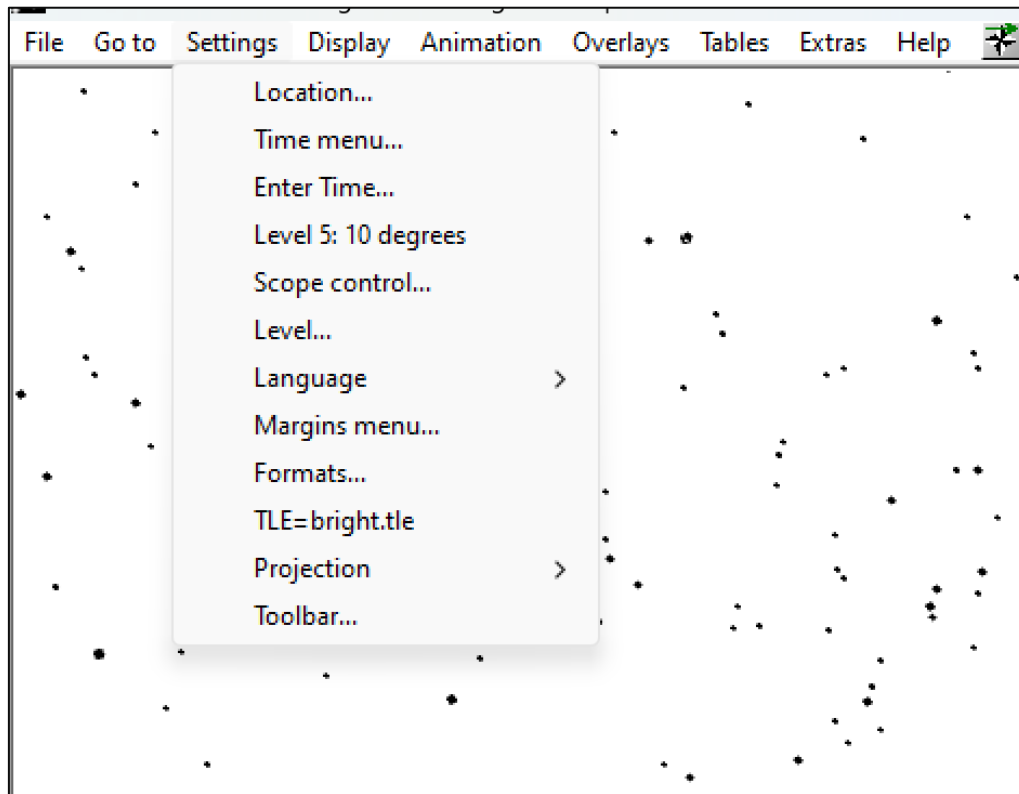
- Star Coordinates



The RA and Dec need to be in the format shown.

Settings Menu

- Settings menu controls entry of location, time, field of view, tabs display, and more.



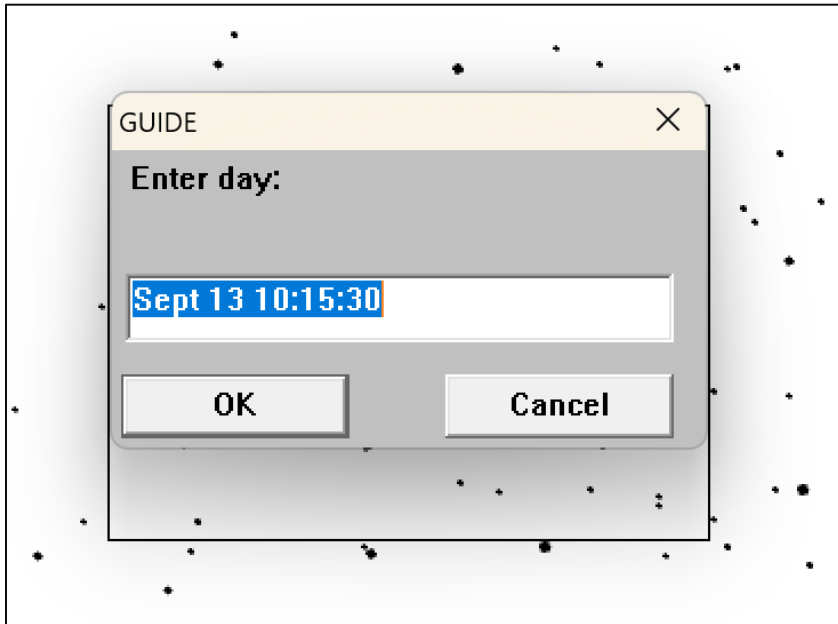
Time menu is the time entry format and Enter Time is where time is entered.

Top Level option changes the sizes of the display, “Level...” is the user selection of which size to use

TLE are Two-Line Elements, a format for distributing artificial satellite elements.

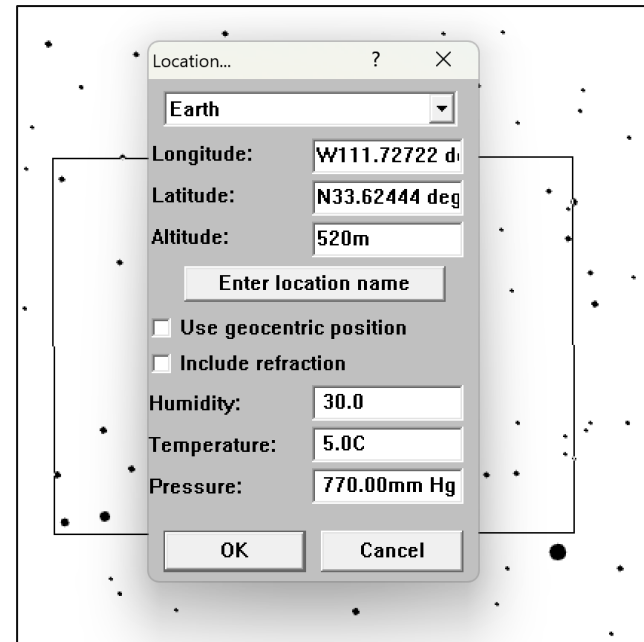
Location and Time

- Time Entry



We work in UT, never have tried using local time.

- Location Coordinates



Longitude and Latitude need to be in degrees and decimals of a degree, as shown.

Check Entry Accuracy

- Display a field and check time, star, altitude and azimuth for agreement with the prediction

Care is needed when moving a mouse around a live Guide image, or with fingers on a touchscreen display. Any click or tap on the display aside from the data entry areas will recenter the display around the clicked/tapped location, forcing a restart.

Click on this box to toggle between N-up or zenith-up display

Right click on the star in the center and identification information is displayed

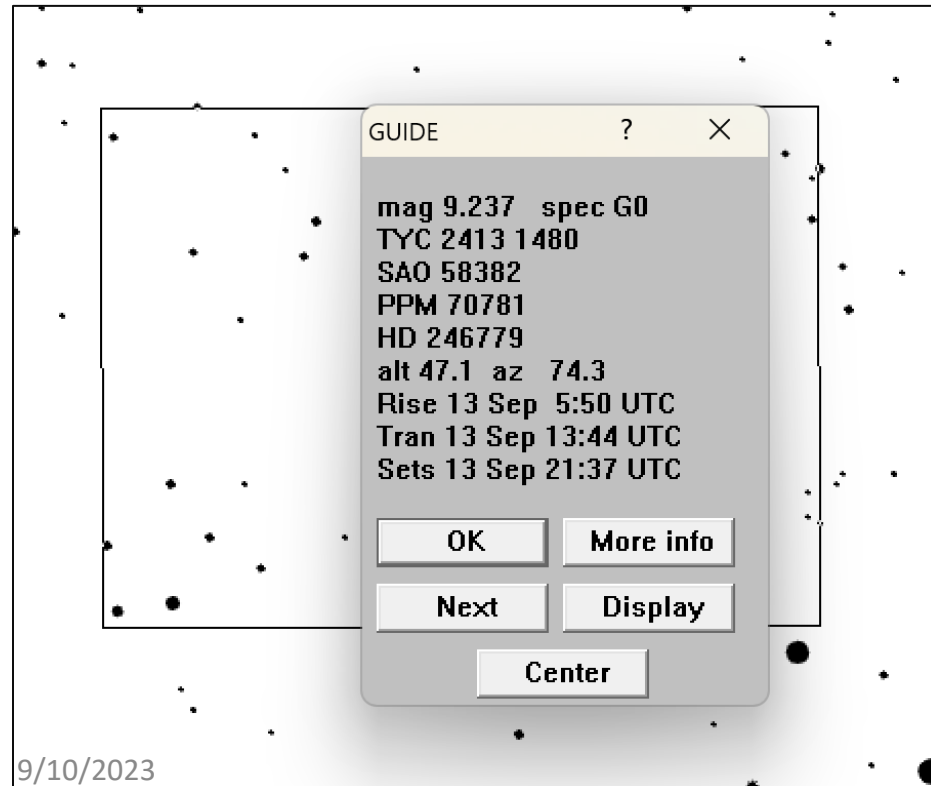
Check Alt and Az

6 ● 10 ●
7 ● 11 ●
8 ● 12 ●
9 ● 13 ●
W111.7272 deg N33.6245 deg
05h44m19.2s J2000.0
+33 57' 48" Aur
Alt 47.134 Az 74.334
Level 8: 1 degree
13 Sep 2023 10:15:30 UTC
Interamnia

Create a Prepoint Line

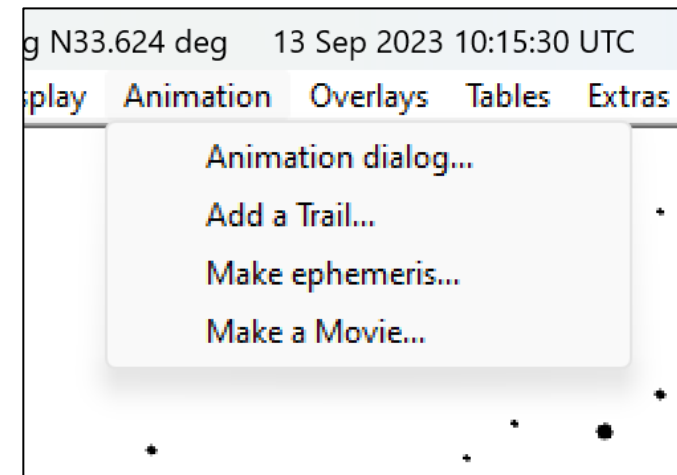
Right click the target for the star display

- Click the Center button.



Animation

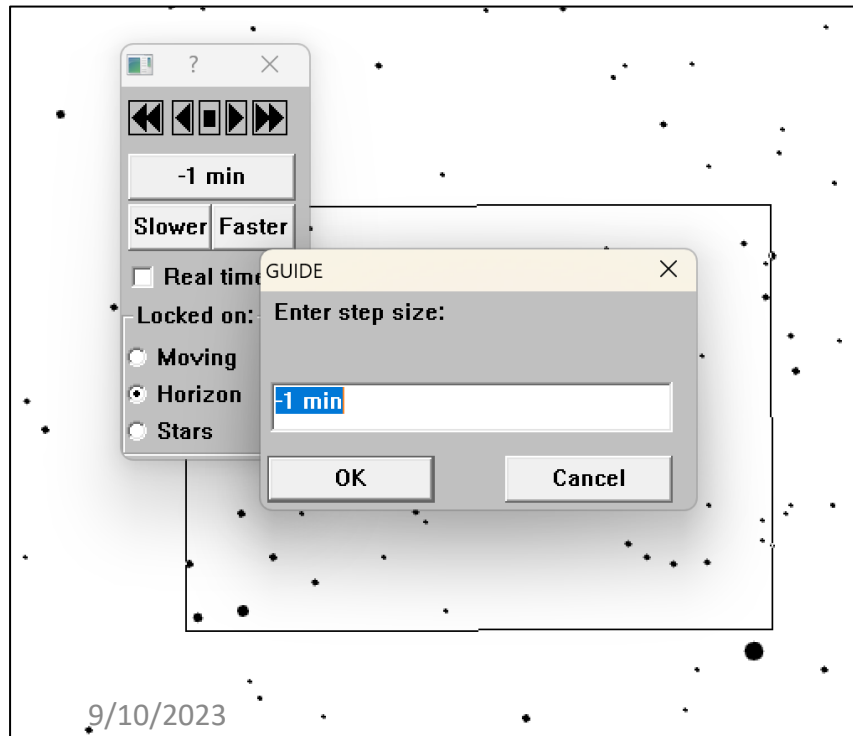
- Prepoint lines are controlled via the Animation Dialog tab



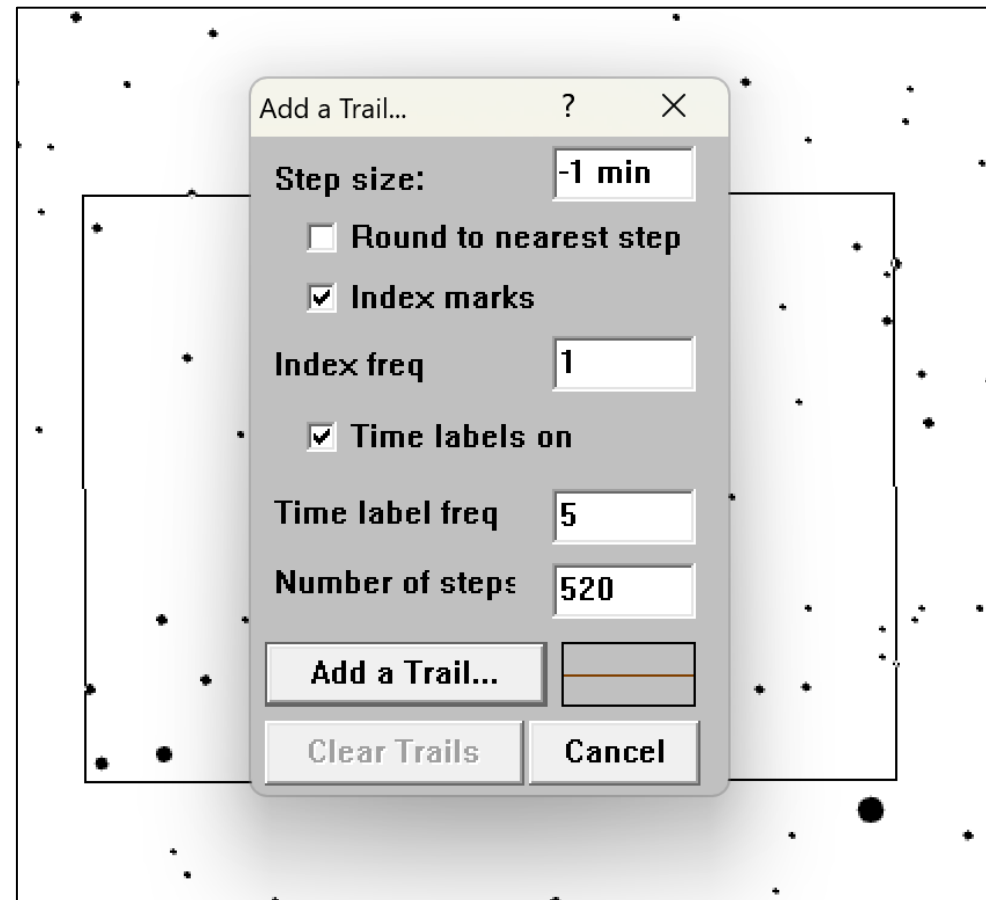
The target star needs to be at the center to provide an end for the prepoint line.

Set the Line (trail in Guide terminology)

- Select Animation Dialog
- Set step size to -1 min and Horizon for the locked on



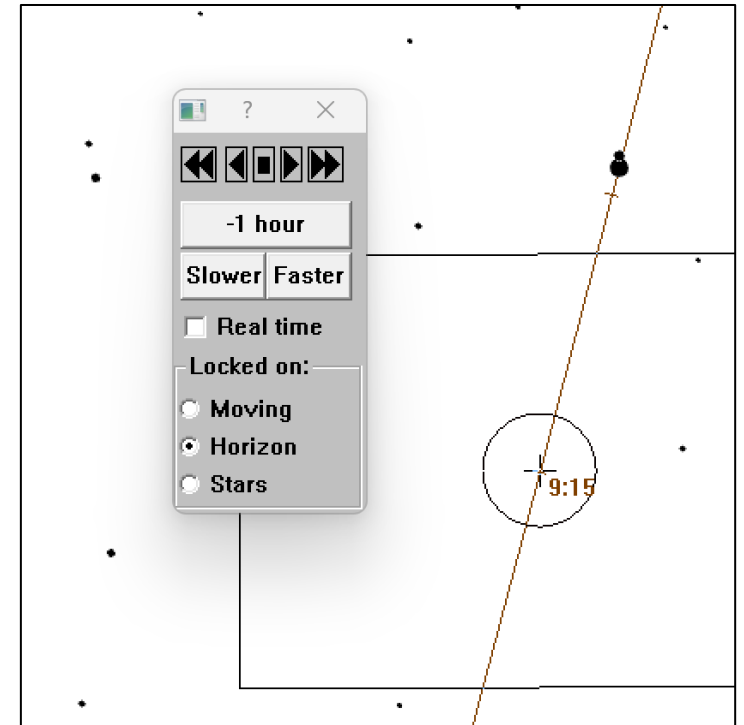
- Add a trail



If everything has been set and formatted correctly, a trail beginning at the target and extending back for however steps (minutes) specified should appear.

Animation Use

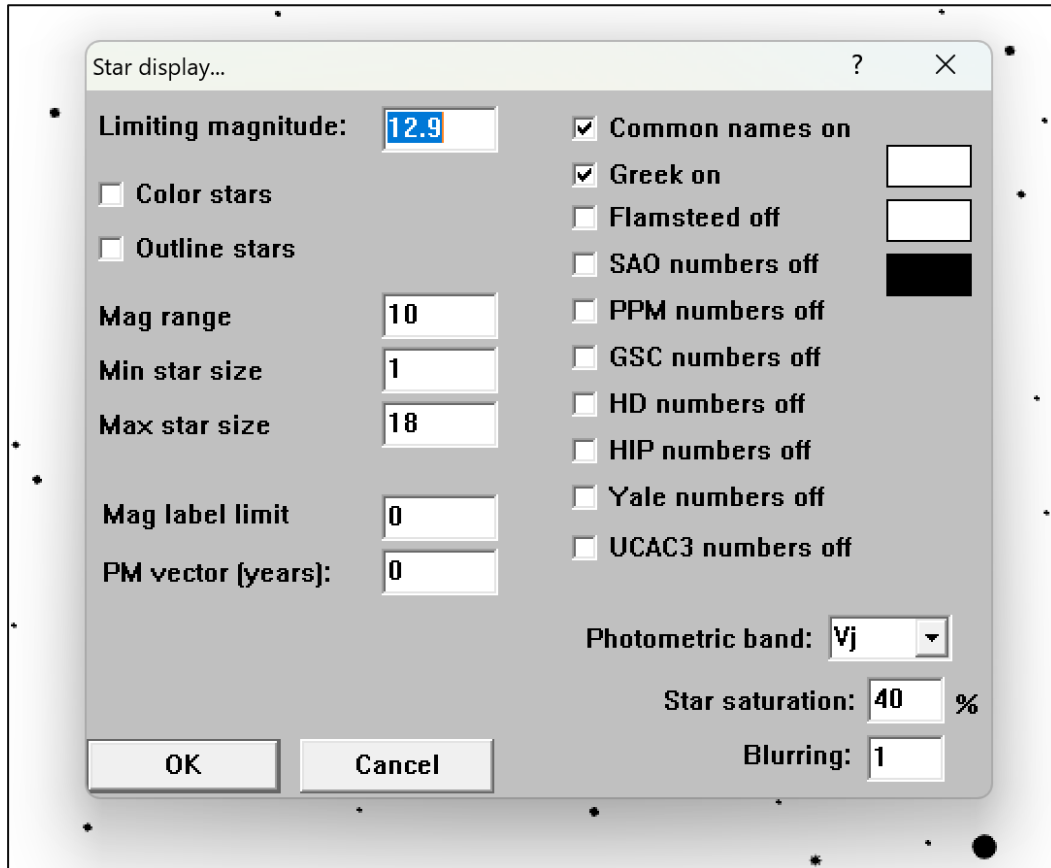
- Under Animation, select Animation Dialog and set a desired step size for stepping along the prepoint line.
- The units for step size are sec, min, hour, day.
- The default is day. If you forget to specify a unit, Guide will use day
- You can move back and forth along the line with the single headed arrows at the top. The double headed jump to the beginning and end of the line.
- The step size for moving along the line can be changed at any time. The units for time display can only be changed by deleting and re-entering the line on the add a trail dialog



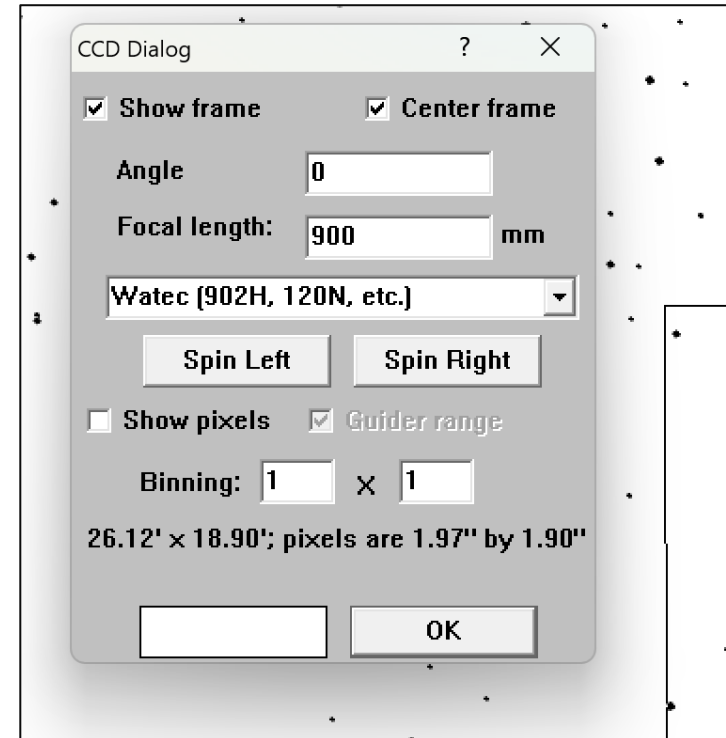
Setting Guide Display

Display what works for you.

Menus



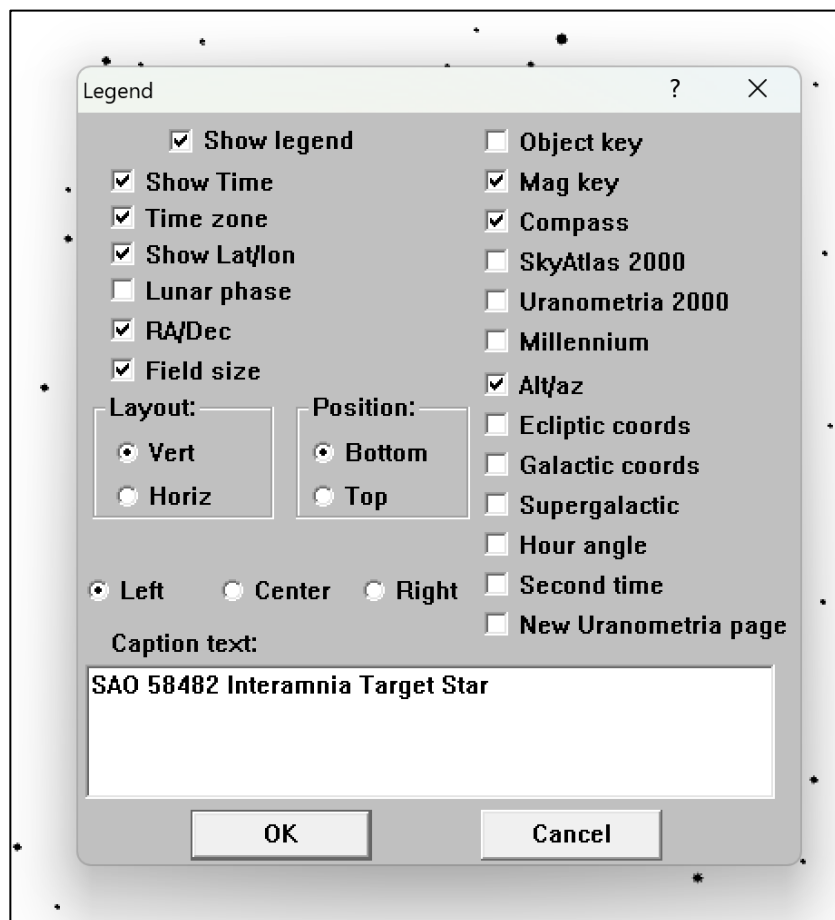
Star display – Note the black patch next to the SAO numbers. The default is to give them in blue which is hard to read in the dark



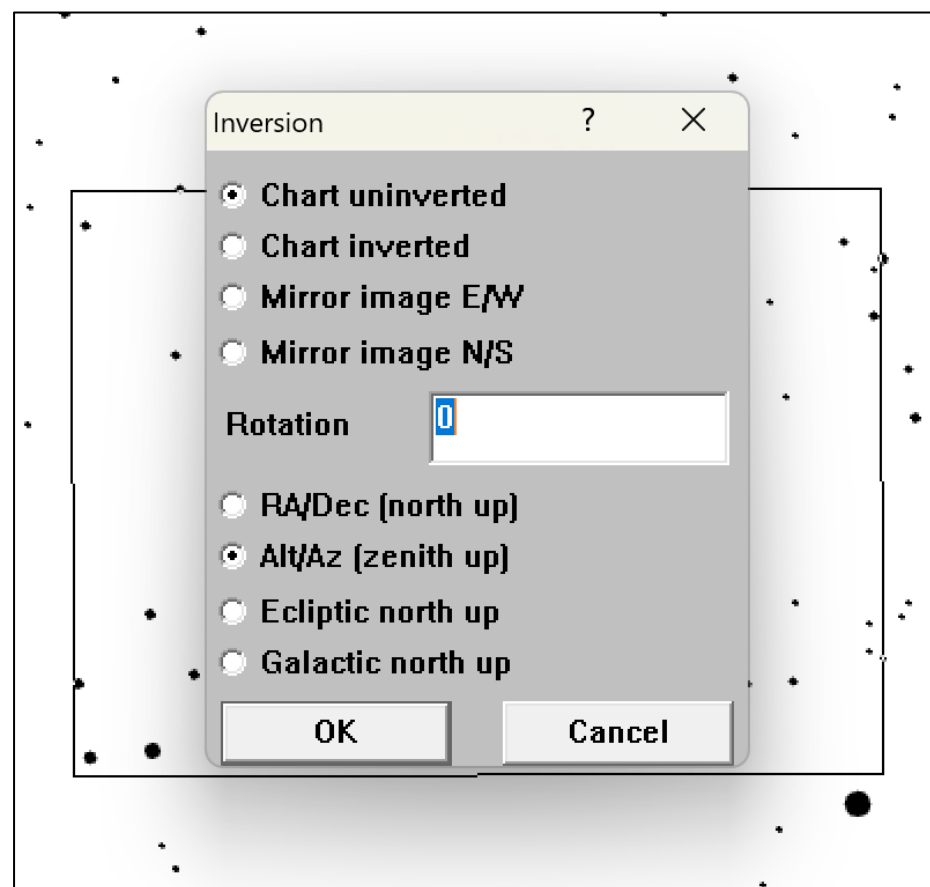
CCD dialog – set the frame size for the CCD display. The two we use are 900mm for the main camera and 120mm for the finder camera.

More Menus

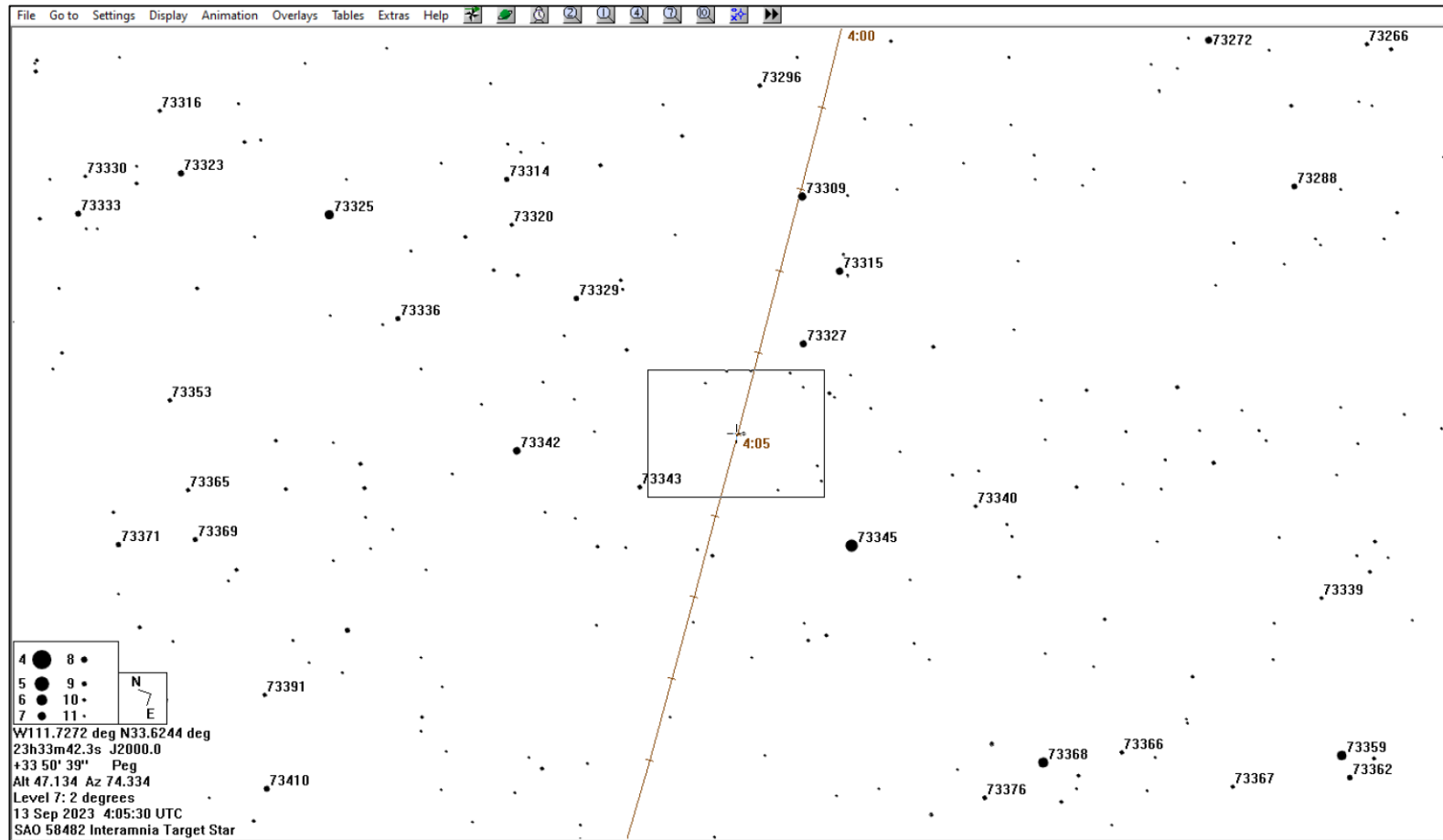
Legend – Select what is shown about the chart and where it is displayed



Inversion – Set the chart to show what is displayed by your scope and camera

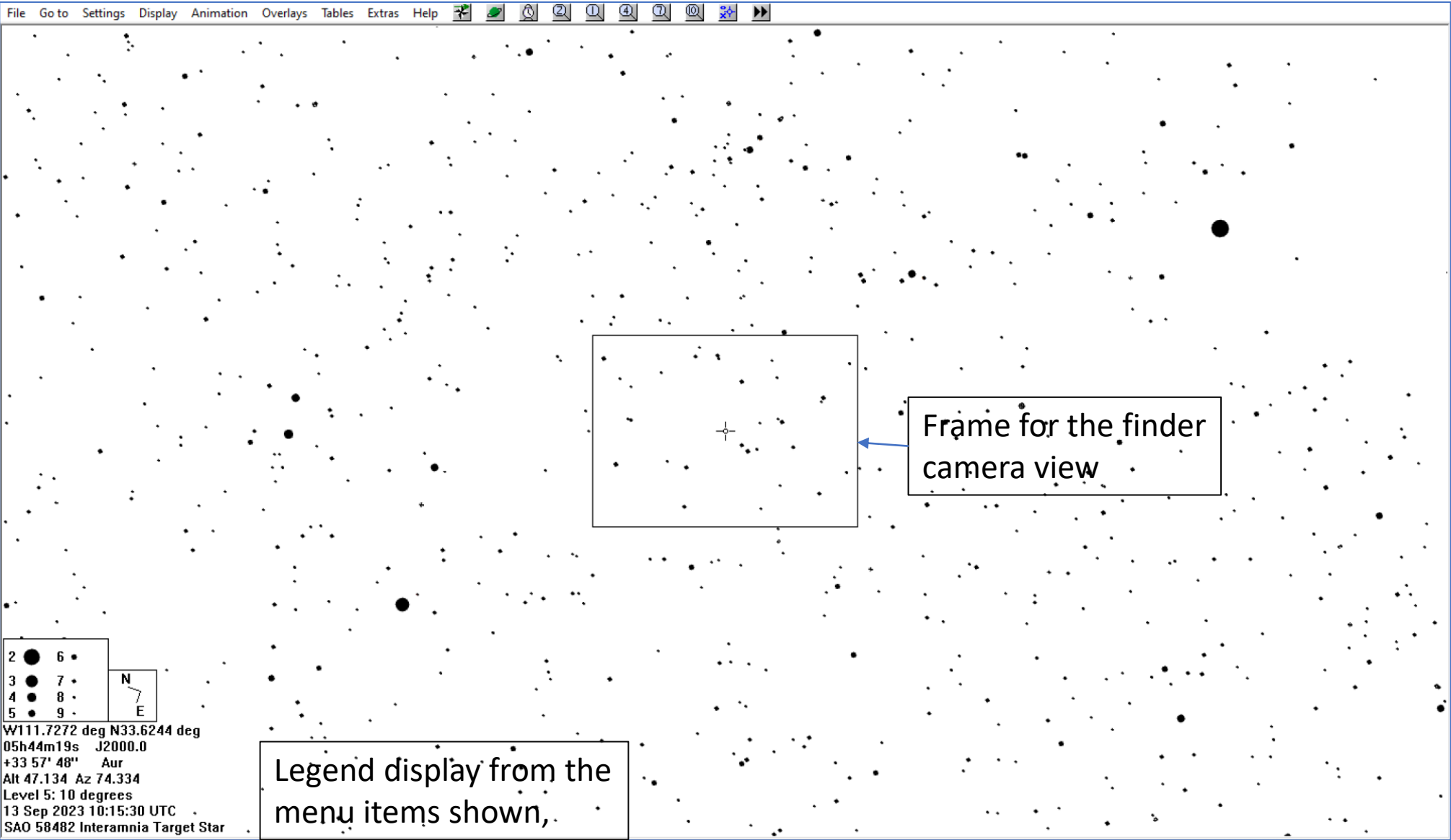


Example of a Trail



Example of a prepoint trail for Interamnia at our Fountain Hills location , showing a nice prepoint target, SAO 73309, at 4:02 UT

A Level 5 chart for the finder scope



How We Use Finder Charts

Pre-Pointing

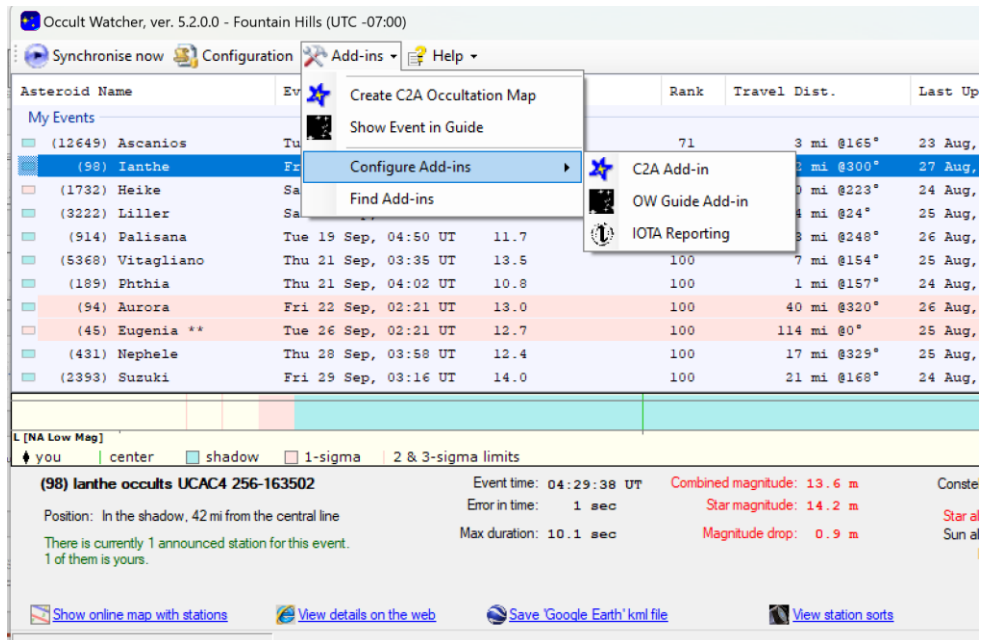
- What we use
 - Level 8 (1 degree), and/or a Level 7 (2 degrees) for the main scope
 - Add SAO numbers if we are using the Skywatcher
 - Add HIP numbers if we are using the iOptron
 - Inverted charts for the 10" suitcase scope
 - Level 5 (10 degree) for the finder
 - Our finders are equipped with cameras, but this also works for visual finders
- We print all the charts we might need, especially if we are going to be away from the printer. For time spans that cover multiple hours, that can be quite a few charts.
- With prepointing, a single observer can have multiple sites. If every observer were to add one station, that would double our observing capability.

Other Considerations

- Prepointed scopes are usually undriven, since they operate unattended.
- The time available for recording the event as the target star drifts across the field depends on the field of view (FOV). The bigger the FOV, the more time for recording.
 - Shorter focal length scopes have wider FOV
 - A focal reducer on the camera gives a larger FOV
- Roger Venable's talk "Near Earth Asteroid Observation Principles" gave more information on scopes, equipment, and observing locations for remote sites at the 2022 IOTA Annual Meeting
 - [Occultations.org>Community>Meetings/Conferences](https://occultations.org/Community/Meetings/Conferences), select the 2022 meeting and then select the link to his presentation

OccultWatcher Guide Add-in

- Add-in posts user location and star data for a selected event into Guide



You can find the add-in here, in Occult Watcher. Follow the instructions it will provide, basically asking where on your computer to find Guide.

Select an event and click on the “Show Event in Guide”. Guide will then display a finder chart for you with the target star centered and the time and location data for your position as specified in your Occult Watcher configuration.

The add-in was created by Andreas Eberle and is maintained by Hristo Pavlov.

Comments on Guide Use

- It uses older catalogs, UCAC3 not UCAC4 or Gaia data
- Entering comet or asteroid data is not easy